STEERING SYSTEM

SECTION ST

CONTENTS

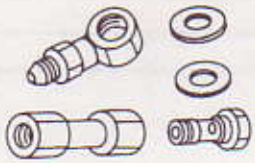
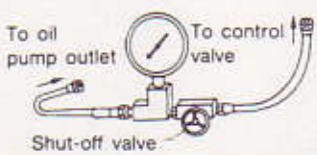
Precautions

- 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.
- When disassembling parts, be sure to place them in order on a part rack so they can be reinstalled in their proper positions.
- Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.
- Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.
- Before assembly, apply a coat of recommended A.T.F.* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.

*: Automatic transmission fluid

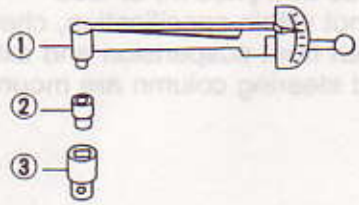
Preparation

SPECIAL SERVICE TOOLS

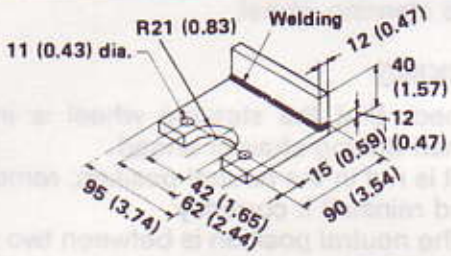
Tool number Tool name	Description	Application	
		R24N	PR26SC
KV48100700 Torque adapter	 Measuring pinion rotating torque	—	X
KV48101100 Torque adapter	 Measuring pinion rotating torque	X	—
KV48102500 Pressure gauge adapter	 Measuring oil pressure	—	X
ST27180001 Steering wheel puller	 Removing and installing steering wheel	X	X
ST27850000 Ball joint remover	 Removing ball joint	X	X
ST27091000 Pressure gauge	 Measuring oil pressure	—	X

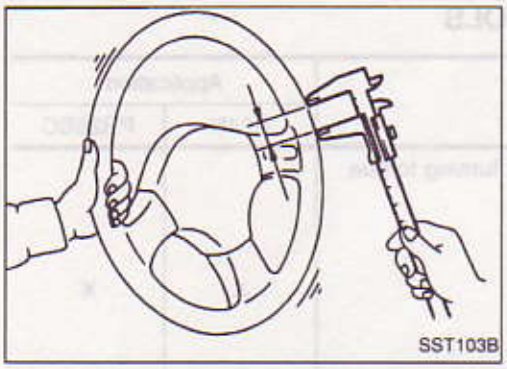
Preparation (Cont'd)

SPECIAL SERVICE TOOLS

Tool number Tool name	Description	Application	
		R24N	PR26SC
ST3127S000 ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter	Measuring turning torque 	X	X

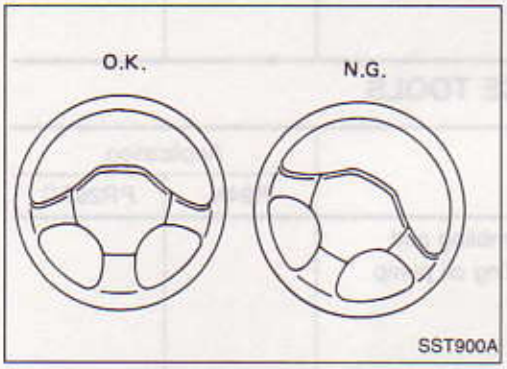
COMMERCIAL SERVICE TOOLS

Tool number Tool name	Description	Application	
		R24N	PR26SC
Oil pump attachment	Disassembling and assembling oil pump  Unit: mm (in)	—	X


SST103B

Checking Steering Wheel Play

1. With wheels in a straight-ahead position, check steering wheel play.
   Steering wheel play:
   35 mm (1.38 in) or less
2. If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.



SST900A

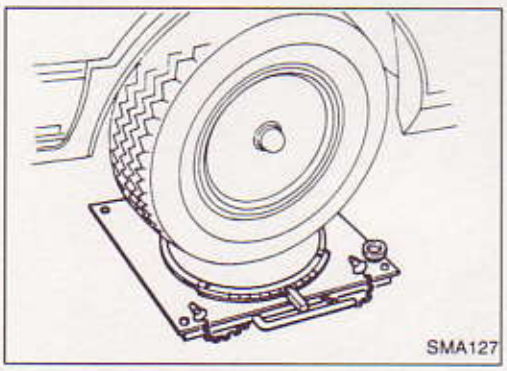
Checking Neutral Position on Steering Wheel

PRE-CHECKING

- Make sure that wheel alignment is correct.
  Wheel alignment:
  Refer to section FA for S.D.S.
- Verify that the steering gear is centered before removing the steering wheel.

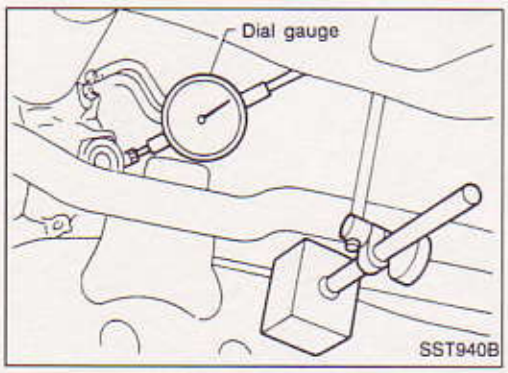
CHECKING

1. Check that the steering wheel is in the neutral position when driving straight ahead.
2. If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
3. If the neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in the neutral position.


SMA127

Front Wheel Turning Angle

1. Rotate steering wheel all the way right and left; measure turning angle.
   Turning angle of full turns:
   Refer to section FA for S.D.S.
2. If it is not within specification, check rack stroke.
   Rack stroke "L":
   Refer to S.D.S.



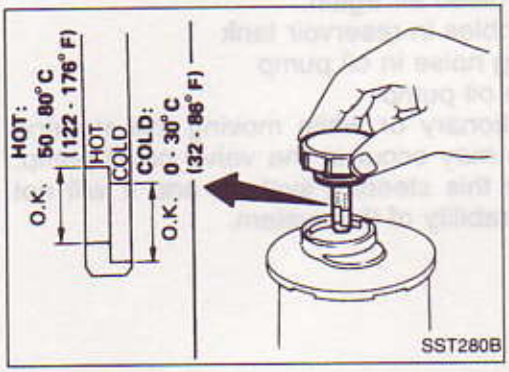
SST940B

Checking Gear Housing Movement

1. Check the movement of steering gear housing during stationary steering on a dry paved surface.
- Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement.
  Turn off ignition key while checking on models equipped with power steering.
  Movement of gear housing:
  ±2 mm (±0.08 in) or less
2. If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.

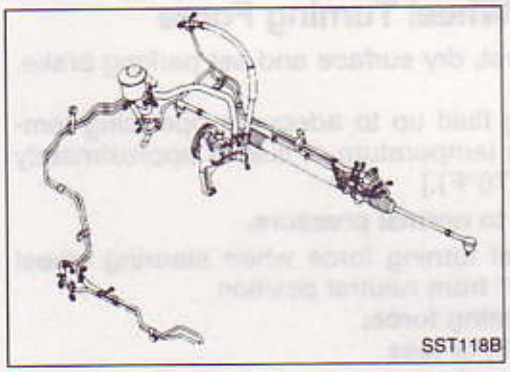


Checking Fluid Level

Check fluid level.
Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "DEXRON™" type.**



Checking Fluid Leakage

Check the lines for improper attachment and for leaks, cracks, damage, loose connections, chafing or deterioration.

1. Run engine between idle speed and 1,000 rpm.

Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).

2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

CAUTION:
Do not hold the steering wheel in a locked position for more than 15 seconds.

4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.

Do not overtighten connector as this can damage O-ring, washer and connector.

Bleeding Hydraulic System

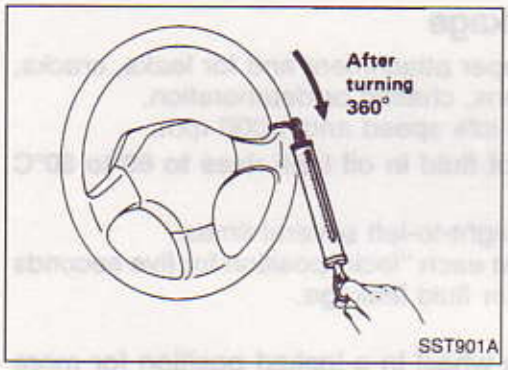
1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Meanwhile quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   Repeat step 2 above.

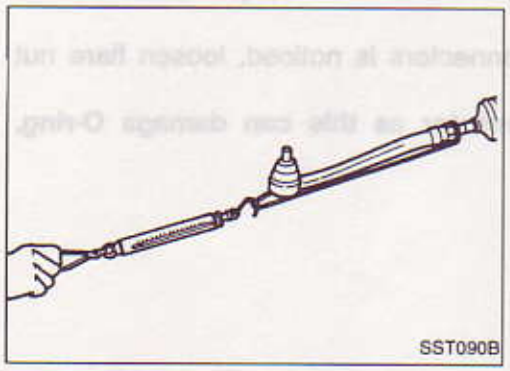
- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

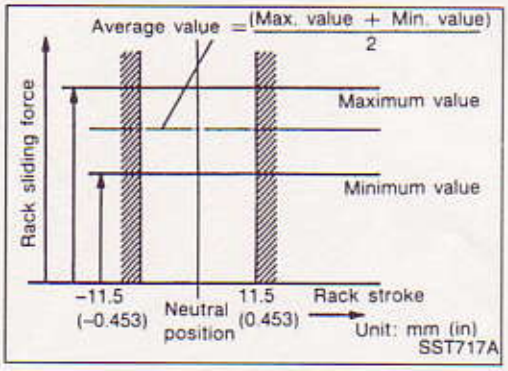
a. Generation of air bubbles in reservoir tank
b. Generation of clicking noise in oil pump
c. Excessive buzzing in oil pump

While the vehicle is stationary or while moving the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this steering system, and it will not affect performance or durability of the system.

Checking Steering Wheel Turning Force







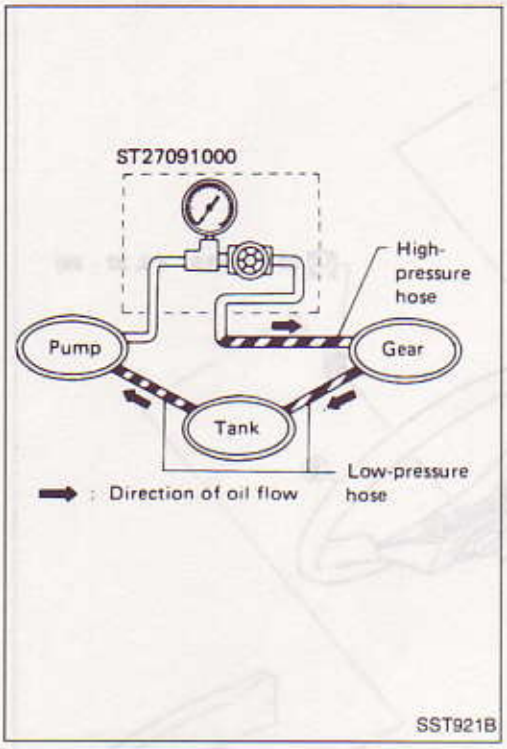
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

Tires need to be inflated to normal pressure.

4. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.
   Steering wheel turning force:
   39 N (4 kg, 9 lb) or less
5. If steering wheel turning force is out of specifications, check rack sliding force to detect condition of steering gear assembly.

a. Disconnect steering column lower joint and knuckle arms from the gear.
b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.
c. While pulling tie-rod slowly in the ±11.5 mm (±0.453 in) range from the neutral position, make sure rack sliding force is within specification.
   Average rack sliding force:
   284 N (29 kg, 64 lb)
d. Check sliding force outside above range.
   Maximum rack sliding force:
   Not more than 39 N (4 kg, 9 lb) beyond above value

6. If rack sliding force is not within specification, overhaul steering gear assembly.



Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
2. Run engine.

Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).

WARNING:

Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, oil pressure in oil pump will increase to relief pressure, resulting in an abnormal rise in oil temperature.

3. Check pressure with steering wheel fully turned to left and right positions with engine idling at 1,000 rpm.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

Oil pump maximum standard pressure:
7,846 kPa (78.5 bar, 1,138 psi)

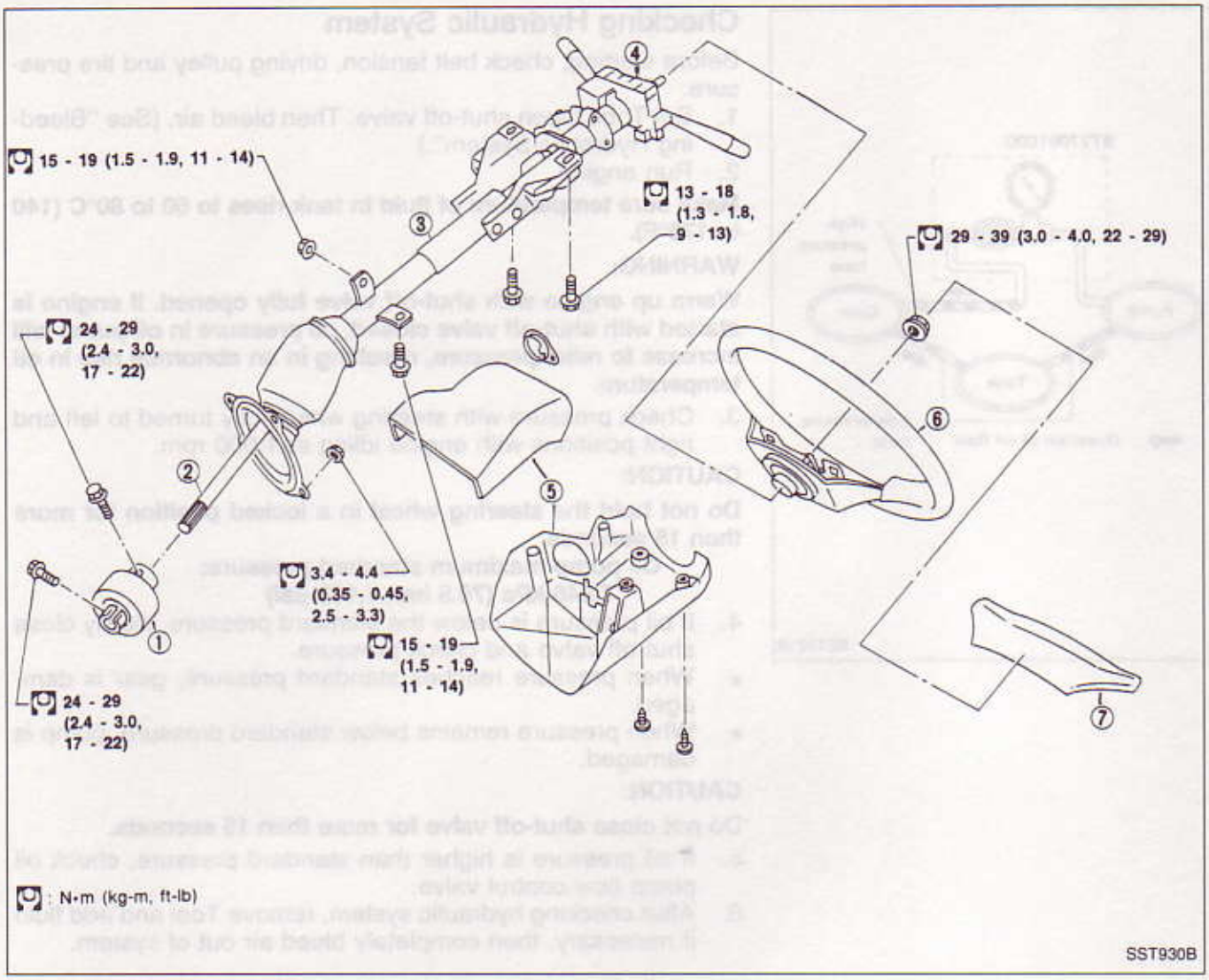
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.

- When pressure reaches standard pressure, gear is damaged.
- When pressure remains below standard pressure, pump is damaged.

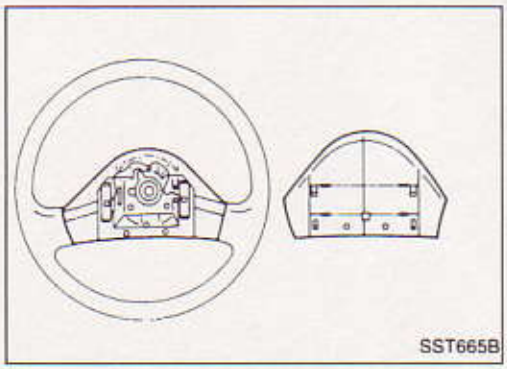
CAUTION:

Do not close shut-off valve for more than 15 seconds.

5. If oil pressure is higher than standard pressure, check oil pump flow control valve.
6. After checking hydraulic system, remove Tool and add fluid if necessary, then completely bleed air out of system.



① Column lower joint
② Column shaft
③ Column bracket
④ Combination switch
⑤ Column covers
⑥ Steering wheel
⑦ Horn pad



Removal

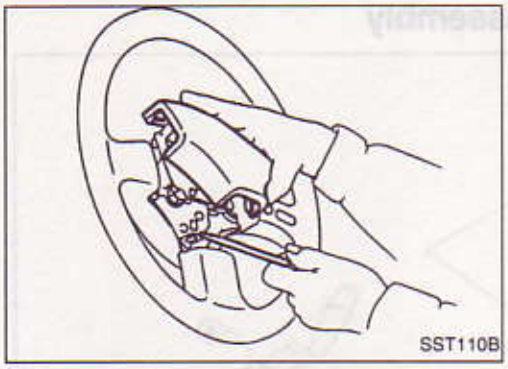
STEERING WHEEL

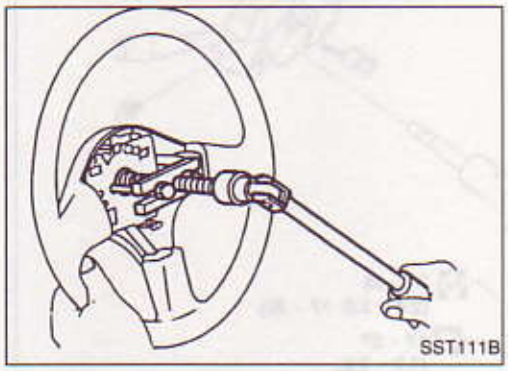
1. Remove horn pad.

— Two spoke type —

Removal (Cont'd)

— Three spoke type —


SST110B

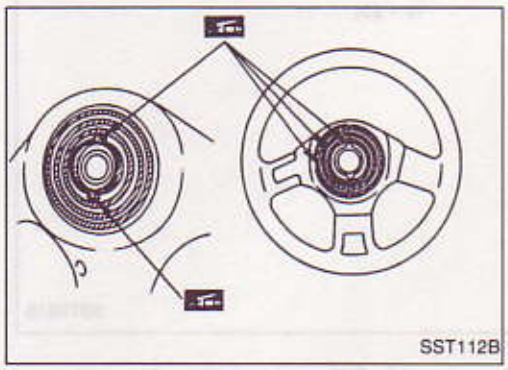

SST111B

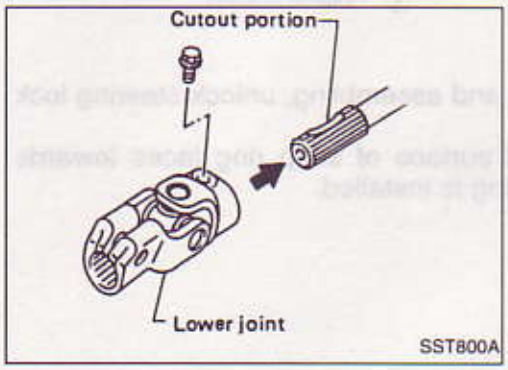
2. Remove steering wheel with Tool.

Installation

STEERING WHEEL

When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.


SST112B



SST800A

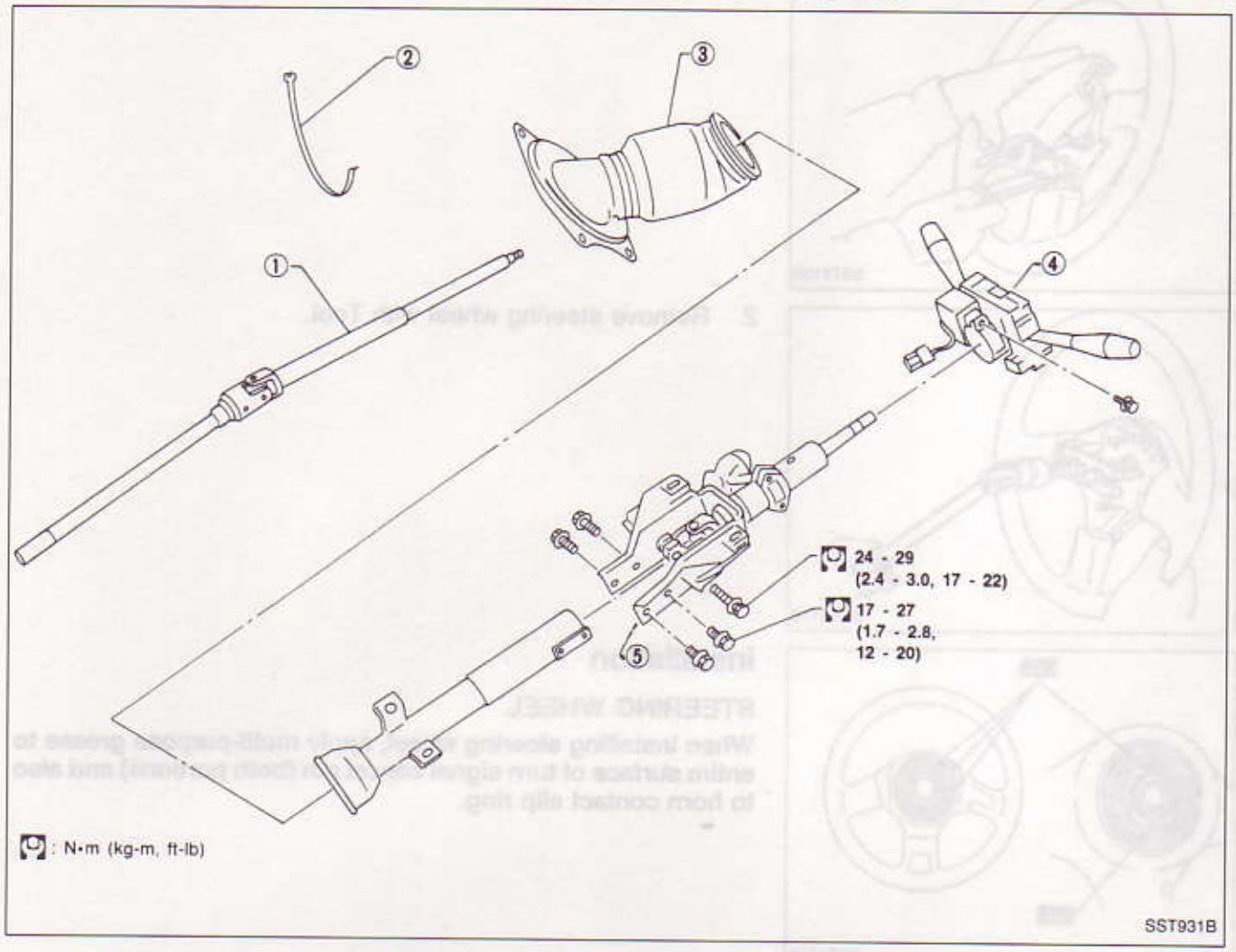
STEERING COLUMN

- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.
- When attaching coupling joint, be sure tightening bolt faces cutout portion.

CAUTION:

After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal. Be sure that the steering wheel is in a neutral position when driving straight ahead.

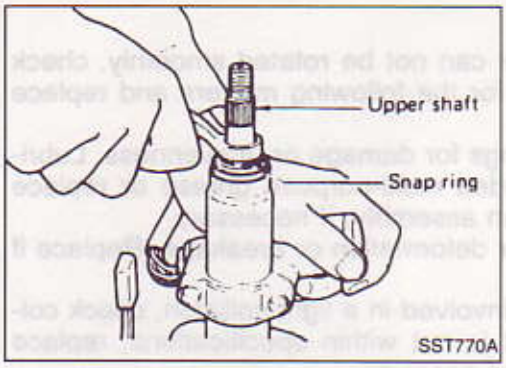
Disassembly and Assembly



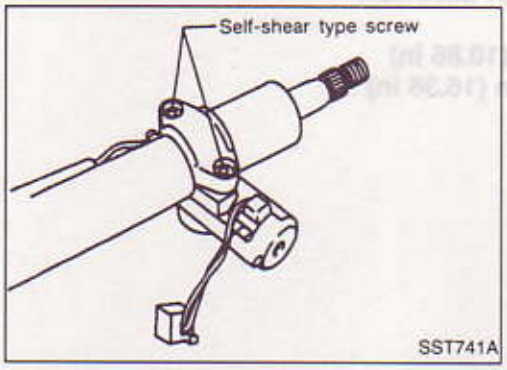
① Column shaft
② Clamp
③ Boot
④ Combination switch
⑤ Column bracket

- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces towards bearing when snap ring is installed.

Disassembly and Assembly (Cont'd)

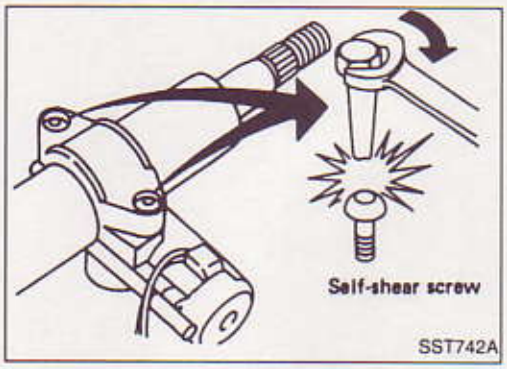


- Install snap ring on upper shaft with a suitable tool.

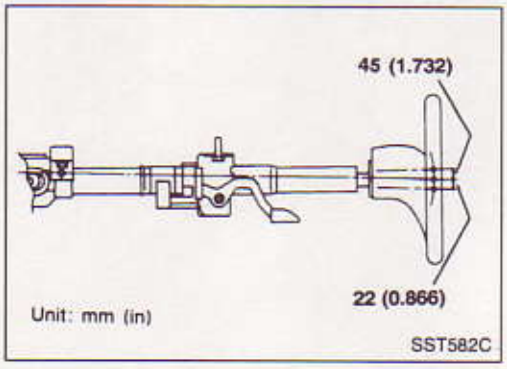


- Steering lock

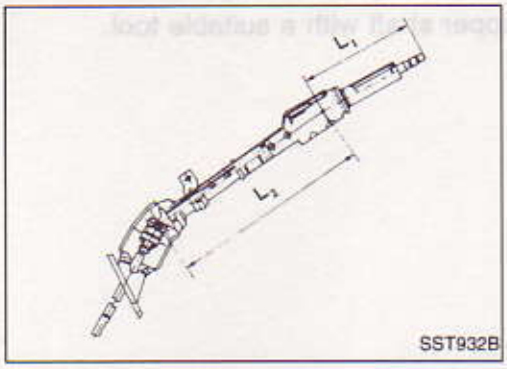
a. Break self-shear type bolts with a drill or other appropriate tool.



b. Install self-shear type bolts and tighten until bolt heads break off.



- After installing steering column, check tilt mechanism operation. (Vehicles with tilt system)



Inspection

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.

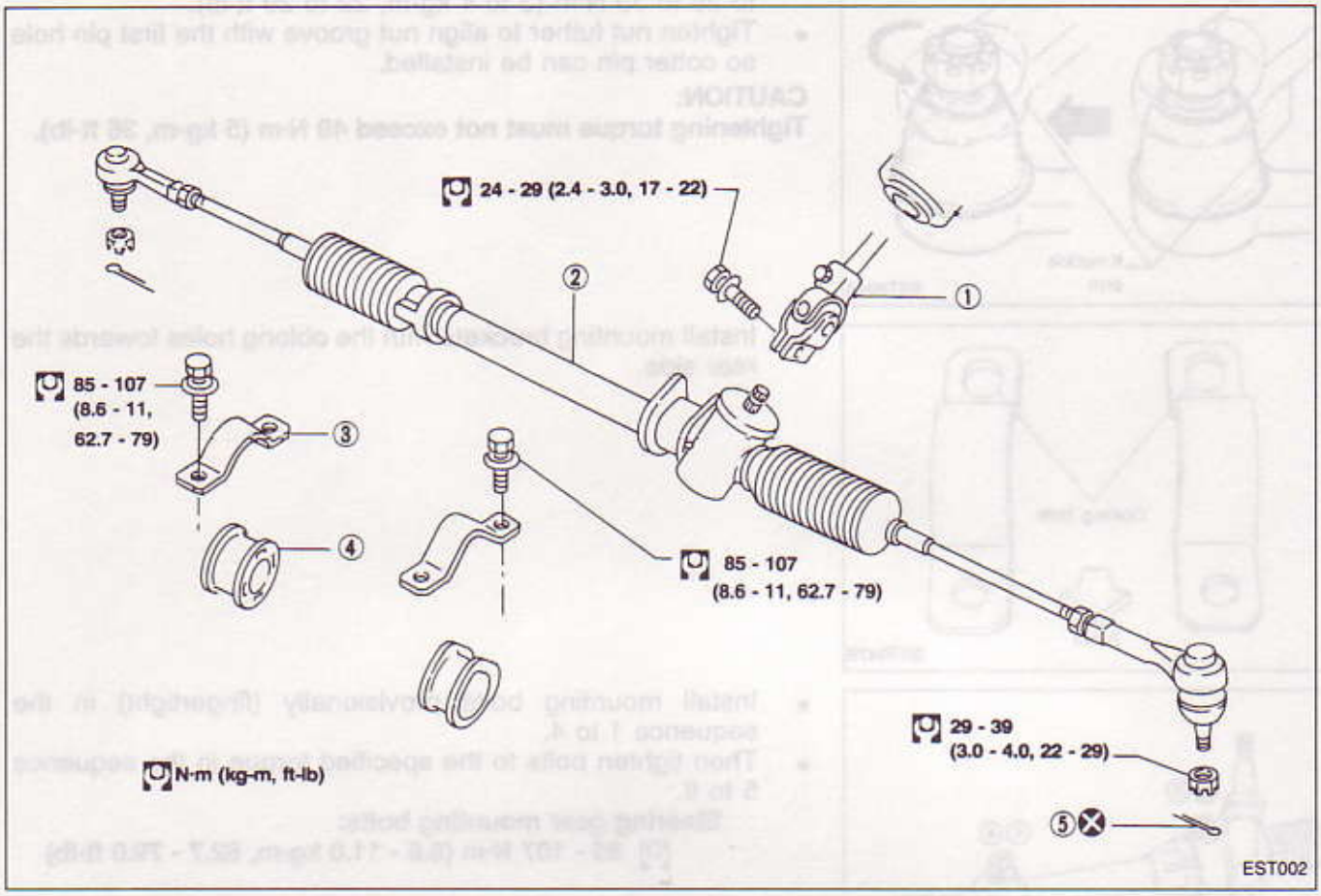
a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.

b. Check jacket tube for deformation or breakage. Replace if necessary.

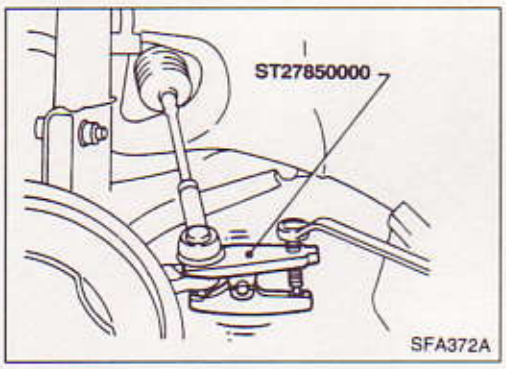
- When the vehicle is involved in a light collision, check column length "L". If it is not within specifications, replace steering column as an assembly.

Column length:
"L_1" 276 mm (10.86 in)
"L_2" 415.7 mm (16.36 in)

Removal and Installation

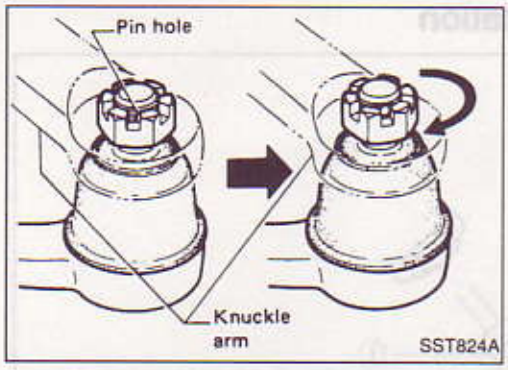


① Lower joint
② Manual steering gear assembly
③ Steering gear mounting clamp
④ Rack mounting insulator
⑤ Cotter pin



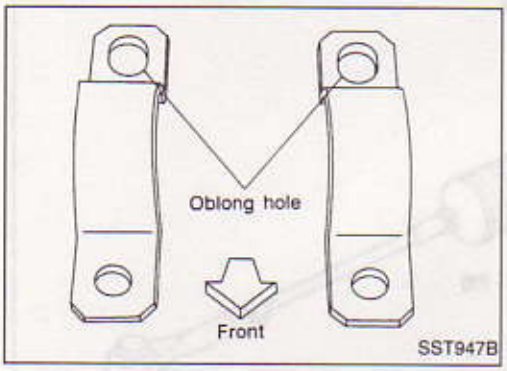
- Detach tie-rod ball studs from knuckle arms with Tool.

Removal and Installation (Cont'd)

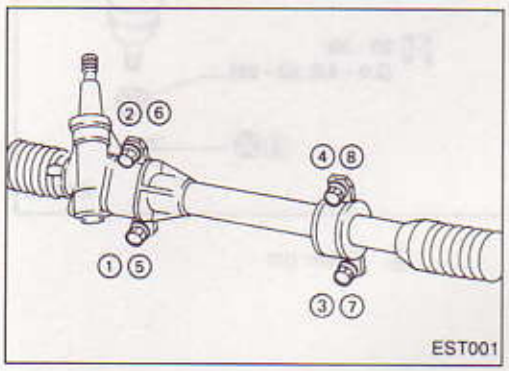


- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb).
- Tighten nut futher to align nut groove with the first pin hole so cotter pin can be installed.

CAUTION:
Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).



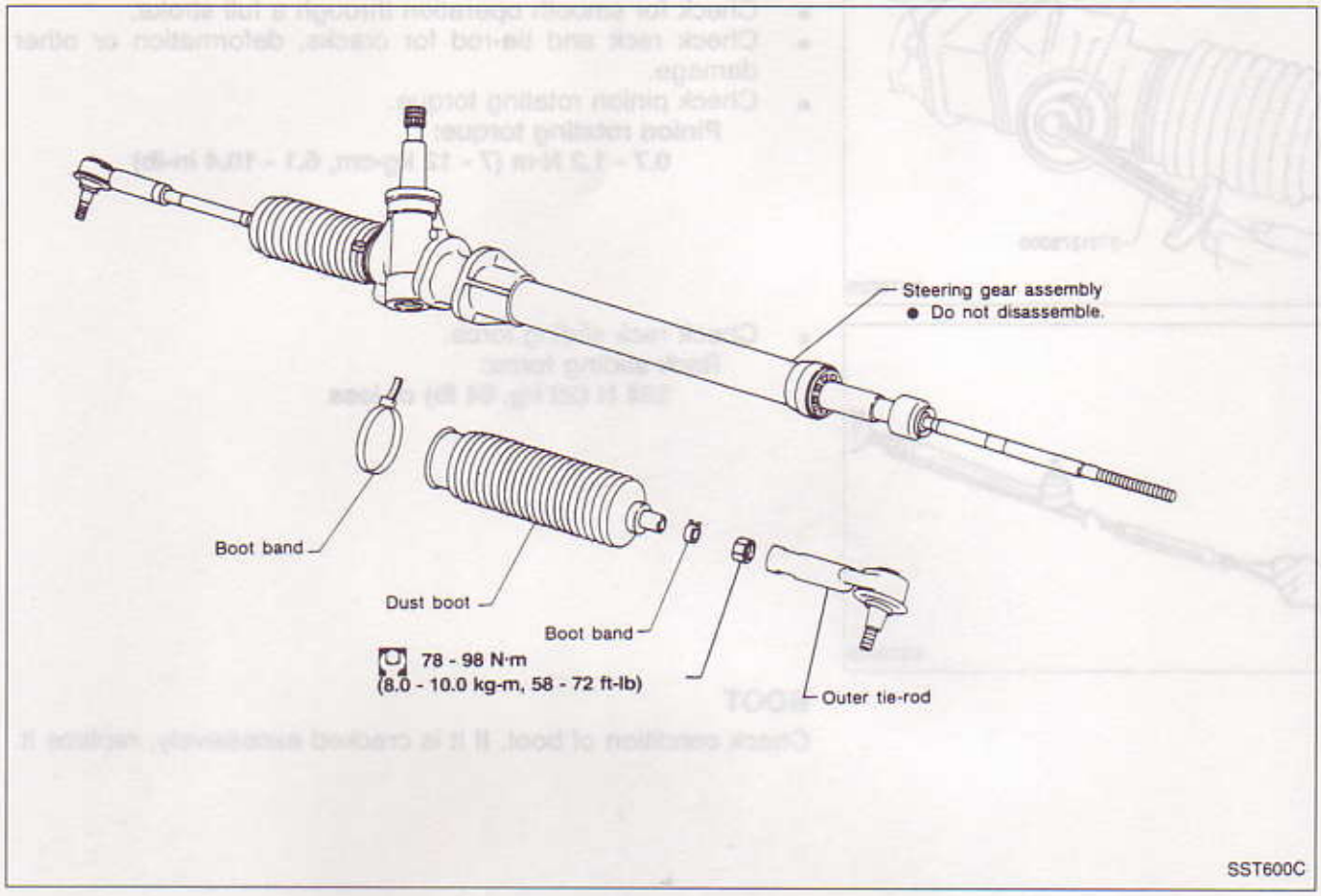
- Install mounting brackets with the oblong holes towards the rear side.

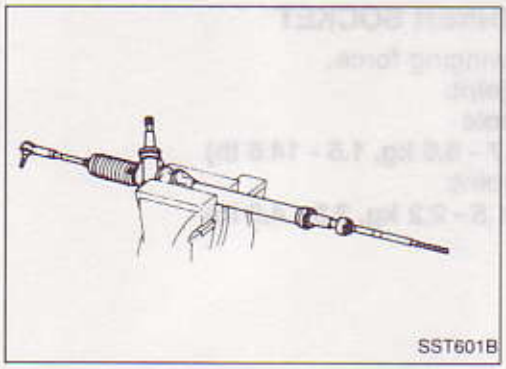


- Install mounting bolts provisionally (fingertight) in the sequence 1 to 4.
- Then tighten bolts to the specified torque in the sequence 5 to 8.

Steering gear mounting bolts:
85 - 107 N·m (8.6 - 11.0 kg-m, 62.7 - 79.0 ft-lb)

Disassembly





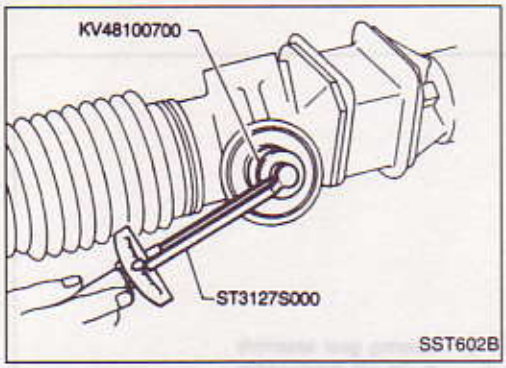
Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.

1. Remove outer tie-rod.
2. Remove dust boot.

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "Dexron™" type, and blow dry with compressed air, if available.

Inspection (Cont'd)

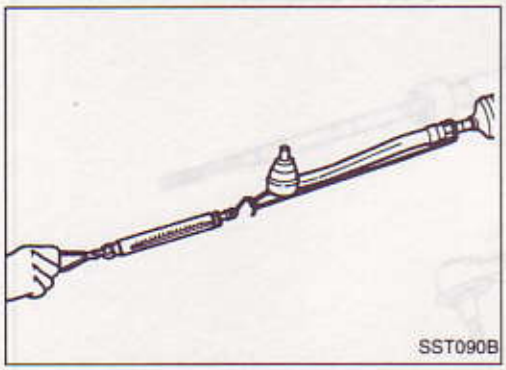


STEERING GEAR ASSEMBLY

- Check for smooth operation through a full stroke.
- Check rack and tie-rod for cracks, deformation or other damage.
- Check pinion rotating torque.

  Pinion rotating torque:

  0.7 - 1.2 N·m (7 - 12 kg-cm, 6.1 - 10.4 in-lb)



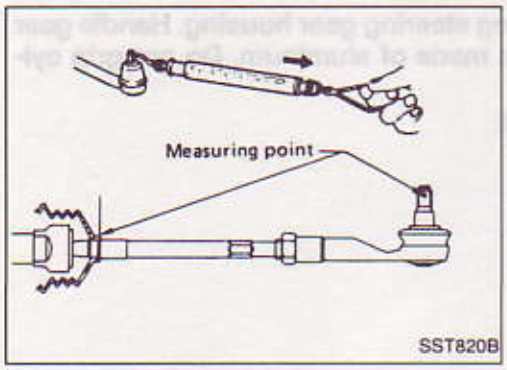
- Check rack sliding force.

  Rack sliding force:

  284 N (29 kg, 64 lb) or less

BOOT

Check condition of boot. If it is cracked excessively, replace it.



TIE-ROD OUTER AND INNER SOCKET

- Check ball joint for swinging force.

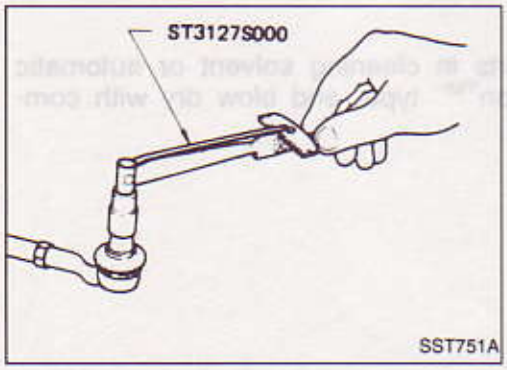
  Tie-rod outer ball joint:

  At cotter pin hole

  6.9 - 64.7 N (0.7 - 6.6 kg, 1.5 - 14.6 lb)

  Tie-rod inner ball joint:

  14.7 - 21.6 N (1.5 - 2.2 kg, 3.3 - 4.9 lb)



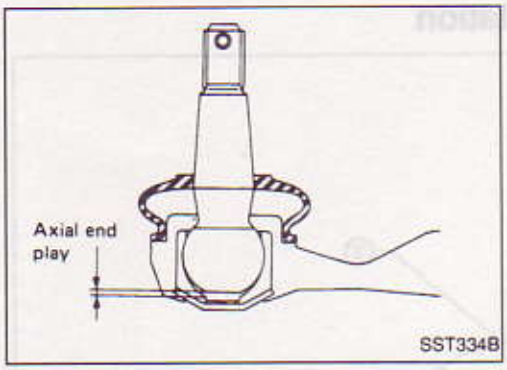
- Check ball joint for rotating torque.

  Tie-rod outer ball joint:

  0.3 - 2.9 N·m

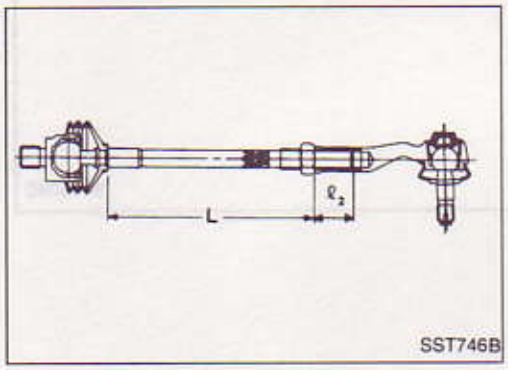
  (3 - 30 kg-cm, 2.6 - 26.0 in-lb)

Inspection (Cont'd)



- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  Less than 0.5 mm (0.020 in)
  Tie-rod inner ball joint:
  0 mm (0 in)

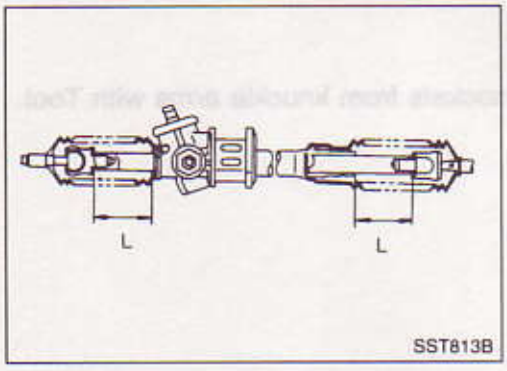
- Check condition of dust cover. If it is cracked excessively, replace ball joint.



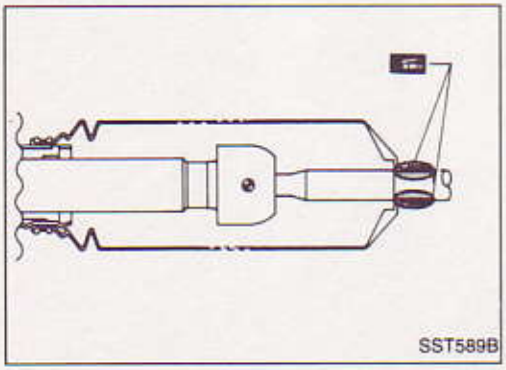
Assembly

TIE-ROD AND BOOT

1. Install boot on tie-rod inner socket.
2. Apply locking sealant to threaded portion of inner socket and install tie-rod inner socket to rack end together with spacer and new lock plate.
3. Install lock nut and outer socket to inner socket. Adjust tie-rod length "L" and tighten lock nut.
   Tie-rod length "L": Refer to S.D.S.
   Screwed length "ℓ_2": 43.6 mm (1.716 in)



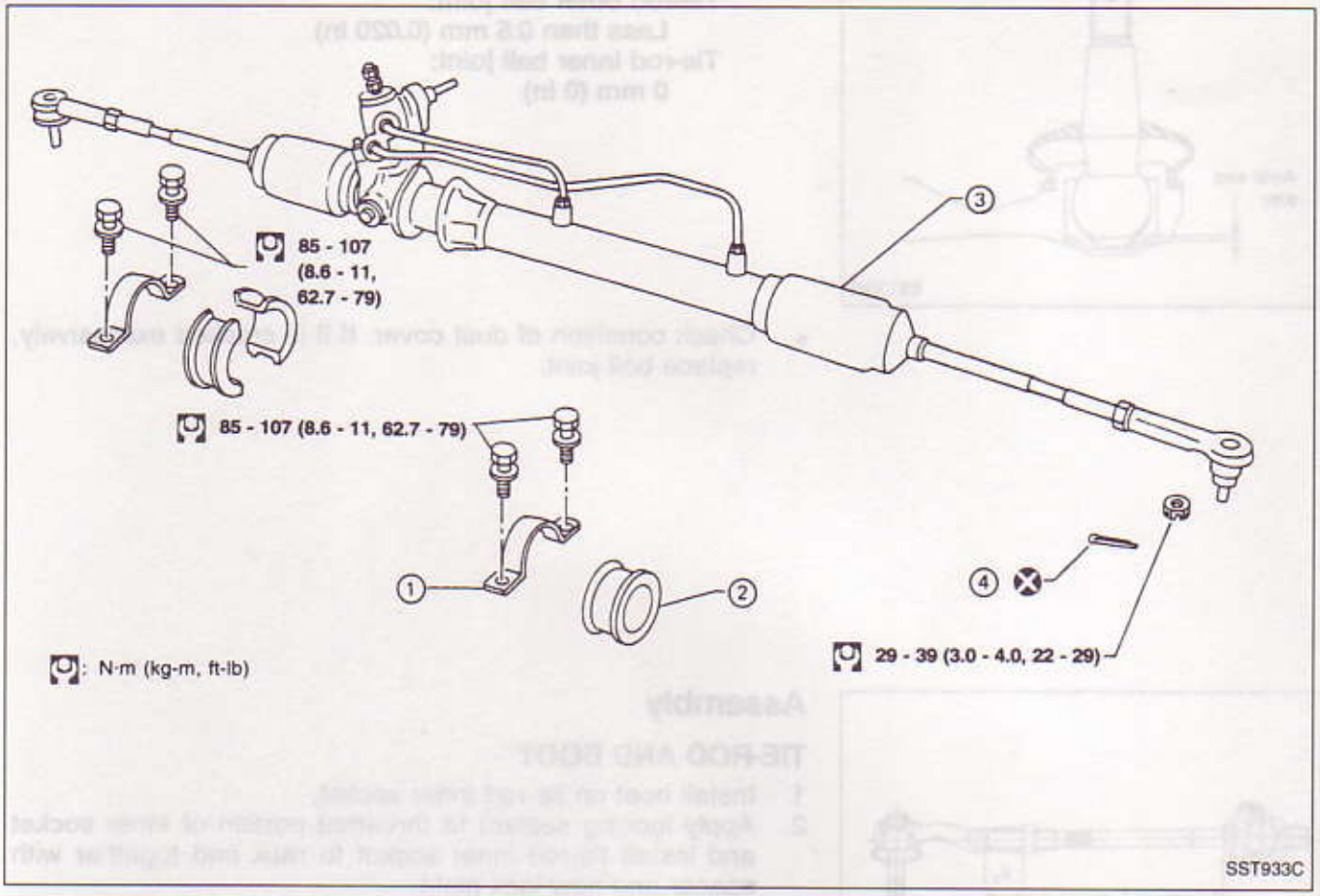
4. Measure rack stroke.
   Measure length "L":
   Refer to S.D.S.



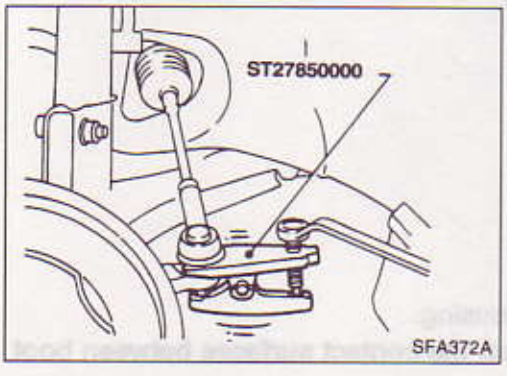
5. Install boot to gear housing.

Before installing boot, coat the contact surfaces between boot and tie-rod with grease.

Removal and Installation

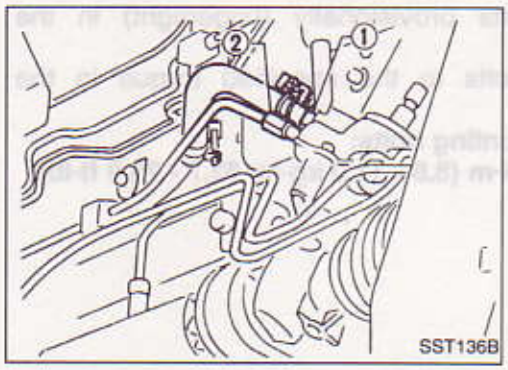


① Gear housing mounting bracket
② Rack mounting insulator
③ Gear and linkage assembly
④ Cotter pin



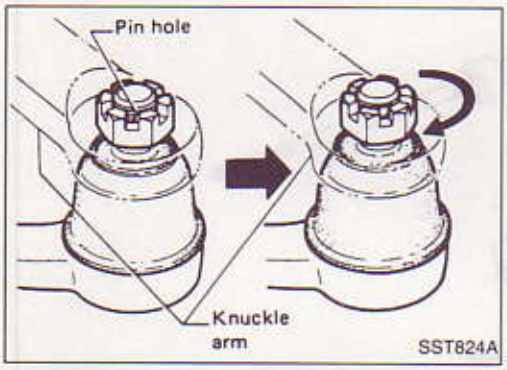
- Detach tie-rod outer sockets from knuckle arms with Tool.

Removal and Installation (Cont'd)



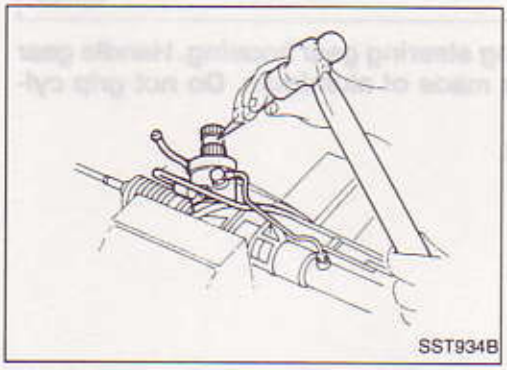
- Install pipe connectors.
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.

Connector tightening torque:
Low-pressure side "1"
27 - 39 N·m (2.8 - 4.0 kg-m, 20 - 29 ft-lb)
High-pressure side "2"
15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)

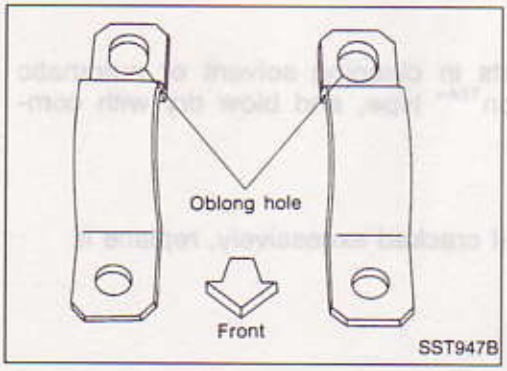


- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb).
- Tighten nut further to align nut groove with the first pin hole so cotter pin can be installed.

CAUTION:
Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).

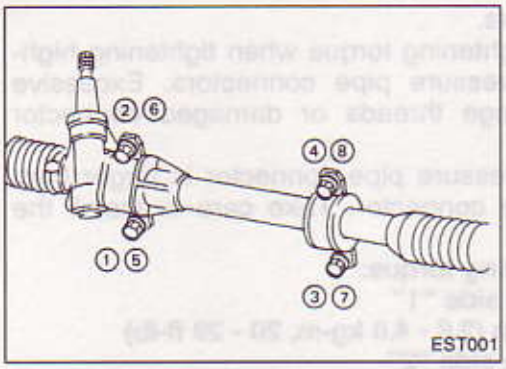


- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matching marks of pinion shaft and pinion housing.



- Install mounting brackets with the oblong holes towards the rear side.

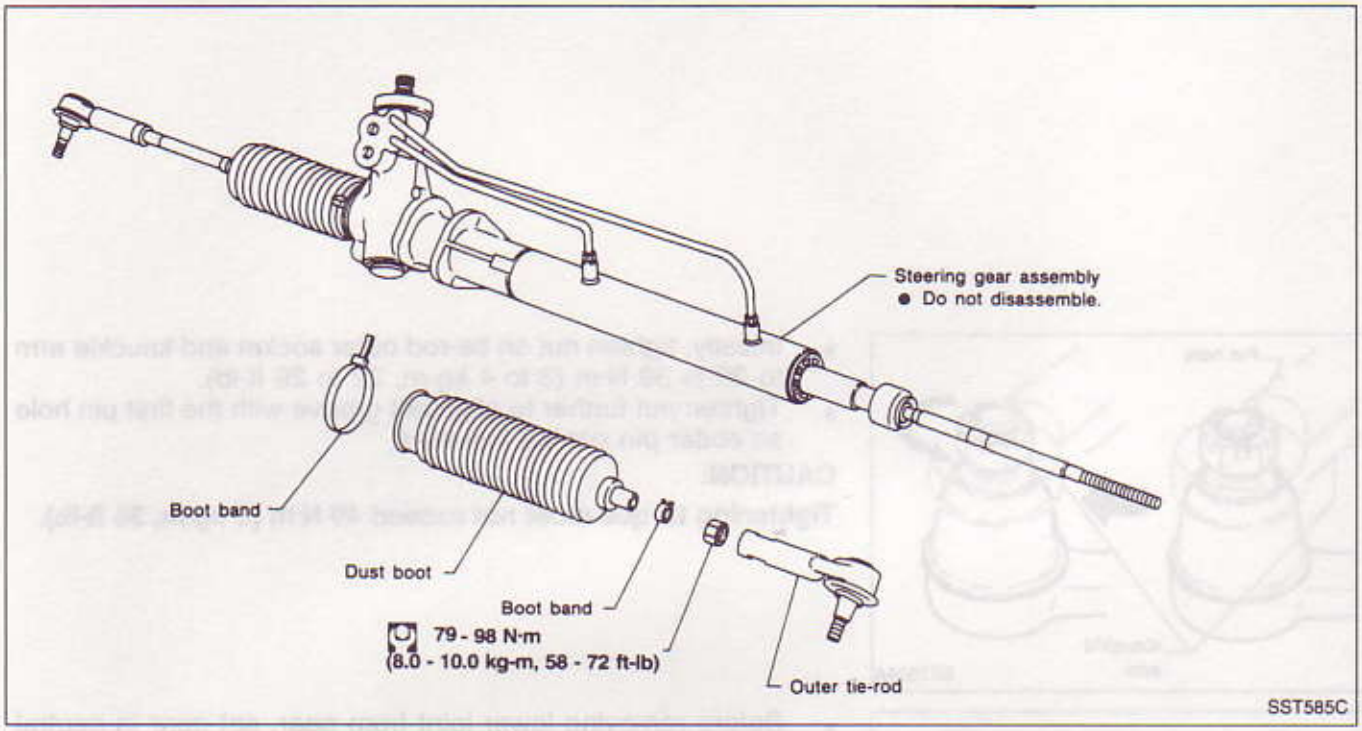
Removal and Installation (Cont'd)

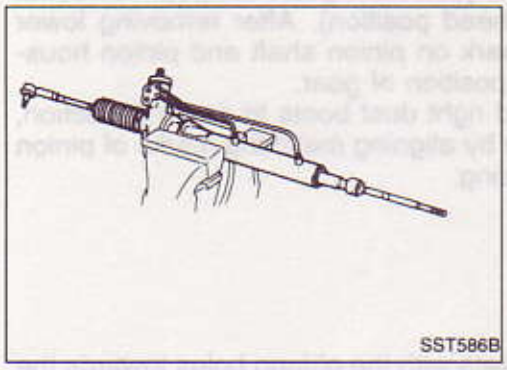


- Install mounting bolts provisionally (fingertight) in the sequence 1 to 4.
- Then tighten the bolts to the specified torque in the sequence 5 to 8.

Steering gear mounting bolts:
: 85 - 107 N·m (8.6 - 11.0 kg-m, 62.7 - 79.0 ft-lb)

Disassembly





Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.

1. Remove outer tie-rod.
2. Remove dust boot.

Inspection

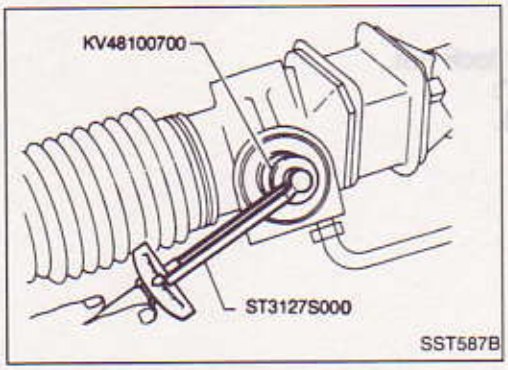
Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "Dexron™" type, and blow dry with compressed air, if available.

BOOT

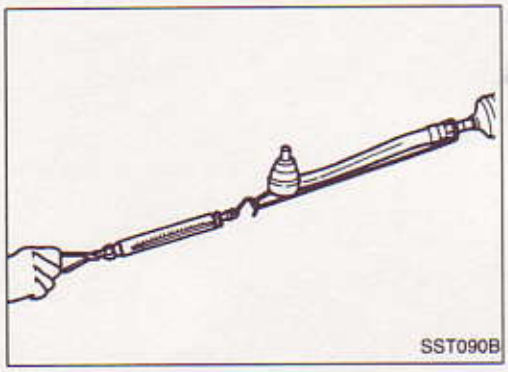
Check condition of boot. If cracked excessively, replace it.

Inspection (Cont'd)

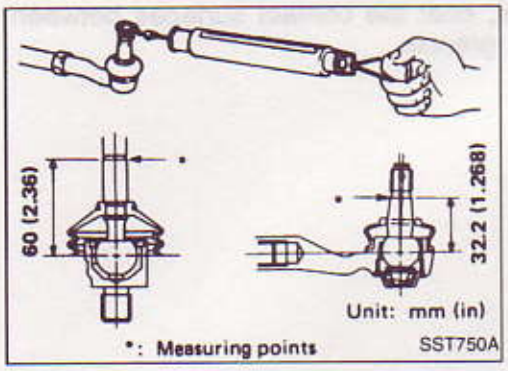
STEERING GEAR ASSEMBLY



- Check for smooth operation through a full stroke.
- Check rack and tie-rod for cracks, deformation or other damage.
- Check pinion rotating torque:
  Pinion rotating torque:
  0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)

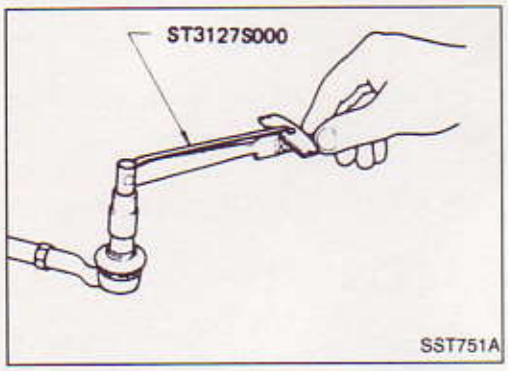


- Check rack sliding force.
  Rack sliding force:
  284 N (29 kg, 64 lb) or less

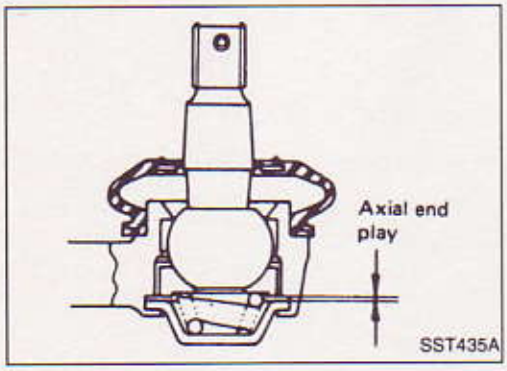


TIE-ROD OUTER AND INNER SOCKET

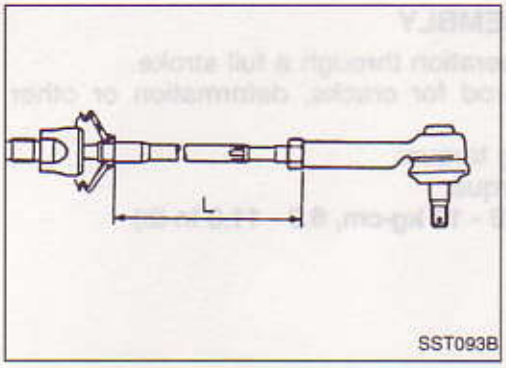
- Check ball joint for swinging force.
  Tie-rod outer ball joint:
  6.9 - 63.7 N
  (0.7 - 6.5 kg, 1.5 - 14.3 lb)
  Tie-rod inner ball joint:
  16.7 - 147.1 N
  (1.7 - 15 kg, 3.7 - 33.1 lb)



- Check ball joint for rotating torque.
  Tie-rod outer ball joint:
  0.3 - 2.9 N·m
  (3 - 30 kg-cm, 2.6 - 26.0 in-lb)

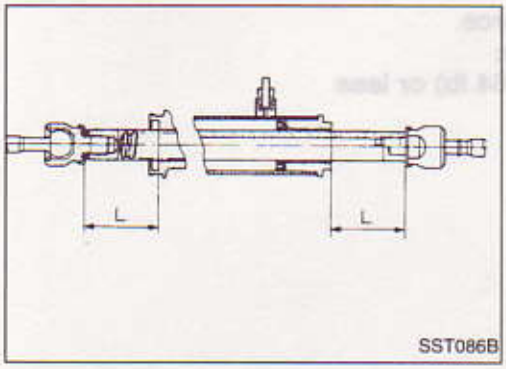


- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  less than 0.5 mm (0.020 in)
  Tie-rod inner ball joint:
  0 mm (0 in)
- Check condition of dust cover. If cracked excessively, replace it.

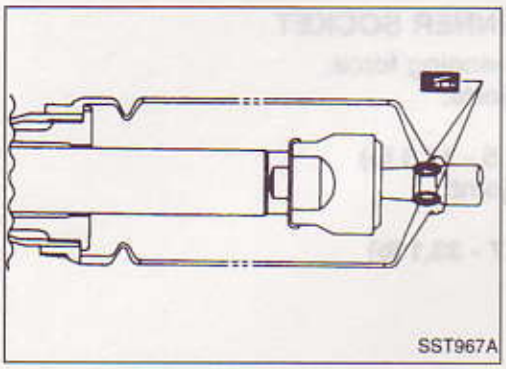


Assembly

1. Tighten outer socket lock nut.
   Tie-rod length "L":
   Refer to S.D.S.

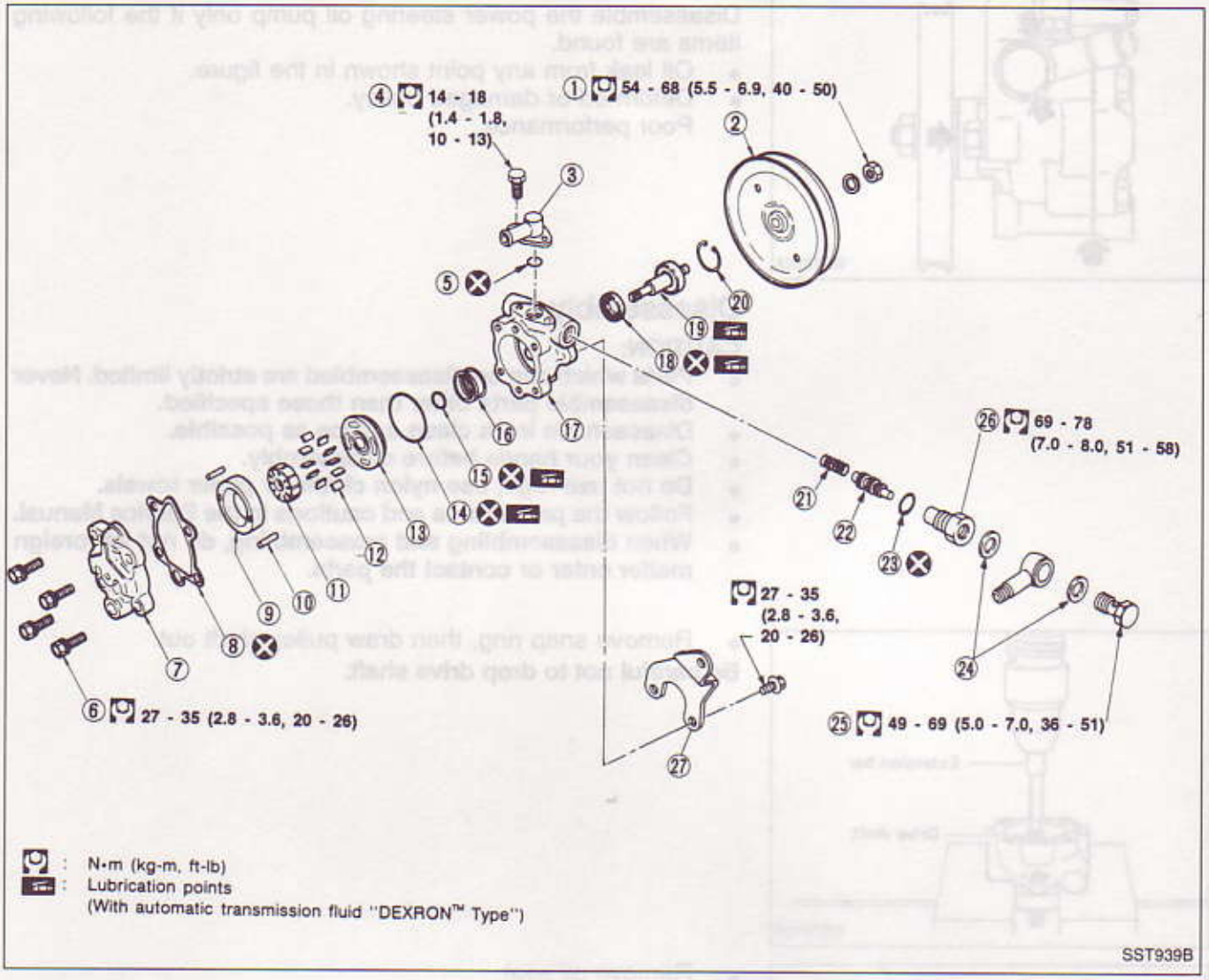


2. Measure rack stroke.
   Rack stroke "L":
   Refer to S.D.S.

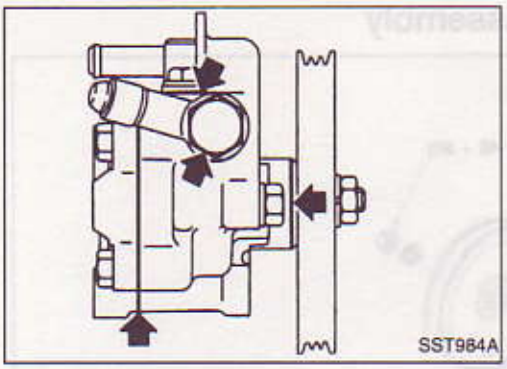


3. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.

Disassembly and Assembly



① Nut
② Pulley
③ Suction pipe
④ Bolt
⑤ O-ring
⑥ Bolt
⑦ Rear cover
⑧ Gasket
⑨ Cam ring
⑩ Pin
⑪ Rotor
⑫ Vane
⑬ Front side plate
⑭ O-ring
⑮ O-ring
⑯ Spring
⑰ Front housing
⑱ Oil seal
⑲ Drive shaft
⑳ Snap ring
㉑ Flow control valve spring
㉒ Flow control valve
㉓ O-ring
㉔ Washers
㉕ Connector bolt
㉖ Connector
㉗ Bracket



Pre-disassembly Inspection

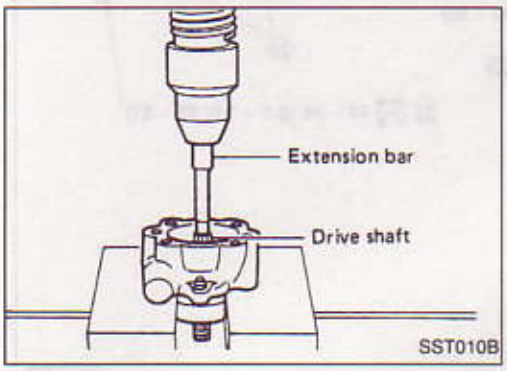
Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance.

Disassembly

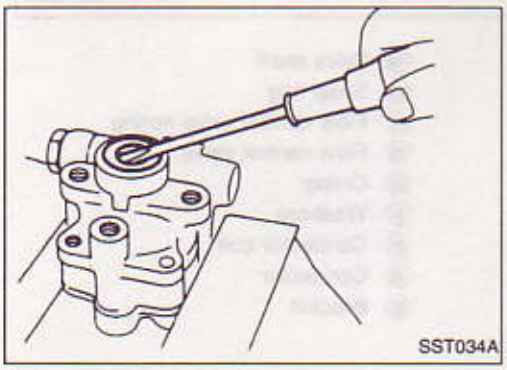
CAUTION:

- **Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.**
- **Disassemble in as clean a place as possible.**
- **Clean your hands before disassembly.**
- **Do not use rags; use nylon cloths or paper towels.**
- **Follow the procedures and cautions in the Service Manual.**
- **When disassembling and reassembling, do not let foreign matter enter or contact the parts.**



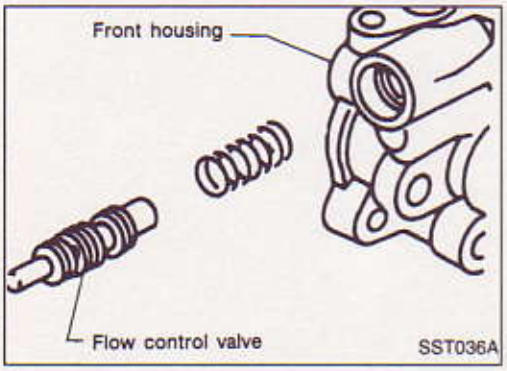
- Remove snap ring, then draw pulley shaft out.

Be careful not to drop drive shaft.



- Remove oil seal.

Be careful not to damage front housing.

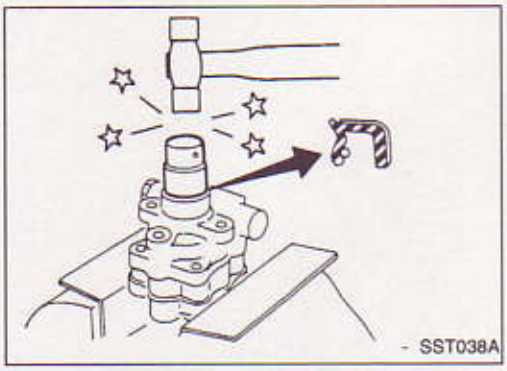


- Remove connector.

Be careful not to drop control valve.

Inspection

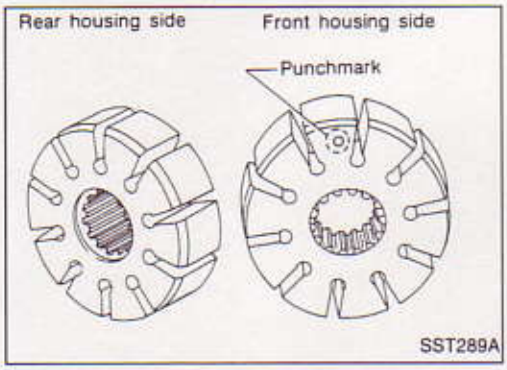
Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.



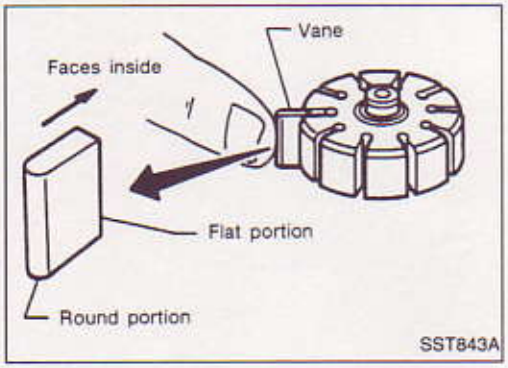
Assembly

Assemble oil pump, noting the following instructions.

- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.
- Coat each part with A.T.F. when assembling.

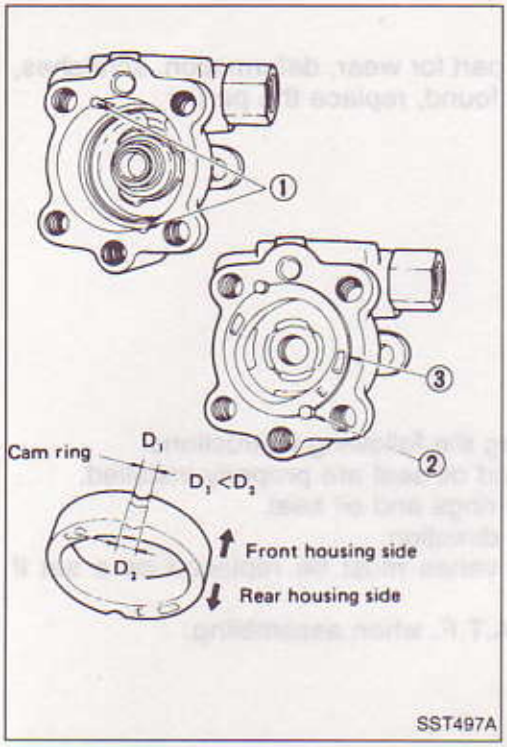


- Pay attention to the direction of rotor.



- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.

Assembly (Cont'd)



- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

General Specifications

Steering model	Manual steering	Power steering
Steering gear type	R24N	PR26SC
Turns of steering wheel (Lock to lock)	4.62	4.40
Overall gear ratio	22.5	24.6
Steering column type	Collapsible, tilt or non-tilt	

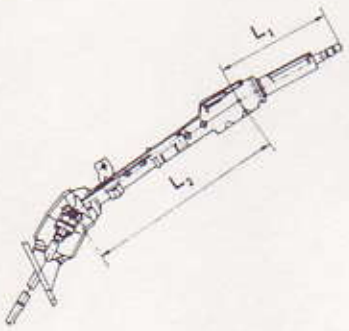
Inspection and Adjustment

GENERAL

Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	35 (1.38) or less
Movement of gear housing mm (in)	±2 (±0.08) or less

STEERING COLUMN

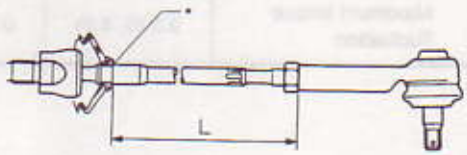
Steering column length mm (in)	
L_1	276 (10.86)
L_2	415.7 (16.36)



SST932B

STEERING GEAR AND LINKAGE

Steering gear type	R24N	PR26SC
Tie-rod outer ball joint Swinging force at cotter pin hole N (kg, lb)	6.9- 64.7 (0.7 - 6.6, 1.5 - 14.6)	6.9 - 63.7 (0.7 - 6.5, 1.5 - 14.3)
Rotating torque N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)	
Axial end play limit mm (in)	Less than 0.5 (0.020)	
Tie-rod inner ball joint Swinging force* N (kg, lb)	14.7 - 21.6 (1.5 - 2.2, 3.3 - 4.9)	16.7 - 147.1 (1.7 - 15, 3.7 - 33.1)
Axial end play limit mm (in)	0 (0)	
Tie-rod standard length "L" mm (in)	197.3 (7.768)	



SST304B

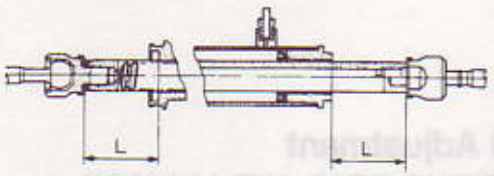
*: Measuring point

Inspection and Adjustment (Cont'd)

STEERING GEAR AND LINKAGE (Cont'd)

Rack stroke "L" mm (in)	75.0 (2.953)*1 71.5 (2.815)*2

*1: For R24N
*2: For PR26SC



SST086B

Steering gear type	R24N	PR26SC
Pinion gear preload without gear oil N·m (kg-cm, in-lb)		
Within ±100° from the neutral position		
Average rotating torque	0.7 - 1.2 (7 - 12, 6.1 - 10.4)	0.8 - 1.3 (8 - 13, 6.9 - 11.3)
Maximum torque fluctuation	0.3 (3, 2.6)	0.4 (4, 3.5)
Except above range		
Maximum rotating torque	1.5 (15, 13)	1.9 (19, 16)
Maximum torque fluctuation	0.5 (5, 4.3)	0.6 (6, 5.2)

POWER STEERING

Steering gear type	PR26SC
Rack sliding force N (kg, lb)	
Under normal operating oil pressure	
Range within ±11.5 mm (±0.453 in) from the neutral position	284 (29, 64)*
Except above range	Not more than 39 (4, 9) beyond above value
Steering wheel turning force (Measured at one full turn from the neutral position) N (kg, lb)	39 (4, 9) or less
Fluid capacity (Approximate) ℓ (Imp qt)	1 (7/8)
Oil pump maximum pressure kPa (bar, kg/cm², psi)	7,846 (78.5, 1,138)

*: Also for R24N