

# STEERING SYSTEM

## SECTION **ST**

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# PRECAUTIONS AND PREPARATION

## Precautions

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

The Supplemental Restraint System “Air Bag” and “Seat Belt Pre-tensioner”, used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.

If the vehicle is equipped with side air bag as the Supplemental Restraint System, the side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (which is one of components of air bags for a frontal collision), wiring harness, warning lamp (which is one of components of air bags for a frontal collision).

#### **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 dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual. SRS wiring harnesses are covered with yellow insulation (either just before the harness connectors or for the complete harness), for easy identification.

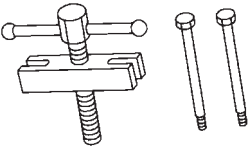
## STEERING SYSTEM

- 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 correct positions.
- Only use nylon cloths or paper towels to clean parts. Do not use rags or other materials containing lint. Residual debris may damage the system.
- Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.
- Before assembly, apply a coat of recommended ATF\* 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

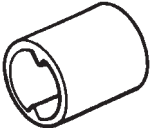
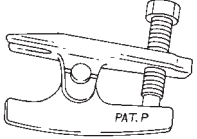
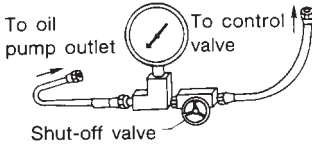
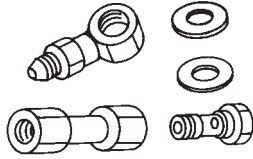
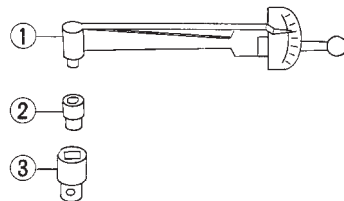
## Preparation

### SPECIAL SERVICE TOOL

Tool number Tool name	Description
ST27180001 Steering wheel puller	 <p>Removing and installing steering wheel</p>

# PREPARATION

## SPECIAL SERVICE TOOLS

Tool number Tool name	Description
KV48100700 Torque adapter	 <p style="text-align: right;">Measuring pinion rotating torque</p>
HT72520000 Ball joint remover	 <p style="text-align: right;">Removing ball joint</p>
ST27091000 Pressure gauge	 <p style="text-align: right;">Measuring oil pressure</p>
KV48102500 Pressure gauge adapter	 <p style="text-align: right;">Measuring oil pressure</p>
ST3127S000 ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter	 <p style="text-align: right;">Measuring turning torque</p>

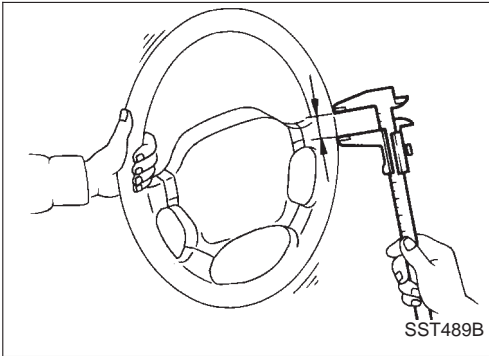
# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

## NVH Troubleshooting Chart

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

Symptom		Possible cause and SUSPECTED PARTS	Reference page																			
			ST-6	ST-6	ST-18	ST-18	ST-19	ST-6	ST-5	ST-7	Refer to MA section.	—	ST-12	ST-5	ST-13	ST-11	ST-14	NVH in FA section	NVH in FA, RA section	NVH in FA section	NCH in FA section	NVH in BR section
STEERING	Noise	X	X	X	X	X	X	X	X	X							X	X	X	X	X	X
	Shake										X	X	X				X	X	X	X	X	X
	Vibration										X	X	X	X	X		X	X	X			
	Shimmy										X	X	X			X		X	X	X	X	X
	Judder												X			X		X	X	X	X	X

X: Applicable

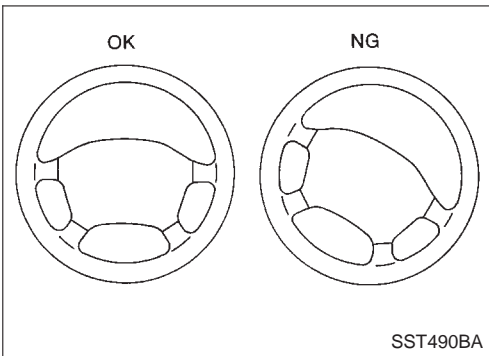


## Checking Steering Wheel Play

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.



## Checking Neutral Position on Steering Wheel

### Pre-checking

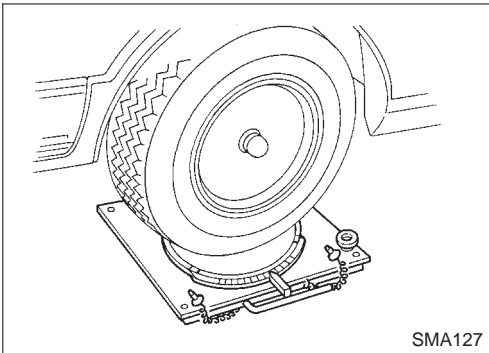
- Make sure that wheel alignment is correct.

**Wheel alignment:**  
**Refer to SDS in FA section**

- 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.



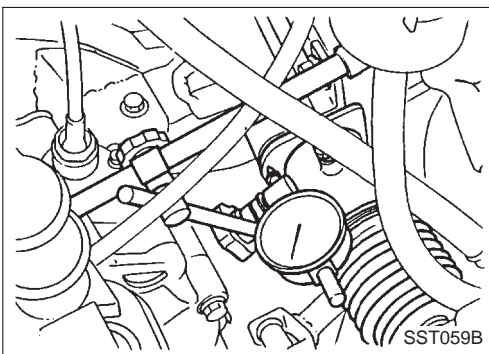
## Front Wheel Turning Angle

1. Rotate steering wheel all the way right and left; measure turning angle.

**Turning angle of full turns:**  
**Refer to SDS in FA section**

2. If it is not within specification, check rack stroke.

**Rack stroke "S":**  
**Refer to SDS (ST-23)**



## 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.

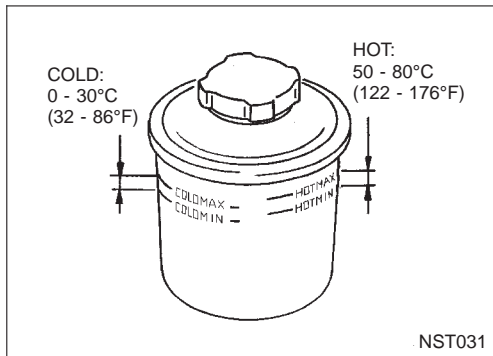
Turn off ignition key while checking.

**Movement of gear housing:**  
**±2 mm (±0.08 in) or less**

2. If movement exceeds the limit, replace mount insulator after confirming correct installation of gear housing clamps.

## Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.



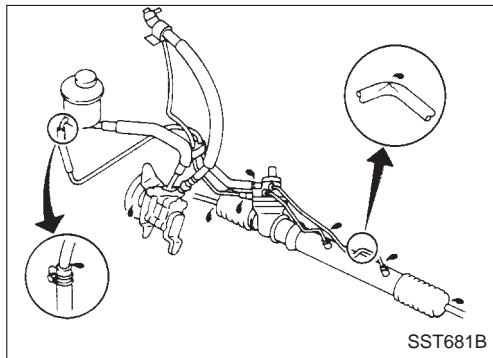
## Checking Fluid Level

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 security, 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.**

5. Check rack boots for accumulation of power steering fluid.

## Bleeding Hydraulic System

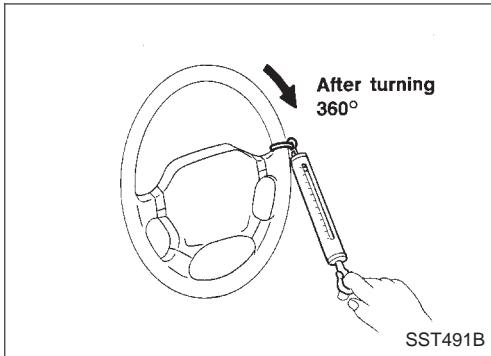
1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Then quickly turn steering wheel fully to right and left and lightly touch steering stoppers.  
Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.  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

## ON-VEHICLE INSPECTION

### Bleeding Hydraulic System (Cont'd)

- 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

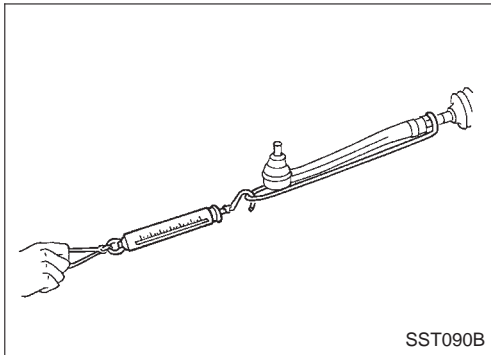
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

**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:**

**44.1 N (4.5 kg, 9.9 lb) or less**

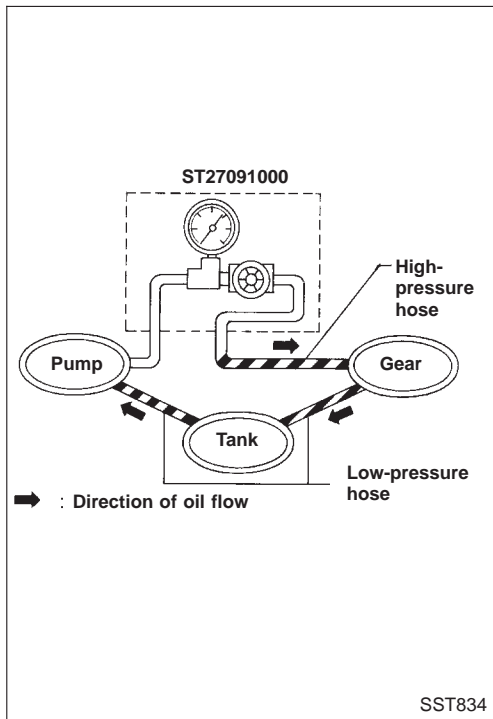


5. If steering wheel turning force is out of specification, check rack sliding force to detect condition of steering gear assembly.
  - a. Disconnect steering column lower joint and knuckle arms from the gear.
  - b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.
  - c. While pulling tie-rod slowly from the neutral position, make sure rack sliding force is within specification.

**Rack sliding force:**

**284 N (29 kg, 64 lb) or less**

6. If rack sliding force is not within specification, replace 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:**

**QG: 7,502 - 8,101 kpa  
(75 - 81 bar, 76.5 - 82.6 kg/cm<sup>2</sup>,  
1,088 - 1,175 psi)**

**SR: 7,002 - 7,600 kPa  
(70 - 76 bar, 71.4 - 77.5 kg/cm<sup>2</sup>,  
1,015 - 1,102 psi)**

**CD: 7,690 - 8,493 kpa  
(77 - 85 bar, 78.5 - 86.6 kg/cm<sup>2</sup>,  
1,116 - 1,231 psi)**

4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.
  - When pressure reaches above standard pressure, gear is damaged.
  - When pressure remains below standard pressure, pump is damaged.

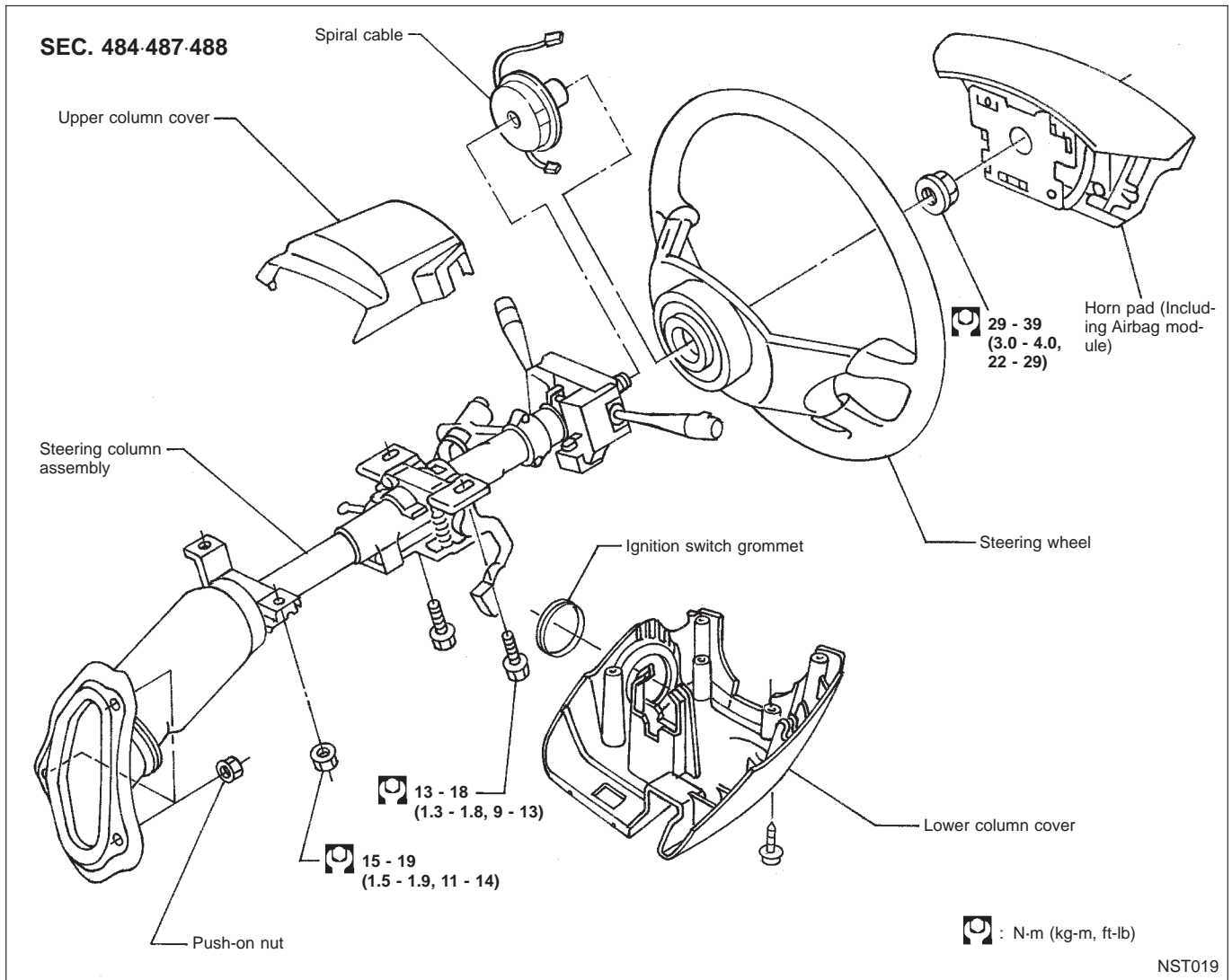
### **CAUTION:**

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

5. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.



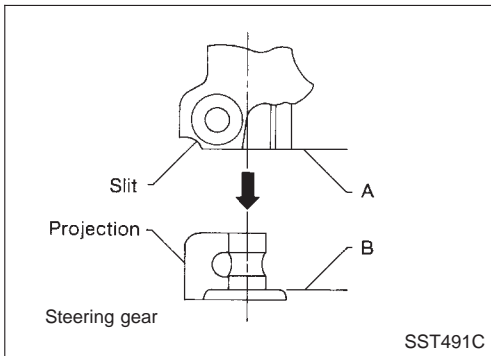
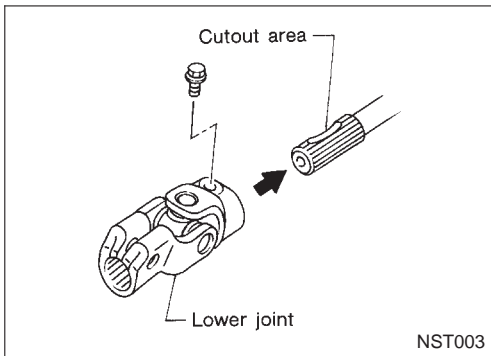
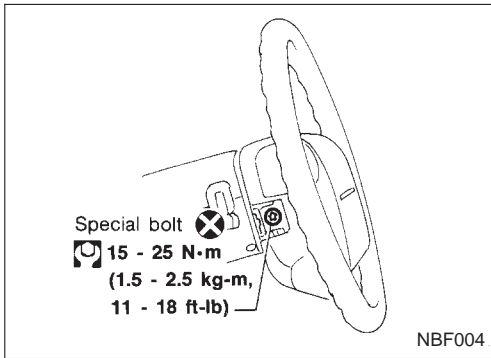
# STEERING WHEEL AND STEERING COLUMN



## CAUTION:

- The rotation of the spiral cable (SRS “Air bag” component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.
- Remove the steering wheel before removing the steering lower joint to avoid damaging the SRS spiral cable.

# STEERING WHEEL AND STEERING COLUMN



## Removal and Installation

### STEERING WHEEL

- Remove screws from both sides of steering wheel and pull out horn pad. Refer to RS section for Air Bag Module and Spiral Cable Removal.
- Align spiral cable correctly when installing steering wheel. Refer to RS-section.

### 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.

- Align slit of lower joint with projection on dust cover. Insert joint until surface A contacts surface B.

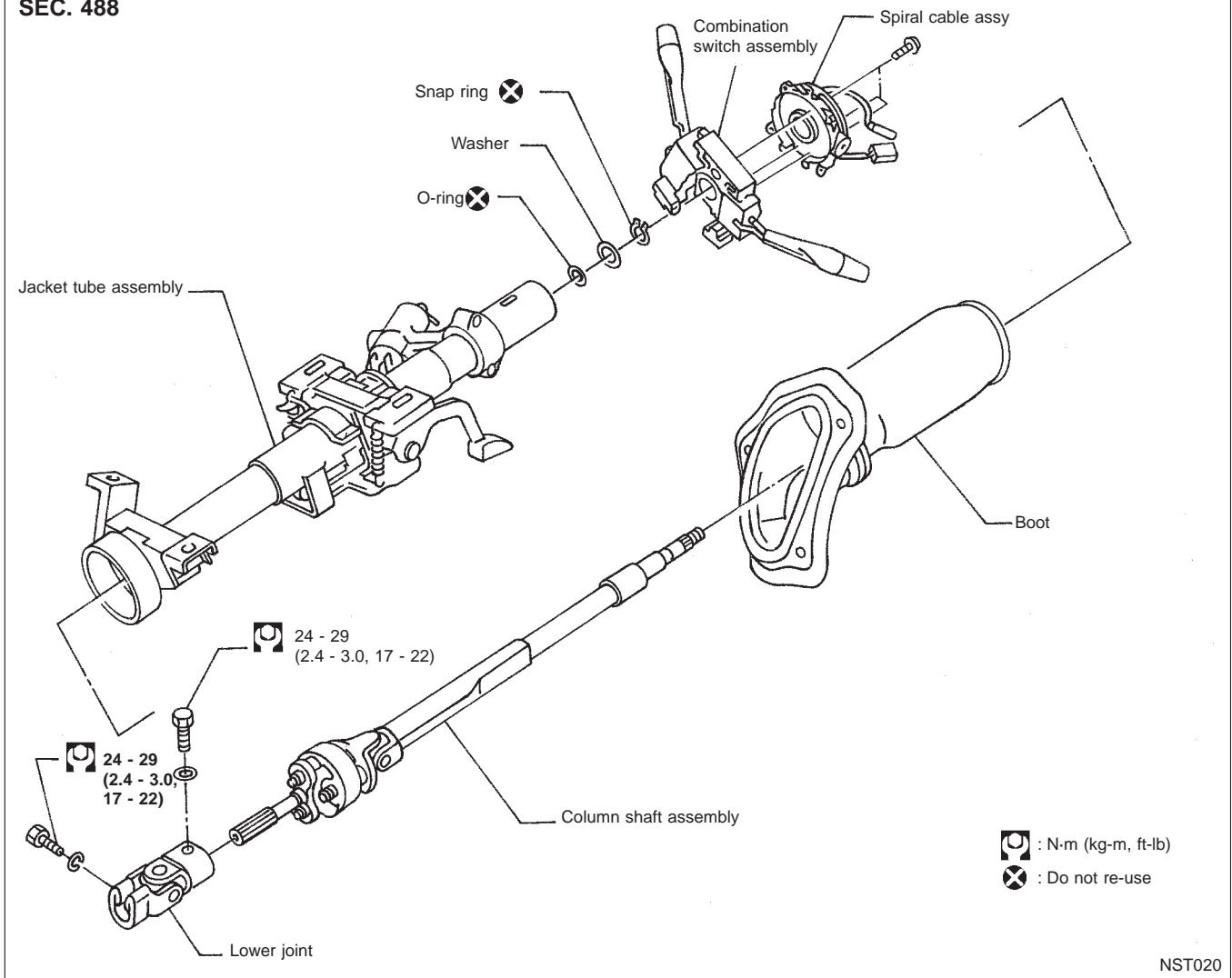
### CAUTION:

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.

# STEERING WHEEL AND STEERING COLUMN

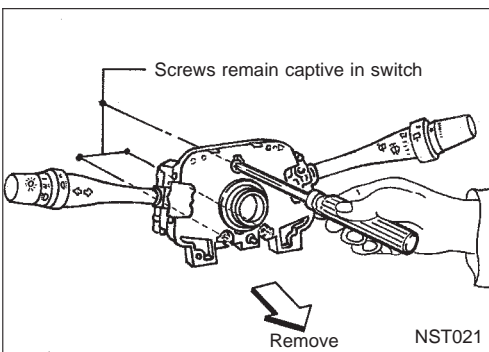
## Disassembly and Assembly

SEC. 488



### WARNING:

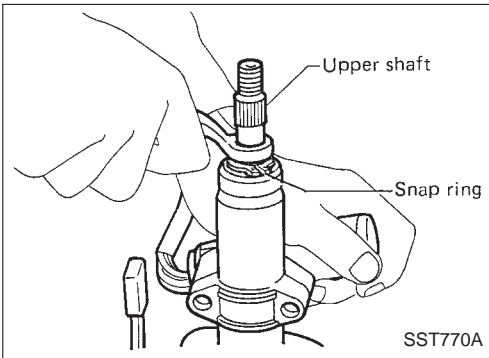
Refer to 'PRECAUTIONS' (on page ST-2) and to RS section for spiral cable servicing information.



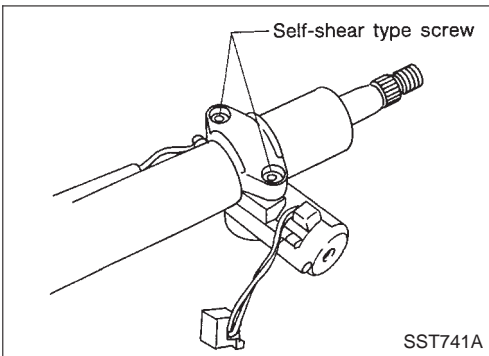
- To remove combination switch, remove attaching screws, disconnect harnesses and remove switch.

# STEERING WHEEL AND STEERING COLUMN

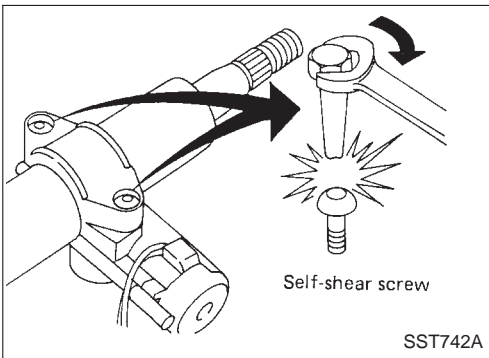
## Disassembly and Assembly (Cont'd)



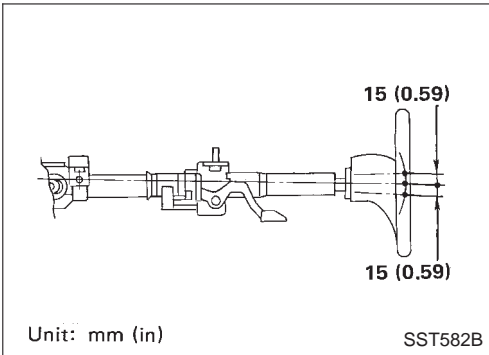
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring on upper shaft with a suitable tool.



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



- b. Install self-shear type screws and then cut off self-shear type screw heads.

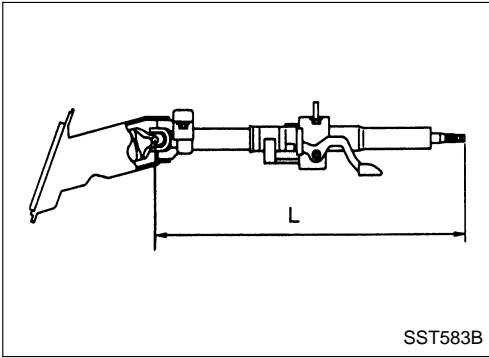


## Inspection

### Tilt mechanism

- After installing steering column, check tilt mechanism operation.

## STEERING WHEEL AND STEERING COLUMN



### Inspection (Cont'd)

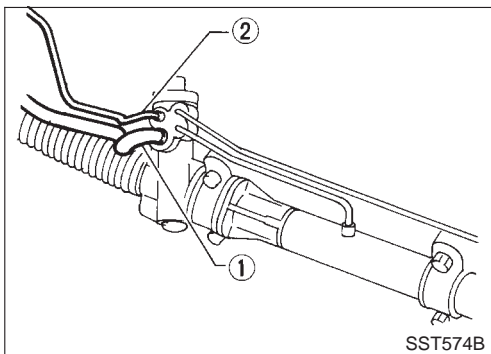
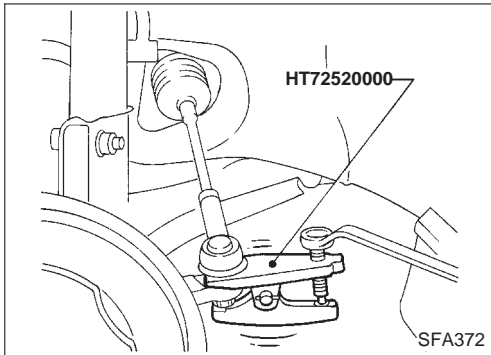
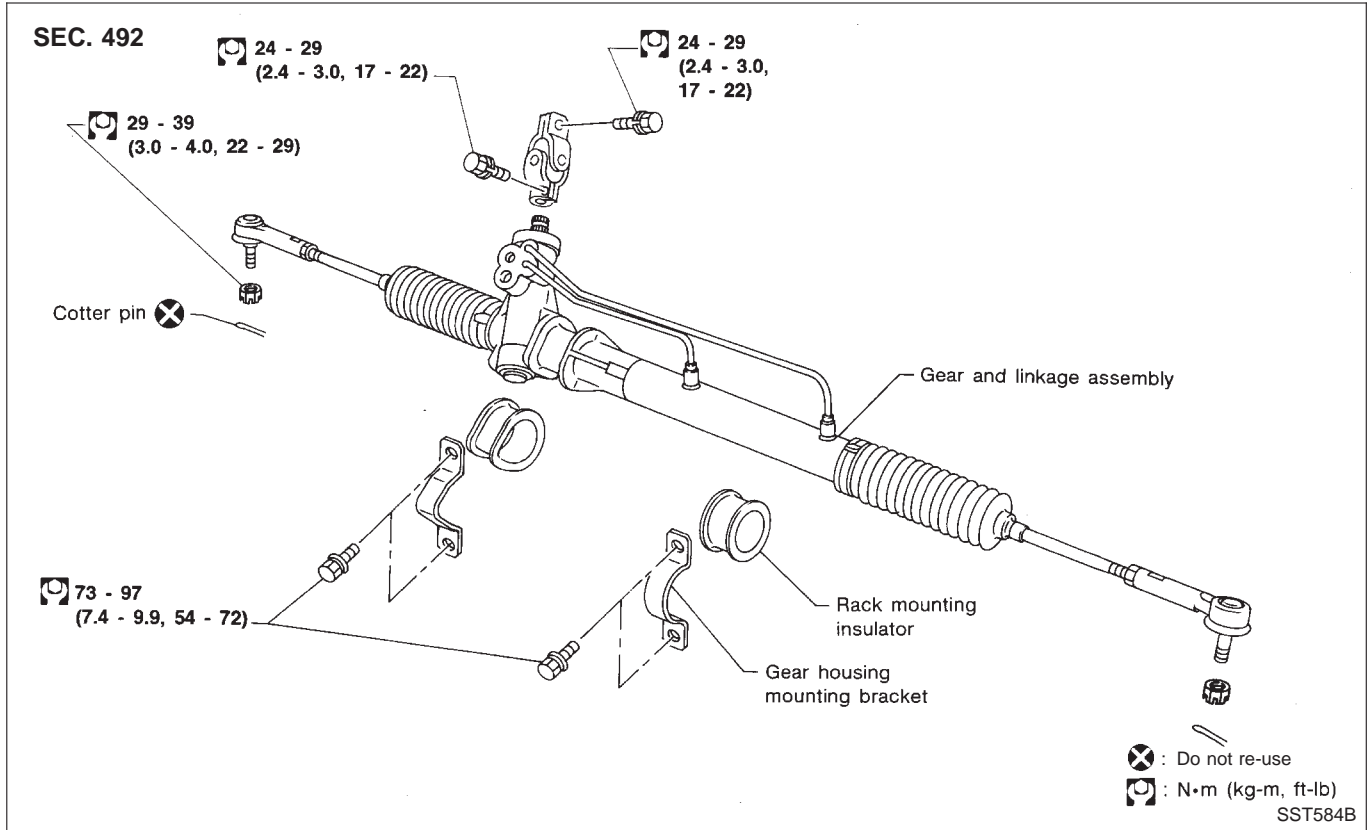
- When steering wheel does not turn smoothly, check the steering column as follows and replace damaged parts.
  - a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
  - b. Check jacket tube for deformation 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":

**536.0 - 538.0 mm (21.10 - 21.18 in)**

# POWER STEERING GEAR AND LINKAGE

## Removal and Installation



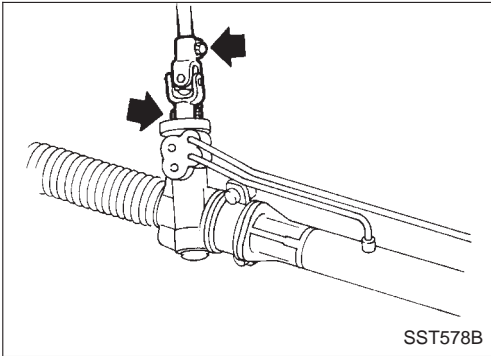
- Detach tie-rod outer sockets from knuckle arms with Tool.

### CAUTION:

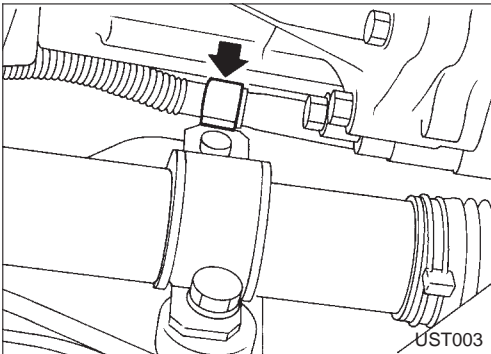
- The rotation of the spiral cable (SRS "Air bag" component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.
- Remove the steering wheel before removing the steering lower joint to avoid damaging the SRS spiral cable.
- Remove low and high pressure connectors ① and ② .
- Remove exhaust front tube.

## POWER STEERING GEAR AND LINKAGE

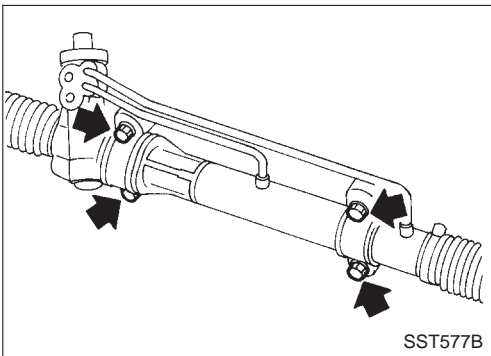
### Removal and Installation (Cont'd)



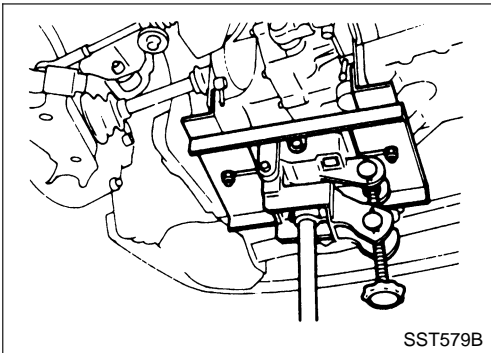
- Remove dust cover from steering lower joint. Remove joint.



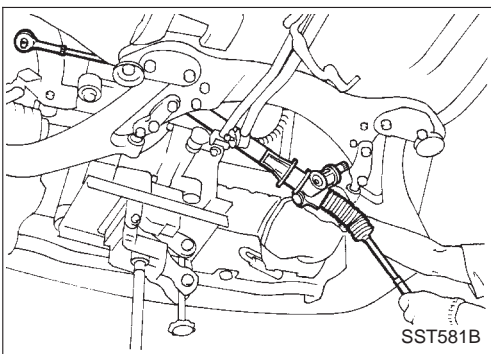
- Remove harness from subframe mounting bracket.



- Remove gear housing brackets.



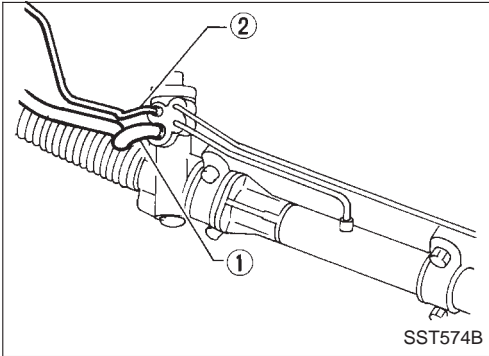
- Support transmission housing with engine jack.
- Remove center member with engine mounting rear bracket.



- Guide transfer tube over harness mounting bracket. Slide gear to left side of vehicle, lower and remove from right side as illustrated.

## POWER STEERING GEAR AND LINKAGE

### Removal and Installation (Cont'd)



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

#### Connector tightening torque:

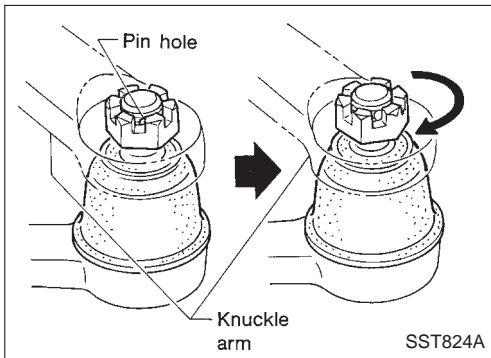
Low-pressure side “①”

20 - 25 N·m (2.0 - 2.6 kg-m, 14 - 19 ft-lb)

High-pressure side “②”

15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)

- Ensure that steering gear is correctly aligned in housing brackets, and that transfer tubes do not foul bulkhead or subframe.



- 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). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

#### CAUTION:

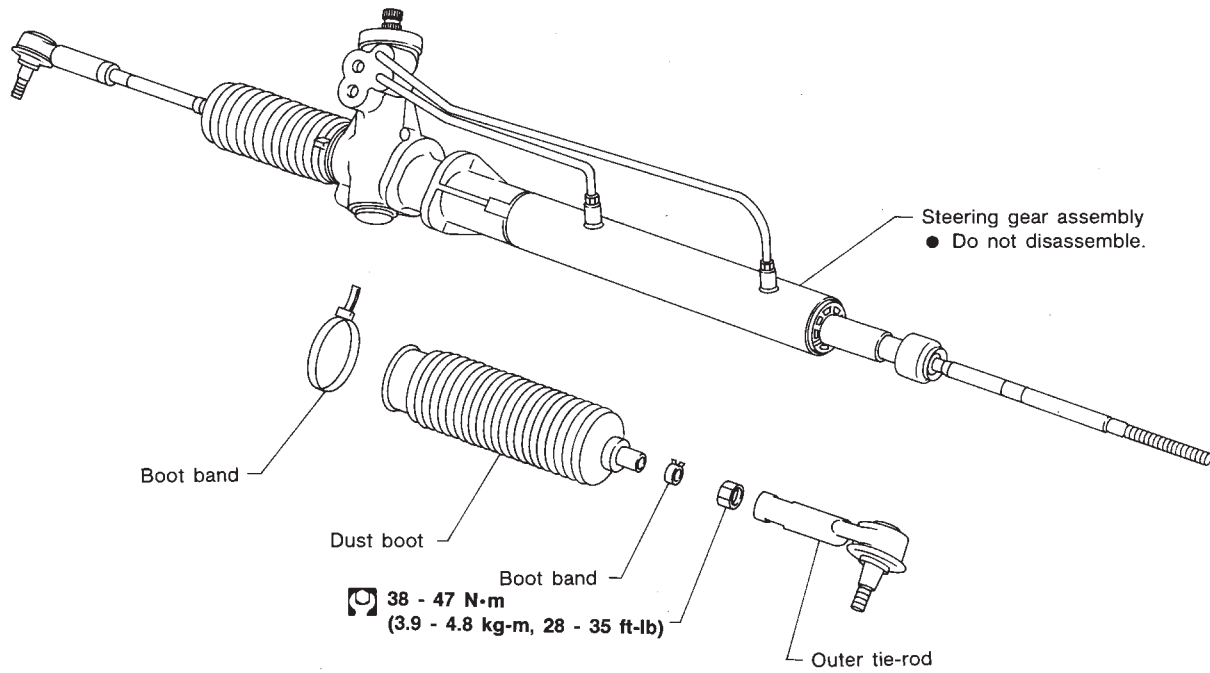
Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).



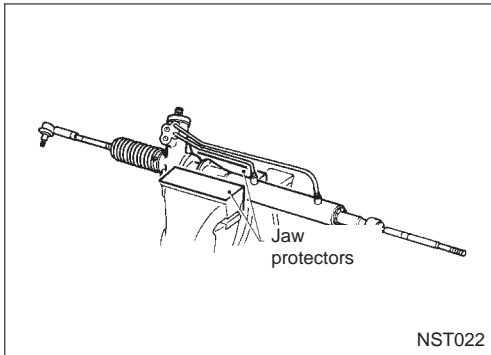
# POWER STEERING GEAR AND LINKAGE

## Removal and Installation (Cont'd)

SEC. 492



SST585B



### Disassembly

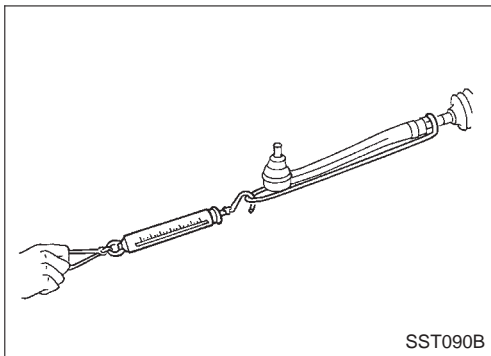
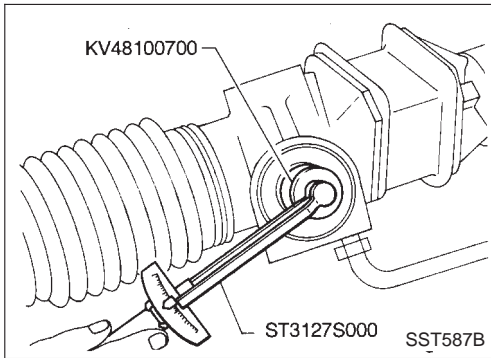
Always use soft jaws when clamping steering gear housing in a vise. Handle gear housing carefully, as it is made of aluminum.

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.

## POWER STEERING GEAR AND LINKAGE



### 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)

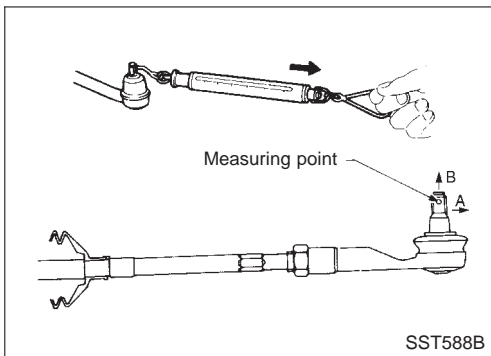
- Check rack sliding force.

#### Rack sliding force:

284 N (29 kg, 64 lb) or less

### BOOT

Check condition of boot. If cracked, replace it.



### TIE-ROD OUTER AND INNER SOCKET

- Check ball joint for swinging force.

#### A Tie-rod outer ball joint:

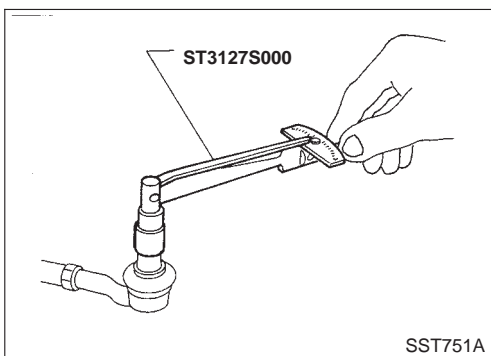
3.3 - 67 N

(0.34 - 6.8 kg, 0.74 - 15.1 lb)

#### B Tie-rod inner ball joint:

0.3 - 24.5 N

(0.03 - 2.5 kg, 0.07 - 5.5 lb)



- Check ball joint for rotating torque.

#### Tie-rod outer ball joint:

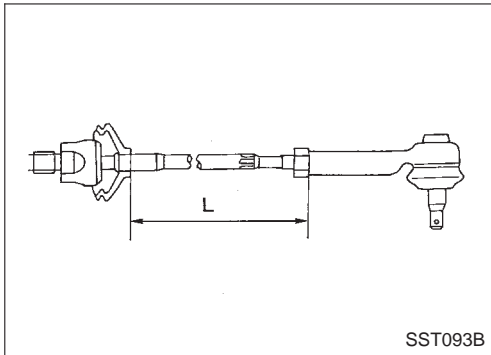
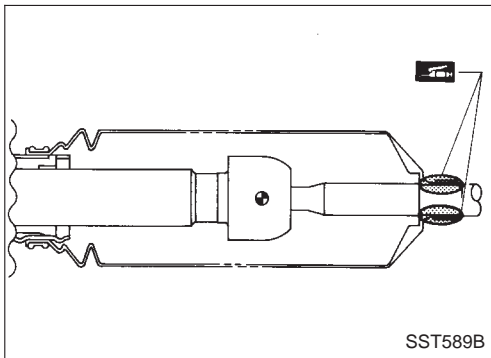
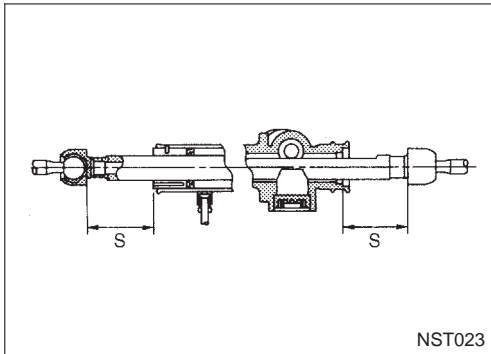
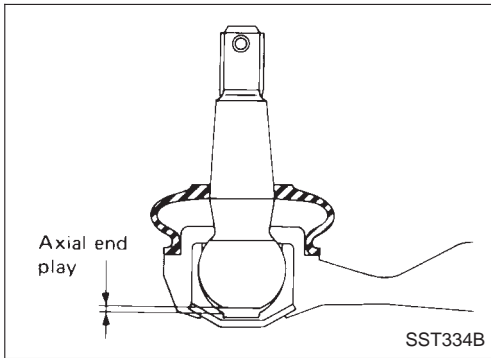
0.15 - 2.9 N·m

(1.5 - 30 kg-cm, 1.3 - 26.0 in-lb)

# POWER STEERING GEAR AND LINKAGE

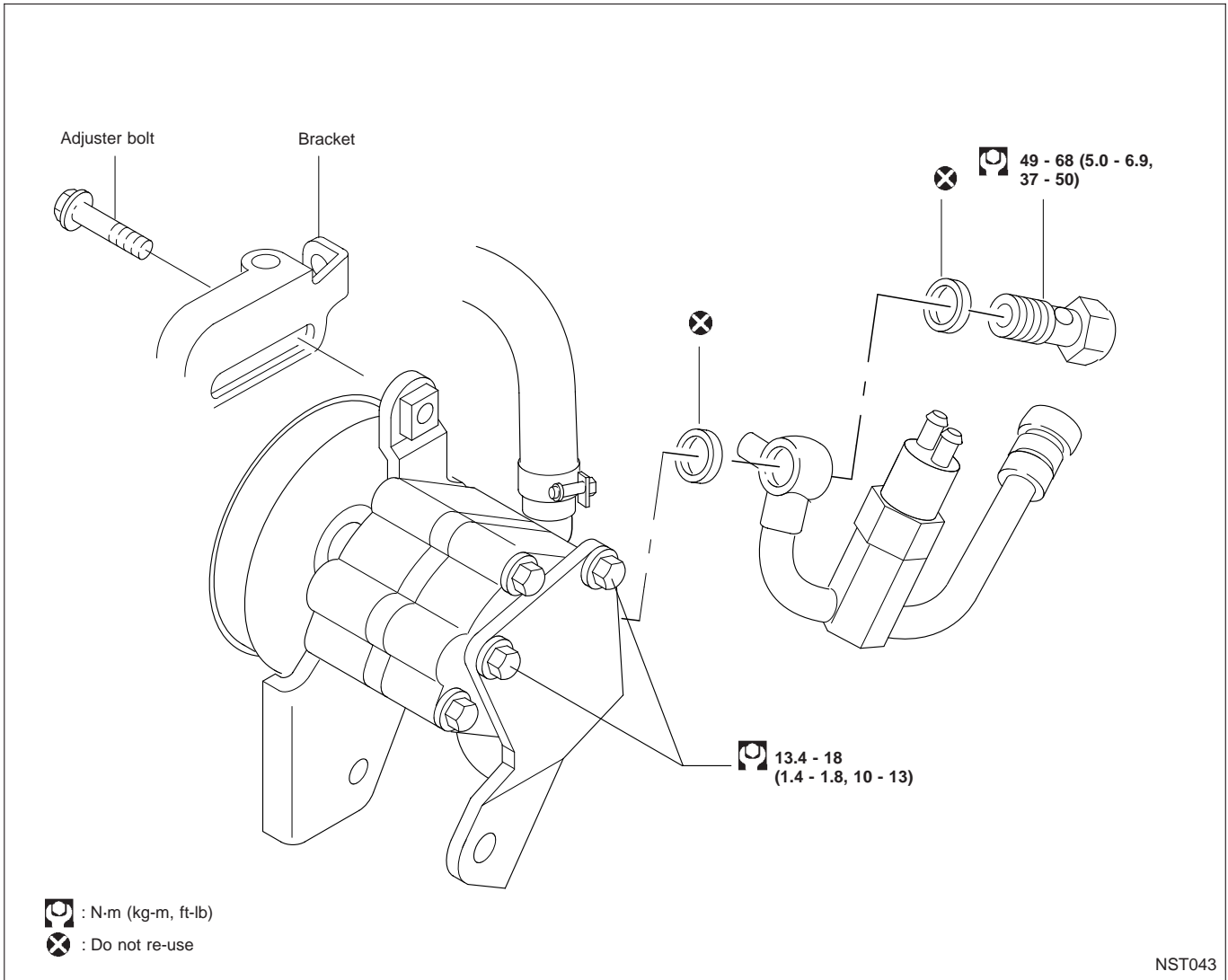
## Inspection (Cont'd)

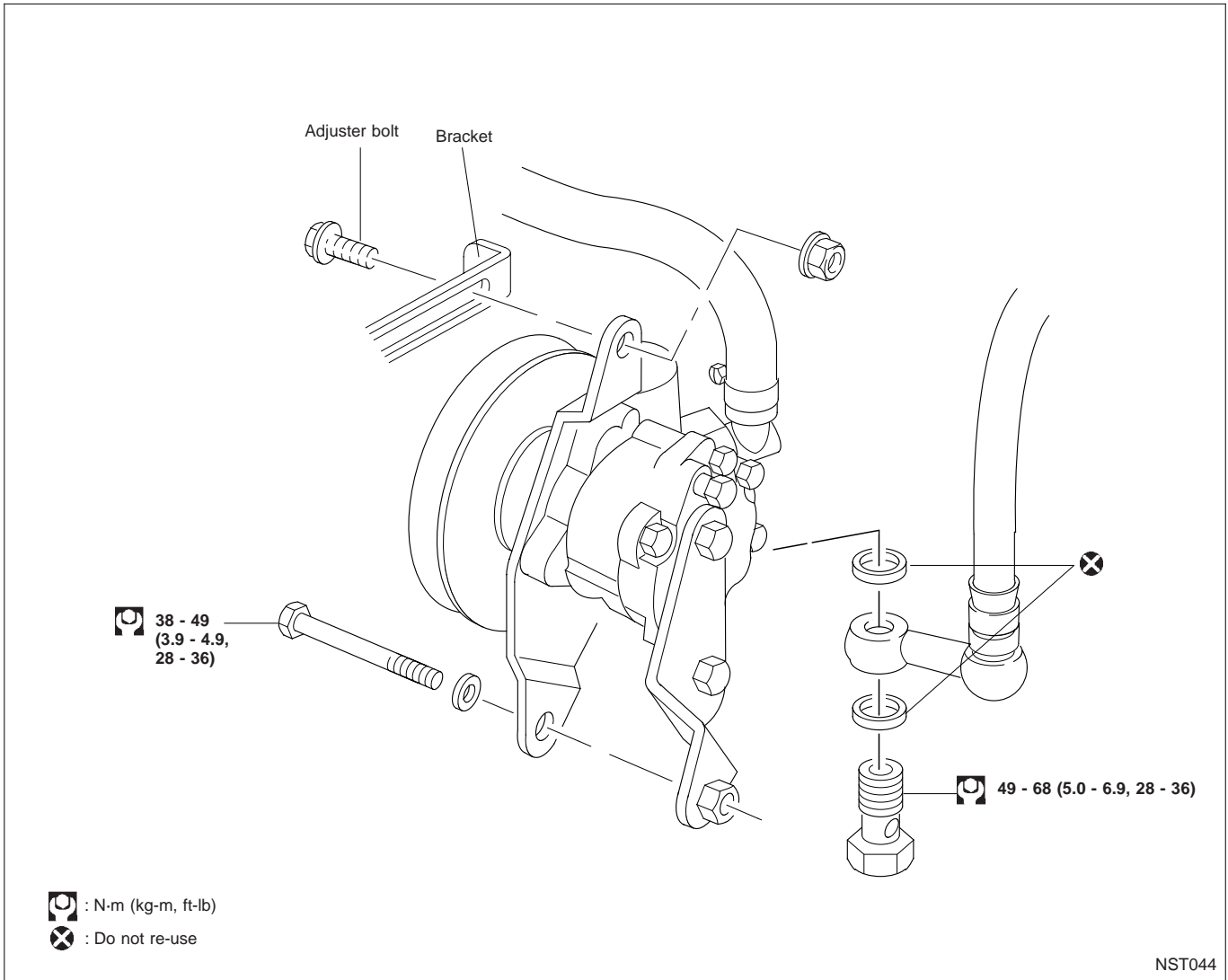
- Check ball joint for axial end play.  
**Tie-rod outer ball joint:**  
0 mm (0 in)  
**Tie-rod inner ball joint:**  
0 mm (0 in)
- Check condition of dust cover. If cracked excessively, replace it.

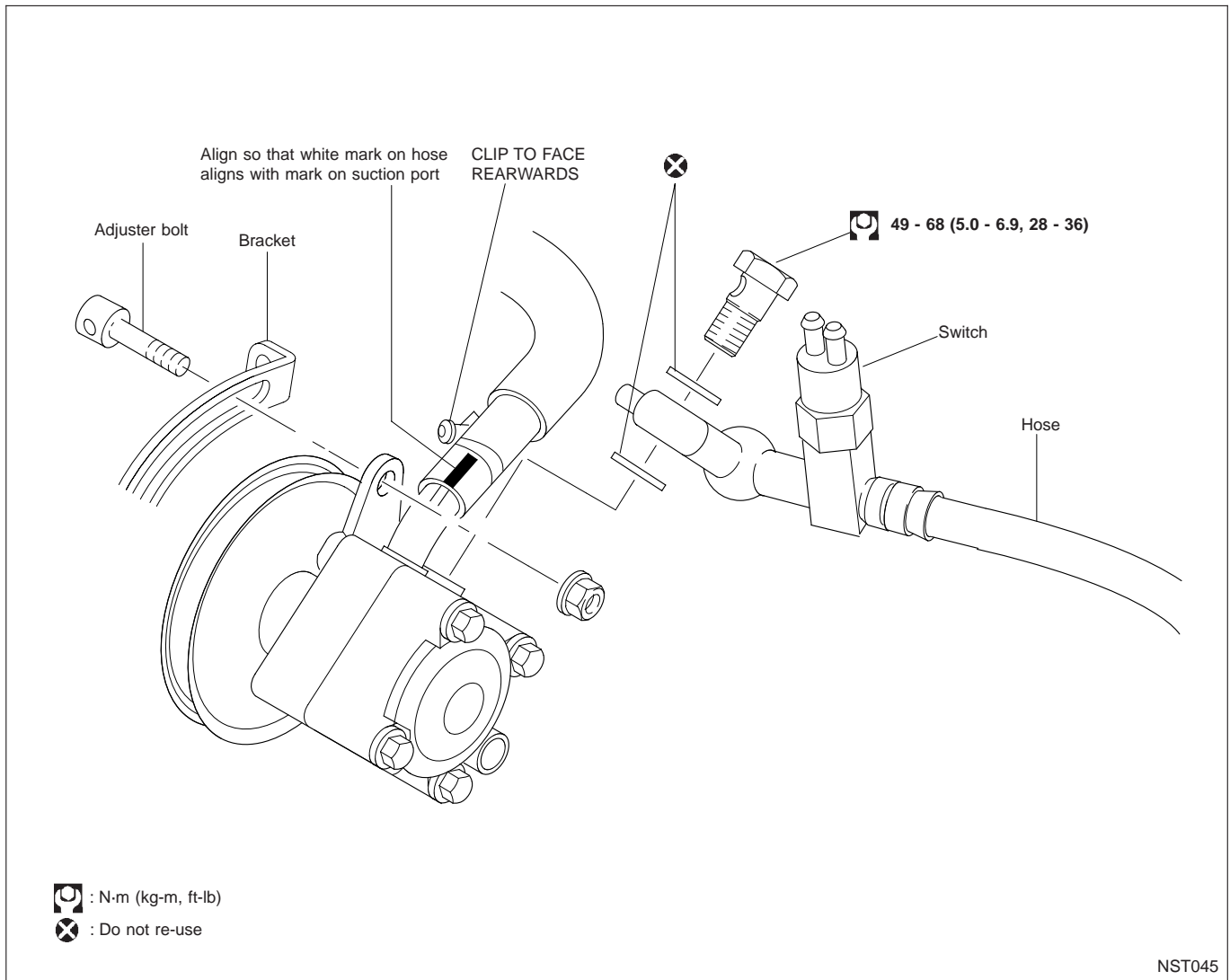


## Assembly

1. Measure rack stroke.  
**Rack stroke "S":**  
Refer to SDS (ST-23)
2. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.
3. Tighten outer socket lock nut.  
**Tie-rod length "L":**  
Refer to SDS (ST-24)







# SERVICE DATA AND SPECIFICATIONS (SDS)

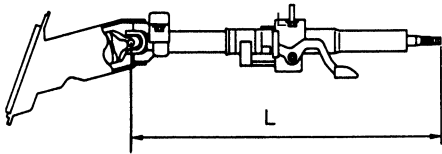
## General Specifications

Applied model		
	15" tire	16" tire
Steering model	Power steering	
Steering gear type	PR25T	
Steering overall gear ratio	16.7	
Turn of steering wheel (Lock to lock)	2.7	2.6
Steering column type	Tilt / collapsible	

## Inspection and Adjustment

### STEERING WHEEL AND COLUMN

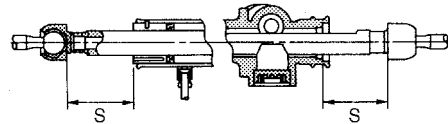
Applied model	Tilt
Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	35 (1.38) or less
Steering column length "L" mm (in)	536 - 538 (21.10 - 21.18 in)



SST583B

### STEERING GEAR

Steering gear type	Power PR25T	
	15" tire	16" tire
Rack stroke "S" mm (in)	68 (2.68)	66 (2.60)
Pinion rotating torque N·m (kg·cm, in·lb)	0.8 - 1.3 (8 - 13, 6.9 - 11.3)	
Rack sliding force N (kg, lb)	284 (29, 64) or less	
Steering wheel turning force (Measured at one full turn from neutral) N (kg, lb)	44.1 (4.5, 9.9) or less	
Fluid capacity (Approximate) ℓ (Imp qt)	0.9 (3/4)	
Oil pump relief pressure kPa (bar, kg/cm <sup>2</sup> , psi)	SR: 7,002 - 7,600, (70 - 76, 71.4 - 77.5, 1,109 - 1,194) QG: 7,502 - 8,101, (75 - 81, 76.5 - 82.6) CD: 7,748 - 8,532 (77.5 - 85.3, 79 - 87, 1,123 - 1,237)	



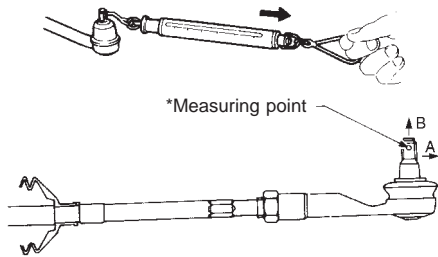
NST023

# SERVICE DATA AND SPECIFICATIONS (SDS)

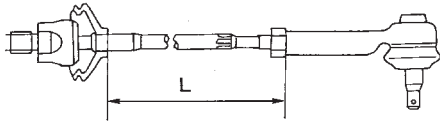
## Inspection and Adjustment (Cont'd)

### STEERING LINKAGE

Steering gear type	Power PR25T
Movement of gear housing mm (in)	±2 (±0.08) or less
Tie-rod outer ball joint	
A Swinging force at cotter pin hole N (kg, lb)	3.3 - 67 (0.34 - 6.8, 0.74 - 15.1)
Rotating torque N·m (kg-cm, in-lb)	0.15 - 2.4 (1.5 - 30, 1.3 - 26.0)
Axial end play mm (in)	0 (0)
Tie-rod inner ball joint	
B Swinging force* N (kg, lb)	0.3 - 24.5 (0.03 - 2.5, 0.07 - 5.5)
Axial end play mm (in)	0 (0)
Tie-rod standard length "L" mm (in)	183.6 (7.23)



SST588B



SST093B