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# SECTION ST

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# PRECAUTIONS

Supplemental Restraint System (SRS) "AIR BAG"

## Supplemental Restraint System (SRS) "AIR BAG"

NAST0001

The Supplemental Restraint System "AIR BAG", used along with a seat belt, helps 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), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS 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 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 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.

### Precautions for Steering System

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- 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.
- Place disassembled parts in order, on a parts rack, for easier and proper assembly.
- 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 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 type DEXRON<sup>TM</sup>III or equivalent

# PREPARATION

Special Service Tools

## Special Service Tools

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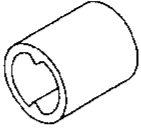
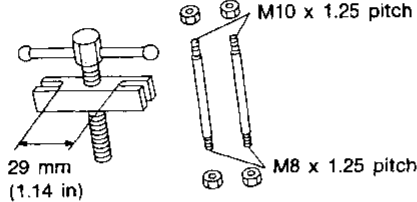
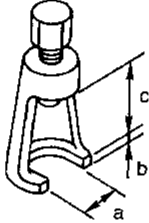
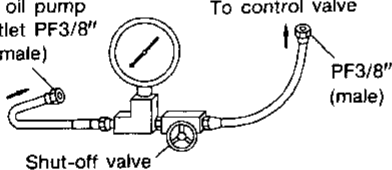
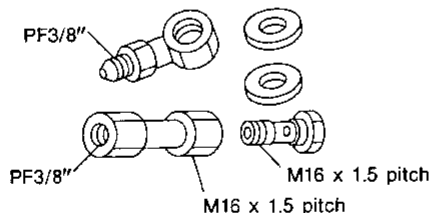
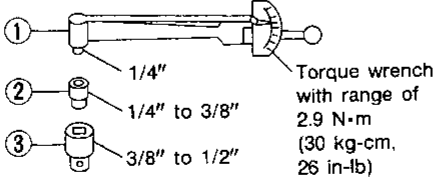
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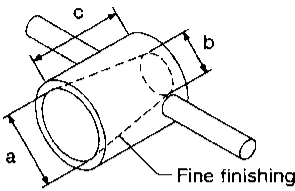
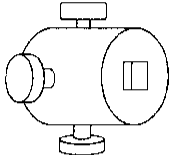
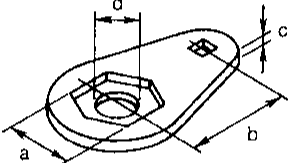
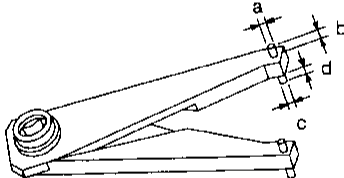
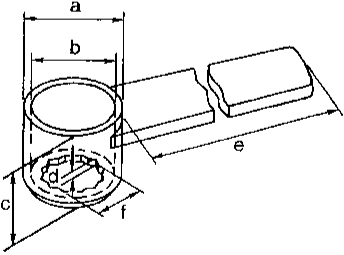
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The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
KV48100700 (J26364) Torque adapter	 <p>Measuring pinion rotating torque</p> <p>NT169</p>
ST27180001 (J25726-A) Steering wheel puller	 <p>Removing and installing steering wheel</p> <p>NT544</p>
ST29020001 (J24319-01) Ball joint remover	 <p>Removing ball joint a: 34 mm (1.34 in) b: 6.5 mm (0.256 in) c: 61.5 mm (2.421 in)</p> <p>NT694</p>
ST27091000 (J26357 and J26357-10) Pressure gauge	 <p>Measuring oil pressure</p> <p>NT547</p>
KV48102500 ( ) Pressure gauge adapter	 <p>Measuring oil pressure</p> <p>NT542</p>
ST3127S000 (See J25765-A) 1 GG91030000 (J25765-A) Torque wrench 2 HT62940000 ( ) Socket adapter 3 HT62900000 ( ) Socket adapter	 <p>Measuring turning torque</p> <p>NT541</p>

# PREPARATION

## Special Service Tools (Cont'd)

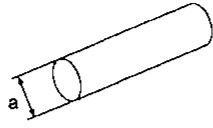
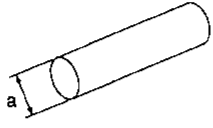
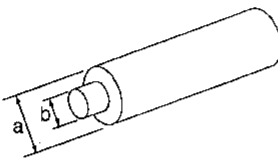
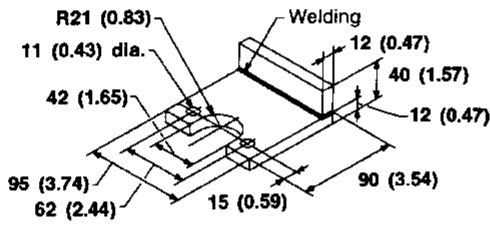
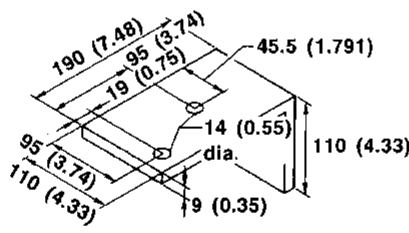
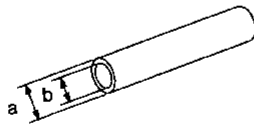
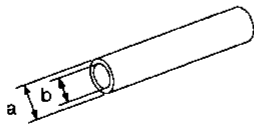
Tool number (Kent-Moore No.) Tool name	Description	
KV48104400 ( — ) Rack seal ring reformer		Reforming teflon ring a: 50 mm (1.97 in) dia. b: 36 mm (1.42 in) dia. c: 100 mm (3.94 in)
KV48103400 ( — ) Torque adapter		Measuring steering transfer gear rotating torque
KV48104500 ( — ) Lock nut wrench		Removing and installing transfer gear rear cover a: 58 mm (2.28 in) b: 100 mm (3.94 in) c: 6 mm (0.24 in) d: 53 mm (2.09 in) dia.
KV48104200 ( — ) Rear cover wrench		Adjusting and tightening gear rear cover a: 4 mm (0.16 in) dia. b: 5 mm (0.20 in) c: 3 mm (0.12 in) dia. d: 5 mm (0.20 in)
KV48105100 ( — ) Output shaft nut wrench		Removing and installing output shaft nut a: 40 mm (1.57 in) dia. b: 34 mm (1.34 in) dia. c: 35.5 mm (1.398 in) d: 5.5 mm (0.217 in) e: 200 mm (7.87 in) f: 24 mm (0.94 in)

# PREPARATION

Commercial Service Tools

## Commercial Service Tools

NAST0004

Tool name	Description
Rear oil seal drift  NT063	 <p>Installing rear oil seal <b>a: 28 mm (1.10 in) dia.</b></p>
Pinion oil seal drift  NT063	 <p>Installing pinion oil seal <b>a: 40 mm (1.57 in) dia.</b></p>
Output shaft bearing drift  NT386	 <p>Installing output shaft bearing <b>a: 34 mm (1.34 in) dia.</b> <b>b: 16 mm (0.63 in) dia.</b></p>
Oil pump attachment  NT179	 <p>Disassembling and assembling oil pump Unit: mm (in)</p>
Transfer gear attachment  NT655	 <p>Disassembling and assembling transfer gear Unit: mm (in)</p>
Output shaft oil seal drift  NT065	 <p>Installing output shaft oil seal <b>a: 40.5 mm (1.594 in) dia.</b> <b>b: 33 mm (1.30 in) dia.</b></p>
Input shaft oil seal drift  NT065	 <p>Installing input shaft oil seal <b>a: 34 mm (1.34 in) dia.</b> <b>b: 18 mm (0.71 in) dia.</b></p>

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# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

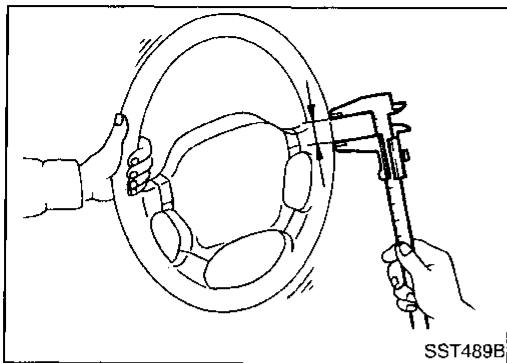
## NVH Troubleshooting Chart

NAST0043S01

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

Symptom	STEERING	Possible cause and SUSPECTED PARTS											Reference page																					
		Noise	Shake	Vibration	Shimmy	Judder	Fluid level	Air in hydraulic system	Tie-rod ball joint swinging force	Tie-rod ball joint rotating torque	Tie-rod 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	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	BRAKES				
		x					x																										ST-8	
		x																															ST-9	
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		x																															Refer to MA section.	
																																	—	
																																	ST-13	
																																		ST-8
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x: Applicable



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## Checking Steering Wheel Play

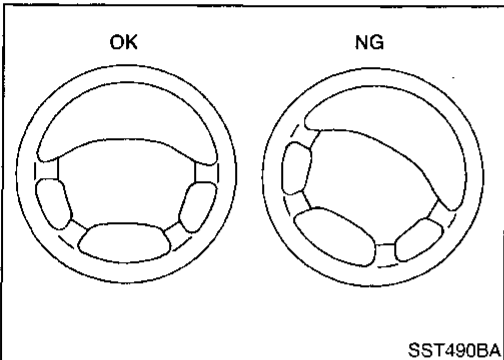
1. With wheels in a straight-ahead position, check steering wheel play.

**Steering wheel play:**  
35 mm (1.38 in) or less

2. If it is not within specification, check the following for loose or worn components.

**Steering gear assembly**  
**Steering column**  
**Front suspension and axle**

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## Checking Neutral Position on Steering Wheel

### PRE-CHECKING

- Make sure that wheel alignment is correct.

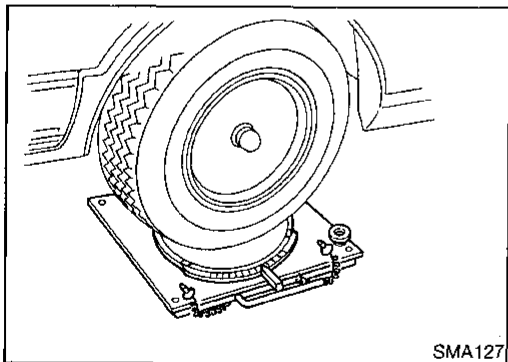
**Wheel alignment:**  
Refer to SU section ("Wheel Alignment", "SDS").

- 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 teeth, loosen tie-rod lock nuts. Turn the tie-rods by the same amount in opposite directions on both left and right sides.

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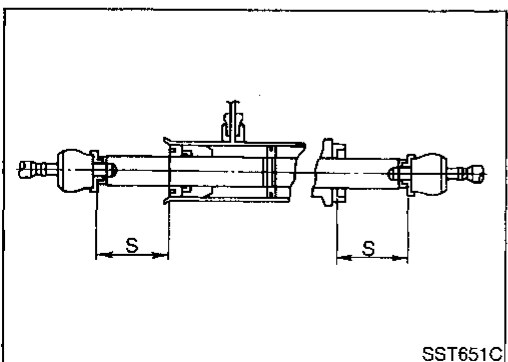
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## Front Wheel Turning Angle

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

**Turning angle of full turns:**  
Refer to SU section ("Wheel Alignment", "SDS").

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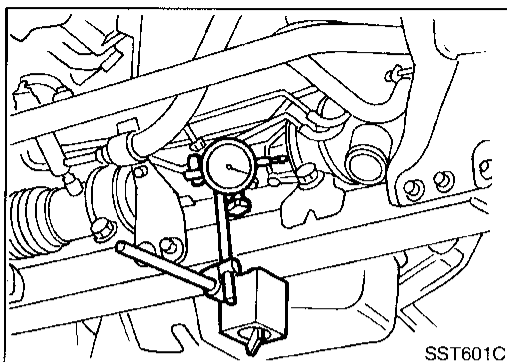
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2. If it is not within specification, check rack stroke.

**Rack stroke "S":**  
Refer to SDS (ST-39).

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## Checking Gear Housing Movement



## Checking Gear Housing Movement

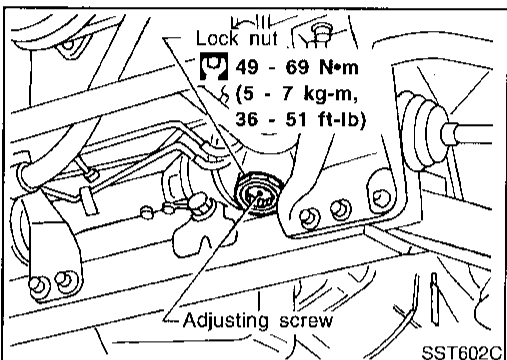
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1. Check the movement of steering gear housing during stationary steering on a dry paved surface.
  - Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement. Turn off ignition key while checking.

### Movement of gear housing:

$\pm 2$  mm ( $\pm 0.08$  in) or less

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



## Adjusting Rack Retainer

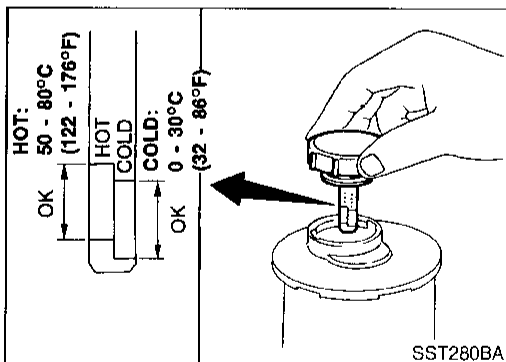
NAST0009

- Perform this driving test on a flat road.
  - a) Check whether vehicle moves in a straight line when steering wheel is released.
  - b) Check whether steering wheel returns to neutral position when steering wheel is released from a slightly turned (approx. 20°) position.
- If any abnormality is found, correct it by resetting adjusting screw.

## Checking and Adjusting Drive Belts

NAST0010

Refer to MA section ("Checking Drive Belts", "ENGINE MAINTENANCE").



## Checking Fluid Level

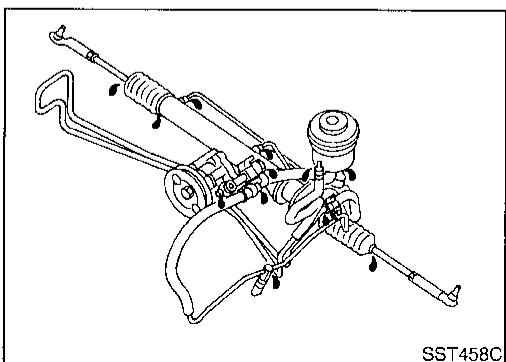
NAST0011

Check fluid level.

Use the correct range of the dipstick depending on the fluid temperature. Use the "HOT" range at 50 to 80°C (122 to 176°F), or the "COLD" range at 0 to 30°C (32 to 86°F).

### CAUTION:

- Do not overfill.
- Recommended fluid is Automatic Transmission Fluid type DEXRON™ III or equivalent.



## Checking Fluid Leakage

NAST0012

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

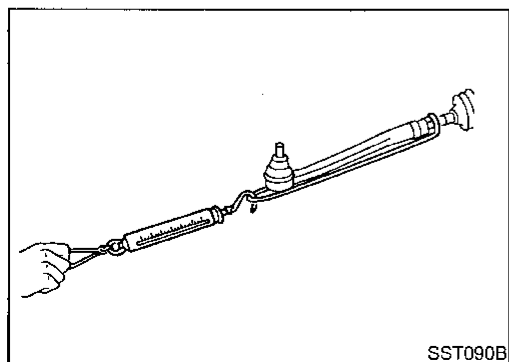
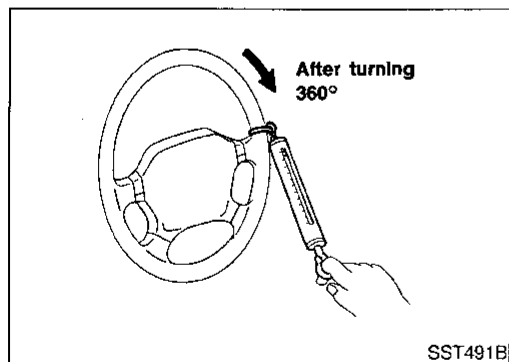
Repeat steering wheel operation until fluid level no longer decreases.

3. Start engine.  
Repeat step 2 above.

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

- a) Air bubbles in reservoir tank
- b) Clicking noise in oil pump
- c) Excessive buzzing in oil pump

Fluid noise may occur in the valve or oil pump. This is common when the vehicle is stationary or while turning steering wheel slowly. This does 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 the neutral position.

**Steering wheel turning force:**

**39 N (4 kg, 9 lb) or less**

5. If steering wheel turning force is out of specification, check rack sliding force.

- 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. Pull tie-rod slowly to move it from neutral position to  $\pm 11.5$  mm ( $\pm 0.453$  in) at speed of 3.5 mm (0.138 in)/s. Check that rack sliding force is within specification.

**Rack sliding force:**

**137 - 255 N (14 - 26 kg, 31 - 57 lb)**

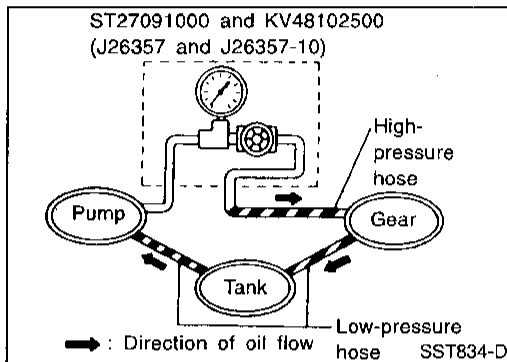
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# ON-VEHICLE SERVICE

## Checking Steering Wheel Turning Force (Cont'd)

6. If rack sliding force is not within specification, overhaul steering gear assembly.
7. If rack sliding force is OK, inspect steering column. Refer to "Inspection", "STEERING WHEEL AND STEERING COLUMN", ST-14.



## Checking Hydraulic System

NAST0015

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

1. Set Tool. Open shut-off valve. Then bleed air. Refer to "Bleeding Hydraulic System", ST-9.
2. Run engine, at idle speed or 1,000 rpm.

**Make sure fluid temperature in reservoir 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, fluid pressure in the power steering pump increase to maximum. This will raise fluid temperature abnormally.**

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.**

**Power steering pump maximum operating pressure:**

**8,630 - 9,219 kPa**

**(88 - 94 kg/cm<sup>2</sup>, 1,251 - 1,337 psi)**

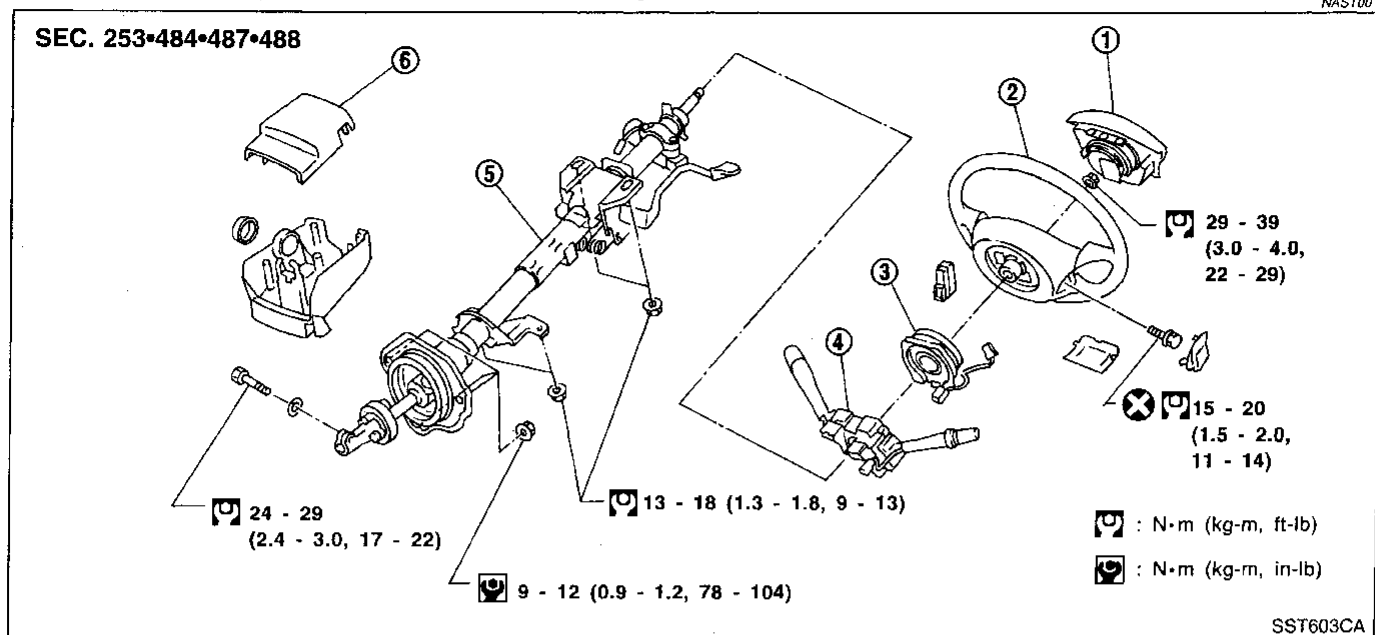
- If pressure reaches maximum operating pressure, system is OK.
  - If pressure increases above maximum operating pressure, check power steering pump flow control valve. Refer to ST-35.
4. If power steering pressure is below the maximum operating pressure, slowly close shut-off valve and check pressure again.

### CAUTION:

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

- If pressure increases to maximum operating pressure, gear should be damaged. Refer to "Removal and Installation", ST-25.
  - If pressure remains below maximum operating pressure, pump should be damaged. Refer to "Disassembly", ST-35.
5. After checking hydraulic system, remove Tool and add fluid as necessary. Then completely bleed air out of system. Refer to ST-9.

## Components



- |                   |                       |                             |
|-------------------|-----------------------|-----------------------------|
| 1. Air bag module | 3. Spiral cable       | 5. Steering column assembly |
| 2. Steering wheel | 4. Combination switch | 6. Column cover             |

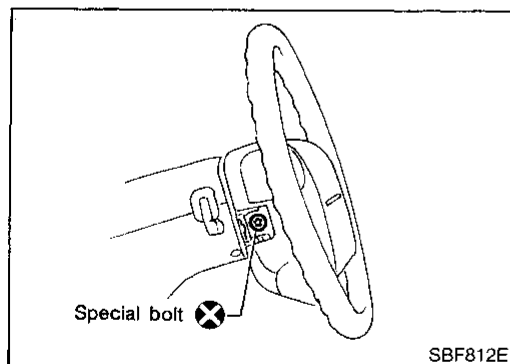
### CAUTION:

- 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.

## Removal and Installation

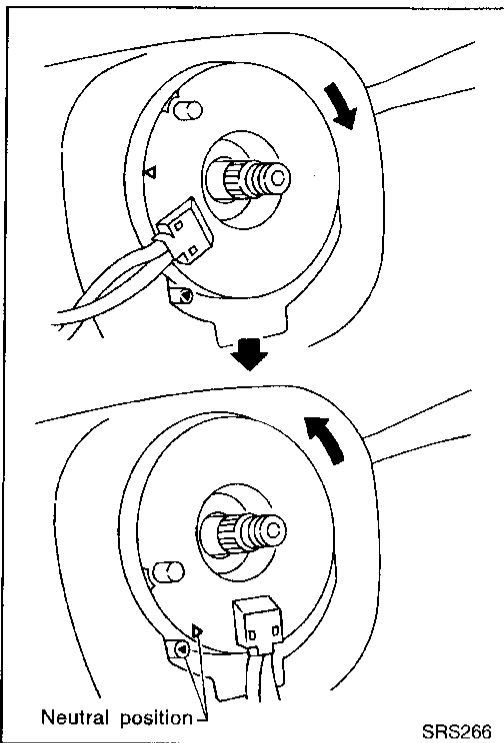
### STEERING WHEEL

1. Remove air bag module and spiral cable. Refer to RS section. ("Removal — Air Bag Module and Spiral Cable", "SUPPLEMENTAL RESTRAINT SYSTEM").



# STEERING WHEEL AND STEERING COLUMN

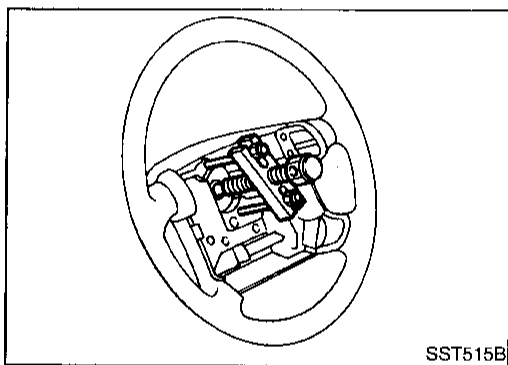
Removal and Installation (Cont'd)



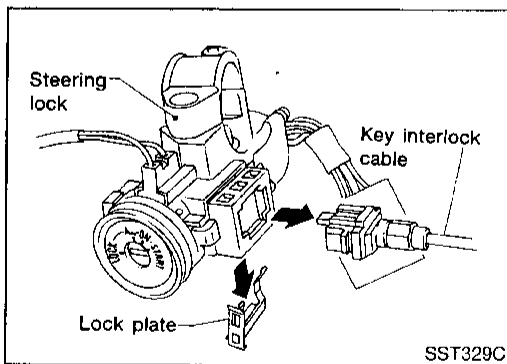
2. Align spiral cable correctly when installing steering wheel.
  - a. Set the front wheels in the straight-ahead position.
  - b. Make sure that the spiral cable is in the neutral position. The neutral position is detected by turning left about 2.5 revolutions from the right end position. Align the two marks (X).

### CAUTION:

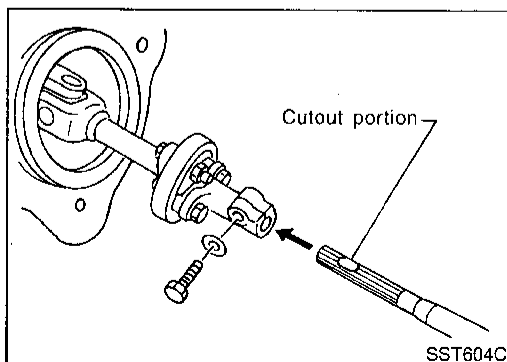
- The spiral cable may snap due to steering operation if the cable is installed in an improper position.
- Also, with the steering linkage disconnected, the cable may snap by turning the steering wheel beyond the limited number of turns. The spiral cable can be turned to the left about 2.5 turns from the right end position.



3. Remove steering wheel with Tool.



4. Remove key interlock cable (A/T models).



### 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.

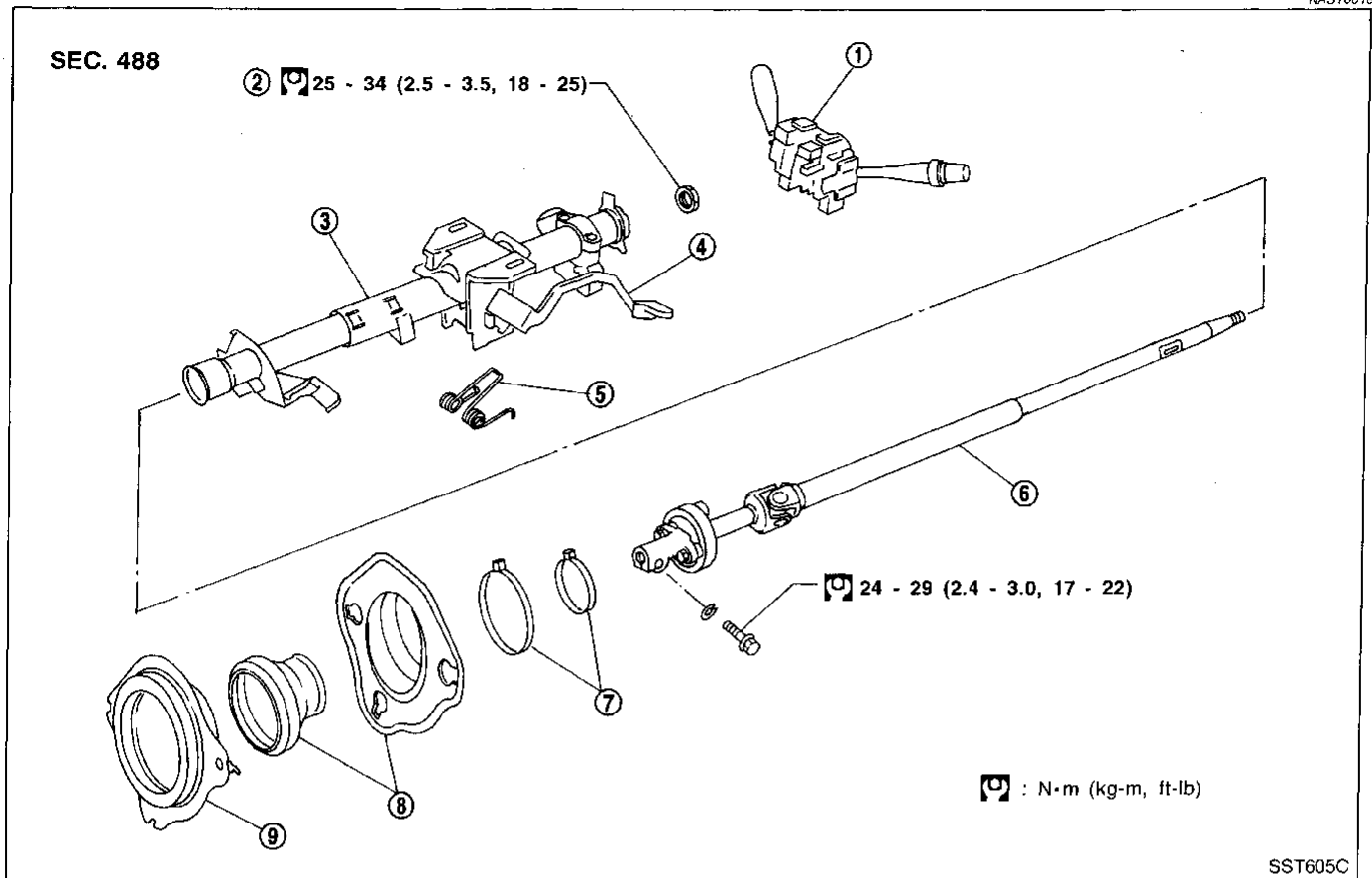
NAST0017502

# STEERING WHEEL AND STEERING COLUMN

Disassembly and Assembly

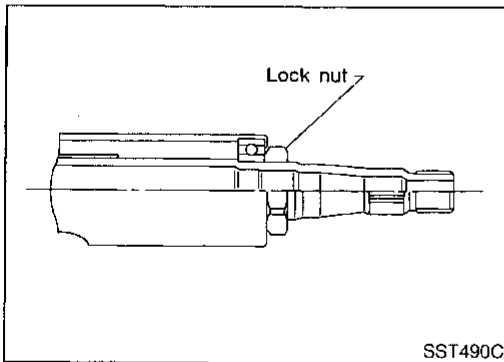
## Disassembly and Assembly

NAST0018



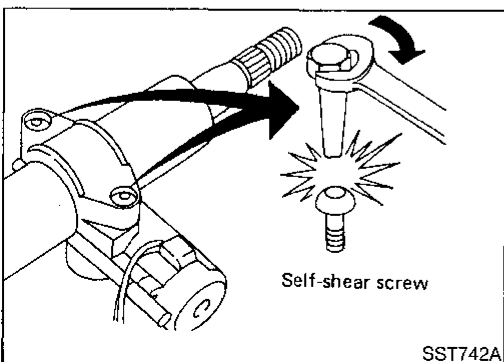
SST605C

- |                         |                                   |   |
|-------------------------|-----------------------------------|---|
| 1. Combination switch   | 4. Tilt lever                     | 7. Band                                   |
| 2. Lock nut             | 5. Tilt spring                    | 8. Jacket tube bracket insulator assembly |
| 3. Jacket tube assembly | 6. Steering column shaft assembly | 9. Hole cover                             |



- When disassembling and assembling, unlock steering lock with key.
- Install lock nut on steering column shaft and tighten the nut to specification.

$\square$  : 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)

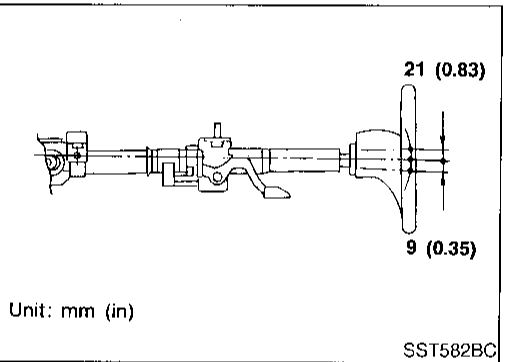
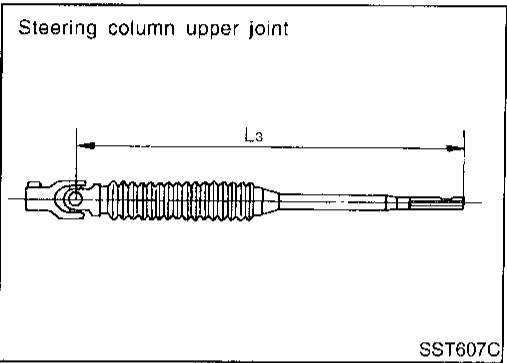
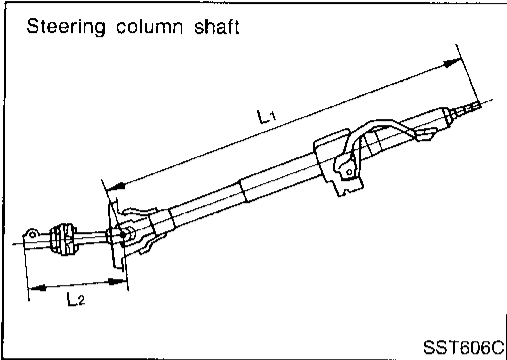


- Steering lock
  - a) Break self-shear type screws with a drill or other appropriate tool.
  - b) Install new self-shear type screws and then cut off self-shear type screw heads.

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IDX

# STEERING WHEEL AND STEERING COLUMN

## Inspection



## Inspection

- When steering wheel does not turn smoothly, check the steering column as follows and replace damaged parts. NAST0019
- a) Check column bearings for damage and unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
- b) Check steering column lower shaft for deformation and breakage. Replace if necessary.
- When the vehicle comes into a light collision, check length "L<sub>1</sub>", "L<sub>2</sub>" and "L<sub>3</sub>".

**Steering column length "L<sub>1</sub>":**

**700.3 - 704.3 mm (27.57 - 27.73 in)**

**Steering column lower shaft length "L<sub>2</sub>":**

**178 - 180 mm (7.01 - 7.09 in)**

**Steering column upper joint length "L<sub>3</sub>":**

**430.7 - 432.7 mm (16.96 - 17.04 in)**

If out of the specifications, replace steering column upper joint or steering column as an assembly.

## TILT MECHANISM

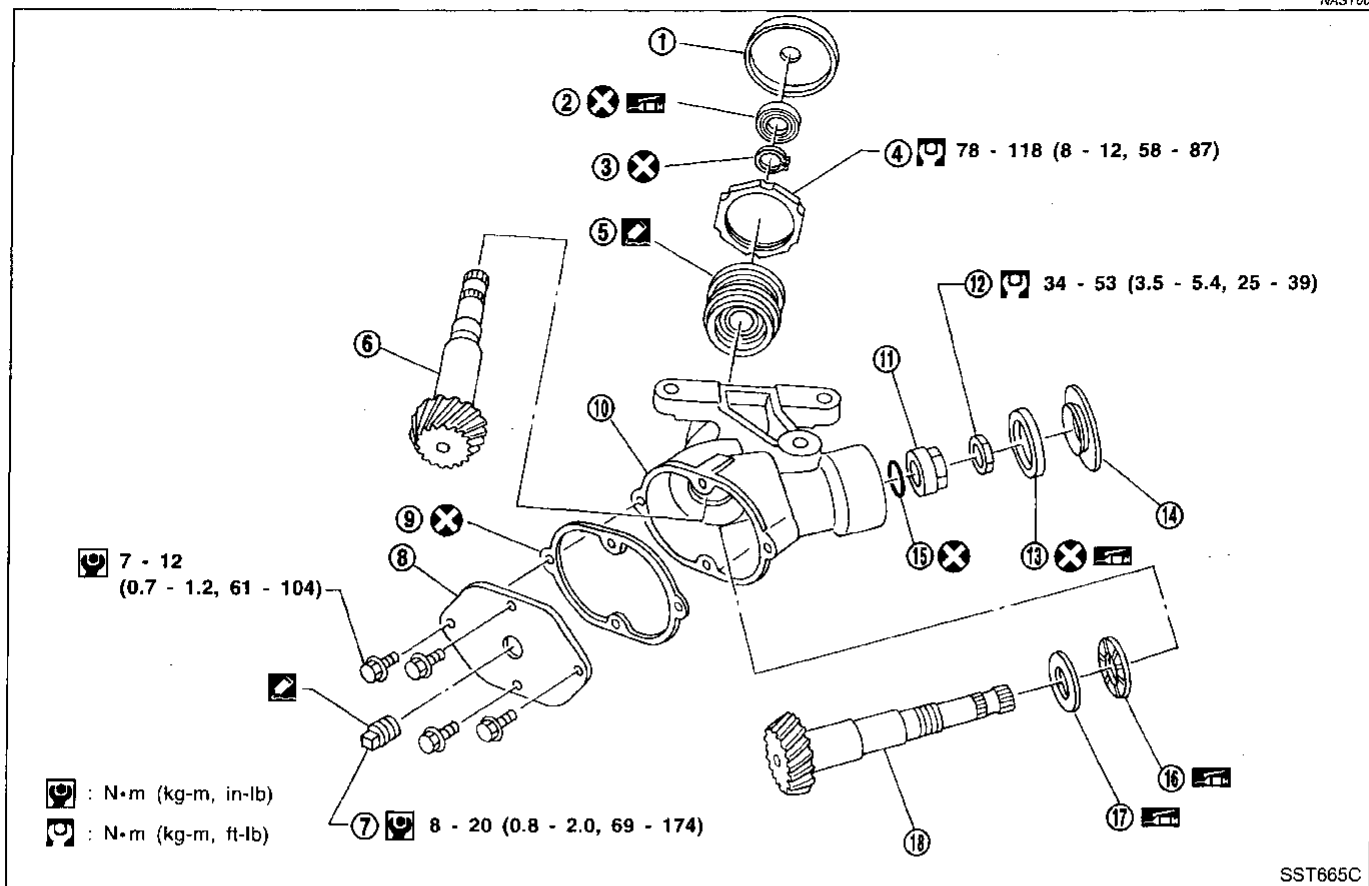
After installing steering column, check tilt mechanism operation. NAST0019S01

# STEERING TRANSFER GEAR

Components

## Components

NAST0020



SST665C

- |                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| 1. Dust cover          | 7. Plug                        | 13. Oil seal       |
| 2. Oil seal            | 8. Front cover                 | 14. Dust cover     |
| 3. Snap ring           | 9. Gasket                      | 15. O-ring         |
| 4. Lock nut            | 10. Transfer gear box assembly | 16. Thrust bearing |
| 5. Rear cover assembly | 11. Inner nut                  | 17. Bearing race   |
| 6. Input shaft         | 12. Lock nut                   | 18. Output shaft   |

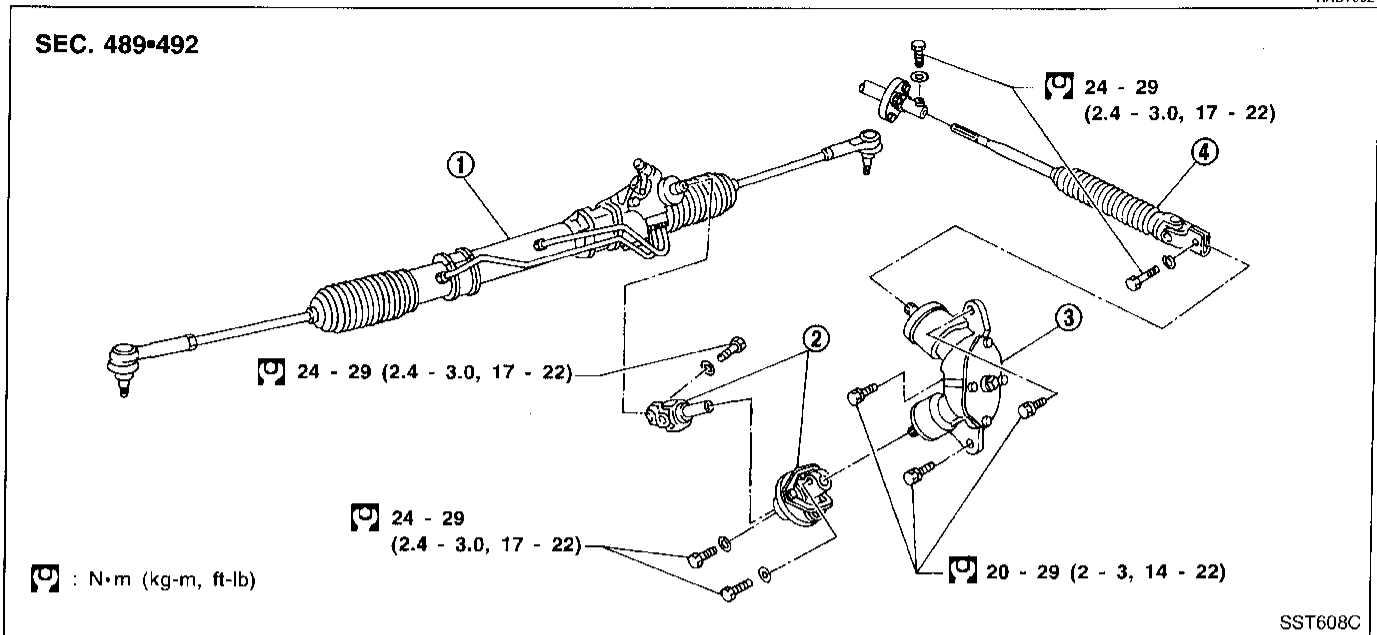
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# STEERING TRANSFER GEAR

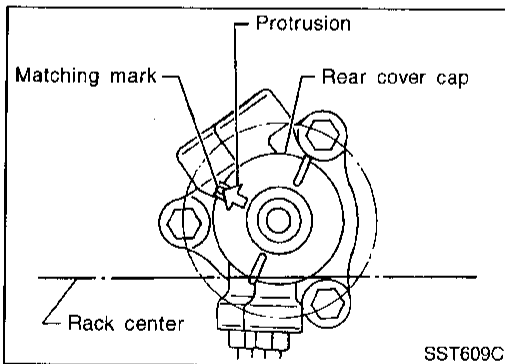
Removal

## Removal

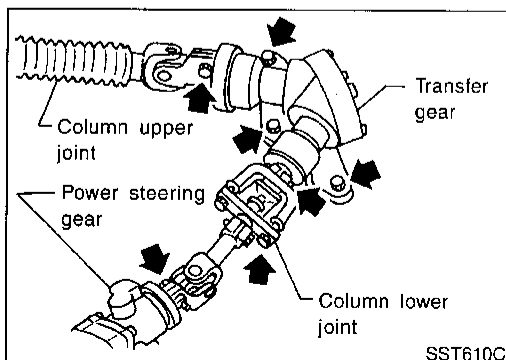
NAST0021



1. Power steering gear assembly
2. Steering column lower joint
3. Transfer gear assembly
4. Steering column upper joint

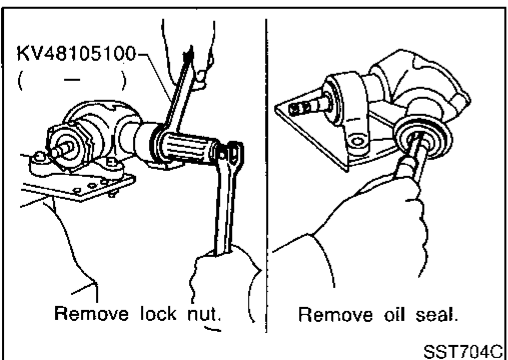
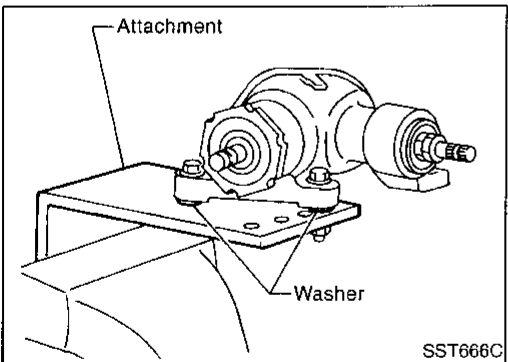
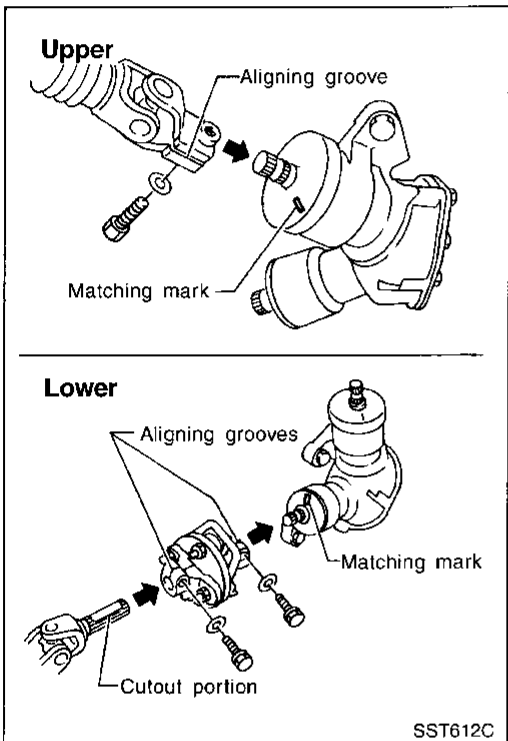
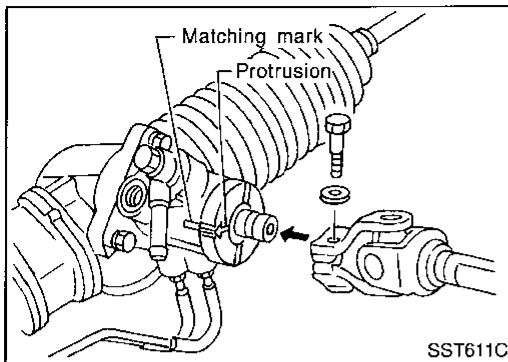


1. Set wheels in the straight-ahead position.
2. Straight-forward position is indicated by a protrusion on the power steering gear rear cover cap and matching mark on the rear housing.



3. Remove steering column upper and lower joint from transfer gear.
4. Remove transfer gear assembly.





## Installation

NAST0022

1. Set wheels in the straight-ahead position.
2. Install transfer gear assembly.
3. Install column lower joint while aligning groove with protrusions on the steering gear rear cover cap.
4. Tighten bolt while aligning groove on steering gear. Before tightening bolt, ensure it is inserted correctly.
5. When attaching steering column upper and lower joint to transfer gear, it must be positioned as shown in figure at left.

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

AX

SU

## Disassembly

NAST0023

1. Clean exterior of transfer gear assembly.
2. Set transfer gear assembly on vise with attachment and a washer.
3. Remove dust covers.

BR

ST

RS

BT

## OUTPUT SHAFT SIDE

NAST0023501

1. While holding inner nut using Tool, remove lock nut.
2. Remove inner nut.
3. Remove oil seal.

HA

SC

### CAUTION:

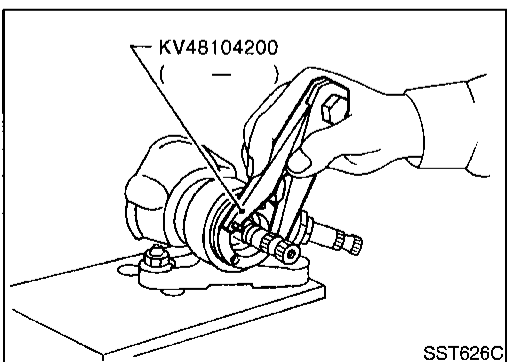
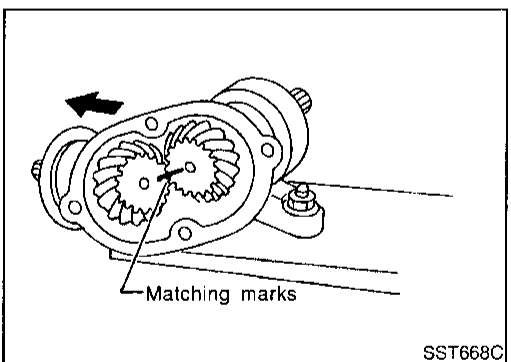
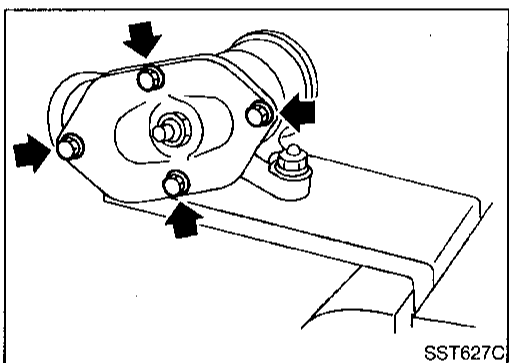
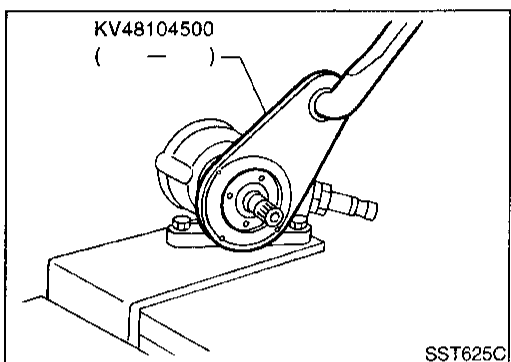
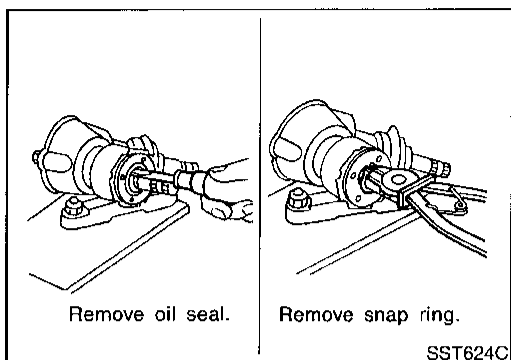
- Do not damage the input shaft body during oil seal removal. Also be careful not to damage the oil seal mounting surface.
- Do not re-use the output shaft oil seal.

EL

IDX

# STEERING TRANSFER GEAR

Disassembly (Cont'd)



## INPUT SHAFT SIDE

NAST0023S02

1. Remove oil seal.

### CAUTION:

- Do not damage the input shaft body during oil seal removal. Also be careful not to damage the oil seal mounting surface.
  - Do not re-use the input shaft oil seal.
2. Remove snap ring.

3. Remove lock nut with Tool.

4. Remove front cover.  
Leave one upper bolt loosely fitted to prevent the front cover from falling down.

To remove front cover, use a small punch and hammer to tap on the cover from rear side lip.

Completely remove gasket from housing and front cover with resin or wooden bar. (Do not damage gasket surface.)

### CAUTION:

Position the punch carefully to keep from damaging the front cover gasket and transfer gear housing sealing surface.

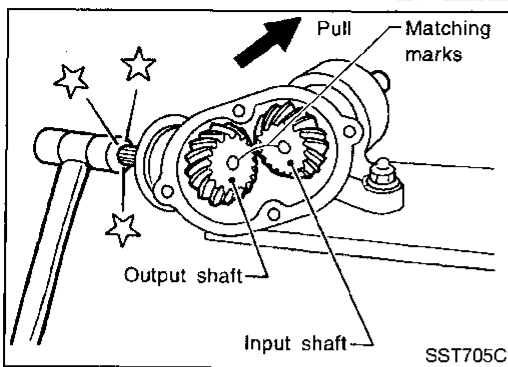
5. Wipe grease from the input and output gears.

6. Put matching marks on gears.

7. Remove rear cover with Tool (pin-type lock nut wrench). Remove thread locker residue from the transfer gear housing using a toothbrush and thinner.

# STEERING TRANSFER GEAR

Disassembly (Cont'd)



8. While pulling input shaft in the direction of the arrow shown in figure, drive output shaft out using a plastic hammer. (Input shaft cannot be removed before removing output shaft.)

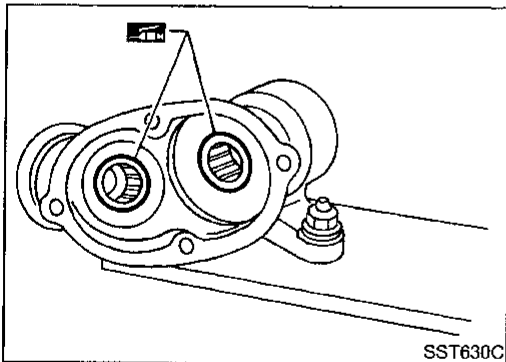
**Be careful not to damage thrust bearing between output shaft gear and gear box during removal.**

9. Remove thrust bearing, bearing race and O-ring from output shaft.

10. Remove input shaft.

## Inspection

- Check that needle bearings and output shaft bearing rotate smoothly. Also check them for deformation and damage. Replace transfer gear box assembly if necessary.
- Check that thrust bearing and bearing race rotate smoothly. Also check them for deformation and damage. Replace thrust bearing assembly if necessary.
- Check that input shaft bearing of rear cover assembly rotates smoothly. Check it for deformation and damage. Replace rear cover assembly if necessary.
- Check teeth of input and output shafts for excessive wear, chips and cracks. Replace shafts if necessary.

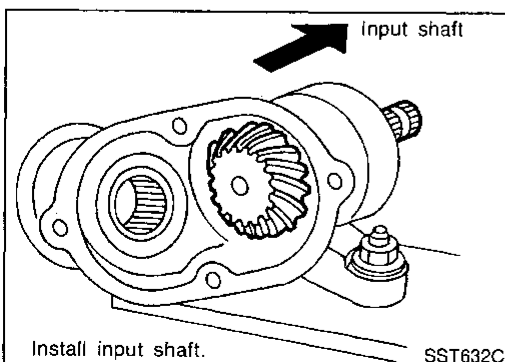


## Assembly

1. Apply grease to needle bearings before installing output shaft and input shaft.

**Recommended grease: MULTEMP PS No. 2**

**Apply the grease onto the bearings with your finger until the roller cage is packed, making the actual needle bearings difficult to see [ 2 to 3 g (0.07 to 0.11 oz) each ].**

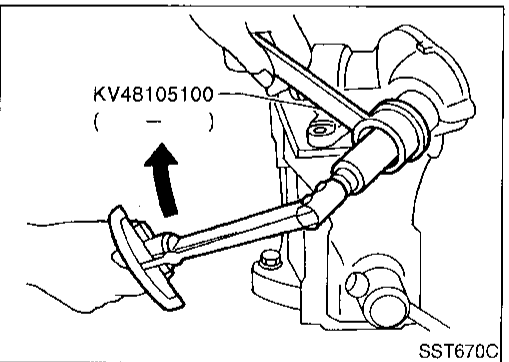
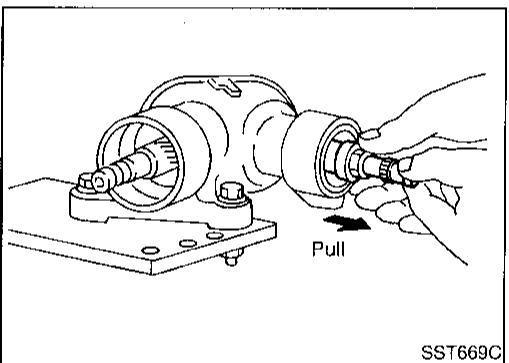
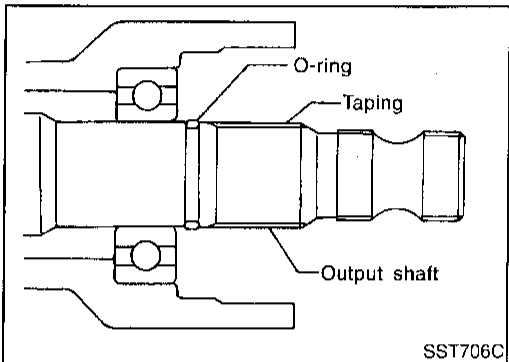
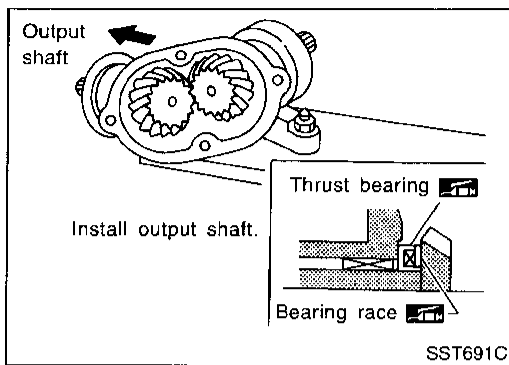


2. Insert input shaft until it comes in contact with end face of gear box.

**Output shaft cannot be installed before installing input shaft.**

# STEERING TRANSFER GEAR

Assembly (Cont'd)



3. Apply grease to output shaft thrust bearing.  
**Recommended grease: MULTEMP PS No. 2**
4. Insert bearing race and thrust bearing to output shaft.  
**Insert thrust bearing with roller side towards the bearing race as shown in the illustration.**
5. Insert output shaft until it comes in contact with end face of gear box.

6. Insert new O-ring to output shaft.  
**Cover screw threads of output shaft with tape to prevent damage to O-ring.**  
**CAUTION:**  
**Install O-ring after installing output shaft to housing.**

7. While pulling output shaft in the direction of the arrow, hand-tighten inner nut.
8. Use Tool to tighten inner nut slightly while holding output shaft gear by hand.
9. Check rotating torque of output shaft gear.

**Rotating torque:**

**Approx. 0.15 - 0.20 N·m (1.5 - 2 kg-cm, 1.3 - 1.7 in-lb)**

10. Check that output shaft has no axial end play by pushing and pulling top of shaft side-to-side.  
Repeat steps from 8 to 10 if axial end play exists.
11. While holding inner nut using Tool, tighten lock nut using a torque wrench.

**□ : 34 - 53 N·m (3.5 - 5.4 kg-m, 25 - 39 ft-lb)**

12. Measure rotating torque (rotating speed is 7 - 10 sec./rotation) of output shaft using a bar type torque wrench and adapter nut. If rotating torque is out of specification, loosen lock nut and inner nut. Then repeat from step 7.

**Rotating torque:**

**0.1 - 0.15 N·m (1 - 1.5 kg-cm, 0.9 - 1.3 in-lb)**

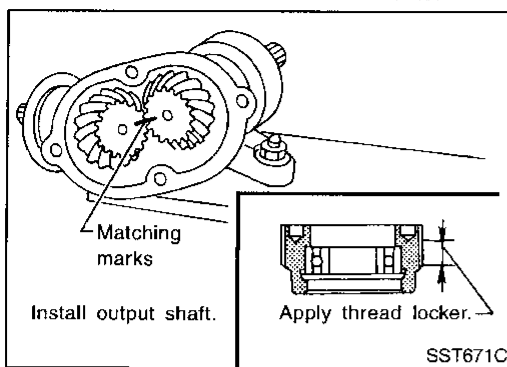
**If rotating torque is out of specification, rotate the input shaft two turns clockwise, then two turns counterclockwise. Repeat this step 9 times. The turning torque will then meet specification due to conditioning.**

**CAUTION:**

**Do not allow input shaft to mesh with output shaft while checking output shaft rotating torque.**

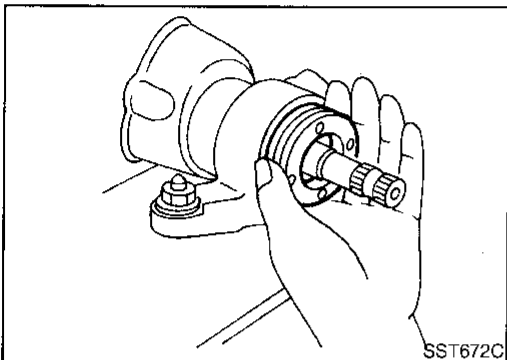
# STEERING TRANSFER GEAR

Assembly (Cont'd)



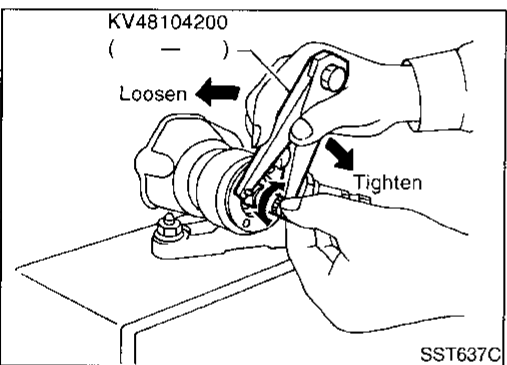
13. Align matching marks on gears made during disassembly step.
14. Apply thread locker to the circumference of the bottom 3 - 5 threads of the rear cover.

GI  
MA  
EM  
LC



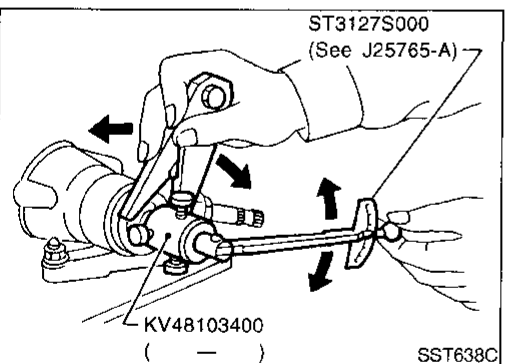
15. Install and hand tighten input shaft rear cover.  
**When the gears mesh with each other, preload occurs and resistance is felt when gears are rotated.**

EC  
FE  
CL



16. Tighten input shaft rear cover until input shaft meshes with output shaft.  
**When the gears mesh with each other, preload occurs and resistance is felt when gears are rotated.**

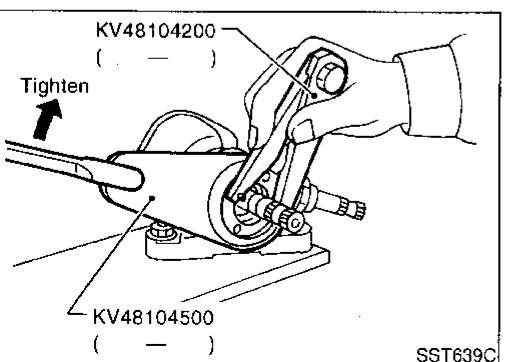
MT  
AT  
TF



17. While adjusting rear cover, measure rotating torque of input and output shaft (as a unit) with Tools.  
**Rotating torque:**  
0.25 - 0.69 N·m (2.5 - 7.0 kg-cm, 2.2 - 6.1 in-lb)

PD  
AX  
SU

**ST**



18. While holding rear cover with Tool (pin-type nut wrench), tighten lock nut with Tool.  
**⚙ : 78 - 118 N·m (8 - 12 kg-m, 58 - 87 ft-lb)**
19. Check rotating torque 360° in both direction. If rotating torque is out of specification, loosen lock nut and repeat steps 17 and 18.

BR  
RS  
BT

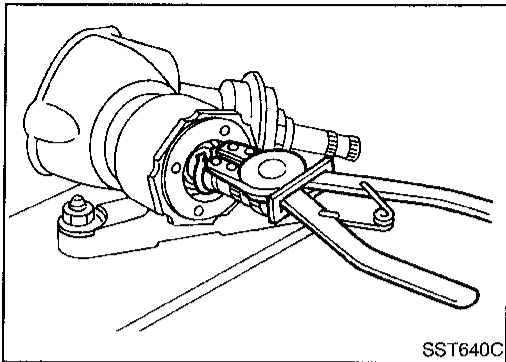
HA  
SC

**If rotating torque is out of specification, rotate input shaft two turns clockwise, then two turns counterclockwise. Repeat this step 9 times. The turning torque will then meet specification due to conditioning.**

EL  
IDX

# STEERING TRANSFER GEAR

Assembly (Cont'd)

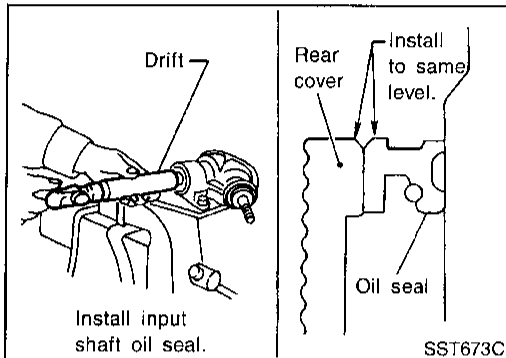


20. Install snap ring in the groove correctly.

The snap ring is installed correctly about 2 mm (0.08 in) gap exists at the snap ring ends.

**CAUTION:**

Do not spread snap ring end gap more than 7 mm (0.28 in). (Snap ring will fatigue.)



21. Apply grease to input and output seal lips. Install oil seals with drift.

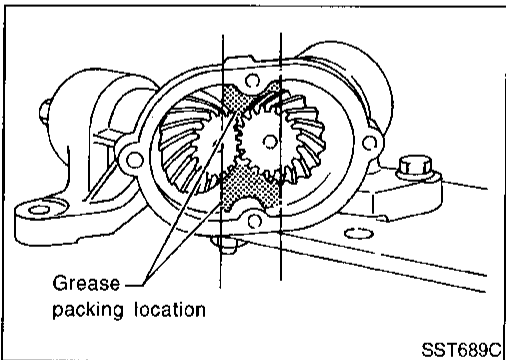
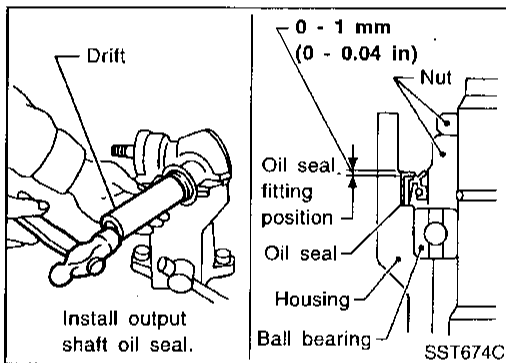
**Recommended grease:**

**ONE-LUBER SG No. 2**

**CAUTION:**

Be careful seal lip does not contact input shaft splines. Pay attention to oil seal direction.

Spring side faces inward.



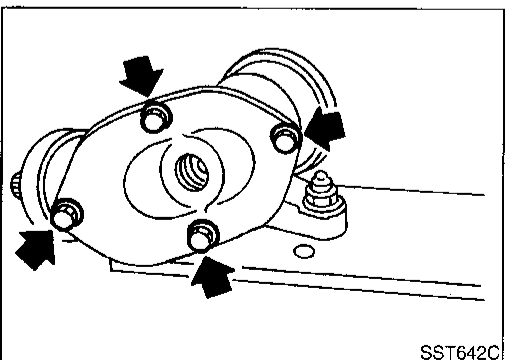
22. Pack input and output shaft gears with grease.

**Specified grease:**

**ONE-LUBER SG No. 00**

**Specified amount of grease:**

**40 - 45 g (1.41 - 1.59 oz)**



23. Install front cover using a new gasket.

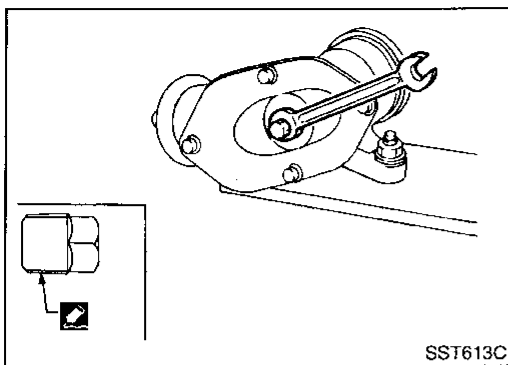
**CAUTION:**

Do not torque front cover bolts in a circle, torque in an "X" pattern.

 : 7 - 12 N·m (0.7 - 1.2 kg·m, 61 - 104 in·lb)

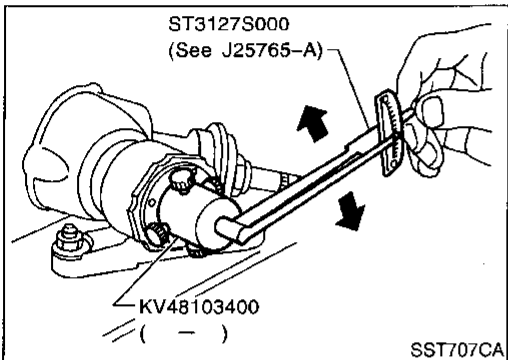
# STEERING TRANSFER GEAR

Assembly (Cont'd)



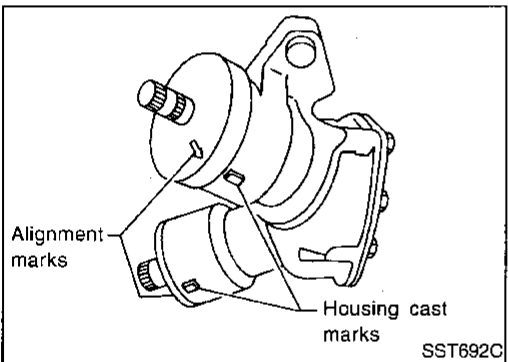
24. Apply liquid packing to threads of plug, and tighten it.

: 8 - 20 N·m (0.8 - 2.0 kg·m, 69 - 174 in·lb)



25. Measure rotating torque at input shaft.

Use same torque specification as step 19. If out of specification, repeat steps 17 and 18.



26. Locate position of highest torque.

While holding the input shaft position at the point of the highest torque, align the mating rib of the input dust cover with the protrusion on the transfer gear housing.

27. Install output dust cover with index mark aligned with casting mark on housing.

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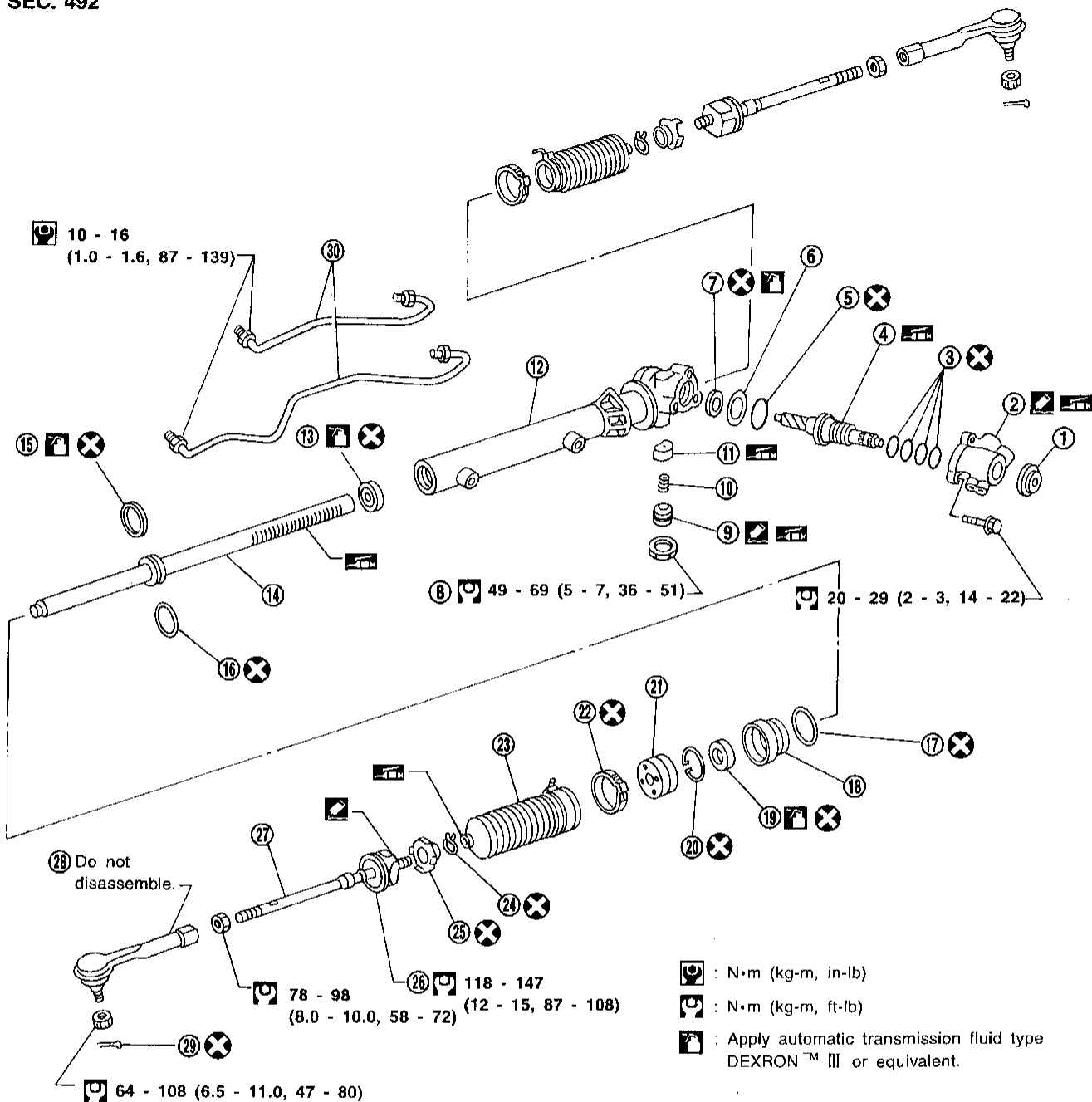
# POWER STEERING GEAR AND LINKAGE

Components

## Components

NAST0026

SEC. 492



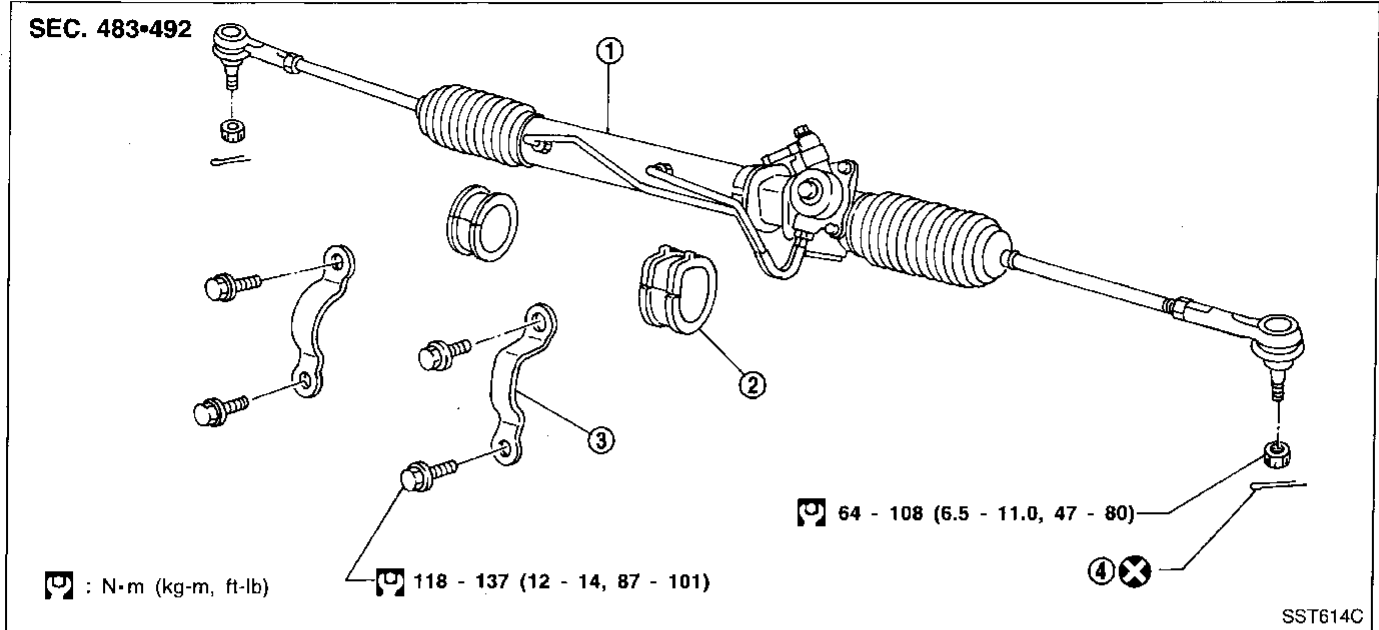
SST618CA

- |                          |                           |                          |
|--------------------------|---------------------------|--------------------------|
| 1. Rear cover cap        | 11. Retainer              | 21. End cover assembly   |
| 2. Rear housing assembly | 12. Gear housing assembly | 22. Boot clamp           |
| 3. Pinion seal ring      | 13. Rack oil seal         | 23. Dust boot            |
| 4. Pinion assembly       | 14. Rack assembly         | 24. Boot clamp           |
| 5. O-ring                | 15. Rack seal ring        | 25. Lock plate           |
| 6. Shim                  | 16. O-ring                | 26. Tie-rod inner socket |
| 7. Pinion oil seal       | 17. O-ring                | 27. Tie-rod              |
| 8. Lock nut              | 18. Rack bushing          | 28. Tie-rod outer socket |
| 9. Adjusting screw       | 19. Rack oil seal         | 29. Cotter pin           |
| 10. Spring               | 20. Snap ring             | 30. Cylinder tube        |

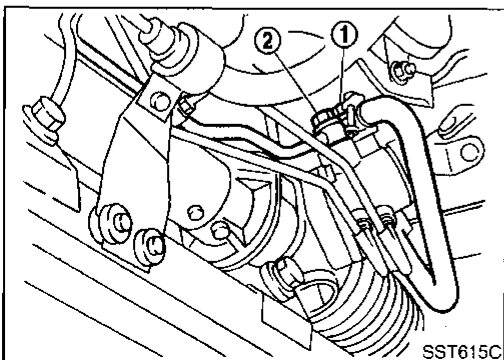
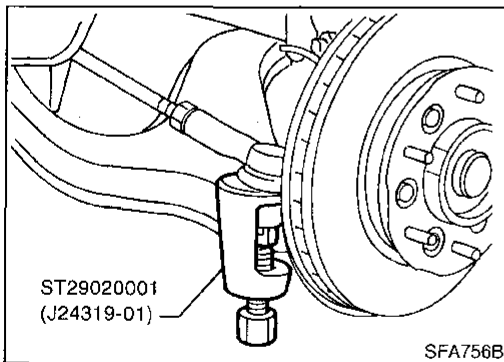


## Removal and Installation

NAST0027



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



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

- Install pipe connector.
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening will damage threads of connector or O-ring.

#### Connector tightening torque:

##### Low-pressure side "1"

30 - 35 N·m (3.1 - 3.6 kg-m, 22 - 26 ft-lb)

##### High-pressure side "2"

30 - 35 N·m (3.1 - 3.6 kg-m, 22 - 26 ft-lb)

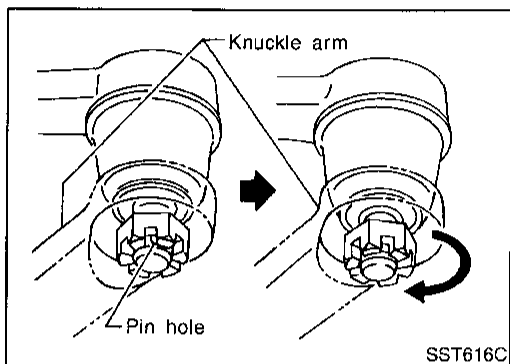
- The O-ring in low-pressure pipe connector is larger than that

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# POWER STEERING GEAR AND LINKAGE

Removal and Installation (Cont'd)

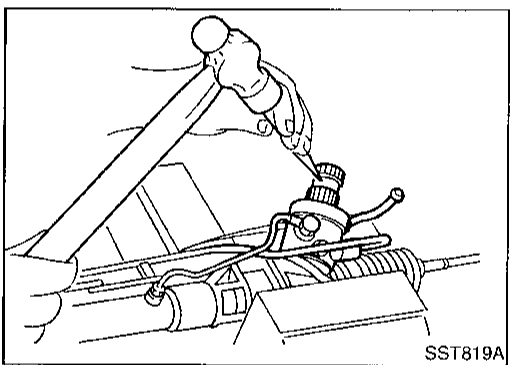
in high-pressure connector. Take care to install the proper O-ring.



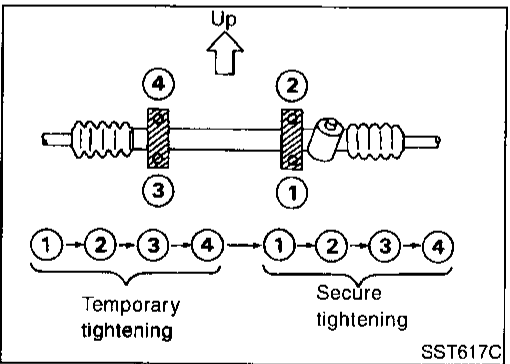
- Initially, tighten nut on tie-rod outer socket and knuckle arm to 64 to 69 N·m (6.5 to 7.0 kg-m, 47 to 51 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

**CAUTION:**

**Tightening torque must not exceed 108 N·m (11.0 kg-m, 80 ft-lb).**



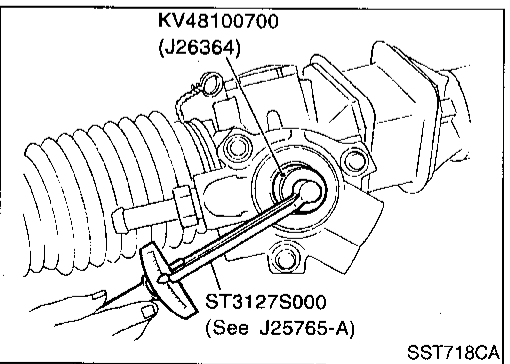
- Before removing steering column lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing steering column lower joint, put matching mark on pinion shaft and pinion housing to record neutral position.
- To install, set left and right dust boots to equal deflection.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



- Tighten gear housing mounting bracket bolts in the order shown.

**Secure tightening torque:**

**118 - 137 N·m (12 - 14 kg-m, 87 - 101 ft-lb)**



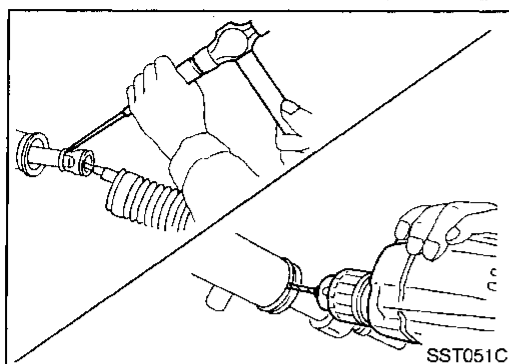
## Disassembly

- Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.
  - Before measuring, disconnect cylinder tube and drain fluid.
  - 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.
- Remove pinion gear.

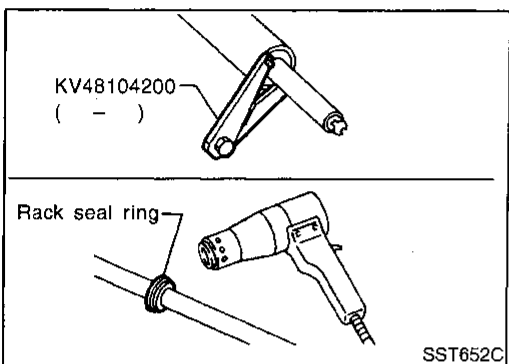
**Be careful not to damage pinion gear when removing pinion seal ring.**

# POWER STEERING GEAR AND LINKAGE

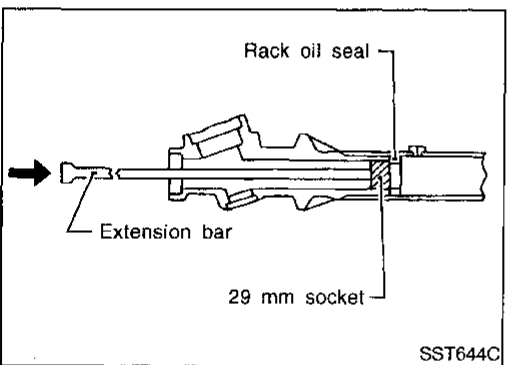
Disassembly (Cont'd)



3. Remove tie-rod outer sockets and boots.
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
5. Remove retainer.
6. Remove pinion assembly.
7. Use a 2 to 2.5 mm (0.079 to 0.098 in) diameter drill to completely remove staked portion of gear housing end.



8. Remove gear housing end cover assembly with a suitable tool.
  9. Draw out rack assembly.
  10. Remove rack seal ring.
    - Using a heat gun, heat rack seal to approximately 40°C (104°F).
    - Remove rack seal ring.
- Be careful not to damage rack.**



11. Remove rack bushing and rack oil seal using tape wrapped socket and extension bar.
- Do not scratch inner surfaces of pinion housing.**

## Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid type DEXRON™ III or equivalent. Blow dry with compressed air, if available.

## BOOT

- Check condition of boot. If cracked excessively, replace it.
- Check boots for accumulation of power steering fluid.

## RACK

Thoroughly examine rack gear. If damaged, cracked and worn, replace it.

## PINION ASSEMBLY

- Thoroughly examine pinion gear. If pinion gear is damaged, cracked and worn, replace it.
- Check that all bearings roll freely. Ensure that balls, rollers and races are not cracked, pitted and worn.

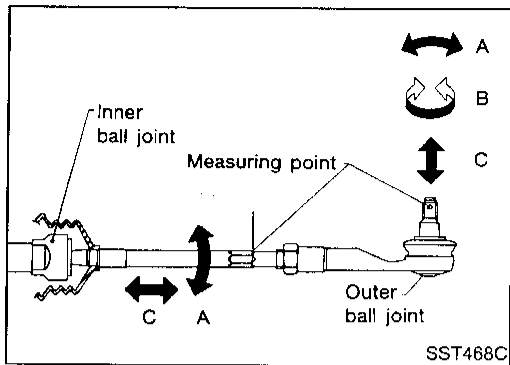
## GEAR HOUSING CYLINDER

Check gear housing cylinder bore for scratches and other damage. Replace if necessary.

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# POWER STEERING GEAR AND LINKAGE

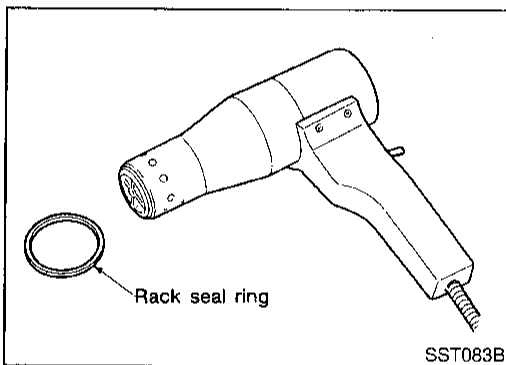
Inspection (Cont'd)



## TIE-ROD OUTER AND INNER SOCKETS

NAST0029S05

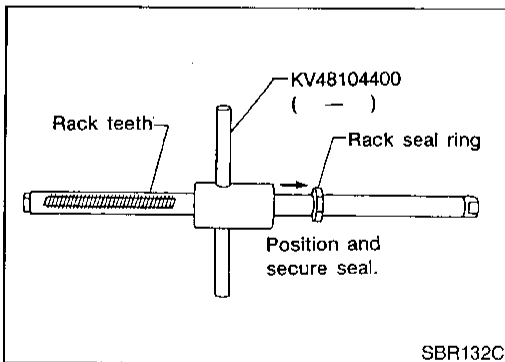
- Check ball joints for swinging force.  
**Tie-rod outer and inner ball joints swinging force "A":**  
**Refer to SDS, ST-39.**
- Check ball joint for rotating torque.  
**Tie-rod outer ball joint rotating torque "B":**  
**Refer to SDS, ST-39.**
- Check ball joints for axial end play.  
**Tie-rod outer and inner ball joints axial end play "C":**  
**Refer to SDS, ST-39.**
- Check condition of dust cover. If cracked excessively, replace outer tie-rod.



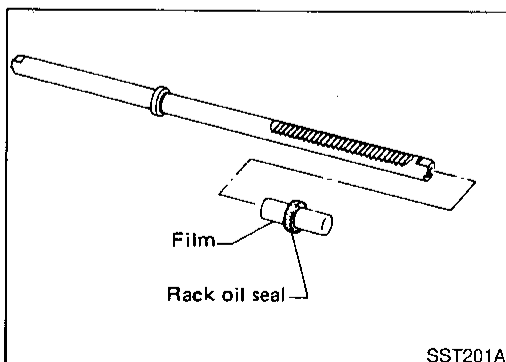
## Assembly

NAST0030

1. Using a heat gun, heat new teflon rack seal ring to approximately 40°C (104°F). Then place it onto rack.



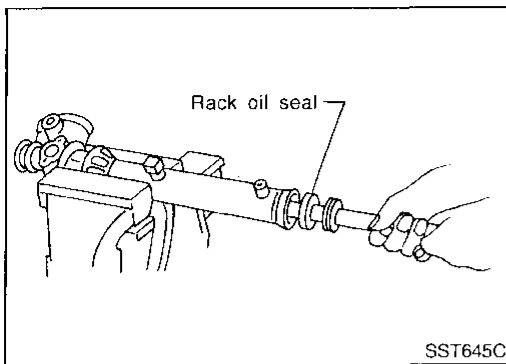
2. Using Tool, compress rack seal ring securely on rack.  
**Always insert Tool from the rack gear side.**



3. Insert new rack oil seal.
  - Place plastic film into rack oil seal to prevent damage by rack teeth.
  - Do not forget to remove plastic film after rack oil seal is positioned properly.
  - Make sure lips of rack oil seal face each other.

# POWER STEERING GEAR AND LINKAGE

Assembly (Cont'd)



4. Install rack oil seal and rack bushing with rack assembly.

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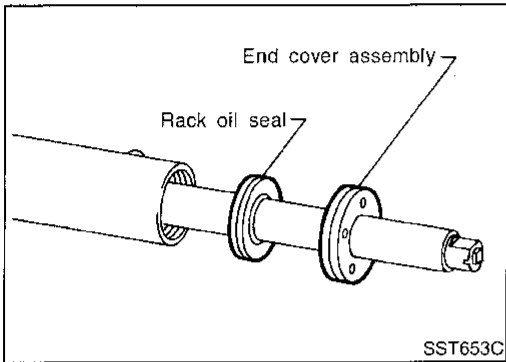
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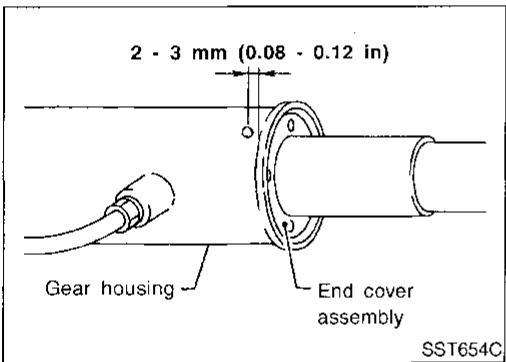
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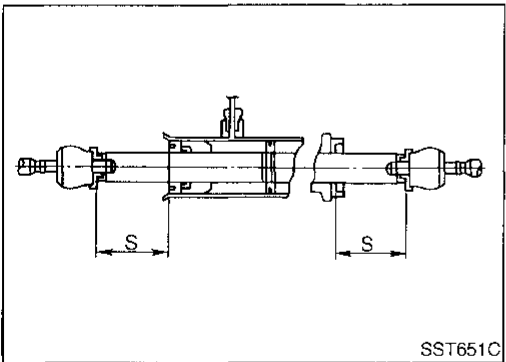
DX



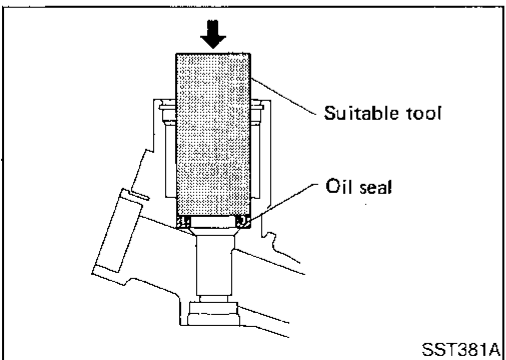
5. Insert rack oil seal and end cover assembly to rack. Then tighten end cover assembly.



6. Fasten cylinder end cover assembly to gear housing by staking.



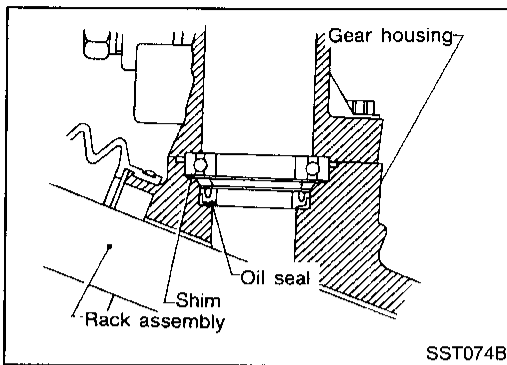
7. Set rack gear in the neutral position.  
**Rack stroke "S":**  
Refer to SDS, ST-39.



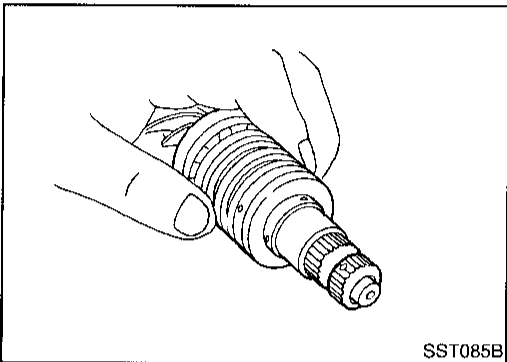
8. Coat seal lip of new pinion oil seal with multi-purpose grease. Install it into pinion housing of gear with a suitable tool.  
**Make sure lip of oil seal faces up when installed.**

# POWER STEERING GEAR AND LINKAGE

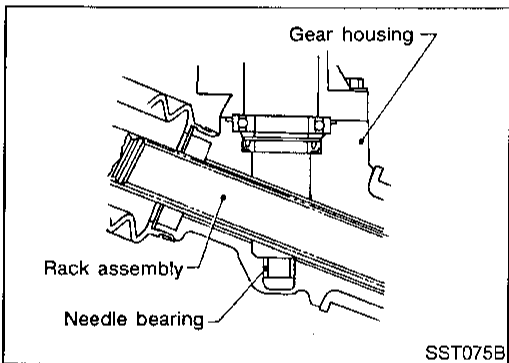
Assembly (Cont'd)



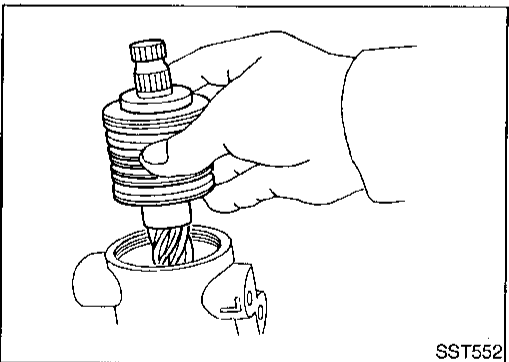
9. Install pinion bearing adjusting shim(s).
  - Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.



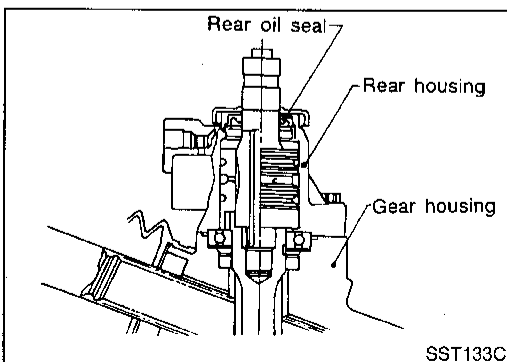
10. Install new pinion seal ring (made of Teflon) on pinion gear assembly.
  - Using a heat gun, heat pinion seal ring to approximately 40°C (104°F) before installing it onto pinion gear assembly.
  - Make sure pinion seal ring is properly settled in valve groove.



11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip.



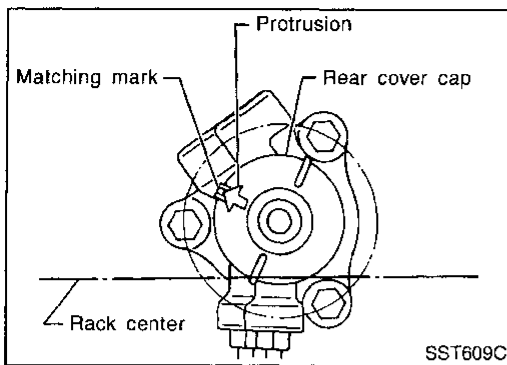
12. Install pinion assembly to rear housing.  
**Be careful not to damage pinion oil seal.**



13. Apply a coat of multi-purpose grease to new rear oil seal lip before installing rear housing.

# POWER STEERING GEAR AND LINKAGE

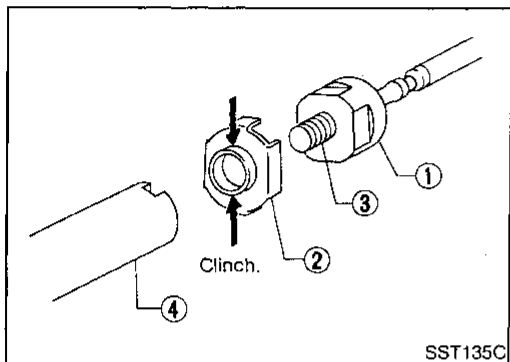
Assembly (Cont'd)



14. Ensure that the rack is centered. Install rear cover cap so that its protrusion is positioned as shown in figure.

**Be careful not to damage worm ring and oil seal.**

15. Install retainer, spring and adjusting screw temporarily.

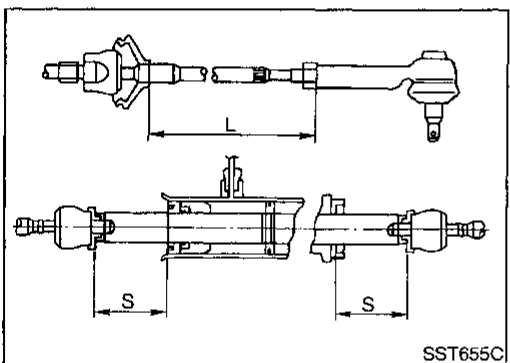


16. Install new lock plate.

- Attach lock plate 2 to side rod inner socket 1.
- Apply locking sealant to inner socket threads 3. Screw inner socket into rack 4 and tighten to specified torque.
- Clinch two places of lock plate at rack's groove.

**CAUTION:**

To prevent scratching the boot, remove burrs from lock plate.



17. Tighten outer socket lock nut.

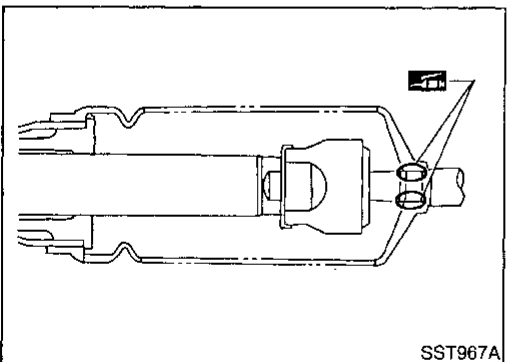
**Tie-rod length "L":**

**Refer to SDS, ST-39.**

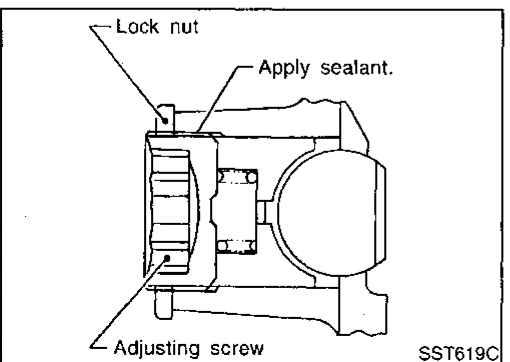
18. Measure rack stroke.

**Rack stroke "S":**

**Refer to SDS, ST-39.**



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



## Adjustment

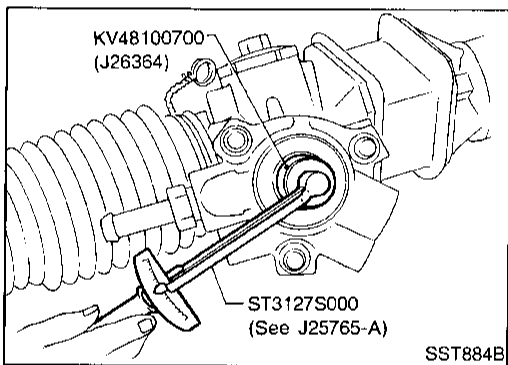
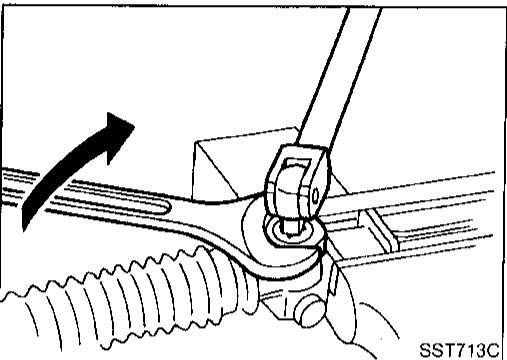
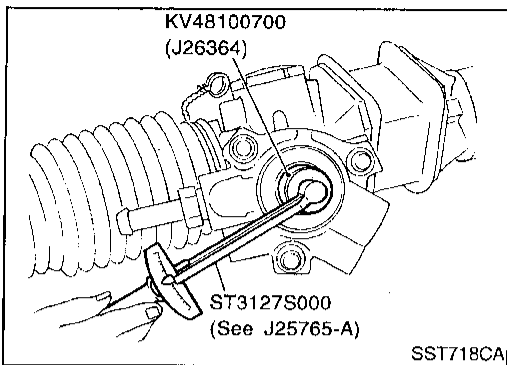
NAST0031

Adjust pinion rotating torque as follows:

1. Set rack to the neutral position without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.2 N·m (2 kg-cm, 1.7 in-lb).

# POWER STEERING GEAR AND LINKAGE

Adjustment (Cont'd)



6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of 180° from neutral position.  
Stop the gear at the point of maximum torque.
8. Loosen adjusting screw, then retighten it to 4.9 to 5.9 N·m (50 to 60 kg·cm, 43 to 52 in·lb).
9. Loosen adjusting screw by 10° to 20°.

10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

11. Measure pinion rotating torque.

**Lock to lock:**

**Average rotating torque**

**0.78 - 1.47 N·m (8.0 - 15.0 kg·cm, 6.9 - 13.0 in·lb)**

**Within ±100° from the neutral position:**

**Maximum torque variation**

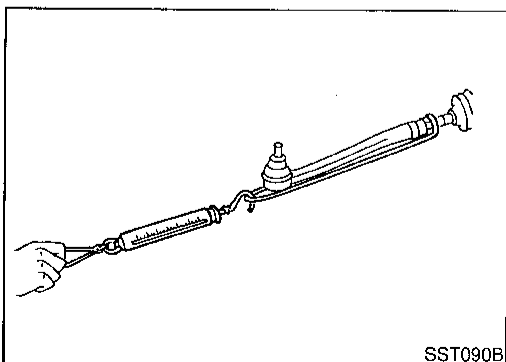
**0.4 N·m (4 kg·cm, 3.5 in·lb)**

**Outside the above range:**

**Maximum force variation**

**0.6 N·m (6 kg·cm, 5.2 in·lb)**

- If pinion rotating torque is not within specifications, readjust it starting from step 4. If pinion rotating torque is still out of specifications after readjustment, replace steering gear assembly.



12. Check rack sliding force on vehicle as follows:
  - a. Install steering gear onto vehicle, but do not connect tie-rod to knuckle arm.
  - b. Connect all piping and fill with steering fluid.
  - c. Start engine and bleed air completely.
  - d. Disconnect steering column lower joint from the gear.
  - e. Keep engine at idle and make sure steering fluid has reached normal operating temperature.
  - f. Pull tie-rod slowly to move it from neutral position to ±11.5 mm (±0.453 in) at speed of 3.5 mm (0.138 in)/s. Check that rack sliding force is within specification.



# POWER STEERING GEAR AND LINKAGE

Adjustment (Cont'd)

## Rack sliding force:

137 - 255 N (14 - 26 kg, 31 - 57 lb)

- If rack sliding force is not within specification, readjust by repeating adjustment procedure from the beginning.
- If rack sliding force is still out of specification after readjustment, gear assembly needs to be replaced.

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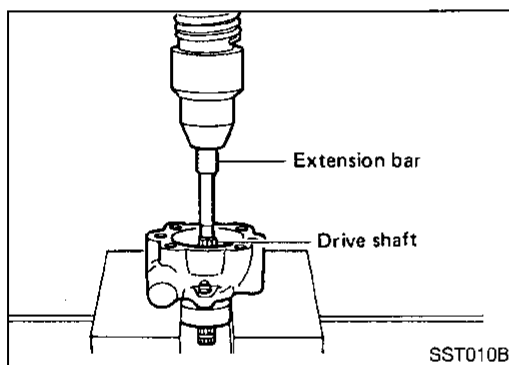
## Disassembly

NAST0034

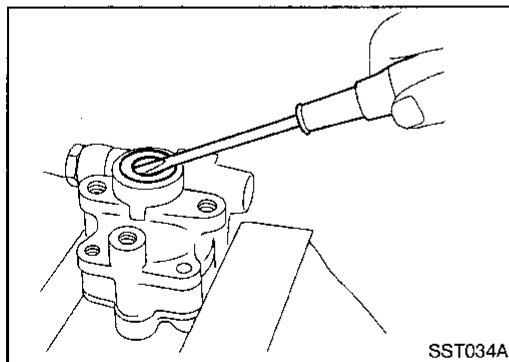
### CAUTION:

- 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.

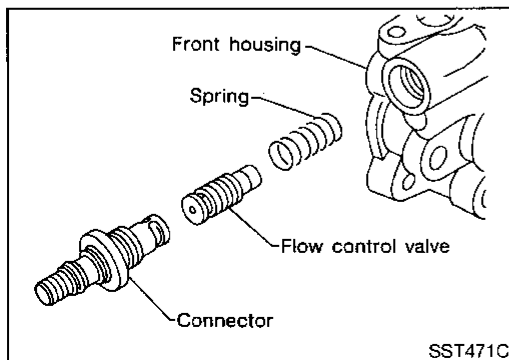
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- Remove snap ring, then draw pulley shaft out.  
**Be careful not to drop drive shaft.**



- Remove oil seal.  
**Be careful not to damage front housing.**



- Remove connector and flow control valve with spring.  
**Be careful not to drop flow control valve.**

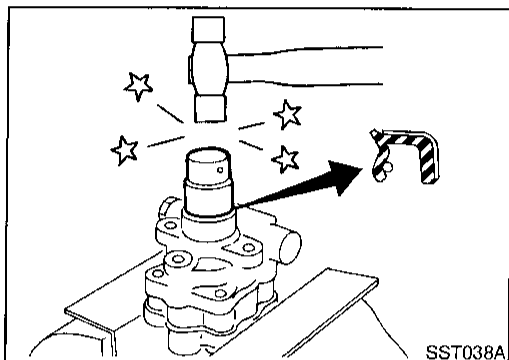
# POWER STEERING OIL PUMP

Inspection

## Inspection

NAST0035

- If pulley is cracked or deformed, replace it.
- If an oil leak is found around pulley shaft oil seal, replace the seal.
- If serration on pulley or pulley shaft is deformed or worn, replace it.

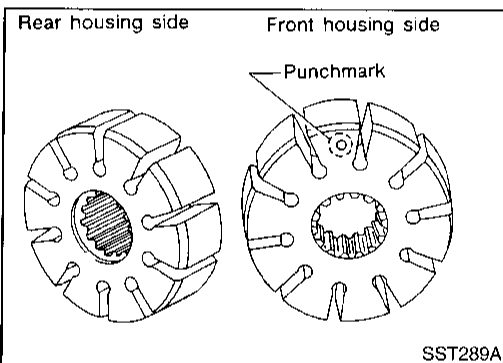


## Assembly

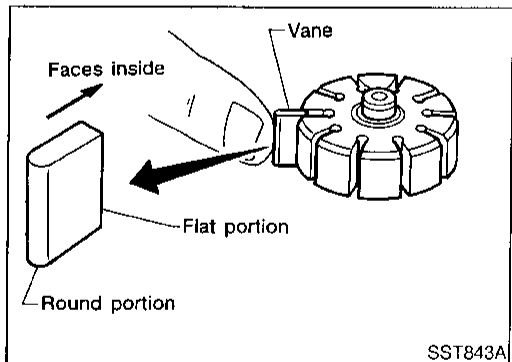
NAST0036

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 ATF when assembling.



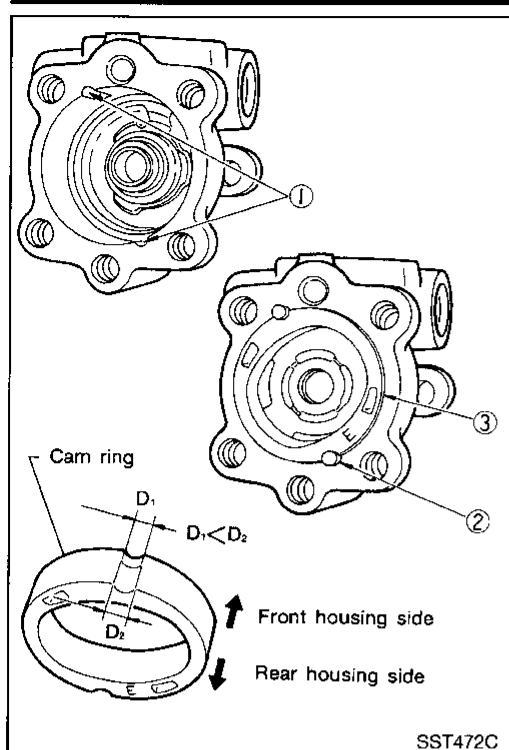
- Pay attention to the direction of rotor.



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

# POWER STEERING OIL PUMP

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.

**Cam ring:**

**$D_1$  is less than  $D_2$ .**

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# SERVICE DATA AND SPECIFICATIONS (SDS)

## General Specifications

General Specifications		
Applied model	235/70 R15 tire	265/70 R15 tire
Steering model	Power steering	
Steering gear type	PR32K	
Steering overall gear ratio	17.2	
Turns of steering wheel (Lock to lock)	3.28	3.09
Steering column type	Collapsible, tilt	

NAST0037

## Steering Wheel

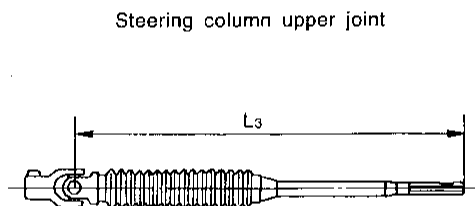
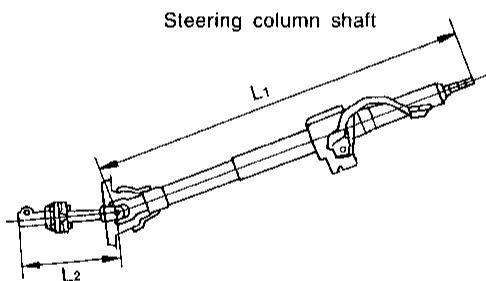
NAST0038  
Unit: mm (in)

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

## Steering Column

NAST0039  
Unit: mm (in)

Steering column length "L <sub>1</sub> "	700.3 - 704.3 (27.57 - 27.73)
Steering column lower shaft length "L <sub>2</sub> "	178 - 180 (7.01 - 7.09)
Steering column upper joint length "L <sub>3</sub> "	430.7 - 432.7 (16.96 - 17.04)



SST739C

## Steering Transfer Gear

NAST0041

Rotating torque	0.25 - 0.69 N·m (2.5 - 7.0 kg·cm, 2.2 - 6.1 in·lb)	
Grease	Quality	Multi-purpose grease [ONE-LUBER SG No. 00]
	Specified amount of grease	40 - 45 g (1.41 - 1.59 oz)

# SERVICE DATA AND SPECIFICATIONS (SDS)

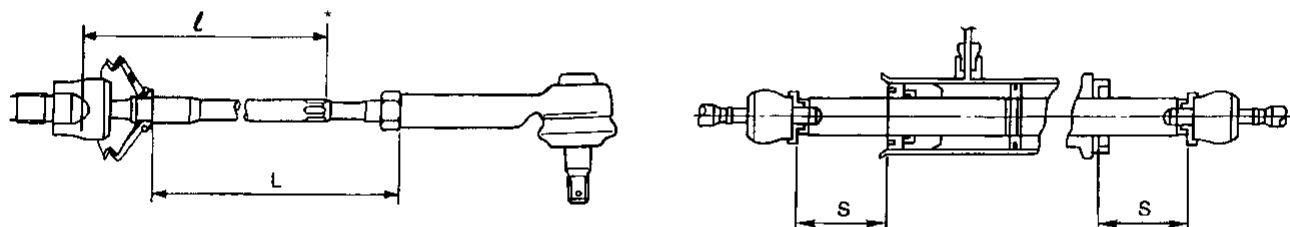
Steering Gear and Linkage

## Steering Gear and Linkage

NAST0040

Applied model		235/70 R15 tire	265/70 R15 tire
Steering gear type		PR32K	
Tie-rod outer ball joint	Swinging force at cotter pin hole: "A"	4.9 - 47.1 N (0.5 - 4.8 kg, 1.1 - 10.6 lb)	
	Rotating torque: "B"	0.3 - 2.9 N·m (3 - 30 kg-cm, 2.6 - 26.0 in-lb)	
	Axial end play: "C"	0.1 mm (0.004 in) or less	
Tie-rod inner ball joint	Swinging force*: "A"	3.9 - 32.4 N (0.4 - 3.3 kg, 0.9 - 7.3 lb)	
	Axial end play: "C"	0.3 mm (0.012 in) or less	
Tie-rod standard length "L"		200 mm (7.87 in)	
Rack stroke "S"		76.5 mm (3.012 in)	72.0 mm (2.835 in)
Pinion gear preload without gear fluid	Lock to lock Average rotating torque	0.78 - 1.47 N·m (8.0 - 15.0 kg-cm, 6.9 - 13.0 in-lb)	
	Within ±100° from the neutral position Maximum torque variation	0.4 N·m (4 kg-cm, 3.5 in-lb)	
	Outside the above range Maximum torque variation	0.6 N·m (6 kg-cm, 5.2 in-lb)	

\*: Measuring point [ $l$ : 240 mm (9.45 in)]



SST740C

## Power Steering

NAST0042

Steering gear type		PR32K
Rack sliding force Under normal operating oil pressure		137 - 255 N (14 - 26 kg, 31 - 57 lb)
Retainer adjustment (Adjustment screw)	Initial tightening torque	4.9 - 5.9 N·m (50 - 60 kg-cm, 43 - 52 in-lb)
	Retightening torque after loosening	0.2 N·m (2 kg-cm, 1.7 in-lb)
	Tightening torque after gear has settled	4.9 - 5.9 N·m (50 - 60 kg-cm, 43 - 52 in-lb)
	Returning angle	10° - 20°
Steering wheel turning force (Measured at one full turn from the neutral position)		39 N (4 kg, 9 lb) or less
Fluid capacity (Approximate)		0.9 ℓ (1 US qt, 3/4 Imp qt)
Oil pump maximum pressure		8,630 - 9,219 kPa (88 - 94 kg/cm <sup>2</sup> , 1,251 - 1,337 psi)