

STEERING SYSTEM

SECTION **ST**

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PRECAUTIONS AND PREPARATION

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” 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 SRS system composition which is available to NISSAN MODEL Y61 is as follows (The composition varies according to the destination.):

Driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioner, 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:

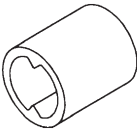
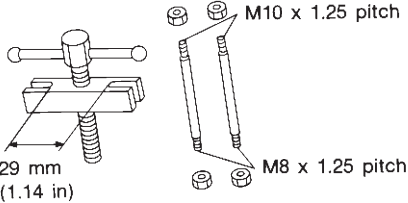
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation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

Precautions for 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.
- 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.

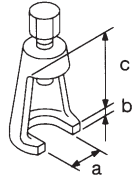
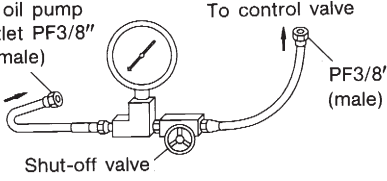
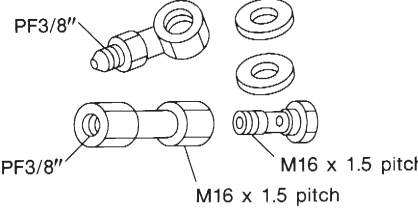
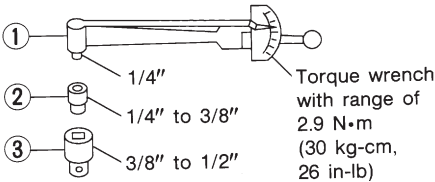
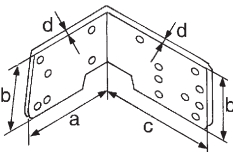
*: Automatic Transmission Fluid type DEXRON™III or equivalent

Special Service Tools

Tool number Tool name	Description	
KV48100700 Torque adapter		Measuring turning torque
ST27180001 Steering wheel puller		Removing steering wheel

PRECAUTIONS AND PREPARATION

Special Service Tools (Cont'd)

Tool number Tool name	Description	
ST29020001 Ball joint remover	 <p style="text-align: center;">NT551</p>	Removing ball joint a: 34 mm (1.34 in) b: 6.5 mm (0.256 in) c: 61.5 mm (2.421 in)
ST27091000 Pressure gauge	 <p style="text-align: center;">NT547</p>	Measuring oil pressure
KV48102500 Pressure gauge adapter	 <p style="text-align: center;">NT542</p>	Measuring oil pressure
ST3127S000 ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter	 <p style="text-align: center;">NT541</p>	Measuring turning torque
KV48100301 Strut and steering gear box attachment	 <p style="text-align: center;">NT688</p>	Disassembling and assembling steering gear a: 162 mm (6.38 in) b: 110 mm (4.33 in) c: 190 mm (7.48 in) d: 9 mm (0.35 in)

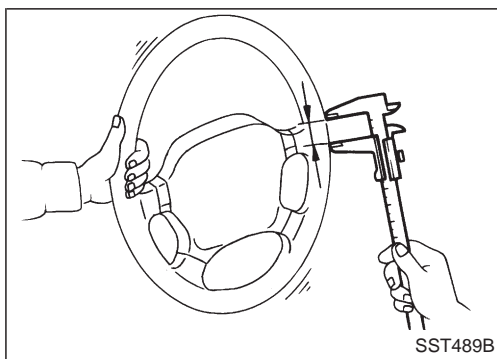
NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

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							
			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 wheel turning force	Drive belt looseness	Improper steering wheel or damage	Improper installation or looseness of tilt lock lever	Steering column deformation	Improper installation or looseness of steering column	Steering linkage looseness		PROPELLER SHAFT	DIFFERENTIAL	AXLE AND SUSPENSION	TIRES	ROAD WHEEL	AXLE SHAFT	BRAKES
STEERING	Noise	X	X	X	X	X	X	X	X	X						X	X	X	X	X	X	X	X	ST-5
	Shake										X	X				X		X	X	X	X	X	X	ST-6
	Vibration										X	X	X	X		X		X	X					ST-20
	Shimmy										X	X			X			X	X	X				ST-20
	Judder														X			X	X	X				ST-20
																								ST-5
																								ST-5
																								ST-4
																								ST-6
																								Refer to MA section.
																								—
																								ST-11
																								ST-11
																								ST-10
																								ST-19
																								NVH in PD section
																								NVH in PD section
																								NVH in FA, RA section
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																								NVH in FA section
																								NVH in FA section
																								NVH in BR section

X: Applicable



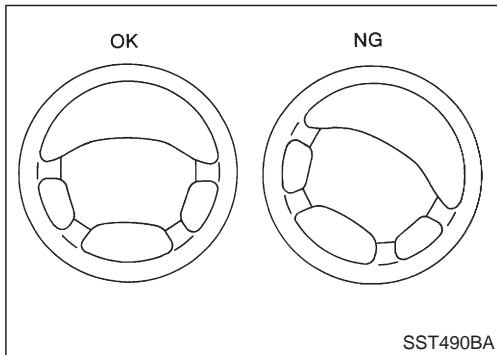
Checking Steering Wheel Play

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

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

- If it is not within specification, check the following for loose and worn components.

Steering gear assembly
Steering linkage
Steering column
Front suspension and axle



Checking Neutral Position on Steering Wheel

Pre-checking

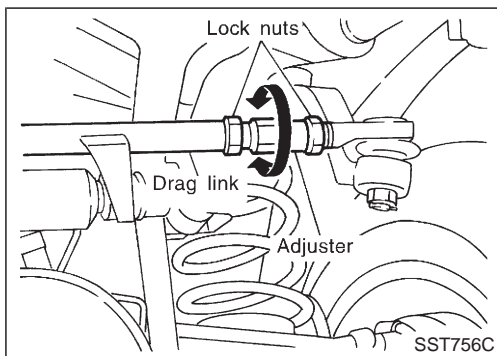
- Make sure that wheel alignment is correct.

Wheel alignment:
Refer to SDS in FA section.

- Verify that the steering gear is centered before removing the steering wheel.

Checking

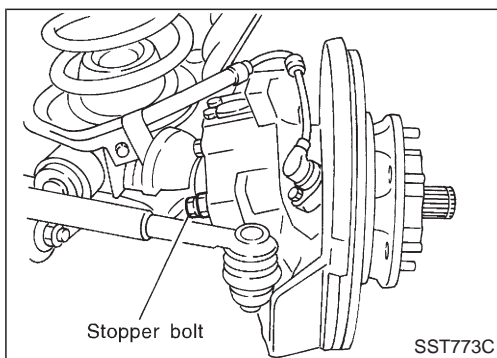
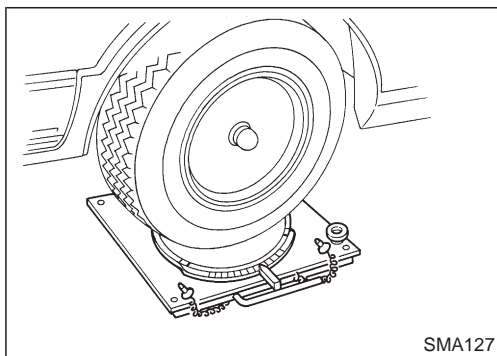
- Check that the steering wheel is in the neutral position when driving straight ahead.
- If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
- If the neutral position is between two teeth, loosen drag link lock nuts. Adjust neutral position by turning drag link adjuster.



Front Wheel Turning Angle

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

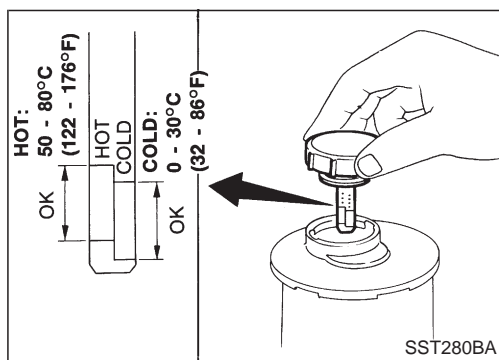
Turning angle of full turns:
Refer to SDS in FA section.



- If not within specification, adjust using stopper bolt.

Checking and Adjusting Drive Belts

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



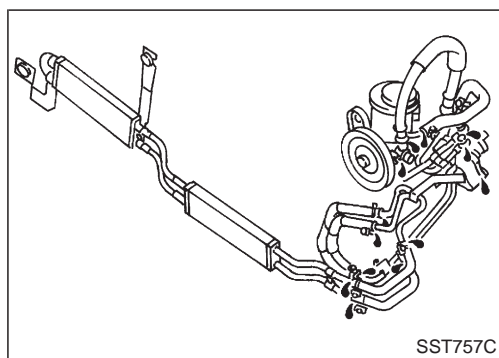
Checking Fluid Level

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

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:

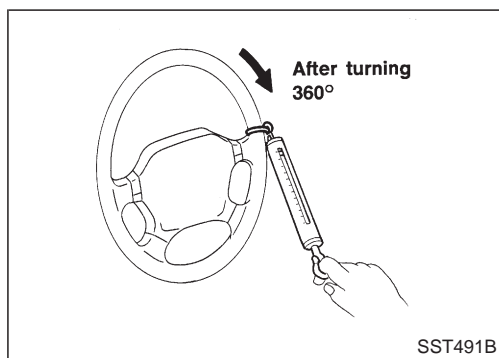
Do not hold the steering wheel in a locked position for more than 15 seconds.

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.

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.



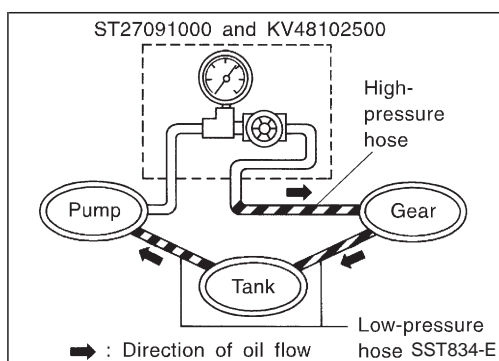
Checking Steering Wheel Turning Force

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**



Checking Hydraulic System

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-6.
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 increases 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:
8,140 - 8,728 kPa (81.4 - 87.3 bar, 83 - 89 kg/cm²,
1,180 - 1,266 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-16.

ON-VEHICLE SERVICE

Checking Hydraulic System (Cont'd)

4. If power steering pressure is below the maximum operating pressure, slowly close shut-off valve and check pressure again.

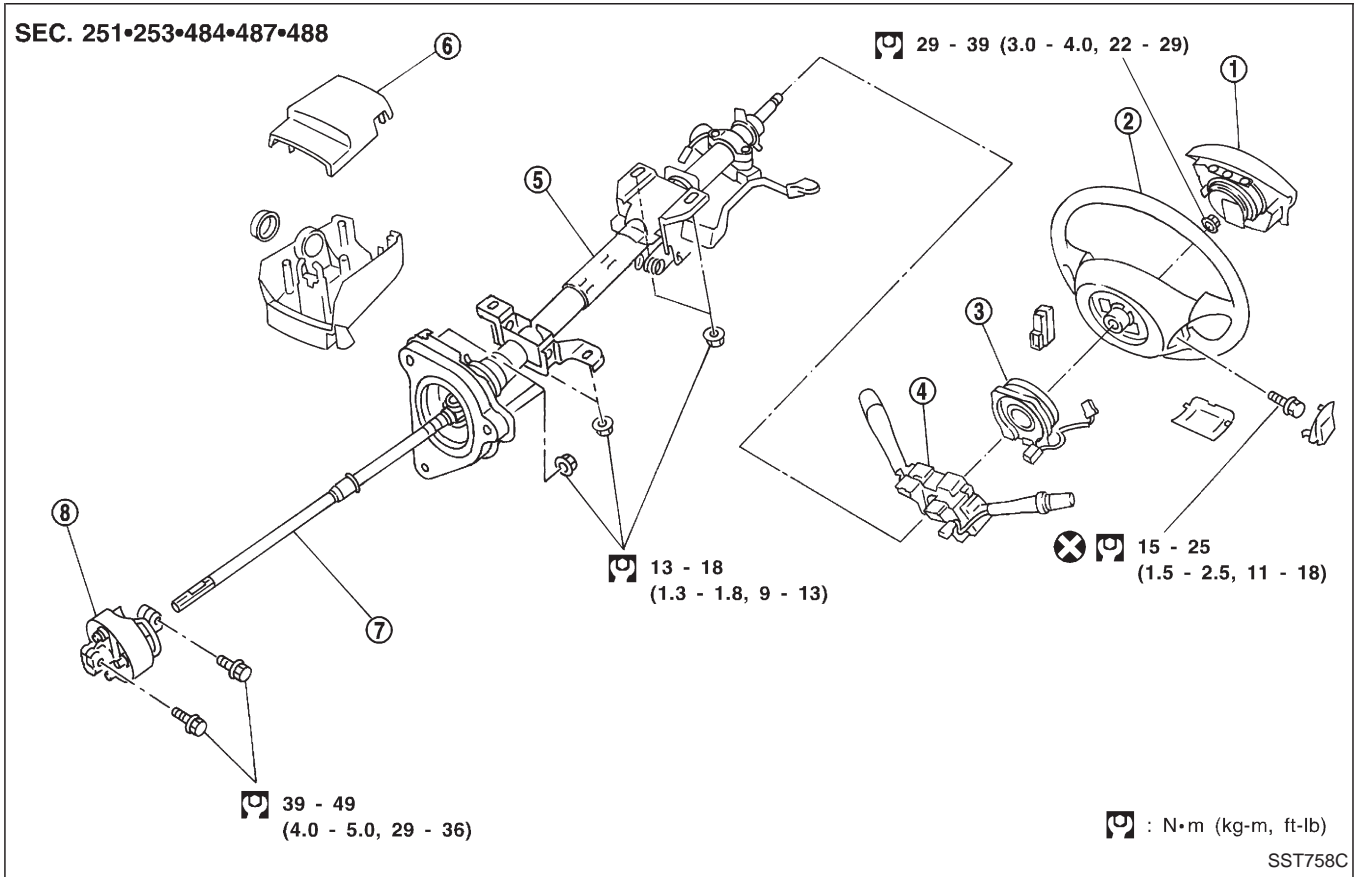
CAUTION:

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

- If pressure increases to maximum operating pressure, gear is damaged. Refer to "Removal and Installation", ST-13.
 - If pressure remains below maximum operating pressure, pump is damaged. Refer to "Disassembly", ST-17.
5. After checking hydraulic system, remove Tool and add fluid as necessary. Then completely bleed air out of system. Refer to ST-6.

STEERING WHEEL AND STEERING COLUMN

Removal and Installation



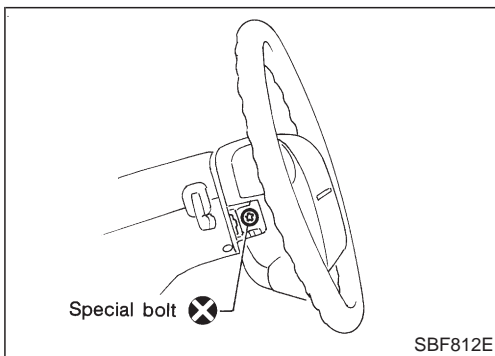
- | | | |
|------------------|----------------------------|---------------|
| ① Air bag module | ④ Combination switch | ⑦ Lower shaft |
| ② Steering wheel | ⑤ Steering column assembly | ⑧ Coupling |
| ③ Spiral cable | ⑥ Column cover | |

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.

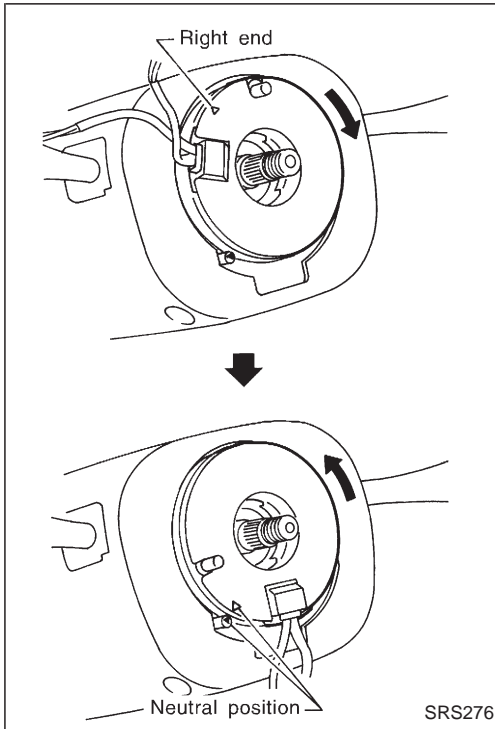
STEERING WHEEL

- 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

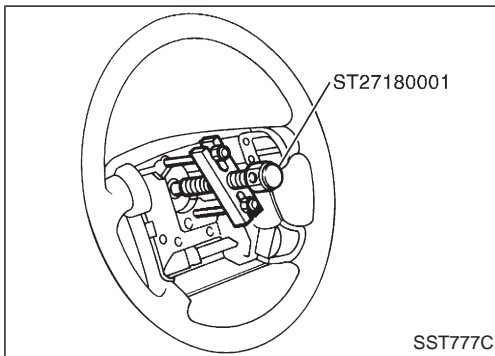
Removal and Installation (Cont'd)



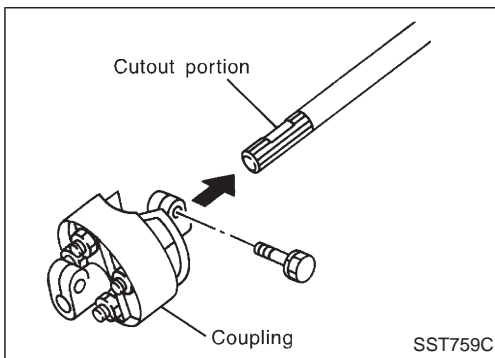
- Align spiral cable correctly when installing steering wheel.
 - a. Set the front wheels in the straight-ahead position.
 - b. Make sure that the spiral cable is in the neutral position.
The neutral position is detected by turning left 2.5 revolutions from the right end position. Align the two marks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



- Remove steering wheel with Tool.



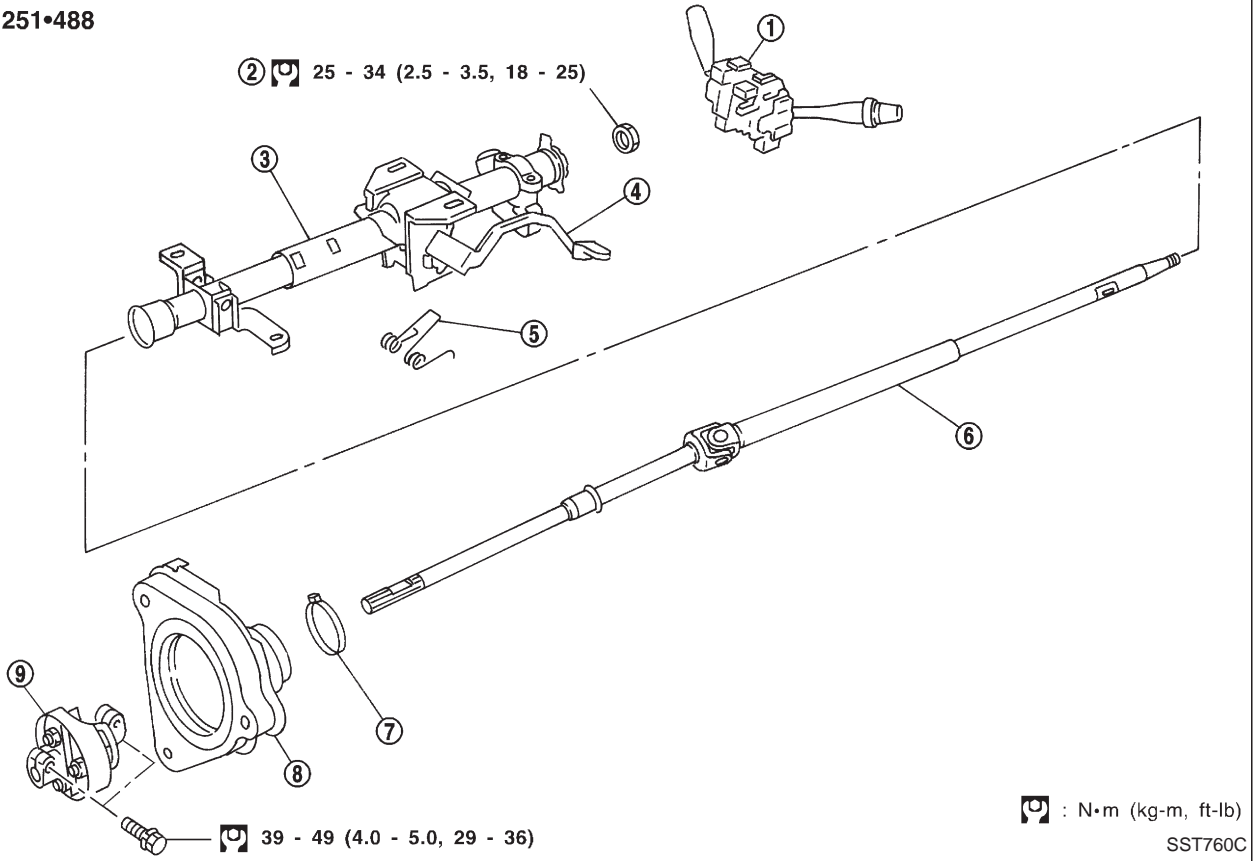
STEERING COLUMN

- 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.

STEERING WHEEL AND STEERING COLUMN

Disassembly and Assembly

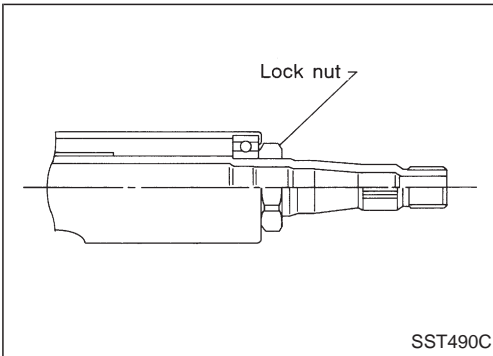
SEC. 251•488



- ① Combination switch
- ② Lock nut
- ③ Jacket tube assembly

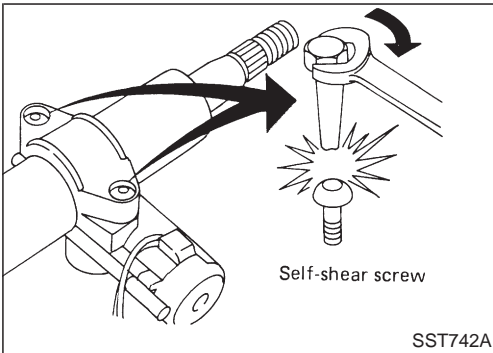
- ④ Tilt lever
- ⑤ Tilt spring
- ⑥ Steering column shaft assembly

- ⑦ Band
- ⑧ Column cover
- ⑨ Coupling



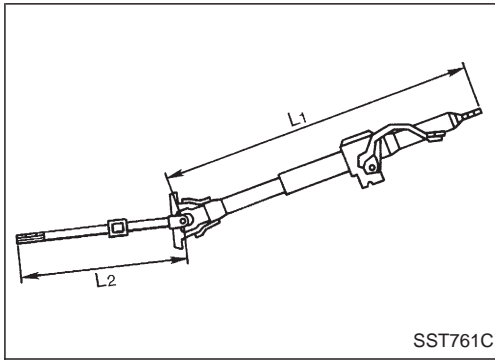
- When disassembling and assembling, unlock steering lock with key.
- Install lock nut on steering column shaft and tighten the nut to specification.

: 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.

STEERING WHEEL AND STEERING COLUMN



Inspection

- When steering wheel does not turn smoothly, check the steering column as follows and replace damaged parts.
 - 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 “L₁” and “L₂”.

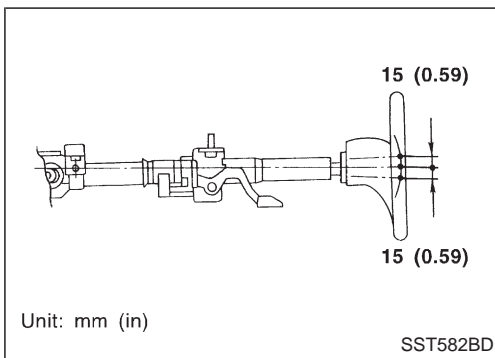
Steering column length “L₁”:

679.9 - 681.5 mm (26.77 - 26.83 in)

Steering column lower shaft length “L₂”:

489.3 - 493.3 mm (19.26 - 19.42 in)

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



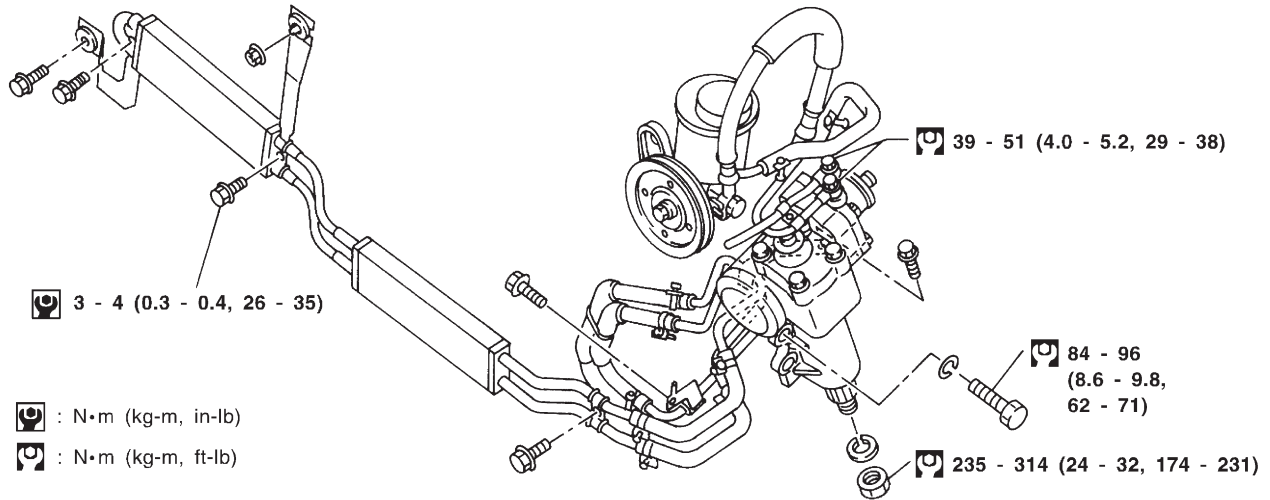
Tilt mechanism

After installing steering column, check tilt mechanism operation.

POWER STEERING SYSTEM (Model: PB69K)

Description

SEC. 490•492•497



SST762C

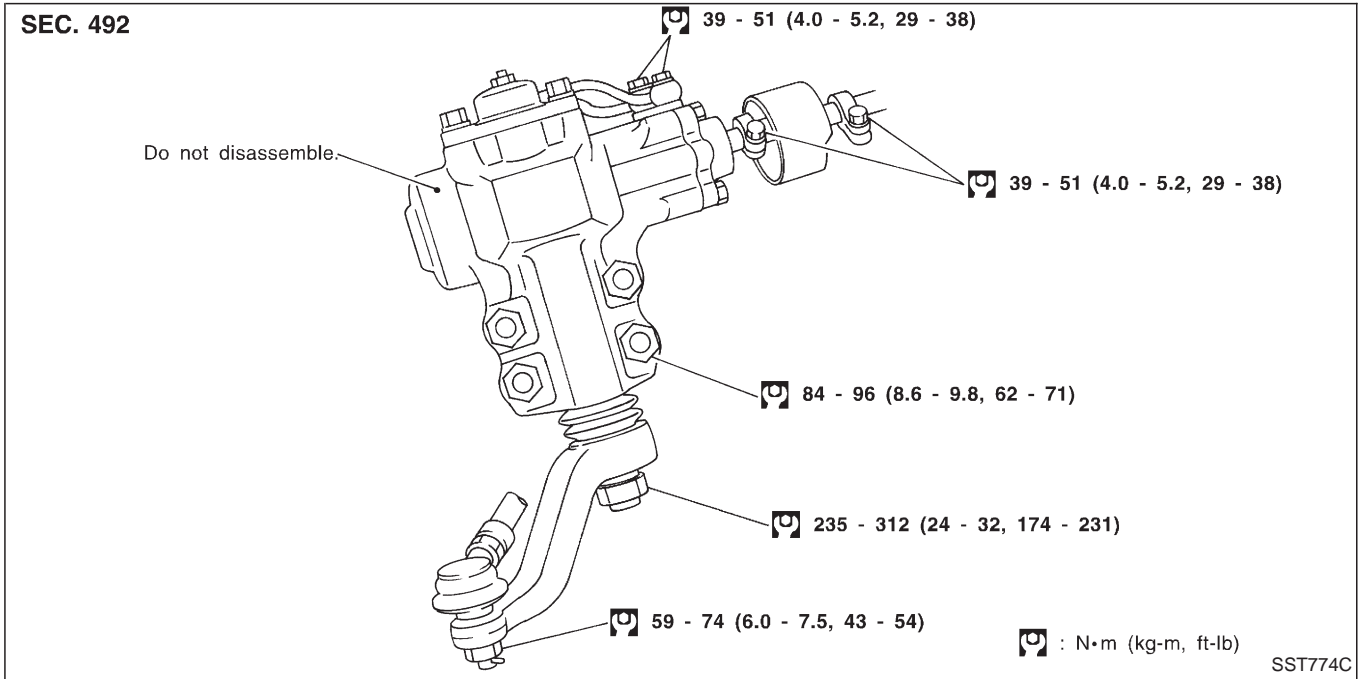
CAUTION:

- 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 indicated in the Service Manual.

POWER STEERING GEAR (Model: PB69K)

Removal and Installation

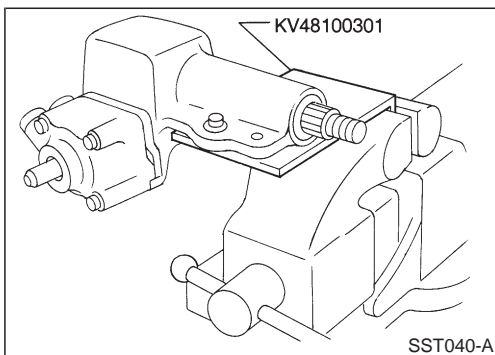
Before removal, clean gear housing and oil pump exteriors using a steam cleaner. Then dry with compressed air.



- Plug openings of gear housing, and securely locate hose connectors at a position higher than oil pump and cover with paper towels.
- Be extremely careful to prevent entry of foreign matter into hoses through connectors.
- When installing pitman arm, align four grooves of pitman arm serrations with four projections of sector shaft serrations, and install and tighten lock washer and nut.

Inspection

Do not disassemble for power steering gear assembly.

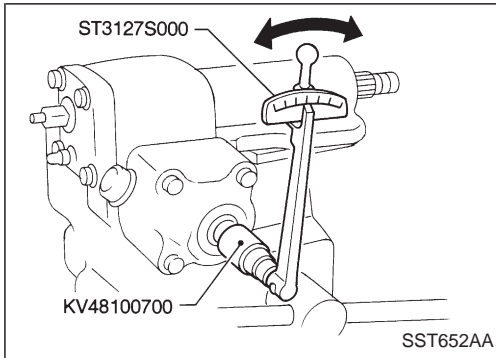


TURNING TORQUE MEASUREMENT

1. Measure turning torque at 360° position.
 - a. Install steering gear on Tool.

POWER STEERING GEAR (Model: PB69K)

Inspection (Cont'd)



- b. Turn stub shaft all the way to right and left several times.
- c. Measure turning torque at 360° position from straight-ahead position with Tools.

Turning torque at 360°

0.15 - 0.78 N·m (1.5 - 8.0 kg-cm, 1.3 - 6.9 in-lb)

2. Measure turning torque at straight-ahead position.
Straight-ahead position is a position where stub shaft is turned 2.14 turns (two full turns and 50°) from lock position.

Turning torque at straight-ahead position:

0.2 - 0.5 N·m (2 - 5 kg-cm, 1.7 - 4.3 in-lb)

higher than turning torque at 360°

Maximum turning torque:

0.44 - 1.18 N·m (4.5 - 12 kg-cm, 3.9 - 10.4 in-lb)

3. Check sector shaft end play in neutral position.

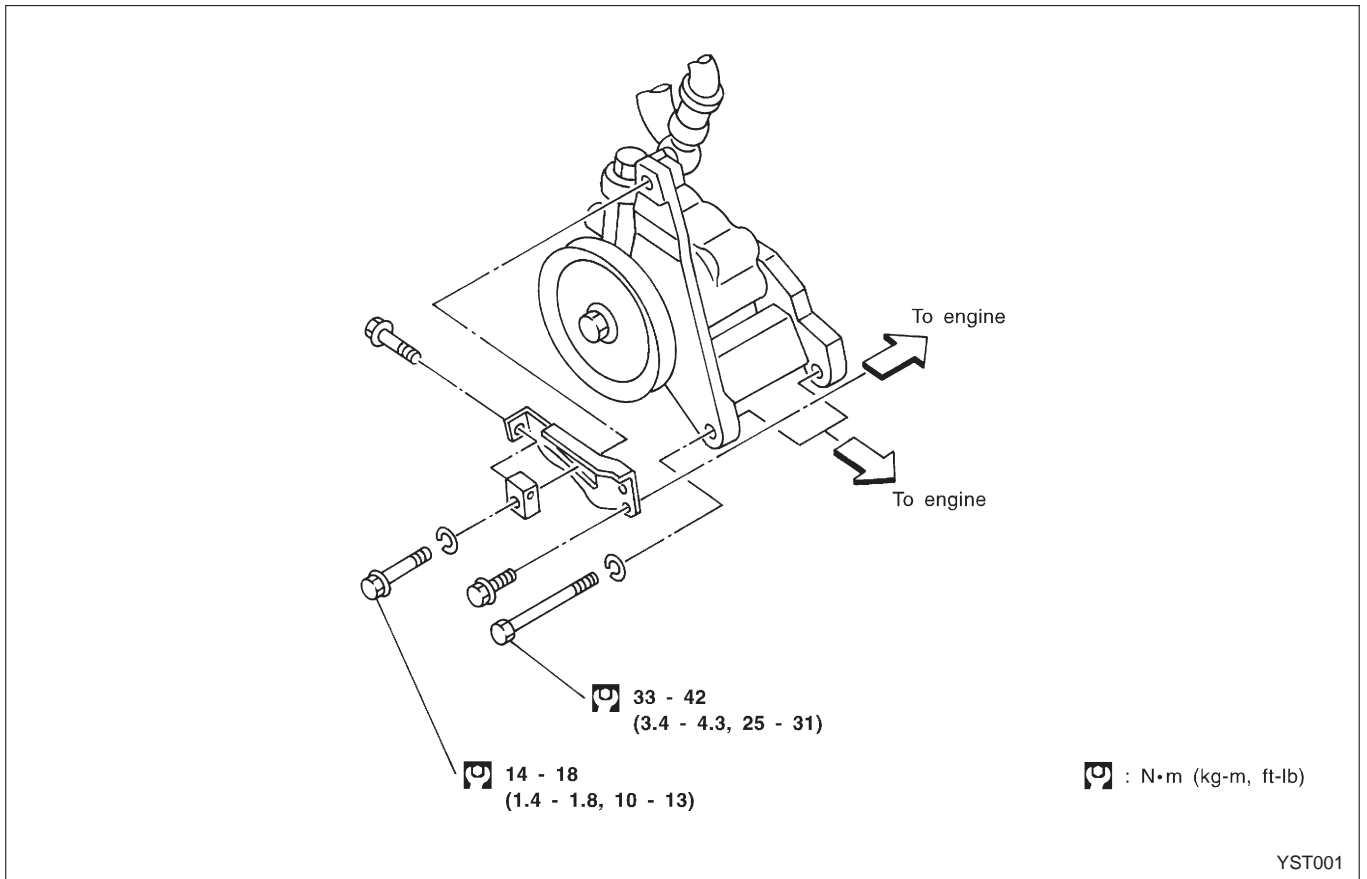
End play:

Less than 0.1 mm (0.004 in)

If turning torque and end play are not within specifications, replace power steering gear assembly.

POWER STEERING OIL PUMP

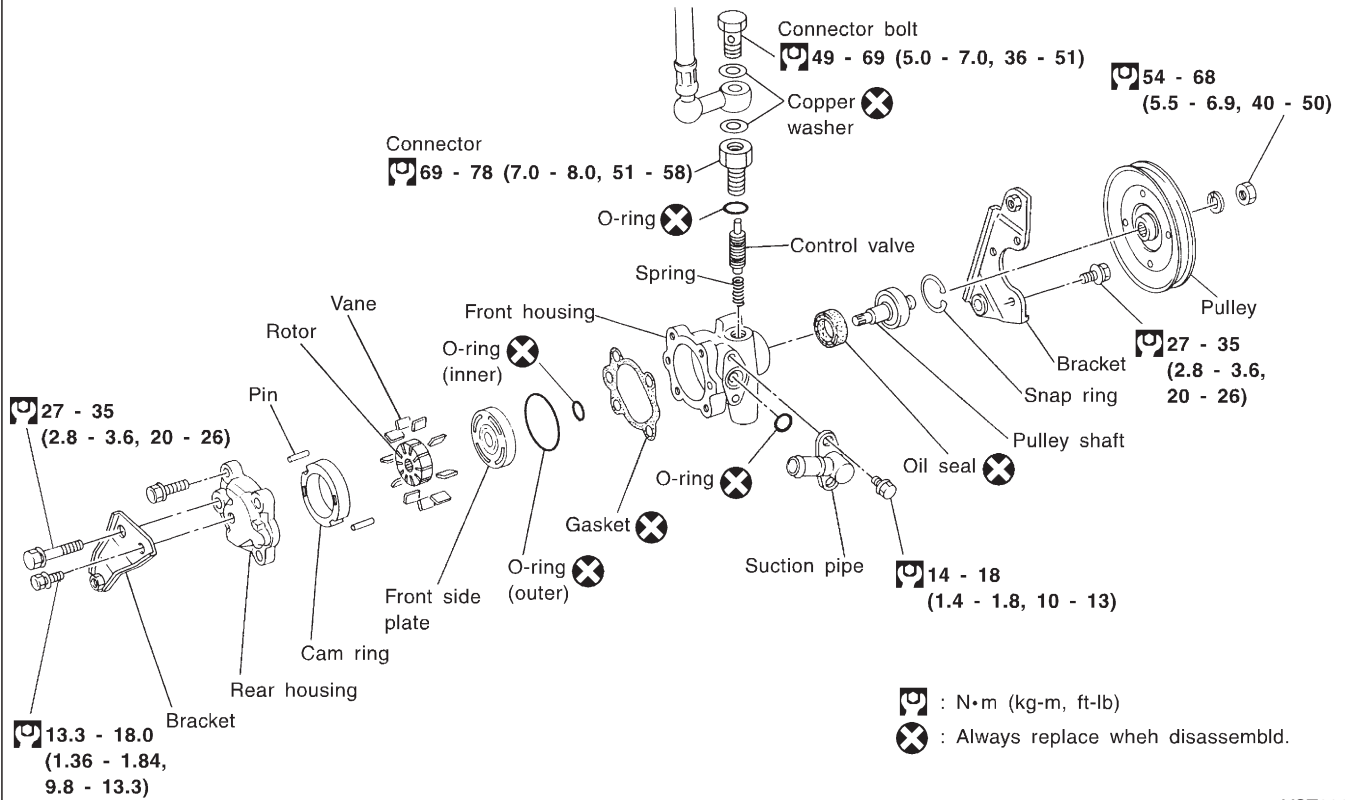
Removal and Installation



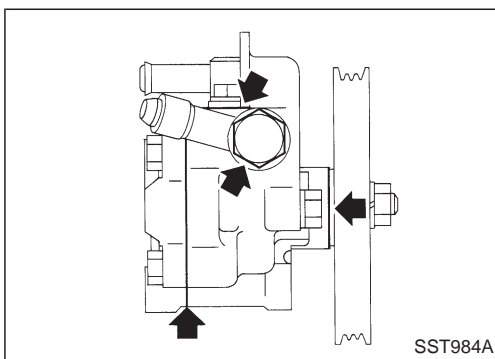
POWER STEERING OIL PUMP

Disassembly and Assembly

SEC. 490•493



YST002



Pre-disassembly Inspection

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

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

POWER STEERING OIL PUMP

Inspection

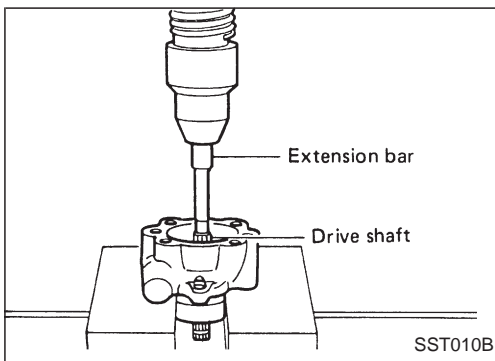
PULLEY AND PULLEY SHAFT

- If pulley is cracked or deformed, replace it.
- If fluid leak is found around the pulley shaft, replace the oil seal.

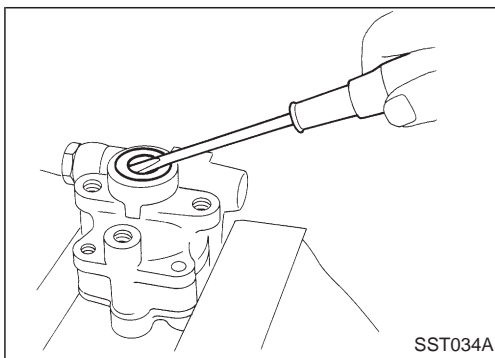
Disassembly

CAUTION:

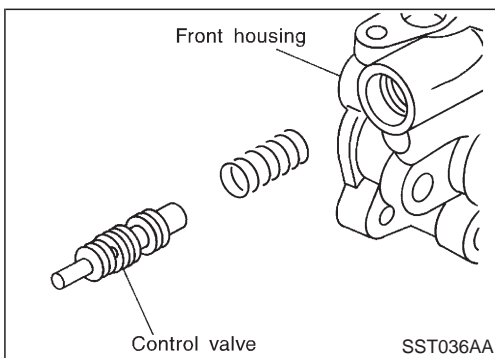
- Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.
- Disassemble in as clean a place as possible.
- Clean your hands before disassembly.
- Do not use rags; use nylon cloths or paper towels.
- When disassembling and reassembling, do not let foreign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



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



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



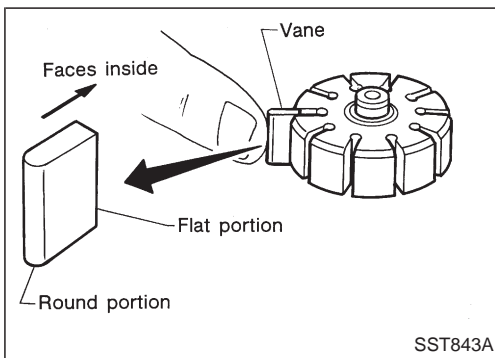
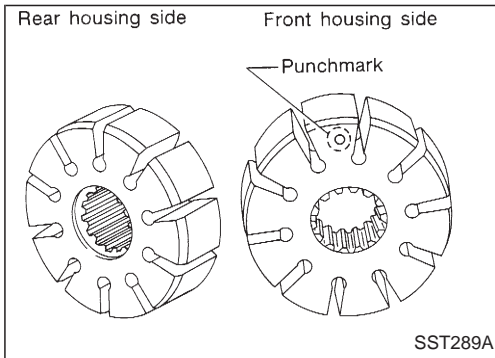
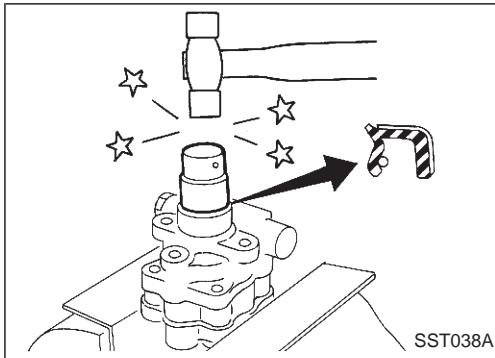
- Remove connector.
- **Be careful not to drop control valve.**

POWER STEERING OIL PUMP

Assembly

Assemble oil pump, noting the following instructions.

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



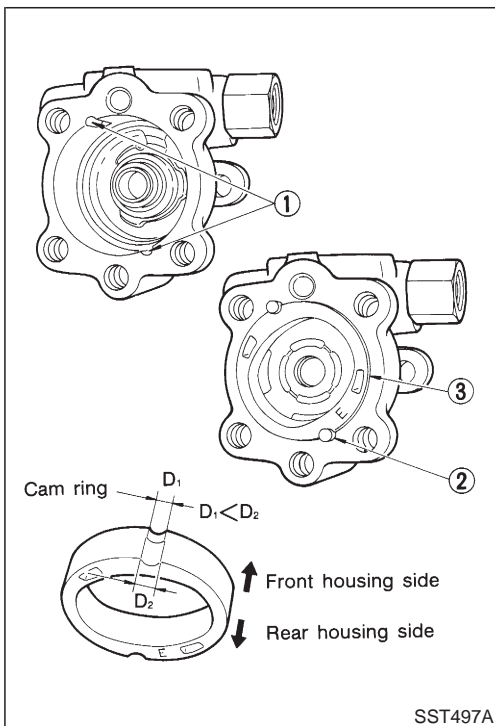
- Pay attention to the direction of rotor.

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

- 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:

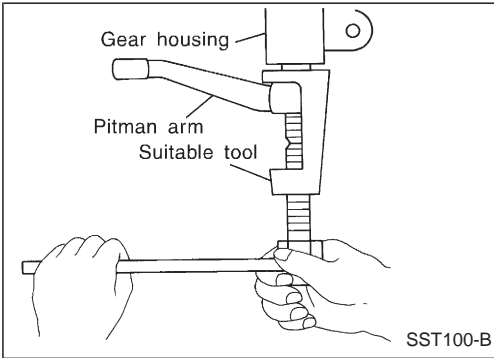
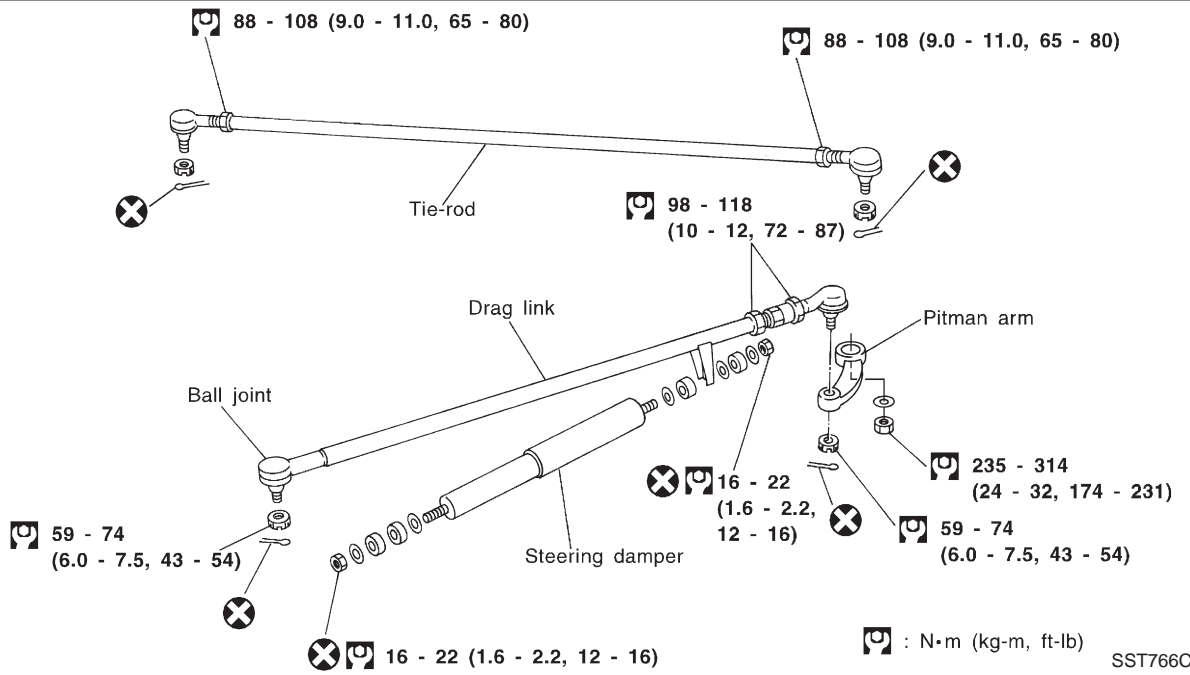
D_1 is less than D_2



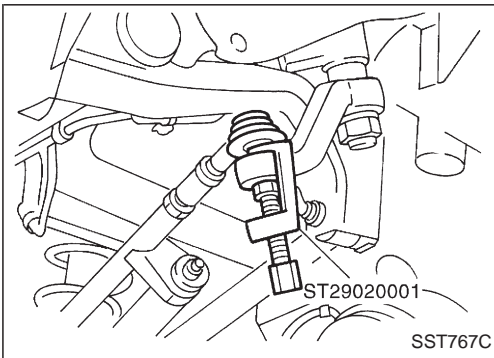
STEERING LINKAGE

Removal and Installation

SEC. 485

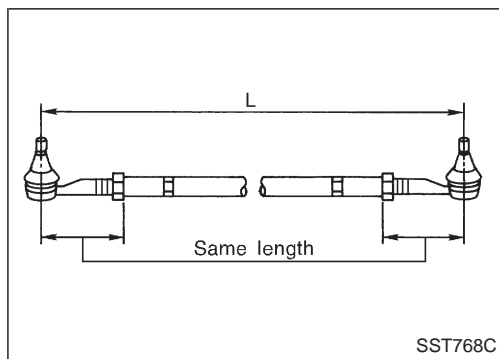


- Remove pitman arm with tool.
- Remove steering damper.



- Remove tie-rod and drag link with Tool.

STEERING LINKAGE



Disassembly

TIE-ROD

When tie-rod ball joints and tie-rod bar are separated, adjust tie-rod length correctly.

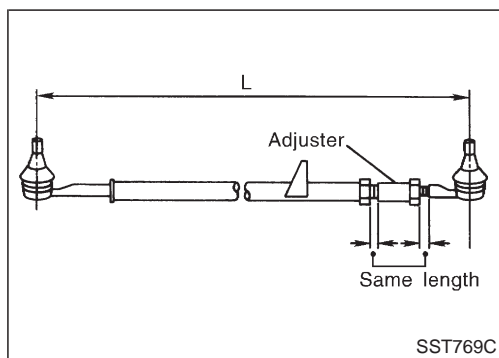
Adjustment should be done between ball stud centers.

L: Standard

1,302 mm (51.26 in)

CAUTION:

- Make sure that tie-rod ball joints are the same length as to the left and right.
- The toe-in must be adjusted to within dimension “L” \pm 5 mm (0.20 in).



DRAG LINK

When drag link ball joints and drag link bar are separated, adjust drag link length correctly.

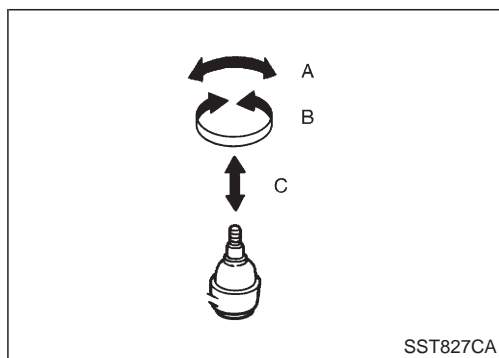
Adjustment should be done between ball stud centers.

L: Standard

1,123.4 mm (44.23 in)

CAUTION:

- Make sure that drag link ball joint and adjuster are turned to the same length.
- The neutral position must be adjusted to within dimension “L” \pm 1 mm (0.04 in).



Inspection

BALL JOINT

1. Check joints for play. If ball is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

Swinging force (Measure point: Cotter pin hole) “A”:

4.9 - 49.0 N (0.5 - 5.0 kg, 1.1 - 11.0 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 mm (0 in)

2. Check condition of dust cover. If it is cracked excessively, replace as a complete unit.

CAUTION:

Be careful not to apply grease or oil to taper of joint.

STEERING LINKAGE

Inspection (Cont'd)

TIE-ROD AND DRAG LINK

Check tie-rod and drag link for breakage, bends and cracks, and replace with a new one if necessary.

FIXING LOCATION

- Check fixing location (nuts and cotter pins) for looseness, play and breakage.
- When looseness or play is found, check for wear and tapered portion of ball joints, pitman arm and knuckle arms.
- When reassembling each joint, use new cotter pins.

STEERING DAMPER

Check for oil leakage and measure damping force. Replace if necessary.

Damping force:

at 0.3 m (1.0 ft)/sec

4,443 N (453 kg, 999 lb)

... Extended direction

3,315 N (338 kg, 745 lb)

... Compressed direction

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

	Power steering
Steering gear type	PB69K
Turns of steering wheel on the vehicle (Lock-to-lock)	3.4
Steering gear ratio	17.0

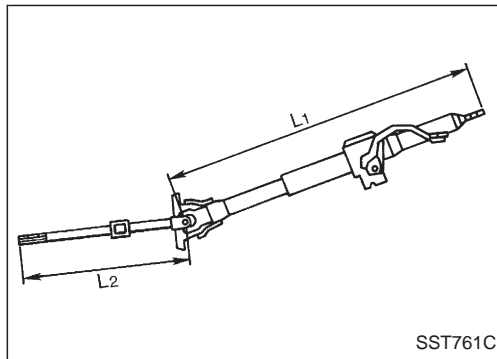
Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	35 (1.38) or less
Steering damper [at 0.3 m (1.0 ft)/sec.] N (kg, lb)	4,443 (453, 999) ... Extended direction 3,315 (338, 745) ... Compressed direction

Inspection and Adjustment

STEERING COLUMN

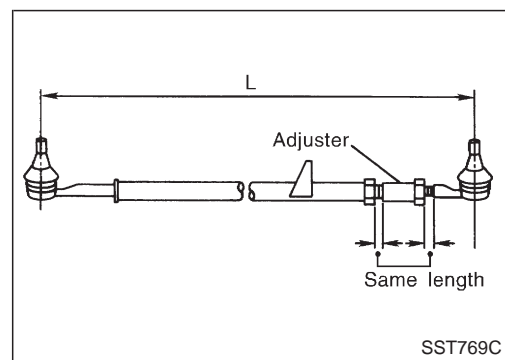
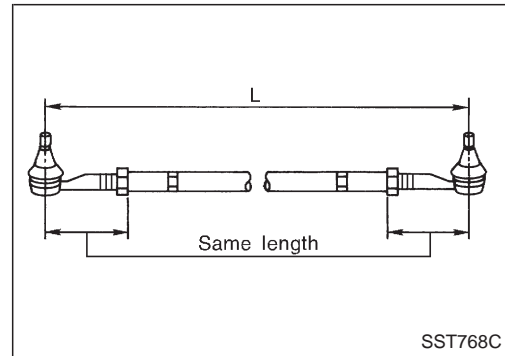
Unit: mm (in)

Steering column (L ₁)	679.9 - 681.5 (26.77 - 26.83)
Steering column lower shaft (L ₂)	489.3 - 493.3 (19.26 - 19.42)



STEERING LINKAGE

Tie-rod & drag link ball joint	
Swinging force at cotter pin hole N (kg, lb)	4.9 - 49.0 (0.5 - 5.0, 1.1 - 11.0)
Rotating torque N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)
Axial end play mm (in)	0 (0)
Tie-rod standard length (L) mm (in)	1,302 (51.26)
Drag link standard length (L) mm (in)	1,123.4 (44.23)



SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

POWER STEERING SYSTEM (Model: PB69K)

Steering wheel turning force (at 360° from neutral position and circumference of steering wheel) N (kg, lb)	39 (4, 9) or less
Oil pump pressure kPa (bar, kg/cm ² , psi)	8,140 - 8,728 (81.4 - 87.3, 83 - 89, 1,180 - 1,266) at idling
Fluid capacity mℓ (Imp fl oz)	Approximately 1,000 (35.2)
Normal operating temperature °C (°F)	60 - 80 (140 - 176)
Steering gear turning torque N-m (kg-cm, in-lb)	
360° position from straight-ahead position	0.15 - 0.78 (1.5 - 8.0, 1.3 - 6.9)
Straight-ahead position (As compared with steering wheel turned 360°)	0.2 - 0.5 (2 - 5, 1.7 - 4.3) higher
Maximum turning torque	0.44 - 1.18 (4.5 - 12, 3.9 - 10.4)
Backlash at pitman arm top end (in a straight-ahead position) mm (in)	0 - 0.1 (0 - 0.004)
End play (at sector shaft end in neutral position) mm (in)	0.1 (0.004) or less