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SECTION PS

POWER STEERING SYSTEM

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PRECAUTIONS

PRECAUTIONS

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

EGS001M0

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

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

Precautions for Steering System

EGS001L9

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

PREPARATION

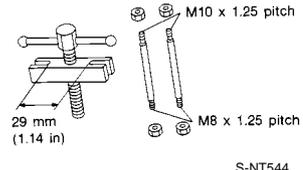
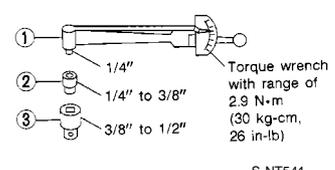
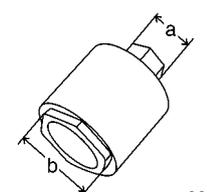
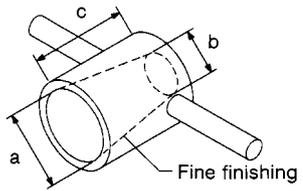
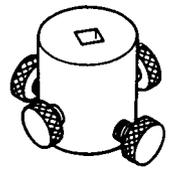
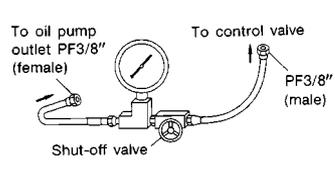
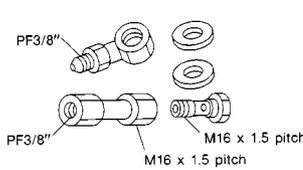
PREPARATION

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Special Service Tools [SST]

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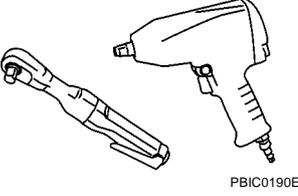
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Tool number Tool name	Description
<p>ST27180001 Steering wheel puller</p> 	<p>Removing steering wheel</p>
<p>ST3127 S000 Preload gauge 1. GG9103000 Torque wrench 2. HT62940000 Socket adapter 3. HT62900000 Socket adapter</p> 	<p>Inspecting of rotating torque for ball joint</p>
<p>KV489Q0030 Rear cover wrench a: 19 mm (0.75 in) b: 34.9 mm (1.374 in)</p> 	<p>Removing and installing rear cover</p>
<p>KV489Q0020 Teflon ring correcting tool a: 50 mm (1.97 in) dia. b: 36 mm (1.42 in) dia. c: 100 mm (3.94 in) dia.</p> 	<p>Installing rack Teflon ring</p>
<p>KV48103400 Preload adapter</p> 	<p>Inspecting rotating torque</p>
<p>KV48103500 Pressure gauge</p> 	<p>Measuring oil pump relief pressure</p>
<p>KV48102500 Pressure gauge adapter</p> 	<p>Measuring oil pump relief pressure</p>

PREPARATION

Commercial Service Tools

EGS001LB

Tool name	Description
<p>Power tool</p>  <p>PBIC0190E</p>	<ul style="list-style-type: none">● Removing wheel nuts● Removing undercover

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

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NVH Troubleshooting Chart

EGS001LC

Use 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																							
			PS-6	PS-6	PS-18	PS-18	PS-18	PS-6	PS-8	PS-8	EM-12	PS-8	—	PS-18	PS-12	PS-11	PS-16	NVH in PR section	NVH in RFD section	NVH in FAX, RAX, FSU, RSU section	NVH in WT section	NVH in WT section	NVH in BR section	NVH in BR section		
Steering	Noise	Fluid level	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	Shake	Air in hydraulic system																								
	Vibration	Outer socket ball joint swinging force																								
	Shimmy	Outer socket ball joint rotating torque																								
	Shudder	Outer socket ball joint end play																								
		Steering fluid leakage																								
		Steering wheel play																								
		Steering gear rack sliding force																								
		Drive belt looseness																								
		Improper steering wheel																								
		Improper installation or looseness of tilt lock lever																								
		Mounting rubber deterioration																								
		Steering column deformation or damage																								
		Improper installation or looseness of steering column																								
		Steering linkage looseness																								
		PROPELLER SHAFT																								
		DIFFERENTIAL																								
		AXLE and SUSPENSION																								
		TYRES																								
		ROAD WHEEL																								
		DRIVE SHAFT																								
		BRAKES																								

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POWER STEERING FLUID

PFP:KLF20

POWER STEERING FLUID

EGS001LD

Checking Fluid Level

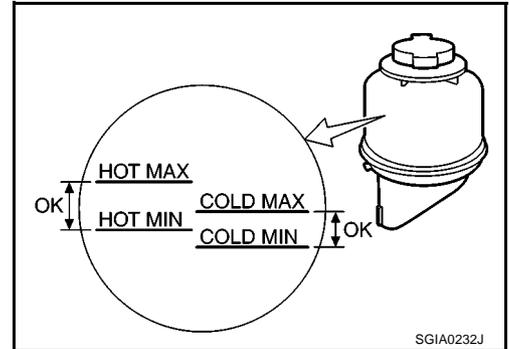
- Check fluid level with engine stopped.
- Make sure that fluid level is between MIN and MAX.
- Fluid levels at HOT and COLD are different. Do not confuse them.

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

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

CAUTION:

- The fluid level should not exceed the MAX line. Excessive fluid will cause fluid leakage from the cap.
- Do not reuse drained power steering fluid.
- Recommended fluid is Type DEXRON™ III or equivalent.



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Checking Fluid Leakage

EGS001LE

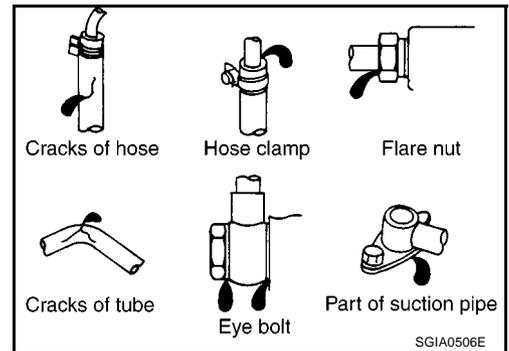
Check hydraulic connections for fluid leakage, cracks, damage, looseness, or wear.

1. Run engine until the fluid temperature reaches 50 to 80°C (122 to 176°F) in reservoir tank, and keep engine speed idle.
2. Turn steering wheel several times from full left stop to full right stop.
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 10 seconds. (There is the possibility that oil pump may be damaged.)

4. If fluid leakage at connections is noticed, then loosen flare nut and then retighten. Do not over-tighten connector as this can damage O-ring, washer and connector.
5. If fluid leakage from oil pump is noticed, check oil pump. Refer to [PS-25, "POWER STEERING OIL PUMP"](#).
6. Check steering gear boots for accumulation of fluid, indicating from steering gear.



SGIA0506E

Air Bleeding Hydraulic System

EGS001LF

If air bleeding is not complete, the following symptoms can be observed.

- Bubbles are created in reservoir tank.
- Clicking noise can be heard from oil pump.
- Excessive buzzing in the oil pump

NOTE:

Fluid noise may occur in the steering gear or oil pump. This does not affect performance or durability of the system.

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

CAUTION:

Turn steering wheel while filling reservoir tank with fluid so as not to lower fluid level below the MIN line.

2. Start engine and hold steering wheel at each lock position for 3 seconds at idle to check for fluid leakage.
3. Repeat step 2 above several times at approximately 3 second intervals.

CAUTION:

Do not hold the steering wheel in a locked position for more than 10 seconds. (There is the possibility that oil pump may be damaged.)

4. Check fluid for bubbles and while contamination.

POWER STEERING FLUID

-
5. Stop engine if bubbles and white contamination do not drain out. Perform step 2 and 3 above after waiting until bubbles and white contamination drain out.
 6. Stop the engine, and then check fluid level.

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STEERING WHEEL

STEERING WHEEL

PFP:48430

On-Vehicle Inspection and Service

EGS001LG

CHECKING CONDITION OF INSTALLATION

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

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

- Check steering gear assembly mounting bolts and nuts for looseness. Refer to [PS-14, "COMPONENT"](#) .

CHECKING STEERING WHEEL PLAY

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

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

- When the measurement value is outside the standard value, check backlash for each joint of steering column assembly and installation condition of steering gear assembly.

CHECKING NEUTRAL POSITION STEERING WHEEL

- Make sure that steering gear assembly, steering column assembly and steering wheel are installed in the correct position.
- Perform neutral position inspection after wheel alignment. Refer to [FSU-7, "Front Wheel Alignment"](#) .
- Set vehicle to the straight-ahead position and confirm steering wheel is in the neutral position.
- Loosen outer socket lock nut and turn inner socket to left and right equally to make fine adjustment if steering wheel is not in the neutral position.

CHECKING STEERING WHEEL TURNING FORCE

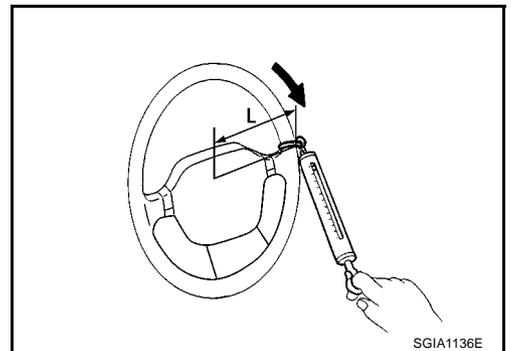
1. Park vehicle on a level and dry surface, set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 50 to 80°C (122 to 176°F).]
4. Check steering wheel turning force when steering wheel has been turned 360°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

Steering wheel turning force : Less than 39 N (4.0 kg-m, 8.8 lb)

NOTE:

Multiply the distance (L) from the hook of spring scale to the center of steering wheel by the measurement value with a spring scale.

5. If steering wheel turning force is out of the specification, check rack sliding force and relief hydraulic pressure of oil pump. Regarding relief hydraulic pressure of oil pump, refer to [PS-25, "CHECKING RELIEF OIL PRESSURE"](#) .
 - a. Disconnect lower joint and steering knuckle from steering gear assembly. Refer to [PS-11, "COMPONENT"](#) , [FAX-5, "Removal and Installation"](#) .
 - b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.

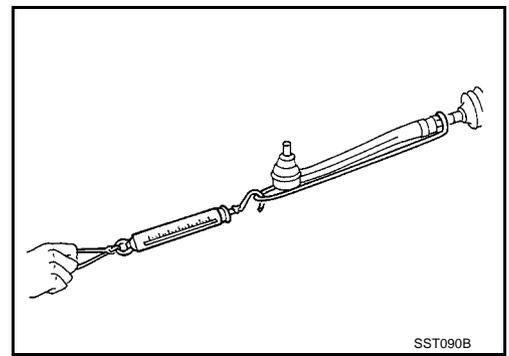


STEERING WHEEL

- c. While pulling outer socket slowly in ± 11.5 mm (± 0.453 in) range from neutral position, make sure rack sliding force is within specification.

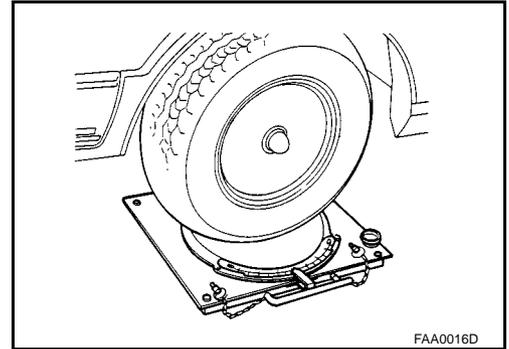
Rack sliding force: **210 - 270 N**
(21.4 - 27.5 kg, 47.2 - 60.6 lb)

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



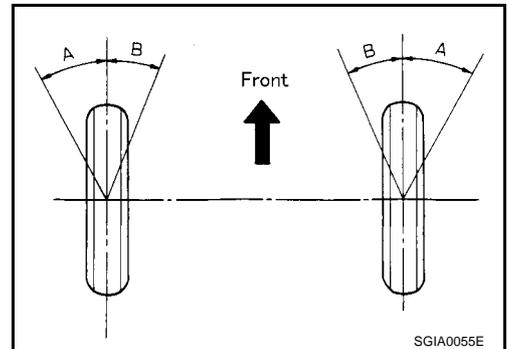
CHECKING FRONT WHEEL TURNING ANGLE

- Check front wheel turning angle after toe-in inspection. Place front wheels on turning radius gauges and rear wheels on stands. Check the maximum inner and outer wheel turning angles for LH and RH road wheels.



- With the engine at idle, turn steering wheel from full left stop to full right stop and measure the turning angles.

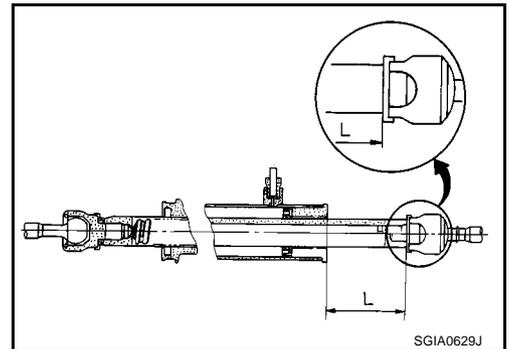
Inner wheel (Angle: A)	2WD	33° 31' - 35° 31' (33.5° - 36.5°)
	4WD	33° 48' - 35° 48' (33.8° - 35.8°)
Outer wheel (Angle: B)	2WD	29° 23' - 31° 23' (29.4° - 31.4°)
	4WD	29° 40' - 31° 40' (29.7° - 31.7°)



- Measure rack stroke if angles are outside the specified value.

Rack stroke "L" : 84 mm (3.31 in)

- Disassemble steering gear assembly to check the cause that rack stroke is outside of the standard.
- Steering angles are not adjustable. Check steering gear assembly, steering column assembly and front suspension components for wear or damage if any of the turning angles are different from the specified value. Replace any of them, if any non-standard condition exists.



STEERING WHEEL

EGS001LH

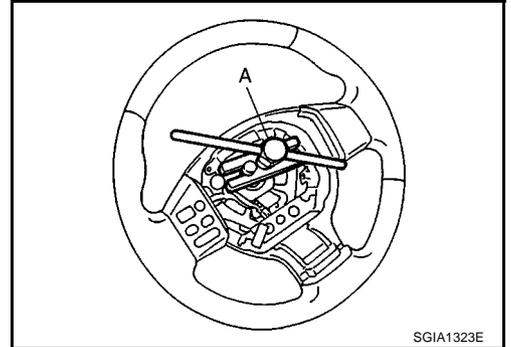
Removal and Installation

REMOVAL

NOTE:

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

1. Set vehicle to the straight-ahead position.
2. Remove driver air bag module. Refer to [SRS-36, "DRIVER AIR BAG MODULE"](#) .
3. Remove steering wheel lock nut after steering is locked.
4. Remove steering wheel with the steering wheel puller [SST: ST27180001] (A).



INSTALLATION

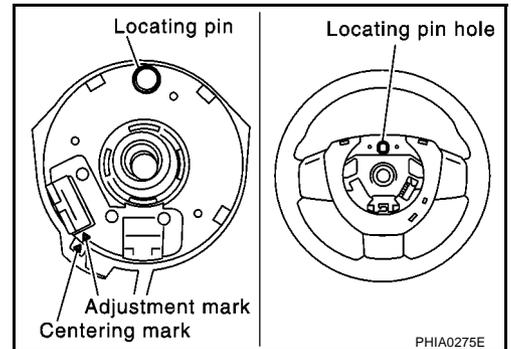
Reverse the removal procedure for installation attentive to the following operation.

NOTE:

Make sure that the spiral cable is in the neutral position. The neutral position is detected by turning left 2.6 revolutions from the right end position and ending with the locating pin at the top.

CAUTION:

Do not run spiral cable idle needlessly. And do not turn it more than necessary (or it leads to disconnection of the cable).



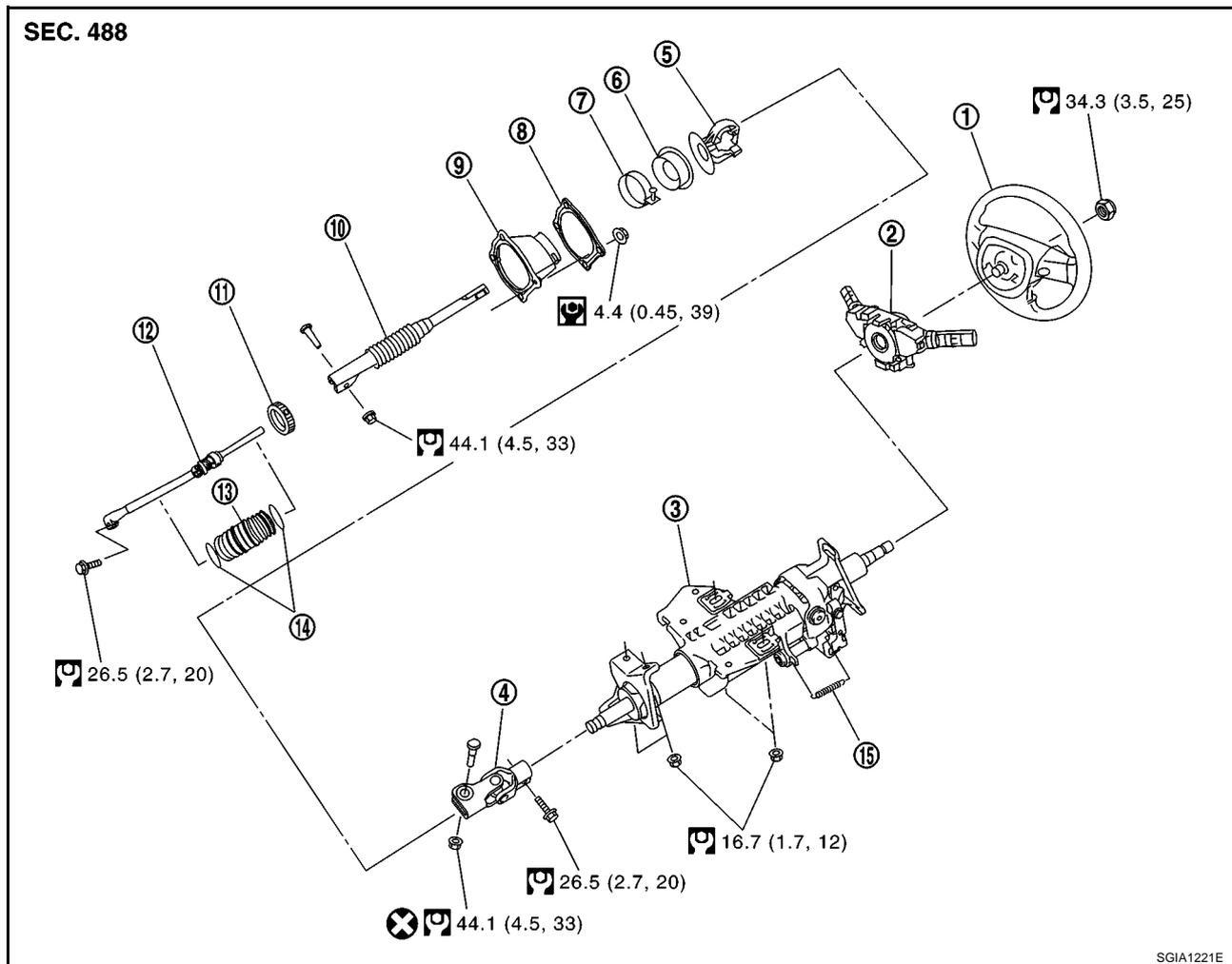
STEERING COLUMN

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EGS001LI

STEERING COLUMN

Removal and Installation COMPONENT



- | | | |
|-------------------|--------------------------------------|-----------------------------|
| 1. Steering wheel | 2. Combination switch & spiral cable | 3. Steering column assembly |
| 4. Upper joint | 5. Collar | 6. Hole cover seal |
| 7. Clamp | 8. Hole cover mounting plate | 9. Hole cover |
| 10. Upper shaft | 11. Boot clamp | 12. Lower shaft |
| 13. Boot | 14. Clips (plastic) | 15. Spring |

Refer to [GI-10, "Components"](#) for the symbols in the figure.

CAUTION:

- Do not give axial impact to steering column assembly during removal and installation.
- Do not move steering gear assembly when removing steering column assembly.

REMOVAL

1. Set vehicle to the straight ahead-position.
2. Remove driver air bag module. Refer to [SRS-36, "DRIVER AIR BAG MODULE"](#).
3. Remove steering wheel. Refer to [PS-10, "Removal and Installation"](#).
4. Remove steering column cover (upper and lower). Refer to [IP-10, "INSTRUMENT PANEL ASSEMBLY"](#).
5. Remove combination switch & spiral cable. Refer to [SRS-38, "SPIRAL CABLE"](#).
6. Remove lower instrument panel LH. Refer to [IP-10, "INSTRUMENT PANEL ASSEMBLY"](#).
7. Disconnect each switch connectors installed to steering column assembly, and then disconnect harness from steering column assembly.
8. Remove fixing bolt of upper joint (steering column assembly side), and then remove upper joint from steering column assembly.

STEERING COLUMN

9. Remove steering column assembly mounting nuts, and then remove steering column assembly from vehicle.
10. Remove fixing bolt and nut of upper joint (lower side), and then remove upper joint and collar from upper shaft.
11. Loosen clamp, and then remove hole cover seal from hole cover.
12. Remove mounting nuts of hole cover, and then remove clamp, hole cover mounting plate and hole cover from dash panel.
13. Raise vehicle.
14. Remove fixing bolt of lower shaft (lower side), and then remove lower shaft and upper shaft from vehicle.

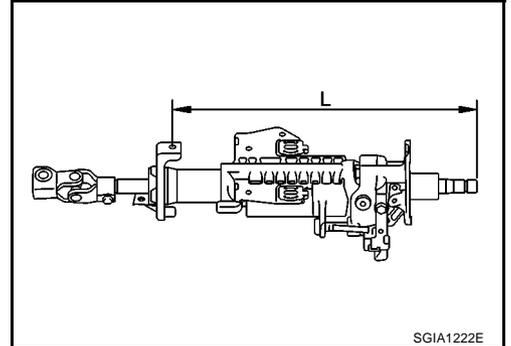
INSPECTION AFTER REMOVAL

- Check component parts for damage or other malfunctions. Replace if there are.
- Measure the length "L" as shown in the figure if vehicle has been involved in a minor collision. Replace steering column assembly if outside the standard.

Steering column length "L" : 423.1 mm (16.66 in)

- Measure steering column assembly rotating torque using preload gauge [SST: ST3127S000]. Replace steering column assembly if outside the standard.

Rotating torque : 0 - 0.2 N-m (0 - 0.02 kg-m, 0 - 1 in-lb)



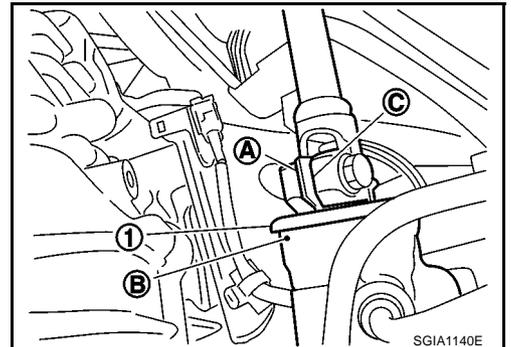
INSTALLATION

- Installation is the reverse order of removal. For tightening torque, refer to [PS-11, "COMPONENT"](#).
- When installing lower shaft to steering gear assembly, follow the procedure listed below.
 - Set rack of steering gear in the neutral position.

NOTE:

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

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



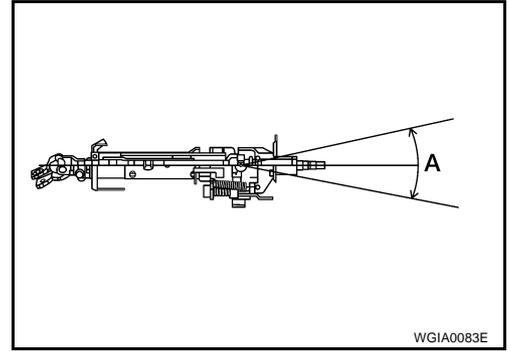
STEERING COLUMN

INSPECTION AFTER INSTALLATION

- Check tilt mechanism operating range "A" as shown in the figure.

Operating range "A" : 73.8 mm (2.906 in)

- Make sure that steering wheel operates smoothly by turning several times from full left stop to full right stop.



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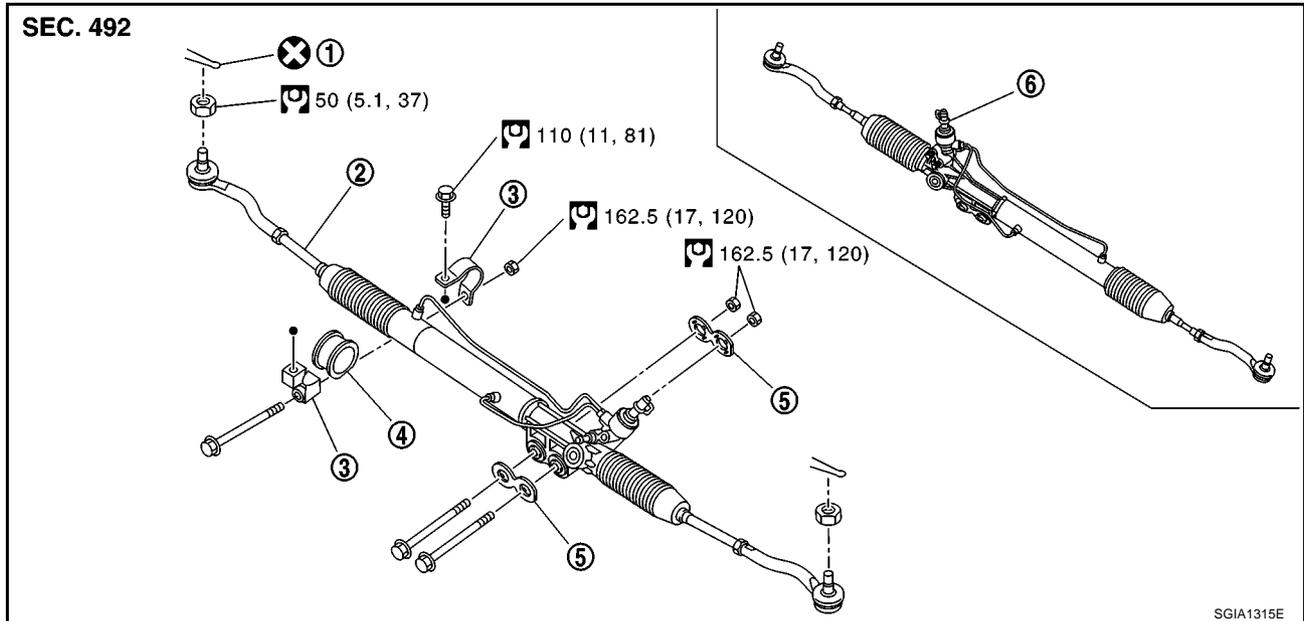
POWER STEERING GEAR AND LINKAGE

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EGS001LJ

POWER STEERING GEAR AND LINKAGE

Removal and Installation COMPONENT



- | | | |
|----------------------------|---------------------------|--------------------------|
| 1. Cotter pin | 2. Steering gear assembly | 3. Rack mounting bracket |
| 4. Rack mounting insulator | 5. Washer | 6. RHD models |

Refer to [GI-10. "Components"](#) for the symbols in the figure.

CAUTION:

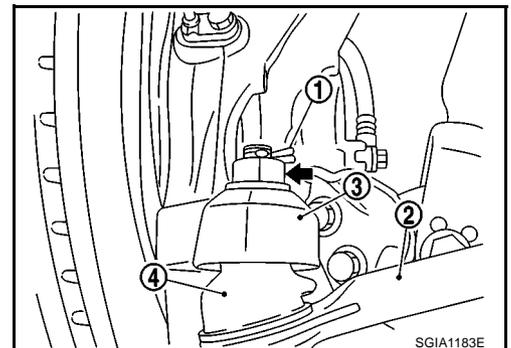
Spiral cable may be cut if steering wheel turns while separating steering column assembly and steering gear assembly. Be sure to secure steering wheel using string to avoid turning.

REMOVAL

1. Set vehicle to the straight-ahead position.
2. Remove tyres from vehicle with a power tool.
3. Remove undercover from vehicle with a power tool.
4. Remove lower side fixing bolt of lower shaft.
5. Remove cotter pin (1), and then loosen the nut.
6. Remove steering outer socket (2) from steering knuckle (3) so as not to damage ball joint boot (4) using the ball joint remover (suitable tool).

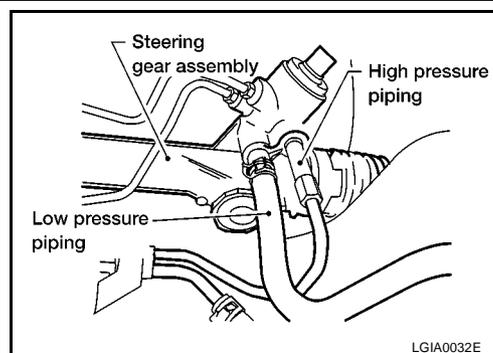
CAUTION:

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



POWER STEERING GEAR AND LINKAGE

7. Remove high and low pressure piping of hydraulic piping, and then drain power steering fluid. Refer to [PS-6, "POWER STEERING FLUID"](#) .
8. Remove steering hydraulic piping bracket from front suspension member. Refer to [PS-30, "HYDRAULIC LINE"](#) .
9. Remove mounting bolts and nuts of steering gear assembly, and then remove steering gear assembly, rack mounting bracket, rack mounting insulator and washer from vehicle.



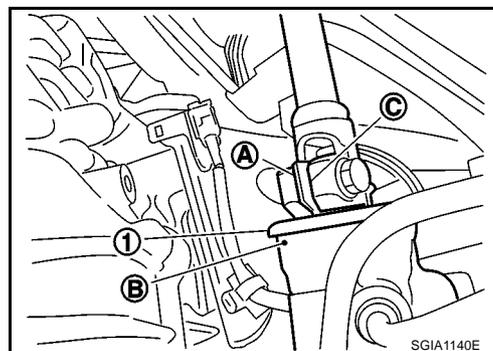
INSTALLATION

- Installation is the reverse order of removal. For tightening torque, refer to [PS-14, "COMPONENT"](#) .
- When installing lower shaft to steering gear assembly, follow the procedure listed below.
- Set rack of steering gear in the neutral position.

NOTE:

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

- Align rear cover cap projection (A) with the marking position (B) of gear housing assembly.
- Install slit part of lower shaft (C) aligning with the projection (A) of rear cover cap (1). Make sure that the slit part of lower shaft (C) is aligned with both the projection (A) of rear cover cap (1) and the marking position (B) of gear housing assembly.
- After installation, bleed air from the steering hydraulic system. Refer to [PS-6, "Air Bleeding Hydraulic System"](#) .
- Perform final tightening of nuts and bolts on each part under unladen conditions with tyres on level ground when removing steering gear assembly. Check wheel alignment. Refer to [FSU-7, "Front Wheel Alignment"](#) .



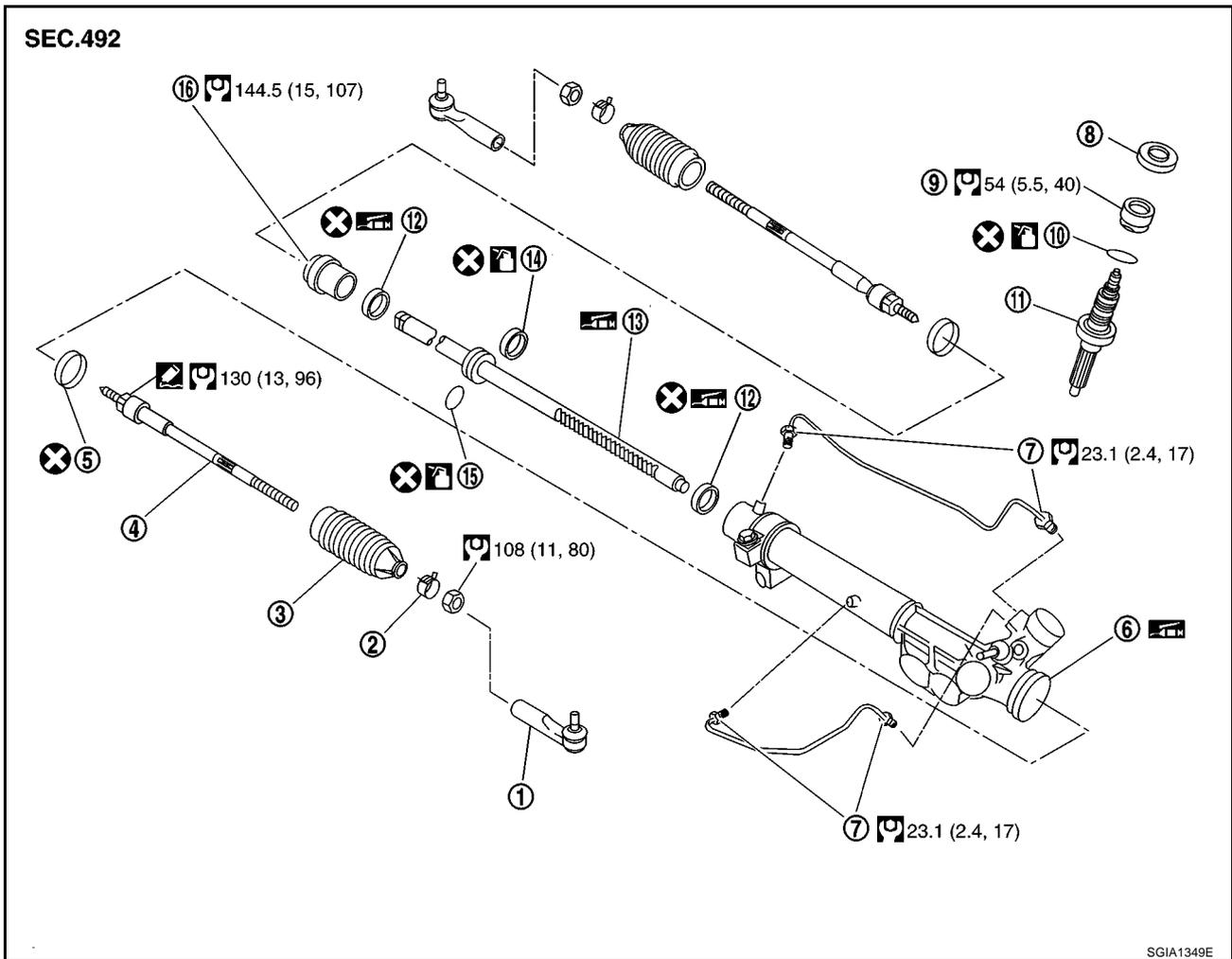
INSPECTION AFTER INSTALLATION

Make sure that steering wheel operates smoothly by turning several times from full left stop to full right stop.

POWER STEERING GEAR AND LINKAGE

EGS001LK

Disassembly and Assembly COMPONENT



- | | | |
|------------------------|----------------------|--------------------------|
| 1. Outer socket | 2. Boot clamp | 3. Boot |
| 4. Inner socket | 5. Boot clamp | 6. Gear housing assembly |
| 7. Cylinder tubes | 8. Rear cover cap | 9. Rear cover |
| 10. O-ring A | 11. Pinion assembly | 12. Rack oil seal |
| 13. Rack assembly | 14. Rack Teflon ring | 15. O-ring B |
| 16. End cover assembly | | |

Refer to [GI-10, "Components"](#) and the followings for the symbols in the figure.

- : Apply Type DEXRON™ III or equivalent.
- : Apply Genuine Thread Locking Sealant, Three Bound TB1111 or equivalent.
- : Apply multi-purpose grease.

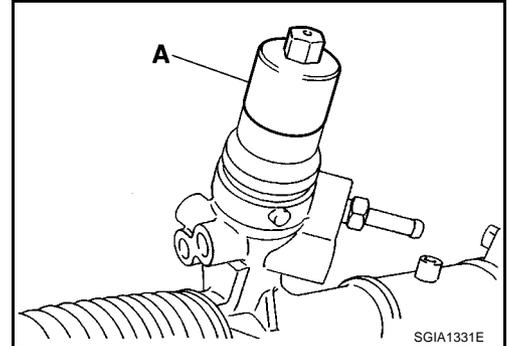
CAUTION:

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

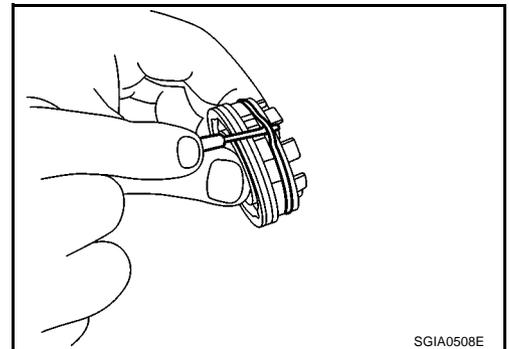
POWER STEERING GEAR AND LINKAGE

DISASSEMBLY

1. Remove cylinder tubes from gear housing assembly.
2. Remove rear cover cap from gear-sub assembly.
3. Using a rear cover wrench [SST: KV489Q0030] (A) to remove rear cover from pinion assembly.



4. Remove O-ring A using a flat-bladed screwdriver, and pull out rear cover.



5. Measure adjusting screw height "H", and loosen adjusting screw.

CAUTION:

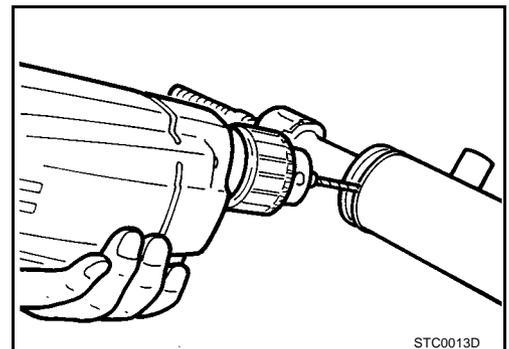
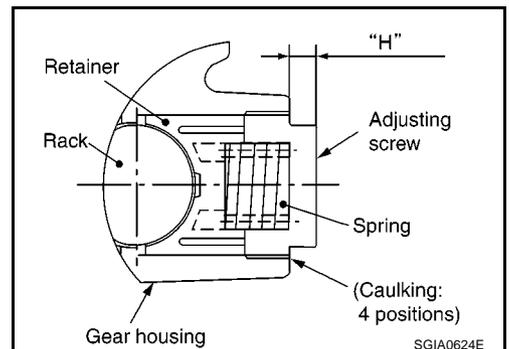
- Do not loosen adjusting screw 2 turns or more.
- Replace steering gear assembly if adjusting screw is loosened 2 turns or more and it is removed.

6. Remove pinion assembly from gear housing assembly.
7. Loosen outer socket lock nut, and remove outer socket.
8. Remove boot clamp, and then remove boot from inner socket.

CAUTION:

Do not damage inner socket and gear housing assembly when removing boot. Inner socket and gear housing assembly must be replaced if inner socket and gear housing assembly are damaged because it may cause foreign material interfusion.

9. Remove inner socket from gear housing assembly.
10. Drill out the clinching part of gear housing assembly (end cover assembly side) outer rim with a 3 mm (0.12 in) drill bit. [Drill for approximately 1.5 mm (0.059 in) depth.]



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POWER STEERING GEAR AND LINKAGE

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

CAUTION:

Do not damage rack assembly surface when removing. Rack assembly must be replaced if damaged because it may cause fluid leakage.

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

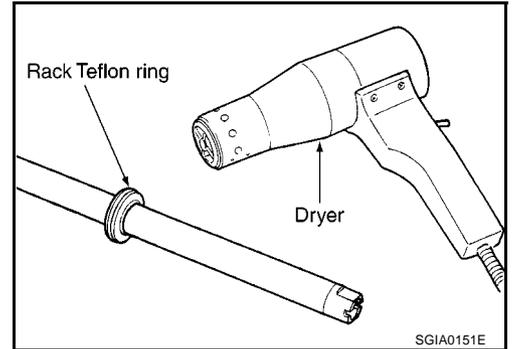
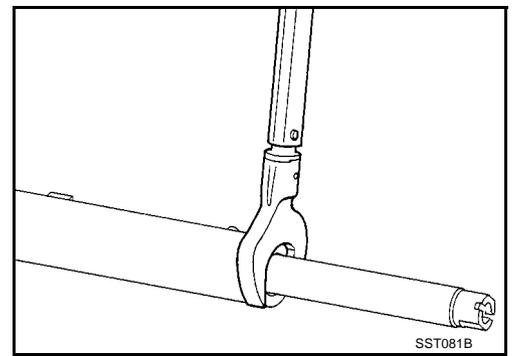
CAUTION:

Do not damage cylinder inner wall when removing rack assembly. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.

13. Heat rack Teflon ring to approximately 40°C (104°F) with a dryer, and remove rack Teflon ring and O-ring B from rack assembly.

CAUTION:

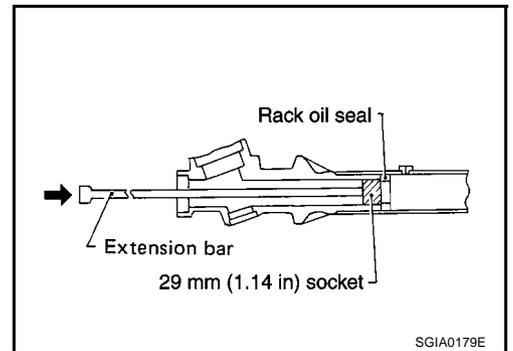
Do not damage rack assembly. Rack assembly must be replaced if damaged because it may cause fluid leakage.



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

CAUTION:

Do not damage gear housing assembly and cylinder inner wall. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.



INSPECTION AFTER DISASSEMBLY

Boot

Check boot for cracks, and replace it if a malfunction is detected.

Rack Assembly

Check rack for damage or wear, and replace it if a malfunction is detected.

Pinion Assembly

- Check pinion assembly for damage or wear, and replace it if a malfunction is detected.
- Rotate pinion and check for torque variation or rattle, and replace it if a malfunction is detected.

Gear Housing Assembly

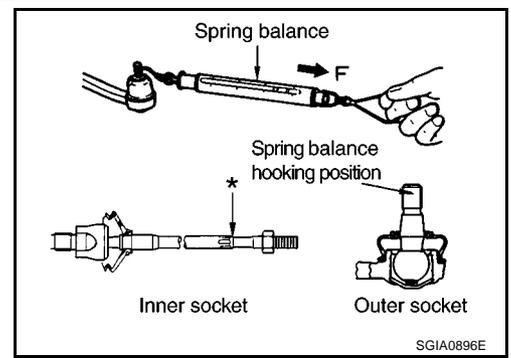
Check gear housing assembly for damage and scratches (inner wall). Replace if there are.

Outer Socket and Inner Socket

1. Ball joint swinging torque

POWER STEERING GEAR AND LINKAGE

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

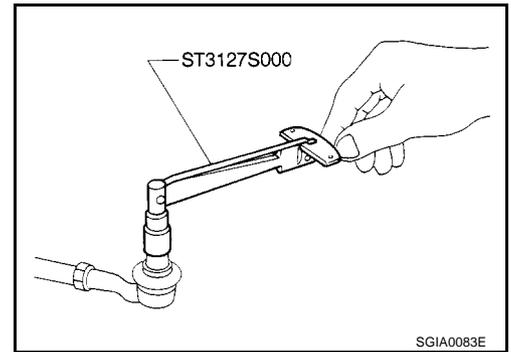


Items	Outer socket	Inner socket
Measuring point of spring balance	Stud cotter pin mounting hole	Measuring point at *mark shown in the figure
Swinging torque	0.3 - 2.9 N·m (0.03 - 0.29 kg-m, 3.0 - 25 in-lb)	1.0 - 7.8 N·m (0.11 - 0.79 kg-m, 9.0 - 69 in-lb)
Spring balance measurement	4.84 - 46.7 N (0.5 - 4.8 kg, 1.1 - 10.6 lb)	12.1 - 93.7 N (1.2 - 9.6 kg, 2.6 - 21.2 lb)

2. Ball joint rotating torque

- Make sure that the reading is within the following specified range using the preload gauge [SST]. Replace outer socket if the reading is outside the specified value.

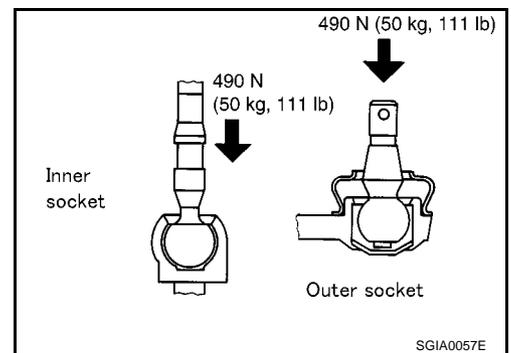
Outer socket rotating torque	0.3 - 2.9 N·m (0.03 - 0.29 kg-m, 3.0 - 25 in-lb)
------------------------------	---



3. Ball joint axial end play

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

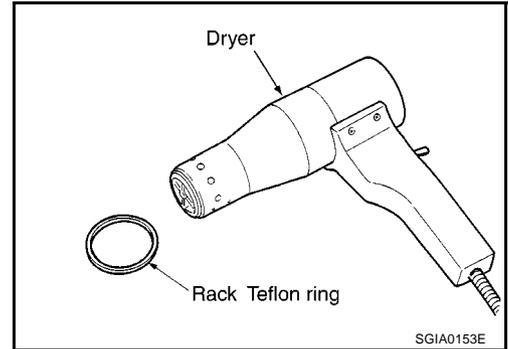
Outer socket	0.5 mm (0.020 in) or less
Inner socket	0.2 mm (0.008 in) or less



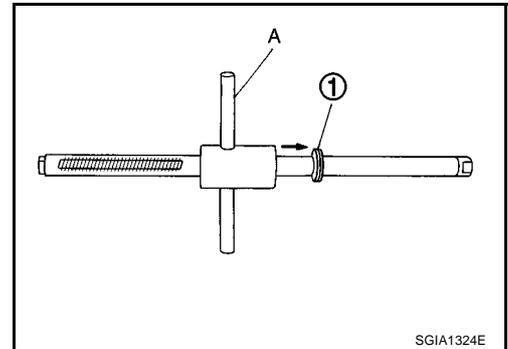
POWER STEERING GEAR AND LINKAGE

ASSEMBLY

1. Apply recommended fluid to O-ring B. Put an O-ring B into a rack Teflon ring.
2. Heat rack Teflon ring to approximately 40° C (104°F) with a dryer. Assemble it to mounting groove of rack assembly.



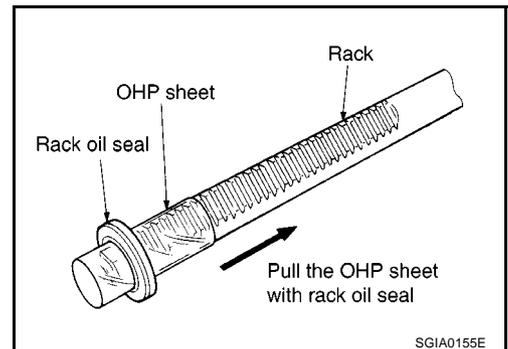
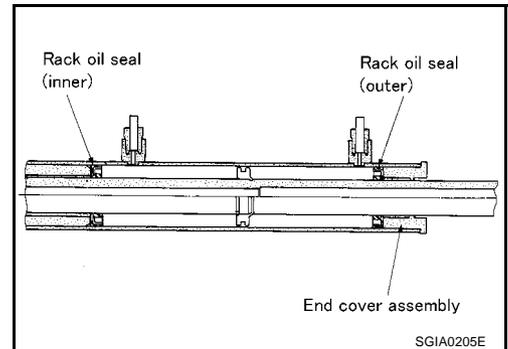
3. Install the Teflon ring correcting tool [SST: KV489Q0020] (A) from tooth side of rack to fit rack Teflon ring (1) on rack. Compress the ring with tool.



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

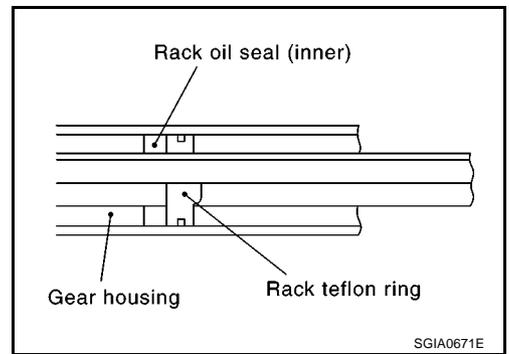
CAUTION:

- Install rack oil seal in a direction so that the lip of inner oil seal and the lip of outer oil seal face each other.
 - Do not damage retainer sliding surface by rack assembly. Replace gear housing assembly if damaged.
 - Do not damage gear housing assembly inner wall by rack assembly. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.
- a. Wrap an OHP sheet [approximately 70 mm (2.76 in) × 100 mm (3.94 in)]. Around rack assembly teeth to avoid damaging rack oil seal (inner). Install rack oil seal over sheet. Then, pull oil seal along with OHP sheet until they pass rack assembly teeth, and remove OHP sheet.

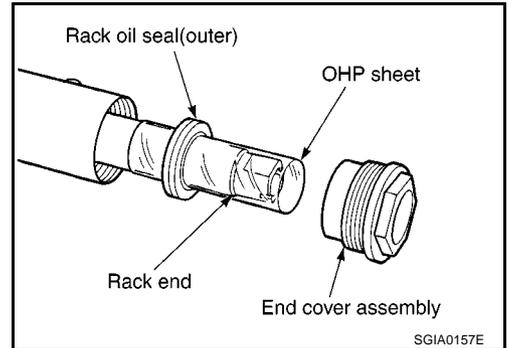


POWER STEERING GEAR AND LINKAGE

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



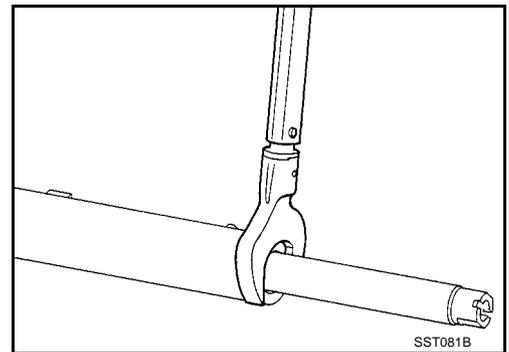
- d. Wrap an OHP sheet [approximately 70 mm (2.76 in) × 100 mm (3.94 in)]. Around the edge to avoid damaging rack oil seal (outer). Install rack oil seal over sheet. Then, pull oil seal along with OHP sheet until they pass rack edge, and remove OHP sheet.
- e. Install end cover assembly to rack edge,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



5. Tighten end cover assembly to specified torque using a 45 mm (1.77 in) open head (suitable tool).

CAUTION:

Do not damage rack assembly. Replace it if damaged because it may cause fluid leakage.



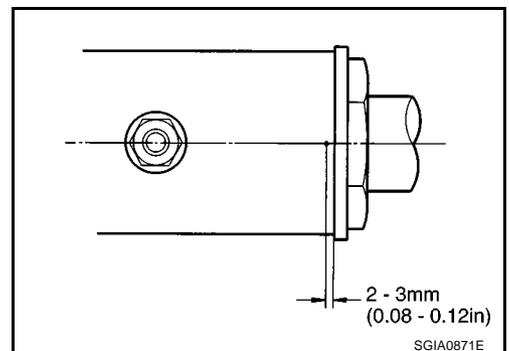
6. Crimp gear housing assembly at one point using a punch as shown in the figure so as to prevent end cover assembly from getting loose after tightening end cover assembly.

7. Install pinion assembly to gear housing assembly.

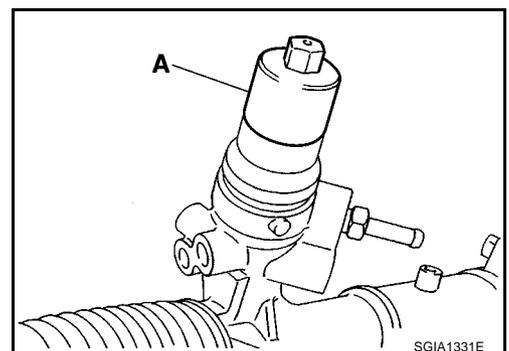
CAUTION:

In order to protect rack oil seal from any damage, insert pinion assembly out straightly.

8. Apply recommended fluid to O-ring A. Install O-ring A to rear cover.



9. Using a rear cover wrench [SST: KV489Q0030] (A), install rear cover to gear housing assembly.



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POWER STEERING GEAR AND LINKAGE

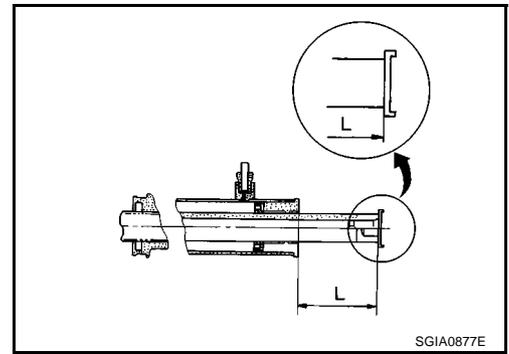
10. Decide on the neutral position for the rack.

Rack stroke : 84 mm (3.31 in)

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

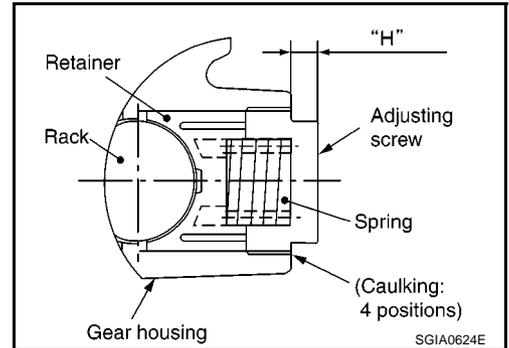
CAUTION:

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



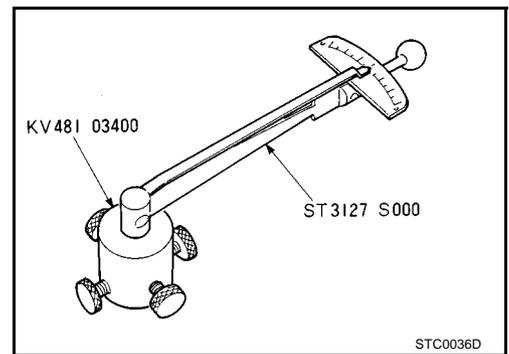
12. Apply recommended thread locking sealant to the thread (2 turns thread), and then screw in the adjusting screw until it reaches height "H" from gear housing assembly measured before disassembling.

13. Move rack assembly 10 strokes throughout the full stroke so that the parts can fit with each other.

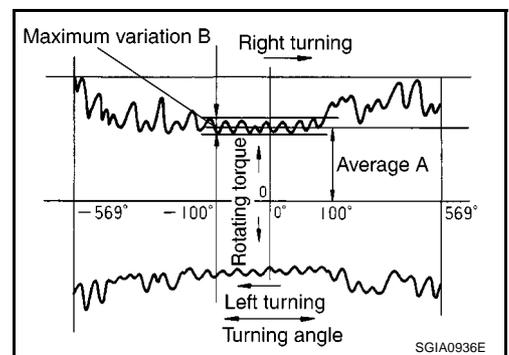


14. Measure pinion rotating torque within $\pm 180^\circ$ of neutral position of the rack assembly using the preload gauge [SST] and preload adapter [SST]. Stop the gear at the point where highest torque is read.

15. Loosen adjusting screw and retighten to 5.4 N·m (0.55 kg·m, 48 in-lb), and then loosen by 20 to 40°.



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

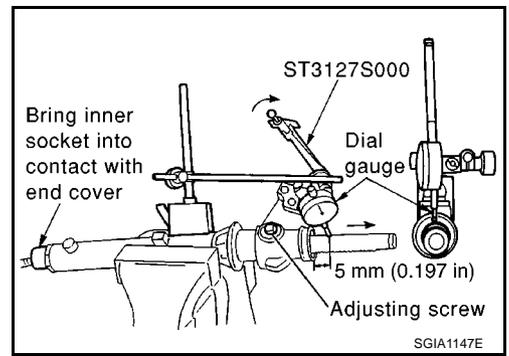


Pinion rotating torque standard	
Around neutral position (within $\pm 100^\circ$) Average A	0.8 - 2.0 N·m (0.09 - 0.20 kg·m, 7.0 - 17 in-lb)
Maximum variation B	2.3 N·m (0.23 kg·m, 20 in-lb)

17. Apply recommended thread locking sealant to inner socket and turn pinion fully to left with inner socket installed to gear housing assembly.

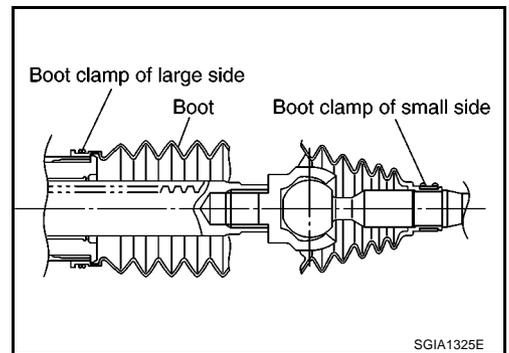
POWER STEERING GEAR AND LINKAGE

18. Set dial gauge as shown in the figure. Measure vertical movement of rack assembly when pinion is turned clockwise with torque of 19.6 N·m (2.0 kg-m, 14 ft-lb). Readjust adjusting screw angle if the measured value is outside the standard. Replace steering gear assembly if the measured value is still outside the standard or adjusting screw rotating torque is 5 N·m (0.51 kg-m, 44 in-lb) or less.

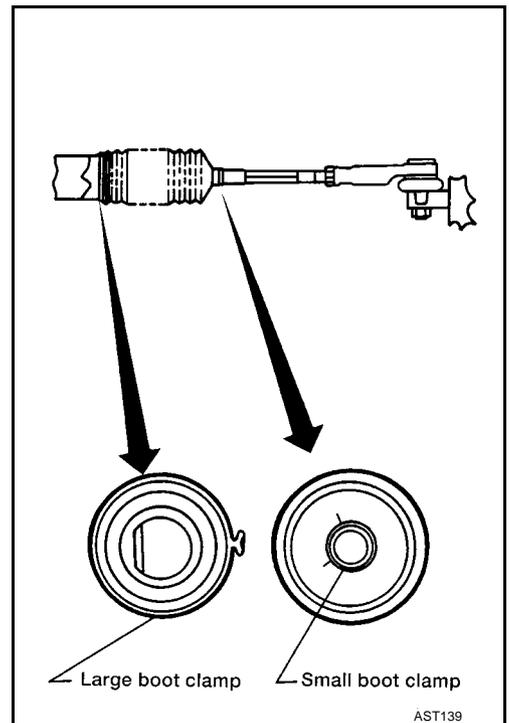


Measuring point	Rack axial direction	5 mm (0.20 in) from housing end surface
	Rack radial direction	Axial direction of the adjusting screw
Vertical movement		0.265 mm (0.0104 in)

19. Install large end of boot to gear housing assembly.
20. Install small end of boot to inner socket boot mounting groove.

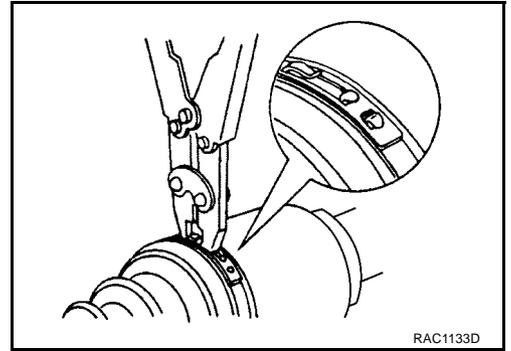


21. Install boot clamps to boots, as shown in the figure.



POWER STEERING GEAR AND LINKAGE

22. Crimp the large-diameter boot clamp using suitable tool.
23. Install cylinder tubes to gear housing assembly.

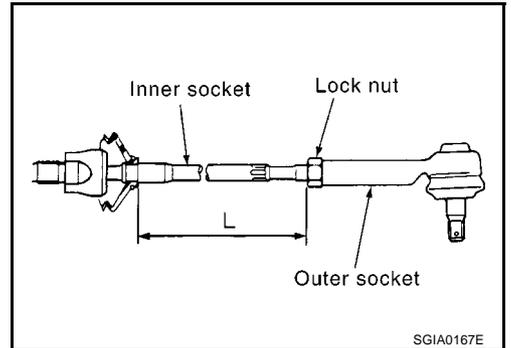


24. Adjust inner socket to standard length "L", and then tighten lock nut to the specified torque. Refer to [PS-16, "COMPONENT"](#). Check length of inner socket "L" again after tightening lock nut. Make sure that the length is the standard.

Inner socket length "L" : 79 mm (3.11 in)

CAUTION:

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



POWER STEERING OIL PUMP

POWER STEERING OIL PUMP

PFP:49110

On-Vehicle Inspection and Service CHECKING RELIEF OIL PRESSURE

EGS001LL

CAUTION:

Make sure that belt tension is normal before starting the following procedure.

1. Connect the hydraulic pressure gauge [SST] between oil pump discharge connector and high-pressure hose. Bleed air from the hydraulic circuit while opening valve fully. Refer to [PS-6, "Air Bleeding Hydraulic System"](#).
2. Start engine. Run engine until oil temperature reaches 50 to 80°C (122 to 176°F).

CAUTION:

- Leave the valve of the hydraulic pressure gauge [SST] fully open while starting and running engine. If engine is started with the valve closed, the hydraulic pressure in oil pump goes up to the relief pressure along with unusual increase of oil temperature.
 - Be sure to keep hose clear or belts and other parts when engine is started.
3. Fully close the hydraulic pressure gauge [SST] valve with engine at idle and measure the relief oil pressure.

Relief oil pressure:

8,500 - 9,300 kpa (86.7 - 94.9 kg/cm² , 1,233 - 1,349 psi)

CAUTION:

Never keep valve closed for 10 seconds or longer.

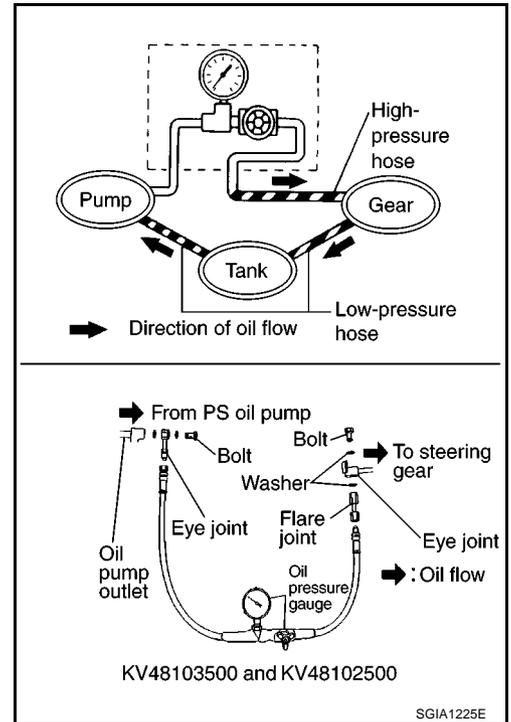
4. Open the valve slowly after measuring. Repair oil pump is the relief oil pressure is outside the standard. Refer to [PS-26, "Disassembly and Assembly"](#).
5. After inspection, disconnect the hydraulic pressure gauge [SST] from hydraulic circuit, then add fluid and bleed air. Refer to [PS-6, "Air Bleeding Hydraulic System"](#).

Removal and Installation

REMOVAL

EGS001LM

1. Drain power steering fluid from reservoir tank.
2. Remove radiator shroud. Refer to [CO-11, "Components"](#).
3. Loosen drive belt. Refer to [EM-12, "DRIVE BELTS"](#).
4. Remove drive belt from oil pump pulley.
5. Disconnect the pressure sensor electrical connector.
6. Remove piping of high pressure and low pressure (drain fluid from their pipings). Refer to [PS-30, "HYDRAULIC LINE"](#).
7. Remove oil pump mounting bolts, and then remove power steering pump. Refer to [PS-30, "HYDRAULIC LINE"](#).



POWER STEERING OIL PUMP

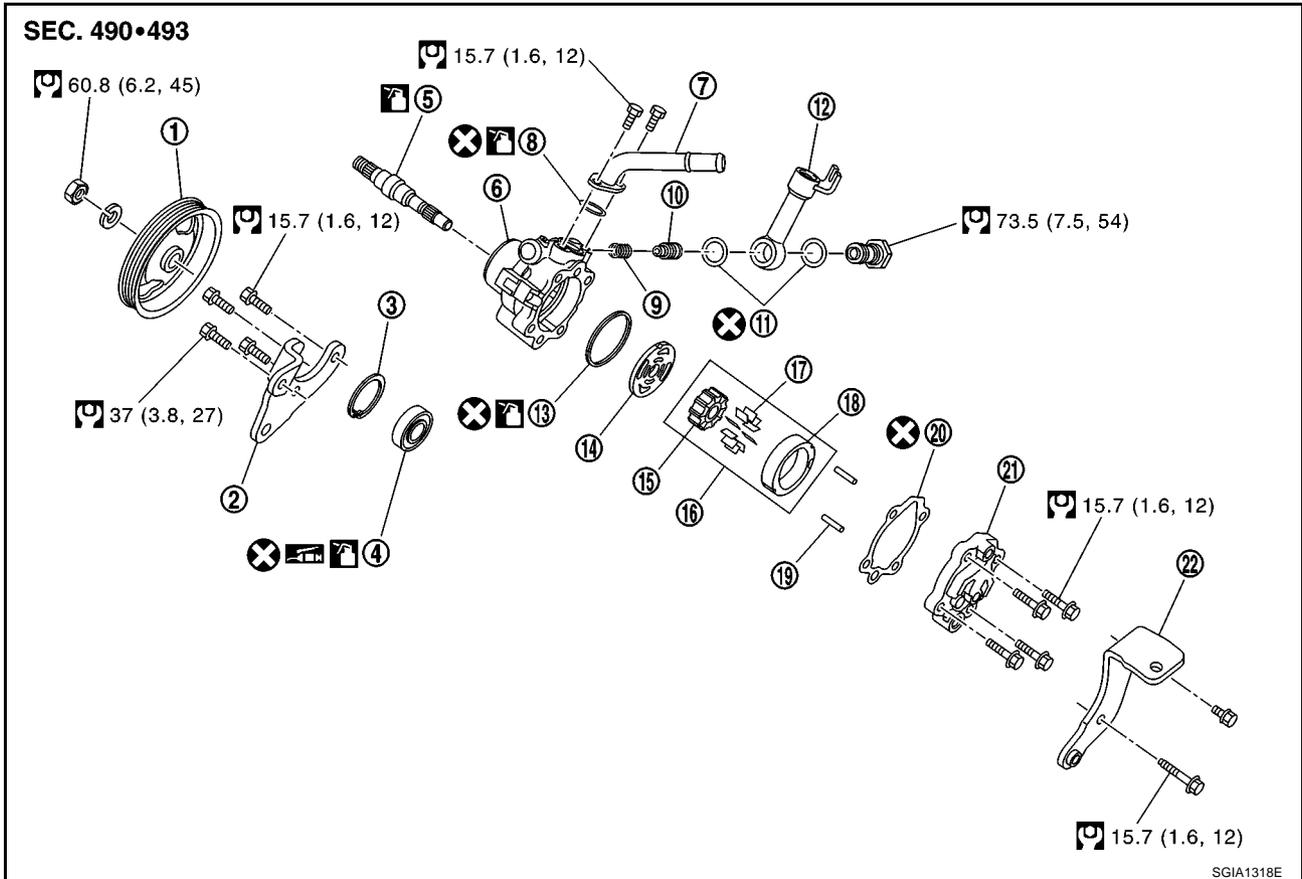
INSTALLATION

Installation is the reverse order of removal. For tightening torque, refer to [PS-30, "HYDRAULIC LINE"](#) .

- Perform the following procedure after installing.
 - Adjust belt tension. Refer to [EM-12, "DRIVE BELTS"](#) .
 - Bleed air. Refer to [PS-6, "Air Bleeding Hydraulic System"](#) .

Disassembly and Assembly COMPONENT

EGS001LN



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

Referr to [GI-10, "Components"](#) and the followings for the symbols in the figure.

: Apply Type DEXRON™ III or equivalent.

: Apply multi-purpose grease.

INSPECTION BEFORE DISASSEMBLY

Disassemble oil pump only when the following malfunctions occur.

- If oil leakage is found on oil pump.
- Oil pump pulley is damaged or deformed.
- Performance of oil pump is low.

POWER STEERING OIL PUMP

DISASSEMBLY

NOTE:

Secure oil pump in a vise if necessary.

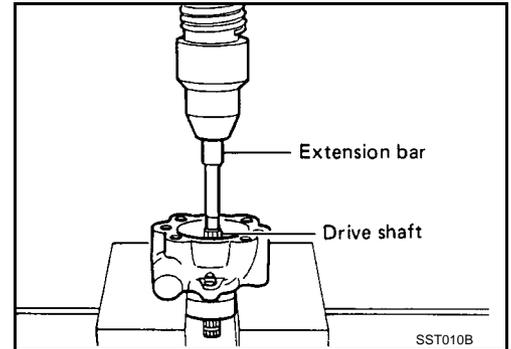
CAUTION:

Use copper plates when securing in a vise.

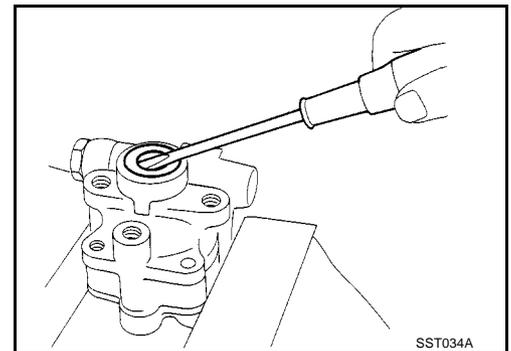
1. Remove rear bracket mounting bolts, and then remove rear bracket from rear cover.
2. Remove rear cover mounting bolts, and then remove rear cover from body assembly.
3. Remove gasket from body assembly.
4. Remove dowel pin, cartridge and side plate from body assembly.
5. Remove pulley mounting nut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

CAUTION:

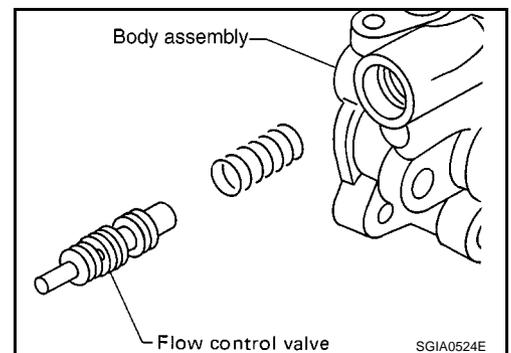
When removing snap ring, be careful not to damage drive shaft.



7. Remove oil seal from body assembly using flat-bladed screw driver.
8. Remove O-ring B from body assembly.



9. Remove eye bolt, and then remove joint and copper washer, then pull out flow control valve and spring from body assembly.
10. Remove fixing bolts of suction pipe, and then remove suction pipe from body assembly.
11. Remove O-ring A from body assembly.
12. Remove mounting bolts of front bracket, and then remove front bracket from body assembly.



INSPECTION AFTER DISASSEMBLY

Body Assembly and Rear Cover Inspection

Check body assembly and rear cover for internal damage. Replace rear cover if it is damaged. Replace oil pump assembly if body assembly is damaged.

Cartridge Assembly Inspection

Check cam ring, rotor and vane for damage. Replace cartridge assembly if there are.

Side Plate Inspection

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

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POWER STEERING OIL PUMP

Flow Control Valve Inspection

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

ASSEMBLY

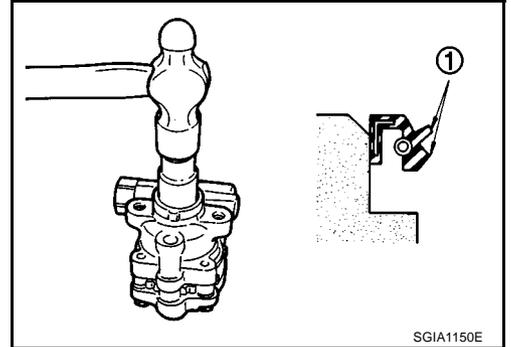
NOTE:

Secure oil pump in a vise if necessary.

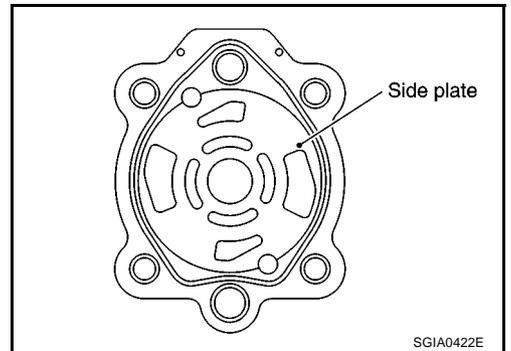
CAUTION:

Use copper plates when securing in a vise.

1. Apply recommended grease to oil seal lips (1). Apply recommended fluid to around oil seal, and then install oil seal to body assembly.
2. Apply recommended fluid to drive shaft, and press drive shaft into body assembly, then install snap ring.
3. Apply recommended fluid to O-ring B, and install O-ring B into body assembly.



4. Install side plate to body assembly.

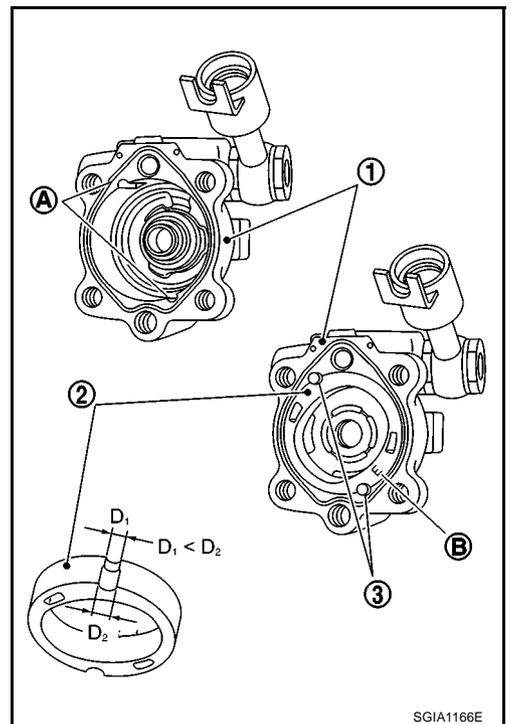


5. Install dowel pin (3) into dowel pin hole (A), and install cam ring (2) pointing its D₁ side toward the body assembly (1) side as shown in the figure.
 - When installing cam ring, turn carved face with a letter E (B) of it to rear cover.

CAUTION:

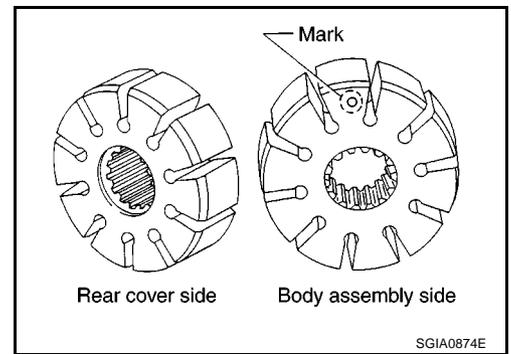
Do not confuse the assembling direction of cam ring. If cam ring is installed facing the incorrect direction, it may cause oil pump operation malfunction.

6. Install rotor to body assembly.

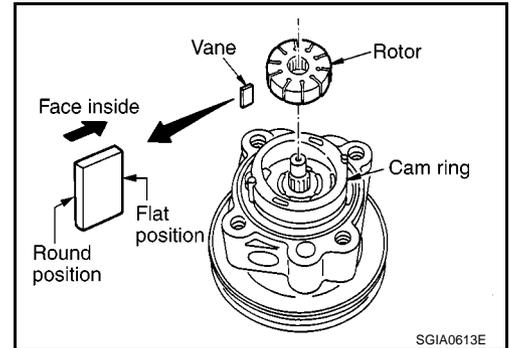


POWER STEERING OIL PUMP

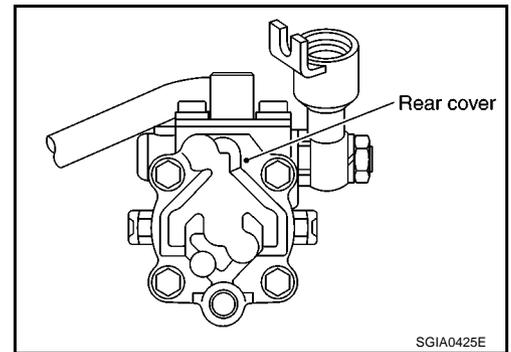
- When installing rotor, turn mark face on rotor to body assembly.



7. Install vane to rotor so that arc of vane faces cam ring side.
8. Check if drive shaft turns smoothly.
9. Install gasket to body assembly.



10. Install rear cover to body assembly, and then tighten mounting bolts to the specified torque.
11. Install rear bracket to body assembly, and tighten the mounting bolts to the specified torque.
12. Install front bracket to body assembly, and tighten the mounting bolts to the specified torque.
13. Install pulley and washer to drive shaft, and then tighten lock nut at the specified torque.
14. Install spring, flow control valve, copper washer, joint and eye-bolt to body assembly. Then tighten eye-bolt to the specified torque.
15. Apply recommended fluid to O-ring A, and then install O-ring A to body assembly.
16. Install suction pipe to body assembly.



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HYDRAULIC LINE

PFP:49721

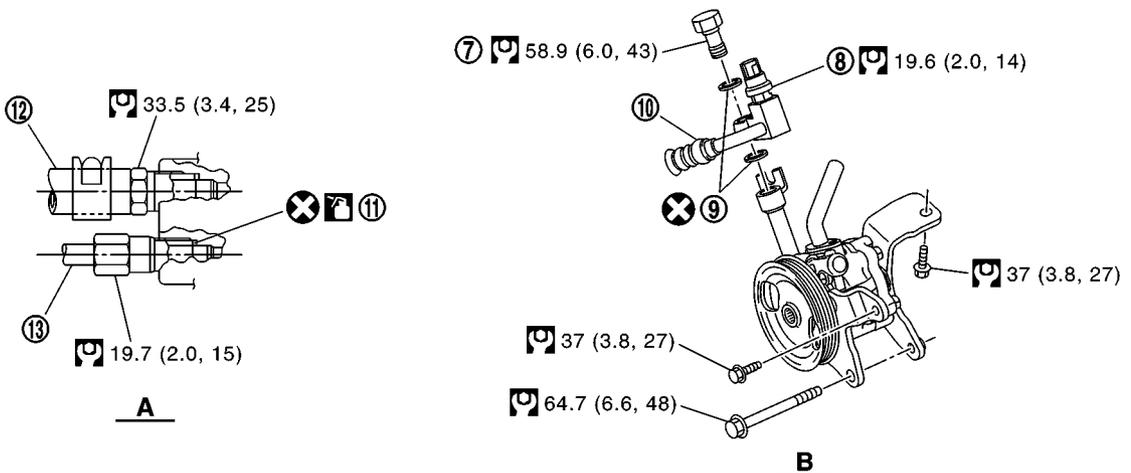
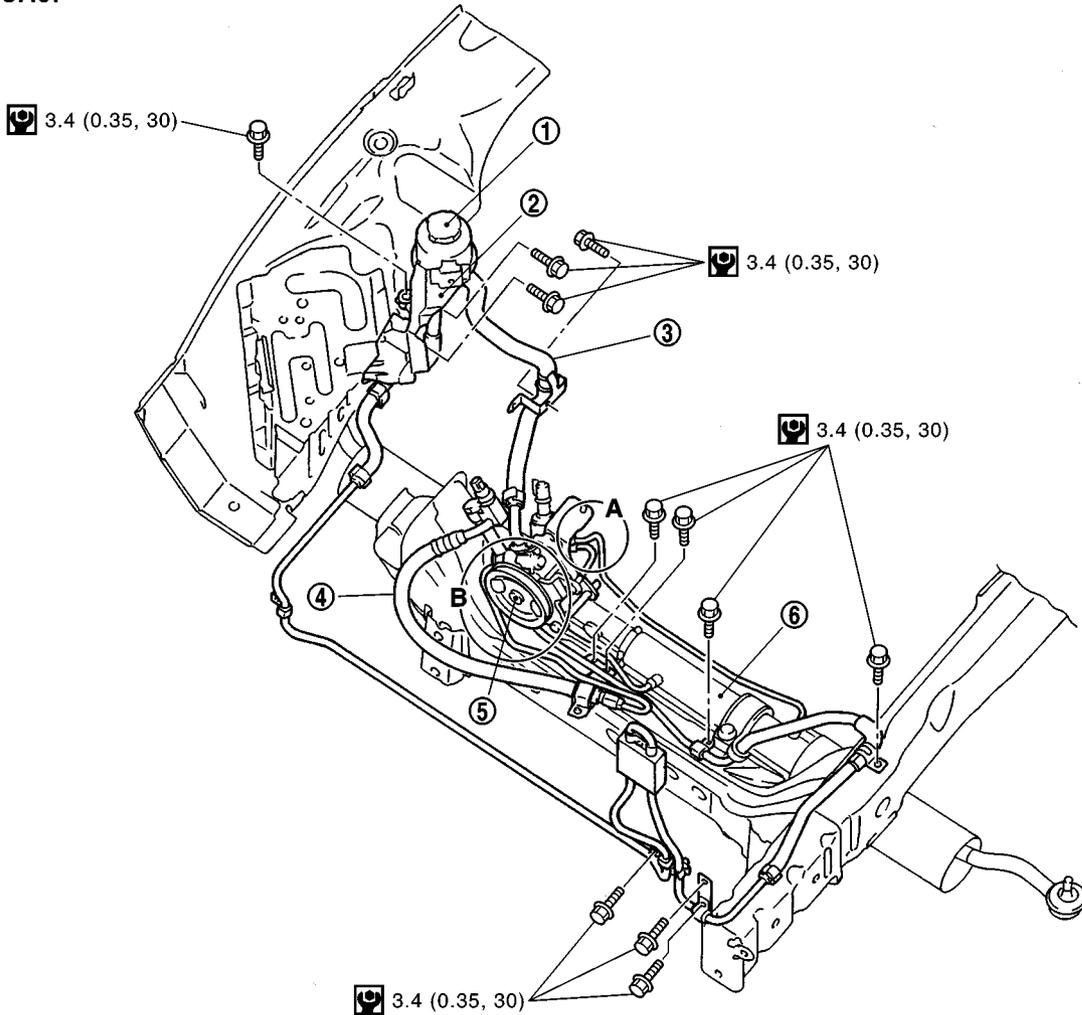
EGS001LO

HYDRAULIC LINE

Component (RHD Models)

CAUTION:
Securely insert harness connector to pressure sensor.

SEC.497



SGIA1319E

- | | | |
|-----------------------|---------------------------|---------------------------|
| 1. Reservoir tank | 2. Reservoir tank bracket | 3. Suction hose |
| 4. High pressure hose | 5. Oil pump assembly | 6. Steering gear assembly |

HYDRAULIC LINE

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- | | | |
|--|--------------------|-------------------------|
| 7. Eye-bolt | 8. Pressure sensor | 9. Copper washer |
| 10. Eye-joint (assembled to high pressure side hose) | 11. O-ring | 12. Low pressure piping |
| 13. High pressure piping | | |

Refer to [GI-9. "HOW TO USE THIS MANUAL"](#) and the followings for the symbols in the figure.

: Apply Type DEXRON™ III or equivalent.

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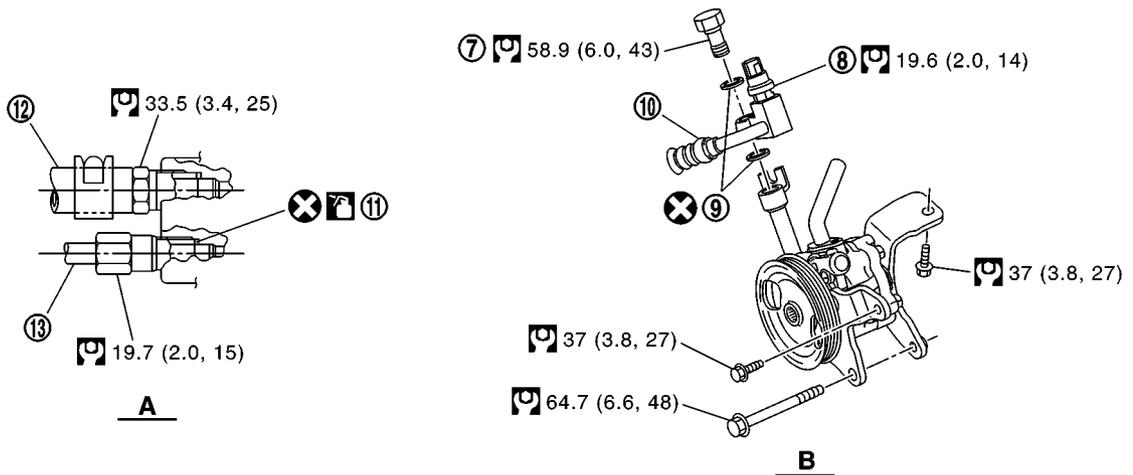
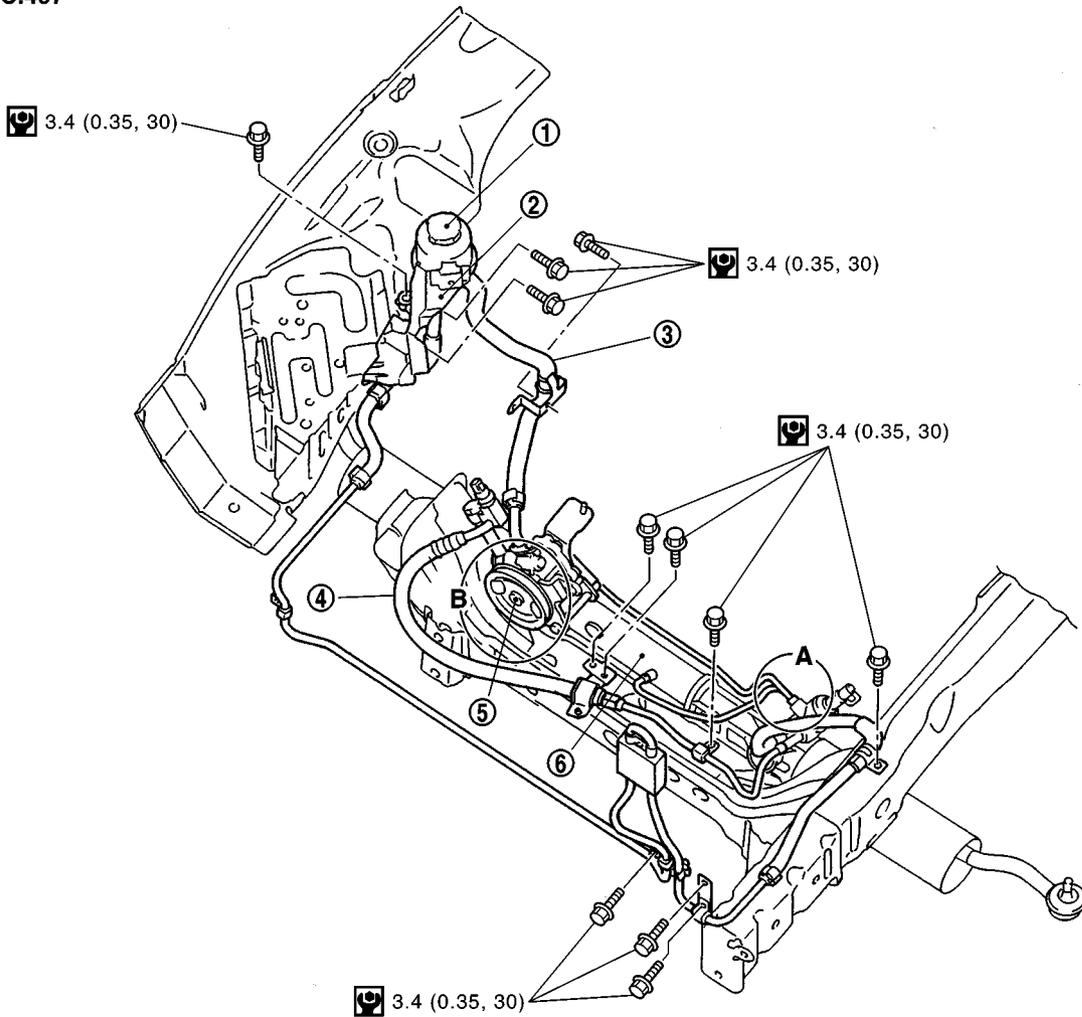
HYDRAULIC LINE

EGS001LP

Component (LHD Models)

CAUTION:
Securely insert harness connector to pressure sensor.

SEC.497



SGIA1320E

- | | | |
|-----------------------|---------------------------|---------------------------|
| 1. Reservoir tank | 2. Reservoir tank bracket | 3. Suction hose |
| 4. High pressure hose | 5. Oil pump assembly | 6. Steering gear assembly |
| 7. Eye-bolt | 8. Pressure sensor | 9. Copper washer |

HYDRAULIC LINE

- 10. Eye-joint (assembled to high pressure side hose)
- 11. O-ring
- 12. Low pressure piping
- 13. High pressure piping

Refer to [GI-9, "HOW TO USE THIS MANUAL"](#) and the followings for the symbols in the figure.

: Apply Type DEXRON™ III or equivalent.

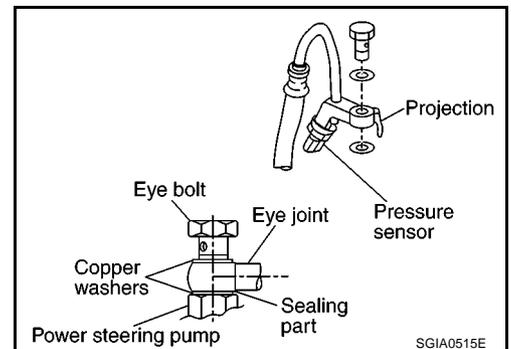
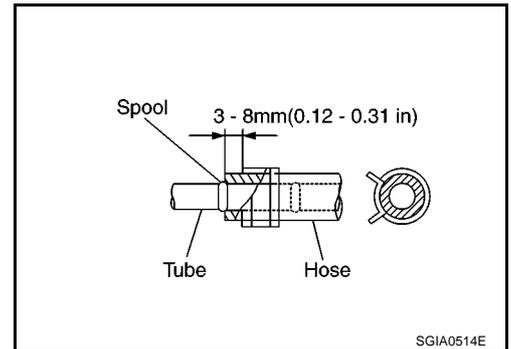
Removal and Installation

- Insert hose securely until it contacts tube spool.

CAUTION:
Do not apply fluid.

- Install eye-bolt with eye-joint (assembled to high-pressure hose) protrusion facing with pump side cutout, and then tighten it to the specified torque after tightening by hand.

EGS001LQ



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SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Steering Wheel

EGS001LR

Steering wheel axial end play	0 mm (0 in)
Steering wheel play	0 - 35 mm (0 - 1.38 in)

Steering Angle

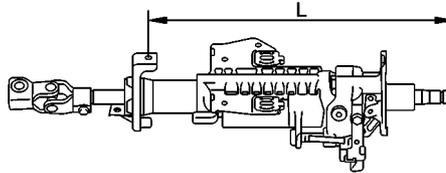
EGS001LS

Inner wheel Degree minute (Decimal degree)	2WD	33° 31' - 35° 31' (33.5° - 36.5°)
	4WD	33° 48' - 35° 48' (33.8° - 35.8°)
Outer wheel Degree minute (Decimal degree)	2WD	29° 23' - 31° 23' (29.4° - 31.4°)
	4WD	29° 40' - 31° 40' (29.7° - 31.7°)

Steering Column

EGS001LT

Steering column length "L"	423.1 mm (16.66 in)
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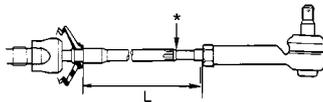


SGIA1222E

Steering Outer Socket and Inner Socket

EGS001LU

Steering gear type		PR32AM
Outer socket	Swinging torque	0.3 - 2.9 N·m (0.03 - 0.29 kg·m, 3.0 - 25 in-lb)
	Measurement on spring balance Measuring point: cotter pin hole of stud	4.84 - 46.7 N (0.5 - 4.8 kg, 1.1 - 10.6 lb)
	Rotating torque	0.3 - 2.9 N·m (0.03 - 0.29 kg·m, 3.0 - 25 in-lb)
	Axial end play	0.5 mm (0.020 in) or less
Inner socket	Swinging torque	1.0 - 7.8 N·m (0.11 - 0.79 kg·m, 9.0 - 69 in-lb)
	<ul style="list-style-type: none"> ● Measurement on spring balance ● Measuring point at *mark shown in the figure 	12.1 - 93.7 N (1.2 - 9.6 kg, 2.6 - 21.2 lb)
	Axial end play	0.2 mm (0.008 in) or less
Inner socket length "L"		79 mm (3.11 in)



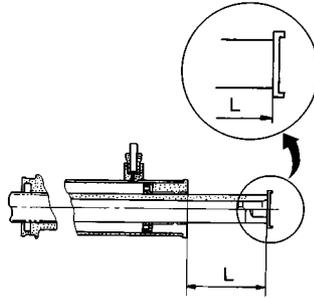
SGIA0950E

SERVICE DATA AND SPECIFICATIONS (SDS)

Steering Gear

EGS001LV

Steering gear model	PR32AM
Rack neutral position, dimension "L" (rack stroke)	84 mm (3.31 in)



SGIA0877E

Oil Pump

EGS001LW

Oil pump relief hydraulic pressure	8,500 - 9,300 kpa (86.7 - 94.9 kg/cm ² , 1,233 - 1,349 psi)
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Steering Fluid

EGS001LX

Fluid capacity	Approx. 1.0 ℓ (1 - 1/8 US qt, 7/8 Imp qt)
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SERVICE DATA AND SPECIFICATIONS (SDS)
