

PS

SECTION

POWER STEERING SYSTEM

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PRECAUTIONS

< SERVICE INFORMATION >

SERVICE INFORMATION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000003036361

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. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the "SUPPLEMENTAL RESTRAINT SYSTEM" and "SEAT BELTS" 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 "SUPPLEMENTAL RESTRAINT SYSTEM".
- 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 WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.

Precaution for Battery Service

INFOID:000000001646711

Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.

Precaution for Steering System

INFOID:000000001646712

- 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.
- Before inspection or reassembly, carefully clean all parts in order on a parts rack.
- Before assembly, apply a coat of recommended power steering fluid to hydraulic parts. Petroleum jelly 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.

PREPARATION

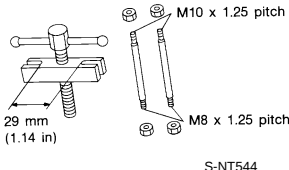
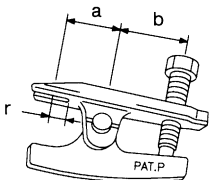
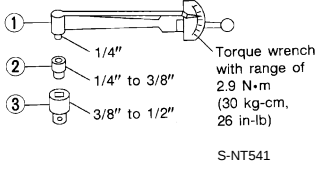
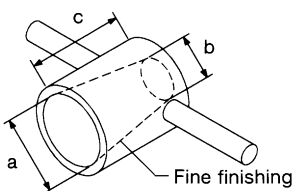
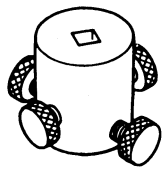
< SERVICE INFORMATION >

PREPARATION

Special Service Tool

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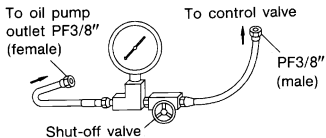
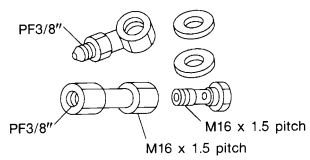
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
ST27180001 (J-25726-A) Steering wheel puller  S-NT544	Removing steering wheel
HT72520000 (J-25730-A) Ball joint remover a: 33 mm (1.30 in) b: 50 mm (1.97 in) r: 11.5 mm (0.453 in)  NT546	Removing outer socket ball joint
ST3127S000 (See J-25765-A) Preload gauge 1. GG9103000 (J-25765-A) Torque wrench 2. HT62940000 (-) Socket adapter 3. HT62900000 (-) Socket adapter  S-NT541	Inspecting of rotating torque
KV48104400 (-) Teflon ring installation tool a: 50 mm (1.97 in) dia. b: 36 mm (1.42 in) dia. c: 100 mm (3.94 in)  S-NT550	Installing of rack Teflon ring
KV48103400 (-) Torque adapter  ZZA0824D	Inspecting rotating torque

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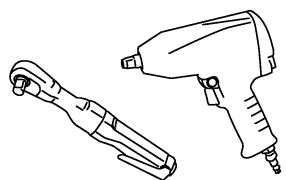
PREPARATION

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Tool number (Kent-Moore No.) Tool name	Description
KV48103500 (J-26357) Pressure gauge  NT547	Measuring oil pump relief pressure
KV48102500 (J-33914) Pressure gauge adapter  NT542	Measuring oil pump relief pressure

Commercial Service Tool

INFOID:0000000001646714

Tool name	Description
Power tool  PBIC0190E	Removing oil pump and wheel nuts

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

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NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

INFOID:000000001646715

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

Reference page		PS-6	PS-6	PS-20	PS-20	PS-20	PS-6	PS-7	PS-20	EM-13	PS-7	PS-14	PS-17	PS-10	PS-10	PS-17	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 RAX section	NVH in BR section
Possible cause and suspected parts		Fluid level	Air in hydraulic system	Outer socket ball joint swinging force	Outer socket ball joint sliding torque	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	TIRES	ROAD WHEEL	DRIVE SHAFT	BRAKES
Symptom	Noise	x	x	x	x	x	x	x	x	x							x	x	x	x	x	x	x
	Shake										x	x	x				x		x	x	x	x	x
	Vibration										x	x	x	x	x		x		x	x		x	
	Shimmy										x	x	x			x			x	x	x		x
	Judder												x			x			x	x	x		x

x: Applicable

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POWER STEERING FLUID

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POWER STEERING FLUID

Checking Fluid Level

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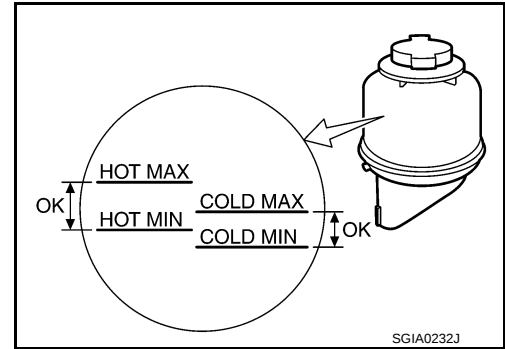
- Stop engine before performing a fluid level check.
- Ensure that fluid level is between the MAX range and MIN level.
- Because fluid level differs within the HOT range and the COLD range, check it carefully.

HOT : Fluid temperatures from 50 to 80 °C (122 to 176°F)

COLD : Fluid temperatures from 0 to 30°C (32 to 86°F)

CAUTION:

- Do not overfill the MAX level.
- Do not reuse any used power steering fluid.



Checking Fluid Leakage

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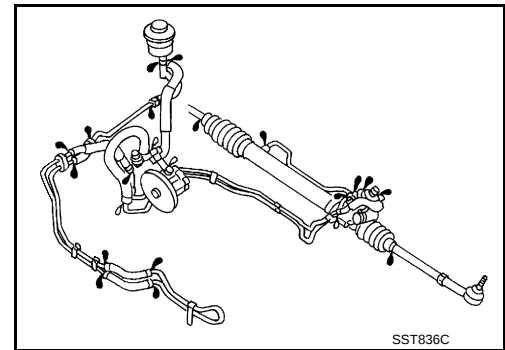
Check that hydraulic piping lines for improper attachment and for leaks, cracks, damage, loose connections, chafing or deterioration.

1. Run engine until fluid temperature reaches 50 to 80° C (122 to 176°F) in reservoir tank. Keep engine speed idle.
2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds to check fluid leakage.

CAUTION:

Do not hold 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 at the connectors is noticed, then loosen the flare nut and retighten it.
6. Check steering gear boots for accumulation of fluid indicating from steering gear.



Air Bleeding Hydraulic System

INFOID:000000001646718

Incomplete air bleeding causes the following. When this happens, bleed air again.

- Generation of air bubbles in reservoir tank
- Generation of clicking noise in oil pump
- Excessive buzzing in oil pump

NOTE:

When vehicle is stationary or while steering wheel is being turned slowly, some noise may be heard from oil pump or gear. This noise is normal and does not affect any system.

1. Stop engine, and then turn steering wheel fully to right and left several times.

CAUTION:

Do not allow steering fluid reservoir tank to go below the low-level line. Check tank frequenter and add fluid as needed.

2. Run engine at idle speed. Turn steering wheel fully to the right and then fully to the left, and keep for about 3 seconds. Then check whether a fluid leakage has occurred.
3. Repeat the 2nd procedure several times at about three seconds intervals.

CAUTION:

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

4. Check generation of air bubbles and cloud in fluid.
5. If air bubbles and the cloud don't fade, stop engine, hold air bleeding until air bubbles and the cloud fade. Perform the 2nd and the 3rd procedures again.
6. Stop engine, check fluid level.

STEERING WHEEL

< SERVICE INFORMATION >

STEERING WHEEL

On-Vehicle Inspection and Service

INFOID:000000001646719

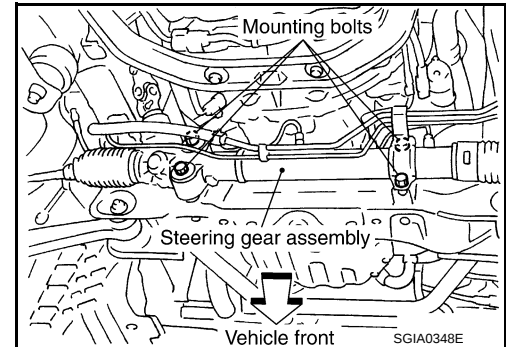
CHECKING CONDITION OF INSTALLATION

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

End play of the axle direction for steering wheel:

0 mm (0 in)

- Check if the mounting bolts for steering gear assembly are loose or not. Refer to [PS-17](#).



CHECKING STEERING WHEEL PLAY

1. Set tires to the straight ahead, start engine, then turn steering wheel to the left and right lightly, and measure steering wheel movement on the outer circumference when steering wheel is turned up to the point where tires start moving.

Steering wheel play on the outer circumference : 0 - 35 mm (0 - 1.38 in)

CHECKING NEUTRAL POSITION ON STEERING WHEEL

- Check neutral position on steering wheel after confirming that front wheel alignment is correct. Refer to [PS-35](#).
1. Set the vehicle to the straight ahead-direction, check if steering wheel is in the neutral position.
 2. If it is not in the neutral position, remove steering wheel and reinstall it correctly.
 3. If the neutral position cannot adjust in the two teeth of steering gear assembly, loosen tie-rod lock nuts of steering outer sockets, then adjust tie-rods by the same amount in the opposite direction.

CHECKING STEERING WHEEL TURNING FORCE

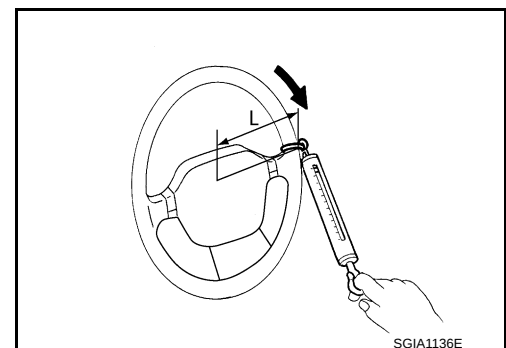
1. Park vehicle on a level and dry surface, set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 50 to 80°C (122 to 176°F).]
4. Check steering wheel turning force when steering wheel has been turned 540° from neutral position.

Steering wheel turning : 7.45 N·m (0.76 kg-m, 66 in-lb) force

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-28, "On-Vehicle Inspection and Service"](#).
- a. Disconnect lower joint and steering knuckle from steering gear assembly. Refer to [PS-17, "Removal and Installation"](#), [FAX-4, "Removal and Installation"](#).
- b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.



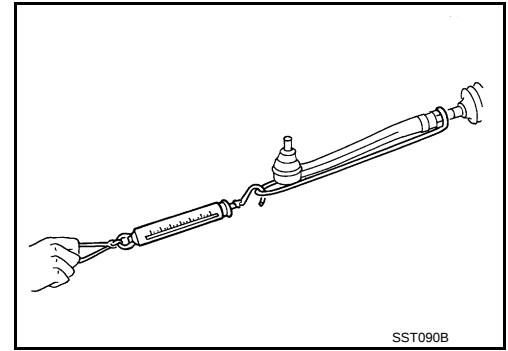
STEERING WHEEL

< SERVICE INFORMATION >

- 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.

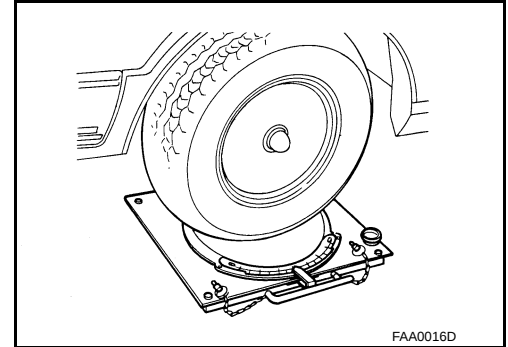
Rack sliding force: **171 - 234 N**
(17.4 - 23.9 kg, 38 - 53 lb)

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



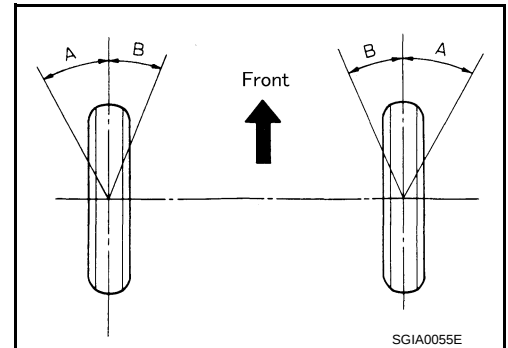
CHECKING FRONT WHEEL TURNING ANGLE

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



- Start engine and run at idle, turn steering wheel all the way right and left, measure the turning angle.

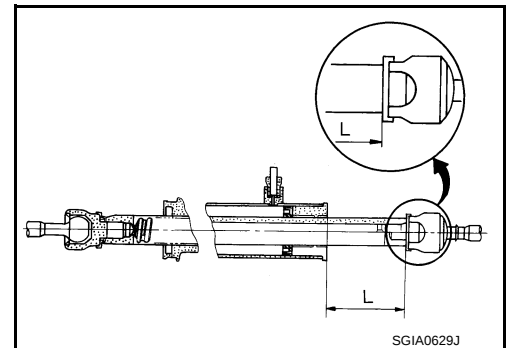
Inner wheel (Angle: A)	Minimum	35° 55' (35.9°)
	Nominal	38° 55' (38.9°)
	Maximum	39° 55' (39.9°)
Outer wheel (Angle: B)	Nominal	30° 40' (30.7°)



- If it is not within specification, measure rack strokes.

Rack stroke "L" : 64.5 mm (2.539 in)

- If rack stroke is out of specification, disassemble steering gear assembly to check rack stroke.
- Any turning angles are not adjustable. If any of steering angles are out of the specification, check if the following parts are wear or damaged.
 - Steering gear
 - Steering column
 - Front suspension components
 If found that they are worn or damaged, replace them with new ones respectively.



Removal and Installation

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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 cable installation.

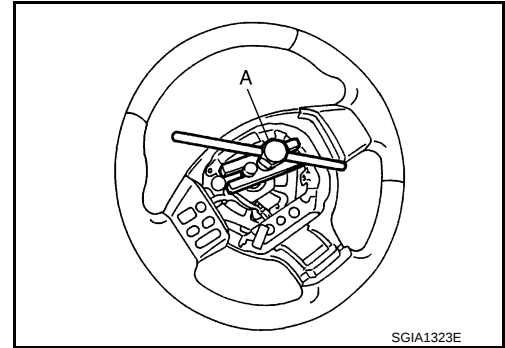
- Set vehicle to the straight-ahead position.

STEERING WHEEL

< SERVICE INFORMATION >

2. Remove driver air bag module. Refer to [SRS-42, "Removal and Installation"](#).
3. Remove steering wheel lock nut after steering is locked.
4. Remove steering wheel with the steering wheel puller A.

Tool number **A: ST27180001 (J-25726-A)**



INSTALLATION

Installation is the reverse order of removal. For tightening torque, refer to [PS-10, "Removal and Installation"](#).

NOTE:

Check the spiral cable neutral position after replacing or rotating spiral cable. Refer to [SRS-44, "Removal and Installation"](#).

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STEERING COLUMN

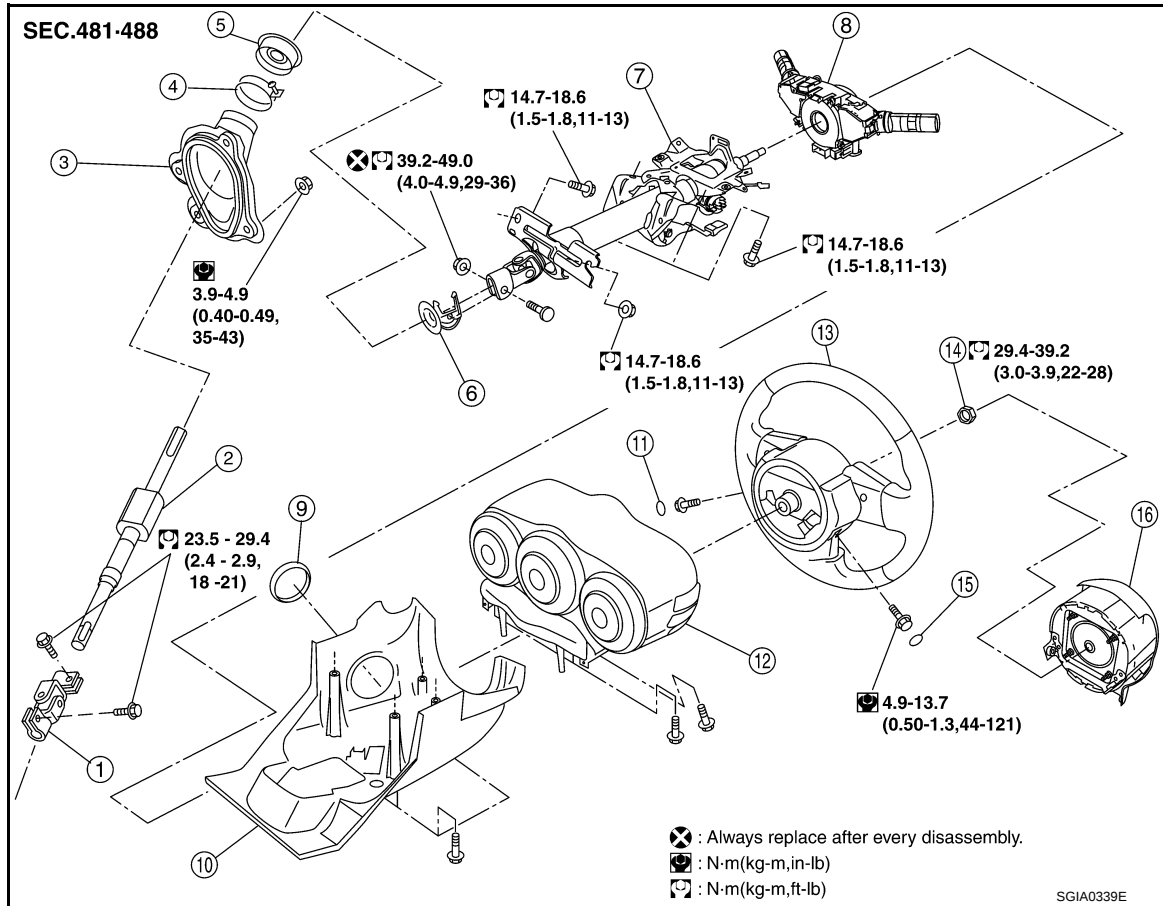
< SERVICE INFORMATION >

STEERING COLUMN

Removal and Installation

INFOID:000000001646721

COMPONENTS



- | | | |
|-----------------------------|--------------------------------------|--|
| 1. Lower joint | 2. Lower shaft | 3. Hole cover |
| 4. Clamp | 5. Hole cover seal | 6. Collar |
| 7. Steering column assembly | 8. Combination switch & spiral cable | 9. Escutcheon |
| 10. Column lower cover | 11. Right lid | 12. Combination meter & column upper cover |
| 13. Steering wheel | 14. Steering wheel lock nut | 15. Left lid |
| 16. Driver air bag module | | |

CAUTION:

- Care must be taken not to give axial impact to steering column assembly during removal and installation.
- Care must be taken not to move steering gear during removal of steering column assembly.

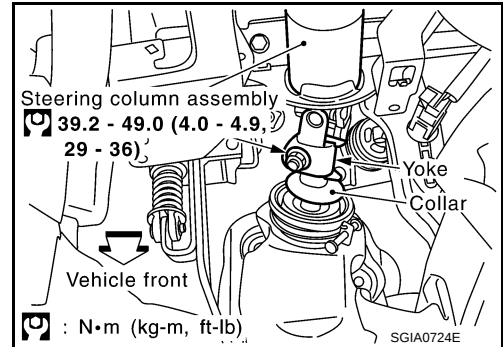
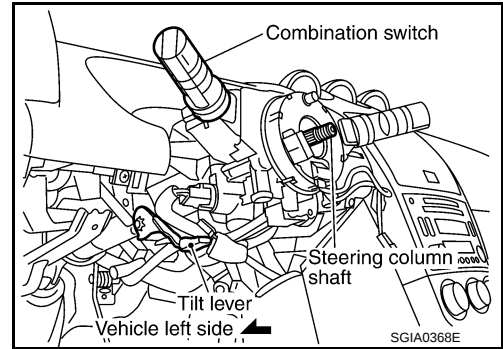
REMOVAL

1. Set vehicle to the straight ahead-direction.
2. Remove driver air bag module from steering wheel. Refer to [SRS-42](#).
3. Disconnect steering switch connector, remove steering wheel lock nut, then remove steering wheel. Refer to [PS-7](#).
4. Remove dash side finisher (LH). Refer to [IP-11](#).
5. Remove instrument driver panel lower. Refer to [IP-11](#).
6. Remove column lower cover and combination meter (which is connected with steering column upper cover) from steering column assembly. Refer to [DI-22, "Removal and Installation for Combination Meter"](#).

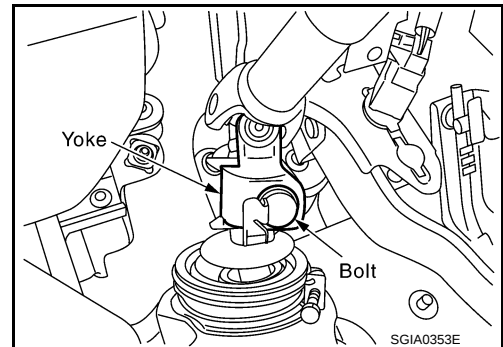
STEERING COLUMN

< SERVICE INFORMATION >

7. Remove combination switch & spiral cable from steering column assembly. Refer to [SRS-44, "Removal and Installation"](#).
8. Disconnect the following connector from steering column assembly.
 - Steering lock harness connector
 - Ignition switch harness connector
 - Key switch harness connector
9. Remove control unit with VDC/TCS/ABS control unit. Refer to [BRC-122](#).
10. Disconnect brake switch harness connector.
11. Remove steering column shaft from lower shaft in the following procedure.
 - a. Remove lock nut from yoke.



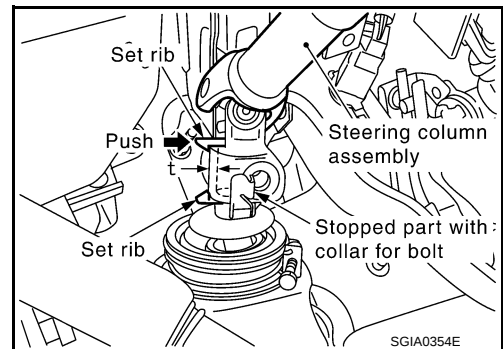
- b. Turn steering wheel to the right to appear the head of bolt.
 - c. Remove the fixed part of collar for bolt to the outside of its head, remove bolt.



- d. Remove the set lib of steering column assembly side from yoke, push it equal to the thick part of yoke.

NOTE:

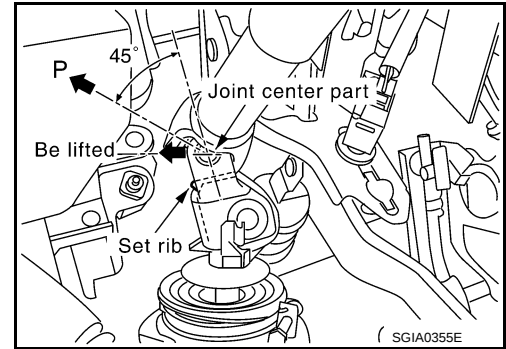
Because collar is set in lower shaft, if the set lib is pushed (action), joint center will be lifted in the opposite direction (reaction), and then the set lib will be in squeezed to the thick part of yoke.



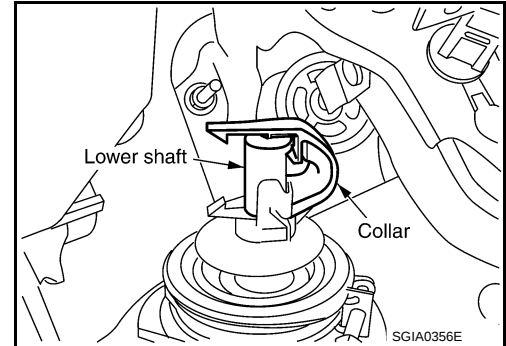
STEERING COLUMN

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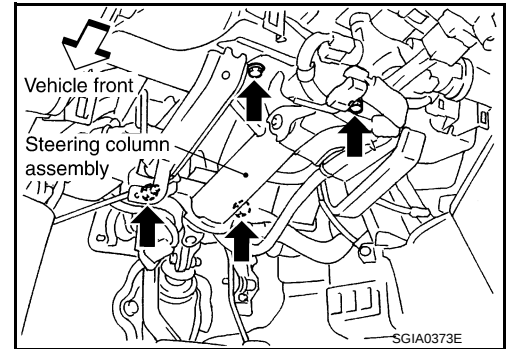
- e. Yoke will be removed from collar, when steering column assembly is lifted about 45° oblique upward.



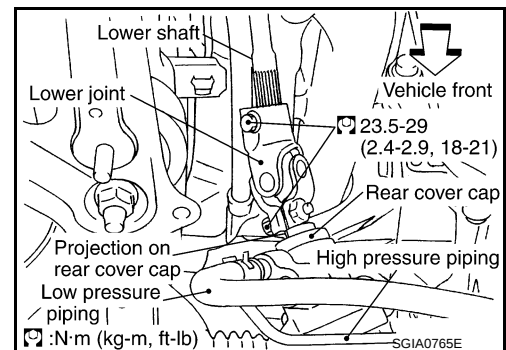
- f. Collar remains on lower shaft.



12. Remove bolts and nut from steering member, remove steering column assembly from steering member.
13. Remove collar from lower shaft.
14. Remove hole cover seal from lower shaft.
15. Remove mounting bolts, then remove hole cover from panel.



16. Raise vehicle, then loosen bolt for lower yoke of lower joint and remove joint together with lower shaft.



INSPECTION AFTER REMOVAL

- Check if there is something wrong with jacket tube of steering column assembly and collar etc. And then if they are damaged, replace with new one.

STEERING COLUMN

< SERVICE INFORMATION >

- If vehicle has a collision light shocked, check column length "L" as shown in the figure. Then if it is out of the specified value, replace with new one.

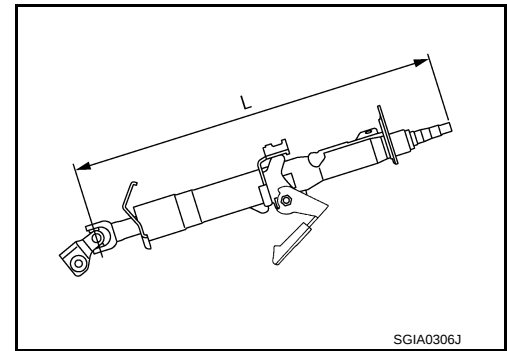
Specified value

Steering column length "L": 548 mm (21.57 in)

- Check the turning torque of steering column with preload gauge (SST: ST3127S000 [J-25765-A]). If it is out of the specified value, repair it or replace with new one.

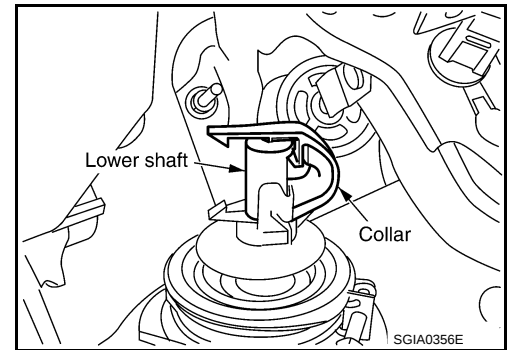
Specified value

Turning torque : 0 - 0.2 N·m (0 - 0.02 kg-m, 0 - 2 in-lb)

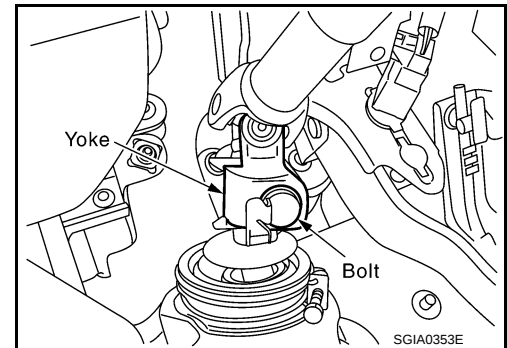


INSTALLATION

1. Install collar to lower shaft.



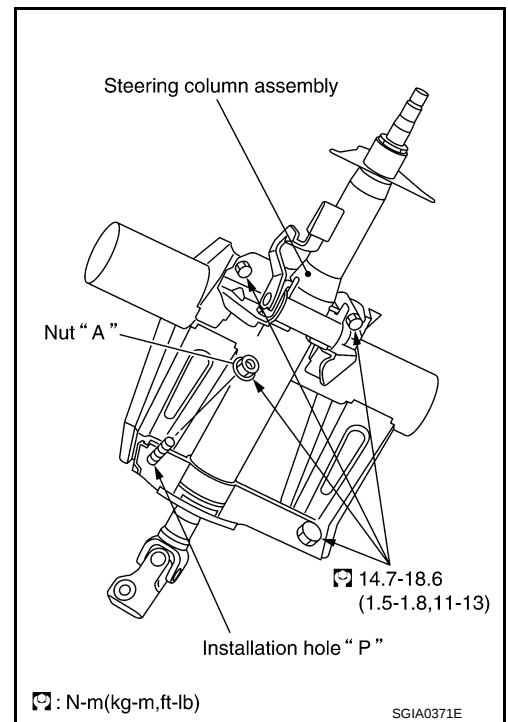
2. Install yoke of column shaft to collar, tack bolt and nut.



STEERING COLUMN

< SERVICE INFORMATION >

- Put steering column assembly (installation hole "P") on bolt for steering member side and install nut "A" then tighten it together with the other bolts at the specified torque.
- Connect yoke and collar with bolt, tighten nut at the specified torque.



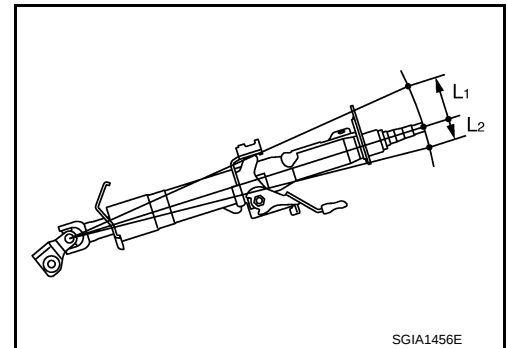
INSPECTION AFTER INSTALLATION

- After installing steering column to vehicle, check tilt device and its operation range "L1", "L2".

Tilt operating range "L1" : 28 - 32 mm (1.10 - 1.26 in)

"L2" : 13 - 17 mm (0.51 - 0.67 in)

- Check if steering operation can turn to the end of the left and right smoothly.



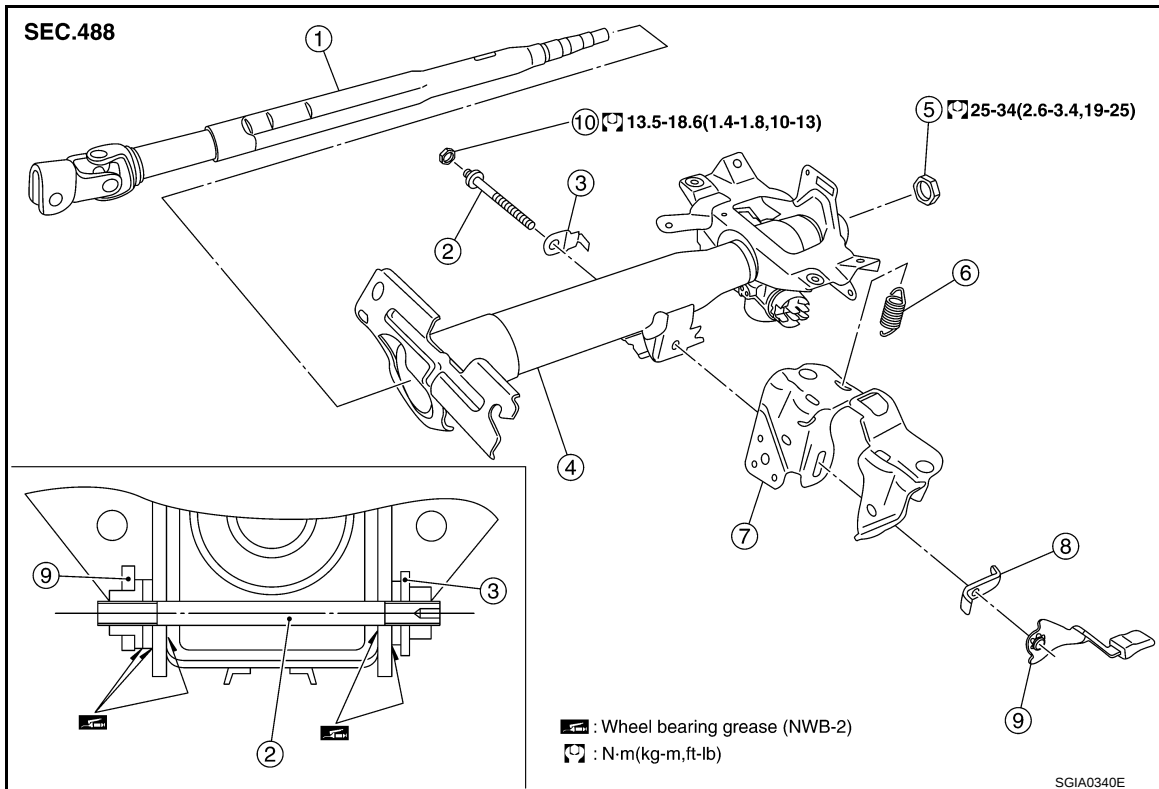
Disassembly and Assembly

COMPONENTS

INFOID:000000001646722

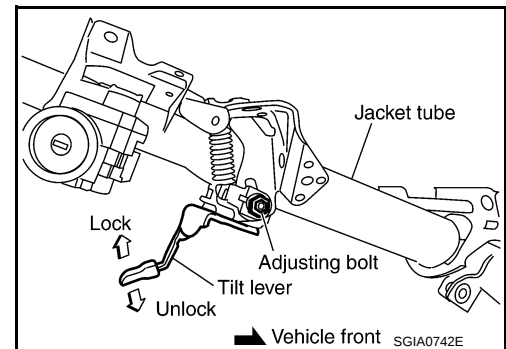
STEERING COLUMN

< SERVICE INFORMATION >



DISASSEMBLY

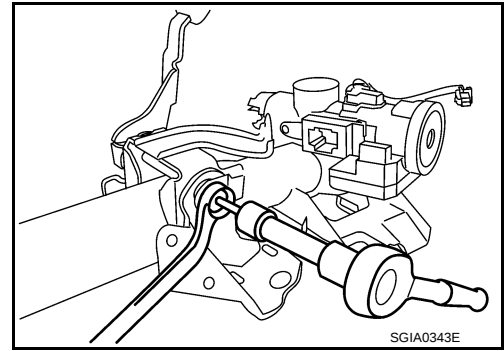
1. Remove steering column shaft lock nut, then remove steering column shaft from front side of jacket tube.
2. Remove tilt device from jacket tube.
3. Remove lock nut and adjusting stopper according to the following procedure.
 - a. Turn tilt lever to the unlock side.
 - b. Remove spring from column mounting bracket.



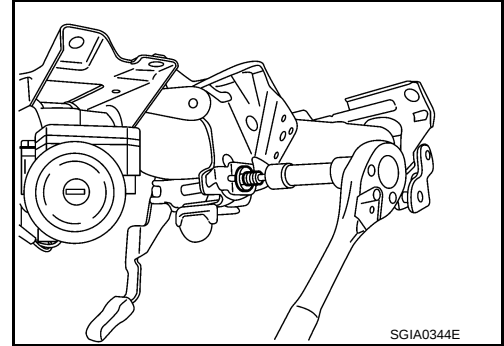
STEERING COLUMN

< SERVICE INFORMATION >

c. Lock adjusting bolt, then remove lock nut.



d. Remove adjusting bolt, adjusting stopper, column mounting bracket, tilt lever stopper and tilt lever from jacket tube.



INSPECTION AFTER DISASSEMBLY

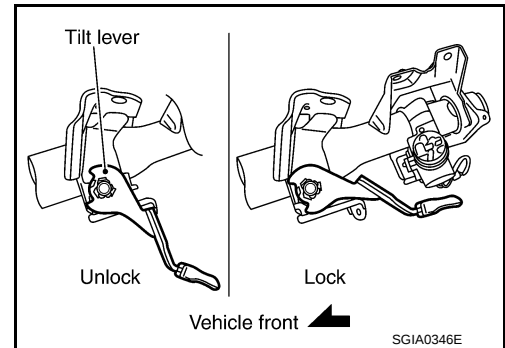
- Check if there is something wrong with steering column shaft and bearing. And then if they are damaged, replace with new one.
- Check if there is something wrong with the component of tilt device. And then if it is damaged, replace with new one.

ASSEMBLY

1. Install tilt device to jacket tube. Refer to "Disassembly and Assembly".

NOTE:

- Turn tilt lever to unlock side while at work to make it easier.
- That can avoid column shaft's sudden descent when tilt lever is operated on vehicle.

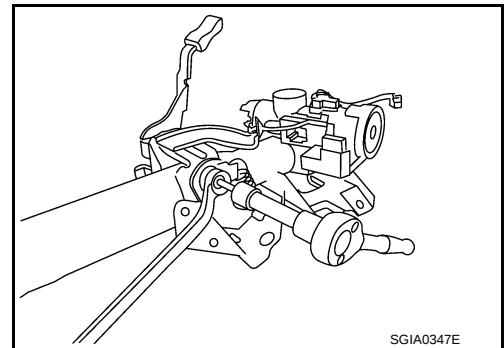


2. When tilt lever is in the locked position (operation range is about 40°), tighten lock nut at the specified torque to make tilt lever locked.

Tightening torque:

13.5 - 18.6 N·m (1.4 - 1.8 kg-m, 10 - 13 ft-lb)

3. Apply grease to the part shown in the figure of component. Refer to "Disassembly and Assembly".
4. Install steering column shaft to jacket tube, tighten steering column shaft lock nut at the specified torque.



Tightening torque : 25 - 34 N·m (2.6 - 3.4 kg-m, 19 - 25 ft-lb)

POWER STEERING GEAR AND LINKAGE

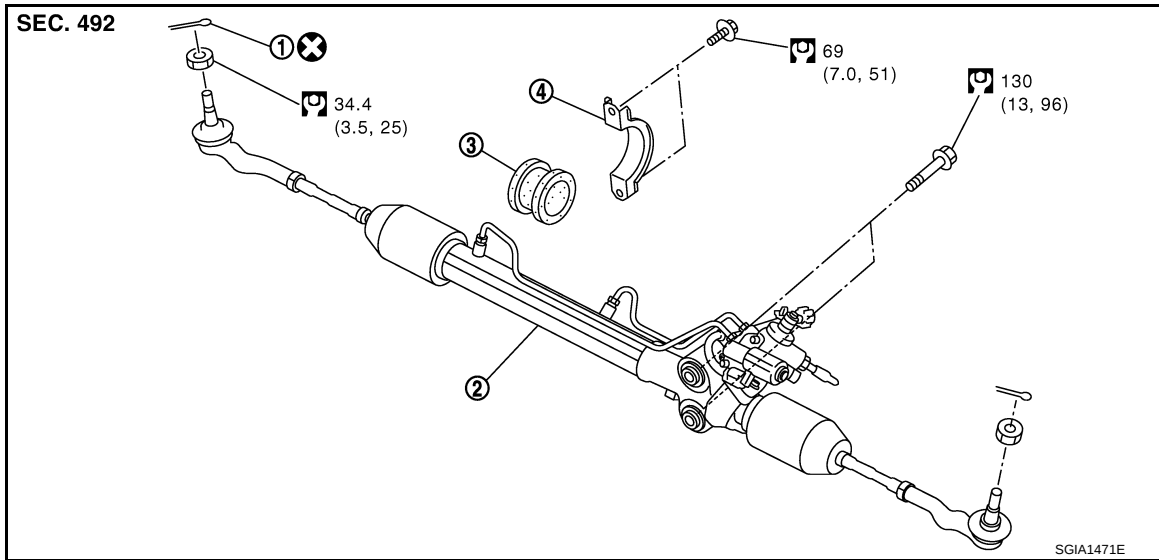
< SERVICE INFORMATION >

POWER STEERING GEAR AND LINKAGE

Removal and Installation

INFOID:000000001646723

COMPONENTS



1. Cotter pin
2. Steering gear assembly
3. Rack mounting insulator
4. Rack mounting bracket

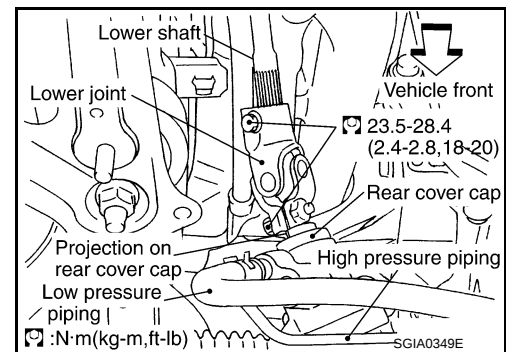
Refer to [GI-8, "Component"](#), for the symbols in the figure.

CAUTION:

Spiral cable may snap due to steering operation if steering column is separated from steering gear assembly. Therefore fix steering wheel with a string to avoid turns.

REMOVAL

1. Set wheels in the straight-ahead position.
2. Remove undercover and tires from vehicle with power tool.
3. Remove front crossbar. Refer to [FSU-7, "Component"](#).
4. Confirm slit of lower joints fits with the projection on rear cover cap, furthermore marking position on steering gear assembly nearly fits with the projection on rear cover cap.
5. Remove cotter pin at steering outer socket, then loosen mounting nut.



POWER STEERING GEAR AND LINKAGE

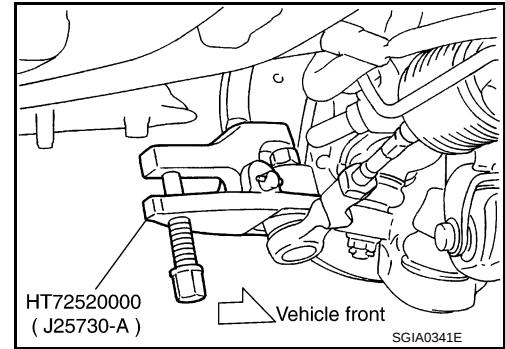
< SERVICE INFORMATION >

6. Use a ball joint remover (SST) to remove steering outer socket from steering knuckle. Be careful not to damage ball joint boot.

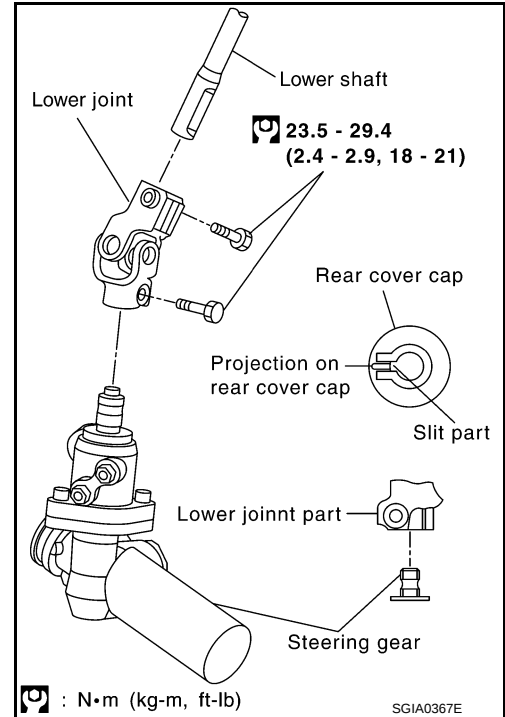
CAUTION:

Tighten temporarily mounting nut to prevent damage to threads and to prevent ball joint remover (SST) from coming off.

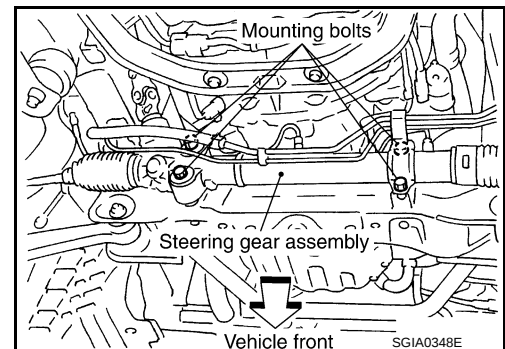
7. Remove oil pipings (high pressure side and low pressure side) from steering gear assembly, then drain fluid from pipings.



8. Loosen bolt on upper yoke of lower joint and remove bolt on lower yoke of joint, then slide lower joint into lower shaft. Separate steering gear assembly from lower shaft.
9. Tack bolt on upper yoke of lower joint, fix lower joint to lower shaft.



10. Remove the fixing bolt and remove steering gear assembly, rack mounting bracket and insulator from vehicle.



INSTALLATION

- Refer to "Removal and Installation" for tightening torque. Install in the reverse order of removal.

NOTE:

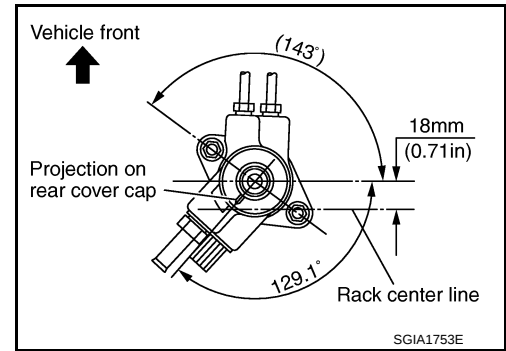
Refer to component parts location and do not reuse non-reusable parts.

- After removing/installing or replacing steering components, check wheel alignment. Refer to [FSU-5. "Wheel Alignment Inspection"](#).

POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >

- When steering wheel is set in the straight ahead direction, confirm slit of lower joint fits with the projection on rear cover cap, furthermore marking position on steering gear assembly nearly fits with the projection on rear cover cap.
- After installation, bleed air from piping. Refer to [PS-6, "Air Bleeding Hydraulic System"](#).



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POWER STEERING GEAR

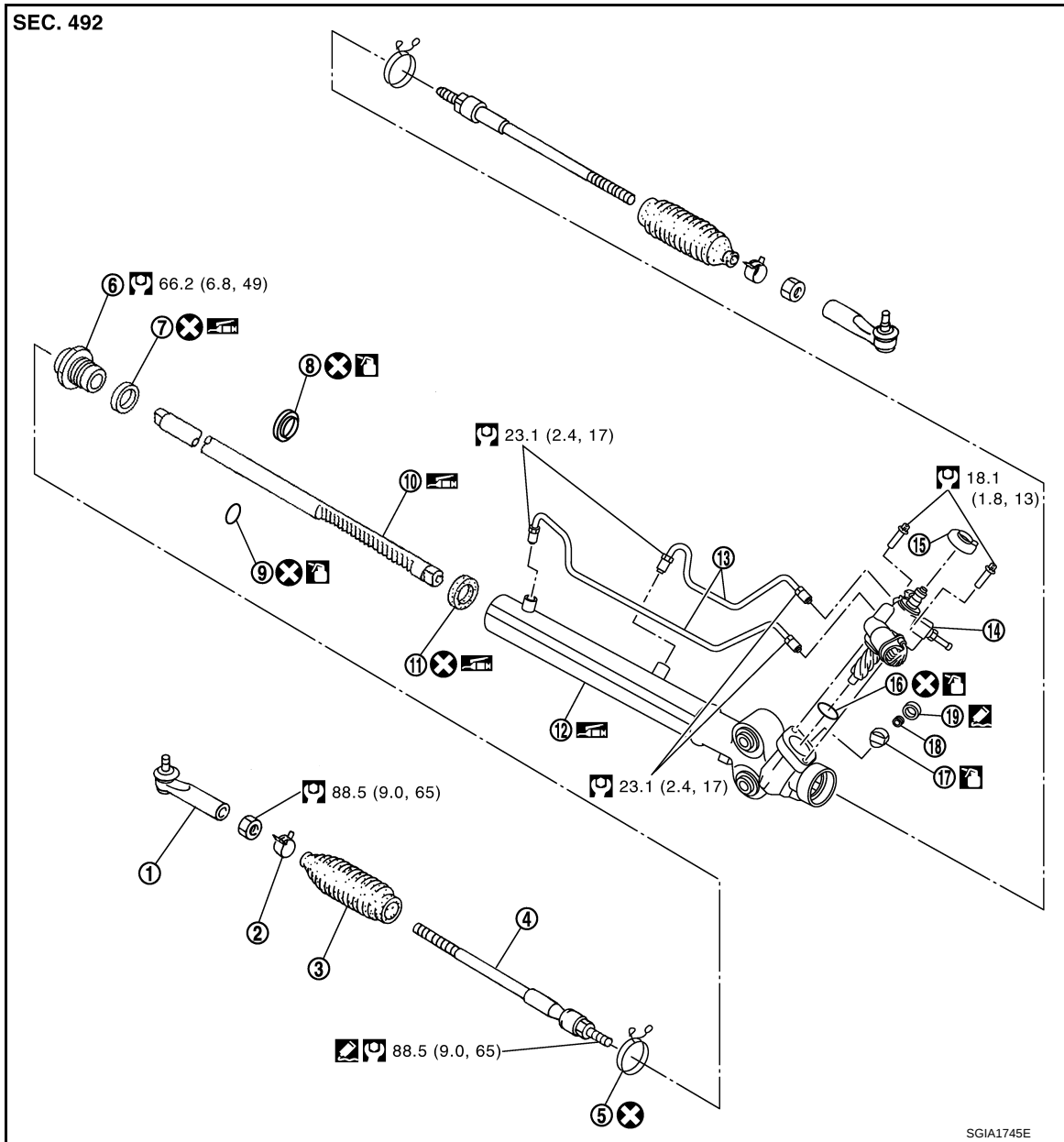
< SERVICE INFORMATION >

POWER STEERING GEAR

Disassembly and Assembly

INFOID:000000001646724

COMPONENTS



- | | | |
|---------------------|-----------------------|---------------------------|
| 1. Outer socket | 2. Boot clamp | 3. Boot |
| 4. Inner socket | 5. Boot clamp | 6. End cover assembly |
| 7. Rack oil seal | 8. Rack Teflon ring | 9. O-ring A |
| 10. Rack assembly | 11. Rack oil seal | 12. Gear housing assembly |
| 13. Cylinder tube | 14. Gear-sub assembly | 15. Rear cover cap |
| 16. O-ring B | 17. Retainer | 18. Spring |
| 19. Adjusting screw | | |

Refer to [GI-8, "Component"](#), and the followings for the symbols in the figure.



Apply Genuine Thread Locking Sealant, Three Bound 1111B or equivalent.



Apply multi-purpose grease.



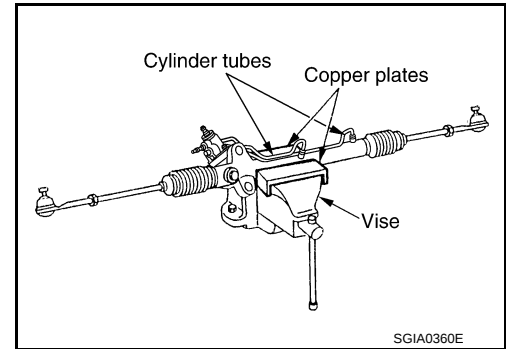
Apply Genuine NISSAN PSF or equivalent.

POWER STEERING GEAR

< SERVICE INFORMATION >

CAUTION:

- Secure steering gear assembly with a vise, using copper plates or something similar to prevent it from being damaged. Do not grip cylinder with a vise.
- Before performing disassembly, clean steering gear assembly with kerosene. Be careful not to bring any kerosene into contact with the discharge and return port connectors.



DISASSEMBLY

1. Remove cylinder tubes from gear housing assembly.
2. Remove rear cover cap from gear-sub assembly.
3. Measure adjusting screw height from gear housing assembly, then loosen adjusting screw.

CAUTION:

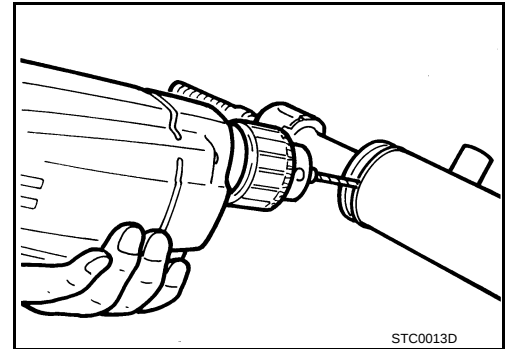
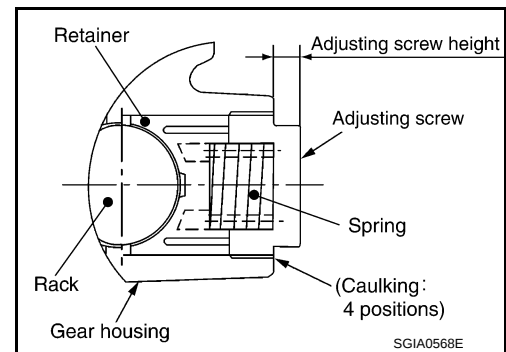
- Do not turn adjusting screw more than twice.
- Replace steering gear assembly when adjusting screw is removed or more than twice.

4. Remove fixing bolts of gear-sub assembly, and then remove gear-sub assembly from gear housing assembly.
5. Remove O-ring B from gear housing assembly.
6. Loosen lock nut of outer socket, and remove outer socket.
7. Remove boot clamps of the small diameter side and the large diameter side, then remove boots.

CAUTION:

On removing boots, be careful not to damage the inner socket and the gear housing assembly. If they are damaged, change them to avoid oil leaks.

8. Drill out the clinching part of cylinder outer rim with a 3 mm (0.12 in) drill in 1.5 mm (0.059 in) depth.



9. Remove end cover assembly with a 42 mm (1.65 in) open head (suitable tool).

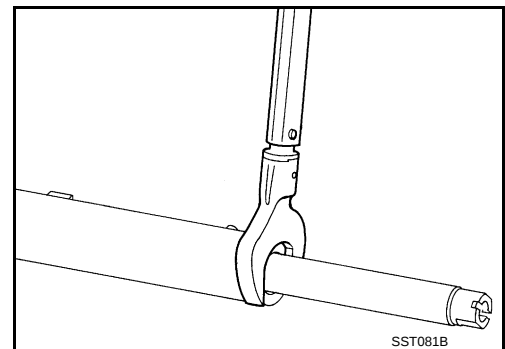
CAUTION:

Be careful not to damage rack. If it is damaged, replace rack. Otherwise, oil leaks may result.

10. Pull rack with rack oil seal out of gear housing assembly.

CAUTION:

Be careful not to damage cylinder. If it is damaged, replace gear housing assembly. Otherwise, oil leaks may result.



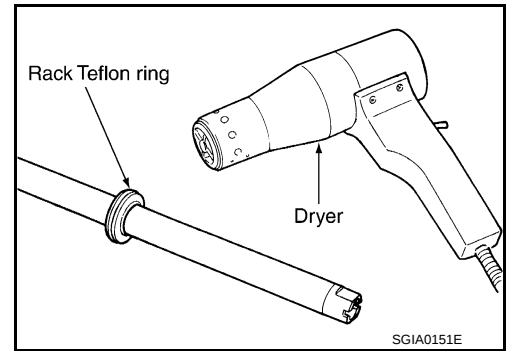
POWER STEERING GEAR

< SERVICE INFORMATION >

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

CAUTION:

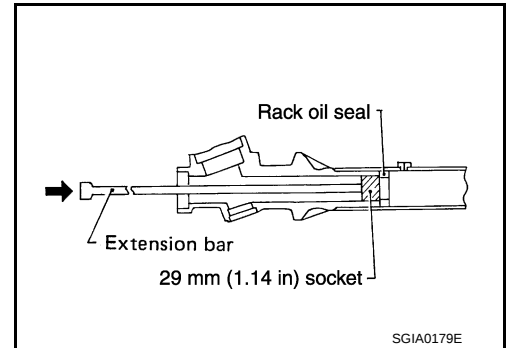
Be careful not to damage rack. If it is damaged, change to a new one to avoid oil leaks.



- Use a taped 29 mm (1.14 in) socket and an extension bar. Remove rack oil seal from gear housing assembly.

CAUTION:

Be careful not to damage gear housing assembly and cylinder inner wall. If it is damaged, gear housing assembly must be replaced. Otherwise, oil leaks will result.



INSPECTION AFTER DISASSEMBLY

Boot

Check boot for cracks and deformation. Replace it, if necessary.

Rack Assembly

Check rack for damage and wear. Replace it, if necessary.

Gear-sub Assembly

- Check pinion gear for damage or wear. Replace if necessary.
- Rotate pinion and check for torque variation or rattle. Replace if necessary.

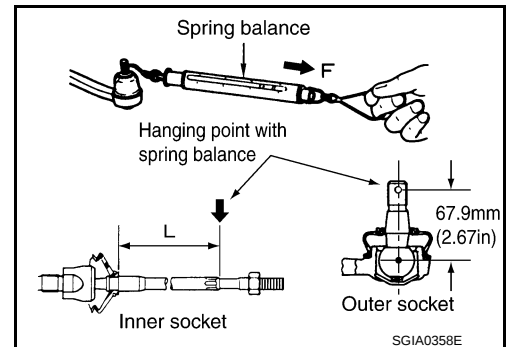
Gear Housing Assembly

Check gear housing assembly for damage and scratches (inner wall). Replace it, if necessary.

Outer Socket and Inner Socket

Swing Torque

- Hook a spring balance at the point shown in the figure. Confirm if the reading is within the specification. When ball stud and inner socket start moving the measured value must be within the specification. If the reading is outside the specification, replace socket.



Specified value

Item	Outer socket	Inner socket
Measuring point	Cotter-pin hole of stud	shown as L: 48.5 mm (1.909 in)
Swing torque	0.3 - 2.9 N·m (0.03 - 0.29 kg-m, 3 - 25 in-lb)	1.0 - 7.8 N·m (0.11 - 0.79 kg-m, 9 - 69 in-lb)
Measuring value	4.42 - 42.7 N (0.5 - 4.4 kg, 1 - 10 lb)	10 - 78 N (1 - 8 kg, 2 - 18 lb)

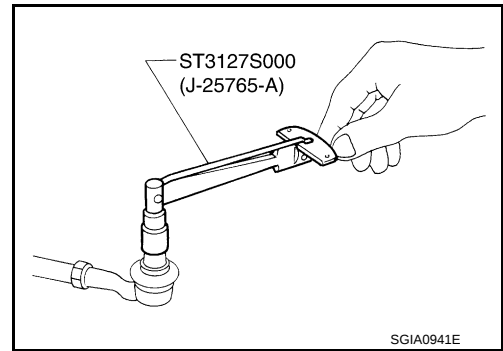
Rotating Torque

POWER STEERING GEAR

< SERVICE INFORMATION >

- Using a preload gauge (SST), check if reading is within the value specified below. If the value is outside the standard, replace outer sockets.

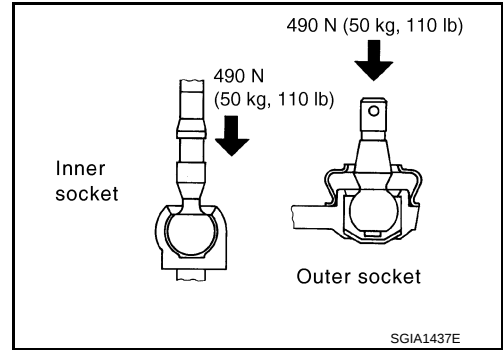
Rotating torque	0.3 - 2.9 N·m (0.03 - 0.29 kg·m, 3 - 25 in·lb)
-----------------	--



Axial End Play

- Apply load of 490 N (50 kg, 110 lb) to ball stud axially. Use a dial-gauge to measure the amount of the movement that the stud makes. Check if the reading is within the specified below. If the value is outside the standard, replace outer and inner sockets.

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



ASSEMBLY

- Apply recommended fluid to O-ring A. Put an O-ring A into rack Teflon ring.

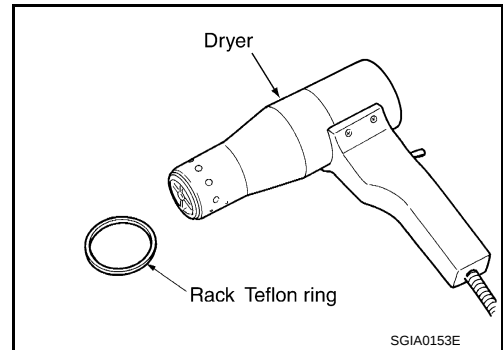
NOTE:

Do not reuse O-ring A.

- Heat rack Teflon ring to approximately 40°C (104°F) with a dryer. Assemble it to mounting groove of rack.

NOTE:

Do not reuse rack Teflon ring.



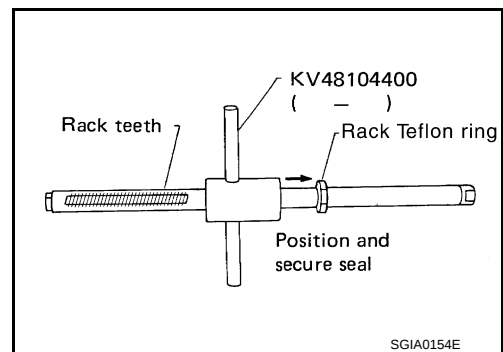
- To fit rack Teflon ring on rack, use rack Teflon ring installation tool (SST) from tooth side. Compress rim of ring with the tool.
- Apply Multi-purpose grease or equivalent to rack oil seal. Insert rack oil seal, then insert rack to gear housing assembly.

NOTE:

Do not reuse rack oil seal.

CAUTION:

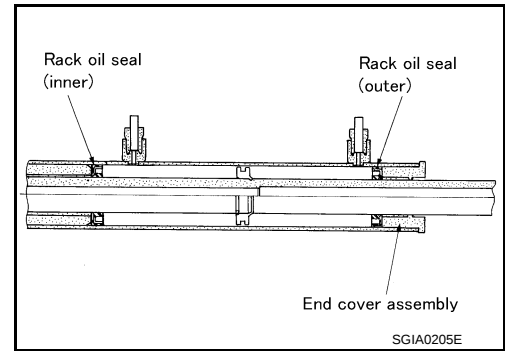
- When inserting rack, do not damage retainer sliding part. If it is damaged, replace gear housing assembly.
- When unstring rack, do not damage cylinder inner wall. If it is damaged, It may cause oil leaks. Replace gear housing assembly.



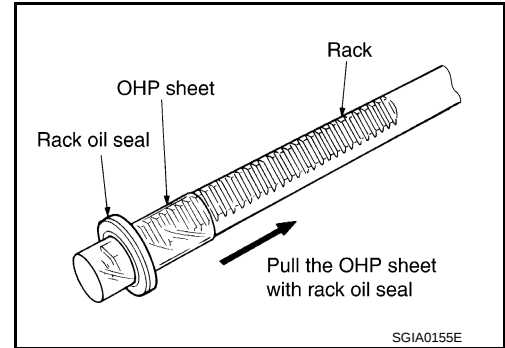
POWER STEERING GEAR

< SERVICE INFORMATION >

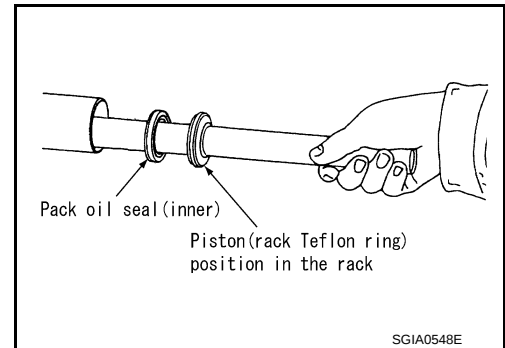
- Attach rack oil seal. Both inner lip and outer lip should face each other.



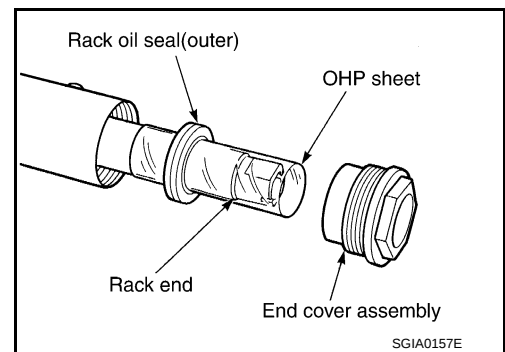
- a. To avoid damaging inner rack oil seal, wrap an OHP sheet [approximately. 70 mm (2.76 in) × 100 mm (3.94 in)] around rack tooth. Place oil seal on sheet. Then, pull oil seal along with OHP sheet until they pass the toothed section of rack, then remove it.



- b. Insert rack oil seal (inner) to piston (rack Teflon ring) position and push retainer to adjust screw side with fingers lightly, and then make rack move in gear housing assembly, install rack oil seal (inner) to fit in with gear housing assembly.



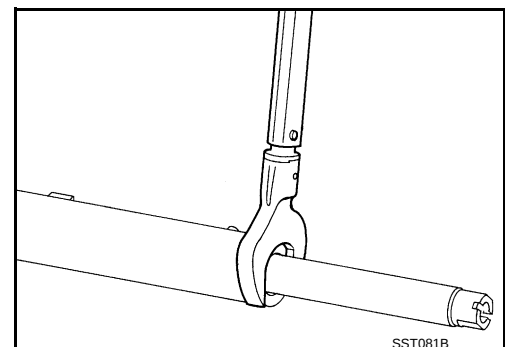
- c. When installing outer rack oil seal, cover the end of rack with an OHP sheet [70 mm (2.76 in) × 100 mm (3.94 in)]. It will avoid damaging rack oil seal. Then place oil seal on sheet. Pull rack oil seal along with OHP sheet until they pass rack end. Then remove OHP sheet.
- d. Install end cover assembly to rack, move it to gear housing assembly.



5. Using a 42 mm (1.65 in) open head (suitable tool), tighten end cover assembly at the specified torque.

CAUTION:

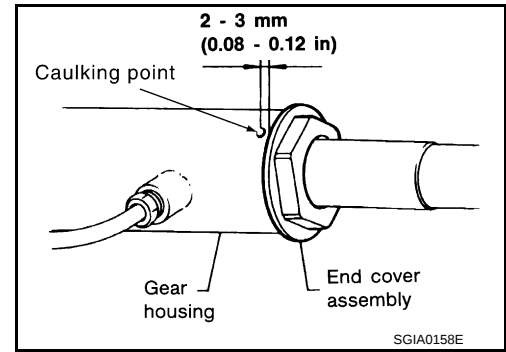
Do not damage rack surface. If it is damaged, it may cause oil leaks. Replace rack assembly.



POWER STEERING GEAR

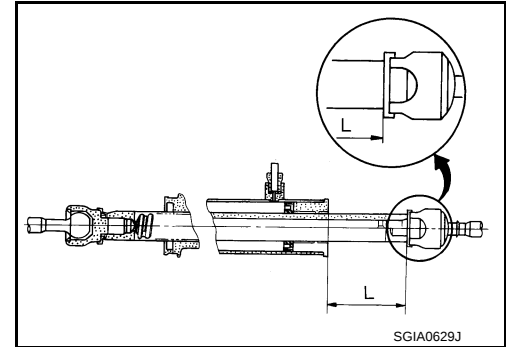
< SERVICE INFORMATION >

6. After tightening end cover assembly, caulk cylinder at one point as shown in the figure using a punch. This will prevent end cover from getting loose.
7. Apply recommended fluid to O-ring B. Install O-ring B to gear housing assembly.
NOTE:
Do not reuse O-ring B.
8. Install gear-sub assembly to gear housing assembly.

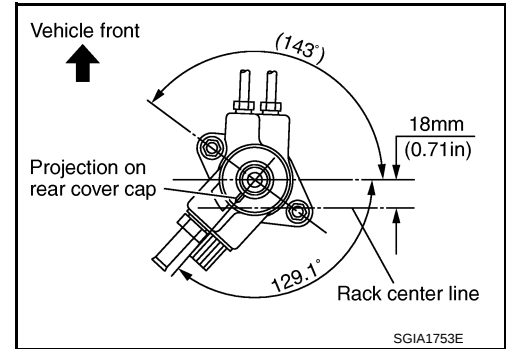


9. Decide neutral position of rack.

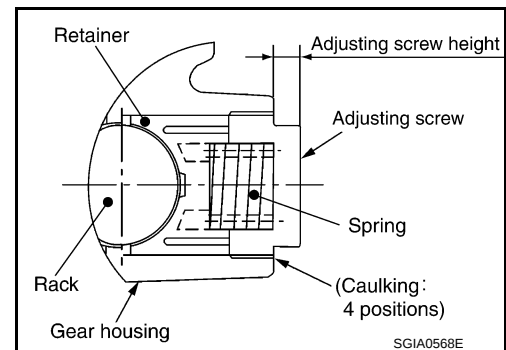
Rack stroke "L" : 64.5 mm (2.539 in)



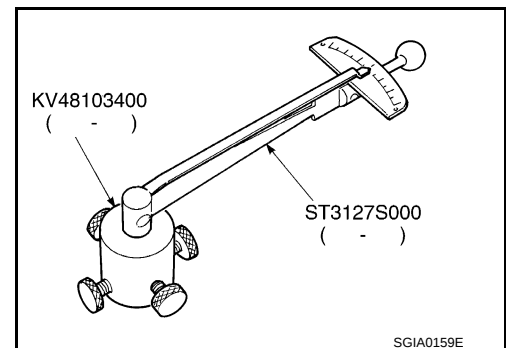
10. Install the projection part (Tip) of rear cover cap to gear-sub assembly as shown in the figure.



11. Apply thread locking adhesive (Three Bond 1111B or equivalent) to the thread of adjusting screw to the adjusting screw height from gear housing assembly. The adjusting screw height is the same as it was measured in the overhaul in advance.
12. Rotate pinion ten times whole range of rack so that parts get to fit with each other.



13. Measure pinion rotating torque within from -180° to $+180^\circ$ make preload gauge (SST) and torque adapter (SST) in rack neutral position, then hold preload gauge (SST) at maximum torque.
14. After loosening adjusting screw once, tighten it again with torque of 4.9 - 5.9 N·m (0.50 - 0.60 kg-m, 44 - 52 in-lb). After that loosen it within from 20° to 40° .



POWER STEERING GEAR

< SERVICE INFORMATION >

15. Measure pinion rotating torque with torque adapter (SST) and preload gauge (SST), then confirm whether its reading is within the specified value. If the reading is not within the specified value, readjust screw angle with adjusting screw. Change gear assembly to new one, if the reading is still not within the specified value or the rotating torque of adjusting screw is less than 5 N·m (0.51kg-m, 44 in-lb)

Pinion rotation torque:

Around neutral position (within $\pm 100^\circ$)

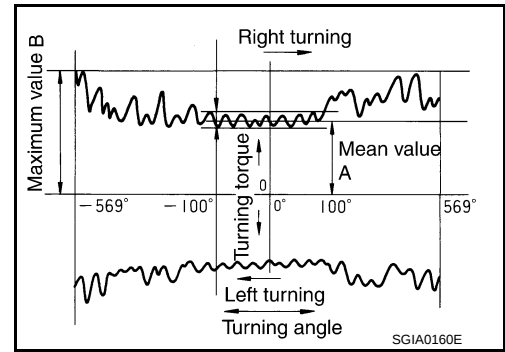
Average "A":

1.71 - 2.34 N·m (0.18 - 0.23 kg-m, 16 - 20 in-lb)

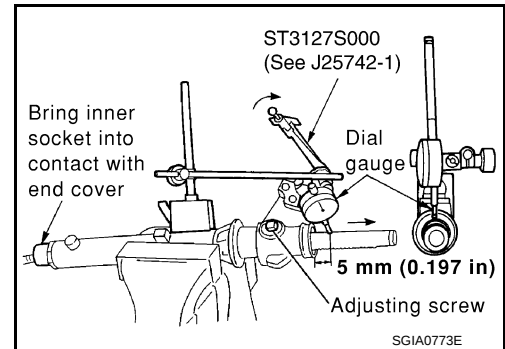
Other than above (more than $\pm 100^\circ$)

Maximum variation "B":

2.3 N·m (0.23 kg-m, 20 in-lb)



16. Turn pinion fully to the end of the left with tie-rods to rack.
17. Set dial gauge to rack as shown in the figure. Measure vertical movement of rack when pinion is turned counterclockwise with torque of 19.6 N·m (2.0 kg-m, 14 ft-lb). Check reading is within the specified value. If reading is outside of the specification, readjust screw angle with adjusting screw. If reading is still outside of specification, or if the rotating torque of adjusting screw is less than 5 N·m (0.51 kg-m, 44 in-lb), replace steering gear assembly.



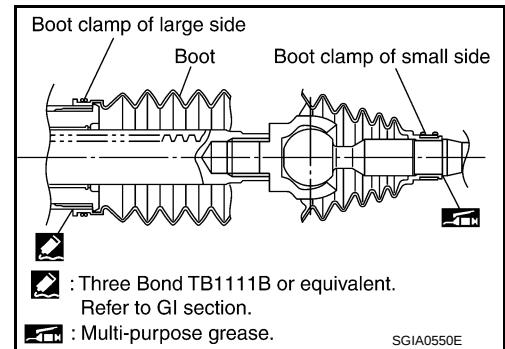
Specified value

Amount of vertical movement with rack	Less than 0.265 mm (0.0104 in)	
Measuring point	Axial direction of rack	5 mm (0.20 in) away from end of gear housing
	Radius direction of rack	Shaft direction of adjusting screw

18. Install large-diameter side of boot to gear housing assembly.
19. Install small-diameter side of boot to the mounting groove of inner socket boot.
20. Install boot clamp to the small-diameter side of boot.
21. Install boot clamp to the large-diameter side of boot.

NOTE:

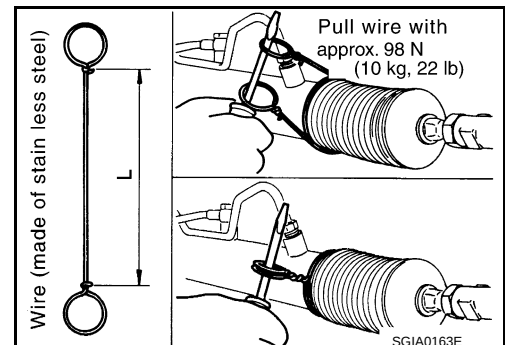
Do not reuse boot clamp.



- a. Tighten large-diameter side of RH/LH boot with boot clamp (stainless wire).

Wire length "L" : 370 mm (14.57 in)

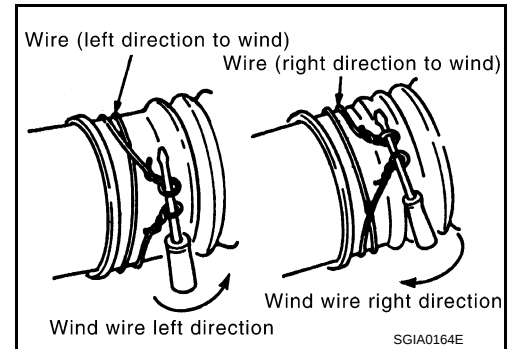
- b. After wrapping clamp around boot groove for two turns, insert screwdriver in loop on both ends of wire. Twist 4 to 4.5 turns while pulling with a force of approx. 98 N (10 kg, 22 lb).



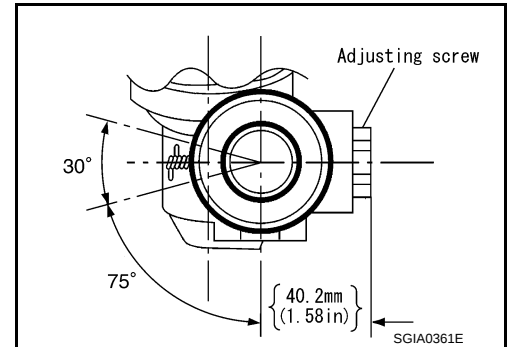
POWER STEERING GEAR

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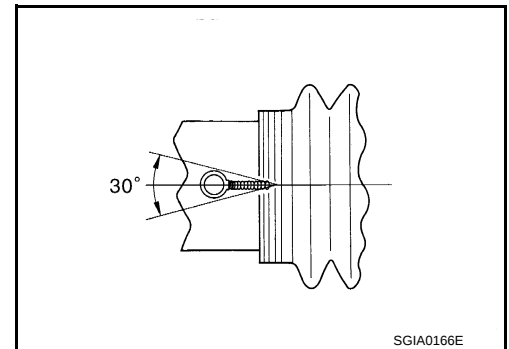
- c. Twist boot clamp as shown in the figure, pay attention to relationship between winding and twisting directions.



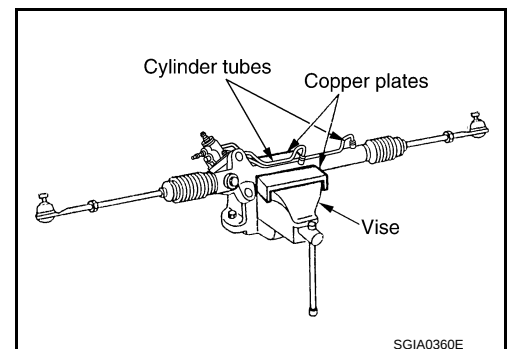
- d. Confirm the twisted point with clamp faces in the opposite direction to adjusting screw within 30° as shown in the figure.



- e. After twisting wire 4 to 4.5 turns, bend cut end of wire. Cut end of wire should not touch boot. Be sure wire end is at least 5 mm (0.20 in) away from clearance for tube.



22. Install cylinder tubes to gear housing assembly.

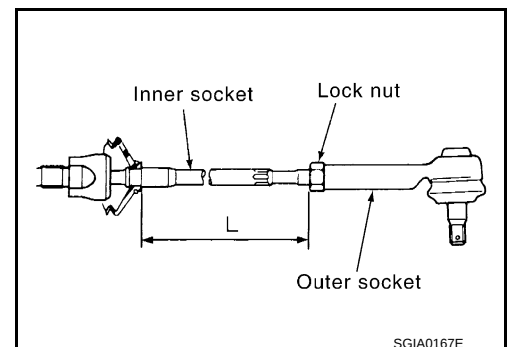


23. Tighten lightly inner socket in specified length "L", then tighten lock nut at specified torque. Refer to "COMPONENTS". Reconfirm if inner socket length is within limit of specified length "L".

Inner socket length "L" : 106.3 mm (4.19 in)

CAUTION:

Perform toe-in adjustment after this procedure. Length achieved after toe-in adjustment is not necessarily value given here.



POWER STEERING OIL PUMP

< SERVICE INFORMATION >

POWER STEERING OIL PUMP

On-Vehicle Inspection and Service

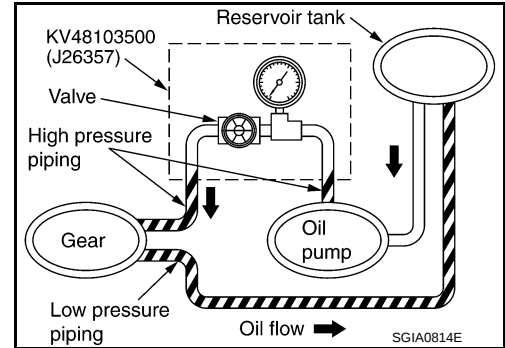
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CHECKING RELIEF OIL PRESSURE

CAUTION:

Before starting work, confirm belt tension is proper.

1. Connect oil pressure gauge (SST) and oil pressure gauge adapter (SST) between oil pump discharge connector and high pressure hose and then bleed air from the hydraulic circuit.

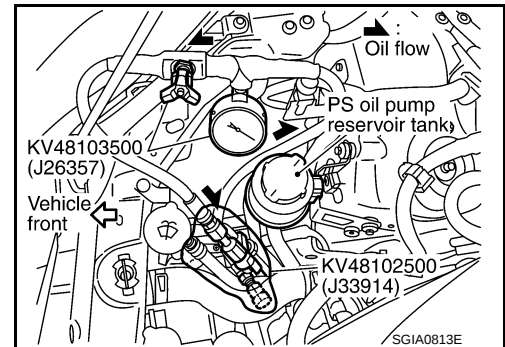


2. Start engine. Allow engine to run until tank temperature reaches 50 to 80°C (122 to 176°F).

CAUTION:

- Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, fluid pressure in power steering pump increases to maximum. This will raise fluid temperature excessively.
- Be careful not to contact hose with belt when engine is started.

3. With engine at idle, close shut-off valve and read the relief oil pressure.



Relief oil pressure:

9,600 - 10,200 kPa (97.9 - 104 kg/cm², 1,392 - 1,479 psi)

CAUTION:

Do not close shut-off valve of pressure gauge for more than 10 seconds.

4. After measurement, open shut-off valve slowly.
 - If relief oil pressure is outside the specification, disassemble and repair oil pump. Refer to [PS-29. "Disassembly and Assembly"](#).
5. After inspection, disconnect oil pressure gauge (SST) and oil pressure gauge adapter (SST) from hydraulic circuit, connect oil pump discharge connector and high pressure hose. Add fluid and bleed air from hydraulic circuit thoroughly. Refer to [PS-6. "Air Bleeding Hydraulic System"](#).

Removal and Installation

INFOID:000000001646726

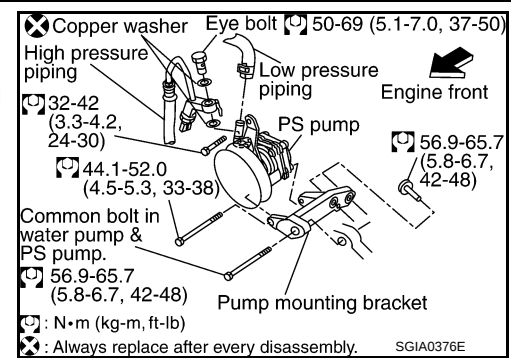
REMOVAL

1. Remove engine cover.
2. Remove air cleaner box.
3. Drain water from radiator upper tank, then remove radiator upper hose.
4. Remove radiator fan shroud. Refer to [CO-12. "Removal and Installation"](#).

POWER STEERING OIL PUMP

< SERVICE INFORMATION >

5. Loosen idler pulley, then remove belt.
6. Drain power steering fluid from reservoir tank.
7. Remove piping of high pressure and low pressure (drain fluid from their pipings)
8. Remove bolt common to water pump and power steering pump.
9. Remove bolt then remove power steering pump.



INSTALLATION

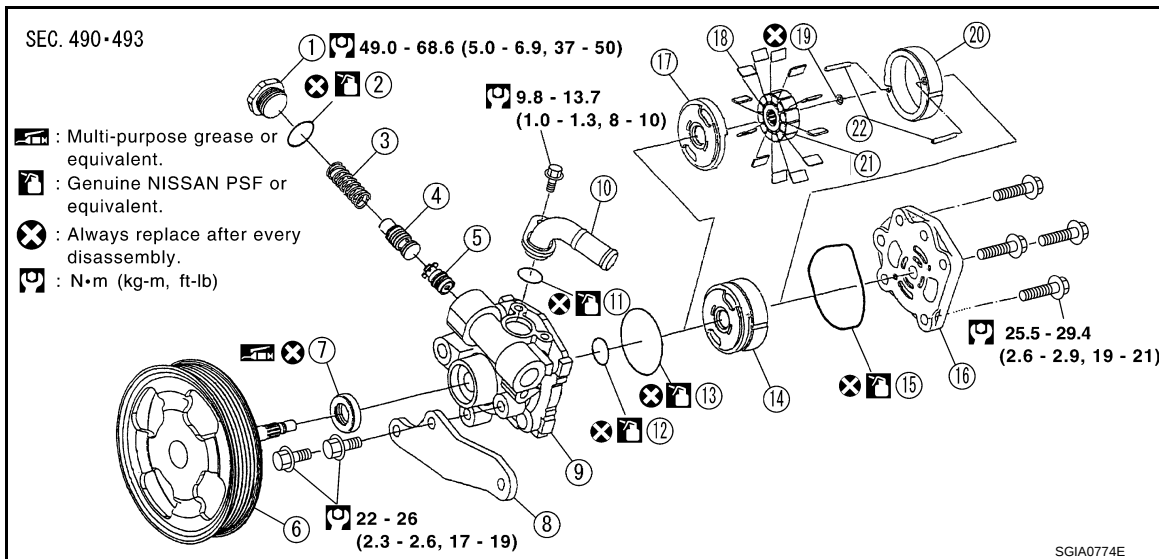
Refer to [PS-33](#) for tightening torque. Install in the reverse order of removal.

- After installation, adjust belt tension. Refer to [EM-13](#).
- After installation, bleed air. Refer to [PS-6, "Air Bleeding Hydraulic System"](#).

Disassembly and Assembly

INFOID:000000001646727

COMPONENTS



- | | | |
|--------------------------------|--------------------------------|------------------------------|
| 1. Plug | 2. O-ring D | 3. Flow control valve spring |
| 4. Relief valve assembly | 5. Flow control valve assembly | 6. Shaft kit |
| 7. Oil seal | 8. Bracket | 9. Body assembly |
| 10. Suction connector assembly | 11. O-ring E | 12. O-ring C |
| 13. O-ring B | 14. Cartridge assembly | 15. O-ring A |
| 16. Cover assembly | 17. Side plate | 18. Vane |
| 19. Rotor snap ring | 20. Cam ring | 21. Rotor |
| 22. Dowel pin | | |

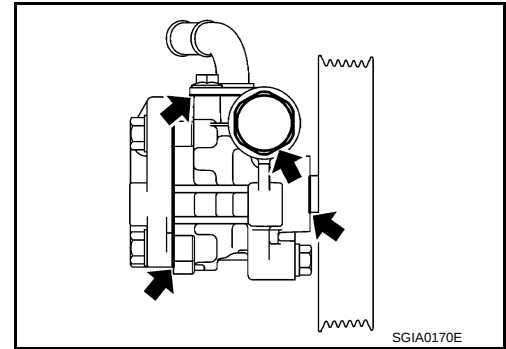
INSPECTION BEFORE DISASSEMBLY

POWER STEERING OIL PUMP

< SERVICE INFORMATION >

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

- Oil leakage from oil pump
- Deformed or damaged pulley
- Poor performance



DISASSEMBLY

NOTE:

Fix oil pump in vise as the occasion demands.

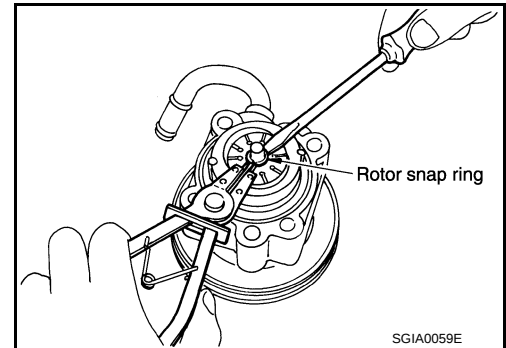
CAUTION:

When retaining drive shaft in a vise, always use copper or aluminum plates between vise and shaft.

1. Unscrew two front bracket bolts and remove bracket from body assembly.
2. Unscrew four cover assembly bolts and remove cover assembly from body assembly.
3. Remove O-ring A from body assembly.
4. Remove rotor snap ring with snap ring pliers, and remove shaft kit from body assembly.

CAUTION:

When removing rotor snap ring, be careful not to damage pulley shaft of shaft kit.

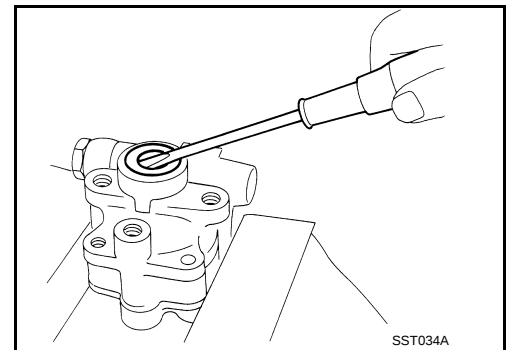


5. Using a screwdriver, remove oil seal for body assembly.
6. Remove cam ring, rotor, vane, side plate, O-ring B and O-ring C from body assembly.
7. Remove plug, then remove O-ring D, flow control valve spring, relief valve assembly and flow control valve assembly from body assembly.

CAUTION:

Be careful not to drop and deform relief valve assembly and flow control valve assembly.

8. Remove fixing bolt of suction connector assembly, then remove suction connector assembly and O-ring E from body assembly.



INSPECTION AFTER DISASSEMBLY

Body Assembly and Cover Assembly Inspection

- Check body assembly and cover assembly for damage. If any damage is found, replace with new part for cover assembly, and replace with new power steering pump assembly for body assembly.

Cartridge Assembly Inspection

- Check cam ring, side plate, rotor and vane for damage. If any damage is found, replace cartridge assembly with new one.

Relief Valve Assembly Inspection

- Check relief valve assembly for damage. If any damage is found, replace it with new one.

Flow Control Valve Assembly Inspection

- Check flow control valve assembly for damage. If any damage is found, replace it with new one.

ASSEMBLY

POWER STEERING OIL PUMP

< SERVICE INFORMATION >

NOTE:

Fix oil pump in vise as occasion demands.

CAUTION:

When retaining drive shaft in a vise, always use copper or aluminum plates between vise and shaft.

1. Apply a coat of Multi-purpose grease or equivalent to oil seal lip and to the circumference of oil seal. Using proper tool such as hand press machine, install it to the body assembly.

NOTE:

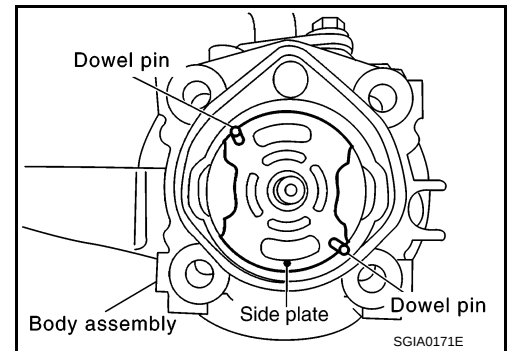
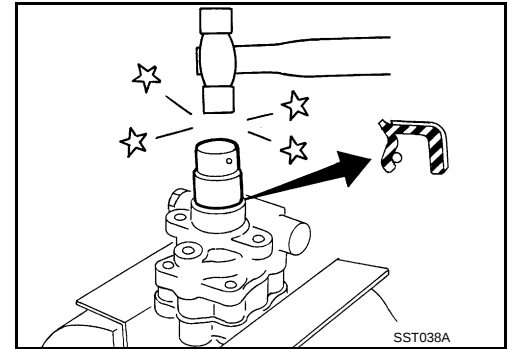
Do not reuse oil seal.

2. Install shaft kit to body assembly.
3. Apply recommended fluid to O-ring B and O-ring C, then install O-ring B and O-ring C to body assembly.

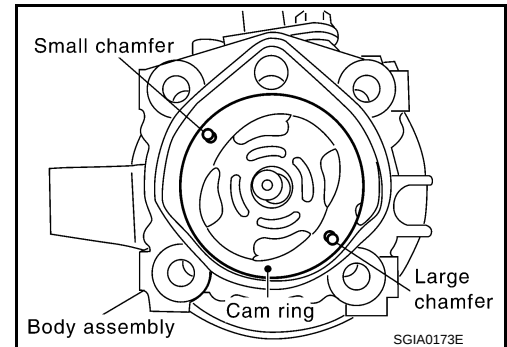
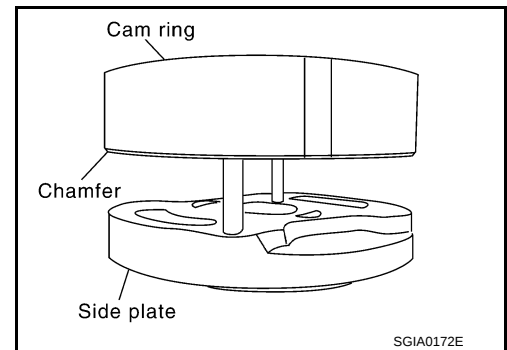
NOTE:

Do not reuse O-ring B and O-ring C.

4. Set dowel pin at the illustration position (The position is the same regardless of right or left direction), and install side plate to body assembly.



5. Install cam ring on side plate as follows;
 - Turn chamfered edge side of cam ring to side plate as shown in the figure.
 - Position large chamfered side of cam ring as shown in the figure.



POWER STEERING OIL PUMP

< SERVICE INFORMATION >

6. Install rotor to shaft of shaft kit (rotor direction is the same regardless of the front and back).
7. Install vane to rotor (vane direction is the same regardless of inside and outside).
8. Install rotor snap ring to shaft of shaft kit.

NOTE:

- Do not reuse rotor snap ring.

CAUTION:

Be careful not to damage rotor and pulley shaft.

9. Apply recommended fluid to O-ring A, then install O-ring A to body assembly.

NOTE:

Do not reuse O-ring A.

10. Attach cover assembly to body assembly and tighten fixing bolts diagonally at the specified torque.
11. Install flow control valve assembly, relief valve assembly and flow control valve spring to body assembly.
12. Apply recommended fluid to O-ring D and install to plug, then tighten plug at the specified torque.

NOTE:

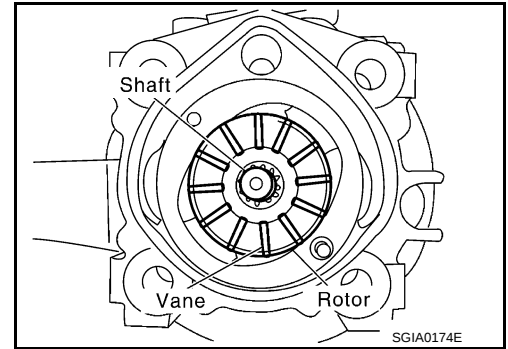
Do not reuse O-ring D.

13. Apply recommended fluid to O-ring E and install to suction connector assembly, then install suction connector to body assembly.

NOTE:

Do not reuse O-ring E.

14. Install bracket to body assembly, and tighten mounting bolts at the specified torque.



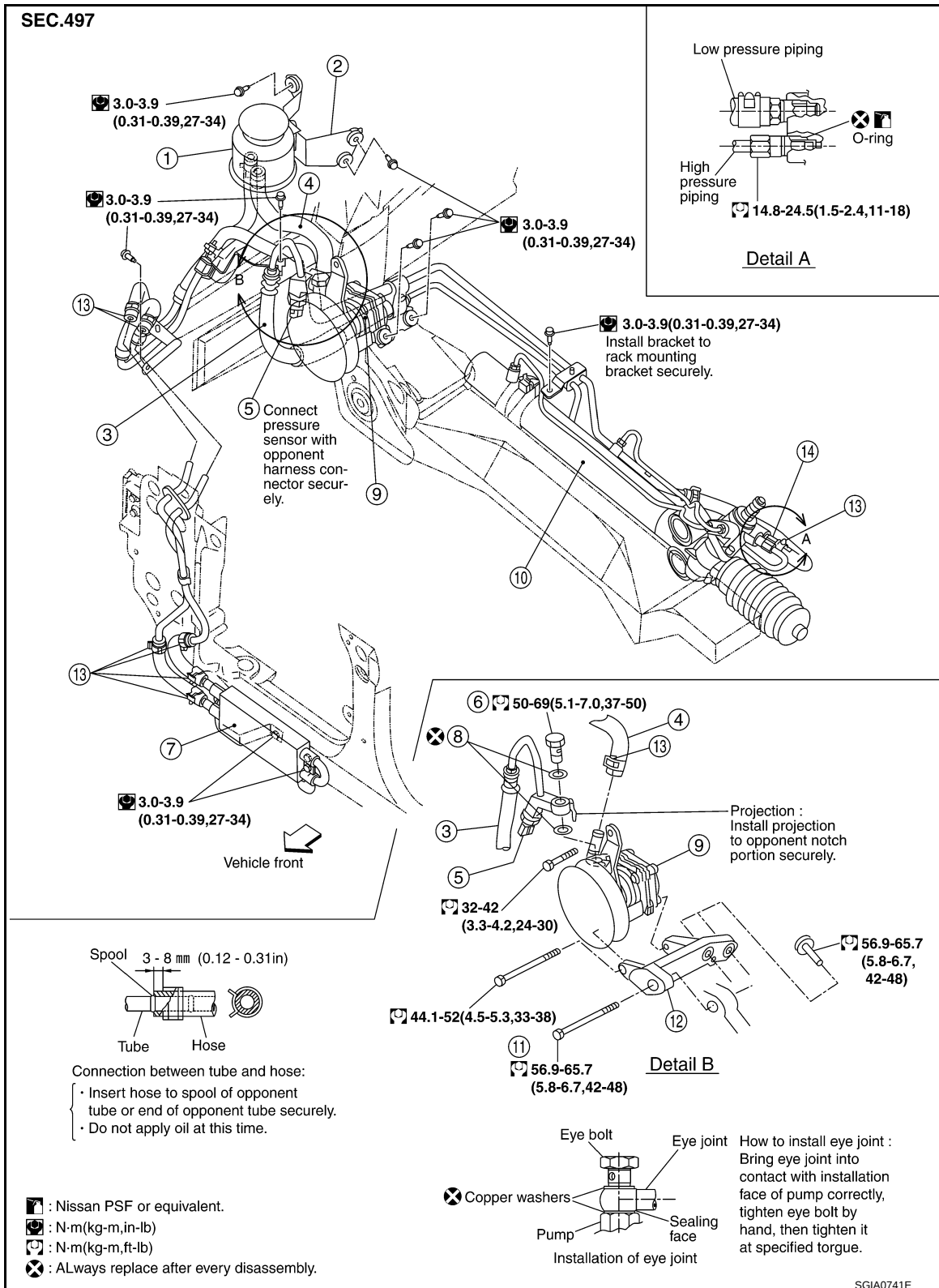
HYDRAULIC LINE

< SERVICE INFORMATION >

HYDRAULIC LINE

Removal and Installation

INFOID:000000001646728



- | | | |
|-------------------|---------------------------|----------------------------|
| 1. Reservoir tank | 2. Reservoir tank bracket | 3. Hose & tube assembly |
| 4. Suction hose | 5. Oil pressure sensor | 6. Eye bolt |
| 7. Oil cooler | 8. Copper washer | 9. Power steering oil pump |

HYDRAULIC LINE

< SERVICE INFORMATION >

- | | | |
|----------------------------|-----------------|----------------------|
| 10. Steering gear assembly | 11. Common bolt | 12. Oil pump bracket |
| 13. Clip | | |

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE INFORMATION >

SERVICE DATA AND SPECIFICATIONS (SDS)

Steering Wheel

INFOID:0000000001646729

End play of the axle direction for steering wheel	0 mm (0 in)
Steering wheel play on the outer circumference	0 - 35 mm (0 - 1.38 in) or less

Steering Angle

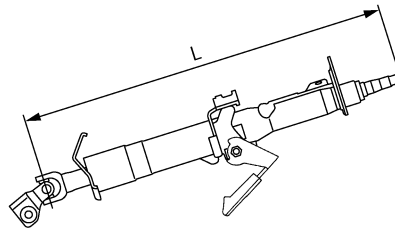
INFOID:0000000001646730

Inner wheel Degree minute (Decimal degree)	Minimum	35° 55' (35.9°)
	Nominal	38° 55' (38.9°)
	Maximum	39° 55' (39.9°)
Outer wheel Degree minute (Decimal degree)	Nominal	30° 40' (30.7°)

Steering Column

INFOID:0000000001646731

Steering column length "L"	548 mm (21.57 in)
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SGIA0306J

Steering Outer Socket and Inner Socket

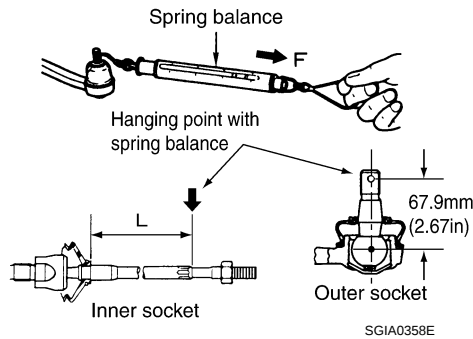
INFOID:0000000001646732

Steering gear type	PR26AF	
Outer socket ball joint outer socket	Swinging torque	0.3 - 2.9 N·m (0.03 - 0.29 kg-m, 3 - 25 in-lb)
	Measurement on spring balance • Measuring point: stud cotter pin hole	4.42 - 42.7 N (0.5 - 4.4 kg, 1 - 10 lb)
	Rotating torque	0.3 - 2.9 N·m (0.03 - 0.29 kg-m, 3 - 25 in-lb)
	Axial end play	0.5 mm (0.020 in) or less

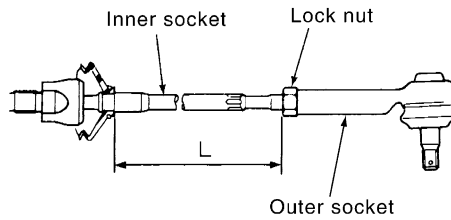
SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE INFORMATION >

Steering gear type	PR26AF	
Inner socket ball joint inner socket	Swinging torque	1.0 - 7.8 N·m (0.11 - 0.79 kg-m, 9 - 69 in-lb)
	Measurement on spring balance • Measuring point: L mark see below, L=48.5 mm (1.91 in).	10 - 78 N (1 - 8 kg, 2 - 18 lb)
	Axial end play	0.2 mm (0.008 in) or less



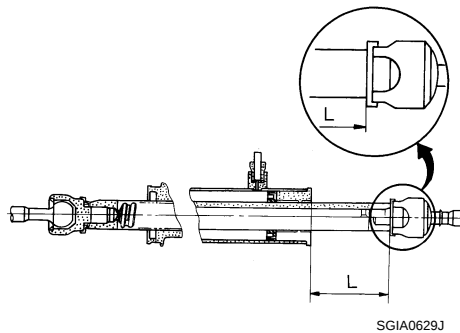
Inner socket length "L"	106.3 mm (4.19 in)
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Steering Gear

INFOID:0000000001646733

Steering gear model	PR26AF
Rack neutral position, dimension "L" (rack stroke)	64.5 mm (2.539 in)



Oil Pump

INFOID:0000000001646734

Oil pump relief hydraulic pressure	9,600 - 10,200 kPa (97.9 - 104 kg/cm ² , 1,392 - 1,479 psi)
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SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE INFORMATION >

Steering Fluid

INFOID:0000000001646735

Fluid capacity	Approx. 1.0 ℓ (1-1/8 US qt, 7/8 Imp qt)
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B
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PS
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