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SECTION PS

POWER STEERING SYSTEM

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PRECAUTIONS

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SERVICE INFORMATION

PRECAUTIONS

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

INFOID:000000005213972

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 Necessary for Steering Wheel Rotation After Battery Disconnect

INFOID:000000004158168

NOTE:

- This Procedure is applied only to models with Intelligent Key system and NVIS/IVIS (NISSAN/INFINITI VEHICLE IMMOBILIZER SYSTEM - NATS).
- Remove and install all control units after disconnecting both battery cables with the ignition knob in the "LOCK" position.
- Always use CONSULT-III to perform self-diagnosis as a part of each function inspection after finishing work. If DTC is detected, perform trouble diagnosis according to self-diagnostic results.

For models equipped with the Intelligent Key system and NVIS/IVIS, an electrically controlled steering lock mechanism is adopted on the key cylinder.

For this reason, if the battery is disconnected or if the battery is discharged, the steering wheel will lock and steering wheel rotation will become impossible.

If steering wheel rotation is required when battery power is interrupted, follow the procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.

NOTE:

Supply power using jumper cables if battery is discharged.

2. Use the Intelligent Key or mechanical key to turn the ignition switch to the "ACC" position. At this time, the steering lock will be released.
3. Disconnect both battery cables. The steering lock will remain released and the steering wheel can be rotated.
4. Perform the necessary repair operation.

PRECAUTIONS

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5. When the repair work is completed, return the ignition switch to the "LOCK" position before connecting the battery cables. (At this time, the steering lock mechanism will engage.)
6. Perform a self-diagnosis check of all control units using CONSULT-III.

Precaution for Steering System

INFOID:000000004158169

- 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.

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PREPARATION

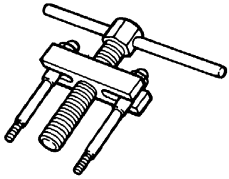
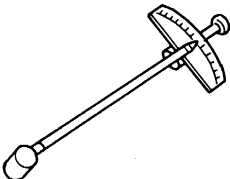
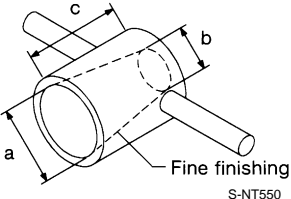
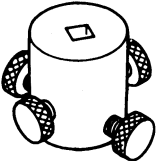
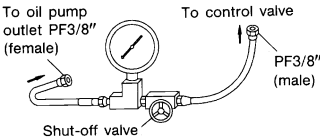
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PREPARATION

Special Service Tools

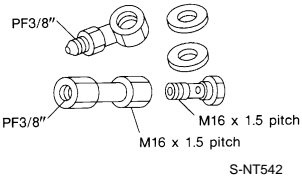
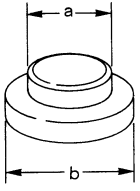
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The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number (Kent-Moore No.) Tool name | Description |
|---|--|
| ST27180001 (J-25726-A) Steering wheel puller |  <p style="text-align: right; margin-right: 20px;">ZZA0819D</p> |
| ST3127S000 (J-25765-A) Preload gauge |  <p style="text-align: right; margin-right: 20px;">ZZA0806D</p> |
| KV48104400 (-) Teflon ring correcting tool a: 50 mm (1.97 in) dia. b: 36 mm (1.42 in) dia. c: 100 mm (3.94 in) |  <p style="text-align: right; margin-right: 20px;">S-NT550</p> |
| KV48103400 (-) Preload adapter |  <p style="text-align: right; margin-right: 20px;">ZZA0824D</p> |
| KV48103500 (J-26357) Oil pressure gauge |  <p style="text-align: right; margin-right: 20px;">S-NT547</p> |

PREPARATION

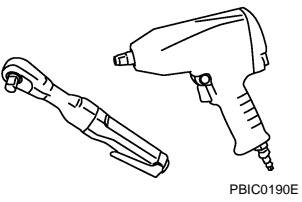
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| Tool number (Kent-Moore No.) Tool name | Description | |
|--|---|-------------|
| KV48102500 (J-33914) Oil pressure gauge adapter |  | A B C |
| ST35300000 (-) Drift a: 45.1 mm (1.776 in) dia. b: 59.0 mm (2.323 in) dia. |  | D E F |

Commercial Service Tool

INFOID:000000004158171

PS

| Tool number Tool name | Description | |
|--------------------------|--|---|
| Power tool |  | H I J K L M N O P |

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SERVICE INFORMATION >

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

INFOID:000000004158172

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

| Symptom | Steering | Possible cause and SUSPECTED PARTS | | | | | | | | | | Reference page | | | | | | | | | | | | | |
|---------|-----------|------------------------------------|-------------------------|---|---|----------------------------------|------------------------|---------------------|----------------------------------|----------------------|-------------------------|----------------|---|-------------------------------|---------------------------------------|---|----------------------------|-----------------|--------------|---------------------|-------|------------|-------------|--------|-----------------------------------|
| | | Fluid level | Air in hydraulic system | Outer socket ball joint swinging torque | Outer socket ball joint rotating 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 | |
| | Noise | x | x | x | x | x | x | x | x | x | | | | | | | | | | | | | | | PS-7 |
| | Shake | | | | | | | | | | x | | | | | | | | | | | | | | PS-7 |
| | Vibration | | | | | | | | | | | x | x | x | | | | | | | | | | | PS-19 |
| | Shimmy | | | | | | | | | | | x | x | | x | | | | | | | | | | PS-19 |
| | Judder | | | | | | | | | | | | | | x | | | | | | | | | | PS-19 |
| | | | | | | | | | | | | | | | | | | | | | | | | | PS-7 |
| | | | | | | | | | | | | | | | | | | | | | | | | | PS-7 |
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| | | | | | | | | | | | | | | | | | | | | | | | | | EM-15,EM-169 |
| | | | | | | | | | | | | | | | | | | | | | | | | | PS-9 |
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| | | | | | | | | | | | | | | | | | | | | | | | | | PS-12 |
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| | | | | | | | | | | | | | | | | | | | | | | | | | PS-19 |
| | | | | | | | | | | | | | | | | | | | | | | | | | 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 FAX section |
| | | | | | | | | | | | | | | | | | | | | | | | | | NVH in BR section |

x: Applicable

POWER STEERING FLUID

< SERVICE INFORMATION >

POWER STEERING FLUID

Checking Fluid Level

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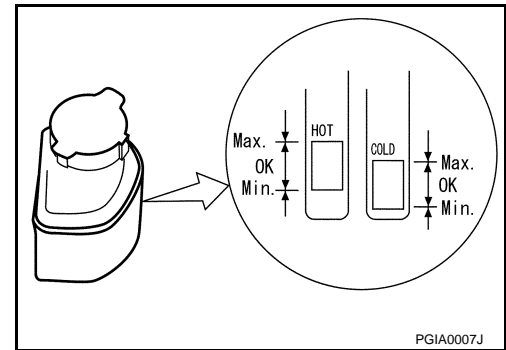
- Check fluid level with engine stopped.
- Make sure that fluid level is between MIN and MAX.
- Fluid levels at HOT and COLD are different. Do not confuse them.

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

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

Recommended fluid : Refer to [MA-9, "Fluids and Lubricants"](#).

Fluid capacity : Refer to [PS-42, "Steering Fluid"](#).



CAUTION:

- The fluid level should not exceed the MAX line. Excessive fluid will cause fluid leakage from the cap.
- Never reuse drained power steering fluid.

Checking Fluid Leakage

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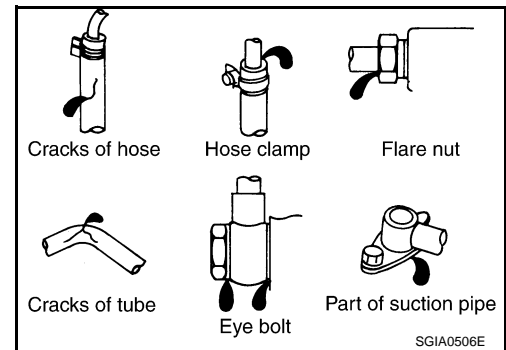
Check hydraulic connections for fluid leakage, cracks, damage, looseness, or wear.

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 overtighten 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-28](#).
6. Check steering gear boots for accumulation of fluid indicating from steering gear.



Air Bleeding Hydraulic System

INFOID:000000004158175

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 stop to full right stop with engine off.

CAUTION:

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

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.)

POWER STEERING FLUID

< SERVICE INFORMATION >

4. Check fluid for bubbles and white contamination.
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.

STEERING WHEEL

< SERVICE INFORMATION >

STEERING WHEEL

On-Vehicle Inspection and Service

INFOID:000000004158176

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.

Standard

Steering wheel axial end play : Refer to [PS-41, "Steering Wheel"](#).

- Check steering gear assembly mounting bolts and nut for looseness. Refer to [PS-18, "Removal and Installation"](#).

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.

Standard

Steering wheel play : Refer to [PS-41, "Steering Wheel"](#).

- 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-5, "Wheel Alignment Inspection" \(2WD\)](#), [FSU-22, "Wheel Alignment Inspection" \(AWD\)](#).
- 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 adjustments 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 540° from neutral position.

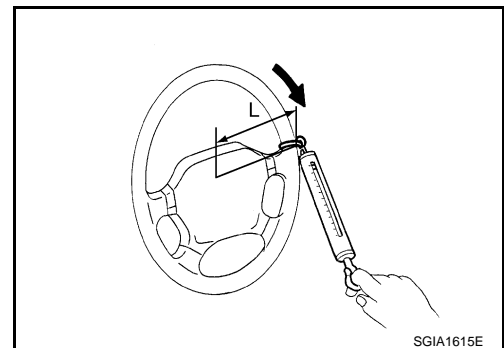
Standard

Steering wheel turning force : Refer to [PS-41, "Steering Wheel"](#).

NOTE:

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

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-12, "Removal and Installation"](#), [FAX-6, "Removal and Installation"](#).



STEERING WHEEL

< SERVICE INFORMATION >

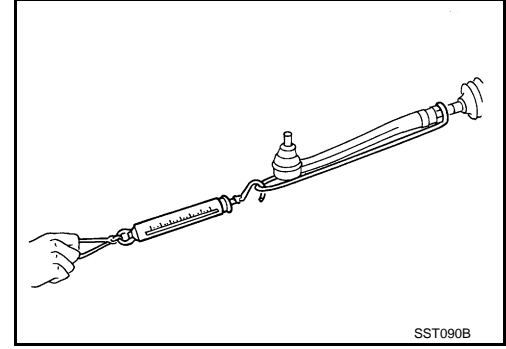
- b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.
- c. While pulling outer socket slowly in ± 11.5 mm (± 0.453 in) range from neutral position, make sure rack sliding force is within specification.

Standard

Rack sliding force

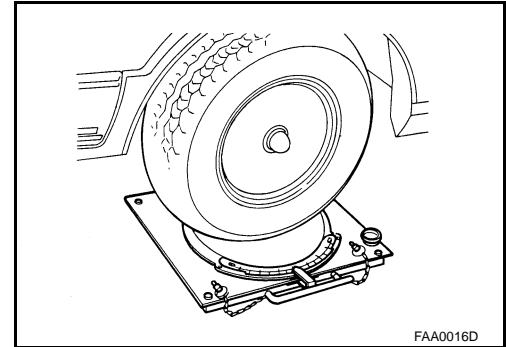
: Refer to [PS-41, "Steering Gear"](#).

- 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.

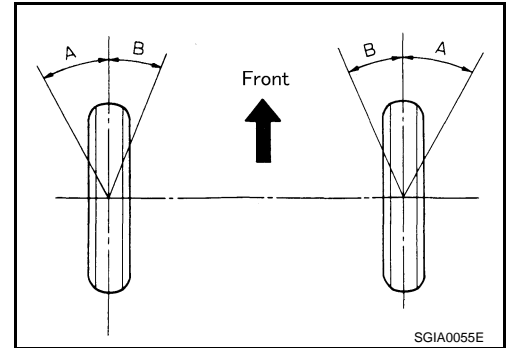
Standard

Inner wheel (Angle: A)

: Refer to [PS-41, "Steering Angle"](#).

Outer wheel (Angle: B)

: Refer to [PS-41, "Steering Angle"](#).



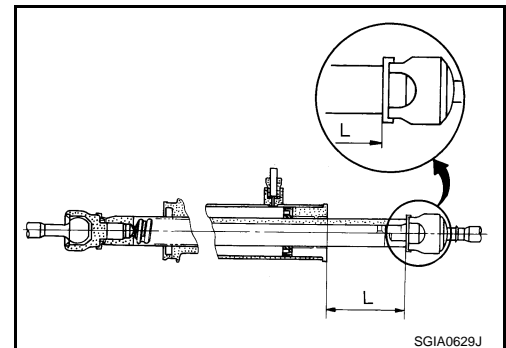
- Measure rack stroke if angles are outside the specified value.

Standard

Rack stroke "L"

: Refer to [PS-41, "Steering Gear"](#).

- 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.



Removal and Installation

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REMOVAL

NOTE:

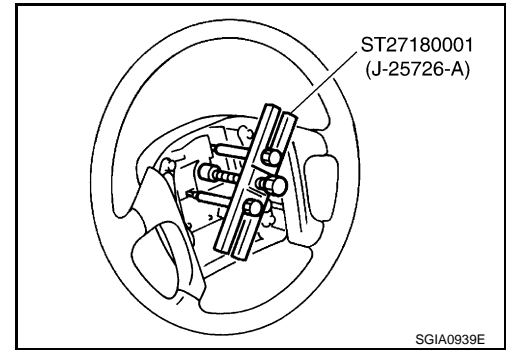
When reconnecting spiral cable, fix cable with a tape so that fixing case and rotating part keep aligned. This will omit neutral position alignment procedure during spiral cable installation.

1. Set vehicle to the straight-ahead position.

STEERING WHEEL

< SERVICE INFORMATION >

2. Remove driver air bag module. Refer to [SRS-34](#).
3. Remove steering wheel lock nut after steering is locked.
4. Remove steering wheel with the steering wheel puller [SST].



INSTALLATION

Installation is the reverse order of removal. For tightening torque, refer to [PS-12. "Removal and Installation"](#).

NOTE:

Check the spiral cable neutral position after replacing or rotating spiral cable. Refer to [SRS-36. "Removal and Installation"](#).

CAUTION:

Do not twist spiral cable freely on excessively after it becomes tight (doing so may cause the cable to be turn off).

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STEERING COLUMN

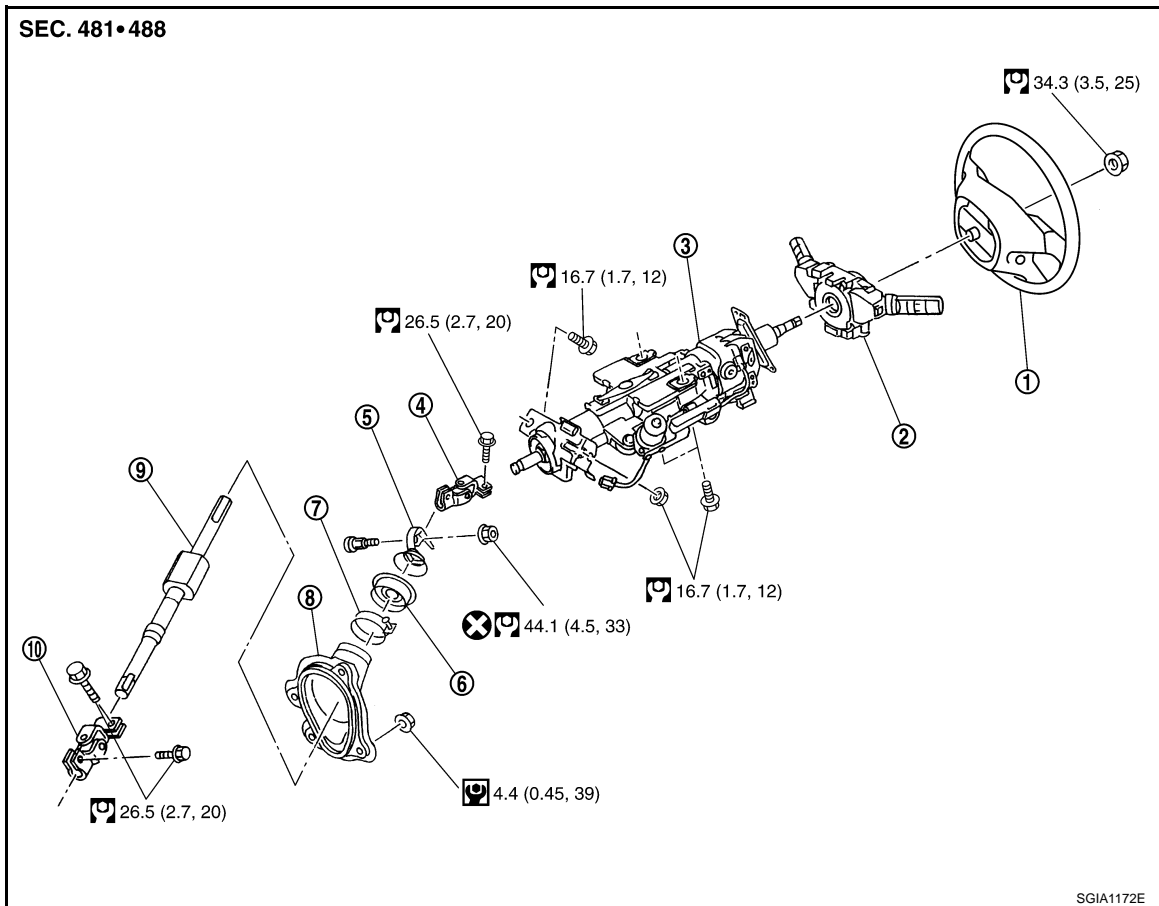
< SERVICE INFORMATION >

STEERING COLUMN

Removal and Installation

INFOID:000000004158178

COMPONENTS



- | | | |
|-------------------|--------------------------------------|-----------------------------|
| 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 | 9. Lower shaft |
| 10. Lower joint | | |

Refer to [GI-9, "Component"](#), 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.

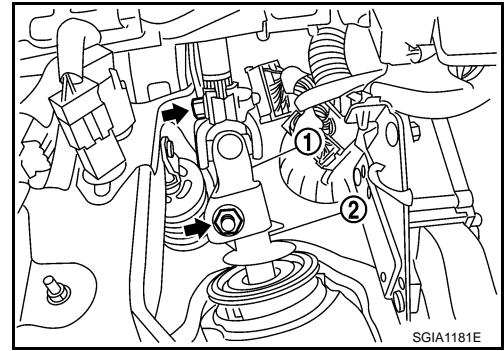
REMOVAL OF UPPER JOINT, COLLAR, HOLE COVER SEAL, HOLE COVER, LOWER SHAFT AND LOWER JOINT

1. Set vehicle to the straight ahead-position.

STEERING COLUMN

< SERVICE INFORMATION >

- Remove fixing bolts and nut of upper joint (1), then remove upper joint (1), collar (2) from lower shaft and steering column assembly.



← : Bolt

- Raise vehicle.

- Remove lower joint fixing bolt (Steering gear side).
- Remove upper side fixing bolt of lower joint, then remove lower joint from lower shaft and steering gear assembly.
- Remove lower shaft from vehicle.
- Lowering vehicle.
- Loosen clamp, and then remove hole cover seal from hole cover.
- Remove mounting nuts of hole cover, and then remove clamp and hole cover from dash panel.

INSPECTION AFTER REMOVAL

- Check each part of upper joint, collar, hole cover seal, hole cover, lower shaft and lower joint for damage or other malfunctions. Replace if there are.
- Check the sliding range of the lower shaft (VK45DE).

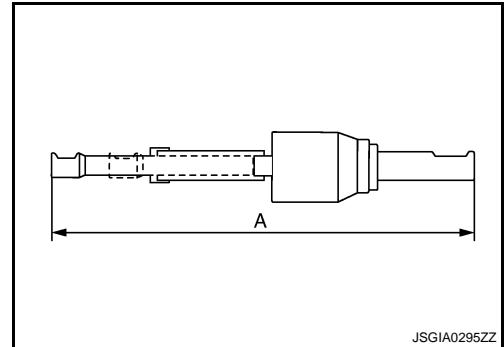
CAUTION:

Check the sliding range (A) (between the extended position and the contracted position) of the lower shaft.

Standard

Sliding range

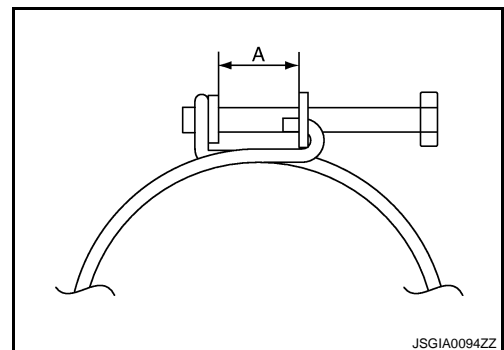
: Refer to [PS-41, "Lower Shaft"](#).



INSTALLATION OF UPPER JOINT, COLLAR, HOLE COVER SEAL, HOLE COVER, LOWER SHAFT AND LOWER JOINT

- Installation is the reverse order of removal. For tightening torque, refer to "COMPONENTS".
- Tighten the clamp to the specified torque and check the clamp length (A).

Clamp length "A" : 14.0 – 18.0 mm (0.551 – 0.709 in)



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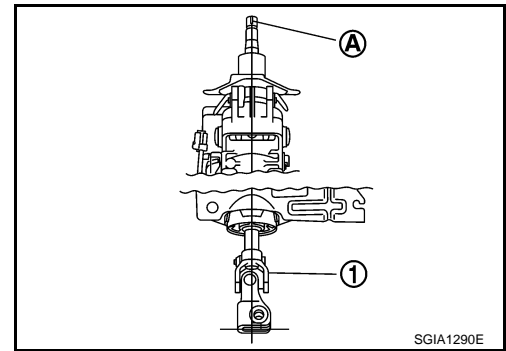
STEERING COLUMN

< SERVICE INFORMATION >

- When installing upper joint, the angle which upper joint yoke (1) forms with shaft center groove (A) should be at 90°.
- When installing lower joint to steering gear assembly, follow the procedure listed below.
- Set rack of steering gear in the neutral position.

NOTE:

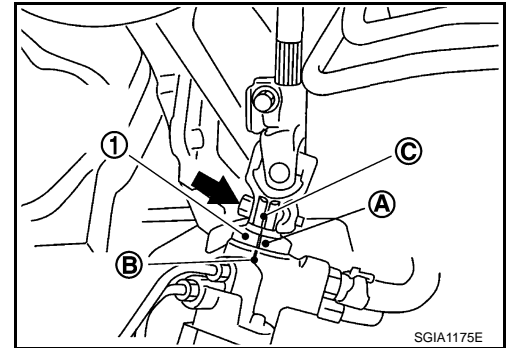
To get the neutral position of rack, turn gear-sub assembly and measure the distance of inner socket, and then measure the intermediate position of the distance.



- Align rear cover cap projection (A) with the marking position (B) of gear housing assembly.

← : Bolt

- Install slit part of lower joint (C) aligning with the projection (A) of rear cover cap (1). Make sure that the slit part of lower joint (C) is aligned with projection (A) of rear cover cap (1) and the marking position (B) of gear housing assembly.
- Adjust neutral position of steering angle sensor. Refer to [BRC-8, "Adjustment of Steering Angle Sensor Neutral Position"](#).
-

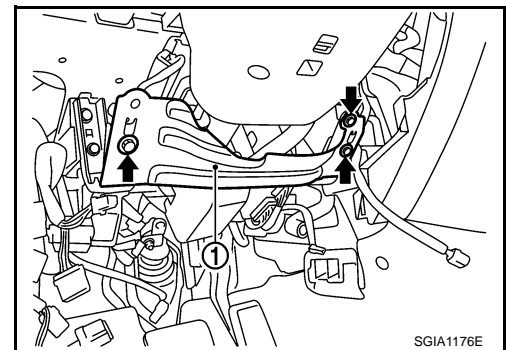


REMOVAL OF STEERING COLUMN ASSEMBLY

1. Set vehicle to the straight-ahead position.
2. Remove driver air bag module. Refer to [SRS-34, "Removal and Installation"](#).
3. Remove steering wheel. Refer to [PS-10, "Removal and Installation"](#).
4. Remove steering column cover. Refer to [IP-12, "INSTRUMENT PANEL : Component Parts Location"](#).
5. Remove combination switch & spiral cable. Refer to [SRS-36, "Removal and Installation"](#).
6. Remove instrument driver lower panel. Refer to [IP-12, "INSTRUMENT PANEL : Component Parts Location"](#).
7. Remove fixing bolts of knee protector (1), then remove knee protector (1) from vehicle.

← : Bolt

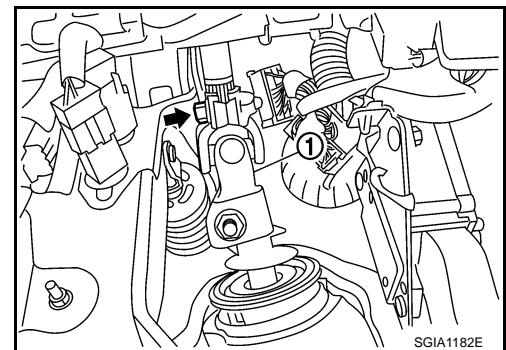
8. Remove low tire pressure warning control unit. Refer to [WT-38, "Low Tire Pressure Warning Control Unit"](#).
9. Disconnect each switch connectors installed to steering column assembly, and then disconnect harness from steering column assembly.



10. Remove fixing bolt of upper joint (1) (steering column assembly side).

← : Bolt

11. Remove steering column assembly mounting bolts and nut, then remove steering column assembly from vehicle.



INSPECTION AFTER REMOVAL

- Check each part of steering column assembly for damage or other malfunctions. Replace if there are.

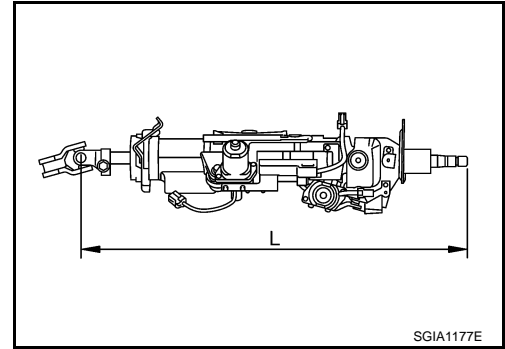
STEERING COLUMN

< SERVICE INFORMATION >

- 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.

Standard

Steering column length "L" :Refer to [PS-41, "Steering Column"](#)

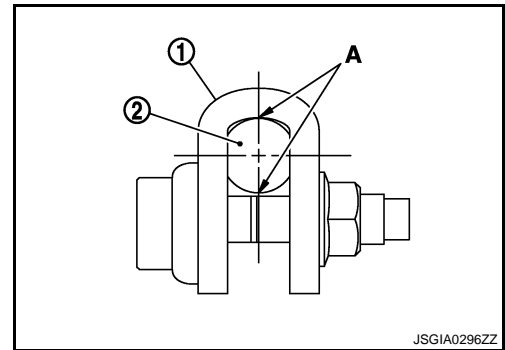


- Measure steering column assembly rotating torque using preload gauge [SST: ST3127S000]. Replace steering column assembly if outside the standard.

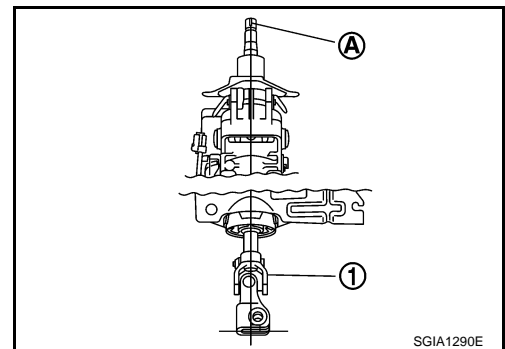
Rotating torque : 0 – 0.2 N·m (0 – 0.02 kg·m, 0 – 1 in·lb)

INSTALLATION OF STEERING COLUMN ASSEMBLY

- Installation is the reverse order of removal. For tightening torque, refer to "COMPONENTS".
- After lower shaft fitted, make sure there is no gap (A) between the upper joint (1) and lower shaft.



- When installing upper joint, the angle which upper joint yoke (1) forms with shaft center groove (A) should be at 90°.
- Adjust neutral position of steering angle sensor. Refer to [BRC-8, "Adjustment of Steering Angle Sensor Neutral Position"](#).



INSPECTION AFTER INSTALLATION

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

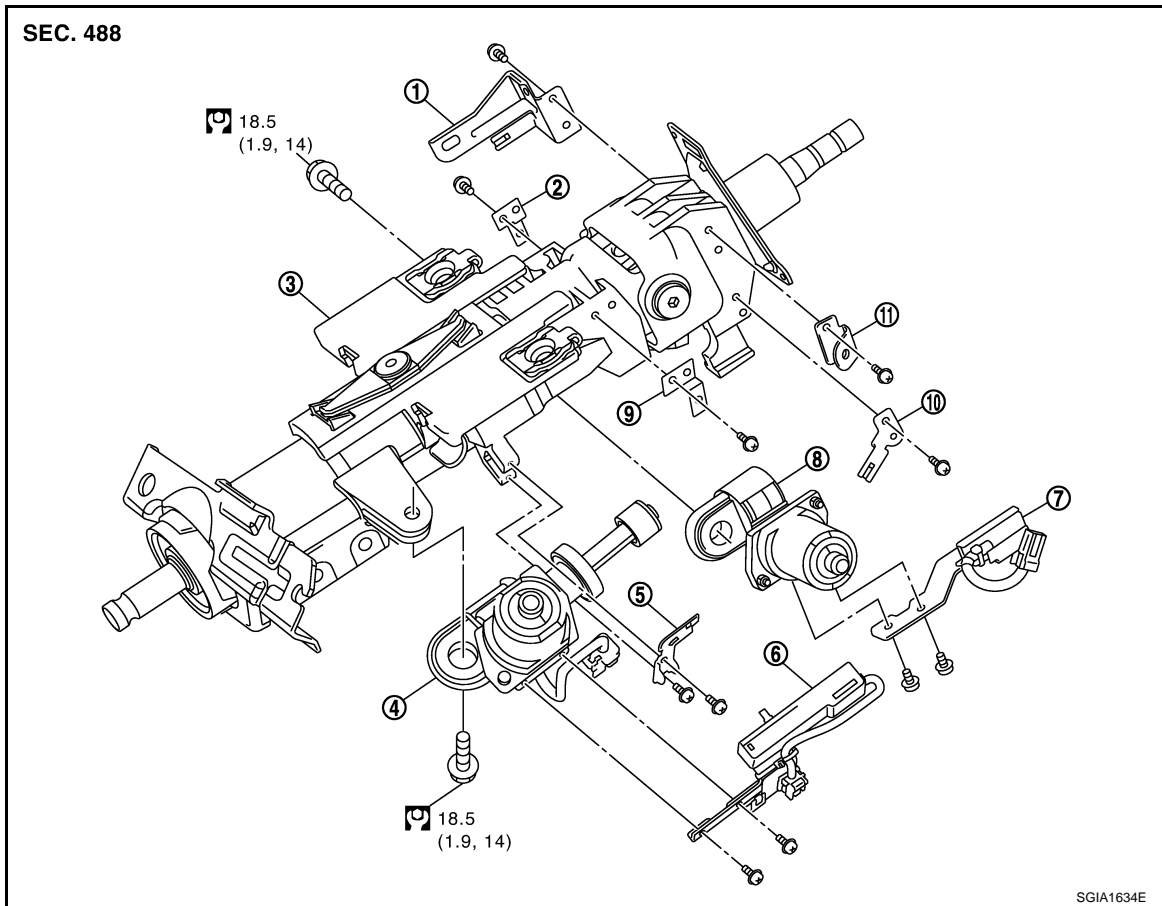
Disassembly and Assembly

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COMPONENTS

STEERING COLUMN

< SERVICE INFORMATION >



- | | | |
|---------------------|---------------|----------------------|
| 1. Bracket | 2. Bracket | 3. Steering column |
| 4. Telescopic motor | 5. Bracket | 6. Telescopic sensor |
| 7. Tilt sensor | 8. Tilt motor | 9. Bracket |
| 10. Bracket | 11. Bracket | |

Refer to [GI-9, "Component"](#), for the symbols in the figure.

DISASSEMBLY

1. Remove fixing screws of telescopic sensor, and then remove telescopic sensor from steering column.
2. Remove fixing screw of bracket, and then remove bracket from telescopic motor.
3. Remove fixing bolt of telescopic motor, and then remove telescopic motor from steering column.
4. Remove fixing screws of tilt sensor, and then remove tilt sensor from steering column.
5. Remove fixing bolt of tilt motor, and then remove tilt motor from steering column.
6. Remove fixing screws of brackets, and then remove brackets from steering column.

INSPECTION AFTER DISASSEMBLY

Check component parts for damage or other malfunctions. Replace if there are.

ASSEMBLY

Assembly is the reverse order of disassembly. For tightening torque, refer to "COMPONENTS".

INSPECTION AFTER ASSEMBLY

STEERING COLUMN

< SERVICE INFORMATION >

Check tilt and telescopic mechanism operating range L^1 , L^2 as shown in the figure.

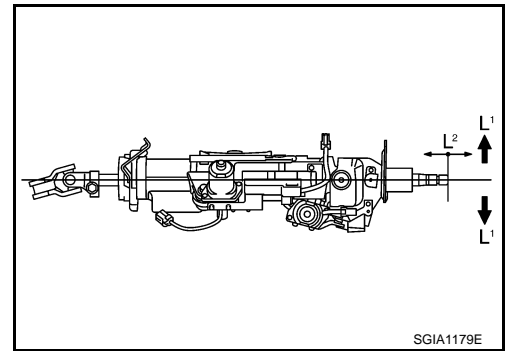
Standard

Tilt operating range " L^1 "

: Refer to [PS-41, "Steering Column"](#).

Telescopic operating range " L^2 "

: Refer to [PS-41, "Steering Column"](#).



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POWER STEERING GEAR AND LINKAGE

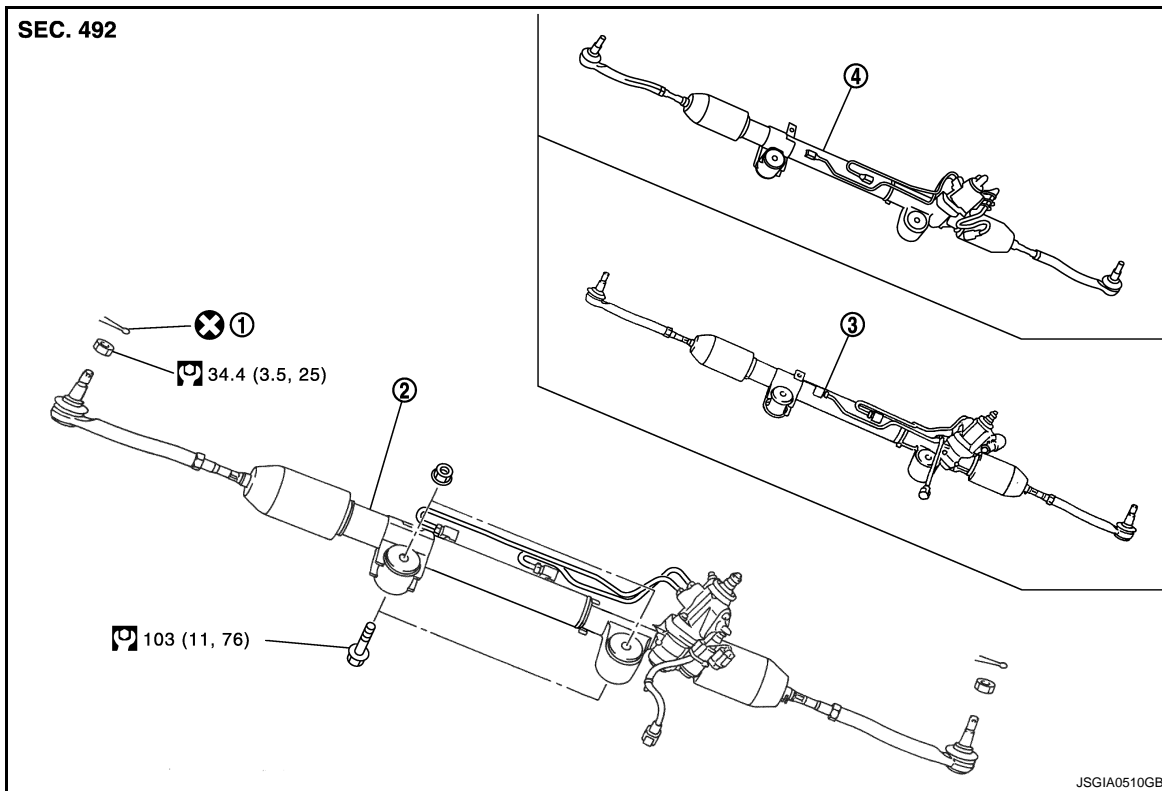
< SERVICE INFORMATION >

POWER STEERING GEAR AND LINKAGE

Removal and Installation

INFOID:000000004158180

COMPONENTS



1. Cotter pin
2. Steering gear assembly (2WD models)
3. Steering gear assembly (VQ35HR, AWD models)
4. Steering gear assembly (VK45DE, AWD models)

Refer to [GI-9, "Component"](#), 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.

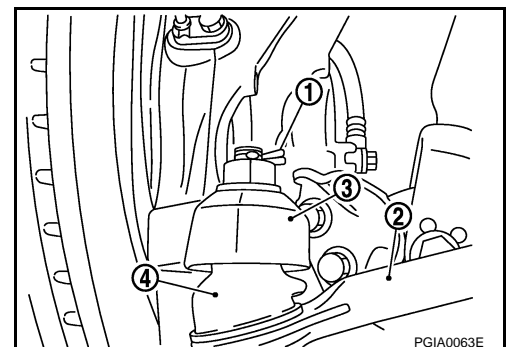
REMOVAL

1. Set vehicle to the straight-ahead position.
2. Remove tires from vehicle.
3. Remove undercover from vehicle.
4. Remove lower side fixing bolt of lower joint.
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 from suddenly coming off.

7. Remove high and low pressure piping of hydraulic piping, and then drain power steering fluid. Refer to [PS-36](#).



POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >

8. Remove steering hydraulic piping bracket from front suspension member. Refer to [PS-36](#).
9. Remove power steering solenoid valve harness connector. Refer to [PS-19, "Disassembly and Assembly"](#).
10. Remove rack stay (2WD) or front cross bar (AWD). Refer to [FSU-7, "Component"](#), [FSU-24, "Component"](#).
11. Remove mounting bolts and nuts of steering gear assembly, and then remove steering gear assembly from vehicle.

INSTALLATION

Installation is the reverse order of removal. For tightening torque, refer to "COMPONENTS".

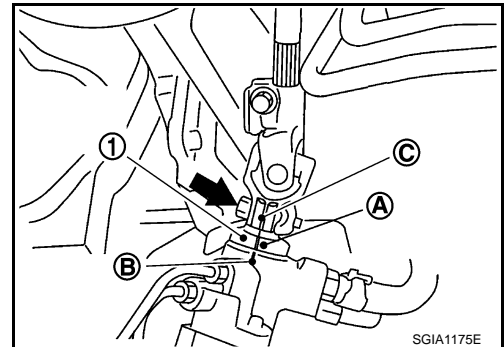
- When installing lower joint to steering gear assembly, follow the procedure listed below.
- Set rack of steering gear in the neutral position.

NOTE:

- To get the neutral position of rack, turn gear-sub 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.

← : Bolt

- Install slit part of lower joint (C) aligning with the projection (A) of rear cover cap (1). Make sure that the slit part of lower joint (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-7, "Air Bleeding Hydraulic System"](#).
- Perform final tightening of nuts and bolts on each part under unladen conditions with tires on level ground when removing steering gear assembly. Check wheel alignment. Refer to [FSU-5, "Wheel Alignment Inspection"](#), [FSU-22, "Wheel Alignment Inspection"](#).
- Adjust neutral position of steering angle sensor after checking wheel alignment. Refer to [BRC-8, "Adjustment of Steering Angle Sensor Neutral Position"](#).



INSPECTION AFTER INSTALLATION

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

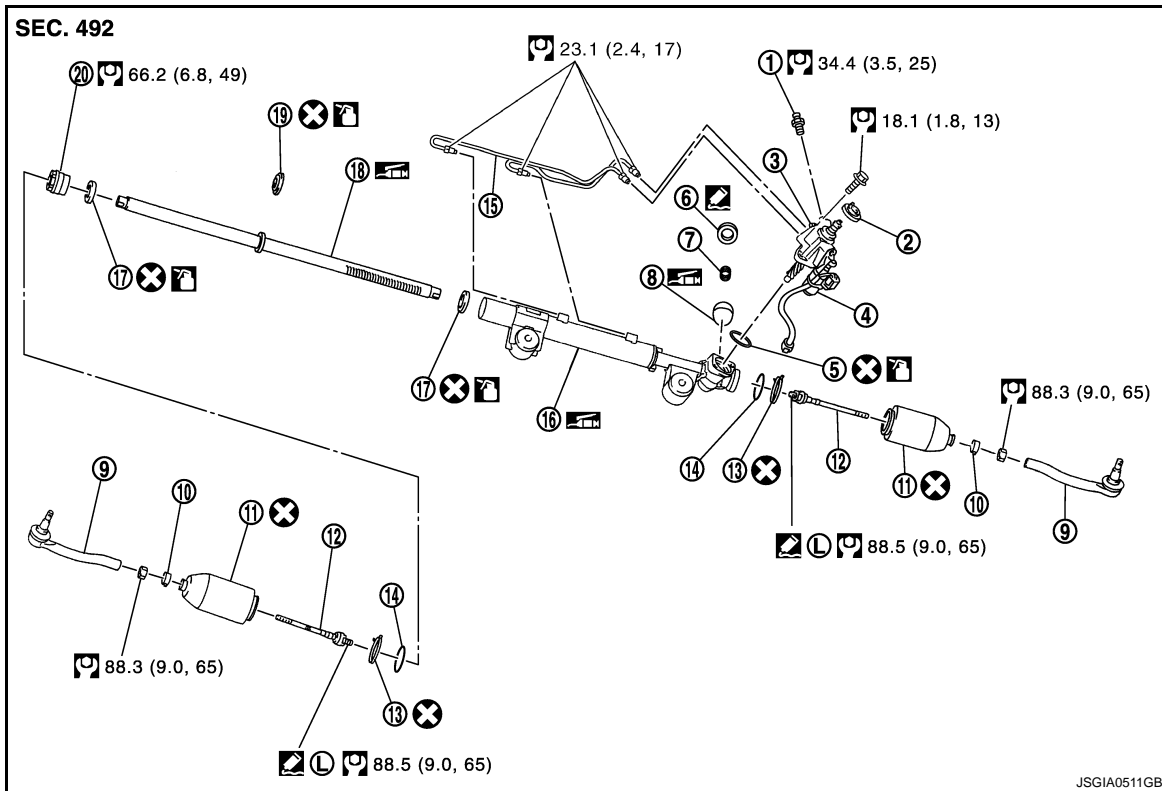
Disassembly and Assembly

INFOID:000000004158181

COMPONENTS

POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >



- | | | |
|----------------------------------|------------------------|----------------------|
| 1. Low pressure piping | 2. Rear cover cap | 3. Gear-sub assembly |
| 4. Power steering solenoid valve | 5. O-ring | 6. Adjusting screw |
| 7. Spring | 8. Retainer | 9. Outer socket |
| 10. Boot clamp | 11. Boot | 12. Inner socket |
| 13. Boot clamp (stainless wire) | 14. Spacer | 15. Cylinder tubes |
| 16. Gear housing assembly | 17. Rack oil seal | 18. Rack assembly |
| 19. Rack Teflon ring | 20. End cover assembly | |

: Apply power steering fluid.

: Apply Genuine High Performance Thread Sealant or equivalent. Refer to [GI-46, "Recommended Chemical Product and Sealant"](#).

: Apply Genuine Medium Strength Thread Locking Sealant or equivalent. Refer to [GI-46, "Recommended Chemical Product and Sealant"](#).

: Apply multi-purpose grease.

Refer to [GI-9, "Component"](#) for symbols not described on the above.

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.

DISASSEMBLY

1. Remove fixing bolts of power steering solenoid valve, and then remove power steering solenoid valve from gear-sub assembly.
2. Remove cylinder tubes from gear housing assembly.
3. Remove rear cover cap from gear-sub assembly.

POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >

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

CAUTION:

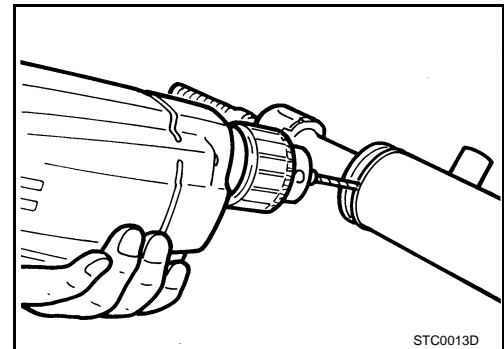
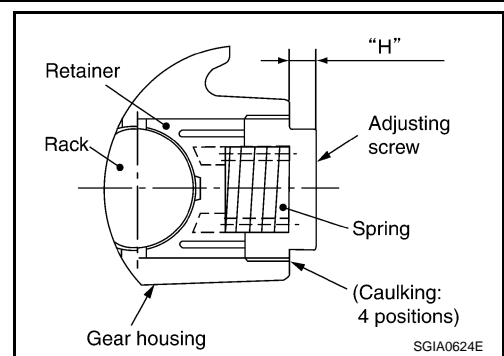
- Never loosen adjusting screw 2 turns or more.
- Replace steering gear assembly if adjusting screw is loosened 2 turns or more and it is removed.

5. Remove fixing bolts of gear-sub assembly, and then remove gear-sub assembly from gear housing assembly.
6. Remove O-ring 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:

Never 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. Remove spacer from gear housing assembly.
11. 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.]



12. Remove end cover assembly with a 36 mm (1.42 in) open head (suitable tool).

CAUTION:

Never damage rack assembly surface when removing. Rack assembly must be replaced if damaged because it may cause fluid leakage.

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

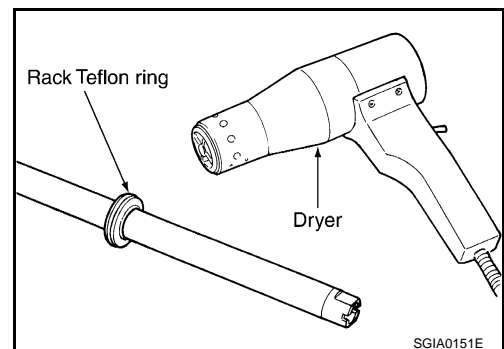
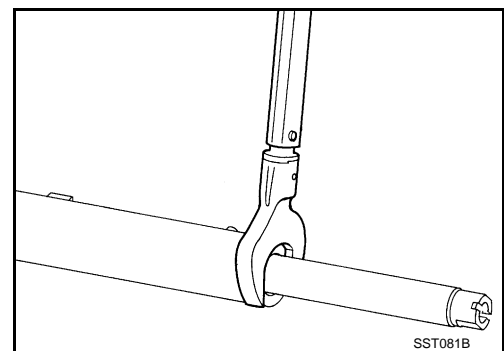
CAUTION:

Never damage cylinder inner wall when removing rack assembly. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.

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

CAUTION:

Never damage rack assembly. Rack assembly must be replaced if damaged because it may cause fluid leakage.



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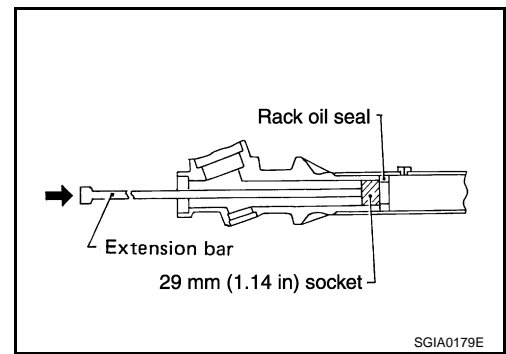
POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >

15. 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:

Never 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.

Gear-Sub Assembly

- Check gear-sub assembly for damage or wear, and replace it if a malfunction is detected.
- Rotate gear-sub assembly 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

- 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.

Standard for outer socket

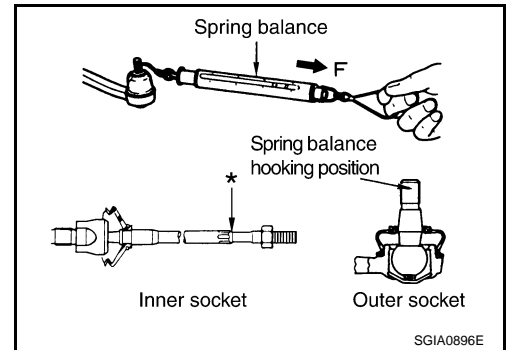
(Measuring point: Stud cotter pin mounting hole)

Spring balance measurement : Refer to [PS-41, "Steering Gear"](#).

Standard for outer socket

(Measuring point: "★" mark shown in the figure)

Spring balance measurement : Refer to [PS-41, "Steering Gear"](#).

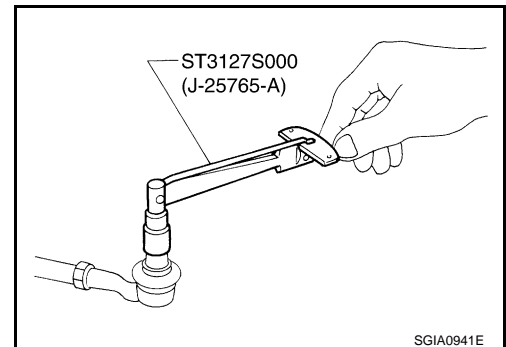


2. Ball joint rotating torque

- 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.

Standard

Outer socket rotating torque : Refer to [PS-41, "Steering Gear"](#).



3. Ball joint axial end play

POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >

- 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.

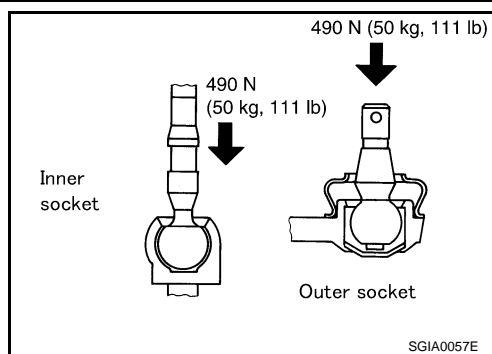
Standard

Outer socket

: Refer to [PS-41, "Steering Gear"](#).

inner socket

: Refer to [PS-41, "Steering Gear"](#).

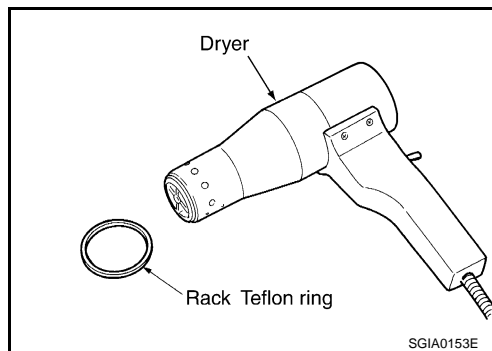


ASSEMBLY

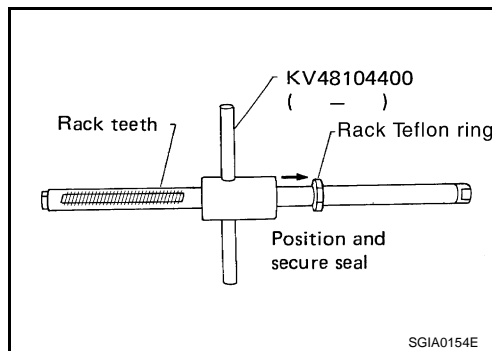
- Apply recommended fluid to rack Teflon ring.
- Heat rack Teflon ring to approximately 40°C (104°F) with a dryer. Assemble it to mounting groove of rack assembly.

CAUTION:

Never reuse rack Teflon ring.



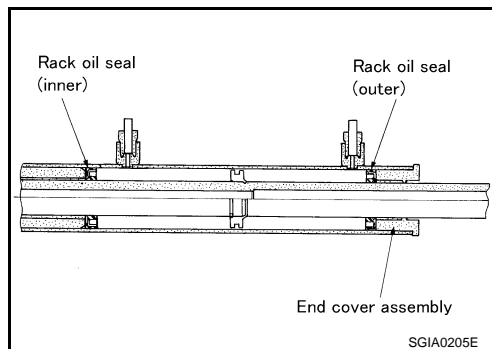
- Install the Teflon ring correcting tool [SST: KV48104400 (—)] from tooth side of rack to rack Teflon ring on rack. Compress the ring with tool.



- Apply recommended grease to rack oil seal, and then install rack oil seal in the following procedure. Then assemble rack assembly to gear housing assembly.

CAUTION:

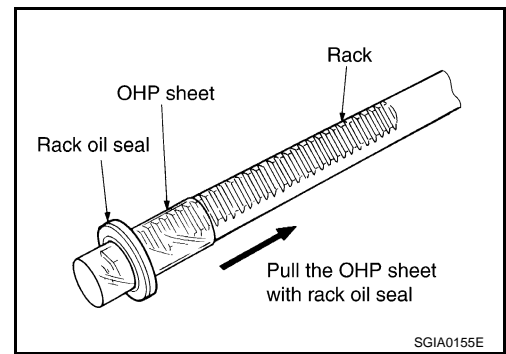
- Install rack oil seal in a direction so that the lip of inner oil seal and the lip of outer oil seal face each other.
- Never damage retainer sliding surface by rack assembly. Replace gear housing assembly if damaged.
- Never damage gear housing assembly inner wall by rack assembly. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.



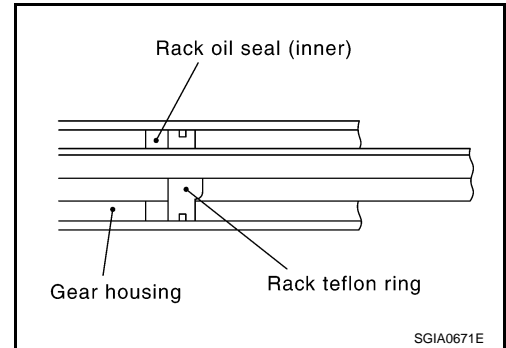
POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >

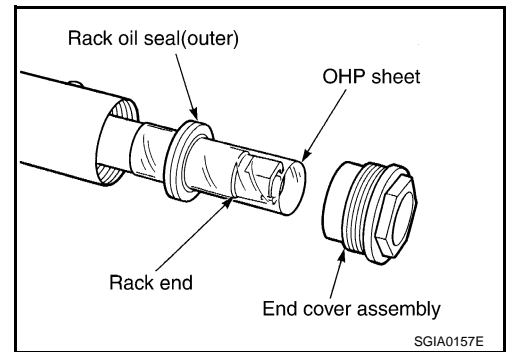
- a. Wrap an OHP sheet [approximately 70 mm (2.76 in) × 100 mm (3.94 in)]. Around rack assembly teeth to avoid damaging rack oil seal (inner). Install rack oil seal over sheet. Then, pull OHP sheet along with rack oil seal until they pass rack assembly teeth, and remove OHP sheet.



- 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.



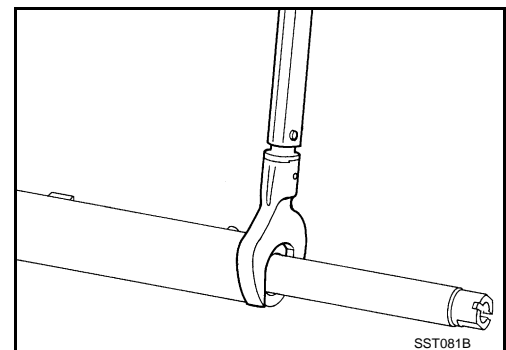
- d. Wrap an OHP sheet [approximately 70 mm (2.76 in) × 100 mm (3.94 in)]. Around the edge to avoid damaging rack oil seal (outer). Install rack oil seal over sheet. Then, pull oil seal along with OHP sheet until they pass rack edge, and remove OHP sheet.
- e. Install end cover assembly to rack edge,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



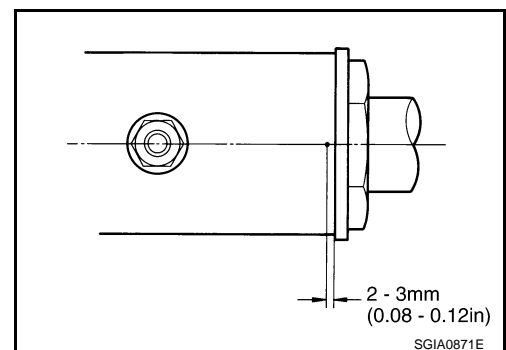
5. Tighten end cover assembly to specified torque using a 36 mm (1.42 in) open head (suitable tool).

CAUTION:

Never 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. Apply recommended fluid to O-ring, and then install O-ring to gear housing assembly.
8. Install gear-sub assembly to gear housing assembly.
9. Install power steering solenoid valve to gear-sub assembly.



POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >

10. Install inner socket to gear housing assembly with the following procedure.
 - a. Install spacer to gear housing assembly.
 - b. Apply thread sealant into the thread of inner socket.
Use Genuine Medium Strength Thread Locking Sealant or equivalent. Refer to [GI-46, "Recommended Chemical Product and Sealant"](#).
11. Screw inner socket into rack part and tighten at the specified torque.
12. Decide on the neutral position for the rack.

Standard

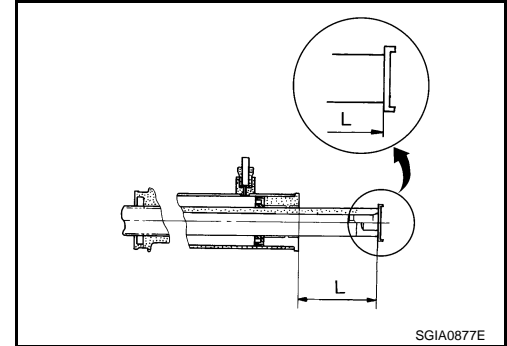
Rack stroke "L"

: Refer to [PS-41, "Steering Gear"](#).

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

CAUTION:

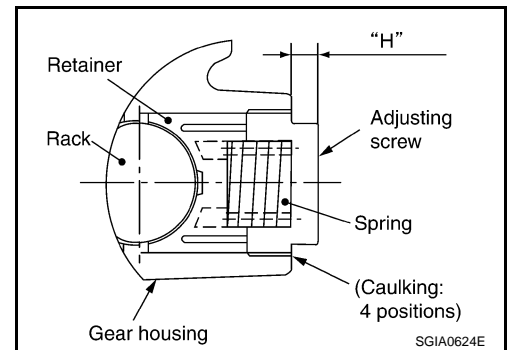
Make sure that the projection of rear cover cap is aligned with the marking position of gear housing assembly.



14. Apply recommended thread 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.

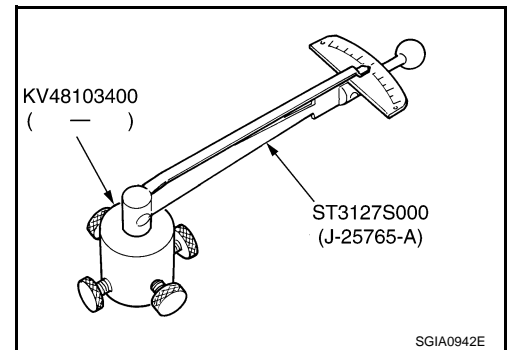
Use Genuine High Performance Thread Sealant or equivalent. Refer to [GI-46, "Recommended Chemical Product and Sealant"](#).

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

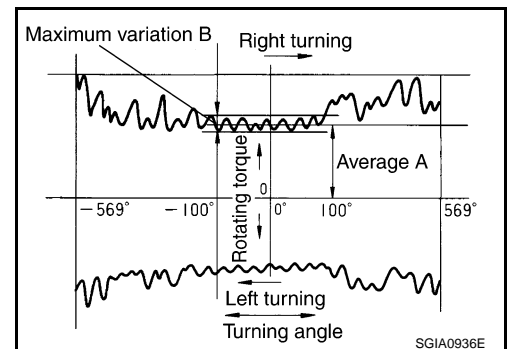


16. Measure pinion rotating torque within $\pm 180^\circ$ of neutral position of the rack assembly using the preload gauge [SST] and preload adapter [SST]. Stop the gear at the point where highest torque is read.

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



18. 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 after readjusting or adjusting screw rotating torque is 5 N·m (0.51 kg·m, 44 in·lb) or less.



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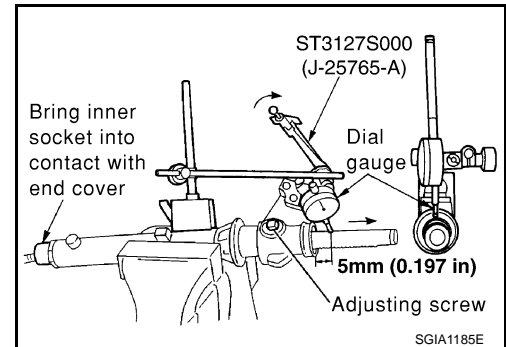
POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >

| Pinion rotating torque standard | 2WD | AWD |
|--|--|--|
| Around neutral position (within±100°) Average A | 1.38 - 1.83 N·m (0.14 - 0.18 kg·m, 13 - 16 in·lb) | 1.61 - 2.16 N·m (0.17 - 0.22 kg·m, 15 - 19 in·lb) |
| Maximum variation B | 0.98 N·m (0.10 kg·m, 9.0 in·lb) | |

19. Apply recommended liquid gasket to inner socket and turn pinion fully to left with inner socket installed to gear housing assembly.

20. 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.

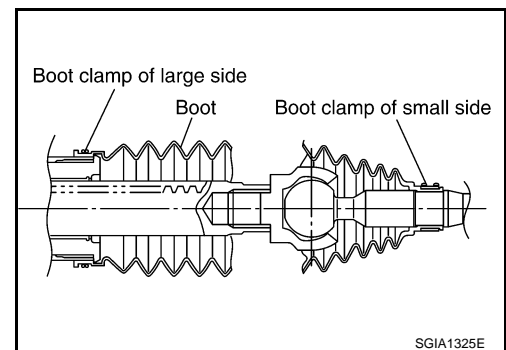


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| Measuring point | Rack axial direction | 5 mm (0.20 in) from housing end surface |
| | Rack radial direction | Axial direction of the adjusting screw |
| Vertical movement of rack | 0.265 mm (0.0104 in) | |

21. Install large end of boot to gear housing assembly.

22. Install small end of boot to inner socket boot mounting groove.

23. Install boot clamp to boot small end.



24. Install large side of boot clamp.

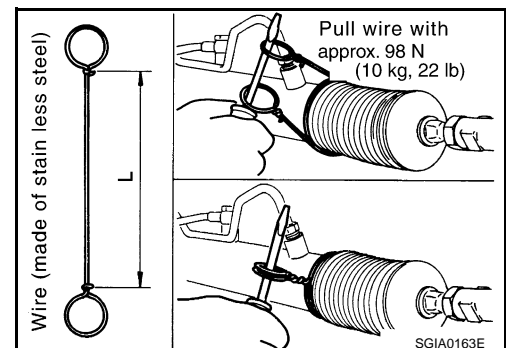
CAUTION:

Never reuse boot clamp.

- Tighten large side of boot with boot clamp (stainless wire).

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

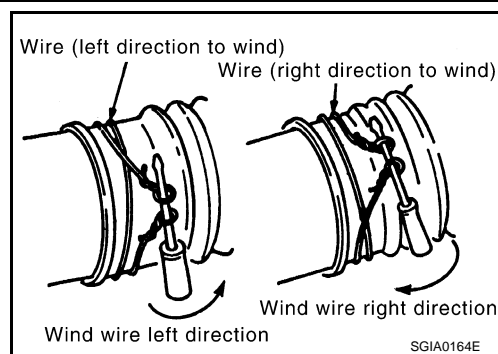
- Wrap clamp around boot groove for two turns. Insert a flat-bladed screwdriver in loops on both ends of wire. Twist 4 to 4.5 turns while pulling them with force of approximately 98 N (10 kg, 22 lb).



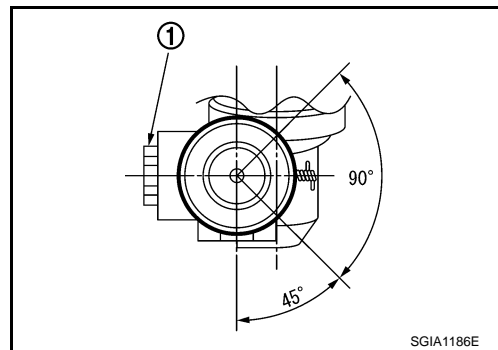
POWER STEERING GEAR AND LINKAGE

< SERVICE INFORMATION >

- Twist boot clamp as shown. Pay attention to relationship between winding and twisting directions.



- Twisted point of clamp is in the opposite side of adjusting screw (1) as shown in the figure (to prevent contact with other parts).

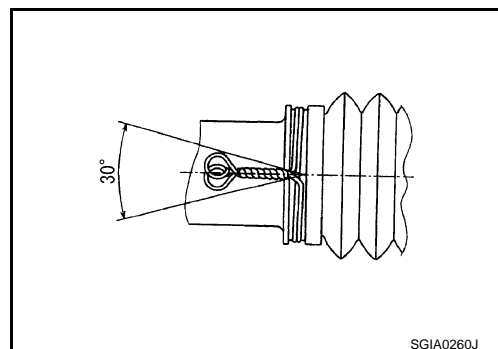


- Bent cut end of the wire toward rack axial as shown in the figure after twisting the wire 4 to 4.5 turns so that cut end does not contact with boot.

CAUTION:

Keep gap from cylinder tube 5 mm (0.20 in) or more.

25. Install cylinder tubes to gear housing assembly.



26. Adjust inner socket to standard length L, and then tighten lock nut to the specified torque. Refer to "COMPONENTS". Check length of inner socket L again after tightening lock nut. Make sure that the length is the standard.

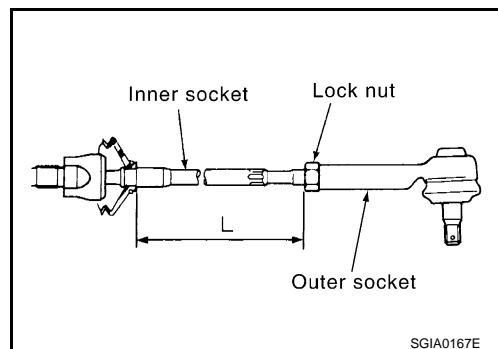
Standard

Inner socket length "L"

: Refer to [PS-41, "Steering Gear"](#).

CAUTION:

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



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POWER STEERING OIL PUMP

< SERVICE INFORMATION >

POWER STEERING OIL PUMP

On-Vehicle Inspection and Service

INFOID:000000004158182

CHECKING RELIEF OIL PRESSURE

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-7, "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 of 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.

Standard

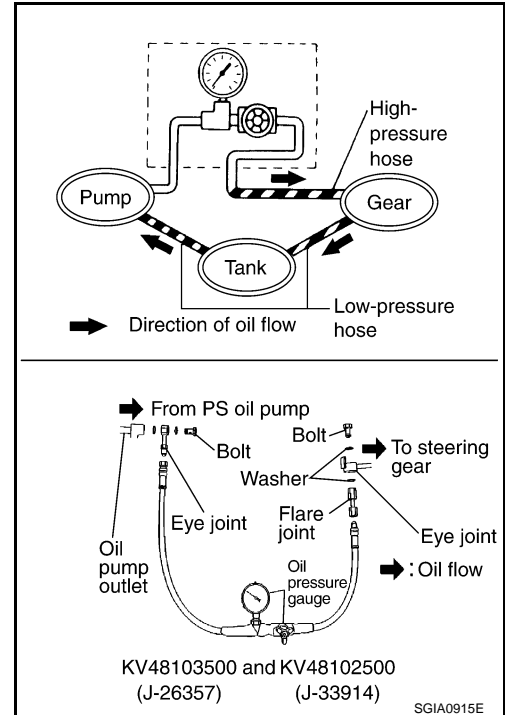
Relief pressure

: Refer to [PS-42, "Oil Pump"](#).

CAUTION:

Never keep valve closed for 10 seconds or longer.

4. Open the valve slowly after measuring. Repair oil pump if the relief oil pressure is outside the standard. Refer to [PS-28, "Disassembly and Assembly \(Models with VK45DE\)"](#), [PS-32, "Disassembly and Assembly \(Models with VQ35HR\)"](#).
5. After inspection, disconnect the hydraulic pressure gauge [SST] from hydraulic circuit, then add fluid and bleed air. Refer to [PS-7, "Air Bleeding Hydraulic System"](#).



Removal and Installation

INFOID:000000004158183

REMOVAL

1. Drain power steering fluid from reservoir tank.
2. Remove undercover from vehicle with a power tool.
3. Loosen drive belt. Refer to [EM-15, "Removal and Installation" \(VQ35HR\)](#), [EM-169, "Removal and Installation" \(VK45DE\)](#).
4. Remove drive belt from oil pump pulley.
5. Remove piping of high pressure and low pressure (drain fluid from their pipings). Refer to [PS-36](#).
6. Remove power steering oil pump mounting bolts, and then remove power steering oil pump. Refer to [PS-36, "Removal and Installation"](#).

INSTALLATION

Installation is the reverse order of removal. For tightening torque, refer to [PS-36](#).

- Perform the following procedure after installing.
 - Adjust belt tension (VQ35HR). Refer to [EM-15, "Tension Adjustment"](#).
 - About the installation of VK45DE drive belt, refer to [EM-169, "Tension Adjustment"](#).
 - Bleed air. Refer to [PS-7, "Air Bleeding Hydraulic System"](#).

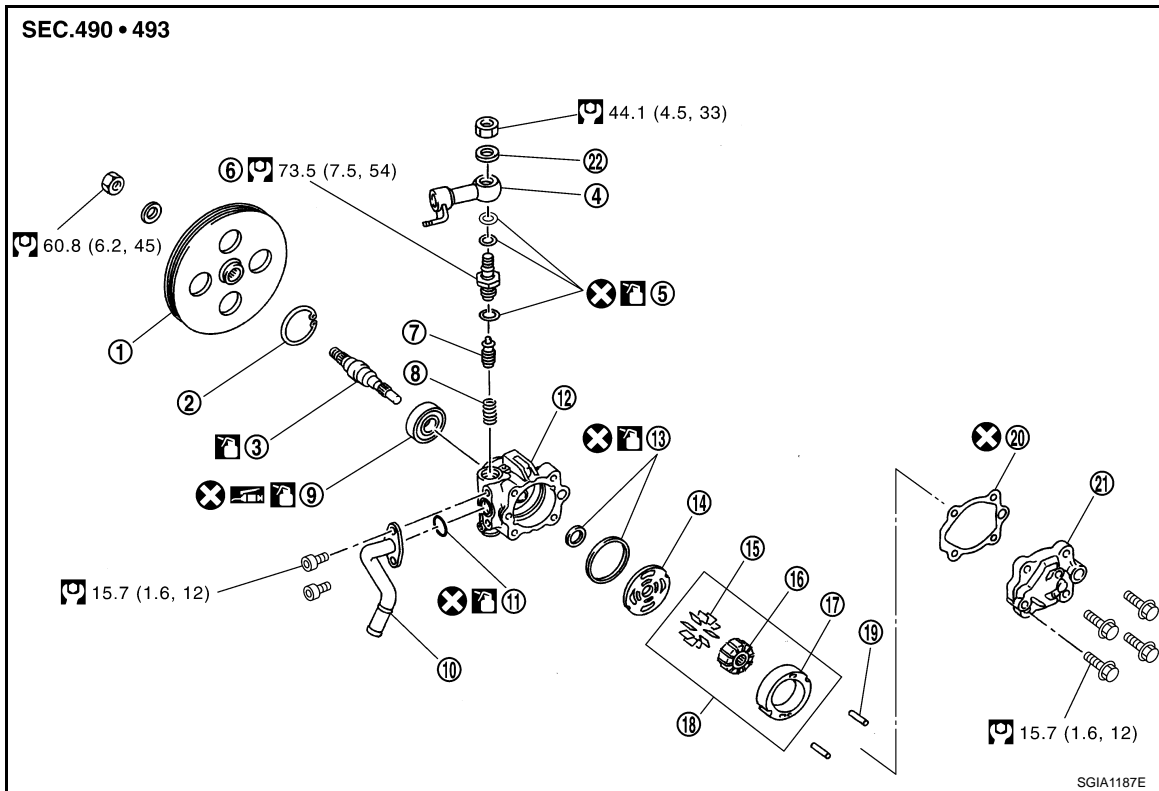
Disassembly and Assembly (Models with VK45DE)

INFOID:000000004158184

COMPONENTS

POWER STEERING OIL PUMP

< SERVICE INFORMATION >



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

Refer to [GI-9, "Component"](#), and the followings for the symbols in the figure.

Apply power steering fluid.

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.

DISASSEMBLY

NOTE:

Secure oil pump in a vise if necessary.

CAUTION:

Use copper plates when securing in a vise.

1. Remove rear cover mounting bolts, and then remove rear cover from body assembly.
2. Remove gasket from body assembly.
3. Remove dowel pin, cartridge and side plate from body assembly.
4. Remove pulley mounting nut and washer, then remove pulley from drive shaft.

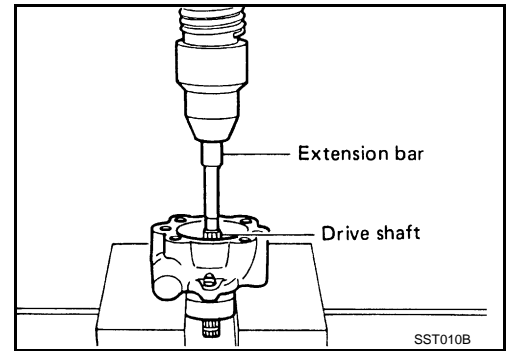
POWER STEERING OIL PUMP

< SERVICE INFORMATION >

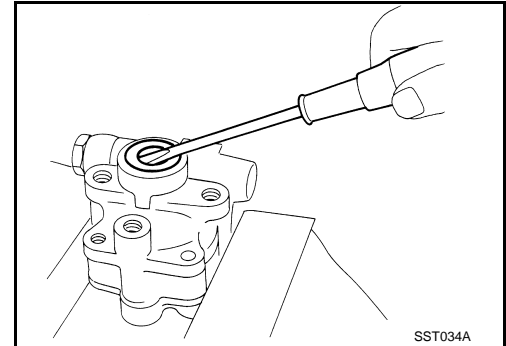
5. Remove snap ring from drive shaft and press out it.

CAUTION:

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



6. Remove oil seal from body assembly using a flat-bladed screwdriver.
7. Remove O-ring from body assembly.
8. Remove lock nut, and then remove copper washer, joint and O-ring.
9. Remove connector bolt, and then remove O-ring, flow control valve and spring from body assembly.
10. Remove mounting bolts of suction pipe, and then remove suction pipe from body assembly.
11. Remove O-ring 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.

Flow Control Valve Inspection

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

ASSEMBLY

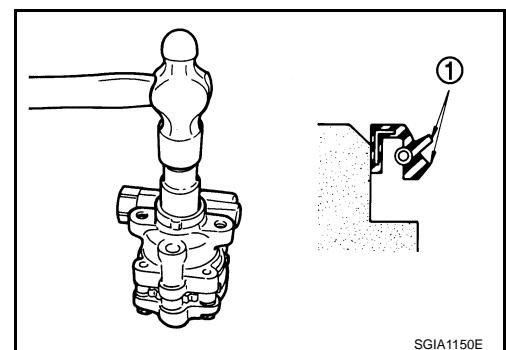
NOTE:

Secure oil pump in a vise if necessary.

CAUTION:

Use copper plates when securing in a vise.

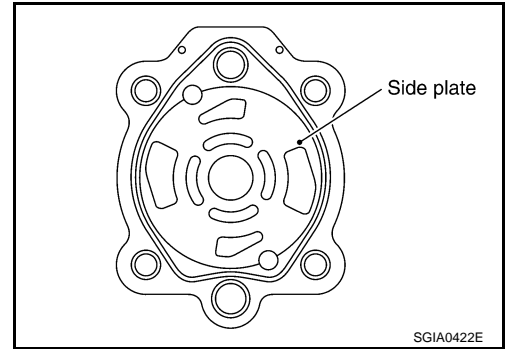
1. Apply recommended grease to oil seal lips (1). Apply recommended fluid to around oil seal, and then install oil seal to body assembly.
2. Apply recommended fluid to drive shaft, and press drive shaft into body assembly, then install snap ring.
3. Apply recommended fluid to O-ring, and then install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



POWER STEERING OIL PUMP

< SERVICE INFORMATION >

4. Install side plate to body assembly.



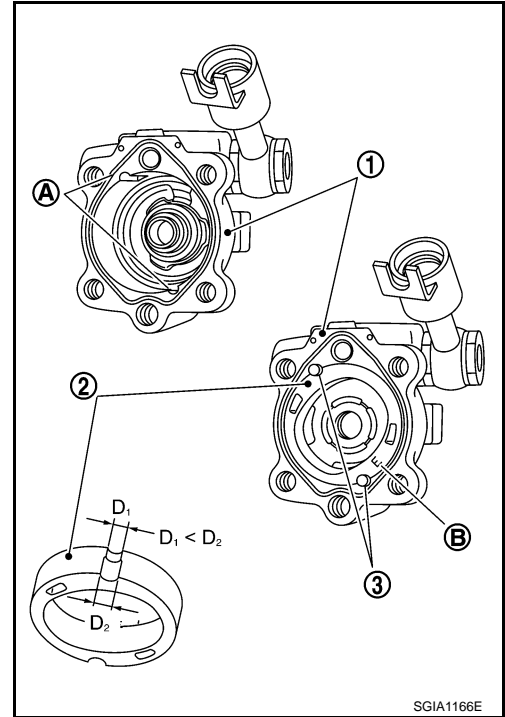
5. Install dowel pin (3) into dowel pin hole (A), and then install cam ring (2) pointing it's D1 side toward the body assembly (1) side as shown in the figure.

- When installing cam ring, turn carved face with a letter E (B) of it to rear cover.

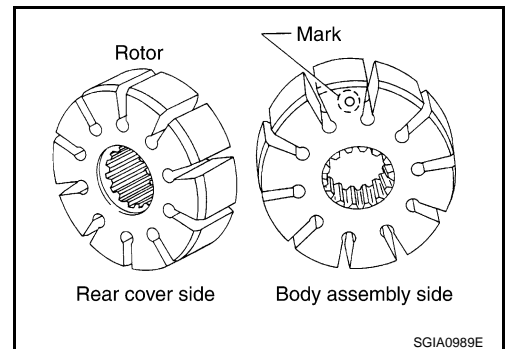
CAUTION:

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.

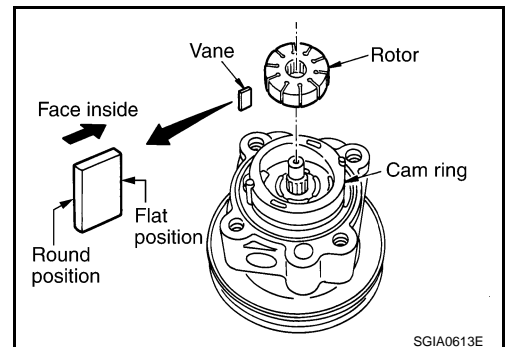
6. Install rotor to body assembly.



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



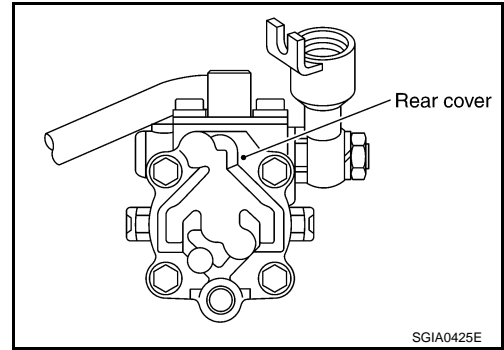
7. Install vane to rotor so that arc of vane faces cam ring side.
8. Check if drive shaft turns smoothly.
9. Install gasket to body assembly.



POWER STEERING OIL PUMP

< SERVICE INFORMATION >

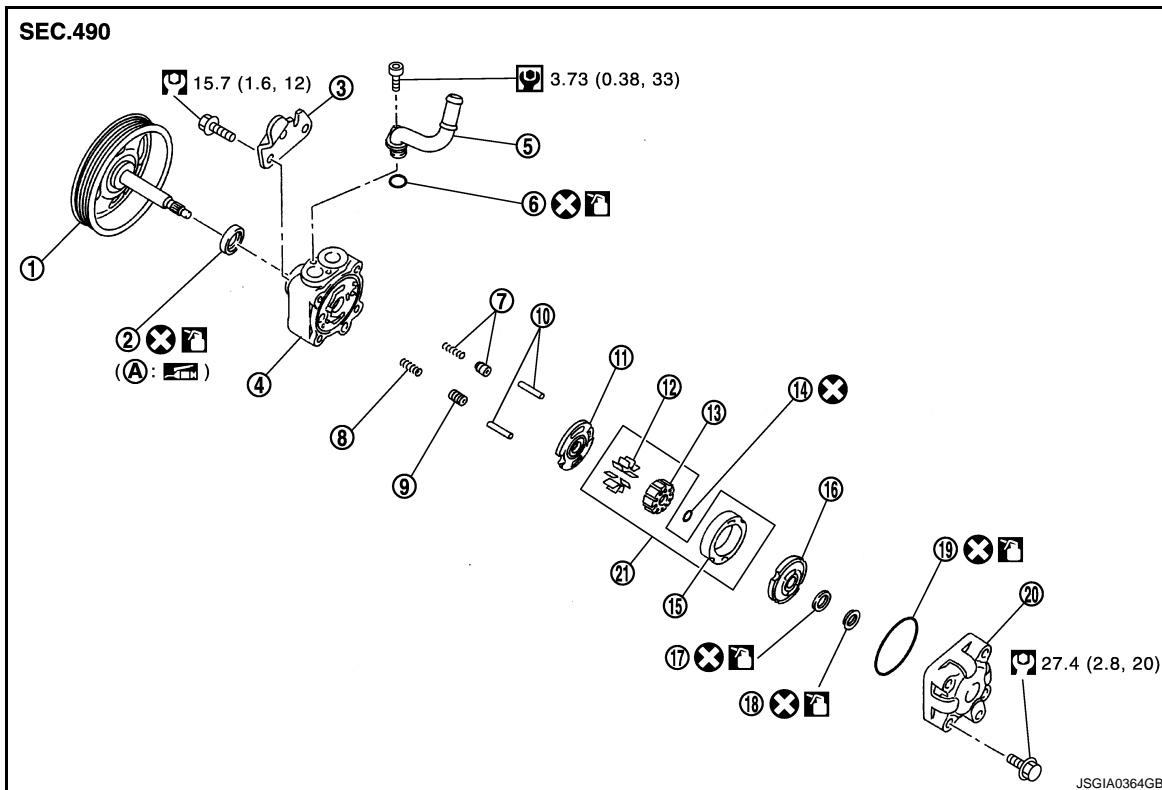
10. Install rear cover to body assembly, and then tighten mounting bolts to the specified torque.
11. Install pulley and washer to drive shaft, and then tighten lock nut at the specified torque.
12. Apply recommended fluid to O-ring. Install spring, flow control valve and O-ring to body assembly, and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



Disassembly and Assembly (Models with VQ35HR)

INFOID:000000004158185

COMPONENTS



- | | | |
|----------------------------------|------------------------------|-------------------------|
| 1. Pulley | 2. Oil seal | 3. Bracket |
| 4. Body assembly | 5. Suction pipe | 6. O-ring |
| 7. Flow control valve B assembly | 8. Flow control valve spring | 9. Flow control valve A |
| 10. Dowel pin | 11. Front side plate | 12. Vane |
| 13. Rotor | 14. Rotor snap ring | 15. Cam ring |
| 16. Rear side plate | 17. O-ring | 18. Teflon ring |
| 19. O-ring | 20. Rear cover | 21. Cartridge |
| A. Oil seal lip | | |

: Apply power steering fluid.

: Apply multi-purpose grease.

Refer to [GI-9, "Component"](#) for symbols not described on the above.

POWER STEERING OIL PUMP

< SERVICE INFORMATION >

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.

DISASSEMBLY

1. Remove rear cover mounting bolts, and then remove rear cover from body assembly.

CAUTION:

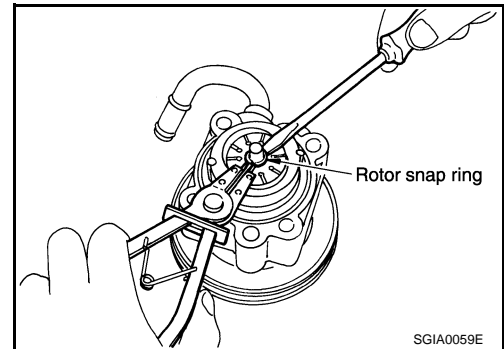
- **Fix oil pump with a vise if necessary.**
- **Use copper plates when fixing with a vise.**

2. Remove O-ring from body assembly.
3. Remove rear side plate from cartridge, and then remove Teflon ring and O-ring from rear side plate.

4. Remove rotor snap ring using a snap ring pliers, and remove pulley from body assembly.

CAUTION:

Remove pulley so as not to be damaged when removing rotor snap ring.

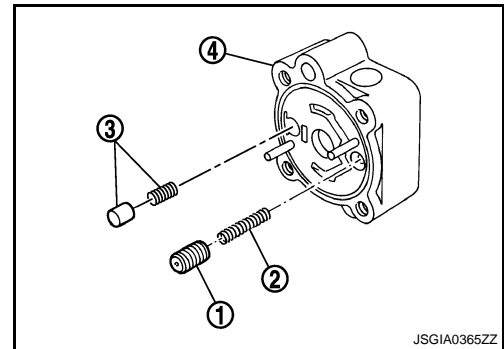


5. Remove cartridge and front side plate.
6. Remove flow control valve A (1), flow control valve spring (2) and flow control valve B assembly (3) from body assembly (4).

CAUTION:

Never drop and damage flow control valve A and flow control valve B assembly when removing.

7. Remove oil seal from body assembly.
8. Remove mounting bolt of suction pipe, and then remove suction pipe from body assembly.
9. Remove O-ring from body assembly.
10. Remove bracket mounting bolts, and then remove 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 plates (front and rear) for damage. Side plates (front and rear) must be replaced as a set if they are damaged.

Flow Control Valve Inspection

Check flow control valve A, flow control valve spring and flow control valve B assembly for damage. Replace if there are.

ASSEMBLY

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POWER STEERING OIL PUMP

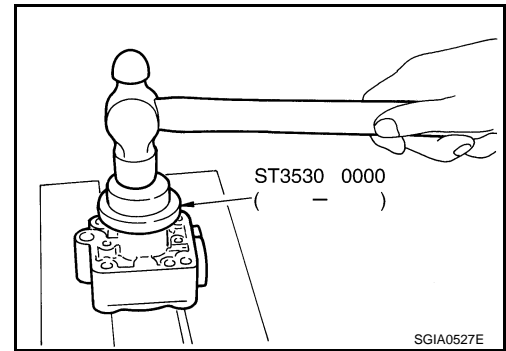
< SERVICE INFORMATION >

1. Apply recommended grease to oil seal lips. Apply recommended fluid to around oil seal, and then install oil seal to body assembly using a drift [SST].

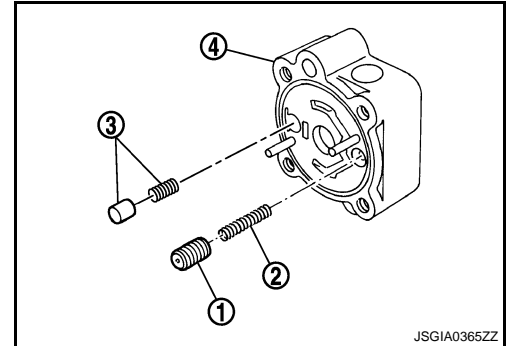
CAUTION:

- Fix oil pump with a vise if necessary.
- Use copper plates when fixing with a vise.

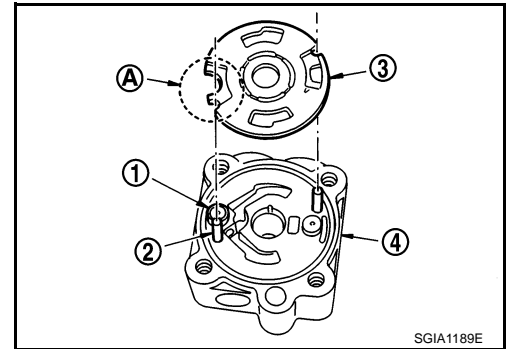
2. Install bracket to body assembly.
3. If dowel pin has been removed, insert it into body assembly by hand. If it cannot be inserted by hand, lightly tap with a hammer.



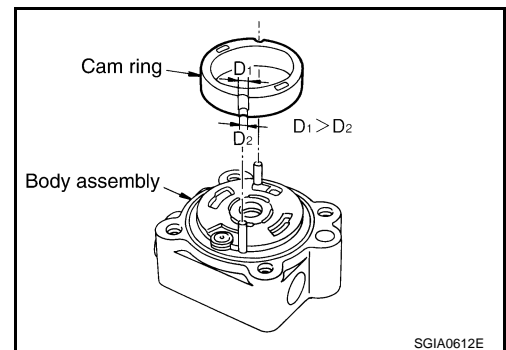
4. Install flow control valve A (1), flow control valve spring (2) and flow control valve B assembly (3) to body assembly (4).



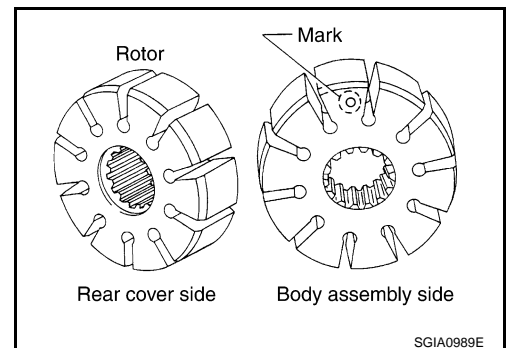
5. Install front side plate (3) with dowel pin (2) on flow control valve A (1) side as shown in the figure aligning with front side plate cutout (A) to body assembly (4).



6. Install cam ring as shown in the figure.
7. Install pulley to body assembly.
CAUTION:
Never damage oil seal when installing pulley.



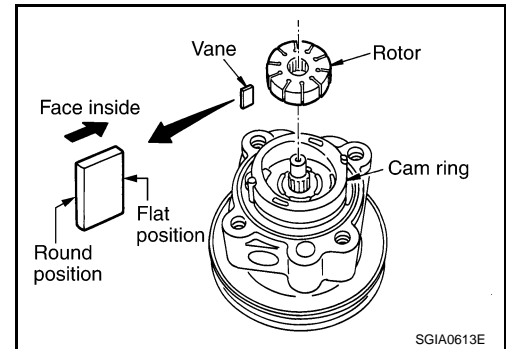
8. Install rotor so that mark faces body assembly, and then install it to pulley shaft.



POWER STEERING OIL PUMP

< SERVICE INFORMATION >

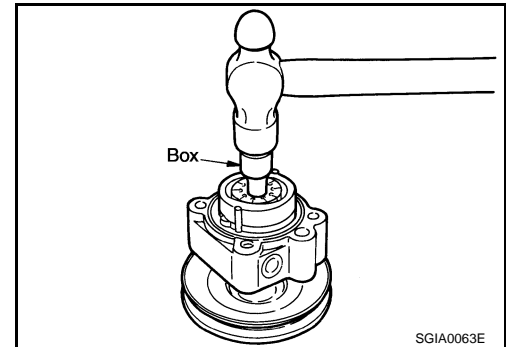
9. Install vane to rotor so that arc of vane faces cam ring side.



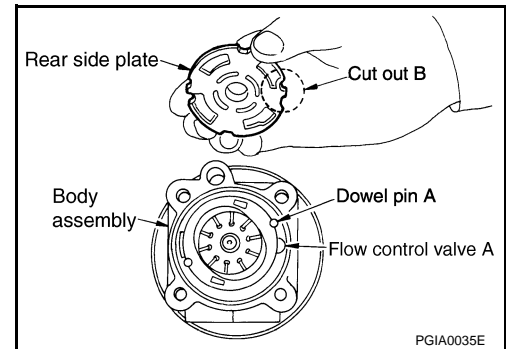
10. Install rotor snap ring to slit of pulley shaft using a hammer and a 10 mm (0.39 in) box.

CAUTION:

- Never damage rotor and pulley shaft.
- Oil pump assembly must be replaced if rotor is damaged.



11. Install rear side plate with dowel pin A on flow control valve A side as shown in the figure aligning with rear side plate cutout B to cartridge.
12. Apply recommended fluid to O-ring, and then install O-ring to body assembly.
13. Apply recommended fluid to O-ring, and then install O-ring to rear side plate.
14. Apply recommended fluid to Teflon ring, and then install Teflon ring to rear side plate.
15. Install rear cover to body assembly.
16. Apply recommended fluid to O-ring, and then install O-ring to body assembly.
17. Install suction pipe to body assembly.



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HYDRAULIC LINE

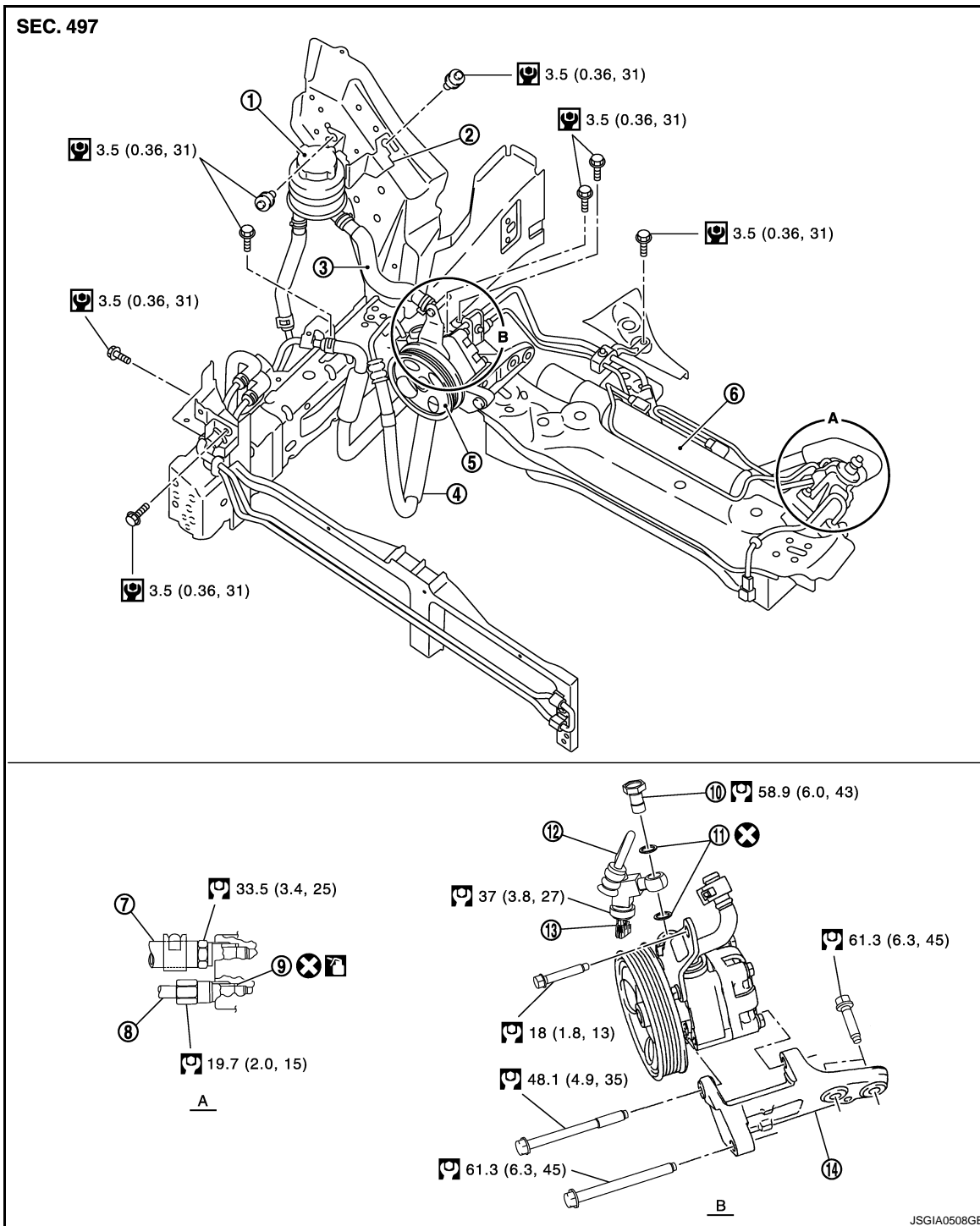
< SERVICE INFORMATION >

HYDRAULIC LINE

Removal and Installation

INFOID:000000004158186

COMPONENTS (VQ35HR 2WD MODELS)




- | | | |
|-----------------------|---------------------------|--|
| 1. Reservoir tank | 2. Reservoir tank bracket | 3. Suction hose |
| 4. High pressure hose | 5. Oil pump assembly | 6. Steering gear assembly |
| 7. Low pressure hose | 8. High pressure piping | 9. O-ring |
| 10. Eye-bolt | 11. Copper washer | 12. Eye-joint (assembled to high-pressure side hose) |
| 13. Pressure sensor | 14. Oil pump bracket | |

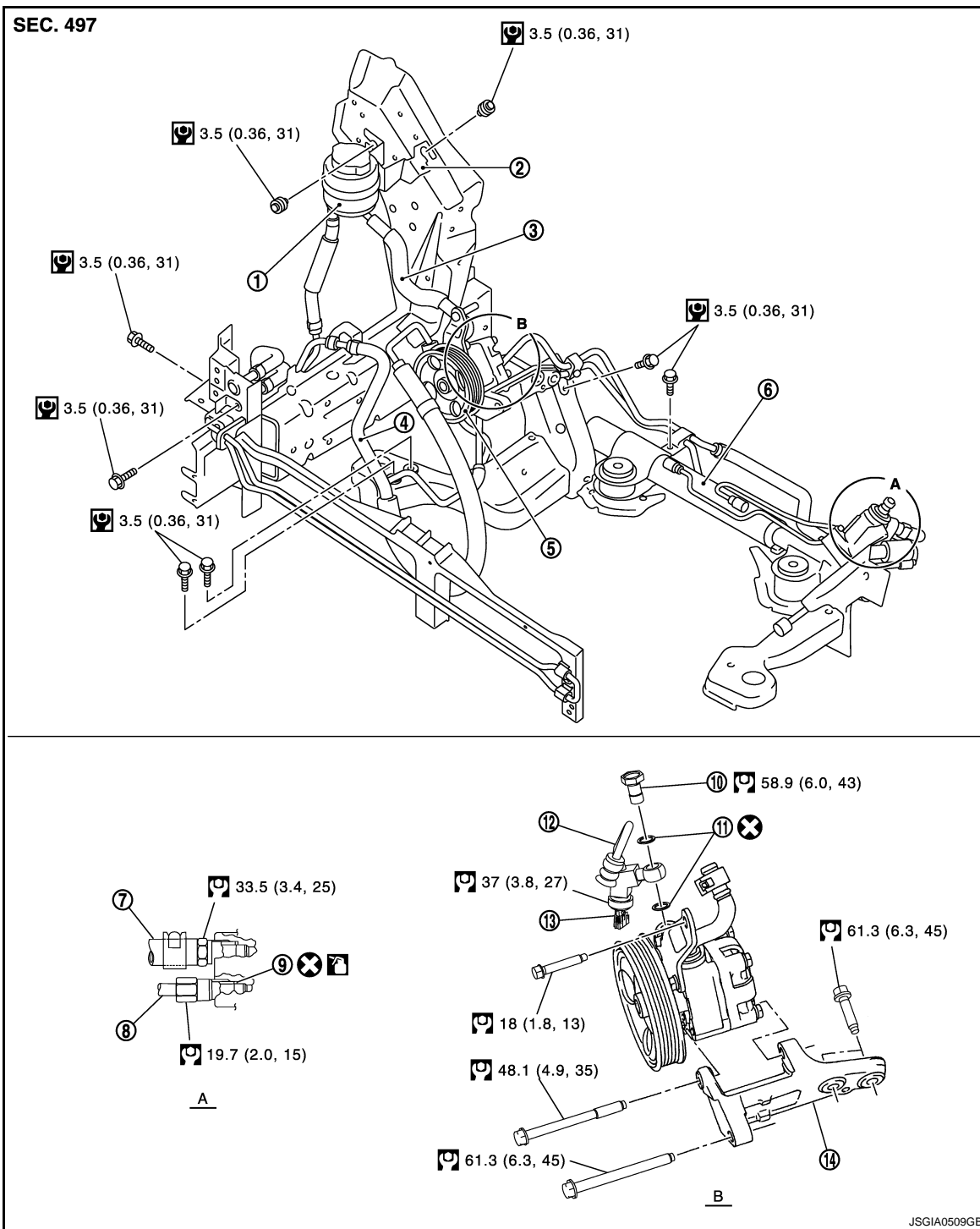
HYDRAULIC LINE

< SERVICE INFORMATION >

Refer to [GI-9, "Component"](#), and the followings for the symbols in the figure.

: Apply power steering fluid.

COMPONENTS (VQ35HR AWD MODELS)




- | | | |
|-----------------------|---------------------------|--|
| 1. Reservoir tank | 2. Reservoir tank bracket | 3. Suction hose |
| 4. High-pressure hose | 5. Oil pump assembly | 6. Steering gear assembly |
| 7. Low pressure hose | 8. High pressure piping | 9. O-ring |
| 10. Eye-bolt | 11. Copper washer | 12. Eye-joint (assembled to high-pressure side hose) |
| 13. Pressure sensor | 14. Oil pump bracket | |

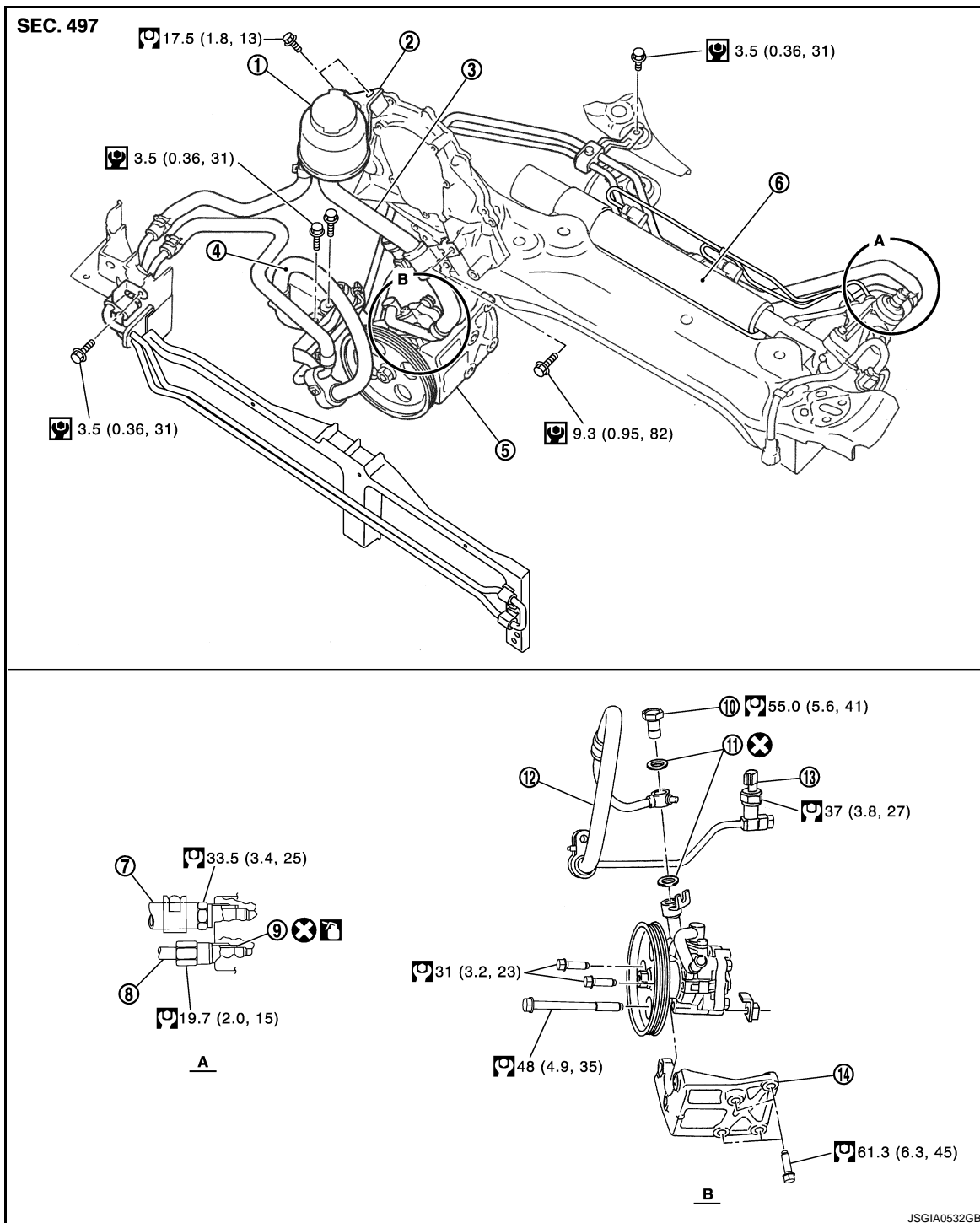
HYDRAULIC LINE

< SERVICE INFORMATION >

Refer to [GI-9, "Component"](#), and the followings for the symbols in the figure.

: Apply power steering fluid.

COMPONENTS (VK45DE 2WD MODELS)




- | | | |
|-----------------------|---------------------------|--|
| 1. Reservoir tank | 2. Reservoir tank bracket | 3. Suction hose |
| 4. High-pressure hose | 5. Oil pump assembly | 6. Steering gear assembly |
| 7. Low pressure hose | 8. High pressure piping | 9. O-ring |
| 10. Eye-bolt | 11. Copper washer | 12. Eye-joint (assembled to high-pressure side hose) |
| 13. Pressure sensor | 14. Oil pump bracket | |

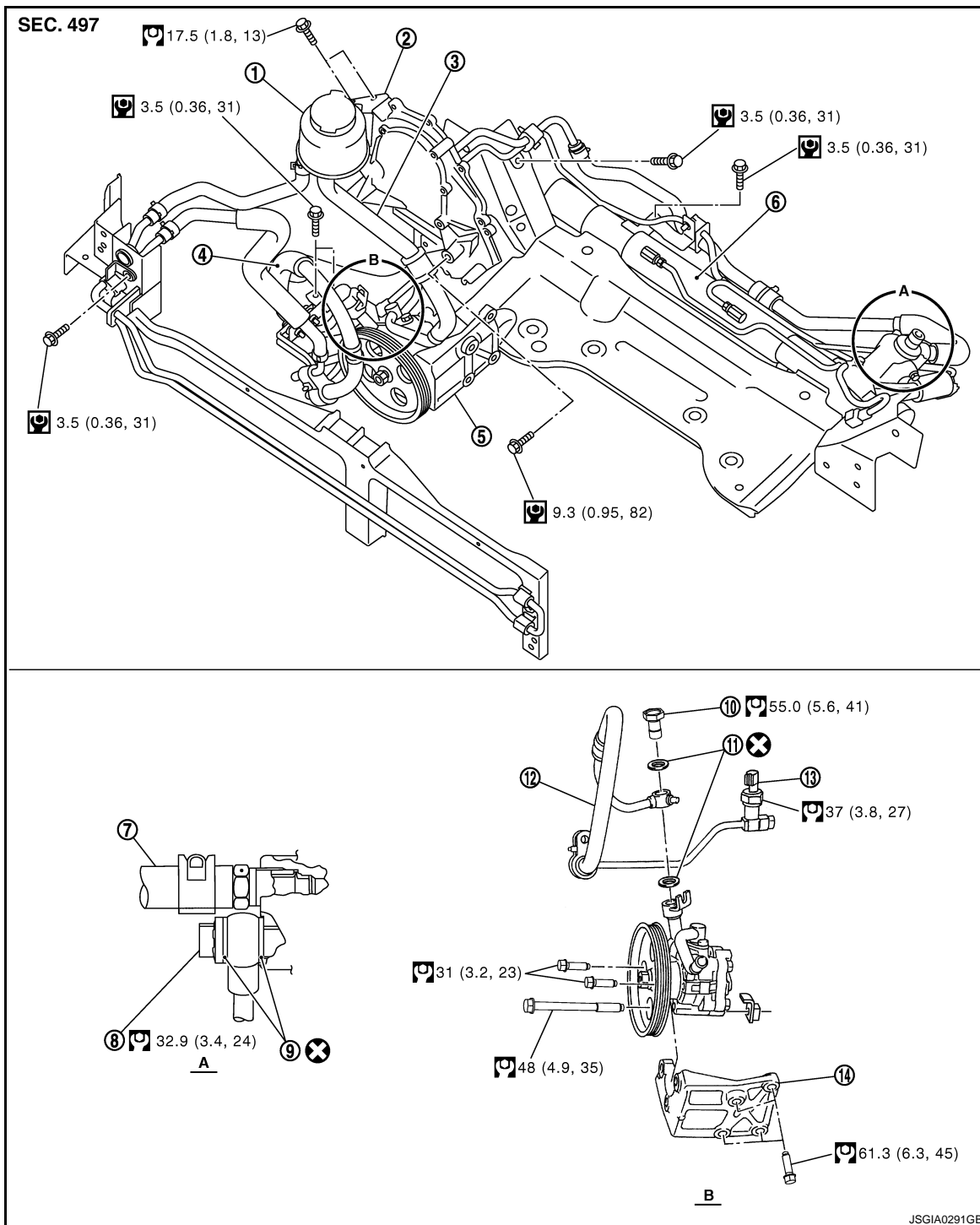
HYDRAULIC LINE

< SERVICE INFORMATION >

Refer to [GI-9, "Component"](#), and the followings for the symbols in the figure.

: Apply power steering fluid.

COMPONENTS (VK45DE AWD MODELS)



- | | | |
|-----------------------|---------------------------|--|
| 1. Reservoir tank | 2. Reservoir tank bracket | 3. Suction hose |
| 4. High-pressure hose | 5. Oil pump assembly | 6. Steering gear assembly |
| 7. Low pressure hose | 8. Eye-bolt | 9. Copper washer |
| 10. Eye-bolt | 11. Copper washer | 12. Eye-joint (assembled to high-pressure side hose) |
| 13. Pressure sensor | 14. Oil pump bracket | |

HYDRAULIC LINE

< SERVICE INFORMATION >

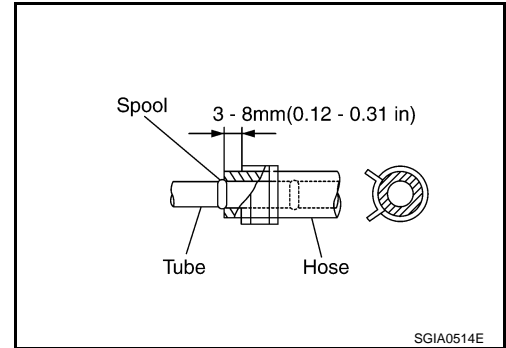
Refer to [GI-9, "Component"](#), and the followings for the symbols in the figure.

: Apply power steering fluid.

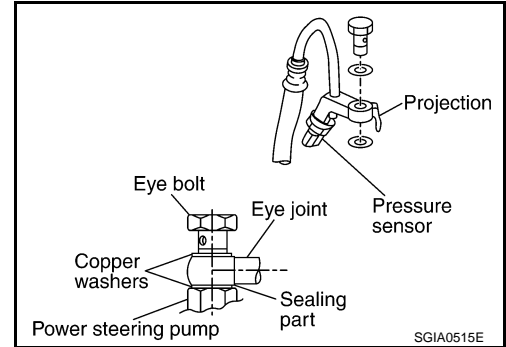
REMOVAL AND INSTALLATION

CAUTION:

- Securely insert harness connector to pressure sensor.
- Insert hose securely until it contacts tube spool (Do not apply fluid).



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



SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE INFORMATION >

SERVICE DATA AND SPECIFICATIONS (SDS)

Steering Wheel

INFOID:000000004158187

| | |
|-------------------------------|--------------------------------|
| Steering wheel axial end play | 0 mm (0 in) |
| Steering wheel play | 0 – 35 mm (0 – 1.38 in) |
| Steering wheel turning force | 7.45 N·m (0.76 kg·m, 66 in·lb) |

Steering Angle

INFOID:000000004158188

| Drive type | 2WD | | AWD |
|---|-----------|----------------|----------------|
| Tire size | 245/45R18 | 245/40R19 | 245/45R18 |
| Inner wheel Degree minute (Decimal degree) | Minimum | 36°20' (36.3°) | |
| | Nominal | 39°20' (39.3°) | |
| | Maximum | 40°20' (40.3°) | |
| Outer wheel Degree minute (Decimal degree) | Nominal | 33°25' (33.4°) | 32°30' (32.5°) |
| | | 33°20' (33.3°) | |

Steering Column

INFOID:000000004158189

STEERING COLUMN LENGTH

| | | |
|------------------------|--------------------|---------------------------------|
| Steering column length | Telescopic maximum | 551 – 555 mm (21.69 – 21.85 in) |
| | Telescopic minimum | 591 – 595 mm (23.27 – 23.43 in) |

TILT AND TELESCOPIC MECHANISM OPERATING RANGE

| | |
|--------------------------------------|--------------------|
| Tilt mechanism operating range | 37.5 mm (1.476 in) |
| Telescopic mechanism operating range | 40 mm (1.57 in) |

Lower Shaft

INFOID:000000004158190

Unit: mm (in)

| | | |
|---------------|---------------|---------------|
| Engine type | VK45DE | |
| Drive type | 2WD | AWD |
| Sliding range | 427.6 (16.83) | 435.4 (17.14) |

Steering Gear

INFOID:000000004158191

STEERING OUTER SOCKET AND INNER SOCKET

| | | |
|--------------------|---|--|
| Steering gear type | PR26AF | |
| Outer socket | Swinging torque | 0.1 – 2.9 N·m (0.01 – 0.29 kg·m, 1 – 25 in·lb) |
| | Measurement on spring balance • Measuring point at cotter pin hole of stud | 1.5 – 42.7 N (0.16 – 4.35 kg, 0.34 – 9.59 lb) |
| | Rotating torque | 0.1 – 2.9 N·m (0.01 – 0.29 kg·m, 1 – 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 | Swinging torque | 0.1 – 7.8 N·m (0.01 – 0.79 kg-m, 1 – 69 in-lb) |
| | Measurement on spring balance • Measuring point at *mark shown in the figure | 1.4 – 105.4 N (0.15 – 10.75 kg, 0.32 – 23.69 lb) |
| | Axial end play | 0.2 mm (0.008 in) or less |
| Inner socket length | | 63.9 mm (2.516 in) (2WD) 55.2 mm (2.173 in) (AWD) |

RACK STROKE

| | | |
|--|--------------------|--------------------|
| Steering gear model | PR26AF | |
| Drive type | 2WD | AWD |
| Rack neutral position, dimension (rack stroke) | 68.5 mm (2.697 in) | 67.5 mm (2.657 in) |

RACK SLIDING FORCE

| | | |
|--------------------|-----|--|
| Rack sliding force | 2WD | 195 – 258 N (19.9 – 26.3 kg, 44 – 58 lb) |
| | AWD | 227 – 305 N (23.2 – 31.1 kg, 51 – 69 lb) |

Oil Pump

INFOID:000000004158192

| | | | | |
|------------------------------------|--|-----|--|--|
| Engine type | VQ35HR | | VK45DE | |
| Drive type | 2WD | AWD | 2WD | AWD |
| Oil pump relief hydraulic pressure | 8,530 – 9,330 kPa (87.0 – 95.1 kg/cm ² , 1,237 – 1,352 psi) | | 8,520 – 9,320 kPa (86.9 – 95.1 kg/cm ² , 1,235 – 1,351 psi) | 8,800 – 9,300 kPa (89.8 – 94.8 kg/cm ² , 1,276 – 1,348 psi) |

Steering Fluid

INFOID:000000004158193

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