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**STEERING SYSTEM**

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## PRECAUTION

### PRECAUTIONS

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

INFOID:000000008459262

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 "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

**WARNING:**

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that 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 "SRS AIR BAG".
- Never 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:**

Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never 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.

#### Service Notice or Precautions for Steering System

INFOID:000000008459263

- 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.
  - Never reuse non-reusable parts.
  - Before assembling, apply the specified grease to the directed parts.

# PREPARATION

[WITH HEATED STEERING WHEEL]

< PREPARATION >

## PREPARATION

### PREPARATION

#### Special Service Tools

INFOID:000000008459264

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

| Tool number<br>(Kent-Moore No.)<br>Tool name  | Description   |
|---|---|
| ST27180001<br>(J-25726-A)<br>Steering wheel puller  | Removing steering wheel   |
| ST3127S000<br>(J-25765-A)<br>Preload gauge  | <ul style="list-style-type: none"> <li>• Measuring steering column rotating torque</li> <li>• Measuring pinion rotating torque</li> <li>• Measuring ball joint rotating torque</li> </ul> |
| KV48104400<br>( — )<br>Teflon ring correcting tool<br>a: 50 mm (1.97 in) dia.<br>b: 36 mm (1.42 in) dia.<br>c: 100 mm (3.94 in) | Installing rack Teflon ring   |
| KV48103400<br>( — )<br>Preload adapter  | Measuring pinion rotating torque  |
| ST35300000<br>( — )<br>Drift<br>a: 45.1 mm (1.776 in) dia.<br>b: 59.0 mm (2.323 in) dia.  | Installing oil pump oil seal  |

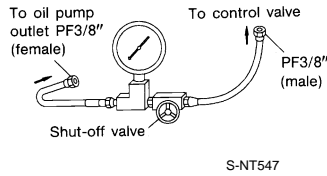
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# PREPARATION

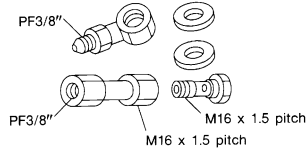
< PREPARATION >

[WITH HEATED STEERING WHEEL]

| Tool number<br>(Kent-Moore No.)<br>Tool name          | Description                        |
|---|------------------------------------|
| KV48103500<br>(J-26357)<br>Oil pressure gauge         | Measuring oil pump relief pressure |
| KV48102500<br>(J-33914)<br>Oil pressure gauge adapter | Measuring oil pump relief pressure |



S-NT547

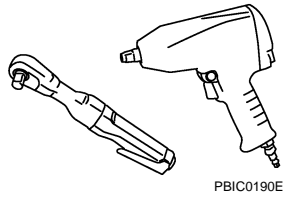


S-NT542

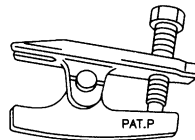
## Commercial Service Tools

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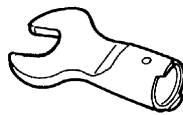
| Tool name          | Description                    |
|--------------------|--------------------------------|
| Power tool         | Loosening bolts and nuts       |
| Ball joint remover | Removing steering outer socket |
| Open head          | Tightening end cover assembly  |



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S-NT146

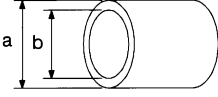
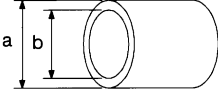


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# PREPARATION

< PREPARATION >

[WITH HEATED STEERING WHEEL]

| Tool name   | Description                         |
|---|-------------------------------------|
| <p>Drift<br/>                     a: 15 mm (0.59 in) dia.<br/>                     b: 10 mm (0.39 in) dia.</p>  <p style="text-align: center;">S-NT474</p> | <p>Installing rotor snap ring</p>   |
| <p>Drift<br/>                     a: 36 mm (1.42 in) dia.<br/>                     b: 20 mm (0.79 in) dia.</p>  <p style="text-align: center;">S-NT474</p> | <p>Installing oil pump oil seal</p> |

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# COMPONENT PARTS

< SYSTEM DESCRIPTION >

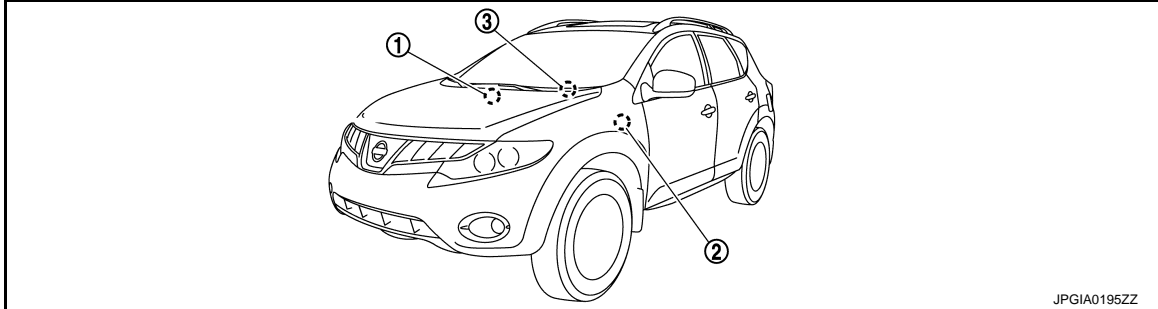
[WITH HEATED STEERING WHEEL]

## SYSTEM DESCRIPTION

### COMPONENT PARTS

#### Component Parts Location (Heated Steering Wheel)

INFOID:000000008459266



JPGIA0195ZZ

1. Heated steering wheel relay  
Refer to [PG-38, "Main Harness"](#).
2. Heated steering wheel switch
3. Heated steering wheel

#### Component Description (Heated Steering Wheel)

INFOID:000000008459267

| Part name                    |                 | Reference/Function  |
|------------------------------|-----------------|---|
| Heated steering wheel        | Heating element | Refer to <a href="#">ST-8, "Heated Steering Wheel"</a> .        |
|                              | Thermostat      |   |
| Heated steering wheel relay  |                 | Refer to <a href="#">ST-8, "Heated Steering Wheel Relay"</a> .  |
| Heated steering wheel switch | Timer           | Refer to <a href="#">ST-8, "Heated Steering Wheel Switch"</a> . |

#### Heated Steering Wheel

INFOID:000000008459268

The heated steering wheel is activated by the power supply from the heated steering wheel relay. Furthermore, the heated steering wheel incorporates a heating element and a thermostat to control heated steering wheel temperatures.

- Heating element: Heat is generated by the passage of an electric current.
- Thermostat: ON/OFF operation of power supply at a certain temperature.

#### Heated Steering Wheel Switch

INFOID:000000008459269

- Controls the heated steering wheel relay and operates the heated steering wheel system.  
The heated steering wheel switch incorporates a timer and turns OFF the heated steering wheel relay when operating time reaches a certain time.
- Timer: ON/OFF operation of the heated steering wheel relay at a certain time.
- Turns the indicator lamp ON when the system is activated.

#### Heated Steering Wheel Relay

INFOID:000000008459270

Operates the heated steering system with the control signal from the heated steering wheel switch.



SYSTEM

System Description (Heated Steering Wheel)

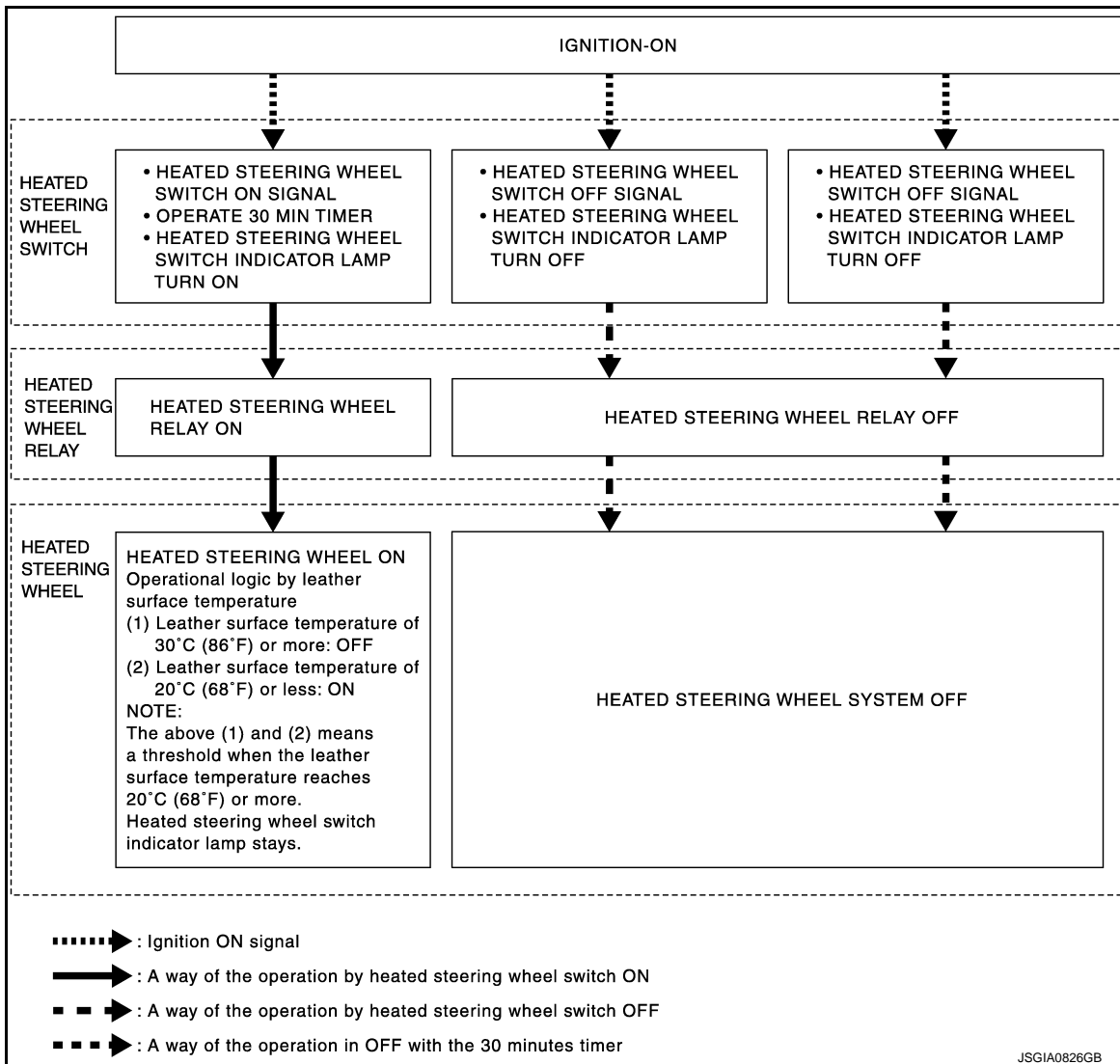
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The heated steering wheel switch controls the heated steering wheel relay. When the heated steering wheel switch is turned on, the heated steering wheel relay is energized and the heated steering wheel system will operate. The heated steering wheel system will turn off when the heated steering wheel temperature reaches approximately 30°C (86°F). Heated steering wheel system operation can also be canceled by pressing the heated steering wheel switch again. In addition, the heated steering wheel switch incorporates a timer and turns OFF the heated steering wheel relay to exit the heated steering wheel system when the operating time reaches a certain time.

**NOTE:**

If the surface temperature of the steering wheel is below 20°C (68°F), the system will heat the steering wheel and cycle off and on to maintain a temperature above 20°C (68°F). The indicator lamp will remain on as long as the system is on. Push the switch again to turn the heated steering wheel system off manually. The indicator lamp will go off.

SYSTEM DIAGRAM



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# HEATED STEERING WHEEL

[WITH HEATED STEERING WHEEL]

< WIRING DIAGRAM >

## WIRING DIAGRAM

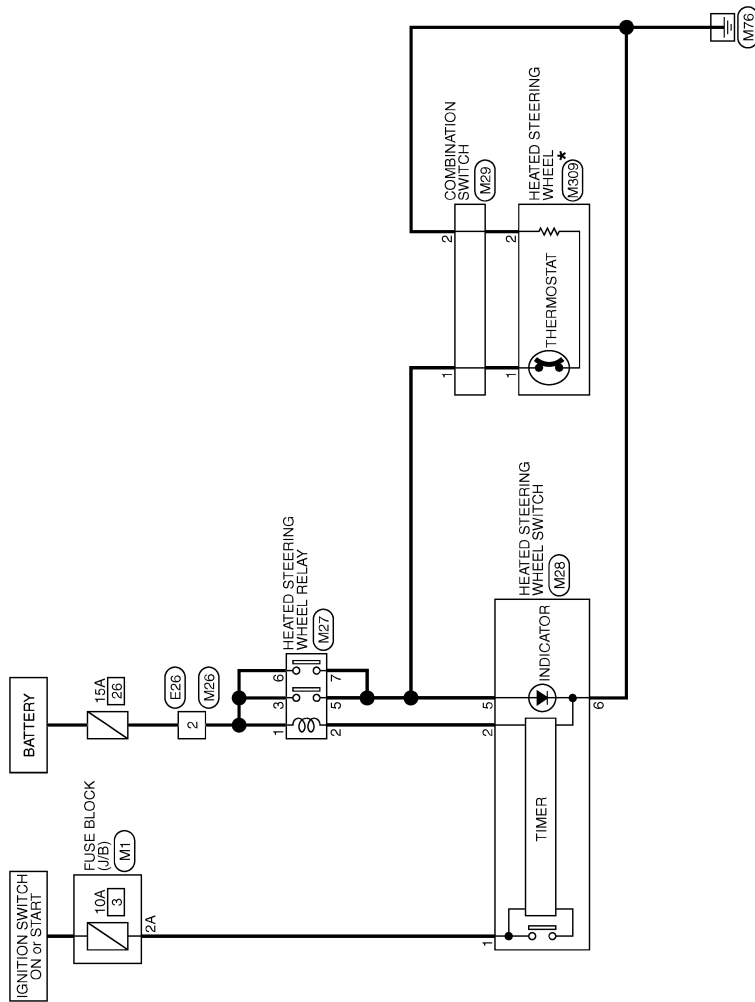
### HEATED STEERING WHEEL

#### Wiring Diagram

INFOID:000000008459272

For connector terminal arrangements, harness layouts, and alphabets in a ◊ (option abbreviation; if not described in wiring diagram), refer to [GI-12. "Connector Information"](#).

#### HEATED STEERING WHEEL



\*: This connector is not shown in "Harness Layout".

2010/09/06

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# DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

[WITH HEATED STEERING WHEEL]

## BASIC INSPECTION

### DIAGNOSIS AND REPAIR WORK FLOW

WorkFlow (Heated Steering Wheel)

INFOID:000000008459273

#### DETAILED FLOW

#### 1.OBTAIN INFORMATION ABOUT SYMPTOM

Interview the customer to obtain the malfunction information (conditions and environment when the malfunction occurred) as much as possible when the customer brings the vehicle in.

>> GO TO 2.

#### 2.REPRODUCE THE MALFUNCTION INFORMATION

Check the malfunction on the vehicle that the customer describes.  
Inspect the relation of the symptoms and the condition when the symptoms occur.

>> GO TO 3.

#### 3.IDENTIFY THE MALFUNCTIONING SYSTEM WITH "SYMPTOM DIAGNOSIS"

Use "Symptom diagnosis" from the symptom inspection result in step 2 and then identify where to start performing the diagnosis based on possible causes and symptoms.

>> GO TO 4.

#### 4.IDENTIFY THE MALFUNCTIONING PARTS WITH "COMPONENT DIAGNOSIS"

Perform the diagnosis with "Component diagnosis" of the applicable system.

>> GO TO 5.

#### 5.REPAIR OR REPLACE THE MALFUNCTIONING PARTS

Repair or replace the specified malfunctioning parts.

>> GO TO 6.

#### 6.FINAL CHECK

Check that malfunctions are not reproduced when obtaining the malfunction information from the customer, referring to the symptom inspection result in step 2.

Are the malfunctions corrected?

YES >> INSPECTION END

NO >> GO TO 2.

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# STEERING WHEEL

< BASIC INSPECTION >

[WITH HEATED STEERING WHEEL]

## STEERING WHEEL

### Inspection

INFOID:000000008459274

#### NEUTRAL POSITION STEERING WHEEL

1. Check that steering gear assembly, steering column assembly and steering wheel are installed in the correct position.
2. Perform neutral position inspection after wheel alignment. Refer to [FSU-7, "Inspection"](#).
3. Set the vehicle to the straight-ahead position and confirm steering wheel is in the neutral position.
4. 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.

#### STEERING WHEEL TURNING FORCE

1. Park the vehicle on a level and dry surface, set parking brake.
2. Tires need to be inflated normal pressure. Refer to [WT-49, "Tire Air Pressure"](#).
3. Start the engine.
4. Bring power steering fluid up to adequate operating temperature.

**Fluid temperature** : 50 – 80°C (122 – 176°F)

5. Check steering wheel turning force when steering wheel has been turned 540° from neutral position.

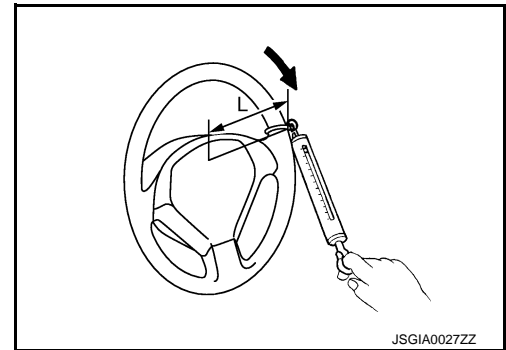
**Standard**

**Steering wheel turning force** : Refer to [ST-65, "Steering Wheel Turning Force"](#).

**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.

6. 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 [ST-60, "Inspection"](#).



#### RACK SLIDING FORCE

1. Disconnect lower joint and steering knuckle from steering gear assembly. Refer to [ST-41, "Exploded View"](#).
2. Start and run the engine at idle to make sure steering fluid has reached normal operating temperature.

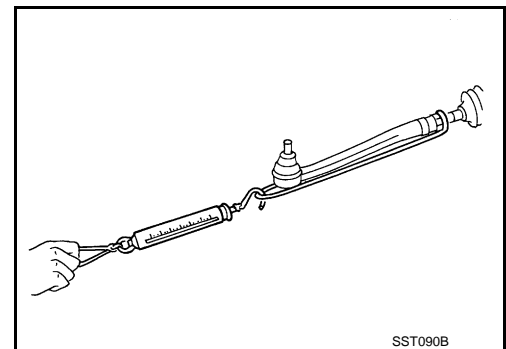
**Fluid temperature** : 50 – 80°C (122 – 176°F)

3. While pulling outer socket slowly in  $\pm 11.5$  mm ( $\pm 0.453$  in) range from neutral position, make sure rack sliding force is within specification.

**Standard**

**Rack sliding force** : Refer to [ST-66, "Rack Sliding Force"](#).

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



#### FRONT WHEEL TURNING ANGLE

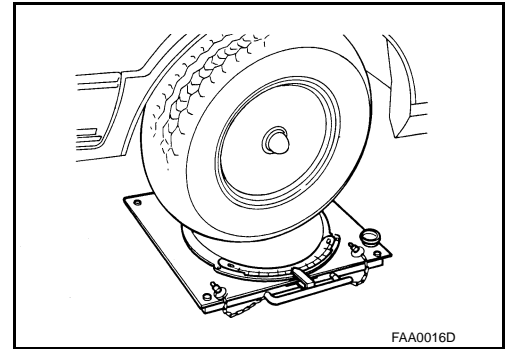
1. Check front wheel turning angle after toe-in inspection. Refer to [FSU-7, "Inspection"](#).

# STEERING WHEEL

## < BASIC INSPECTION >

## [WITH HEATED STEERING WHEEL]

- 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.

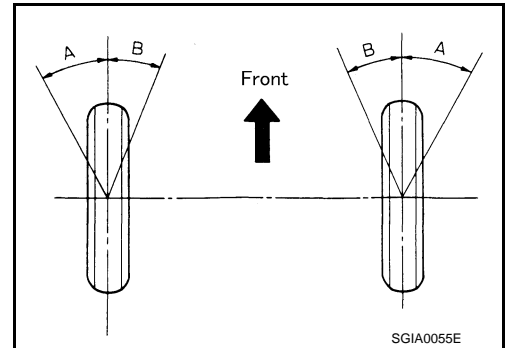


- With the engine at idle, turn steering wheel from full left stop to full right stop and measure the turning angles.

### Standard

**Inner wheel (Angle: A)** : Refer to [ST-65, "Steering Angle"](#).

**Outer wheel (Angle: B)** : Refer to [ST-65, "Steering Angle"](#).



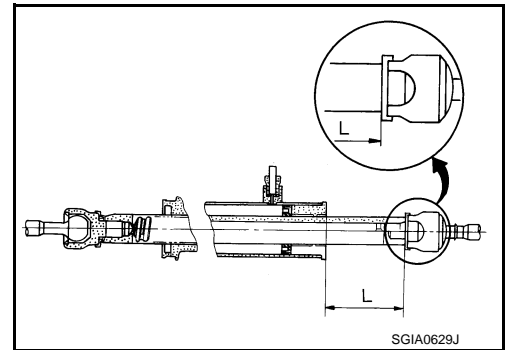
- Check the following items when turning angle is out of the standard.

- Check the neutral position of the rack stroke (L).

### Standard

**Rack stroke neutral position (L)** : Refer to [ST-66, "Rack Stroke"](#).

- 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.



A  
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P

# HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

## DTC/CIRCUIT DIAGNOSIS

### HEATED STEERING WHEEL SYSTEM

#### Component Function Check

INFOID:000000008459275

#### 1. CHECK HEATED STEERING WHEEL SYSTEM

Check operate heated steering wheel system. Refer to [ST-9. "System Description \(Heated Steering Wheel\)"](#).

Is the inspection result normal?

YES >> Go to [ST-14. "Diagnosis Procedure"](#).

NO >> INSPECTION END

#### Diagnosis Procedure

INFOID:000000008459276

#### 1. CHECK POWER SOURCE AND GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Remove the heated steering wheel. Refer to [ST-34. "Removal and Installation"](#).
3. Turn ignition switch ON.  
**CAUTION:**  
**Never start the engine.**
4. Turn heated steering wheel switch ON.
5. Check voltage between heated steering wheel harness connector terminals.

| Heated steering wheel |          | Condition  | Voltage (Approx.) |
|-----------------------|----------|--|-------------------|
| Connector             | Terminal |  |                   |
| M309                  | 1 - 2    | Within 30 minutes after turning ON the heated steering switch. | Battery voltage   |
|                       |          | Other conditions.  | 0 V               |

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

#### 2. CHECK HEATED STEERING WHEEL

Check heated steering wheel. Refer to [ST-16. "Component Inspection \(Heated Steering Wheel\)"](#).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace heated steering wheel. Refer to [ST-34. "Removal and Installation"](#).

#### 3. CHECK GROUND CIRCUIT

Check continuity between heated steering wheel harness connector terminal and ground.

| Heated steering wheel |          | Ground | Continuity |
|-----------------------|----------|--------|------------|
| Connector             | Terminal |        |            |
| M309                  | 2        |        | Existed    |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace damaged parts.

#### 4. CHECK HARNESS BETWEEN HEATED STEERING WHEEL RELAY AND HEATED STEERING WHEEL

1. Turn ignition switch OFF.
2. Disconnect heated steering wheel relay connector. Refer to [ST-8. "Component Parts Location \(Heated Steering Wheel\)"](#).
3. Disconnect heated steering wheel switch connector. Refer to [ST-64. "Removal and Installation"](#).
4. Check continuity between heated steering wheel relay harness connector terminal and heated steering wheel harness connector terminal.

# HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

| Heated steering wheel relay |          | Heated steering wheel |          | Continuity |
|-----------------------------|----------|-----------------------|----------|------------|
| Connector                   | Terminal | Connector             | Terminal |            |
| M27                         | 5        | M309                  | 1        | Existed    |
|                             | 7        |                       |          |            |

5. Check continuity between heated steering wheel relay harness connector terminal and ground.

| Heated steering wheel relay |          | Ground | Continuity  |
|-----------------------------|----------|--------|-------------|
| Connector                   | Terminal |        |             |
| M27                         | 5        |        | Not existed |
|                             | 7        |        |             |

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace damaged parts.

## 5.CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to [ST-17. "Component Inspection \(Heated Steering Wheel Relay\)".](#)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace heated steering wheel relay. Refer to [ST-8. "Component Parts Location \(Heated Steering Wheel\)".](#)

## 6.CHECK POWER SUPPLY (BATTERY)

Check the following.

- Battery
- Harness for short or open between battery and 15 A fuse (No.26).
- 15 A fuse (No.26).
- Harness for short or open between 15 A fuse (No.26) and heated steering wheel relay.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace damaged parts.

## 7.CHECK GROUND CIRCUIT

Check continuity between heated steering wheel switch harness connector terminal and ground.

| Heated steering wheel switch |          | Ground | Continuity |
|------------------------------|----------|--------|------------|
| Connector                    | Terminal |        |            |
| M28                          | 6        |        | Existed    |

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace damaged parts.

## 8.CHECK HARNESS BETWEEN HEATED STEERING WHEEL RELAY AND HEATED STEERING WHEEL SWITCH

1. Check continuity between heated steering wheel relay harness connector terminal and heated steering wheel switch harness connector terminal.

| Heated steering wheel relay |          | Heated steering wheel switch |          | Continuity |
|-----------------------------|----------|------------------------------|----------|------------|
| Connector                   | Terminal | Connector                    | Terminal |            |
| M27                         | 2        | M28                          | 2        | Existed    |

2. Check continuity between heated steering wheel relay harness connector terminal and ground.

# HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

| Heated steering wheel relay |          | Ground | Continuity  |
|-----------------------------|----------|--------|-------------|
| Connector                   | Terminal |        |             |
| M27                         | 2        |        | Not existed |

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace damaged parts.

## 9.CHECK HARNESS BETWEEN FUSE BLOCK (J/B) AND HEATED STEERING WHEEL SWITCH

1. Check continuity between fuse block (J/B) connector terminal and heated steering wheel switch harness connector terminal.

| Fuse block (J/B) |          | Heated steering wheel switch |          | Continuity |
|------------------|----------|------------------------------|----------|------------|
| Connector        | Terminal | Connector                    | Terminal |            |
| M1               | 2A       | M28                          | 1        | Existed    |

2. Check continuity between fuse block (J/B) harness connector terminal and ground.

| Fuse block (J/B) |          | Ground | Continuity  |
|------------------|----------|--------|-------------|
| Connector        | Terminal |        |             |
| M1               | 2A       |        | Not existed |

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace damaged parts.

## 10.CHECK POWER SUPPLY (IGNITION)

Check the following.

- Ignition switch
- Harness for short or open between ignition switch and fuse block (J/B). Refer to [PG-21, "Wiring Diagram - IGNITION POWER SUPPLY -"](#).
- 10A fuse [No.3, located in the fuse block (J/B)]. Refer to [PG-112, "Fuse, Connector and Terminal Arrangement"](#).
- Fuse block (J/B)

Is the inspection result normal?

YES >> Replace heated steering wheel switch. Refer to [ST-64, "Removal and Installation"](#).

NO >> Repair or replace damaged parts.

## Component Inspection (Heated Steering Wheel)

INFOID:000000008459277

### 1.CHECK HEATED STEERING WHEEL CONTINUITY

Check continuity between heated steering wheel connector terminals.

| Heated steering wheel |  | Condition  | Continuity  |
|-----------------------|--|--|-------------|
| Terminal              |  |  |             |
| 1 - 2                 |  | Leather surface temperature of 20°C (68°F) or less | Existed     |
|                       |  | Leather surface temperature of 30°C (86°) or more  | Not existed |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace heated steering wheel. Refer to [ST-34, "Removal and Installation"](#).

### 2.CHECK HEATED STEERING WHEEL RESISTANCE

Check resistance between heated steering wheel connector terminals.



# HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

| Heated steering wheel<br>Terminal | Condition                                  | Resistance (Approx.) |
|-----------------------------------|--|----------------------|
| 1 – 2                             | Leather surface temperature of 20°C (68°F) | 1.83 Ω               |

A  
B

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace heated steering wheel. Refer to [ST-34. "Removal and Installation"](#).

C

## Component Inspection (Heated Steering Wheel Relay)

INFOID:0000000008459278

### 1. CHECK HEATED STEERING WHEEL RELAY CONTINUITY

D

Check continuity between heated steering wheel relay terminals.

**CAUTION:**

**Connect the fuse between the terminals when applying the voltage.**

E

| Heated steering wheel relay<br>Terminal | Condition  | Continuity  |
|---|--|-------------|
| 3 – 5<br>6 – 7                          | Apply 12 V direct current between terminals 1 and 2. | Existed     |
|   | Other conditions.                                    | Not existed |

F

ST

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace heated steering wheel relay. Refer to [ST-8. "Component Parts Location \(Heated Steering Wheel\)"](#).

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# HEATED STEERING WHEEL SWITCH INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

## HEATED STEERING WHEEL SWITCH INDICATOR LAMP

### Component Function Check

INFOID:000000008459279

#### 1. CHECK HEATED STEERING WHEEL INDICATOR LAMP

1. Turn ignition switch ON.
2. Turn heated steering wheel switch ON.

Does heated steering wheel indicator lamp turn on the lamp?

- YES >> GO TO 2.  
NO >> Go to [ST-18. "Diagnosis Procedure"](#).

#### 2. CHECK HEATED STEERING WHEEL INDICATOR LAMP

Turn heated steering wheel switch OFF.

Does heated steering wheel indicator lamp turn off the lamp?

- YES >> INSPECTION END  
NO >> Go to [ST-18. "Diagnosis Procedure"](#).

### Diagnosis Procedure

INFOID:000000008459280

#### 1. CHECK POWER SOURCE AND GROUND CIRCUIT

1. Turn ignition switch ON.  
**CAUTION:**  
**Never start the engine.**
2. Turn heated steering wheel switch ON.
3. Check voltage between heated steering wheel switch harness connector terminals.

| Heated steering wheel |          | Condition  | Voltage (Approx.) |
|-----------------------|----------|--|-------------------|
| Connector             | Terminal |  |                   |
| M28                   | 5 - 6    | Within 30 minutes after turning ON the heated steering switch. | Battery voltage   |
|                       |          | Other conditions.  | 0 V               |

Is the inspection result normal?

- YES >> GO TO 7.  
NO >> GO TO 2.

#### 2. CHECK POWER SUPPLY (BATTERY)

Check the following.

- Battery
- Harness for short or open between battery and 15 A fuse (No.26).
- 15 A fuse (No.26).
- Harness for short or open between 15 A fuse (No.26) and heated steering wheel relay.

Is the inspection result normal?

- YES >> GO TO 3.  
NO >> Repair or replace damaged parts.

#### 3. CHECK GROUND CIRCUIT

Check continuity between heated steering wheel switch harness connector terminal and ground.

| Heated steering wheel switch |          | Ground | Continuity |
|------------------------------|----------|--------|------------|
| Connector                    | Terminal |        |            |
| M28                          | 6        |        | Existed    |

Is the inspection result normal?

- YES >> GO TO 4.  
NO >> Repair or replace damaged parts.

# HEATED STEERING WHEEL SWITCH INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

## 4. CHECK HARNESS BETWEEN HEATED STEERING WHEEL RELAY AND HEATED STEERING WHEEL SWITCH

1. Turn ignition switch OFF.
2. Disconnect heated steering wheel relay connector. Refer to [ST-8, "Component Parts Location \(Heated Steering Wheel\)"](#).
3. Disconnect heated steering wheel switch connector. Refer to [ST-64, "Removal and Installation"](#).
4. Check continuity between heated steering wheel relay harness connector terminal and heated steering wheel switch harness connector terminal.

| Heated steering wheel relay |          | Heated steering wheel switch |          | Continuity |
|-----------------------------|----------|------------------------------|----------|------------|
| Connector                   | Terminal | Connector                    | Terminal |            |
| M27                         | 5        | M28                          | 5        | Existed    |
|                             | 7        |                              |          |            |

5. Check continuity between heated steering wheel relay harness connector terminal and ground.

| Heated steering wheel relay |          | Ground | Continuity  |
|-----------------------------|----------|--------|-------------|
| Connector                   | Terminal |        |             |
| M27                         | 5        |        | Not existed |
|                             | 7        |        |             |

Is the inspection result normal?

- YES >> GO TO 5.  
 NO >> Repair or replace damaged parts.

## 5. CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to [ST-20, "Component Inspection \(Heated Steering Wheel Relay\)"](#).

Is the inspection result normal?

- YES >> GO TO 6.  
 NO >> Replace heated steering wheel relay. Refer to [ST-8, "Component Parts Location \(Heated Steering Wheel\)"](#).

## 6. CHECK HARNESS BETWEEN HEATED STEERING WHEEL RELAY AND HEATED STEERING WHEEL SWITCH

1. Check continuity between heated steering wheel relay harness connector terminal and heated steering wheel switch harness connector terminal.

| Heated steering wheel relay |          | Heated steering wheel switch |          | Continuity |
|-----------------------------|----------|------------------------------|----------|------------|
| Connector                   | Terminal | Connector                    | Terminal |            |
| M27                         | 2        | M28                          | 2        | Existed    |

2. Check continuity between heated steering wheel relay harness connector terminal and ground.

| Heated steering wheel relay |          | Ground | Continuity  |
|-----------------------------|----------|--------|-------------|
| Connector                   | Terminal |        |             |
| M27                         | 2        |        | Not existed |

Is the inspection result normal?

- YES >> GO TO 7.  
 NO >> Repair or replace damaged parts.

## 7. CHECK HARNESS BETWEEN FUSE BLOCK (J/B) AND HEATED STEERING WHEEL SWITCH

1. Check continuity between fuse block (J/B) connector terminal and heated steering wheel switch harness connector terminal.

# HEATED STEERING WHEEL SWITCH INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

| Fuse block (J/B) |          | Heated steering wheel switch |          | Continuity |
|------------------|----------|------------------------------|----------|------------|
| Connector        | Terminal | Connector                    | Terminal |            |
| M1               | 2A       | M28                          | 1        | Existed    |

2. Check continuity between fuse block (J/B) harness connector terminal and ground.

| Fuse block (J/B) |          | Ground | Continuity  |
|------------------|----------|--------|-------------|
| Connector        | Terminal |        |             |
| M1               | 2A       |        | Not existed |

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Repair or replace damaged parts.

## 8. CHECK POWER SUPPLY (IGNITION)

Check the following.

- Ignition switch
- Harness for short or open between ignition switch and fuse block (J/B). Refer to [PG-21, "Wiring Diagram - IGNITION POWER SUPPLY -"](#).
- 10A fuse [No.3, located in the fuse block (J/B)]. Refer to [PG-112, "Fuse, Connector and Terminal Arrangement"](#).
- Fuse block (J/B)

Is the inspection result normal?

- YES >> Replace heated steering wheel switch. Refer to [ST-64, "Removal and Installation"](#).
- NO >> Repair or replace damaged parts.

## Component Inspection (Heated Steering Wheel Relay)

INFOID:000000008459281

### 1. CHECK HEATED STEERING WHEEL RELAY CONTINUITY

Check continuity between heated steering wheel relay terminals.

**CAUTION:**

**Connect the fuse between the terminals when applying the voltage.**

| Heated steering wheel relay |       | Condition  | Continuity  |
|-----------------------------|-------|--|-------------|
| Terminal                    |       |  |             |
| 3 – 5                       | 6 – 7 | Apply 12 V direct current between terminals 1 and 2. | Existed     |
|                             |       | Other conditions.                                    | Not existed |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace heated steering wheel relay. Refer to [ST-8, "Component Parts Location \(Heated Steering Wheel\)"](#).

# HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

< SYMPTOM DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

## SYMPTOM DIAGNOSIS

### HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

#### Description

INFOID:000000008459282

- The heated steering wheel does not warm up.
- The heated steering wheel system cannot be turned OFF.

#### Diagnosis Procedure

INFOID:000000008459283

#### 1. CHECK POWER SOURCE AND GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Remove the heated steering wheel. Refer to [ST-34, "Removal and Installation"](#).
3. Turn ignition switch ON.  
**CAUTION:**  
**Never start the engine.**
4. Turn heated steering wheel switch ON.
5. Check voltage between heated steering wheel harness connector terminals.

| Heated steering wheel |          | Condition  | Voltage (Approx.) |
|-----------------------|----------|--|-------------------|
| Connector             | Terminal |  |                   |
| M309                  | 1 - 2    | Within 30 minutes after turning ON the heated steering switch. | Battery voltage   |
|                       |          | Other conditions.  | 0 V               |

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> GO TO 3.

#### 2. CHECK HEATED STEERING WHEEL

Check heated steering wheel. Refer to [ST-16, "Component Inspection \(Heated Steering Wheel\)"](#).

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace heated steering wheel. Refer to [ST-34, "Removal and Installation"](#).

#### 3. CHECK GROUND CIRCUIT

Check continuity between heated steering wheel harness connector terminal and ground.

| Heated steering wheel |          | Ground | Continuity |
|-----------------------|----------|--------|------------|
| Connector             | Terminal |        |            |
| M309                  | 2        |        | Existed    |

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair or replace damaged parts.

#### 4. CHECK HARNESS BETWEEN HEATED STEERING WHEEL RELAY AND HEATED STEERING WHEEL

1. Turn ignition switch OFF.
2. Disconnect heated steering wheel relay connector. Refer to [ST-16, "Component Inspection \(Heated Steering Wheel\)"](#).
3. Disconnect heated steering wheel switch connector. Refer to [ST-64, "Removal and Installation"](#).
4. Check continuity between heated steering wheel relay harness connector terminal and heated steering wheel harness connector terminal.

# HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

< SYMPTOM DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

| Heated steering wheel relay |          | Heated steering wheel |          | Continuity |
|-----------------------------|----------|-----------------------|----------|------------|
| Connector                   | Terminal | Connector             | Terminal |            |
| M27                         | 5        | M309                  | 1        | Existed    |
|                             | 7        |                       |          |            |

5. Check continuity between heated steering wheel relay harness connector terminal and ground.

| Heated steering wheel relay |          | Ground | Continuity  |
|-----------------------------|----------|--------|-------------|
| Connector                   | Terminal |        |             |
| M27                         | 5        |        | Not existed |
|                             | 7        |        |             |

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace damaged parts.

## 5.CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to [ST-17. "Component Inspection \(Heated Steering Wheel Relay\)".](#)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace heated steering wheel relay. Refer to [ST-17. "Component Inspection \(Heated Steering Wheel Relay\)".](#)

## 6.CHECK POWER SUPPLY (BATTERY)

Check the following.

- Battery
- Harness for short or open between battery and 15 A fuse (No.26).
- 15 A fuse (No.26).
- Harness for short or open between 15 A fuse (No.26) and heated steering wheel relay.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace damaged parts.

## 7.CHECK GROUND CIRCUIT

Check continuity between heated steering wheel switch harness connector terminal and ground.

| Heated steering wheel switch |          | Ground | Continuity |
|------------------------------|----------|--------|------------|
| Connector                    | Terminal |        |            |
| M28                          | 6        |        | Existed    |

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace damaged parts.

## 8.CHECK HARNESS BETWEEN HEATED STEERING WHEEL RELAY AND HEATED STEERING WHEEL SWITCH

1. Check continuity between heated steering wheel relay harness connector terminal and heated steering wheel switch harness connector terminal.

| Heated steering wheel relay |          | Heated steering wheel switch |          | Continuity |
|-----------------------------|----------|------------------------------|----------|------------|
| Connector                   | Terminal | Connector                    | Terminal |            |
| M27                         | 2        | M28                          | 2        | Existed    |

2. Check continuity between heated steering wheel relay harness connector terminal and ground.

# HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

< SYMPTOM DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

| Heated steering wheel relay |          | Ground | Continuity  |
|-----------------------------|----------|--------|-------------|
| Connector                   | Terminal |        |             |
| M27                         | 2        |        | Not existed |

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace damaged parts.

## 9. CHECK HARNESS BETWEEN FUSE BLOCK (J/B) AND HEATED STEERING WHEEL SWITCH

1. Check continuity between fuse block (J/B) connector terminal and heated steering wheel switch harness connector terminal.

| Fuse block (J/B) |          | Heated steering wheel switch |          | Continuity |
|------------------|----------|------------------------------|----------|------------|
| Connector        | Terminal | Connector                    | Terminal |            |
| M1               | 2A       | M28                          | 1        | Existed    |

2. Check continuity between fuse block (J/B) harness connector terminal and ground.

| Fuse block (J/B) |          | Ground | Continuity  |
|------------------|----------|--------|-------------|
| Connector        | Terminal |        |             |
| M1               | 2A       |        | Not existed |

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace damaged parts.

## 10. CHECK POWER SUPPLY (IGNITION)

Check the following.

- Ignition switch
- Harness for short or open between ignition switch and fuse block (J/B). Refer to [PG-21, "Wiring Diagram - IGNITION POWER SUPPLY -"](#).
- 10A fuse [No.3, located in the fuse block (J/B)]. Refer to [PG-112, "Fuse, Connector and Terminal Arrangement"](#).
- Fuse block (J/B)

Is the inspection result normal?

YES >> Replace heated steering wheel switch. Refer to [ST-64, "Removal and Installation"](#).

NO >> Repair or replace damaged parts.

# HEATED STEERING WHEEL SWITCH INDICATOR LAMP DOES NOT TURN ON [WITH HEATED STEERING WHEEL]

< SYMPTOM DIAGNOSIS >

## HEATED STEERING WHEEL SWITCH INDICATOR LAMP DOES NOT TURN ON

### Description

INFOID:000000008459284

- Heated steering wheel switch indicator lamp does not turn on the lamp.
- Heated steering wheel switch indicator lamp does not turn off the lamp.

### Diagnosis Procedure

INFOID:000000008459285

#### 1. CHECK POWER SOURCE AND GROUND CIRCUIT

1. Turn ignition switch ON.  
**CAUTION:**  
**Never start the engine.**
2. Turn heated steering wheel switch ON.
3. Check voltage between heated steering wheel switch harness connector terminals.

| Heated steering wheel |          | Condition  | Voltage (Approx.) |
|-----------------------|----------|--|-------------------|
| Connector             | Terminal |  |                   |
| M28                   | 5 – 6    | Within 30 minutes after turning ON the heated steering switch. | Battery voltage   |
|                       |          | Other conditions.  | 0 V               |

Is the inspection result normal?

- YES >> GO TO 7.  
NO >> GO TO 2.

#### 2. CHECK POWER SUPPLY (BATTERY)

Check the following.

- Battery
- Harness for short or open between battery and 15 A fuse (No.26).
- 15 A fuse (No.26).
- Harness for short or open between 15 A fuse (No.26) and heated steering wheel relay.

Is the inspection result normal?

- YES >> GO TO 3.  
NO >> Repair or replace damaged parts.

#### 3. CHECK GROUND CIRCUIT

Check continuity between heated steering wheel switch harness connector terminal and ground.

| Heated steering wheel switch |          | Ground | Continuity |
|------------------------------|----------|--------|------------|
| Connector                    | Terminal |        |            |
| M28                          | 6        |        | Existed    |

Is the inspection result normal?

- YES >> GO TO 4.  
NO >> Repair or replace damaged parts.

#### 4. CHECK HARNESS BETWEEN HEATED STEERING WHEEL RELAY AND HEATED STEERING WHEEL SWITCH

1. Turn ignition switch OFF.
2. Disconnect heated steering wheel relay connector. Refer to [ST-17. "Component Inspection \(Heated Steering Wheel Relay\)"](#).
3. Disconnect heated steering wheel switch connector. Refer to [ST-64. "Removal and Installation"](#).
4. Check continuity between heated steering wheel relay harness connector terminal and heated steering wheel switch harness connector terminal.



# HEATED STEERING WHEEL SWITCH INDICATOR LAMP DOES NOT TURN ON [WITH HEATED STEERING WHEEL]

< SYMPTOM DIAGNOSIS >

| Heated steering wheel relay |          | Heated steering wheel switch |          | Continuity |
|-----------------------------|----------|------------------------------|----------|------------|
| Connector                   | Terminal | Connector                    | Terminal |            |
| M27                         | 5        | M28                          | 5        | Existed    |
|                             | 7        |                              |          |            |

5. Check continuity between heated steering wheel relay harness connector terminal and ground.

| Heated steering wheel relay |          | Ground | Continuity  |
|-----------------------------|----------|--------|-------------|
| Connector                   | Terminal |        |             |
| M27                         | 5        |        | Not existed |
|                             | 7        |        |             |

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace damaged parts.

## 5.CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to [ST-17. "Component Inspection \(Heated Steering Wheel Relay\)".](#)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace heated steering wheel relay. Refer to [ST-17. "Component Inspection \(Heated Steering Wheel Relay\)".](#)

## 6.CHECK HARNESS BETWEEN HEATED STEERING WHEEL RELAY AND HEATED STEERING WHEEL SWITCH

1. Check continuity between heated steering wheel relay harness connector terminal and heated steering wheel switch harness connector terminal.

| Heated steering wheel relay |          | Heated steering wheel switch |          | Continuity |
|-----------------------------|----------|------------------------------|----------|------------|
| Connector                   | Terminal | Connector                    | Terminal |            |
| M27                         | 2        | M28                          | 2        | Existed    |

2. Check continuity between heated steering wheel relay harness connector terminal and ground.

| Heated steering wheel relay |          | Ground | Continuity  |
|-----------------------------|----------|--------|-------------|
| Connector                   | Terminal |        |             |
| M27                         | 2        |        | Not existed |

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace damaged parts.

## 7.CHECK HARNESS BETWEEN FUSE BLOCK (J/B) AND HEATED STEERING WHEEL SWITCH

1. Check continuity between fuse block (J/B) connector terminal and heated steering wheel switch harness connector terminal.

| Fuse block (J/B) |          | Heated steering wheel switch |          | Continuity |
|------------------|----------|------------------------------|----------|------------|
| Connector        | Terminal | Connector                    | Terminal |            |
| M1               | 2A       | M28                          | 1        | Existed    |

2. Check continuity between fuse block (J/B) harness connector terminal and ground.

| Fuse block (J/B) |          | Ground | Continuity  |
|------------------|----------|--------|-------------|
| Connector        | Terminal |        |             |
| M1               | 2A       |        | Not existed |

Is the inspection result normal?

**HEATED STEERING WHEEL SWITCH INDICATOR LAMP DOES NOT TURN ON**  
< SYMPTOM DIAGNOSIS > **[WITH HEATED STEERING WHEEL]**

---

- YES >> GO TO 8.  
NO >> Repair or replace damaged parts.

**8.CHECK POWER SUPPLY (IGNITION)**

---

Check the following.

- Ignition switch
- Harness for short or open between ignition switch and fuse block (J/B). Refer to [PG-21, "Wiring Diagram - IGNITION POWER SUPPLY -"](#).
- 10A fuse [No.3, located in the fuse block (J/B)]. Refer to [PG-112, "Fuse, Connector and Terminal Arrangement"](#).
- Fuse block (J/B)

Is the inspection result normal?

- YES >> Replace heated steering wheel switch. Refer to [ST-64, "Removal and Installation"](#).  
NO >> Repair or replace damaged parts.

# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

## NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

### NVH Troubleshooting Chart

INFOID:000000008459286

#### 2WD MODELS (WITHOUT ELECTRIC MOTOR)

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

| Symptom  |           |  | Possible cause and SUSPECTED PARTS |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   | Reference |                            |                     |      |            |             |   |
|----------|-----------|--|------------------------------------|-------------------------|---|---|--|------------------------|---------------------|----------------------------------|----------------------|-------------------------|---|--------------------|---------------------------------------|---|-----------|----------------------------|---------------------|------|------------|-------------|---|
|          |           |  | Fluid level                        | Air in hydraulic system | Outer/inner socket ball joint swinging torque | Outer/inner socket ball joint rotating torque | Outer/inner 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 looseness | Steering column deformation or damage | Improper installation or looseness of steering column |           | Steering linkage looseness | AXLE and SUSPENSION | TIRE | ROAD WHEEL | DRIVE SHAFT | BRAKE   |
| Steering | Noise     |  | x                                  | x                       | x   | x   | x                                      | x                      | x                   | x                                |                      |                         |   |                    | x                                     | x   |           |                            |                     |      |            |             | ST-31, "Inspection"                             |
|          | Shake     |  |                                    |                         |   |   |  |                        |                     |                                  | x                    | x                       | x   |                    |                                       |   | x         | x                          | x                   |      |            |             | ST-31, "Inspection"                             |
|          | Vibration |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   | x                  | x                                     |   |           |                            |                     |      |            |             | ST-54, "Inspection"                             |
|          | Shimmy    |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       | x   | x         | x                          |                     |      |            |             | ST-54, "Inspection"                             |
|          | Judder    |  |                                    |                         |   |   |  |                        |                     |                                  |                      | x                       | x   |                    |                                       |   | x         | x                          | x                   |      |            |             | ST-31, "Inspection"                             |
|          |           |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   |           |                            |                     |      |            |             | ST-33, "Inspection"                             |
|          |           |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   |           |                            |                     |      |            |             | EM-16, "Checking"                               |
|          |           |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   |           |                            |                     |      |            |             | ST-33, "Inspection"                             |
|          |           |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   |           |                            |                     |      |            |             | —   |
|          |           |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   |           |                            |                     |      |            |             | ST-44, "Exploded View"                          |
|          |           |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   |           |                            |                     |      |            |             | ST-36, "WITHOUT ELECTRIC MOTOR : Inspection"    |
|          |           |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   |           |                            |                     |      |            |             | ST-35, "WITHOUT ELECTRIC MOTOR : Exploded View" |
|          |           |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   |           |                            |                     |      |            |             | ST-44, "Exploded View"                          |
|          |           |  |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |   |           |                            |                     |      |            |             | 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

#### 2WD MODELS (WITH ELECTRIC MOTOR)

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# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

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

| Symptom |           | Steering | Possible cause and SUSPECTED PARTS |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       | Reference |   |                            |                     |      |            |             |  |
|---------|-----------|----------|------------------------------------|-------------------------|---|---|--|------------------------|---------------------|----------------------------------|----------------------|-------------------------|---|--------------------|---------------------------------------|-----------|---|----------------------------|---------------------|------|------------|-------------|--|
|         |           |          | Fluid level                        | Air in hydraulic system | Outer/inner socket ball joint swinging torque | Outer/inner socket ball joint rotating torque | Outer/inner 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 looseness | Steering column deformation or damage |           | Improper installation or looseness of steering column | Steering linkage looseness | AXLE and SUSPENSION | TIRE | ROAD WHEEL | DRIVE SHAFT | BRAKE  |
|         | Noise     |          | x                                  | x                       | x   | x   | x                                      | x                      | x                   | x                                |                      |                         |   |                    | x                                     | x         | x   | x                          | x                   | x    | x          | x           | ST-31, "Inspection"                          |
|         | Shake     |          |                                    |                         |   |   |  |                        |                     |                                  | x                    | x                       | x   |                    |                                       |           |   |                            |                     |      |            |             | ST-31, "Inspection"                          |
|         | Vibration |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   | x                  | x                                     |           |   |                            |                     |      |            |             | ST-54, "Inspection"                          |
|         | Shimmy    |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           | x   | x                          | x                   |      |            |             | ST-54, "Inspection"                          |
|         | Judder    |          |                                    |                         |   |   |  |                        |                     |                                  |                      | x                       | x   | x                  | x                                     | x         | x   | x                          | x                   |      |            |             | ST-54, "Inspection"                          |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | ST-31, "Inspection"                          |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | ST-33, "Inspection"                          |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | ST-33, "Inspection"                          |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | EM-16, "Checking"                            |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | ST-33, "Inspection"                          |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | —  |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | ST-44, "Exploded View"                       |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | ST-39, "WITH ELECTRIC MOTOR : Inspection"    |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | ST-38, "WITH ELECTRIC MOTOR : Exploded View" |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | ST-44, "Exploded View"                       |
|         |           |          |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |   |                    |                                       |           |   |                            |                     |      |            |             | 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

AWD MODELS (WITHOUT ELECTRIC MOTOR)

# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

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

| Symptom | Steering  | Possible cause and SUSPECTED PARTS |   | Reference                                       |
|---------|-----------|------------------------------------|---|---|
|         |           |                                    |   |   |
|         | Noise     | x                                  | Fluid level   | ST-31. "Inspection"                             |
|         | Shake     | x                                  | Air in hydraulic system                               | ST-31. "Inspection"                             |
|         | Vibration | x                                  | Outer/inner socket ball joint swinging torque         | ST-54. "Inspection"                             |
|         | Shimmy    | x                                  | Outer/inner socket ball joint rotating torque         | ST-54. "Inspection"                             |
|         | Judder    | x                                  | Outer/inner socket ball joint end play                | ST-54. "Inspection"                             |
|         |           | x                                  | Steering fluid leakage                                | ST-31. "Inspection"                             |
|         |           | x                                  | Steering wheel play                                   | ST-33. "Inspection"                             |
|         |           | x                                  | Steering gear rack sliding force                      | ST-33. "Inspection"                             |
|         |           | x                                  | Drive belt looseness                                  | EM-16. "Checking"                               |
|         |           |                                    | Improper steering wheel                               | ST-33. "Inspection"                             |
|         |           |                                    | Improper installation or looseness of tilt lock lever | —   |
|         |           |                                    | Mounting looseness                                    | ST-44. "Exploded View"                          |
|         |           | x                                  | Steering column deformation or damage                 | ST-36. "WITHOUT ELECTRIC MOTOR : Inspection"    |
|         |           | x                                  | Improper installation or looseness of steering column | ST-35. "WITHOUT ELECTRIC MOTOR : Exploded View" |
|         |           |                                    | Steering linkage looseness                            | ST-44. "Exploded View"                          |
|         |           | x                                  | PROPELLER SHAFT                                       | NVH in DLN section.                             |
|         |           | x                                  | DIFFERENTIAL  | NVH in DLN section.                             |
|         |           | x                                  | AXLE and SUSPENSION                                   | NVH in FAX, RAX, FSU, RSU section.              |
|         |           | x                                  | TIRE  | NVH in WT section.                              |
|         |           | x                                  | ROAD WHEEL  | NVH in WT section.                              |
|         |           | x                                  | DRIVE SHAFT   | NVH in FAX, RAX section.                        |
|         |           | x                                  | BRAKE   | NVH in BR section.                              |

x: Applicable

AWD MODELS (WITH ELECTRIC MOTOR)

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# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[WITH HEATED STEERING WHEEL]

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

| Symptom   |  | Steering | Noise |   | Shake |  | Vibration |  | Shimmy |  | Judder |  |
|---|--|----------|-------|---|-------|--|-----------|--|--------|--|--------|--|
|   |  |          | ×     |   | ×     |  | ×         |  | ×      |  | ×      |  |
| Reference   |  |          |       |   |       |  |           |  |        |  |        |  |
| Possible cause and SUSPECTED PARTS                    |  |          |       |   |       |  |           |  |        |  |        |  |
| Fluid level   |  |          | ×     |   |       |  |           |  |        |  |        |  |
| Air in hydraulic system                               |  |          | ×     |   |       |  |           |  |        |  |        |  |
| Outer/inner socket ball joint swinging torque         |  |          | ×     |   |       |  |           |  |        |  |        |  |
| Outer/inner socket ball joint rotating torque         |  |          | ×     |   |       |  |           |  |        |  |        |  |
| Outer/inner 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 looseness                                    |  |          |       | × |       |  |           |  | ×      |  |        |  |
| Steering column deformation or damage                 |  |          |       | × |       |  |           |  | ×      |  |        |  |
| Improper installation or looseness of steering column |  |          |       | × |       |  |           |  | ×      |  |        |  |
| Steering linkage looseness                            |  |          |       |   |       |  |           |  | ×      |  |        |  |
| PROPELLER SHAFT                                       |  |          |       | × |       |  |           |  |        |  |        |  |
| DIFFERENTIAL  |  |          |       | × |       |  |           |  |        |  |        |  |
| AXLE and SUSPENSION                                   |  |          |       | × |       |  |           |  | ×      |  |        |  |
| TIRE  |  |          |       | × |       |  |           |  | ×      |  |        |  |
| ROAD WHEEL  |  |          |       | × |       |  |           |  | ×      |  |        |  |
| DRIVE SHAFT   |  |          |       | × |       |  |           |  |        |  |        |  |
| BRAKE   |  |          |       | × |       |  |           |  |        |  |        |  |

×: Applicable

PERIODIC MAINTENANCE

POWER STEERING FLUID

Inspection

INFOID:000000008459287

FLUID LEVEL

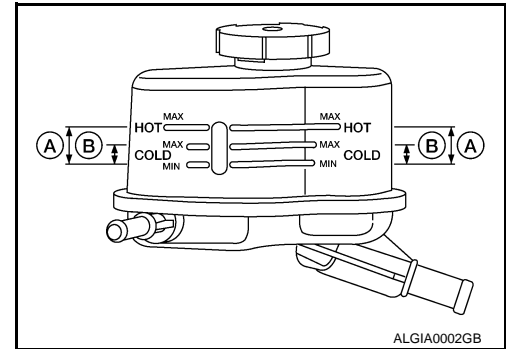
1. Check fluid level with engine stopped.
2. Ensure that fluid level is between MIN and MAX.
3. Fluid levels at HOT and COLD are different. Do not confuse them.

**HOT (A)** : Fluid temperature 50 – 80°C (122 – 176°F)

**COLD (B)** : Fluid temperature 0 – 30°C (32 – 86°F)

**Recommended fluid** : Refer to [MA-16, "FOR NORTH AMERICA : Fluids and Lubricants" \(For North America\)](#), [MA-17, "FOR MEXICO : Fluids and Lubricants" \(For Mexico\)](#).

**Fluid capacity** : Refer to [ST-65, "General Specifications"](#).



**CAUTION:**

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

FLUID LEAKAGE

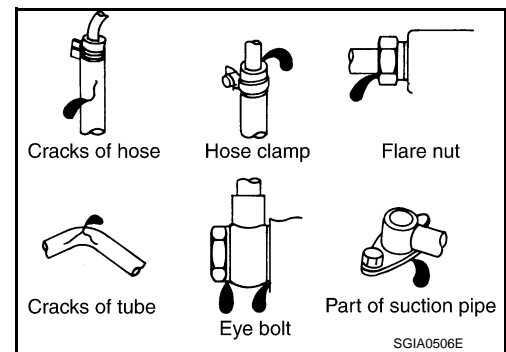
Check hydraulic connections for fluid leakage, cracks, damage, looseness, or wear.

1. Run the 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:**

**Never hold the steering wheel in a locked position for more than 10 seconds. (There is the possibility that power steering oil pump assembly 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.
6. Check steering gear boots for accumulation of fluid leaked from steering gear.



AIR BLEEDING HYDRAULIC SYSTEM

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:**

## POWER STEERING FLUID

< PERIODIC MAINTENANCE >

[WITH HEATED STEERING WHEEL]

---

**Fill reservoir tank with a sufficient amount of fluid so that fluid level is not below the MIN line while turning steering wheel.**

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

**CAUTION:**

**Never hold the steering wheel in a locked position for more than 10 seconds. (There is the possibility that oil pump may be damaged.)**

4. Check fluid for bubbles and white contamination.
5. Stop the 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

### Inspection

INFOID:000000008459288

#### STEERING WHEEL AXIAL END PLAY

1. Check installation conditions of steering gear assembly, front suspension assembly, axle and steering column assembly.
2. 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 [ST-65, "Steering Wheel Axial End Play and Play"](#).

3. Check the following items when steering wheel axial end play is out of the standard.
  - Check the steering column assembly mounting condition. Refer to [ST-35, "WITHOUT ELECTRIC MOTOR : Exploded View"](#) (Without electric motor), [ST-38, "WITH ELECTRIC MOTOR : Exploded View"](#) (with electric motor).
  - Check steering gear assembly mounting condition for looseness. Refer to [ST-44, "Exploded View"](#).

#### STEERING WHEEL PLAY

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

**Standard**

**Steering wheel play** : Refer to [ST-65, "Steering Wheel Axial End Play and Play"](#).

4. Check the following items when steering wheel play is out of the standard.
  - Check backlash for each joint of steering column assembly.
  - Check installation condition of steering gear assembly.

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# STEERING WHEEL

< REMOVAL AND INSTALLATION >

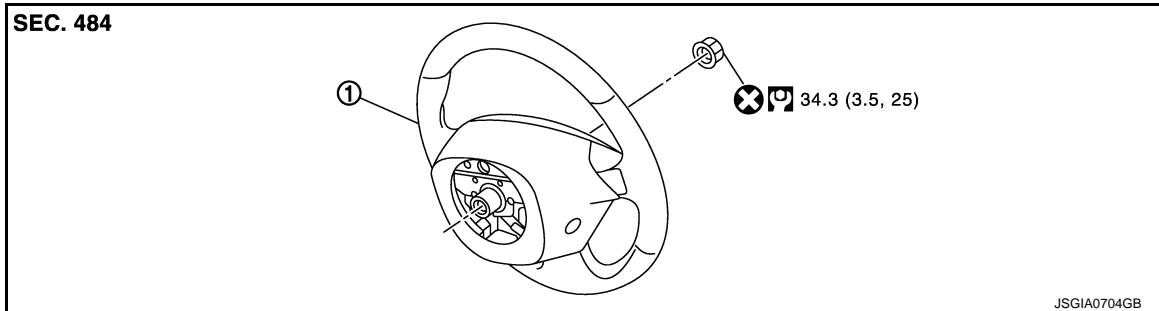
[WITH HEATED STEERING WHEEL]

## REMOVAL AND INSTALLATION

### STEERING WHEEL

#### Exploded View

INFOID:000000008459289



1. Steering wheel

Refer to [GI-4, "Components"](#) for symbols in the figure.

#### Removal and Installation

INFOID:000000008459290

##### REMOVAL

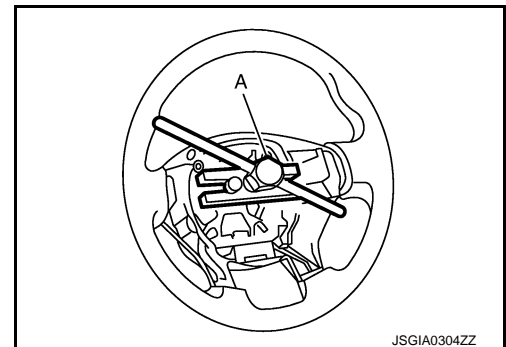
###### NOTE:

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 the vehicle to the straight-ahead position.
2. Remove driver air bag module. Refer to [SR-11, "Exploded View"](#).
3. Remove steering wheel lock nut after steering is locked.
4. Remove steering wheel with the steering wheel puller (A) [SST: ST27180001 (J-25726-A)].

###### NOTE:

Put paint marks on the steering wheel and the column shaft for supporting accurate positioning during the installation procedure.



##### INSTALLATION

Note the following, and install in the reverse order of removal.

- Check the spiral cable neutral position after replacing or rotating spiral cable. Refer to [SR-14, "Exploded View"](#).

###### CAUTION:

**Never twist spiral cable freely on excessively after it becomes tight (doing so may cause the cable to tear off).**

- Never reuse steering wheel lock nut.

# STEERING COLUMN

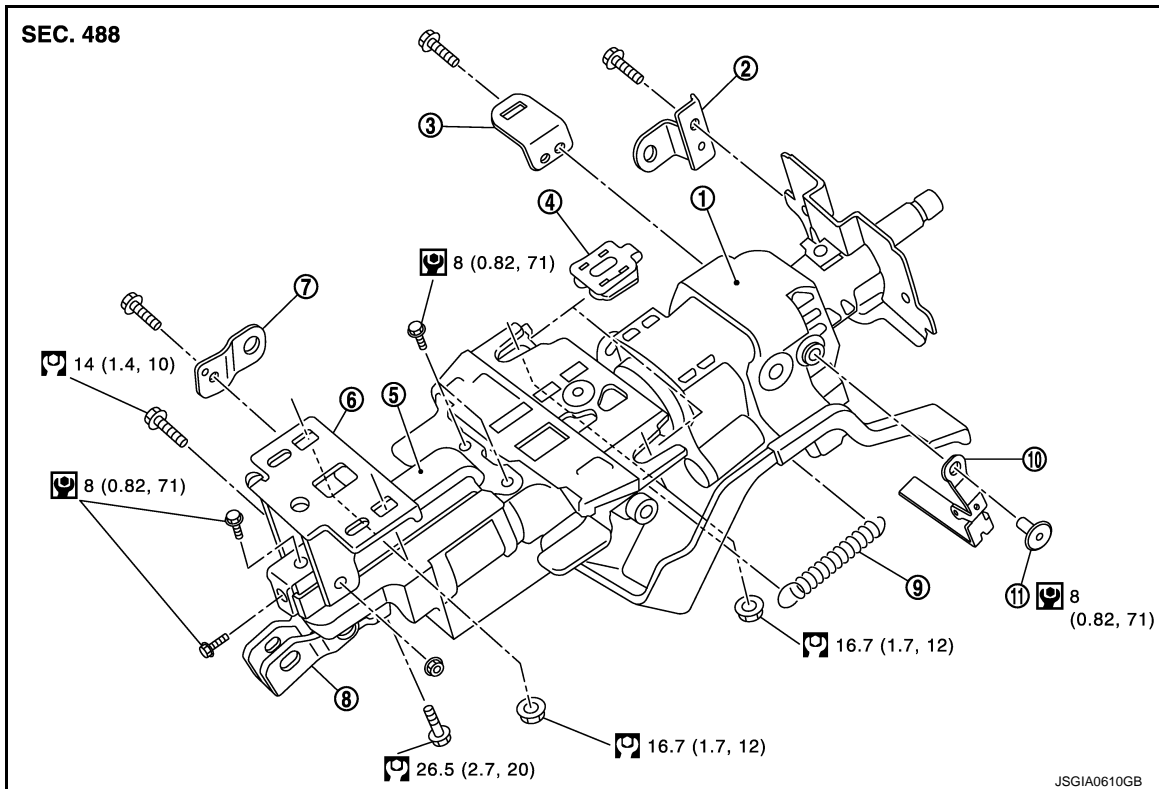
< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

## STEERING COLUMN WITHOUT ELECTRIC MOTOR

WITHOUT ELECTRIC MOTOR : Exploded View

INFOID:000000008459291



- |                             |                  |                        |
|-----------------------------|------------------|------------------------|
| 1. Steering column assembly | 2. Bracket       | 3. Bracket             |
| 4. Slide plate              | 5. Slide bracket | 6. Lower mount bracket |
| 7. Bracket                  | 8. Upper joint   | 9. Spring              |
| 10. Tilt lever              | 11. Clip         |                        |

Refer to [GI-4. "Components"](#) for symbols in the figure.

## WITHOUT ELECTRIC MOTOR : Removal and Installation

INFOID:000000008459292

### REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Place the tilt to the highest level. Place the telescopic to the longest level.
3. Remove driver air bag module. Refer to [SR-11. "Exploded View"](#).
4. Remove steering wheel. Refer to [ST-34. "Exploded View"](#).
5. Remove instrument driver lower panel. Refer to [IP-12. "Exploded View"](#).
6. Remove steering column cover. Refer to [IP-12. "Exploded View"](#).
7. Remove spiral cable. Refer to [SR-11. "Exploded View"](#).
8. Remove cluster lid A. Refer to [IP-12. "Exploded View"](#).

# STEERING COLUMN

## < REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

9. Remove knee protector (1).

← : Bolt

10. Disconnect each switch harness connectors installed to steering column assembly.  
 11. Remove the upper joint mounting bolt and nut (lower shaft side), and separate the upper joint from lower shaft.

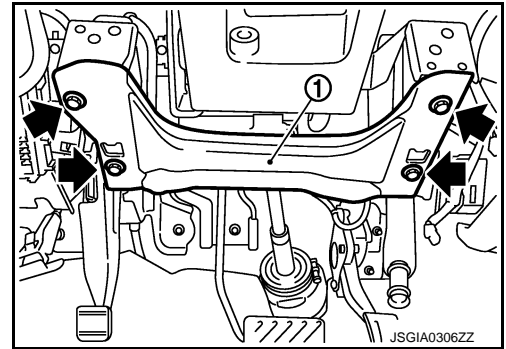
**CAUTION:**

**When removing upper joint, never insert a tool, such as a screwdriver, into the yoke groove to pull out the upper joint. In case of the violation of the above, replace upper joint with a new one.**

12. Remove steering column assembly.

**CAUTION:**

- Never give axial impact to steering column assembly during removal.
- Never move steering gear assembly when removing steering column assembly.



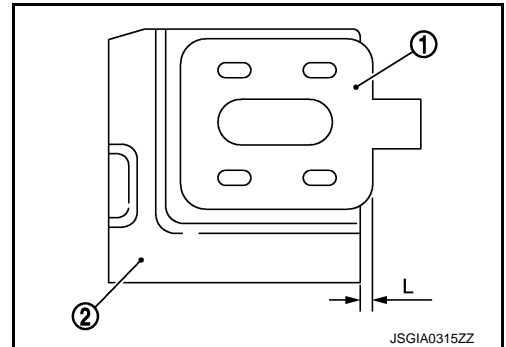
### INSTALLATION

Note the following, and install in the reverse order of removal.

- Install the slide plate (1) and steering column housing (2) so that the mounting dimensions (L) is within the specified range as described below.

**Standard**

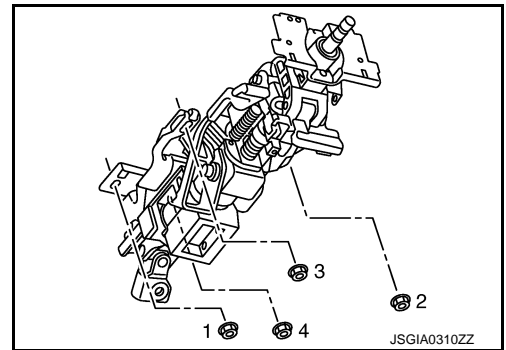
**L : 2.0 mm (0.079 in) or less**



- Tighten the mounting bolts in the order shown in the figure when installing the steering column assembly.
- Be careful of the following points when installing the steering column assembly.

**CAUTION:**

- Never give axial impact to steering column assembly during installation.
- Never move steering gear assembly.
- Never reuse the joint mounting nut (lower shaft side).
- Adjust neutral position of steering angle sensor. Refer to [BRC-9, "ADJUSTMENT OF STEERING ANGLE SENSOR NEUTRAL POSITION : Special Repair Requirement"](#).



### WITHOUT ELECTRIC MOTOR : Inspection

INFOID:000000008459293

#### INSPECTION AFTER REMOVAL

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Measure steering column assembly rotating torque using a preload gauge [SST: ST3127S000 (J-25765-A)]. Replace steering column assembly if outside the standard.

**Standard**

**Rotating torque : Refer to [ST-65, "Steering Column Operating Range"](#).**

# STEERING COLUMN

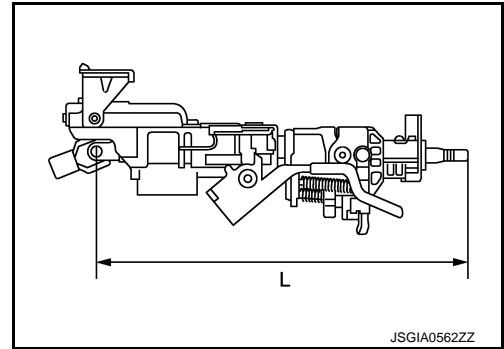
## < REMOVAL AND INSTALLATION >

## [WITH HEATED STEERING WHEEL]

- Measure the length (L) as shown, if vehicle has been involved in a minor collision. Replace steering column assembly if out side the standard.

### Standard

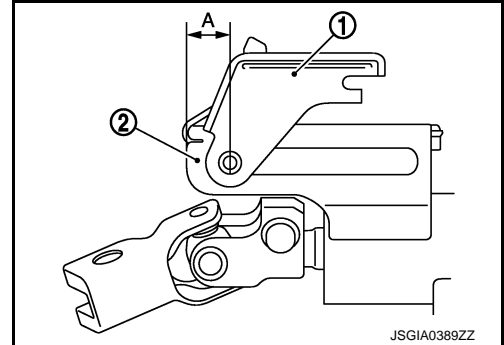
**Steering column length (L)** : Refer to [ST-65, "Steering Column Length"](#).



- Install the bracket (1) and steering column housing (2) so that the clearance (A) is within the specified range as described below. Replace steering column assembly if out side the standard.

### Standard

**Mounting dimensions (A)** : Refer to [ST-65, "Steering Column Mounting Dimensions"](#).



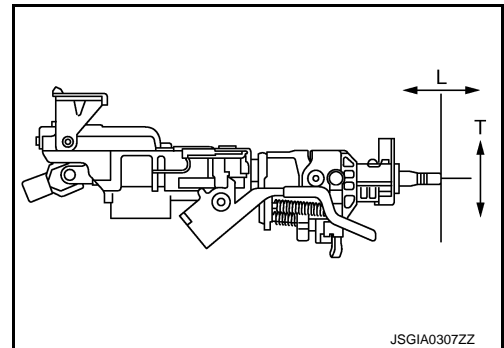
## INSPECTION AFTER INSTALLATION

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle. Refer to [ST-33, "Inspection"](#).
- Check tilt and telescopic mechanism operating range tilt operating range (T), telescopic operating range (L) as shown in the figure.

### Standard

**Tilt operating range (T)** : Refer to [ST-65, "Steering Column Operating Range"](#).

**Telescopic operating range (L)** : Refer to [ST-65, "Steering Column Operating Range"](#).



## WITH ELECTRIC MOTOR

A  
B  
C  
D  
E  
F  
ST  
H  
I  
J  
K  
L  
M  
N  
O  
P

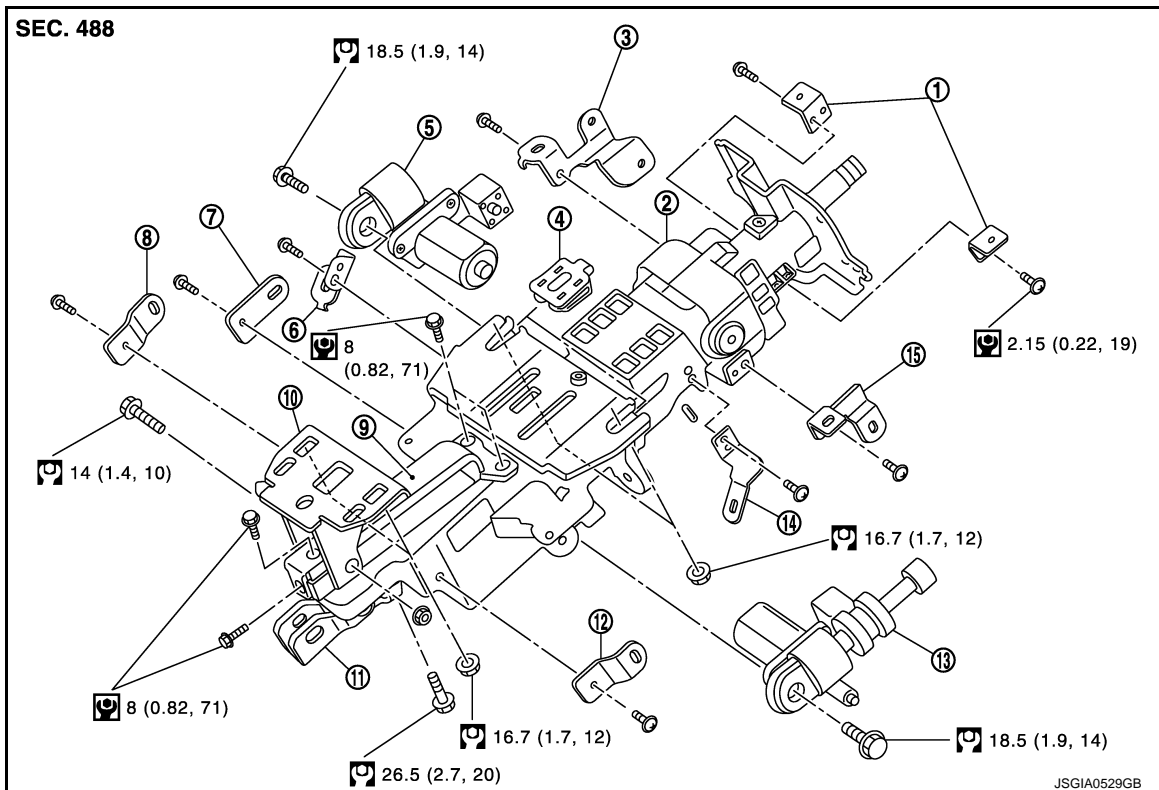
# STEERING COLUMN

< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

WITH ELECTRIC MOTOR : Exploded View

INFOID:000000008459294



- |                         |                             |                  |
|-------------------------|-----------------------------|------------------|
| 1. Bracket              | 2. Steering column assembly | 3. Bracket       |
| 4. Clip                 | 5. Tilt motor               | 6. Bracket       |
| 7. Bracket              | 8. Bracket                  | 9. Slide bracket |
| 10. Lower mount bracket | 11. Upper joint             | 12. Bracket      |
| 13. Telescopic motor    | 14. Bracket                 | 15. Bracket      |

Refer to [GI-4, "Components"](#) for symbols in the figure.

## WITH ELECTRIC MOTOR : Removal and Installation

INFOID:000000008459295

### REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Place the tilt to the highest level. Place the telescopic to the longest level.
3. Remove driver air bag module. Refer to [SR-11, "Exploded View"](#).
4. Remove steering wheel. Refer to [ST-34, "Exploded View"](#).
5. Remove instrument driver lower panel. Refer to [IP-12, "Exploded View"](#).
6. Remove steering column cover. Refer to [IP-12, "Exploded View"](#).
7. Remove spiral cable. Refer to [SR-14, "Exploded View"](#).
8. Remove cluster lid A. Refer to [IP-12, "Exploded View"](#).

# STEERING COLUMN

## < REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

9. Remove knee protector (1).

← : Bolt

10. Disconnect each switch harness connectors installed to steering column assembly.
11. Remove the upper joint mounting bolt and nut (lower shaft side), and separate the upper joint from lower shaft.

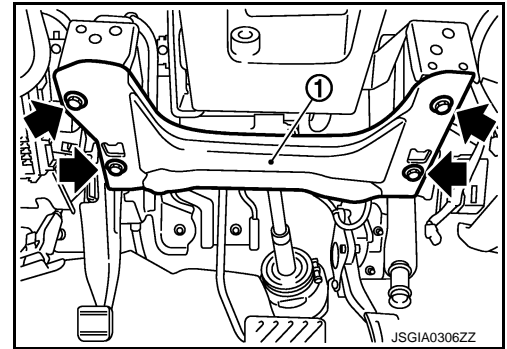
**CAUTION:**

**When removing upper joint, never insert a tool, such as a screwdriver, into the yoke groove to pull out the upper joint. In case of the violation of the above, replace upper joint with a new one.**

12. Remove steering column assembly.

**CAUTION:**

- Never give axial impact to steering column assembly during removal.
- Never move steering gear assembly when removing steering column assembly.



## INSTALLATION

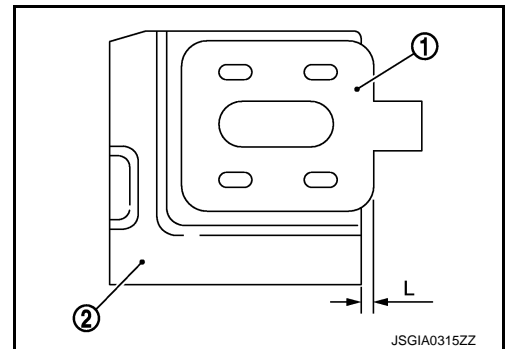
Note the following, and install in the reverse order of removal.

- Install the slide plate (1) and steering column housing (2) so that the mounting dimensions (L) is within the specified range as described below.

**Standard**

**L**

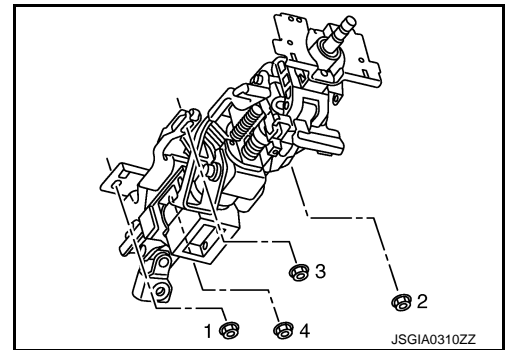
**: 2.0 mm (0.079 in) or less**



- Tighten the mounting bolts in the order shown in the figure when installing the steering column assembly.
- Be careful of the following points when installing the steering column assembly.

**CAUTION:**

- Never give axial impact to steering column assembly during installation.
- Never move steering gear assembly.
- Never reuse the joint mounting nut (lower shaft side).
- Adjust neutral position of steering angle sensor. Refer to [BRC-9, "ADJUSTMENT OF STEERING ANGLE SENSOR NEUTRAL POSITION : Special Repair Requirement"](#).



## WITH ELECTRIC MOTOR : Inspection

INFOID:000000008459296

### INSPECTION AFTER REMOVAL

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Measure steering column assembly rotating torque using a preload gauge [SST: ST3127S000 (J-25765-A)]. Replace steering column assembly if outside the standard.

**Standard**

**Rotating torque**

**: Refer to [ST-65, "Steering Column Operating Range"](#).**

# STEERING COLUMN

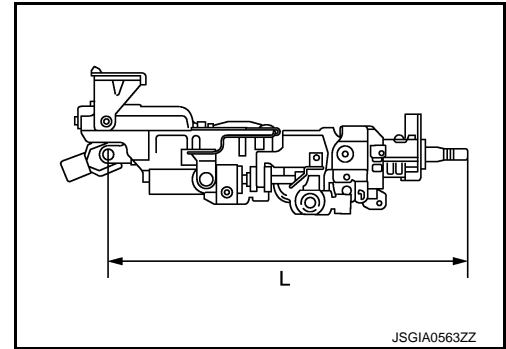
## < REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

- Measure the length (L) as shown, if vehicle has been involved in a minor collision. Replace steering column assembly if out side the standard.

### Standard

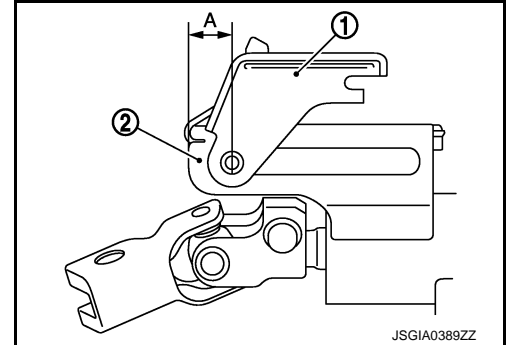
Steering column length (L) : Refer to [ST-65, "Steering Column Length"](#).



- Install the bracket (1) and steering column housing (2) so that the clearance (A) is within the specified range as described below. Replace steering column assembly if out side the standard.

### Standard

Mounting dimensions (A) : Refer to [ST-65, "Steering Column Mounting Dimensions"](#).



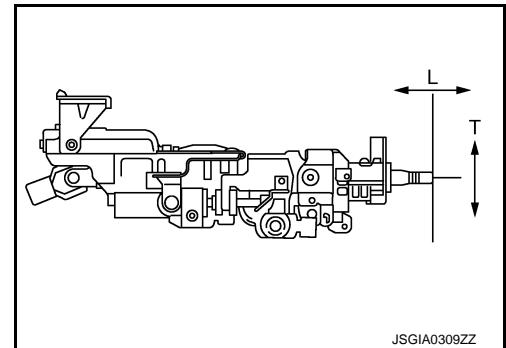
## INSPECTION AFTER INSTALLATION

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle. Refer to [ST-33, "Inspection"](#).
- Check tilt and telescopic mechanism operating range tilt operating range (T), telescopic operating range (L) as shown in the figure.

### Standard

Tilt operating range (T) : Refer to [ST-65, "Steering Column Operating Range"](#).

Telescopic operating range (L) : Refer to [ST-65, "Steering Column Operating Range"](#).





# LOWER SHAFT

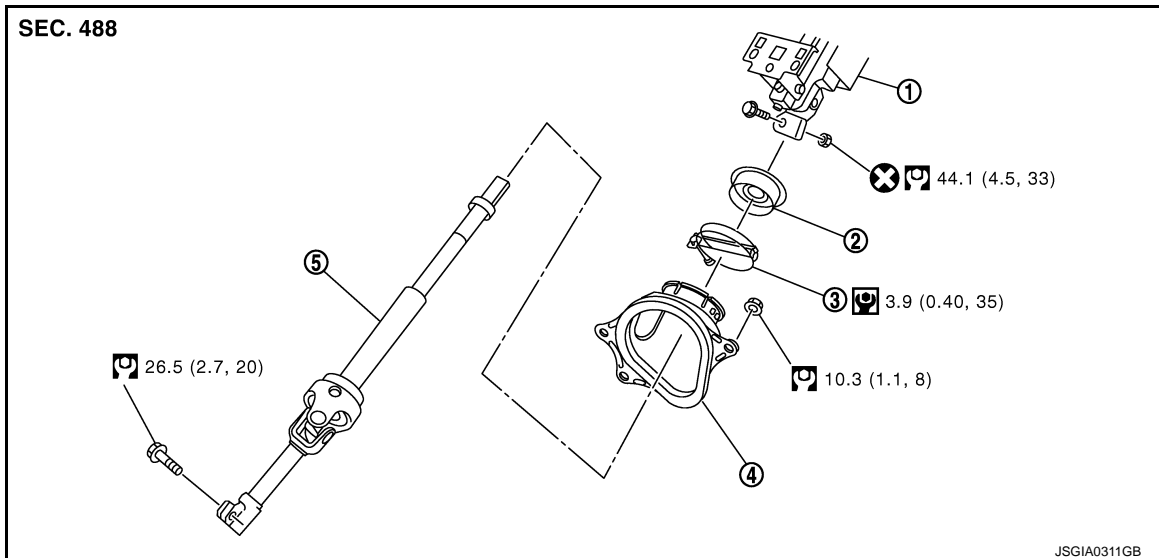
< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

## LOWER SHAFT

### Exploded View

INFOID:000000008459297



1. Steering column assembly
2. Hole cover seal
3. Clamp
4. Hole cover
5. Lower shaft

Refer to [GI-4, "Components"](#) for symbols in the figure.

## Removal and Installation

INFOID:000000008459298

### REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Fix the steering wheel.
3. Remove upper joint fixing bolt and nut (lower shaft side).
4. Separate the lower shaft from the upper joint by sliding the slide shaft (A: sliding range).

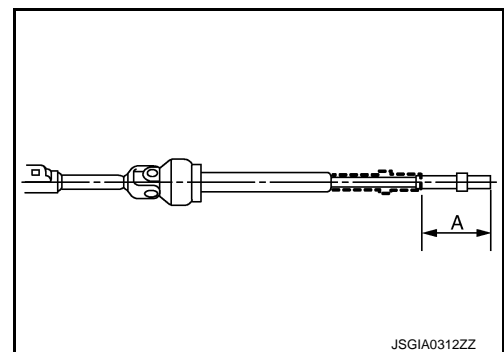
#### CAUTION:

- Spiral cable may be cut if steering wheel turns while separating steering column assembly and steering column assembly. Be sure to secure steering wheel using string to avoid turning.
- When removing upper joint, never insert a tool, such as a screwdriver, into the yoke groove to pull out the upper joint. In case of the violation of the above, replace upper joint with a new one.

5. Remove the accelerator pedal bracket and lever assembly. Refer to [ACC-4, "Exploded View"](#).
6. Remove the side brake pedal bracket and wire clamp stay.
7. Remove the hole cover mounting nuts.
8. Remove the hole cover seal, clamp and hole cover.
9. Remove lower shaft joint fixing bolt (steering gear side).
10. Remove the lower shaft from steering gear assembly.

#### CAUTION:

When removing lower shaft, never insert a tool, such as a screwdriver, into the yoke groove to pull out the lower shaft. In case of the violation of the above, replace lower shaft with a new one.



# LOWER SHAFT

< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

## INSTALLATION

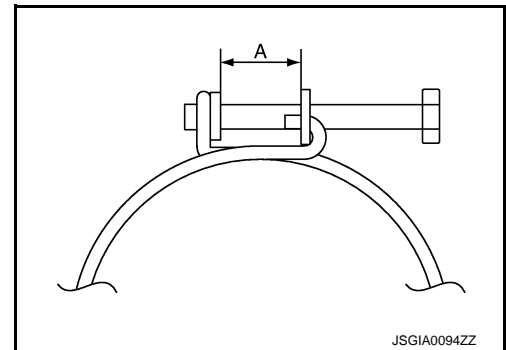
Note the following, and install in the reverse order of removal.

### CAUTION:

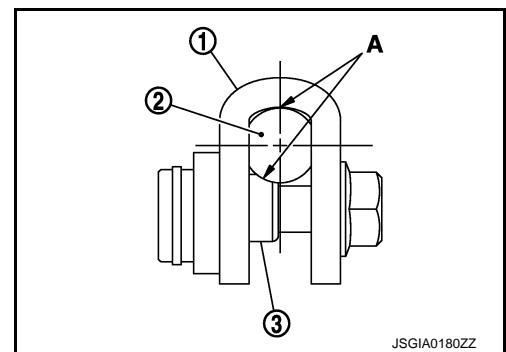
**Spiral cable may be cut if steering wheel turns while separating steering column assembly and steering gear assembly. Be sure to secure steering wheel using string to avoid turning.**

- 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)**



- After lower shaft (steering gear side) fitted, make sure there is not gap (A) between the yoke (1), lower shaft (2), joint fixing bolt (3).



- 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 of gear housing assembly (B).

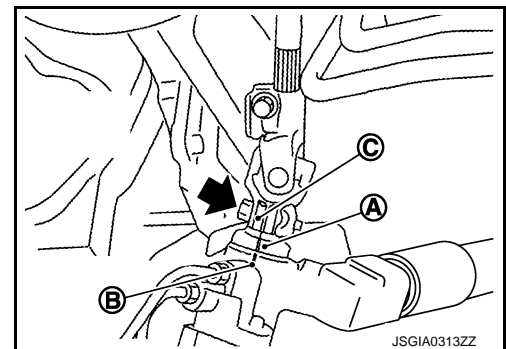
← : Bolt

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

- Adjust neutral position of steering angle sensor. Refer to [BRC-9. "ADJUSTMENT OF STEERING ANGLE SENSOR NEUTRAL POSITION : Special Repair Requirement"](#).

- Check the following after installation:

- Check if steering wheel turns smoothly when it is turned several times fully to the end of the left and right.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle. Refer to [ST-33. "Inspection"](#).



# LOWER SHAFT

< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

## Inspection

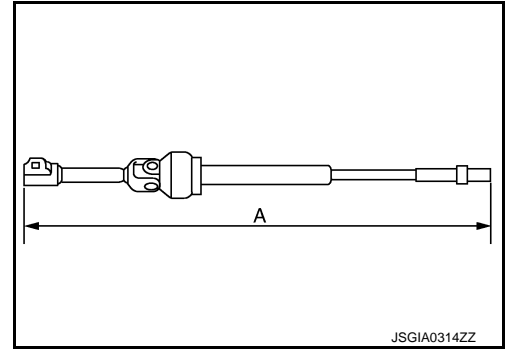
INFOID:000000008459299

- Check the length (A) (extended position) of the lower shaft.

### Standard

Lower shaft length (A) : Refer to [ST-66, "Lower Shaft Length"](#).

- Check each part of lower shaft for damage or other malfunctions. Replace if there are.



A  
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I  
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O  
P

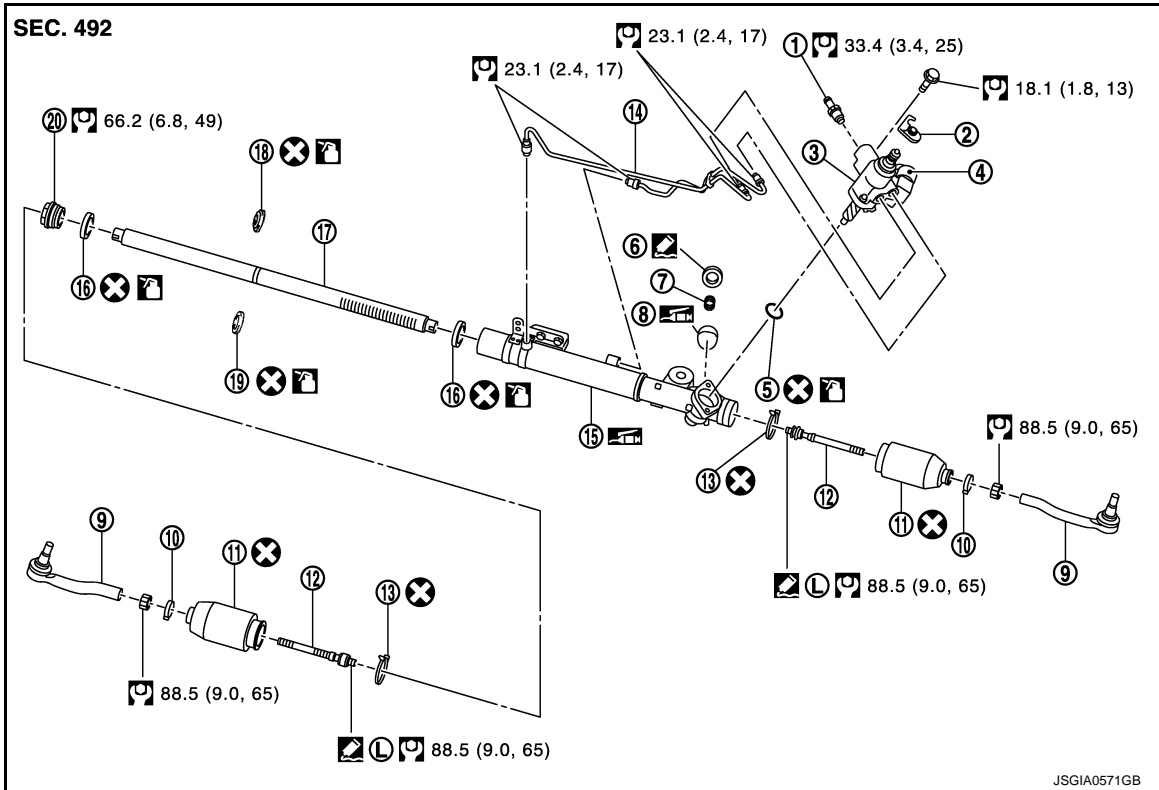


# STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

2WD models



- |                                  |                        |                           |
|----------------------------------|------------------------|---------------------------|
| 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. Cylinder tube      | 15. Gear housing assembly |
| 16. Rack oil seal                | 17. Rack assembly      | 18. Rack Teflon ring      |
| 19. O-ring                       | 20. End cover assembly |                           |

: Apply power steering fluid.

(L): Apply Genuine Medium Strength Thread Locking Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).

: Apply Genuine High Performance Thread Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).

: Apply multi-purpose grease.

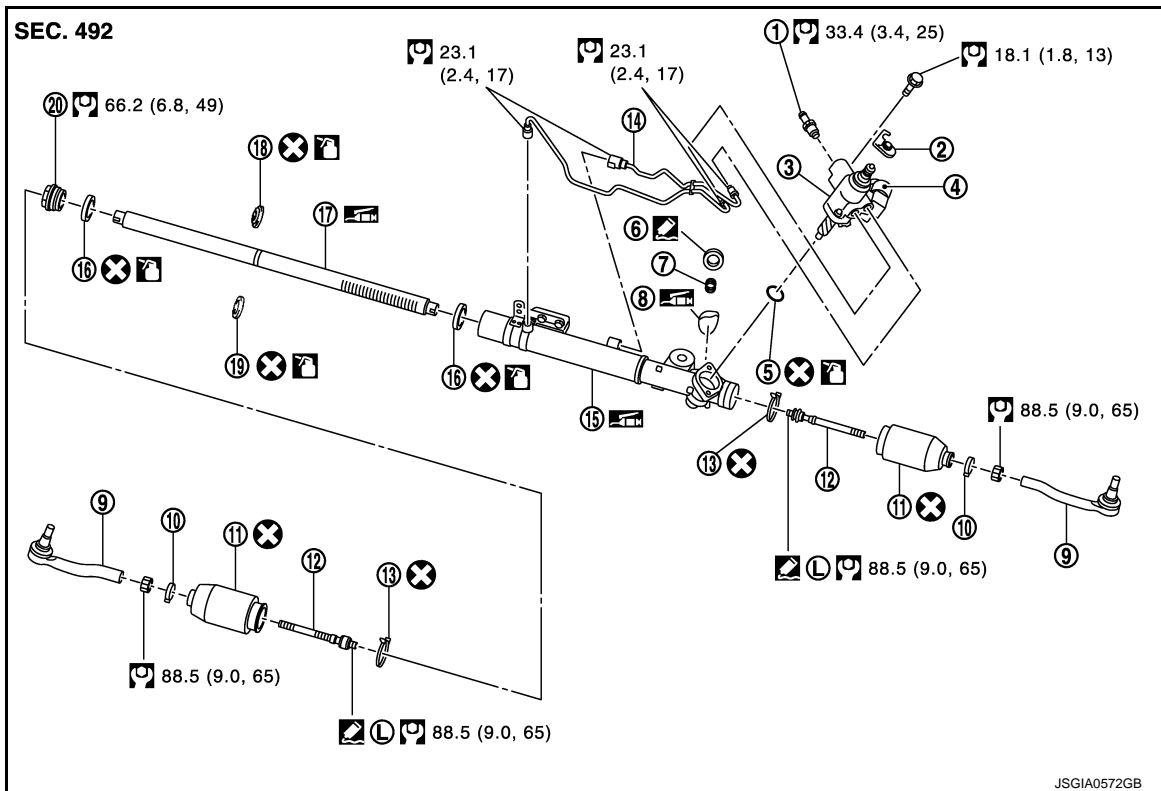
Refer to [GI-4, "Components"](#) for symbols not described on the above.

# STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

AWD models



- |                                  |                        |                           |
|----------------------------------|------------------------|---------------------------|
| 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. Cylinder tube      | 15. Gear housing assembly |
| 16. Rack oil seal                | 17. Rack assembly      | 18. Rack Teflon ring      |
| 19. O-ring                       | 20. End cover assembly |                           |

: Apply power steering fluid.

(L): Apply Genuine Medium Strength Thread Locking Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).

: Apply Genuine High Performance Thread Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).

: Apply multi-purpose grease.

Refer to [GI-4, "Components"](#) for symbols not described on the above.

## Removal and Installation

INFOID:000000008459301

### REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Remove front road wheel and tires.
3. Remove splash guards (RH and LH). Refer to [EXT-23, "FENDER PROTECTOR : Exploded View"](#).
4. Remove engine under cover. Refer to [EXT-26, "Exploded View"](#).
5. Remove exhaust front tube. Refer to [EX-5, "Exploded View"](#).
6. Separate the rear propeller shaft (front side). Refer to [DLN-78, "Exploded View"](#) (AWD models).
7. Remove heat insulator from front floor.

# STEERING GEAR AND LINKAGE

## < REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

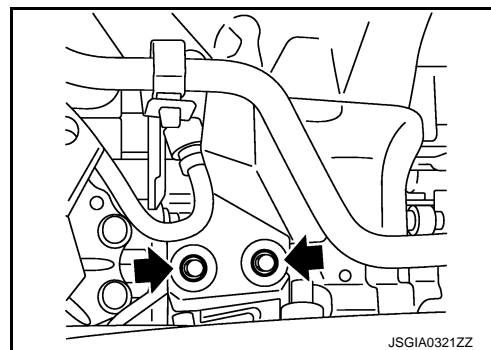
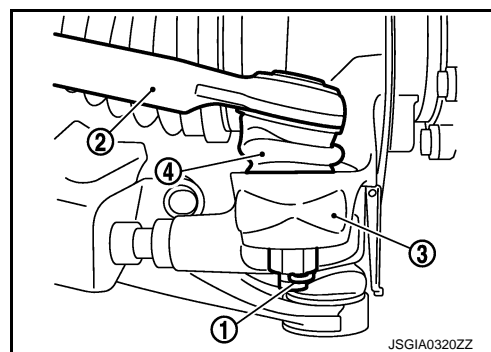
8. Remove cotter pin (1), and then loosen the nuts.
9. Remove steering outer socket (2) from steering knuckle (3) so as not to damage ball joint boot (4) using a ball joint remover (commercial service tool).

**CAUTION:**

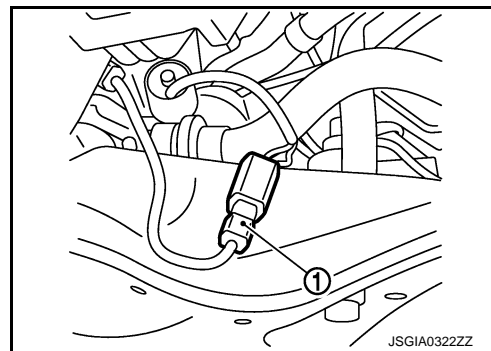
**Temporarily tighten the nut to prevent damage to threads and to prevent the ball joint remover from suddenly coming off.**

10. Remove high pressure piping and low pressure hose of hydraulic piping, and then drain power steering fluid.
11. Remove steering hydraulic piping bracket from front steering gear assembly.

← : Bolt



12. Remove power steering solenoid valve harness connector (1) and harness clip.
13. Remove lower joint fixing bolt (steering gear side).



14. Separate the lower shaft from the steering gear assembly by sliding the slide shaft.  
**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.**
  - **When removing lower shaft, never insert a tool, such as a screwdriver, into the yoke groove to pull out the lower shaft. In case of the violation of the above, replace lower shaft with a new one.**
15. Remove the stabilizer assembly. Refer to [FSU-14, "Exploded View"](#).
16. Support front suspension member with a suitable jack.
17. Remove engine mounting insulator (rear) mounting bolt (lower side). Refer to [EM-71, "2WD : Exploded View"](#) (2WD models), [EM-80, "AWD : Exploded View"](#) (AWD models).
18. Remove engine mounting insulator (LH). Refer to [EM-71, "2WD : Exploded View"](#) (2WD models), [EM-80, "AWD : Exploded View"](#) (AWD models).
19. Remove the mounting bolts and nuts of steering gear assembly.
20. Remove member stay, front suspension member fixing bolts and nuts. Refer to [FSU-16, "Exploded View"](#).
21. Lower the suitable jack for the front suspension member to the steering gear assembly can be removed.

## INSTALLATION

Note the following, and install in the reverse order of removal.

**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.**

A  
B  
C  
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P

# STEERING GEAR AND LINKAGE

## < REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

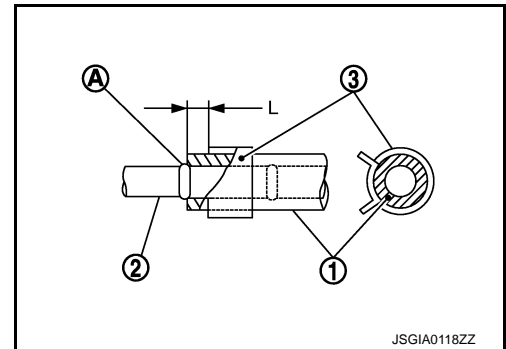
- When installing low pressure hose (1), refer to the figure.

**CAUTION:**

- **Never apply fluid to the hose (1) and tube (2).**
- **Insert hose securely until it contacts spool (A) of tube.**
- **Leave clearance (L) when installing clamp (3).**

**Standard**

**L : 3 – 8 mm (0.12 – 0.31 in)**



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

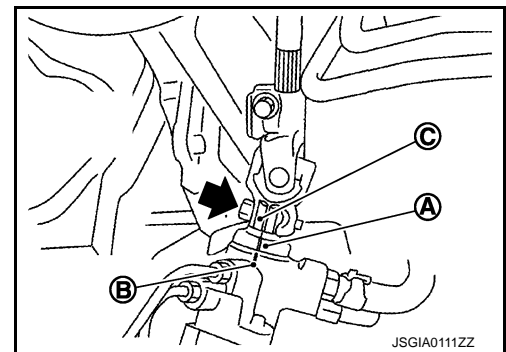
**NOTE:**

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 of gear housing assembly (B).

← : Bolt

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



- After installation, bleed air from the steering hydraulic system. Refer to [ST-31, "Inspection"](#).
- 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-7, "Inspection"](#).
- Adjust neutral position of steering angle sensor after checking wheel alignment. Refer to [BRC-9, "ADJUSTMENT OF STEERING ANGLE SENSOR NEUTRAL POSITION : Special Repair Requirement"](#).

## Disassembly and Assembly

INFOID:000000008459302

### DISASSEMBLY

1. Remove low pressure piping.
2. Remove cylinder tubes from gear housing assembly.
3. Remove rear cover cap from gear-sub assembly.
4. Measure adjusting screw height "H", and loosen adjusting screw.

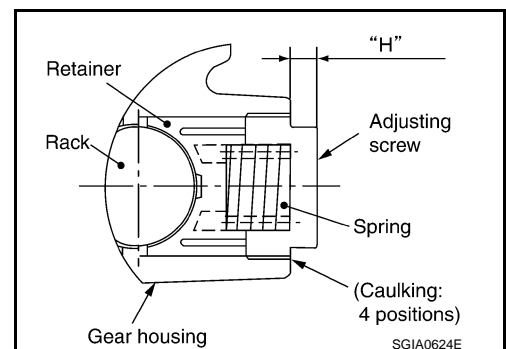
**CAUTION:**

- **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 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 clamps, 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.**



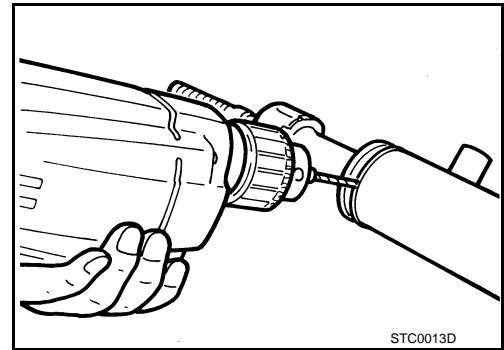


# STEERING GEAR AND LINKAGE

## < REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

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



11. Remove end cover assembly with a 36 mm (1.42 in) open head (commercial service tool).

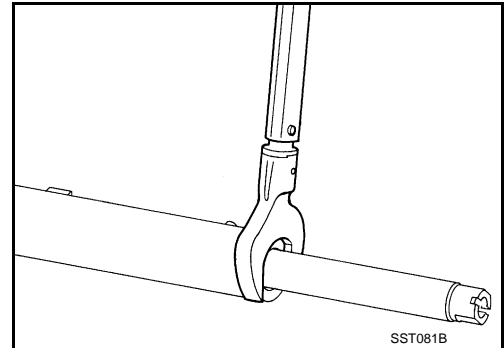
**CAUTION:**

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

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

**CAUTION:**

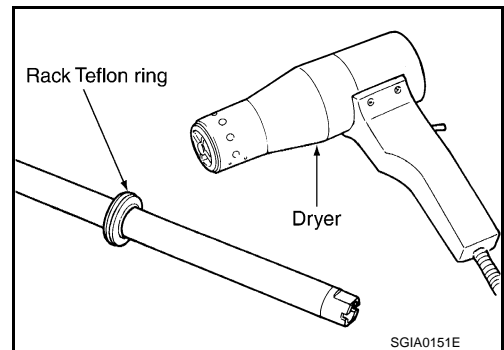
**Never damage cylinder inner wall when remove rack assembly. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.**



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

**CAUTION:**

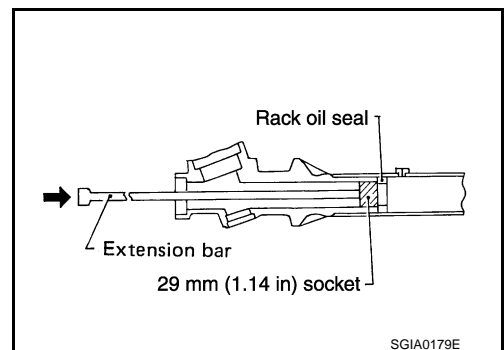
**Never damage rack assembly. Rack assembly must be replaced if damaged because it cause fluid leakage.**



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

**CAUTION:**

**Never damage gear housing assembly and cylinder inner wall. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.**



## ASSEMBLY

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

**CAUTION:**

**Never reuse O-ring.**

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# STEERING GEAR AND LINKAGE

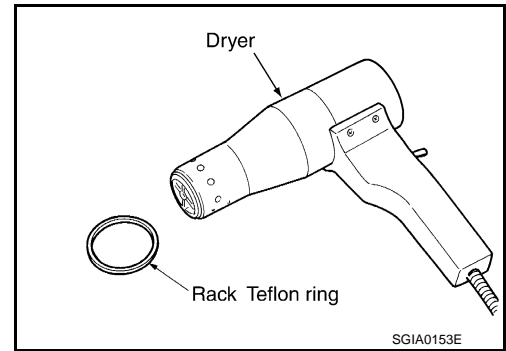
## < REMOVAL AND INSTALLATION >

## [WITH HEATED STEERING WHEEL]

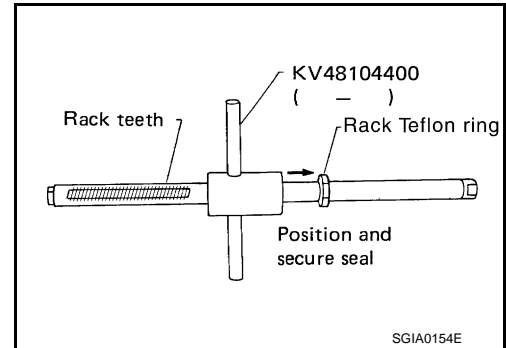
2. Heat rack Teflon ring to approximately 40°C (104°C) with a dryer. Assemble it to mounting groove of rack assembly.

**CAUTION:**

**Never reuse rack Teflon ring.**



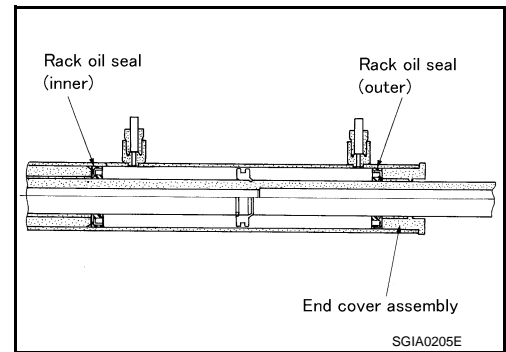
3. Install the rack Teflon ring correcting tool [SST: KV48104400 ( — )] from tooth side of rack fit rack Teflon ring on rack. Compress the with tool.



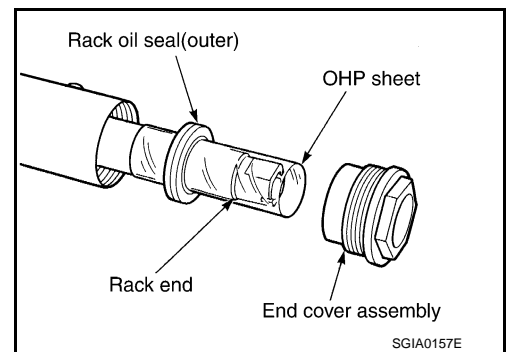
4. Apply recommended grease to rack oil seal, and then install rack oil seal in the following procedure. Then assemble rack assembly to gear housing assembly.

**CAUTION:**

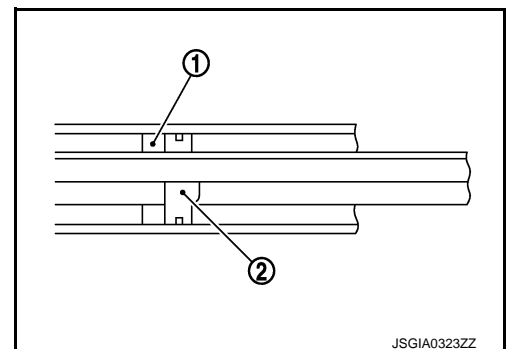
- Install rack oil seal in a direction so that the lip of inner oil seal and the lip of outer oil seal face each other.
- Never damage retainer sliding surface by rack assembly. Replace gear housing assembly if damaged.
- Never damage gear housing assembly inner wall by rack assembly. Gear housing assembly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



- 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) (1) into rack assembly piston (2).
- 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.



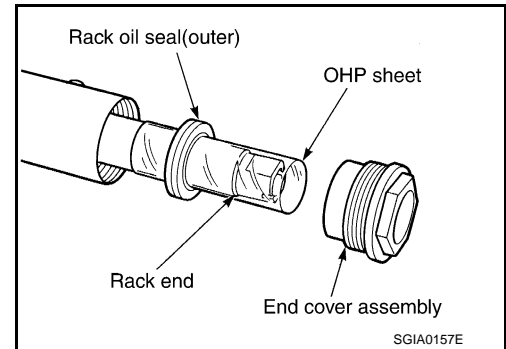
# STEERING GEAR AND LINKAGE

## < REMOVAL AND INSTALLATION >

## [WITH HEATED STEERING WHEEL]

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.

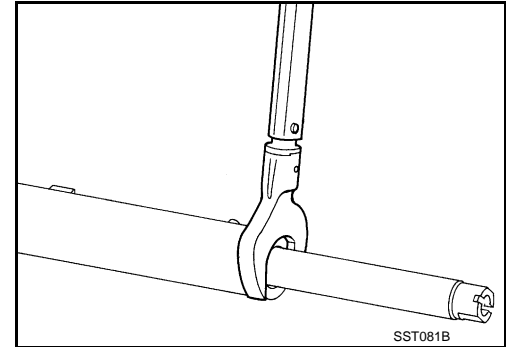
e. Install end cover assembly to rack edge, and move rack oil seal (outer) until it contacts with gear housing assembly.



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

**CAUTION:**

**In order to protect oil seal from any damage, insert gear-sub assembly straightly.**

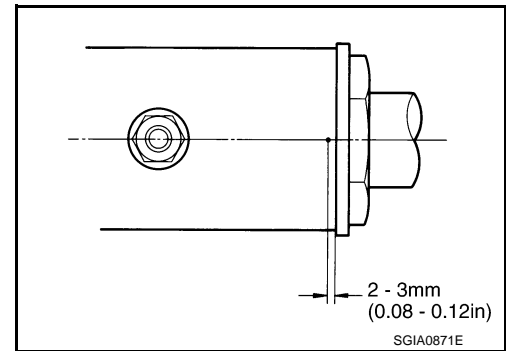
9. Install inner socket to gear housing assembly with the following procedure.

a. Apply thread sealant into the thread of inner socket.

**Use Genuine Medium Strength Thread Locking Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).**

b. Screw inner socket into rack part and tighten at the specified torque.

10. Decide on the neutral position of the rack stroke (L).



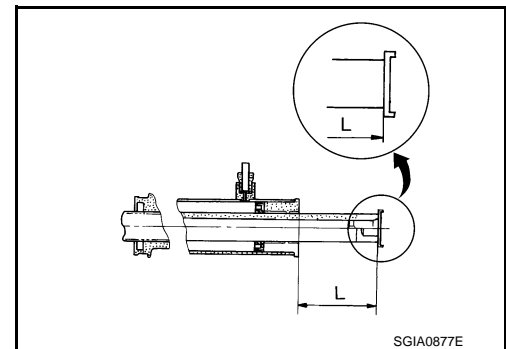
**Standard**

**Rack stroke neutral position (L) : Refer to [ST-66, "Rack Stroke"](#).**

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

**CAUTION:**

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



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# STEERING GEAR AND LINKAGE

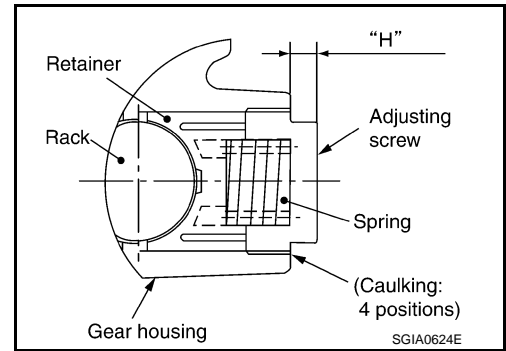
[WITH HEATED STEERING WHEEL]

## < REMOVAL AND INSTALLATION >

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

**Use Genuine High Performance Thread Sealant or equivalent. Refer to GI-22. "Recommended Chemical Products and Sealants".**

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

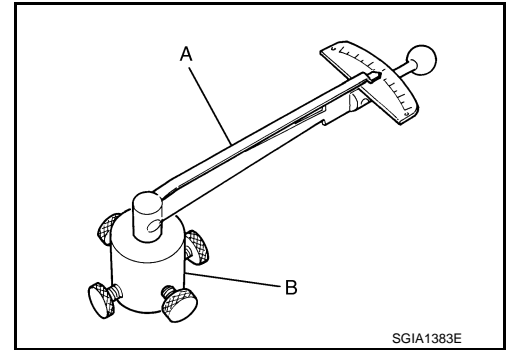


14. Adjust pinion rotating torque with the following procedure.
- Measure pinion rotating torque within  $\pm 180^\circ$  of neutral position of the rack assembly using Tools. Stop the gear at the point where highest torque is read.

A: Preload gauge [SST: ST3127S000 (J-25765-A)]

B: Preload adapter [SST: KV48103400 ( — )]

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

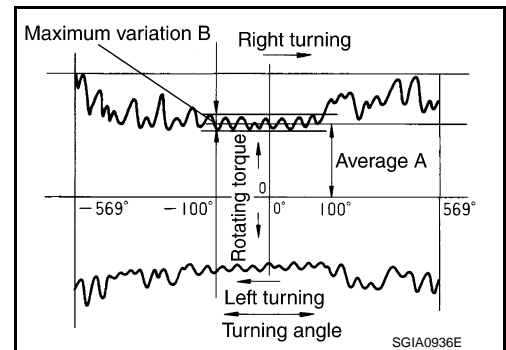


- Measure pinion rotating torque using Tools to make sure that the measured value is within the standard. Readjust if the value is outside the standard. Replace steering gear assembly, if the value is outside the standard after readjusting, or adjusting screw rotating torque is 5 N·m (0.51 kg·m, 44 in·lb)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

### Pinion rotating torque

**Around neutral position (within  $\pm 100^\circ$ ) average (A) : 1.59 – 2.0 N·m (0.17 – 0.20 kg·m, 14 – 17 in·lb)**

**Maximum variation (B) : 0.39 N·m (0.04 kg·m, 3.0 in·lb)**



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

- Install dial gauge at 5 mm (0.20 in) (L) from the edge of gear housing assembly (1), and tooth point.

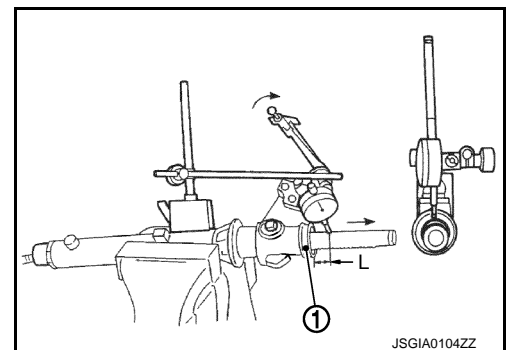
- Measure vertical movement of rack assembly when pinion is turned clockwise with torque of 19.6 N·m (2.0 kg·m, 14 ft·lb). Readjust adjusting screw angle if the measured value is outside the standard.

**Vertical movement : 0.265 mm (0.0104 in)**

- If reading is outside of the specification, readjust screw angle with adjusting screw.

### CAUTION:

- 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.
- Never turn adjusting screw more than twice.
- Replace steering gear assembly when adjusting screw is removed or turned more than twice.

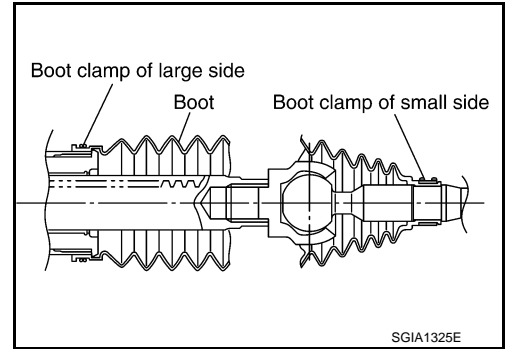


# STEERING GEAR AND LINKAGE

## < REMOVAL AND INSTALLATION >

## [WITH HEATED STEERING WHEEL]

15. Install large end of boot to gear housing assembly.
16. Install small end of boot to inner socket boot mounting groove.
17. Install boot clamp to boot small end.



18. Install boot clamp to the large side of boot with the following procedure.

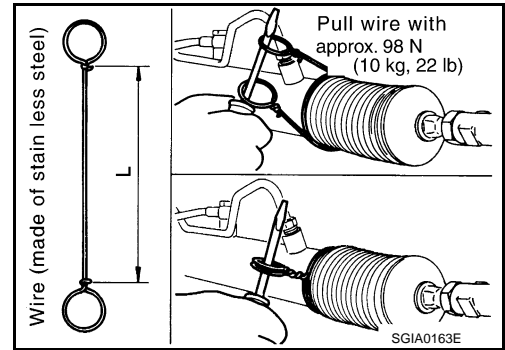
**CAUTION:**

**Never reuse boot clamp.**

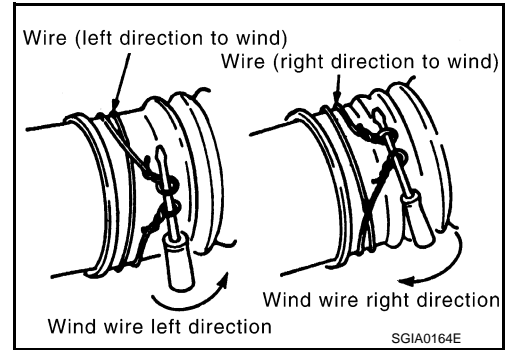
- a. Tighten large side of boot with boot clamp (stainless wire).

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

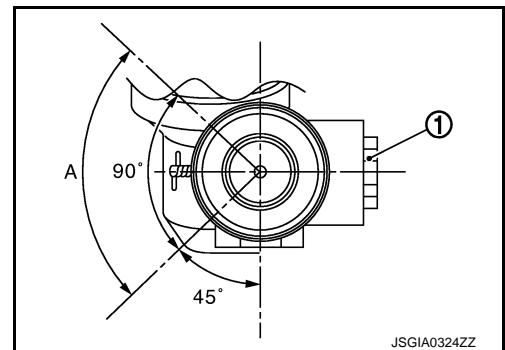
- b. Wrap clamp around boot groove for two turns. Insert a flat-bladed screwdriver in loops on both ends of wire. Twist 4 to 4.5 turns while pulling them with force of approximately 98 N (10 kg, 22 lb).



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



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



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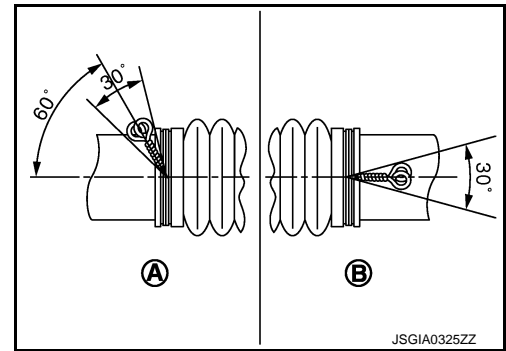
# STEERING GEAR AND LINKAGE

## < REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

e. 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.

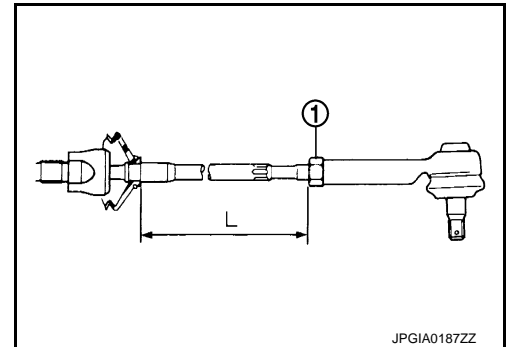
- A : Gear housing RHD side
- B : Gear housing LHD side



19. Install cylinder tubes to gear housing assembly.
20. Install low pressure piping.
21. Adjust inner socket to standard length (L), and then tighten lock nut (1) to the specified torque. Check length again after tightening lock nut.

**Standard**  
**Inner socket length (L)** : Refer to [ST-66, "Inner Socket Length"](#).

**CAUTION:**  
**Adjust toe-in after this procedure. The length achieved after toe-in adjustment is not necessary the above value.**



## Inspection

### 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.

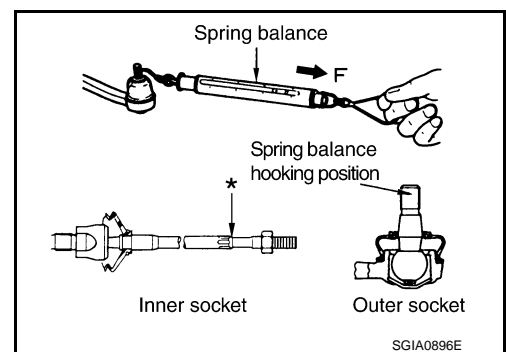
#### Outer Socket and Inner Socket

Check the following items and replace the component if it does not meet the standard.

#### 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 inner socket if they are outside the standard.

**Standard**  
**(Measuring point of outer socket: Stud cotter pin mounting hole)**  
**Outer socket** : Refer to [ST-66, "Socket Swing Force and Rotating Torque"](#).



# STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

## Standard

(Measuring point of inner socket: "\*" mark shown in the figure)

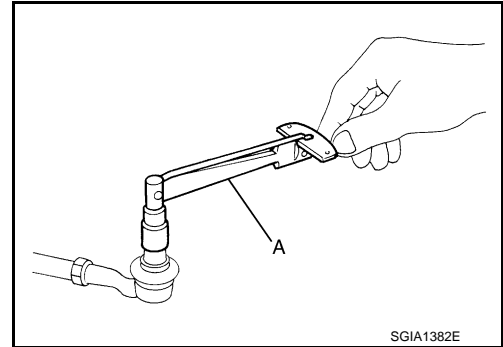
Inner socket : Refer to [ST-66, "Socket Swing Force and Rotating Torque"](#).

## BALL JOINT ROTATING TORQUE

Make sure that the reading is within the following specified range using preload gauge (A) [SST: ST3127S000 (J-25765-A)]. Replace outer socket if the reading is outside the specified value.

## Standard

Rotating torque : Refer to [ST-66, "Socket Swing Force and Rotating Torque"](#).



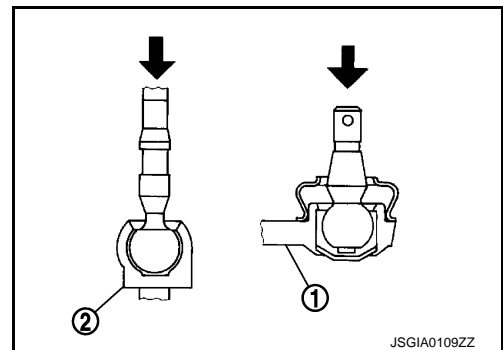
## BALL JOINT AXIAL END PLAY

Apply an axial load of 490 N (50 kg, 110 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 (1) and inner socket (2) if the measured value is outside the standard.

## Standard

Outer socket : Refer to [ST-66, "Socket Axial End Play"](#).

Inner socket : Refer to [ST-66, "Socket Axial End Play"](#).



## INSPECTION AFTER INSTALLATION

- Check if steering wheel turns smoothly when it is turned several times fully to the end of the left and right.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle. Refer to [ST-33, "Inspection"](#).
- Check the fluid level, fluid leakage, and air bleeding hydraulic system. Refer to [ST-31, "Inspection"](#).

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# POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

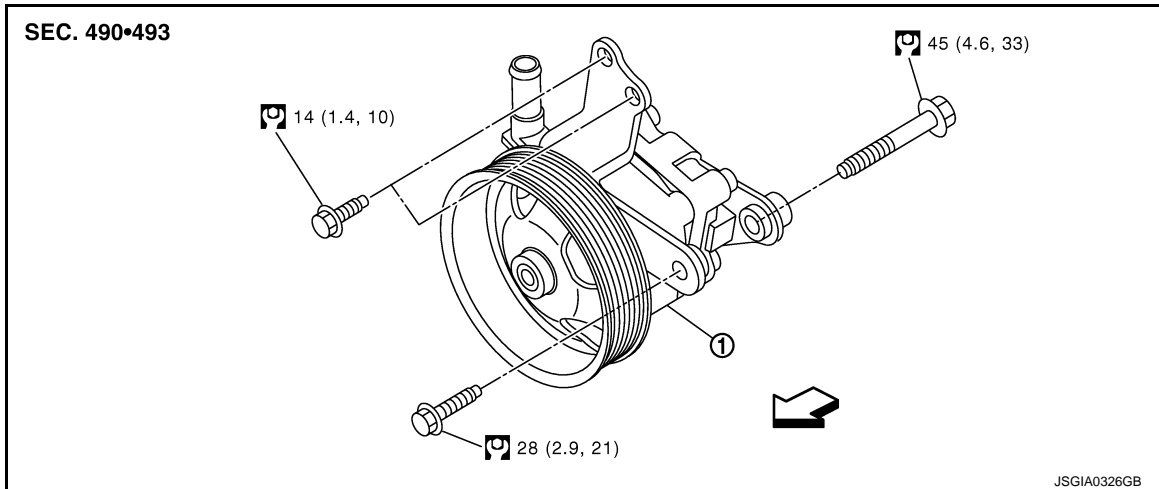
[WITH HEATED STEERING WHEEL]

## POWER STEERING OIL PUMP

Exploded View

INFOID:000000008459304

### REMOVAL

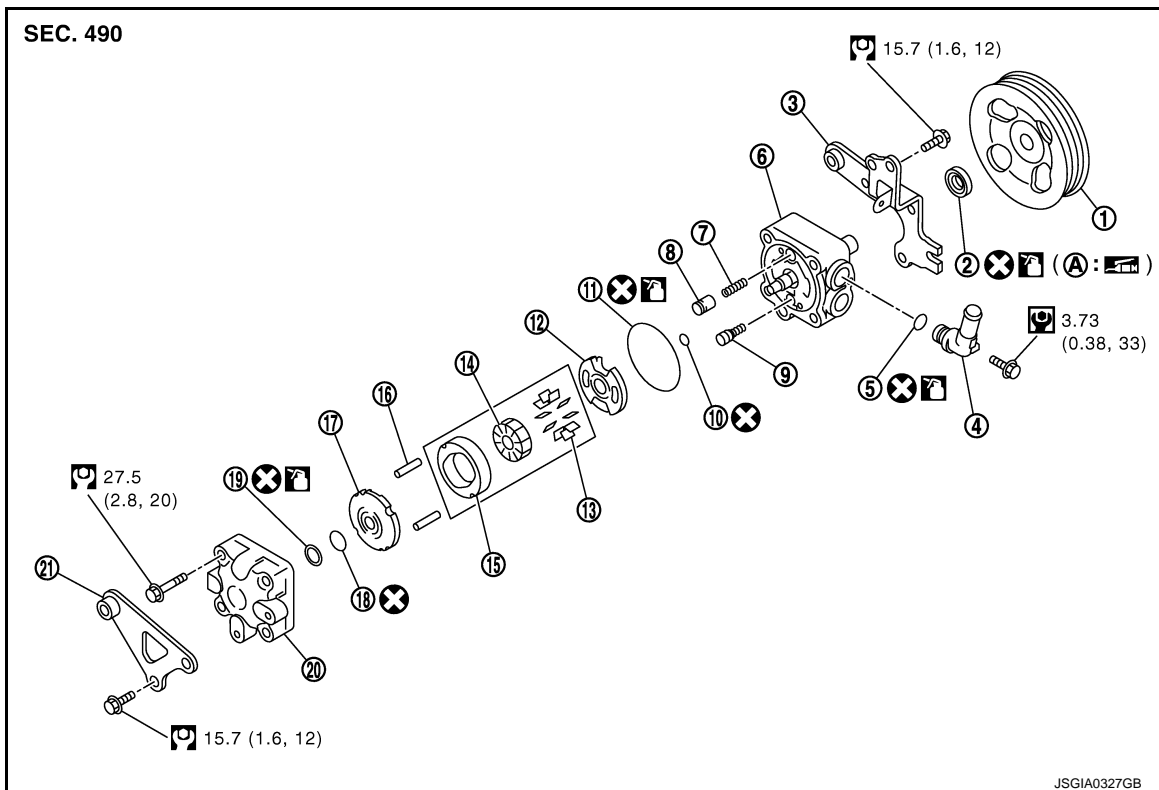


1. Power steering oil pump

⇐: Vehicle front

Refer to [GI-4. "Components"](#) for symbols in the figure.

### DISASSEMBLY



- |                              |                       |                                    |
|------------------------------|-----------------------|------------------------------------|
| 1. Pulley                    | 2. Oil seal           | 3. Front bracket                   |
| 4. Suction pipe              | 5. O-ring             | 6. Body assembly                   |
| 7. Flow control valve spring | 8. Flow control valve | 9. Flow control valve sub assembly |




# POWER STEERING OIL PUMP

## < REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

- |                 |                     |                      |
|-----------------|---------------------|----------------------|
| 10. O-ring      | 11. O-ring          | 12. Front side plate |
| 13. Vane        | 14. Rotor           | 15. Cam ring         |
| 16. Dowel pin   | 17. Rear side plate | 18. O-ring           |
| 19. Teflon ring | 20. Rear cover      | 21. Rear bracket     |
| A. Oil seal lip |                     |                      |

: Apply power steering fluid.

: Apply multi-purpose grease.

Refer to [GI-4, "Components"](#) for symbols not described on the above.

## Removal and Installation

INFOID:000000008459305

### REMOVAL

1. Drain power steering fluid from reservoir tank.
2. Remove front road wheel and tires.
3. Remove splash guard. Refer to [EXT-23, "FENDER PROTECTOR : Exploded View"](#).
4. Loosen drive belt. Refer to [EM-16, "Removal and Installation"](#).
5. Remove drive belt from oil pump pulley.
6. Remove copper washers and eye bolt (drain fluid from their pipings).
7. Remove suction hose (drain fluid from their pipings).
8. Remove oil pump mounting bolts, and then remove oil pump.

**CAUTION:**

**Never damage drive shaft boot.**

### INSTALLATION

Note the following, and install in the reverse order of removal.

- When installing suction hoses (1), refer to the figure.

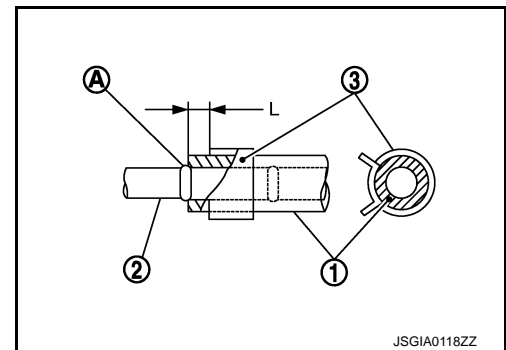
**CAUTION:**

- **Never apply fluid to the hose (1) and tube (2).**
- **Insert hose securely until it contacts spool (A) of tube.**
- **Leave clearance (L) when installing clamp (3).**

Standard

L

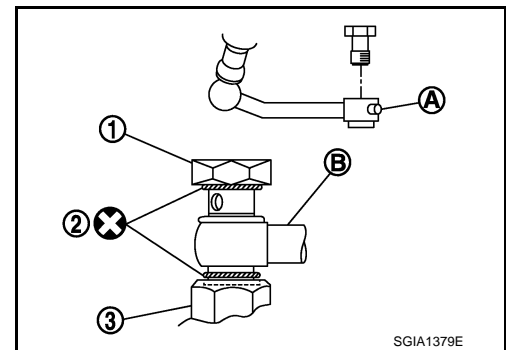
: 3 – 8 mm (0.12 – 0.31 in)



- When installing eye bolt (1) and copper washers (2) to oil pump (3), refer to the figure.

**CAUTION:**

- **Never reuse copper washer.**
  - **Apply power steering fluid to around copper washer, then install eye bolt.**
  - **Install eye bolt with eye joint (assembled to high pressure hose) (B) protrusion (A) facing with pump side cutout, and then tighten it to the specified torque after tightening by hand. Refer to [ST-62, "Exploded View"](#).**
  - **Securely insert harness connector to pressure sensor.**
- Adjust belt tension. Refer to [EM-16, "Tension Adjustment"](#).
- Check fluid level, fluid leakage and air bleeding hydraulic system after the installation. Refer to [ST-31, "Inspection"](#).



## Disassembly and Assembly

INFOID:000000008459306

### DISASSEMBLY

1. Remove rear bracket.

# POWER STEERING OIL PUMP

[WITH HEATED STEERING WHEEL]

## < REMOVAL AND INSTALLATION >

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

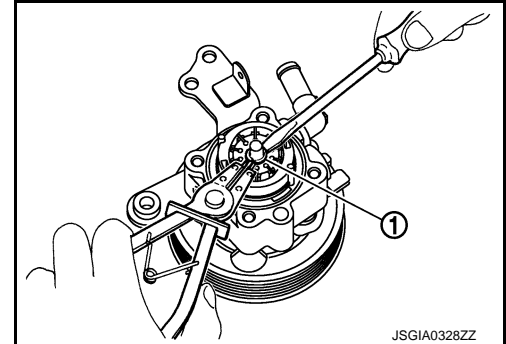
**CAUTION:**

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

3. Remove O-ring from body assembly.
4. Remove rear side plate from cartridge, and then remove Teflon ring and O-ring from rear side plate.
5. Remove rotor snap ring (1) using a snap ring pliers, and remove cam ring, rotor and vane from body assembly.

**CAUTION:**

When removing the snap ring, never damage the pulley shaft.



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

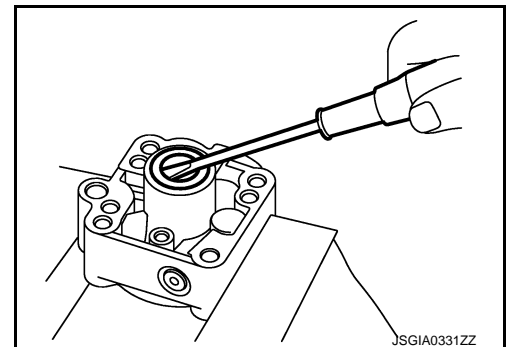
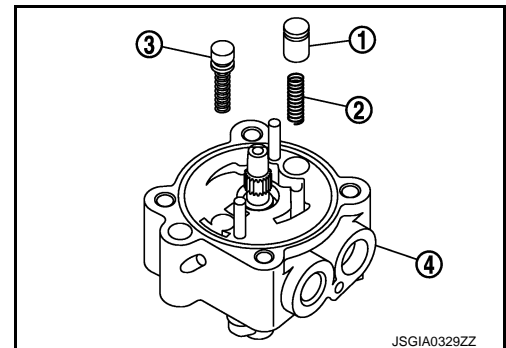
**CAUTION:**

Never drop and damage flow control valve and flow control valve sub assembly when removing.

8. Remove oil seal from body assembly.
9. Remove mounting bolt of suction pipe, and then remove suction pipe from body assembly.
10. Remove pulley from body assembly.
11. Remove front bracket from body assembly.
12. Remove oil seal from body assembly using a flat-bladed screwdriver.

**CAUTION:**

Never damage the body assembly.



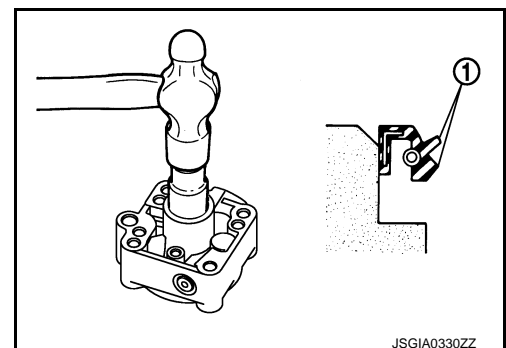
## ASSEMBLY

1. Apply recommended grease to oil seal lips (1). Apply recommended fluid to around oil seal. Install oil seal to body assembly using a drift (commercial service tool).

**CAUTION:**

- Never reuse the oil seal.
- Fix oil pump with a vise if necessary.
- Use copper plates when fixing with a vise.

2. Install front bracket to body assembly.
3. Install pulley to body assembly.
4. 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.

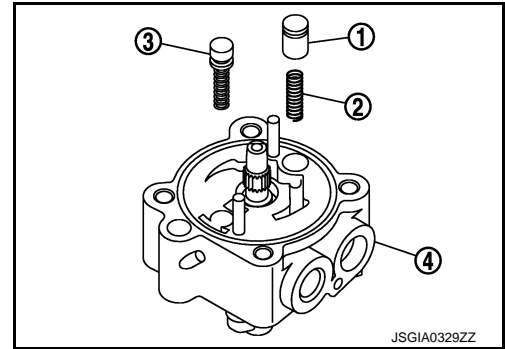


# POWER STEERING OIL PUMP

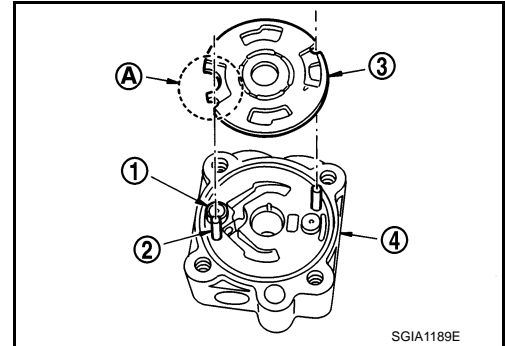
## < REMOVAL AND INSTALLATION >

## [WITH HEATED STEERING WHEEL]

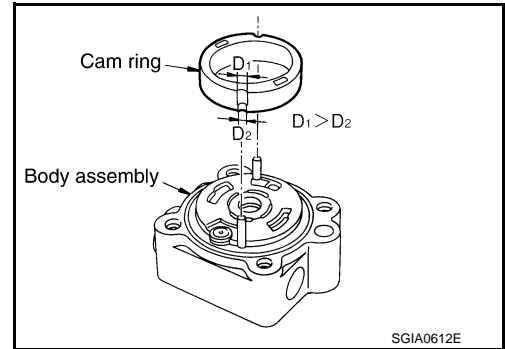
5. Install flow control valve (1), flow control valve spring (2) and flow control valve sub assembly (3) as shown in the figure to body assembly (4).



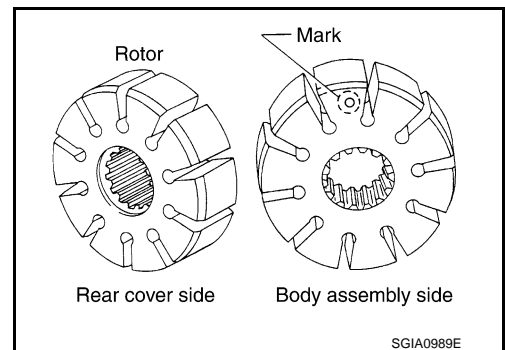
6. Install front side plate (3) with dowel pin (2) on flow control valve A (1) side as shown in the figure aligning with front side plate cutout (A) to body assembly (4).



7. Install cam ring as shown in the figure.



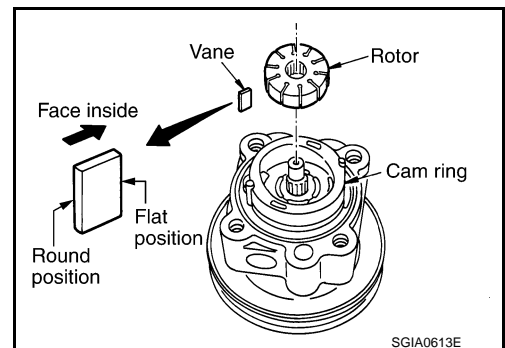
8. Install rotor so that mark faces body assembly, and then install it to pulley shaft.



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 drift (commercial service tool).

**CAUTION:**

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

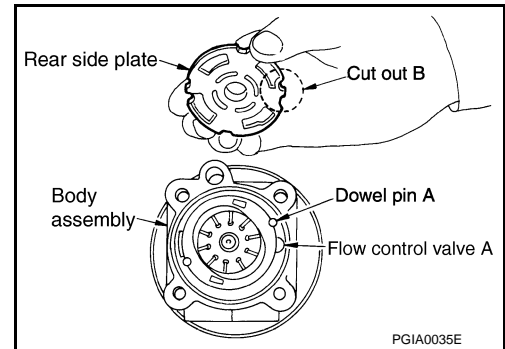


# POWER STEERING OIL PUMP

## < REMOVAL AND INSTALLATION >

## [WITH HEATED STEERING WHEEL]

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.
18. Install rear bracket.



## Inspection

INFOID:000000008459307

## RELIEF OIL PRESSURE

### CAUTION:

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

1. Connect the oil pressure gauge [SST: KV48103500 (J-26357)] and the oil pressure gauge adapter [SST: KV48102500 (J-33914)] between oil pump discharge connector and high-pressure hose. Bleed air from the hydraulic circuit while opening valve fully. Refer to [ST-31, "Inspection"](#).
2. Start the engine. Run the engine until oil temperature reaches 50 to 80°C (122 to 176°F).

### CAUTION:

- Leave the valve of the oil pressure gauge fully open while starting and running the 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 oil pressure gauge valve with engine at idle and measure the relief oil pressure.

### Standard

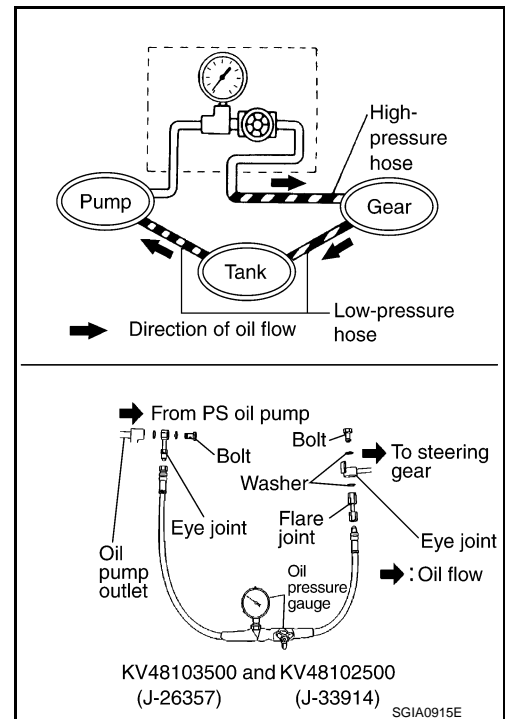
Relief oil pressure

: Refer to [ST-66, "Relief Oil Pressure"](#).

### 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 [ST-57, "Disassembly and Assembly"](#).
5. Disconnect the oil pressure gauge from hydraulic circuit.



# POWER STEERING OIL PUMP

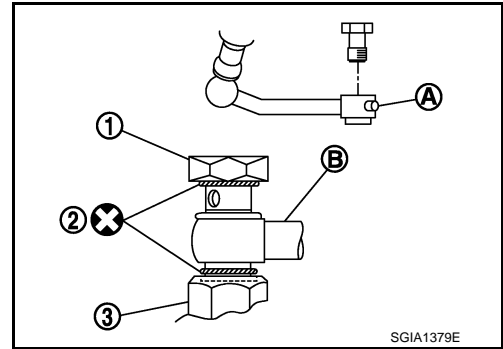
## < REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

6. When installing eye bolt (1) and copper washers (2) to oil pump (3), refer to the figure.

**CAUTION:**

- Never reuse copper washer.
- Apply power steering fluid or equivalent to around copper washer, then install eye bolt.
- Install eye bolt with eye joint (assembled to high pressure hose) (B) protrusion (A) facing with pump side cutout, and then tighten it to the specified torque after tightening by hand. Refer to [ST-62. "Exploded View"](#).
- Securely insert harness connector to pressure sensor.



7. Check fluid level, fluid leakage and air bleeding hydraulic system after the installation. Refer to [ST-31. "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.

### 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 necessary.

#### Side Plate Inspection

- Check side plate for damage. Replace side plate if necessary.

#### Flow Control Valve Inspection

- Check flow control valve and spring for damage. Replace if necessary.

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# HYDRAULIC LINE

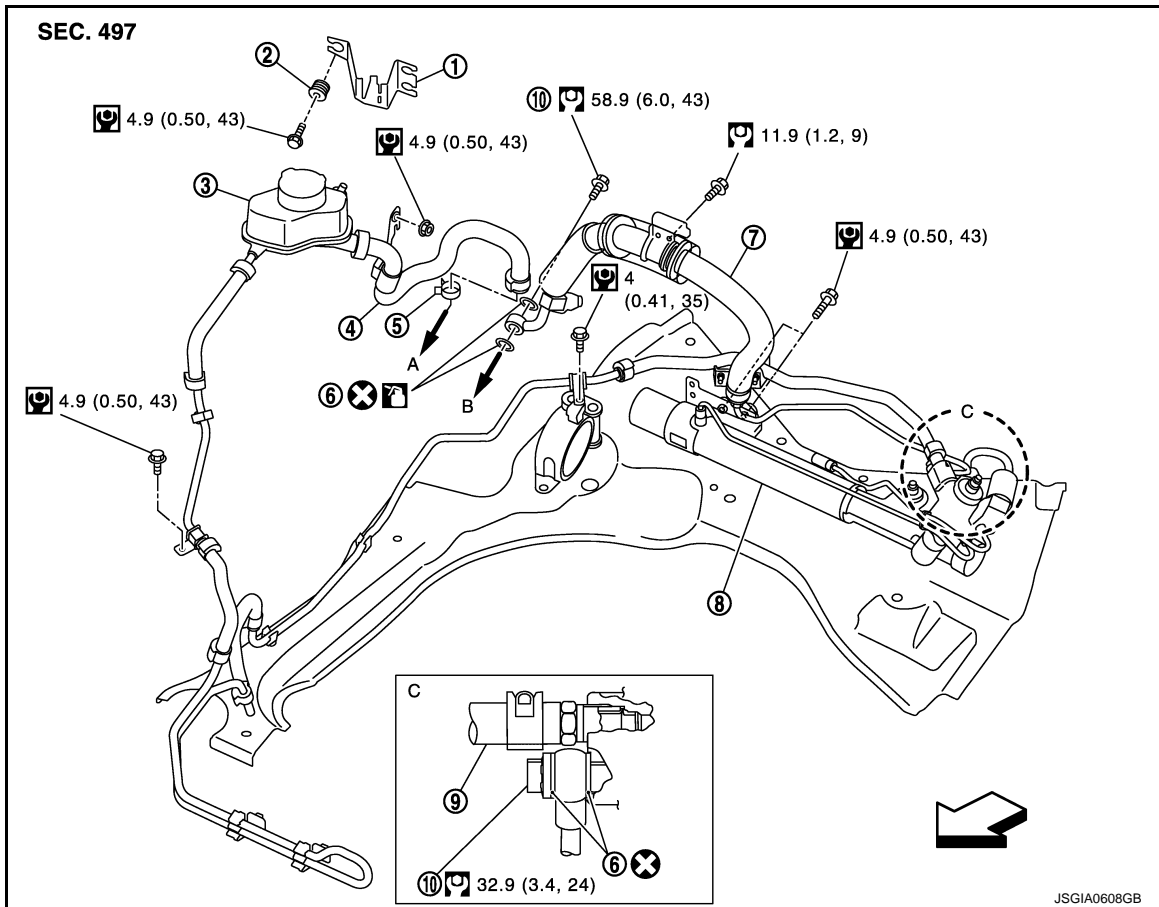
< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

## HYDRAULIC LINE

Exploded View

INFOID:000000008459308



- |   |                                |                      |
|---|--------------------------------|----------------------|
| 1. Reservoir tank bracket                   | 2. Bushing                     | 3. Reservoir tank    |
| 4. Suction hose                             | 5. Clamp                       | 6. Copper washer     |
| 7. High pressure piping                     | 8. Steering gear assembly      | 9. Low pressure hose |
| 10. Eye bolt                                |                                |                      |
| A. To power steering oil pump suction hose. | B. To power steering oil pump. |                      |

⇐: Vehicle front

: Apply power steering fluid.

Refer to [GI-4, "Components"](#) for symbols not described on the above.

## Removal and Installation

INFOID:000000008459309

**CAUTION:**

# HYDRAULIC LINE

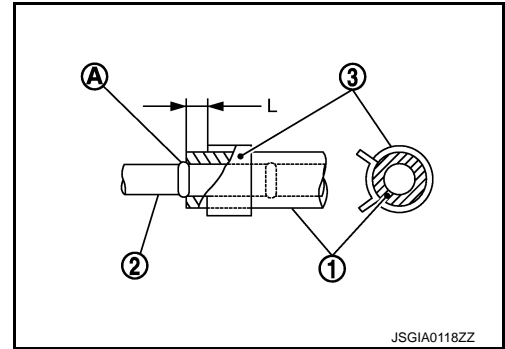
## < REMOVAL AND INSTALLATION >

## [WITH HEATED STEERING WHEEL]

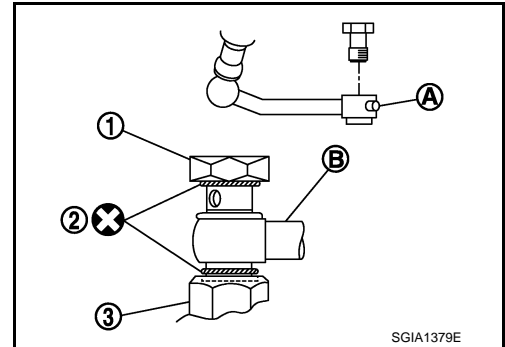
- Never apply fluid to the hose (1) and tube (2).
- Insert hose securely until it contacts spool (A) of tube.
- Leave clearance (L) when installing clamp (3).

Standard

L : 3 – 8 mm (0.12 – 0.31 in)



- Install eye bolt with eye joint (assembled to high pressure hose) (B) protrusion (A) facing with pump side cutout, and then tighten it to the specified torque after tightening by hand. Refer to [ST-62, "Exploded View"](#).
- Securely insert harness connector to pressure sensor.
- Apply power steering fluid to around copper washer, then install eye bolt.
- Never reuse copper washer.



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## HEATED STEERING WHEEL SWITCH

< REMOVAL AND INSTALLATION >

[WITH HEATED STEERING WHEEL]

---

### HEATED STEERING WHEEL SWITCH

#### Removal and Installation

INFOID:000000008459310

#### REMOVAL

1. Remove Instrument lower panel LH. Refer to [IP-13. "Removal and Installation"](#).
2. Remove heated steering wheel switch.

#### INSTALLATION

Install in the reverse order of removal.



# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[WITH HEATED STEERING WHEEL]

## SERVICE DATA AND SPECIFICATIONS (SDS)

### SERVICE DATA AND SPECIFICATIONS (SDS)

#### General Specifications

INFOID:000000008459311

|                          |                                    |
|--------------------------|------------------------------------|
| Steering gear model      | PR26AF                             |
| Fluid capacity (Approx.) | ℓ (US qt, Imp qt) 1.0 (1-1/8, 7/8) |

#### Steering Wheel Axial End Play and Play

INFOID:000000008459312

Unit: mm (in)

| Item   | Standard          |
|--|-------------------|
| Steering wheel axial end play                  | 0 (0)             |
| Steering wheel play on the outer circumference | 0 – 35 (0 – 1.38) |

#### Steering Wheel Turning Force

INFOID:000000008459313

Unit: N·m (kg·m, in·lb)

| Item                         | Standard        |
|------------------------------|-----------------|
| Steering wheel turning force | 7.45 (0.76, 66) |

#### Steering Angle

INFOID:000000008459314

Unit: Degree minute (Decimal degree)

| Item        |         | Standard            |                     |
|-------------|---------|---------------------|---------------------|
|             |         | Wheel size: 18 inch | Wheel size: 20 inch |
| Inner wheel | Minimum | 33°30' (33.5°)      | 32°00' (32.0°)      |
|             | Nominal | 36°30' (36.5°)      | 35°00' (35.0°)      |
|             | Maximum | 37°30' (37.5°)      | 36° (36.0°)         |
| Outer wheel | Nominal | 31°30' (31.5°)      | 30°30' (30.5°)      |

#### Steering Column Length

INFOID:000000008459315

Unit: mm (in)

| Item                   | Standard    |
|------------------------|-------------|
| Steering column length | 463 (18.23) |

#### Steering Column Mounting Dimensions

INFOID:000000008459316

Unit: mm (in)

| Item               | Standard          |
|--------------------|-------------------|
| Mounting dimension | 30 (1.18) or less |

#### Steering Column Operating Range

INFOID:000000008459317

| Item                       | Standard                      |                     |
|----------------------------|-------------------------------|---------------------|
|                            | Without electric motor        | With electric motor |
| Tilt operating range       | 15°                           | 18°                 |
| Telescopic operating range | 40 mm (1.57 in)               |                     |
| Rotating torque            | 0.49 N·m (0.05 kg·m, 4 in·lb) |                     |

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[WITH HEATED STEERING WHEEL]

## Lower Shaft Length

INFOID:000000008459318

Unit: mm (in)

| Item                                   | Standard                      |
|--|-------------------------------|
| Lower shaft length (extended position) | 524.6 – 525.6 (20.65 – 20.69) |

## Rack Sliding Force

INFOID:000000008459319

Unit: N (kg, lb)

| Item               | Standard                             |                                      |
|--------------------|--------------------------------------|--------------------------------------|
|                    | 2WD                                  | AWD                                  |
| Rack sliding force | 195 – 258 (19.9 – 26.3, 43.8 – 57.9) | 227 – 305 (23.2 – 31.1, 51.1 – 68.5) |

## Rack Stroke

INFOID:000000008459320

Unit: mm (in)

| Item                         | Standard            |                     |
|------------------------------|---------------------|---------------------|
|                              | Wheel size: 18 inch | Wheel size: 20 inch |
| Rack stroke neutral position | 70.5 (2.776)        | 68.0 (2.677)        |

## Socket Swing Force and Rotating Torque

INFOID:000000008459321

### SWING FORCE

Unit: N (kg, lb)

| Item         | Standard                            |
|--------------|-------------------------------------|
| Outer socket | 4.81 – 45.7 (0.5 – 4.6, 1.1 – 10.2) |
| Inner socket | 8.9 – 64 (0.91 – 6.5, 2.01 – 14.3)  |

### ROTATING TORQUE

Unit: N·m (kg-m, in-lb)

| Item         | Standard                        |
|--------------|---------------------------------|
| Outer socket | 0.3 – 2.9 (0.03 – 0.29, 3 – 25) |

## Socket Axial End Play

INFOID:000000008459322

Unit: mm (in)

| Item         | Standard            |
|--------------|---------------------|
| Outer socket | 0.5 (0.02) or less  |
| Inner socket | 0.2 (0.008) or less |

## Inner Socket Length

INFOID:000000008459323

Unit: mm (in)

| Item                | Standard     |
|---------------------|--------------|
| Inner socket length | 120.6 (4.75) |

## Relief Oil Pressure

INFOID:000000008459324

Unit: kPa (kg/cm<sup>2</sup>, psi)

| Item                | Standard                                     |
|---------------------|--|
| Relief oil pressure | 9,400 – 10,400 (95.9 – 106.1, 1,363 – 1,508) |

# PRECAUTIONS

< PRECAUTION >

[WITHOUT HEATED STEERING WHEEL]

## PRECAUTION

### PRECAUTIONS

#### FOR USA AND CANADA

#### FOR USA AND CANADA : Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000008942354

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 "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

#### **WARNING:**

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that 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 "SRS AIR BAG".
- Never 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:**

Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never 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.

#### FOR MEXICO

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

INFOID:000000008942355

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

#### **WARNING:**

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that 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 "SRS AIR BAG".
- Never 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:**

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## PRECAUTIONS

< PRECAUTION >

[WITHOUT HEATED STEERING WHEEL]

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Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never 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.

# PREPARATION

[WITHOUT HEATED STEERING WHEEL]

< PREPARATION >

## PREPARATION

### PREPARATION

#### Special Service Tools

INFOID:000000008459327

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

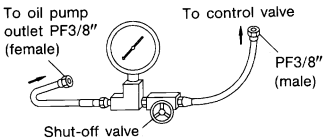
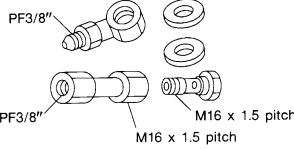
| Tool number<br>(Kent-Moore No.)<br>Tool name  | Description   |
|---|---|
| ST27180001<br>(J-25726-A)<br>Steering wheel puller  | Removing steering wheel   |
| ST3127S000<br>(J-25765-A)<br>Preload gauge  | <ul style="list-style-type: none"> <li>Measuring steering column rotating torque</li> <li>Measuring pinion rotating torque</li> <li>Measuring ball joint rotating torque</li> </ul> |
| KV48104400<br>( — )<br>Teflon ring correcting tool<br>a: 50 mm (1.97 in) dia.<br>b: 36 mm (1.42 in) dia.<br>c: 100 mm (3.94 in) | Installing rack Teflon ring   |
| KV48103400<br>( — )<br>Preload adapter  | Measuring pinion rotating torque  |
| ST35300000<br>( — )<br>Drift<br>a: 45.1 mm (1.776 in) dia.<br>b: 59.0 mm (2.323 in) dia.  | Installing oil pump oil seal  |

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# PREPARATION

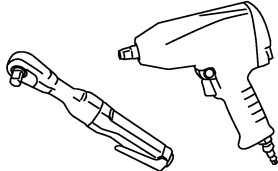
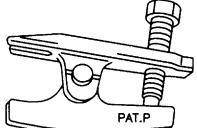
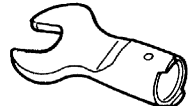
**[WITHOUT HEATED STEERING WHEEL]**

< PREPARATION >

| Tool number<br>(Kent-Moore No.)<br>Tool name   | Description                        |
|--|------------------------------------|
| KV48103500<br>(J-26357)<br>Oil pressure gauge  | Measuring oil pump relief pressure |
|  <p style="text-align: center;">S-NT547</p> |                                    |
| KV48102500<br>(J-33914)<br>Oil pressure gauge adapter  | Measuring oil pump relief pressure |
|  <p style="text-align: center;">S-NT542</p> |                                    |

## Commercial Service Tools

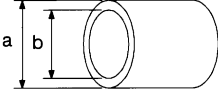
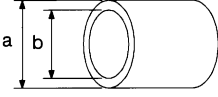
INFOID:000000008459328

| Tool name   | Description                    |
|---|--------------------------------|
| Power tool  | Loosening bolts and nuts       |
|  <p style="text-align: center;">PBIC0190E</p> |                                |
| Ball joint remover  | Removing steering outer socket |
|  <p style="text-align: center;">S-NT146</p>  |                                |
| Open head   | Tightening end cover assembly  |
|  <p style="text-align: center;">ZZA0822D</p> |                                |

# PREPARATION

< PREPARATION >

[WITHOUT HEATED STEERING WHEEL]

| Tool name   | Description                         |
|---|-------------------------------------|
| <p>Drift<br/>                     a: 15 mm (0.59 in) dia.<br/>                     b: 10 mm (0.39 in) dia.</p>  <p style="text-align: center;">S-NT474</p> | <p>Installing rotor snap ring</p>   |
| <p>Drift<br/>                     a: 36 mm (1.42 in) dia.<br/>                     b: 20 mm (0.79 in) dia.</p>  <p style="text-align: center;">S-NT474</p> | <p>Installing oil pump oil seal</p> |

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# STEERING WHEEL

< BASIC INSPECTION >

[WITHOUT HEATED STEERING WHEEL]

## BASIC INSPECTION

### STEERING WHEEL

#### Inspection

INFOID:000000008459329

#### NEUTRAL POSITION STEERING WHEEL

1. Check that steering gear assembly, steering column assembly and steering wheel are installed in the correct position.
2. Perform neutral position inspection after wheel alignment. Refer to [FSU-7, "Inspection"](#).
3. Set the vehicle to the straight-ahead position and confirm steering wheel is in the neutral position.
4. 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.

#### STEERING WHEEL TURNING FORCE

1. Park the vehicle on a level and dry surface, set parking brake.
2. Tires need to be inflated normal pressure. Refer to [WT-49, "Tire Air Pressure"](#).
3. Start the engine.
4. Bring power steering fluid up to adequate operating temperature.

**Fluid temperature** : 50 – 80°C (122 – 176°F)

5. Check steering wheel turning force when steering wheel has been turned 540° from neutral position.

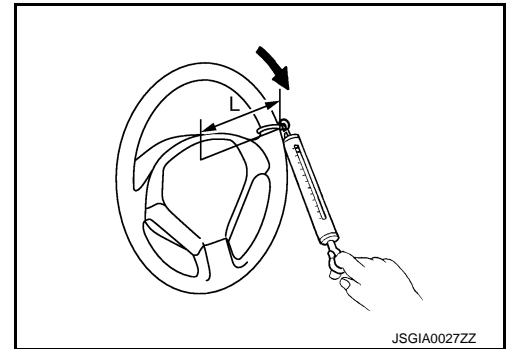
**Standard**

**Steering wheel turning force** : Refer to [ST-106, "Steering Wheel Turning Force"](#).

#### 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.

6. 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 [ST-102, "Inspection"](#).



#### RACK SLIDING FORCE

1. Disconnect lower joint and steering knuckle from steering gear assembly. Refer to [ST-83, "Exploded View"](#).
2. Start and run the engine at idle to make sure steering fluid has reached normal operating temperature.

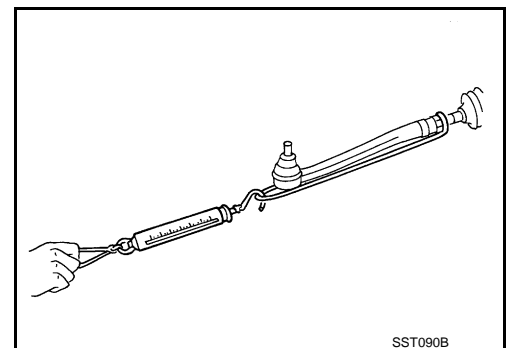
**Fluid temperature** : 50 – 80°C (122 – 176°F)

3. While pulling outer socket slowly in  $\pm 11.5$  mm ( $\pm 0.453$  in) range from neutral position, make sure rack sliding force is within specification.

**Standard**

**Rack sliding force** : Refer to [ST-107, "Rack Sliding Force"](#).

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



#### FRONT WHEEL TURNING ANGLE

1. Check front wheel turning angle after toe-in inspection. Refer to [FSU-7, "Inspection"](#).

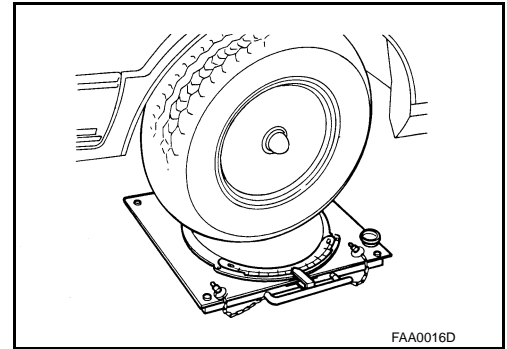


# STEERING WHEEL

[WITHOUT HEATED STEERING WHEEL]

## < BASIC 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.

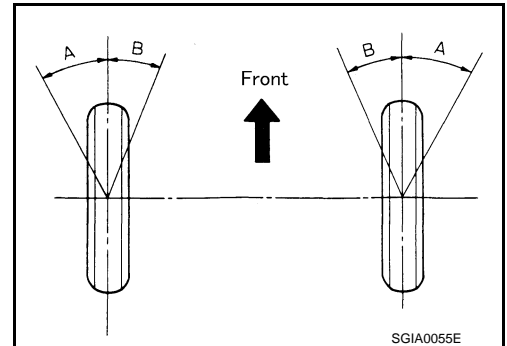


- With the engine at idle, turn steering wheel from full left stop to full right stop and measure the turning angles.

### Standard

**Inner wheel (Angle: A)** : Refer to [ST-106, "Steering Angle"](#).

**Outer wheel (Angle: B)** : Refer to [ST-106, "Steering Angle"](#).



- Check the following items when turning angle is out of the standard.

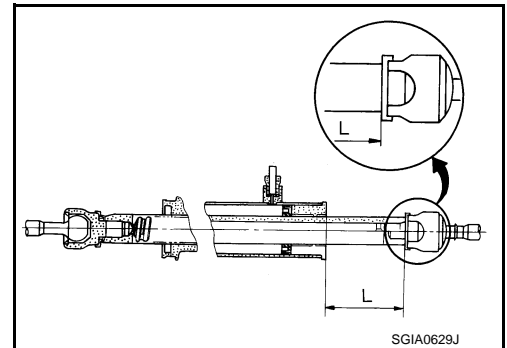
- Check the neutral position of the rack stroke (L).

### Standard

**Rack stroke neutral position (L)** : Refer to [ST-107, "Rack Stroke"](#).

- 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.



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# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[WITHOUT HEATED STEERING WHEEL]

## SYMPTOM DIAGNOSIS

### NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

#### NVH Troubleshooting Chart

INFOID:000000008459330

#### 2WD MODELS

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

| Symptom  |           | Noise | Possible cause and SUSPECTED PARTS |                         |   |   |  |                        |                     |                                  |                      |                         | Reference |   |                    |                                       |   |                            |                     |      |            |             |                                    |
|----------|-----------|-------|------------------------------------|-------------------------|---|---|--|------------------------|---------------------|----------------------------------|----------------------|-------------------------|-----------|---|--------------------|---------------------------------------|---|----------------------------|---------------------|------|------------|-------------|------------------------------------|
|          |           |       | Fluid level                        | Air in hydraulic system | Outer/inner socket ball joint swinging torque | Outer/inner socket ball joint rotating torque | Outer/inner 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 looseness | Steering column deformation or damage | Improper installation or looseness of steering column | Steering linkage looseness | AXLE and SUSPENSION | TIRE | ROAD WHEEL | DRIVE SHAFT | BRAKE                              |
| Steering | Noise     | x     | x                                  | x                       | x   | x   | x                                      | x                      | x                   | x                                |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-76. "Inspection"                |
|          | Shake     |       |                                    |                         |   |   |  |                        |                     |                                  | x                    | x                       | x         |   |                    |                                       |   |                            |                     |      |            |             | ST-76. "Inspection"                |
|          | Vibration |       |                                    |                         |   |   |  |                        |                     |                                  | x                    | x                       | x         | x   |                    |                                       |   |                            |                     |      |            |             | ST-96. "Inspection"                |
|          | Shimmy    |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   | x                  | x                                     | x   | x                          | x                   | x    |            |             | ST-96. "Inspection"                |
|          | Judder    |       |                                    |                         |   |   |  |                        |                     |                                  |                      | x                       | x         |   | x                  | x                                     | x   | x                          | x                   |      |            |             | ST-96. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-76. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-76. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-96. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-96. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-76. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-78. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-78. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | EM-16. "Checking"                  |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-78. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | —                                  |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-86. "Exploded View"             |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-81. "Inspection"                |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-80. "Exploded View"             |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | ST-86. "Exploded View"             |
|          |           |       |                                    |                         |   |   |  |                        |                     |                                  |                      |                         |           |   |                    |                                       |   |                            |                     |      |            |             | 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

#### AWD MODELS

# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[WITHOUT HEATED STEERING WHEEL]

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

| Symptom  |           | Possible cause and SUSPECTED PARTS |                         |   |   |  |                        |                     |                                  |                      |                         | Reference |   |                    |                                       |   |                            |                 |              |                     |      |            |             |  |
|----------|-----------|------------------------------------|-------------------------|---|---|--|------------------------|---------------------|----------------------------------|----------------------|-------------------------|-----------|---|--------------------|---------------------------------------|---|----------------------------|-----------------|--------------|---------------------|------|------------|-------------|--|
|          |           | Fluid level                        | Air in hydraulic system | Outer/inner socket ball joint swinging torque | Outer/inner socket ball joint rotating torque | Outer/inner 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 looseness | Steering column deformation or damage | Improper installation or looseness of steering column | Steering linkage looseness | PROPELLER SHAFT | DIFFERENTIAL | AXLE and SUSPENSION | TIRE | ROAD WHEEL | DRIVE SHAFT | BRAKE  |
| Steering | Noise     | x                                  | x                       | x   | x   | x                                      | x                      | x                   | x                                | x                    |                         |           |   | x                  | x                                     |   | x                          | x               | x            | x                   | x    | x          | x           | ST-76. "Inspection"<br>ST-76. "Inspection"<br>ST-96. "Inspection"<br>ST-96. "Inspection"<br>ST-96. "Inspection"<br>ST-76. "Inspection"<br>ST-78. "Inspection"<br>ST-78. "Inspection"<br>EM-16. "Checking"<br>ST-78. "Inspection"<br>—<br>ST-86. "Exploded View"<br>ST-81. "Inspection"<br>ST-80. "Exploded View"<br>ST-86. "Exploded View" |
|          | Shake     |                                    |                         |   |   |  |                        |                     |                                  | x                    | x                       | x         |   |                    |                                       |   | x                          |                 | x            | x                   | x    | x          | x           |  |
|          | Vibration |                                    |                         |   |   |  |                        |                     |                                  | x                    | x                       | x         | x   | x                  |                                       |   |                            |                 | x            | x                   |      |            |             |  |
|          | Shimmy    |                                    |                         |   |   |  |                        |                     |                                  | x                    |                         |           | x   |                    | x                                     |   |                            |                 | x            | x                   | x    |            | x           |  |
|          | Judder    |                                    |                         |   |   |  |                        |                     |                                  |                      | x                       | x         | x   |                    |                                       | x   |                            |                 | x            | x                   | x    |            | x           |  |

x: Applicable

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**ST**  
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O  
P

# POWER STEERING FLUID

< PERIODIC MAINTENANCE >

[WITHOUT HEATED STEERING WHEEL]

## PERIODIC MAINTENANCE

### POWER STEERING FLUID

#### Inspection

INFOID:000000008459331

#### FLUID LEVEL

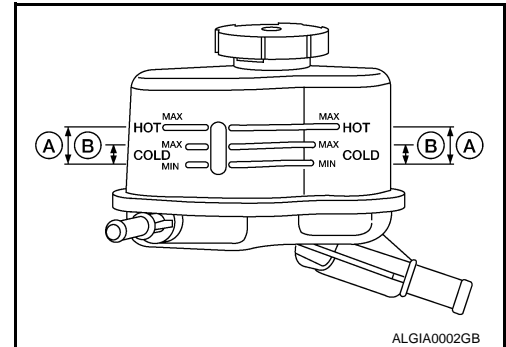
1. Check fluid level with engine stopped.
2. Ensure that fluid level is between MIN and MAX.
3. Fluid levels at HOT and COLD are different. Do not confuse them.

**HOT (A)** : Fluid temperature 50 – 80°C (122 – 176°F)

**COLD (B)** : Fluid temperature 0 – 30°C (32 – 86°F)

**Recommended fluid** : Refer to [MA-16, "FOR NORTH AMERICA : Fluids and Lubricants"](#) (For North America), [MA-17, "FOR MEXICO : Fluids and Lubricants"](#) (For Mexico).

**Fluid capacity** : Refer to [ST-106, "General Specifications"](#).



#### CAUTION:

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

#### FLUID LEAKAGE

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

1. Run the 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:

**Never hold the steering wheel in a locked position for more than 10 seconds. (There is the possibility that power steering oil pump assembly 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.
6. Check steering gear boots for accumulation of fluid leaked from steering gear.

#### AIR BLEEDING HYDRAULIC SYSTEM

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

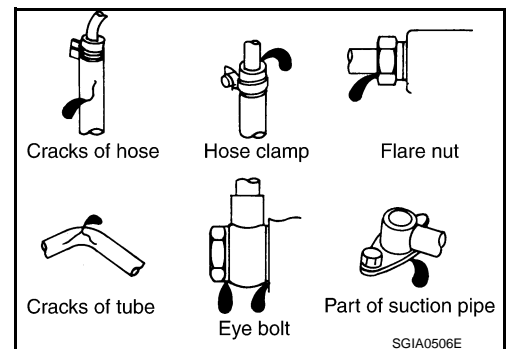
- Bubbles are created in reservoir tank.
- Clicking noise can be heard from oil pump.
- Excessive buzzing in the oil pump.

#### 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:



## POWER STEERING FLUID

< PERIODIC MAINTENANCE >

[WITHOUT HEATED STEERING WHEEL]

**Fill reservoir tank with a sufficient amount of fluid so that fluid level is not below the MIN line while turning steering wheel.**

2. Start the engine and hold steering wheel at each lock position for 3 second at idle to check for fluid leakage.

3. Repeat step 2 above several times at approximately 3 second intervals.

**CAUTION:**

**Never hold the steering wheel in a locked position for more than 10 seconds. (There is the possibility that oil pump may be damaged.)**

4. Check fluid for bubbles and white contamination.

5. Stop the engine if bubbles and white contamination do not drain out. Perform step 2 and 3 above after waiting until bubbles and white contamination drain out.

6. Stop the engine, and then check fluid level.

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## STEERING WHEEL

### Inspection

INFOID:000000008459332

#### STEERING WHEEL AXIAL END PLAY

1. Check installation conditions of steering gear assembly, front suspension assembly, axle and steering column assembly.
2. 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 [ST-106, "Steering Wheel Axial End Play and Play"](#).

3. Check the following items when steering wheel axial end play is out of the standard.
  - Check the steering column assembly mounting condition. Refer to [ST-80, "Exploded View"](#).
  - Check steering gear assembly mounting condition for looseness. Refer to [ST-86, "Exploded View"](#).

#### STEERING WHEEL PLAY

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

#### Standard

**Steering wheel play** : Refer to [ST-106, "Steering Wheel Axial End Play and Play"](#).

4. Check the following items when steering wheel play is out of the standard.
  - Check backlash for each joint of steering column assembly.
  - Check installation condition of steering gear assembly.

# STEERING WHEEL

< REMOVAL AND INSTALLATION >

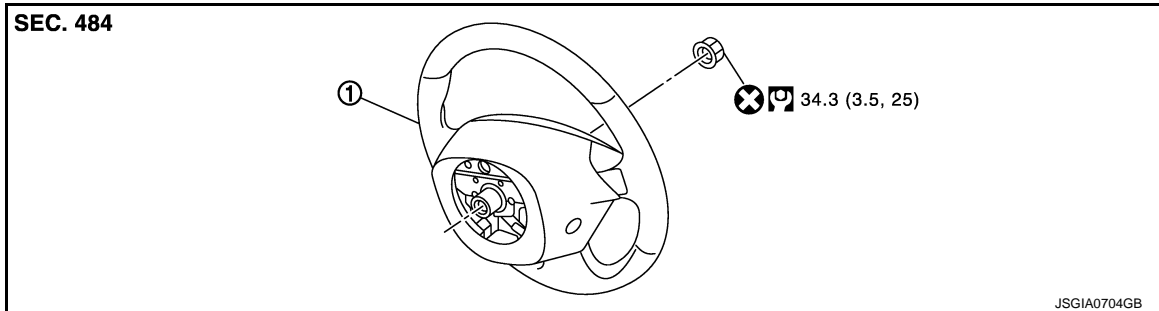
[WITHOUT HEATED STEERING WHEEL]

## REMOVAL AND INSTALLATION

### STEERING WHEEL

#### Exploded View

INFOID:000000008459333



1. Steering wheel

Refer to [GI-4, "Components"](#) for symbols in the figure.

#### Removal and Installation

INFOID:000000008459334

##### REMOVAL

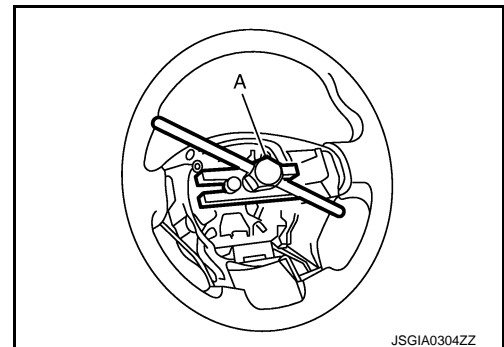
###### NOTE:

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 the vehicle to the straight-ahead position.
2. Remove driver air bag module. Refer to [SR-11, "Exploded View"](#).
3. Remove steering wheel lock nut after steering is locked.
4. Remove steering wheel with the steering wheel puller (A) [SST: ST27180001 (J-25726-A)].

###### NOTE:

Put paint marks on the steering wheel and the column shaft head for supporting accurate positioning during the installation procedure.



##### INSTALLATION

Note the following, and install in the reverse order of removal.

- Check the spiral cable neutral position after replacing or rotating spiral cable. Refer to [SR-14, "Exploded View"](#).

###### CAUTION:

**Never twist spiral cable freely on excessively after it becomes tight (doing so may cause the cable to tear off).**

- Never reuse steering wheel lock nut.

# STEERING COLUMN

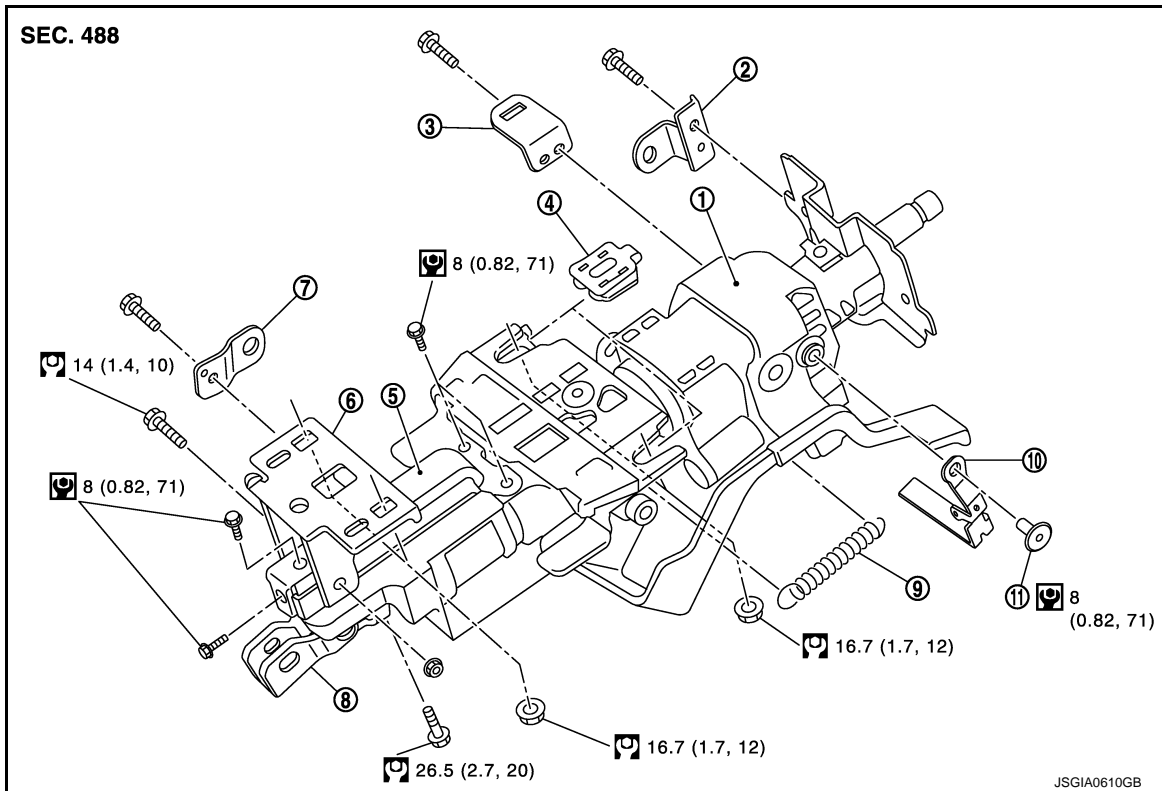
< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

## STEERING COLUMN

Exploded View

INFOID:000000008459335



- |                             |                  |                        |
|-----------------------------|------------------|------------------------|
| 1. Steering column assembly | 2. Bracket       | 3. Bracket             |
| 4. Slide plate              | 5. Slide bracket | 6. Lower mount bracket |
| 7. Bracket                  | 8. Upper joint   | 9. Spring              |
| 10. Tilt lever              | 11. Clip         |                        |

Refer to [GI-4, "Components"](#) for symbols in the figure.

## Removal and Installation

INFOID:000000008459336

### REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Place the tilt to the highest level. Place the telescopic to the longest level.
3. Remove driver air bag module. Refer to [SR-11, "Exploded View"](#).
4. Remove steering wheel. Refer to [ST-79, "Exploded View"](#).
5. Remove instrument driver lower panel. Refer to [IP-12, "Exploded View"](#).
6. Remove steering column cover. Refer to [IP-12, "Exploded View"](#).
7. Remove spiral cable. Refer to [SR-11, "Exploded View"](#).
8. Remove cluster lid A. Refer to [IP-12, "Exploded View"](#).



# STEERING COLUMN

## < REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

9. Remove knee protector (1).

← : Bolt

10. Disconnect each switch harness connectors installed to steering column assembly.
11. Remove the upper joint mounting bolt and nut (lower shaft side), and separate the upper joint from lower shaft.

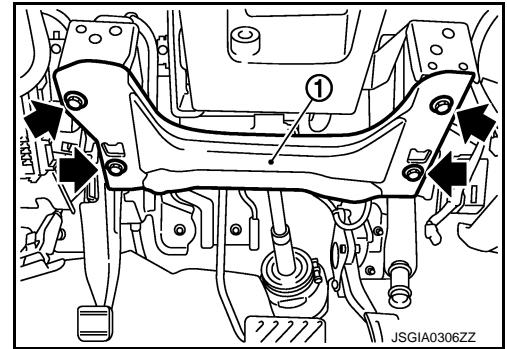
**CAUTION:**

**When removing upper joint, never insert a tool, such as a screwdriver, into the yoke groove to pull out the upper joint. In case of the violation of the above, replace upper joint with a new one.**

12. Remove steering column assembly.

**CAUTION:**

- Never give axial impact to steering column assembly during removal.
- Never move steering gear assembly when removing steering column assembly.



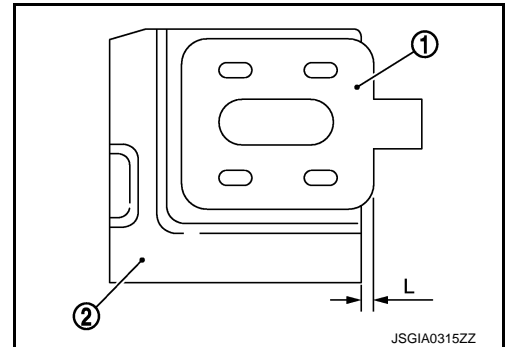
## INSTALLATION

Note the following, and install in the reverse order of removal.

- Install the slide plate (1) and steering column housing (2) so that the mounting dimensions (L) is within the specified range as described below.

**Standard**

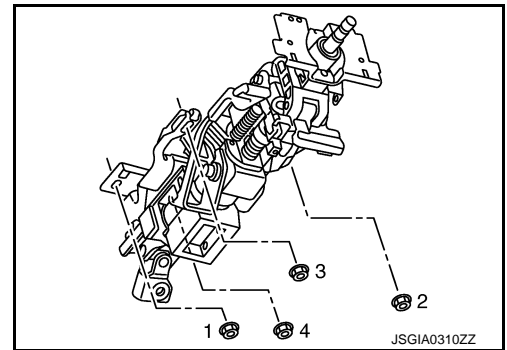
**L : 2.0 mm (0.079 in) or less**



- Tighten the mounting bolts in the order shown in the figure when installing the steering column assembly.
- Be careful of the following points when installing the steering column assembly.

**CAUTION:**

- Never give axial impact to steering column assembly during installation.
- Never move steering gear assembly.
- Never reuse the joint mounting nut (lower shaft side).
- Adjust neutral position of steering angle sensor. Refer to [BRC-9, "ADJUSTMENT OF STEERING ANGLE SENSOR NEUTRAL POSITION : Special Repair Requirement"](#).



## Inspection

INFOID:000000008459337

## INSPECTION AFTER REMOVAL

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Measure steering column assembly rotating torque using a preload gauge [SST: ST3127S000 (J-25765-A)]. Replace steering column assembly if outside the standard.

**Standard**

**Rotating torque : Refer to [ST-106, "Steering Column Operating Range"](#).**

# STEERING COLUMN

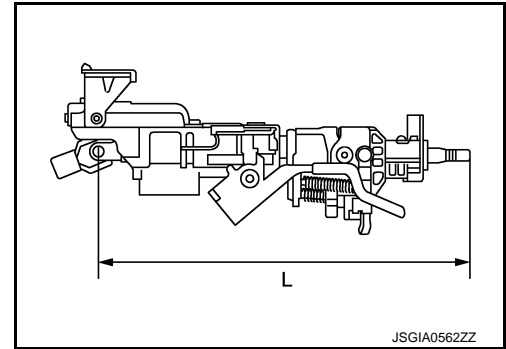
## < REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

- Measure the length (L) as shown, if vehicle has been involved in a minor collision. Replace steering column assembly if out side the standard.

### Standard

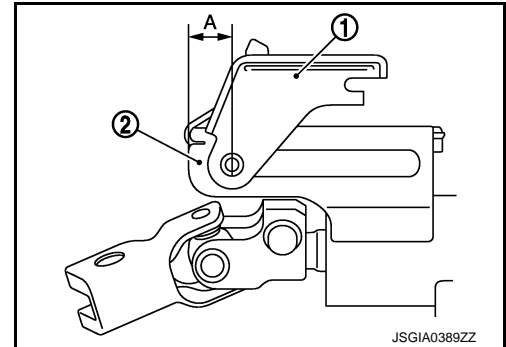
Steering column length (L) : Refer to [ST-106, "Steering Column Length"](#).



- Install the bracket (1) and steering column housing (2) so that the clearance (A) is within the specified range as described below. Replace steering column assembly if out side the standard.

### Standard

Mounting dimensions (A) : Refer to [ST-106, "Steering Column Mounting Dimensions"](#).



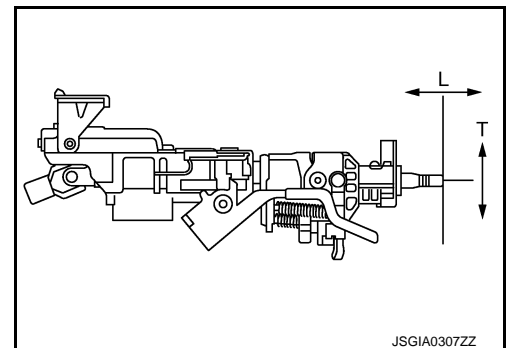
## INSPECTION AFTER INSTALLATION

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle. Refer to [ST-78, "Inspection"](#).
- Check tilt and telescopic mechanism operating range tilt operating range (T), telescopic operating range (L) as shown in the figure.

### Standard

Tilt operating range (T) : Refer to [ST-106, "Steering Column Operating Range"](#).

Telescopic operating range (L) : Refer to [ST-106, "Steering Column Operating Range"](#).



# LOWER SHAFT

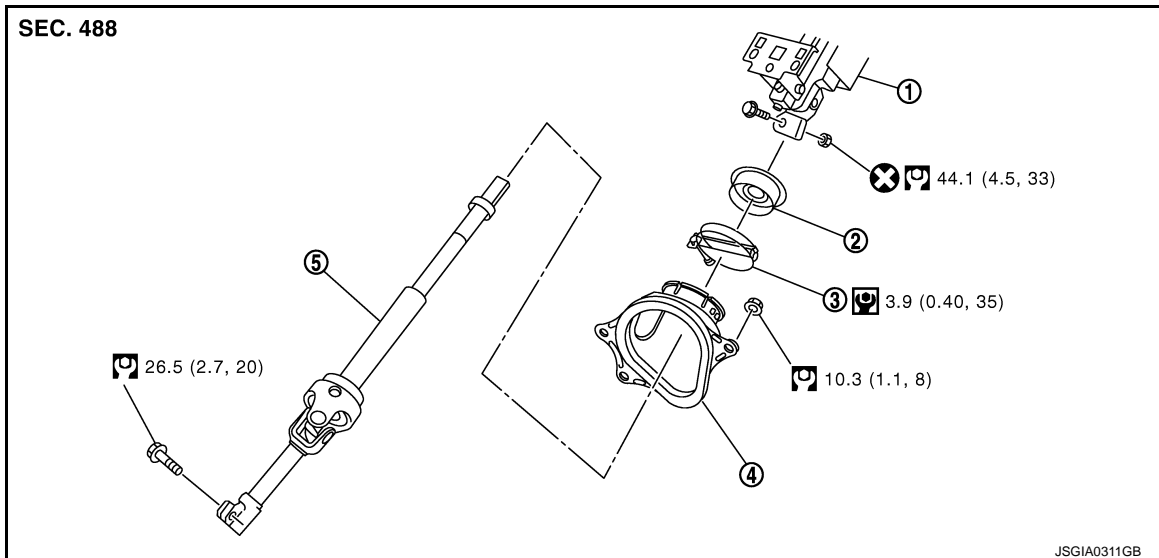
< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

## LOWER SHAFT

### Exploded View

INFOID:000000008459338



- |                             |                    |          |
|-----------------------------|--------------------|----------|
| 1. Steering column assembly | 2. Hole cover seal | 3. Clamp |
| 4. Hole cover               | 5. Lower shaft     |          |

Refer to [GI-4, "Components"](#) for symbols in the figure.

## Removal and Installation

INFOID:000000008459339

### REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Fix the steering wheel.
3. Remove upper joint fixing bolt and nut (lower shaft side).
4. Separate the lower shaft from the upper joint by sliding the slide shaft (A: sliding range).

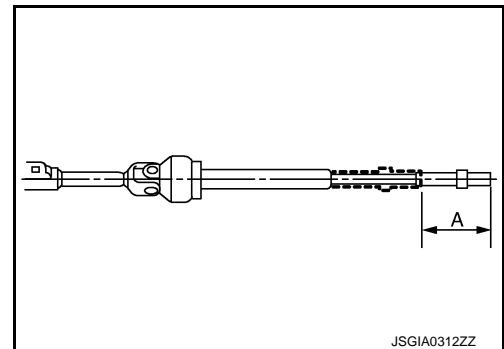
#### CAUTION:

- Spiral cable may be cut if steering wheel turns while separating steering column assembly and steering column assembly. Be sure to secure steering wheel using string to avoid turning.
- When removing upper joint, never insert a tool, such as a screwdriver, into the yoke groove to pull out the upper joint. In case of the violation of the above, replace upper joint with a new one.

5. Remove the accelerator pedal bracket and lever assembly. Refer to [ACC-4, "Exploded View"](#).
6. Remove the side brake pedal bracket and wire clamp stay.
7. Remove the hole cover mounting nuts.
8. Remove the hole cover seal, clamp and hole cover.
9. Remove lower shaft joint fixing bolt (steering gear side).
10. Remove the lower shaft from steering gear assembly.

#### CAUTION:

When removing lower shaft, never insert a tool, such as a screwdriver, into the yoke groove to pull out the lower shaft. In case of the violation of the above, replace lower shaft with a new one.



# LOWER SHAFT

< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

## INSTALLATION

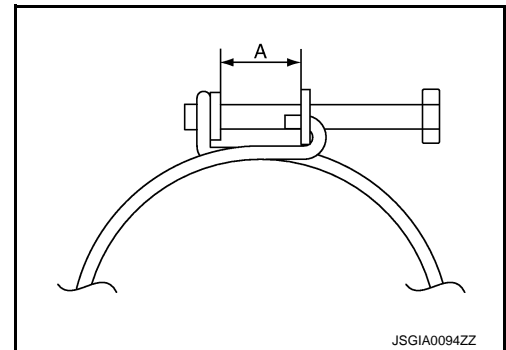
Note the following, and install in the reverse order of removal.

### CAUTION:

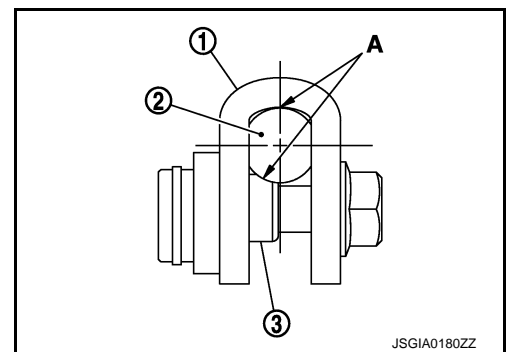
**Spiral cable may be cut if steering wheel turns while separating steering column assembly and steering gear assembly. Be sure to secure steering wheel using string to avoid turning.**

- 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)



- After lower shaft (steering gear side) fitted, make sure there is not gap (A) between the yoke (1), lower shaft (2), joint fixing bolt (3).



- 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 of gear housing assembly (B).

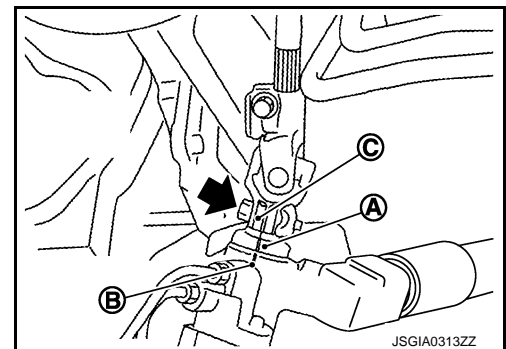
← : Bolt

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

- Adjust neutral position of steering angle sensor. Refer to [BRC-9. "ADJUSTMENT OF STEERING ANGLE SENSOR NEUTRAL POSITION : Special Repair Requirement"](#).

- Check the following after installation:

- Check if steering wheel turns smoothly when it is turned several times fully to the end of the left and right.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle. Refer to [ST-78. "Inspection"](#).



# LOWER SHAFT

< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

## Inspection

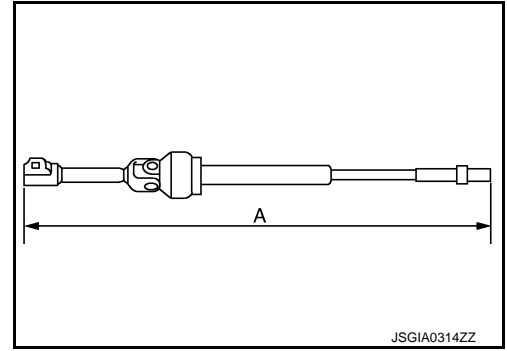
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- Check the length (A) (extended position) of the lower shaft.

### Standard

Lower shaft length (A) : Refer to [ST-107, "Lower Shaft Length"](#).

- Check each part of lower shaft for damage or other malfunctions. Replace if there are.



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# STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

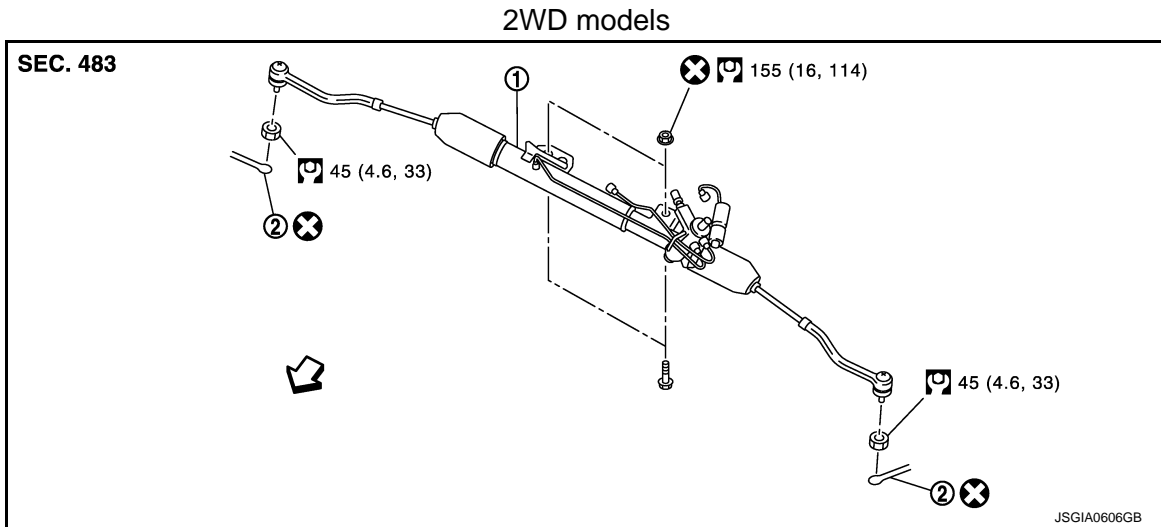
[WITHOUT HEATED STEERING WHEEL]

## STEERING GEAR AND LINKAGE

Exploded View

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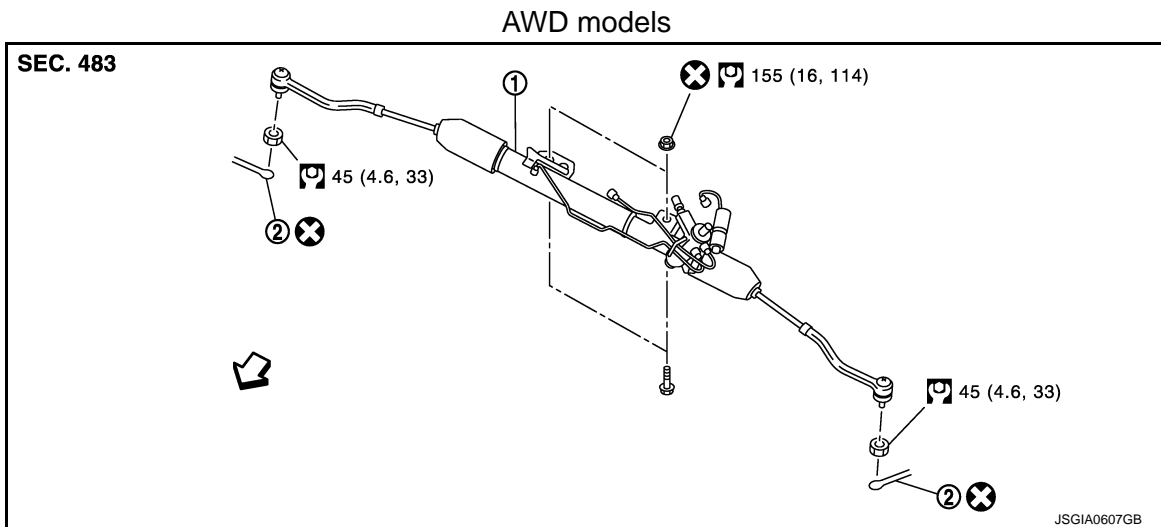
### REMOVAL



1. Steering gear assembly
2. Cotter pin

↔: Vehicle front

Refer to [GI-4, "Components"](#) for symbols in the figure.



1. Steering gear assembly
2. Cotter pin

↔: Vehicle front

Refer to [GI-4, "Components"](#) for symbols in the figure.

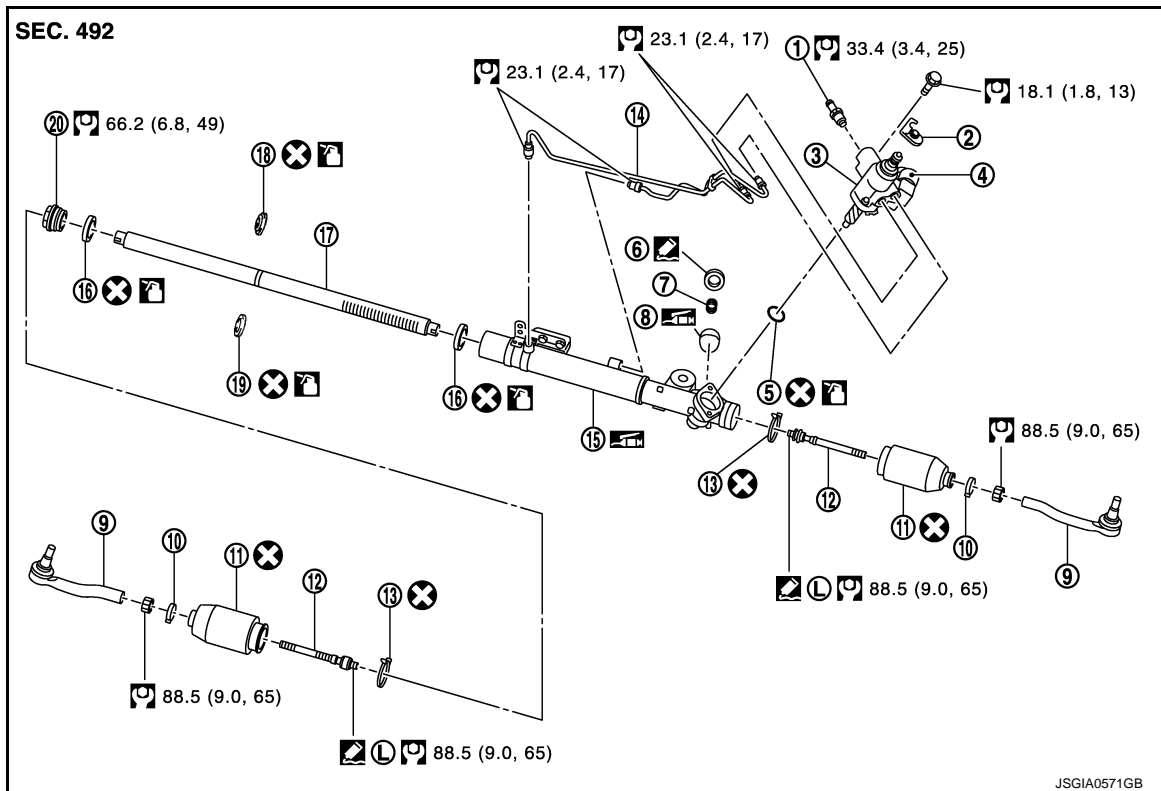
### DISASSEMBLY

# STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

2WD models



- |                                  |                        |                           |
|----------------------------------|------------------------|---------------------------|
| 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. Cylinder tube      | 15. Gear housing assembly |
| 16. Rack oil seal                | 17. Rack assembly      | 18. Rack Teflon ring      |
| 19. O-ring                       | 20. End cover assembly |                           |

: Apply power steering fluid.

: Apply Genuine Medium Strength Thread Locking Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).

: Apply Genuine High Performance Thread Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).

: Apply multi-purpose grease.

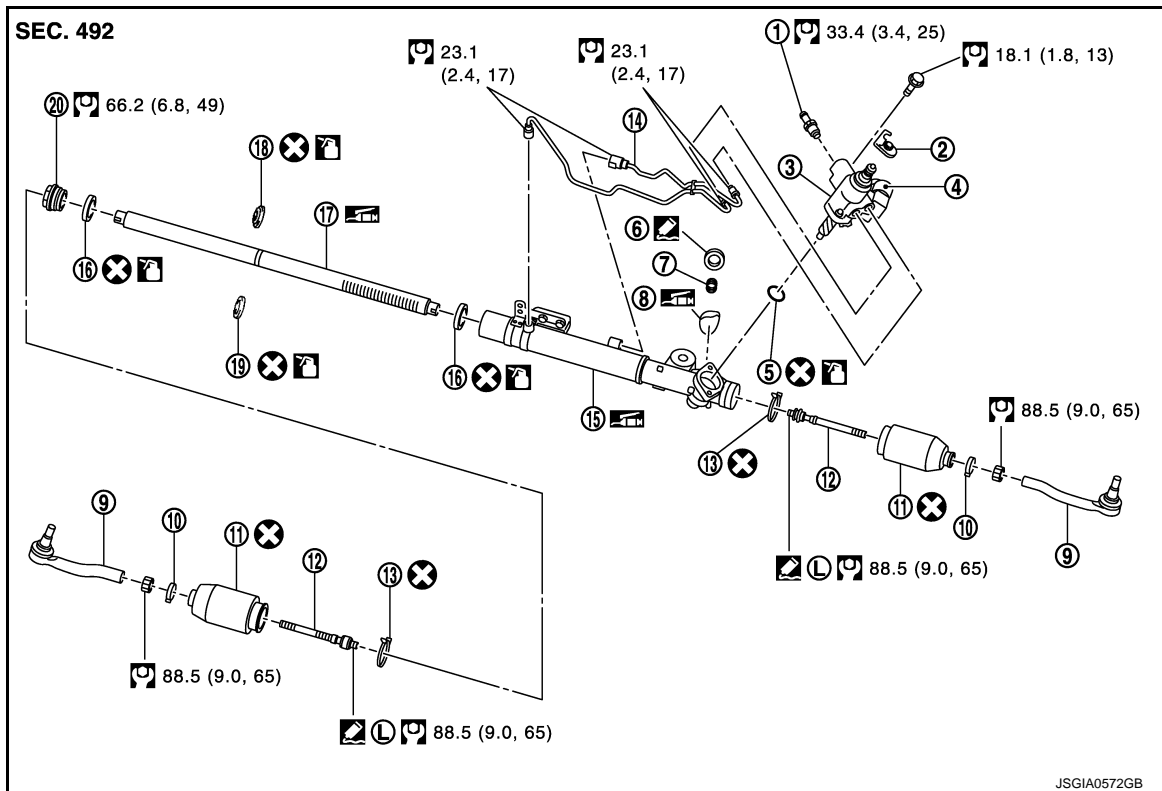
Refer to [GI-4, "Components"](#) for symbols not described on the above.

# STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

AWD models



- |                                  |                        |                           |
|----------------------------------|------------------------|---------------------------|
| 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. Cylinder tube      | 15. Gear housing assembly |
| 16. Rack oil seal                | 17. Rack assembly      | 18. Rack Teflon ring      |
| 19. O-ring                       | 20. End cover assembly |                           |

: Apply power steering fluid.

: Apply Genuine Medium Strength Thread Locking Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).

: Apply Genuine High Performance Thread Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).

: Apply multi-purpose grease.

Refer to [GI-4, "Components"](#) for symbols not described on the above.

## Removal and Installation

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### REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Remove front road wheel and tires.
3. Remove splash guards (RH and LH). Refer to [EXT-23, "FENDER PROTECTOR : Exploded View"](#).
4. Remove engine under cover. Refer to [EXT-26, "Exploded View"](#).
5. Remove exhaust front tube. Refer to [EX-5, "Exploded View"](#).
6. Separate the rear propeller shaft (front side). Refer to [DLN-78, "Exploded View"](#) (AWD models).
7. Remove heat insulator from front floor.



# STEERING GEAR AND LINKAGE

[WITHOUT HEATED STEERING WHEEL]

## < REMOVAL AND INSTALLATION >

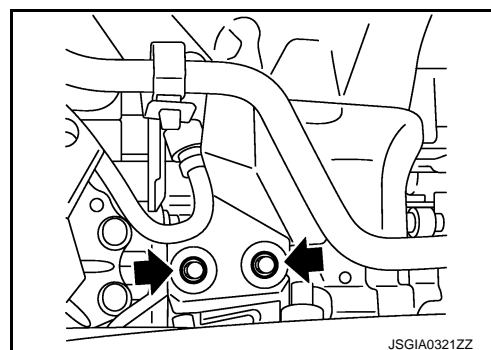
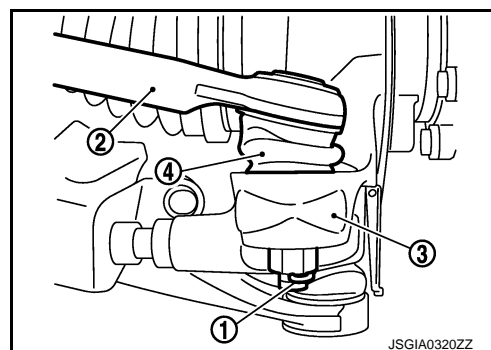
8. Remove cotter pin (1), and then loosen the nuts.
9. Remove steering outer socket (2) from steering knuckle (3) so as not to damage ball joint boot (4) using a ball joint remover (commercial service tool).

**CAUTION:**

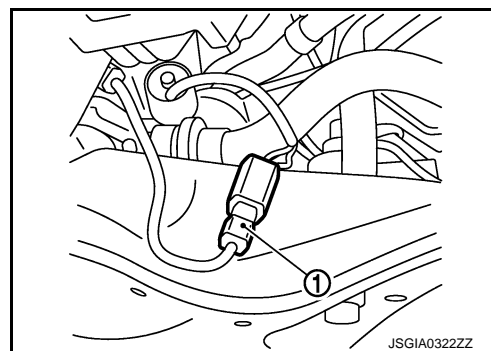
**Temporarily tighten the nut to prevent damage to threads and to prevent the ball joint remover from suddenly coming off.**

10. Remove high pressure piping and low pressure hose of hydraulic piping, and then drain power steering fluid.
11. Remove steering hydraulic piping bracket from front steering gear assembly.

← : Bolt



12. Remove power steering solenoid valve harness connector (1) and harness clip.
13. Remove lower joint fixing bolt (steering gear side).



14. Separate the lower shaft from the steering gear assembly by sliding the slide shaft.

**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.
  - When removing lower shaft, never insert a tool, such as a screwdriver, into the yoke groove to pull out the lower shaft. In case of the violation of the above, replace lower shaft with a new one.
15. Remove the stabilizer assembly. Refer to [FSU-14, "Exploded View"](#).
16. Support front suspension member with a suitable jack.
17. Remove engine mounting insulator (rear) mounting bolt (lower side). Refer to [EM-71, "2WD : Exploded View"](#) (2WD models), [EM-80, "AWD : Exploded View"](#) (AWD models).
18. Remove engine mounting insulator (LH). Refer to [EM-71, "2WD : Exploded View"](#) (2WD models), [EM-80, "AWD : Exploded View"](#) (AWD models).
19. Remove the mounting bolts and nuts of steering gear assembly.
20. Remove member stay, front suspension member fixing bolts and nuts. Refer to [FSU-16, "Exploded View"](#).
21. Lower the suitable jack for the front suspension member to the steering gear assembly can be removed.

## INSTALLATION

Note the following, and install in the reverse order of removal.

**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.**

# STEERING GEAR AND LINKAGE

## < REMOVAL AND INSTALLATION >

## [WITHOUT HEATED STEERING WHEEL]

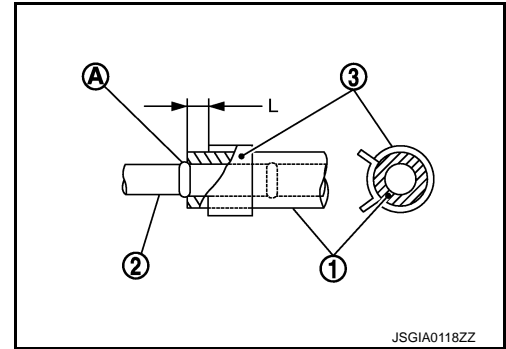
- When installing low pressure hose (1), refer to the figure.

### CAUTION:

- **Never apply fluid to the hose (1) and tube (2).**
- **Insert hose securely until it contacts spool (A) of tube.**
- **Leave clearance (L) when installing clamp (3).**

### Standard

L : 3 – 8 mm (0.12 – 0.31 in)



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

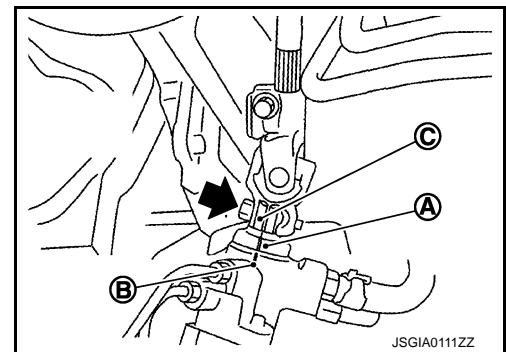
### NOTE:

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 of gear housing assembly (B).

← : Bolt

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



- After installation, bleed air from the steering hydraulic system. Refer to [ST-76. "Inspection"](#).
- 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-7. "Inspection"](#).
- Adjust neutral position of steering angle sensor after checking wheel alignment. Refer to [BRC-9. "ADJUSTMENT OF STEERING ANGLE SENSOR NEUTRAL POSITION : Special Repair Requirement"](#).

## Disassembly and Assembly

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### DISASSEMBLY

1. Remove low pressure piping.

### CAUTION:

- **Disassemble and assemble steering gear assembly by fixing the mounting area with 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.**

2. Remove cylinder tubes from gear housing assembly.
3. Remove rear cover cap from gear-sub assembly.
4. Measure adjusting screw height "H", and loosen adjusting screw.

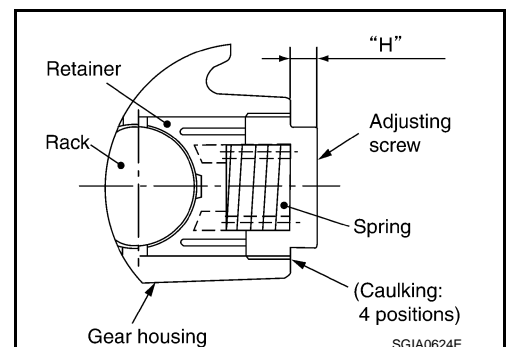
### CAUTION:

- **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 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 clamps, 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.**

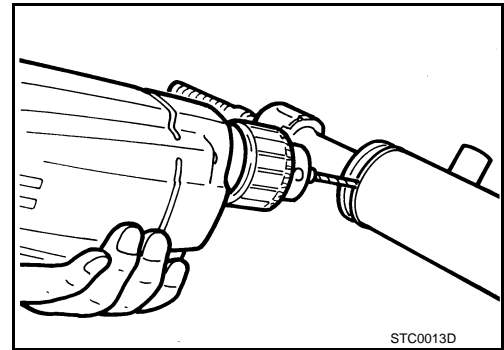


# STEERING GEAR AND LINKAGE

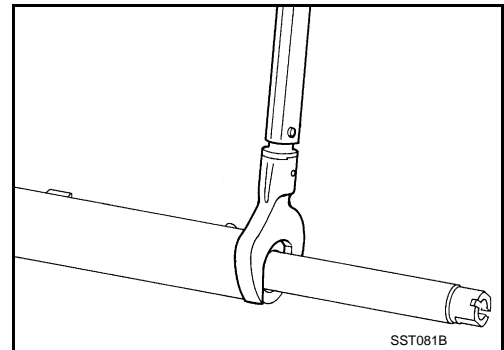
## < REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

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

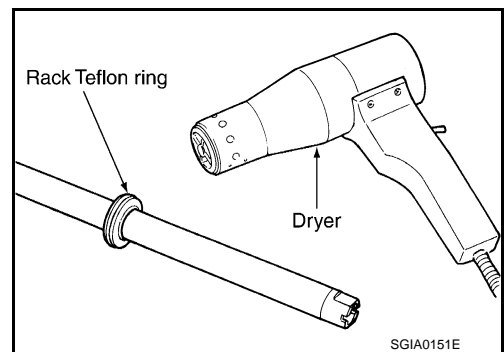


11. Remove end cover assembly with a 36 mm (1.42 in) open head (commercial service tool).  
**CAUTION:**  
Never damage rack assembly surface when removing. Rack assembly must be replaced if damaged because it may cause fluid leakage.

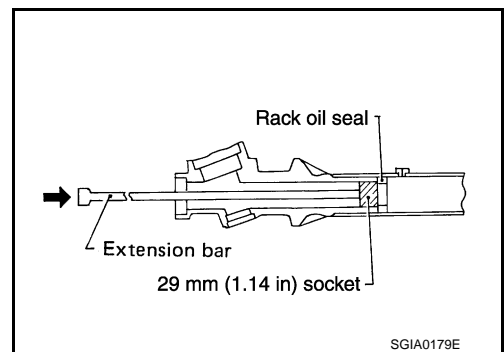


12. Pull rack assembly together with rack oil seal (outer side) out from gear housing assembly.  
**CAUTION:**  
Never damage cylinder inner wall when remove rack assembly. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.

13. Heat rack Teflon ring to approximately 40°C (104°F) with a dryer, and remove rack Teflon ring and O-ring from rack assembly.  
**CAUTION:**  
Never damage rack assembly. Rack assembly must be replaced if damaged because it cause fluid leakage.



14. Push rack oil seal inside with a 29 mm (1.14 in) socket and an extension bar to push out rack oil seal (inner side) from gear housing assembly.  
**CAUTION:**  
Never damage gear housing assembly and cylinder inner wall. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.



## ASSEMBLY

1. Apply recommended fluid to O-ring. Put an O-ring into a rack Teflon ring.  
**CAUTION:**  
Never reuse O-ring.

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# STEERING GEAR AND LINKAGE

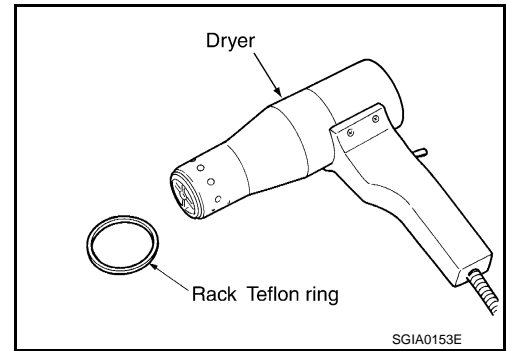
## < REMOVAL AND INSTALLATION >

## [WITHOUT HEATED STEERING WHEEL]

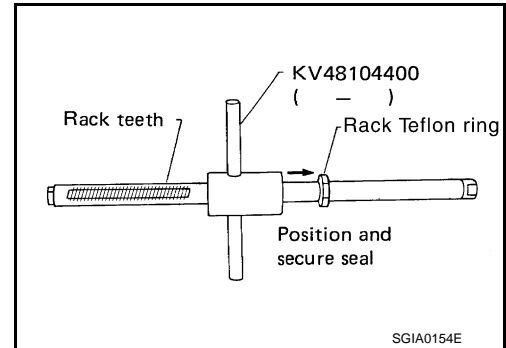
2. Heat rack Teflon ring to approximately 40°C (104°C) with a dryer. Assemble it to mounting groove of rack assembly.

**CAUTION:**

**Never reuse rack Teflon ring.**



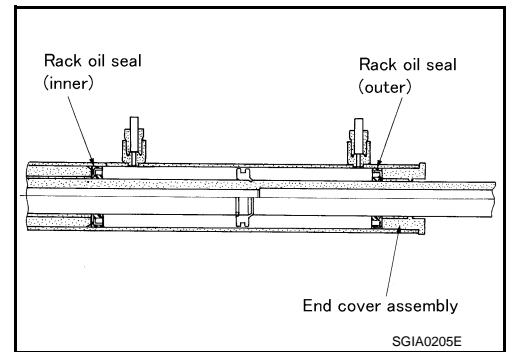
3. Install the rack Teflon ring correcting tool [SST: KV48104400 ( — )] from tooth side of rack fit rack Teflon ring on rack. Compress the with tool.



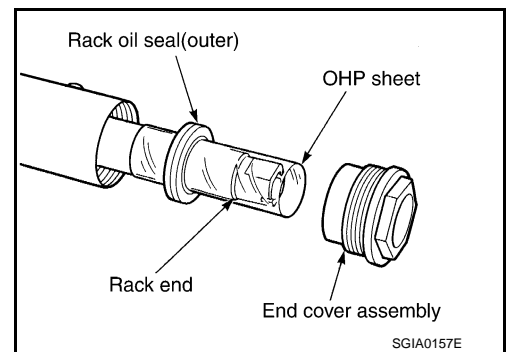
4. Apply recommended grease to rack oil seal, and then install rack oil seal in the following procedure. Then assemble rack assembly to gear housing assembly.

**CAUTION:**

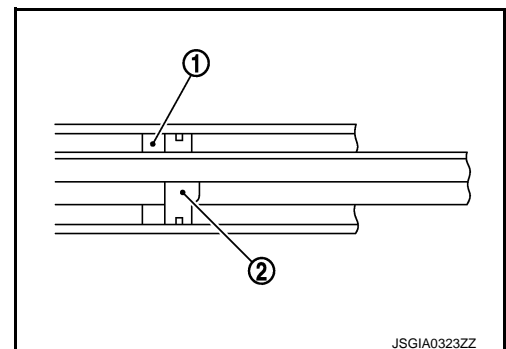
- Install rack oil seal in a direction so that the lip of inner oil seal and the lip of outer oil seal face each other.
- Never damage retainer sliding surface by rack assembly. Replace gear housing assembly if damaged.
- Never damage gear housing assembly inner wall by rack assembly. Gear housing assembly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



- 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) (1) into rack assembly piston (2).
- 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.



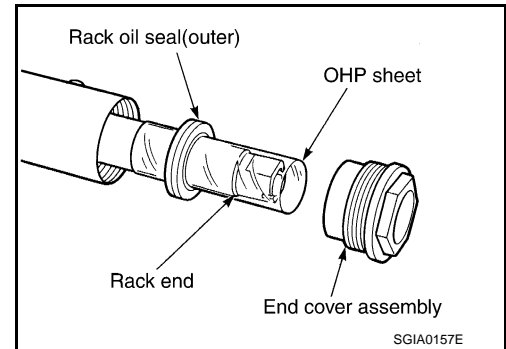
# STEERING GEAR AND LINKAGE

## < REMOVAL AND INSTALLATION >

## [WITHOUT HEATED STEERING WHEEL]

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.

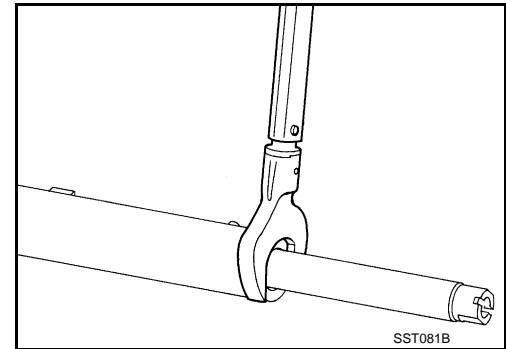
e. Install end cover assembly to rack edge, and move rack oil seal (outer) until it contacts with gear housing assembly.



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

**CAUTION:**

**In order to protect oil seal from any damage, insert gear-sub assembly straightly.**

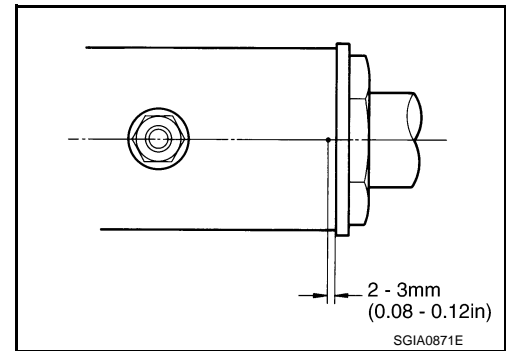
9. Install inner socket to gear housing assembly with the following procedure.

a. Apply thread sealant into the thread of inner socket.

**Use Genuine Medium Strength Thread Locking Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).**

b. Screw inner socket into rack part and tighten at the specified torque.

10. Decide on the neutral position of the rack stroke (L).



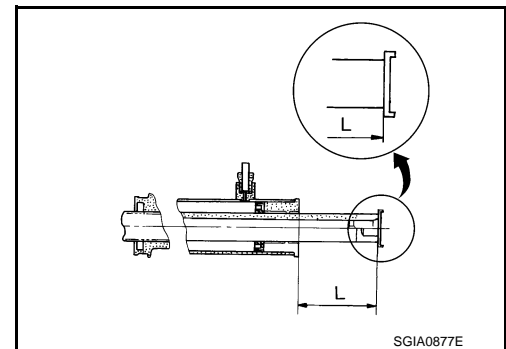
**Standard**

**Rack stroke neutral position (L) : Refer to [ST-107, "Rack Stroke"](#).**

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

**CAUTION:**

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



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# STEERING GEAR AND LINKAGE

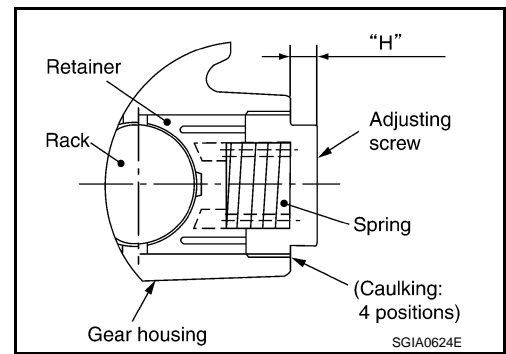
[WITHOUT HEATED STEERING WHEEL]

## < REMOVAL AND INSTALLATION >

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

**Use Genuine High Performance Thread Sealant or equivalent. Refer to GI-22. "Recommended Chemical Products and Sealants".**

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

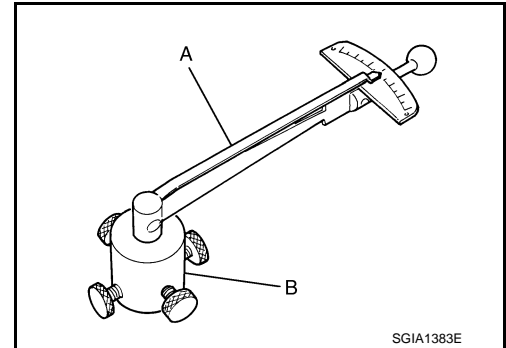


14. Adjust pinion rotating torque with the following procedure.
- Measure pinion rotating torque within  $\pm 180^\circ$  of neutral position of the rack assembly using Tools. Stop the gear at the point where highest torque is read.

A: Preload gauge [SST: ST3127S000 (J-25765-A)]

B: Preload adapter [SST: KV48103400 ( — )]

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

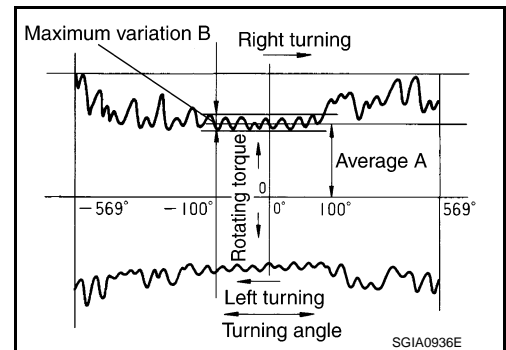


- Measure pinion rotating torque using Tools to make sure that the measured value is within the standard. Readjust if the value is outside the standard. Replace steering gear assembly, if the value is outside the standard after readjusting, or adjusting screw rotating torque is 5 N·m (0.51 kg·m, 44 in·lb)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

### Pinion rotating torque

**Around neutral position (within  $\pm 100^\circ$ ) average (A) : 1.59 – 2.0 N·m (0.17 – 0.20 kg·m, 14 – 17 in·lb)**

**Maximum variation (B) : 0.39 N·m (0.04 kg·m, 3.0 in·lb)**



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

- Install dial gauge at 5 mm (0.20 in) (L) from the edge of gear housing assembly (1), and tooth point.

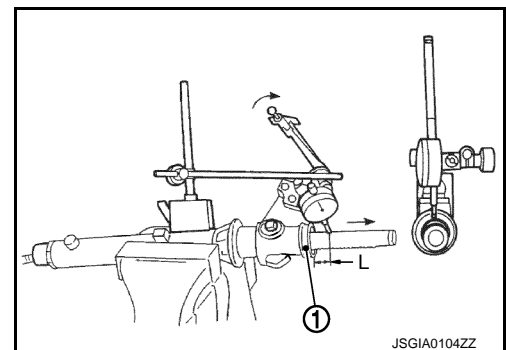
- Measure vertical movement of rack assembly when pinion is turned clockwise with torque of 19.6 N·m (2.0 kg·m, 14 ft·lb). Readjust adjusting screw angle if the measured value is outside the standard.

**Vertical movement : 0.265 mm (0.0104 in)**

- If reading is outside of the specification, readjust screw angle with adjusting screw.

### CAUTION:

- 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.
- Never turn adjusting screw more than twice.
- Replace steering gear assembly when adjusting screw is removed or turned more than twice.



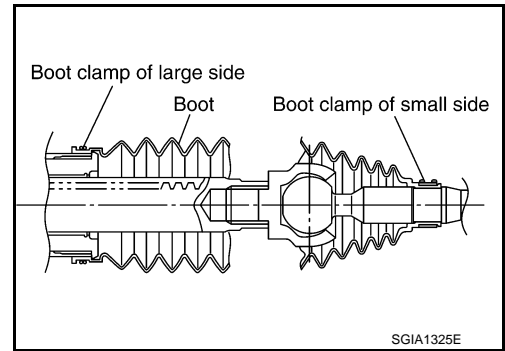


# STEERING GEAR AND LINKAGE

[WITHOUT HEATED STEERING WHEEL]

## < REMOVAL AND INSTALLATION >

15. Install large end of boot to gear housing assembly.
16. Install small end of boot to inner socket boot mounting groove.
17. Install boot clamp to boot small end.



18. Install boot clamp to the large side of boot with the following procedure.

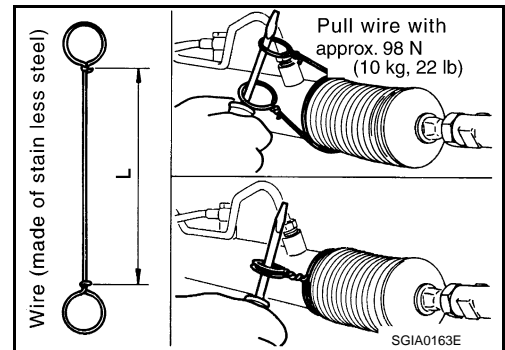
**CAUTION:**

**Never reuse boot clamp.**

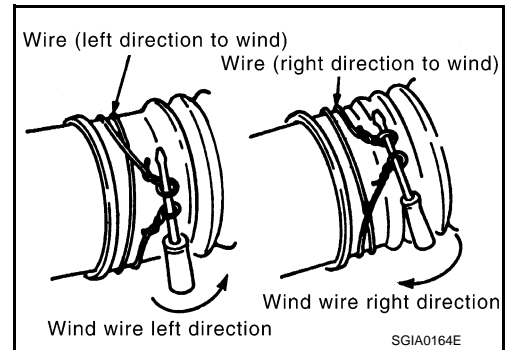
- a. Tighten large side of boot with boot clamp (stainless wire).

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

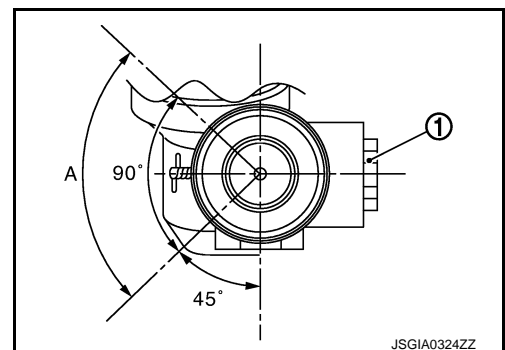
- b. Wrap clamp around boot groove for two turns. Insert a flat-bladed screwdriver in loops on both ends of wire. Twist 4 to 4.5 turns while pulling them with force of approximately 98 N (10 kg, 22 lb).



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



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



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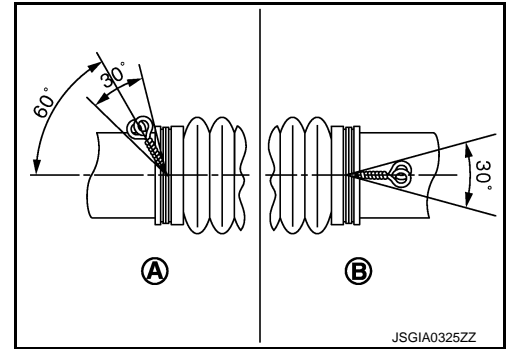
# STEERING GEAR AND LINKAGE

## < REMOVAL AND INSTALLATION >

## [WITHOUT HEATED STEERING WHEEL]

e. 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.

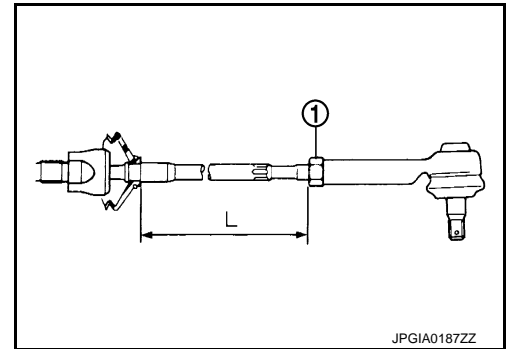
- A : Gear housing RHD side
- B : Gear housing LHD side



19. Install cylinder tubes to gear housing assembly.
20. Install low pressure piping.
21. Adjust inner socket to standard length (L), and then tighten lock nut (1) to the specified torque. Check length again after tightening lock nut.

**Standard**  
**Inner socket length (L)** : Refer to [ST-107, "Inner Socket Length"](#).

**CAUTION:**  
**Adjust toe-in after this procedure. The length achieved after toe-in adjustment is not necessary the above value.**



## Inspection

### 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.

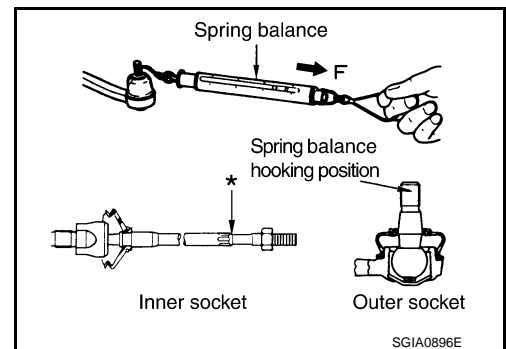
#### Outer Socket and Inner Socket

Check the following items and replace the component if it does not meet the standard.

#### 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 inner socket if they are outside the standard.

**Standard**  
**(Measuring point of outer socket: Stud cotter pin mounting hole)**  
**Outer socket** : Refer to [ST-107, "Socket Swing Force and Rotating Torque"](#).





# STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

## Standard

(Measuring point of inner socket: "\*" mark shown in the figure)

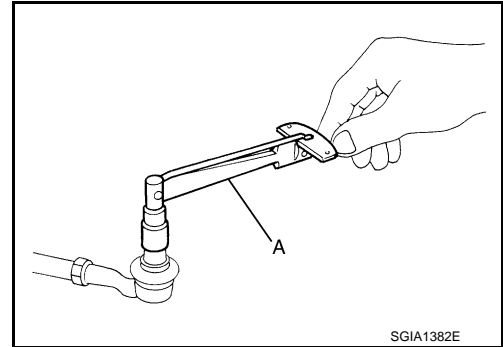
Inner socket : Refer to [ST-107, "Socket Swing Force and Rotating Torque"](#).

## BALL JOINT ROTATING TORQUE

Make sure that the reading is within the following specified range using preload gauge (A) [SST: ST3127S000 (J-25765-A)]. Replace outer socket if the reading is outside the specified value.

## Standard

Rotating torque : Refer to [ST-107, "Socket Swing Force and Rotating Torque"](#).



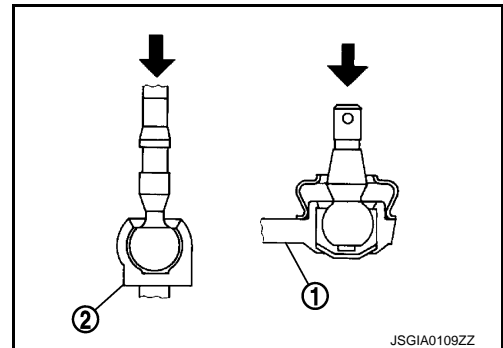
## BALL JOINT AXIAL END PLAY

Apply an axial load of 490 N (50 kg, 110 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 (1) and inner socket (2) if the measured value is outside the standard.

## Standard

Outer socket : Refer to [ST-107, "Socket Axial End Play"](#).

Inner socket : Refer to [ST-107, "Socket Axial End Play"](#).



## INSPECTION AFTER INSTALLATION

- Check if steering wheel turns smoothly when it is turned several times fully to the end of the left and right.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle. Refer to [ST-78, "Inspection"](#).
- Check the fluid level, fluid leakage, and air bleeding hydraulic system. Refer to [ST-76, "Inspection"](#).

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# POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

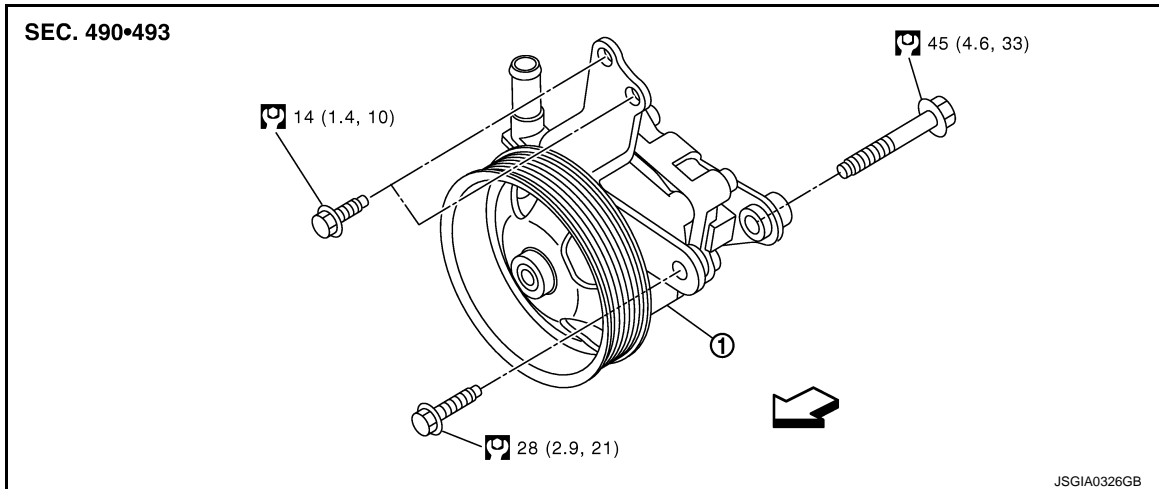
[WITHOUT HEATED STEERING WHEEL]

## POWER STEERING OIL PUMP

Exploded View

INFOID:000000008459345

### REMOVAL

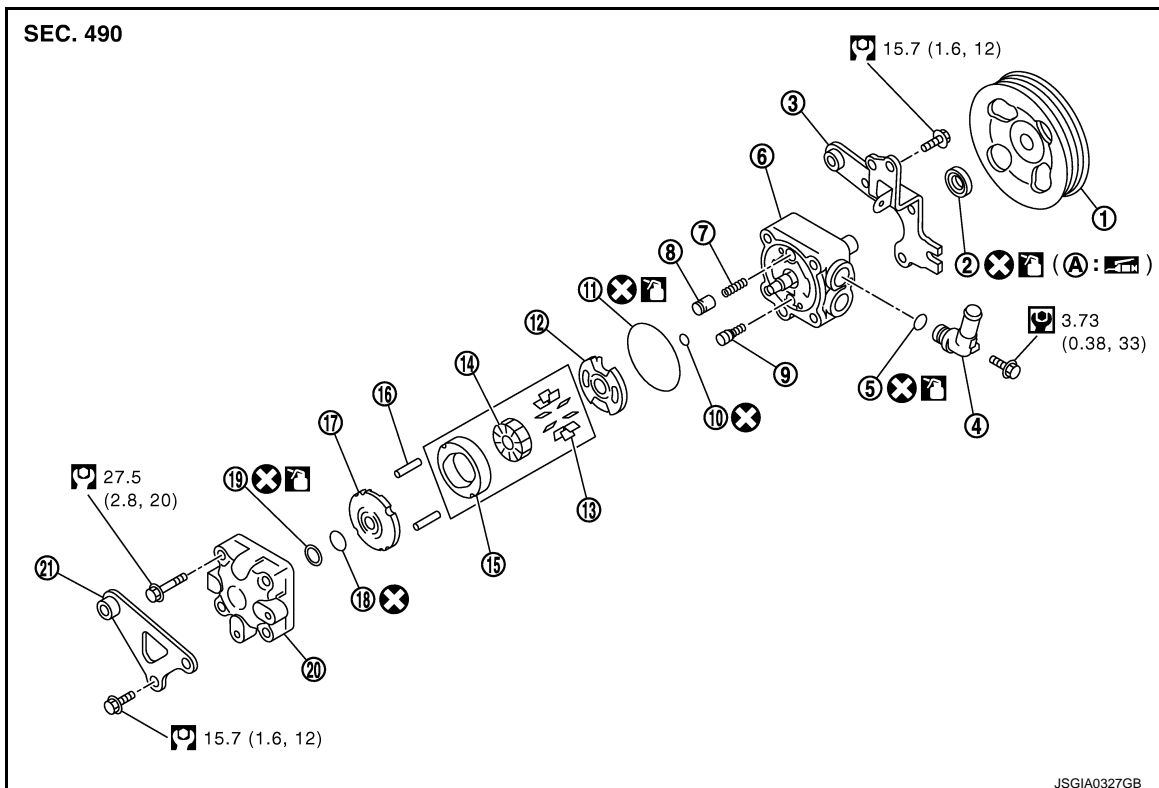


1. Power steering oil pump

⇐: Vehicle front

Refer to [GI-4, "Components"](#) for symbols in the figure.

### DISASSEMBLY




- |                              |                       |                                    |
|------------------------------|-----------------------|------------------------------------|
| 1. Pulley                    | 2. Oil seal           | 3. Front bracket                   |
| 4. Suction pipe              | 5. O-ring             | 6. Body assembly                   |
| 7. Flow control valve spring | 8. Flow control valve | 9. Flow control valve sub assembly |


# POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

- |                 |                     |                      |
|-----------------|---------------------|----------------------|
| 10. O-ring      | 11. O-ring          | 12. Front side plate |
| 13. Vane        | 14. Rotor           | 15. Cam ring         |
| 16. Dowel pin   | 17. Rear side plate | 18. O-ring           |
| 19. Teflon ring | 20. Rear cover      | 21. Rear bracket     |
| A. Oil seal lip |                     |                      |

: Apply power steering fluid.

: Apply multi-purpose grease.

Refer to [GI-4, "Components"](#) for symbols not described on the above.

## Removal and Installation

INFOID:000000008459346

### REMOVAL

1. Drain power steering fluid from reservoir tank.
2. Remove front road wheel and tires.
3. Remove splash guard. Refer to [EXT-23, "FENDER PROTECTOR : Exploded View"](#).
4. Loosen drive belt. Refer to [EM-16, "Removal and Installation"](#).
5. Remove drive belt from oil pump pulley.
6. Remove copper washers and eye bolt (drain fluid from their pipings).
7. Remove suction hose (drain fluid from their pipings).
8. Remove oil pump mounting bolts, and then remove oil pump.

**CAUTION:**

**Never damage drive shaft boot.**

### INSTALLATION

Note the following, and install in the reverse order of removal.

- When installing suction hoses (1), refer to the figure.

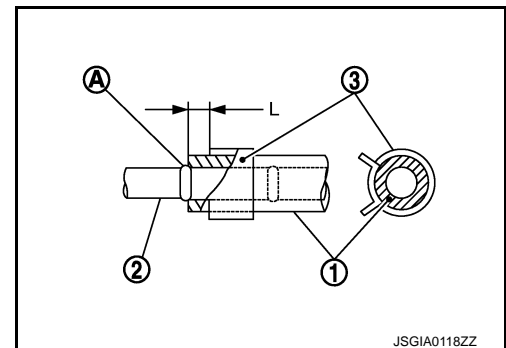
**CAUTION:**

- **Never apply fluid to the hose (1) and tube (2).**
- **Insert hose securely until it contacts spool (A) of tube.**
- **Leave clearance (L) when installing clamp (3).**

Standard

L

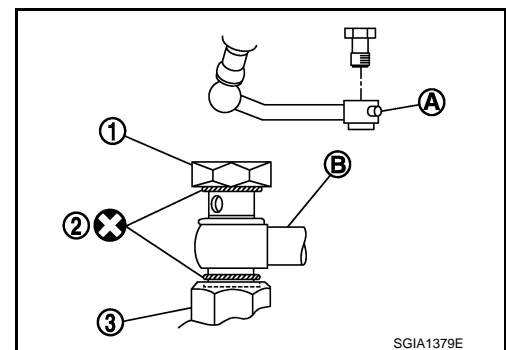
: 3 – 8 mm (0.12 – 0.31 in)



- When installing eye bolt (1) and copper washers (2) to oil pump (3), refer to the figure.

**CAUTION:**

- **Never reuse copper washer.**
  - **Apply power steering fluid to around copper washer, then install eye bolt.**
  - **Install eye bolt with eye joint (assembled to high pressure hose) (B) protrusion (A) facing with pump side cutout, and then tighten it to the specified torque after tightening by hand. Refer to [ST-104, "Exploded View"](#).**
  - **Securely insert harness connector to pressure sensor.**
1. Adjust belt tension. Refer to [EM-16, "Tension Adjustment"](#).
  2. Check fluid level, fluid leakage and air bleeding hydraulic system after the installation. Refer to [ST-76, "Inspection"](#).



## Disassembly and Assembly

INFOID:000000008459347

### DISASSEMBLY

1. Remove rear bracket.

# POWER STEERING OIL PUMP

[WITHOUT HEATED STEERING WHEEL]

## < REMOVAL AND INSTALLATION >

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

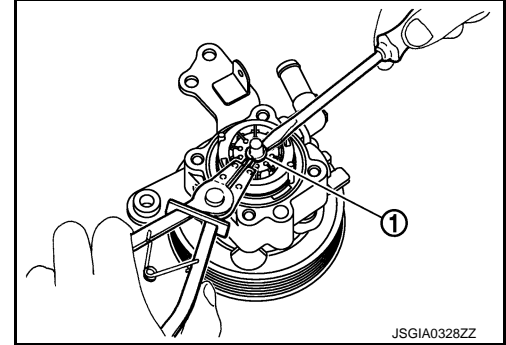
**CAUTION:**

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

3. Remove O-ring from body assembly.
4. Remove rear side plate from cartridge, and then remove Teflon ring and O-ring from rear side plate.
5. Remove rotor snap ring (1) using a snap ring pliers, and remove cam ring, rotor and vane from body assembly.

**CAUTION:**

When removing the snap ring, never damage the pulley shaft.



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

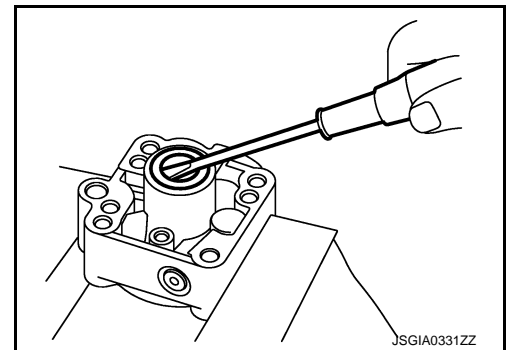
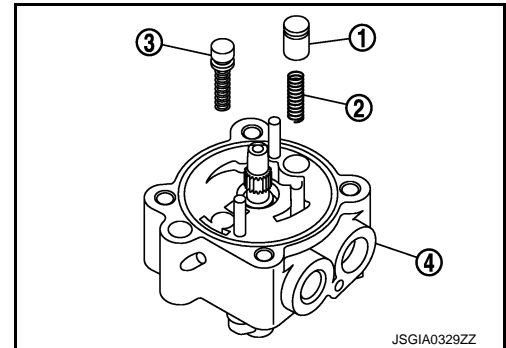
**CAUTION:**

Never drop and damage flow control valve and flow control valve sub assembly when removing.

8. Remove oil seal from body assembly.
9. Remove mounting bolt of suction pipe, and then remove suction pipe from body assembly.
10. Remove pulley from body assembly.
11. Remove front bracket from body assembly.
12. Remove oil seal from body assembly using a flat-bladed screwdriver.

**CAUTION:**

Never damage the body assembly.



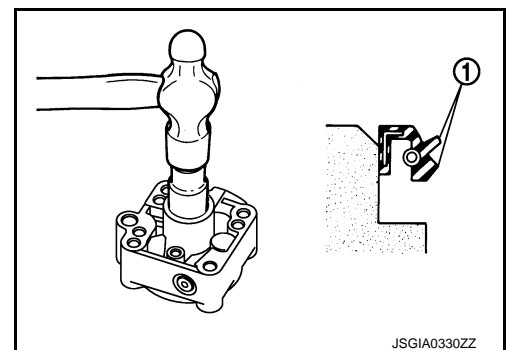
## ASSEMBLY

1. Apply recommended grease to oil seal lips (1). Apply recommended fluid to around oil seal. Install oil seal to body assembly using a drift (commercial service tool).

**CAUTION:**

- Never reuse the oil seal.
- Fix oil pump with a vise if necessary.
- Use copper plates when fixing with a vise.

2. Install front bracket to body assembly.
3. Install pulley to body assembly.
4. 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.

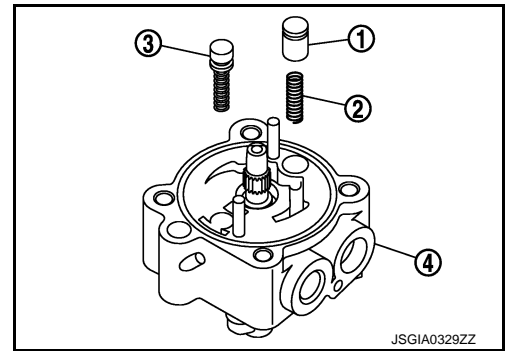


# POWER STEERING OIL PUMP

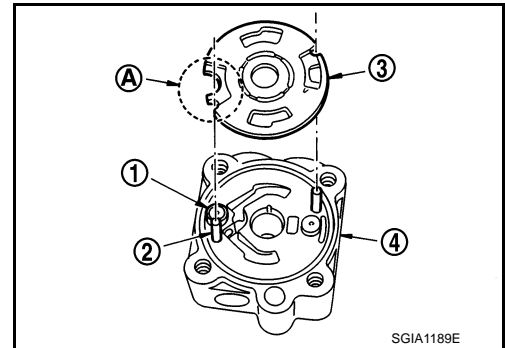
## < REMOVAL AND INSTALLATION >

## [WITHOUT HEATED STEERING WHEEL]

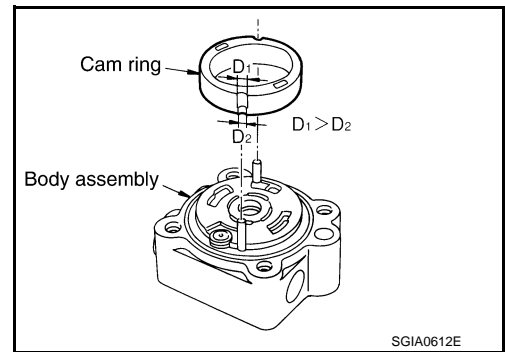
5. Install flow control valve (1), flow control valve spring (2) and flow control valve sub assembly (3) as shown in the figure to body assembly (4).



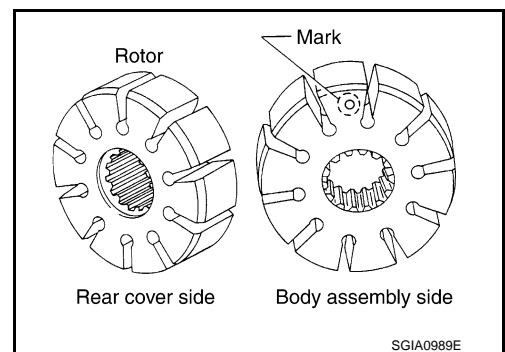
6. Install front side plate (3) with dowel pin (2) on flow control valve A (1) side as shown in the figure aligning with front side plate cutout (A) to body assembly (4).



7. Install cam ring as shown in the figure.



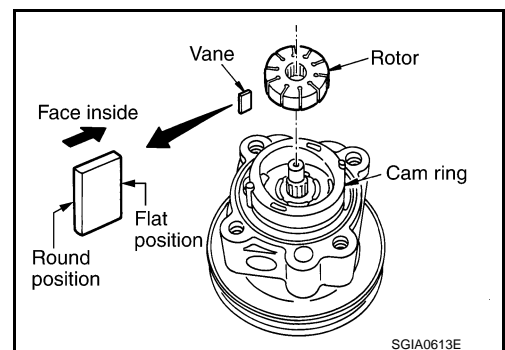
8. Install rotor so that mark faces body assembly, and then install it to pulley shaft.



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 drift (commercial service tool).

**CAUTION:**

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



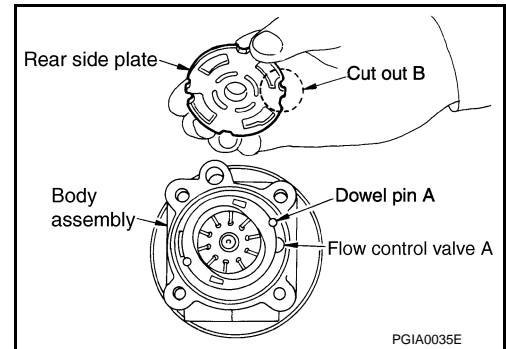
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# POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

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.
18. Install rear bracket.



## Inspection

INFOID:000000008459348

## RELIEF OIL PRESSURE

### CAUTION:

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

1. Connect the oil pressure gauge [SST: KV48103500 (J-26357)] and the oil pressure gauge adapter [SST: KV48102500 (J-33914)] between oil pump discharge connector and high-pressure hose. Bleed air from the hydraulic circuit while opening valve fully. Refer to [ST-76, "Inspection"](#).
2. Start the engine. Run the engine until oil temperature reaches 50 to 80°C (122 to 176°F).

### CAUTION:

- Leave the valve of the oil pressure gauge fully open while starting and running the 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 oil pressure gauge valve with engine at idle and measure the relief oil pressure.

### Standard

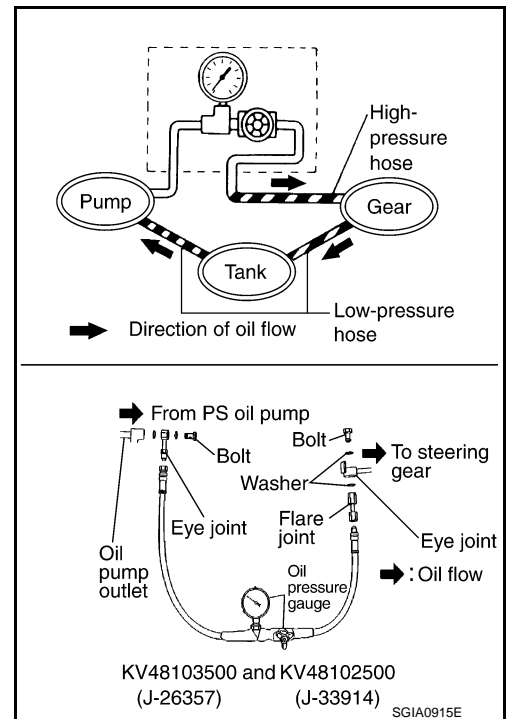
Relief oil pressure

: Refer to [ST-107, "Relief Oil Pressure"](#).

### 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 [ST-99, "Disassembly and Assembly"](#).
5. Disconnect the oil pressure gauge from hydraulic circuit.



# POWER STEERING OIL PUMP

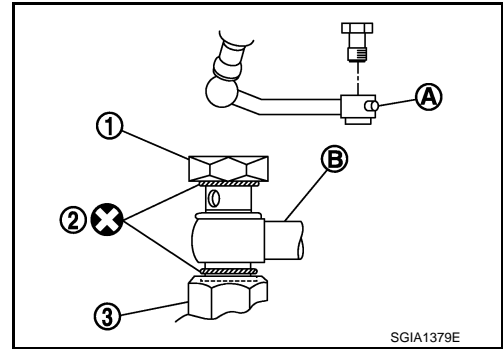
< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

6. When installing eye bolt (1) and copper washers (2) to oil pump (3), refer to the figure.

**CAUTION:**

- Never reuse copper washer.
- Apply power steering fluid or equivalent to around copper washer, then install eye bolt.
- Install eye bolt with eye joint (assembled to high pressure hose) (B) protrusion (A) facing with pump side cutout, and then tighten it to the specified torque after tightening by hand. Refer to [ST-104, "Exploded View"](#).
- Securely insert harness connector to pressure sensor.



7. Check fluid level, fluid leakage and air bleeding hydraulic system after the installation. Refer to [ST-76, "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.

## 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 necessary.

### Side Plate Inspection

- Check side plate for damage. Replace side plate if necessary.

### Flow Control Valve Inspection

- Check flow control valve and spring for damage. Replace if necessary.

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# HYDRAULIC LINE

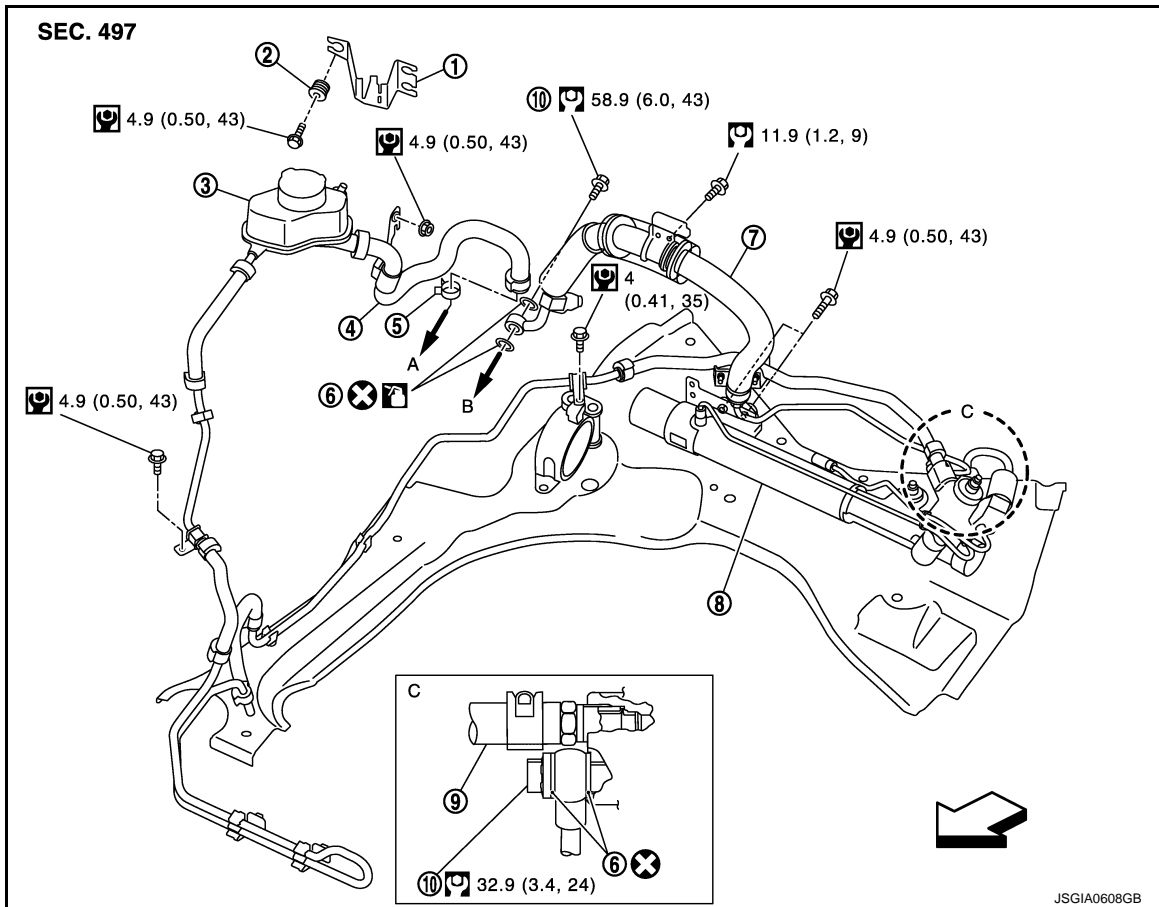
< REMOVAL AND INSTALLATION >

[WITHOUT HEATED STEERING WHEEL]

## HYDRAULIC LINE


Exploded View

INFOID:000000008459349



- |   |                                |                      |
|---|--------------------------------|----------------------|
| 1. Reservoir tank bracket                   | 2. Bushing                     | 3. Reservoir tank    |
| 4. Suction hose                             | 5. Clamp                       | 6. Copper washer     |
| 7. High pressure piping                     | 8. Steering gear assembly      | 9. Low pressure hose |
| 10. Eye bolt                                |                                |                      |
| A. To power steering oil pump suction hose. | B. To power steering oil pump. |                      |

⇐: Vehicle front

: Apply power steering fluid.

Refer to [GI-4, "Components"](#) for symbols not described on the above.

## Removal and Installation

INFOID:000000008459350

**CAUTION:**



# HYDRAULIC LINE

< REMOVAL AND INSTALLATION >

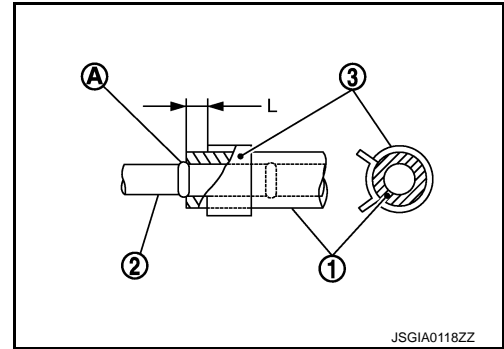
[WITHOUT HEATED STEERING WHEEL]

- Never apply fluid to the hose (1) and tube (2).
- Insert hose securely until it contacts spool (A) of tube.
- Leave clearance (L) when installing clamp (3).

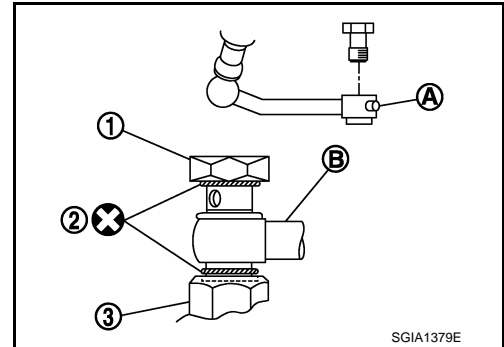
Standard

L

: 3 – 8 mm (0.12 – 0.31 in)



- Install eye bolt with eye joint (assembled to high pressure hose) (B) protrusion (A) facing with pump side cutout, and then tighten it to the specified torque after tightening by hand. Refer to [ST-104, "Exploded View"](#).
- Securely insert harness connector to pressure sensor.
- Apply power steering fluid to around copper washer, then install eye bolt.
- Never reuse copper washer.



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# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[WITHOUT HEATED STEERING WHEEL]

## SERVICE DATA AND SPECIFICATIONS (SDS)

### SERVICE DATA AND SPECIFICATIONS (SDS)

#### General Specifications

INFOID:000000008459351

|                          |                                       |
|--------------------------|---------------------------------------|
| Steering gear model      | PR26AF                                |
| Fluid capacity (Approx.) | ℓ (US qt, Imp qt)<br>1.0 (1-1/8, 7/8) |

#### Steering Wheel Axial End Play and Play

INFOID:000000008459352

Unit: mm (in)

| Item   | Standard          |
|--|-------------------|
| Steering wheel axial end play                  | 0 (0)             |
| Steering wheel play on the outer circumference | 0 – 35 (0 – 1.38) |

#### Steering Wheel Turning Force

INFOID:000000008459353

Unit: N·m (kg·m, in·lb)

| Item                         | Standard        |
|------------------------------|-----------------|
| Steering wheel turning force | 7.45 (0.76, 66) |

#### Steering Angle

INFOID:000000008459354

Unit: Degree minute (Decimal degree)

| Item        |         | Standard            |                     |
|-------------|---------|---------------------|---------------------|
|             |         | Wheel size: 18 inch | Wheel size: 20 inch |
| Inner wheel | Minimum | 33°30' (33.5°)      | 32°00' (32.0°)      |
|             | Nominal | 36°30' (36.5°)      | 35°00' (35.0°)      |
|             | Maximum | 37°30' (37.5°)      | 36° (36.0°)         |
| Outer wheel | Nominal | 31°30' (31.5°)      | 30°30' (30.5°)      |

#### Steering Column Length

INFOID:000000008459355

Unit: mm (in)

| Item                   | Standard    |
|------------------------|-------------|
| Steering column length | 463 (18.23) |

#### Steering Column Mounting Dimensions

INFOID:000000008459356

Unit: mm (in)

| Item               | Standard          |
|--------------------|-------------------|
| Mounting dimension | 30 (1.18) or less |

#### Steering Column Operating Range

INFOID:000000008459357

| Item                       | Standard                      |
|----------------------------|-------------------------------|
| Tilt operating range       | 15°                           |
| Telescopic operating range | 40 mm (1.57 in)               |
| Rotating torque            | 0.49 N·m (0.05 kg·m, 4 in·lb) |

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[WITHOUT HEATED STEERING WHEEL]

## Lower Shaft Length

INFOID:0000000008459358

Unit: mm (in)

| Item                                   | Standard                      |
|--|-------------------------------|
| Lower shaft length (extended position) | 524.6 – 525.6 (20.65 – 20.69) |

## Rack Sliding Force

INFOID:0000000008459359

Unit: N (kg, lb)

| Item               | Standard                             |                                      |
|--------------------|--------------------------------------|--------------------------------------|
|                    | 2WD                                  | AWD                                  |
| Rack sliding force | 195 – 258 (19.9 – 26.3, 43.8 – 57.9) | 227 – 305 (23.2 – 31.1, 51.1 – 68.5) |

## Rack Stroke

INFOID:0000000008459360

Unit: mm (in)

| Item                         | Standard            |                     |
|------------------------------|---------------------|---------------------|
|                              | Wheel size: 18 inch | Wheel size: 20 inch |
| Rack stroke neutral position | 70.5 (2.776)        | 68.0 (2.677)        |

## Socket Swing Force and Rotating Torque

INFOID:0000000008459361

### SWING FORCE

Unit: N (kg, lb)

| Item         | Standard                            |
|--------------|-------------------------------------|
| Outer socket | 4.81 – 45.7 (0.5 – 4.6, 1.1 – 10.2) |
| Inner socket | 8.9 – 64 (0.91 – 6.5, 2.01 – 14.3)  |

### ROTATING TORQUE

Unit: N·m (kg·m, in·lb)

| Item         | Standard                        |
|--------------|---------------------------------|
| Outer socket | 0.3 – 2.9 (0.03 – 0.29, 3 – 25) |

## Socket Axial End Play

INFOID:0000000008459362

Unit: mm (in)

| Item         | Standard            |
|--------------|---------------------|
| Outer socket | 0.5 (0.02) or less  |
| Inner socket | 0.2 (0.008) or less |

## Inner Socket Length

INFOID:0000000008459363

Unit: mm (in)

| Item                | Standard     |
|---------------------|--------------|
| Inner socket length | 120.6 (4.75) |

## Relief Oil Pressure

INFOID:0000000008459364

Unit: kPa (kg/cm<sup>2</sup>, psi)

| Item                | Standard                                     |
|---------------------|--|
| Relief oil pressure | 9,400 – 10,400 (95.9 – 106.1, 1,363 – 1,508) |