

SECTION **ST**
STEERING SYSTEM

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PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

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

INFOID:000000010257421

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:

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:000000010257422

- 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.

Precautions for Removing Battery Terminal

INFOID:000000010257423

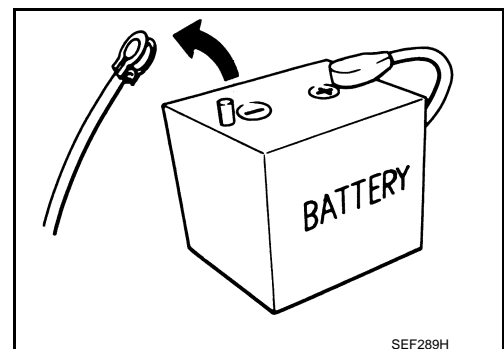
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.

NOTE:

ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.

- For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch.

NOTE:



PRECAUTIONS

< PRECAUTION >

If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.

- After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.

NOTE:

The removal of 12V battery may cause a DTC detection error.

PREPARATION

< PREPARATION >

PREPARATION

PREPARATION

Special Service Tools

INFOID:0000000010257424

The actual shapes of Techmate tools may differ from those of special service tools illustrated here.

| Tool number (Techmate No.) Tool name | Description |
|---|---|
| ST27180001 (J-25726-A) Steering wheel puller <div> </div> | Removing steering wheel |
| ST3127S000 (J-25765-A) Preload gauge <div> </div> | <ul style="list-style-type: none"> Measuring steering column rotating torque Measuring pinion rotating torque Measuring ball joint rotating torque |
| KV48103400 (—) Preload adapter <div> </div> | Measuring rotating torque |
| KV40107300 (—) Boot band crimping tool <div> </div> | Installing boot band |
| KV48103500 (J-26357) Oil pressure gauge <div> </div> | Measuring oil pump relief pressure |
| KV48102500 (J-33914) Oil pressure gauge adapter <div> </div> | Measuring oil pump relief pressure |

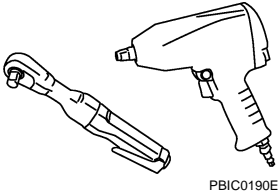
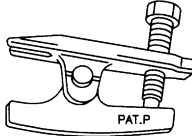
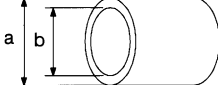
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PREPARATION

< PREPARATION >

Commercial Service Tools

INFOID:000000010257425

| Tool name | Description |
|---|---|
| <p>Power tool</p>  <p>PBIC0190E</p> | <p>Loosening bolts and nuts</p> |
| <p>Ball joint remover</p>  <p>PAT.P</p> <p>S-NT146</p> | <p>Removing steering outer socket</p> |
| <p>Drift</p> <p>a: 35 mm (1.38 in) dia.</p> <p>b: 21 mm (0.83 in) dia.</p>  <p>S-NT474</p> | <p>Installing oil pump oil seal</p> |

COMPONENT PARTS

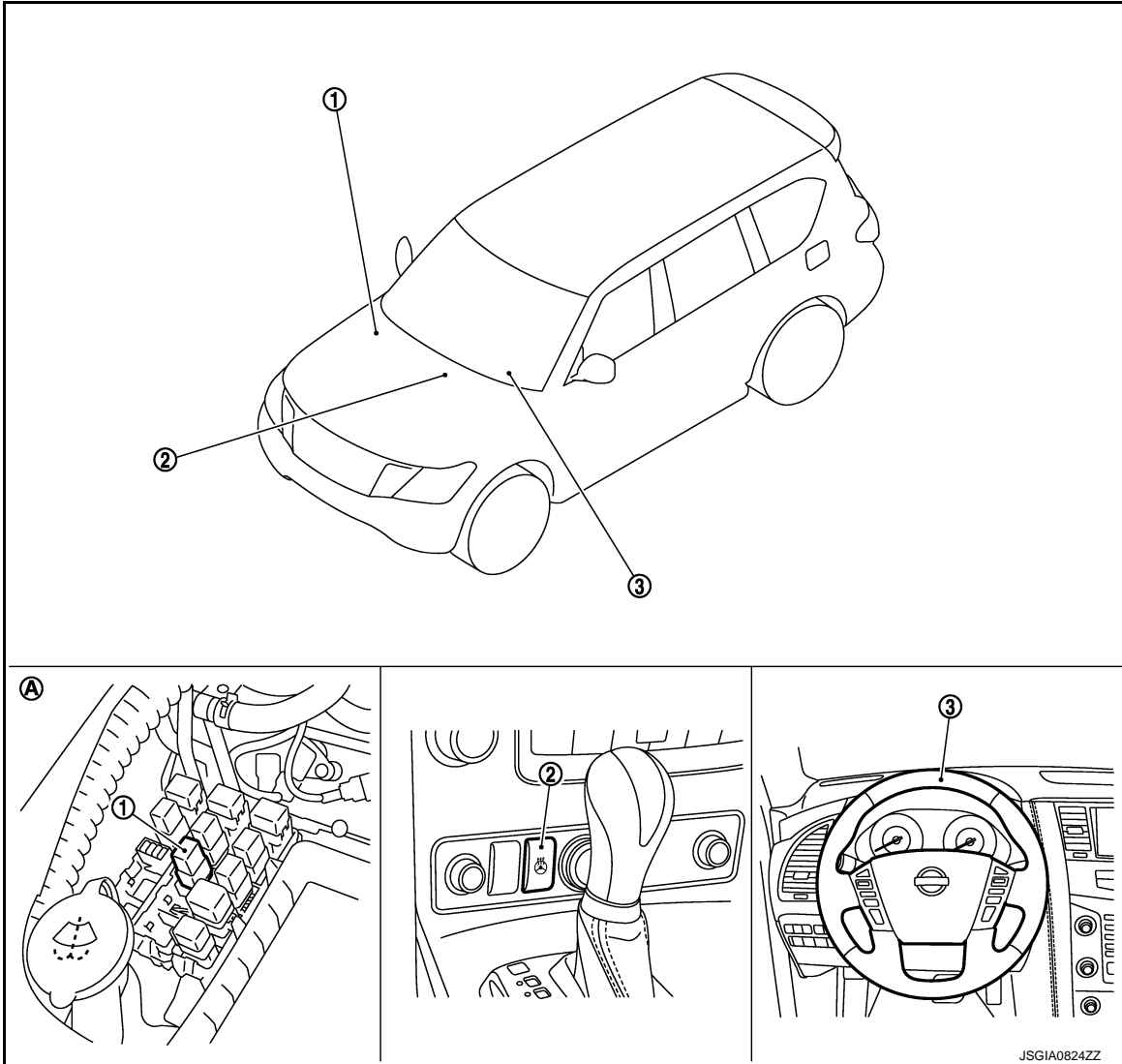
< SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location (Heated Steering Wheel)

INFOID:0000000010257426



- 1. Heated steering wheel relay
- 2. Heated steering wheel switch
- 3. Heated steering wheel
- A. Engine room right side

Component Description (Heated Steering Wheel)

INFOID:0000000010257427

| Part name | | Reference/Function |
|------------------------------|-----------------|---|
| Heated steering wheel | Heating element | Refer to ST-7, "Heated Steering Wheel" . |
| | Thermostat | |
| Heated steering wheel relay | | Refer to ST-8, "Heated Steering Wheel Relay" . |
| Heated steering wheel switch | Timer | Refer to ST-8, "Heated Steering Wheel Switch" . |

Heated Steering Wheel

INFOID:0000000010257428

The heated steering wheel is activated by the power supply from the heated steering wheel relay.

COMPONENT PARTS

< SYSTEM DESCRIPTION >

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:000000010257429

- 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:000000010257430

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

SYSTEM

< SYSTEM DESCRIPTION >

SYSTEM

System Description (Heated Steering Wheel)

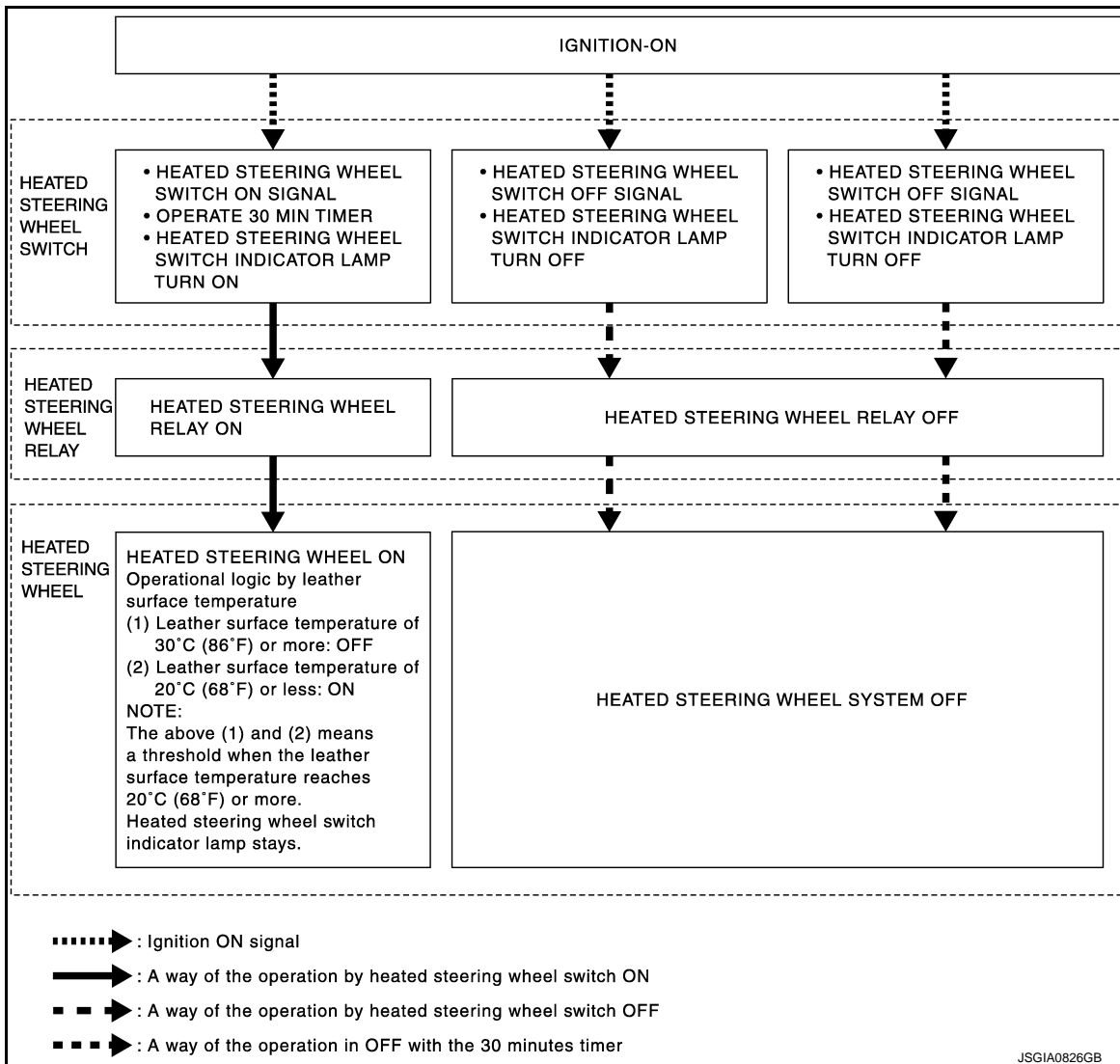
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The heated steering wheel switch controls the heated steering wheel relay. When the heated steering wheel switch is turned on, the heated steering wheel relay is energized and the heated steering wheel system will operate. The heated steering wheel 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 light 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 light will go off.

SYSTEM DIAGRAM



HEATED STEERING WHEEL

< WIRING DIAGRAM >

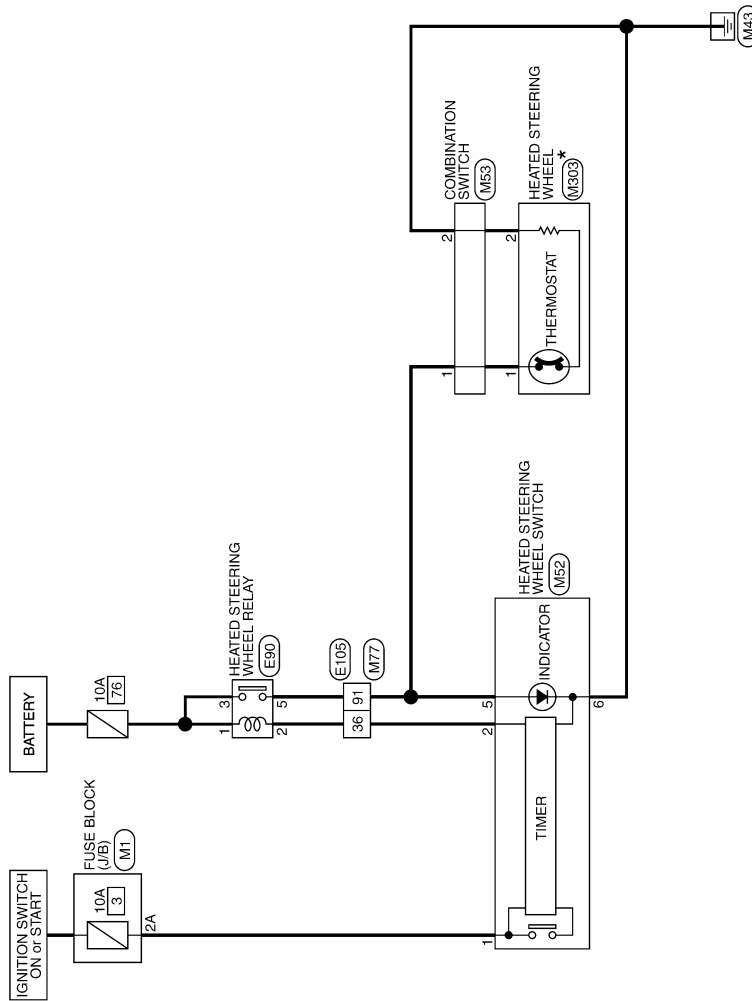
WIRING DIAGRAM

HEATED STEERING WHEEL

Wiring Diagram

INFOID:0000000010257432

HEATED STEERING WHEEL



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

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HEATED STEERING WHEEL

< WIRING DIAGRAM >

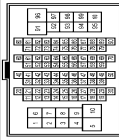
HEATED STEERING WHEEL

| | |
|----------------|-----------------------------|
| Connector No. | E90 |
| Connector Name | HEATED STEERING WHEEL RELAY |
| Connector Type | MS02FL-M2-LC |



| Terminal No. | Color Of Wire | Signal Name [Specification] |
|--------------|---------------|-----------------------------|
| 1 | B/W | - |
| 2 | B/R | - |
| 3 | B/W | - |
| 5 | BR | - |

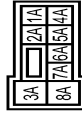
| | |
|----------------|-----------------|
| Connector No. | E105 |
| Connector Name | WIRE TO WIRE |
| Connector Type | TH80MW-CS16-TM4 |



| Terminal No. | Color Of Wire | Signal Name [Specification] |
|--------------|---------------|-----------------------------|
| 1 | L | - |
| 2 | L/W | - |
| 3 | R/B | - |
| 4 | Y | - |
| 5 | Y | - |
| 7 | W/G | - |
| 8 | P/B | - |
| 9 | W/B | - |
| 10 | G | - |
| 11 | L | - |
| 12 | P | - |
| 13 | P/B | - |
| 14 | BR | - |
| 15 | L/B | - |
| 16 | SB | - |

| | | |
|-----|------|---|
| 18 | BR | - |
| 19 | Y/G | - |
| 20 | BR/Y | - |
| 21 | Y/V | - |
| 22 | L | - |
| 23 | Y | - |
| 24 | L/W | - |
| 28 | O | - |
| 29 | B/W | - |
| 30 | L/B | - |
| 31 | - | - |
| 32 | GR/R | - |
| 34 | Y | - |
| 35 | R | - |
| 36 | B/R | - |
| 37 | G/Y | - |
| 38 | G | - |
| 40 | SB | - |
| 41 | W/R | - |
| 42 | R | - |
| 43 | V | - |
| 54 | GR/L | - |
| 91 | BR | - |
| 92 | L/W | - |
| 84 | Y/B | - |
| 85 | G/R | - |
| 87 | R | - |
| 88 | G/B | - |
| 100 | W/R | - |

| | |
|----------------|------------------|
| Connector No. | M1 |
| Connector Name | FUSE BLOCK (J/B) |
| Connector Type | NS02FW-M2 |



| Terminal No. | Color Of Wire | Signal Name [Specification] |
|--------------|---------------|-----------------------------|
| 1A | Y | - |
| 2A | GR | - |
| 3A | W | - |
| 4A | Y/G | - |

| | | |
|----|-----|---|
| 5A | V | - |
| 6A | L/W | - |
| 7A | LG | - |
| 8A | W | - |

| | |
|----------------|------------------------------|
| Connector No. | M52 |
| Connector Name | HEATED STEERING WHEEL SWITCH |
| Connector Type | NS02FW-CS |



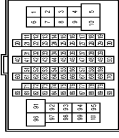
| Terminal No. | Color Of Wire | Signal Name [Specification] |
|--------------|---------------|-----------------------------|
| 1 | GR | - |
| 2 | B/O | - |
| 3 | L/W | - |
| 4 | B | - |
| 5 | BR | - |
| 6 | B | - |

| | |
|----------------|--------------------|
| Connector No. | M53 |
| Connector Name | COMBINATION SWITCH |
| Connector Type | NS02FW-CS |



| Terminal No. | Color Of Wire | Signal Name [Specification] |
|--------------|---------------|-----------------------------|
| 1 | BR | - |
| 2 | B | - |

| | |
|----------------|-----------------|
| Connector No. | M77 |
| Connector Name | WIRE TO WIRE |
| Connector Type | TH80FW-CS16-TM4 |



| Terminal No. | Color Of Wire | Signal Name [Specification] |
|--------------|---------------|-----------------------------|
| 1 | W | - |
| 2 | L/W | - |
| 3 | R/B | - |
| 4 | L | - |
| 5 | Y | - |
| 7 | W/G | - |
| 8 | P/B | - |
| 9 | W/B | - |
| 10 | G | - |
| 11 | L | - |
| 12 | P | - |
| 13 | P/B | - |
| 14 | BR | - |
| 15 | O/L | - |
| 16 | SB | - |
| 18 | BR | - |
| 19 | Y/G | - |
| 20 | BR/Y | - |
| 21 | V | - |
| 22 | L | - |
| 23 | Y | - |
| 24 | L/W | - |
| 28 | O | - |
| 29 | R/W | - |
| 30 | O/L | - |
| 31 | - | - |
| 32 | GR/R | - |
| 34 | Y | - |
| 35 | R | - |
| 36 | B/O | - |
| 37 | G/Y | - |
| 38 | G | - |
| 40 | SB | - |
| 41 | W/R | - |
| 42 | R | - |

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HEATED STEERING WHEEL

< WIRING DIAGRAM >

HEATED STEERING WHEEL

| | | |
|-----|------|---|
| 43 | V | - |
| 54 | GR/L | - |
| 91 | BR | - |
| 92 | L/W | - |
| 94 | Y/B | - |
| 95 | L/R | - |
| 97 | R | - |
| 98 | O/L | - |
| 100 | W/B | - |

| | |
|----------------|-----------------------|
| Connector No. | M303 |
| Connector Name | HEATED STEERING WHEEL |
| Connector Type | INSU/FEW |



| Terminal No. | Color Of Wire | Signal Name (Specification) |
|--------------|---------------|-----------------------------|
| 1 | - | - |
| 2 | - | - |

JRGWC1535GB

DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow (Heated Steering Wheel)

INFOID:0000000010257433

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 >

STEERING WHEEL

Inspection

INFOID:000000010257434

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 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 vehicle on a level and dry surface, set parking brake.
2. Tires need to be inflated the specified pressure. Refer to [WT-67, "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)

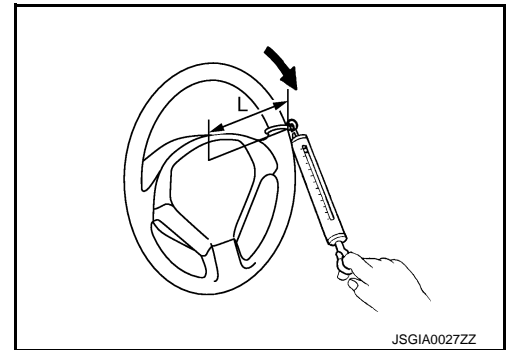
5. Check steering wheel turning force when steering wheel has been turned 540° from neutral position.

Steering wheel turning force : Refer to [ST-57, "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-52, "Inspection"](#).



RACK SLIDING FORCE

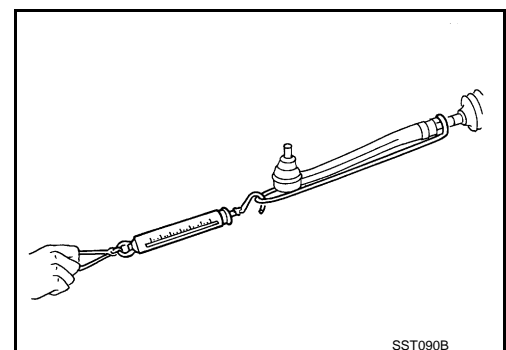
1. Disconnect lower joint and steering knuckle from steering gear assembly. Refer to [ST-41, "Exploded View"](#).
2. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.

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

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

Rack sliding force : Refer to [ST-58, "Rack Sliding Force"](#).

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



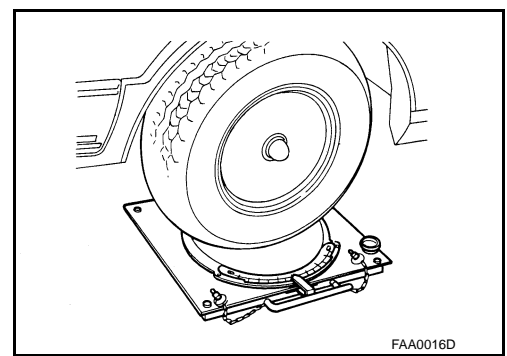
FRONT WHEEL TURNING ANGLE

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

STEERING WHEEL

< BASIC INSPECTION >

- 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.

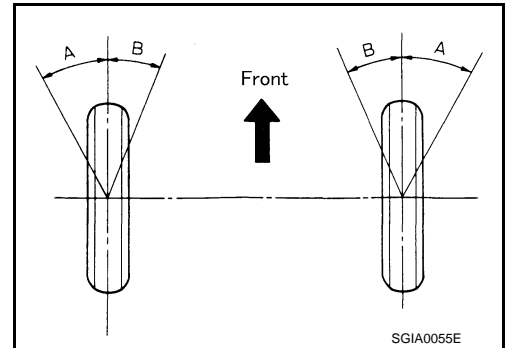


- With the engine at idle, turn steering wheel from full left stop to full right stop and measure the turning angles.

Inner wheel (Angle: A) : Refer to [ST-57, "Steering Angle"](#).

Outer wheel (Angle: B) : Refer to [ST-57, "Steering Angle"](#).

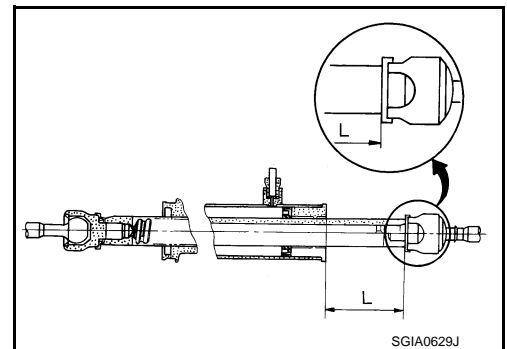
- Steering angles are not adjustable. Check steering gear assembly, steering column assembly and front suspension components for wear or damage if any of the turning angles are different from the specified value. Replace any of them, if any non-standard condition exists.



- Check the following items when turning angle is out of the standard.
 - Check the neutral position of the rack stroke (L).

Rack stroke neutral position (L) : Refer to [ST-58, "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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HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

DTC/CIRCUIT DIAGNOSIS

HEATED STEERING WHEEL SYSTEM

Component Function Check

INFOID:0000000010257435

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-16. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010257436

1. CHECK POWER SOURCE AND GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Remove the heated steering wheel. Refer to [ST-33. "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 | | |
| M303 | 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-18. "Component Inspection \(Heated Steering Wheel\)"](#).

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Replace heated steering wheel. Refer to [ST-33. "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 | | |
| M303 | 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-7. "Component Parts Location \(Heated Steering Wheel\)"](#).
3. Disconnect heated steering wheel switch connector. Refer to [ST-56. "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 >

| Heated steering wheel relay | | Heated steering wheel | | Continuity |
|-----------------------------|----------|-----------------------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| E90 | 5 | M303 | 1 | Existed |

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

| Heated steering wheel relay | | Ground | Continuity |
|-----------------------------|----------|--------|-------------|
| Connector | Terminal | | |
| E90 | 5 | | Not existed |

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-19, "Component Inspection \(Heated Steering Wheel Relay\)"](#).

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Replace heated steering wheel relay. Refer to [ST-7, "Component Parts Location \(Heated Steering Wheel\)"](#).

6.DETECT MALFUNCTIONING ITEM

Check the following.

- Battery
- Harness for short or open between battery and 10A fuse. Refer to [PG-12, "Wiring Diagram - BATTERY POWER SUPPLY -"](#).
- 10A fuse (No.76). Refer to [PG-116, "Fuse and Fusible Link Arrangement"](#).
- Harness for short or open between 10A fuse 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 | | |
| M52 | 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 | |
| E90 | 2 | M52 | 2 | Existed |

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

| Heated steering wheel relay | | Ground | Continuity |
|-----------------------------|----------|--------|-------------|
| Connector | Terminal | | |
| E90 | 2 | | Not existed |

HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

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 | M52 | 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. DETECT MALFUNCTIONING ITEM

Check the following.

- Ignition switch
- Harness for short or open between ignition switch and fuse block (J/B). Refer to [PG-84. "Wiring Diagram - IGNITION POWER SUPPLY FUSE No. 3 -"](#).
- 10A fuse [No.3, located in the fuse block (J/B)]. Refer to [PG-118. "Fuse, Connector and Terminal Arrangement"](#).
- Fuse block (J/B)

Is the inspection result normal?

- YES >> Replace heated steering wheel switch. Refer to [ST-56. "Removal and Installation"](#).
 NO >> Repair or replace damaged parts.

Component Inspection (Heated Steering Wheel)

INFOID:000000010257437

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-33. "Removal and Installation"](#).

2. CHECK HEATED STEERING WHEEL RESISTANCE

Check resistance between heated steering wheel connector terminals.

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

HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace heated steering wheel. Refer to [ST-33, "Removal and Installation"](#).

Component Inspection (Heated Steering Wheel Relay)

INFOID:0000000010257438

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 Terminal | Condition | Continuity |
|---|--|-------------|
| 3 – 5 | 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-7, "Component Parts Location \(Heated Steering Wheel\)"](#).

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HEATED STEERING WHEEL SWITCH INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

HEATED STEERING WHEEL SWITCH INDICATOR LAMP

Component Function Check

INFOID:000000010257439

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-20. "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-20. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000010257440

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 | | |
| M52 | 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 GROUND CIRCUIT

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

| Heated steering wheel switch | | Ground | Continuity |
|------------------------------|----------|--------|------------|
| Connector | Terminal | | |
| M52 | 6 | | Existed |

Is the inspection result normal?

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

3. 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-7. "Component Parts Location \(Heated Steering Wheel\)"](#).
3. Disconnect heated steering wheel switch connector. Refer to [ST-33. "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

< DTC/CIRCUIT DIAGNOSIS >

| Heated steering wheel relay | | Heated steering wheel switch | | Continuity |
|-----------------------------|----------|------------------------------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| E90 | 5 | M52 | 5 | Existed |

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

| Heated steering wheel relay | | Ground | Continuity |
|-----------------------------|----------|--------|-------------|
| Connector | Terminal | | |
| E90 | 5 | | Not existed |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace damaged parts.

4.CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to [ST-22, "Component Inspection \(Heated Steering Wheel Relay\)"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace heated steering wheel relay. Refer to [ST-7, "Component Parts Location \(Heated Steering Wheel\)"](#).

5.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 | |
| E90 | 2 | M52 | 2 | Existed |

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

| Heated steering wheel relay | | Ground | Continuity |
|-----------------------------|----------|--------|-------------|
| Connector | Terminal | | |
| E90 | 2 | | Not existed |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace damaged parts.

6.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 | M52 | 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 7.

NO >> Repair or replace damaged parts.

HEATED STEERING WHEEL SWITCH INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

7. DETECT MALFUNCTIONING ITEM

Check the following.

- Ignition switch
- Harness for short or open between ignition switch and fuse block (J/B). Refer to [PG-60, "Wiring Diagram - IGNITION POWER SUPPLY -"](#).
- 10A fuse [No.3, located in the fuse block (J/B)]. Refer to [PG-118, "Fuse, Connector and Terminal Arrangement"](#).
- Fuse block (J/B)

Is the inspection result normal?

- YES >> Replace heated steering wheel switch. Refer to [ST-56, "Removal and Installation"](#).
NO >> Repair or replace damaged parts.

Component Inspection (Heated Steering Wheel Relay)

INFOID:000000010257441

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 Terminal | Condition | Continuity |
|---|--|-------------|
| 3 – 5 | 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-7, "Component Parts Location \(Heated Steering Wheel\)"](#).

HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

Description

INFOID:0000000010257442

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

Diagnosis Procedure

INFOID:0000000010257443

1. CHECK POWER SOURCE AND GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Remove the heated steering wheel. Refer to [ST-33, "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 | | |
| M303 | 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-18, "Component Inspection \(Heated Steering Wheel\)"](#).

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace heated steering wheel. Refer to [ST-33, "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 | | |
| M303 | 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-7, "Component Parts Location \(Heated Steering Wheel\)"](#).
3. Disconnect heated steering wheel switch connector. Refer to [ST-56, "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 >

| Heated steering wheel relay | | Heated steering wheel | | Continuity |
|-----------------------------|----------|-----------------------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| E90 | 5 | M303 | 1 | Existed |

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

| Heated steering wheel relay | | Ground | Continuity |
|-----------------------------|----------|--------|-------------|
| Connector | Terminal | | |
| E90 | 5 | | Not existed |

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-19, "Component Inspection \(Heated Steering Wheel Relay\)"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace heated steering wheel relay. Refer to [ST-7, "Component Parts Location \(Heated Steering Wheel\)"](#).

6. DETECT MALFUNCTIONING ITEM

Check the following.

- Battery
- Harness for short or open between battery and 10A fuse. Refer to [PG-12, "Wiring Diagram - BATTERY POWER SUPPLY -"](#).
- 10A fuse (No.76). Refer to [PG-116, "Fuse and Fusible Link Arrangement"](#).
- Harness for short or open between 10A fuse 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 | | |
| M52 | 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 | |
| E90 | 2 | M52 | 2 | Existed |

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

| Heated steering wheel relay | | Ground | Continuity |
|-----------------------------|----------|--------|-------------|
| Connector | Terminal | | |
| E90 | 2 | | Not existed |

HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

< SYMPTOM DIAGNOSIS >

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 | M52 | 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. DETECT MALFUNCTIONING ITEM

Check the following.

- Ignition switch
- Harness for short or open between ignition switch and fuse block (J/B). Refer to [PG-60, "Wiring Diagram - IGNITION POWER SUPPLY -"](#).
- 10A fuse [No.3, located in the fuse block (J/B)]. Refer to [PG-118, "Fuse, Connector and Terminal Arrangement"](#).
- Fuse block (J/B)

Is the inspection result normal?

- YES >> Replace heated steering wheel switch. Refer to [ST-56, "Removal and Installation"](#).
NO >> Repair or replace damaged parts.

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HEATED STEERING WHEEL SWITCH INDICATOR LAMP DOES NOT TURN ON

< SYMPTOM DIAGNOSIS >

HEATED STEERING WHEEL SWITCH INDICATOR LAMP DOES NOT TURN ON

Description

INFOID:000000010257444

- 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:000000010257445

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 | | |
| M52 | 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 GROUND CIRCUIT

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

| Heated steering wheel switch | | Ground | Continuity |
|------------------------------|----------|--------|------------|
| Connector | Terminal | | |
| M52 | 6 | | Existed |

Is the inspection result normal?

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

3. 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-7, "Component Parts Location \(Heated Steering Wheel\)"](#).
3. Disconnect heated steering wheel switch connector. Refer to [ST-56, "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 | |
| E90 | 5 | M52 | 5 | Existed |

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

| Heated steering wheel relay | | Ground | Continuity |
|-----------------------------|----------|--------|-------------|
| Connector | Terminal | | |
| E90 | 5 | | Not existed |

HEATED STEERING WHEEL SWITCH INDICATOR LAMP DOES NOT TURN ON

< SYMPTOM DIAGNOSIS >

Is the inspection result normal?

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

4.CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to [ST-22, "Component Inspection \(Heated Steering Wheel Relay\)".](#)

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Replace heated steering wheel relay. Refer to [ST-7, "Component Parts Location \(Heated Steering Wheel\)".](#)

5.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 | |
| E90 | 2 | M52 | 2 | Existed |

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

| Heated steering wheel relay | | Ground | Continuity |
|-----------------------------|----------|--------|-------------|
| Connector | Terminal | | |
| E90 | 2 | | Not existed |

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair or replace damaged parts.

6.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 | M52 | 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 7.
NO >> Repair or replace damaged parts.

7.DETECT MALFUNCTIONING ITEM

Check the following.

- Ignition switch
- Harness for short or open between ignition switch and fuse block (J/B). Refer to [PG-60, "Wiring Diagram - IGNITION POWER SUPPLY -"](#).
- 10A fuse [No.3, located in the fuse block (J/B)]. Refer to [PG-118, "Fuse, Connector and Terminal Arrangement"](#).
- Fuse block (J/B)

Is the inspection result normal?

- YES >> Replace heated steering wheel switch. Refer to [ST-56, "Removal and Installation"](#).

HEATED STEERING WHEEL SWITCH INDICATOR LAMP DOES NOT TURN ON

< SYMPTOM DIAGNOSIS >

NO >> Repair or replace damaged parts.

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

INFOID:0000000110257446

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 | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|-----------|---|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------------------|---------------------|---|------------------------|---------------------|------------------------|------------------------|---------------------|---------------------|------------------------------------|--------------------|--------------------|--------------------------|--------------------|---|--|--|
| | | | ST-30, "Inspection" | ST-30, "Inspection" | ST-46, "Inspection" | ST-46, "Inspection" | ST-46, "Inspection" | ST-30, "Inspection" | ST-32, "Inspection" | ST-32, "Inspection" | EM-20, "Checking" | ST-32, "Inspection" | — | ST-41, "Exploded View" | ST-35, "Inspection" | ST-34, "Exploded View" | ST-41, "Exploded View" | NVH in DLN section. | NVH in DLN section. | NVH in FAX, RAX, FSU, RSU section. | NVH in WT section. | NVH in WT section. | NVH in FAX, RAX section. | NVH in BR section. | | | |
| Steering | Noise | Fluid level | x | x | x | x | x | x | x | x | x | x | | | x | x | | x | x | x | x | x | x | x | x | | |
| | Shake | Air in hydraulic system | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Vibration | Outer/inner socket ball joint swinging torque | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Shimmy | Outer/inner socket ball joint rotating torque | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Judder | 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 | | | | | | | | | | | | | | | | | | | | | | | | | |

x: Applicable

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POWER STEERING FLUID

< PERIODIC MAINTENANCE >

PERIODIC MAINTENANCE

POWER STEERING FLUID

Inspection

INFOID:000000010257447

FLUID LEVEL

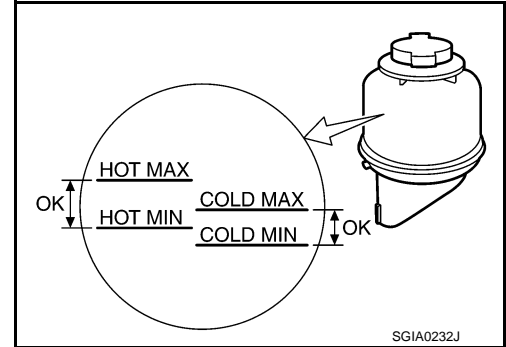
1. Check fluid level with engine stopped.
2. Ensure that fluid level is between MIN and MAX.
3. Fluid levels at HOT and COLD are different. Do not confuse them.

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

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

Recommended fluid : Refer to [MA-15, "FOR NORTH AMERICA : Fluids and Lubricants"](#) (for NORTH AMERICA), [MA-16, "FOR MEXICO : Fluids and Lubricants"](#) (for MEXICO).

Fluid capacity : Refer to [ST-57, "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.
- Always use the specified fluid. Refer to [MA-15, "FOR NORTH AMERICA : Fluids and Lubricants"](#) (for NORTH AMERICA), [MA-16, "FOR MEXICO : Fluids and Lubricants"](#) (for MEXICO).

FLUID LEAKAGE

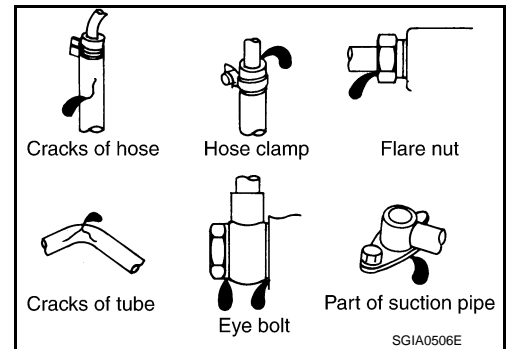
Check hydraulic connections for fluid leakage, cracks, damage, looseness, or wear.

1. Run engine until the fluid temperature reaches 50 to 80°C (122 to 176°F) in reservoir tank, and keep engine speed idle.
2. Turn steering wheel several times from full left stop to full right stop.
3. Hold steering wheel at each lock position for five seconds and carefully, check for fluid leakage.

CAUTION:

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. Refer to [ST-52, "Inspection"](#).
6. Check steering gear boots for accumulation of fluid indicating 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.

POWER STEERING FLUID

< PERIODIC MAINTENANCE >

1. Turn steering wheel several times from full left stop to full right stop with engine off.
CAUTION:
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 engine and hold steering wheel at each lock position for 3 seconds at idle to check for fluid leakage.
3. Repeat step 2 above several times at approximately 3 seconds 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 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

< PERIODIC MAINTENANCE >

STEERING WHEEL

Inspection

INFOID:000000010257448

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.

Steering wheel axial end play : Refer to [ST-57, "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-34, "Exploded View"](#).
 - Check steering gear assembly mounting condition for looseness. Refer to [ST-41, "Exploded View"](#).

STEERING WHEEL PLAY

1. Turn steering wheel so that front wheels come to the straight-ahead position.
2. Start 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.

Steering wheel play : Refer to [ST-57, "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

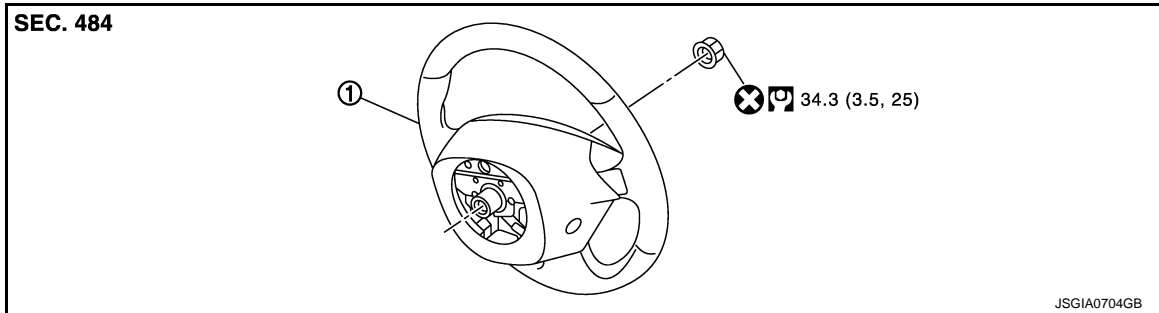
< REMOVAL AND INSTALLATION >

REMOVAL AND INSTALLATION

STEERING WHEEL

Exploded View

INFOID:000000010257449



1. Steering wheel

⊗: Always replace after every disassembly.

Ⓜ: N·m (kg·m, ft·lb)

Removal and Installation

INFOID:000000010257450

REMOVAL

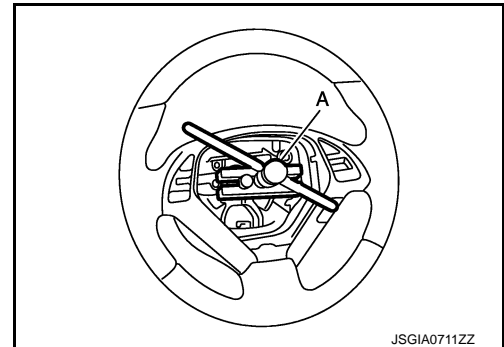
NOTE:

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

1. Set vehicle to the straight-ahead position.
2. Remove driver air bag module. Refer to [SR-11, "Removal and Installation"](#).
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, "Removal and Installation"](#).

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.

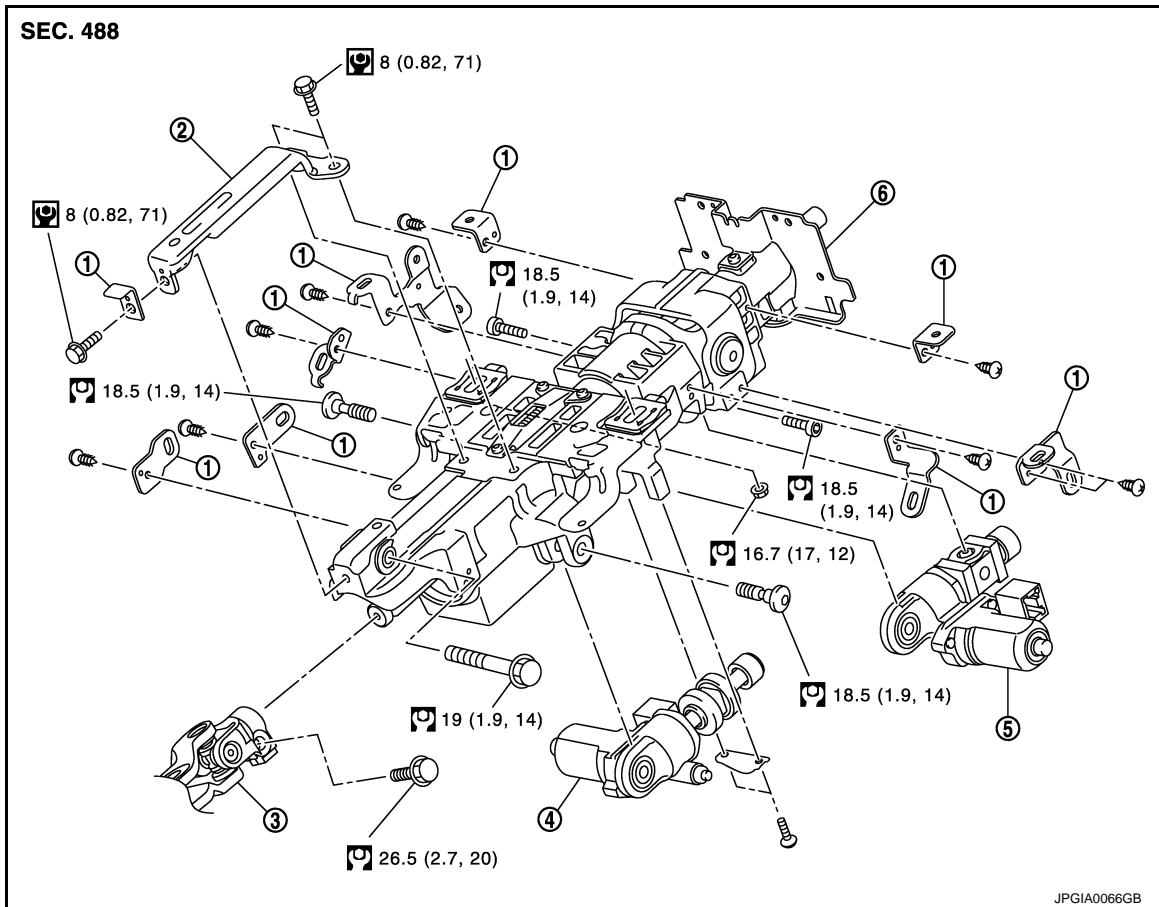
STEERING COLUMN

< REMOVAL AND INSTALLATION >

STEERING COLUMN

Exploded View

INFOID:000000010257451



- | | | |
|---------------------|-------------------------------------|-----------------------------|
| 1. Bracket | 2. Steering column mounting bracket | 3. Upper joint |
| 4. Telescopic motor | 5. Tilt motor | 6. Steering column assembly |

⊕: N-m (kg-m, ft-lb)

⊕: N-m (kg-m, in-lb)

Removal and Installation

INFOID:000000010257452

REMOVAL

CAUTION:

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

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, "Removal and Installation"](#).
4. Remove steering wheel. Refer to [ST-33, "Removal and Installation"](#).
5. Remove instrument lower panel LH. Refer to [IP-14, "Removal and Installation"](#).
6. Remove the steering column cover. Refer to [IP-14, "Removal and Installation"](#).
7. Remove spiral cable. Refer to [SR-14, "Removal and Installation"](#).
8. Remove combination switch. Refer to [BCS-96, "Removal and Installation"](#).
9. Disconnect each switch harness connectors installed to steering column assembly.

STEERING COLUMN

< REMOVAL AND INSTALLATION >

10. Remove the upper joint mounting bolt and separate the joint from upper joint.

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.

11. Remove steering column assembly.

- If necessary, remove telescopic motor, tilt motor, and brackets.

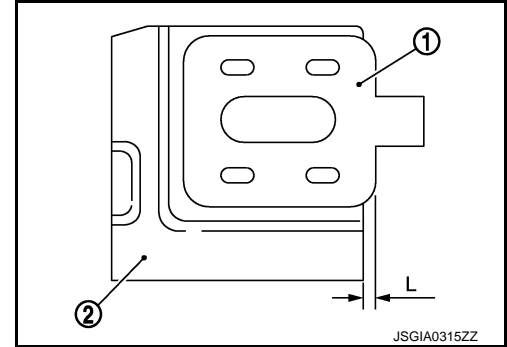
12. Perform inspection after removal. Refer to [ST-35, "Inspection"](#).

INSTALLATION

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

- To install the slide plate (1), create clearance (L) in the steering column assembly mounting area (2) as follows.

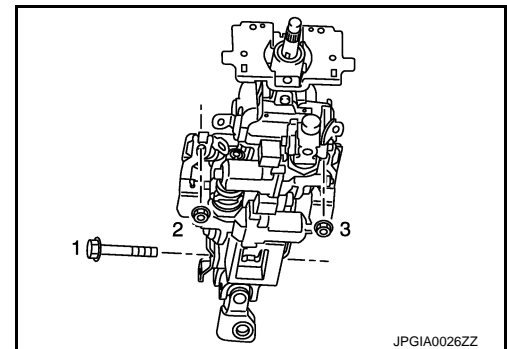
L : 2.0 mm (0.079 in)



- Tighten the mounting bolts and nuts 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.**
- Perform inspection after installation. Refer to [ST-35, "Inspection"](#).



INFOID:000000010257453

Inspection

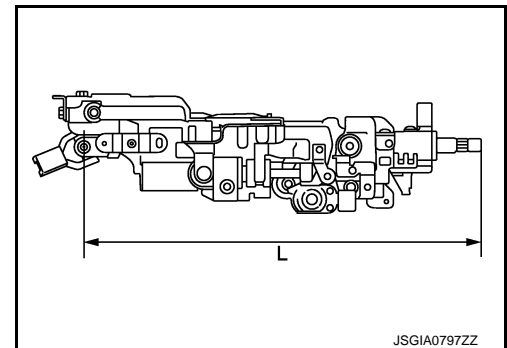
INSPECTION AFTER REMOVAL

- 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.

Rotating torque : Refer to [ST-57, "Steering Column Operating Range"](#).

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

Steering column length (L) : Refer to [ST-57, "Steering Column Length"](#).

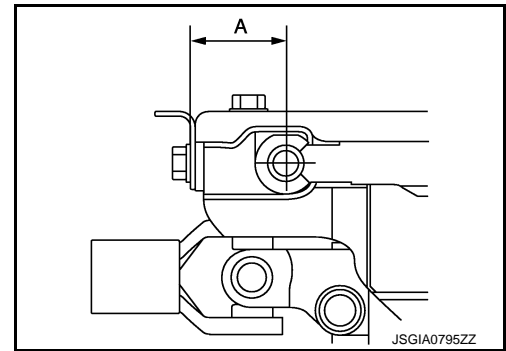


STEERING COLUMN

< REMOVAL AND INSTALLATION >

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

Mounting dimensions (A) : Refer to [ST-57, "Steering Column Mounting Dimensions"](#).



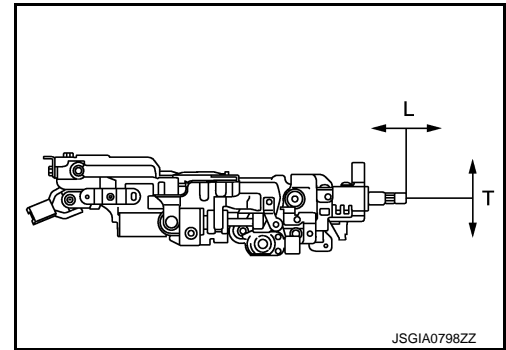
INSPECTION AFTER INSTALLATION

- 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-32, "Inspection"](#).
- Check tilt and telescopic mechanism operating range tilt operating range (T), telescopic operating range (L) as shown in the figure.

Tilt operating range (T) : Refer to [ST-57, "Steering Column Operating Range"](#).

Telescopic operating range (L) : Refer to [ST-57, "Steering Column Operating Range"](#).

- Adjust neutral position of steering angle sensor. Refer to [BRC-62, "Work Procedure"](#).



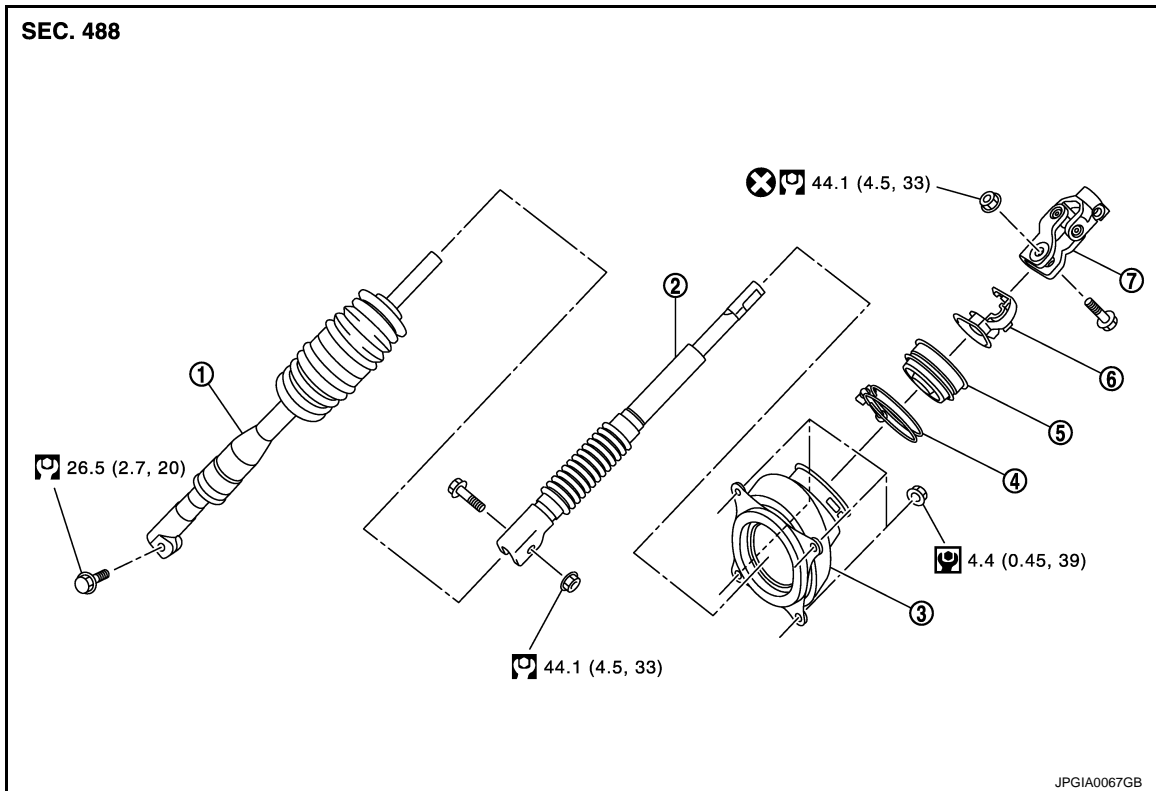
STEERING SHAFT

< REMOVAL AND INSTALLATION >

STEERING SHAFT

Exploded View

INFOID:000000010257454



- | | | |
|----------------|--------------------|----------------|
| 1. Lower joint | 2. Steering shaft | 3. Hole cover* |
| 4. Clamp* | 5. Hole cover seal | 6. Collar |
| 7. Upper joint | | |

*: Replace "3" and "4" as a set.

⊗: Always replace after every disassembly.

⊙: N·m (kg-m, ft-lb)

⊚: N·m (kg-m, in-lb)

Removal and Installation

INFOID:000000010257455

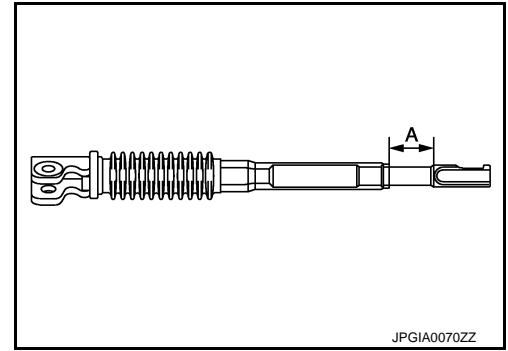
REMOVAL

1. Set vehicle to the straight-ahead position.
2. Fix the steering wheel.
3. Remove steering shaft fixing bolt and nut (lower joint side).
CAUTION:
The steering shaft bellows are easily bent. Never press the bellows too much with a tool.
4. Remove lower joint fixing bolt (steering gear side).
5. Remove lower joint from steering shaft and steering gear assembly.
CAUTION:
 - When removing lower joint, never insert a tool, such as a screwdriver, into the yoke groove to pull out the lower joint. In case of the violation of the above, replace lower joint with a new one.
 - 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.
6. Turn carpet and remove the hole cover mounting nuts.
7. Remove the upper joint fixing bolt and nut (steering shaft side).

STEERING SHAFT

< REMOVAL AND INSTALLATION >

8. Remove the steering shaft from upper joint by sliding the steering shaft (A: sliding range).
9. Remove the steering shaft and hole cover.
10. Remove collar, hole cover seal, and hole cover assembly.
CAUTION:
Never damage hole cover seal.
11. Perform inspection after removal. Refer to [ST-39. "Inspection"](#).



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.

- Insert hole cover seal all the way to the hole cover.

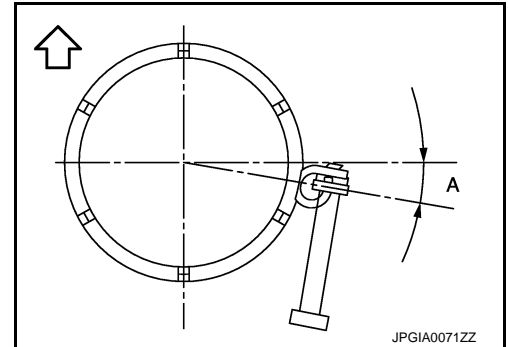
CAUTION:

Never damage the seal lip of the hole cover seal with the tip of the steering shaft.

- Install clamp as shown in the figure.

A : 9.2°

⇐ : Vehicle front



- Tighten the clamp to the specified torque and check the clamp length (A).

Clamp length "A" : 3.0 mm (0.12 in) or less

- After tightening the upper joint fixing bolt and nut, check the no clearance between bolt and steering shaft.

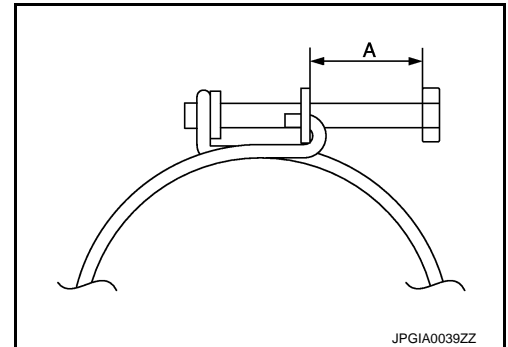
CAUTION:

Never reuse upper joint mounting nut.

- When installing lower joint, tighten the steering gear side fixing bolt first.
- 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.



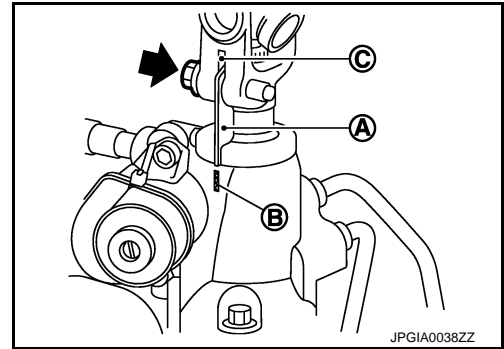
STEERING SHAFT

< REMOVAL AND INSTALLATION >

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

← : Bolt

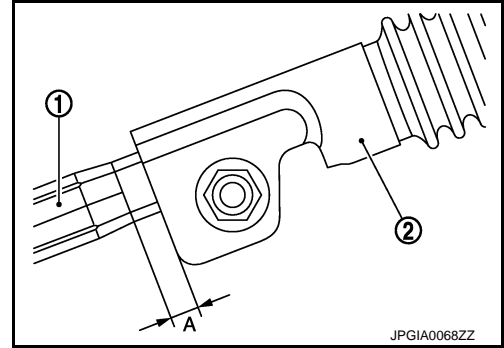
- Install slit part of lower joint (C) aligning with the rear cover cap projection (A). Make sure that the slit part of lower joint is aligned with rear cover cap projection and the marking position of gear housing assembly (B).



- When installing lower joint (1) to steering shaft (2), check the fixing length (A).

A : 15.3 mm (0.602 in)

- Perform inspection after installation. Refer to [ST-39, "Inspection"](#).



Inspection

INFOID:000000010257456

INSPECTION AFTER REMOVAL

Lower Joint

- Check dust boot clamp (looseness and disconnection) and dust boot (scratches, cracks, and holes). Replace the lower joint, as necessary.
- Check each part of lower joint for damage and other malfunctions. Replace if there is a malfunction.

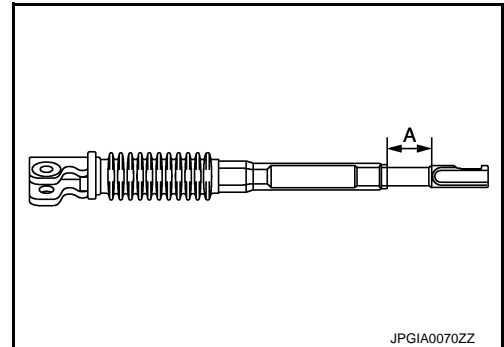
Steering Shaft

- Check steering shaft and hole cover seal for scratches, cracks, and holes. Replace the steering shaft or hole cover seal, as necessary.
- Check the sliding range of the steering shaft.

CAUTION:

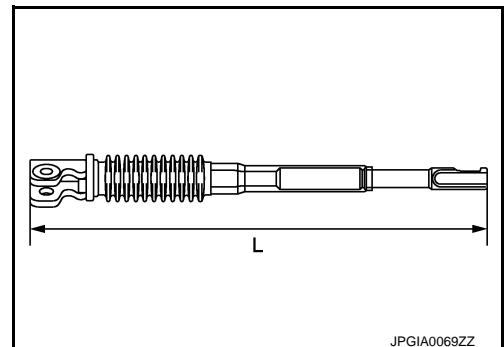
Check the sliding range (A) (between the extended position and the contracted position) of the steering shaft.

Sliding range (A) : Refer to [ST-58, "Steering Shaft Sliding Range"](#).



- Check the length (L) (extended position) of the steering shaft.

Steering shaft length (L) : Refer to [ST-58, "Steering Shaft Sliding Range"](#).



STEERING SHAFT

< REMOVAL AND INSTALLATION >

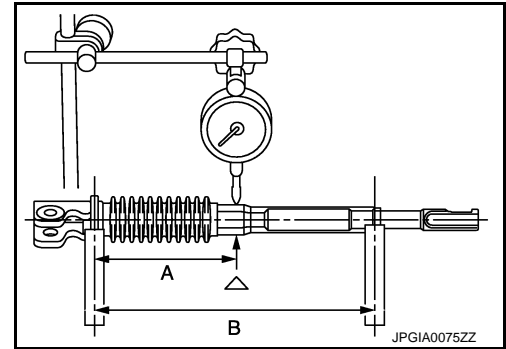
- Rotate the steering shaft to check runout of the steering shaft at the runout measuring point (Δ) by using dial indicator and V-block.

Steering shaft runout : Refer to [ST-58. "Steering Shaft Sliding Range"](#).

A : 120 mm (4.72 in)

B : 240 mm (9.45 in)

- Check each part of steering shaft for damage and other malfunctions. Replace if there is a malfunction.



INSPECTION AFTER INSTALLATION

- Check dust boot bellows (deformation, such as dents). Manually rework the bellows, as necessary.
- 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-32. "Inspection"](#).
- Adjust neutral position of steering angle sensor. Refer to [BRC-62. "Work Procedure"](#).

STEERING GEAR AND LINKAGE

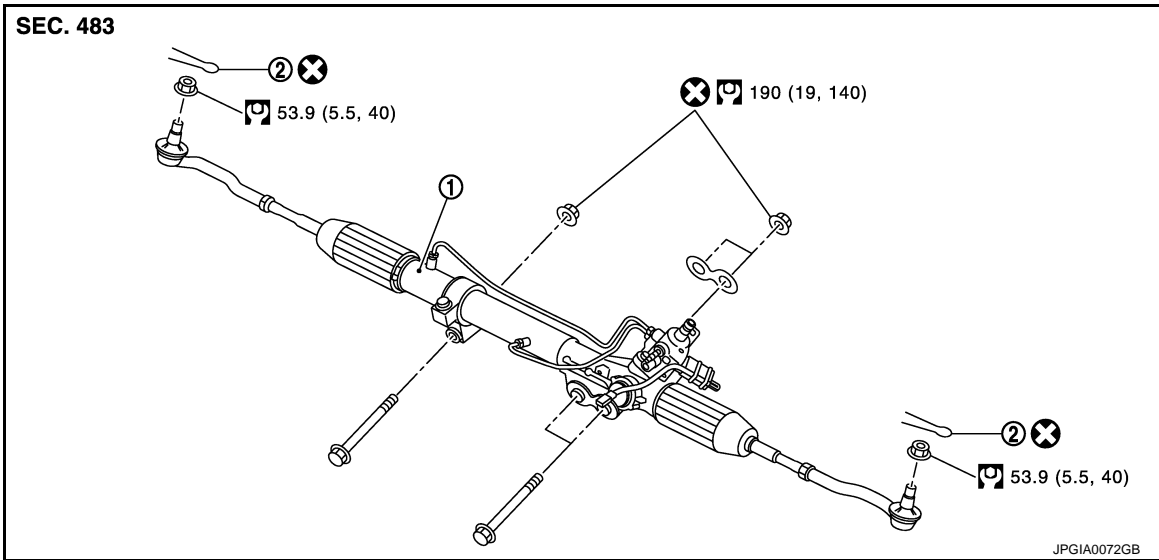
< REMOVAL AND INSTALLATION >

STEERING GEAR AND LINKAGE

Exploded View

INFOID:000000010257457

REMOVAL



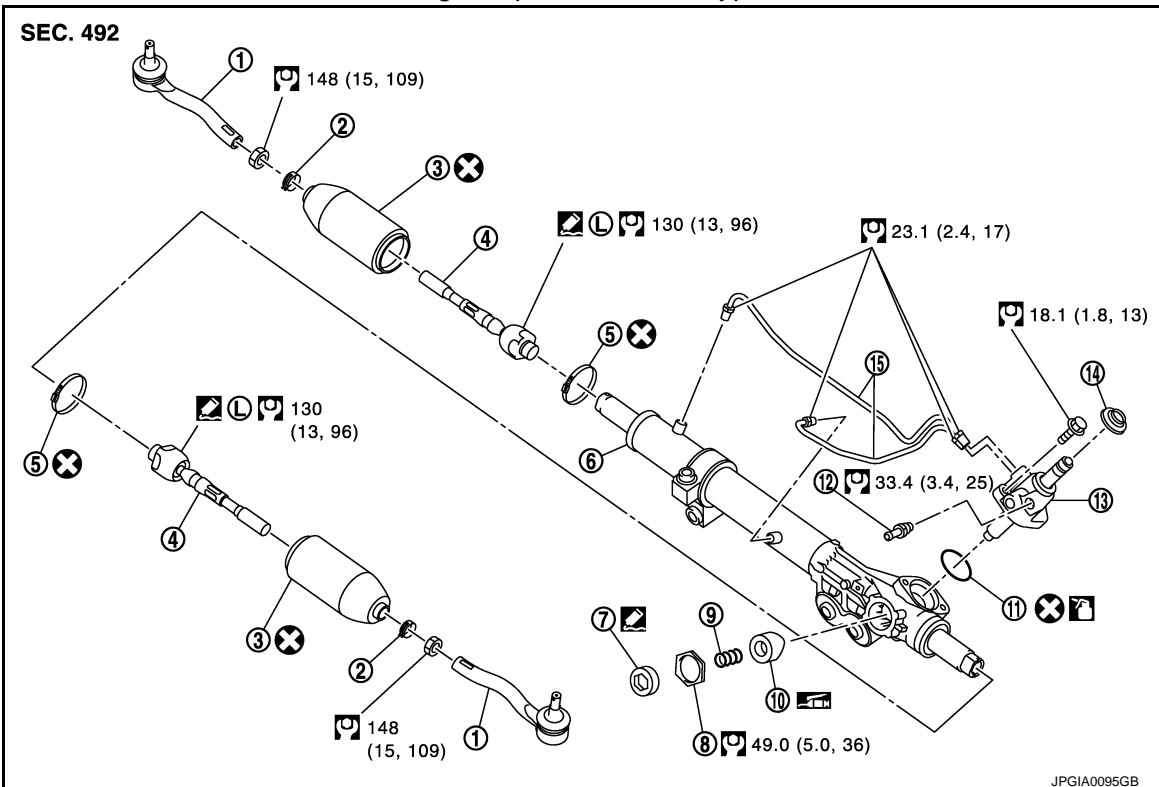
1. Steering gear assembly 2. Cotter pin

⊗: Always replace after every disassembly.

□: N·m (kg-m, ft-lb)

DISASSEMBLY

Engine speed sensitive type



STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

- | | | |
|-----------------------|-----------------------------|--------------------------|
| 1. Outer socket | 2. Boot clamp | 3. Boot |
| 4. Inner socket | 5. Boot clamp | 6. Gear housing assembly |
| 7. Adjusting screw | 8. Adjusting screw lock nut | 9. Spring |
| 10. Retainer | 11. O-ring | 12. Low pressure piping |
| 13. Gear-sub assembly | 14. Rear cover cap | 15. Cylinder tubes |

⊗: Always replace after every disassembly.

Ⓜ: N-m (kg-m, ft-lb)

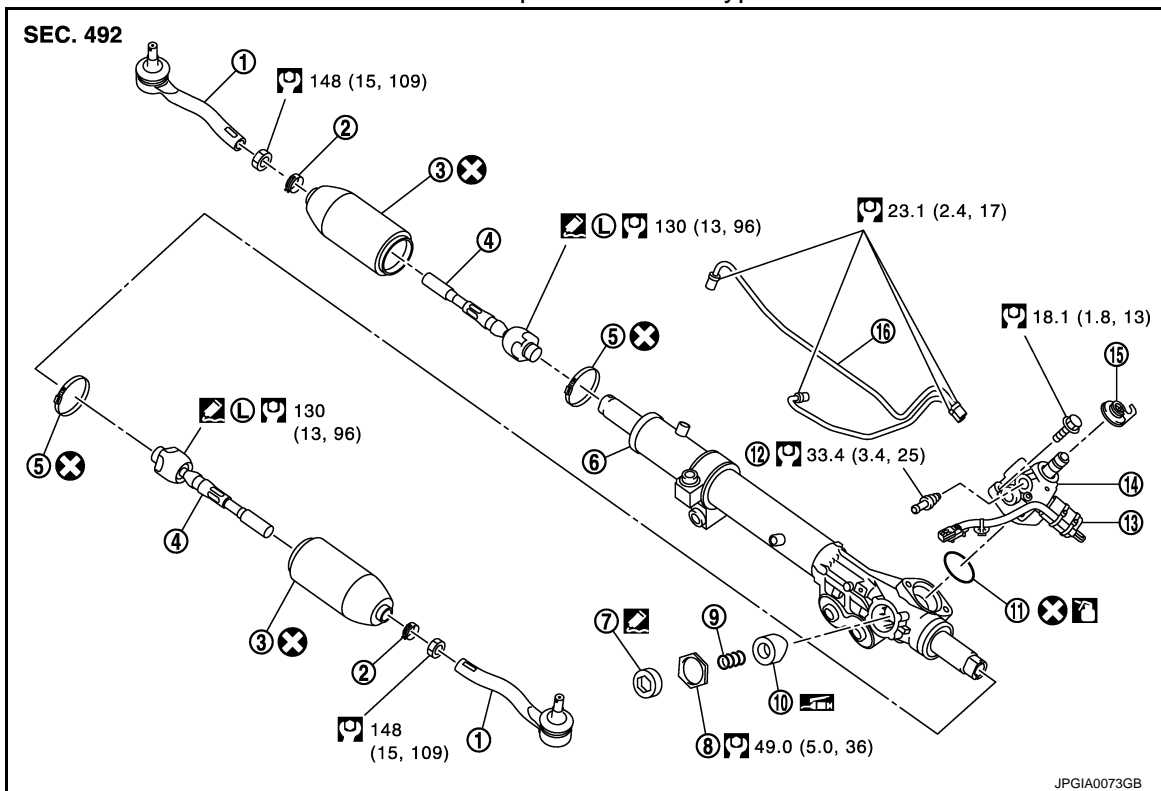
🔧: Apply power steering fluid.

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

🔧: Apply Genuine Liquid Gasket, Three Bond 1111B or equivalent.

🔧: Apply multi-purpose grease.

Vehicle speed sensitive type



- | | | |
|-----------------------------------|-----------------------------|--------------------------|
| 1. Outer socket | 2. Boot clamp | 3. Boot |
| 4. Inner socket | 5. Boot clamp | 6. Gear housing assembly |
| 7. Adjusting screw | 8. Adjusting screw lock nut | 9. Spring |
| 10. Retainer | 11. O-ring | 12. Low pressure piping |
| 13. Power steering solenoid valve | 14. Gear-sub assembly | 15. Rear cover cap |
| 16. Cylinder tubes | | |

⊗: Always replace after every disassembly.

Ⓜ: N-m (kg-m, ft-lb)

🔧: Apply power steering fluid.

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

🔧: Apply Genuine Liquid Gasket, Three Bond 1111B or equivalent.

🔧: Apply multi-purpose grease.

STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

Removal and Installation

INFOID:000000010257458

REMOVAL

1. Set vehicle to the straight-ahead position.
2. Remove tires.
3. Remove front final drive assembly. Refer to [DLN-174. "Removal and Installation"](#).
4. Remove cotter pin (1), and then loosen the nut.

5. Remove steering outer socket (2) from steering knuckle (3) so as not to damage ball joint boot (4) using suitable ball joint remover (commercial service tool).

CAUTION:

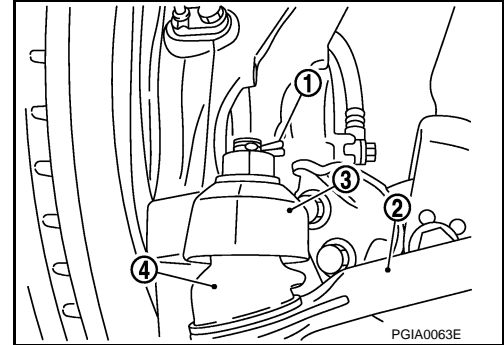
Temporarily tighten the nut to prevent damage to threads and to prevent the ball joint remover from suddenly coming off.

6. Remove high pressure piping and low pressure piping of hydraulic piping, and then drain power steering fluid.
7. Remove power steering solenoid valve harness connector.
8. Remove lower joint fixing bolt (steering gear side).
9. Separate the lower joint from the steering gear assembly. Refer to [ST-37. "Exploded View"](#).

CAUTION:

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

10. Remove steering gear assembly.



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.

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

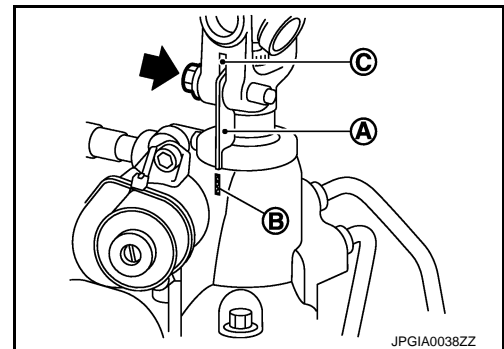
NOTE:

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 is aligned with rear cover cap projection and the marking position of gear housing assembly (B).
- Never reuse cotter pin and steering gear mounting nut.
- Perform inspection after installation. Refer to [ST-46. "Inspection"](#).



Disassembly and Assembly

INFOID:000000010257459

DISASSEMBLY

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.

1. Remove cylinder tubes from gear housing assembly.

STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

2. Remove rear cover cap from gear-sub assembly.
3. Measure adjusting screw height (H), and loosen adjusting screw lock nut (1) and adjusting screw (2).

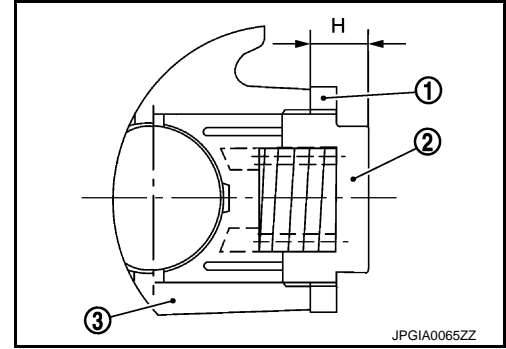
3 : Gear housing assembly

4. Remove gear-sub assembly from gear housing assembly.
5. Remove O-ring from gear housing assembly.
6. Loosen outer socket lock nut, and remove outer socket.
7. 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.

8. Remove inner socket from gear housing assembly.



JPGIA0065ZZ

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.

ASSEMBLY

1. Apply recommended fluid to O-ring, and then install O-ring to gear housing assembly.

CAUTION:

Never reuse O-ring.

2. Install gear-sub assembly to gear housing assembly.

CAUTION:

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

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

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

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

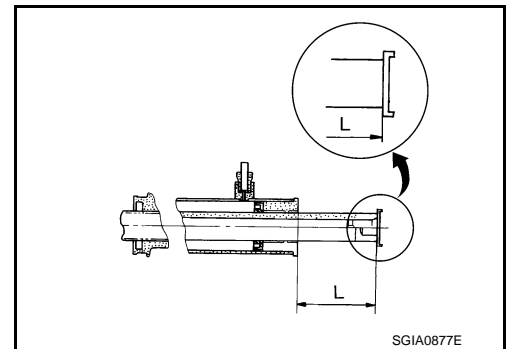
4. Screw inner socket into rack part and tighten at the specified torque.
5. Decide on the neutral position of the rack stroke (L).

Rack stroke neutral position (L) : Refer to [ST-58. "Rack Stroke"](#).

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

CAUTION:

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



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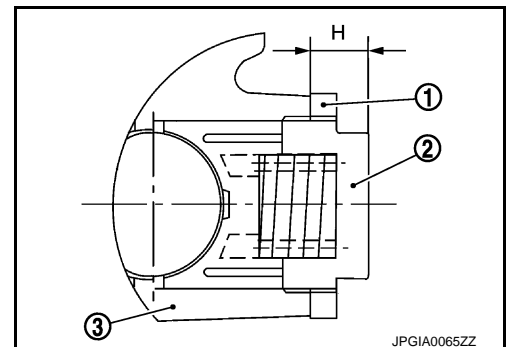
7. Install adjusting screw with the following procedure.

- a. Set rack to the neutral position without fluid in the gear.

- b. Apply recommended sealant into the thread of adjusting screw (2) (2 turns thread), and then screw in the adjusting screw until it reaches height (H) from gear housing assembly (3) measured before disassembling.

Use Genuine Liquid Gasket, Three Bond 1111B or equivalent.

- c. Tighten the adjusting screw lock nut (1) to the specified torque.
8. Move rack assembly 10 strokes throughout the full stroke so that the parts can fit with each other.



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STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

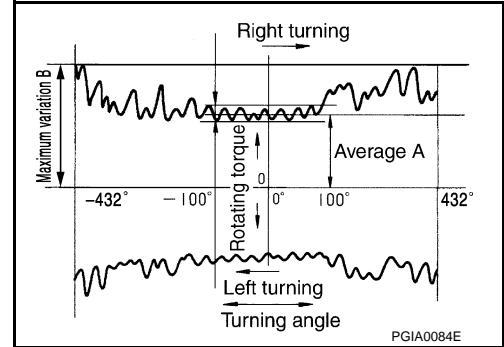
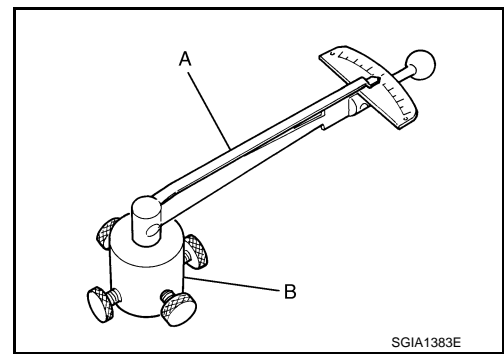
9. Check pinion rotating torque within the range of $\pm 180^\circ$ from neutral position of the rack assembly using special service Tools. Stop the gear at the point of maximum torque.

A: Preload gauge [SST: ST3127S000 (J-25765-A)]
 B: Preload adapter [SST: KV48103400 (—)]

- a. Loosen adjusting screw lock nut, then retighten adjusting screw to 9.8 N·m (1.0 kg·m, 87 in·lb).
- b. Loosen adjusting screw by 27° to 40° .
- c. Prevent adjusting screw from turning, and tighten lock nut to 40 – 58 N·m (4.1 – 5.9 kg·m, 30 – 42 ft·lb).
- d. Measure pinion rotating torque using special service 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.

Pinion rotating torque

Around neutral position (within $\pm 100^\circ$) average "A" : 0.70 – 2.0 N·m (0.08 – 0.20 kg·m, 7 – 17 in·lb)
Maximum variation "B" : 2.30 N·m (0.23 kg·m, 20 in·lb)



10. Check vertical movement with the following procedure.

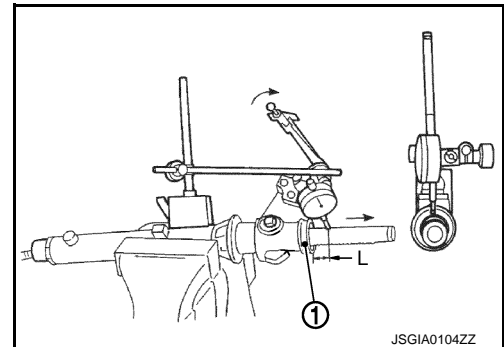
- a. Turn pinion fully to left.
- b. Install dial indicator at 5 mm (0.20 in) (L) from the edge of gear housing assembly (1), and tooth point.
- c. Measure vertical movement of rack assembly when pinion is turned clockwise with torque of 19.6 N·m (2.0 kg·m, 14 ft·lb).

Vertical movement : 0.265 mm (0.0104 in)

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

CAUTION:

If measured value is still outside of specification, replace steering gear assembly.

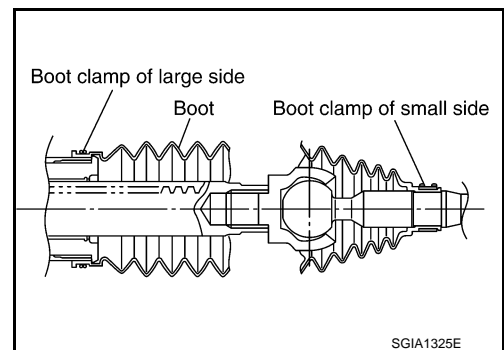


11. Install large end of boot to gear housing assembly.

CAUTION:

Never reuse boot.

12. Install small end of boot to inner socket boot mounting groove.
13. Install boot clamp to boot small end.



STEERING GEAR AND LINKAGE

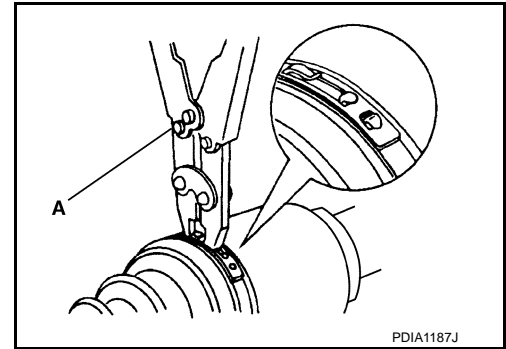
< REMOVAL AND INSTALLATION >

14. Install boot clamp to the large side using the boot band crimping tool (A) [SST: KV40107300 (—)].

CAUTION:

Never reuse boot clamp.

15. Install cylinder tubes to gear housing assembly.

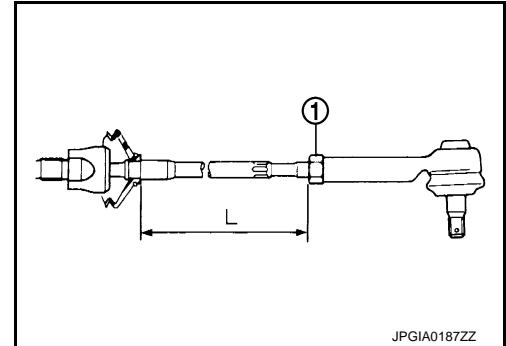


16. Adjust inner socket to standard length (L), and then tighten lock nut (1) to the specified torque. Check length again after tightening lock nut.

Inner socket length (L) : Refer to [ST-58, "Inner Socket Length"](#).

CAUTION:

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



Inspection

INFOID:0000000010257460

INSPECTION AFTER DISASSEMBLY

Boot

- Check boot for cracks or damage, 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), and replace it if a malfunction is detected.

Outer Socket and Inner Socket

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

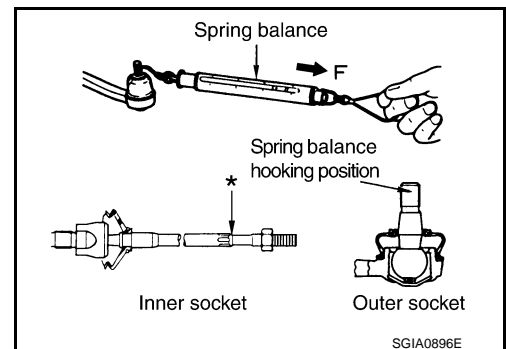
BALL JOINT SWINGING TORQUE

- 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.

Outer socket

(Measuring point: Stud cotter pin mounting hole)

Spring balance measurement : Refer to [ST-58, "Socket Swing Force and Rotating Torque"](#).



STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

Inner socket

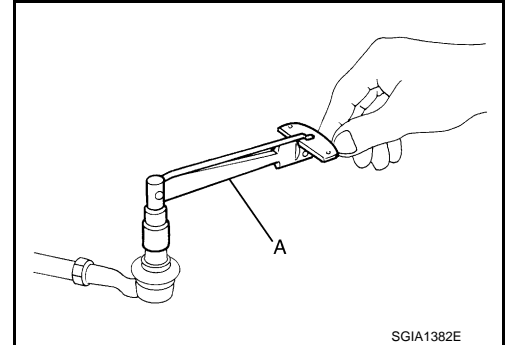
(Measuring point: "*" mark shown in the figure)

Spring balance measurement : Refer to [ST-58, "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.

Outer socket rotating torque : Refer to [ST-58, "Socket Swing Force and Rotating Torque"](#).

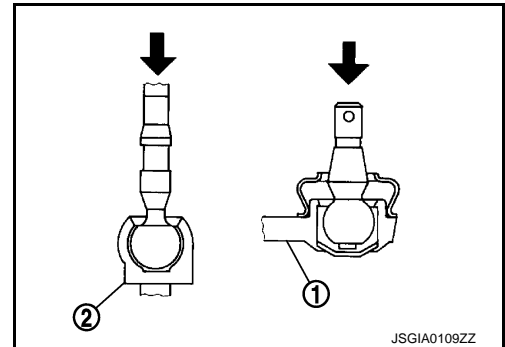


BALL JOINT AXIAL END PLAY

- 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.

Outer socket : Refer to [ST-58, "Socket Axial End Play"](#).

Inner socket : Refer to [ST-58, "Socket Axial End Play"](#).



INSPECTION AFTER INSTALLATION

- After installation, bleed air from the steering hydraulic system. Refer to [ST-30, "Inspection"](#).
- 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-32, "Inspection"](#).
- Check the fluid level, fluid leakage, and air bleeding hydraulic system. Refer to [ST-30, "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-62, "Work Procedure"](#).

POWER STEERING OIL PUMP

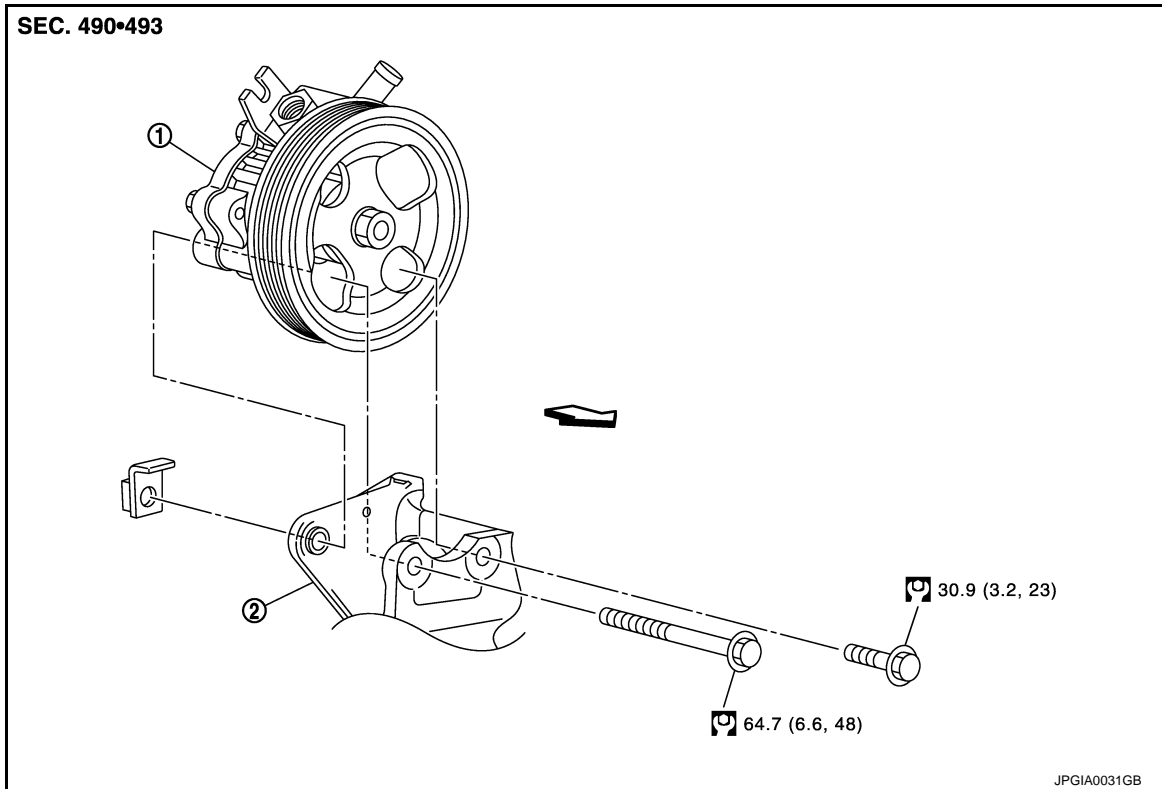
< REMOVAL AND INSTALLATION >

POWER STEERING OIL PUMP

Exploded View

INFOID:000000010257461

REMOVAL



1. Power steering oil pump

2. Bracket

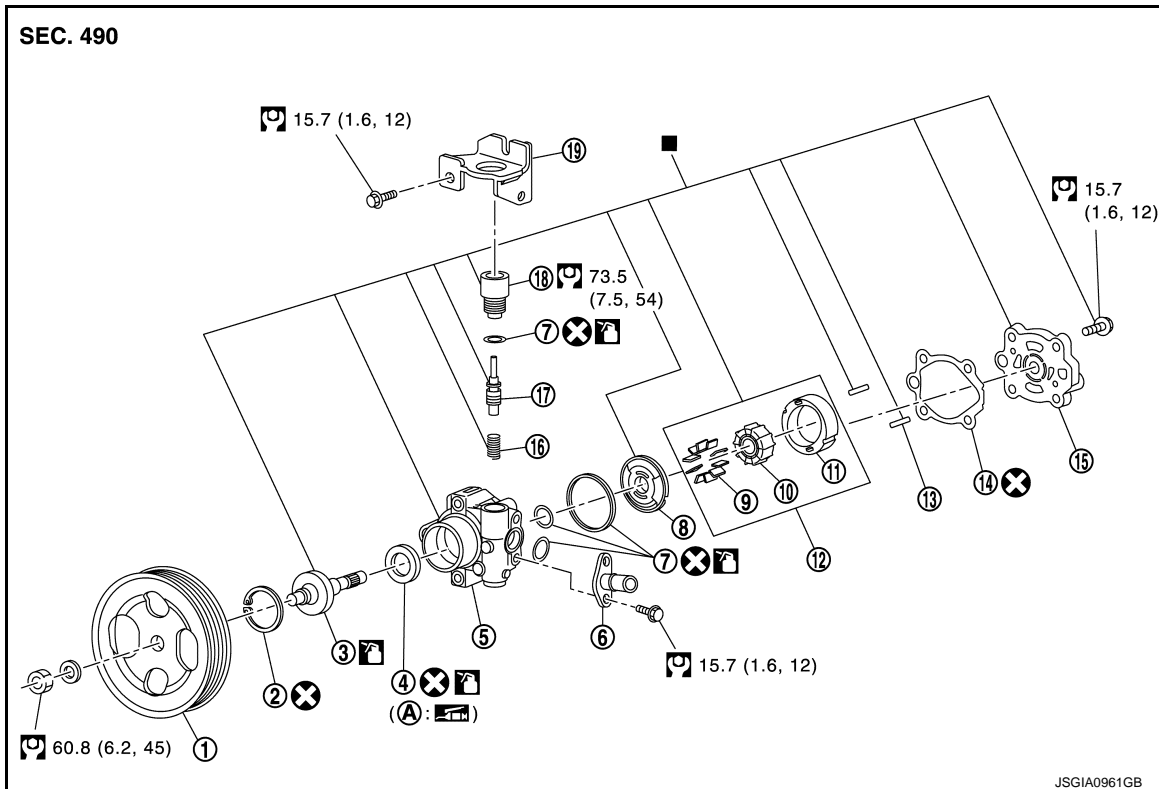
←: Vehicle front

⊕: N-m (kg-m, ft-lb)

DISASSEMBLY

POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >



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

⊗: Always replace after every disassembly.

⊞: N·m (kg-m, ft-lb)

■: Replace the parts as a set.

A. Oil seal lip

🔧: Apply power steering fluid.

🛠️: Apply multi-purpose grease.

Removal and Installation

INFOID:0000000010257462

REMOVAL

1. Drain power steering fluid from reservoir tank.
 - CAUTION:**
 - Never reuse drained power steering fluid.
 - Always use the specified fluid. Refer to [MA-15, "FOR NORTH AMERICA : Fluids and Lubricants" \(for NORTH AMERICA\)](#), [MA-16, "FOR MEXICO : Fluids and Lubricants" \(for MEXICO\)](#).
2. Remove the reservoir tank. Refer to [CO-14, "Removal and Installation"](#).
3. Remove the battery and battery tray from vehicle. Refer to [PG-141, "Removal and Installation"](#).
4. Loosen drive belt. Refer to [EM-20, "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).

POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

8. Remove oil pump mounting bolts, and then remove oil pump.

INSTALLATION

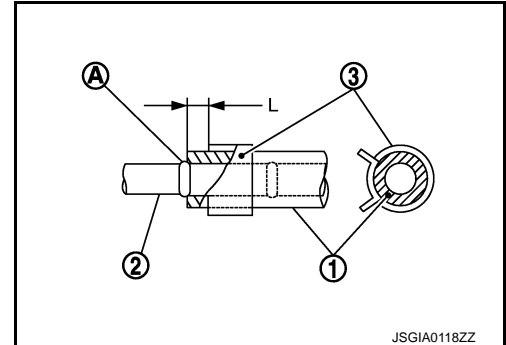
Note the following, and install in the reverse order of removal.

- 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).

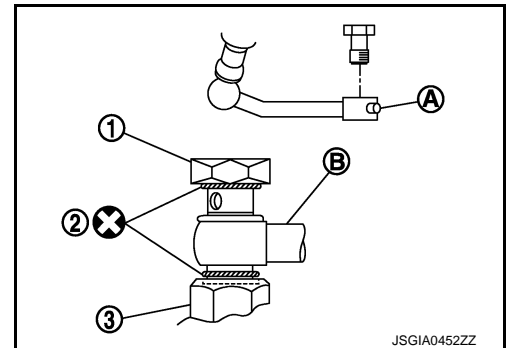
L : 3 – 8 mm (0.12 – 0.31 in)



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

CAUTION:

- Never reuse copper washer.
 - Apply power steering fluid to around copper washers, 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-54, "Exploded View"](#).
 - Securely insert harness connector to pressure sensor.
- About the installation of drive belt. Refer to [EM-20, "Tension Adjustment"](#).
- Check fluid level, fluid leakage and air bleeding hydraulic system after the installation. Refer to [ST-30, "Inspection"](#).



Disassembly and Assembly

INFOID:000000010257463

DISASSEMBLY

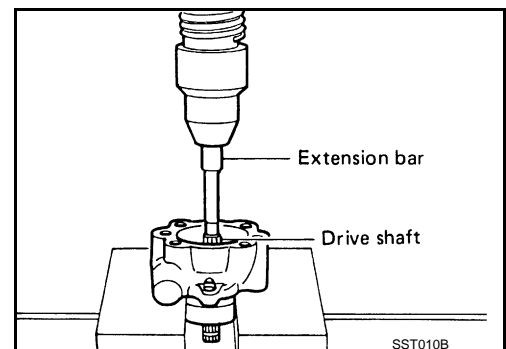
CAUTION:

- Fix oil pump with a vise if necessary.
 - Use copper plates when fixing with a vise.
1. Perform inspection before disassembly. Refer to [ST-52, "Inspection"](#).
 2. Remove rear cover mounting bolts, and then remove rear cover from body assembly.
 3. Remove gasket from body assembly.
 4. Remove dowel pin, cartridge and side plate from body assembly.
 5. Remove pulley mounting nut and washer, then remove pulley from drive shaft.
 6. Remove snap ring from drive shaft and press out it.

CAUTION:

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

7. Remove oil seal from body assembly using a suitable tool.
8. Remove O-ring from body assembly.
9. Remove mounting bolts of suction pipe, and then remove suction pipe and bracket from body assembly.
10. Remove connector bolt, and then remove O-ring, flow control valve and spring from body assembly.
11. Perform inspection after disassembly. Refer to [ST-52, "Inspection"](#).



ASSEMBLY

CAUTION:

POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

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

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.

CAUTION:

Never reuse oil seal.

2. Apply recommended fluid to drive shaft, and press drive shaft into body assembly, then install snap ring.

CAUTION:

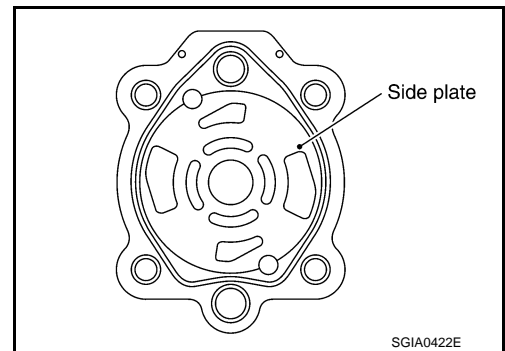
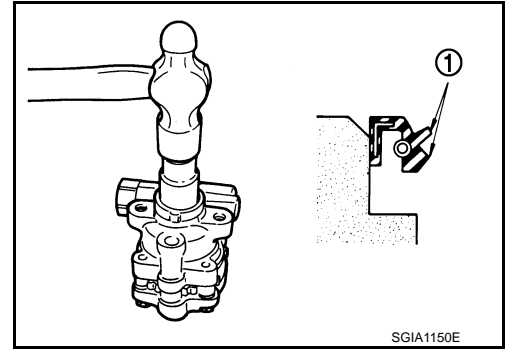
Never reuse snap ring.

3. Apply recommended fluid to O-ring, and then install O-ring into body assembly.

CAUTION:

Never reuse O-ring.

4. Install side plate to body assembly.

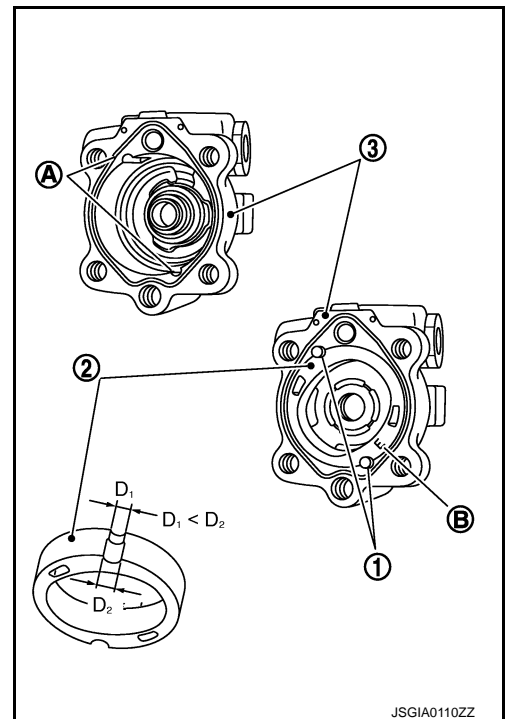


5. Install dowel pin (1) into dowel pin hole (A), and then install cam ring (2) pointing it's D1 side toward the body assembly (3) side as shown in the figure.

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

CAUTION:

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



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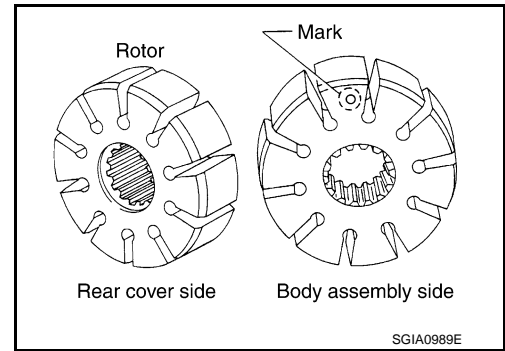
POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

6. Install rotor to body assembly.

CAUTION:

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



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

8. Check if drive shaft assembly turns smoothly.

9. Install gasket to body assembly.

CAUTION:

Never reuse gasket.

10. Install rear cover to body assembly, and then tighten mounting bolts to the specified torque.

11. Install pulley and washer to drive shaft, and then tighten lock nut at the specified torque.

12. Apply recommended fluid to O-ring. Install flow control valve spring, flow control valve and O-ring to body assembly, and then tighten connector bolt to the specified torque.

CAUTION:

Never reuse O-ring.

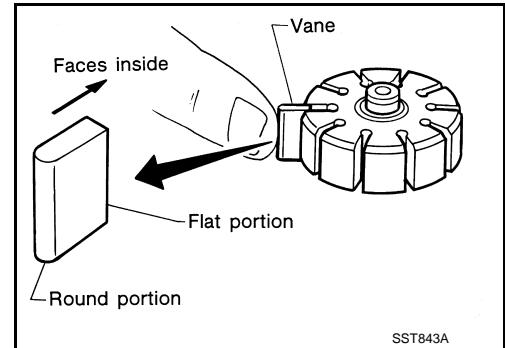
13. Apply recommended fluid to O-ring, and then install O-ring to body assembly.

CAUTION:

Never reuse O-ring.

14. Install suction pipe and bracket to body assembly.

15. Perform inspection after assembly. Refer to [ST-52. "Inspection"](#).



Inspection

INFOID:000000010257464

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.

INSPECTION AFTER DISASSEMBLY

Body Assembly and Rear Cover Inspection

Check body assembly and rear cover for internal damage. Replace oil pump assembly if necessary.

Cartridge Assembly Inspection

Check cam ring, rotor and vane for damage. Replace oil pump assembly if necessary.

Side Plate Inspection

Check side plate for damage. Replace oil pump assembly if necessary.

Flow Control Valve Inspection

Check flow control valve and spring for damage. Replace oil pump assembly if necessary.

INSPECTION AFTER ASSEMBLY

Relief Oil Pressure

CAUTION:

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

POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

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-30, "Inspection"](#).

2. Start engine. Run 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 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.

Relief oil pressure : Refer to [ST-58, "Relief Oil Pressure"](#).

CAUTION:

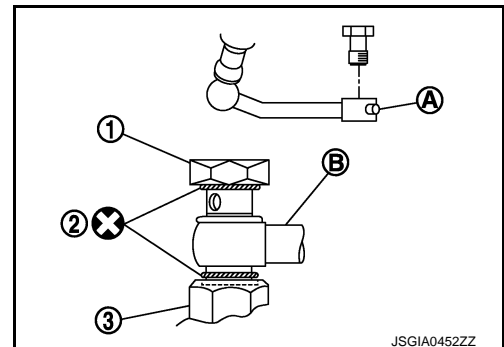
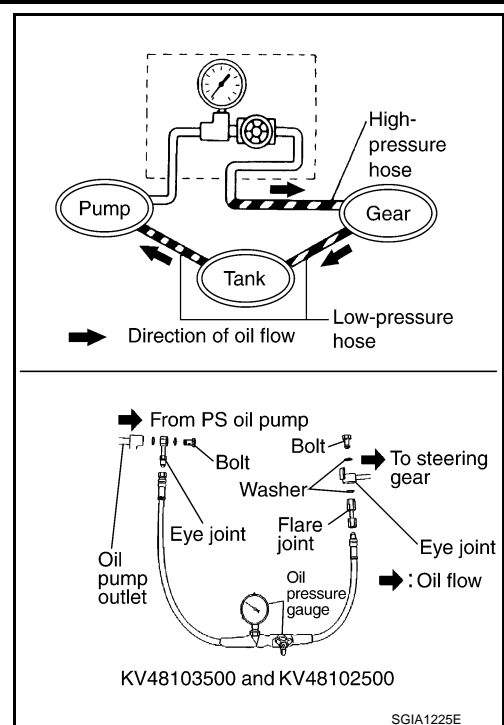
Never keep valve closed for 10 seconds or longer.

4. Open the valve slowly after measuring. Repair oil pump if the relief oil pressure is outside the standard. Refer to [ST-50, "Disassembly and Assembly"](#).
5. Disconnect the oil pressure gauge from hydraulic circuit.
6. When installing eye bolt (1) and copper washer (2) to oil pump (3), refer to the figure.

CAUTION:

- Never reuse copper washers.
- 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-54, "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-30, "Inspection"](#).



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HYDRAULIC LINE

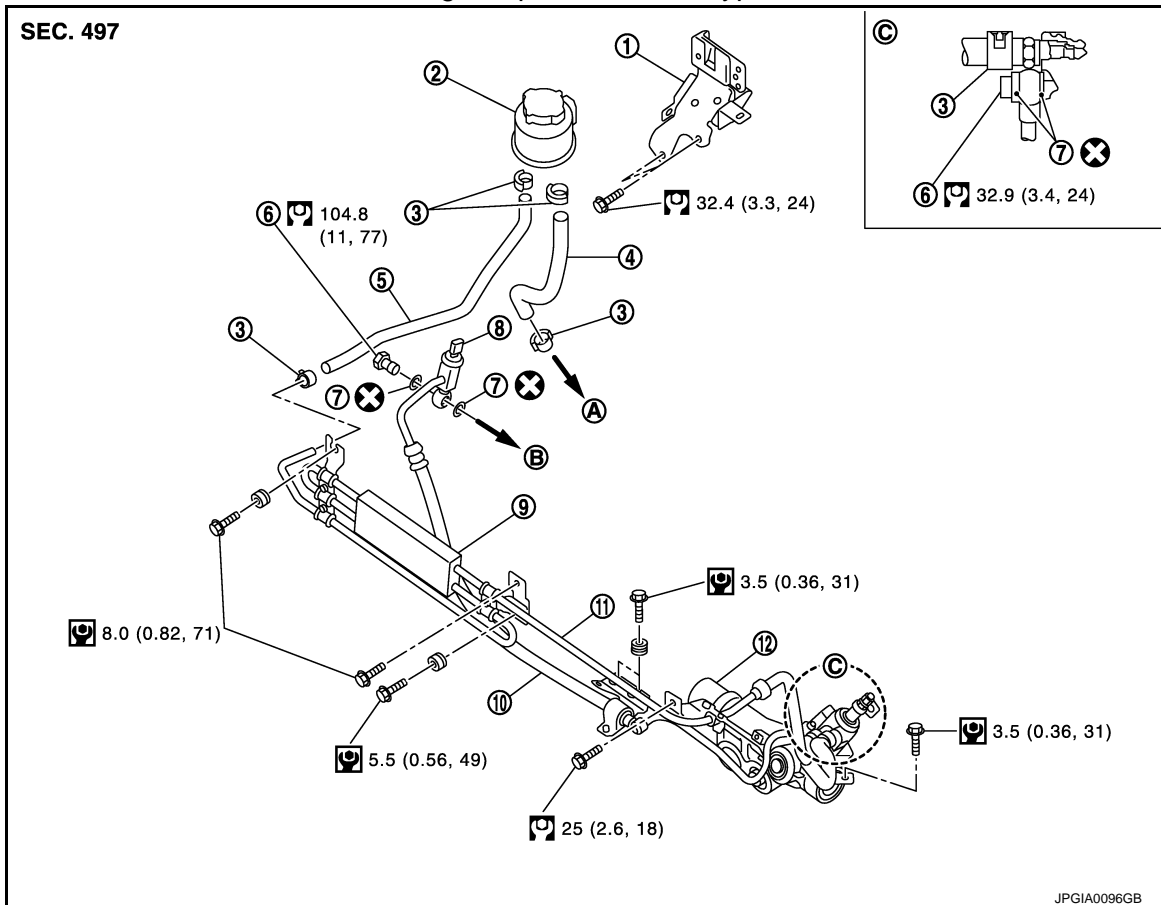
< REMOVAL AND INSTALLATION >

HYDRAULIC LINE

Exploded View

INFOID:000000010257465

Engine speed sensitive type



- | | | |
|---------------------------|-------------------------|----------------------------|
| 1. Reservoir tank bracket | 2. Reservoir tank | 3. Clamp |
| 4. Suction hose | 5. Return hose | 6. Eye bolt |
| 7. Copper washer | 8. Pressure sensor | 9. Oil cooler |
| 10. High pressure piping | 11. Low pressure piping | 12. Steering gear assembly |

A. To power steering oil pump suction hose.

B. To power steering oil pump.

⊗: Always replace after every disassembly.

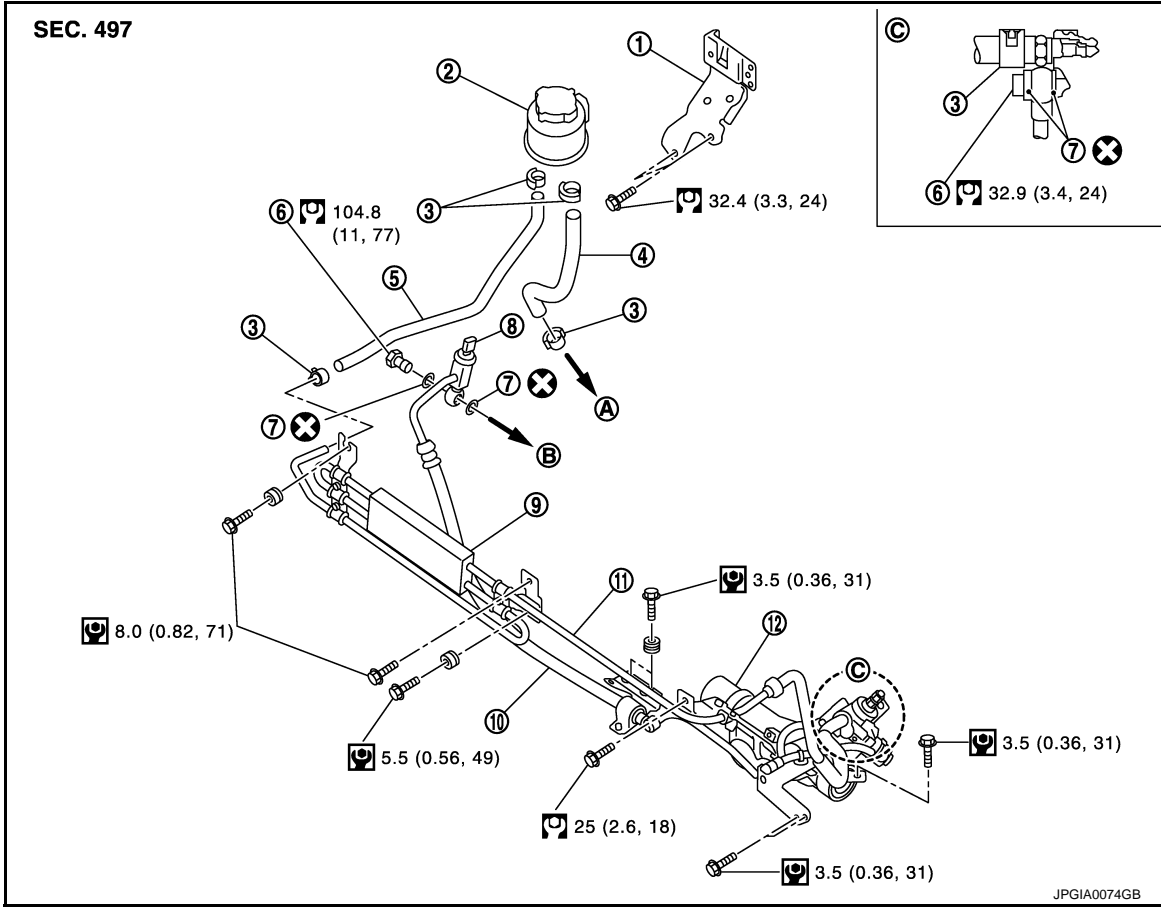
⊙: N-m (kg-m, ft-lb)

⊙: N-m (kg-m, in-lb)

HYDRAULIC LINE

< REMOVAL AND INSTALLATION >

Vehicle speed sensitive type



- | | | |
|---------------------------|-------------------------|----------------------------|
| 1. Reservoir tank bracket | 2. Reservoir tank | 3. Clamp |
| 4. Suction hose | 5. Return hose | 6. Eye bolt |
| 7. Copper washer | 8. Pressure sensor | 9. Oil cooler |
| 10. High pressure piping | 11. Low pressure piping | 12. Steering gear assembly |
- A. To power steering oil pump suction hose.
 B. To power steering oil pump.
- ⊗: Always replace after every disassembly.
- ⊙: N·m (kg-m, ft-lb)
 ⊙: N·m (kg-m, in-lb)

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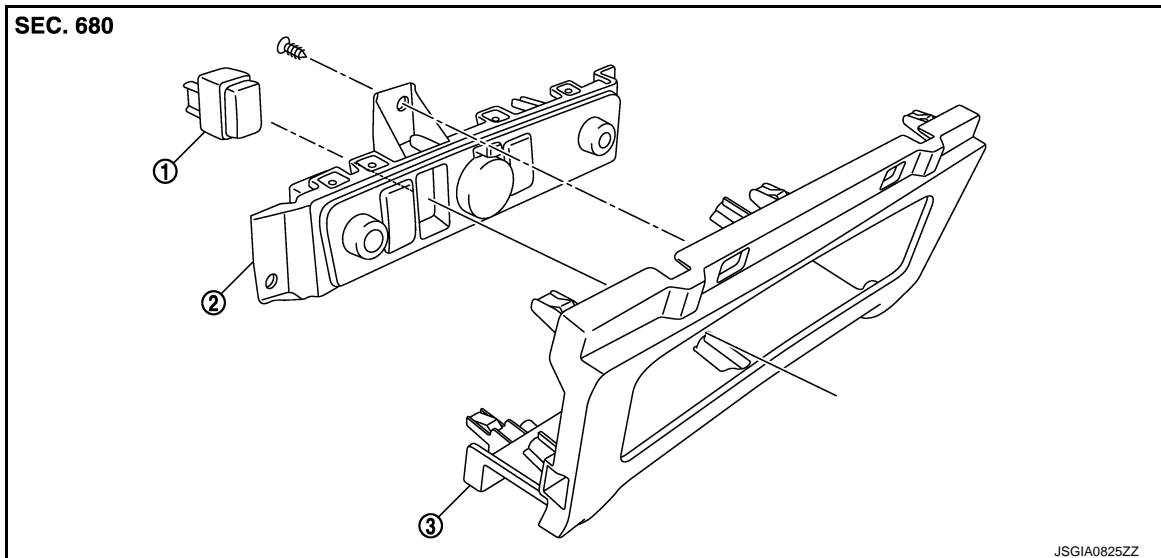
HEATED STEERING WHEEL SWITCH

< REMOVAL AND INSTALLATION >

HEATED STEERING WHEEL SWITCH

Exploded View

INFOID:000000010257466



1. Heated steering wheel switch

2. Cluster lid C lower (inside)

3. Cluster lid C lower (outside)

Removal and Installation

INFOID:000000010257467

REMOVAL

1. Remove Instrument center finisher LH and Instrument center finisher RH. Refer to [IP-14, "Removal and Installation"](#).
2. Remove cluster lid C. Refer to [IP-14, "Removal and Installation"](#).
3. Remove cluster lid C lower. Refer to [IP-14, "Removal and Installation"](#).
4. Remove cluster lid C lower (inside) from cluster lid C lower (outside).
5. Remove heated steering wheel switch from cluster lid C lower (inside).

INSTALLATION

Install in the reverse order of removal.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

INFOID:0000000010257468

| | | |
|--------------------------|------------------------------|------------------|
| Steering gear model | Engine speed sensitive type | PR32AD |
| | Vehicle speed sensitive type | PR32AF |
| Fluid capacity (Approx.) | ℓ (US qt, Imp qt) | 1.0 (1-1/8, 7/8) |

Steering Wheel Axial End Play and Play

INFOID:0000000010257469

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:0000000010257470

Unit: N·m (kg·m, in·lb)

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

Steering Angle

INFOID:0000000010257471

Unit: Degree minute (Decimal degree)

| Item | Standard | | |
|-------------|-----------|-----------------|-----------------|
| | Left side | Right side | |
| Inner wheel | Minimum | 33°45' (33.75°) | 33°30' (33.50°) |
| | Nominal | 36°45' (36.75°) | 36°30' (37.50°) |
| | Maximum | 37°45' (37.75°) | 37°30' (37.50°) |
| Outer wheel | Nominal | 32°20' (32.33°) | 32°40' (32.67°) |

Steering Column Length

INFOID:0000000010257472

Unit: mm (in)

| Item | Standard |
|---------------|-------------------------------|
| Column length | 529.8 – 533.8 (20.86 – 21.02) |

Steering Column Mounting Dimensions

INFOID:0000000010257473

Unit: mm (in)

| Item | Standard |
|--------------------|-----------------------------|
| Mounting dimension | 34.1 – 36.1 (1.343 – 1.421) |

Steering Column Operating Range

INFOID:0000000010257474

| Item | Standard |
|----------------------------|-------------------------------|
| Tilt operating range | 73.8 mm (2.91 in) |
| 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)

Steering Shaft Sliding Range

INFOID:0000000010257475

Unit: mm (in)

| Item | Standard |
|---|---------------------|
| Sliding range | 47 (1.85) |
| Steering shaft length (extended position) | 393 (15.47) or less |
| Steering shaft runout | 1.5 (0.059) or less |

Rack Sliding Force

INFOID:0000000010257476

Unit: N (kg, lb)

| Item | Standard |
|--------------------|--|
| Rack sliding force | 249.6 – 308.4 (25.5 – 31.4, 56.2 – 69.3) |

Rack Stroke

INFOID:0000000010257477

Unit: mm (in)

| Item | Standard |
|------------------------------|--------------|
| Rack stroke neutral position | 83.5 (3.287) |

Socket Swing Force and Rotating Torque

INFOID:0000000010257478

SWING FORCE

Unit: N (kg, lb)

| Item | Spring balance |
|--------------|--|
| Outer socket | 10.0 – 36.7 (1.02 – 3.74, 2.25 – 8.25) |
| Inner socket | 19.4 – 32.3 (1.98 – 3.29, 4.37 – 7.26) |

ROTATING TORQUE

Unit: N·m (kg·m, in·lb)

| Item | Standard |
|--------------|----------------------------------|
| Outer socket | 0.3 – 2.9 (0.03 – 0.3, 2.7 – 26) |

Socket Axial End Play

INFOID:0000000010257479

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:0000000010257480

Unit: mm (in)

| Item | Standard |
|---------------------|--------------|
| Inner socket length | 110.8 (4.36) |

Relief Oil Pressure

INFOID:0000000010257481

Unit: kPa (bar, kg/cm², psi)

| Item | Standard |
|---------------------|--|
| Relief oil pressure | 9,500 – 10,300 (95 – 103, 96.9 – 105.0, 1,378 – 1,493) |