

SECTION **ST**
STEERING SYSTEM

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PRECAUTIONS

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PRECAUTION

PRECAUTIONS

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

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The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

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

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

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

Service Notice or Precautions for Steering System

INFOID:000000009266805

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

PREPARATION

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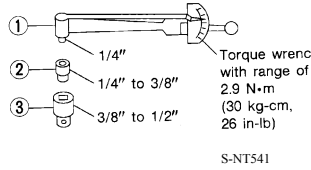
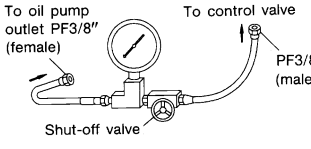
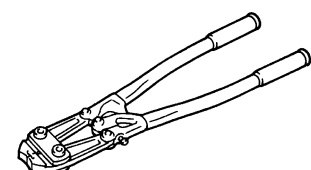
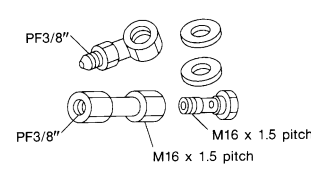
PREPARATION

PREPARATION

Special Service Tool

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

Tool number (Kent-Moore No.) Tool name	Description
ST3127S000 (J-25765-A) Preload gauge 1. GG9103000 (J-25765-A) Torque wrench 2. HT62940000 (-) Socket adapter 3. HT62900000 (-) Socket adapter	Inspecting of rotating torque for ball joint and steering column  <p style="text-align: center;">S-NT541</p>
KV48103500 (J-26357) Pressure gauge	Measuring oil pump relief pressure  <p style="text-align: center;">S-NT547</p>
KV40107300 (-) Boot clamp crimping tool	Installing boot clamps  <p style="text-align: center;">ZZA1229D</p>
KV48102500 (J-33914) Pressure gauge adapter	Measuring oil pump relief pressure  <p style="text-align: center;">S-NT542</p>

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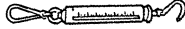
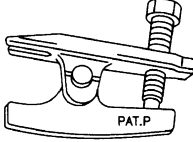
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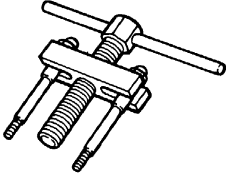

PREPARATION

< PREPARATION >

Tool number (Kent-Moore No.) Tool name	Description
— (J-44372) Spring gauge  LST024	Measuring steering wheel turning force, rack sliding force and ball joint swinging force
HT72520000 (J-25730-A) Ball joint remover  NT146	Removing ball joint

Commercial Service Tool

INFOID:000000009266807

Tool name	Description
Steering wheel puller  ZZA0819D	Removing steering wheel
Power tool  PIIB1407E	Loosening nuts, screws and bolts

STEERING WHEEL

< BASIC INSPECTION >

BASIC INSPECTION

STEERING WHEEL

Inspection

INFOID:000000009266808

CHECKING CONDITION OF INSTALLATION

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

Steering wheel axial end play and play : Refer to [ST-19, "Steering Wheel Axial End Play and Play"](#).

- Check steering gear assembly bolts and nuts for looseness. Refer to [ST-14, "Removal and Installation"](#).

CHECKING STEERING WHEEL PLAY

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

Steering wheel axial end play and play : Refer to [ST-19, "Steering Wheel Axial End Play and Play"](#).

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

NEUTRAL POSITION STEERING WHEEL

1. Check that steering gear assembly, steering column assembly and steering wheel are installed in the correct position.
2. Check wheel alignment within specification. Refer to [FSU-6, "Inspection and Adjustment"](#).
3. Set vehicle to the straight-ahead position and confirm steering wheel is in the neutral position.
 - Loosen outer socket lock nut and turn inner socket to left and right equally to make fine adjustments if steering wheel is not in the neutral position.

CAUTION:

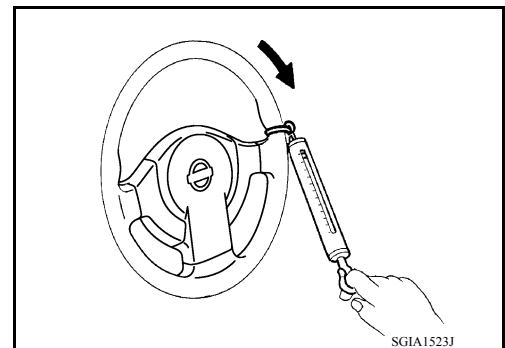
If the adjustment is performed by using the inner socket, check wheel alignment after the adjustment. Refer to [FSU-6, "Inspection and Adjustment"](#).

STEERING WHEEL TURNING FORCE

1. Park vehicle on a level and dry surface, set parking brake.
2. Tires need to be inflated normal pressure. Refer to [WT-45, "Tire Air Pressure"](#).
3. Start engine.
4. Check steering wheel turning force when steering wheel has been turned 360° from neutral position using Tool as shown.

Tool number : — (J-44372)

Steering wheel turning force : Refer to [ST-19, "Steering Wheel Turning Force"](#).



FRONT WHEEL TURNING ANGLE

1. Perform toe-in inspection. Refer to [FSU-6, "Inspection and Adjustment"](#).

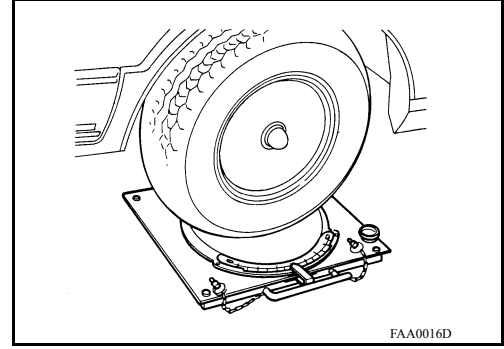
CAUTION:

STEERING WHEEL

< BASIC INSPECTION >

Perform front wheel turning angle inspection, after toe-in inspection.

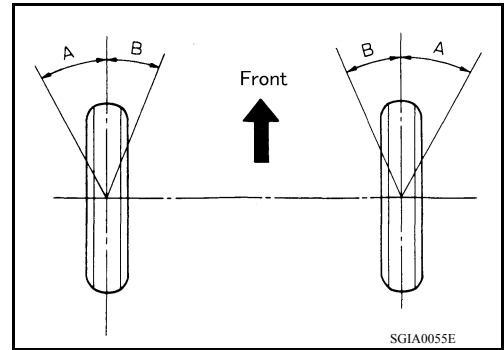
2. Place front wheels on turning radius gauges and rear wheels on stands, so that vehicle can be level.
3. Check the maximum inner and outer wheel turning angles for LH and RH road wheels.



- 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-19, "Steering Angle"](#).

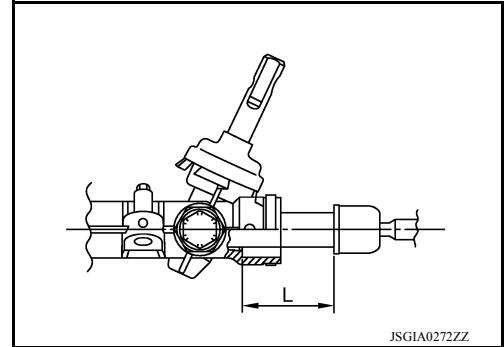
Outer wheel (Angle: B) : Refer to [ST-19, "Steering Angle"](#).



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

Rack stroke (L) : Refer to [ST-20, "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.



NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

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

Symptom		Possible cause and SUSPECTED PARTS														
		Outer/inner socket ball joint swinging torque	Outer/inner socket ball joint rotating torque	Outer/inner socket ball joint end play	Steering wheel play	Improper steering wheel	Improper installation or looseness of tilt lock lever	Mounting looseness	Steering column deformation or damage	Improper installation or looseness of steering column	Steering linkage looseness	AXLE and SUSPENSION	TIRE	ROAD WHEEL	DRIVE SHAFT	BRAKE
Noise	Noise	x	x	x	x			x	x	x		x	x	x	x	x
	Shake					x	x	x				x	x	x	x	x
	Vibration					x	x	x	x	x		x	x		x	
	Shimmy					x		x			x	x	x			x
	Shudder						x	x			x	x	x	x		x

x: Applicable

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STEERING WHEEL

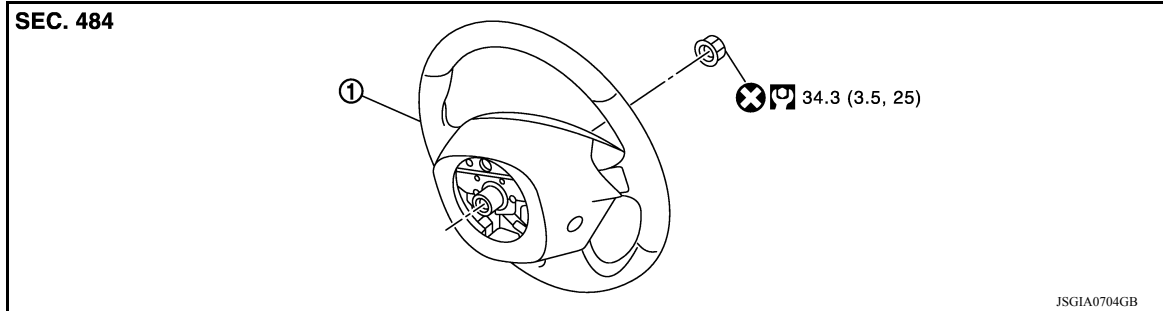
< REMOVAL AND INSTALLATION >

REMOVAL AND INSTALLATION

STEERING WHEEL

Exploded View

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1. Steering wheel

Removal and Installation

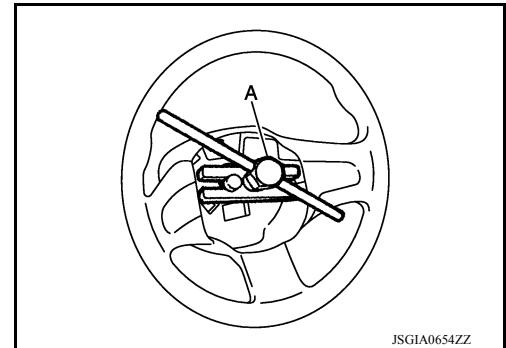
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REMOVAL

NOTE:

When reconnecting spiral cable, secure cable with a tape so that case and rotating part stay 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 using a suitable tool (A).



INSTALLATION

Installation is 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:

- Do not twist spiral cable excessively after it becomes tight. (Twisting may cause the cable to be torn off.)
- Do not reuse steering wheel lock nut.

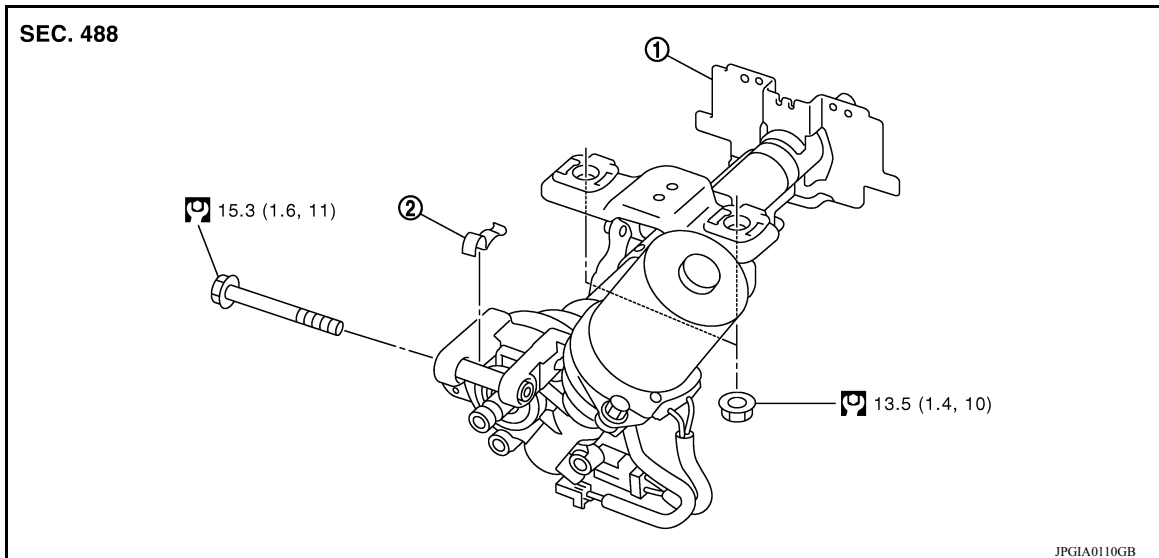
STEERING COLUMN

< REMOVAL AND INSTALLATION >

STEERING COLUMN

Exploded View

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1. Steering column assembly
2. Clamp

Removal and Installation

INFOID:000000009266813

REMOVAL

CAUTION:

- Keep steering column assembly away from magnetic sources.
- Do not disassemble steering column assembly.
- While removing the steering column assembly, do not move the steering gear.
- When removing the steering column assembly, be careful not to allow the intermediate shaft to turn.

1. Set vehicle to the straight-ahead position.
2. Place the steering column tilt to the lowest selection.
3. Remove instrument lower panel LH. Refer to [IP-20, "Removal and Installation"](#).
4. Remove driver air bag module. Refer to [SR-11, "Removal and Installation"](#).
5. Remove steering wheel. Refer to [ST-8, "Exploded View"](#).
6. Remove steering column covers. Refer to [IP-15, "Removal and Installation"](#).
7. Remove spiral cable. Refer to [SR-14, "Removal and Installation"](#).
8. Remove combination switch. Refer to [EXL-107, "Exploded View"](#).
9. Remove the cluster lid A. Refer to [IP-19, "Removal and Installation"](#).
10. Disconnect the harness connectors from the steering switch.
11. Remove the key cylinder only if the steering column is being replaced. Refer to [TM-435, "Removal and Installation"](#).
12. Place the steering column tilt to the middle selection.

CAUTION:

Do not change the position of the tilt mechanism until the steering column is reinstalled.

13. Loosen the steering shaft lower joint bolt.
14. Remove the intermediate shaft upper bolt and separate intermediate shaft from steering column assembly. Refer to [ST-12, "Removal and Installation"](#).

CAUTION:

- Place a matching mark on both intermediate shaft and steering column assembly before removing intermediate shaft.

STEERING COLUMN

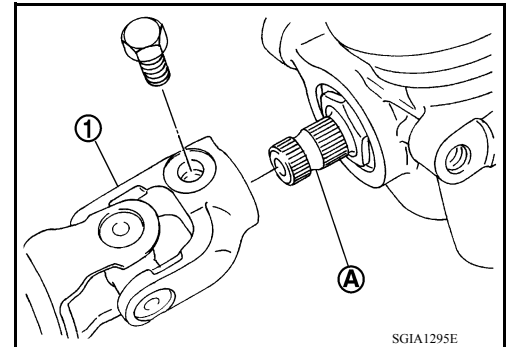
< REMOVAL AND INSTALLATION >

- When removing intermediate shaft, do not insert any tool into the yoke groove to pull out the intermediate shaft or damage could occur. Replace intermediate shaft with a new one if damaged.
15. Disconnect the harness connectors from EPS control unit.
 16. Remove steering column assembly.
 17. Remove EPS control unit from steering column assembly. Refer to [STC-40, "Removal and Installation"](#).
 18. Remove clamp from steering column assembly.
 19. Perform inspection after removal. Refer to [ST-10, "Inspection"](#).

INSTALLATION

CAUTION:

- Do not impact on the axis when removing steering column assembly.
 - When installing the steering column cover, check that the vehicle harness is not stuck in the cover.
- Installation is in the reverse order of removal.
- For intermediate shaft bolt direction, refer to [ST-12, "Exploded View"](#).
 - When connecting intermediate shaft upper side (1) and column shaft, make sure the bolt is securely seated in groove (A) of column shaft before final tightening.
 - After installing steering column assembly, perform self-diagnosis with CONSULT to ensure correct operation. Refer to [STC-9, "CONSULT Function"](#).
 - Perform inspection after installation. Refer to [ST-10, "Inspection"](#).



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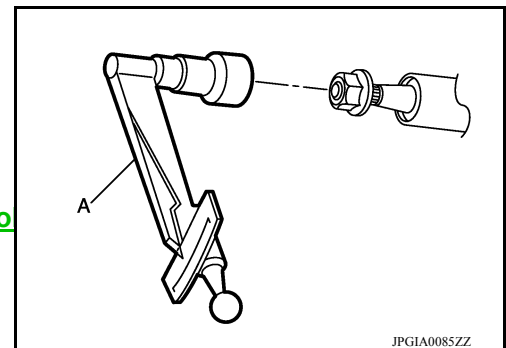
Inspection

INSPECTION AFTER REMOVAL

- Check each part of steering column assembly for damage or other malfunctions. Replace if there are any abnormal conditions.
- Measure steering column rotating torque using Tool (A). Replace steering column assembly if the rotating torque is outside the standard.

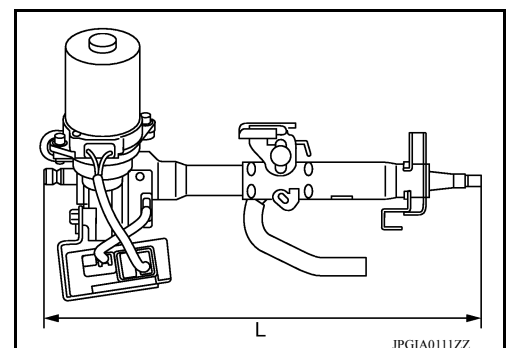
Tool number : — (J-25765-A)

Rotating torque : Refer to [ST-19, "Steering Column Operating Range"](#).



- Measure the steering column length (L) as shown, if vehicle has been involved in a minor collision. Replace steering column assembly (with motor, reduction gear, sensor) if (L) is outside the standard.

Steering column length (L) : Refer to [ST-19, "Steering Column Operating Range"](#).



INSPECTION AFTER INSTALLATION

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

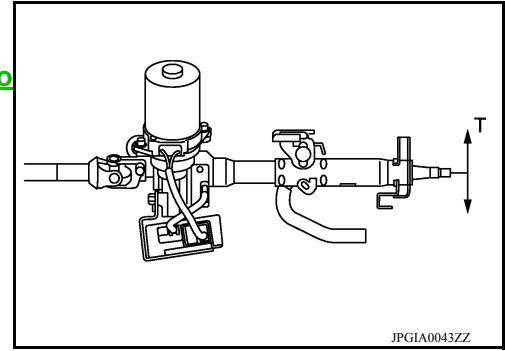
STEERING COLUMN

< REMOVAL AND INSTALLATION >

- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle. Refer to [ST-5, "Inspection"](#).
- Check tilt mechanism operating range (T) as shown.

Tilt operating range (T)

: Refer to [ST-19, "Steering Column Operating Range"](#).



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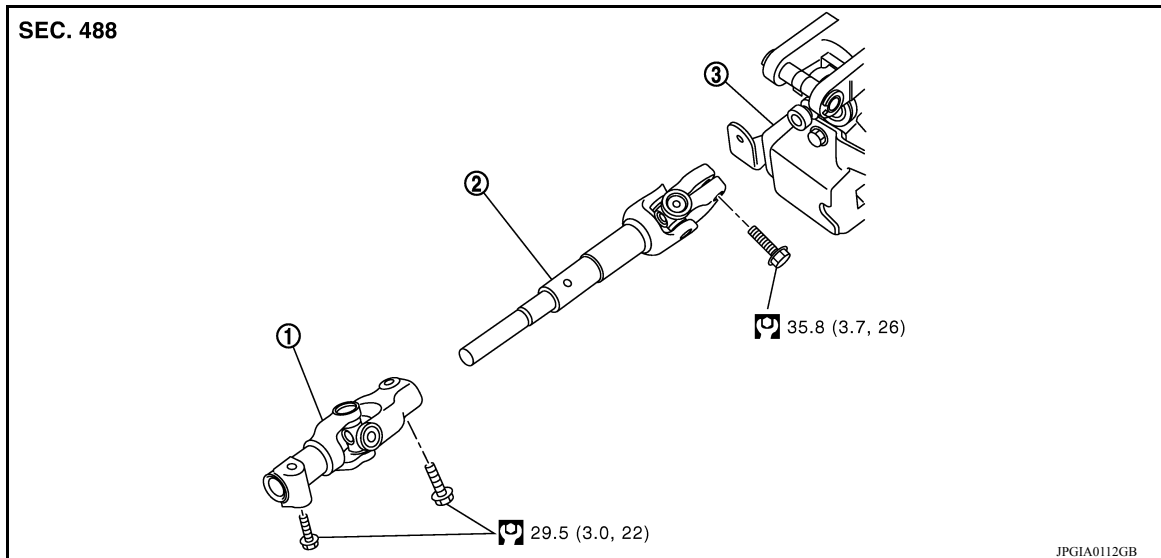
STEERING SHAFT

< REMOVAL AND INSTALLATION >

STEERING SHAFT

Exploded View

INFOID:000000009266815



1. Lower joint

2. Intermediate shaft

3. Steering column assembly

Removal and Installation

INFOID:000000009266816

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.

1. Set vehicle to the straight-ahead position.
2. Place the steering column tilt to the middle selection.
3. Remove instrument lower panel LH. Refer to [IP-20. "Removal and Installation"](#).
4. Loosen lower joint upper bolt.
5. Remove lower joint lower bolt and separate lower joint from steering gear assembly.

CAUTION:

- Place a matching mark on both lower joint and steering gear assembly before removing lower joint.
- When removing lower joint, do not insert any tool into the yoke groove to pull out the lower joint. Replace the lower joint with a new one if damaged.

6. Remove lower joint from intermediate shaft.
7. Remove intermediate shaft bolt (steering column side), and remove intermediate shaft from steering column assembly.

CAUTION:

- Place a matching mark on both intermediate shaft and steering column assembly before removing intermediate shaft.
- When removing intermediate shaft, do not insert any tool into the yoke groove to pull out the intermediate shaft or damage could occur. Replace intermediate shaft with a new one if damaged.

INSTALLATION

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.

Installation is in the reverse order of removal.

- Before installation, check that the tilt position is at the middle level.
- For intermediate shaft bolt, and lower joint bolt direction, refer to [ST-12. "Exploded View"](#).

STEERING SHAFT

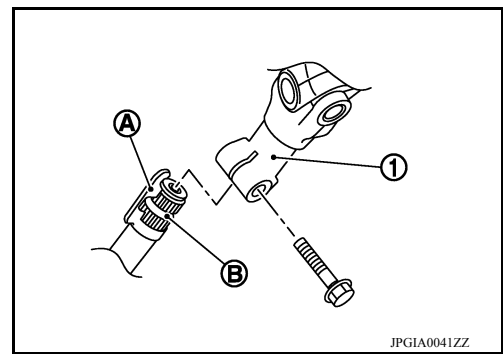
< REMOVAL AND INSTALLATION >

- To install align the steering gear guide protrusion (A) with the groove of lower joint (1), make sure the bolt is securely seated in groove (B) of steering gear before final tightening.

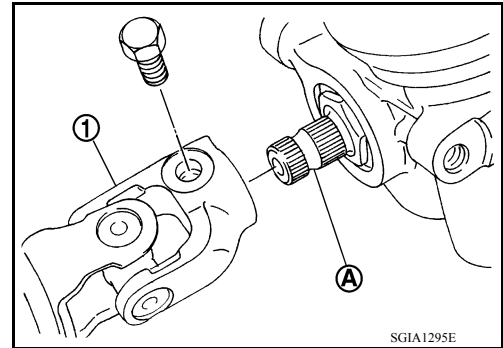
CAUTION:

If a guide protrusion is not included, align with the matching mark placed at the removal step.

- When tightening lower joint bolt (steering gear assembly side), temporarily tighten it and make sure there is no sticking or galling before final tightening.



- When connecting intermediate shaft upper side (1) and column shaft, make sure the bolt is securely seated in groove (A) of column shaft before final tightening.
- Perform inspection after installation. Refer to [ST-13. "Inspection"](#).



Inspection

INFOID:000000009266817

INSPECTION AFTER REMOVAL

- Check each part of lower joint for damage or other malfunctions. Replace if there are any abnormal conditions.
- Check each part of intermediate shaft for damage or other malfunctions. Replace if there are any abnormal conditions.

INSPECTION AFTER INSTALLATION

- Check each part of lower joint for damage or other malfunctions. Replace if there are any abnormal conditions.
- Check each part of intermediate shaft for damage or other malfunctions. Replace if there are any abnormal conditions.
- Rotate steering wheel to check for decentered condition, binding, noise, or excessive steering effort.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle.
 - Steering wheel play: Refer to [ST-5. "Inspection"](#).
 - Neutral position steering wheel, steering wheel turning force, and front wheel turning angle: Refer to [ST-5. "Inspection"](#).

STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

10. Separate cowl seal from vehicle.
11. Lower the suitable jack to the position where the steering gear assembly can be removed.

CAUTION:

Secure front suspension member to a jack.

12. Remove guide from pinion assembly.
13. Remove cowl seal from steering gear assembly.

INSTALLATION

Installation is 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. Always secure the steering wheel using string to avoid turning.**
- **The guide protrusion is not required to be reinstalled.**
- Before installation, check that the steering column tilt position is at the middle level.
- Clean mating surface on the body side of cowl seal when installing steering gear assembly.
- 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-6, "Inspection and Adjustment"](#).
- Rotate steering wheel to check that the spiral cable is centered, binding, noise or excessive steering effort.
- Do not reuse steering outer socket nut and cowl seal.
- Perform inspection after installation. Refer to [ST-15, "Inspection"](#).

Inspection

INFOID:000000009266820

ST

INSPECTION AFTER INSTALLATION

- Check if steering wheel turns smoothly when it is turned several times throughout the full steering range.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning force, and front wheel turning angle.
- Steering wheel play: Refer to [ST-5, "Inspection"](#).
- Neutral position steering wheel, steering wheel turning force and front wheel turning angle: Refer to [ST-5, "Inspection"](#).

STEERING GEAR AND LINKAGE

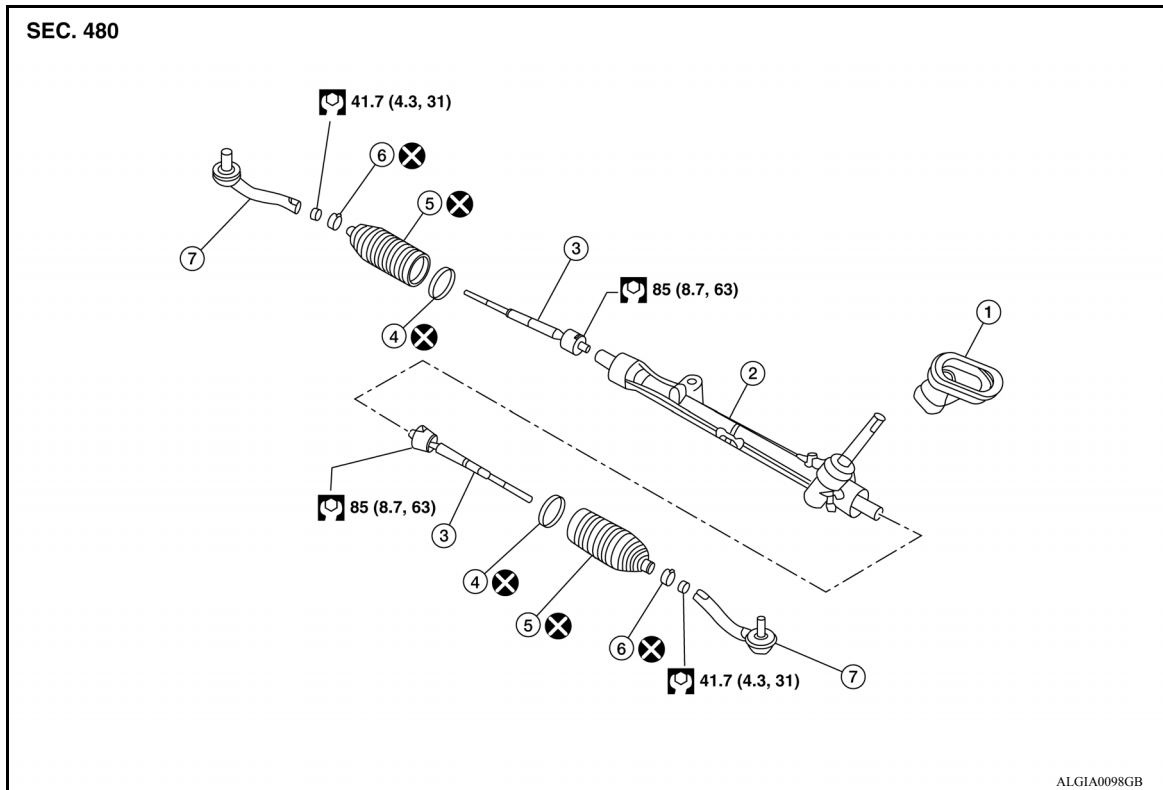
< UNIT DISASSEMBLY AND ASSEMBLY >

UNIT DISASSEMBLY AND ASSEMBLY

STEERING GEAR AND LINKAGE

Exploded View

INFOID:000000009266821



- | | | |
|-----------------|---------------------------|---------------------|
| 1. Joint cover | 2. Steering gear assembly | 3. Inner socket |
| 4. Large clamp | 5. Boot | 6. Small boot clamp |
| 7. Outer socket | | |

Disassembly and Assembly

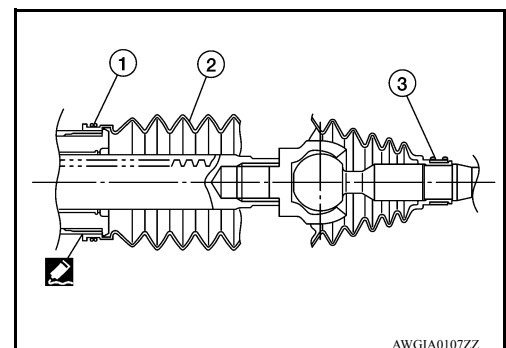
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DISASSEMBLY

1. Remove outer socket locknut and outer socket.
2. Remove boot clamps and boot.
3. Remove inner socket.

ASSEMBLY

1. Apply Three Bond 1111B or equivalent to inner socket and turn pinion fully to retract inner socket into gear housing assembly.
2. Install large end (1) of boot (2) to gear housing assembly.
3. Install small end (3) of boot (2) to inner socket boot mounting groove.



STEERING GEAR AND LINKAGE

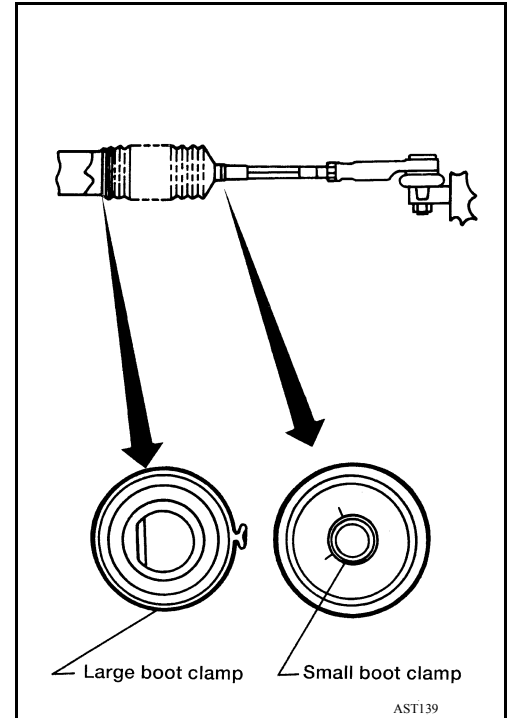
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4. Install boot clamp to boot small end.
5. Install boot clamp to boot large end using Tool.

CAUTION:

Do not reuse boot clamps.

Tool number : KV40107300 (—)

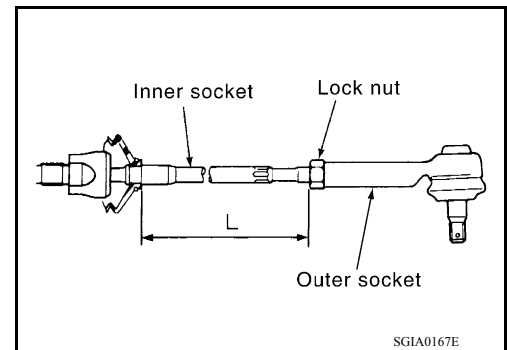


6. Adjust inner socket to standard length (L) and then tighten lock nut to the specified torque. Check length of inner socket (L) again after tightening lock nut. Make sure that the length is the standard.

Inner socket length (L) : Refer to [ST-20, "Ball Joint Swing Force"](#).

CAUTION:

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



Inspection

INSPECTION AFTER DISASSEMBLY

Boot

- Check boot for cracks and replace it if damage exists.

Steering gear Assembly

- Check steering gear assembly for damage and scratches (inner wall). Replace if there are any abnormal conditions.

Outer Socket and Inner Socket

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

BALL JOINT SWINGING FORCE

STEERING GEAR AND LINKAGE

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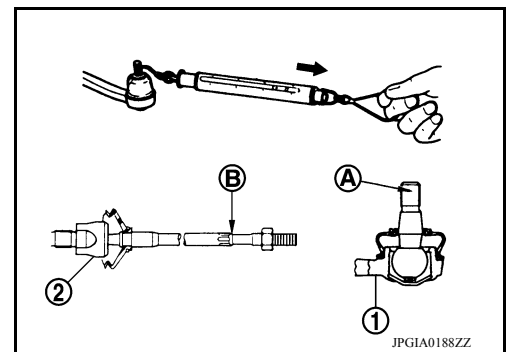
- Hook a Tool at the point shown and pull the spring balance. Make sure that the Tool reads the specified value when ball stud and inner socket start to move. Replace outer socket (1) and inner socket (2) if they are outside the standard.

Tool number : — (J-44372)

Measuring point of outer socket (1) : Ball stud upper side (A)

Measuring point of inner socket (2) : Point (B)

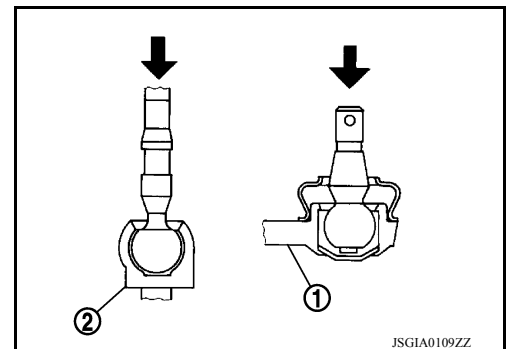
Swinging force : Refer to [ST-20, "Ball Joint Swing Force"](#).



BALL JOINT AXIAL END PLAY

- Apply an axial load of 490 N (50 kg-f, 110 lb-f) to ball stud. Using a dial gauge, measure amount of stud movement and 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.

Axial end play : Refer to [ST-20, "Ball Joint Axial End Play"](#).



SERVICE DATA AND SPECIFICATIONS (SDS)

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SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

INFOID:000000009266824

Steering gear model	R24K
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Steering Wheel Axial End Play and Play

INFOID:000000009266825

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

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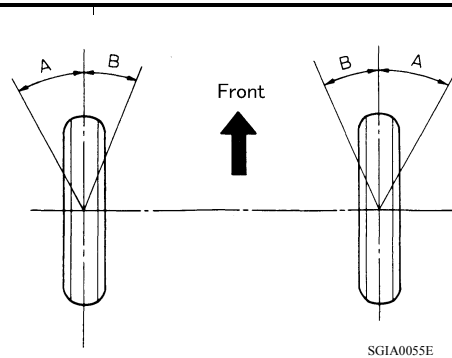
Unit: N (kg-f, lb-f)

Item	Standard
Steering wheel turning force	36 (3.7, 8.09) or less

Steering Angle

INFOID:000000009266827

Unit: Degree minute (Decimal degree)



Item		Standard
Inner wheel (Angle A)	Minimum	34° 30' (34.5°)
	Nominal	37° 30' (37.5°)
	Maximum	38° 30' (38.5°)
Outer wheel (Angle B)	Nominal	32° 00' (32.0°)

Steering Column Operating Range

INFOID:000000009266828

Item	Standard
Tilt operating range*	39.4 mm (1.551 in)
Rotating torque	0 - 2.1 N·m (0 - 0.21 kg-m, 0 - 2 in-lb)
Steering column length*	477.9 mm (18.81 in)

*: For measuring position, refer to [ST-10. "Inspection"](#).

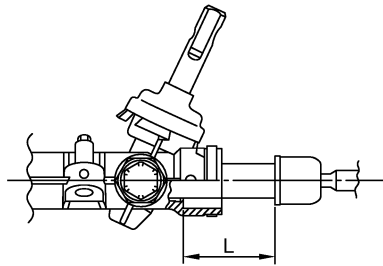
SERVICE DATA AND SPECIFICATIONS (SDS)

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Rack Stroke

INFOID:000000009266829

Unit: mm (in)



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Item	Standard
Rack stroke neutral position (L)	64.6 (2.543)

Ball Joint Swing Force

INFOID:000000009266830

Item	Standard
Outer socket Spring balance measurement*	6.0 – 58 N (0.61 – 5.9 kg-f, 1.35 – 13.03 lb-f)
Inner socket Spring balance measurement*	3.5 – 34.7 N (0.36 – 3.5 kg-f, 0.79 – 7.8 lb-f)

*: For measuring position, refer to [ST-15. "Inspection"](#).

Ball Joint Axial End Play

INFOID:000000009266831

Unit: mm (in)

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

Inner Socket Length

INFOID:000000009266832

Unit: mm (in)

Item	Standard
Rack neutral position, dimension	67.3 (2.650)