

SECTION **ST**

STEERING SYSTEM

CONTENTS

PRECAUTION	2	
PRECAUTIONS	2	
Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"	2	
Precaution Necessary for Steering Wheel Rotation After Battery Disconnect	2	
Precautions for Removing Battery Terminal	3	
Service Notice or Precautions for Steering System	4	
PREPARATION	5	
PREPARATION	5	
Special Service Tools	5	
Commercial Service Tools	5	
Sealant or/and Lubricant	5	
SYMPTOM DIAGNOSIS	7	
NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING	7	
NVH Troubleshooting Chart	7	
BASIC INSPECTION	9	
STEERING WHEEL	9	
Inspection	9	
PERIODIC MAINTENANCE	11	
STEERING WHEEL	11	
Inspection	11	
REMOVAL AND INSTALLATION	12	
STEERING WHEEL	12	
Exploded View	12	
Removal and Installation	12	
STEERING COLUMN	13	
Exploded View	13	
Removal and Installation	13	
Inspection	15	
STEERING SHAFT	17	
Exploded View	17	
Removal and Installation	17	
Inspection	19	
STEERING GEAR AND LINKAGE	20	
LHD	20	
LHD : Exploded View	20	
RHD	21	
RHD : Exploded View	21	
Removal and Installation	22	
Disassembly and Assembly	25	
Inspection	26	
SERVICE DATA AND SPECIFICATIONS (SDS)	28	
SERVICE DATA AND SPECIFICATIONS (SDS)	28	
Steering Wheel	28	
Steering Angle	28	
Steering Column	28	
Steering Gear and Linkage	28	

PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

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

INFOID:0000000010839323

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.

Precaution Necessary for Steering Wheel Rotation After Battery Disconnect

INFOID:0000000010839324

CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- Before removing and installing any control units, first turn the ignition power source and accessory power source to the OFF, then disconnect both battery cables.
- After finishing work, confirm that all control unit connectors are connected properly, then re-connect both battery cables.
- Always use CONSULT to perform self-diagnosis as a part of each function inspection after finishing work. If a DTC is detected, perform trouble diagnosis according to self-diagnosis results.

For vehicle with steering lock unit, if the battery is disconnected or discharged, the steering wheel will lock and cannot be turned.

If turning the steering wheel is required with the battery disconnected or discharged, follow the operation procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.

NOTE:

Supply power using jumper cables if battery is discharged.

2. Open driver door.
3. Turn the ignition switch to the ON position.
(At this time, the steering lock will be released.)
4. Turn the ignition switch to OFF position with driver door open.
5. Wait for 3 minutes or longer with driver door open.

NOTE:

- Do not close driver door because the steering wheel locks when driver door is closed.

PRECAUTIONS

< PRECAUTION >

- The auto acc function is adapted to this vehicle. For this reason, even when the ignition switch is turned to OFF position, the accessory power source does not turned OFF and continues to be supplied for a certain amount of time.
- 6. Disconnect both battery cables. The steering lock will remain released with both battery cables disconnected and the steering wheel can be turned.
- 7. Perform the necessary repair operation.
- 8. When the repair work is completed, re-connect both battery cables. With the brake pedal released, turn the ignition switch from OFF position to ON position, then to LOCK position. (The steering wheel will lock when the ignition switch is turned to LOCK position.)
- 9. Perform self-diagnosis check of all control units using CONSULT.

Precautions for Removing Battery Terminal

INFOID:000000011014043

- With the adoption of Auto ACC function, ACC power is automatically supplied by operating the intelligent key or remote keyless entry or by opening/closing the driver side door. In addition, ACC power is supplied even after the ignition switch is turned to the OFF position, i.e. ACC power is supplied for a certain fixed time.
- When disconnecting the 12V battery terminal, turn off the ACC power before disconnecting the 12V battery terminal, observing "How to disconnect 12V battery terminal" described below.

NOTE:

Some ECUs operate for a certain fixed time even after ignition switch is turned OFF and ignition power supply is stopped. If the battery terminal is disconnected before ECU stops, accidental DTC detection or ECU data damage 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.

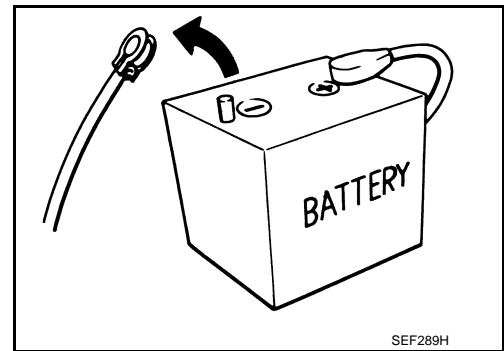
NOTE:

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.



HOW TO DISCONNECT 12V BATTERY TERMINAL

Disconnect 12V battery terminal according to Instruction 1 or Instruction 2 described below.

For vehicles parked by ignition switch OFF, refer to Instruction 2.

INSTRUCTION 1

1. Open the hood.
2. Turn key switch to the OFF position with the driver side door opened.
3. Get out of the vehicle and close the driver side door.
4. Wait at least 3 minutes. For vehicle with the engine listed below, remove the battery terminal after a lapse of the specified time.

D4D engine	: 20 minutes
HRA2DDT	: 12 minutes
K9K engine	: 4 minutes
M9R engine	: 4 minutes
R9M engine	: 4 minutes
V9X engine	: 4 minutes

CAUTION:

While waiting, never operate the vehicle such as locking, opening, and closing doors. Violation of this caution results in the activation of ACC power supply according to the Auto ACC function.

5. Remove 12V battery terminal.

CAUTION:

After installing 12V battery, always check self-diagnosis results of all ECUs and erase DTC.

INSTRUCTION 2 (FOR VEHICLES PARKED BY IGNITION SWITCH OFF)

1. Unlock the door with intelligent key or remote keyless entry.

PRECAUTIONS

< PRECAUTION >

NOTE:

At this moment, ACC power is supplied.

2. Open the driver side door.
3. Open the hood.
4. Close the driver side door.
5. Wait at least 3 minutes.

CAUTION:

While waiting, never operate the vehicle such as locking, opening, and closing doors. Violation of this caution results in the activation of ACC power supply according to the Auto ACC function.

6. Remove 12V battery terminal.

CAUTION:

After installing 12V battery, always check self-diagnosis results of all ECUs and erase DTC.

Service Notice or Precautions for Steering System

INFOID:0000000010839326

- 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.
- During quick steering, rasping noise may be heard from around the steering wheel. This is not a malfunction. The noise is an operating noise of the EPS system under normal conditions. If the rasping noise occurs during slow steering, this may not be an operating noise of the system. In this case, it is necessary to find out the location of the noise and repair, if necessary.
- Never repeat static steering. (Motor and EPS control unit could be heated.)

PREPARATION

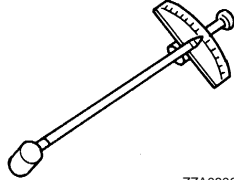
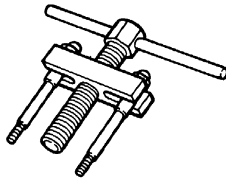
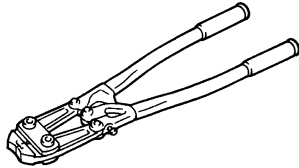
< PREPARATION >

PREPARATION

PREPARATION

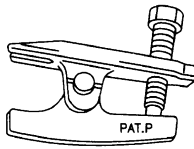
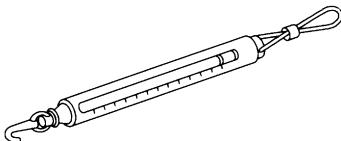
Special Service Tools

INFOID:0000000010839327

Tool number Tool name	Description
ST3127S000 Preload gauge	Measuring steering column rotating torque
 ZZA0806D	
ST27180001 Steering wheel puller	Removing steering wheel
 ZZA0819D	
KV40107300 Boot Band crimping tool	Installing boot clamp (large diameter)
 ZZA1229D	

Commercial Service Tools

INFOID:0000000010839328

Tool name	Description
Ball joint remover	Removing steering outer socket
 PAT.P NT146	
Spring gauge	Checking steering wheel turning force
 NT127	

Sealant or/and Lubricant

INFOID:0000000010839329

PREPARATION

< PREPARATION >

Name	Description
Molywhite LSG (manufactured by Kyodo yushi)	Gear housing assembly
RENOLIT 1619	<ul style="list-style-type: none">• Gear housing assembly boot mounting part• Inner socket

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

INFOID:0000000010839330

2WD MODELS

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	
Steering	Noise	x	x	x	x								ST-26, "Inspection"	
	Shake					x	x	x					ST-26, "Inspection"	
	Vibration												ST-26, "Inspection"	
	Shimmy							x	x	x			ST-11, "Inspection"	
	Judder							x	x	x			ST-12, "Exploded View"	
						Improper installation or looseness of tilt lock lever						—		
						Mounting looseness						ST-20, "LHD : Exploded View" (LHD), ST-21, "RHD : Exploded View" (RHD)		
						Steering column deformation or damage						ST-15, "Inspection"		
						Improper installation or looseness of steering column						ST-13, "Exploded View"		
						Steering linkage looseness						ST-20, "LHD : Exploded View" (LHD), ST-21, "RHD : Exploded View" (RHD)		
						AXLE and SUSPENSION						NVH in FAX, RAX, FSU, RSU section		
						TIRE						NVH in WT section		
						ROAD WHEEL						NVH in WT section		
						DRIVE SHAFT						NVH in FAX section		
						BRAKE						NVH in BR section		

x: Applicable

4WD MODELS

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

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

Symptom			Steering			Possible cause and SUSPECTED PARTS										Reference
	Noise	×	×	×	×	Outer/inner socket ball joint swinging torque	ST-26, "Inspection"									
	Shake		×	×	×	Outer/inner socket ball joint rotating torque	ST-26, "Inspection"									
	Vibration					Outer/inner socket ball joint end play	ST-26, "Inspection"									
	Shimmy					Steering wheel play	ST-11, "Inspection"									
	Judder					Improper steering wheel	ST-12, "Exploded View"									
		×	×	×	×	Improper installation or looseness of tilt lock lever	—									
		×	×	×	×	Mounting looseness	ST-20, "LHD : Exploded View" (LHD), ST-21, "RHD : Exploded View" (RHD)									
		×	×	×	×	Steering column deformation or damage	ST-15, "Inspection"									
						Improper installation or looseness of steering column	ST-13, "Exploded View"									
		×				Steering linkage looseness	ST-20, "LHD : Exploded View" (LHD), ST-21, "RHD : Exploded View" (RHD)									
			×	×	×	PROPELLER SHAFT	NVH in DLN section									
						DIFFERENTIAL	NVH in DLN section									
		×	×	×	×	AXLE and SUSPENSION	NVH in FAX, RAX, FSU, RSU section									
		×	×	×	×	TIRE	NVH in WT section									
		×	×	×	×	ROAD WHEEL	NVH in WT section									
						DRIVE SHAFT	NVH in FAX, RAX section									
		×				BRAKE	NVH in BR section									

×: Applicable

STEERING WHEEL

< BASIC INSPECTION >

BASIC INSPECTION

STEERING WHEEL

Inspection

INFOID:0000000010839331

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-8, "Inspection"](#).
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.

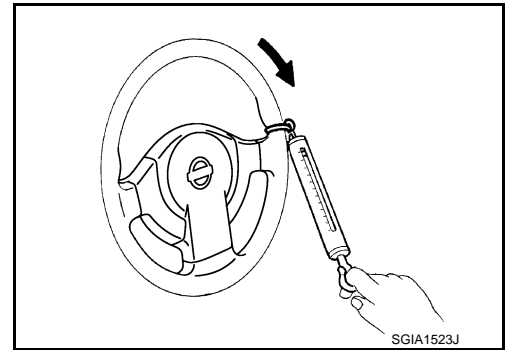
CAUTION:

If the adjustment is performed by using the inner socket, check wheel alignment after the adjustment. Refer to [FSU-8, "Inspection"](#).

STEERING WHEEL TURNING FORCE

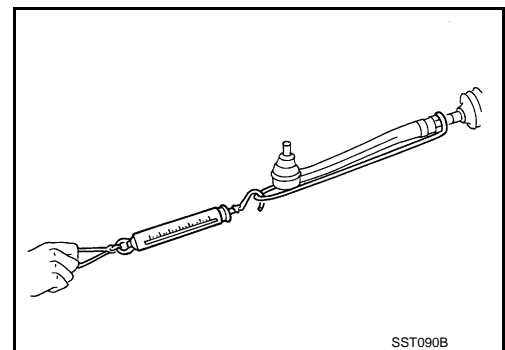
1. Park vehicle on a level and dry surface, set parking brake.
2. Start engine.
3. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

Steering wheel turning force : Refer to [ST-28, "Steering Wheel"](#).



4. If steering wheel turning force is not within specification, check rack sliding force.
 - a. Disconnect steering shaft from steering gear assembly. Refer to [ST-17, "Removal and Installation"](#).
 - b. Disconnect steering outer socket from steering knuckle. Refer to [ST-22, "Removal and Installation"](#).
 - c. While pulling outer socket slowly in ± 70 mm (± 2.76 in) range from neutral position, make sure rack sliding force is within specification.

Rack sliding force : Refer to [ST-28, "Steering Wheel"](#).



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

FRONT WHEEL TURNING ANGLE

1. Perform toe-in inspection. Refer to [FSU-8, "Inspection"](#).

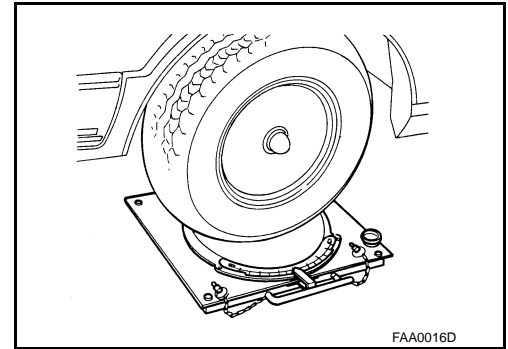
CAUTION:

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

STEERING WHEEL

< BASIC INSPECTION >

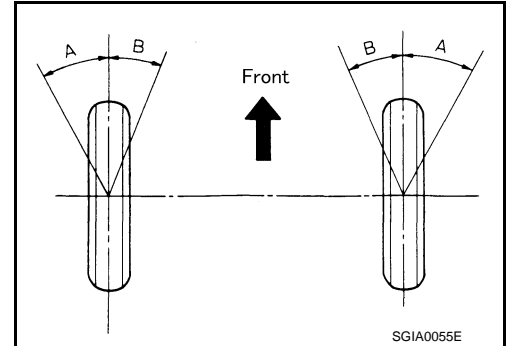
2. Place front wheels on turning radius gauges and rear wheels on stands, so that vehicle can be level.
3. Check the maximum inner and outer wheel turning angles for LH and RH road wheels.



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

A : Inner wheel angle
B : Outer wheel angle

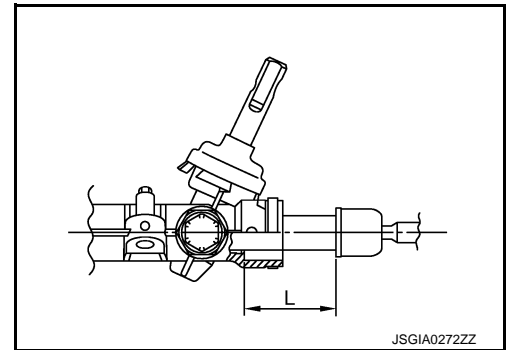
Steering angle : Refer to [ST-28, "Steering Angle"](#).



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

Rack stroke (L) : Refer to [ST-28, "Steering Gear and Linkage"](#).

- b. 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.



STEERING WHEEL

< PERIODIC MAINTENANCE >

PERIODIC MAINTENANCE

STEERING WHEEL

Inspection

INFOID:0000000010839332

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-28, "Steering Wheel"](#).

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-13, "Exploded View"](#).
 - Check steering gear assembly mounting condition for looseness. Refer to [ST-20, "LHD : Exploded View"](#) (LHD), [ST-21, "RHD : Exploded View"](#) (RHD).

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 on the outer circumference : Refer to [ST-28, "Steering Wheel"](#).

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

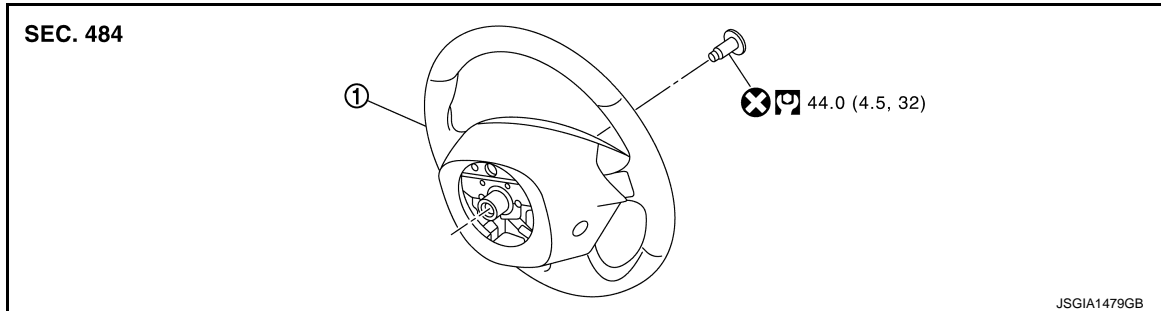
< REMOVAL AND INSTALLATION >

REMOVAL AND INSTALLATION

STEERING WHEEL

Exploded View

INFOID:0000000010839333



① Steering wheel

⊗: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

Removal and Installation

INFOID:0000000010839334

REMOVAL

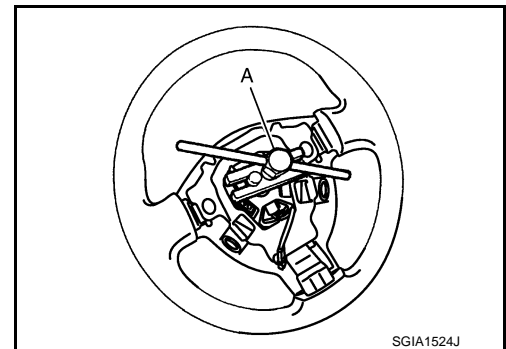
NOTE:

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-19, "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).

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-23, "Removal and Installation"](#).

CAUTION:

- Never twist spiral cable excessively after it becomes tight. (Twisting may cause the cable to be torn off.)
- Never reuse steering wheel mounting bolt.

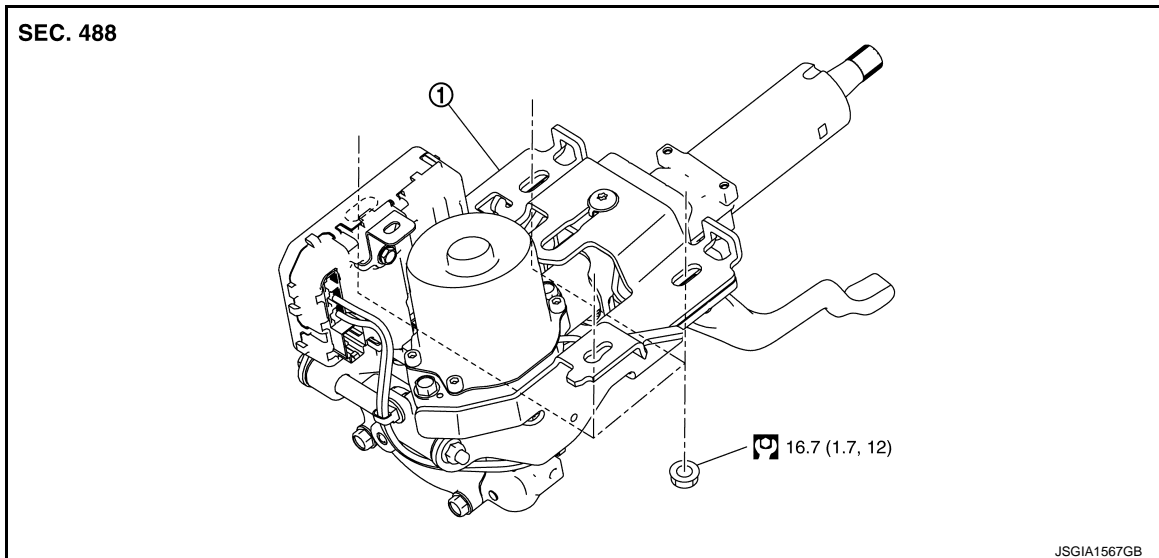
STEERING COLUMN

< REMOVAL AND INSTALLATION >

STEERING COLUMN

Exploded View

INFOID:0000000010839335



① Steering column assembly

: N·m (kg-m, ft-lb)

Removal and Installation

INFOID:0000000010839336

REMOVAL

CAUTION:

- Never impact on the axis when removing steering column assembly.
- Be careful when removing steering column assembly from the vehicle because it is heavy.
- Keep steering column assembly away from magnetic sources.
- Never disassemble steering column assembly. It is not separable.
- While removing the steering column assembly, never move the steering gear.
- When removing the steering column assembly, be careful not to allow the steering shaft to turn.
- Place a matching mark on both steering shaft and steering column assembly when removing steering shaft.
- Never repeat static steering. (Motor and EPS control unit could be heated.)

1. Set vehicle to the straight-ahead position.
2. Place the tilt to the highest level.
3. Remove driver air bag module. Refer to [SR-19, "Removal and Installation"](#).
4. Remove steering wheel. Refer to [ST-12, "Removal and Installation"](#).
5. Remove steering column cover. Refer to [IP-14, "Removal and Installation"](#) (LHD), [IP-41, "Removal and Installation"](#) (RHD).
6. Remove spiral cable. Refer to [SR-23, "Removal and Installation"](#).
7. Remove combination switch. Refer to [BCS-122, "Removal and Installation"](#).
8. Remove instrument lower panel. Refer to [IP-14, "Removal and Installation"](#) (LHD), [IP-41, "Removal and Installation"](#) (RHD).
9. Disconnect each switch harness connectors installed to steering column assembly.
10. Remove hole cover. Refer to [ST-17, "Removal and Installation"](#).

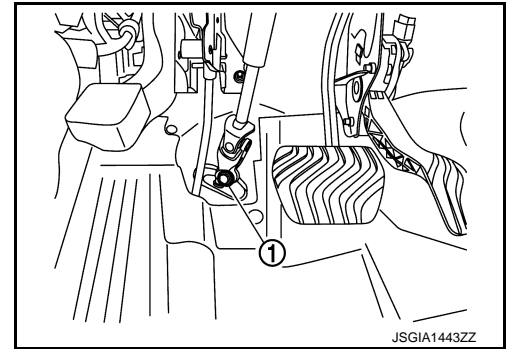
STEERING COLUMN

< REMOVAL AND INSTALLATION >

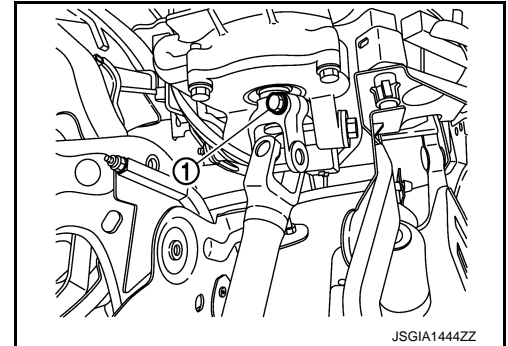
11. Remove steering shaft mounting bolt ① (steering gear side).
12. Remove steering shaft from steering gear assembly.

CAUTION:

When removing steering shaft, 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 steering shaft with a new one.

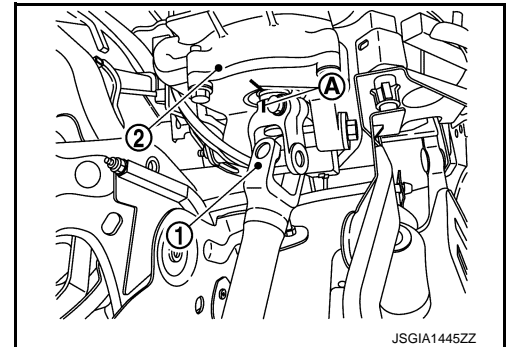


13. Remove steering shaft mounting bolt ① (steering column assembly side).
14. Remove steering shaft from steering column assembly.



CAUTION:

- Place a matching mark ④ on both steering shaft ① and steering column assembly ② before removing steering shaft.
- When removing steering shaft, 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 steering shaft with a new one.



15. Remove the steering column assembly mounting nut, and then remove steering column assembly.

CAUTION:

When removing the mounting nut, be careful not to drop the steering column assembly.

16. Perform inspection after removal. Refer to [ST-15, "Inspection"](#).

INSTALLATION

CAUTION:

- Never 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.
- If the dash seal is deformed, replace it. (It becomes the cause for the water leak.)

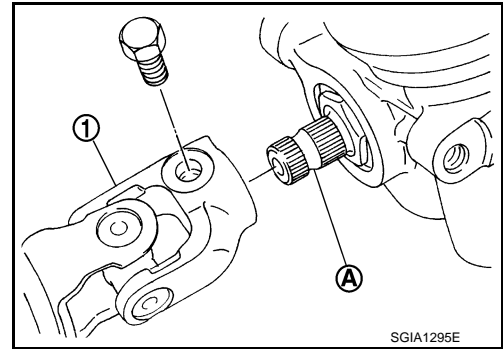
Note the following, and install in the reverse order of removal.

- For steering shaft mounting bolt direction, refer to [ST-17, "Exploded View"](#). (Do not insert it from the other side.)

STEERING COLUMN

< REMOVAL AND INSTALLATION >

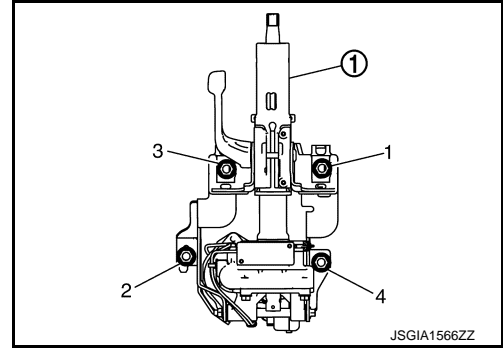
- When connecting steering shaft joint part ① and column shaft, make sure the bolt is securely seated in groove A of column shaft before final tightening.



- When installing the steering column assembly ①, tighten to the specified torque in the numerical order shown below:

Tightening order

1 → 2 → 3 → 4



- After installing steering column assembly, perform self-diagnosis with CONSULT to ensure correct operation. Refer to [STC-16, "CONSULT Function"](#).
- Perform inspection after installation. Refer to [ST-15, "Inspection"](#).

Inspection

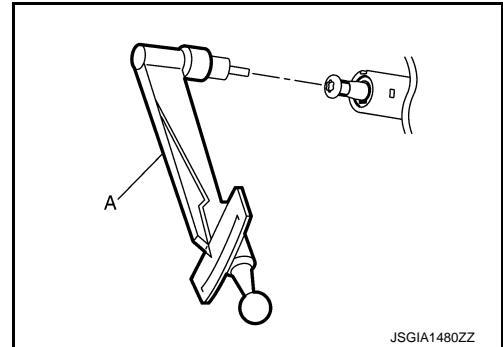
INFOID:0000000010839337

INSPECTION AFTER REMOVAL

Check the following items and replace, if necessary.

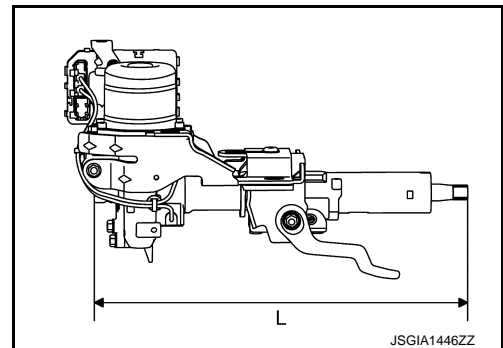
- Check each part of steering column assembly for damage or other malfunctions. Replace if there are any abnormal conditions.
- Measure steering column rotating torque using a preload gauge (A) (SST: ST3127S000). Replace steering column assembly if the rotating torque is outside the standard.

Rotating torque : Refer to [ST-28, "Steering Column"](#).



- Measure the length "L" shown in the figure, 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-28, "Steering Column"](#).



INSPECTION AFTER INSTALLATION

STEERING COLUMN

< REMOVAL AND INSTALLATION >

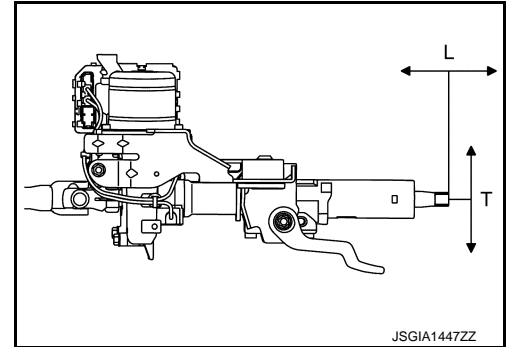
Check the following items and replace, if necessary.

- Check each part of steering column assembly for damage or other malfunctions. Replace if there are any abnormal conditions.
- Check tilt and telescopic mechanism operating range “T”, “L” as shown in the figure.

Tilt operating range (T) : Refer to [ST-28, "Steering Column"](#).

Telescopic operating range (L) : Refer to [ST-28, "Steering Column"](#).

- 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 torque, and front wheel turning angle.
 - Steering wheel play: Refer to [ST-11, "Inspection"](#).
 - Neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to [ST-9, "Inspection"](#).
- Adjust neutral position of steering angle sensor. Refer to [BRC-99, "Work Procedure"](#).



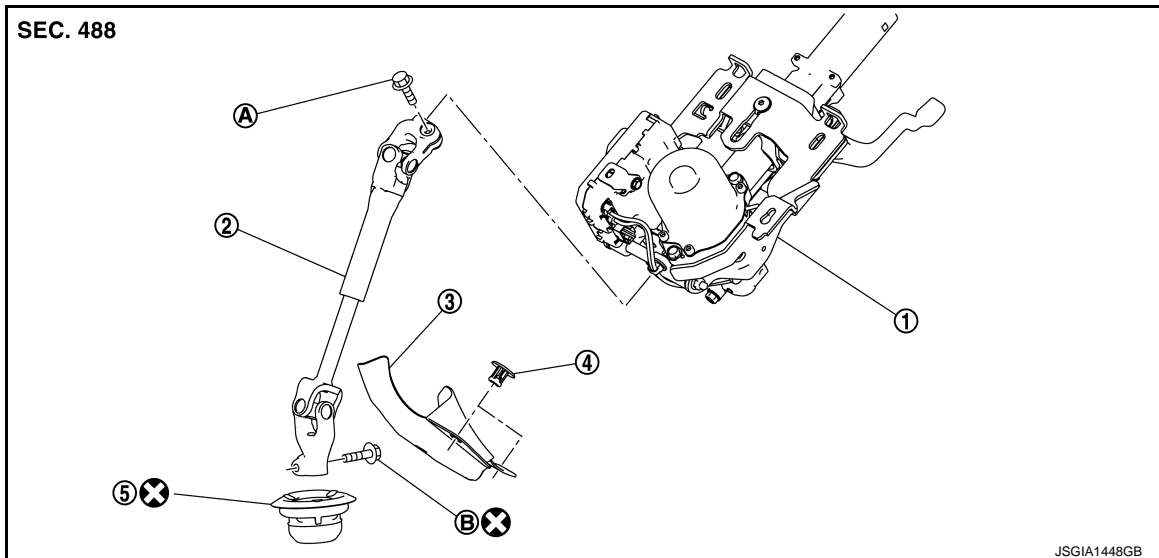
STEERING SHAFT

< REMOVAL AND INSTALLATION >

STEERING SHAFT

Exploded View

INFOID:0000000010839338



- ① Steering column assembly
- ② Steering shaft
- ③ Hole cover
- ④ Clip
- ⑤ Dash seal

(A), (B): Tightening must be done following the installation procedure.

⊗: Always replace after every disassembly.

⊕: N·m (kg·m, ft·lb)

Removal and Installation

INFOID:0000000010839339

REMOVAL

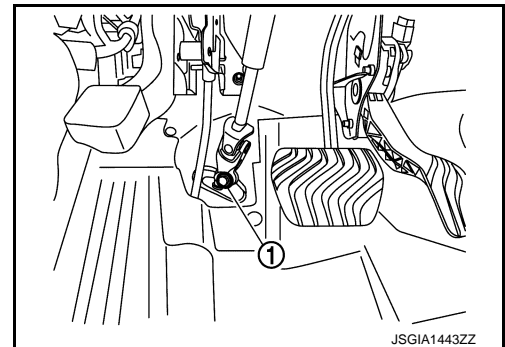
CAUTION:

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 tilt to the highest level.
3. Remove instrument lower panel. Refer to [IP-14, "Removal and Installation"](#) (LHD), [IP-41, "Removal and Installation"](#) (RHD).
4. Remove hole cover.
5. Remove steering shaft mounting bolt ① (steering gear side).
6. Remove steering shaft from steering gear assembly.

CAUTION:

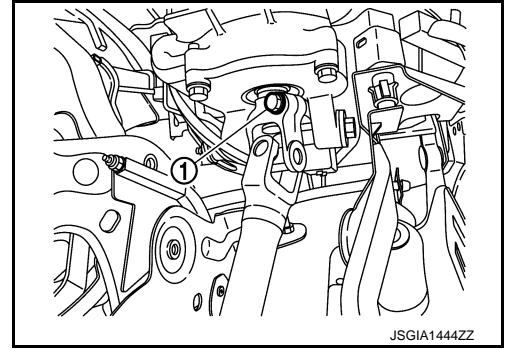
When removing steering shaft, never insert a tool, such as a screwdriver, into the yoke groove to pull out the upper joint. In case of the violation of the above, replace steering shaft with a new one.



STEERING SHAFT

< REMOVAL AND INSTALLATION >

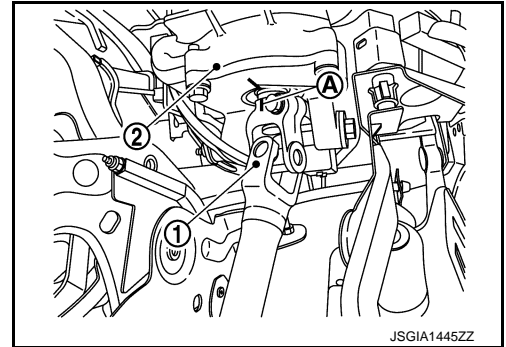
7. Remove steering shaft mounting bolt ① (steering column assembly side).



8. Remove steering shaft from steering column assembly.

CAUTION:

- Place a matching mark ① on both steering shaft ① and steering column assembly ② before removing steering shaft.
- When removing steering shaft, 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 steering shaft with a new one.



9. Perform inspection after removal. Refer to [ST-19. "Inspection"](#).

INSTALLATION

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

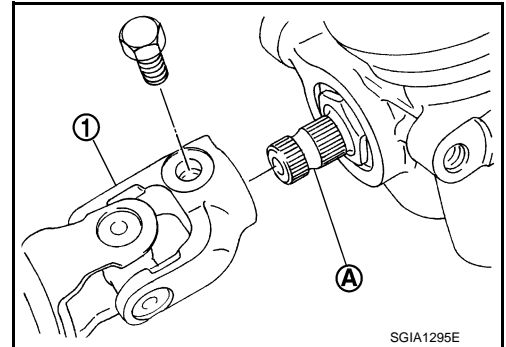
CAUTION:

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.

- For steering shaft and steering column assembly mounting bolt direction, refer to [ST-17. "Exploded View"](#). (Do not insert it from the other side.)
- When connecting steering shaft joint part ① and column shaft, make sure the bolt is securely seated in groove ① of column shaft before final tightening.

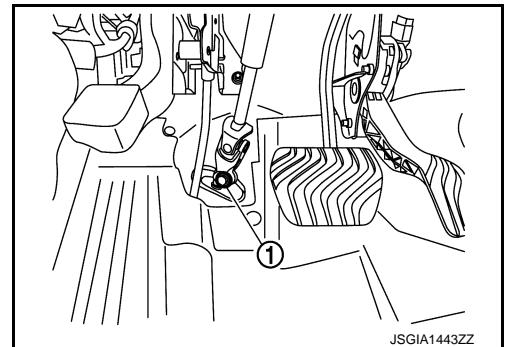
Tightening torque : 26 (2.7, 19) - 36 (3.7, 27) N·m

- Perform inspection after installation. Refer to [ST-19. "Inspection"](#).



- Tighten the mounting bolt ① of steering shaft (steering gear side) to the specified torque.

Tightening torque : 45 (4.6, 33) - 55 (5.6, 41) N·m



STEERING SHAFT

< REMOVAL AND INSTALLATION >

Inspection

INFOID:0000000010839340

INSPECTION AFTER REMOVAL

Check the following items and replace, if necessary.

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

INSPECTION AFTER INSTALLATION

Check the following items and replace, if necessary.

- Check each part of steering 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 torque, and front wheel turning angle.
 - Steering wheel play: Refer to [ST-11, "Inspection"](#).
 - Neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to [ST-9, "Inspection"](#).
- Adjust neutral position of steering angle sensor. Refer to [BRC-99, "Work Procedure"](#).

A
B
C
D
E
F

H
I
J
K
L
M
N
O
P

ST

STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

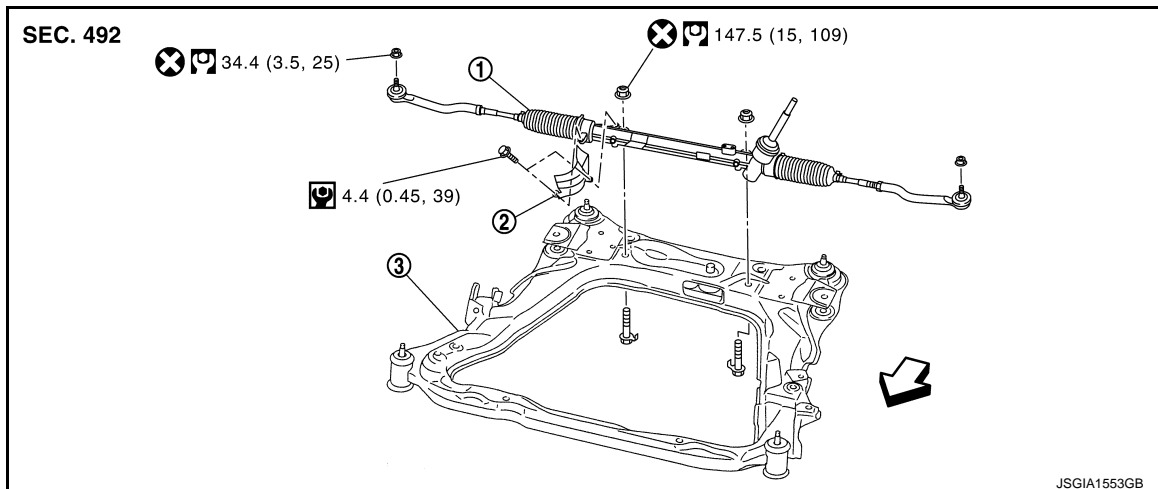
STEERING GEAR AND LINKAGE

LHD

LHD : Exploded View

INFOID:000000010839341

REMOVAL



① Steering gear assembly

② Heat insulator

③ Front suspension member

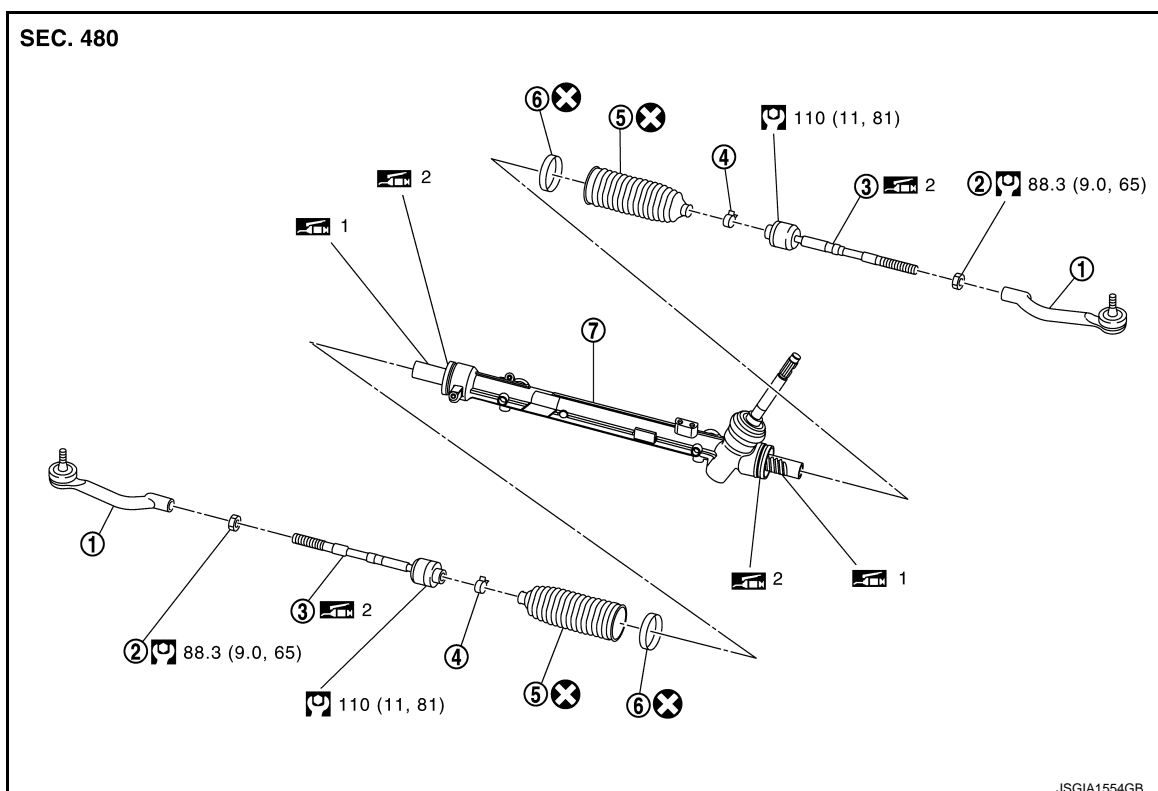
⇐: Vehicle front

⊗: Always replace after every disassembly.

⊞: N-m (kg-m, ft-lb)

⊞: N-m (kg-m, in-lb)

DISASSEMBLY



STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

- | | | |
|-------------------------------|-------------------------|-------------------------------|
| ① Outer socket | ② Outer socket lock nut | ③ Inner socket |
| ④ Boot clamp (small diameter) | ⑤ Boot | ⑥ Boot clamp (large diameter) |
| ⑦ Gear housing assembly | | |

⊗: Always replace after every disassembly.

⊙: N·m (kg-m, ft-lb)

🔧1: Apply Molywhite LSG or equivalent.

🔧2: Apply RENOLIT JP1619

CAUTION:

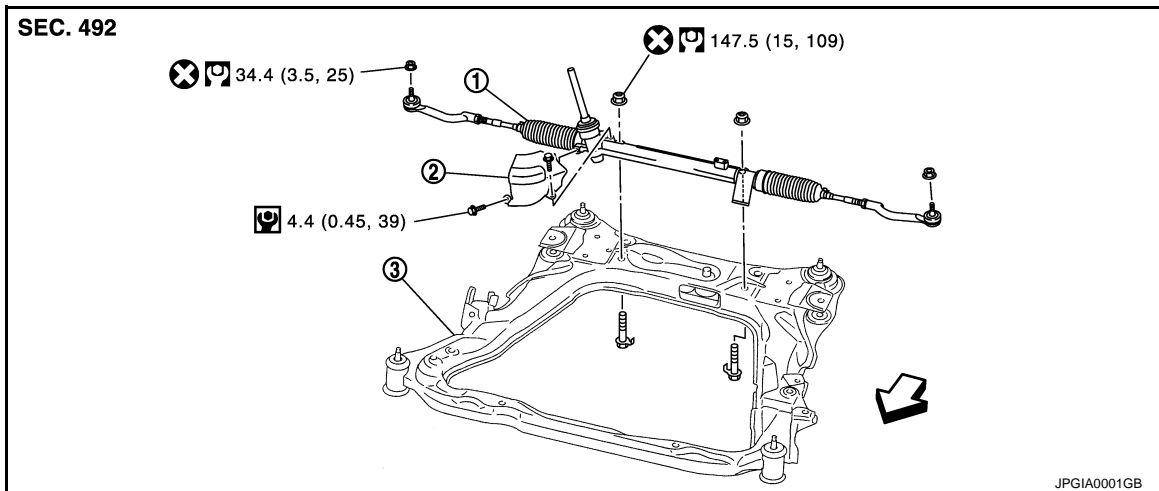
- Apply Molywhite LSG (manufactured by Kyodo yushi) to steering rack of proper quantity, if the grease of steering rack adheres into boot inside in removing boots and the grease is removed.
- Never apply the grease to the surface between steering rack and inner socket screw part.

RHD

RHD : Exploded View

INFOID:0000000010839342

REMOVAL



- | | | |
|--------------------------|------------------|---------------------------|
| ① Steering gear assembly | ② Heat insulator | ③ Front suspension member |
|--------------------------|------------------|---------------------------|

⇐: Vehicle front

⊗: Always replace after every disassembly.

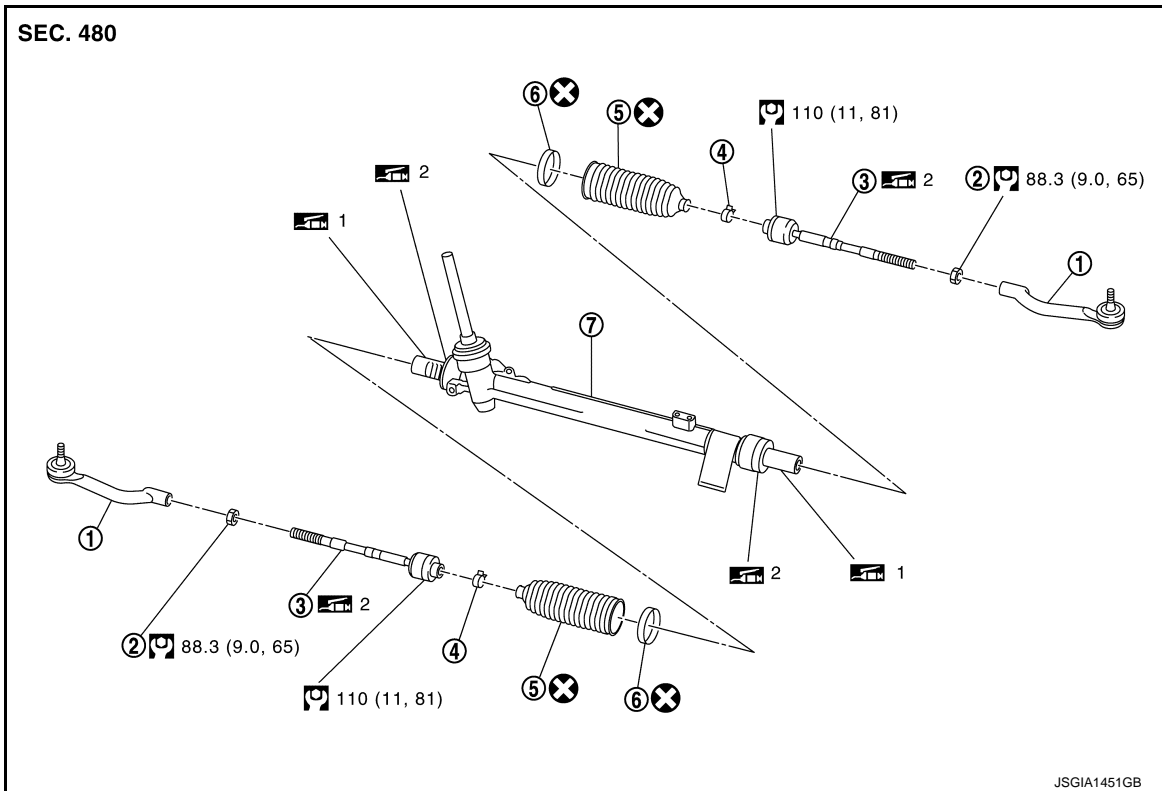
⊙: N·m (kg-m, ft-lb)

⊙: N·m (kg-m, in-lb)

DISASSEMBLY

STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >



- ① Outer socket
- ② Outer socket lock nut
- ③ Inner socket
- ④ Boot clamp (small diameter)
- ⑤ Boot
- ⑥ Boot clamp (large diameter)
- ⑦ Gear housing assembly

⊗: Always replace after every disassembly.

U: N·m (kg·m, ft·lb)

1: Apply Molywhite LSG or equivalent.

2: Apply RENOLIT JP1619

CAUTION:

- Apply Molywhite LSG (manufactured by Kyodo yushi) to steering rack of proper quantity, if the grease of steering rack adheres into boot inside in removing boots and the grease is removed.
- Never apply the grease to the surface between steering rack and inner socket screw part.

Removal and Installation

INFOID:0000000010839343

REMOVAL

1. Set vehicle to the straight-ahead position.
2. Remove hole cover.
3. Remove steering shaft mounting bolt (steering gear side). Refer to [ST-17, "Removal and Installation"](#).
4. Separate steering shaft from steering gear assembly. Refer to [ST-17, "Removal and Installation"](#).

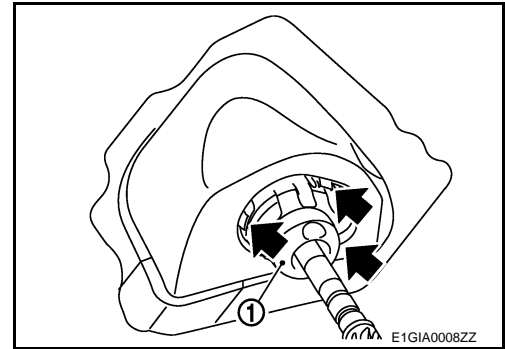
CAUTION:

- Spiral cable may be cut if steering wheel turns while separating steering shaft and steering gear assembly. Be sure to secure steering wheel using string to avoid turning.
- When removing steering shaft, 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 steering shaft with a new one.

STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

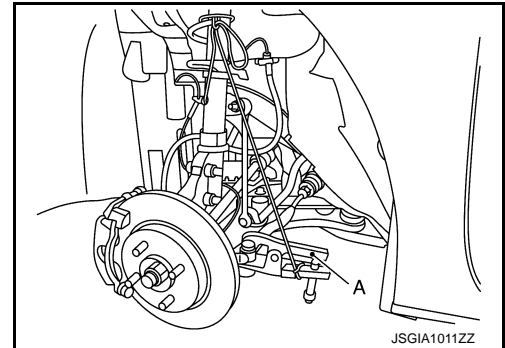
5. Remove dash seal ① by the following procedure.
 - Push the 3 clip parts of dash seal (↔) from vehicle underside.
 - Remove the clip part from the vehicle by pushing the dash seal slowly to vehicle inside.
 - Remove dash seal.



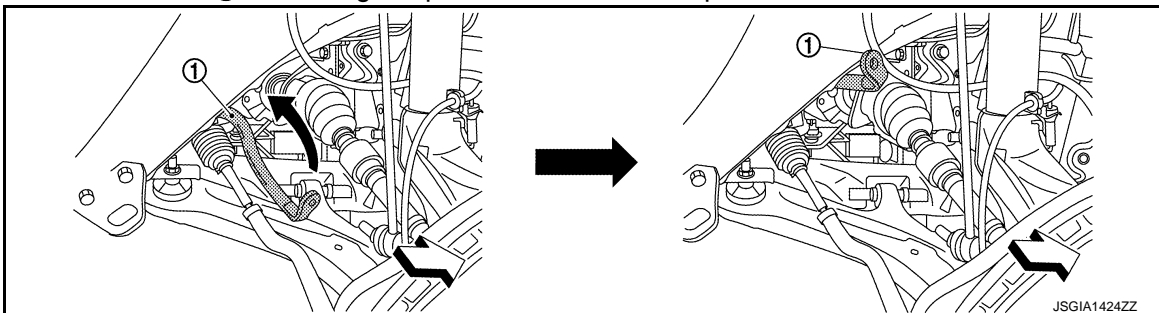
6. Remove tires. Refer to [WT-61, "Exploded View"](#).
7. Remove steering outer socket from steering knuckle so as not to damage ball joint boot using a ball joint remover (A) (commercial service tool).

CAUTION:

 - Temporarily tighten the nut to prevent damage to threads and to prevent the ball joint remover from sudden drop turning.
 - Never damage the boot of ball joint.



8. Remove front stabilizer mounting nut (lower side). Refer to [FSU-19, "Exploded View"](#).
9. Rotate front stabilizer ① like facing to upward to secure workspace.



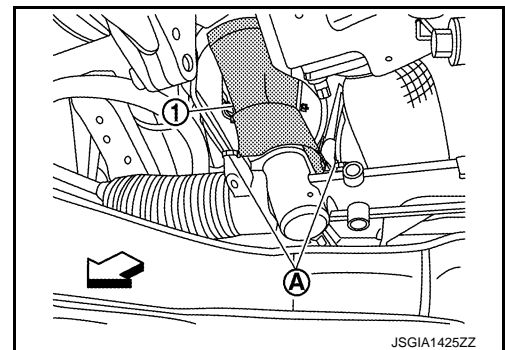
↔ : Vehicle front

10. Remove heat insulator ① (steering gear right side) mounting bolt (A), and then remove heat insulator from steering gear.

↔ : Vehicle front

CAUTION:

- Perform the operation with the exhaust system fully cooled down because the system will be hot just after engine stops.
- Be careful not to cut your hand on the heat insulator edge.



STEERING GEAR AND LINKAGE

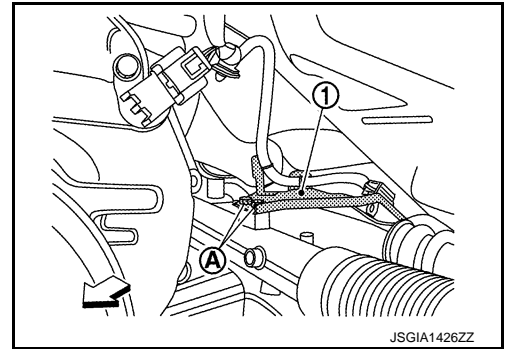
< REMOVAL AND INSTALLATION >

11. Remove O2 sensor bracket mounting bolt (A) and, move the O2 sensor bracket (1) not to interfere with work.

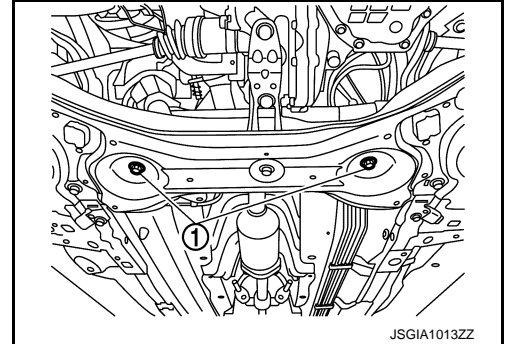
⇐ : Vehicle front

CAUTION:

- Perform the operation with the exhaust system fully cooled down because the system will be hot just after engine stops.
- Be careful not to cut your hand on the heat insulator edge.



12. Remove steering gear assembly mounting bolts (1), and nuts.



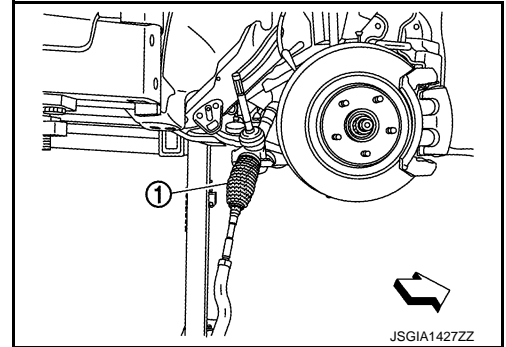
13. Remove steering gear assembly (1) from vehicle left side (LHD) or vehicle right side (RHD)

⇐ : Vehicle front

CAUTION:

When removing the steering gear from the vehicle, be careful of the following work to remove it.

- Never interfere with vehicle body or surrounding parts.
- Never damage the spline part of steering gear assembly.



INSTALLATION

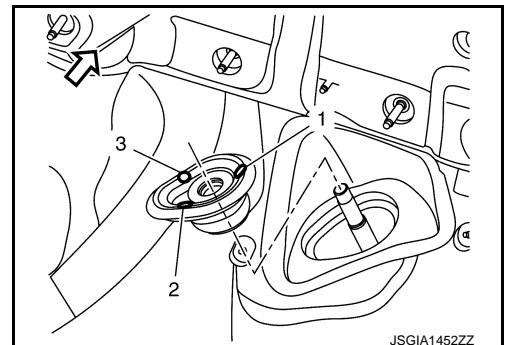
Note the following, and install in the reverse order of removal.

CAUTION:

- Spiral cable may be cut if steering wheel turns while separating steering column assembly and steering gear assembly. Always fix the steering wheel using string to avoid turning.
- Never interfere with vehicle body or surrounding parts.
- Never damage the spline part of steering gear assembly.
- Before installation, check that the tilt mechanism is middle position.
- 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-8, "Inspection"](#).
- If the dash seal is deformed, replace it. (It becomes the cause for the water leak.)
- When installing the dash seal, push the boss part in numerical order.

Pushing order : 1→2→3

⇐ : Vehicle front



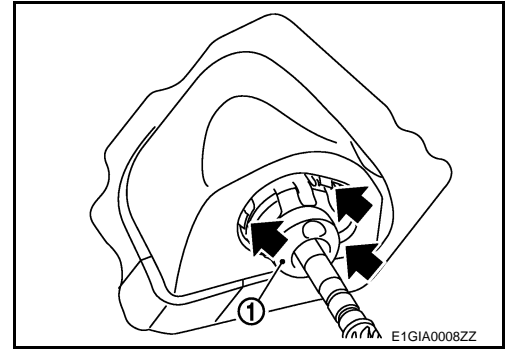
STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

CAUTION:

Confirm the clip part (↔) is fixed in mounting hole from vehicle underside.

- ① Dash seal



- Perform inspection after installation. Refer to [ST-26, "Inspection"](#).

Disassembly and Assembly

INFOID:000000010839344

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. Loosen outer socket lock nut, and remove outer socket.
2. Remove boot clamps, and then remove boot from inner socket.

CAUTION:

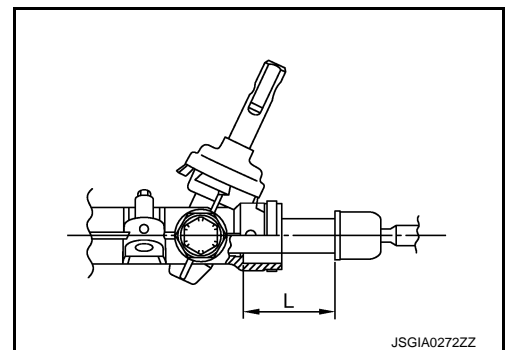
Never damage inner socket and gear housing assembly when removing boot. Inner socket and gear housing assembly must be replaced if inner socket and gear housing assembly are damaged because it may cause foreign material interfusion.

3. Remove inner socket from gear housing assembly.

ASSEMBLY

1. Install inner socket to gear housing assembly.
2. Apply recommended grease to gear housing assembly. Use Molywhite LSG (manufactured by Kyodo yushi) or equivalent.
3. Decide on the neutral position for the rack stroke (L).

Rack stroke neutral position (L) : Refer to [ST-28, "Steering Gear and Linkage"](#).

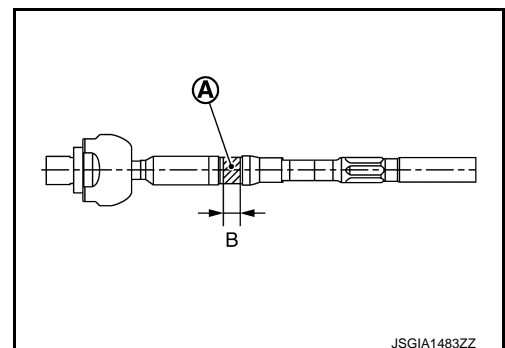


4. Apply recommended grease to inner socket (A). Use Renolit JP1619 or equivalent.

B 10 mm

NOTE:

Amount grease: 0.45 - 1.00 g (0.016 - 0.035 oz)



STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

5. Apply recommended grease to the boot mounting groove of gear housing assembly. Use Renolit JP1619 or equivalent.

NOTE:

Amount grease: 1.05 - 1.50 g (0.037 - 0.053 oz)

6. Install boot to gear housing assembly and inner socket.
7. Install the boot clamp (large diameter) as following.
 - After installing steering gear assembly to front suspension member, crimp it so that crimp part ⑥ is within ① range in the figure.

① 270°

③ 45°

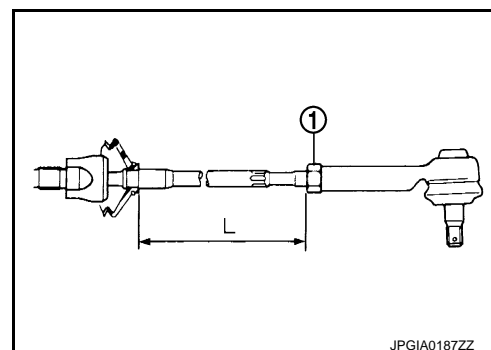
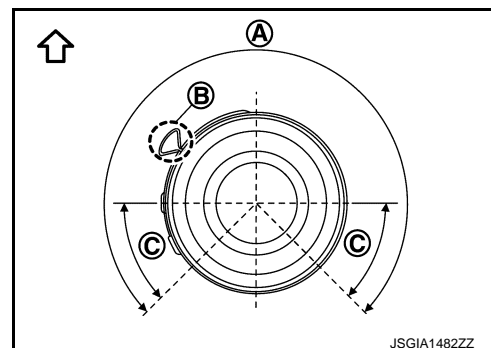
↖ : Vehicle upper

CAUTION:

Never crimp boot clamp beyond ① range.

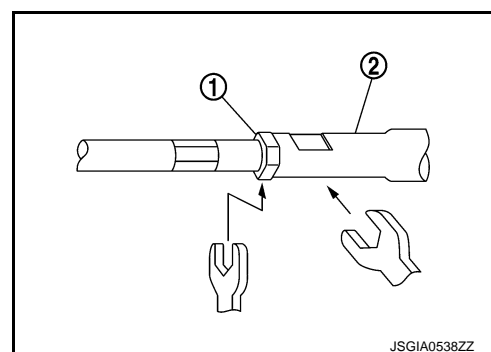
8. Install the boot clamp (Small diameter).
9. Adjust inner socket to standard length (L), and then tighten lock nut ① to the specified torque. Check length again after tightening lock nut.

L : Refer to [ST-28, "Steering Gear and Linkage"](#).



CAUTION:

- When tightening the lock nut ①, be sure to fix outer socket ② with a wrench or an equivalent to prevent the ball joint from getting contact with the knuckle.
- Adjust toe-in after this procedure. The length achieved after toe-in adjustment is not necessary the above value.



Inspection

INFOID:0000000010839345

INSPECTION AFTER INSTALLATION

Check the following items and replace, if necessary.

- Check if steering wheel turns smoothly when it is turned several times fully to the end of the left and right.
- 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 torque, and front wheel turning angle.
 - Steering wheel play: Refer to [ST-11, "Inspection"](#).
 - Neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to [ST-9, "Inspection"](#).
- Adjust neutral position of steering angle sensor. Refer to [BRC-99, "Work Procedure"](#).

INSPECTION AFTER DISASSEMBLY

Check the following items and replace, if necessary.

STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

Boot

Check boot for cracks, and replace it if a malfunction is detected.

Pinion Assembly

Check pinion gear for damage or wear, and replace it if a malfunction is detected.

Rack

Check rack for damage or wear, and replace it if a malfunction is detected.

Gear Housing Assembly

Check gear housing assembly for damage and scratches. 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

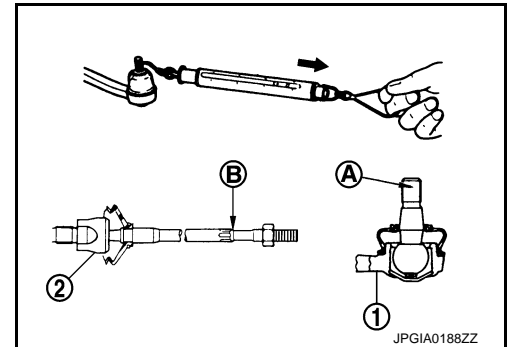
- Hook a spring balance at the point and pull the spring balance. Make sure that the spring balance reads the specified value when ball stud and inner socket start to move. Replace outer socket or steering gear assembly (inner socket) if they are outside the standard.

Measuring point

Outer socket ① : Ball stud upper side ①

Inner socket ② : Point ② shown in the figure

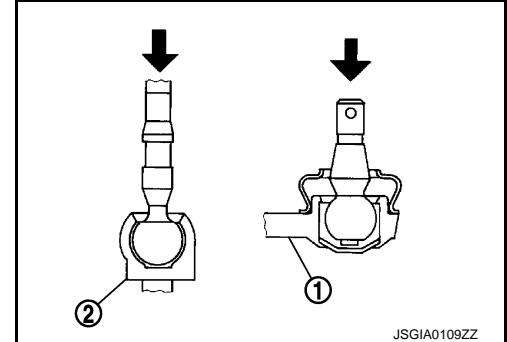
Swinging force : Refer to [ST-28, "Steering Gear and Linkage"](#).



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 or steering gear assembly (inner socket) ② if the measured value is outside the standard.

Axial end play : Refer to [ST-28, "Steering Gear and Linkage"](#).



SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Steering Wheel

INFOID:0000000010839346

Item	Standard
Steering wheel axial end play	0 mm (0 in)
Steering wheel play on the outer circumference	0 – 35 mm (0 – 1.38 in)
Steering wheel turning force	34 N (3.5 kg-f, 7.6 lb-f)
Rack sliding force	85 – 135 N (8.67 – 13.77 kg, 19.11 – 30.35 lb)

Steering Angle

INFOID:0000000010839347

Item		Standard
Inner wheel	Minimum	34° 00' (34.0°)
	Nominal	37° 00' (37.0°)
	Maximum	38° 00' (38.0°)
Outer wheel		31° 00' (31.0°)

Steering Column

INFOID:0000000010839348

Item	Standard
Steering column length*	463.7 mm (18.26 in)
Tilt operating range*	44 mm (1.73 in)
Telescopic operating range*	50 mm (1.97 in)
Rotating torque	0 – 2.2 N·m (0 – 0.22 kg-m, 0 – 19 in-lb)

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

Steering Gear and Linkage

INFOID:0000000010839349

Item		Standard
Rack stroke neutral position		74 mm (2.91 in)
Outer socket ball joint	Swing force* ① (Spring balance measurement)	0.3 – 2.9 N·m (0.03 – 0.29 kg-m, 3 – 25 in-lb)
	Axial end play	0.5 mm (0.020 in) or less
Inner socket ball joint	Swing force* ② (Spring balance measurement)	1.0 – 7.8 N·m (0.11 – 0.79 kg-m, 9 – 69 in-lb)
	Axial end play	0.2 mm (0.008 in) or less
Inner socket length		99.5 mm (3.917 in)

*: For measuring position, Refer to [ST-26, "Inspection"](#).