SECTION ST
STEERING SYSTEM

CONTENTS

PRECAUTION

PRECAUTIONS

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

INFOID:0000000012793859

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

WARNING:

Always observe the following items for preventing accidental activation.

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, it is recommended that all maintenance and repair be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper repair, 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.

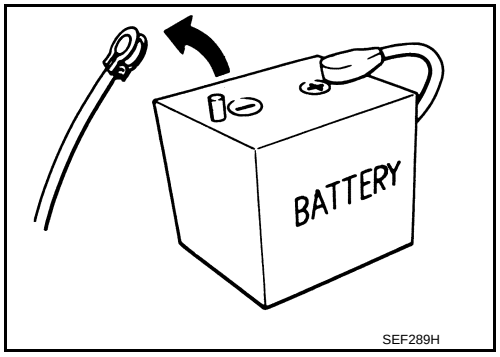
- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery or batteries, and wait at least 3 minutes before performing any service.**

Precautions for Removing Battery Terminal

INFOID:0000000013509484

When disconnecting the battery terminal, pay attention to the following.

- Always use a 12V battery as power source.
- Never disconnect battery terminal while engine is running.
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
- For vehicles with the engine listed below, remove the battery terminal after a lapse of the specified time:



BR08DE	: 4 minutes	V9X engine	: 4 minutes
D4D engine	: 20 minutes	YD25DDTi	: 2 minutes
HR09DET	: 12 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		

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.

- After high-load driving, if the vehicle is equipped with the V9X engine, turn the ignition switch OFF and wait for at least 15 minutes to remove the battery terminal.

NOTE:

- Turbocharger cooling pump may operate in a few minutes after the ignition switch is turned OFF.
- Example of high-load driving
  - Driving for 30 minutes or more at 140 km/h (86 MPH) or more.
  - Driving for 30 minutes or more on a steep slope.

- 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.

Precautions for Performing 2-wheel Drive Test

INFOID:0000000013509507

A vehicle with 2.2L diesel engine or 2.0L turbo gasoline engine of this model limits torque when a difference occurs in each wheel speed. For this reason, it is necessary to use Chassis Dynamometer Mode when performing the 2-wheel drive test (e.g. with 2-wheel chassis dynamometer, speedometer tester).
For Chassis Dynamometer Mode, refer to ENGINE >> ENGINE CONTROL SYSTEM >> BASIC INSPECTION >> CHASSIS DYNAMOMETER MODE >> Description.

Service Notice or Precautions for Steering System

INFOID:0000000012793861

- In case of removing steering gear assembly, make the final tightening with grounded and unloaded vehicle condition, and then check wheel alignment.
- Observe the following precautions when disassembling.
  - Before disassembly, thoroughly clean the outside of the unit.
  - Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
  - For easier and proper assembly, place disassembled parts in order on a parts rack.
  - Use nylon cloth or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.
  - Never reuse non-reusable parts.
  - Before assembling, apply the specified grease to the directed parts.

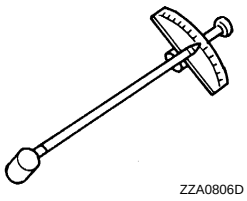
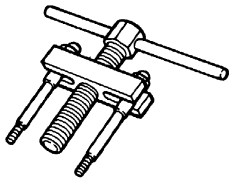
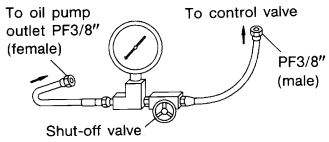
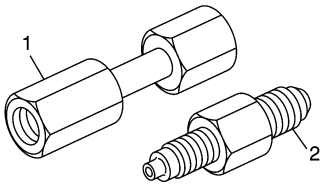
PREPARATION

PREPARATION

Special Service Tools

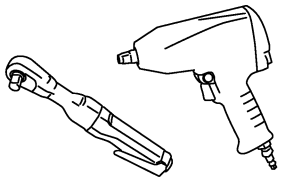
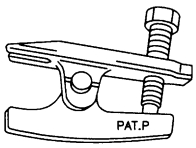
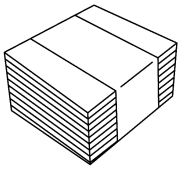
INFOID:0000000012793862

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

Tool number (TechMate No.) Tool name	Description
ST3127S000 (J-25765-A) Preload gauge  ZZA0806D	• Measuring steering column rotating torque • Measuring ball joint rotating torque
ST27180001 (J-25726-A) Steering wheel puller  ZZA0819D	Removing steering wheel
KV48103500 (J-26357) Oil pressure gauge  S-NT547	Measuring oil pump relief pressure
KV481059S0 (—) Adapter set 1. KV48105910 Adapter (female side) 2. KV48105920 Adapter (male side)  JPGIA0171ZZ	Measuring oil pump relief pressure

Commercial Service Tools

INFOID:0000000012793863

Tool name	Description
Power tool  PBIC0190E	Loosening bolts and nuts
Ball joint remover  S-NT146	Removing steering outer socket
Lint-free paper  JSDIA4746ZZ	Power steering oil pump disassembly

Lubricant or/and Sealant

INFOID:0000000012793864

Name	Description	Note
Genuine High Strength Thread Locking Sealant, Loctite 271 or equivalent	Steering gear assembly	—

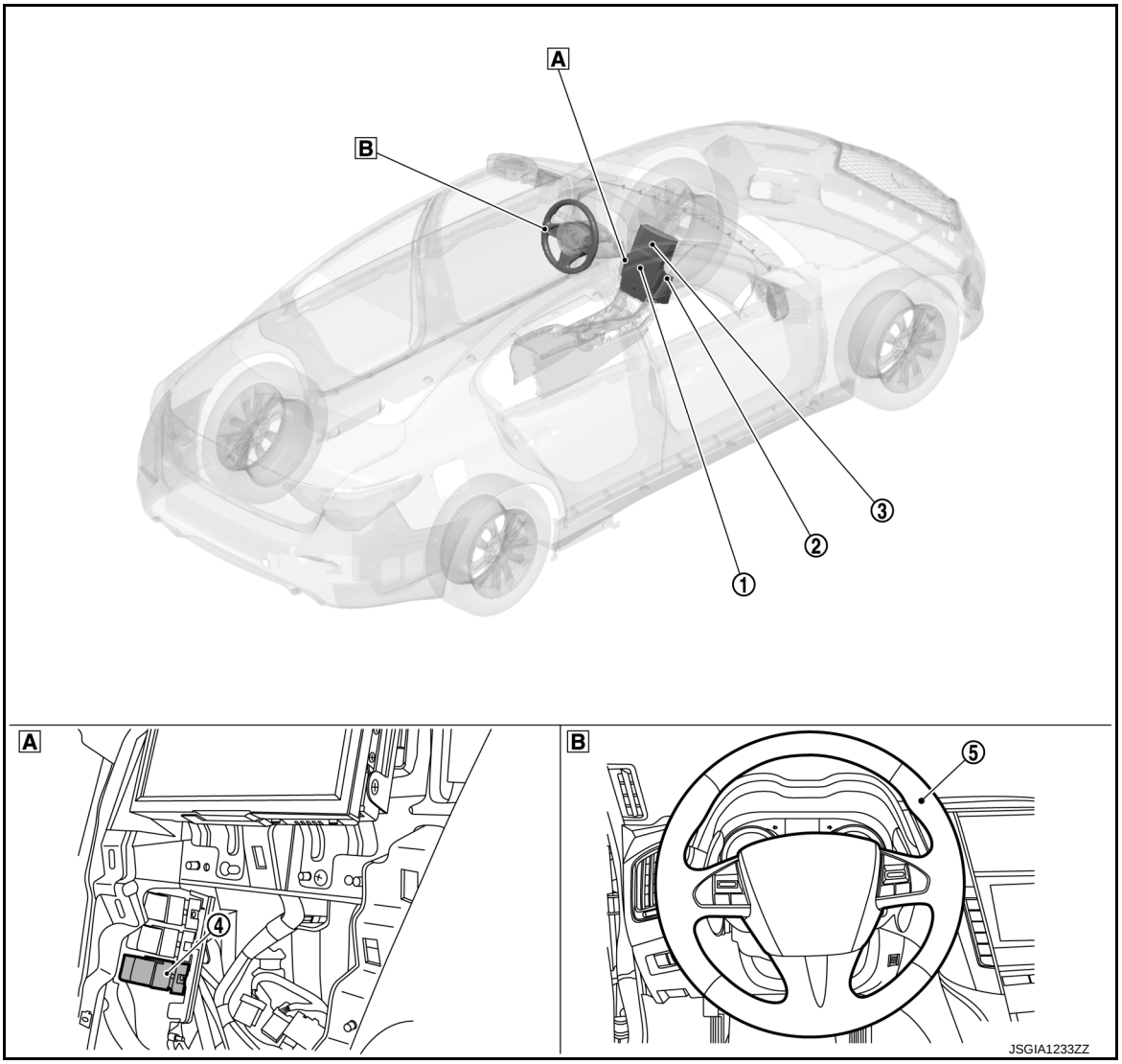
SYSTEM DESCRIPTION

COMPONENT PARTS

HEATED STEERING WHEEL SYSTEM

HEATED STEERING WHEEL SYSTEM : Component Parts Location

INFOID:0000000012793865



A At the back of integral switch B Steering wheel

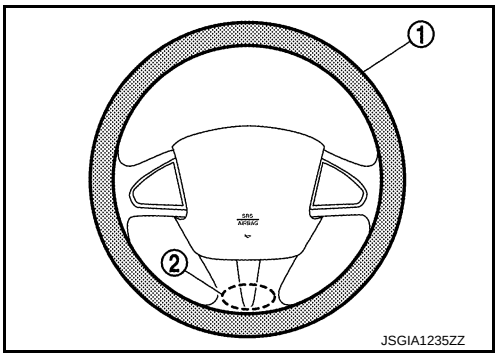
No.	Component	Function
①	Integral switch	• Changes the following settings according to the operation of the display part. - Steering heater function ON/OFF - Steering heater AUTO function ON/OFF • Transmits the following signals to display control unit via communication line. - Steering heater signal - Steering heater auto signal • Refer to AV-14, "Component Parts Location" for detailed installation location.
②	A/C auto amp.	• For the function, refer to ST-10, "HEATED STEERING WHEEL SYSTEM : A/C Auto Amp.". • Refer to HAC-6, "AUTOMATIC AIR CONDITIONING SYSTEM : Component Parts Location" for detailed installation location.
③	Display control unit	• Transmits the following signals received from integral switch to AC auto amp. via CAN communication. - Steering heater signal - Steering heater auto signal • Refer to AV-14, "Component Parts Location" for detailed installation location.
④	Heated steering wheel relay	ST-10, "HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel Relay"
⑤	Heated steering wheel	ST-10, "HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel"

HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel

INFOID:0000000012793866

With the power supply from the heated steering wheel relay, the heated steering wheel controls temperature through the heating element ① and thermostat ② built into the steering wheel.

- Heating element: Generates heat by energization.
  NOTE:
  Heating element is located at the back of the steering wheel leather surface.
- Thermostat: Turns ON/OFF power supply according to the specified temperature.



HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel Relay

INFOID:0000000012793867

Through the control of the A/C auto amp., the heated steering wheel relay turns ON/OFF electricity to the heating element built-in the steering wheel. For location, refer to ST-9, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

HEATED STEERING WHEEL SYSTEM : A/C Auto Amp.

INFOID:0000000012793868

- A/C auto amp. turns ON/OFF the heated steering wheel relay, according to a signal transmitted from display control unit by CAN communication.
- The A/C auto amp. includes a timer. The heated steering wheel relay is turned OFF when the timer operating time reaches 30 minutes.
- Timer: Turns ON/OFF the heated steering wheel relay for a specified period of time
- For other information of A/C auto amp., refer to HAC-15, "A/C Auto Amp.".

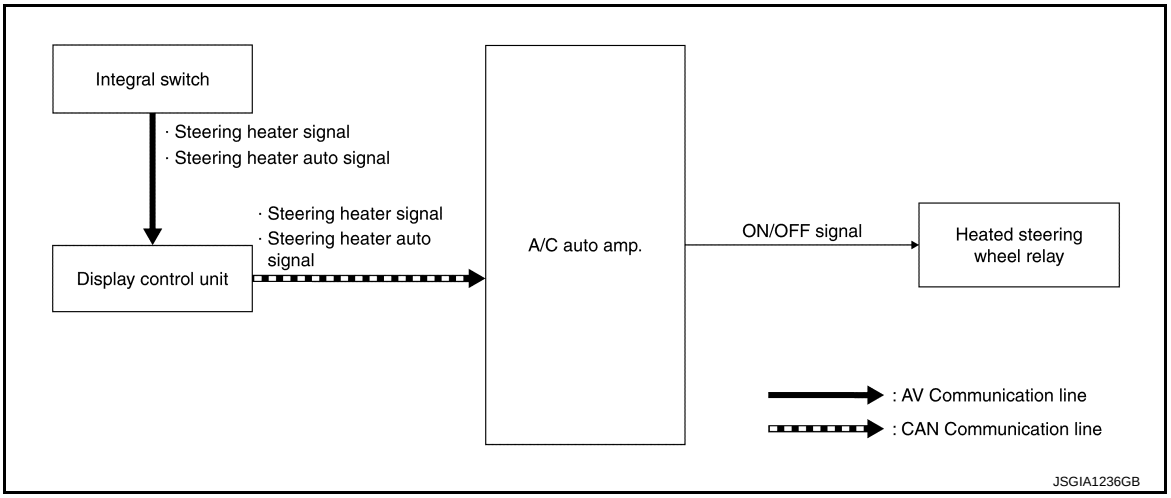
SYSTEM

HEATED STEERING WHEEL SYSTEM

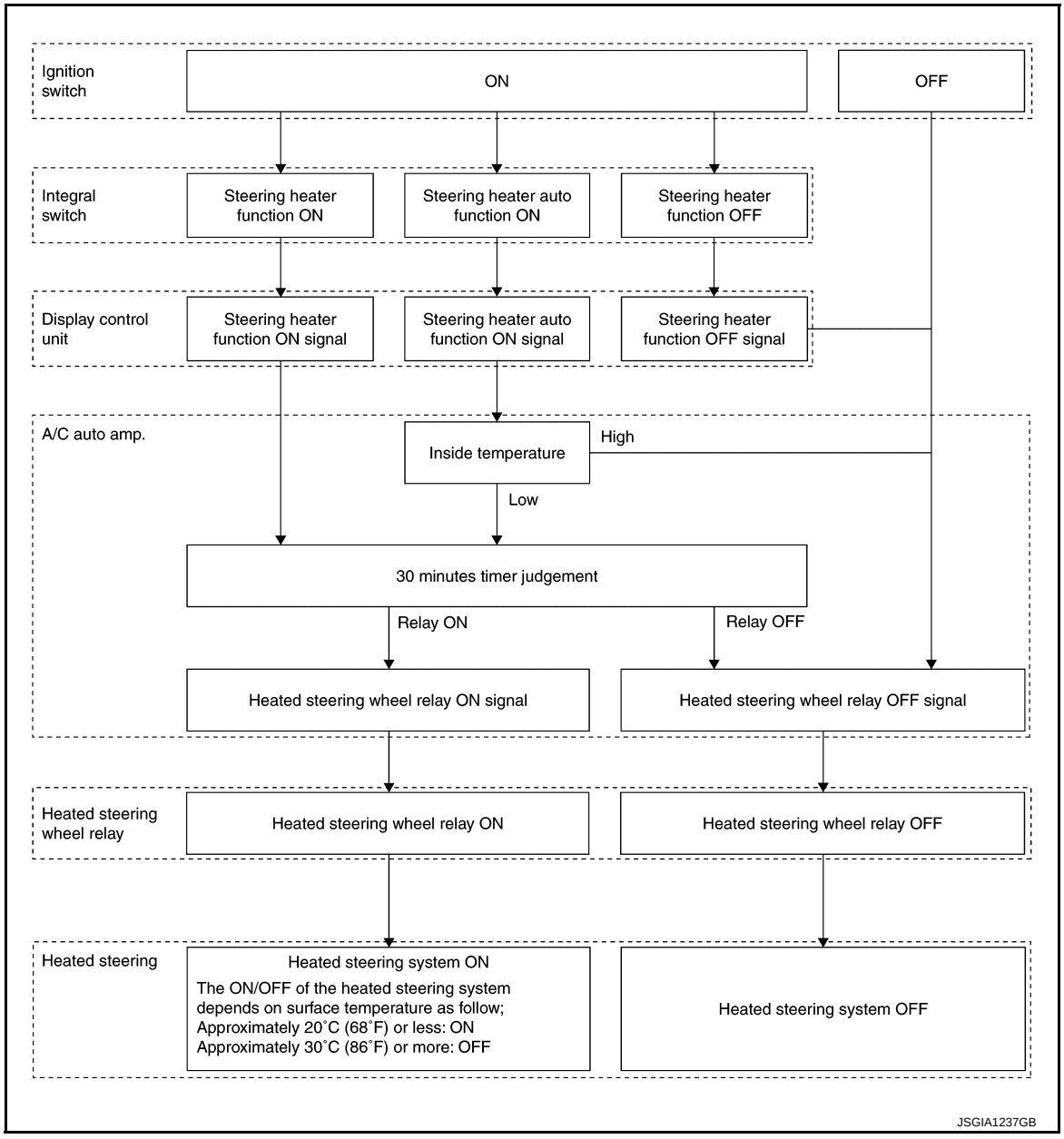
HEATED STEERING WHEEL SYSTEM : System Description

INFOID:0000000012793869

SYSTEM DIAGRAM



FUNCTION FLOW



DESCRIPTION

Normal Control

- The heated steering wheel system maintains the surface temperature of the steering wheel between 20°C (68°F) and 30°C (86°F).
- Once steering heater function turns ON on the integral switch display, A/C auto amp. that has received signal via display control unit turns the heated steering wheel relay ON and electrifies to the heat elements built-in the steering wheel to heat the steering wheel.
- When steering heater function turns OFF, A/C auto amp. turns OFF the heated steering wheel relay and stops the electricity supply to the heat elements.
- When the surface temperature of the steering wheel is higher than 30°C (86°F), the thermostat built-in the steering wheel turns OFF, and electricity to the heating element is turned OFF. When the surface temperature drops to less than 20°C (68°F), the thermostat built-in the steering wheel turns ON, and electricity to the heating element is turned ON.

Auto Control

- Once steering heater auto function turns ON on the integral switch display part, the steering heater switches to the auto control.

- Under the auto control, A/C auto amp. turns the heated steering wheel relay ON and electrifies the heat elements built in the steering wheel to heat the steering wheel when the temperature in the passenger room is low.
- After the heated steering wheel relay turns ON, the electricity to the heat element switches ON/OFF corresponding to the steering wheel surface temperature as well as under the normal control.
- If ON⇔OFF operation of “Steering Heater” is performed on the integral switch display, the auto control is cancelled.

Timer Function

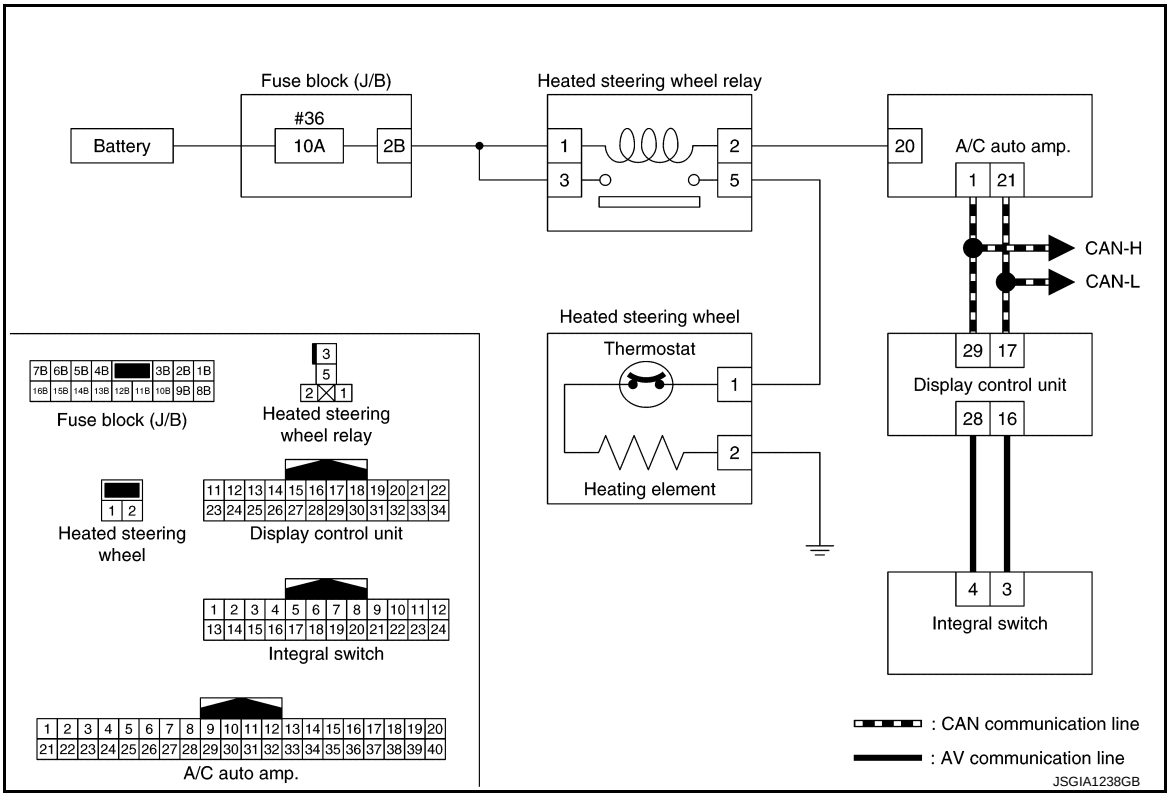
- The A/C auto amp. has a timer. After steering heater function or steering heater auto function turns ON, when operating time becomes more than the specified time (30 minutes), the A/C auto amp. turns OFF the heated steering wheel relay to stop heating.

Condition for Electrifying Heat Elements

Ignition switch	Timer function judgment result	Steering Heater Mode	Electrifying heat elements
ON	ON	Steering Heater ON	Turns ON/OFF corresponding to the steering wheel surface temperature.
		Steering Heater Auto ON	• Turns ON when the passenger room temperature is low. • Turns ON/OFF corresponding to the steering wheel surface temperature after electricity turns ON.
		• Steering Heater OFF • Steering Heater Auto OFF	OFF
	OFF	—	OFF
OFF	—	—	OFF

HEATED STEERING WHEEL SYSTEM : Circuit Diagram

INFOID:0000000012793870

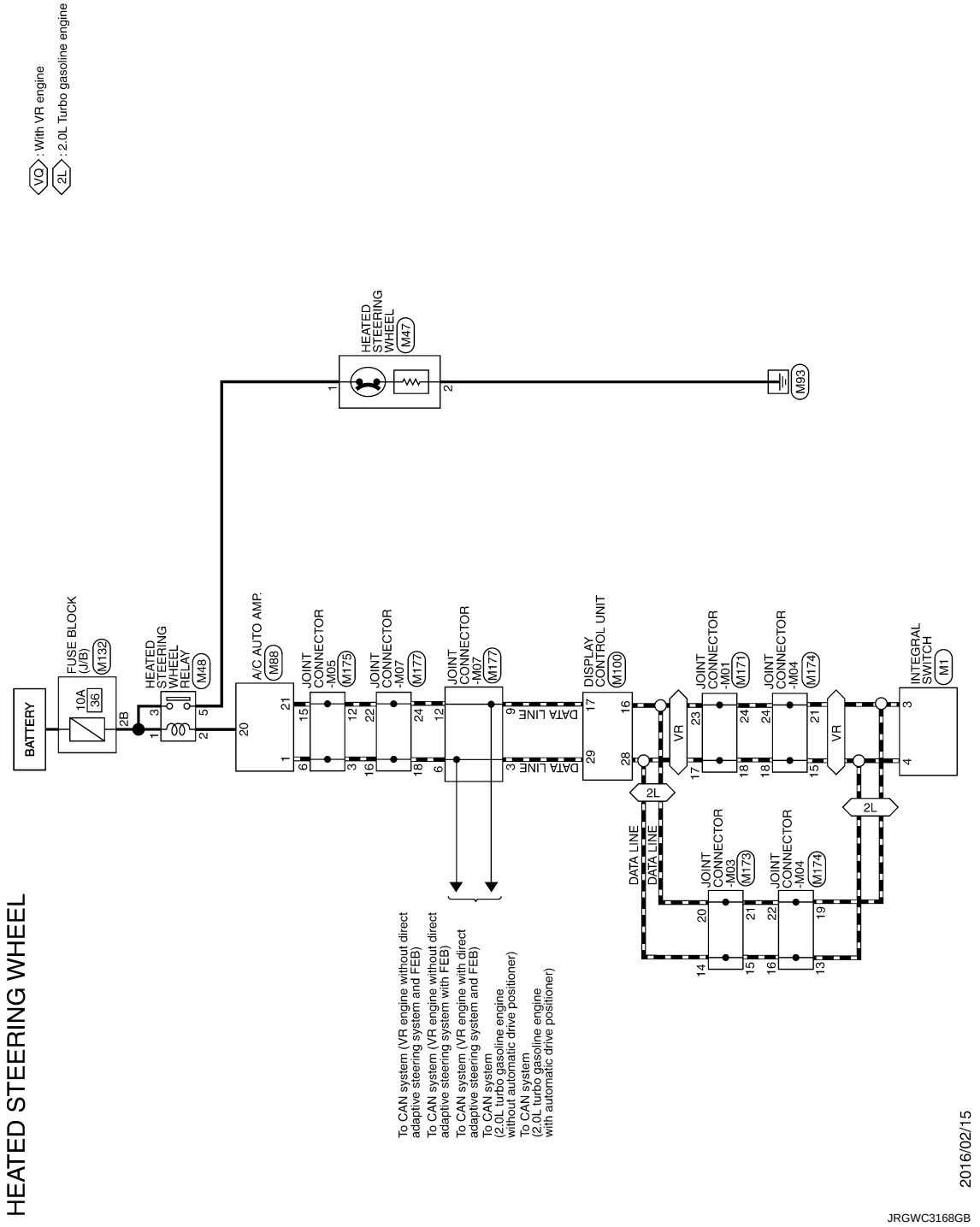


WIRING DIAGRAM

HEATED STEERING WHEEL

Wiring Diagram

INFOID:0000000012793871



HEATED STEERING WHEEL

Connector No.	M1
Connector Name	INTEGRAL SWITCH
Connector Type	TH24FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
2	R	ILLUMINATION SIGNAL
3	LG	AV COMM (L)
4	SB	AV COMM (H)
7	W/B	DISK EJECT SIGNAL
8	G	HAZERD SIGNAL
13	B	GND
14	SB	ACC [For 2.0L turbo gasoline engine]
14	V	ACC [For VR30 engine]
15	B	ILLUMINATION CONTROL SIGNAL
16	BG	DISK EJECT SIGNAL GROUND
18	R	IGN [For VR30 engine]
18	W	IGN [For 2.0L turbo gasoline engine]
19	BR	CAMERA SWITCH SIGNAL
20	LG	AIR BAG INDICATOR OFF SIGNAL

Connector No.	M47
Connector Name	HEATED STEERING WHEEL
Connector Type	NS02FW-CS

H.S.

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

Connector No.	M48
Connector Name	HEATED STEERING WHEEL RELAY
Connector Type	M502FL-M2-LC

H.S.

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

Connector No.	M88
Connector Name	A/C AUTO AMP.
Connector Type	TH40FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	CAN-H
2	B	GROUND
3	W	BATTERY POWER SUPPLY
7	G	AMBIENT SENSOR SIGNAL
9	R	SUNLOAD SENSOR SIGNAL
13	SB	ACC POWER SUPPLY [With 2.0L turbo gasoline engine]
13	V	ACC POWER SUPPLY [With VR30 engine]
16	P	LIN SIGNAL
17	R	DOOR MOTOR POWER SUPPLY
18	P	BLOWER MOTOR CONTROL SIGNAL
20	L	HEATED STEERING WHEEL RELAY CONTROL SIGNAL
21	P	CAN-L
22	B	GROUND
23	R	IGNITION POWER SUPPLY [With VR30 engine and with ISS]
23	W	IGNITION POWER SUPPLY [Except with VR30 engine and with ISS]

26	B	SENSOR GROUND
27	LG	IN-VEHICLE SENSOR SIGNAL
28	BR	INTAKE SENSOR SIGNAL
30	BG	EXHAUST GAS / OUTSIDE ODOR DETECTING SENSOR SIGNAL
37	B	GROUND
38	BG	IGNIZER (ON/OFF) CONTROL SIGNAL
40	BG	ECV CONTROL SIGNAL

Connector No.	M100
Connector Name	DISPLAY CONTROL UNIT
Connector Type	TH24FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
16	LG	AV COMM (L)
17	P	CAN-L
19	R	DIMMER SIGNAL
20	BR	REVERSE SIGNAL
22	B	GND
26	BR	CAMERA SWITCH SIGNAL
28	SB	AV COMM (H)
29	L	CAN-H
30	R	IGN [For VR30 engine]
30	W	IGN [For 2.0L turbo gasoline engine]
31	R	VEHICLE SPEED SIGNAL (8-PULSE)
33	SB	ACC [Except for VR30 engine and with ISS]
33	V	ACC [For VR30 engine and with ISS]
34	Y	BAT

Connector No.	M132
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS16FW-CS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
11B	LG	-
13B	P	-
14B	G	-
15B	Y	-
16B	Y	-
2B	B	-
4B	W	-
5B	R	-
9B	Y	-

Connector No.	M171
Connector Name	JOINT CONNECTOR-M01
Connector Type	24342_4GA2A

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	-
2	B	-
3	B	-
4	B	-
5	B	-
6	B	-
7	B	-
8	B	-
9	B	-
10	G	-

JRGWC3169GB

HEATED STEERING WHEEL

11	G	-
14	B	-
15	B	-
16	SB	- [With VR30 engine]
16	Y	- [With 2.0L turbo gasoline engine]
17	SB	- [With VR30 engine]
17	Y	- [With 2.0L turbo gasoline engine]
18	SB	- [With VR30 engine]
18	Y	- [With 2.0L turbo gasoline engine]
19	G	-
20	G	-
22	LG	- [With VR30 engine]
22	SB	- [With 2.0L turbo gasoline engine]
23	LG	- [With VR30 engine]
23	SB	- [With 2.0L turbo gasoline engine]
24	LG	- [With VR30 engine]
24	SB	- [With 2.0L turbo gasoline engine]

Connector No.	M173
Connector Name	JOINT CONNECTOR-M03
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1	
12	11	10	9	8	7	
18	17	16	15	14	13	
24	23	22	21	20	19	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	R	-
8	R	-
9	R	-
10	R	-
11	R	-
12	R	-
13	SB	-
14	SB	-
15	SB	-
16	L	- [With 2.0L turbo gasoline engine]
16	SB	- [With VR30 engine]

17	L	- [With 2.0L turbo gasoline engine]
17	SB	- [With VR30 engine]
18	L	- [With 2.0L turbo gasoline engine]
18	SB	- [With VR30 engine]
19	BR	- [With VR30 engine]
19	LG	- [With 2.0L turbo gasoline engine]
20	BR	- [With VR30 engine]
20	LG	- [With 2.0L turbo gasoline engine]
21	BR	- [With VR30 engine]
21	LG	- [With 2.0L turbo gasoline engine]
22	R	- [With 2.0L turbo gasoline engine]
22	SB	- [With VR30 engine and without ISS]
22	V	- [With VR30 engine and with ISS]
23	R	- [With 2.0L turbo gasoline engine]
23	SB	- [With VR30 engine and without ISS]
23	V	- [With VR30 engine and with ISS]
24	R	- [With 2.0L turbo gasoline engine]
24	SB	- [With VR30 engine and without ISS]
24	V	- [With VR30 engine and with ISS]

Connector No.	M174
Connector Name	JOINT CONNECTOR-M04
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1	
12	11	10	9	8	7	
18	17	16	15	14	13	
24	23	22	21	20	19	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	Y	-
8	Y	-
9	Y	-
10	Y	-
11	Y	-
12	Y	-
13	SB	-
14	SB	-
15	SB	-

16	SB	-
17	SB	-
18	SB	-
19	LG	-
20	LG	-
21	LG	-
22	LG	-
23	LG	-
24	LG	-

Connector No.	M175
Connector Name	JOINT CONNECTOR-M05
Connector Type	NH20FL-DC

H.S.

		8	7	6	5	4	3	2	1	
20	19	17	16	15	14	13	12	11	10	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	L	-
8	L	-
10	P	-
11	P	-
12	P	-
13	P	-
14	P	-
15	P	-
16	P	- [With VR30 engine]
16	R	- [With 2.0L turbo gasoline engine]
17	P	- [With VR30 engine]
17	R	- [With 2.0L turbo gasoline engine]
19	R	- [With VR30 engine and with ISS]
19	W	- [Except with VR30 engine and with ISS]
20	R	- [With VR30 engine and with ISS]
20	W	- [Except with VR30 engine and with ISS]

Connector No.	M177
Connector Name	JOINT CONNECTOR-M07
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1	
12	11	10	9	8	7	
18	17	16	15	14	13	
24	23	22	21	20	19	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	P	-
8	P	-
9	P	-
10	P	-
11	P	-
12	P	-
13	L	-
14	L	-
15	L	-
16	L	-
17	L	-
18	L	-
19	W	-
20	W	-
21	W	-
22	P	-
23	P	-
24	P	-

JRGWC3170GB

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow (Heated Steering Wheel)

INFOID:0000000012793872

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.

CAUTION:

Customers are not professional. Never guess easily like “maybe the customer means that...,” or “maybe the customer mentions this symptom”.

>> 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 “DTC/CIRCUIT DIAGNOSIS”

Perform the diagnosis with “DTC/circuit 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.

STEERING WHEEL

Inspection

INFOID:0000000013466854

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-28, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-54, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (AWD).
3. Set the 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.

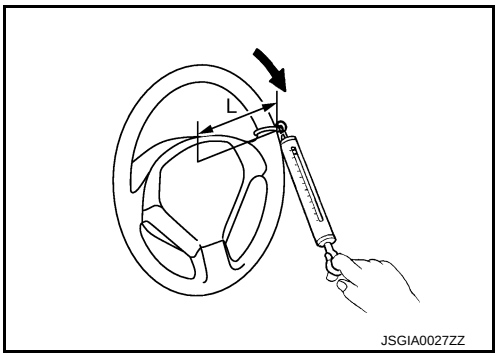
   CAUTION:
   If the adjustment is performed by using the inner socket, check wheel alignment after the adjustment. Refer to FSU-28, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-54, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (AWD).

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-82, "Tire Air Pressure".
3. Start engine.
4. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

   Steering wheel turning force : Refer to ST-55, "Steering Wheel".

   L : 185 mm (7.28 in)

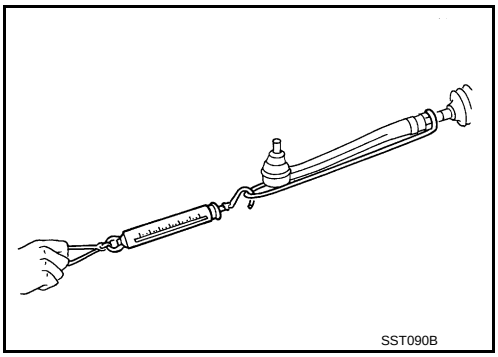


RACK SLIDING FORCE

1. Disconnect lower joint from steering gear assembly. Refer to ST-40, "Removal and Installation".
2. Disconnect steering outer socket from steering knuckle. Refer to ST-45, "Removal and Installation".
3. Run the engine at idle and adjust the reservoir tank oil temperature to room temperature [recommended oil temperature: approximately 55°C (131°F)].
4. 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-56, "Steering Gear And Linkage".

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

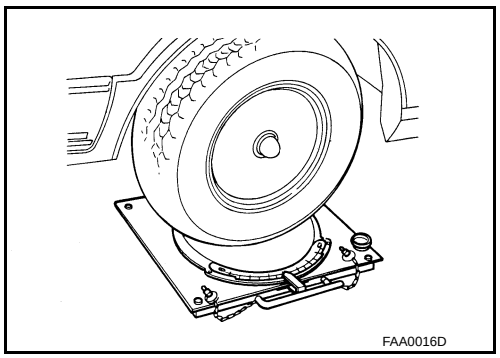


FRONT WHEEL TURNING ANGLE

1. Perform toe-in inspection. Refer to FSU-28, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-54, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (AWD).

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

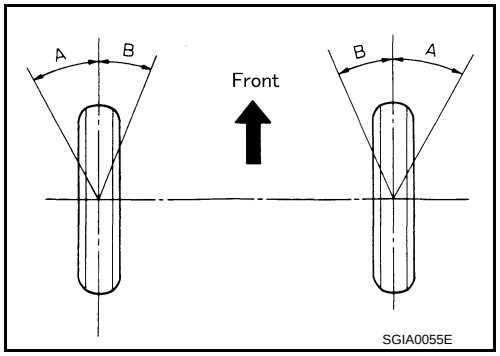
2. Place front wheels on turning radius gauges and rear wheels on stands, so that vehicle can be level.
3. Check the maximum inner and outer wheel turning angles for LH and RH road wheels.



- Start the engine, and turn steering wheel from full left stop to full right stop and measure the turning angles (maximum inner wheel steering angle and maximum outer wheel steering angle).

A : Inner wheel angle
B : Outer wheel angle

Steering angle : Refer to ST-55, "Steering Angle".

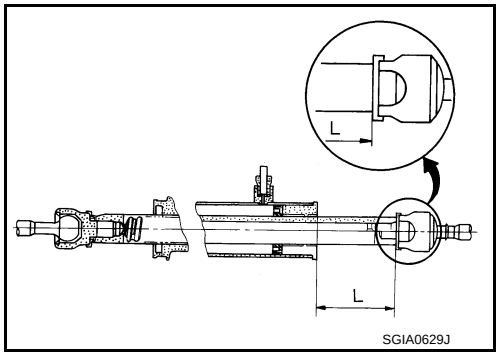


- Check the following items when turning angle is out of the standard.

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

Rack stroke neutral position (L) : Refer to ST-56, "Steering Gear And Linkage".

- 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.



DTC/CIRCUIT DIAGNOSIS

HEATED STEERING WHEEL SYSTEM

Component Function Check

INFOID:0000000012793874

1.CHECK HEATED STEERING WHEEL SYSTEM

Check operate heated steering wheel system. Refer to ST-11, "HEATED STEERING WHEEL SYSTEM : System Description".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ST-20, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000012793875

1.CHECK HEATED STEERING WHEEL POWER SUPPLY

1. Switch heated steering mode to ON.
2. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	5	—	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.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 3.
NO >> Replace heated steering wheel relay. Refer to ST-9, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

3.CHECK HEATED STEERING WHEEL RELAY POWER SUPPLY

1. Turn the ignition switch OFF.
2. Disconnect heated steering wheel relay harness connector.
3. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	1	—	Battery voltage
	3		

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.CHECK HEATED STEERING WHEEL RELAY CIRCUIT (1)

1. Check 10A fuse (#36).
2. Disconnect fuse block (J/B) harness connector.

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

Heated steering wheel relay		Fuse block (J/B)		Continuity
Connector	Terminal	Connector	Terminal	
M48	1	M132	2B	Existed
	3			

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

Heated steering wheel relay		Ground	Continuity
Connector	Terminal	—	
M48	1	Ground	Not existed
	3		

Is the inspection result normal?

YES >> Perform trouble diagnosis for battery power supply circuit.
NO >> Repair or replace error-detected parts.

5. CHECK HEATED STEERING WHEEL RELAY CIRCUIT (2)

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector terminal and A/C auto amp. harness connector terminal.

Heated steering wheel relay		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M48	2	M88	20	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	2	Ground	Not existed

Is the inspection result normal?

YES >> Repair or replace A/C auto amp.. Refer to HAC-137, "Removal and Installation".
NO >> Repair or replace error-detected parts.

6. CHECK HEATED STEERING WHEEL CIRCUIT

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector and heated steering wheel harness connector.

Heated steering wheel relay		Heated steering wheel		Continuity
Connector	Terminal	Connector	Terminal	
M48	5	M47	1	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	5	Ground	Not existed

Is the inspection result normal?

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

7. CHECK HEATED STEERING WHEEL

Check heated steering wheel. Refer to ST-22, "Component Inspection (Heated Steering Wheel)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated steering wheel. Refer to ST-32, "Removal and Installation".

8.CHECK GROUND CIRCUIT

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

Heated steering wheel		—	Continuity
Connector	Terminal		
M47	2	Ground	Existed

Is the inspection result normal?

YES >> Check the intermittent incident. Refer to GI-45, "Intermittent Incident".
NO >> Repair or replace damaged parts.

Component Inspection (Heated Steering Wheel)

INFOID:0000000012793876

1.CHECK HEATED STEERING WHEEL CONTINUITY

1. Turn ignition switch OFF.
2. Remove the heated steering wheel. Refer to ST-32, "Removal and Installation".
3. Check continuity between heated steering wheel harness connector terminal and ground.

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°F) or more	Not existed

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace heated steering wheel. Refer to ST-32, "Removal and Installation".

2.CHECK HEATED STEERING WHEEL RESISTANCE

Check resistance between heated steering wheel connector terminals.

Heated steering wheel	Condition	Resistance
Terminal		
1 – 2	Leather surface temperature of 20°C (68°F)	1.7 – 2.17 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated steering wheel. Refer to ST-32, "Removal and Installation".

Component Inspection (Heated Steering Wheel Relay)

INFOID:0000000012793877

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.**
- **To prevent damage, always observe the correct polarity.**
- **Prevent short-circuit.**

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-9, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

SYMPTOM DIAGNOSIS

HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

Description

INFOID:0000000012793878

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

Diagnosis Procedure

INFOID:0000000012793879

1.CHECK HEATED STEERING WHEEL POWER SUPPLY

1. Switch heated steering mode to ON.
2. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	5	—	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.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 3.
NO >> Replace heated steering wheel relay. Refer to ST-9, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

3.CHECK HEATED STEERING WHEEL RELAY POWER SUPPLY

1. Turn the ignition switch OFF.
2. Disconnect heated steering wheel relay harness connector.
3. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	1	—	Battery voltage
	3		

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.CHECK HEATED STEERING WHEEL RELAY CIRCUIT (1)

1. Check 10A fuse (#36).
2. Disconnect fuse block (J/B) harness connector.
3. Check continuity between heated steering wheel relay harness connector terminal and fuse block (J/B) harness connector terminal.

Heated steering wheel relay		Fuse block (J/B)		Continuity
Connector	Terminal	Connector	Terminal	
M48	1	M132	2B	Existed
	3			

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

Heated steering wheel relay		Ground	Continuity
Connector	Terminal	—	
M48	1	Ground	Not existed
	3		

Is the inspection result normal?

YES >> Perform trouble diagnosis for battery power supply circuit.
NO >> Repair or replace error-detected parts.

5. CHECK HEATED STEERING WHEEL RELAY CIRCUIT (2)

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector terminal and A/C auto amp. harness connector terminal.

Heated steering wheel relay		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M48	2	M88	20	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	2	Ground	Not existed

Is the inspection result normal?

YES >> Repair or replace A/C auto amp.. Refer to HAC-137, "Removal and Installation".
NO >> Repair or replace error-detected parts.

6. CHECK HEATED STEERING WHEEL CIRCUIT

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector and heated steering wheel harness connector.

Heated steering wheel relay		Heated steering wheel		Continuity
Connector	Terminal	Connector	Terminal	
M48	5	M47	1	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	5	Ground	Not existed

Is the inspection result normal?

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

7. CHECK HEATED STEERING WHEEL

Check heated steering wheel. Refer to ST-22, "Component Inspection (Heated Steering Wheel)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated steering wheel. Refer to ST-32, "Removal and Installation".

8. CHECK GROUND CIRCUIT

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

Heated steering wheel		—	Continuity
Connector	Terminal		
M47	2	Ground	Existed

Is the inspection result normal?

YES >> Check the intermittent incident. Refer to GI-45, "Intermittent Incident".
NO >> Repair or replace damaged parts.

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

INFOID:0000000012793880

WITHOUT ELECTRIC MOTOR

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

		Reference	ST-29, "Inspection"	ST-29, "Inspection"	ST-48, "Inspection"	ST-48, "Inspection"	ST-48, "Inspection"	ST-29, "Inspection"	ST-31, "Inspection"	ST-18, "Inspection"	—	—	ST-44, "Exploded View"	ST-34, "WITHOUT ELECTRIC MOTOR : Inspection"	ST-33, "WITHOUT ELECTRIC MOTOR : Exploded View"	ST-44, "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 RAX section.	NVH in BR section.
		Possible cause and SUSPECTED PARTS	Fluid level	Air in hydraulic system	Outer/inner socket ball joint swinging torque	Outer/inner socket ball joint rotating torque	Outer/inner socket ball joint end play	Steering fluid leakage	Steering wheel play	Steering gear rack sliding force	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
Symptom	Steering	Noise	×	×	×	×	×	×	×	×	—	—	—	×	×	—	×	×	×	×	×	×	×
		Shake	—	—	—	—	—	—	—	—	×	×	×	—	—	—	×	—	×	×	×	×	×
		Vibration	—	—	—	—	—	—	—	—	×	×	×	×	×	—	×	—	×	×	—	×	—
		Shimmy	—	—	—	—	—	—	—	—	×	—	×	—	—	×	—	—	×	×	×	—	×
		Judder	—	—	—	—	—	—	—	—	—	×	×	—	—	×	—	—	×	×	×	—	×

×: Applicable, —: Not applicable

WITH ELECTRIC MOTOR

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

			Reference	Fluid level	Air in hydraulic system	Outer/inner socket ball joint swinging torque	Outer/inner socket ball joint rotating torque	Outer/inner socket ball joint end play	Steering fluid leakage	Steering wheel play	Steering gear rack sliding force	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
			Possible cause and SUSPECTED PARTS	Fluid level	Air in hydraulic system	Outer/inner socket ball joint swinging torque	Outer/inner socket ball joint rotating torque	Outer/inner socket ball joint end play	Steering fluid leakage	Steering wheel play	Steering gear rack sliding force	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
Symptom	Steering	Noise		×	×	×	×	×	×	×	×	—	—	—	×	×	—	×	×	×	×	×	×	×
		Shake		—	—	—	—	—	—	—	—	×	×	×	—	—	—	×	×	×	×	×	×	×
		Vibration		—	—	—	—	—	—	—	—	×	×	×	×	×	—	×	×	×	×	—	×	—
		Shimmy		—	—	—	—	—	—	—	—	×	—	×	—	—	×	—	—	×	×	×	—	×
		Judder		—	—	—	—	—	—	—	—	—	×	×	—	—	×	—	—	×	×	×	—	×

×: Applicable, —: Not applicable

PERIODIC MAINTENANCE

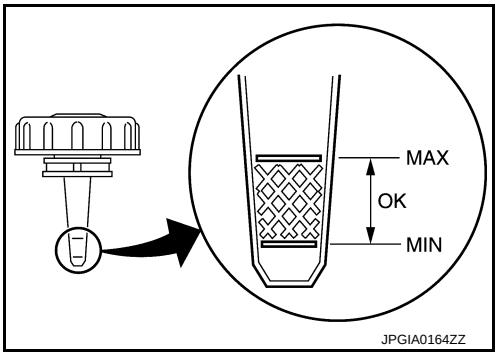
POWER STEERING FLUID

Inspection

INFOID:0000000012793881

FLUID LEVEL

With the engine stopped, check that the fluid level is between MIN and MAX of the reservoir cap level gauge when the fluid temperature is in COLD state.



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

Recommended fluid : Refer to MA-20, "Recommeded Fluids and Lubricants".

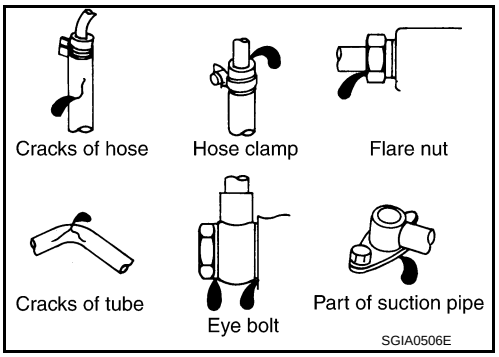
Fluid capacity : Refer to ST-55, "General Specifications".

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-20, "Recommeded Fluids and Lubricants".**

FLUID LEAKAGE

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



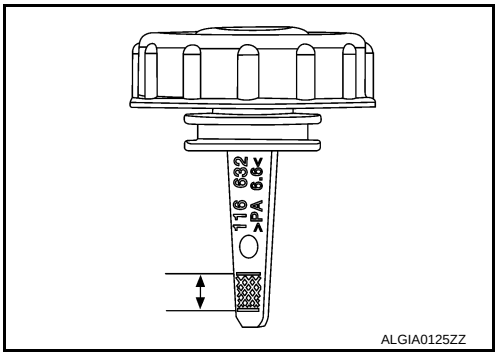
1. Run the engine at idle and adjust the reservoir tank oil temperature to room temperature [recommended oil temperature: approximately 20°C (68°F)].
2. Turn steering wheel several times from full left stop to full right stop.
3. Hold steering wheel at each lock position for five seconds and carefully 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 leaks from the joint, loosen the joint part and retighten it, being careful not to damage it.
   CAUTION:
   For tightening torque and non reusable parts, refer to ST-54, "Exploded View".
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 leaked from steering gear.

AIR BLEEDING HYDRAULIC SYSTEM

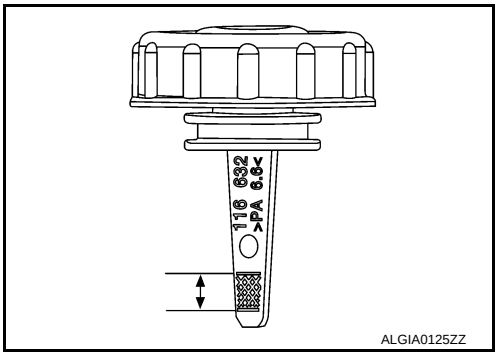
If air bleeding is not complete, excessive noise in the power steering oil pump will be present.

1. Make sure engine is off.
2. Turn the steering wheel from the full right stop position and then to full left stop position several times. Repeat until bubbles are no longer being generated in the reservoir.

3. When the power steering fluid level lowers, refill the reservoir.
CAUTION:
Never allow the power steering fluid level to drop below the hatching area.



4. Repeat steps one and two until the power steering fluid level stabilizes.
5. Start the engine and run at idle.
6. Turn the steering wheel from the full right stop position and then to full left stop position several times. Repeat until bubbles or fluid discoloration are no longer being generated in the reservoir.
7. When the power steering fluid level lowers, refill the reservoir.
8. Stop the engine.
9. Verify proper power steering fluid level. Power steering fluid level should be between the hatching area of the indicator on the power steering reservoir tank cap.



STEERING WHEEL

Inspection

INFOID:0000000012793882

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-55, "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-33, "WITHOUT ELECTRIC MOTOR : Exploded View" (without electric motor), ST-36, "WITH ELECTRIC MOTOR : Exploded View" (with electric motor).
   - Check steering gear assembly mounting condition for looseness. Refer to ST-44, "Exploded View".

STEERING WHEEL PLAY

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

Steering wheel play : Refer to ST-55, "Steering Wheel".

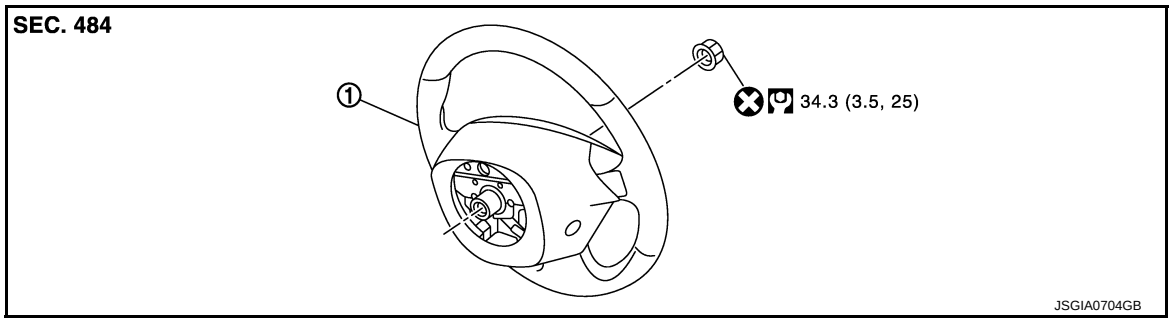
4. Check the following items when steering wheel play is out of the standard.
   - Check backlash for each joint of steering column assembly.
   - Check installation condition of steering gear assembly.

REMOVAL AND INSTALLATION

STEERING WHEEL

Exploded View

INFOID:0000000012793883



① Steering wheel

: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

Removal and Installation

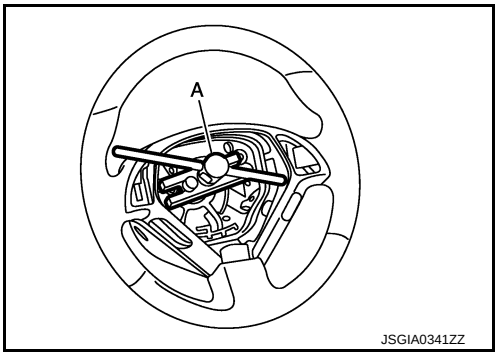
INFOID:0000000012793884

REMOVAL

NOTE:

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

1. Set the vehicle to the straight-ahead position.
2. Remove driver air bag module. Refer to SR-17, "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.

CAUTION:

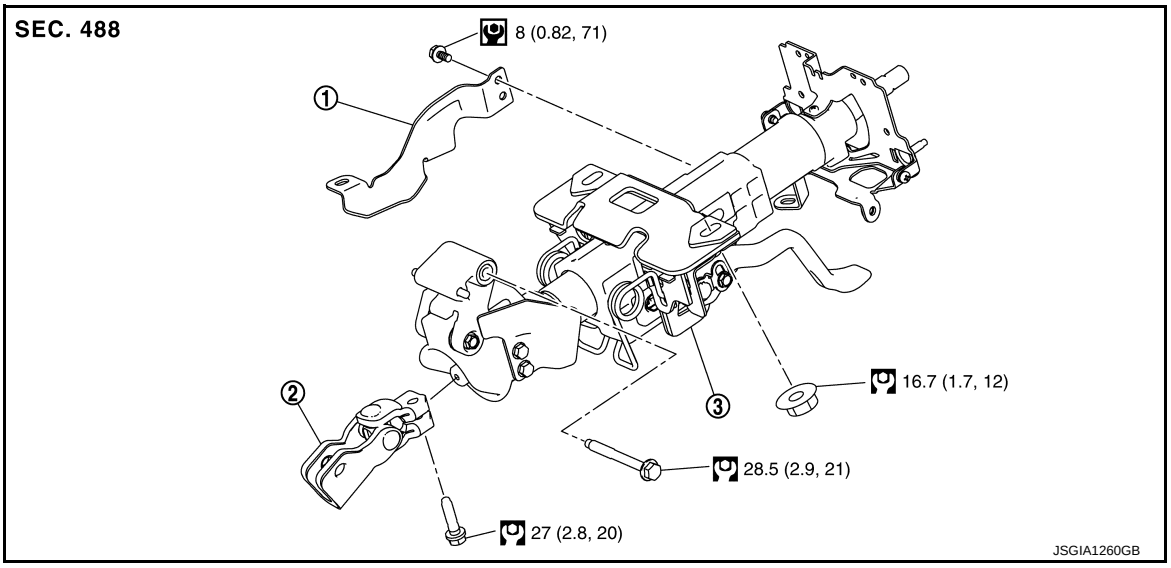
Never reuse steering wheel lock nut.

- Check the spiral cable neutral position after replacing or rotating spiral cable. Refer to SR-22, "Removal and Installation".
  CAUTION:
  Never twist spiral cable freely on excessively after it becomes tight (doing so may cause the cable to tear off).

STEERING COLUMN
WITHOUT ELECTRIC MOTOR

WITHOUT ELECTRIC MOTOR : Exploded View

INFOID:0000000013466781



① Harness bracket ② Upper joint ③ Steering column assembly

: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

WITHOUT ELECTRIC MOTOR : Removal and Installation

INFOID:0000000013466782

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.**
- **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.**
- **To prevent a malfunction and deformation from occurring in the tilt mechanism, never apply excessive force to the tilt lever.**

1. Set the vehicle to the straight-ahead position.
2. Place the tilt to the highest level, and place telescopic to the longest level.
   CAUTION:
   Securely lock the tilt telescopic lever.
3. Remove driver air bag module. Refer to SR-17, "Removal and Installation".
4. Remove steering wheel. Refer to ST-32, "Removal and Installation".
5. Remove instrument lower panel. Refer to IP-13, "Removal and Installation".
6. Remove the steering column cover. Refer to IP-13, "Removal and Installation".
7. Remove spiral cable. Refer to SR-22, "Removal and Installation".
8. Remove combination switch. Refer to BCS-100, "Removal and Installation".
9. Disconnect each switch harness connectors installed to steering column assembly.
10. Remove upper joint mounting bolt and nut (steering shaft side).
11. Separate the upper joint from steering shaft. Refer to ST-40, "Removal and Installation".
    CAUTION:
    - **Place a matching mark on both steering shaft and upper joint before removing steering shaft.**

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

12. Remove steering column assembly.
CAUTION:
When removing the mounting, be careful not to drop the steering column assembly.
13. If necessary, remove upper joint and bracket.
14. Perform inspection after removal. Refer to ST-34, "WITHOUT ELECTRIC MOTOR : Inspection".

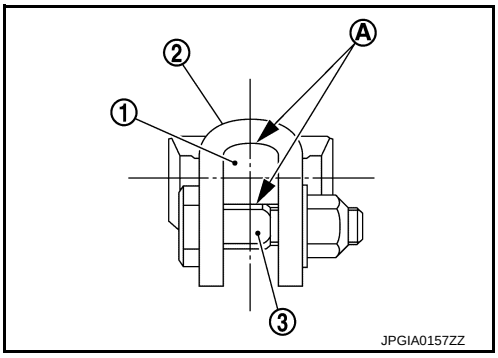
INSTALLATION

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

CAUTION:

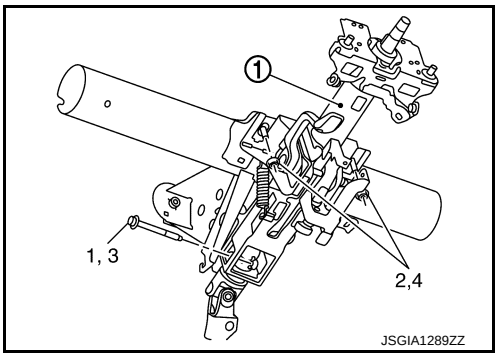
- **Never impact on the axis when removing steering column assembly.**
- **While removing the steering column assembly, never move the steering gear.**
- When installing steering shaft to upper joint, follow the procedure listed below.

- To tighten upper joint mounting nut (steering shaft side), manually tighten the bolt to check for scoring or galling before tightening the nut to the specified torque.
CAUTION:
Never reuse nut.
- After installation, check that there is no clearance Ⓐ between steering shaft ① and upper joint yoke ② and between steering shaft and mounting bolt ③.



- When installing the steering column assembly ①, temporarily tighten the bolt and nuts before tightening to the specified torque, referring to the tightening method and the numerical order shown below:

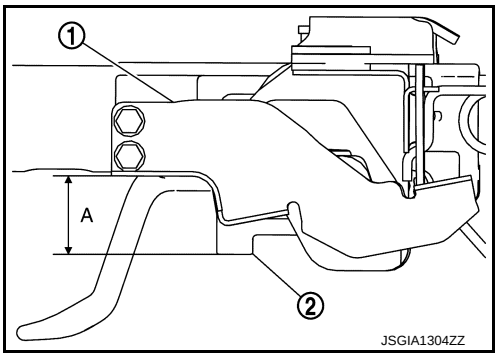
Temporary tightening	1 → 2
Final tightening (Specified torque)	3 → 4



- Install the bracket ① so that its end face become parallel to steering column assembly ② end face.

A : 34 mm (1.34 in)

- Perform inspection after installation. Refer to ST-34, "WITHOUT ELECTRIC MOTOR : Inspection".



WITHOUT ELECTRIC MOTOR : Inspection

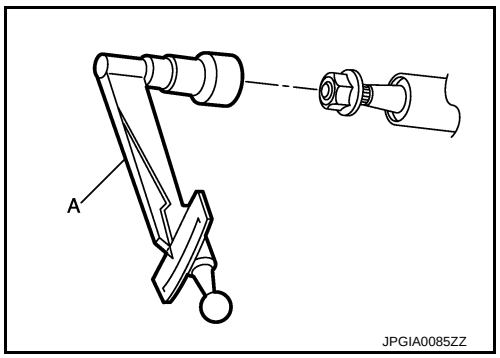
INFOID:0000000013466783

INSPECTION AFTER REMOVAL

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

- 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-55, "Steering Column".

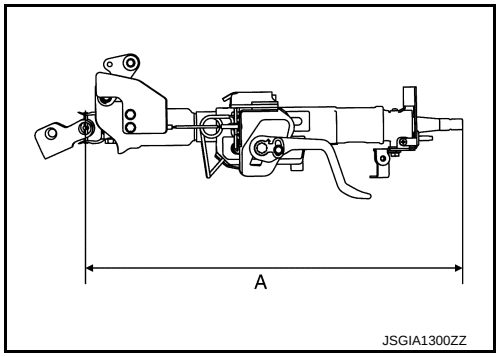


- Check the following item, if vehicle has been involved in a minor collision. Replace steering column assembly if outside the standard.

- Check the length (A) shown in the figure.

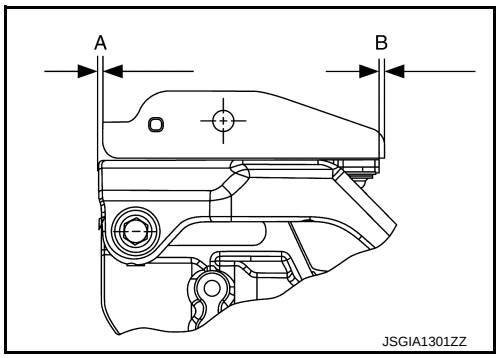
CAUTION:
Set the telescopic mechanism to its maximum length to measure the length of steering column.

Steering column length (A) : Refer to ST-55, "Steering Column".

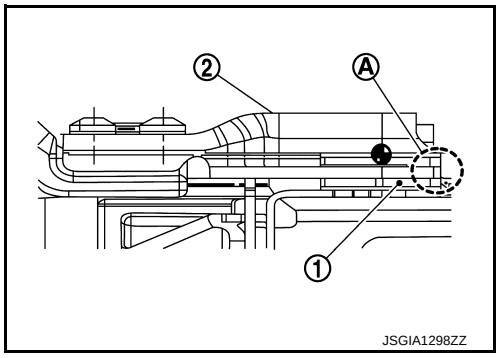


- Check the dimension (A) and (B) shown in the figure.

Impact displacement absorption part dimension (A) and (B) : Refer to ST-55, "Steering Column".



- Check that there is not the gap and unmatching in part Ⓐ between slide block ① and upper bracket ②.



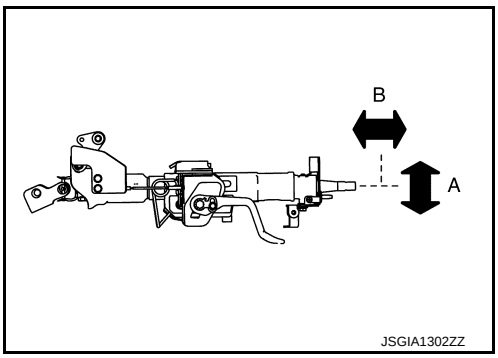
INSPECTION AFTER INSTALLATION

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Check that there is no malfunction, such as unusual steering feel or interference when operating tilt and telescopic.

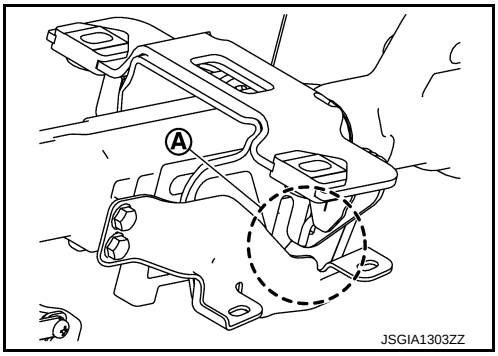
- Check tilt and telescopic mechanism operating range “A”, “B” as shown in the figure.

Tilt operating range (A) **: Refer to ST-55, "Steering Column".**

Telescopic operating range (B) **: Refer to ST-55, "Steering Column".**



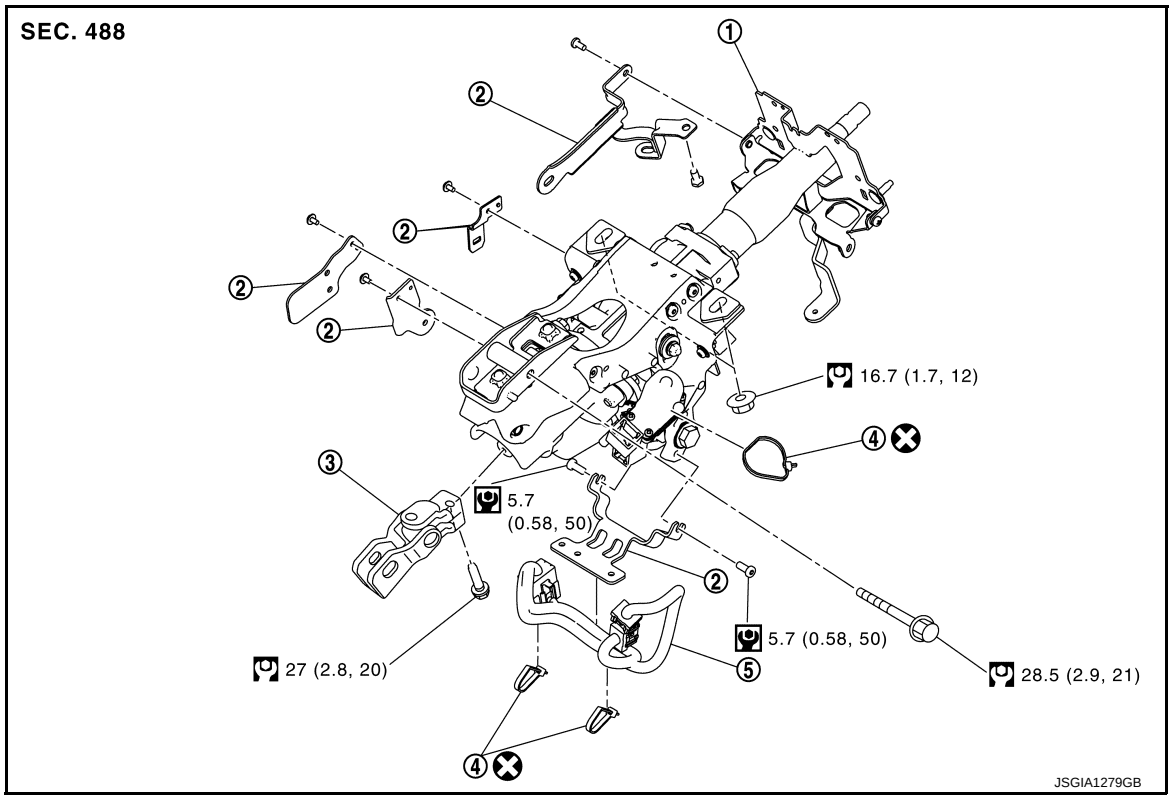
- When operating tilt and telescopic mechanism, check that there is not interference in part Ⓐ.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning torque, and front wheel turning angle.
- Steering wheel play: Refer to ST-31, "Inspection".
- neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-18, "Inspection".
- Adjust neutral position of steering angle sensor. Refer to BRC-91, "Description".



WITH ELECTRIC MOTOR

WITH ELECTRIC MOTOR : Exploded View

INFOID:0000000013466784



① Steering column assembly ② bracket ③ Upper joint
④ Band ⑤ Harness
⊗: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

WITH ELECTRIC MOTOR : Removal and Installation

INFOID:0000000013466785

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.**
- **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.**
- **To prevent a malfunction and deformation from occurring in the tilt mechanism, never apply excessive force to the tilt lever.**

1. Set the vehicle to the straight-ahead position.
2. Place the tilt to the highest level, and place the telescopic to the longest level.
3. Remove driver air bag module. Refer to SR-17, "Removal and Installation".
4. Remove steering wheel. Refer to ST-32, "Removal and Installation".
5. Remove instrument lower panel. Refer to IP-13, "Removal and Installation".
6. Remove the steering column cover. Refer to IP-13, "Removal and Installation".
7. Remove spiral cable. Refer to SR-22, "Removal and Installation".
8. Remove combination switch. Refer to BCS-100, "Removal and Installation".
9. Disconnect each switch harness connectors installed to steering column assembly.
10. Remove upper joint mounting bolt and nut (steering shaft side).
11. Separate the upper joint from steeringshaft. Refer to ST-40, "Removal and Installation".
    CAUTION:
    - **Place a matching mark on both steering shaft and upper joint before removing steering shaft.**
    - **When removing upper joint, never insert a tool, such as a screwdriver, into the yoke groove to pull out the upper joint. In case of the violation of the above, replace upper joint with a new one.**
12. Remove steering column assembly.
    CAUTION:
    When removing the mounting, be careful not to drop the steering column assembly.
13. If necessary, remove upper joint, harness, band, and brackets.
14. Perform inspection after removal. Refer to ST-38, "WITH ELECTRIC MOTOR : Inspection".

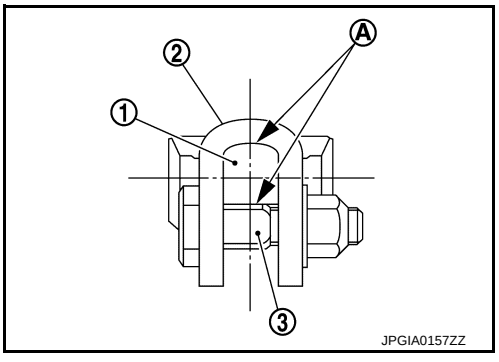
INSTALLATION

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

CAUTION:

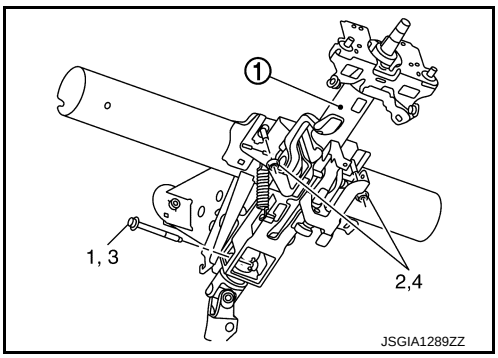
- **Never impact on the axis when removing steering column assembly.**
- **While removing the steering column assembly, never move the steering gear.**
- When installing steering shaft to upper joint, follow the procedure listed below.

- To tighten upper joint mounting nut (steering shaft side), manually tighten the bolt to check for scoring or galling before tightening the nut to the specified torque.
  CAUTION:
  Never reuse nut.
- After installation, check that there is no clearance Ⓐ between steering shaft ① and upper joint yoke ② and between steering shaft and mounting bolt ③.



- When installing the steering column assembly ①, temporarily tighten the bolt and nuts before tightening to the specified torque, referring to the tightening method and the numerical order shown below:

Temporary tightening	1 → 2
Final tightening (Specified torque)	3 → 4



- Perform inspection after installation. Refer to ST-38, "WITH ELECTRIC MOTOR : Inspection".

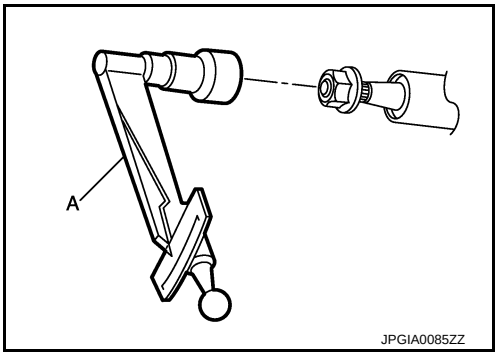
WITH ELECTRIC MOTOR : Inspection

INFOID:0000000013466786

INSPECTION AFTER REMOVAL

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- 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-55, "Steering Column".

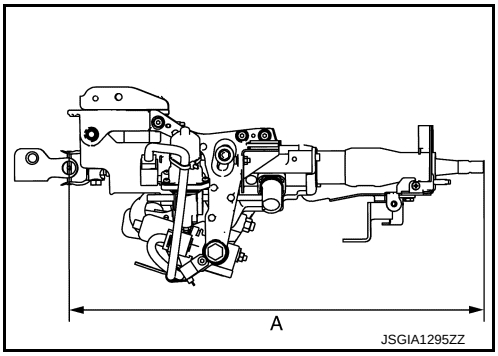


- Check the following item, if vehicle has been involved in a minor collision. Replace steering column assembly if outside the standard.

- Check the length (A) shown in the figure.

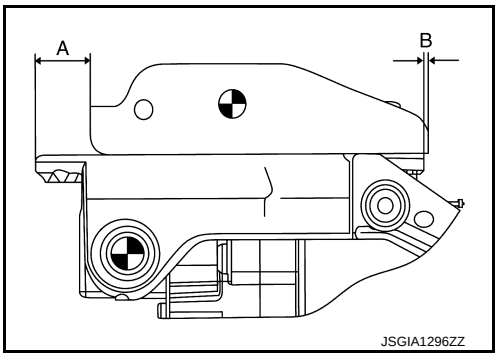
CAUTION:
Set the telescopic mechanism to its maximum length to measure the length of steering column.

Steering column length (A) : Refer to ST-55, "Steering Column".



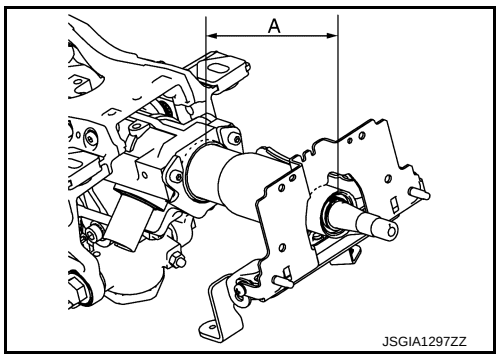
- Check the dimension “A” and “B” shown in the figure.

Impact displacement absorption part dimension (A) and (B) : Refer to ST-55, "Steering Column".



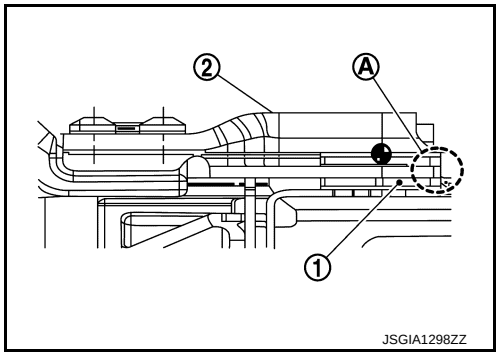
- Check the dimension (A) shown in the figure.

Impact displacement absorption part dimension (A) : **Refer to ST-55, "Steering Column".**



- Check that there is not the gap and unmatching in part Ⓐ between slide block ① and upper bracket ②.

Impact displacement absorption part dimension (A) and (B) : **Refer to ST-55, "Steering Column".**

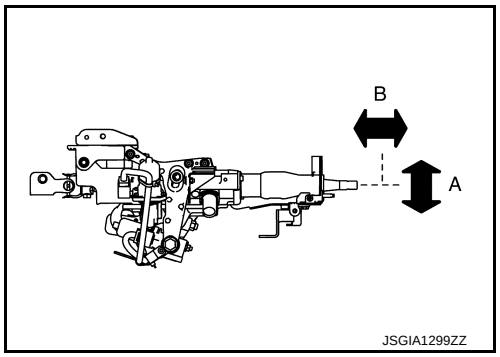


INSPECTION AFTER INSTALLATION

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Check that there is no malfunction, such as unusual steering feel or interference when operating tilt and telescopic.
- Check tilt and telescopic mechanism operating range (A), (B) as shown in the figure.

Tilt operating range (A) : **Refer to ST-55, "Steering Column".**

Telescopic operating range (B) : **Refer to ST-55, "Steering Column".**

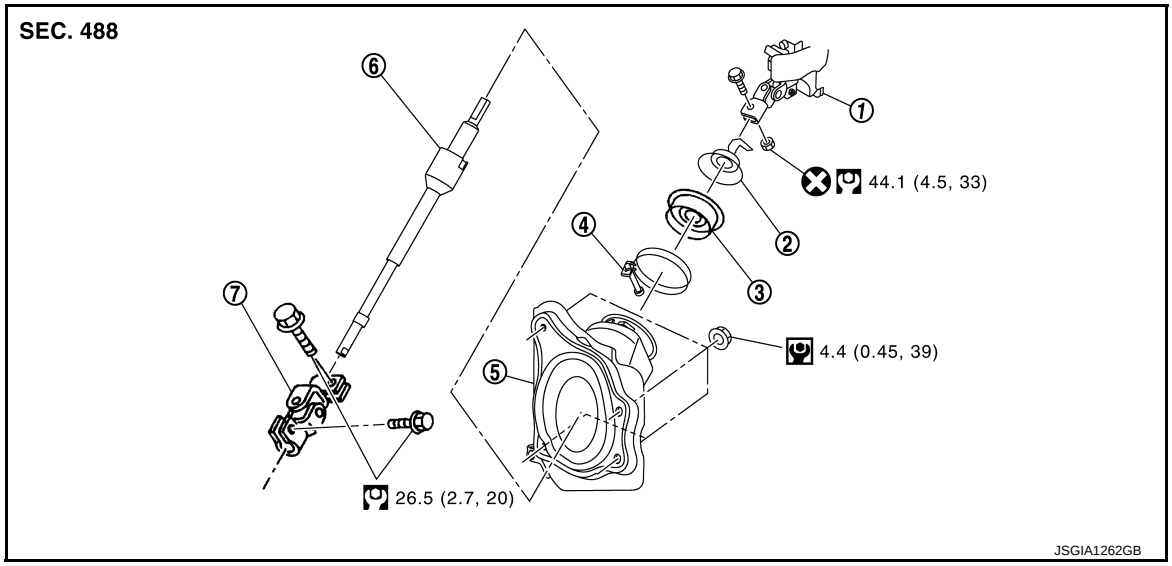


- Check the steering wheel play, neutral position steering wheel, steering wheel turning torque, and front wheel turning angle.
- Steering wheel play: Refer to ST-31, "Inspection".
- neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-18, "Inspection".
- Adjust neutral position of steering angle sensor. Refer to BRC-91, "Description".

STEERING SHAFT

Exploded View

INFOID:0000000012793888



① Steering column assembly ② Collar ③ Hole cover seal
④ Clamp ⑤ Hole cover ⑥ Steering shaft
⑦ Lower joint

: Always replace after every disassembly.
: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)

Removal and Installation

INFOID:0000000012793889

REMOVAL

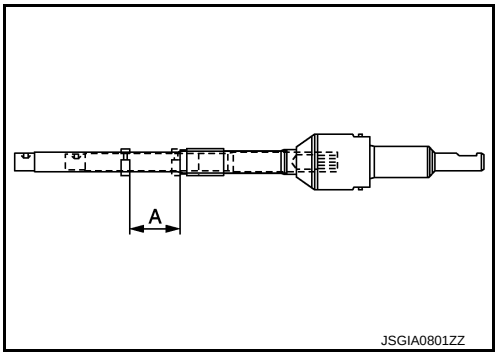
CAUTION:

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. Fix the steering wheel.
3. Remove lower joint mounting bolt (steering gear side).
4. Separate the lower joint from the steering gear assembly by sliding the slide shaft (A: sliding range).

   CAUTION:

   - **Place a matching mark on both lower joint and steering gear assembly before removing lower joint.**
   - **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.**



5. Remove the hole cover mounting nuts.
6. Remove upper joint mounting bolt and nut (steering shaft side).

   CAUTION:

   - **Never damage collar.**
   - **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.**
7. Remove the steering shaft and hole cover.

8. Remove hole cover seal and, clamp and collar.
9. Perform inspection after removal. Refer to ST-42, "Inspection".

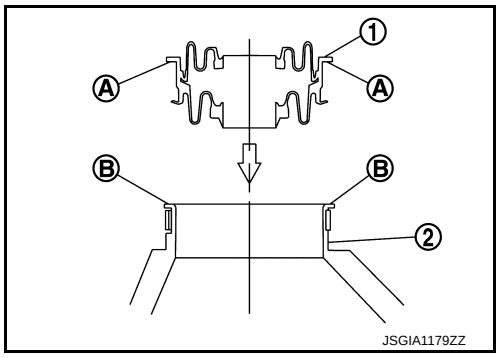
INSTALLATION

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.

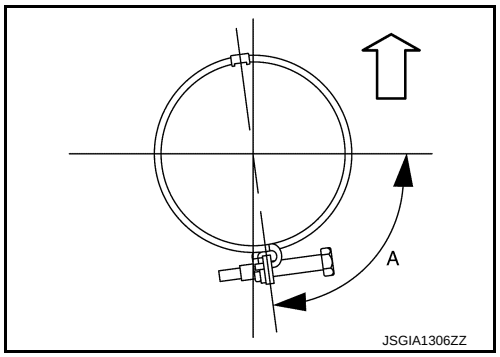
- When installing hole cover seal ① to hole cover ②, Insert hole cover seal end face Ⓐ until contacts hole cover end face Ⓑ.
- Never damage seal lip when inserting hole cover seal to steering shaft.



- Install clamp as shown in the figure.

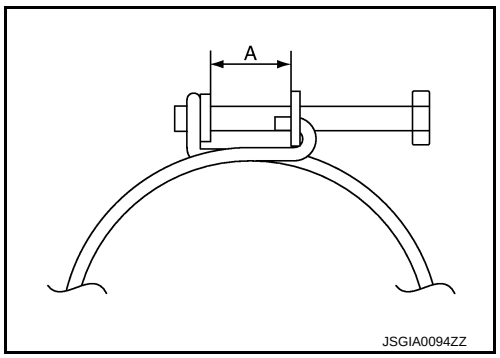
A : 76 – 86°

⇦ : Vehicle upper



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

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



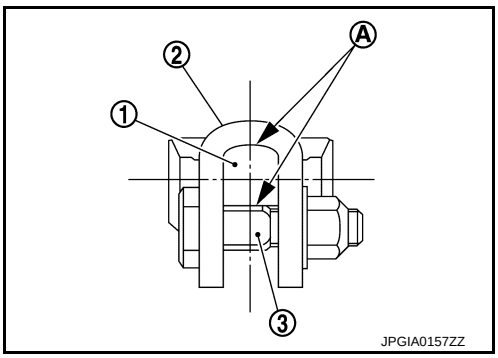
- For upper joint mounting bolt direction, refer to ST-40, "Exploded View". (Do not insert it from the other side.)
- When installing steering shaft to upper joint, follow the procedure listed below.

- To tighten upper joint mounting nut (steering shaft side), manually tighten the bolt to check for scoring or galling before tightening the bold to the specified torque.

CAUTION:

Never reuse upper joint mounting nut (steering shaft side).

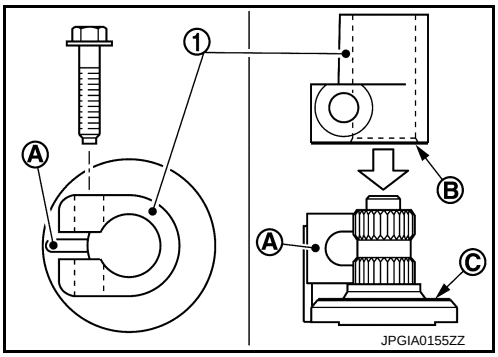
- After installation, check that there is no clearance Ⓐ between steering shaft ① and upper joint yoke ② and between steering shaft and mounting bolt ③.



- When installing lower joint to steering gear assembly, follow the procedure listed below.

- Align slit of lower joint ① with rear cover cap projection Ⓐ, insert lower joint end face Ⓑ until contacts steering gear assembly end face Ⓒ.
- When tightening the lower joint mounting bolt (steering shaft side), manually tighten the bolt and check that there is no hook and scratch. Check that the bolt is properly placed in the groove of the steering gear assembly before tightening the bolt to the specified torque.

- Perform inspection after installation. Refer to ST-42, "Inspection".



Inspection

INFOID:0000000012793890

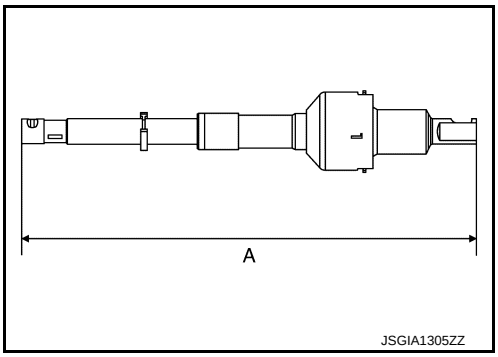
INSPECTION AFTER REMOVAL

Check the following items and replace, if necessary.

- Check hole cover and hole cover seal for damage or other malfunctions.
- Check steering shaft for damage or other malfunctions.
- Check the length (A) of the steering shaft.

CAUTION:
Check the length extended position of the steering shaft.

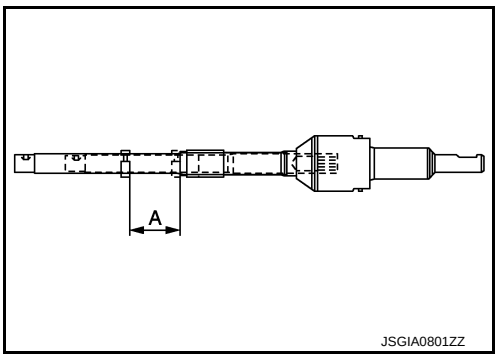
Shaft length (A) : Refer to ST-55, "Steering Shaft".



- Check the sliding range (A) of the steering shaft.

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

Shaft sliding range (A) : Refer to ST-55, "Steering Shaft".



INSPECTION AFTER INSTALLATION

Check the following items and replace, if necessary.

- Check hole cover and hole cover seal for damage or other malfunctions.
- Check steering shaft for damage or other malfunctions.

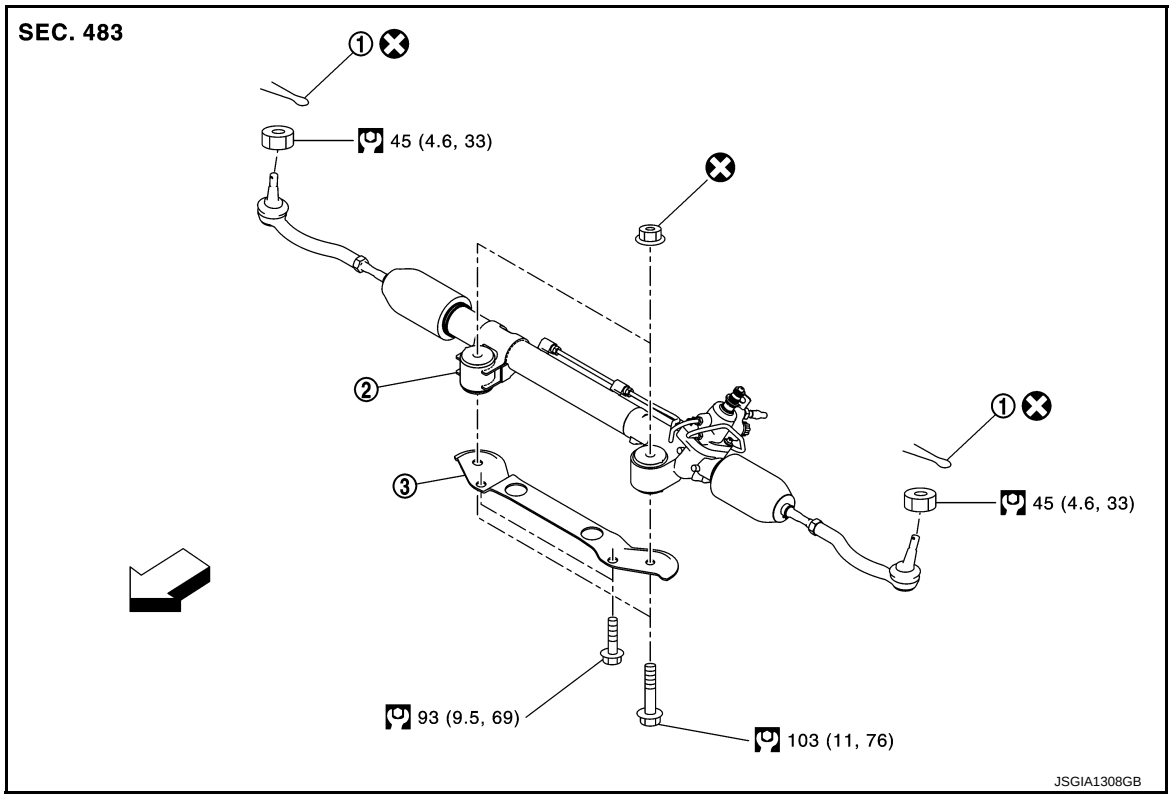
- Check if steering wheel turns smoothly when it is turned several times fully to the end of the left and right.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning torque, and front wheel turning angle.
  - Steering wheel play: Refer to ST-31, "Inspection".
  - neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-18, "Inspection".
- Adjust neutral position of steering angle sensor. Refer to BRC-91, "Description".

STEERING GEAR AND LINKAGE

Exploded View

INFOID:0000000013466588

REMOVAL



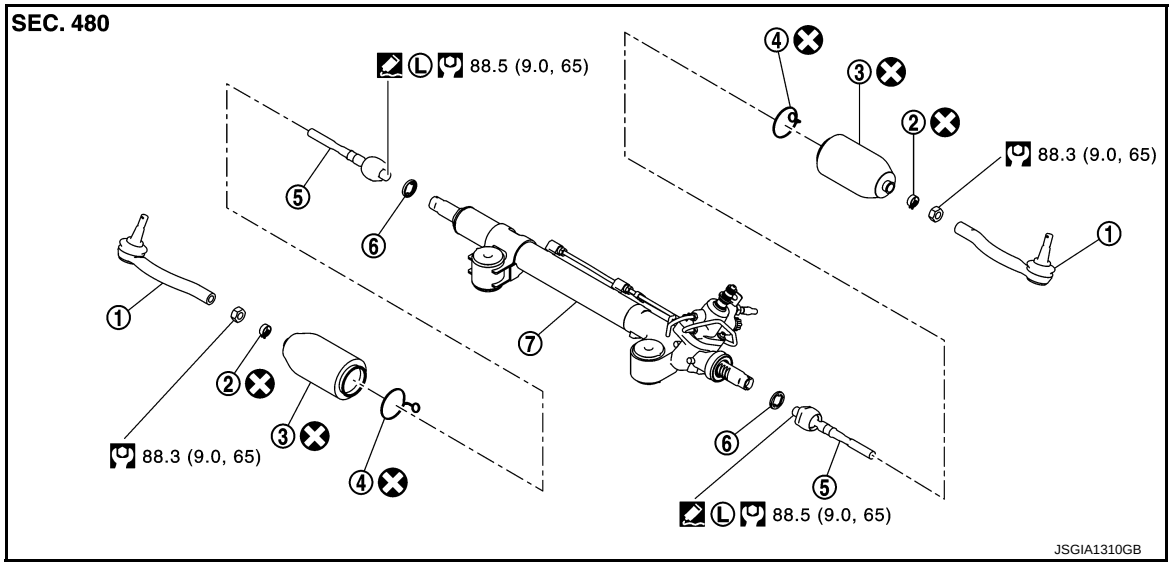
① Cotter pin ② Steering gear assembly ③ Rack stay

⇦: Vehicle front

: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

DISASSEMBLY



① Outer socket ② Boot clamp ③ Boot
④ Boot clamp (stainless wire) ⑤ Inner socket ⑥ Spacer
⑦ Gear housing assembly

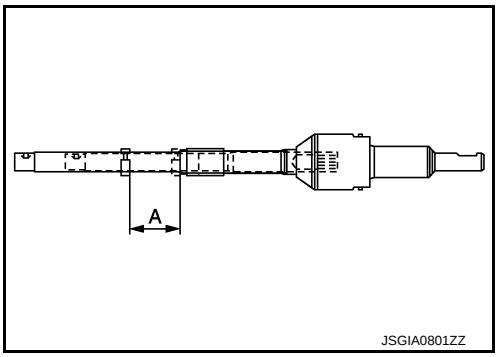
: Always replace after every disassembly.
: N·m (kg-m, ft-lb)
Ⓛ: Apply Genuine High Strength Thread Locking Sealant, Loctite 271 or equivalent.

Removal and Installation

INFOID:0000000013466589

REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Remove tires. Refer to WT-74, "Exploded View".
3. Remove suspension member stay. (2WD) Refer to FSU-43, "Removal and Installation".
4. Remove front cross bar. (AWD) Refer to FSU-71, "Removal and Installation".
5. Remove cotter pin, and then loosen the nut.
6. Remove steering outer socket from steering knuckle so as not to damage ball joint boot using a ball joint remover (commercial service tool).
   CAUTION:
   Temporarily tighten the nut to prevent damage to threads and to prevent the ball joint remover from suddenly coming off.
7. Remove high pressure piping and return hose of hydraulic piping, and then drain power steering fluid.
8. Remove lower joint fixing bolt (steering gear side).
9. Separate the steering shaft from the steering gear assembly by sliding the side shaft (A: sliding range).
   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 mounting bolts, and nuts.
11. Remove rack stay.
12. Remove steering gear assembly.

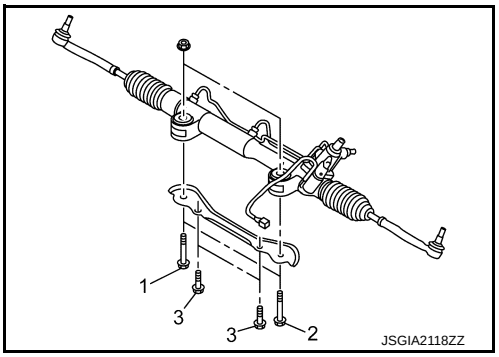
INSTALLATION

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

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

- Tighten the mounting bolts in the order shown in the figure when installing the steering gear assembly.

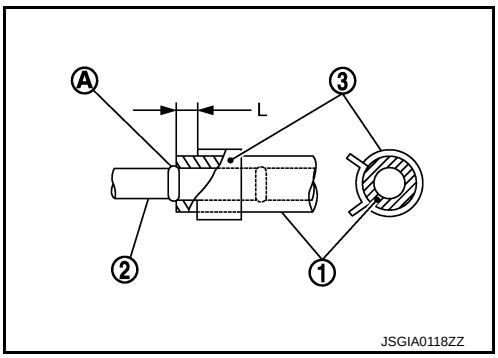
Temporary tightening: 1 ⇒ 2 ⇒ 3
Final tightening: 1 ⇒ 2 ⇒ 3



CAUTION:
Never reuse the steering gear assembly mounting nut.

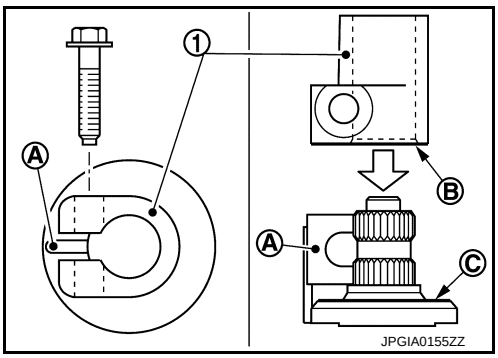
- When installing return hoses ①, refer to the figure.
  CAUTION:
  - **Never apply fluid to the hose and tube ②.**
  - **Insert hose securely until it contacts spool Ⓐ of tube.**
  - **Leave clearance (L) when installing clamp ③.**

  L : 3 – 8 mm (0.12 – 0.31 in)



JSGIA0118ZZ

- When installing lower joint to steering gear assembly, follow the procedure listed below.
- Align slit of lower joint ① with rear cover cap projection Ⓐ, insert lower joint end face Ⓑ until contacts steering gear assembly end face Ⓒ.
- When tightening the lower joint mounting bolt (steering gear assembly side) to the specified torque, manually tighten the bolt and check that there is no hook and scratch.
- When tightening the lower joint mounting bolt (steering shaft side), manually tighten the bolt and check that there is no hook and scratch. Check that the bolt is properly placed in the groove of the steering gear assembly before tightening the bolt to the specified torque.
- Perform inspection after installation. Refer to ST-48, "Inspection".



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Disassembly and Assembly

INFOID:0000000013466590

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.
4. Remove spacer from gear housing assembly.
   CAUTION:
   Never damage gear housing assembly.
5. Perform inspection after disassembly. Refer to ST-48, "Inspection".

ASSEMBLY

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

a. Install spacer to gear housing assembly.

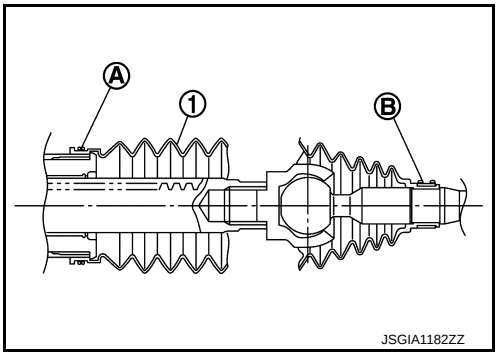
b. Apply thread sealant into the thread of inner socket.
   Use Genuine High Strength Thread Locking Sealant, Loctite 271 or equivalent.

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

2. Install large end Ⓐ of boot ① to gear housing assembly.

Ⓑ : Small end of boot

CAUTION:
Never reuse boot.



3. Install small end of boot to inner socket boot mounting groove.
4. Install boot clamp to boot small end.

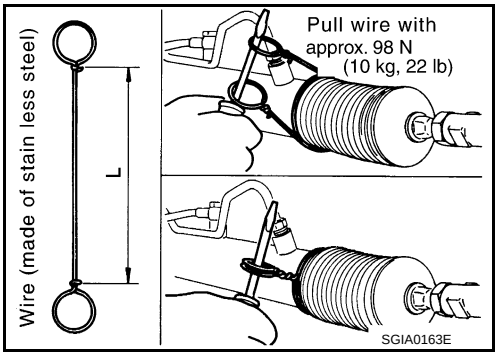
CAUTION:
Never reuse boot clamp.

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

CAUTION:
Never reuse boot clamp (steinless wire).

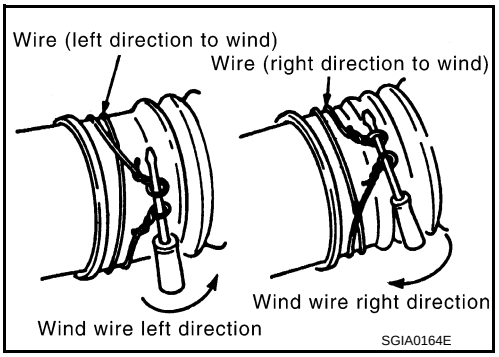
a. Tighten large side of boot with boot clamp (stainless wire).

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



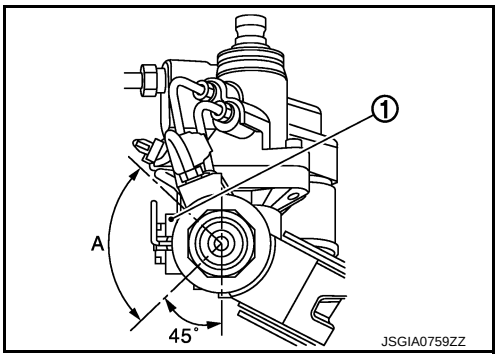
b. Wrap clamp around boot groove for two turns. Insert a flat-bladed screwdriver in loops on both ends of wire. Twist 4 to 4.5 turns while pulling them with force of approximately 98 N (10 kg, 22 lb).

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



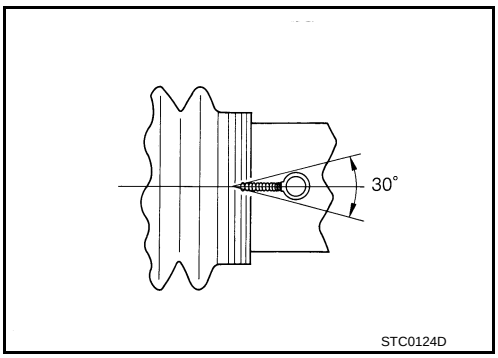
d. Twisted area (A) of clamp is in the adjusting screw side (1) as shown in the figure (to prevent contact with other parts).

A : 90°



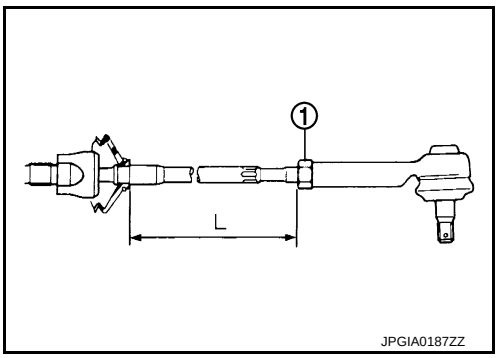
e. Bent cut end of the wire toward rack axial as shown in the figure after twisting the wire 4 to 4.5 turns so that cut end does not contact with boot.

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

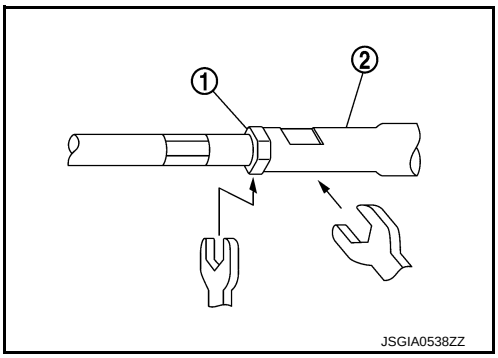


6. Adjust inner socket to standard length (L), and then tighten lock nut ① to the specified torque. Check length again after tightening lock nut.

Inner socket length (L) **: Refer to ST-56, "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:0000000013466591

INSPECTION AFTER DISASSEMBLY

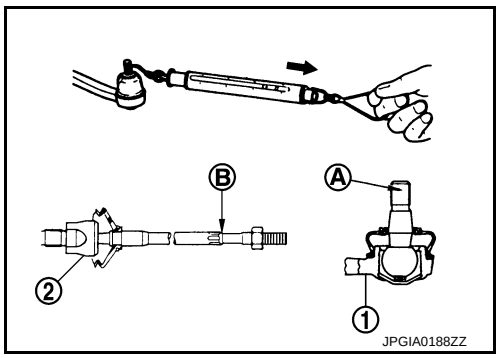
Boot
- Check boot for cracks, and replace it if a malfunction is detected.

Gear Housing Assembly
Check gear housing assembly for damage and scratches (inner wall). Replace if there are.

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

BALL JOINT SWINGING 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 and inner socket (gear housing assembly) if they are outside the standard.



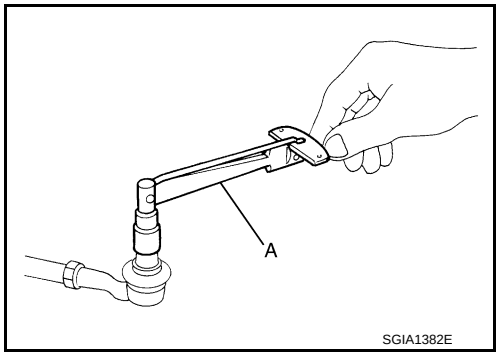
Measuring point of outer socket ① : Ball stud upper side Ⓐ

Measuring point of inner socket ② : Point Ⓑ shown in the figure

Swinging force (Spring balance measurement) : **Refer to ST-56, "Steering Gear And Linkage".**

BALL JOINT ROTATING TORQUE

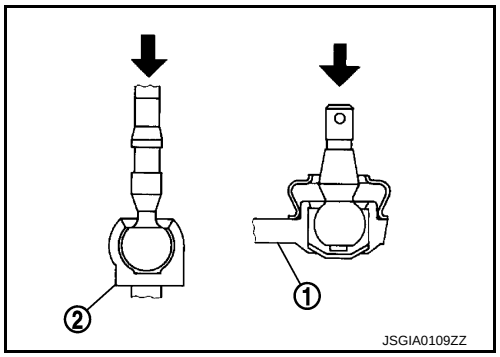
Make sure that the reading is within the following specified range using preload gauge (A) (SST: ST3127S000). Replace outer socket if the reading is outside the specified value.



Rotating torque : **Refer to ST-56, "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 indicator, 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 (gear housing assembly) ② if the measured value is outside the standard.



Axial end play : **Refer to ST-56, "Steering Gear And Linkage".**

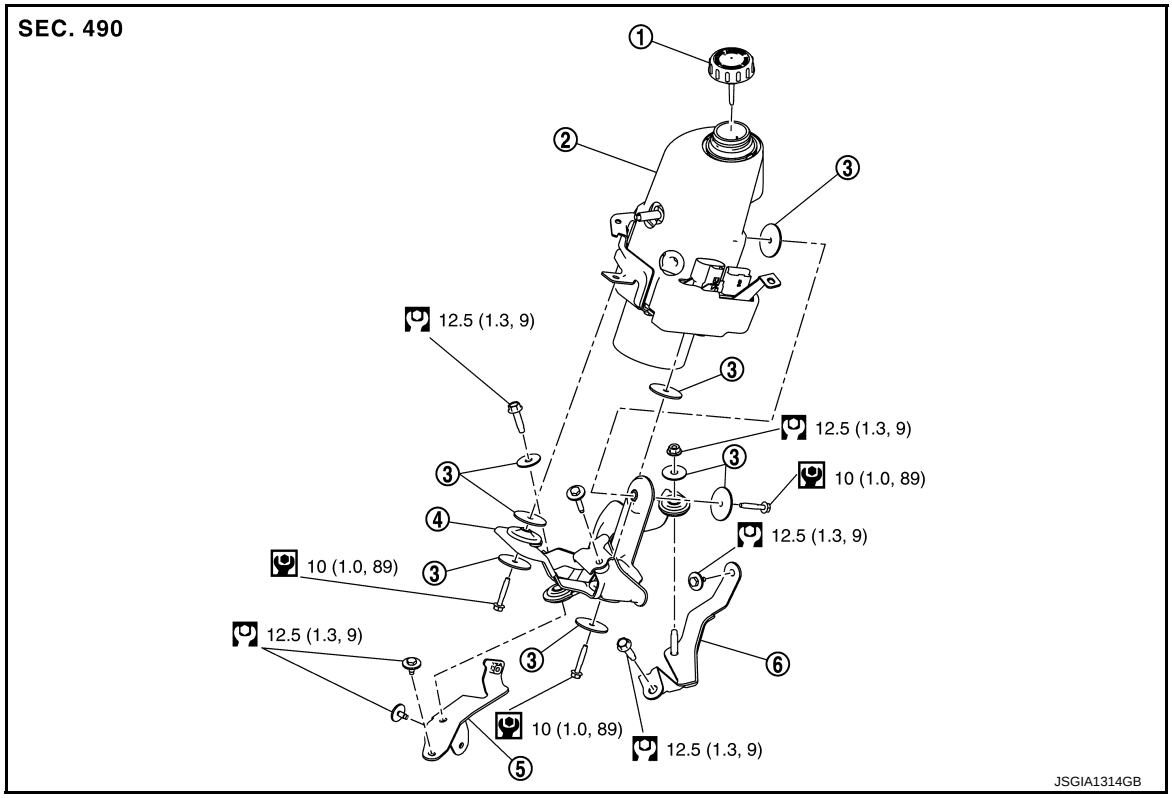
INSPECTION AFTER INSTALLATION

- Check if steering wheel turns smoothly when it is turned several times fully to the end of the left and right.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning torque, and front wheel turning angle.
  - Steering wheel play: Refer to ST-31, "Inspection".
  - Neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-18, "Inspection".
- Bleed the hydraulic system. Refer to ST-29, "Inspection".
- Check the fluid level and check for leakage. Refer to ST-29, "Inspection".
- Check wheel alignment. Refer to FSU-28, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-54, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (AWD).
- Adjust neutral position of steering angle sensor. Refer to BRC-91, "Description".

POWER STEERING OIL PUMP

Exploded View

INFOID:0000000013466592



① Power steering oil pump cap ② Power steering oil pump assembly ③ Washer
④ Bracket A ⑤ Bracket B ⑥ Bracket C

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

Removal and Installation

INFOID:0000000013466593

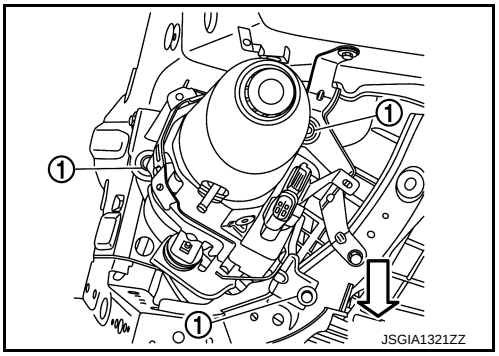
REMOVAL

CAUTION:

Disconnect the battery negative terminal before performing the work.

1. Disconnect each connector and grand cable from power steering control module.
2. Remove high-pressure flexible hose. Refer to ST-54, "Exploded View".
3. Remove return hose, and drain power steering fluid. Refer to ST-54, "Exploded View".
   CAUTION:
   - **Never reuse drained power steering fluid.**
   - **Always use the specified fluid. Refer to MA-20, "Recommeded Fluids and Lubricants".**
4. Remove high-pressure piping and O-ring. Refer to ST-54, "Exploded View".

5. Remove oil pump assembly mounting bolts ①, nut, and washers, and then remove power steering oil pump assembly and bracket A.
6. Remove bracket B and bracket C.
7. Remove bracket A from power steering oil pump assembly.
8. Perform inspection after removal. Refer to ST-52, "Inspection".

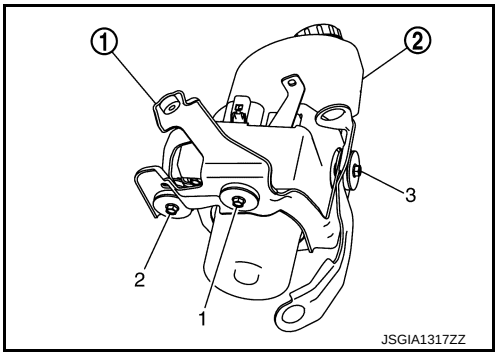


INSTALLATION

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

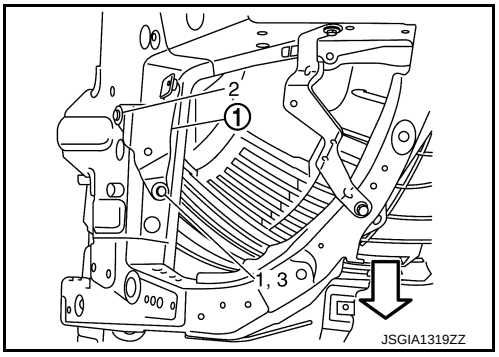
- When installing the bracket A ① to power steering oil pump assembly ②, temporarily tighten the bolt and nuts before tightening to the specified torque, referring to the tightening method and the numerical order shown below:

Temporary tightening	1 → 2 → 3
Final tightening (Specified torque)	1 → 2 → 3



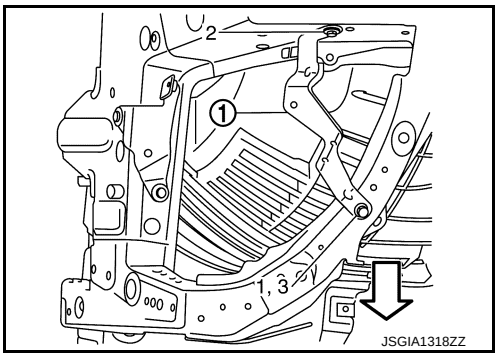
- When installing the bracket B ① to vehicle, temporarily tighten the bolt and nuts before tightening to the specified torque, referring to the tightening method and the numerical order shown below:

Temporary tightening	1
Final tightening (Specified torque)	2 → 3



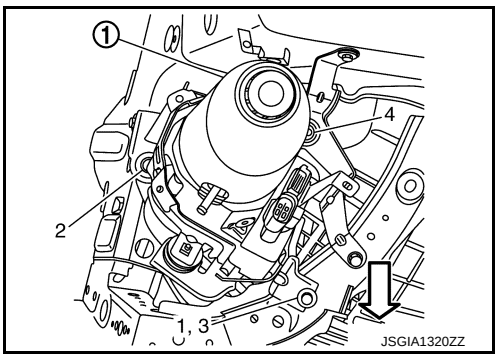
- When installing the bracket C ① to vehicle, temporarily tighten the bolt and nuts before tightening to the specified torque, referring to the tightening method and the numerical order shown below:

Temporary tightening	1
Final tightening (Specified torque)	2 → 3



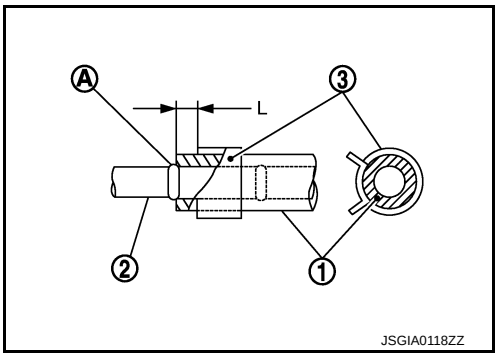
- When installing the power steering oil pump assembly ① to brackets, temporarily tighten the bolt and nuts before tightening to the specified torque, referring to the tightening method and the numerical order shown below:

Temporary tightening	1
Final tightening (Specified torque)	2 → 3 → 4



- When installing high-pressure piping, securely install O-ring to high-pressure piping.
  CAUTION:
  Never reuse O-ring.
- When installing return hoses, refer to the figure.
  CAUTION:
  - **Never apply fluid to the hose ① and tube ②.**
  - **Insert hose securely until it contacts spool Ⓐ of tube.**
  - **Leave clearance (L) when installing clamp ③.**

L : 3 – 8 mm (0.12 – 0.31 in)



- Perform inspection after installation. Refer to ST-52, "Inspection".

Inspection

INFOID:0000000013466594

INSPECTION AFTER REMOVAL

Check oil pump assembly for damage or other malfunctions. Replace if necessary.

INSPECTION AFTER INSTALLATION

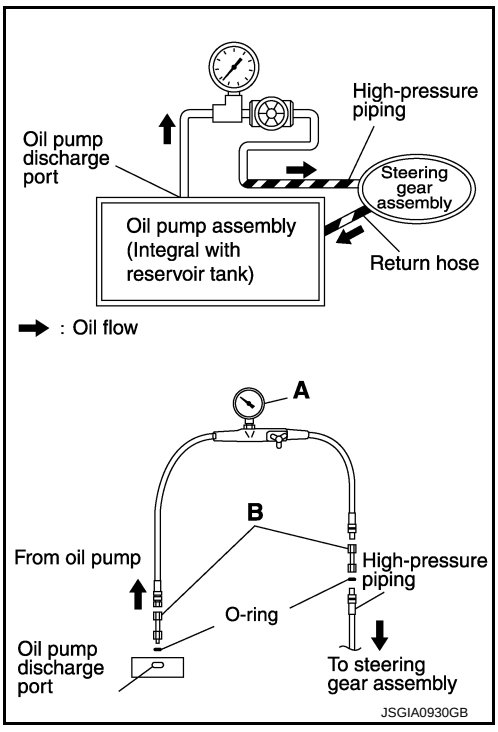
- Check oil pump assembly for damage or other malfunctions. Replace if necessary.
- Check the fluid level and check for leakage. Refer to ST-29, "Inspection".
- Bleed the hydraulic system. Refer to ST-29, "Inspection".

RELIEF OIL PRESSURE

1. Connect the oil pressure gauge [SST: KV48103500 (J-26357)] (A) and the adapter set [SST: KV481059S0 (—)] (B) between oil pump discharge port and high-pressure piping. Bleed air from the hydraulic circuit while opening valve fully.
   CAUTION:
   Check that O-ring is installed on adapter (male side) [SST: KV48105920 (—)].
2. Start the engine and adjust the reservoir tank oil temperature to room temperature [recommended oil temperature: approximately 40 – 50°C (104 – 122°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.
3. Fully close the oil pressure gauge valve with engine at idle and measure the relief oil pressure.

Relief oil pressure : Refer to ST-56, "Oil Pump".

   CAUTION:
   Never keep valve closed for 10 seconds or longer.
4. Open the valve slowly after measuring. Replace oil pump if the relief oil pressure is outside the standard.

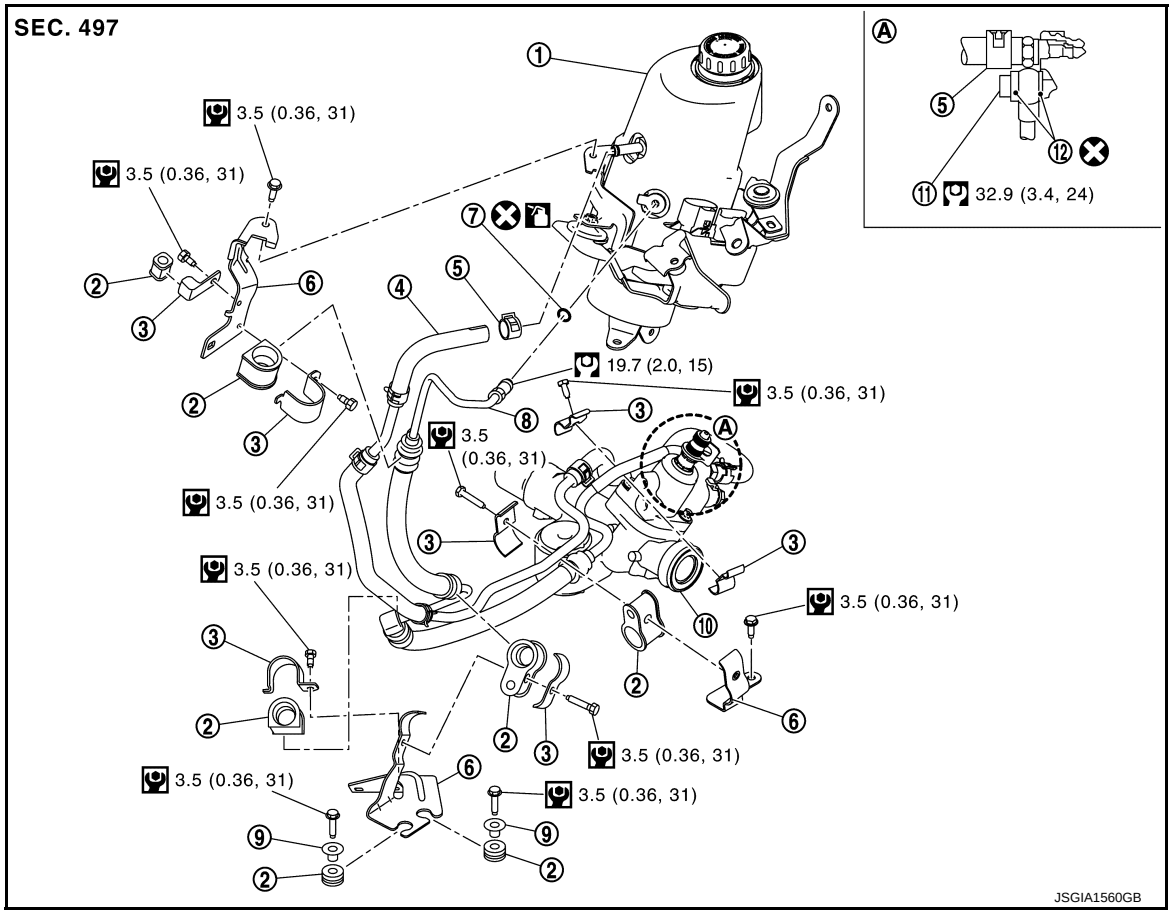


5. Disconnect the oil pressure gauge and adapters from hydraulic circuit.
6. Connect high-pressure piping with O-ring to oil pump assembly.
   CAUTION:
   Never reuse O-ring.
7. Check fluid level, fluid leakage and air bleeding hydraulic system after the installation. Refer to ST-29, "Inspection".

HYDRAULIC LINE

Exploded View

INFOID:0000000013466595



① Power steering oil pump assembly	② Bushing	③ Clamp
④ Return hose assembly	⑤ Clamp	⑥ Bracket
⑦ O-ring	⑧ High pressure piping assembly	⑨ Collar
⑩ Steering gear assembly	⑪ Eye bolt	⑫ Copper washer

Ⓐ Location in steering gear assembly

: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Apply power steering fluid. Refer to MA-20, "Recommeded Fluids and Lubricants".

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

INFOID:0000000012793905

Steering gear model	FR26AD
Fluid capacity (Approx.) ℓ (US qt, Imp qt)	1.0 (1, 7/8)

Steering Wheel

INFOID:0000000012793906

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	39 N (4 kg-f, 9 lb-f)

Steering Angle

INFOID:0000000012793907

Unit: Degree minute (Decimal degree)

Item		Standard
Inner wheel	Minimum	36° 00′ (36.00°)
	Nominal	39° 00′ (39.00°)
	Maximum	40° 00′ (40.00°)
Outer wheel	Nominal	30° 40′ (30.67°)

Steering Column

INFOID:0000000012793908

Item		Standard	
		without electric motor	with electric motor
Rotating torque		0.49 N·m (0.05 kg-m, 4 in-lb) or less	
Steering column length*		492– 496 mm (19.37 – 19.53 in)	
Impact displacement absorption part dimension*	Dimension A	0.4 mm (0.016 in)	16.9 mm (0.665 in)
	Dimension B	1.5 mm (0.059 in)	1.42 mm (0.0559 in)
	Dimension C	—	140.8 mm (5.54 in)
Tilt operating range*		65 mm (2.56 in)	
Telescopic operating range*		47 mm (1.85 in)	

*: For measuring position, refer to ST-34, "WITHOUT ELECTRIC MOTOR : Inspection" (without electric motor), ST-38, "WITH ELECTRIC MOTOR : Inspection" (with electric motor).

Steering Shaft

INFOID:0000000012793909

Item	Standard
Shaft length*	508.8 mm (20.03 in) or less
Shaft sliding range*	83.7 mm (3.295 in)

*: For measuring position, refer to ST-42, "Inspection".

Steering Gear And Linkage

INFOID:0000000012793910

Item		Standard
Rack sliding force		216.6 – 262.4 N (22.10 – 26.76 kg-f, 48.70 – 58.98 lb-f)
Outer socket ball joint	Swing force* (Spring balance measurement)	4.4 – 42.7 N (0.45 – 4.35 kg-f, 0.99 – 9.59 lb-f)
	Rotating torque	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* (Spring balance measurement)	105.4 N (10.75 kg-f, 23.69 lb-f) or less
	Axial end play	0.2 mm (0.008 in) or less
Inner socket length		68.5 mm (2.697 in) or less
Rack stroke neutral position		64.1 mm (2.524 in)

Oil Pump

INFOID:0000000012793911

Unit: kPa (kg/cm^2, psi)

Item	Standard
Relief oil pressure	9,900 – 10,400 (101 – 106, 1,436 – 1,508)

PRECAUTION

PRECAUTIONS

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

INFOID:0000000013477886

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

WARNING:

Always observe the following items for preventing accidental activation.

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, it is recommended that all maintenance and repair be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper repair, 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.

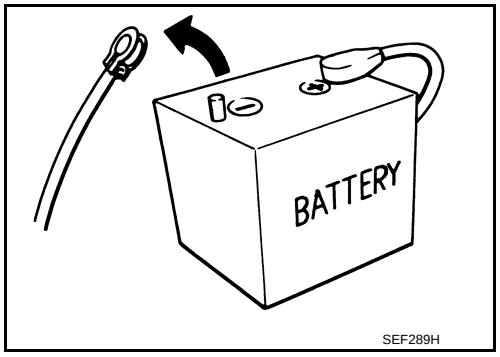
- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery or batteries, and wait at least 3 minutes before performing any service.**

Precautions for Removing Battery Terminal

INFOID:0000000013509485

When disconnecting the battery terminal, pay attention to the following.

- Always use a 12V battery as power source.
- Never disconnect battery terminal while engine is running.
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
- For vehicles with the engine listed below, remove the battery terminal after a lapse of the specified time:



BR08DE	: 4 minutes	V9X engine	: 4 minutes
D4D engine	: 20 minutes	YD25DDTi	: 2 minutes
HR09DET	: 12 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		

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.

- After high-load driving, if the vehicle is equipped with the V9X engine, turn the ignition switch OFF and wait for at least 15 minutes to remove the battery terminal.

NOTE:

  - Turbocharger cooling pump may operate in a few minutes after the ignition switch is turned OFF.
  - Example of high-load driving
    - Driving for 30 minutes or more at 140 km/h (86 MPH) or more.
    - Driving for 30 minutes or more on a steep slope.
- 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.

Service Notice or Precautions for Steering System

INFOID:0000000013477888

- 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 under the vehicle. This is not a malfunction. The noise is an operating noise of the dual pinion electric power steering 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.

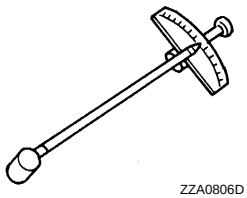
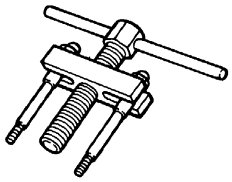
PREPARATION

PREPARATION

Special Service Tools

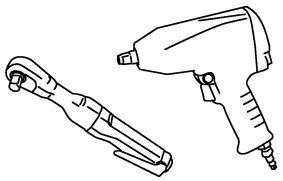
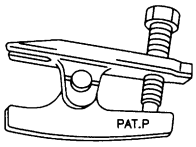
INFOID:0000000013477840

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

Tool number (TechMate No.) Tool name	Description
ST3127S000 (J-25765-A) Preload gauge  ZZA0806D	• Measuring steering wheel turning torque • Measuring steering column rotating torque • Measuring pinion rotating torque • Measuring ball joint rotating torque
ST27180001 (J-25726-A) Steering wheel puller  ZZA0819D	Removing steering wheel

Commercial Service Tools

INFOID:0000000013477841

Tool name	Description
Power tool  PBIC0190E	Loosening bolts and nuts
Ball joint remover  S-NT146	Removing steering outer socket

Lubricant or/and Sealant

INFOID:0000000013477842

Name	Description
Multi-purpose grease	Steering gear assembly inner socket

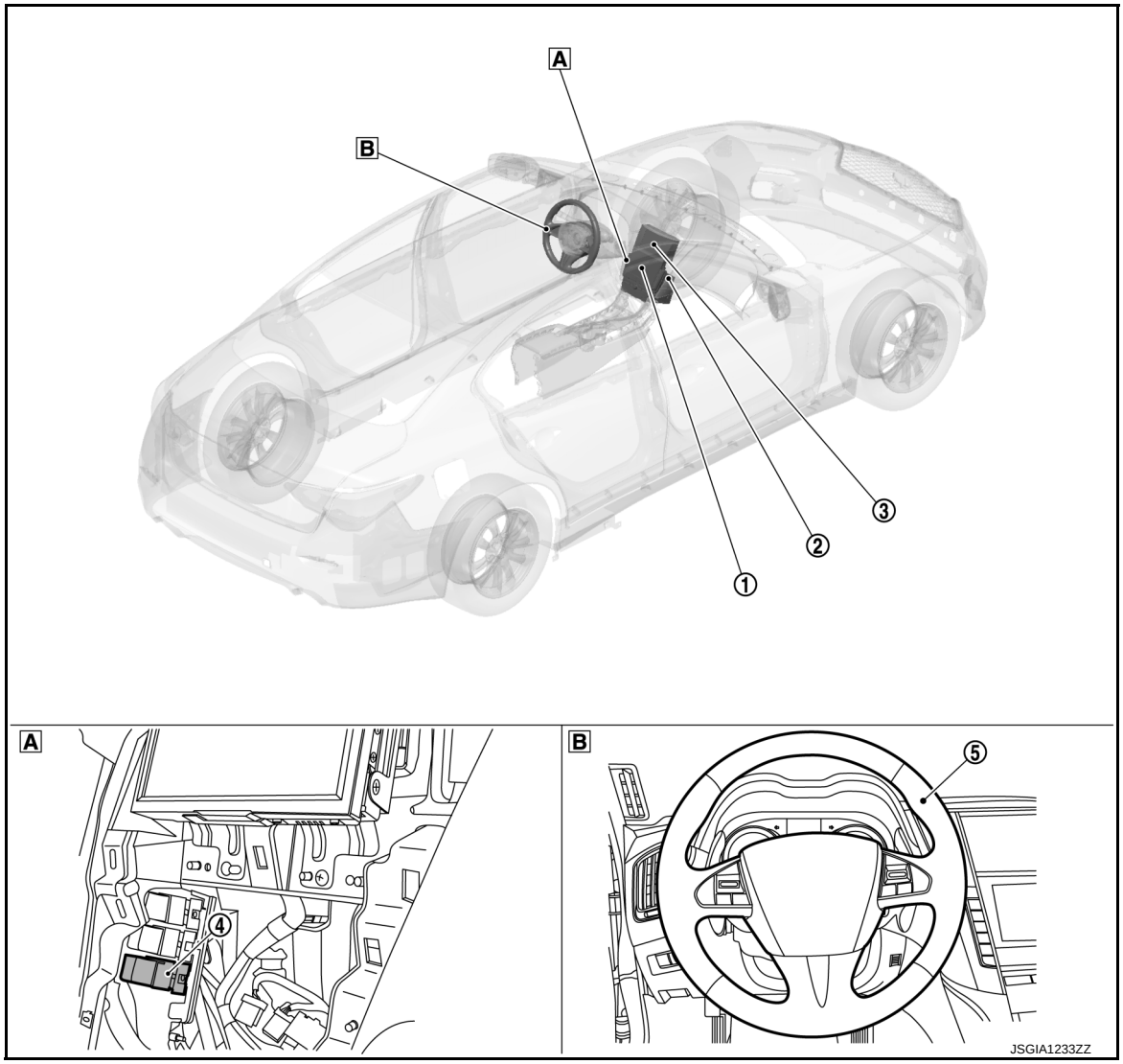
SYSTEM DESCRIPTION

COMPONENT PARTS

HEATED STEERING WHEEL SYSTEM

HEATED STEERING WHEEL SYSTEM : Component Parts Location

INFOID:0000000013477843



A At the back of integral switch

B Steering wheel

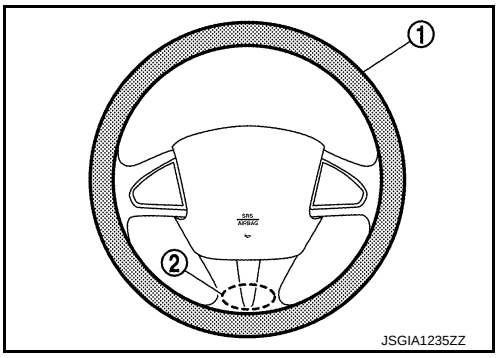
No.	Component	Function
①	Integral switch	• Changes the following settings according to the operation of the display part. - Steering heater function ON/OFF - Steering heater AUTO function ON/OFF • Transmits the following signals to display control unit via communication line. - Steering heater signal - Steering heater auto signal • Refer to AV-14, "Component Parts Location" for detailed installation location.
②	A/C auto amp.	• For the function, refer to ST-61, "HEATED STEERING WHEEL SYSTEM : A/C Auto Amp.". • Refer to HAC-6, "AUTOMATIC AIR CONDITIONING SYSTEM : Component Parts Location" for detailed installation location.
③	Display control unit	• Transmits the following signals received from integral switch to AC auto amp. via CAN communication. - Steering heater signal - Steering heater auto signal • Refer to AV-14, "Component Parts Location" for detailed installation location.
④	Heated steering wheel relay	ST-61, "HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel Relay"
⑤	Heated steering wheel	ST-61, "HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel"

HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel

INFOID:0000000013477844

With the power supply from the heated steering wheel relay, the heated steering wheel controls temperature through the heating element ① and thermostat ② built into the steering wheel.

- Heating element: Generates heat by energization.
  NOTE:
  Heating element is located at the back of the steering wheel leather surface.
- Thermostat: Turns ON/OFF power supply according to the specified temperature.



HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel Relay

INFOID:0000000013477845

Through the control of the A/C auto amp., the heated steering wheel relay turns ON/OFF electricity to the heating element built-in the steering wheel. For location, refer to ST-60, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

HEATED STEERING WHEEL SYSTEM : A/C Auto Amp.

INFOID:0000000013477846

- A/C auto amp. turns ON/OFF the heated steering wheel relay, according to a signal transmitted from display control unit by CAN communication.
- The A/C auto amp. includes a timer. The heated steering wheel relay is turned OFF when the timer operating time reaches 30 minutes.
  - Timer: Turns ON/OFF the heated steering wheel relay for a specified period of time
- For other information of A/C auto amp., refer to HAC-15, "A/C Auto Amp.".

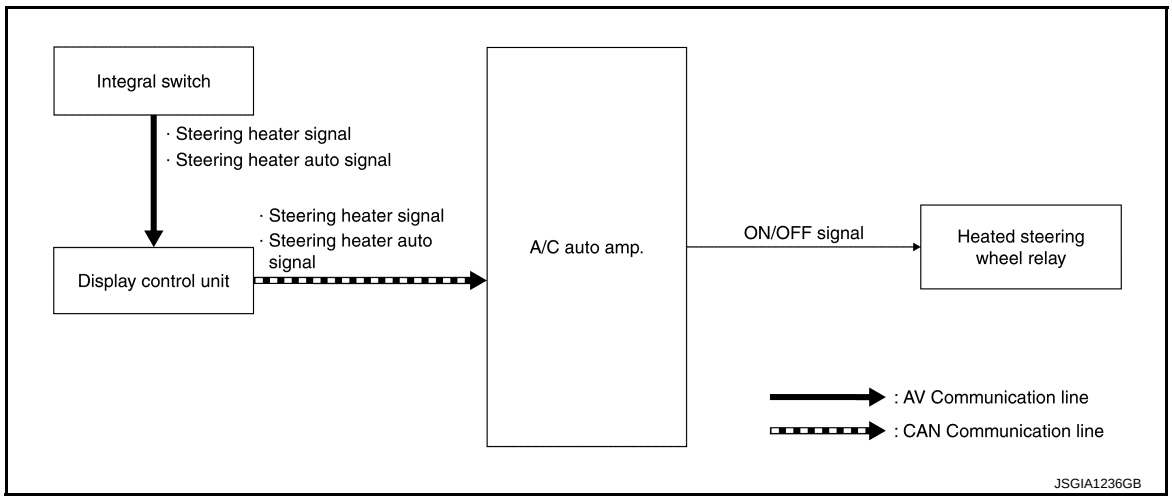
SYSTEM

HEATED STEERING WHEEL SYSTEM

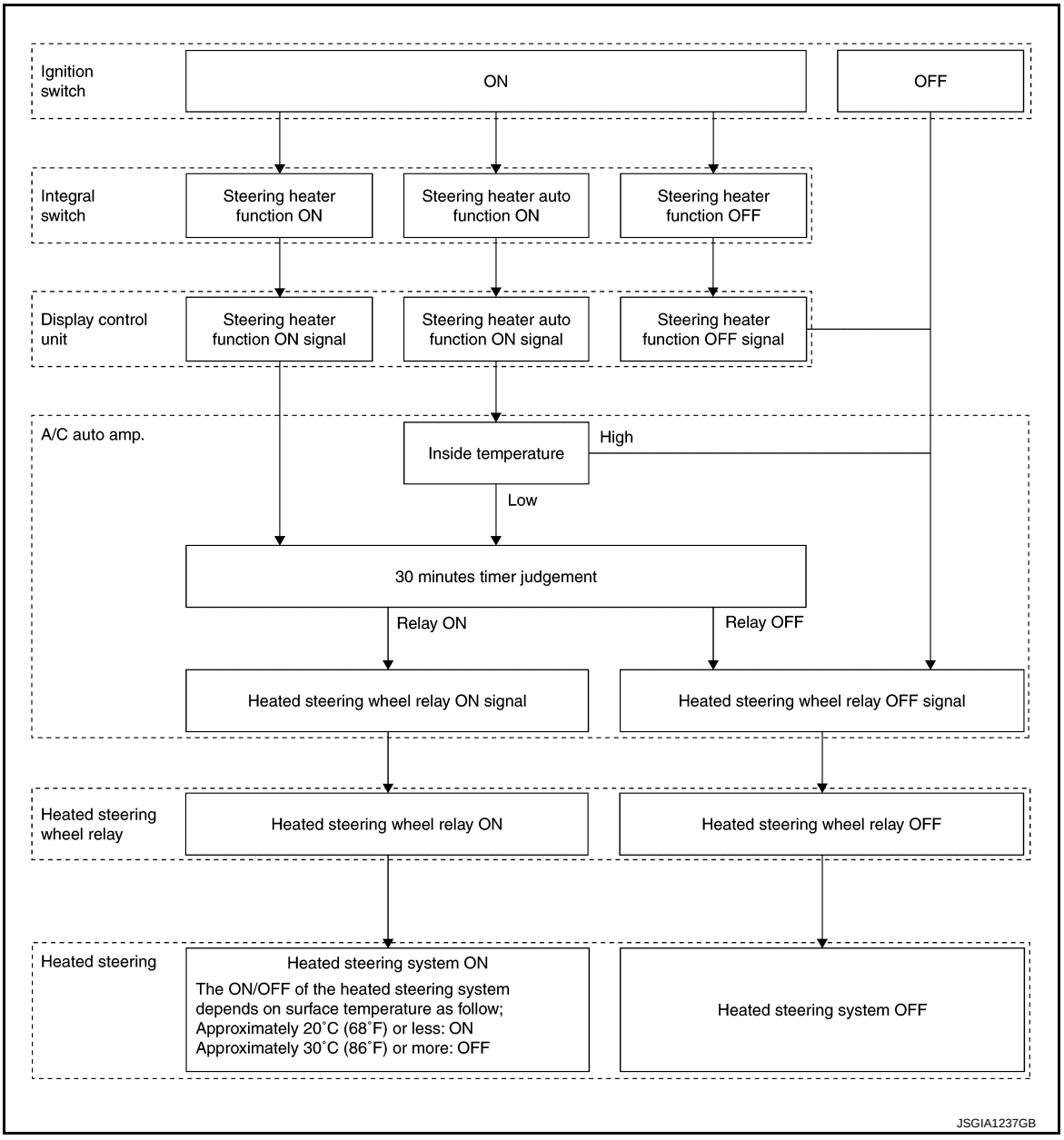
HEATED STEERING WHEEL SYSTEM : System Description

INFOID:0000000013477847

SYSTEM DIAGRAM



FUNCTION FLOW



DESCRIPTION

Normal Control

- The heated steering wheel system maintains the surface temperature of the steering wheel between 20°C (68°F) and 30°C (86°F).
- Once steering heater function turns ON on the integral switch display, A/C auto amp. that has received signal via display control unit turns the heated steering wheel relay ON and electrifies to the heat elements built-in the steering wheel to heat the steering wheel.
- When steering heater function turns OFF, A/C auto amp. turns OFF the heated steering wheel relay and stops the electricity supply to the heat elements.
- When the surface temperature of the steering wheel is higher than 30°C (86°F), the thermostat built-in the steering wheel turns OFF, and electricity to the heating element is turned OFF. When the surface temperature drops to less than 20°C (68°F), the thermostat built-in the steering wheel turns ON, and electricity to the heating element is turned ON.

Auto Control

- Once steering heater auto function turns ON on the integral switch display part, the steering heater switches to the auto control.

- Under the auto control, A/C auto amp. turns the heated steering wheel relay ON and electrifies the heat elements built in the steering wheel to heat the steering wheel when the temperature in the passenger room is low.
- After the heated steering wheel relay turns ON, the electricity to the heat element switches ON/OFF corresponding to the steering wheel surface temperature as well as under the normal control.
- If ON⇔OFF operation of “Steering Heater” is performed on the integral switch display, the auto control is cancelled.

Timer Function

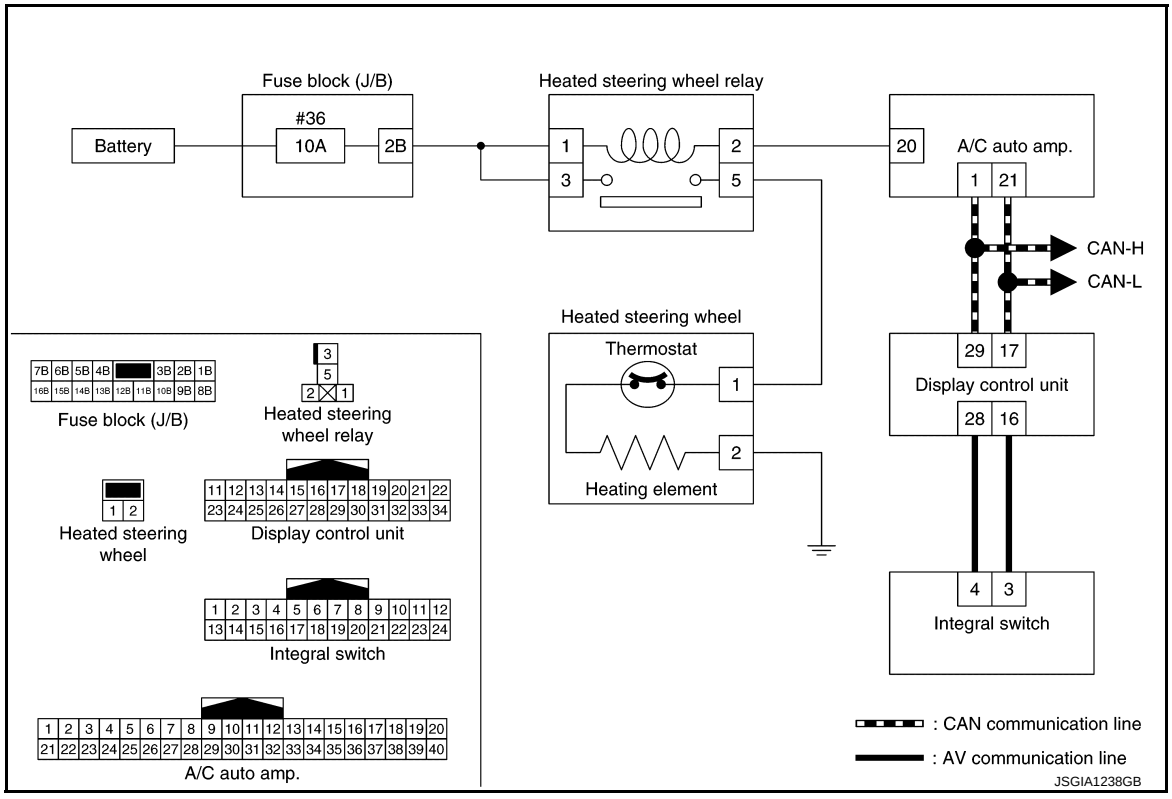
- The A/C auto amp. has a timer. After steering heater function or steering heater auto function turns ON, when operating time becomes more than the specified time (30 minutes), the A/C auto amp. turns OFF the heated steering wheel relay to stop heating.

Condition for Electrifying Heat Elements

Ignition switch	Timer function judgment result	Steering Heater Mode	Electrifying heat elements
ON	ON	Steering Heater ON	Turns ON/OFF corresponding to the steering wheel surface temperature.
		Steering Heater Auto ON	• Turns ON when the passenger room temperature is low. • Turns ON/OFF corresponding to the steering wheel surface temperature after electricity turns ON.
		• Steering Heater OFF • Steering Heater Auto OFF	OFF
	OFF	—	OFF
OFF	—	—	OFF

HEATED STEERING WHEEL SYSTEM : Circuit Diagram

INFOID:0000000013477848

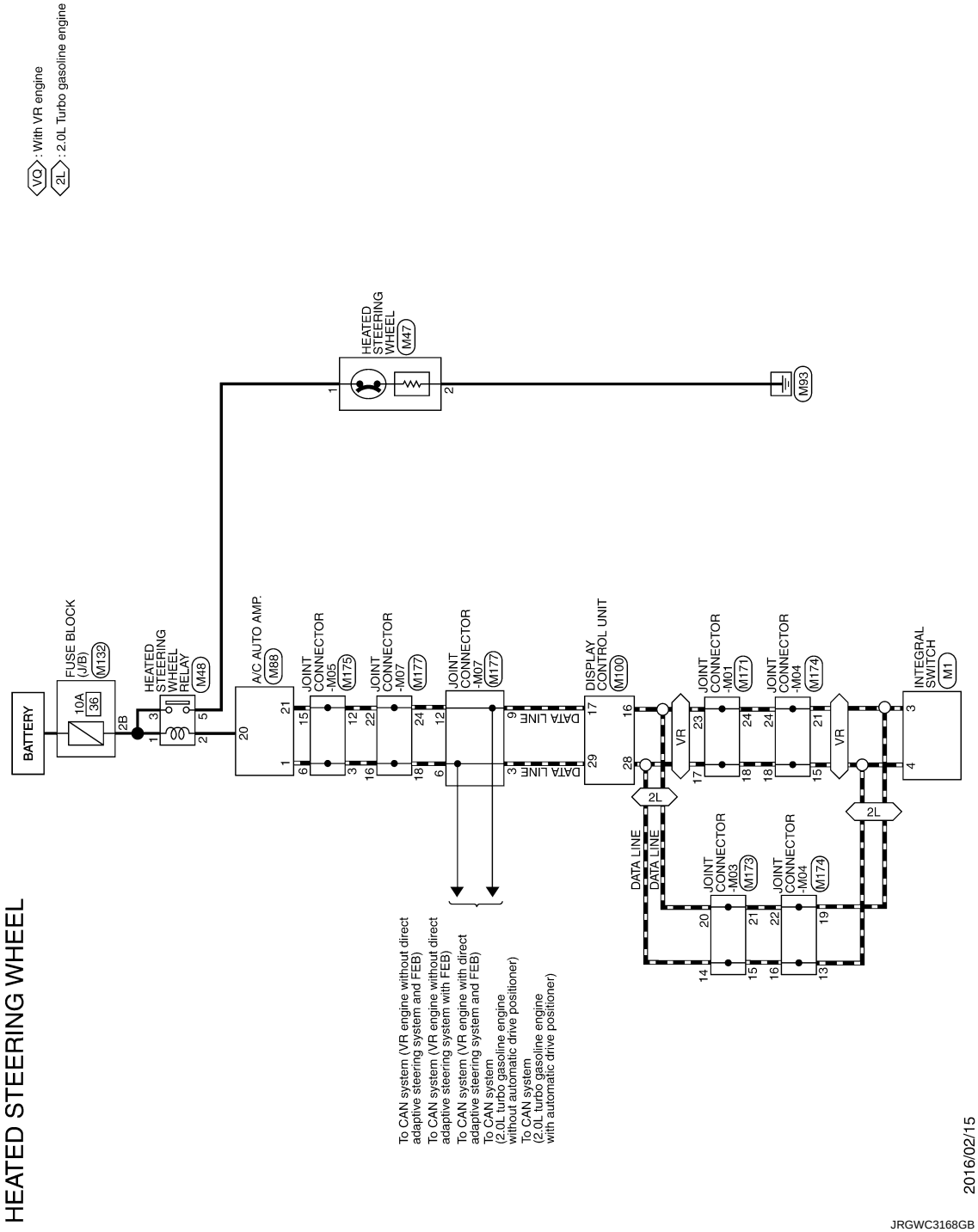


WIRING DIAGRAM

HEATED STEERING WHEEL

Wiring Diagram

INFOID:0000000013523250



HEATED STEERING WHEEL

Connector No.	M1
Connector Name	INTEGRAL SWITCH
Connector Type	TH24FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
2	R	ILLUMINATION SIGNAL
3	LG	AV COMM (L)
4	SB	AV COMM (H)
7	W/B	DISK EJECT SIGNAL
8	G	HAZERD SIGNAL
13	B	GND
14	SB	ACC [For 2.0L turbo gasoline engine]
14	V	ACC [For VR30 engine]
15	B	ILLUMINATION CONTROL SIGNAL
16	BG	DISK EJECT SIGNAL GROUND
18	R	IGN [For VR30 engine]
18	W	IGN [For 2.0L turbo gasoline engine]
19	BR	CAMERA SWITCH SIGNAL
20	LG	AIR BAG INDICATOR OFF SIGNAL

Connector No.	M47
Connector Name	HEATED STEERING WHEEL
Connector Type	NS02FW-CS

H.S.

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

Connector No.	M48
Connector Name	HEATED STEERING WHEEL RELAY
Connector Type	MS02FL-M2-LC

H.S.

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

Connector No.	M88
Connector Name	A/C AUTO AMP.
Connector Type	TH40FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	CAN-H
2	B	GROUND
3	W	BATTERY POWER SUPPLY
7	G	AMBIENT SENSOR SIGNAL
9	R	SUNLOAD SENSOR SIGNAL
13	SB	ACC POWER SUPPLY [With 2.0L turbo gasoline engine]
13	V	ACC POWER SUPPLY [With VR30 engine]
16	P	LIN SIGNAL
17	R	DOOR MOTOR POWER SUPPLY
18	P	BLOWER MOTOR CONTROL SIGNAL
20	L	HEATED STEERING WHEEL RELAY CONTROL SIGNAL
21	P	CAN-L
22	B	GROUND
23	R	IGNITION POWER SUPPLY [With VR30 engine and with ISS]
23	W	IGNITION POWER SUPPLY [Except with VR30 engine and with ISS]

26	B	SENSOR GROUND
27	LG	IN-VEHICLE SENSOR SIGNAL
28	BR	INTAKE SENSOR SIGNAL
30	BG	EXHAUST GAS / OUTSIDE ODOR DETECTING SENSOR SIGNAL
37	B	GROUND
38	BG	IGNIZER (ON/OFF) CONTROL SIGNAL
40	BG	ECV CONTROL SIGNAL

Connector No.	M100
Connector Name	DISPLAY CONTROL UNIT
Connector Type	TH24FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
16	LG	AV COMM (L)
17	P	CAN-L
19	R	DIMMER SIGNAL
20	BR	REVERSE SIGNAL
22	B	GND
26	BR	CAMERA SWITCH SIGNAL
28	SB	AV COMM (H)
29	L	CAN-H
30	R	IGN [For VR30 engine]
30	W	IGN [For 2.0L turbo gasoline engine]
31	R	VEHICLE SPEED SIGNAL (8-PULSE)
33	SB	ACC [Except for VR30 engine and with ISS]
33	V	ACC [For VR30 engine and with ISS]
34	Y	BAT

Connector No.	M132
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS16FW-CS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
11B	LG	-
13B	P	-
14B	G	-
15B	Y	-
16B	Y	-
2B	B	-
4B	W	-
5B	R	-
9B	Y	-

Connector No.	M171
Connector Name	JOINT CONNECTOR-M01
Connector Type	24342_4GA2A

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	-
2	B	-
3	B	-
4	B	-
5	B	-
6	B	-
7	B	-
8	B	-
9	B	-
10	G	-

JRGWC3169GB

HEATED STEERING WHEEL

11	G	-
14	B	-
15	B	-
16	SB	- [With VR30 engine]
16	Y	- [With 2.0L turbo gasoline engine]
17	SB	- [With VR30 engine]
17	Y	- [With 2.0L turbo gasoline engine]
18	SB	- [With VR30 engine]
18	Y	- [With 2.0L turbo gasoline engine]
19	G	-
20	G	-
22	LG	- [With VR30 engine]
22	SB	- [With 2.0L turbo gasoline engine]
23	LG	- [With VR30 engine]
23	SB	- [With 2.0L turbo gasoline engine]
24	LG	- [With VR30 engine]
24	SB	- [With 2.0L turbo gasoline engine]

Connector No.	M173
Connector Name	JOINT CONNECTOR-M03
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1	
12	11	10	9	8	7	
18	17	16	15	14	13	
24	23	22	21	20	19	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	R	-
8	R	-
9	R	-
10	R	-
11	R	-
12	R	-
13	SB	-
14	SB	-
15	SB	-
16	L	- [With 2.0L turbo gasoline engine]
16	SB	- [With VR30 engine]

17	L	- [With 2.0L turbo gasoline engine]
17	SB	- [With VR30 engine]
18	L	- [With 2.0L turbo gasoline engine]
18	SB	- [With VR30 engine]
19	BR	- [With VR30 engine]
19	LG	- [With 2.0L turbo gasoline engine]
20	BR	- [With VR30 engine]
20	LG	- [With 2.0L turbo gasoline engine]
21	BR	- [With VR30 engine]
21	LG	- [With 2.0L turbo gasoline engine]
22	R	- [With 2.0L turbo gasoline engine]
22	SB	- [With VR30 engine and without ISS]
22	V	- [With VR30 engine and with ISS]
23	R	- [With 2.0L turbo gasoline engine]
23	SB	- [With VR30 engine and without ISS]
23	V	- [With VR30 engine and with ISS]
24	R	- [With 2.0L turbo gasoline engine]
24	SB	- [With VR30 engine and without ISS]
24	V	- [With VR30 engine and with ISS]

Connector No.	M174
Connector Name	JOINT CONNECTOR-M04
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1	
12	11	10	9	8	7	
18	17	16	15	14	13	
24	23	22	21	20	19	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	Y	-
8	Y	-
9	Y	-
10	Y	-
11	Y	-
12	Y	-
13	SB	-
14	SB	-
15	SB	-

16	SB	-
17	SB	-
18	SB	-
19	LG	-
20	LG	-
21	LG	-
22	LG	-
23	LG	-
24	LG	-

Connector No.	M175
Connector Name	JOINT CONNECTOR-M05
Connector Type	NH20FL-DC

H.S.

		8	7	6	5	4	3	2	1	
20	19	17	16	15	14	13	12	11	10	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	L	-
8	L	-
10	P	-
11	P	-
12	P	-
13	P	-
14	P	-
15	P	-
16	P	- [With VR30 engine]
16	R	- [With 2.0L turbo gasoline engine]
17	P	- [With VR30 engine]
17	R	- [With 2.0L turbo gasoline engine]
19	R	- [With VR30 engine and with ISS]
19	W	- [Except with VR30 engine and with ISS]
20	R	- [With VR30 engine and with ISS]
20	W	- [Except with VR30 engine and with ISS]

Connector No.	M177
Connector Name	JOINT CONNECTOR-M07
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1	
12	11	10	9	8	7	
18	17	16	15	14	13	
24	23	22	21	20	19	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	P	-
8	P	-
9	P	-
10	P	-
11	P	-
12	P	-
13	L	-
14	L	-
15	L	-
16	L	-
17	L	-
18	L	-
19	W	-
20	W	-
21	W	-
22	P	-
23	P	-
24	P	-

JRGWC3170GB

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow (Heated Steering Wheel)

INFOID:0000000013477850

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.

CAUTION:

Customers are not professional. Never guess easily like “maybe the customer means that...,” or “maybe the customer mentions this symptom”.

>> 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 “DTC/CIRCUIT DIAGNOSIS”

Perform the diagnosis with “DTC/circuit 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.

STEERING WHEEL

Inspection

INFOID:0000000013477851

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-28, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-54, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (AWD).
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.

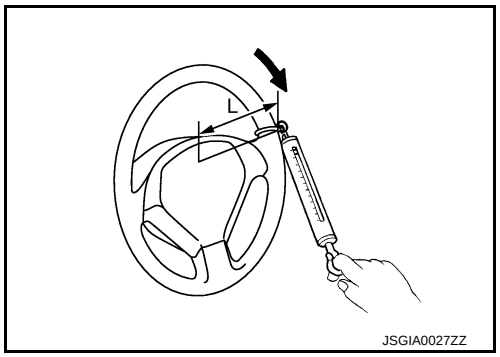
   CAUTION:
   If the adjustment is performed by using the inner socket, check wheel alignment after the adjustment. Refer to Refer to FSU-28, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-54, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (AWD).

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-82, "Tire Air Pressure".
3. Start engine.
4. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

Steering wheel turning force : Refer to ST-100, "Steering Wheel".

L : 185 mm (7.28 in)

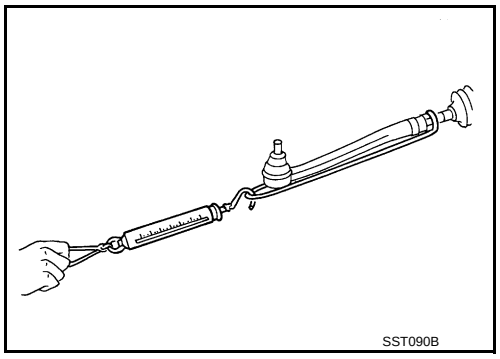


RACK SLIDING FORCE

1. Disconnect lower joint from steering gear assembly. Refer to ST-89, "Removal and Installation".
2. Disconnect steering outer socket from steering knuckle. Refer to ST-95, "Removal and Installation".
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-101, "Steering Gear and Linkage".

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

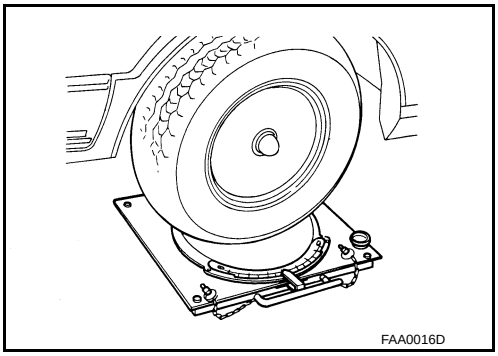


FRONT WHEEL TURNING ANGLE

1. Perform toe-in inspection. Refer to FSU-28, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-54, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection"(AWD).

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

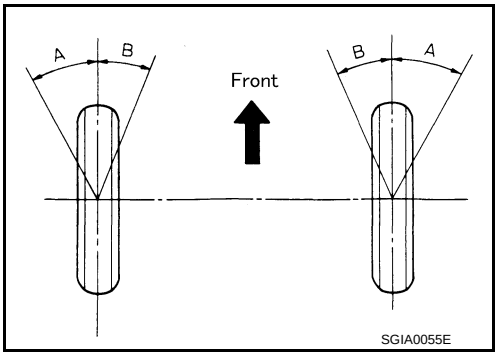
2. Place front wheels on turning radius gauges and rear wheels on stands, so that vehicle can be level.
3. Check the maximum inner and outer wheel turning angles for LH and RH road wheels.



- Start the engine, and turn steering wheel from full left stop to full right stop and measure the turning angles (maximum inner wheel steering angle and maximum outer wheel steering angle).

A : Inner wheel angle
B : Outer wheel angle

Steering angle : Refer to ST-100, "Steering Angle".

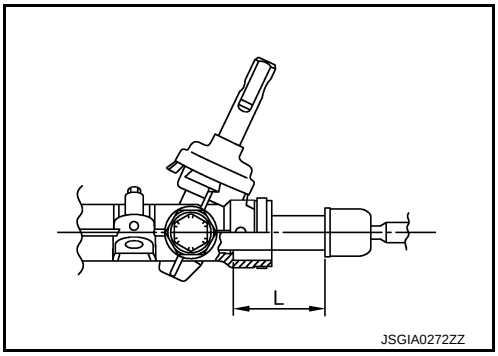


- Check the following items when turning angle is out of the standard.

- Check rack stroke (L).

Rack stroke neutral position (L) : Refer to ST-101, "Steering Gear and Linkage".

- 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.



DTC/CIRCUIT DIAGNOSIS

HEATED STEERING WHEEL SYSTEM

Component Function Check

INFOID:0000000013477852

1.CHECK HEATED STEERING WHEEL SYSTEM

Check operate heated steering wheel system. Refer to ST-62, "HEATED STEERING WHEEL SYSTEM : System Description".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ST-71, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000013477853

1.CHECK HEATED STEERING WHEEL POWER SUPPLY

1. Switch heated steering mode to ON.
2. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	5	—	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to ST-73, "Component Inspection (Heated Steering Wheel Relay)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace heated steering wheel relay. Refer to ST-60, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

3.CHECK HEATED STEERING WHEEL RELAY POWER SUPPLY

1. Turn the ignition switch OFF.
2. Disconnect heated steering wheel relay harness connector.
3. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	1	—	Battery voltage
	3		

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.CHECK HEATED STEERING WHEEL RELAY CIRCUIT (1)

1. Check 10A fuse (#36).
2. Disconnect fuse block (J/B) harness connector.

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

Heated steering wheel relay		Fuse block (J/B)		Continuity
Connector	Terminal	Connector	Terminal	
M48	1	M132	2B	Existed
	3			

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

Heated steering wheel relay		Ground	Continuity
Connector	Terminal	—	
M48	1	Ground	Not existed
	3		

Is the inspection result normal?

YES >> Perform trouble diagnosis for battery power supply circuit.
NO >> Repair or replace error-detected parts.

5.CHECK HEATED STEERING WHEEL RELAY CIRCUIT (2)

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector terminal and A/C auto amp. harness connector terminal.

Heated steering wheel relay		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M48	2	M88	20	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	2	Ground	Not existed

Is the inspection result normal?

YES >> Repair or replace A/C auto amp.. Refer to HAC-137, "Removal and Installation".
NO >> Repair or replace error-detected parts.

6.CHECK HEATED STEERING WHEEL CIRCUIT

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector and heated steering wheel harness connector.

Heated steering wheel relay		Heated steering wheel		Continuity
Connector	Terminal	Connector	Terminal	
M48	5	M47	1	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	5	Ground	Not existed

Is the inspection result normal?

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

7.CHECK HEATED STEERING WHEEL

Check heated steering wheel. Refer to ST-73, "Component Inspection (Heated Steering Wheel)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated steering wheel. Refer to ST-81, "Removal and Installation".

8.CHECK GROUND CIRCUIT

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

Heated steering wheel		—	Continuity
Connector	Terminal		
M47	2	Ground	Existed

Is the inspection result normal?

YES >> Check the intermittent incident. Refer to GI-45, "Intermittent Incident".
NO >> Repair or replace damaged parts.

Component Inspection (Heated Steering Wheel)

INFOID:0000000013477854

1.CHECK HEATED STEERING WHEEL CONTINUITY

1. Turn ignition switch OFF.
2. Remove the heated steering wheel. Refer to ST-81, "Removal and Installation".
3. Check continuity between heated steering wheel harness connector terminal and ground.

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°F) or more	Not existed

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace heated steering wheel. Refer to ST-81, "Removal and Installation".

2.CHECK HEATED STEERING WHEEL RESISTANCE

Check resistance between heated steering wheel connector terminals.

Heated steering wheel	Condition	Resistance
Terminal		
1 – 2	Leather surface temperature of 20°C (68°F)	1.7 – 2.17 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated steering wheel. Refer to ST-81, "Removal and Installation".

Component Inspection (Heated Steering Wheel Relay)

INFOID:0000000013477855

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.**
- **To prevent damage, always observe the correct polarity.**
- **Prevent short-circuit.**

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-60, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

SYMPTOM DIAGNOSIS

HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

Description

INFOID:0000000013477856

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

Diagnosis Procedure

INFOID:0000000013477857

1.CHECK HEATED STEERING WHEEL POWER SUPPLY

1. Switch heated steering mode to ON.
2. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	5	—	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to ST-73, "Component Inspection (Heated Steering Wheel Relay)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace heated steering wheel relay. Refer to ST-60, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

3.CHECK HEATED STEERING WHEEL RELAY POWER SUPPLY

1. Turn the ignition switch OFF.
2. Disconnect heated steering wheel relay harness connector.
3. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	1	—	Battery voltage
	3		

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.CHECK HEATED STEERING WHEEL RELAY CIRCUIT (1)

1. Check 10A fuse (#36).
2. Disconnect fuse block (J/B) harness connector.
3. Check continuity between heated steering wheel relay harness connector terminal and fuse block (J/B) harness connector terminal.

Heated steering wheel relay		Fuse block (J/B)		Continuity
Connector	Terminal	Connector	Terminal	
M48	1	M132	2B	Existed
	3			

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

Heated steering wheel relay		Ground	Continuity
Connector	Terminal	—	
M48	1	Ground	Not existed
	3		

Is the inspection result normal?

YES >> Perform trouble diagnosis for battery power supply circuit.
NO >> Repair or replace error-detected parts.

5. CHECK HEATED STEERING WHEEL RELAY CIRCUIT (2)

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector terminal and A/C auto amp. harness connector terminal.

Heated steering wheel relay		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M48	2	M88	20	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	2	Ground	Not existed

Is the inspection result normal?

YES >> Repair or replace A/C auto amp.. Refer to HAC-137, "Removal and Installation".
NO >> Repair or replace error-detected parts.

6. CHECK HEATED STEERING WHEEL CIRCUIT

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector and heated steering wheel harness connector.

Heated steering wheel relay		Heated steering wheel		Continuity
Connector	Terminal	Connector	Terminal	
M48	5	M47	1	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	5	Ground	Not existed

Is the inspection result normal?

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

7. CHECK HEATED STEERING WHEEL

Check heated steering wheel. Refer to ST-73, "Component Inspection (Heated Steering Wheel)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated steering wheel. Refer to ST-81, "Removal and Installation".

8. CHECK GROUND CIRCUIT

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

Heated steering wheel		—	Continuity
Connector	Terminal		
M47	2	Ground	Existed

Is the inspection result normal?

YES >> Check the intermittent incident. Refer to GI-45, "Intermittent Incident".
NO >> Repair or replace damaged parts.

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

INFOID:0000000013477858

WITHOUT ELECTRIC MOTOR

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

			Reference	ST-98, "Inspection"	ST-98, "Inspection"	ST-98, "Inspection"	ST-69, "Inspection"	ST-69, "Inspection"	—	—	ST-93, "Exploded View"	ST-83, "WITHOUT ELECTRIC MOTOR : Inspection"	ST-82, "WITHOUT ELECTRIC MOTOR : Exploded View"	ST-93, "Exploded View"	NVH in FAX, RAX, FSU, RSU section.	NVH in WT section.	NVH in WT section.	NVH in RAX section.	NVH in BR section.
			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	Steering gear rack sliding force	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
Symptom	Steering	Noise		×	×	×	×	×	—	—	—	×	×	—	×	×	×	×	×
		Shake		—	—	—	—	—	×	×	×	—	—	—	×	×	×	×	×
		Vibration		—	—	—	—	—	×	×	×	×	×	—	×	×	—	×	—
		Shimmy		—	—	—	—	—	×	—	×	—	—	×	×	×	×	—	×
		Judder		—	—	—	—	—	—	×	×	—	—	×	×	×	×	—	×

×: Applicable, —: Not applicable

WITH ELECTRIC MOTOR

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

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	Steering gear rack sliding force	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
Reference			ST-98, "Inspection"	ST-98, "Inspection"	ST-98, "Inspection"	ST-69, "Inspection"	ST-69, "Inspection"	—	—	ST-93, "Exploded View"	ST-87, "WITH ELECTRIC MOTOR : Inspection"	ST-85, "WITH ELECTRIC MOTOR : Exploded View"	ST-93, "Exploded View"	NVH in FAX, RAX, FSU, RSU section.	NVH in WT section.	NVH in WT section.	NVH in RAX section.	NVH in BR section.
Symptom	Steering	Noise	×	×	×	×	×	—	—	—	×	×	—	×	×	×	×	×
		Shake	—	—	—	—	—	×	×	×	—	—	—	×	×	×	×	×
		Vibration	—	—	—	—	—	×	×	×	×	×	—	×	×	—	×	—
		Shimmy	—	—	—	—	—	×	—	×	—	—	×	×	×	×	—	×
		Judder	—	—	—	—	—	—	×	×	—	—	×	×	×	×	—	×

×: Applicable, —: Not applicable

PERIODIC MAINTENANCE

STEERING WHEEL

Inspection

INFOID:0000000013477859

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-100, "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-82, "WITHOUT ELECTRIC MOTOR : Exploded View" (without electric motor), ST-85, "WITH ELECTRIC MOTOR : Exploded View" (with electric motor).
   - Check steering gear assembly mounting condition for looseness. Refer to ST-93, "Exploded View".

STEERING WHEEL PLAY

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

Steering wheel play : Refer to ST-100, "Steering Wheel".

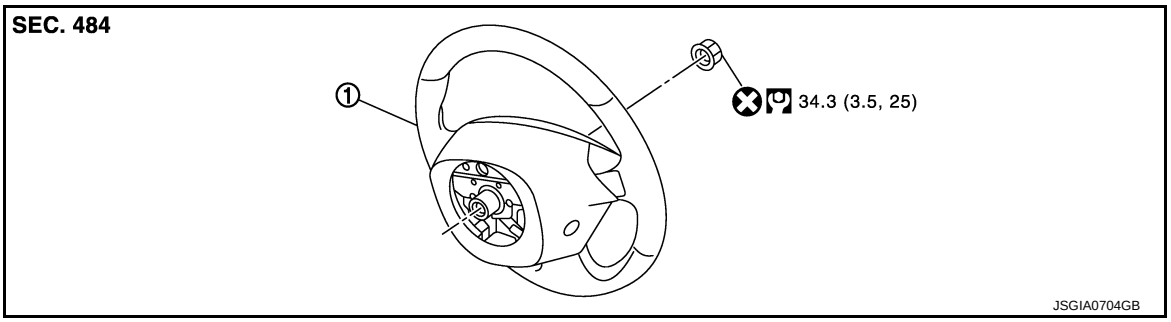
4. Check the following items when steering wheel play is out of the standard.
   - Check backlash for each joint of steering column assembly.
   - Check installation condition of steering gear assembly.

REMOVAL AND INSTALLATION

STEERING WHEEL

Exploded View

INFOID:0000000013477862



① Steering wheel

⊗: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

Removal and Installation

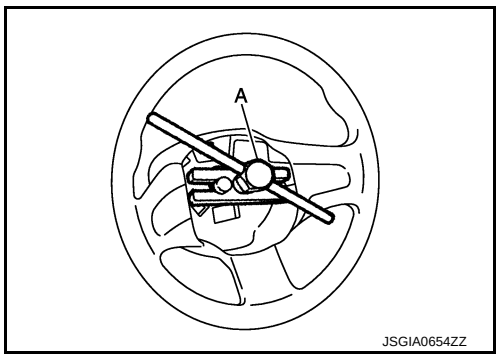
INFOID:0000000013477863

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-17, "Removal and Installation".
3. Disconnect heated steering harness connector.
4. Remove steering wheel lock nut after steering is locked.
5. Remove steering wheel with the steering wheel puller (A) [SST: ST27180001 (J-25726-A)].
   NOTE:
   When removing, place a matching mark on both steering wheel and shaft of steering column assembly before removing.



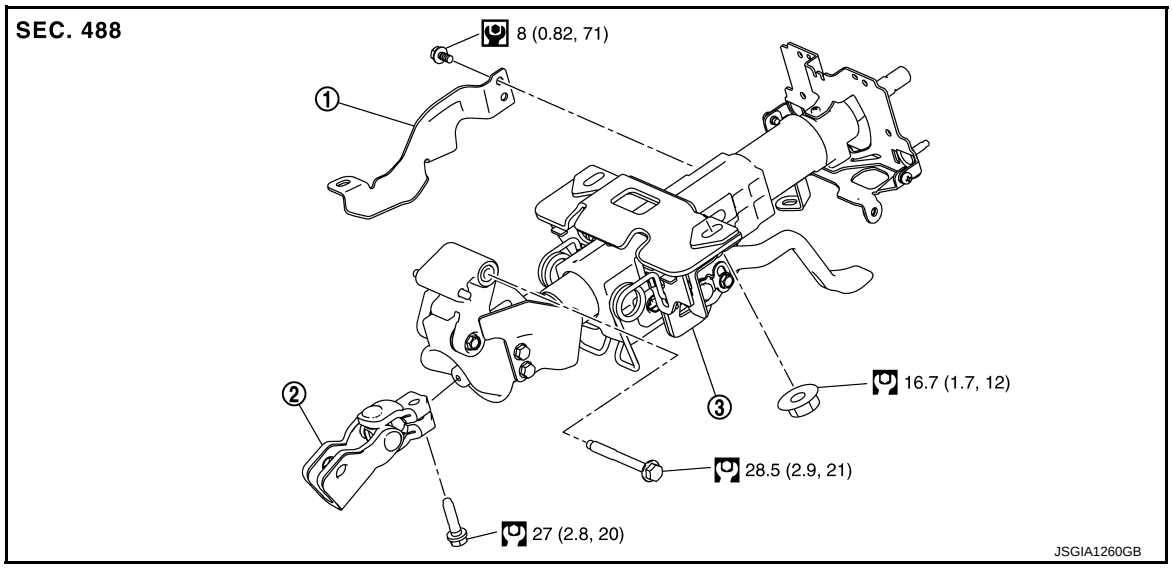
INSTALLATION

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

- Install the steering wheel to the same position when it was removed.
  CAUTION:
  Never reuse steering wheel lock nut.
- Check the spiral cable neutral position after replacing or rotating spiral cable. Refer to SR-22, "Removal and Installation".
  CAUTION:
  Never twist spiral cable excessively after it becomes tight. (Twisting may cause the cable to be torn off.)

STEERING COLUMN
WITHOUT ELECTRIC MOTOR
WITHOUT ELECTRIC MOTOR : Exploded View

INFOID:0000000013929568



① Harness bracket ② Upper joint ③ Steering column assembly

: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

WITHOUT ELECTRIC MOTOR : Removal and Installation

INFOID:0000000013929569

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.**
- **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.**
- **To prevent a malfunction and deformation from occurring in the tilt mechanism, never apply excessive force to the tilt lever.**

1. Set the vehicle to the straight-ahead position.
2. Place the tilt to the highest level, and place telescopic to the longest level.
   CAUTION:
   Securely lock the tilt telescopic lever.
3. Remove driver air bag module. Refer to SR-17, "Removal and Installation".
4. Remove steering wheel. Refer to ST-81, "Removal and Installation".
5. Remove instrument lower panel. Refer to IP-13, "Removal and Installation".
6. Remove the steering column cover. Refer to IP-13, "Removal and Installation".
7. Remove spiral cable. Refer to SR-22, "Removal and Installation".
8. Remove combination switch. Refer to BCS-100, "Removal and Installation".
9. Disconnect each switch harness connectors installed to steering column assembly.
10. Remove upper joint mounting bolt and nut (steering shaft side).
11. Separate the upper joint from steering shaft. Refer to ST-89, "Removal and Installation".
    CAUTION:
    - **Place a matching mark on both steering shaft and upper joint before removing steering shaft.**

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

12. Remove steering column assembly.
CAUTION:
When removing the mounting, be careful not to drop the steering column assembly.
13. If necessary, remove upper joint and bracket.
14. Perform inspection after removal. Refer to ST-83, "WITHOUT ELECTRIC MOTOR : Inspection".

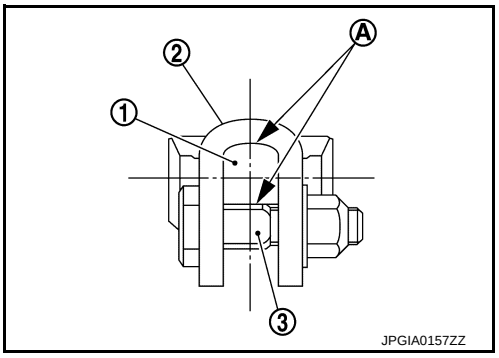
INSTALLATION

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

CAUTION:

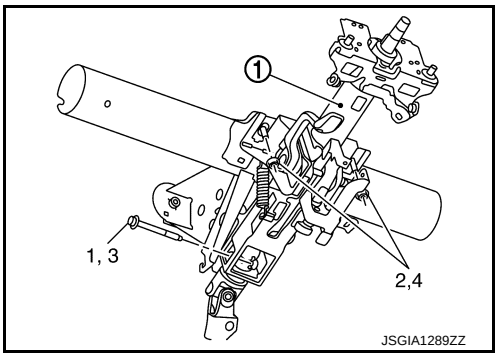
- **Never impact on the axis when removing steering column assembly.**
- **While removing the steering column assembly, never move the steering gear.**
- When installing steering shaft to upper joint, follow the procedure listed below.

- To tighten upper joint mounting nut (steering shaft side), manually tighten the bolt to check for scoring or galling before tightening the nut to the specified torque.
CAUTION:
Never reuse nut.
- After installation, check that there is no clearance Ⓐ between steering shaft ① and upper joint yoke ② and between steering shaft and mounting bolt ③.



- When installing the steering column assembly ①, temporarily tighten the bolt and nuts before tightening to the specified torque, referring to the tightening method and the numerical order shown below:

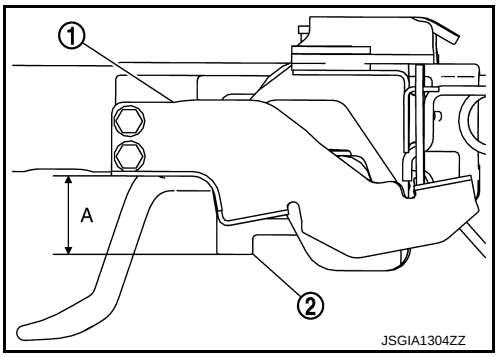
Temporary tightening	1 → 2
Final tightening (Specified torque)	3 → 4



- Install the bracket ① so that its end face become parallel to steering column assembly ② end face.

A : 34 mm (1.34 in)

- Perform inspection after installation. Refer to ST-83, "WITHOUT ELECTRIC MOTOR : Inspection".



WITHOUT ELECTRIC MOTOR : Inspection

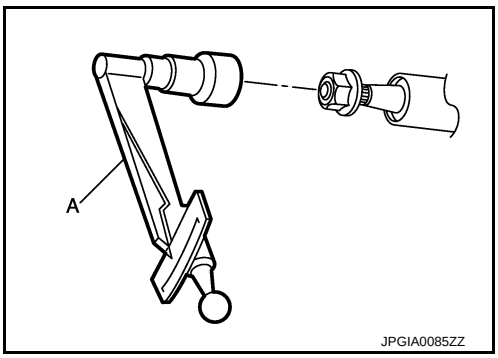
INFOID:0000000013929570

INSPECTION AFTER REMOVAL

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

- 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-100, "Steering Column".

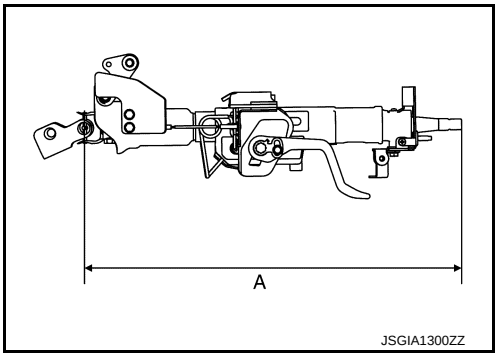


- Check the following item, if vehicle has been involved in a minor collision. Replace steering column assembly if outside the standard.

- Check the length (A) shown in the figure.

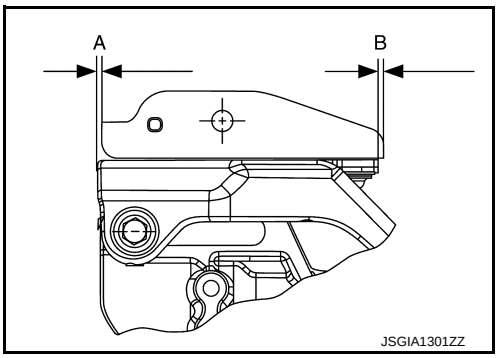
CAUTION:
Set the telescopic mechanism to its maximum length to measure the length of steering column.

Steering column length (A) : Refer to ST-100, "Steering Column".

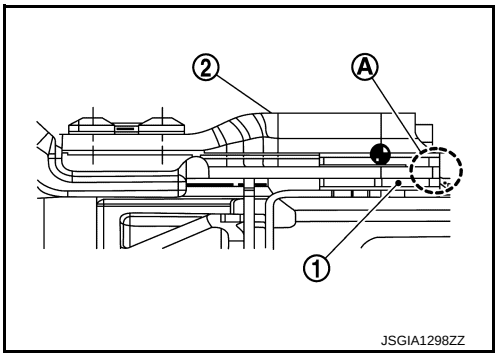


- Check the dimension (A) and (B) shown in the figure.

Impact displacement absorption part dimension (A) and (B) : Refer to ST-100, "Steering Column".



- Check that there is not the gap and unmatching in part Ⓐ between slide block ① and upper bracket ②.



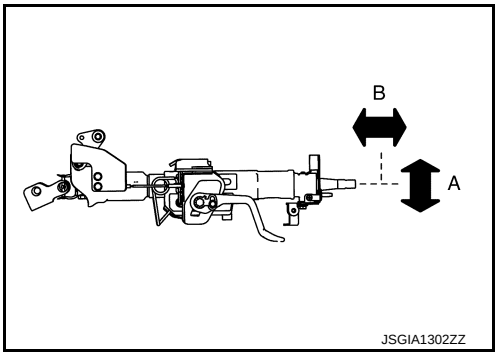
INSPECTION AFTER INSTALLATION

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Check that there is no malfunction, such as unusual steering feel or interference when operating tilt and telescopic.

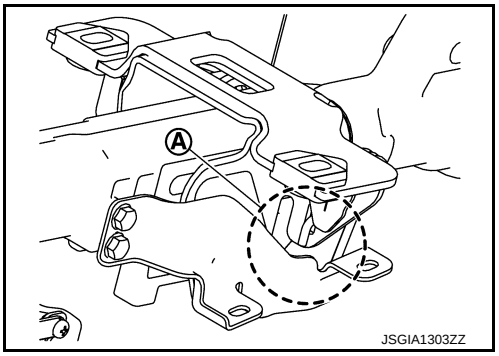
- Check tilt and telescopic mechanism operating range “A”, “B” as shown in the figure.

Tilt operating range (A) : Refer to ST-100, "Steering Column".

Telescopic operating range (B) : Refer to ST-100, "Steering Column".



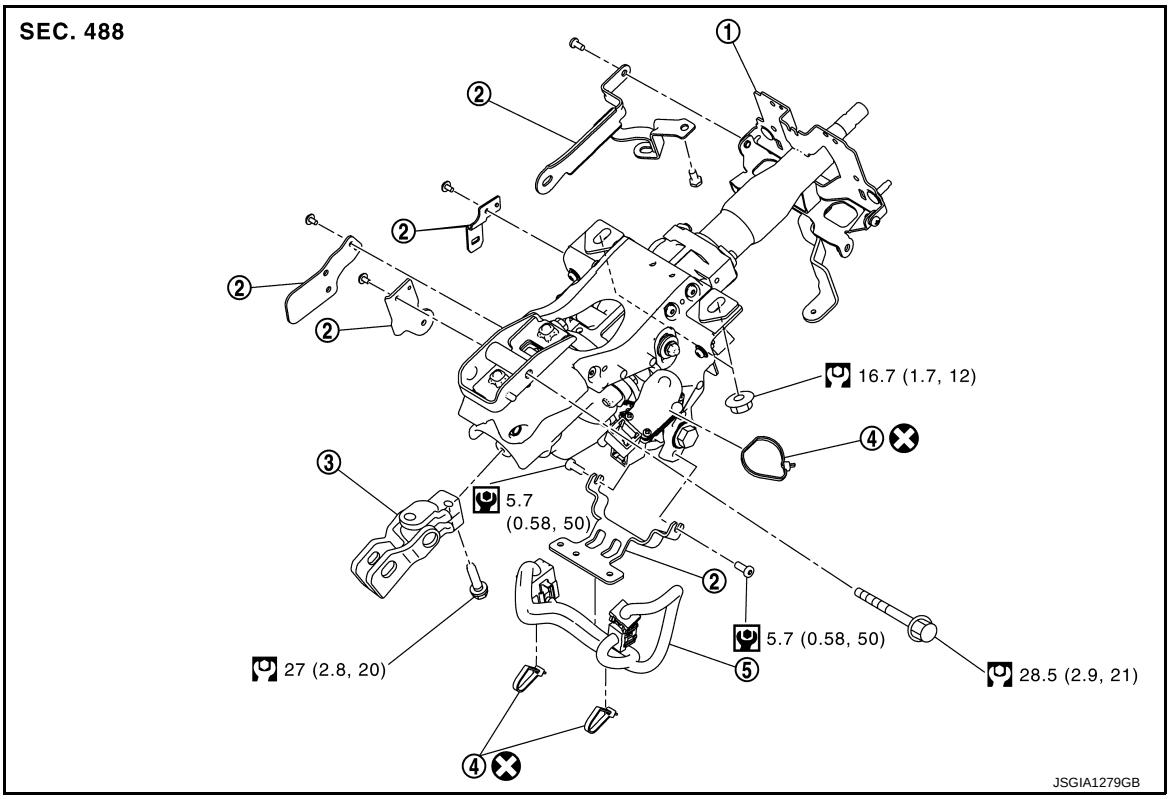
- When operating tilt and telescopic mechanism, check that there is not interference in part Ⓐ.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning torque, and front wheel turning angle.
- Steering wheel play: Refer to ST-80, "Inspection".
- neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-69, "Inspection".
- Adjust neutral position of steering angle sensor. Refer to BRC-91, "Description".



WITH ELECTRIC MOTOR

WITH ELECTRIC MOTOR : Exploded View

INFOID:0000000013477864



① Steering column assembly ② bracket ③ Upper joint
④ Band ⑤ Harness
⊗: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

WITH ELECTRIC MOTOR : Removal and Installation

INFOID:0000000013477865

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.**
- **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.**
- **To prevent a malfunction and deformation from occurring in the tilt mechanism, never apply excessive force to the tilt lever.**

1. Set the vehicle to the straight-ahead position.
2. Place the tilt to the highest level, and place the telescopic to the longest level.
3. Remove driver air bag module. Refer to SR-17, "Removal and Installation".
4. Remove steering wheel. Refer to ST-81, "Removal and Installation".
5. Remove instrument lower panel LH. Refer to IP-13, "Removal and Installation".
6. Remove the steering column cover. Refer to IP-13, "Removal and Installation".
7. Remove spiral cable. Refer to SR-22, "Removal and Installation".
8. Remove combination switch. Refer to BCS-100, "Removal and Installation".
9. Disconnect each harness connectors installed to steering column assembly.
10. Remove upper joint mounting bolt and nut (steering shaft side).
11. Separate the upper joint from steeringshaft. Refer to ST-89, "Removal and Installation".
    CAUTION:
    - **Place a matching mark on both steering shaft and upper joint before removing steering shaft.**
    - **When removing upper joint, never insert a tool, such as a screwdriver, into the yoke groove to pull out the upper joint. In case of the violation of the above, replace upper joint with a new one.**
12. Remove steering column assembly.
    CAUTION:
    When removing the mounting, be careful not to drop the steering column assembly.
13. If necessary, remove upper joint, harness, band, and brackets.
14. Perform inspection after removal. Refer to ST-87, "WITH ELECTRIC MOTOR : Inspection".

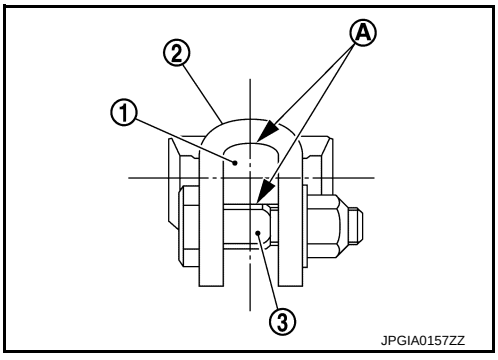
INSTALLATION

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

CAUTION:

- **Never impact on the axis when removing steering column assembly.**
- **While removing the steering column assembly, never move the steering gear.**
- When installing steering shaft to upper joint, follow the procedure listed below.

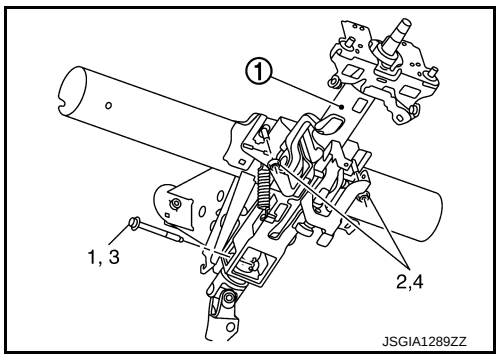
- To tighten upper joint mounting nut (steering shaft side), manually tighten the bolt to check for scoring or galling before tightening the nut to the specified torque.
  CAUTION:
  Never reuse nut.
- After installation, check that there is no clearance Ⓐ between steering shaft ① and upper joint yoke ② and between steering shaft and mounting bolt ③.



- When installing the steering column assembly ①, temporarily tighten the bolt and nuts before tightening to the specified torque, referring to the tightening method and the numerical order shown below:

Temporary tightening	1 → 2
Final tightening (Specified torque)	3 → 4

- Perform inspection after installation. Refer to ST-87, "WITH ELECTRIC MOTOR : Inspection".



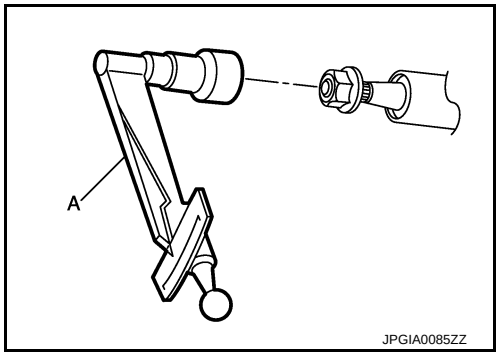
WITH ELECTRIC MOTOR : Inspection

INFOID:0000000013477866

INSPECTION AFTER REMOVAL

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

Rotating torque : Refer to ST-100, "Steering Column".

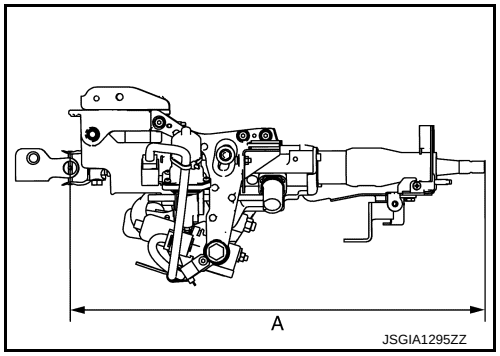


- Check the following item, if vehicle has been involved in a minor collision. Replace steering column assembly if outside the standard.

- Check the length (A) shown in the figure.

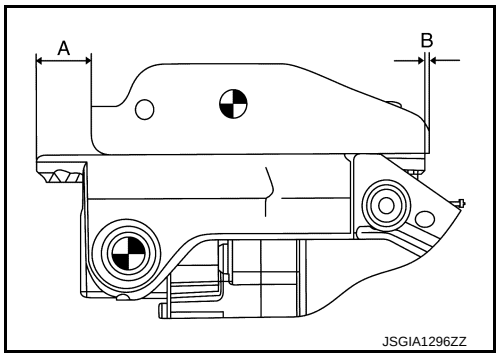
CAUTION:
Set the telescopic mechanism to its maximum length to measure the length of steering column.

Steering column length (A) : Refer to ST-100, "Steering Column".



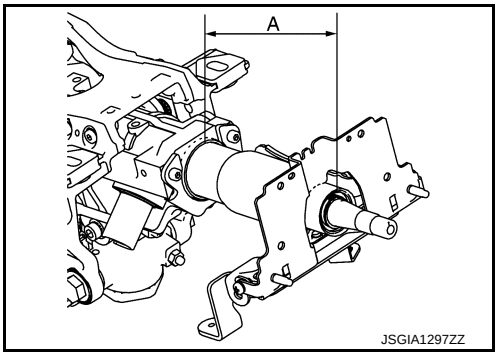
- Check the dimension “A” and “B” shown in the figure.

Impact displacement absorption part dimension (A) and (B) : Refer to ST-100, "Steering Column".



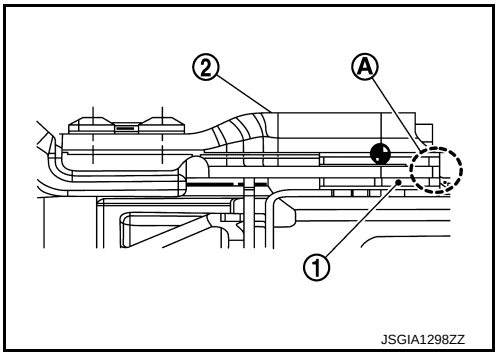
- Check the dimension (A) shown in the figure.

Impact displacement absorption part dimension (A) : **Refer to ST-100, "Steering Column".**



- Check that there is not the gap and unmatching in part Ⓐ between slide block ① and upper bracket ②.

Impact displacement absorption part dimension (A) and (B) : **Refer to ST-100, "Steering Column".**

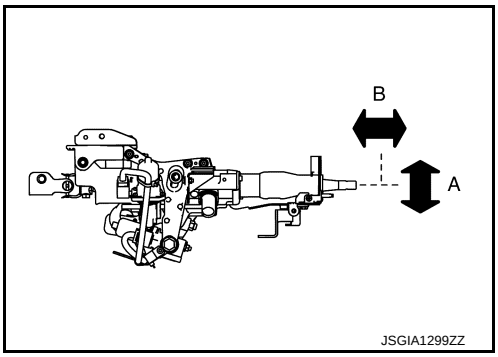


INSPECTION AFTER INSTALLATION

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Check that there is no malfunction, such as unusual steering feel or interference when operating tilt and telescopic.
- Check tilt and telescopic mechanism operating range (A), (B) as shown in the figure.

Tilt operating range (A) : **Refer to ST-100, "Steering Column".**

Telescopic operating range (B) : **Refer to ST-100, "Steering Column".**

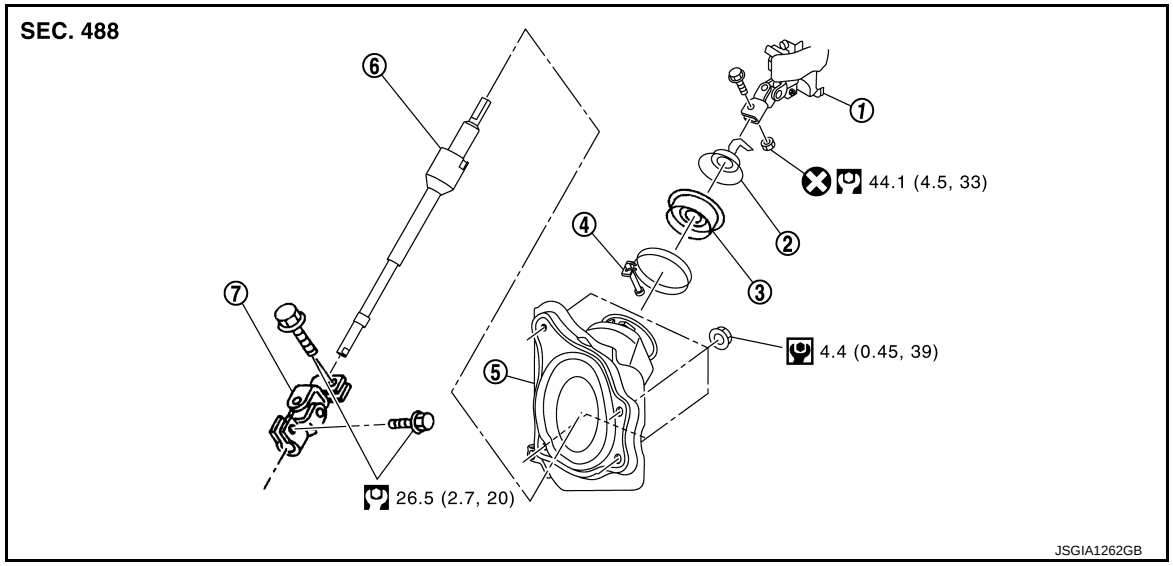


- Check the steering wheel play, neutral position steering wheel, steering wheel turning torque, and front wheel turning angle.
- Steering wheel play: Refer to ST-80, "Inspection".
- Neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-69, "Inspection".
- Adjust neutral position of steering angle sensor. Refer to BRC-91, "Description".

STEERING SHAFT

Exploded View

INFOID:0000000013477867



① Steering column assembly ② Collar ③ Hole cover seal
④ Clamp ⑤ Hole cover ⑥ Steering shaft
⑦ Lower joint

: Always replace after every disassembly.
: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)

Removal and Installation

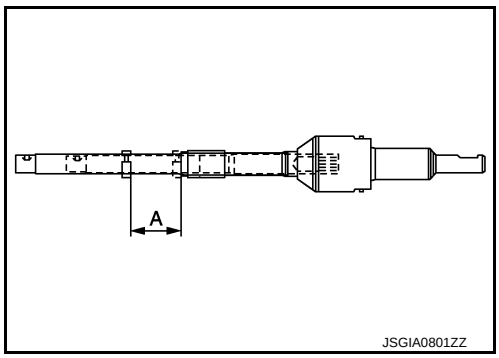
INFOID:0000000013477868

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. Fix the steering wheel.
3. Remove lower joint mounting bolt (steering gear side).
4. Separate the lower joint from the steering gear assembly by sliding the slide shaft (A: sliding range).



CAUTION:

- **Place a matching mark on both lower joint and steeringgear assembly before removing lower joint.**
- **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.**

5. Remove the hole cover mounting nuts.
6. Remove upper joint mounting bolt and nut (steering shaft side).

CAUTION:

- **Never damage collar.**
- **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.**

7. Remove the steering shaft and hole cover.

8. Remove hole cover seal and, clamp and hole cover.
9. Perform inspection after removal. Refer to ST-91, "Inspection".

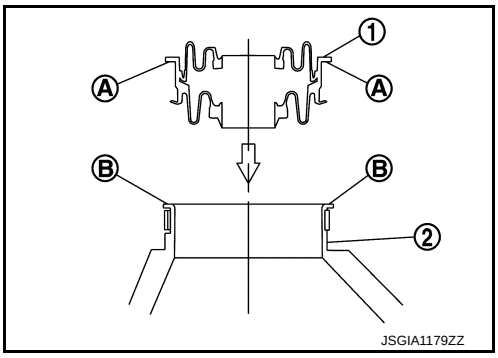
INSTALLATION

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.

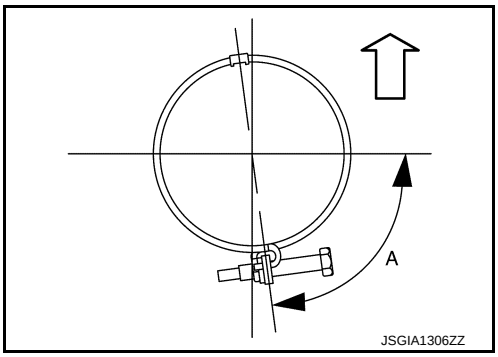
- When installing hole cover seal ① to hole cover ②, Insert hole cover seal end face Ⓐ until contacts hole cover end face Ⓑ.
- Never damage seal lip when inserting hole cover seal to steering shaft.



- Install clamp as shown in the figure.

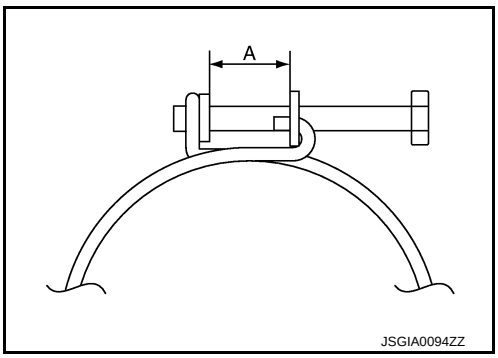
A : 76 – 86°

⇦ : Vehicle upper



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

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



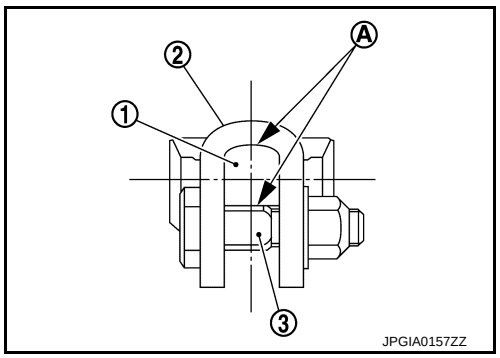
- For upper joint mounting bolt direction, refer to ST-89, "Exploded View". (Do not insert it from the other side.)
- When installing steering shaft to upper joint, follow the procedure listed below.

- To tighten upper joint mounting nut (steering shaft side), manually tighten the bolt to check for scoring or galling before tightening the bold to the specified torque.

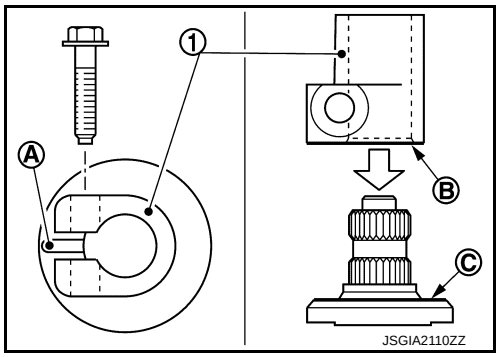
  CAUTION:

  Never reuse upper joint mounting nut (steering shaft side).

- After installation, check that there is no clearance Ⓐ between steering shaft ① and upper joint yoke ② and between steering shaft and mounting bolt ③.



- When installing lower joint to steering gear assembly, follow the procedure listed below.
- Align slit of lower joint ① with rear cover cap marking Ⓐ, insert lower joint end face Ⓑ until contacts steering gear assembly end face Ⓒ.
- When tightening the lower joint mounting bolt (steering gear assembly side) to the specified torque, manually tighten the bolt and check that there is no hook and scratch.
- When tightening the lower joint mounting bolt (steering shaft side), manually tighten the bolt and check that there is no hook and scratch. Check that the bolt is properly placed in the groove of the steering gear assembly before tightening the bolt to the specified torque.
- Perform inspection after installation. Refer to ST-91, "Inspection".



Inspection

INFOID:0000000013477869

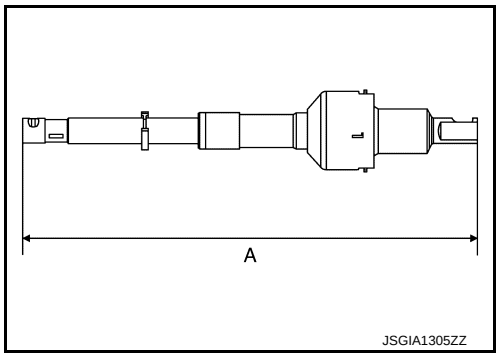
INSPECTION AFTER REMOVAL

Check the following items and replace, if necessary.

- Check hole cover and hole cover seal for damage or other malfunctions.
- Check steering shaft for damage or other malfunctions.
- Check the length (A) of the steering shaft.

CAUTION:
Check the length extended position of the steering shaft.

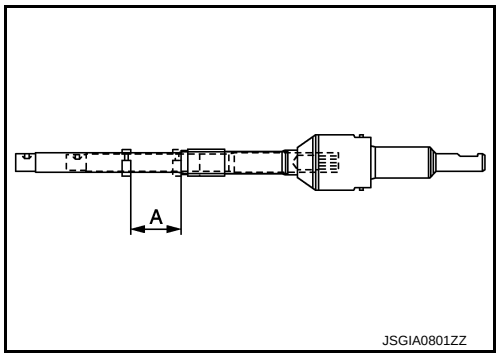
Shaft length (A) : Refer to ST-100, "Steering Shaft".



- Check the sliding range (A) of the steering shaft.

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

Shaft sliding range (A) : Refer to ST-100, "Steering Shaft".



INSPECTION AFTER INSTALLATION

Check the following items and replace, if necessary.

- Check hole cover and hole cover seal for damage or other malfunctions.

- Check steering shaft for damage or other malfunctions.
- 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 torque, and front wheel turning angle.

- Steering wheel play: Refer to ST-80, "Inspection".
- neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-69, "Inspection".

- Adjust neutral position of steering angle sensor. Refer to BRC-91, "Description".

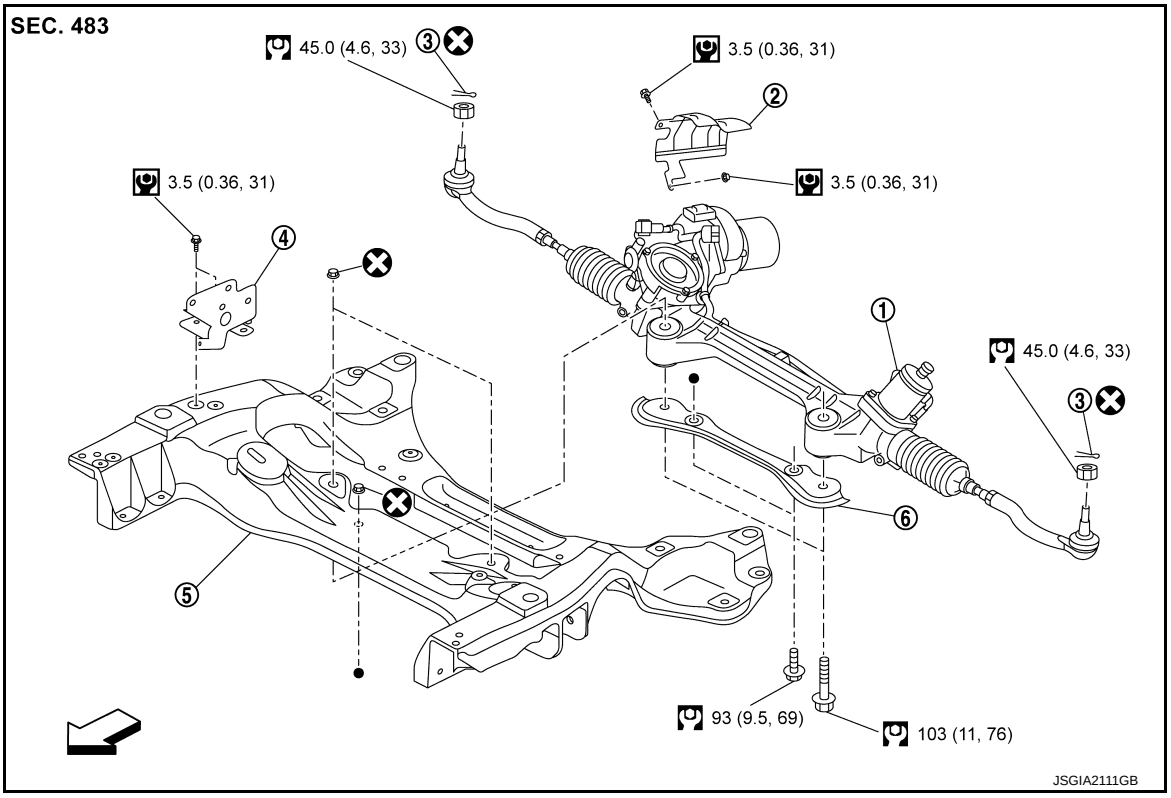
STEERING GEAR AND LINKAGE

Exploded View

INFOID:0000000013477870

REMOVAL

2WD



① Steering gear assembly	② Heat insulator	③ Cotter pin
④ Bracket	⑤ Front suspension member	⑥ Rack stay

⇦: Vehicle front

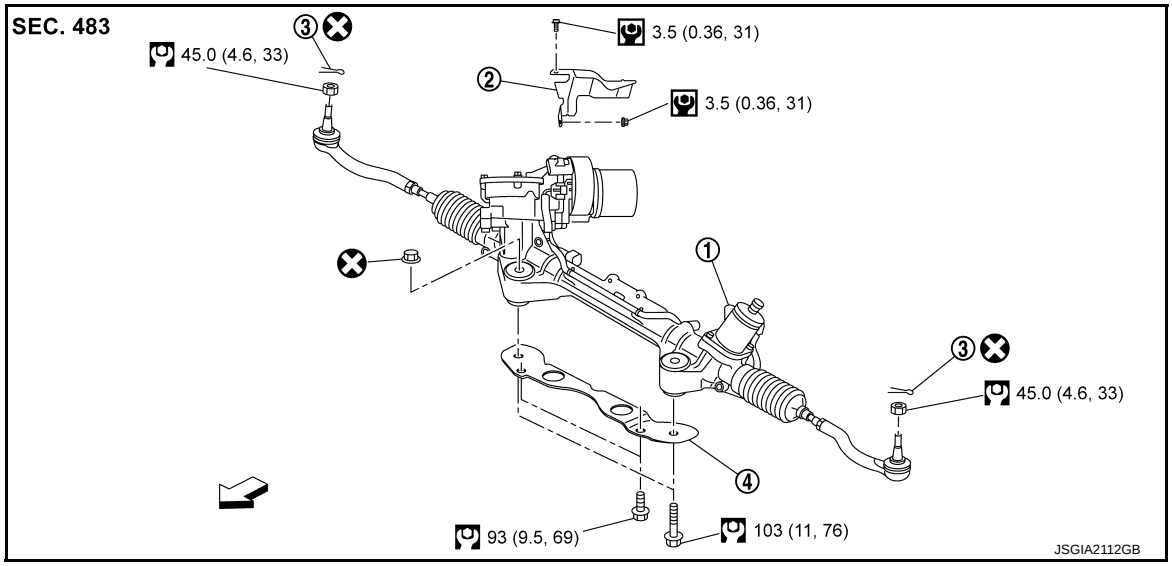
⊗: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

●: Indicates that the part is connected at points with same symbol in actual vehicle

AWD



① Steering gear assembly ② Heat insulator ③ Cotter pin

④ Rack stay

⇦: Vehicle front

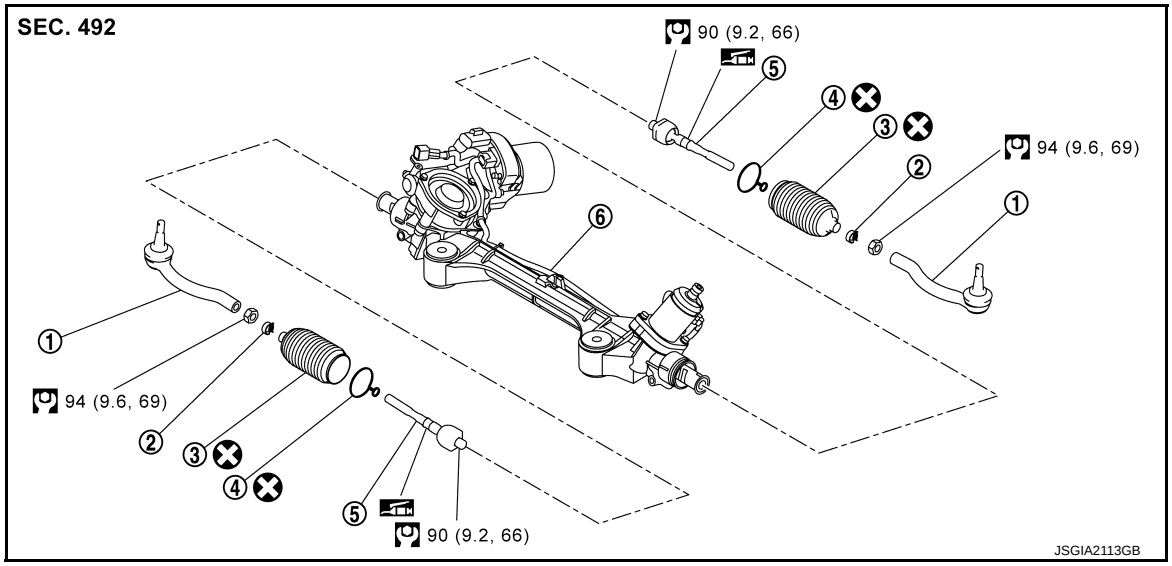
: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

DISASSEMBLY

2WD



① Outer socket ② Boot clamp ③ Boot

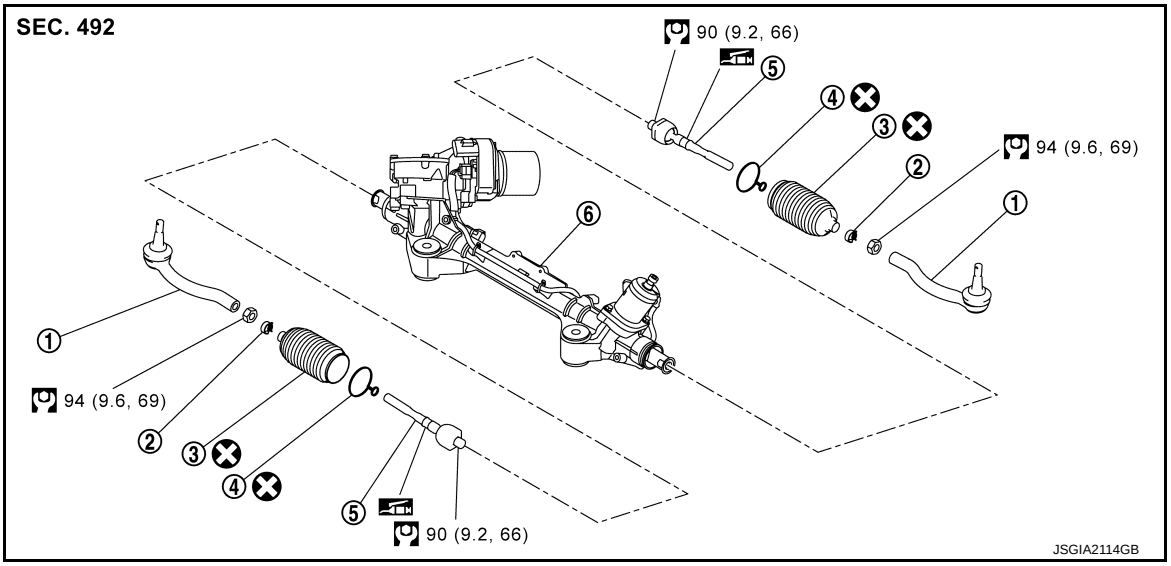
④ Boot clamp (stainless wire) ⑤ Inner socket ⑥ Gear housing assembly

: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: Apply multi-purpose grease.

AWD



① Outer socket ② Boot clamp ③ Boot
④ Boot clamp (stainless wire) ⑤ Inner socket ⑥ Gear housing assembly

⊗: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

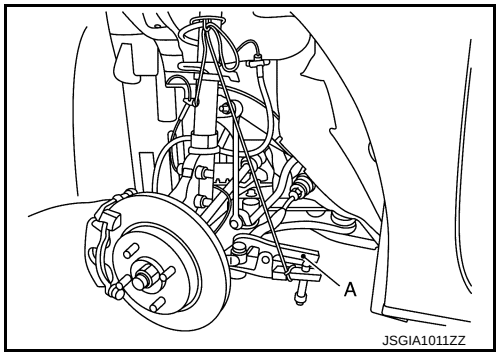
: Apply multi-purpose grease.

Removal and Installation

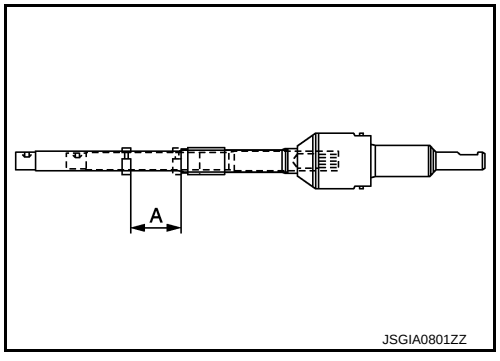
INFOID:0000000013477872

REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Remove tires. Refer to WT-74, "Exploded View".
3. Remove front under cover. Refer to EXT-35, "FRONT UNDER COVER : Removal and Installation".
4. Remove cotter pin, and then loosen the nut.
5. 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 suddenly coming off.



6. Remove lower joint fixing bolt (steering gear side).
7. Separate the lower shaft from the steering gear assembly by sliding the side shaft (A: sliding range).
   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.**



8. Remove three way catalyst (bank 1). Refer to EX-6, "Exploded View".
9. Remove suspenstion member stay. (2WD) Refer to FSU-43, "Removal and Installation".
10. Remove front cross bar. (AWD) Refer to FSU-71, "Removal and Installation".
11. Remove rack stay.
12. Disconnect dual pinion electric power steering harness connector.
13. Remove steering gear assembly mounting bolts, and nuts.
14. Set suitable jack to steering gear assembly.
    CAUTION:
    - **Never damage the steering gear assembly with a jack.**
    - **Check the stable condition when using a jack.**
15. Remove the steering gear assembly from the vehicle with rotating the 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 shaft and steering gear assembly. Be sure to secure steering wheel using string to avoid turning.

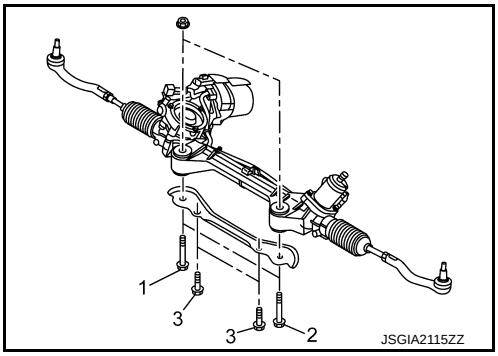
- Tighten the mounting bolts in the order shown in the figure when installing the steering gear assembly.

  Temporary tightening: 1 ⇒ 2 ⇒ 3

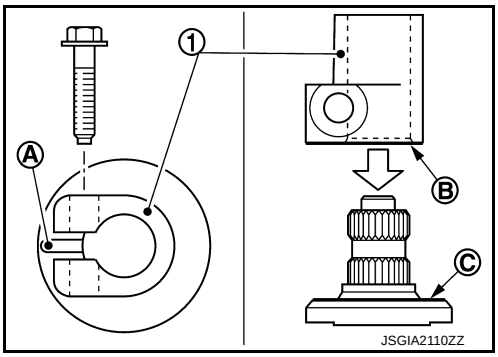
  Final tightening: 1 ⇒ 2 ⇒ 3

  CAUTION:

  Never reuse the steering gear assembly mounting nut.



- When installing lower joint to steering gear assembly, follow the procedure listed below.
  - Align slit of lower joint ① with rear cover cap marking Ⓐ, insert lower joint end face Ⓑ until contacts steering gear assembly end face Ⓒ.
  - When tightening the lower joint mounting bolt (steering gear assembly side) to the specified torque, manually tighten the bolt and check that there is no hook and scratch.
  - When tightening the lower joint mounting bolt (steering shaft side), manually tighten the bolt and check that there is no hook and scratch. Check that the bolt is properly placed in the groove of the steering gear assembly before tightening the bolt to the specified torque.



- To tighten steering mounting bolt (steering gear side), manually tighten the bolt to check for scoring or galling before tightening the bold to the specified torque.
- Perform inspection after installation. Refer to ST-98, "Inspection".

Disassembly and Assembly

INFOID:0000000013477873

DISASSEMBLY

CAUTION:

- **Never disassemble other than the parts shown in ST-93, "Exploded View".**
- **Disassemble and assemble steering gear assembly by fixing the mounting area with a vise using copper plates.**

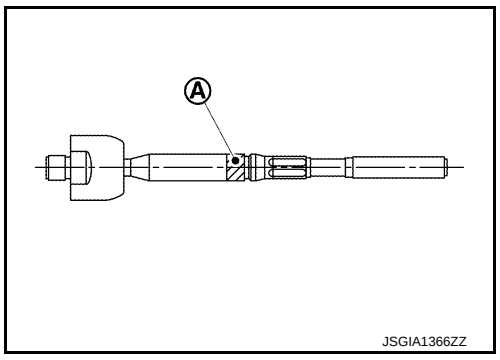
1. Loosen outer socket lock nut, and remove outer socket.
2. Remove boot clamps, and then remove boot from inner socket.
   CAUTION:
   Never damage inner socket and gear housing assembly when removing boot. Inner socket and gear housing assembly must be replaced if inner socket and gear housing assembly are damaged because it may cause foreign material interfusion.

3. Remove inner socket from gear housing assembly.
4. Perform inspection after disassembly. Refer to ST-98, "Inspection".

ASSEMBLY

CAUTION:
Disassemble and assemble steering gear assembly by fixing the mounting area with a vise using copper plates.

1. Install inner socket to gear housing assembly.
2. Apply multi-purpose grease to inner socket Ⓐ part.

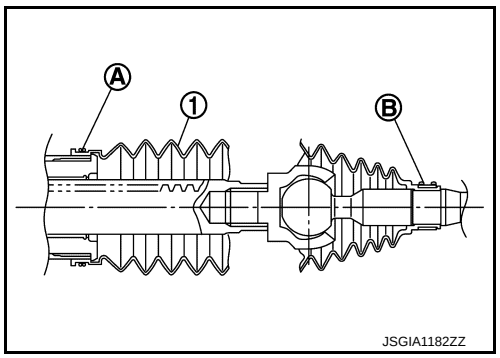


3. Install large end Ⓐ of boot ① to gear housing assembly.

Ⓑ : Small end of boot

CAUTION:
Never reuse boot.

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



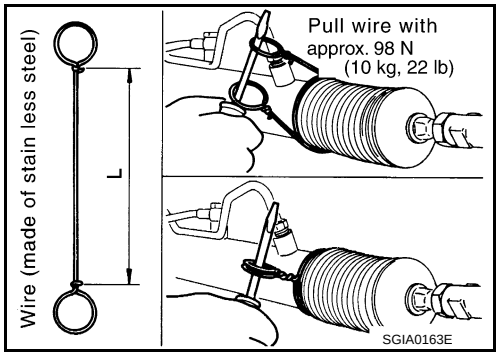
5. Install boot clamp to boot small end.
6. Install boot clamp to the large side of boot with the following procedure.

CAUTION:
Never reuse boot clamp.

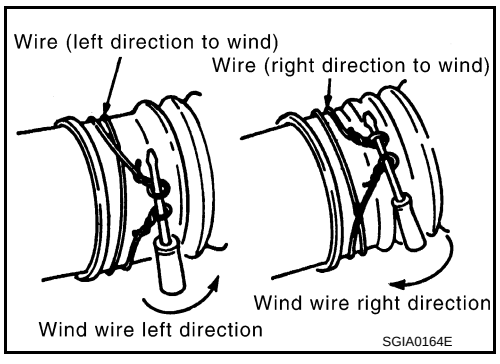
a. Tighten large side of boot with boot clamp (stainless wire).

Wire length (L) : 376 mm (14.80 in)

b. Wrap clamp around boot groove for two turns. Insert a flat-bladed screwdriver in loops on both ends of wire. Twist 3 to 3.5 turns while pulling them with force of approximately 98 N (10 kg, 22 lb).

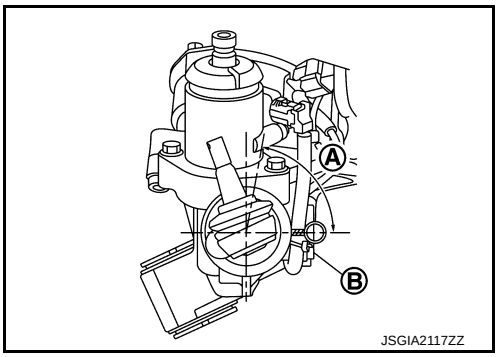


c. Twist boot clamp as shown. Pay attention to relationship between winding and twisting directions.



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

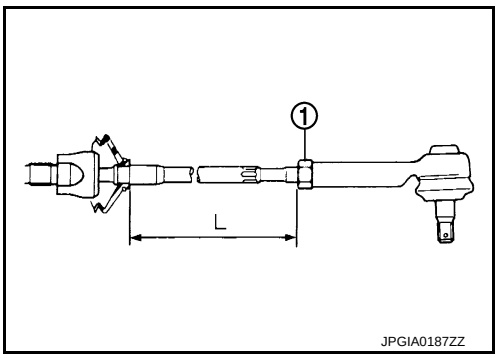
Ⓐ : 80°



JSGIA2117ZZ

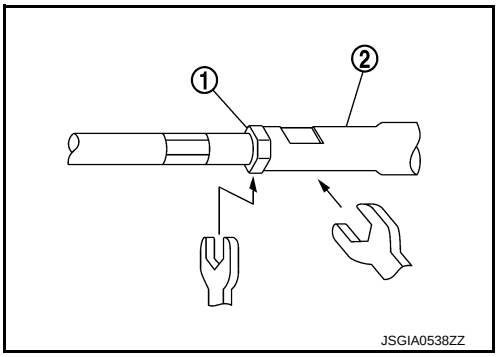
7. Adjust inner socket to standard length (L), and then tighten lock nut ① to the specified torque. Check length again after tightening lock nut.

Inner socket length (L) : **Refer to ST-101, "Steering Gear and Linkage".**



JPGIA0187ZZ

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.**



JSGIA0538ZZ

Inspection

INFOID:0000000013477874

INSPECTION AFTER DISASSEMBLY

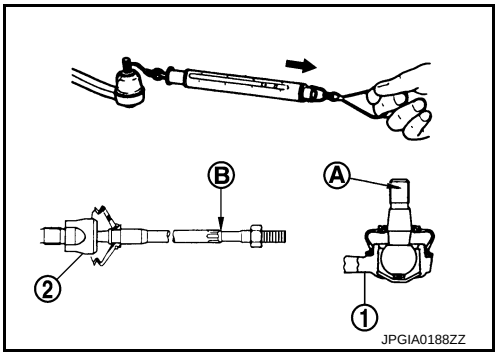
Boot
- Check boot for cracks, and replace it if a malfunction is detected.

Gear Housing Assembly
Check gear housing assembly for damage and scratches (inner wall). Replace if there are.

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

BALL JOINT SWINGING 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 and inner socket (gear housing assembly) if they are outside the standard.



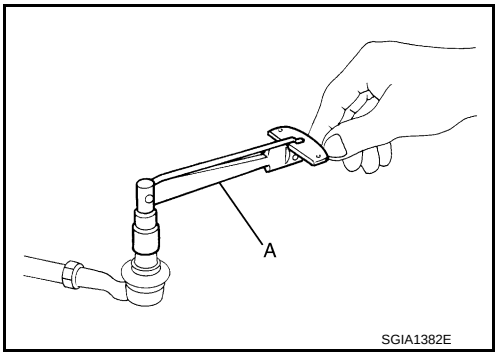
Measuring point of outer socket ① : Ball stud upper side Ⓐ

Measuring point of inner socket ② : Point Ⓑ shown in the figure

Swinging force (Spring balance measurement) : **Refer to ST-101, "Steering Gear and Linkage".**

BALL JOINT ROTATING TORQUE

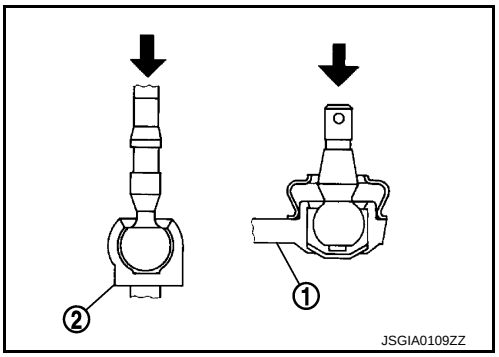
Make sure that the reading is within the following specified range using preload gauge [SST: ST3127S000 (J-25765-A)] (A). Replace outer socket if the reading is outside the specified value.



Rotating torque : **Refer to ST-101, "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 indicator, 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 (gear housing assembly) ② if the measured value is outside the standard.



Axial end play : **Refer to ST-101, "Steering Gear and Linkage".**

INSPECTION AFTER INSTALLATION

- Check if steering wheel turns smoothly when it is turned several times fully to the end of the left and right.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning torque, and front wheel turning angle.
  - Steering wheel play: Refer to ST-80, "Inspection".
  - Neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-69, "Inspection".
- Check wheel alignment. Refer to FSU-28, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-54, "EXCEPT DIRECT ADAPTIVE STEERING : Inspection" (AWD).

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

INFOID:0000000013477875

Steering gear model	PR28YB

Steering Wheel

INFOID:0000000013477876

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	39 N (4 kg-f, 9 lb-f)

Steering Angle

INFOID:0000000013477877

Unit: Degree minute (Decimal degree)

Item		Standard	
		2WD	AWD
Inner wheel	Minimum	35° 15′ (35.25°)	36° 00′ (36.0°)
	Nominal	38° 15′ (38.25°)	39° 00′ (39.0°)
	Maximum	39° 15′ (39.25°)	40° 00′ (40.0°)
Outer wheel	Nominal	32° 35′ (32.58°)	30° 40′ (30.67°)

Steering Column

INFOID:0000000013477878

Item		Standard	
		without electric motor	with electric motor
Rotating torque		0.49 N·m (0.05 kg-m, 4 in-lb) or less	
Steering column length*		492– 496 mm (19.37 – 19.53 in)	
Impact displacement absorption part dimension*	Dimension A	0.4 mm (0.016 in)	16.9 mm (0.665 in)
	Dimension B	1.5 mm (0.059 in)	1.42 mm (0.0559 in)
	Dimension C	—	140.8 mm (5.54 in)
Tilt operating range*		65 mm (2.56 in)	
Telescopic operating range*		47 mm (1.85 in)	

*: For measuring position, refer to ST-83, "WITHOUT ELECTRIC MOTOR : Inspection" (without electric motor), ST-87, "WITH ELECTRIC MOTOR : Inspection" (with electric motor).

Steering Shaft

INFOID:0000000013477879

Item	Standard
Shaft length*	508.8 mm (20.03 in) or less
Shaft sliding range*	83.7 mm (3.295 in)

*: For measuring position, refer to ST-91, "Inspection".

Steering Gear and Linkage

INFOID:0000000013477880

Item		Standard
Rack sliding force		310 – 450 N (31.62 – 45.90 kg-f, 69.69 – 101.16 lb-f)
Outer socket ball joint	Swing force* (Spring balance measurement)	4.4 – 42.7 N (0.45 – 4.35 kg-f, 0.99 – 9.59 lb-f)
	Rotating torque	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* (Spring balance measurement)	96.1 N (9.8 kg-f, 21.6 lb-f) or less
	Axial end play	0.2 mm (0.008 in) or less
Inner socket length		68.5 mm (2.697 in) or less
Rack stroke neutral position	2WD	67.2 mm (2.646 in)
	AWD	64.1 mm (2.524 in)

*: For measuring position, refer to ST-98, "Inspection".

PRECAUTION

PRECAUTIONS

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

INFOID:0000000012793912

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

WARNING:

Always observe the following items for preventing accidental activation.

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, it is recommended that all maintenance and repair be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper repair, 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.

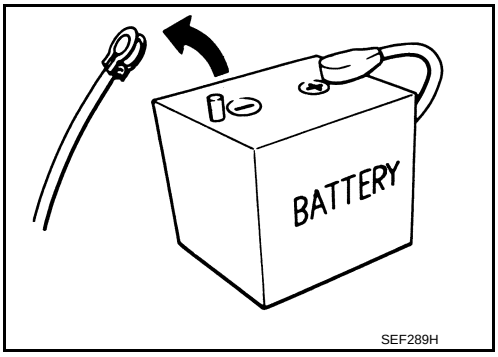
- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery or batteries, and wait at least 3 minutes before performing any service.**

Precautions for Removing Battery Terminal

INFOID:0000000013509509

When disconnecting the battery terminal, pay attention to the following.

- Always use a 12V battery as power source.
- Never disconnect battery terminal while engine is running.
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
- For vehicles with the engine listed below, remove the battery terminal after a lapse of the specified time:



BR08DE	: 4 minutes	V9X engine	: 4 minutes
D4D engine	: 20 minutes	YD25DDTi	: 2 minutes
HR09DET	: 12 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		

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.

- After high-load driving, if the vehicle is equipped with the V9X engine, turn the ignition switch OFF and wait for at least 15 minutes to remove the battery terminal.

NOTE:

- Turbocharger cooling pump may operate in a few minutes after the ignition switch is turned OFF.
- Example of high-load driving
  - Driving for 30 minutes or more at 140 km/h (86 MPH) or more.
  - Driving for 30 minutes or more on a steep slope.

- 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.

Service Notice or Precautions for Direct Adaptive Steering

INFOID:0000000013509511

- Set the vehicle to the straight-ahead position when checking direct adaptive steering and removing each component.
- 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.
- A machine sound may be heard near the driver’s seat when the system is starting. This is an operating sound in normal condition of system and the sound is not.
- Before connecting or disconnecting each component harness connector, turn ignition switch “OFF” and disconnect battery ground cable. Because battery voltage is applied to power steering control module even if ignition switch is turned “OFF”.
- Refer to STC-202, "Special Repair Requirement" for the replacement of each component.

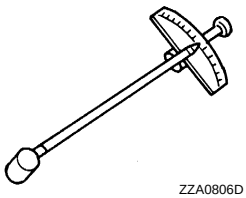
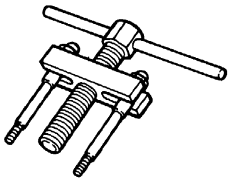
PREPARATION

PREPARATION

Special Service Tools

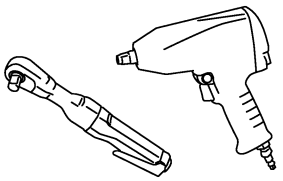
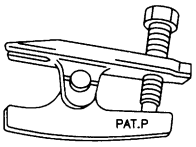
INFOID:0000000012793915

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

Tool number (TechMate No.) Tool name	Description
ST3127S000 (J-25765-A) Preload gauge  ZZA0806D	• Measuring steering wheel turning torque • Measuring steering column rotating torque • Measuring pinion rotating torque • Measuring ball joint rotating torque
ST27180001 (J-25726-A) Steering wheel puller  ZZA0819D	Removing steering wheel

Commercial Service Tools

INFOID:0000000012793916

Tool name	Description
Power tool  PBIC0190E	Loosening bolts and nuts
Ball joint remover  S-NT146	Removing steering outer socket

Lubricant or/and Sealant

INFOID:0000000012793917

Name	Description
Multi-purpose grease	Steering gear assembly inner socket

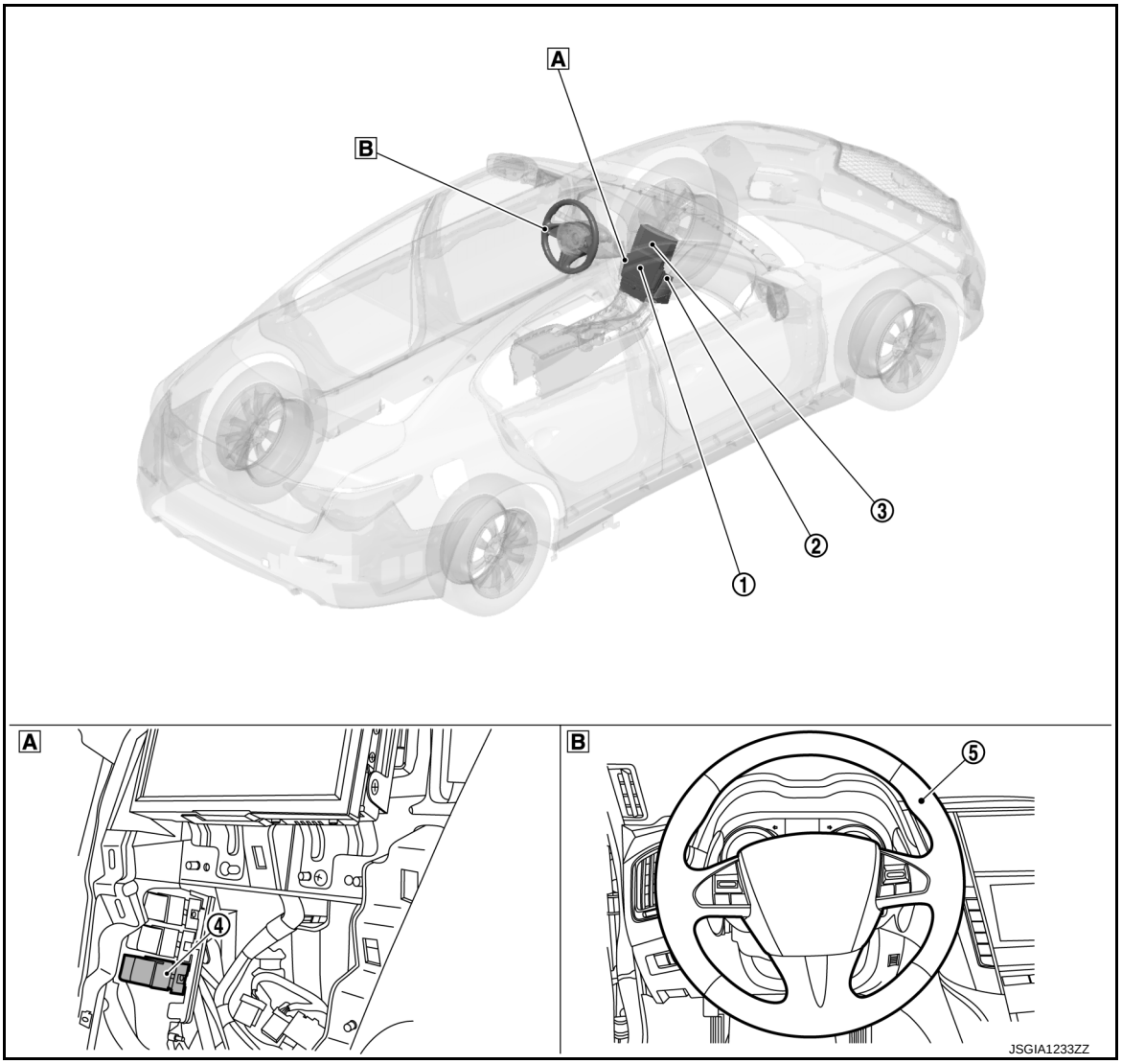
SYSTEM DESCRIPTION

COMPONENT PARTS

HEATED STEERING WHEEL SYSTEM

HEATED STEERING WHEEL SYSTEM : Component Parts Location

INFOID:0000000012793918



A At the back of integral switch

B Steering wheel

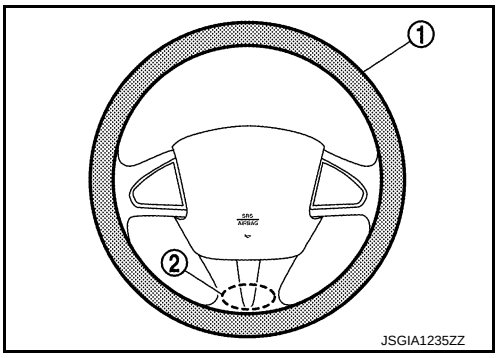
No.	Component	Function
①	Integral switch	• Changes the following settings according to the operation of the display part. - Steering heater function ON/OFF - Steering heater AUTO function ON/OFF • Transmits the following signals to display control unit via communication line. - Steering heater signal - Steering heater auto signal • Refer to AV-14, "Component Parts Location" for detailed installation location.
②	A/C auto amp.	• For the function, refer to ST-106, "HEATED STEERING WHEEL SYSTEM : A/C Auto Amp.". • Refer to HAC-6, "AUTOMATIC AIR CONDITIONING SYSTEM : Component Parts Location" for detailed installation location.
③	Display control unit	• Transmits the following signals received from integral switch to AC auto amp. via CAN communication. - Steering heater signal - Steering heater auto signal • Refer to AV-14, "Component Parts Location" for detailed installation location.
④	Heated steering wheel relay	ST-106, "HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel Relay"
⑤	Heated steering wheel	ST-106, "HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel"

HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel

INFOID:0000000012793919

With the power supply from the heated steering wheel relay, the heated steering wheel controls temperature through the heating element ① and thermostat ② built into the steering wheel.

- Heating element: Generates heat by energization.
  NOTE:
  Heating element is located at the back of the steering wheel leather surface.
- Thermostat: Turns ON/OFF power supply according to the specified temperature.



HEATED STEERING WHEEL SYSTEM : Heated Steering Wheel Relay

INFOID:0000000012793920

Through the control of the A/C auto amp., the heated steering wheel relay turns ON/OFF electricity to the heating element built-in the steering wheel. For location, refer to ST-105, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

HEATED STEERING WHEEL SYSTEM : A/C Auto Amp.

INFOID:0000000012793921

- A/C auto amp. turns ON/OFF the heated steering wheel relay, according to a signal transmitted from display control unit by CAN communication.
- The A/C auto amp. includes a timer. The heated steering wheel relay is turned OFF when the timer operating time reaches 30 minutes.
- Timer: Turns ON/OFF the heated steering wheel relay for a specified period of time
- For other information of A/C auto amp., refer to HAC-15, "A/C Auto Amp.".

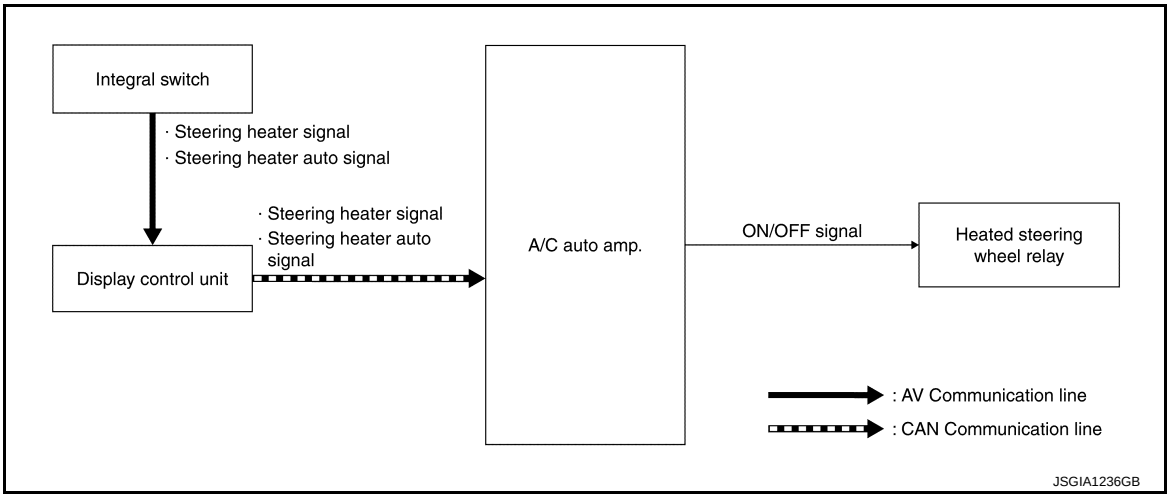
SYSTEM

HEATED STEERING WHEEL SYSTEM

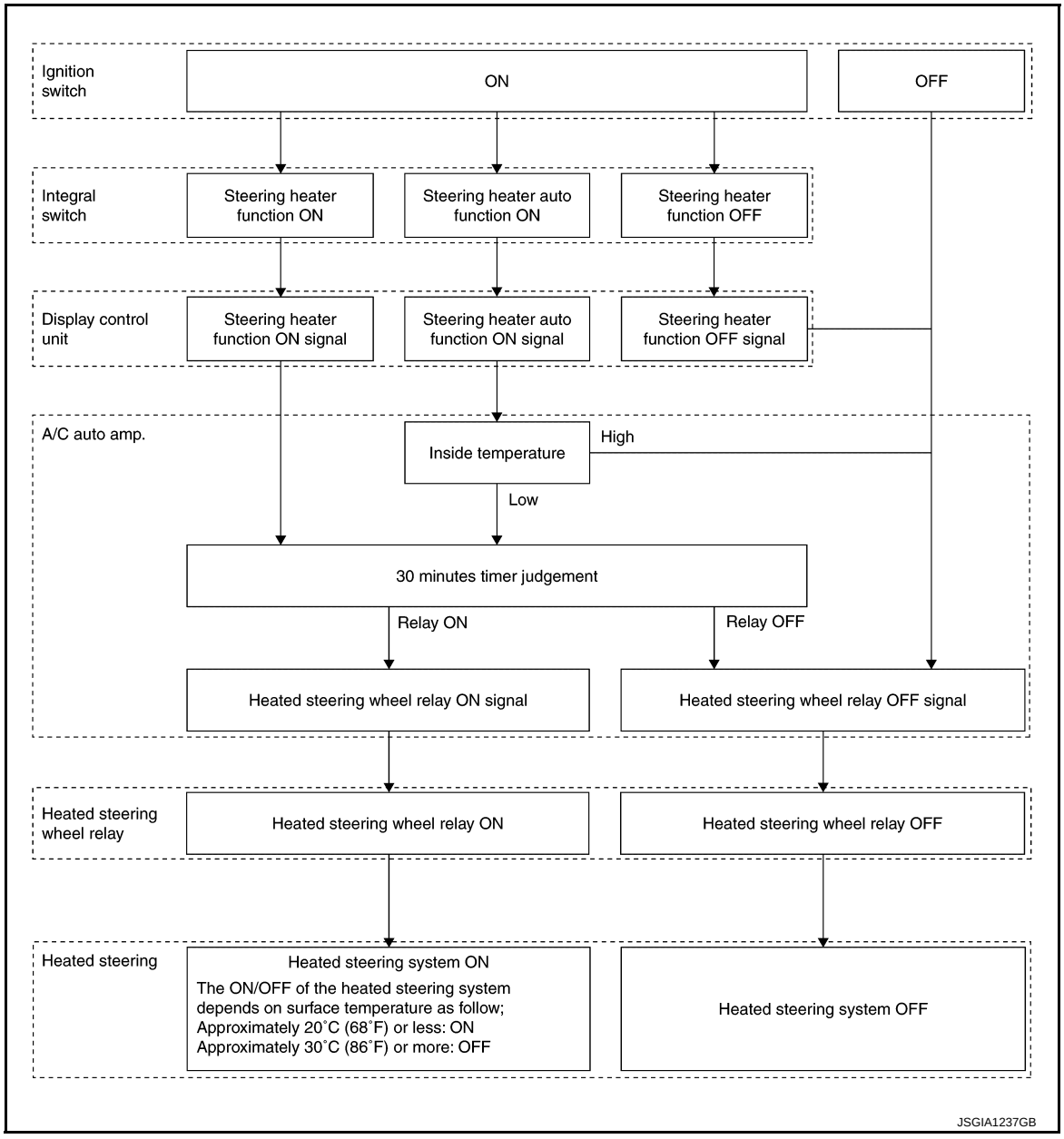
HEATED STEERING WHEEL SYSTEM : System Description

INFOID:0000000012793922

SYSTEM DIAGRAM



FUNCTION FLOW



DESCRIPTION

Normal Control

- The heated steering wheel system maintains the surface temperature of the steering wheel between 20°C (68°F) and 30°C (86°F).
- Once steering heater function turns ON on the integral switch display, A/C auto amp. that has received signal via display control unit turns the heated steering wheel relay ON and electrifies to the heat elements built-in the steering wheel to heat the steering wheel.
- When steering heater function turns OFF, A/C auto amp. turns OFF the heated steering wheel relay and stops the electricity supply to the heat elements.
- When the surface temperature of the steering wheel is higher than 30°C (86°F), the thermostat built-in the steering wheel turns OFF, and electricity to the heating element is turned OFF. When the surface temperature drops to less than 20°C (68°F), the thermostat built-in the steering wheel turns ON, and electricity to the heating element is turned ON.

Auto Control

- Once steering heater auto function turns ON on the integral switch display part, the steering heater switches to the auto control.

- Under the auto control, A/C auto amp. turns the heated steering wheel relay ON and electrifies the heat elements built in the steering wheel to heat the steering wheel when the temperature in the passenger room is low.
- After the heated steering wheel relay turns ON, the electricity to the heat element switches ON/OFF corresponding to the steering wheel surface temperature as well as under the normal control.
- If ON⇔OFF operation of “Steering Heater” is performed on the integral switch display, the auto control is cancelled.

Timer Function

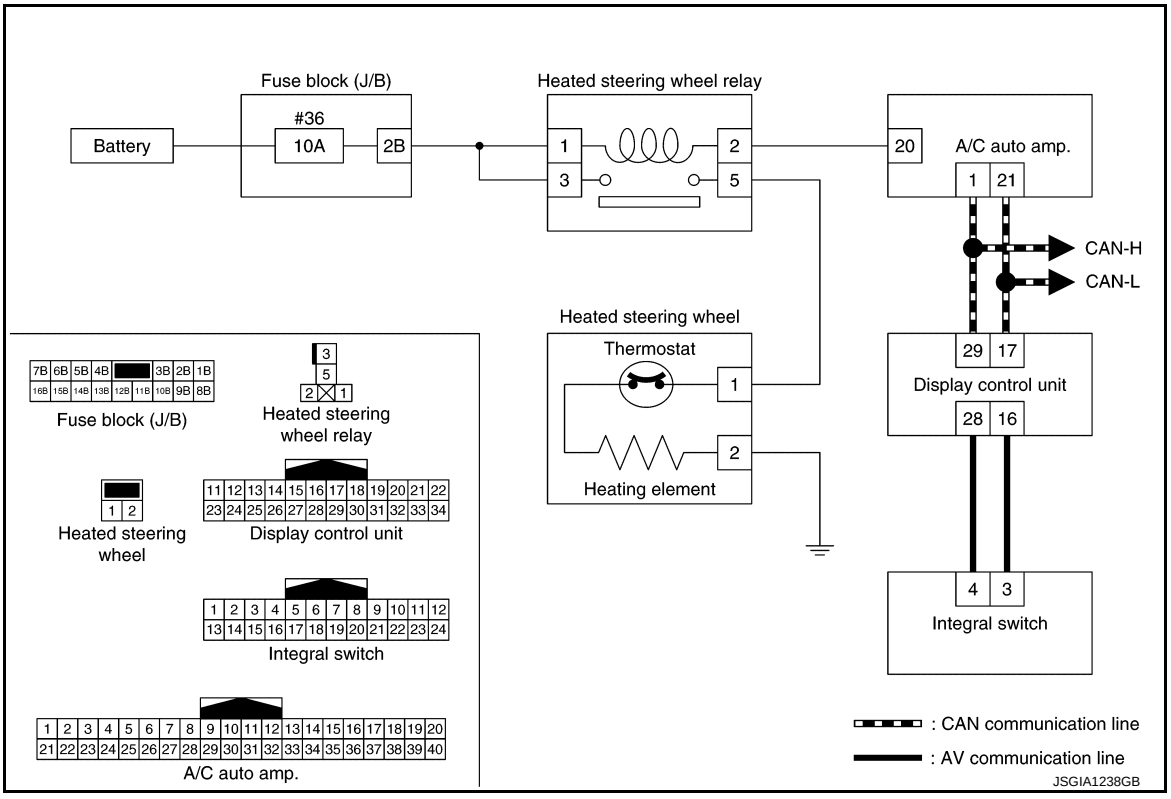
- The A/C auto amp. has a timer. After steering heater function or steering heater auto function turns ON, when operating time becomes more than the specified time (30 minutes), the A/C auto amp. turns OFF the heated steering wheel relay to stop heating.

Condition for Electrifying Heat Elements

Ignition switch	Timer function judgment result	Steering Heater Mode	Electrifying heat elements
ON	ON	Steering Heater ON	Turns ON/OFF corresponding to the steering wheel surface temperature.
		Steering Heater Auto ON	• Turns ON when the passenger room temperature is low. • Turns ON/OFF corresponding to the steering wheel surface temperature after electricity turns ON.
		• Steering Heater OFF • Steering Heater Auto OFF	OFF
	OFF	—	OFF
OFF	—	—	OFF

HEATED STEERING WHEEL SYSTEM : Circuit Diagram

INFOID:0000000012793923

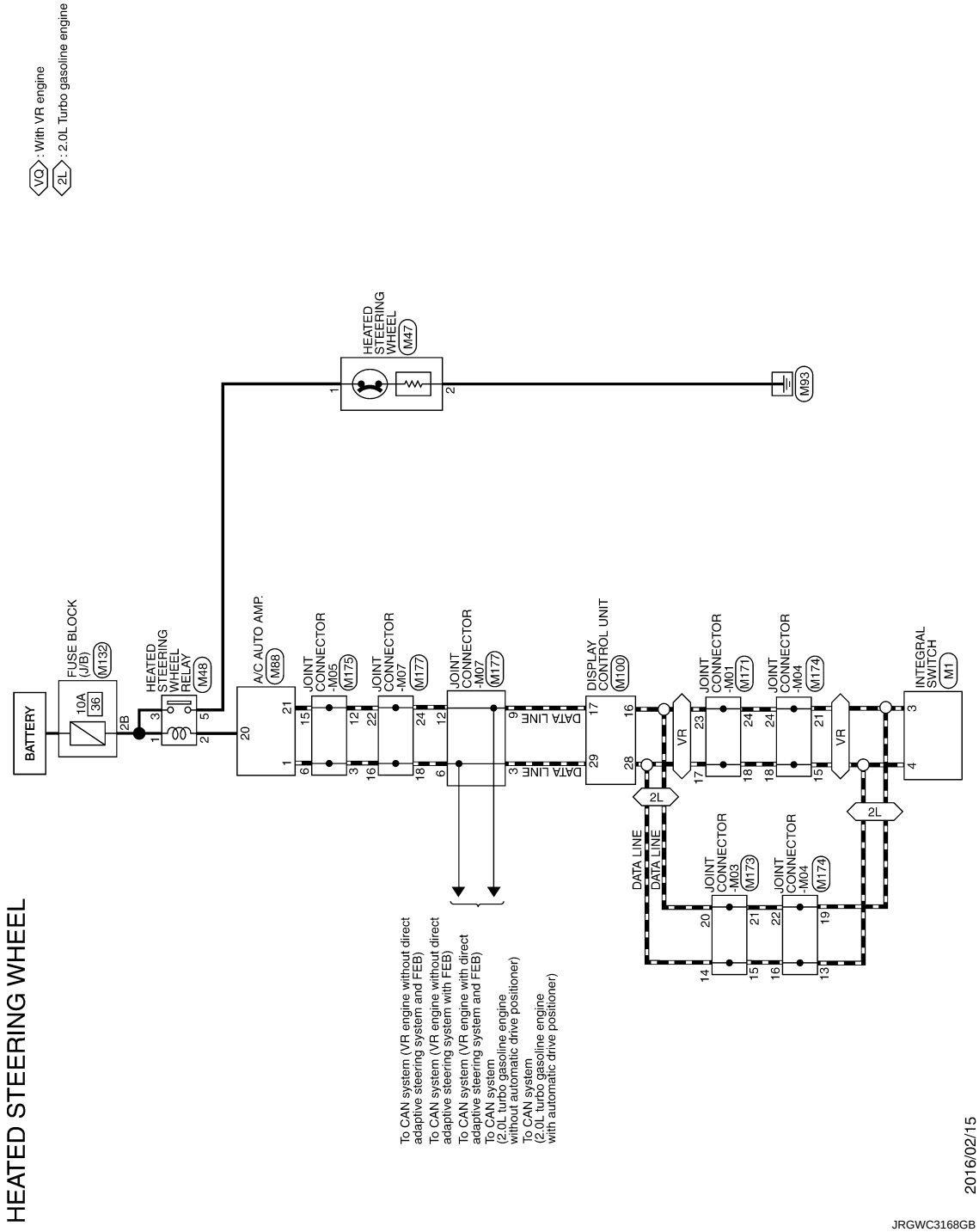


WIRING DIAGRAM

HEATED STEERING WHEEL

Wiring Diagram

INFOID:0000000013523251



HEATED STEERING WHEEL

Connector No.	M1
Connector Name	INTEGRAL SWITCH
Connector Type	TH24FW-NH

H.S.

13	14	15	16	18	19	20
	2	3	4	7	8	

Terminal No.	Color Of Wire	Signal Name [Specification]
2	R	ILLUMINATION SIGNAL
3	LG	AV COMM (L)
4	SB	AV COMM (H)
7	W/B	DISK EJECT SIGNAL
8	G	HAZERD SIGNAL
13	B	GND
14	SB	ACC [For 2.0L turbo gasoline engine]
14	V	ACC [For VR30 engine]
15	B	ILLUMINATION CONTROL SIGNAL
16	BG	DISK EJECT SIGNAL GROUND
18	R	IGN [For VR30 engine]
18	W	IGN [For 2.0L turbo gasoline engine]
19	BR	CAMERA SWITCH SIGNAL
20	LG	AIR BAG INDICATOR OFF SIGNAL

Connector No.	M47
Connector Name	HEATED STEERING WHEEL
Connector Type	NS02FW-CS

H.S.

1	2

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

Connector No.	M48
Connector Name	HEATED STEERING WHEEL RELAY
Connector Type	M502FL-M2-LC

H.S.

3	
5	
2	1

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

Connector No.	M88
Connector Name	A/C AUTO AMP.
Connector Type	TH40FW-NH

H.S.

1	2	3			6	7		9		11		13	14	15	16	17	18		20
21	22	23			26	27	28		30						35	36	37	38	40

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	CAN-H
2	B	GROUND
3	W	BATTERY POWER SUPPLY
7	G	AMBIENT SENSOR SIGNAL
9	R	SUNLOAD SENSOR SIGNAL
13	SB	ACC POWER SUPPLY [With 2.0L turbo gasoline engine]
13	V	ACC POWER SUPPLY [With VR30 engine]
16	P	LIN SIGNAL
17	R	DOOR MOTOR POWER SUPPLY
18	P	BLOWER MOTOR CONTROL SIGNAL
20	L	HEATED STEERING WHEEL RELAY CONTROL SIGNAL
21	P	CAN-L
22	B	GROUND
23	R	IGNITION POWER SUPPLY [With VR30 engine and with ISS]
23	W	IGNITION POWER SUPPLY [Except with VR30 engine and with ISS]

26	B	SENSOR GROUND
27	LG	IN-VEHICLE SENSOR SIGNAL
28	BR	INTAKE SENSOR SIGNAL
30	BG	EXHAUST GAS / OUTSIDE ODOR DETECTING SENSOR SIGNAL
37	B	GROUND
38	BG	IGNIZER (ON/OFF) CONTROL SIGNAL
40	BG	ECV CONTROL SIGNAL

Connector No.	M100
Connector Name	DISPLAY CONTROL UNIT
Connector Type	TH24FW-NH

H.S.

												16	17		19	20		22
												26	28	29	30	31	33	34

Terminal No.	Color Of Wire	Signal Name [Specification]
16	LG	AV COMM (L)
17	P	CAN-L
19	R	DIMMER SIGNAL
20	BR	REVERSE SIGNAL
22	B	GND
26	BR	CAMERA SWITCH SIGNAL
28	SB	AV COMM (H)
29	L	CAN-H
30	R	IGN [For VR30 engine]
30	W	IGN [For 2.0L turbo gasoline engine]
31	R	VEHICLE SPEED SIGNAL (8-PULSE)
33	SB	ACC [Except for VR30 engine and with ISS]
33	V	ACC [For VR30 engine and with ISS]
34	Y	BAT

Connector No.	M132
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS16FW-CS

H.S.

16B	15B	14B	13B	11B	5B	4B	3B	2B	1B	9B

Terminal No.	Color Of Wire	Signal Name [Specification]
11B	LG	-
13B	P	-
14B	G	-
15B	Y	-
16B	Y	-
2B	B	-
4B	W	-
5B	R	-
9B	Y	-

Connector No.	M171
Connector Name	JOINT CONNECTOR-M01
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1
	11	10	9	8	7
18	17	16	15	14	
24	23	22		20	19

Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	-
2	B	-
3	B	-
4	B	-
5	B	-
6	B	-
7	B	-
8	B	-
9	B	-
10	G	-

JRGWC3169GB

HEATED STEERING WHEEL

11	G	-
14	B	-
15	B	-
16	SB	- [With VR30 engine]
16	Y	- [With 2.0L turbo gasoline engine]
17	SB	- [With VR30 engine]
17	Y	- [With 2.0L turbo gasoline engine]
18	SB	- [With VR30 engine]
18	Y	- [With 2.0L turbo gasoline engine]
19	G	-
20	G	-
22	LG	- [With VR30 engine]
22	SB	- [With 2.0L turbo gasoline engine]
23	LG	- [With VR30 engine]
23	SB	- [With 2.0L turbo gasoline engine]
24	LG	- [With VR30 engine]
24	SB	- [With 2.0L turbo gasoline engine]

Connector No.	M173
Connector Name	JOINT CONNECTOR-M03
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1	
12	11	10	9	8	7	
18	17	16	15	14	13	
24	23	22	21	20	19	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	R	-
8	R	-
9	R	-
10	R	-
11	R	-
12	R	-
13	SB	-
14	SB	-
15	SB	-
16	L	- [With 2.0L turbo gasoline engine]
16	SB	- [With VR30 engine]

17	L	- [With 2.0L turbo gasoline engine]
17	SB	- [With VR30 engine]
18	L	- [With 2.0L turbo gasoline engine]
18	SB	- [With VR30 engine]
19	BR	- [With VR30 engine]
19	LG	- [With 2.0L turbo gasoline engine]
20	BR	- [With VR30 engine]
20	LG	- [With 2.0L turbo gasoline engine]
21	BR	- [With VR30 engine]
21	LG	- [With 2.0L turbo gasoline engine]
22	R	- [With 2.0L turbo gasoline engine]
22	SB	- [With VR30 engine and without ISS]
22	V	- [With VR30 engine and with ISS]
23	R	- [With 2.0L turbo gasoline engine]
23	SB	- [With VR30 engine and without ISS]
23	V	- [With VR30 engine and with ISS]
24	R	- [With 2.0L turbo gasoline engine]
24	SB	- [With VR30 engine and without ISS]
24	V	- [With VR30 engine and with ISS]

Connector No.	M174
Connector Name	JOINT CONNECTOR-M04
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1	
12	11	10	9	8	7	
18	17	16	15	14	13	
24	23	22	21	20	19	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	Y	-
8	Y	-
9	Y	-
10	Y	-
11	Y	-
12	Y	-
13	SB	-
14	SB	-
15	SB	-

16	SB	-
17	SB	-
18	SB	-
19	LG	-
20	LG	-
21	LG	-
22	LG	-
23	LG	-
24	LG	-

Connector No.	M175
Connector Name	JOINT CONNECTOR-M05
Connector Type	NH20FL-DC

H.S.

		8	7	6	5	4	3	2	1	
20	19	17	16	15	14	13	12	11	10	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	L	-
8	L	-
10	P	-
11	P	-
12	P	-
13	P	-
14	P	-
15	P	-
16	P	- [With VR30 engine]
16	R	- [With 2.0L turbo gasoline engine]
17	P	- [With VR30 engine]
17	R	- [With 2.0L turbo gasoline engine]
19	R	- [With VR30 engine and with ISS]
19	W	- [Except with VR30 engine and with ISS]
20	R	- [With VR30 engine and with ISS]
20	W	- [Except with VR30 engine and with ISS]

Connector No.	M177
Connector Name	JOINT CONNECTOR-M07
Connector Type	24342_4GA2A

H.S.

6	5	4	3	2	1	
12	11	10	9	8	7	
18	17	16	15	14	13	
24	23	22	21	20	19	

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L	-
3	L	-
4	L	-
5	L	-
6	L	-
7	P	-
8	P	-
9	P	-
10	P	-
11	P	-
12	P	-
13	L	-
14	L	-
15	L	-
16	L	-
17	L	-
18	L	-
19	W	-
20	W	-
21	W	-
22	P	-
23	P	-
24	P	-

JRGWC3170GB

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow (Heated Steering Wheel)

INFOID:0000000012793925

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.

CAUTION:

Customers are not professional. Never guess easily like “maybe the customer means that...,” or “maybe the customer mentions this symptom”.

>> 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 “DTC/CIRCUIT DIAGNOSIS”

Perform the diagnosis with “DTC/circuit 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.

STEERING WHEEL

Inspection

INFOID:0000000012793926

NEUTRAL POSITION STEERING WHEEL

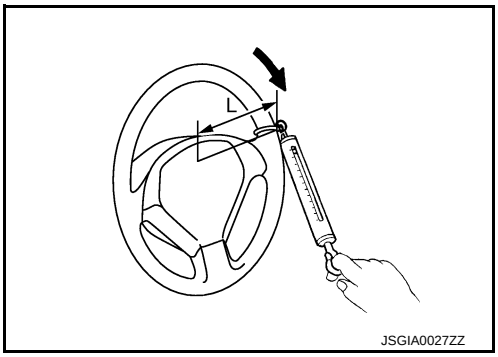
1. Check that steering gear assembly, steering column assembly and steering wheel are installed in the correct position.
2. Check wheel alignment within specification. Refer to FSU-29, "DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-55, "DIRECT ADAPTIVE STEERING : Inspection" (AWD).
3. Set the vehicle to the straight-ahead position and confirm steering wheel is in the neutral position.
   - If steering wheel is not in the neutral position. Refer to STC-473, "Symptom Table".

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-82, "Tire Air Pressure".
3. Start engine.
4. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

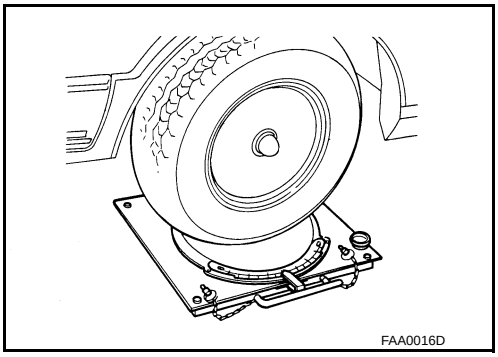
Steering wheel turning force **: Refer to ST-152, "Steering Wheel".**

L : 185 mm (7.28 in)



FRONT WHEEL TURNING ANGLE

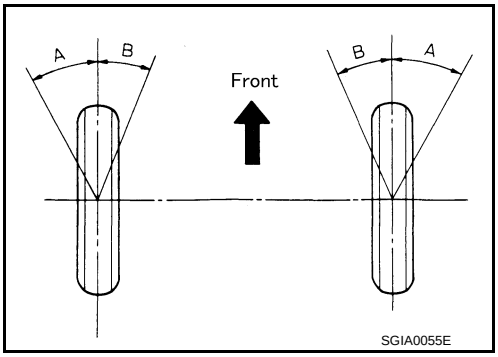
1. Perform toe-in inspection. Refer to FSU-29, "DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-55, "DIRECT ADAPTIVE STEERING : Inspection"(AWD).
   CAUTION:
   Perform front wheel turning angle inspection, after toe-in inspection.
2. Place front wheels on turning radius gauges and rear wheels on stands, so that vehicle can be level.
3. Check the maximum inner and outer wheel turning angles for LH and RH road wheels.



- Start the engine, and turn steering wheel from full left stop to full right stop and measure the turning angles (maximum inner wheel steering angle and maximum outer wheel steering angle).

A : Inner wheel angle
B : Outer wheel angle

Steering angle **: Refer to ST-152, "Steering Angle".**



- Check the following items when turning angle is out of the standard.
  - Perform toe-in adjustment. Refer to FSU-29, "DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-55, "DIRECT ADAPTIVE STEERING : Inspection"(AWD).
  - 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.

DTC/CIRCUIT DIAGNOSIS

HEATED STEERING WHEEL SYSTEM

Component Function Check

INFOID:0000000012793927

1.CHECK HEATED STEERING WHEEL SYSTEM

Check operate heated steering wheel system. Refer to ST-107, "HEATED STEERING WHEEL SYSTEM : System Description".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ST-116, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000012793928

1.CHECK HEATED STEERING WHEEL POWER SUPPLY

1. Switch heated steering mode to ON.
2. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	5	—	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to ST-118, "Component Inspection (Heated Steering Wheel Relay)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace heated steering wheel relay. Refer to ST-105, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

3.CHECK HEATED STEERING WHEEL RELAY POWER SUPPLY

1. Turn the ignition switch OFF.
2. Disconnect heated steering wheel relay harness connector.
3. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	1	—	Battery voltage
	3		

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.CHECK HEATED STEERING WHEEL RELAY CIRCUIT (1)

1. Check 10A fuse (#36).
2. Disconnect fuse block (J/B) harness connector.

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

Heated steering wheel relay		Fuse block (J/B)		Continuity
Connector	Terminal	Connector	Terminal	
M48	1	M132	2B	Existed
	3			

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

Heated steering wheel relay		Ground	Continuity
Connector	Terminal	—	
M48	1	Ground	Not existed
	3		

Is the inspection result normal?

YES >> Perform trouble diagnosis for battery power supply circuit.
NO >> Repair or replace error-detected parts.

5. CHECK HEATED STEERING WHEEL RELAY CIRCUIT (2)

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector terminal and A/C auto amp. harness connector terminal.

Heated steering wheel relay		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M48	2	M88	20	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	2	Ground	Not existed

Is the inspection result normal?

YES >> Repair or replace A/C auto amp.. Refer to HAC-137, "Removal and Installation".
NO >> Repair or replace error-detected parts.

6. CHECK HEATED STEERING WHEEL CIRCUIT

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector and heated steering wheel harness connector.

Heated steering wheel relay		Heated steering wheel		Continuity
Connector	Terminal	Connector	Terminal	
M48	5	M47	1	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	5	Ground	Not existed

Is the inspection result normal?

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

7. CHECK HEATED STEERING WHEEL

Check heated steering wheel. Refer to ST-118, "Component Inspection (Heated Steering Wheel)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated steering wheel. Refer to ST-134, "Removal and Installation".

8.CHECK GROUND CIRCUIT

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

Heated steering wheel		—	Continuity
Connector	Terminal		
M47	2	Ground	Existed

Is the inspection result normal?

YES >> Check the intermittent incident. Refer to GI-45, "Intermittent Incident".
NO >> Repair or replace damaged parts.

Component Inspection (Heated Steering Wheel)

INFOID:0000000012793929

1.CHECK HEATED STEERING WHEEL CONTINUITY

1. Turn ignition switch OFF.
2. Remove the heated steering wheel. Refer to ST-134, "Removal and Installation".
3. Check continuity between heated steering wheel harness connector terminal and ground.

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°F) or more	Not existed

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace heated steering wheel. Refer to ST-134, "Removal and Installation".

2.CHECK HEATED STEERING WHEEL RESISTANCE

Check resistance between heated steering wheel connector terminals.

Heated steering wheel	Condition	Resistance
Terminal		
1 – 2	Leather surface temperature of 20°C (68°F)	1.7 – 2.17 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated steering wheel. Refer to ST-134, "Removal and Installation".

Component Inspection (Heated Steering Wheel Relay)

INFOID:0000000012793930

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.**
- **To prevent damage, always observe the correct polarity.**
- **Prevent short-circuit.**

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-105, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

SYMPTOM DIAGNOSIS

HEATED STEERING WHEEL SYSTEM DOES NOT ACTIVATE

Description

INFOID:0000000012793931

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

Diagnosis Procedure

INFOID:0000000012793932

1.CHECK HEATED STEERING WHEEL POWER SUPPLY

1. Switch heated steering mode to ON.
2. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	5	—	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK HEATED STEERING WHEEL RELAY

Check heated steering wheel relay. Refer to ST-118, "Component Inspection (Heated Steering Wheel Relay)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace heated steering wheel relay. Refer to ST-105, "HEATED STEERING WHEEL SYSTEM : Component Parts Location".

3.CHECK HEATED STEERING WHEEL RELAY POWER SUPPLY

1. Turn the ignition switch OFF.
2. Disconnect heated steering wheel relay harness connector.
3. Check voltage between heated steering wheel relay harness connector and ground.

Terminals			Voltage (Approx.)
(+)		(–)	
Heated steering wheel relay		Ground	
Connector	Terminal		
M48	1	—	Battery voltage
	3		

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.CHECK HEATED STEERING WHEEL RELAY CIRCUIT (1)

1. Check 10A fuse (#36).
2. Disconnect fuse block (J/B) harness connector.
3. Check continuity between heated steering wheel relay harness connector terminal and fuse block (J/B) harness connector terminal.

Heated steering wheel relay		Fuse block (J/B)		Continuity
Connector	Terminal	Connector	Terminal	
M48	1	M132	2B	Existed
	3			

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

Heated steering wheel relay		Ground	Continuity
Connector	Terminal	—	
M48	1	Ground	Not existed
	3		

Is the inspection result normal?

YES >> Perform trouble diagnosis for battery power supply circuit.
NO >> Repair or replace error-detected parts.

5. CHECK HEATED STEERING WHEEL RELAY CIRCUIT (2)

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector terminal and A/C auto amp. harness connector terminal.

Heated steering wheel relay		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M48	2	M88	20	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	2	Ground	Not existed

Is the inspection result normal?

YES >> Repair or replace A/C auto amp.. Refer to HAC-137, "Removal and Installation".
NO >> Repair or replace error-detected parts.

6. CHECK HEATED STEERING WHEEL CIRCUIT

1. Disconnect heated steering wheel harness connector.
2. Check continuity between heated steering wheel relay harness connector and heated steering wheel harness connector.

Heated steering wheel relay		Heated steering wheel		Continuity
Connector	Terminal	Connector	Terminal	
M48	5	M47	1	Existed

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

Heated steering wheel relay		—	Continuity
Connector	Terminal		
M48	5	Ground	Not existed

Is the inspection result normal?

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

7. CHECK HEATED STEERING WHEEL

Check heated steering wheel. Refer to ST-118, "Component Inspection (Heated Steering Wheel)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated steering wheel. Refer to ST-134, "Removal and Installation".

8. CHECK GROUND CIRCUIT

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

Heated steering wheel		—	Continuity
Connector	Terminal		
M47	2	Ground	Existed

Is the inspection result normal?

YES >> Check the intermittent incident. Refer to GI-45, "Intermittent Incident".
NO >> Repair or replace damaged parts.

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

INFOID:0000000012793933

2WD

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

			Reference	ST-150, "Inspection"	ST-150, "Inspection"	ST-150, "Inspection"	ST-114, "Inspection"	ST-114, "Inspection"	—	—	ST-143, "Exploded View"	ST-137, "Inspection"	ST-135, "Exploded View"	ST-143, "Exploded View"	NVH in FAX, RAX, FSU, RSU section.	NVH in WT section.	NVH in WT section.	NVH in RAX section.	NVH in BR section.
			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	Steering gear rack sliding force	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
Symptom	Steering	Noise		×	×	×	×	×	—	—	—	×	×	—	×	×	×	×	×
		Shake		—	—	—	—	—	×	×	×	—	—	—	×	×	×	×	×
		Vibration		—	—	—	—	—	×	×	×	×	×	—	×	×	—	×	—
		Shimmy		—	—	—	—	—	×	—	×	—	—	×	×	×	×	—	×
		Judder		—	—	—	—	—	—	×	×	—	—	×	×	×	×	—	×

×: Applicable, —: Not applicable

AWD

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

			Reference	Outer/inner socket ball joint swinging torque	Outer/inner socket ball joint rotating torque	Outer/inner socket ball joint end play	Steering wheel play	Steering gear rack sliding force	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
			Possible cause and SUSPECTED PARTS	ST-150, "Inspection"	ST-150, "Inspection"	ST-150, "Inspection"	ST-114, "Inspection"	ST-114, "Inspection"	—	—	ST-143, "Exploded View"	ST-137, "Inspection"	ST-135, "Exploded View"	ST-143, "Exploded View"	NVH in FAX, RAX, FSU, RSU section.	NVH in WT section.	NVH in WT section.	NVH in FAX, RAX section.	NVH in BR section.
Symptom	Steering	Noise		×	×	×	×	×	—	—	—	×	×	—	×	×	×	×	×
		Shake		—	—	—	—	—	×	×	×	—	—	—	×	×	×	×	×
		Vibration		—	—	—	—	—	×	×	×	×	×	—	×	×	—	×	—
		Shimmy		—	—	—	—	—	×	—	×	—	—	×	×	×	×	—	×
		Judder		—	—	—	—	—	—	×	×	—	—	×	×	×	×	—	×

×: Applicable, —: Not applicable

PERIODIC MAINTENANCE

STEERING WHEEL

Inspection

INFOID:0000000012793934

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-152, "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-135, "Exploded View".
   - Check steering gear assembly mounting condition for looseness. Refer to ST-143, "Exploded View".

STEERING WHEEL PLAY

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

Steering wheel play : Refer to ST-152, "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.

TOE-IN ADJUSTMENT
ALIGNMENT TESTER
ALIGNMENT TESTER : Inspection and Adjustment

INFOID:0000000012793935

WARNING:
Never move the vehicle during “DAST CALIBRATION (MODE1)” because the steering gear is held in neutral position until ignition switch is turned OFF
CAUTION:
- **Be careful for the moving parts, steering wheel and front wheels are steered automatically when start “DAST CALIBRATION (MODE1)”.**
- **Do not rotate road wheels during the DAST calibration because the system is detected the vehicle running.**
- **Never move the vehicle until the toe-in adjustment is finished.**

1.PREPARATION

1. Set the vehicle to alignment tester. Then set the front wheel on the turn table of 4 wheel alignment tester.
   NOTE:
   Do not lift up the vehicle during “DAST CALIBRATION (MODE1)”.
2. Connect the battery charger to protect the battery.
   NOTE:
   Much electricity is used in “DAST CALIBRATION (MODE1)”.

>> GO TO 2.

2.ECU CONFIGURATION

With CONSULT
1. Connect the CONSULT.
2. Turn the ignition switch ON.
   CAUTION:
   Never start the engine.
3. Perform configuration for steering force control module. Refer to STC-212, "Work Procedure".
   NOTE:
   The replacement of control module included in configuration is not required.
4. Perform configuration for steering angle main control module. Refer to STC-214, "Work Procedure".
   NOTE:
   The replacement of control module included in configuration is not required.
5. Perform configuration for steering angle sub control module. Refer to STC-216, "Work Procedure".
   NOTE:
   The replacement of control module included in configuration is not required.
6. Turn the ignition switch OFF.

>> GO TO 3.

3.DAST CALIBRATION (MODE1) [CLUTCH PHASE LEARNING]

With CONSULT
1. Turn the ignition switch ON.
   CAUTION:
   Never start the engine.
2. Perform “DAST CALIBRATION (MODE1)”. Refer to STC-209, "Description".
3. Turn the ignition switch OFF.
   CAUTION:
   Be sure to perform this step.

>> GO TO 4.

4.DAST CALIBRATION (MODE1) [STEERING RACK NEUTRAL POSITION LEARNING]

With CONSULT

1. Turn the ignition switch ON.
   CAUTION:
   Never start the engine.
2. Perform “DAST CALIBRATION (MODE1)”. Refer to STC-209, "Description".

>> GO TO 5.

5. TOE-IN ADJUSTMENT

Adjust toe-in according to the specified value.

Toe-in : Refer to FSU-45, "Wheel Alignment" (2WD) or FSU-73, "Wheel Alignment" (AWD).

CAUTION:
- **Always evenly adjust both toe-in alternately and adjust the difference between the left and right to the standard.**
- **Always fix the steering inner socket when tightening the steering outer socket.**
- **Never touch the steering wheel during toe-in adjustment.**

NOTE:
Steering gear is held in neutral position until ignition switch is turned OFF

>> GO TO 6.

6. ADJUSTMENT OF STEERING ANGLE SENSOR NEUTRAL POSITION

With CONSULT
1. On the CONSULT screen, select “ABS”>>“WORK SUPPORT”>>“ST ANGLE SENSOR ADJUSTMENT”.
2. Touch START.
   CAUTION:
   Never touch steering wheel while adjusting steering angle sensor.
3. After approx. 10 seconds, select “END”.
4. Turn ignition switch OFF, and then turn it ON again.
   CAUTION:
   Be sure to perform this step.

>> GO TO 7.

7. PERFORM SELF-DIAGNOSIS

With CONSULT
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start the engine.
   CAUTION:
   Never drive the vehicle.
3. Perform self-diagnosis for “EPS/DAST 3”, “DAST 1” and “DAST 2”.

Is any DTC detected?

YES >> Perform Perform trouble diagnosis for the detected DTC. Refer to STC-156, "DTC Index" (EPS/DAST 3), STC-169, "DTC Index" (DAST 1), STC-182, "DTC Index" (DAST 2).
NO >> GO TO 8.

8. FINAL CONFIRMATION

With CONSULT
1. Turn the ignition switch OFF to ON.
   CAUTION:
   Never start the engine.
2. On the CONSULT screen, select “EPS/DAST 3” >> “DATA MONITOR” >> “ANGLE 1”,and then and then check the value.

Monitor item	Standard value
ANGLE 1	–4.4 ≤ ANGLE 1 ≤ 4.4

Is the confirmation result normal?

YES >> GO TO 9.
NO >> Slightly lower the tilt position, and then re-perform “DAST CALIBRATION (MODE1)”. GO TO 3.

9.CHECK INNER SOCKET LENGTH

1. Check that inner socket length is in the specified value. Refer to ST-148, "Disassembly and Assembly".

Is the inspection result normal?

Yes >> GO TO 10.
No >> GO TO 1.

10.STEERING ANGLE INSPECTION

1. Start the engine.
2. Fully steer right and left. And check that the knock sound does not exist from the steering rack.
   CAUTION:
   Never confuse the knock sound with the clutch sound that is heard from nearby of steering column.

Is the inspection result normal?

Yes >> WORK END
No >> GO TO 11.

11.CHECK SUSPENSION AND STEERING PARTS INSTALLATION CONDITION

1. Check suspension and steering parts installation condition.

Is the inspection result normal?

Yes >> GO TO 5.
No >> Install suspension and steering parts properly. Then perform the toe-in adjustment again. GO TO 1.

EXCEPT ALIGNMENT TESTER

EXCEPT ALIGNMENT TESTER : Inspection and Adjustment

INFOID:0000000012793936

WARNING:
Never move the vehicle during “DAST CALIBRATION (MODE1)” because the steering gear is held in neutral position until ignition switch is turned OFF
CAUTION:
- **Be careful for the moving parts, steering wheel and front wheels are steered automatically when start “DAST CALIBRATION (MODE1)” and “DAST CALIBRATION (MODE2)”.**
- **Do not rotate road wheels during the “DAST CALIBRATION (MODE1)” and “DAST CALIBRATION (MODE2)” because the system is detected the vehicle running.**

1.PREPARATION

1. Set the front wheel on the turn table.
   NOTE:
   Do not lift up the vehicle during “DAST CALIBRATION (MODE1)”.
2. Connect the battery charger to protect the 12V battery.
   NOTE:
   Much electricity is used in “DAST CALIBRATION (MODE1)”.
3. Place the tilt to the highest level.

>> GO TO 2.

2.DAST CALIBRATION (MODE1) [CLUTCH PHASE CALCURATION]

With CONSULT
1. Connect CONSULT to the vehicle.
2. Turn ignition switch ON.
   CAUTION:
   Never start the engine.
3. On the CONSULT screen, select “EPS/DAST 3” >> “WORK SUPPORT” >> “DAST CALIBRATION (MODE1)”. Refer to STC-209, "Description".
   CAUTION:

Be careful for the moving parts, steering wheel and front wheels are steered automatically when start "DAST CALIBRATION (MODE1)".

4. Turn ignition switch OFF.
   CAUTION:
   Be sure to perform this step.

>> GO TO 3.

3. ECU CONFIGURATION

With CONSULT

1. Turn ignition switch ON.
   CAUTION:
   Never start the engine.
2. Perform configuration for steering force control module. Refer to STC-212, "Work Procedure".
   NOTE:
   The replacement of control module included in configuration is not required.
3. Perform configuration for steering angle main control module. Refer to STC-214, "Work Procedure".
   NOTE:
   The replacement of control module included in configuration is not required.
4. Perform configuration for steering angle sub control module. Refer to STC-216, "Work Procedure".
   NOTE:
   The replacement of control module included in configuration is not required.
5. Check that EPS warning lamp is turned ON.
   NOTE:
   Direct adaptive steering transfers to EPS mode.
6. Turn ignition switch OFF.
7. Disconnect the battery charger from the 12V battery.
8. Lift down the vehicle and disconnect CONSULT from the vehicle.

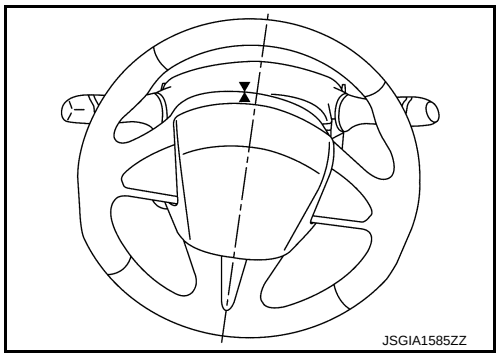
>> GO TO 4.

4. TOE-IN ADJUSTMENT

1. Adjust toe-in according to the specified value.

   Toe-in : Refer to FSU-45, "Wheel Alignment" (2WD) or FSU-73, "Wheel Alignment" (AWD).

   CAUTION:
   - **Loosen the lock nut of steering outer socket and adjust inner socket length.**
   - **Always evenly adjust both toe-in alternately and adjust the difference between the left and right to the standard.**
   - **Always fix the steering inner socket when tightening the steering outer socket.**
2. Drive the vehicle straightly and then stop the vehicle.
3. Place the matching mark (▼) on the steering wheel and steering column cover at the condition that the vehicle goes straight.

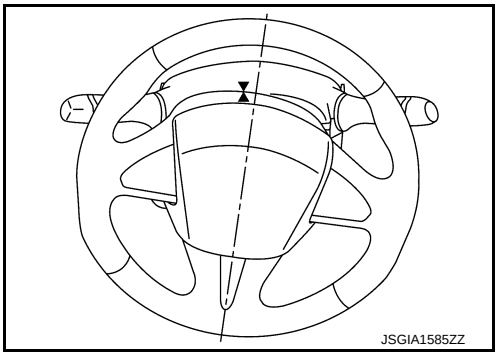


>> GO TO 5.

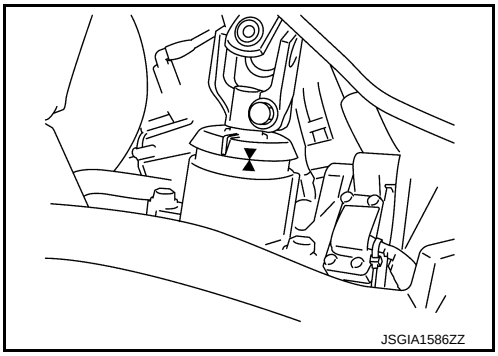
5. PREPARATION OF OFF-CENTER CALCULATION

1. Lift up the vehicle.

2. Align matching marks (▼) (steering wheel and steering column cover) to turn the steering wheel to the position marked in Step 4.



3. Place the matching mark (▼) on the steering lower shaft and steering gear.



4. Connect the battery charger to protect the 12V battery.
NOTE:
Much electricity is used in “DAST CALIBRATION (MODE1/MODE2)”.
5. Lift down the vehicle and then set the front wheel on the turn table.
NOTE:
Do not lift up the vehicle during “DAST CALIBRATION (MODE1/MODE2)”.

>> GO TO 6.

6. DAST CALIBRATION (MODE1) [STEERING RACK NEUTRAL POSITION LEARNING]

With CONSULT
1. Turn ignition switch ON.
CAUTION:
Never start the engine.
2. On the CONSULT screen, select “EPS/DAST 3” >> “WORK SUPPORT” >> “DAST CALIBRATION (MODE1)”. Refer to STC-209, "Description".
CAUTION:
Be careful for the moving parts, steering wheel and front wheels are steered automatically when start “DAST CALIBRATION (MODE1)”.

>> GO TO 7.

7. ADJUSTMENT OF STEERING ANGLE SENSOR NEUTRAL POSITION

With CONSULT
1. On the CONSULT screen, select “ABS”>>“WORK SUPPORT”>>“ST ANGLE SENSOR ADJUSTMENT”.
2. Touch START.
CAUTION:
Never touch steering wheel while adjusting steering angle sensor.
3. After approx. 10 seconds, select “END”.
4. Turn ignition switch OFF, and then turn it ON again.
CAUTION:
- **Never start the engine.**
- **Be sure to perform this step.**

>> GO TO 8.

8. PERFORM SELF-DIAGNOSIS

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start the engine.
   CAUTION:
   Never drive the vehicle.
3. Perform self-diagnosis for “EPS/DAST 3”, “DAST 1” and “DAST 2”.

Is any DTC detected?

YES >> Perform Perform trouble diagnosis for the detected DTC. Refer to STC-156, "DTC Index" (EPS/DAST 3), STC-169, "DTC Index" (DAST 1), STC-182, "DTC Index" (DAST 2).

NO >> GO TO 9.

9. LEARNING VALUE CONFIRMATION

With CONSULT

1. Turn the ignition switch OFF to ON.
   CAUTION:
   Never start the engine.
2. On the CONSULT screen, select “EPS/DAST 3” >> “DATA MONITOR” >> “ANGLE 1”,and then and then check the value.

Monitor item	Standard value
ANGLE 1	–4.4 ≤ ANGLE 1 ≤ 4.4

Is the confirmation result normal?

YES >> GO TO 10.

NO >> Slightly lower the tilt position, and then re-perform “DAST CALIBRATION (MODE1)”. GO TO 6.

10. DAST CALIBRATION (MODE2) [OFF-CENTER CALCULATION]

CAUTION:
Never start the engine.

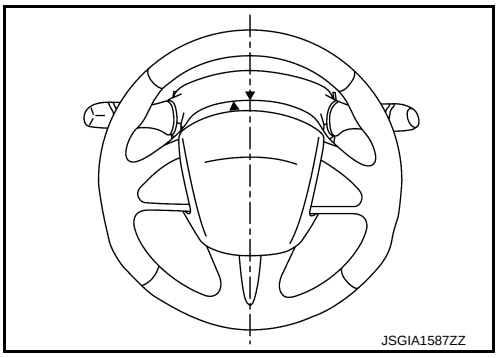
With CONSULT

1. On the CONSULT screen, select “EPS/DAST 3” >> “WORK SUPPORT” >> “DAST CALIBRATION (MODE2)”.
2. Check the following condition, and then touch the “START”.

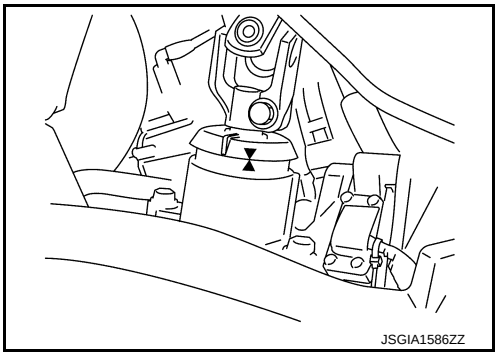
- Ignition switch is ON. (Enigne is not started.)
- Battery charger is connected to 12V battery.
- The front wheel is set on the turn table.

NOTE:
Do not lift up the vehicle during “DAST CALIBRATION (MODE 2)”.

3. Touch “START” to start the automatic steer.
   CAUTION:
   Be careful for the moving parts, steering wheel and front wheels are steered automatically when touch “START”.
   NOTE:
   After finishing the automatic steering (After steering right and left 1.5 round trip, it returns to neutral position), steering clutch is released.
4. Position the steering wheel with the visually neutral position and then touch “START”.
   CAUTION:
   Since the force feedback of steering becomes smaller after the completion of auto steering, take good care for turning the steering. Also, do not turn the steering beyond 120 degrees.



5. Align matching marks (▼) (steering lower shaft and steering gear) to turn the steering wheel to the position marked in Step 5, and then touch “START”.

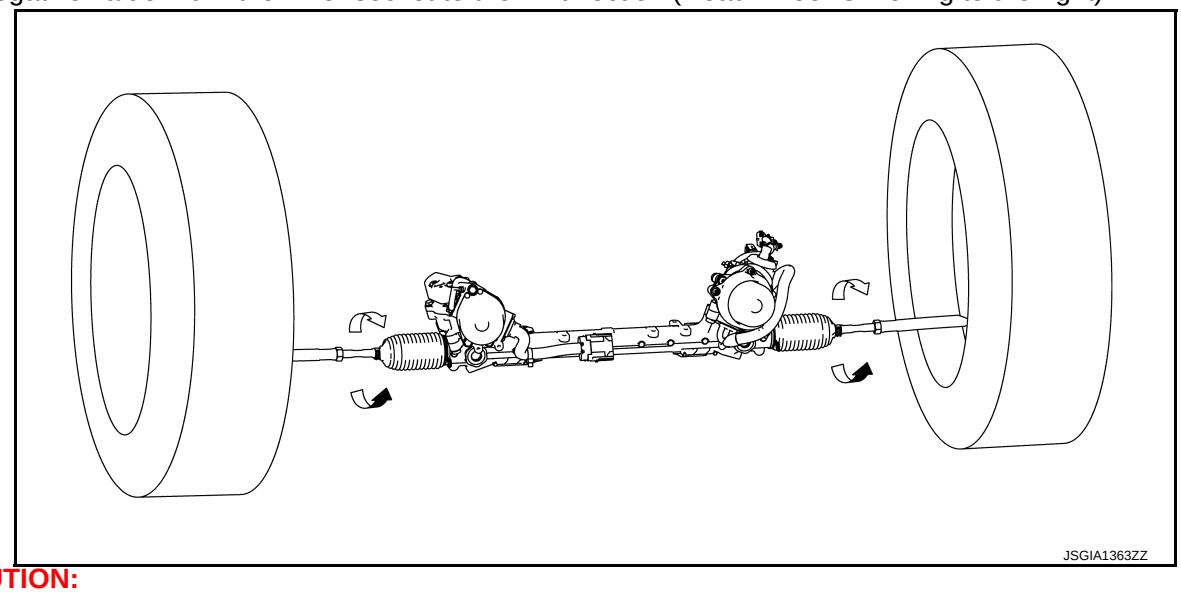


6. Record the displayed value of “off-center”, and then touch “END”.

>> GO TO 11.

11. STEERING RACK OFF-CENTER ADJUSTMENT

1. Adjust the off-center according to the off-center value calculated by “DAST CALIBRATION (MODE2)”.
- Positive value: Turn the inner socket to the ⇦ direction (Road wheel is moving to the left).
- Negative value: Turn the inner socket to the ⬅ direction (Road wheel is moving to the right).



CAUTION:
- **Loosen the lock nut of steering outer socket and adjust inner socket length.**
- **Always evenly adjust both toe-in alternately and adjust the difference between the left and right to the standard.**
- **Always fix the steering inner socket when tightening the steering outer socket.**

2. Turn ignition switch OFF.

CAUTION:
Be sure to perform this step.

>> GO TO 12.

12. CHECK INNER SOCKET LENGTH

1. Check that inner socket length is in the specified value. Refer to ST-148, "Disassembly and Assembly".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 1.

13. STEERING ANGLE INSPECTION

1. Lift down the vehicle.
2. Start the engine.

3. Fully steer right and left. And check that the knock sound does not exist from the steering rack.
   CAUTION:
   Never confuse the knock sound with the clutch sound that is heard from nearby of steering column.

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 16.

14. TOE-IN INSPECTION

1. Check toe-in within the specified value.

Toe-in : Refer to FSU-45, "Wheel Alignment" (2WD) or FSU-73, "Wheel Alignment" (AWD).

Is the inspection result normal?

YES >> GO TO 15.
NO >> GO TO 1.

15. PERFORM SELF-DIAGNOSIS

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start the engine.
   CAUTION:
   Never drive the vehicle.
3. Perform self-diagnosis for “EPS/DAST 3”, “DAST 1” and “DAST 2”.

Is any DTC detected?

YES >> Perform Perform trouble diagnosis for the detected DTC. Refer to STC-156, "DTC Index" (EPS/DAST 3), STC-169, "DTC Index" (DAST 1), STC-182, "DTC Index" (DAST 2).
NO >> WORK END

16. CHECK SUSPENSION AND STEERING PARTS INSTALLATION CONDITION

1. Check suspension and steering parts installation condition.

Is the inspection result normal?

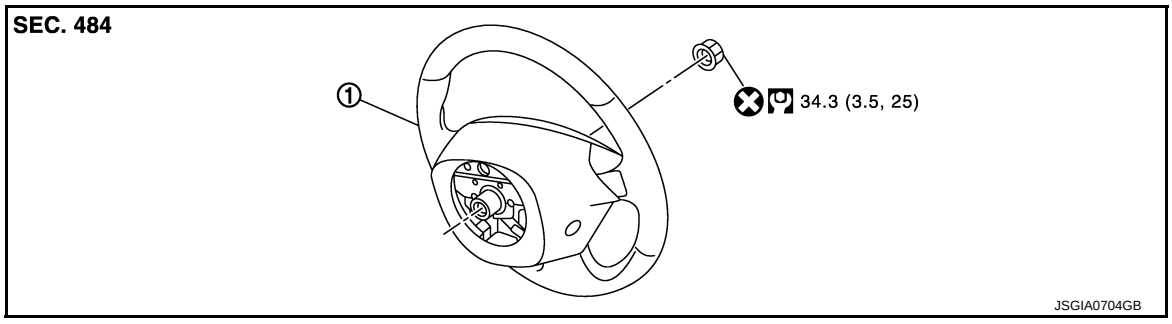
YES >> GO TO 5
NO >> Install suspension and steering parts properly. Then perform the toe-in adjustment again. GO TO 1.

REMOVAL AND INSTALLATION

STEERING WHEEL

Exploded View

INFOID:0000000012793937



① Steering wheel

: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

Removal and Installation

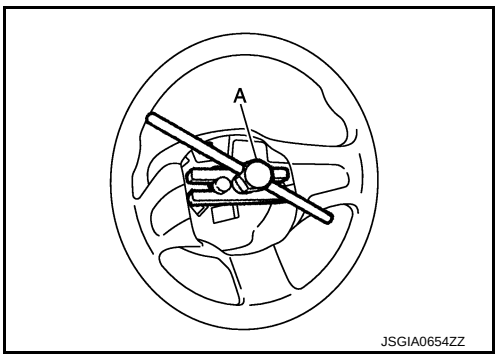
INFOID:0000000012793938

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-17, "Removal and Installation".
3. Disconnect heated steering harness connector.
4. Remove steering wheel lock nut after steering is locked.
5. Remove steering wheel with the steering wheel puller (A) [SST: ST27180001 (J-25726-A)].
   NOTE:
   When removing, place a matching mark on both steering wheel and shaft of steering column assembly before removing.



INSTALLATION

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

- Install the steering wheel to the same position when it was removed.
- Check the spiral cable neutral position after replacing or rotating spiral cable. Refer to SR-22, "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 lock nut.

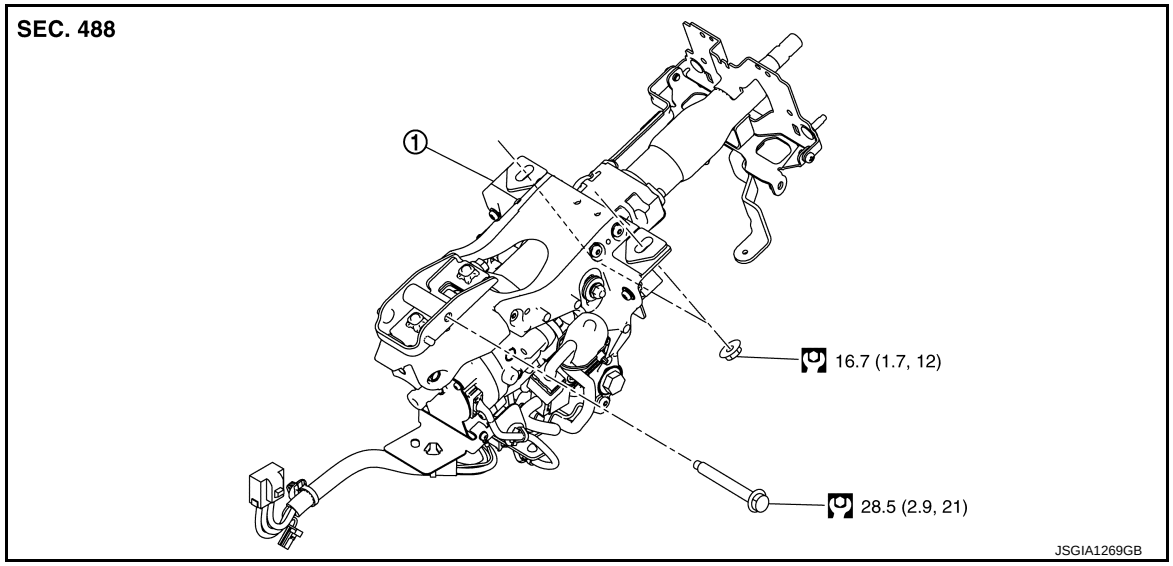
CAUTION:

Perform additional service when removing/replacing steering wheel. Refer to STC-202, "Special Repair Requirement".

STEERING COLUMN

Exploded View

INFOID:0000000012793939



① Steering column assembly

: N·m (kg-m, ft-lb)

CAUTION:
Never disassemble other than the parts shown in Exploded View.

Removal and Installation

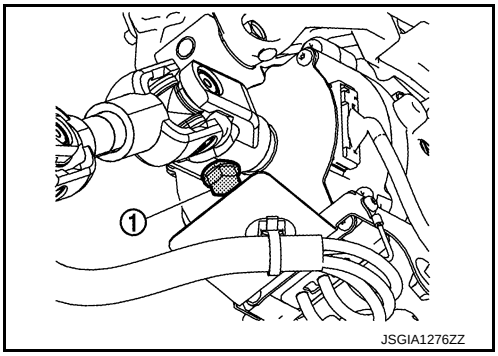
INFOID:0000000012793940

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.**
- **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.**
- **To prevent a malfunction and deformation from occurring in the tilt mechanism, never apply excessive force to the tilt lever.**

1. Set the vehicle to the straight-ahead position.
2. Place the tilt to the highest level.
   CAUTION:
   Securely lock the tilt lever.
3. Remove driver air bag module. Refer to SR-17, "Removal and Installation".
4. Remove steering wheel. Refer to ST-134, "Removal and Installation".
5. Remove instrument lower panel LH. Refer to IP-13, "Removal and Installation".
6. Remove the steering column cover. Refer to IP-13, "Removal and Installation".
7. Remove spiral cable. Refer to SR-22, "Removal and Installation".
8. Remove combination switch. Refer to BCS-100, "Removal and Installation".
9. Disconnect each harness connectors installed to steering column assembly.

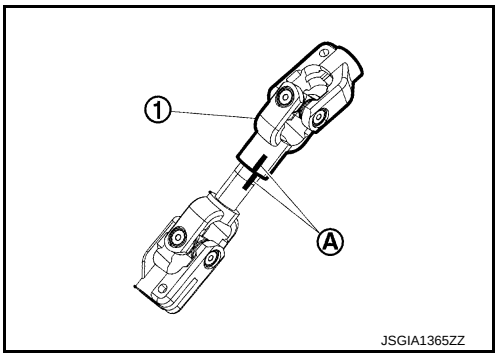
10. Remove steering upper shaft mounting bolt ① (steering column assembly side).



11. Remove steering column assembly.

CAUTION:

- **When removing the mounting, be careful not to drop the steering column assembly.**
- **When carrying the steering column assembly, never hold the harness bracket part. Hold the body of steering column assembly.**
- **When removing steering column assembly, never insert a tool, such as a screwdriver, into the yoke groove to pull out the steering upper shaft. In case of the violation of the above, replace steering upper shaft with a new one.**
- **When removing steering column assembly, fix the steering upper shaft using wire etc., because steering upper shaft may separate the steering column side and steering clutch side. Never separate steering upper shaft steering column side and steering clutch side.**
- **Place a matching marks Ⓐ on steering upper shaft ①. When the steering upper shaft is separated, use matching marks.**



12. Perform inspection after removal. Refer to ST-137, "Inspection".

INSTALLATION

Note the following, and install in the reverse order of removal. Then perform inspection after installation. Refer to ST-137, "Inspection".

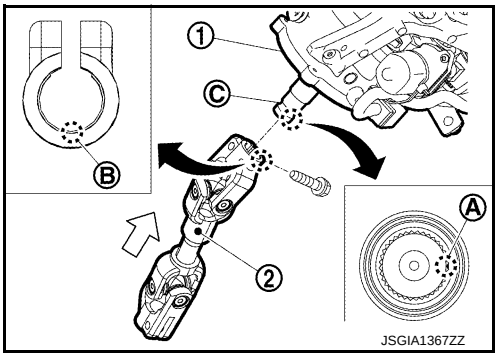
Steering Upper Shaft

CAUTION:

- **Never impact on the axis when removing steering column assembly.**
- **While removing the steering column assembly, never move the steering gear.**
- When installing steering shaft to steering column assembly, follow the procedure listed below.

- Align the part Ⓐ of steering column assembly ① and the part Ⓑ of steering upper shaft ② to install steering upper shaft and steering column assembly.

⇦ : Vehicle upper



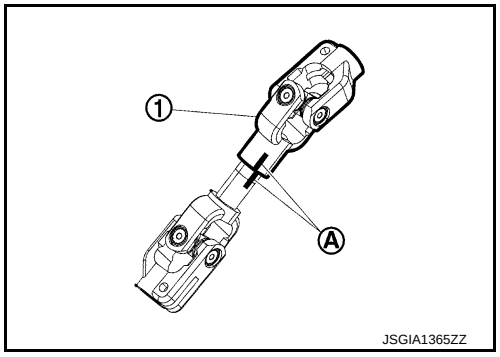
CAUTION:

- **When installing steering upper shaft from steering clutch assembly or steering column assembly, be careful with the vertical direction of the steering upper shaft.**
- **Install the steering upper shaft to the same position when it was removed.**

- When connecting steering upper shaft (steering column side) and steering column shaft, make sure the bolt is securely seated in groove Ⓒ of steering column shaft.

- For steering upper shaft mounting bolt direction, refer to ST-135, "Exploded View". (Do not insert it from the other side.)
- To tighten steering upper shaft mounting bolt (steering column assembly side), manually tighten the bolt to check for scoring or galling before tightening the bold to the specified torque.

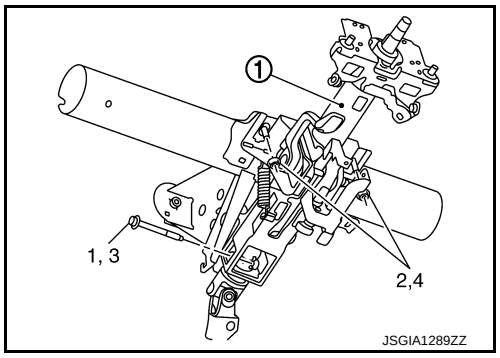
• When steering upper shaft ① is separated, align matching marks Ⓐ to connect steering upper shaft.



Steering Column Assembly

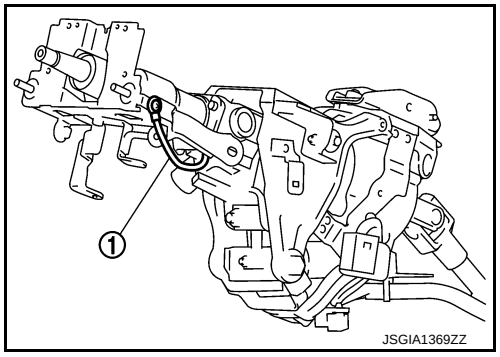
• When installing the steering column assembly ①, temporarily tighten the bolt and nuts before tightening to the specified torque, referring to the tightening method and the numerical order shown below:

Temporary tightening	1 → 2
Final tightening (Specified torque)	3 → 4



Ground Harness (If equipped.)

• Be sure to check ground harness ① connection securely.
• Confirm there is no interference with steering column assembly movements.
• If replacing the ground harness, fix it to main harness at the same position.



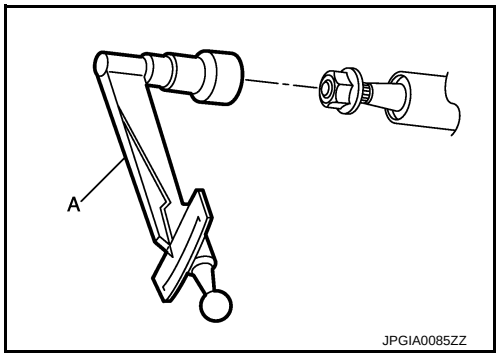
Inspection

INFOID:0000000012793941

INSPECTION AFTER REMOVAL

• Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
• 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-152, "Steering Column".

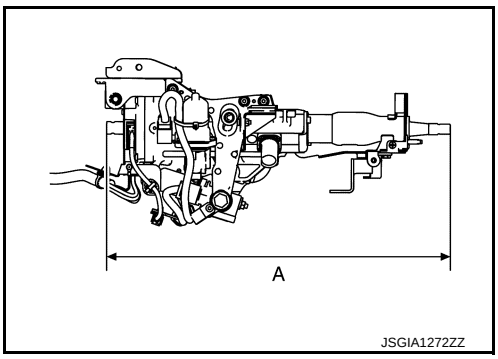


- Check the following items, if vehicle has been involved in a minor collision. Replace steering column assembly if outside the standard.

- Check the length “A” shown in the figure.

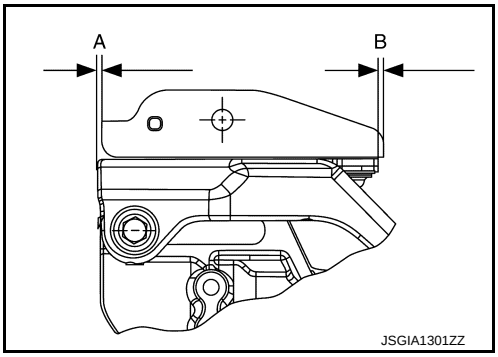
CAUTION:
Set the telescopic mechanism to its minimum length to measure the length of steering column.

Steering column length (A) **: Refer to ST-152, "Steering Column".**



- Check the dimension “A” and “B” shown in the figure.

Impact displacement absorption part dimension (A) and (B) **: Refer to ST-152, "Steering Column".**

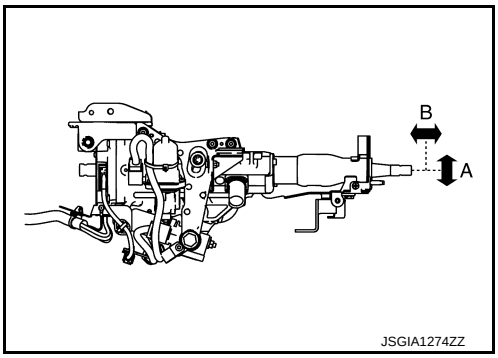


INSPECTION AFTER INSTALLATION

- Check each part of steering column assembly for damage or other malfunctions. Replace if necessary.
- Check that there is no malfunction, such as unusual steering feel or interference when operating tilt and telescopic.
- Check tilt and telescopic mechanism operating range “A”, “B” as shown in the figure.

Tilt operating range (A) **: Refer to ST-152, "Steering Column".**

Telescopic operating range (B) **: Refer to ST-152, "Steering Column".**



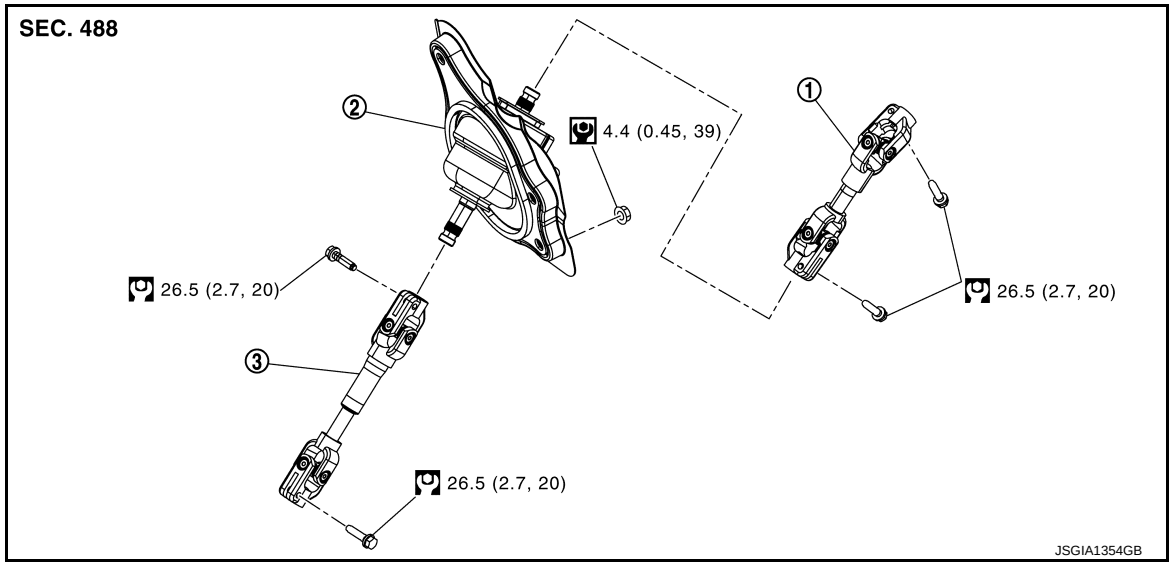
- Check the steering wheel play, neutral position steering wheel, steering wheel turning torque, and front wheel turning angle.
- Steering wheel play: Refer to ST-125, "Inspection".
- neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-114, "Inspection".

CAUTION:
Perform additional service when removing/replacing steering column assembly. Refer to STC-202, "Special Repair Requirement".

STEERING SHAFT

Exploded View

INFOID:0000000012793942



① Steering upper shaft ② Steering clutch assembly ③ Steering lower shaft assembly

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

CAUTION:
Never disassemble other than the parts shown in Exploded View.

Removal and Installation

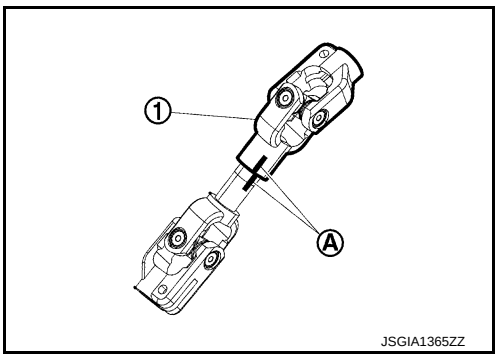
INFOID:0000000012793943

REMOVAL

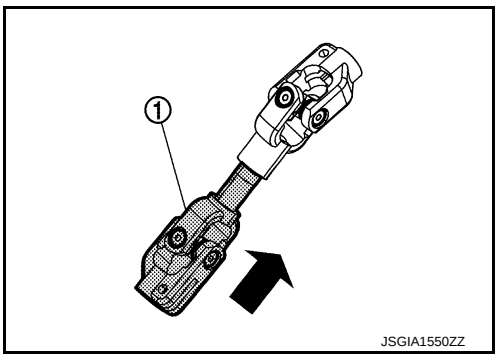
CAUTION:
Spiral cable may be cut if steering wheel turns while separating steering column assembly and steering gear assembly. Be sure to secure steering wheel using string to avoid turning.

1. Set vehicle to the straight-ahead position.
2. Fix the steering wheel.
3. Remove accelerator pedal assembly. Refer to ACC-4, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system), ACC-6, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).
4. Remove steering upper shaft mounting bolt (steering clutch assembly side).
   CAUTION:
   - **When removing steering column assembly, fix the steering upper shaft using wire etc., because steering upper shaft may separate the steering column side and steering clutch side. Never separate steering upper shaft steering column side and steering clutch side.**

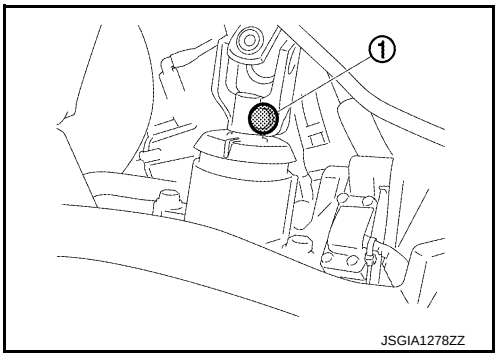
- **Place a matching marks Ⓐ on steering upper shaft ①. When the steering upper shaft is separated, use matching marks.**



5. Move steering upper shaft ① to the steering column side to separate it from steering clutch assembly.
   CAUTION:
   When separating steering upper shaft, never insert a tool, sach as a screwdriver, into the yoke groove to pull out the steering upper shaft. In the case of the violation of the above, replace steering upper shaft with a new one.



6. Remove steering clutch connector.
7. Move parking brake cable to interfere with work. Refer to PB-9, "Removal and Installation".
8. Remove hole cover mounting nut.
9. Remove steering lower shaft mounting bolt ① (steering gear side).



10. Remove steering lower shaft and steering clutch assembly.
    CAUTION:
    When removing steering shaft assembly, never insert a tool, such as a screwdriver, into the yoke groove to pull out the lower shaft. In case of the violation of the above, replace lower shaft with a new one.
11. Remove steering lower shaft from steering clutch assembly.
    CAUTION:
    Never separate steering upper shaft steering column side and steering clutch side.
12. Remove the steering upper shaft from steering column assembly as necessary.
    CAUTION:
    - **Remove the steering upper shaft only when necessary.**
    - **Never separate steering upper shaft into steering column side and steering clutch side.**
13. Perform inspection after removal. Refer to ST-142, "Inspection".

INSTALLATION

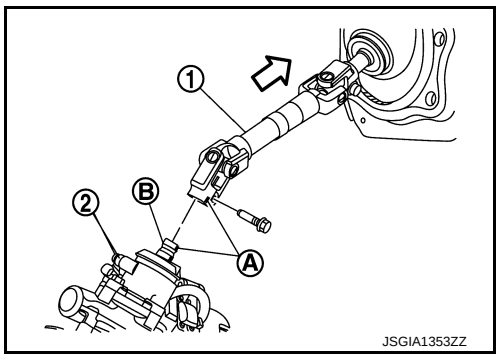
Note the following, and install in the reverse order of removal.

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.

- When installing steering lower shaft to steering gear assembly, follow the procedure listed below.

- Align matching marks Ⓐ to install steering lower shaft ① and steering gear assembly ②.

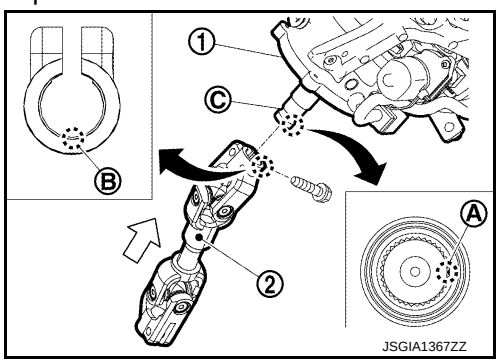


⇦ : Vehicle upper

CAUTION:
- **When installing steering lower shaft from steering clutch assembly steering gear assembly, be careful with the vertical direction of the steering lower shaft.**
- **Install the steering lower shaft to the same position when it was removed.**

- When connecting steering lower shaft (steering gear side) and steering gear assembly, make sure the bolt is securely seated in groove Ⓑ of steering gear assembly.
- For steering lower shaft mounting bolt direction, refer to ST-139, "Exploded View". (Do not insert it from the other side.)
- To tighten steering lower shaft mounting bolt (steering gear side), manually tighten the bolt to check for scoring or galling before tightening the bold to the specified torque.

- When installing steering shaft to steering column assembly, follow the procedure listed below.
- Align the part Ⓐ of steering column assembly ① and the part Ⓑ of steering upper shaft ② to install steering upper shaft and steering column assembly.



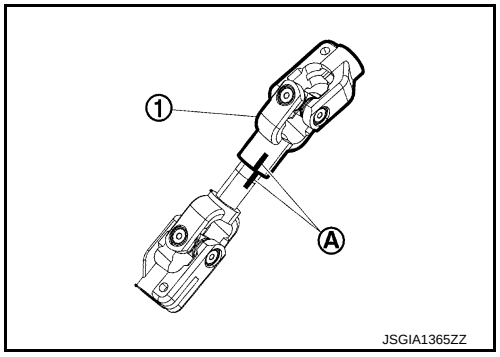
⇦ : Vehicle upper

CAUTION:
- **When installing steering upper shaft from steering clutch assembly or steering column assembly, be careful with the vertical direction of the steering upper shaft.**
- **Install the steering upper shaft to the same position when it was removed.**

- When connecting steering upper shaft (steering column side) and steering column shaft, make sure the bolt is securely seated in groove Ⓒ of steering column shaft.
- For steering upper shaft mounting bolt direction, refer to ST-139, "Exploded View". (Do not insert it from the other side.)
- To tighten steering upper shaft mounting bolt (steering column assembly side), manually tighten the bolt to check for scoring or galling before tightening the bold to the specified torque.

- When connecting steering upper shaft (steering clutch side) and steering clutch assembly, follow the procedure listed below.
- On the CONSULT screen, select “EPS/DAST 3” >> “DATA MONITOR” >> “ST ANGLE SENSOR”, and then check the value.
- Turn the steering upper shaft, and then connect steering upper shaft and steering clutch assembly at the position where the value is ± 45 deg.

- When steering upper shaft ① is separated, align matching marks Ⓐ to connect steering upper shaft.



- If steering upper shaft has been replaced, install with the following procedure.

1. Install steering upper shaft to steering column assembly.
2. Tighten the steering upper shaft mounting bolt (steering column side) to the specified torque.
3. Remove the collar.
4. Move steering upper shaft sliding part to steering column side.

5. Install steering upper shaft to the steering clutch assembly.
6. Tighten the steering upper shaft mounting bolt (steering clutch side) to the specified torque.

• Perform inspection after installation. Refer to ST-142, "Inspection".

Inspection

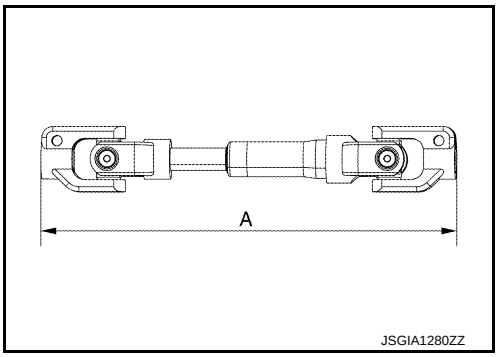
INFOID:0000000012793944

INSPECTION AFTER REMOVAL

Check the following items and replace, if necessary.
• Check steering shaft for damage or other malfunctions.
• Check the length (A) of the steering lower shaft.

CAUTION:
Set the minimum length to measure the length of steering lower shaft.

Steering lower shaft length (A) **Refer to ST-152, "Steering Shaft".**



INSPECTION AFTER INSTALLATION

Check the following items and replace, if necessary.
• Check steering shaft for damage or other malfunctions.
• 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 torque, and front wheel turning angle.
- Steering wheel play: Refer to ST-125, "Inspection".
- neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-114, "Inspection".
• On the CONSULT screen, select “EPS/DAST 3” >> “DATA MONITOR” >> “ST ANGLE SENSOR”, and then check the value. When the value is outside the standard value, separate steering upper shaft from steering clutch assembly. And then, turn the steering wheel to the direction that the value returns to 0 deg with checking “ST ANGLE SENSOR” on “DATA MONITOR”.

Monitor item	Condition	standard value
ST ANGLE SENSOR	Vehicle: Straight-ahead position	ST ANGLE SENSOR ≤ ±20 deg

CAUTION:
Perform additional service when removing/replacing steering upper shaft, steering lower shaft or steering clutch assembly. Refer to STC-202, "Special Repair Requirement".

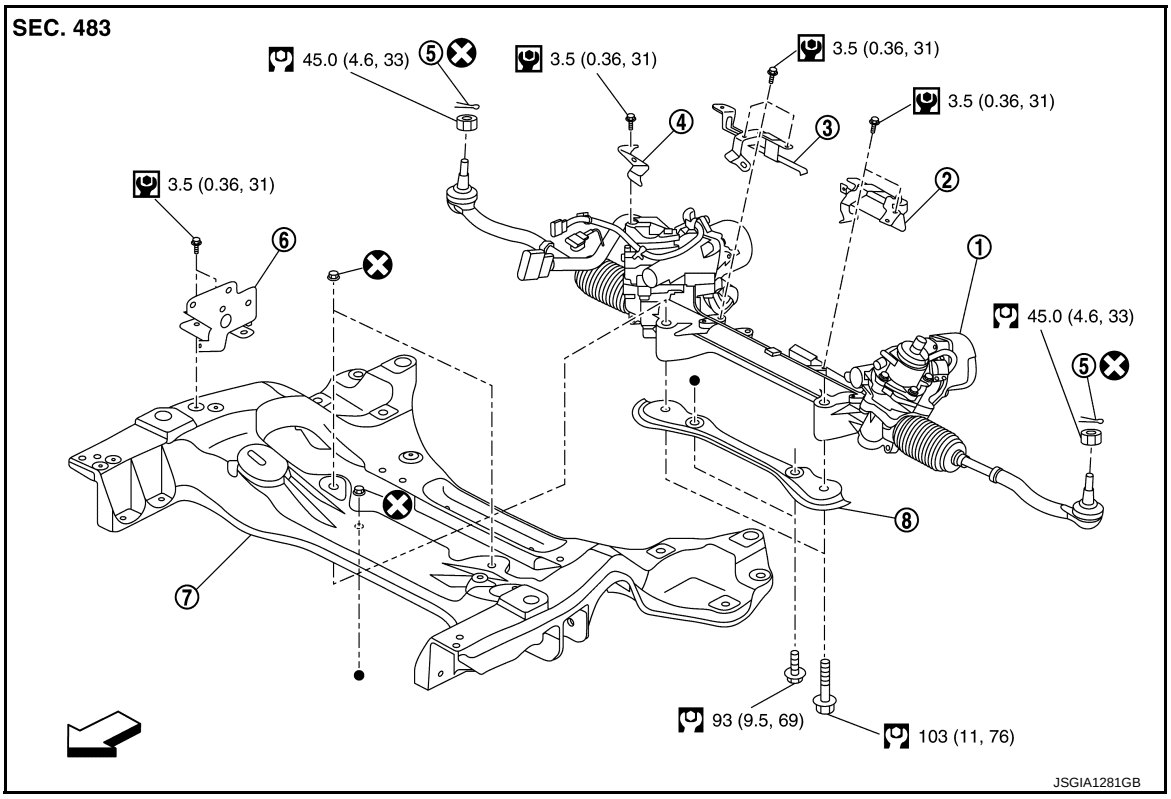
STEERING GEAR AND LINKAGE

Exploded View

INFOID:0000000012793945

REMOVAL

2WD models



① Steering gear assembly ② Bracket ③ Bracket
④ Bracket ⑤ Cotter pin ⑥ Bracket
⑦ Front suspension member ⑧ Rack stay

⇦: Vehicle front

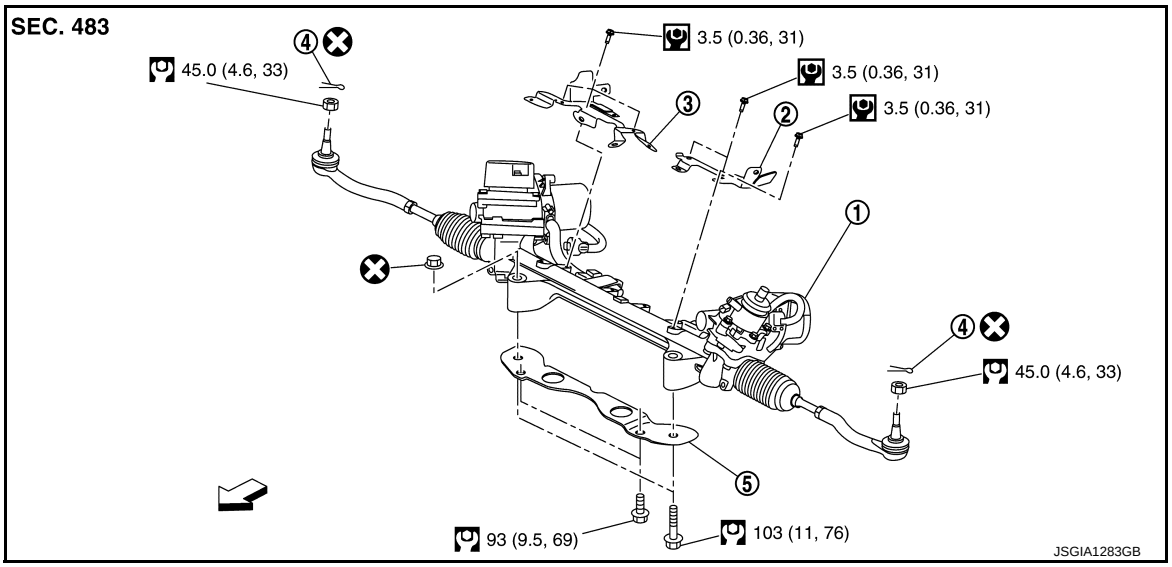
⊗: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

●: Indicates that the part is connected at points with same symbol in actual vehicle

AWD models



① Steering gear assembly ② Bracket ③ Bracket
④ Cotter pin ⑤ Rack stay

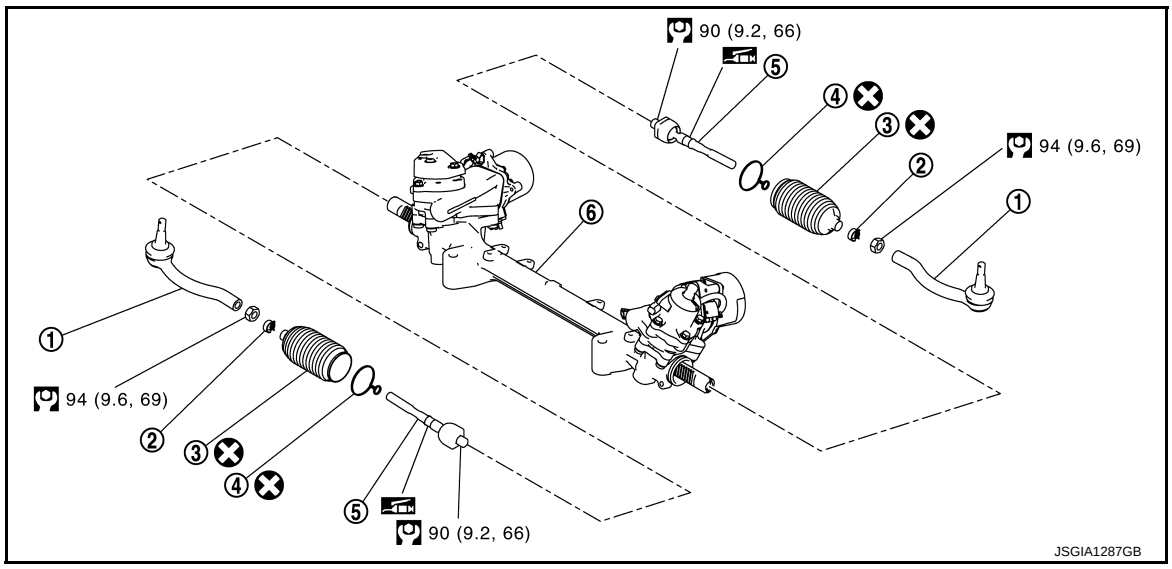
⇦: Vehicle front

⊗: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

DISASSEMBLY



① Outer socket ② Boot clamp ③ Boot
④ Boot clamp (stainless wire) ⑤ Inner socket ⑥ Gear housing assembly

⊗: Always replace after every disassembly.

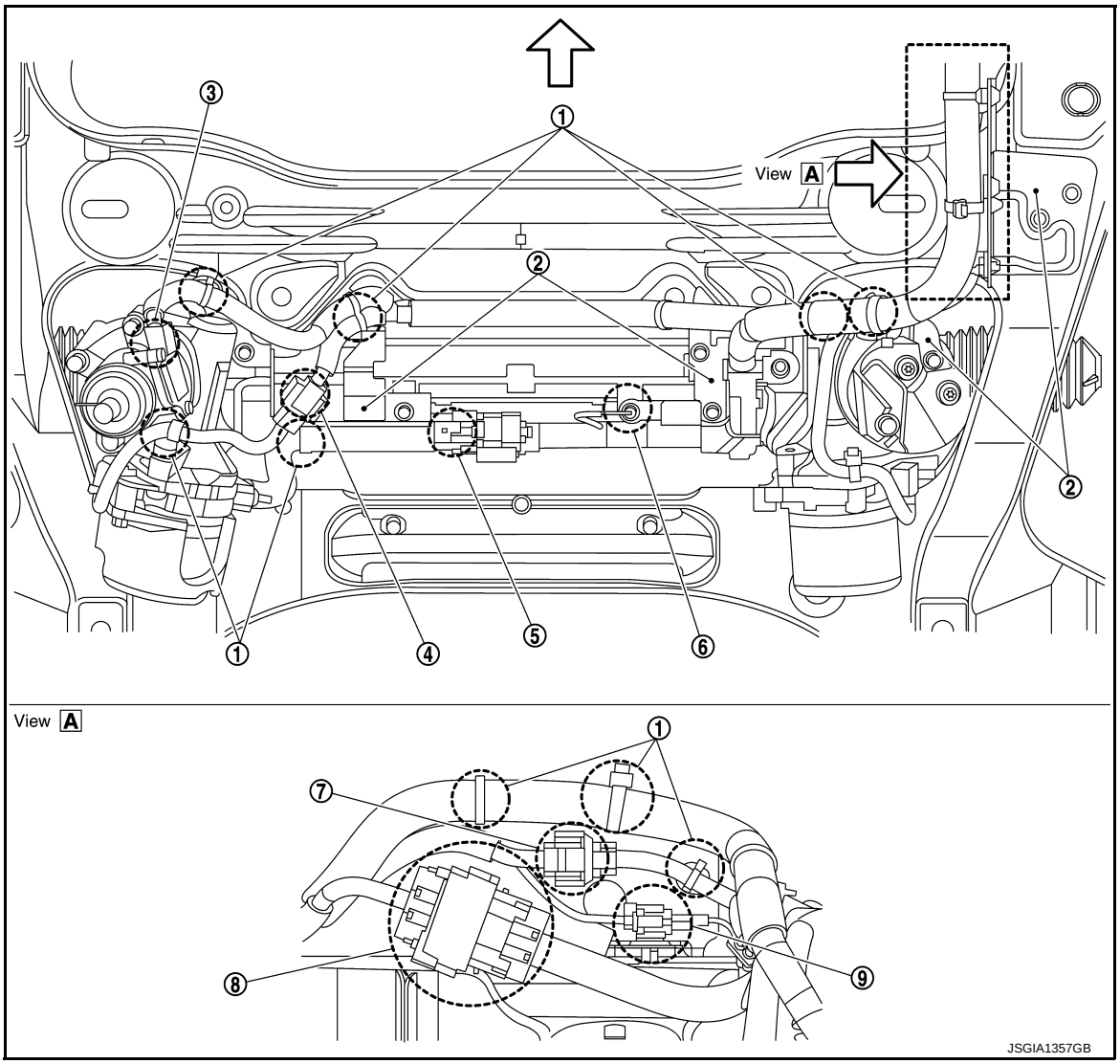
: N·m (kg-m, ft-lb)

: Apply multi-purpose grease.

Harness Layout

INFOID:0000000012793946

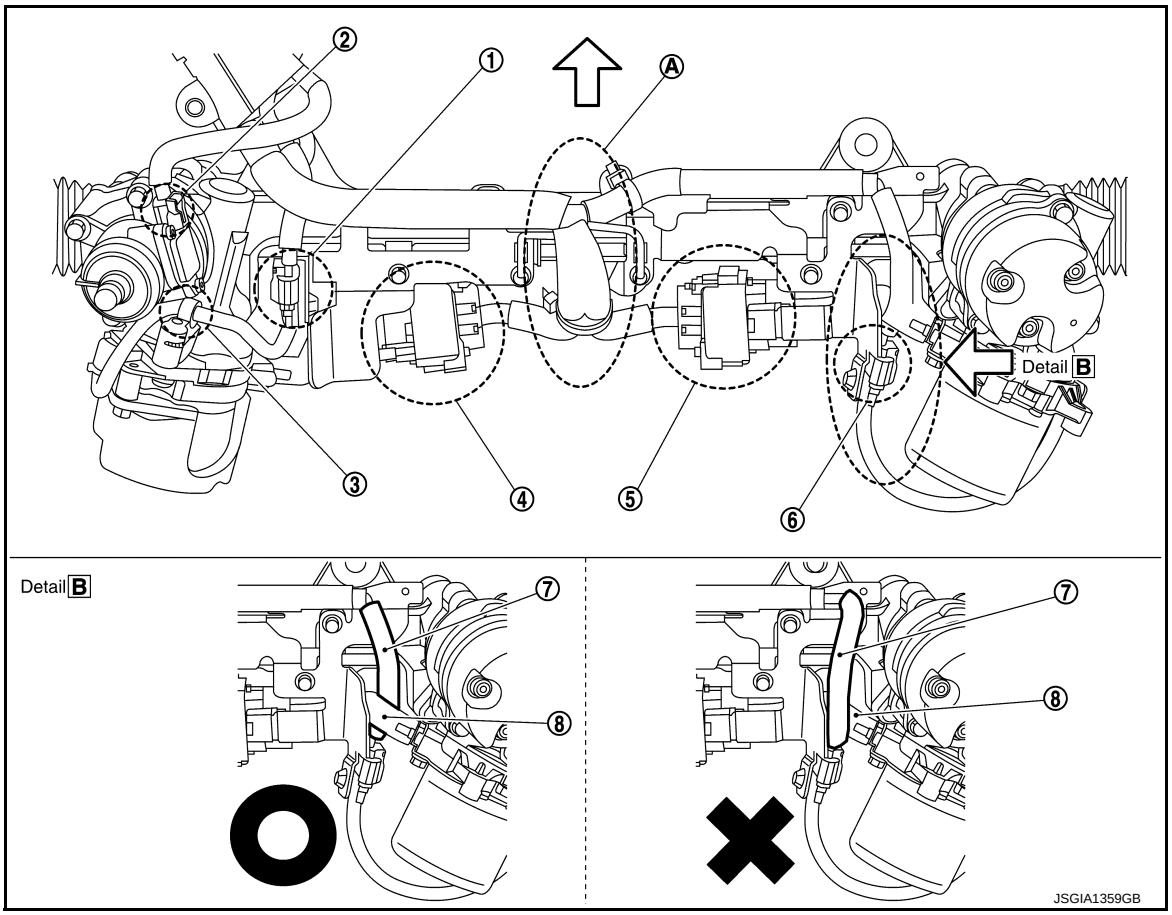
2WD models



① Clip	② Harness bracket	③ Steering torque sensor harness connector
④ Main motor angle sensor harness connector	⑤ Steering angle main motor harness connector	⑥ Steering angle main motor ground terminal
⑦ Sub motor angle sensor harness connector	⑧ Steering angle sub motor harness connector	⑨ Steering angle sub motor harness ground connector

⇦: Vehicle front

AWD models



① Main motor angle sensor harness connector	② Steering torque sensor harness connector	③ Clip
④ Steering angle main motor harness connector	⑤ Steering angle sub motor harness connector	⑥ Sub motor angle sensor harness connector
⑦ Sub motor angle sensor harness	⑧ Steering angle sub motor harness	

⇦: Vehicle front

CAUTION:

- **Check that there is the enough clearance in Ⓐ part between steering angle motor harness and oil pan.**
- **When installing the sub motor angle sensor harness ⑦, place the sub motor angle sensor harness under the steering angle sub motor harness ⑧.**
- **After installation, check that there is the enough clearance between the front propeller shaft flange part and sub motor angle sensor harness.**

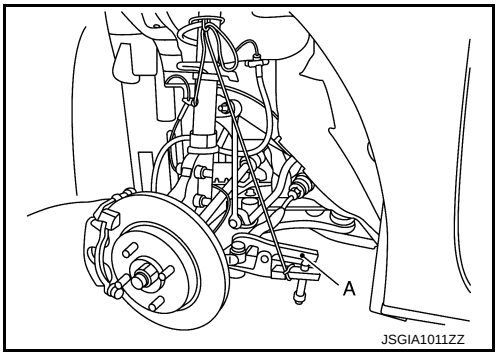
Removal and Installation

INFOID:0000000012793947

REMOVAL

1. Set the vehicle to the straight-ahead position.
2. Remove tires. Refer to WT-74, "Exploded View".
3. Remove front under cover. Refer to EXT-35, "FRONT UNDER COVER : Removal and Installation".
4. Remove cotter pin, and then loosen the nut.

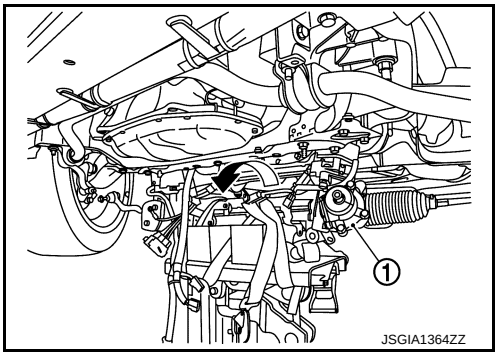
5. Remove steering outer socket from steering knuckle so as not to damage ball joint boot using a ball joint remover (A) (commercial service tool).
CAUTION:
Temporarily tighten the nut to prevent damage to threads and to prevent the ball joint remover from suddenly coming off.



6. Remove steering shaft mounting bolt (steering gear side), and separate steering shaft from steering gear assembly. Refer to ST-139, "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 steering shaft. In case of the violation of the above, replace steering shaft with a new one.**

7. Remove rack stay.
8. Disconnect direct adaptive steering harness connector.
9. Remove direct adaptive steering harness mounting brackets and clips. For layout, refer to ST-143, "Exploded View".
10. Remove steering gear assembly mounting bolts, and nuts.
11. Set suitable jack to steering gear assembly.
CAUTION:
- **Never damage the steering gear assembly with a jack.**
- **Check the stable condition when using a jack.**

12. Remove the steering gear assembly ① from the vehicle with rotating the steering gear assembly as shown.



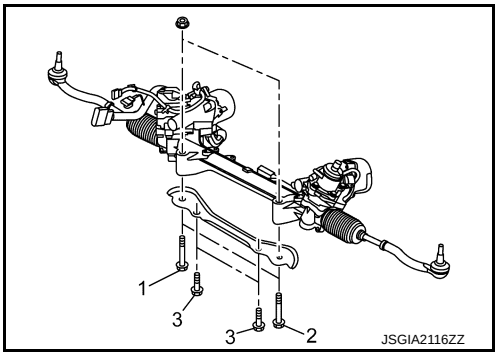
INSTALLATION

Note the following, and install in the reverse order of removal.
CAUTION:
Spiral cable may be cut if steering wheel turns while separating steering shaft and steering gear assembly. Be sure to secure steering wheel using string to avoid turning.

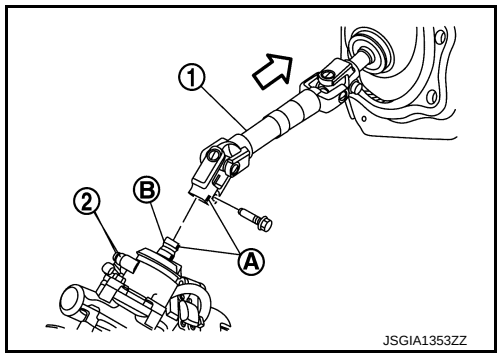
- Tighten the mounting bolts in the order shown in the figure when installing the steering gear assembly.

Temporary tightening: 1 ⇒ 2 ⇒ 3
Final tightening: 1 ⇒ 2 ⇒ 3

CAUTION:
Never reuse the steering gear assembly mounting nut.



- When installing steering lower shaft to steering gear assembly, follow the procedure listed below.
- Align matching marks Ⓐ to install steering lower shaft ① and steering gear assembly ②.



⇦ : Vehicle upper

CAUTION:
- **When installing steering lower shaft from steering clutch assembly, be careful with the vertical direction of the steering lower shaft.**
- **Install the steering lower shaft to the same position when it was removed.**

- When connecting steering lower shaft (steering gear side) and steering gear assembly, make sure the bolt is securely seated in groove Ⓑ of steering gear assembly.
- To tighten steering mounting bolt (steering gear side), manually tighten the bolt to check for scoring or galling before tightening the bold to the specified torque.
- Perform inspection after installation. Refer to ST-150, "Inspection".

Disassembly and Assembly

INFOID:0000000012793948

DISASSEMBLY

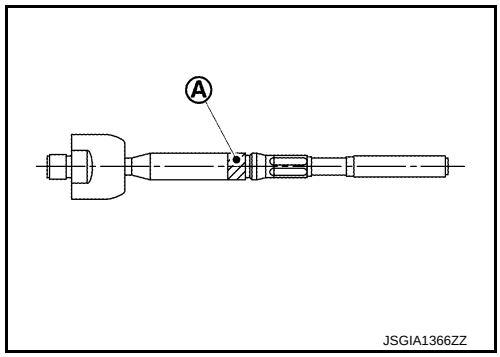
CAUTION:
- **Never disassemble other than the parts shown in ST-143, "Exploded View".**
- **Disassemble and assemble steering gear assembly by fixing the mounting area with a vise using copper plates.**

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.
4. Perform inspection after disassembly. Refer to ST-150, "Inspection".

ASSEMBLY

CAUTION:
Disassemble and assemble steering gear assembly by fixing the mounting area with a vise using copper plates.

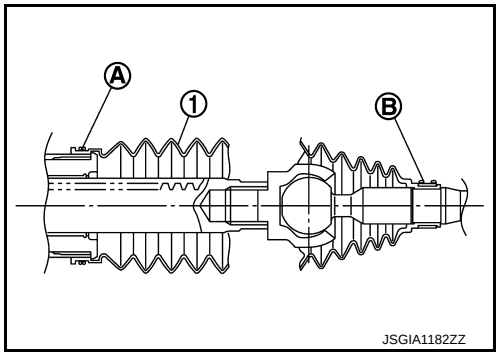
1. Install inner socket to gear housing assembly.
2. Apply multi-purpose grease to inner socket Ⓐ part.



3. Install large end Ⓐ of boot ① to gear housing assembly.

Ⓑ : Small end of boot

CAUTION:
Never reuse boot.

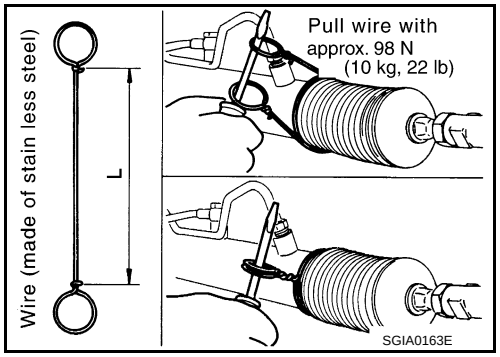


4. Install small end of boot to inner socket boot mounting groove.
5. Install boot clamp to boot small end.
6. Install boot clamp to the large side of boot with the following procedure.

CAUTION:
Never reuse boot clamp.

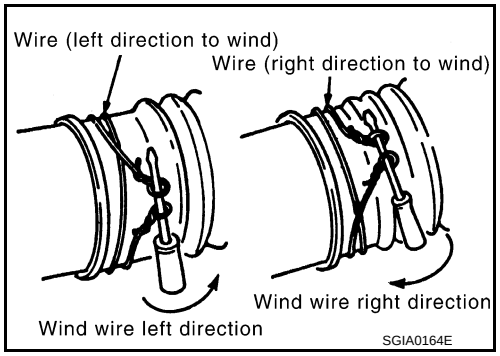
a. Tighten large side of boot with boot clamp (stainless wire).

Wire length (L) : 376 mm (14.80 in)



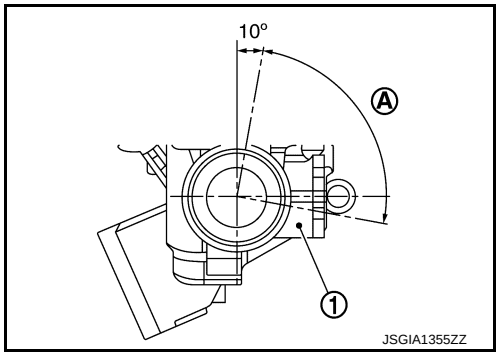
b. Wrap clamp around boot groove for two turns. Insert a flat-bladed screwdriver in loops on both ends of wire. Twist 3 to 3.5 turns while pulling them with force of approximately 98 N (10 kg, 22 lb).

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



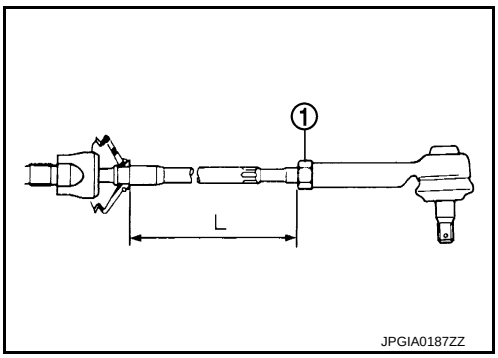
d. Twisted area Ⓐ of clamp is in the adjusting screw side ① as shown in the figure (to prevent contact with other parts).

Ⓐ : 90°



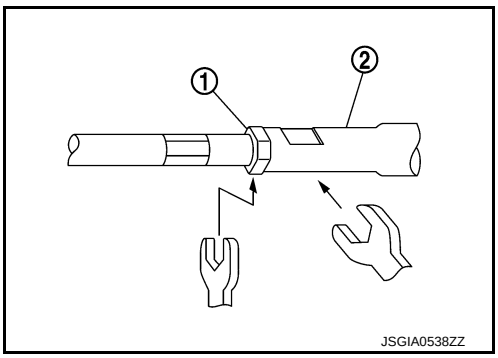
7. Adjust inner socket to standard length (L), and then tighten lock nut ① to the specified torque. Check length again after tightening lock nut.

Inner socket length (L) **: Refer to ST-153, "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:0000000012793949

INSPECTION AFTER DISASSEMBLY

Boot

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

Gear Housing Assembly

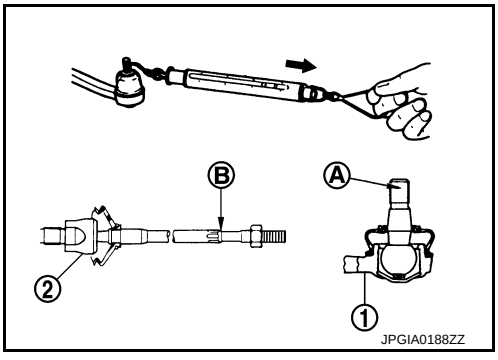
Check gear housing assembly for damage and scratches (inner wall). Replace if there are.

Outer Socket and Inner Socket

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

BALL JOINT SWINGING 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 and inner socket (gear housing assembly) if they are outside the standard.



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

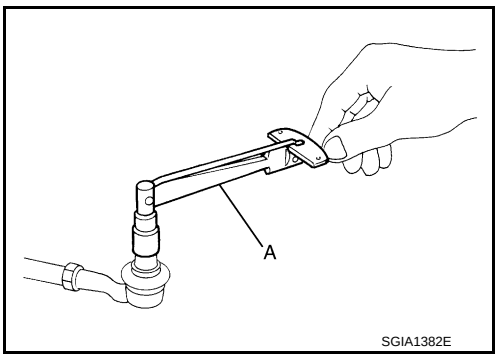
Measuring point of inner socket ② : Point Ⓑ shown in the figure

Swinging force (Spring balance measurement) **: Refer to ST-153, "Steering Gear and Linkage".**

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.

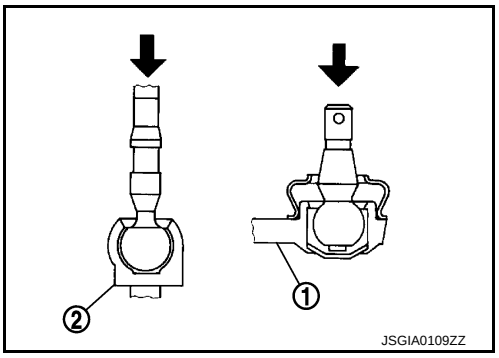
Rotating torque **: Refer to ST-153, "Steering Gear and Linkage".**



BALL JOINT AXIAL END PLAY

Apply an axial load of 490 N (50 kg, 110 lb) to ball stud. Using a dial indicator, 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 (gear housing assembly) ② if the measured value is outside the standard.

Axial end play **: Refer to ST-153, "Steering Gear and Linkage".**



INSPECTION AFTER INSTALLATION

- Check if steering wheel turns smoothly when it is turned several times fully to the end of the left and right.
- Check the steering wheel play, neutral position steering wheel, steering wheel turning torque, and front wheel turning angle.
  - Steering wheel play: Refer to ST-125, "Inspection".
  - Neutral position steering wheel, steering wheel turning torque, and front wheel turning angle: Refer to ST-114, "Inspection".
- Check wheel alignment. Refer to FSU-29, "DIRECT ADAPTIVE STEERING : Inspection" (2WD), FSU-55, "DIRECT ADAPTIVE STEERING : Inspection" (AWD).

CAUTION:

Perform additional service when removing/replacing steering gear assembly. Refer to STC-202, "Special Repair Requirement".

SERVICE DATA AND SPECIFICATIONS (SDS)

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General Specifications

INFOID:0000000012793950

Steering gear model	PR26YA

Steering Wheel

INFOID:0000000012793951

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	39 N (4 kg-f, 9 lb-f)

Steering Angle

INFOID:0000000012793952

Unit: Degree minute (Decimal degree)

Item		Standard	
		2WD	AWD
Inner wheel	Minimum	35° 15′ (35.25°)	36° 00′ (36.0°)
	Nominal	38° 15′ (38.25°)	39° 00′ (39.0°)
	Maximum	39° 15′ (39.25°)	40° 00′ (40.0°)
Outer wheel	Nominal	32° 35′ (32.58°)	30° 40′ (30.67°)

Steering Column

INFOID:0000000012793953

Item		Standard
Rotating torque		0.49 N·m (0.05 kg-m, 4 in-lb) or less
Steering column length*		527 mm (20.75 in) or less
Impact displacement absorption part dimension*	Dimension A	14.8 mm (0.583 in)
	Dimension B	0.6 mm (0.024 in)
Tilt operating range*		65 mm (2.56 in)
Telescopic operating range*		47 mm (1.85 in)

*: For measuring position, refer to ST-137, "Inspection".

Steering Shaft

INFOID:0000000012793954

Item	Standard	
	2WD	AWD
Steering lower shaft length*	266.6 mm (10.50 in) or more	239.6 mm (9.43 in) or more

*: For measuring position, refer to ST-142, "Inspection".

Steering Gear and Linkage

INFOID:0000000012793955

Item		Standard
Outer socket ball joint	Swing force* (Spring balance measurement)	4.81 – 45.7 N (0.50 – 4.66 kg-f, 1.08 – 10.27 lb-f)
	Rotating torque	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* (Spring balance measurement)	8.9 – 64 N (0.91 – 6.52 kg-f, 2.00 – 14.38 lb-f)
	Axial end play	0.2 mm (0.008 in) or less
Inner socket length		68.5 mm (2.697 in) or less

*: For measuring position, refer to ST-150, "Inspection".