

SECTION **ST**
STEERING SYSTEM

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PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

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

INFOID:000000009177053

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

WARNING:

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

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

WARNING:

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

Service Notice or Precautions for Steering System

INFOID:000000009177054

- In case of removing steering gear, 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

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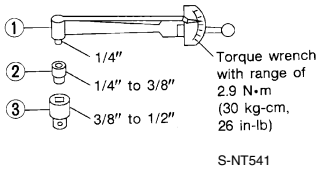
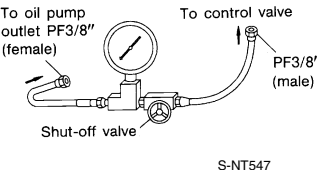
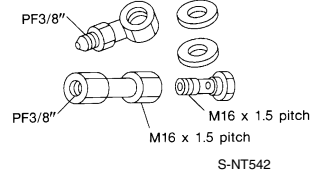
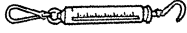
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PREPARATION

Special Service Tool

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

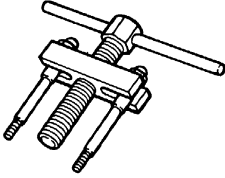
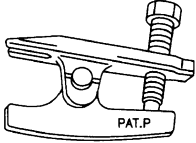
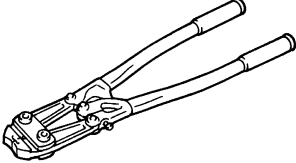

Tool number (Kent-Moore No.) Tool name	Description
<p>ST3127S000 (J-25765-A) Preload gauge 1. GG9103000 (J-25765-A) Torque wrench 2. HT62940000 (-) Socket adapter 3. HT62900000 (-) Socket adapter</p> 	<p>Inspecting of rotating torque for ball joint and steering column</p>
<p>KV48103500 (J-26357) Pressure gauge</p> 	<p>Measuring oil pump relief pressure</p>
<p>KV48102500 (J-33914) Pressure gauge adapter</p> 	<p>Measuring oil pump relief pressure</p>
<p>— (J-44372) Pull gauge</p> 	<p>Measuring steering wheel turning force, rack sliding force and ball joint swinging force</p>

Commercial Service Tool

INFOID:000000009177056

PREPARATION

< PREPARATION >

Tool name	Description
Steering wheel puller  <p style="text-align: right;">ZZA0819D</p>	Removing steering wheel
Ball joint remover  <p style="text-align: right;">NT146</p>	Removing ball joint
Boot clamp crimping tool  <p style="text-align: right;">ZZA1229D</p>	Installing boot clamps
Power tool  <p style="text-align: right;">PIIB1407E</p>	Loosening nuts, screws and bolts

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COMPONENT PARTS

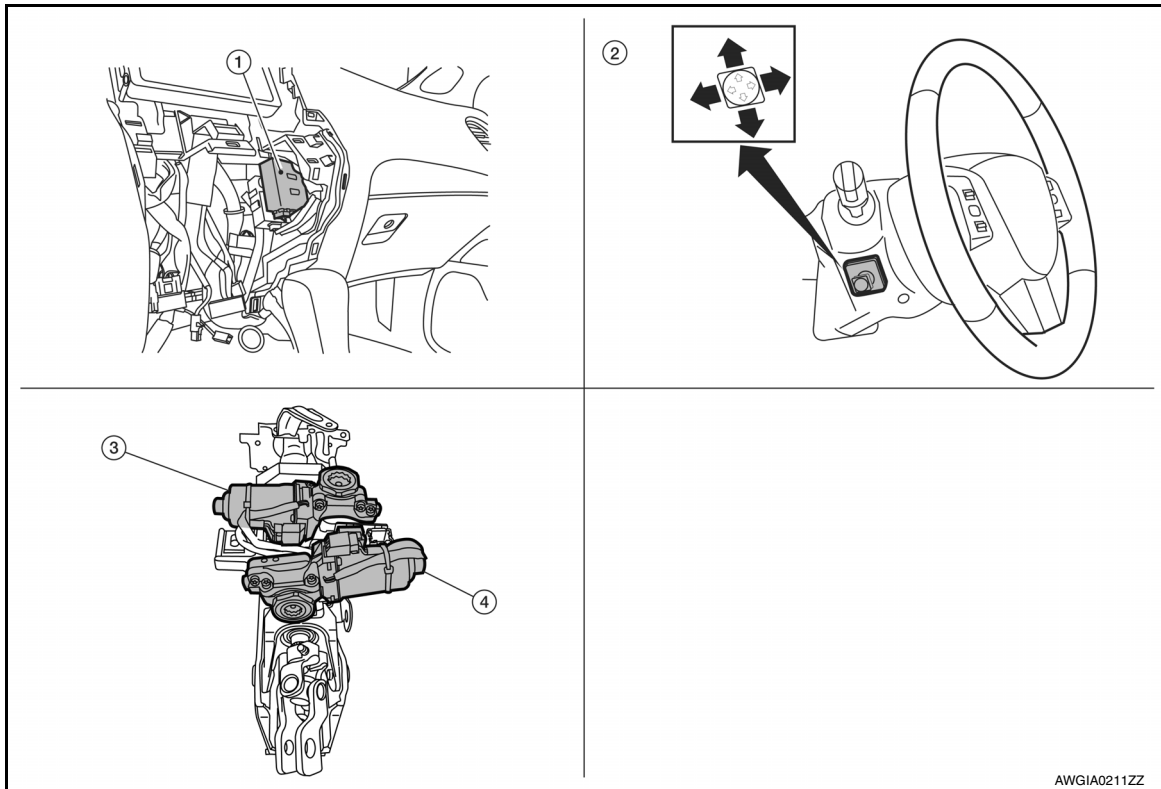
< SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION

COMPONENT PARTS

STEERING TILT & STEERING TELESCOPIC

STEERING TILT & STEERING TELESCOPIC : Component Parts Location INFOID:000000009177057



- | | | |
|---|-------------------------------|---|
| <p>1. Automatic drive positioner control unit
(view with cluster lid C removed)</p> <p>4. Telescopic motor
(view with steering column assembly removed)</p> | <p>2. ADP steering switch</p> | <p>3. Tilt motor
(view with steering column assembly removed)</p> |
|---|-------------------------------|---|

STEERING TILT & STEERING TELESCOPIC : Component Description INFOID:000000009177058

Component parts		Description
Automatic drive positioner control unit		<ul style="list-style-type: none"> Supplies power and ground for tilt and telescopic motors. Receives signals from the ADP steering switch.
ADP steering switch	Tilt switch	<ul style="list-style-type: none"> Controls movement of steering column up and down. Sends tilt up and down signals to automatic drive positioner control unit.
	Telescopic switch	<ul style="list-style-type: none"> Controls movement of steering column forward and backward. Sends forward and backward signals to automatic drive positioner control unit.
Tilt motor		<ul style="list-style-type: none"> Tilts steering column upward and downward by changing the polarity of the tilt motor.
Telescopic motor		<ul style="list-style-type: none"> Telescopes steering column forward and backward by changing the polarity of the telescopic motor.

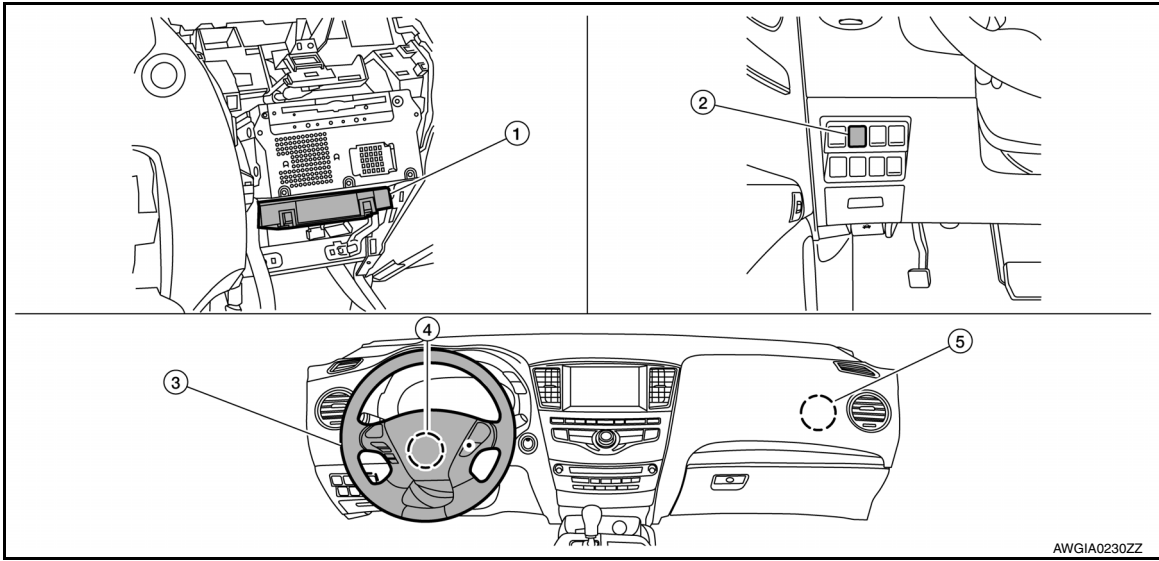
HEATED STEERING WHEEL SYSTEM

COMPONENT PARTS

< SYSTEM DESCRIPTION >

HEATED STEERING WHEEL SYSTEM : Component Parts Location

INFOID:000000009177059



1. A/C Auto amp
(view with cluster lid C removed)
2. Heated steering wheel switch
3. Heated steering wheel
4. Spiral cable
5. Heated steering relay

HEATED STEERING WHEEL SYSTEM : Component Description

INFOID:000000009177060

Components	Description
A/C Auto amp	Controls the heated steering relay by providing a ground signal to the coil.
Heated steering wheel switch	<ul style="list-style-type: none"> • Controls the heated steering relay by providing a ground signal to A/C Auto amp. • Provides switch indicator for system.
Heated steering relay	Provides battery power supply to heated steering wheel and switch indicator.
Heated steering wheel	Contains heating element and over-heat protection.
Spiral cable	Provides rotating electrical connection for heated steering wheel.

SYSTEM

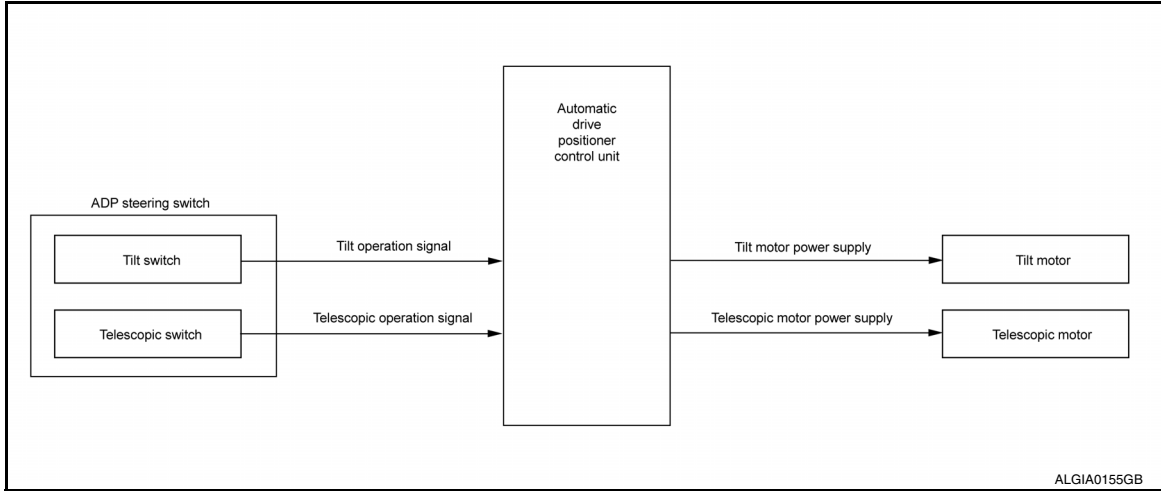
< SYSTEM DESCRIPTION >

SYSTEM

STEERING TILT & STEERING TELESCOPIC

STEERING TILT & STEERING TELESCOPIC : System Diagram

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STEERING TILT & STEERING TELESCOPIC : System Description

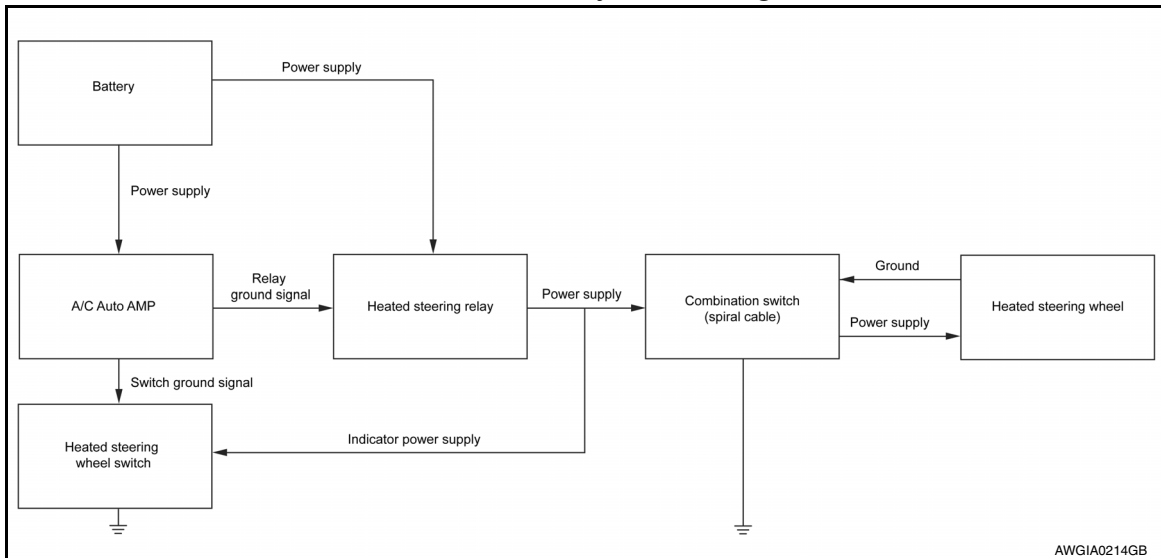
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When the operator adjusts the steering column position using the ADP steering switch (tilt/telescopic), the switch provides a ground signal to the ADP control unit. Power and ground is supplied to the tilt or telescopic motors to move the column in the desired direction.

HEATED STEERING WHEEL SYSTEM

HEATED STEERING WHEEL SYSTEM : System Diagram

INFOID:000000009177063



HEATED STEERING WHEEL SYSTEM : System Description

INFOID:000000009177064

The heated steering wheel switch controls the heated steering relay through the A/C Auto amp. When the switch is turned on, the relay is energized and the heated steering system will operate. The heated steering system will turn off when the steering wheel temperature reaches approximately 86° F (30° C). Heated steering system operation can also be canceled by pressing the heated steering wheel switch again. If the surface temperature of the steering wheel is below 68° F (20° C), the system will heat the steering wheel and cycle off and on to maintain a temperature above 68° F (20° C). The indicator light will remain on as long as the system is on.

AUTOMATIC DRIVE POSITIONER CONTROL UNIT

< ECU DIAGNOSIS INFORMATION >

ECU DIAGNOSIS INFORMATION

AUTOMATIC DRIVE POSITIONER CONTROL UNIT

List of ECU Reference

INFOID:000000009177065

ECU	Reference
ADP Control Unit	ADP-36, "Reference Value"

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STEERING COLUMN

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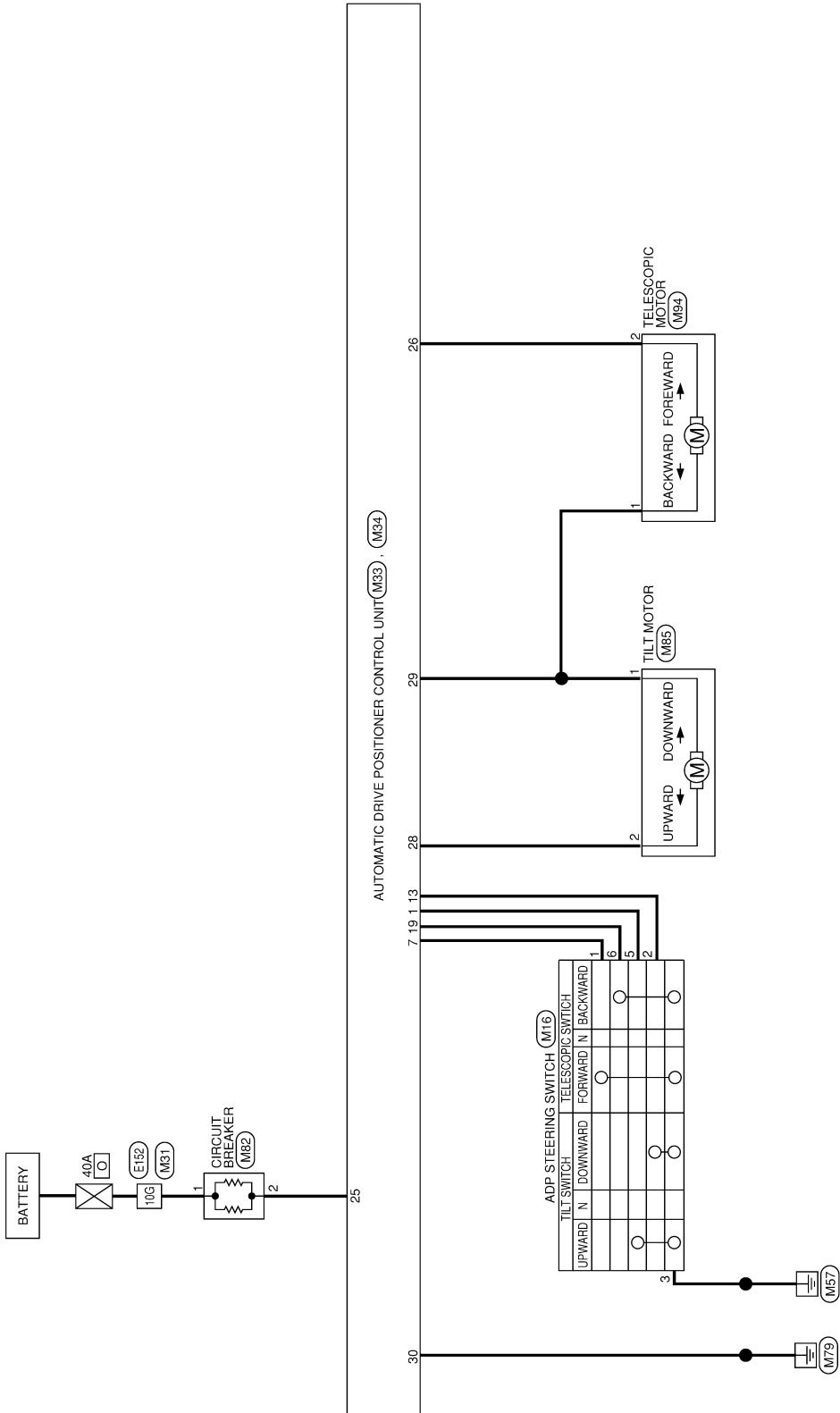
WIRING DIAGRAM

STEERING COLUMN

Wiring Diagram

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TILT & TELESCOPIC STEERING COLUMN



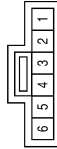
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STEERING COLUMN

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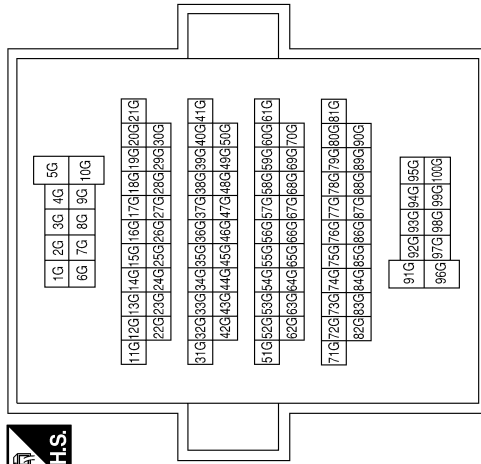
TILT & TELESCOPIC STEERING COLUMN CONNECTORS

Connector No.	M16
Connector Name	ADP STEERING SWITCH
Connector Color	GRAY



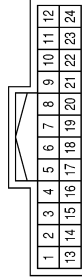
Terminal No.	Color of Wire	Signal Name
1	BR	-
2	Y	-
3	B	-
5	LG	-
6	L	-

Connector No.	M31
Connector Name	WIRE TO WIRE
Connector Color	WHITE



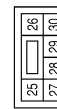
Terminal No.	Color of Wire	Signal Name
10G	W	-

Connector No.	M33
Connector Name	AUTOMATIC DRIVE POSITIONER CONTROL UNIT
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	LG	TILT SW (UPWARD)
7	BR	TELESCOPIC SW (FRONTWARD)
13	Y	TILT SW (DOWNWARD)
19	L	TELESCOPIC SW (BACKWARD)

Connector No.	M34
Connector Name	AUTOMATIC DRIVE POSITIONER CONTROL UNIT
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
25	L	BAT (PTC)
26	V	TELESCOPIC MOTOR (BACKWARD)
28	SB	TILT MOTOR (DOWNWARD)
29	BR	STC MOTOR COMMON (UPWARD/FORWARD)
30	B	GND (POWER)

Connector No.	M82
Connector Name	CIRCUIT BREAKER-2
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	W	-
2	L	-

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STEERING COLUMN

< WIRING DIAGRAM >

Connector No.	M94
Connector Name	TELESCOPIC MOTOR
Connector Color	BROWN



Terminal No.	Color of Wire	Signal Name
1	BR	-
2	V	-

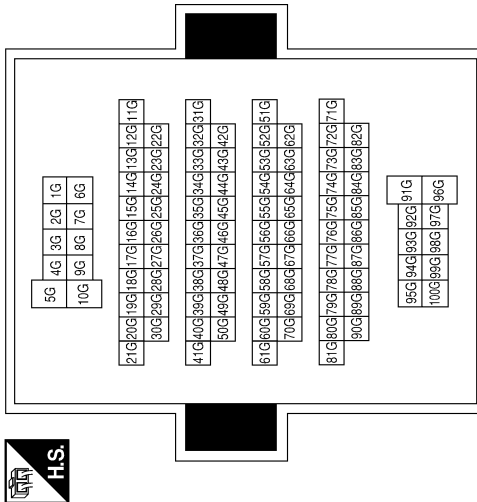
Connector No.	M85
Connector Name	TILT MOTOR
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	BR	-
2	SB	-

Terminal No.	10G
Color of Wire	P
Signal Name	-

Connector No.	E152
Connector Name	WIRE TO WIRE
Connector Color	WHITE



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HEATED STEERING WHEEL

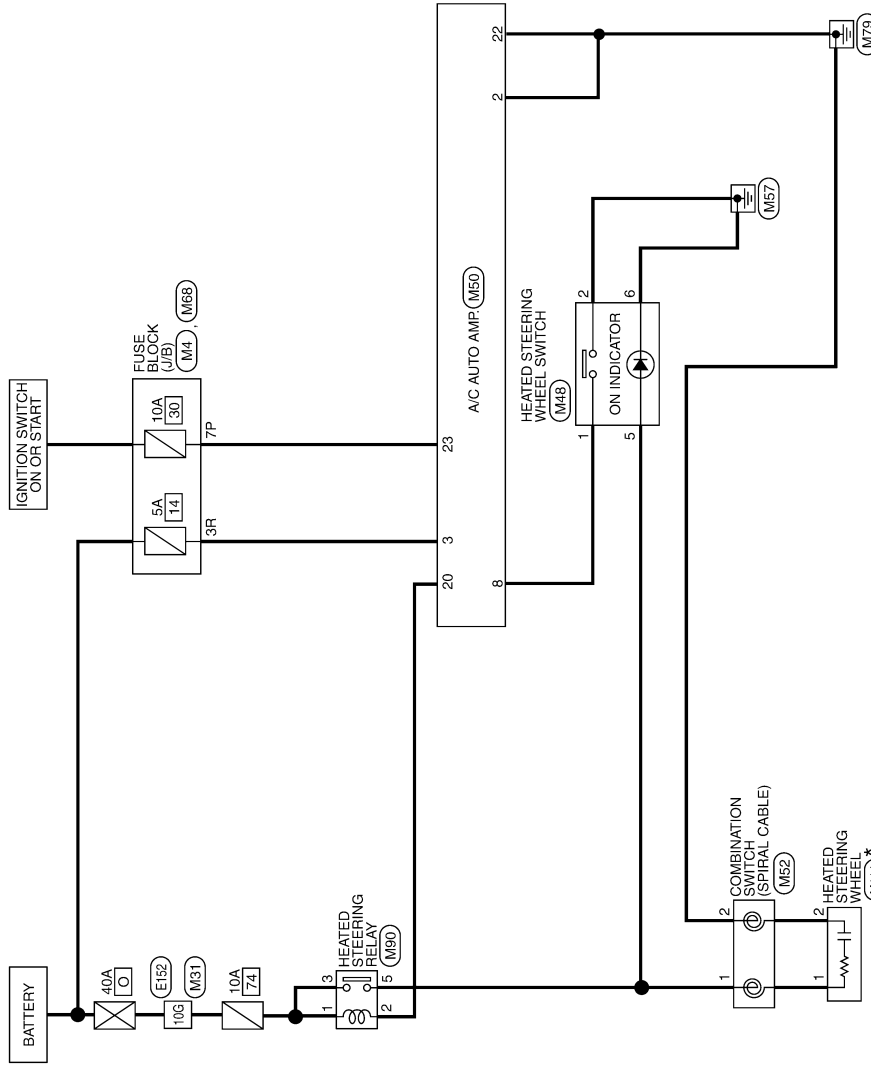
< WIRING DIAGRAM >

HEATED STEERING WHEEL

Wiring Diagram

INFOID:000000009177067

HEATED STEERING WHEEL



* : THIS CONNECTOR IS NOT SHOWN IN "HARNES LAYOUT" OF PG SECTION.

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HEATED STEERING WHEEL

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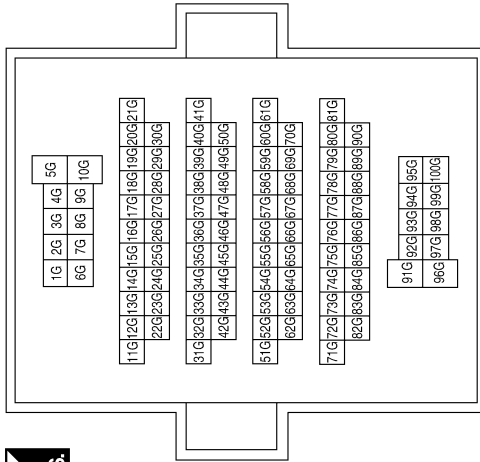
HEATED STEERING WHEEL CONNECTORS

Connector No.	M4
Connector Name	FUSE BLOCK (J/B)
Connector Color	WHITE



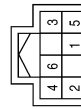
Terminal No.	Color of Wire	Signal Name
7P	LG	-

Connector No.	M31
Connector Name	WIRE TO WIRE
Connector Color	WHITE



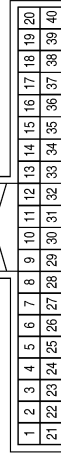
Terminal No.	Color of Wire	Signal Name
10G	W	-

Connector No.	M48
Connector Name	HEATED STEERING WHEEL SWITCH
Connector Color	BLUE



Terminal No.	Color of Wire	Signal Name
1	G	-
2	GR	-
5	Y	-
6	B	-

Connector No.	M50
Connector Name	A/C AUTO AMP.
Connector Color	WHITE



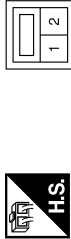
Terminal No.	Color of Wire	Signal Name
20	BR	STRG HTR RLY
22	GR	GND (POWER)
23	LG	IGN

Terminal No.	Color of Wire	Signal Name
2	GR	GND
3	G	B+
8	G	STRG HTR SW

HEATED STEERING WHEEL

< WIRING DIAGRAM >

Connector No.	M52
Connector Name	COMBINATION SWITCH
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	Y	-
2	B	-

Connector No.	M68
Connector Name	FUSE BLOCK (J/B)
Connector Color	BROWN



Terminal No.	Color of Wire	Signal Name
3R	G	-

Connector No.	M90
Connector Name	HEATED STEERING RELAY
Connector Color	BLUE



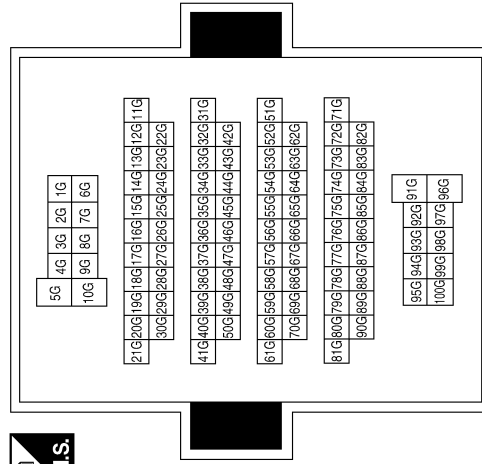
Terminal No.	Color of Wire	Signal Name
1	LG	-
2	BR	-
3	LG	-
5	Y	-

Connector No.	M114
Connector Name	HEATED STEERING WHEEL
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	Y	-
2	L	-

Connector No.	E152
Connector Name	WIRE TO WIRE
Connector Color	WHITE



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DIAGNOSIS AND REPAIR WORK FLOW

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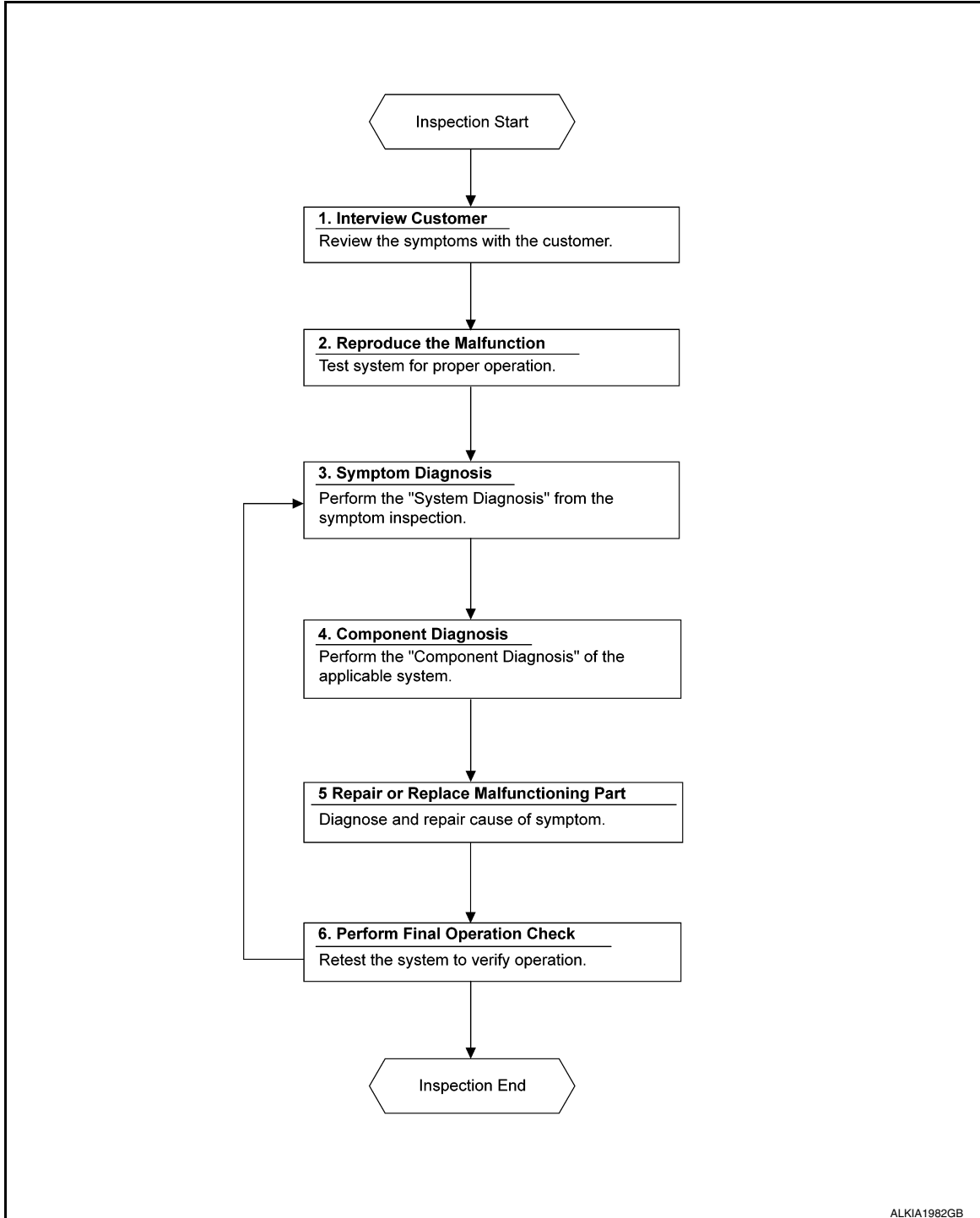
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

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OVERALL SEQUENCE



DETAILED FLOW

1. OBTAIN INFORMATION ABOUT SYMPTOM

Interview the customer to obtain as much information as possible about the conditions and environment under which the malfunction occurred.

DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

>> GO TO 2.

2. CONFIRM THE SYMPTOM

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. Refer to [ST-40, "Symptom Table"](#).

>> GO TO 4.

4. PERFORM THE COMPONENT DIAGNOSIS OF THE OF THE APPLICABLE SYSTEM

Perform the diagnosis with Component diagnosis of the applicable system.

>> GO TO 5.

5. REPAIR OR REPLACE THE MALFUNCTIONING PARTS

Repair or replace the specified malfunctioning parts.

>> GO TO 6.

6. FINAL CHECK

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

Are the malfunctions corrected?

YES >> Inspection End.

NO >> GO TO 3.

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POWER STEERING FLUID

< BASIC INSPECTION >

POWER STEERING FLUID

Inspection

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FLUID LEVEL

Check power steering fluid level at the scale on the power steering reservoir cap indicator.

- Check power steering fluid level with engine stopped and the fluid temp between 0 – 30° C (32 – 86° F).
- Power steering fluid level should be between the hatching area on the power steering reservoir cap indicator.

CAUTION:

- Do not overfill.
- Do not reuse used power steering fluid.
- Recommended power steering fluid is Genuine NISSAN E-PSF or equivalent. Refer to [MA-15, "FOR USA AND CANADA : Fluids and Lubricants"](#) (United States and Canada) or [MA-16, "FOR MEXICO : Fluids and Lubricants"](#) (Mexico).

NOTE:

Power steering fluid level marks are on the reservoir and also on the power steering reservoir cap indicator.

FLUID LEAKAGE

Check the power steering hydraulic system for leaks, cracks, damage, loose connections, chafing or deterioration. Repair or replace as necessary.

1. Start engine and allow engine to idle.
2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds to check fluid leakage.

CAUTION:

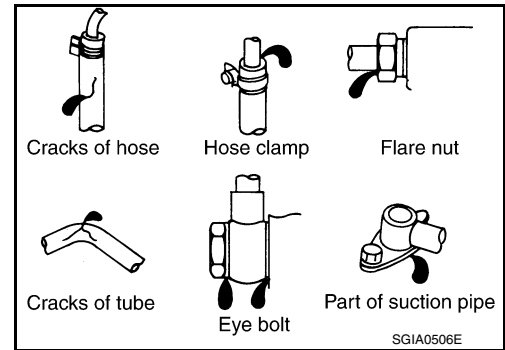
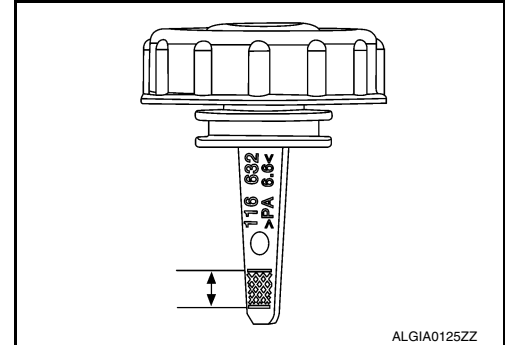
Do not hold steering wheel in a locked position for more than 10 seconds. Damage to power steering oil pump may occur.

4. If power steering fluid leakage at connections is noticed, loosen flare nut and retighten.

CAUTION:

Do not over tighten flare nut as damage to O-ring and connection can occur.

5. If power steering fluid leakage from the power steering oil pump is noticed, repair connection or replace power steering oil pump. Refer to [ST-52, "Removal and Installation"](#).
6. Check steering gear boots for accumulation of power steering fluid. Power steering fluid indicates a leak from the power steering gear, replace as necessary. Refer to [ST-48, "Removal and Installation - 2WD"](#) (2WD) or [ST-49, "Removal and Installation - 4WD"](#) (4WD).



STEERING WHEEL

< BASIC INSPECTION >

STEERING WHEEL

Inspection

INFOID:000000009177070

CONDITION OF INSTALLATION

- Check installation condition of power steering gear, front suspension, front drive shaft and steering column.
- 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-60, "Steering Wheel"](#).

- Verify that the power steering gear nuts are tightened to specification. Refer to [ST-48, "Exploded View"](#).

STEERING WHEEL PLAY

1. Turn tires straight ahead, start engine, then turn steering wheel to the left and right lightly. Measure steering wheel movement on the outer circumference of the steering wheel when it is turned to the point where tires start moving.

Steering wheel play

: Refer to [ST-60, "Steering Wheel"](#).

NEUTRAL POSITION ON STEERING WHEEL

- Check neutral position on steering wheel after confirming that front wheel alignment is correct. Refer to [FSU-5, "Inspection and Adjustment"](#).

1. Turn tires straight ahead, check if steering wheel is in the neutral position.
2. If it is not in the neutral position, remove steering wheel and reinstall it correctly.
3. If the neutral position cannot be attained by repositioning the steering wheel two teeth or less on steering stem, loosen tie-rod lock nuts of power steering gear outer sockets, then adjust tie-rods by the same amount in the opposite direction.

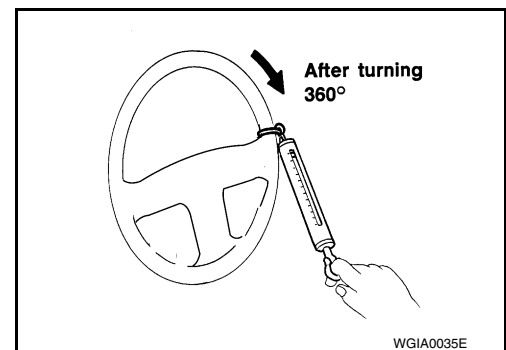
STEERING WHEEL TURNING FORCE

1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to operating temperature.
4. Verify that the tires are inflated to the specified pressure. Refer to [WT-65, "Tire Air Pressure"](#).
5. Check steering wheel turning force using Tool when steering wheel has been turned 360° from the neutral position.

Tool number : (—) (J-44372)

Steering wheel turning force : Refer to [ST-60, "Steering Wheel"](#).

6. If steering wheel turning force is out of specification, inspect steering column. Refer to [ST-21, "Inspection"](#).
7. If steering column meets specification, inspect steering gear. Refer to [ST-23, "Inspection"](#).

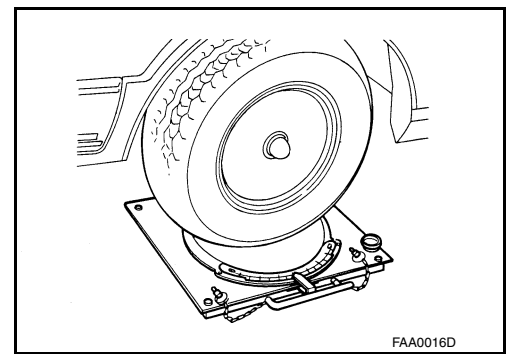


CHECKING FRONT WHEEL TURNING ANGLE

STEERING WHEEL

< BASIC INSPECTION >

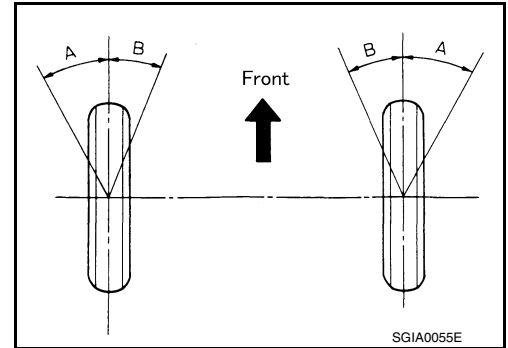
- Check front wheel turning angle after toe-in inspection. Place front wheels on turning radius gauges and rear wheels on stands. Check the maximum inner and outer wheel turning angles for LH and RH road wheels.



- Measure the turning angles with the engine at idle, then turn the steering wheel from full left stop to full right stop and measure the turning angle. Refer to [ST-60, "Steering Angle"](#).

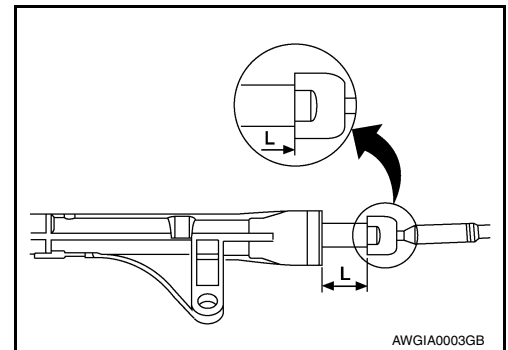
Inner wheel angle (A) : Refer to [ST-60, "Steering Angle"](#).

Outer wheel angle (B) : Refer to [ST-60, "Steering Angle"](#).



- Measure the rack stroke specification with vehicle in neutral position. Refer to [ST-61, "Power Steering Gear"](#).

Rack stroke in neutral position (L) : Refer to [ST-61, "Power Steering Gear"](#).



STEERING COLUMN

< BASIC INSPECTION >

STEERING COLUMN

Inspection

INFOID:000000009177071

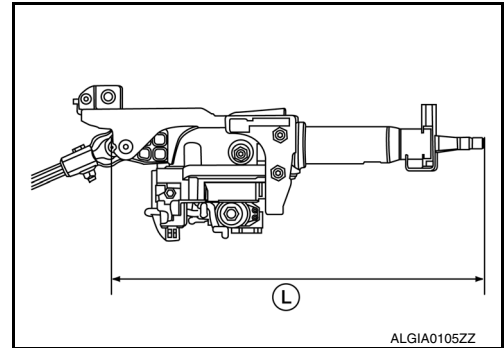
HOLE COVER SEAL, HOLE COVER AND LOWER SHAFT

Check each part of hole cover seal, hole cover and steering column and lower shaft for damage or other malfunctions. Replace if necessary.

STEERING COLUMN

- Check each part of steering column for damage or other malfunctions. Replace entire steering column if any parts are damaged.
- Measure the length (L) as shown if vehicle has been involved in a minor collision. Replace steering column if outside the specifications.

Steering column length (L) : Refer to [ST-60, "Steering Column"](#).



- Measure steering column rotating torque using Tool. Replace steering column if outside the standard.

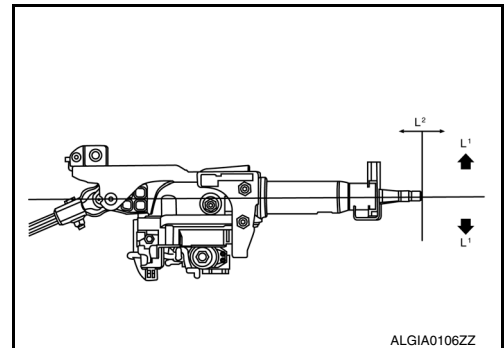
Tool number : [ST3127S000 \(J-25765-A\)](#)

Rotating torque : Refer to [ST-60, "Steering Column"](#).

- Check tilt and telescopic mechanism operating range (L^1), (L^2) as shown.

Tilt operating range (L^1) : Refer to [ST-60, "Steering Column"](#).

Telescopic operating range (L^2) : Refer to [ST-60, "Steering Column"](#).



POWER STEERING OIL PUMP

< BASIC INSPECTION >

POWER STEERING OIL PUMP

Inspection

INFOID:000000009177072

RELIEF OIL PRESSURE

1. Connect the Tool between oil pump discharge connector and high-pressure hose. Bleed air from the hydraulic circuit while opening valve fully. Refer to [ST-42, "Air Bleeding Hydraulic System"](#).

Tool numbers : KV48103500 (J-26357)
: KV48102500 (J-33914)

2. Start engine. Run engine until power steering fluid temperature reaches 50° - 80°C (122° - 176°F).

CAUTION:

- Leave the valve of the hydraulic 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 fluid temperature.
- Be sure to keep hose clear of belts and other parts when engine is started.

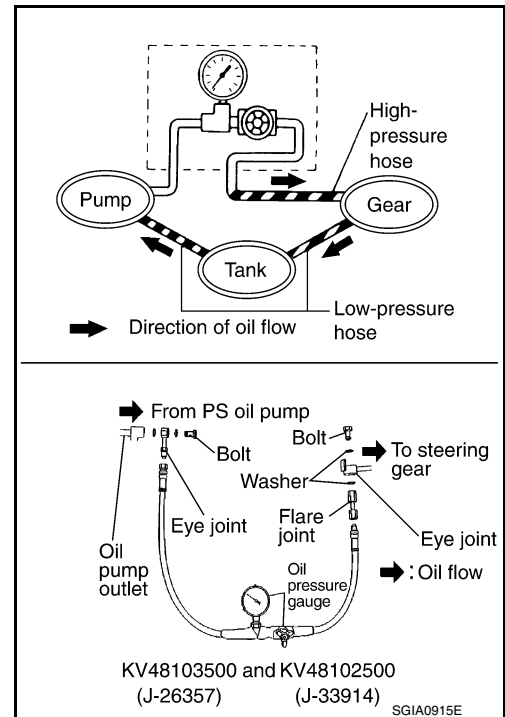
3. Fully close the Tool valve with engine at idle and measure the relief oil pressure.

Relief oil pressure : Refer to [ST-62, "Power Steering Oil Pump"](#)

CAUTION:

Do not 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. After inspection, disconnect the Tool from hydraulic circuit, then add fluid and bleed air. Refer to [ST-42, "Air Bleeding Hydraulic System"](#).



STEERING GEAR AND LINKAGE

< BASIC INSPECTION >

STEERING GEAR AND LINKAGE

Inspection

INFOID:000000009177073

BOOT

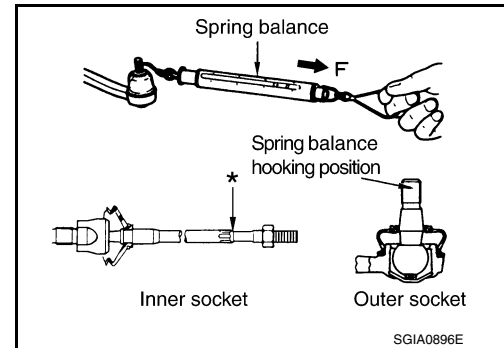
Check boot for cracks. Replace if any damage is found.

OUTER SOCKET AND INNER SOCKET

- Ball joint swinging torque
- Hook a spring balance to the ball stud and inner socket measuring 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 if they are outside the specification.

Tool number : — (J-44372)

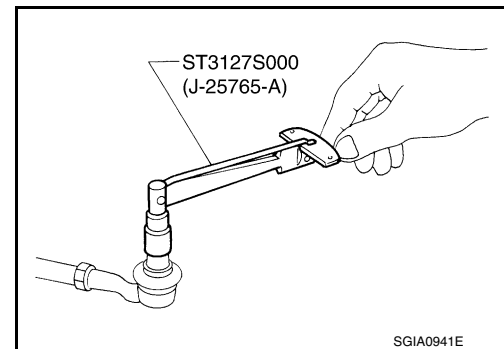
Swinging torque : Refer to [ST-61, "Power Steering Gear"](#).



- Ball joint rotating torque
- Make sure that the reading is within the following specified range using Tool. Replace outer socket if the reading is outside the specification.

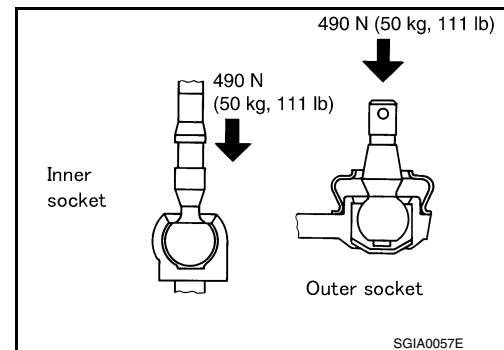
Tool number : ST3127S000 (J-25765-A)

Rotating torque : Refer to [ST-61, "Power Steering Gear"](#).



- Ball joint axial end play
- Apply an axial load of 490 N (50 kg, 111 lb) to ball stud. Measuring the amount of stud movement using a dial gauge, make sure that the value is within specification. Replace outer socket and inner socket if the measured value is outside specification.

Axial end play : Refer to [ST-61, "Power Steering Gear"](#).



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POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

DTC/CIRCUIT DIAGNOSIS

POWER SUPPLY AND GROUND CIRCUIT

AUTOMATIC DRIVE POSITIONER CONTROL UNIT

AUTOMATIC DRIVE POSITIONER CONTROL UNIT : Diagnosis Procedure

INFOID:000000009177074

NOTE:

Do not disconnect the battery negative terminal and the driver seat control unit connector until DTC is confirmed with CONSULT.

Regarding Wiring Diagram information, refer to [ST-10. "Wiring Diagram"](#).

1. CHECK POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect automatic drive positioner control unit.
3. Check voltage between automatic drive positioner control unit harness connector and ground.

(+)		(-)	Voltage (V) (Approx.)
Automatic drive positioner control unit			
Connector	Terminal		
M34	25	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.

- NO >> Check the following.
- Repair or replace harness.
 - Circuit breaker.

2. CHECK GROUND CIRCUIT

Check continuity between the automatic drive positioner control unit harness connector and ground.

Automatic drive positioner control unit		Ground	Continuity
Connector	Terminal		
M34	30		Yes

Is the inspection result normal?

YES >> Inspection End.

NO >> Repair or replace harness.

TILT SWITCH

< DTC/CIRCUIT DIAGNOSIS >

TILT SWITCH

Description

INFOID:000000009177075

ADP steering switch (tilt switch) is equipped to the steering column. The operation signal is input to the automatic drive positioner control unit when the ADP steering switch is operated.

Component Function Check

INFOID:000000009177076

1. CHECK FUNCTION

1. Select "TILT SW-UP", "TILT SW-DOWN" in "DATA MONITOR" mode with CONSULT.
2. Check tilt switch signal under the following conditions.

Monitor item	Condition		Status
TILT SW-UP	Tilt switch (up)	Operate	ON
		Release	OFF
TILT SW-DOWN	Tilt switch (down)	Operate	ON
		Release	OFF

Is the inspection result normal?

- YES >> Inspection End.
NO >> Perform diagnosis procedure. Refer to [ST-25, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000009177077

Regarding Wiring Diagram information, refer to [ST-10, "Wiring Diagram"](#).

1. CHECK TILT SWITCH SIGNAL

1. Disconnect ADP steering switch (tilt switch).
2. Check voltage between ADP steering switch harness connector and ground.

(+)		(-)	Voltage (V) (Approx.)
Connector	Terminals		
M16	5	Ground	Battery voltage
	2		

Is the inspection result normal?

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

2. CHECK TILT SWITCH CIRCUIT

1. Disconnect automatic drive positioner control unit.
2. Check continuity between automatic drive positioner control unit harness connector and ADP steering switch harness connector.

Automatic drive positioner control unit		ADP steering switch (tilt switch)		Continuity
Connector	Terminal	Connector	Terminal	
M33	1	M16	5	Yes
	13		2	

3. Check continuity between automatic drive positioner control unit harness connector and ground.

TILT SWITCH

< DTC/CIRCUIT DIAGNOSIS >

Automatic drive positioner control unit		Ground	Continuity
Connector	Terminal		
M33	1		
	13		

Is the inspection result normal?

- YES >> Replace automatic drive positioner unit. Refer to [ADP-162, "Removal and Installation"](#).
 NO >> Repair or replace harness.

3. CHECK TILT SWITCH

Refer to [ST-26, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> Replace ADP steering switch (tilt switch). Refer to [ADP-165, "Removal and Installation"](#).

4. CHECK INTERMITTENT INCIDENT

Refer to [GI-49, "Intermittent Incident"](#).

>> Inspection End.

Component Inspection

INFOID:000000009177078

1. CHECK TILT SWITCH

1. Turn ignition switch OFF.
2. Disconnect ADP steering switch (tilt switch).
3. Check continuity between ADP steering switch terminals.

ADP steering switch (tilt switch)		Condition	Continuity	
Terminal				
3	5	Tilt switch (up)	Operate	Yes
			Release	No
	2	Tilt switch (down)	Operate	Yes
			Release	No

Is the inspection result normal?

- YES >> Inspection End.
 NO >> Replace ADP steering switch (tilt switch). Refer to [ADP-165, "Removal and Installation"](#).

TELESCOPIC SWITCH

< DTC/CIRCUIT DIAGNOSIS >

TELESCOPIC SWITCH

Description

INFOID:000000009177079

ADP steering switch (telescopic switch) is equipped to the steering column. The operation signal is input to the automatic drive positioner control unit when the telescopic switch is operated.

Component Function Check

INFOID:000000009177080

1. CHECK FUNCTION

1. Select "TELESCO SW-FR", "TELESCO SW-RR" in "DATA MONITOR" mode with CONSULT.
2. Check telescopic switch signal under the following conditions.

Monitor item	Condition		Status
TELESCO SW-FR	Telescopic switch (forward)	Operate	ON
		Release	OFF
TELESCO SW-RR	Telescopic switch (backward)	Operate	ON
		Release	OFF

Is the inspection result normal?

YES >> Inspection End.

NO >> Perform diagnosis procedure. Refer to [ST-27, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000009177081

Regarding Wiring Diagram information, refer to [ST-10, "Wiring Diagram"](#).

1. CHECK TELESCOPIC SWITCH SIGNAL

1. Disconnect ADP steering switch (telescopic switch).
2. Check voltage between ADP steering switch harness connector and ground.

(+)		(-)	Voltage (V) (Approx.)
ADP steering switch (telescopic switch)			
Connector	Terminals	Ground	Battery voltage
M16	1		
	6		

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. CHECK TELESCOPIC SWITCH CIRCUIT

1. Disconnect automatic drive positioner control unit.
2. Check continuity between automatic drive positioner control unit harness connector and ADP steering switch harness connector.

Automatic drive positioner control unit		ADP steering switch (telescopic switch)		Continuity
Connector	Terminal	Connector	Terminal	
M33	7	M16	1	Yes
	19		6	

3. Check continuity between automatic drive positioner control unit harness connector and ground.

TELESCOPIC SWITCH

< DTC/CIRCUIT DIAGNOSIS >

Automatic drive positioner control unit		Ground	Continuity
Connector	Terminal		
M33	7		No
	19		

Is the inspection result normal?

- YES >> Replace automatic drive positioner unit. Refer to [ADP-162, "Removal and Installation"](#).
 NO >> Repair or replace harness.

3. CHECK TELESCOPIC SWITCH

Refer to [ST-28, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> Replace ADP steering switch (telescopic switch). Refer to [ADP-165, "Removal and Installation"](#).

4. CHECK INTERMITTENT INCIDENT

Refer to [GI-49, "Intermittent Incident"](#).

>> Inspection End.

Component Inspection

INFOID:000000009177082

1. CHECK TELESCOPIC SWITCH

1. Turn ignition switch OFF.
2. Disconnect ADP steering switch (telescopic switch).
3. Check continuity between ADP steering switch terminals.

ADP steering switch (telescopic switch)		Condition	Continuity	
Terminal				
3	1	Telescopic switch (forward)	Operate	Yes
			Release	No
	6	Telescopic switch (backward)	Operate	Yes
			Release	No

Is the inspection result normal?

- YES >> Inspection End.
 NO >> Replace ADP steering switch (telescopic switch). Refer to [ADP-165, "Removal and Installation"](#).

TILT & TELESCOPIC SWITCH GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

TILT & TELESCOPIC SWITCH GROUND CIRCUIT

Diagnosis Procedure

INFOID:000000009177083

Regarding Wiring Diagram information, refer to [ST-10, "Wiring Diagram"](#).

1. CHECK ADP STEERING SWITCH (TILT & TELESCOPIC SWITCH) GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ADP steering switch (tilt & telescopic switch).
3. Check continuity between ADP steering switch (tilt & telescopic switch) and ground.

ADP steering switch (tilt & telescopic switch)		Ground	Continuity
Connector	Terminal		
M16	3		Yes

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-49, "Intermittent Incident"](#).
NO >> Repair or replace harness.

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TILT MOTOR

< DTC/CIRCUIT DIAGNOSIS >

TILT MOTOR

Description

INFOID:000000009177084

- The tilt motor is installed to the steering column assembly.
- The tilt motor is activated with the automatic drive positioner control unit.
- The steering column is tilted upward/downward by changing the rotation direction of tilt motor.

Component Function Check

INFOID:000000009177085

1. CHECK FUNCTION

1. Select "TILT MOTOR" in "ACTIVE TEST" mode with CONSULT.
2. Check the tilt motor operation.

Test item		Description	
TILT MOTOR	OFF	Steering tilt	Stop
	UP		Upward
	DWN		Downward

Is the operation of relevant parts normal?

YES >> Inspection End.

NO >> Perform diagnosis procedure. Refer to [ST-30, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000009177086

Regarding Wiring Diagram information, refer to [ST-10, "Wiring Diagram"](#).

1. CHECK TILT MOTOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect tilt motor.
3. Turn the ignition switch ON.
4. Perform "ACTIVE TEST" ("TILT MOTOR") with CONSULT.
5. Check voltage between tilt motor harness connector and ground.

(+)		(-)	Condition	Voltage (V) (Approx.)	
Tilt motor					
Connector	Terminals				
M85	2	Ground	TILT MOTOR	OFF	0
			UP	0	
			DWN (down)	Battery voltage	
	1		TILT MOTOR	OFF	0
			UP	Battery voltage	
			DWN (down)	0	

Is the inspection result normal?

YES >> Replace tilt motor. Refer to [ST-46, "Exploded View"](#).

NO >> GO TO 2.

2. CHECK TILT MOTOR CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect automatic drive positioner control unit.
3. Check continuity between automatic drive positioner control unit harness connector and tilt motor harness connector.

TILT MOTOR

< DTC/CIRCUIT DIAGNOSIS >

Automatic drive positioner control unit		Tilt motor		Continuity
Connector	Terminal	Connector	Terminal	
M34	28	M85	2	Yes
	29		1	

4. Check continuity between automatic drive positioner control unit harness connector and ground.

Automatic drive positioner control unit		Ground	Continuity
Connector	Terminal		
M34	28		No
	29		

Is the inspection result normal?

- YES >> Replace automatic drive positioner control unit. Refer to [ADP-162. "Removal and Installation"](#).
 NO >> Repair or replace harness.

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TELESCOPIC MOTOR

< DTC/CIRCUIT DIAGNOSIS >

TELESCOPIC MOTOR

Description

INFOID:000000009177087

- The telescopic motor is installed to the steering column assembly.
- The telescopic motor is activated with the automatic drive positioner control unit.
- Compresses the steering column by changing the rotation direction of telescopic motor.

Component Function Check

INFOID:000000009177088

1. CHECK FUNCTION

1. Select "TELESCO MOTOR" in "ACTIVE TEST" mode with CONSULT.
2. Check the telescopic motor operation.

Test item		Description	
TELESCO MOTOR	OFF	Steering telescopic	Stop
	FR		Forward
	RR		Backward

Is the operation of relevant parts normal?

YES >> Inspection End.

NO >> Perform diagnosis procedure. Refer to [ST-32, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000009177089

Regarding Wiring Diagram information, refer to [ST-10, "Wiring Diagram"](#).

1. CHECK TELESCOPIC MOTOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect telescopic motor.
3. Turn the ignition switch ON.
4. Perform "ACTIVE TEST" ("TELESCO MOTOR") with CONSULT.
5. Check voltage between telescopic motor harness connector and ground.

(+)		(-)	Condition	Voltage (V) (Approx.)	
Connector	Terminals				
M94	2	Ground	TELE- SCOPIC MOTOR	OFF	0
			FR (forward)	0	
			RR (backward)	Battery voltage	
	1		OFF	0	
			FR (forward)	Battery voltage	
			RR (backward)	0	

Is the inspection result normal?

YES >> Replace telescopic motor. Refer to [ST-46, "Exploded View"](#).

NO >> GO TO 2.

2. CHECK TELESCOPIC MOTOR CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect automatic drive positioner control unit.
3. Check continuity between automatic drive positioner control unit harness connector and telescopic motor harness connector.

TELESCOPIC MOTOR

< DTC/CIRCUIT DIAGNOSIS >

Automatic drive positioner control unit		Telescopic motor		Continuity
Connector	Terminal	Connector	Terminal	
M34	29	M94	1	Yes
	26		2	

4. Check continuity between automatic drive positioner control unit harness connector and ground.

Automatic drive positioner control unit		Ground	Continuity
Connector	Terminal		
M34	29		No
	26		

Is the inspection result normal?

- YES >> Replace automatic drive positioner control unit. Refer to [ADP-162. "Removal and Installation"](#).
 NO >> Repair or replace harness.

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HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

HEATED STEERING WHEEL SYSTEM

Component Function Check

INFOID:000000009177091

1. CHECK HEATED STEERING WHEEL SYSTEM

Check operation of heated steering wheel system. Refer to [ST-8, "HEATED STEERING WHEEL SYSTEM : System Description"](#).

Is the inspection result normal?

YES >> Inspection End.

NO >> Go to [ST-34, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000009177091

Regarding Wiring Diagram information, refer to [ST-10, "Wiring Diagram"](#).

1. CHECK POWER CIRCUIT

1. Turn ignition switch OFF.
2. Remove the steering wheel. Refer to [ST-44, "Removal and Installation"](#).
3. Turn ignition switch ON.
4. Turn heated steering wheel switch ON.
5. Check voltage between heated steering wheel harness connector terminals.

Connector	Terminal		Voltage (Approx.)
	+	-	
M114	1	2	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK HEATED STEERING WHEEL

Check heated steering wheel. Refer to [ST-37, "Component Inspection \(Heated Steering Wheel\)"](#).

Is the inspection result normal?

YES >> Inspection End.

NO >> Replace heated steering wheel. Refer to [ST-44, "Removal and Installation"](#).

3. CHECK GROUND CIRCUIT

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

Connector	Terminal	Ground	Continuity
M114	2	Ground	Yes

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace harness or connector.

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

1. Turn ignition switch OFF.
2. Disconnect heated steering wheel relay connector.
3. Check continuity between heated steering wheel relay harness connector terminal and steering wheel harness connector terminal.

Heated steering wheel relay		Heated steering wheel		Continuity
Connector	Terminal	Connector	Terminal	
M90	5	M114	1	Yes

HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

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

Heated steering wheel relay		Ground	Continuity
Connector	Terminal		
M90	5		No

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Repair or replace harness or connector.

5. CHECK HEATED STEERING RELAY

Check heated steering relay. Refer to [ST-36. "Component Inspection \(Heated Steering Relay\)"](#).

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Replace heated steering relay.

6. CHECK POWER TO HEATED STEERING RELAY

Check the following.

- Battery
- Harness for open or short between battery and 10A fuse (No. 74)
- 10A fuse (No. 74)
- Harness for open or short between 10A fuse (No. 74) and heated steering relay

Is the inspection result normal?

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

7. CHECK GROUND CIRCUIT

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

Connector	Terminal	Ground	Continuity
M48	2		

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Repair or replace harness or connector.

8. CHECK HARNESS BETWEEN HEATED STEERING RELAY AND A/C AUTO AMP.

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

Heated steering relay		A/C Auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M90	2	M50	20	Yes

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

Heated steering relay		Ground	Continuity
Connector	Terminal		
M90	2		No

Is the inspection result normal?

- YES >> GO TO 9.
- NO >> Repair or replace harness or connector.

9. CHECK HARNESS BETWEEN A/C AUTO AMP. AND HEATED STEERING WHEEL SWITCH

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

HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

A/C Auto amp.		Heated steering wheel switch		Continuity
Connector	Terminal	Connector	Terminal	
M50	8	M48	1	Yes

2. Check continuity between A/C auto amp. harness connector terminal and ground.

A/C Auto amp.		Ground	Continuity
Connector	Terminal		
M50	8		No

Is the inspection result normal?

- YES >> GO TO 10.
 NO >> Repair or replace harness or connector.

10. CHECK HEATED STEERING WHEEL SWITCH

Check heated steering wheel switch. Refer to [ST-36, "Component Inspection \(Heated Steering Wheel Switch\)"](#).

Is the inspection result normal?

- YES >> Replace A/C Auto amp. Refer to [HAC-157, "Removal and Installation"](#).
 NO >> Replace heated steering wheel switch. Refer to [IP-25, "Removal and Installation"](#).

Component Inspection (Heated Steering Wheel Switch)

INFOID:000000009177092

1. CHECK HEATED STEERING WHEEL SWITCH

1. Turn ignition switch OFF.
2. Remove the heated steering wheel switch. Refer to [IP-25, "Removal and Installation"](#).
3. Check continuity between heated steering wheel switch terminals.

Terminal		Condition	Continuity
1	2	switch pressed	Yes
		switch released	No

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Replace heated steering wheel switch.

2. CHECK HEATED STEERING WHEEL SWITCH INDICATOR LAMP

Apply 12V direct current between heated steering wheel switch terminals and check that the indicator lamp turns ON.

Terminals		Condition	Indicator lamp status
+	-		
5	6	Apply 12V direct current between terminals	ON

Is the inspection result normal?

- YES >> Inspection End.
 NO >> Replace heated steering wheel switch.

Component Inspection (Heated Steering Relay)

INFOID:000000009177093

1. CHECK HEATED STEERING RELAY CONTINUITY

1. Turn ignition switch OFF.
2. Remove heated steering relay. Refer to [ST-7, "HEATED STEERING WHEEL SYSTEM : Component Parts Location"](#).
3. Apply 12V direct current between heated steering relay terminals and check continuity.

HEATED STEERING WHEEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

Terminal	Condition	Continuity
3 – 5	12V direct current applied between terminals 1 and 2.	Yes
	No current applied.	No

Is the inspection result normal?

- YES >> Inspection End.
 NO >> Replace heated steering wheel relay.

Component Inspection (Heated Steering Wheel)

INFOID:000000009177094

1. CHECK HEATED STEERING WHEEL CONTINUITY

1. Turn ignition switch OFF.
2. Remove the steering wheel. Refer to [ST-44, "Removal and Installation"](#).
3. Check continuity between steering wheel connector terminals.

Terminals	Condition	Continuity
1 – 2	Surface temperature of less than 30°C (86°F)	Yes
	Surface temperature of 30°C (86°F) or more	No

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Replace heated steering wheel.

2. CHECK HEATED STEERING WHEEL RESISTANCE

Check resistance between heated steering wheel connector terminals.

Terminals	Condition	Resistance
1 – 2	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.

HEATED STEERING WHEEL SWITCH INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

HEATED STEERING WHEEL SWITCH INDICATOR LAMP

Component Function Check

INFOID:000000009177095

1. CHECK HEATED STEERING WHEEL SWITCH INDICATOR LAMP

1. Turn ignition switch ON.
2. Turn heated steering wheel switch ON. Observe indicator.
3. Turn heated steering wheel switch OFF. Observe indicator.

Does heated steering wheel switch indicator lamp turn ON and then OFF?

- YES >> Inspection End.
NO >> Go to [ST-38, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000009177096

Regarding Wiring Diagram information, refer to [ST-10, "Wiring Diagram"](#).

1. CHECK POWER CIRCUIT

1. Turn ignition switch OFF.
2. Remove the heated steering wheel switch. Refer to [IP-25, "Removal and Installation"](#).
3. Turn ignition switch ON.
4. Check voltage between heated steering wheel switch harness connector terminals.

Connector	Terminal		Voltage (Approx.)
	+	-	
M48	1	2	Battery voltage

Is the inspection result normal?

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

2. CHECK GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated steering wheel switch connector.
3. Check continuity between heated steering wheel switch harness connector terminal and ground.

Connector	Terminal	Ground	Continuity
M48	6		Yes

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair harness or connector.

3. CHECK HARNESS BETWEEN HEATED STEERING RELAY AND HEATED STEERING WHEEL SWITCH

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

Heated steering relay		Heated steering wheel switch		Continuity
Connector	Terminal	Connector	Terminal	
M90	5	M48	5	Yes

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

Connector	Terminal	Ground	Continuity
M90	5		No

HEATED STEERING WHEEL SWITCH INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair harness or connector.

4. CHECK HEATED STEERING RELAY

Check heated steering relay. Refer to [ST-36. "Component Inspection \(Heated Steering Relay\)"](#).

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Replace heated steering relay.

5. CHECK BATTERY POWER

Check the following:

- Battery
- Harness for open or short between battery and 10A fuse (No. 74)
- 10A fuse (No. 74)
- Harness for open or short between 10A fuse (No. 74) and heated steering wheel relay

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair harness or connector.

6. CHECK HARNESS BETWEEN A/C AUTO AMP. AND HEATED STEERING WHEEL SWITCH

1. Check continuity between A/C Auto amp. harness connector terminal and heated steering wheel switch harness connector terminal.

A/C Auto amp.		Heated steering wheel switch		Continuity
Connector	Terminal	Connector	Terminal	
M50	8	M48	1	Yes

2. Check continuity between A/C Auto amp. harness connector terminal and ground.

A/C auto amp.		Ground	Continuity
Connector	Terminal		
M50	8		No

Is the inspection result normal?

- YES >> GO TO 7.
- NO >> Repair harness or connector.

7. CHECK HEATED STEERING WHEEL SWITCH

Check heated steering wheel switch. Refer to [ST-36. "Component Inspection \(Heated Steering Wheel Switch\)"](#).

Is the inspection result normal?

- YES >> Replace A/C Auto amp. Refer to [HAC-157. "Removal and Installation"](#)
- NO >> Replace heated steering wheel switch. Refer to [IP-25. "Removal and Installation"](#).

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STEERING COLUMN

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

STEERING COLUMN

Symptom Table

INFOID:000000009177097

STEERING COLUMN

Symptom	Inspection item
Tilt and telescopic functions are inoperative	Refer to ST-24. "AUTOMATIC DRIVE POSITIONER CONTROL UNIT : Diagnosis Procedure" (power supply and ground circuit). Refer to ST-29. "Diagnosis Procedure" (tilt and telescopic switch ground circuit).
Tilt function only is inoperative	Refer to ST-25. "Diagnosis Procedure" (tilt switch). Refer to ST-30. "Diagnosis Procedure" (tilt motor).
Telescopic function only is inoperative	Refer to ST-27. "Diagnosis Procedure" (telescopic switch). Refer to ST-32. "Diagnosis Procedure" (telescopic motor).

HEATED STEERING WHEEL

Symptom	Inspection item
Heated steering wheel system inoperative	Refer to ST-34. "Diagnosis Procedure" .
Heated steering wheel switch indicator lamp inoperative	Refer to ST-38. "Diagnosis Procedure" .

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

INFOID:000000009177098

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

Symptom	Steering	Possible cause and SUSPECTED PARTS																Reference page										
		Noise	Shake	Vibration	Shimmy	Shudder	Fluid level	Air in hydraulic system	Outer socket ball joint swinging force	Outer socket ball joint rotating torque	Outer 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 rubber deterioration		Steering column deformation or damage	Improper installation or looseness of steering column	Steering linkage looseness	WHEEL HUB	AXLE and SUSPENSION	TIRES	ROAD WHEEL	DRIVE SHAFT	BRAKES	
		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	ST-18, "Inspection" ST-42, "Air Bleeding Hydraulic System"
																											ST-23, "Inspection"	
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																											ST-23, "Inspection"	
																											Refer to FAX-5, "NVH Troubleshooting Chart"	
																											Refer to FAX-5, "NVH Troubleshooting Chart" Refer to FSU-3, "NVH Troubleshooting Chart"	
																											Refer to WT-56, "NVH Troubleshooting Chart"	
																											Refer to WT-56, "NVH Troubleshooting Chart"	
																											Refer to DLN-101, "NVH Troubleshooting Chart"	
																											Refer to BR-6, "NVH Troubleshooting Chart"	

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POWER STEERING FLUID

< PERIODIC MAINTENANCE >

PERIODIC MAINTENANCE

POWER STEERING FLUID

Draining and Refilling

INFOID:000000009177099

DRAINING

1. Disconnect the high and low pressure piping from the power steering gear. Refer to [ST-54, "Exploded View"](#).
2. Drain power steering fluid into a suitable container.

REFILLING

1. Connect the high and low pressure piping to the power steering gear. Refer to [ST-54, "Exploded View"](#).
2. Fill power steering reservoir while checking power steering fluid level.
3. Bleed air from power steering hydraulic system. Refer to [ST-42, "Air Bleeding Hydraulic System"](#).
4. Check for power steering fluid leaks.

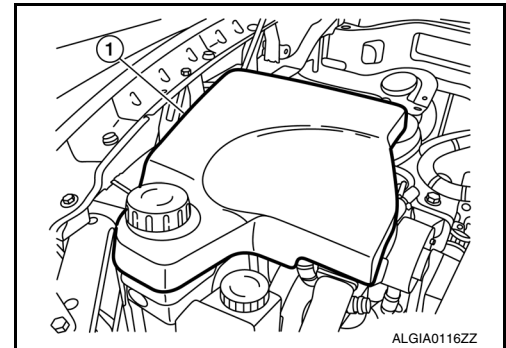
Air Bleeding Hydraulic System

INFOID:000000009177100

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. Remove power steering oil pump cover (1).



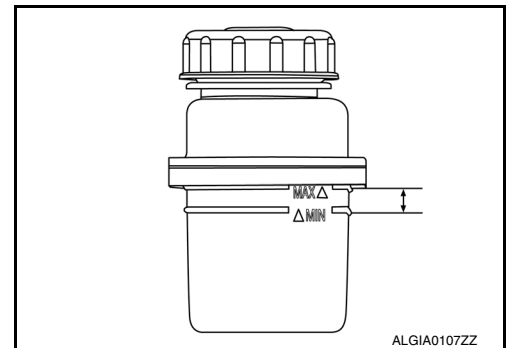
3. Turn the steering wheel from the full right stop position and then to full left stop position several times. Repeat until bubbles are no longer being generated in the reservoir.
4. When the power steering fluid level lowers, refill the reservoir.

CAUTION:

Do not allow the power steering fluid level to drop below the MIN line.

NOTE:

Power steering fluid level marks are on the outside of the power steering reservoir and also on the power steering reservoir cap indicator.

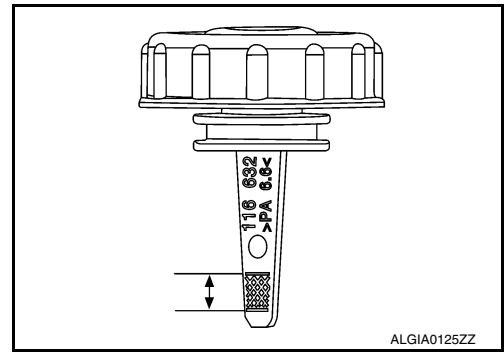


5. Repeat steps one and two until the power steering fluid level stabilizes.
6. Start the engine and run at idle.
7. Turn the steering wheel from the full right stop position and then to full left stop position several times. Repeat until bubbles or fluid discoloration are no longer being generated in the reservoir.
8. When the power steering fluid level lowers, refill the reservoir.
9. Stop the engine.

POWER STEERING FLUID

< PERIODIC MAINTENANCE >

10. Verify proper power steering fluid level. Power steering fluid level should be between the hatching area on the power steering reservoir cap indicator.



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STEERING WHEEL

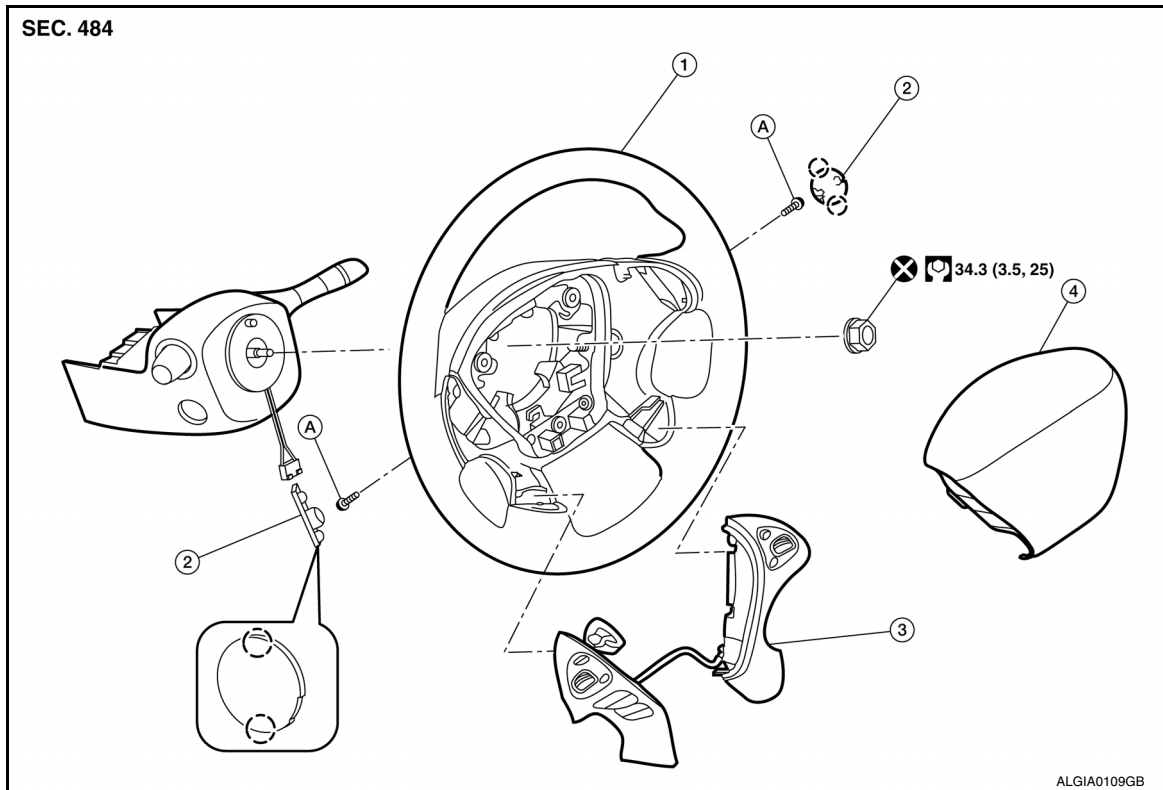
< REMOVAL AND INSTALLATION >

REMOVAL AND INSTALLATION

STEERING WHEEL

Exploded View

INFOID:000000009177101



- | | | |
|--------------------------|--|----------------------|
| 1. Steering wheel | 2. Cover | 3. Steering switches |
| 4. Driver air bag module | A. Refer to SR-12, "Exploded View" . | ⊗ Pawl |

Removal and Installation

INFOID:000000009177102

REMOVAL

1. Set the front wheels and tires in the straight-ahead position.
2. Remove driver air bag module. Refer to [SR-12, "Removal and Installation"](#).
3. Remove steering wheel lock nut.
4. Remove steering switches. Refer to [AV-48, "Removal and Installation"](#) (BASE AUDIO), [AV-190, "Removal and Installation"](#) (MID AUDIO WITH BOSE AUDIO), [AV-368, "Removal and Installation"](#) (MID AUDIO WITHOUT BOSE AUDIO), [AV-614, "Removal and Installation"](#) (PREMIUM AUDIO WITH NAVIGATION).
5. Remove steering wheel using suitable tool.
CAUTION:
Place a piece of tape across the spiral cable so it will not be rotated out of position.
6. Inspect steering wheel near the puller holes for damage. Replace as necessary.

INSTALLATION

Installation is in the reverse order of removal.

- Align spiral cable correctly before installing steering wheel. Make sure that the spiral cable is in the neutral position. Refer to [SR-15, "Removal and Installation"](#).
- Adjust the neutral position of the steering angle sensor. Refer to [BRC-55, "Work Procedure"](#).
- Tighten steering wheel center nut to specification. Refer to [ST-44, "Exploded View"](#).

CAUTION:

STEERING WHEEL

< REMOVAL AND INSTALLATION >

- The spiral cable may snap due to steering operation if the cable is not installed in the correct position.
- With the steering linkage disconnected, the cable may snap by turning the steering wheel beyond the limited number of turns.

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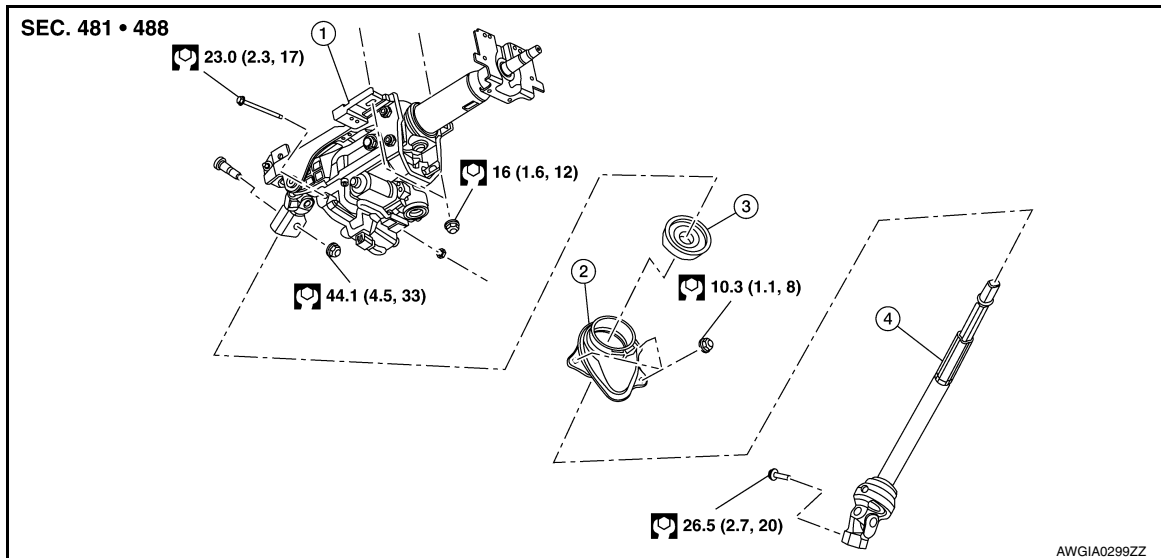
STEERING COLUMN

< REMOVAL AND INSTALLATION >

STEERING COLUMN

Exploded View

INFOID:000000009177103



1. Steering column
2. Hole cover
3. Lower boot
4. Steering intermediate shaft

Removal and Installation

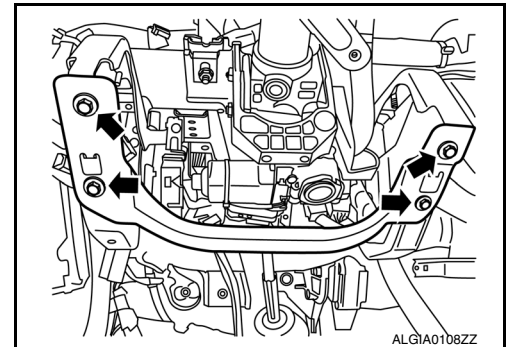
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CAUTION:

- Any time the ignition switch has been disconnected, removed or installed, the keys must be re-registered in the BCM. Refer to **CONSULT** operations manual.
- Care must be taken not to give axial impact to steering column during removal and installation.
- Care must be taken not to move steering gear during removal of steering column.

REMOVAL

1. Remove the steering angle sensor from the steering column. Refer to [BRC-126, "Removal and Installation"](#).
2. Remove the combination switch. Refer to [BCS-81, "Removal and Installation"](#).
3. Remove the instrument lower panel LH. Refer to [IP-25, "Removal and Installation"](#).
4. Remove the instrument panel brace bolts and the instrument panel brace.

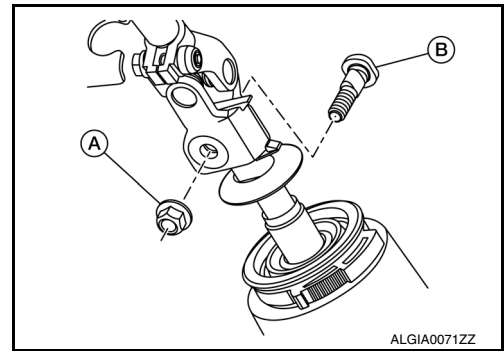


5. Disconnect the tilt motor and telescopic motor harness connectors (if equipped).

STEERING COLUMN

< REMOVAL AND INSTALLATION >

6. Remove lock nut (A) and bolt (B), then separate steering column from steering intermediate shaft.



7. Remove the steering column nuts and bolt, then remove steering column.

INSTALLATION

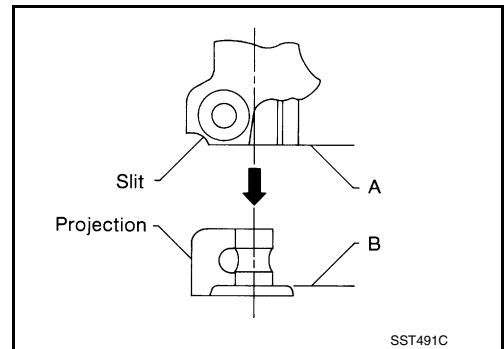
Installation is in the reverse order of removal.

CAUTION:

When installing the steering column, finger-tighten all of the lower bracket and joint retaining bolts; then tighten them to specification. Do not apply undue stress to the steering column.

NOTE:

Align slit of the coupling joint with projection on dust cover. Insert the joint until surface (A) contacts surface (B).



- After installation, turn steering wheel to make sure it moves smoothly. Make sure the number of turns are the same from the straight-forward position to left and right locks. Make sure that the steering wheel is in a neutral position when driving straight ahead.
- When installing steering column to steering member, install nut from front of vehicle.
- After installing the steering column, check the tilt mechanism for proper operation.
- After installing the steering column, check if steering wheel has smooth operation while turning to the left and right end stops.
- Adjust the neutral position of the steering angle sensor. Refer to [BRC-55, "Work Procedure"](#).

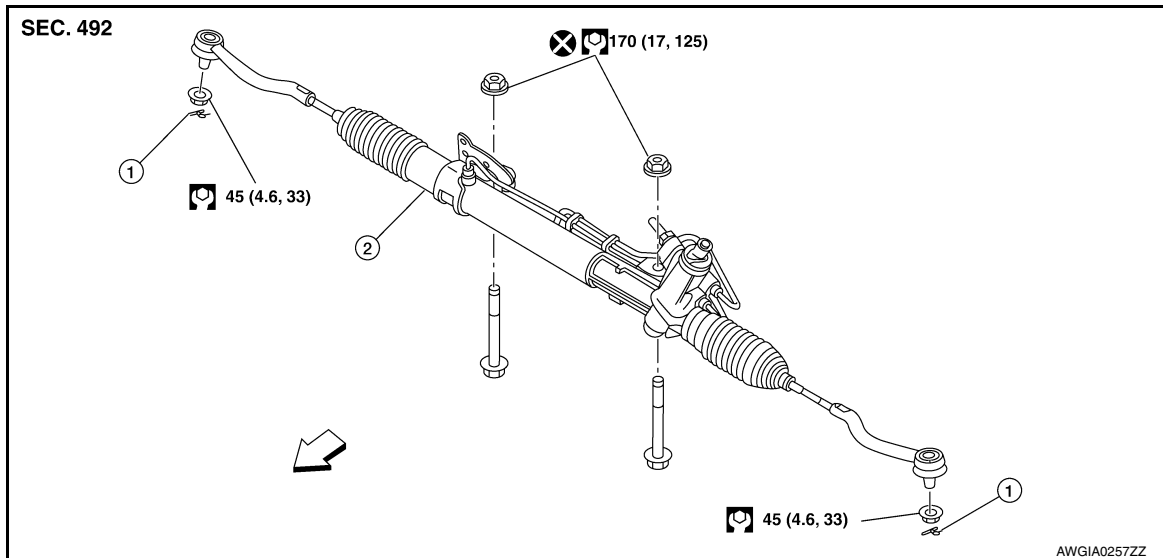
STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

STEERING GEAR AND LINKAGE

Exploded View

INFOID:000000009177105



1. Cotter pin

2. Steering gear

← Front

Removal and Installation - 2WD

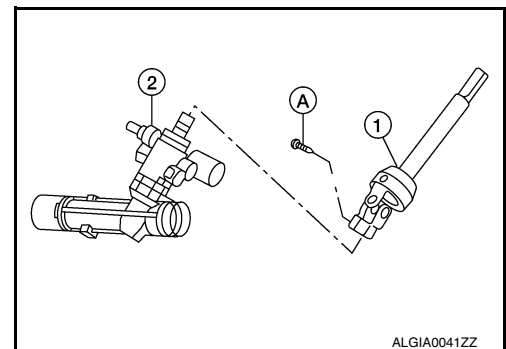
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NOTE:

When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL

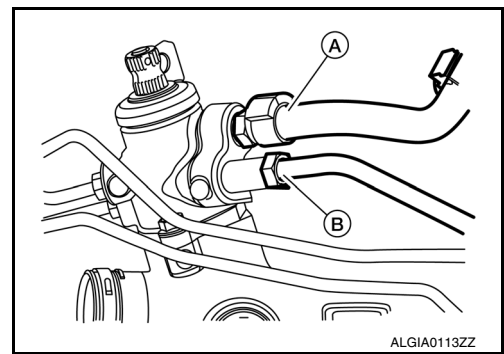
1. Set the front wheels and tires to the straight-ahead position.
2. Remove the front wheels and tires using power tool. Refer to [WT-58, "Adjustment"](#).
3. Drain the power steering fluid. Refer to [ST-42, "Draining and Refilling"](#).
4. Disconnect the outer sockets from the steering knuckles using suitable tool.
5. Remove the rear engine bracket. Refer to [EM-102, "2WD : Exploded View"](#).
6. Remove the front exhaust tube. Refer to [EX-5, "Exploded View"](#).
7. Remove the stabilizer bar. Refer to [FSU-12, "Removal and Installation"](#).
8. Remove the hose and line bracket on the steering gear.
9. Remove bolt (A) and separate the steering intermediate shaft (1) from the steering gear (2).



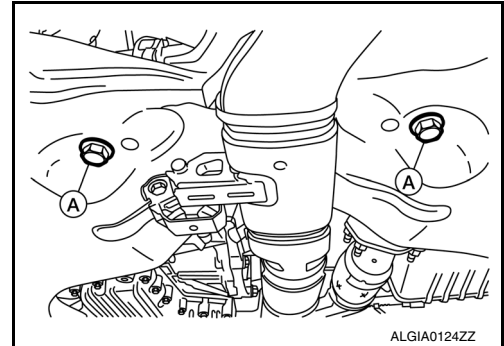
STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

10. Disconnect the low pressure piping (A) and high pressure piping (B) from the steering gear.



11. Remove the steering gear nuts and bolts (A).



12. Remove the steering gear.

INSTALLATION

Installation is in the reverse order of removal.

WARNING:

After torquing the lock nut, be sure to install the cotter pin through the stud hole and bend the cotter pin around the stud.

- Bleed the air from hydraulic system. Refer to [ST-42, "Air Bleeding Hydraulic System"](#).
- Check wheel alignment. Refer to [FSU-5, "Inspection and Adjustment"](#).
- Adjust the neutral position of the steering angle sensor. Refer to [BRC-55, "Work Procedure"](#).

CAUTION:

- **Do not reuse O-rings.**
- **Do not reuse steering gear nuts.**

Removal and Installation - 4WD

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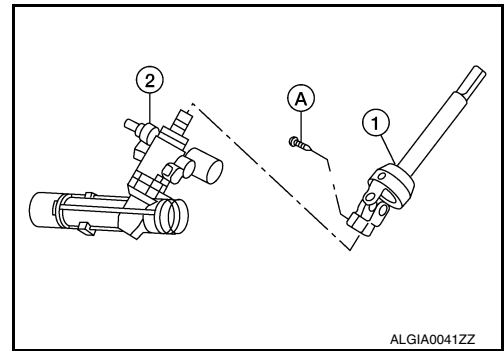
REMOVAL

1. Set the front wheels in the straight-ahead position.
2. Remove the front wheels and tires using power tool. Refer to [WT-58, "Adjustment"](#).
3. Drain the power steering fluid. Refer to [ST-42, "Draining and Refilling"](#).
4. Disconnect the LH outer socket from the steering knuckle using suitable tool.
5. Remove the rear engine mount. Refer to [EM-106, "4WD : Exploded View"](#).
6. Remove the front exhaust tube. Refer to [EX-5, "Removal and Installation"](#).
7. Remove the propeller shaft. Refer to [DLN-103, "Removal and Installation"](#).
8. Remove the stabilizer bar from the LH side. Refer to [FSU-12, "Removal and Installation"](#).
9. Disconnect the low pressure piping and high pressure piping bracket from the steering gear.

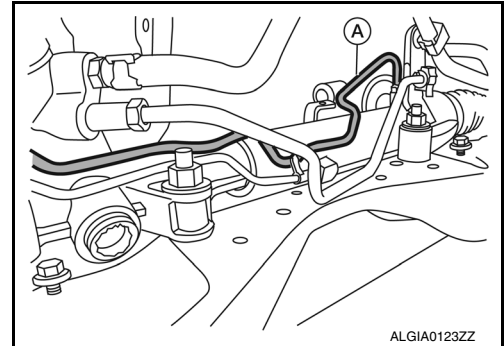
STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

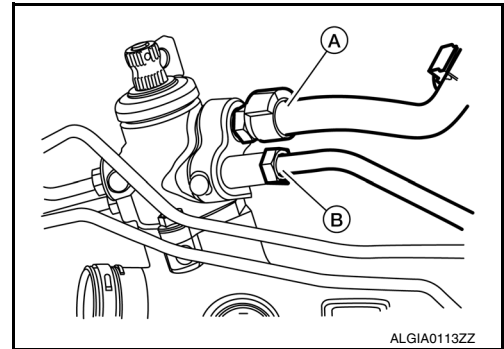
10. Remove bolt (A) and separate the steering intermediate shaft (1) from the steering gear (2).



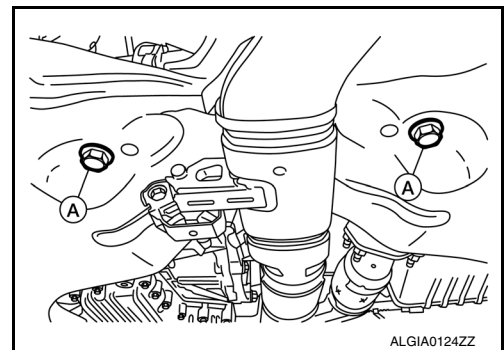
11. Remove the steering gear pressure relief pipe from the steering gear (A).



12. Disconnect the low pressure piping (A) and high pressure piping (B) from the steering gear.



13. Disconnect the RH outer socket from the steering knuckle using suitable tool.
14. Remove the steering gear nuts and bolts (A).



15. Remove the steering gear.

INSTALLATION

Installation is in the reverse order of removal.

WARNING:

After torquing the lock nut, be sure to install the cotter pin through the stud hole and bend the cotter pin around the stud.

- Bleed the air from power steering system. Refer to [ST-42, "Air Bleeding Hydraulic System"](#).
- Check wheel alignment. Refer to [FSU-5, "Inspection and Adjustment"](#).
- Adjust the neutral position of the steering angle sensor. Refer to [BRC-55, "Work Procedure"](#).

STEERING GEAR AND LINKAGE

< REMOVAL AND INSTALLATION >

CAUTION:

- Do not reuse O-rings.
- Do not reuse steering gear nuts.

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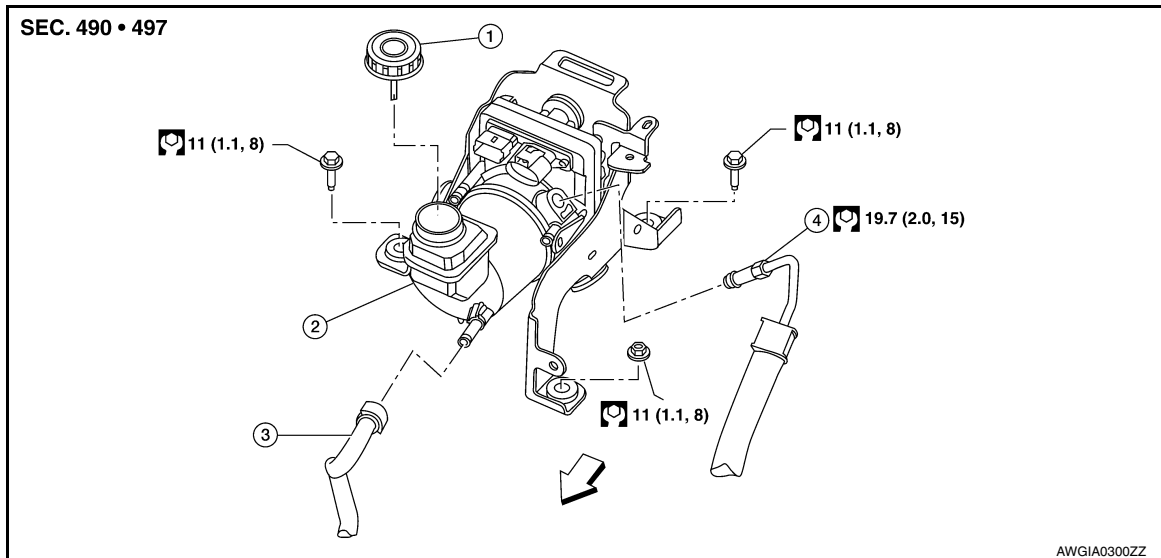
POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

POWER STEERING OIL PUMP

Exploded View

INFOID:000000009177108



- 1. Power steering reservoir cap
 - 2. Power steering pump
 - 3. Low pressure piping
 - 4. High pressure piping
- ⇐ Front

Removal and Installation

INFOID:000000009177109

WARNING:

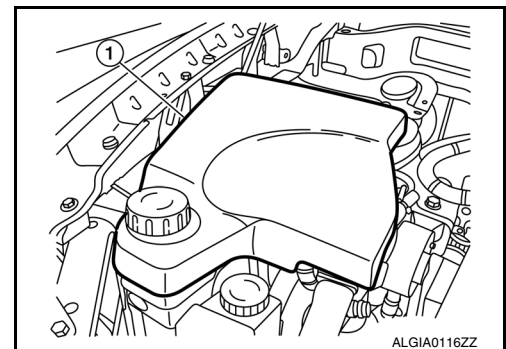
Power steering pump outer shell will be hot while running and after driving. When working, be sure to wear protective equipment to avoid getting burned.

NOTE:

When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL

1. Remove the power steering pump cover (1).

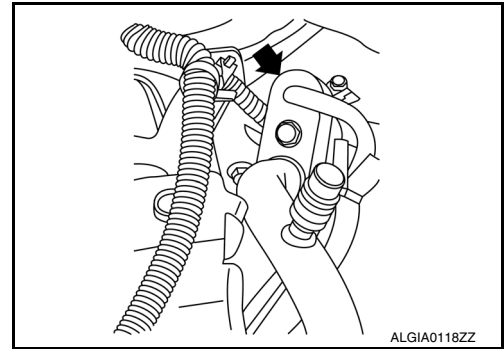


2. Drain power steering fluid. Refer to [ST-42, "Draining and Refilling"](#).
3. Remove the upper torque rod. Refer to [EM-102, "2WD : Exploded View"](#) (2WD) or [EM-106, "4WD : Exploded View"](#) (4WD).
4. Remove the RH upper engine mount insulator nuts. Refer to [EM-102, "2WD : Exploded View"](#) (2WD) or [EM-106, "4WD : Exploded View"](#) (4WD).

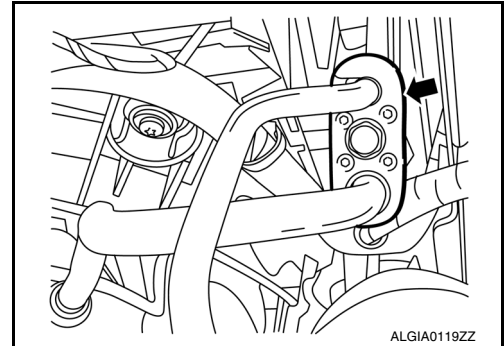
POWER STEERING OIL PUMP

< REMOVAL AND INSTALLATION >

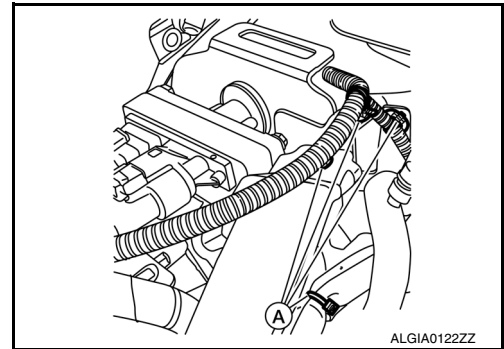
5. Disconnect the A/C rear lines at lower pipes. Refer to [HA-34, "Exploded View"](#).



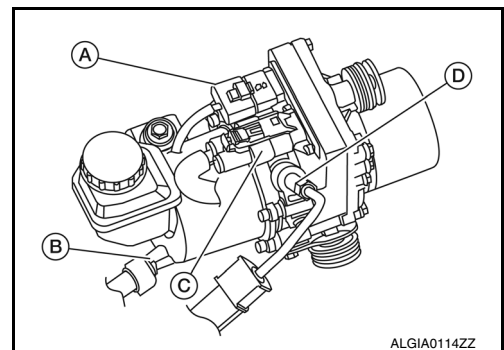
6. Disconnect the A/C front lines at junction. Refer to [HA-34, "Exploded View"](#).



7. Disconnect wiring harness clips from bracket (A).



8. Disconnect the following components from the power steering pump:
- LH power steering pump harness connector (A).
 - Reservoir hose (B).
 - RH power steering pump harness connector (C).
 - High pressure piping (D).
9. Remove power steering pump bolts, and then remove power steering pump.



INSTALLATION

Installation is in the reverse order of removal.

- Bleed air from power steering system. Refer to [ST-42, "Air Bleeding Hydraulic System"](#).

CAUTION:

Do not reuse O-rings.

HYDRAULIC LINE

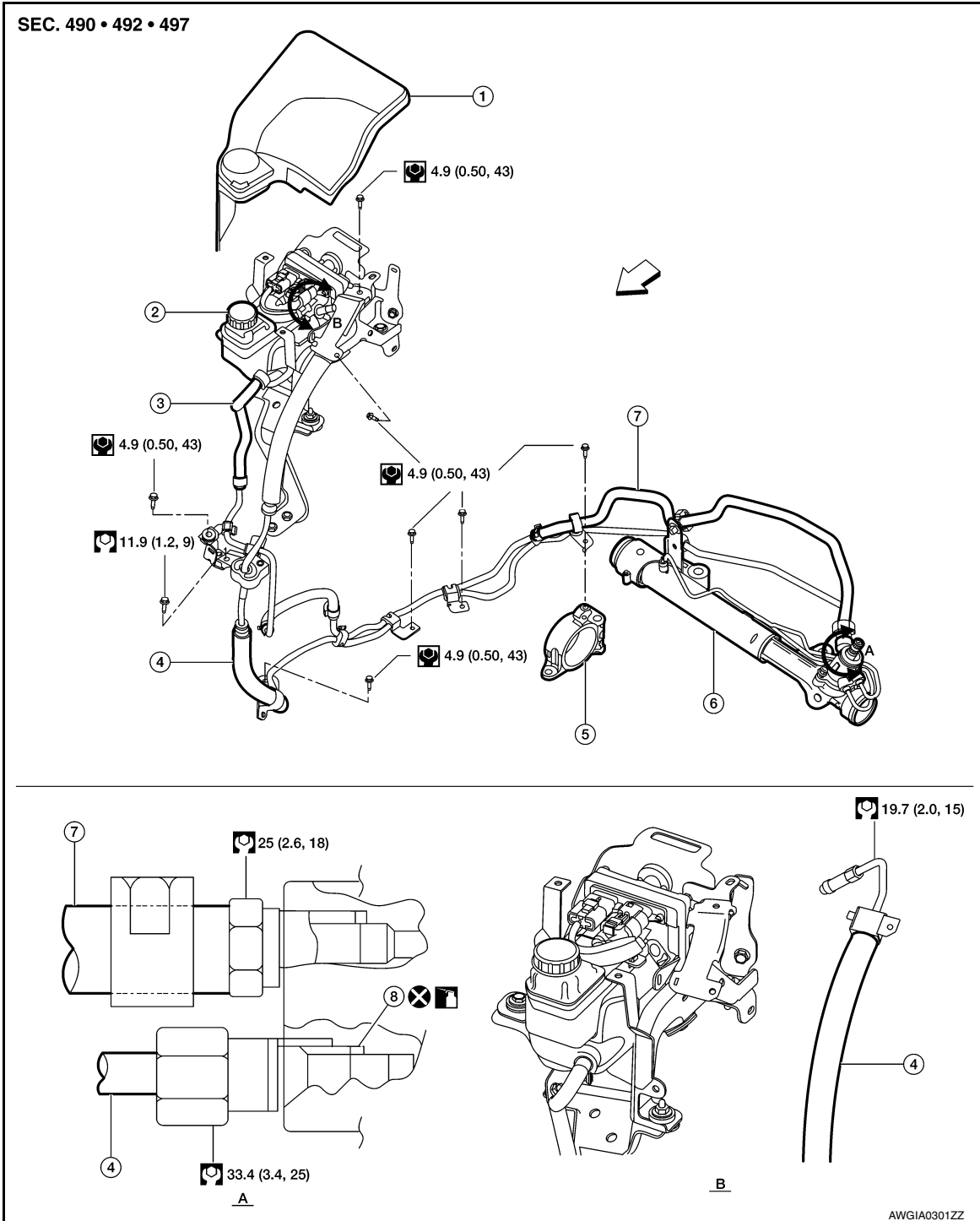
< REMOVAL AND INSTALLATION >

HYDRAULIC LINE

Exploded View

INFOID:000000009177110

2WD

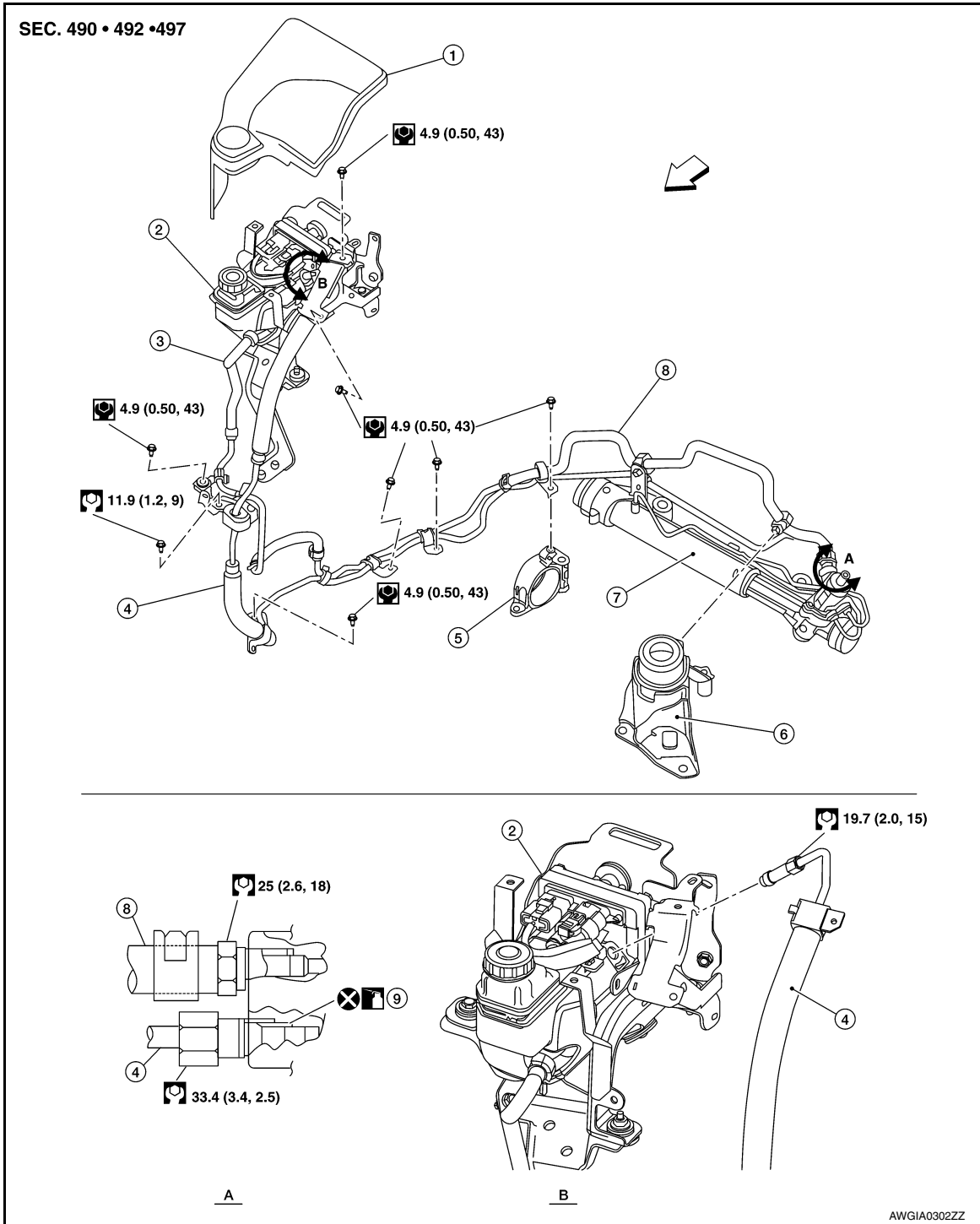


- | | | |
|--|------------------------|------------------------------------|
| 1. Cover | 2. Power steering pump | 3. Low pressure piping (upper) |
| 4. High pressure piping | 5. Engine mount | 6. Power steering gear |
| 7. Low pressure piping (lower) | 8. O-ring | A. Steering gear connection detail |
| B. Power steering pump connection detail | ← Front | |

HYDRAULIC LINE

< REMOVAL AND INSTALLATION >

4WD



- | | | |
|------------------------------------|--|--------------------------------|
| 1. Cover | 2. Power steering pump | 3. Low pressure piping (upper) |
| 4. High pressure piping | 5. Engine mount | 6. Engine mount bracket |
| 7. Power steering gear | 8. High pressure piping (lower) | 9. O-ring |
| A. Steering gear connection detail | B. Power steering pump connection detail | ← Front |

Removal and Installation

INFOID:000000009177111

NOTE:

When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

HYDRAULIC LINE

< REMOVAL AND INSTALLATION >

REMOVAL

Refer to the component parts location illustration for hydraulic line removal. Refer to [ST-54, "Exploded View"](#).

CAUTION:

- Do not reuse O-rings.

INSTALLATION

Installation is in the reverse order of removal.

- Bleed air from power steering system. Refer to [ST-42, "Air Bleeding Hydraulic System"](#).

- Check for fluid leaks. Repair as necessary.

CAUTION:

- Do not reuse O-rings.

STEERING GEAR AND LINKAGE

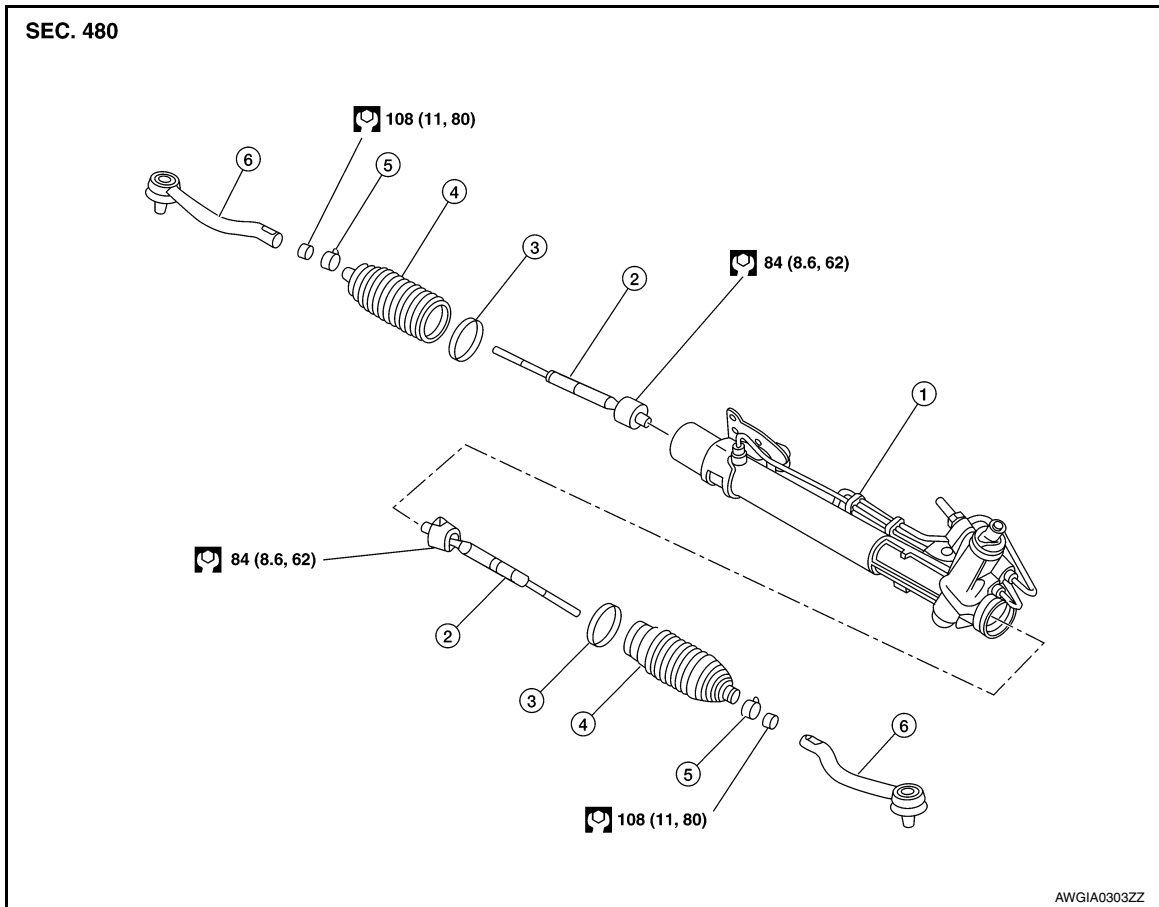
< UNIT DISASSEMBLY AND ASSEMBLY >

UNIT DISASSEMBLY AND ASSEMBLY

STEERING GEAR AND LINKAGE

Exploded View

INFOID:000000009177112



- | | | |
|------------------|---------------------|---------------------|
| 1. Steering gear | 2. Inner socket | 3. Inner boot clamp |
| 4. Boot | 5. Outer boot clamp | 6. Outer socket |
| ⇐ Front | | |

Disassembly and Assembly

INFOID:000000009177113

DISASSEMBLY

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

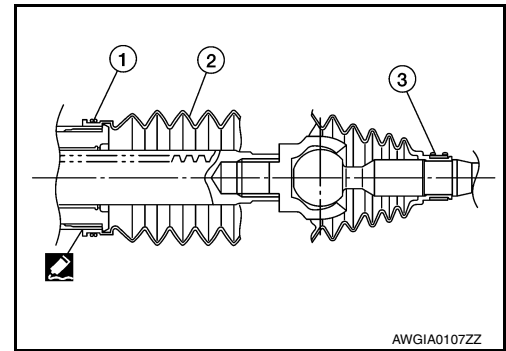
ASSEMBLY

1. Apply Three Bond 1111B or equivalent to inner socket and turn pinion fully to retract inner socket into gear housing.

STEERING GEAR AND LINKAGE

< UNIT DISASSEMBLY AND ASSEMBLY >

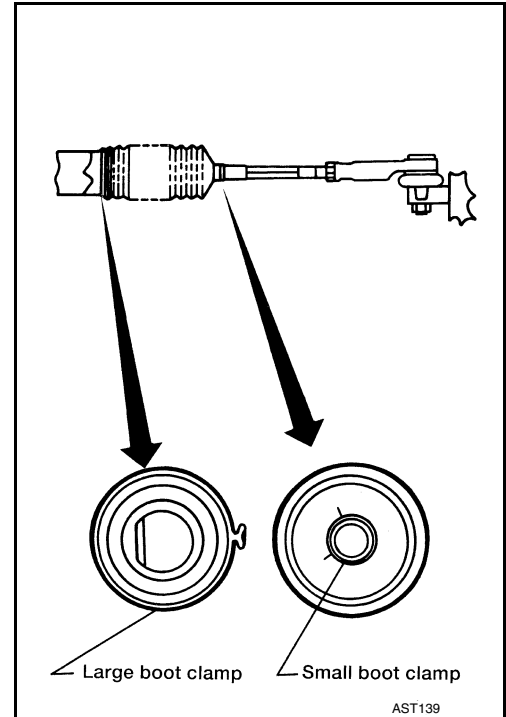
2. Install large end (1) of boot (2) to gear housing.
3. Install small end (3) of boot (2) to inner socket boot mounting groove.



4. Install boot clamp to boot small end.
5. Install boot clamp to boot large end using suitable tool.

CAUTION:

Do not reuse boot clamps.

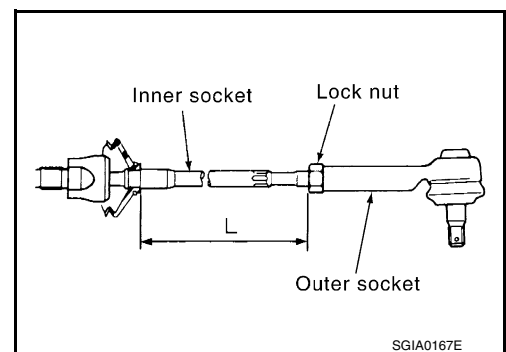


6. Adjust inner socket to standard length (L), and then tighten lock nut to the specified torque. Check length of inner socket (L) again after tightening lock nut. Make sure that the length is the standard.

Inner socket length (L) : Refer to [ST-61, "Power Steering Gear"](#).

CAUTION:

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



POWER STEERING OIL PUMP

< UNIT DISASSEMBLY AND ASSEMBLY >

POWER STEERING OIL PUMP

Disassembly and Assembly

INFOID:000000009177114

The power steering oil pump is not serviceable and should be replaced as an assembly. Refer to [ST-52](#), "[Removal and Installation](#)".

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

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Steering Wheel

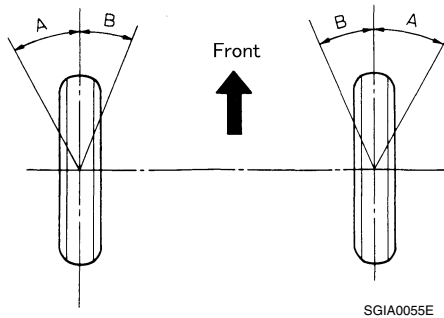
INFOID:000000009177115

Steering wheel axial end play	0 mm (0 in)
Steering wheel play	0 - 35 mm (0 - 1.38 in)
Steering wheel turning force	39 N (4 kg-f, 9 lb-f) or less

Steering Angle

INFOID:000000009177116

Unit: Degree minute (Decimal Degree)



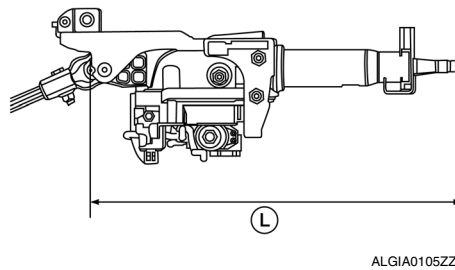
Inner wheel angle (A)	Minimum	35° 00' (35.0°)
	Nominal	38° 00' (38.0°)
	Maximum	39° 00' (39.0°)
Outer wheel angle (B)	Nominal	33° 00' (33.0°)

Steering Column

INFOID:000000009177117

STEERING COLUMN LENGTH

Unit: mm (in)



Steering column length	Length (L)	463 (18.2)
	Telescopic maximum	483 (19.0)
	Telescopic minimum	443 (17.4)

STEERING COLUMN ROTATING TORQUE

Unit: N·m (kg-m, in-lb)

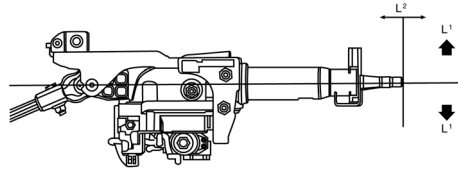
Rotating torque	0.67 (0.07, 6)
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TILT MECHANISM OPERATING RANGE

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

Unit: mm (in)



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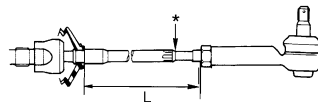
Tilt operating range (L ¹)	50 (2.0)
Telescopic operating range (L ²)	40 (1.6)

Power Steering Gear

INFOID:000000009177118

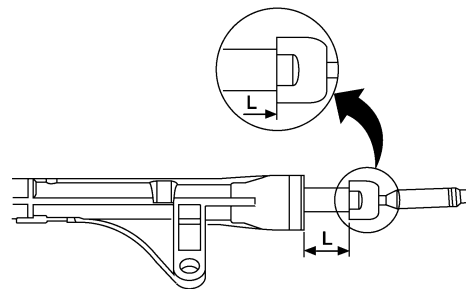
STEERING OUTER SOCKET AND INNER SOCKET

Outer socket	Rocking torque	0.3 - 2.9 N·m (0.03 - 0.30 kg·m, 3 - 26 in·lb)
	<ul style="list-style-type: none"> • Measurement on spring balance • Measuring point: cotter pin hole of stud 	1.4 - 42.7 N (0.143 - 4.36 kg, 0.31 - 9.60 lb)
	Rotating torque	0.3 - 2.9 N·m (0.03 - 0.30 kg·m, 3 - 26 in·lb)
	Axial end play	0.5 mm (0.020 in) or less
Inner socket	Rocking torque	0.1 - 7.8 N·m (0.01 - 0.80 kg·m, 1 - 69 in·lb)
	<ul style="list-style-type: none"> • Measurement on spring balance • Measuring point at * mark shown 	0.8 - 64 N (0.082 - 6.5 kg, 0.18 - 14.4 lb)
	Axial end play	0.2 mm (0.008 in) or less
Inner socket length (L)		127.5 mm (5.02 in) or less



SGIA0950E

RACK STROKE



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Rack stroke in neutral position (L)	73 mm (2.87 in)
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RACK SLIDING FORCE

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

Rack sliding force	270 - 370 N-f (27.5 - 37.7kg-f, 60.7 - 83.2 lb-f)
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Power Steering Oil Pump

INFOID:000000009177119

Relief oil pressure	9,900 -10,400 kPa (100.98 -106.08 kg/cm ² , 1435.5 - 1,508.0 psi)
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Power Steering Fluid

INFOID:000000009177120

Fluid type	E-PSF
Fluid capacity	Refer to MA-15. "FOR USA AND CANADA : Fluids and Lubricants" (United States and Canada) or MA-16. "FOR MEXICO : Fluids and Lubricants" (Mexico).