

POWER ASSISTED SYSTEM (POWER STEERING)

PS

	Page
1. General Description	2
2. Power Steering System	7
3. Steering Wheel	8
4. Universal Joint	13
5. Steering Column	18
6. Electric Power Steering Gearbox	25
7. Power Steering Control Module	41
8. General Diagnostic Table	42



General Description

POWER ASSISTED SYSTEM (POWER STEERING)

1. General Description

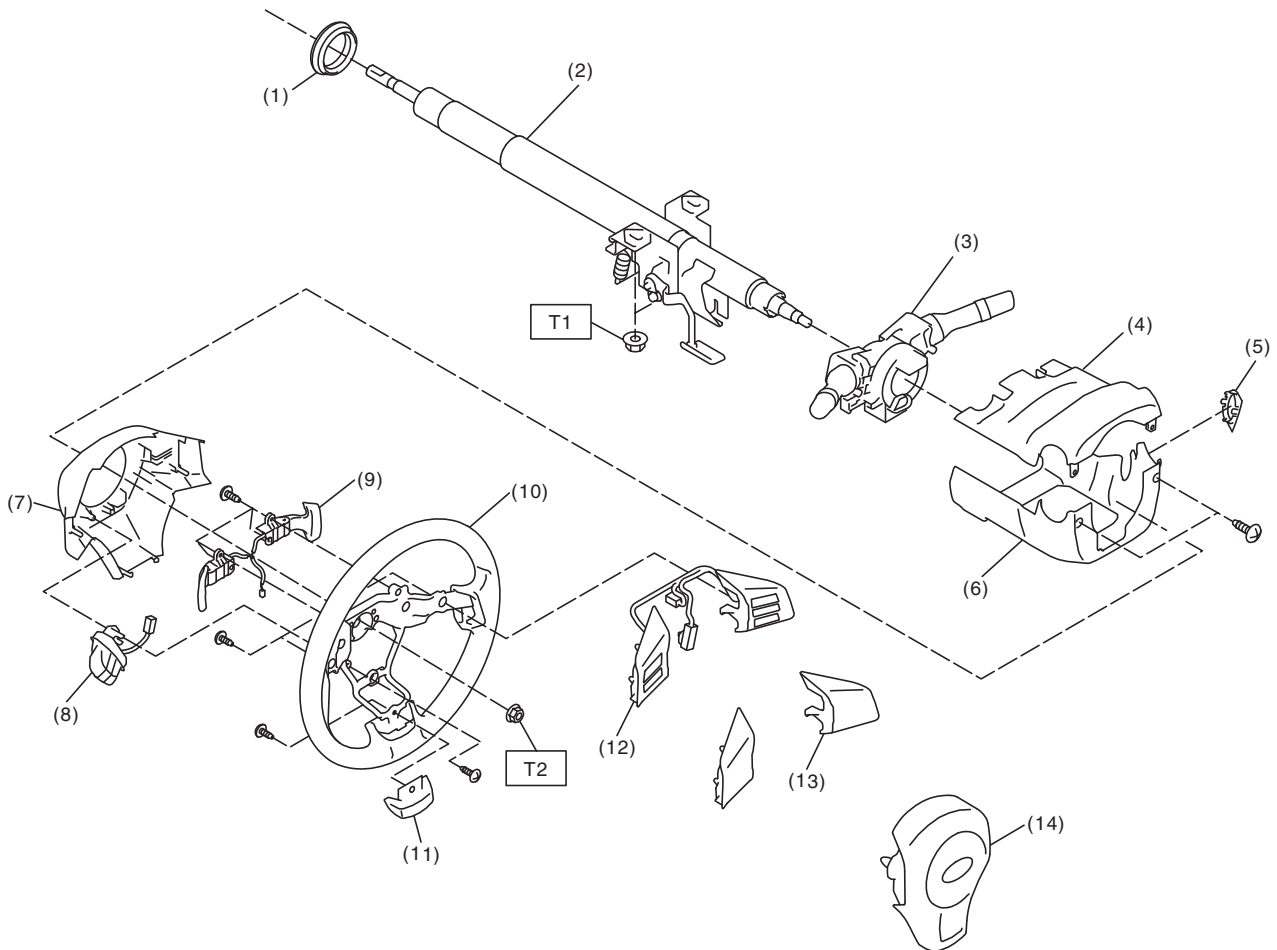
A: SPECIFICATION

Whole system	Minimum turning radius		m (ft)	5.3 (17.4)
	Steering angle	Inner wheel		38.4°±1.5°
		Outer wheel		33.8°±1.5°
	Steering wheel diameter		mm (in)	375 (14.76)
Gearbox	Lock-to-lock revolution number			3.1
	Type			Rack & pinion type
	Backlash			0 (automatic adjusting)
Motor (Temperature 20°C (68°F))	Rated voltage		V	12
	Rated torque		N·m (kgf-m, ft-lb)	4.5 (0.46, 3.31)
	Rated revolution speed		rpm	1,140
	Rated current		A	85
	Rated output		W	561

Steering wheel	Free play		mm (in)	17 (0.67) or less
Column assembly - steering	Clearance between the steering wheel and the cover assembly - column		mm (in)	4 — 6 (0.16 — 0.24)
Steering gearbox (Power steering system)	Sliding resistance		N (kgf, lbf)	350 (36, 79) or less Difference between right and left sliding resistance: 20% or less
	Rack shaft play in the radial direction	Right-turn steering	mm (in)	Horizontal play: 0.6 (0.024) or less Vertical play: 0.4 (0.016) or less
		Left-turn steering	mm (in)	0.4 (0.016) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less
		In axial direction	mm (in)	0.27 (0.0106) or less
	Rotational resistance		N (kgf, lbf)	Maximum allowable value: 18.3 (1.9, 4.1) or less Difference between right and left sliding resistance: 20% or less
Steering wheel effort (Power steering system)	At standstill with engine idling on paved road		N (kgf, lbf)	29.4 (3.0, 6.6) or less
	At standstill with engine stalled on paved road		N (kgf, lbf)	294.2 (30, 66.2) or less

B: COMPONENT

1. STEERING WHEEL AND COLUMN



PS-01626

- | | |
|--------------------------------|-----------------------|
| (1) Bushing | (8) MFD switch |
| (2) Column ASSY - steering | (9) Paddle shift |
| (3) Switch ASSY - combination | (10) Steering wheel |
| (4) Cover ASSY - column UPR | (11) Cover - spoke |
| (5) Cap - key cylinder | (12) Satellite switch |
| (6) Cover ASSY - column LWR | (13) Cover - switch |
| (7) Cover - steering wheel LWR | (14) Airbag module |

Tightening torque: N·m (kgf-m, ft-lb)

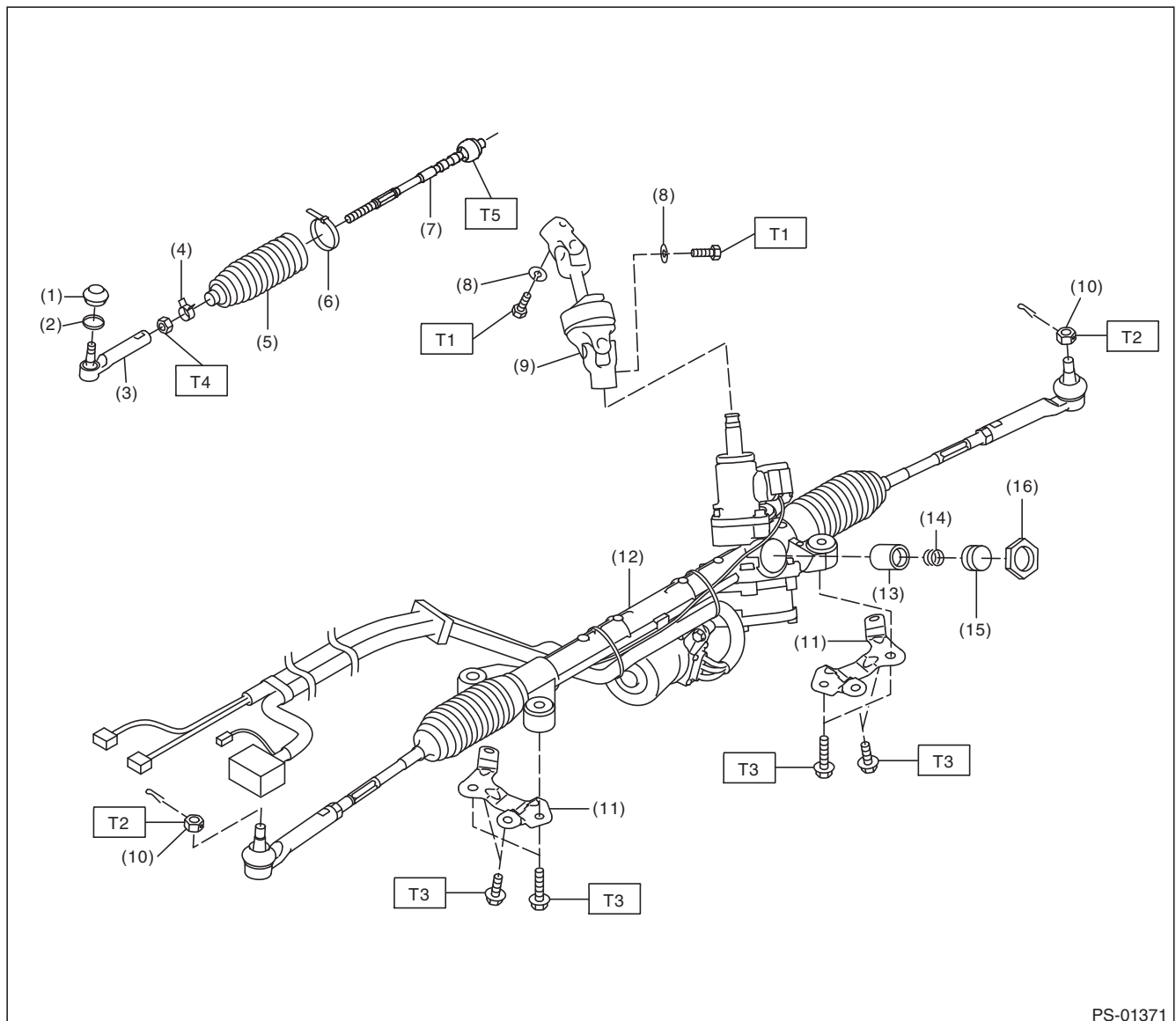
T1: 20 (2.04, 14.8)

T2: 39 (3.98, 28.8)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

2. STEERING GEARBOX



PS-01371

- | | |
|-------------------------------|-------------------------------------|
| (1) Dust seal | (9) Universal joint ASSY - steering |
| (2) Clip - boot tie-rod end B | (10) Castle nut |
| (3) Tie-rod end | (11) Stiffener |
| (4) Clip - boot tie-rod end A | (12) Steering gearbox ASSY |
| (5) Boot - steering gearbox | (13) Pad - pressure |
| (6) Band - boot | (14) Spring - gearbox |
| (7) Tie-rod | (15) Adjusting screw |
| (8) Spring washer | (16) Lock nut |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 24 (2.45, 17.7)

T2: 27 (2.75, 19.9)

T3: 60 (6.12, 44.3)

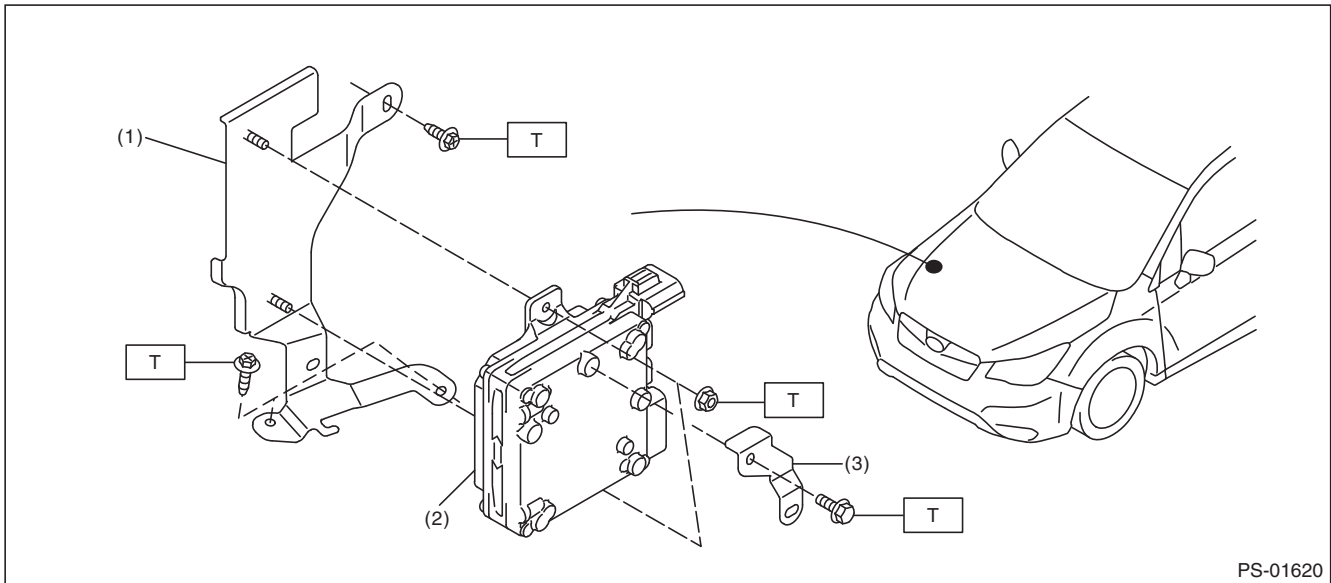
T4: 85 (8.67, 62.7)

T5: 90 (9.18, 66.4)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

3. ELECTRIC POWER STEERING CONTROL MODULE



- (1) Bracket - control module (3) Harness bracket
(2) Power steering control module

Tightening torque: N·m (kgf-m, ft-lb)

T: 7.5 (0.76, 5.5)

C: CAUTION

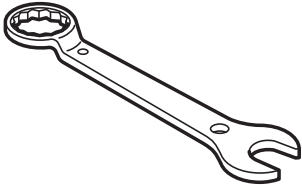
- Wear appropriate work clothing, including a helmet, protective goggles and protective shoes when performing any work.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use grease and oil of SUBARU genuine or the equivalent products. Do not mix them of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wooden blocks, aluminum plate or cloth between the part and the vise.
- If the steering wheel and steering angle sensor are removed, perform "VDC sensor midpoint setting mode" of the VDC. <Ref. to VDC-23, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099PA100	34099PA100	SPANNER	Used when measuring the rotating resistance of gearbox assembly.

2. GENERAL TOOL

TOOL NAME	REMARKS
Steering wheel puller	Used for removing the steering wheel.



Power Steering System

POWER ASSISTED SYSTEM (POWER STEERING)

2. Power Steering System

A: WIRING DIAGRAM

Refer to "Electric Power Steering System" in the wiring diagram. <Ref. to WI-418, WIRING DIAGRAM, Vehicle Dynamics Control System.>

B: ELECTRICAL SPECIFICATION

Refer to Control Module I/O Signal of "POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)". <Ref. to PS(diag)-9, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>

C: INSPECTION

Refer to "POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)". <Ref. to PS(diag)-2, Basic Diagnostic Procedure.>

D: NOTE

For procedure of each component in the power steering system, refer to the respective section.

- Steering wheel: <Ref. to PS-8, Steering Wheel.>
- Universal joint assembly - steering: <Ref. to PS-13, Universal Joint.>
- Steering column: <Ref. to PS-18, Steering Column.>
- Electric power steering gearbox: <Ref. to PS-25, Electric Power Steering Gearbox.>
- Power steering control module: <Ref. to PS-41, Power Steering Control Module.>

Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

3. Steering Wheel

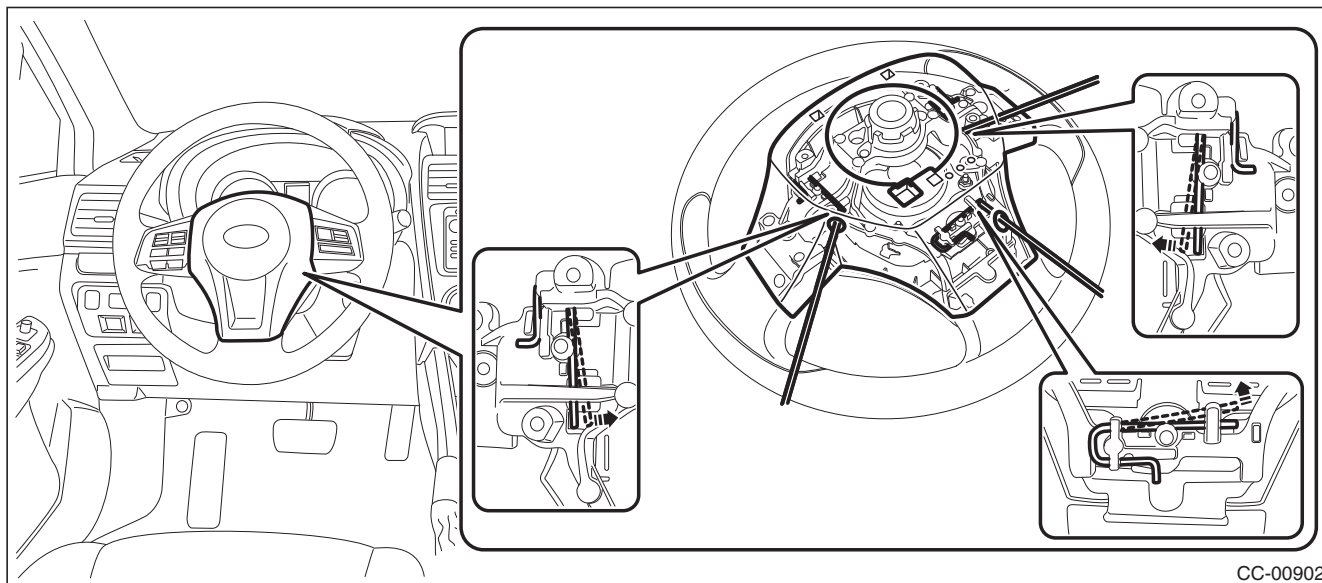
A: REMOVAL

- 1) Disconnect the negative terminal from the battery, and wait for 60 seconds or more.
- 2) Set the tire to the straight-ahead position.
- 3) Remove the driver's airbag module.

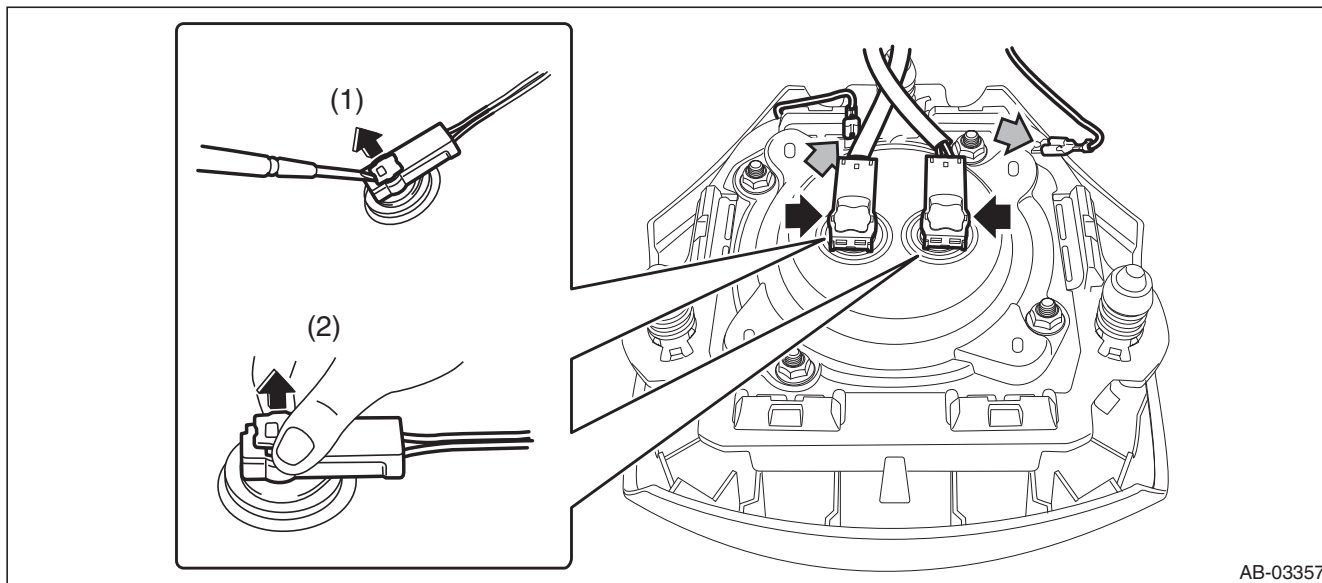
CAUTION:

Before performing service on the airbag module, always refer to "CAUTION" of "General Description" in "AIRBAG SYSTEM" section. <Ref. to AB-9, CAUTION, General Description.>

- (1) Using a hexagon wrench etc. wrapped by protective tape, insert the snap pins and release the locks (3 locations).



- (2) Disconnect the horn harness and airbag connector, and remove the airbag module. <Ref. to AB-21, DRIVER'S AIRBAG MODULE, KNEE AIRBAG MODULE, CURTAIN AIRBAG MODULE AND PRETENSIONER, PROCEDURE, Airbag Connector.>



Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

4) Remove the steering wheel.

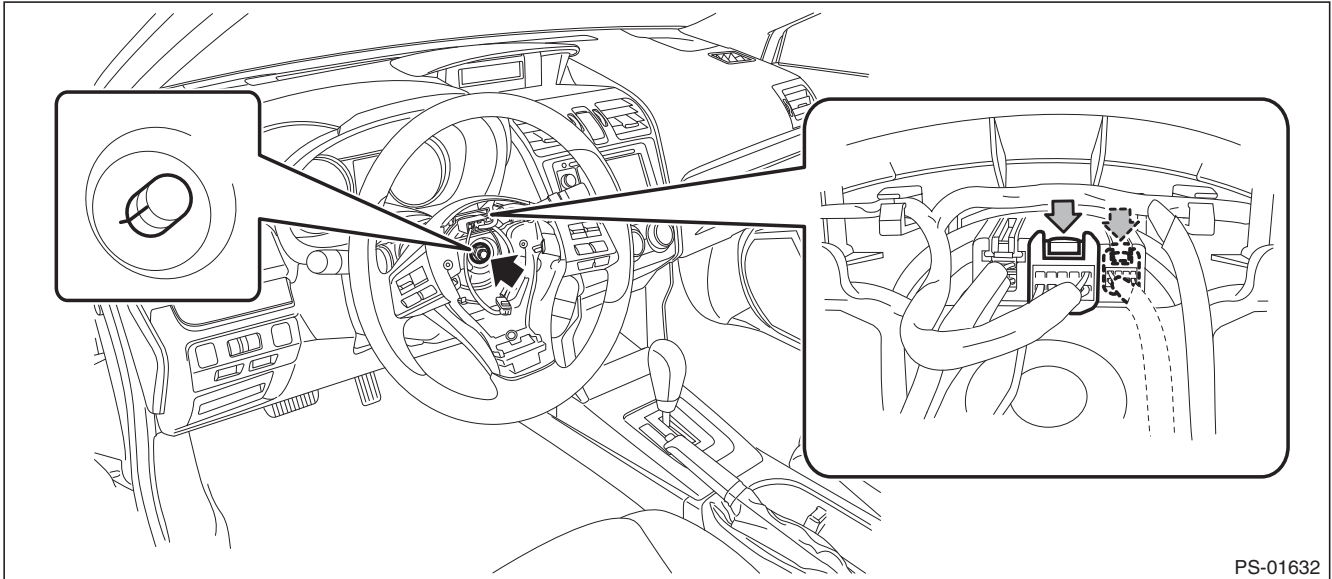
CAUTION:

- Always use the steering wheel puller for removal to avoid deforming the steering wheel.
- If the steering wheel has been removed, make sure that the steering roll connector is not turned from the original position.

Preparation tool:

Steering wheel puller

- (1) Disconnect the connector and remove the nut.
- (2) Put alignment marks and remove the steering wheel.



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Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

CAUTION:

- Before handling the airbag module, refer to “CAUTION” of “General Description” in “AIRBAG SYSTEM”. <Ref. to AB-9, CAUTION, General Description.>
- Be careful not to damage the curtain airbag module during removal.
- If the steering wheel and steering angle sensor are removed, perform “VDC sensor midpoint setting mode” of the VDC. <Ref. to VDC-23, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

1) Align the center position of the roll connector. <Ref. to AB-103, ADJUSTMENT, Roll Connector.>

2) Install each part in the reverse order of removal.

NOTE:

Align the alignment marks on the steering wheel and the column assembly - steering.

Tightening torque:

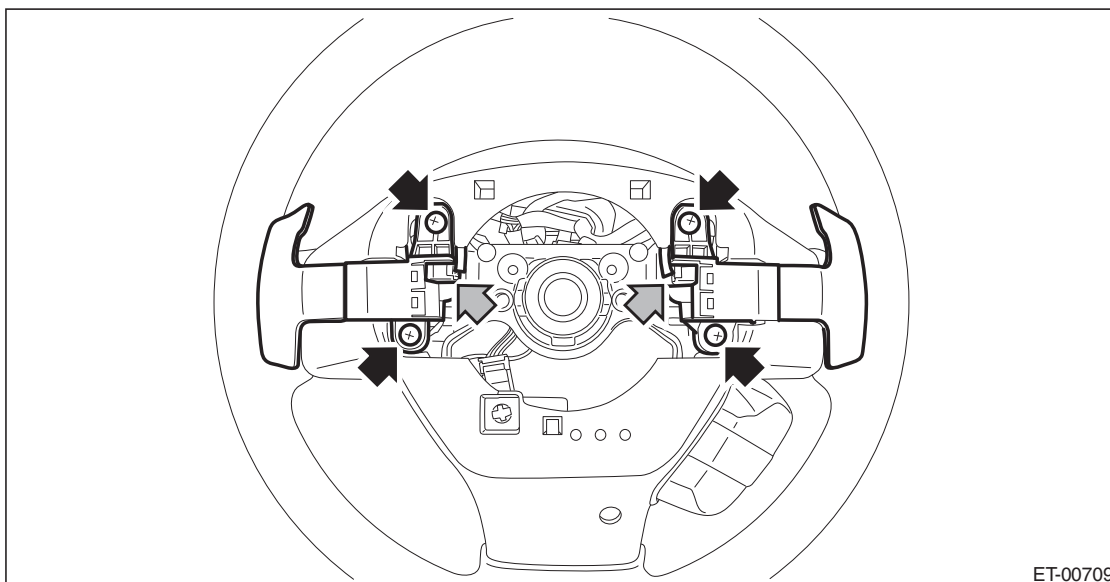
Steering wheel: 39 N·m (3.98 kgf-m, 28.8 ft-lb)

Clearance:

Between cover assembly - column and steering wheel: 4 — 6 mm (0.16 — 0.24 in)

C: DISASSEMBLY

- 1) Remove the screw, disconnect the connector and remove the paddle shift switch. (Model with paddle shift)



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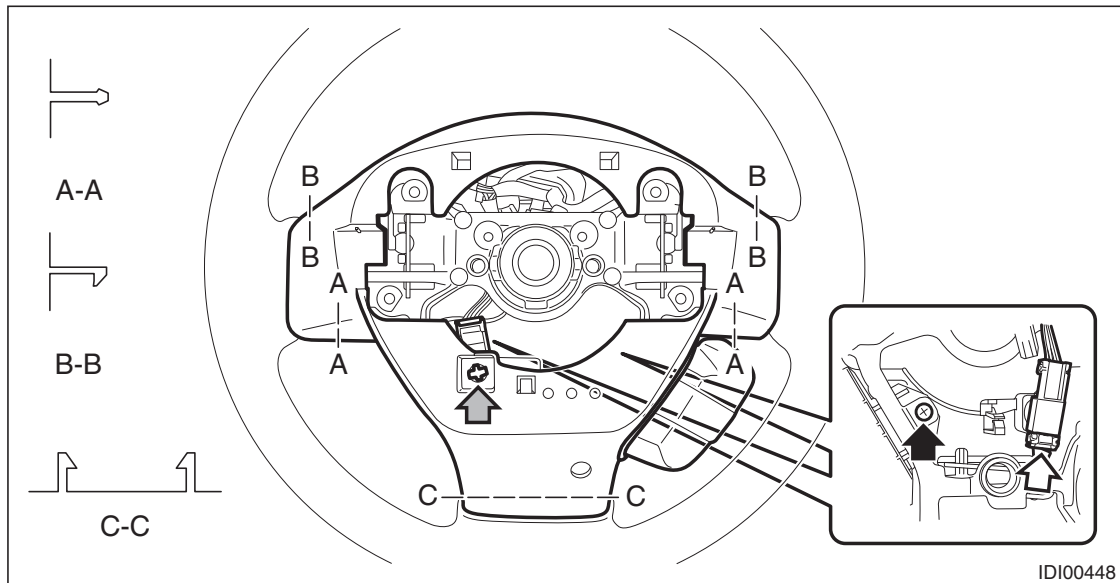
Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

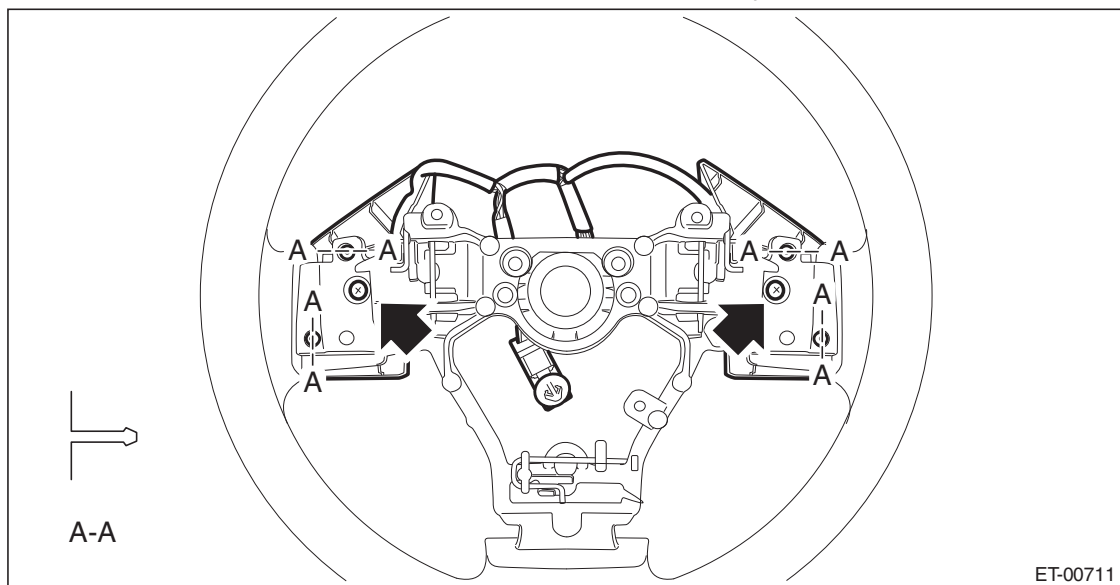
2) Release the claws and clips, and remove the cover - steering wheel LWR.

NOTE:

For model with steering switch, remove the connector and screw.



3) Remove the screws and then remove the satellite switch assembly.



D: ASSEMBLY

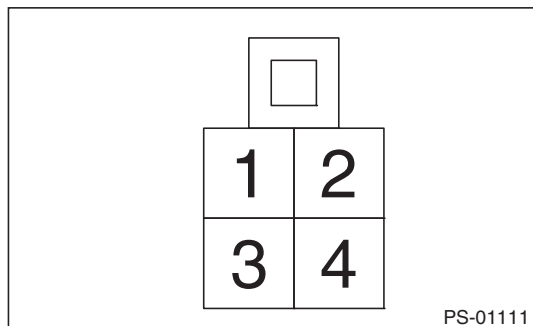
Assemble each part in the reverse order of disassembly.

Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

Check the resistance of paddle switch.



Step	Check	Yes	No
1 SHIFT-UP SWITCH CONTINUITY CHECK. 1) Operate the + side of paddle shift assembly and hold it. 2) Measure the resistance between terminals of the paddle shift assembly connector. Terminals No. 4 — No. 3:	Is the resistance less than 10 Ω ?	Go to step 2.	Replace the paddle shift assembly.
2 SHIFT-DOWN SWITCH CONTINUITY CHECK. 1) Operate the – side of paddle shift assembly and hold it. 2) Measure the resistance between terminals of the paddle shift assembly connector. Terminals No. 4 — No. 1:	Is the resistance less than 10 Ω ?	Go to step 3.	Replace the paddle shift assembly.
3 CHECK SHIFT SWITCH INSULATION. 1) Do not operate the paddle shift assembly. 2) Measure the resistance between terminals of the paddle shift assembly connector. Terminals No. 4 — No. 3: No. 4 — No. 1:	Is the resistance 1 M Ω or more?	Paddle shift assembly is normal.	Replace the paddle shift assembly.

Replace the paddle switch if the inspection result is not within the standard value.

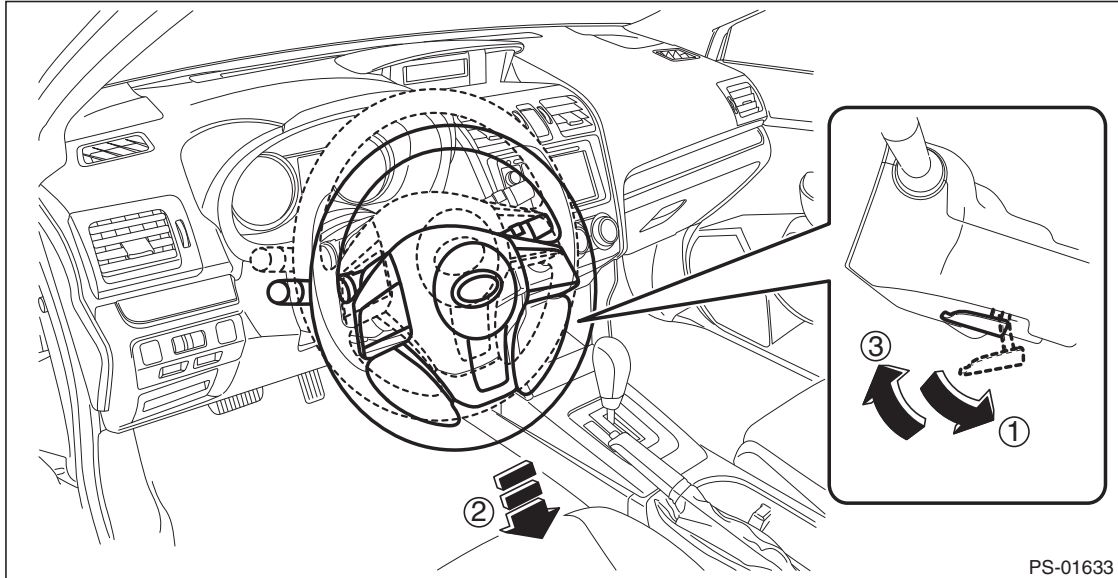
Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

4. Universal Joint

A: REMOVAL

1) Adjust the tilt position of the column assembly - steering to the lowest position and lock the tilt lever.



2) Remove the universal joint assembly - steering.

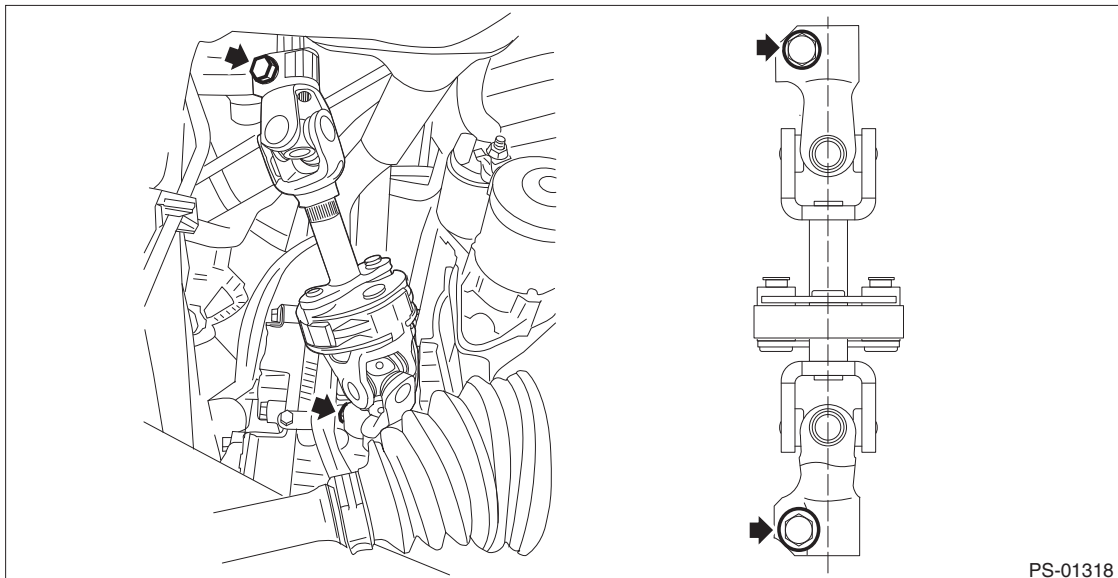
(1) Place alignment marks on the universal joint assembly - steering.

NOTE:

Place alignment marks on the following positions.

- Between the column assembly - steering and the universal joint assembly - steering
- Between the steering gearbox assembly and the universal joint assembly - steering

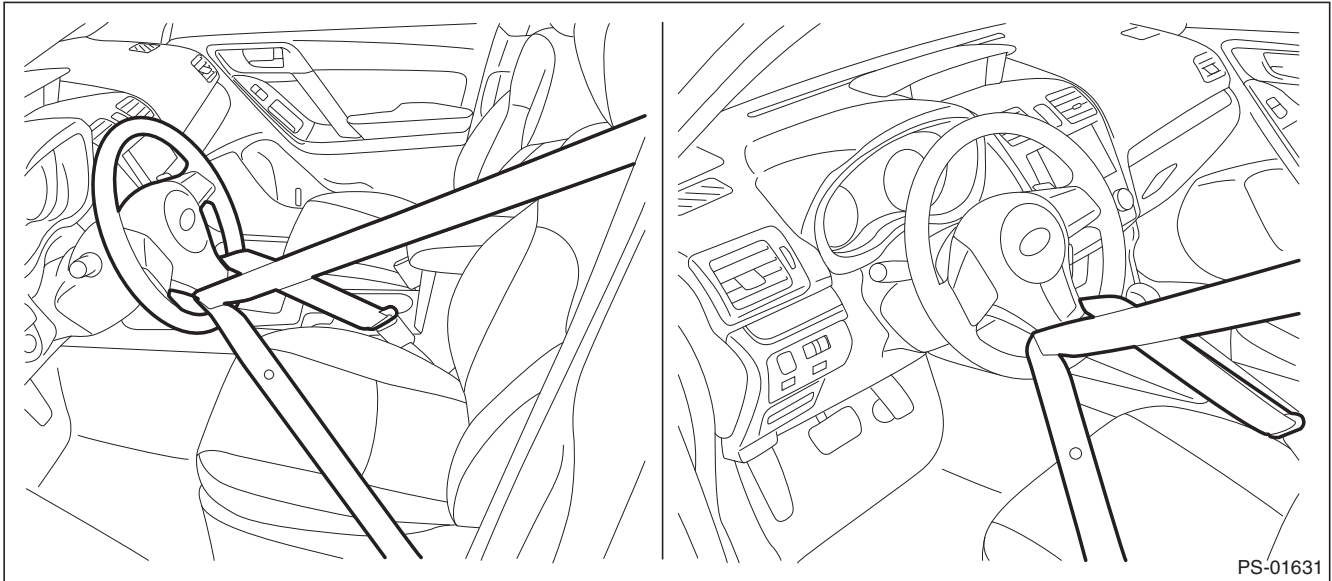
(2) Remove the bolt, and remove the universal joint assembly - steering.



Universal Joint

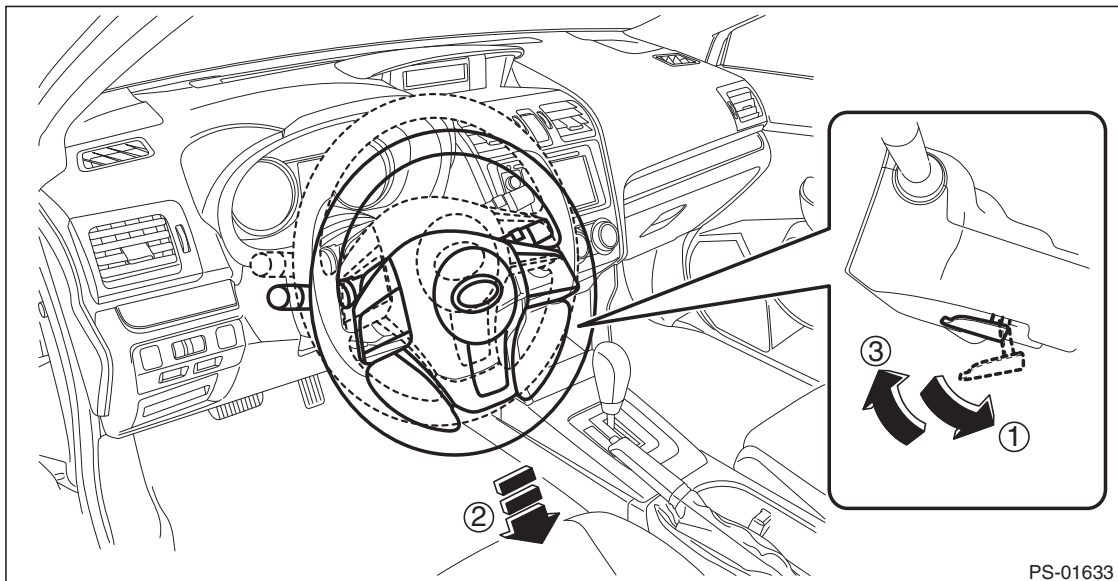
POWER ASSISTED SYSTEM (POWER STEERING)

3) Prevent the steering wheel from turning using the seat belt.



B: INSTALLATION

- 1) Before installation, check the universal joint assembly - steering. <Ref. to PS-16, INSPECTION, Universal Joint.>
- 2) Adjust the tilt position of the column assembly - steering to the neutral position and lock the tilt lever.



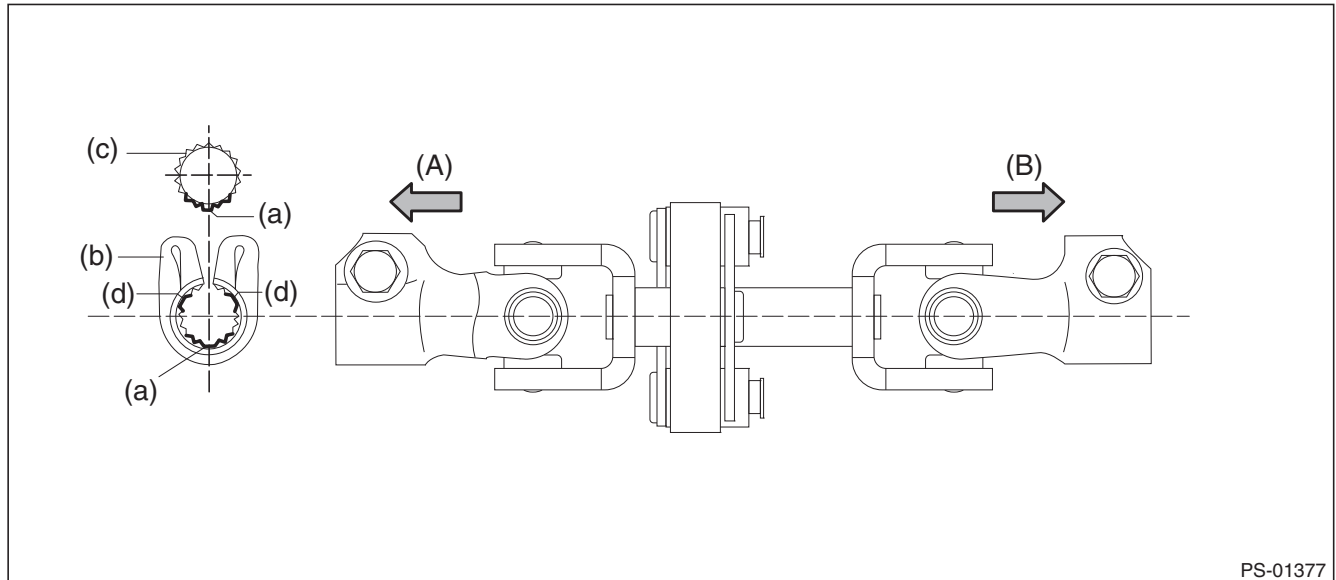
Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

3) Align the cutout portion (a) at serrated section of the column shaft (c) and yoke (b), then install the universal joint assembly - steering into column shaft.

CAUTION:

Be sure to align the protrusion section (a) of the column shaft side with the cutout (a) of the serration. If another cutout portions (d) are used for alignment, the bolt of the universal joint assembly - steering cannot be assembled.



(A) Column shaft side

(B) Gearbox side

4) Install the universal joint assembly - steering to the serrations of the gearbox assembly by matching the alignment marks.

5) Tighten the bolts on the gearbox side first, and then the column shaft side.

CAUTION:

Be sure to follow the tightening order and tightening torque of the universal joint assembly - steering to avoid the steering effort from becoming heavy.

Tightening torque:

24 N·m (2.45 kgf-m, 17.7 ft-lb)

Clearance:

Universal joint assembly - steering coupling to adjacent parts: 15 mm (0.59 in) or more

Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

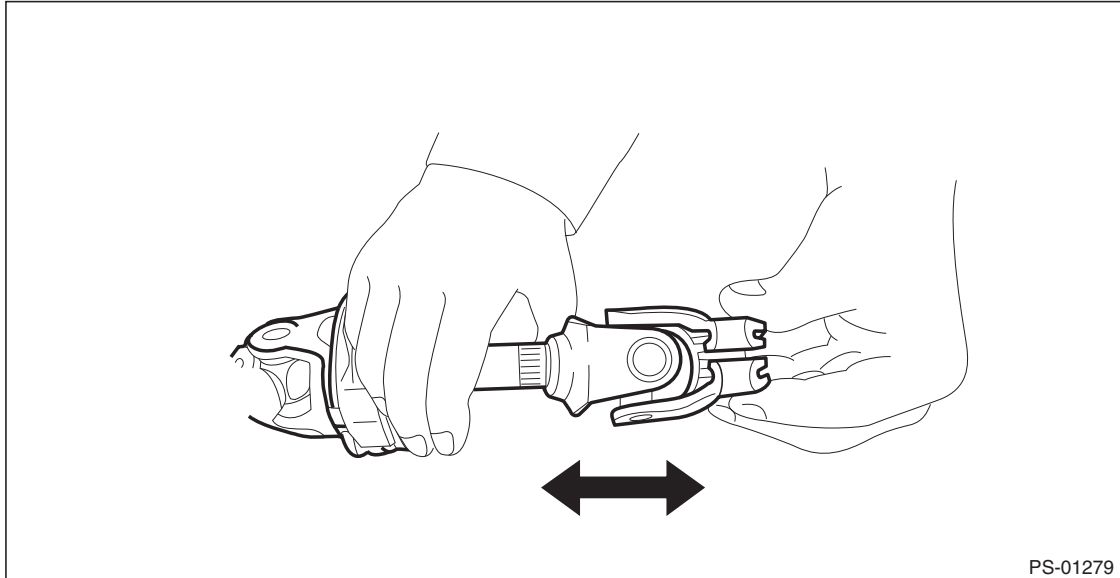
C: INSPECTION

Check for wear, damage or any other faults.

1) Check the universal joint assembly - steering for excessive looseness.

Service limit:

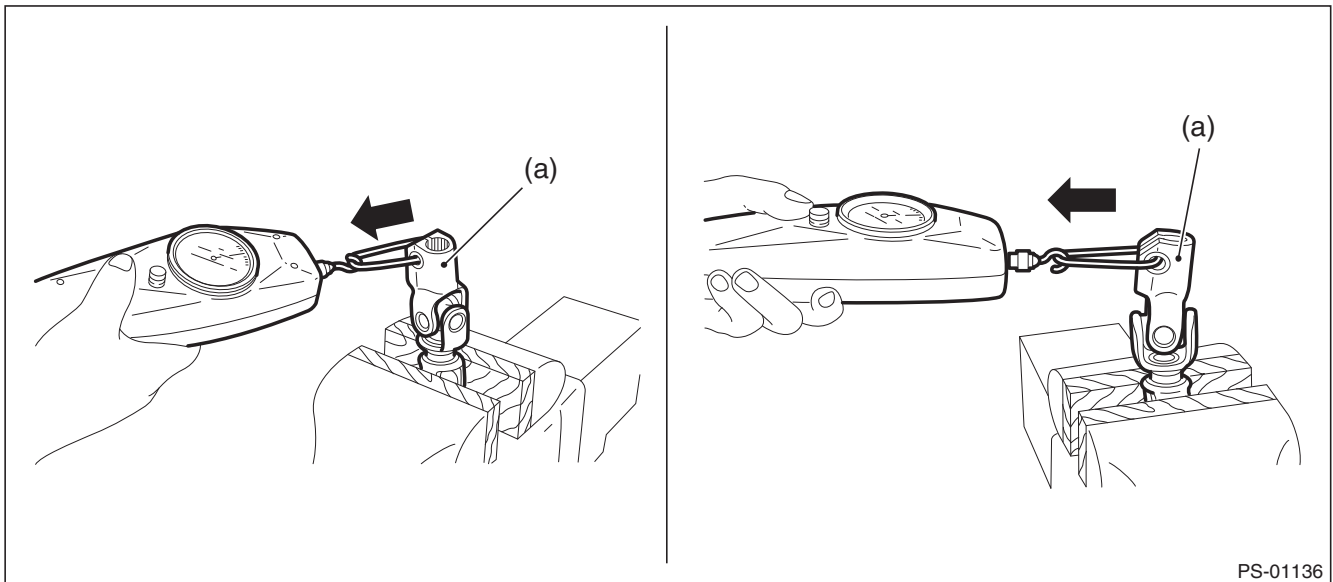
Play of the universal joint assembly - steering: 0 mm (0 in)



2) Measure the swing torque of the universal joint assembly - steering.

(1) Place the universal joint assembly - steering between wooden blocks and fix it on a vise.

(2) With the yoke (a) of gearbox side facing up, measure the swing torque in two directions.



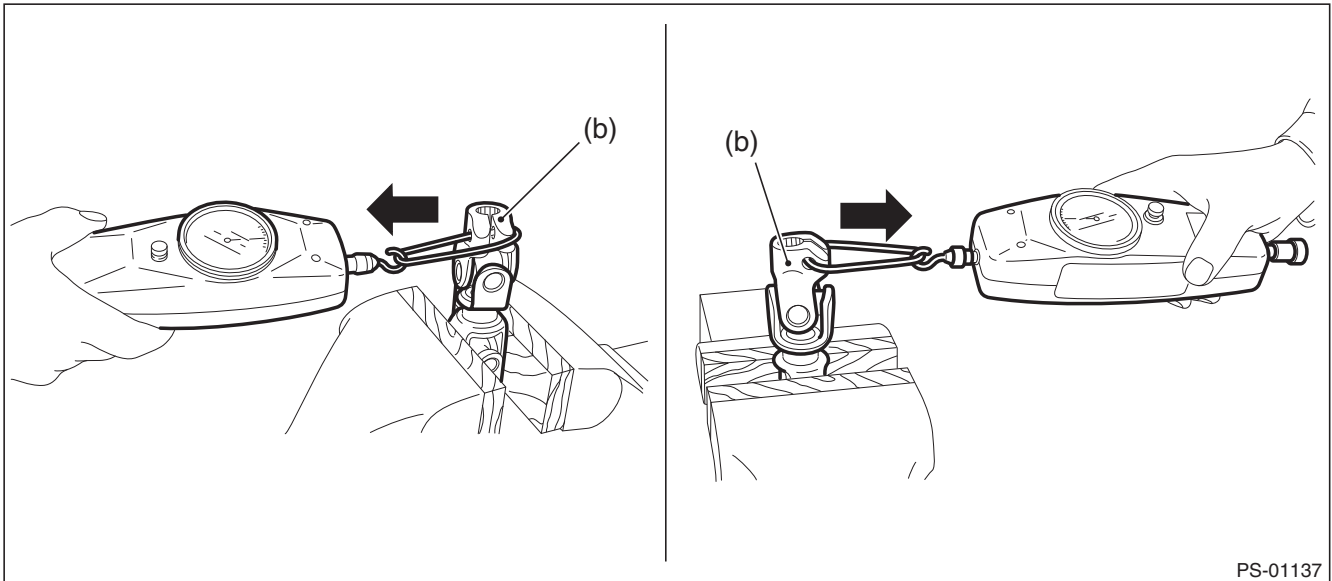
Service limit:

Maximum load: 6.8 N (0.68 kgf, 1.54 lbf) or less

Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

(3) With the yoke (b) of the column assembly - steering side facing up, measure the swing torque in two directions.



Service limit:

Maximum load: 8.1 N (0.81 kgf, 1.84 lbf) or less

(4) Replace as necessary, if it is found defective.



Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

5. Steering Column

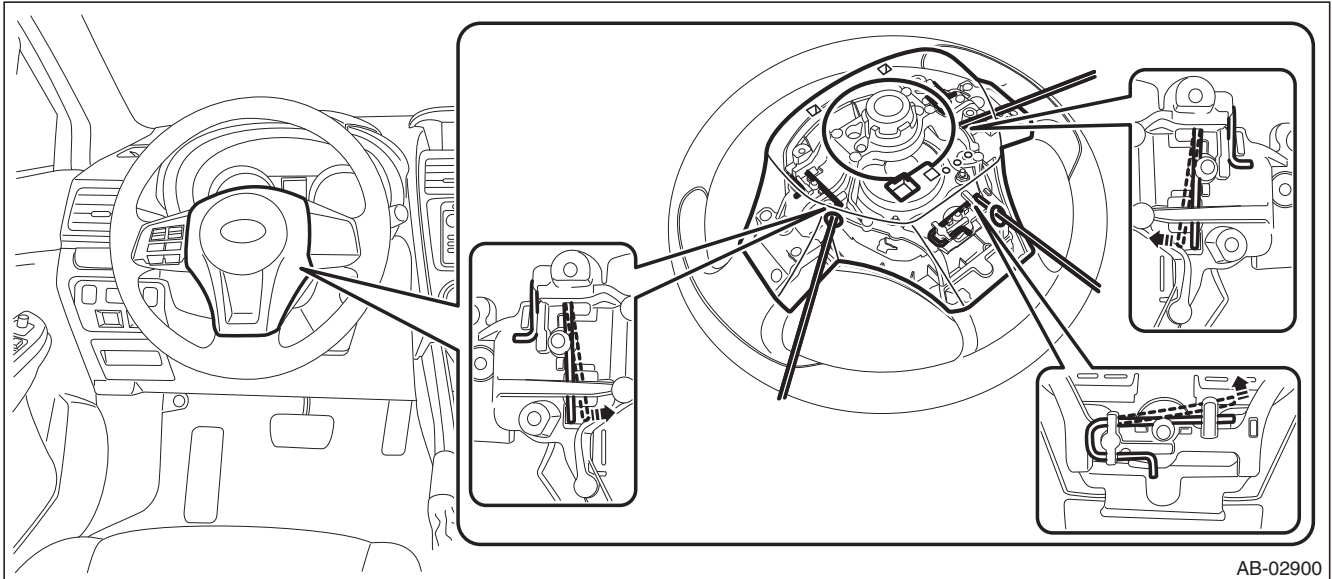
A: REMOVAL

- 1) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
- 2) Remove the driver's airbag module.

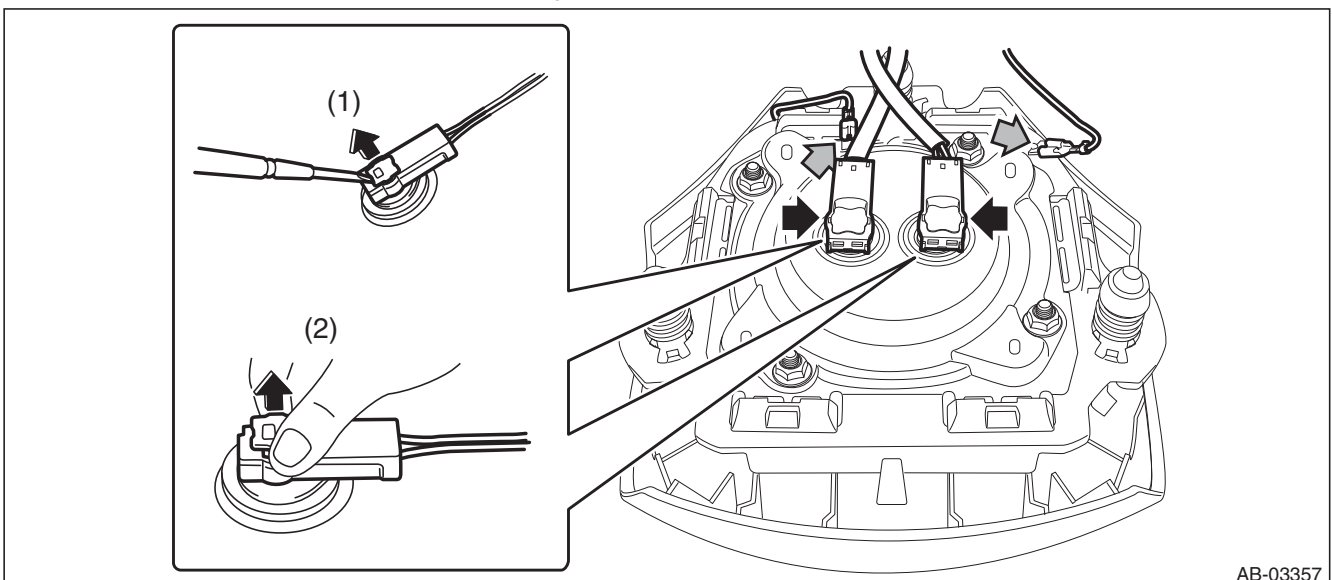
CAUTION:

Before performing service on the airbag module, always refer to "CAUTION" of "General Description" in "AIRBAG SYSTEM" section. <Ref. to AB-9, CAUTION, General Description.>

- (1) Using a hexagon wrench etc. wrapped by protective tape, insert the snap pins and release the locks (3 locations).



- (2) Disconnect the horn harness and airbag connector and remove the airbag module assembly. <Ref. to AB-21, DRIVER'S AIRBAG MODULE, KNEE AIRBAG MODULE, CURTAIN AIRBAG MODULE AND PRETENSIONER, PROCEDURE, Airbag Connector.>



Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

3) Remove the steering wheel.

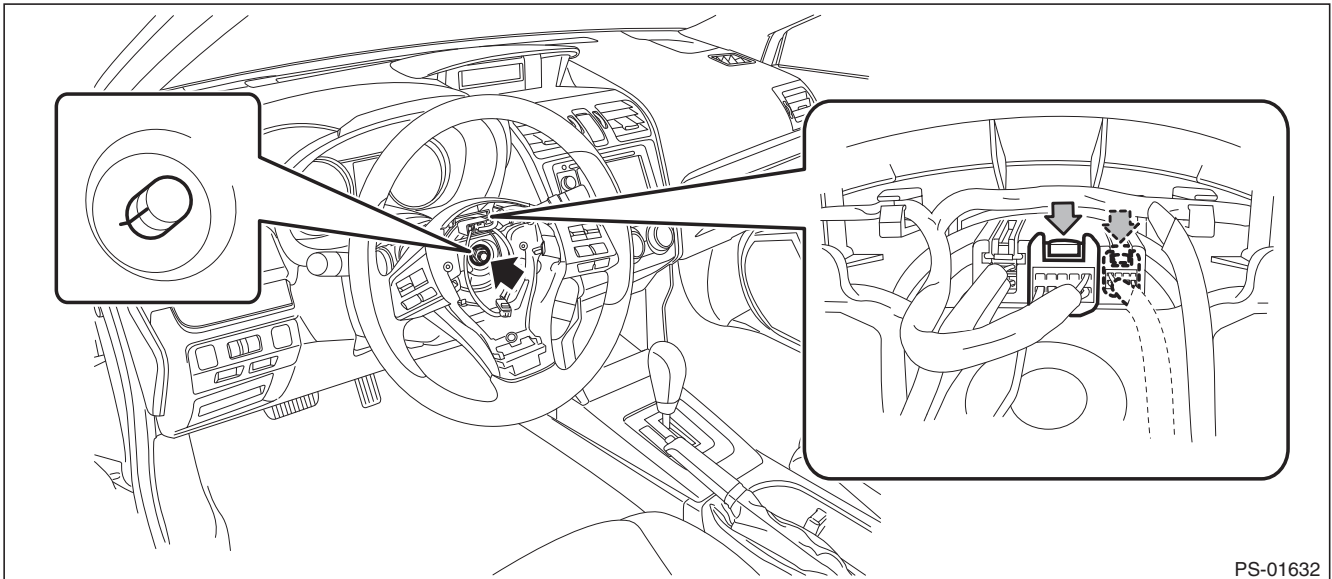
CAUTION:

- Always use the steering wheel puller for removal to avoid deforming the steering wheel.
- If the steering wheel has been removed, make sure that the steering roll connector is not turned from the original position.

Preparation tool:

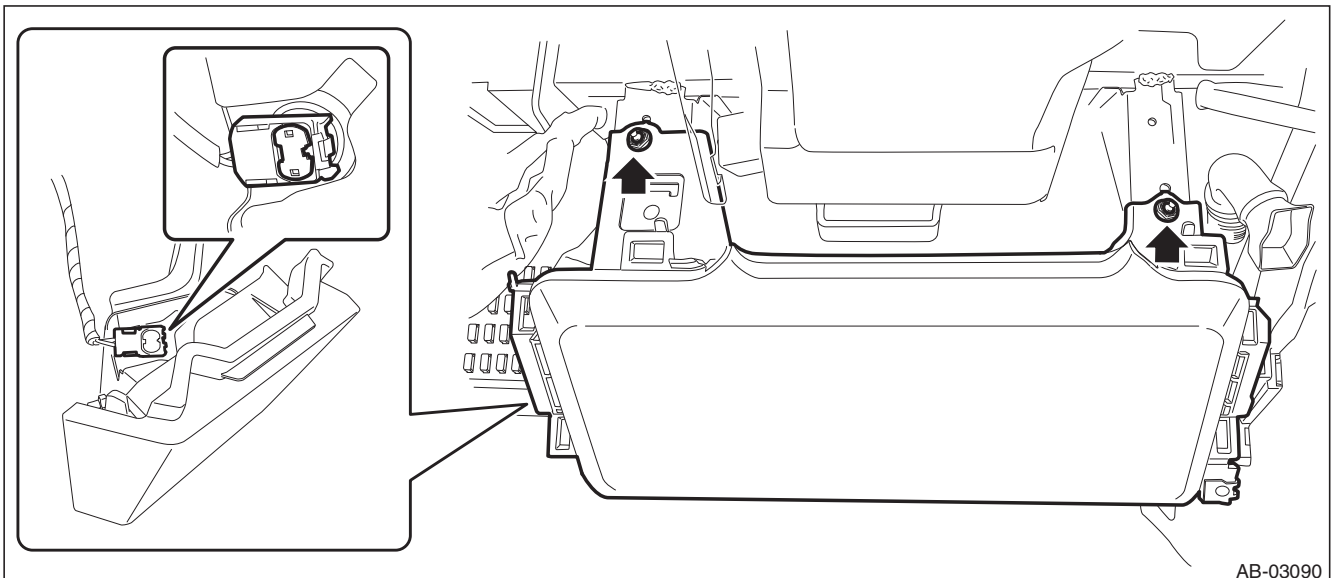
Steering wheel puller

- (1) Disconnect the connector and remove the nut.
- (2) Put alignment marks and remove the steering wheel.



4) Remove the cover assembly - instrument panel LWR driver. <Ref. to EI-59, REMOVAL, Instrument Panel Lower Cover.>

5) Remove the nuts to remove the knee airbag module and disconnect the harness connector. <Ref. to AB-21, DRIVER'S AIRBAG MODULE, KNEE AIRBAG MODULE, CURTAIN AIRBAG MODULE AND PRETENSIONER, PROCEDURE, Airbag Connector.>

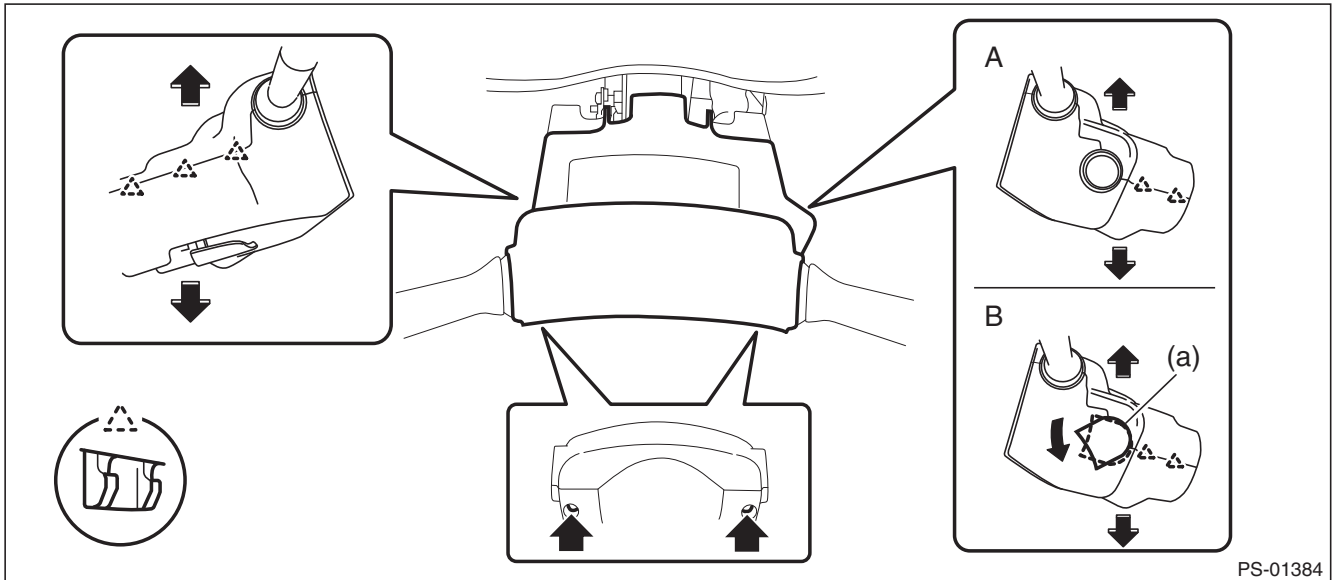


Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

6) Remove the cover assembly - column.

- (1) Release the screws and claws.
- (2) Remove the cap - key cylinder (a). (Model with keyless access)
- (3) Remove the cover assembly - column UPR and the cover assembly - column LWR.



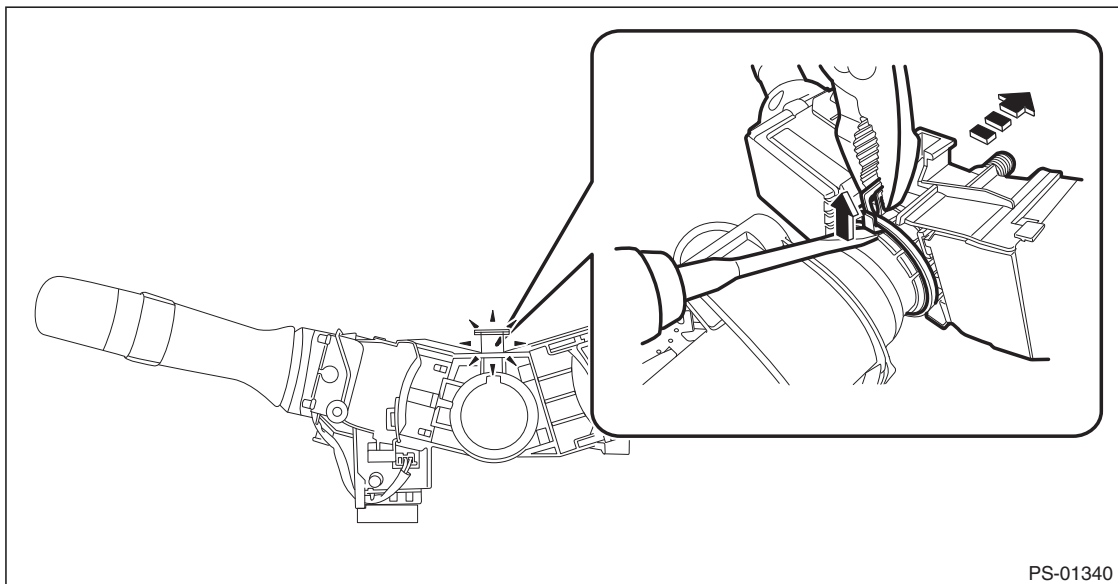
PS-01384

A Models without keyless access

B Models with keyless access

7) Remove the switch assembly - combination.

- (1) Disconnect the connector, and loosen the clamp to release the claws.
- (2) Pull out the switch assembly - combination from the column assembly - steering.



PS-01340

8) Remove all connectors from the column assembly - steering.

Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

9) Remove the universal joint assembly - steering.

CAUTION:

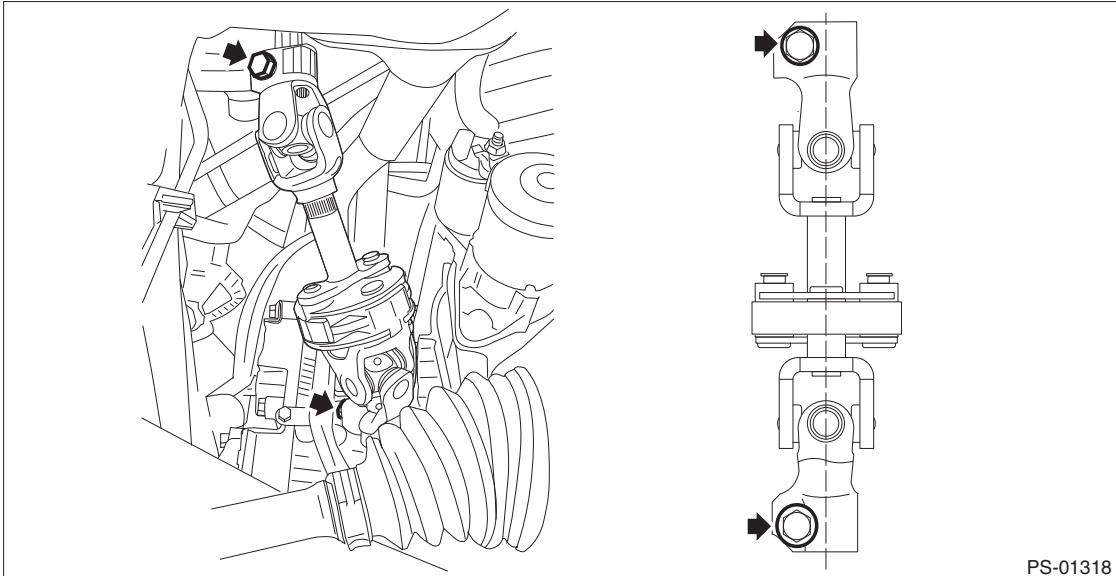
To prevent damage to the universal joint assembly - steering and error of handling force, make sure to remove the universal joint assembly - steering.

(1) Place alignment marks on the universal joint assembly - steering.

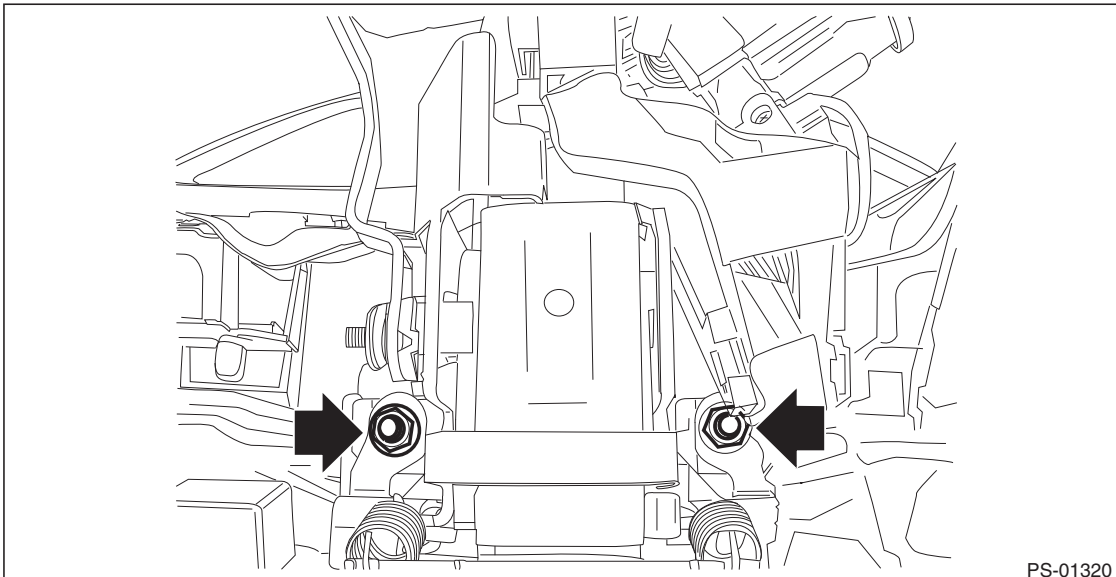
NOTE:

Place alignment marks on the following positions.

- Between the column assembly - steering and the universal joint assembly - steering
 - Between the steering gearbox assembly and the universal joint assembly - steering
- (2) Remove the bolt, and remove the universal joint assembly - steering.



10) Remove the two nuts under the beam COMPL - steering securing the column assembly - steering.



11) Pull out the column assembly - steering from the hole on toe board.

CAUTION:

Do not loosen the tilt lever when the column assembly - steering is not secured to the vehicle.

12) Remove the ignition key lock from the column assembly - steering. <Ref. to SL-58, REPLACEMENT, Ignition Key Lock.>

Steering Column

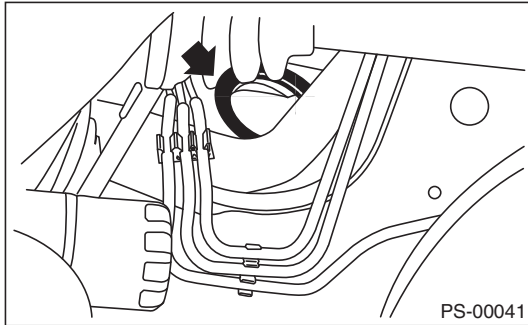
POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

CAUTION:

If the steering wheel and steering angle sensor are removed, perform "VDC sensor midpoint setting mode" of the VDC. <Ref. to VDC-23, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

- 1) Install the grommet to the toe board.



- 2) Insert the end of the column assembly - steering into the toe board grommet.
- 3) Tighten the column assembly - steering installation nut located under the beam COMPL - steering with the tilt lever fixed.

Tightening torque:

20 N·m (2.04 kgf-m, 14.8 ft-lb)

- 4) Connect all connectors located under the beam COMPL - steering.
- 5) Connect the horn harness and airbag connector, and install the airbag module.
- 6) Install the knee airbag module.
- 7) Install the cover assembly - instrument panel LWR driver INN and OUT.
- 8) Install the universal joint assembly - steering. <Ref. to PS-14, INSTALLATION, Universal Joint.>

CAUTION:

- Always install the universal joint assembly - steering after installing the steering column to avoid damage to the universal joint assembly - steering.
- Be sure to follow the tightening order and tightening torque of the universal joint assembly - steering to avoid the steering effort from becoming heavy.

- 9) Align the center position of the steering roll connector. <Ref. to AB-103, ADJUSTMENT, Roll Connector.>
- 10) Install the steering wheel. <Ref. to PS-10, INSTALLATION, Steering Wheel.>

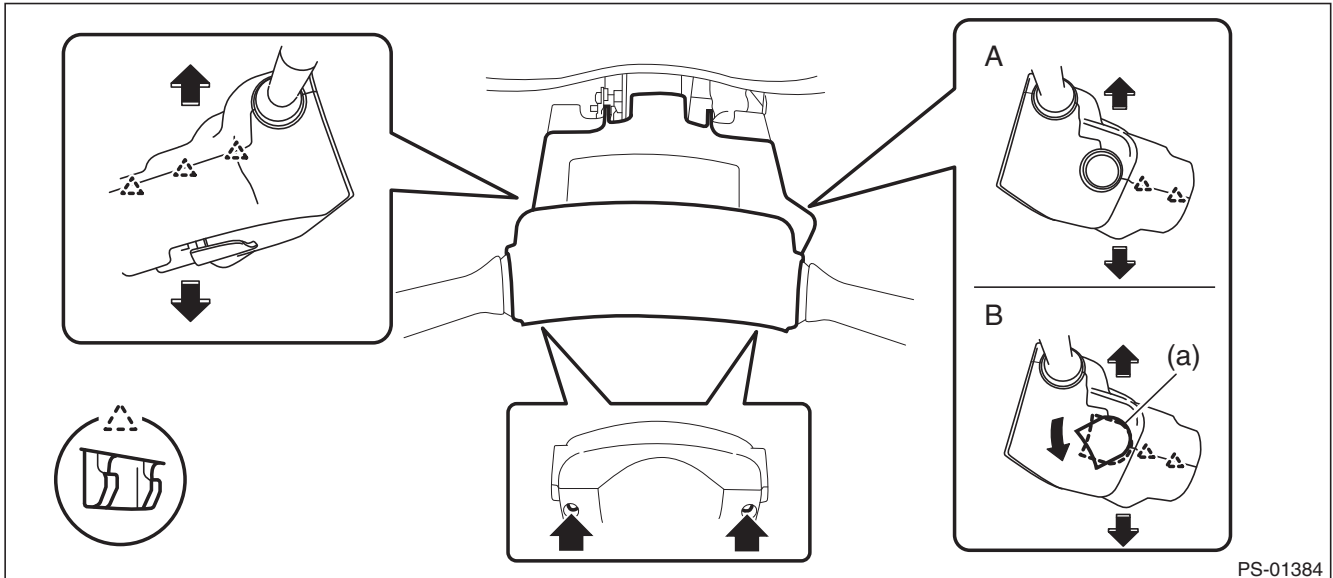
Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

C: DISASSEMBLY

1) Remove the cover assembly - column.

- (1) Release the screws and claws.
- (2) Remove the cap - key cylinder (a). (Model with keyless access)
- (3) Remove the cover assembly - column UPR and the cover assembly - column LWR.

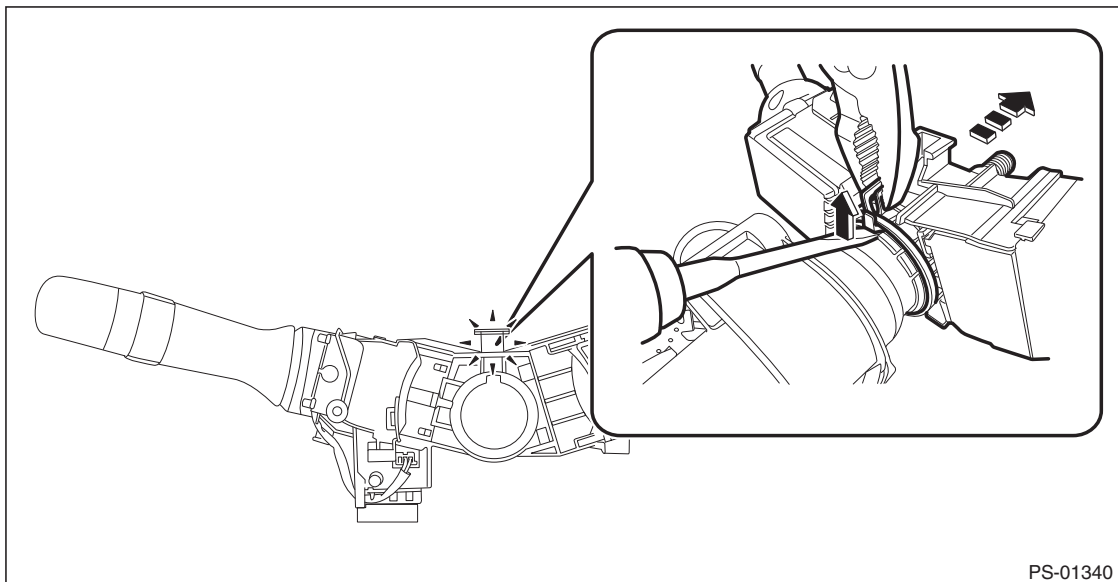


A Models without keyless access

B Models with keyless access

2) Remove the switch assembly - combination.

- (1) Disconnect the connector, and loosen the clamp to release the claws.
- (2) Pull out the switch assembly - combination from the column assembly - steering.



Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

D: ASSEMBLY

Assemble each part in the reverse order of disassembly.

E: INSPECTION

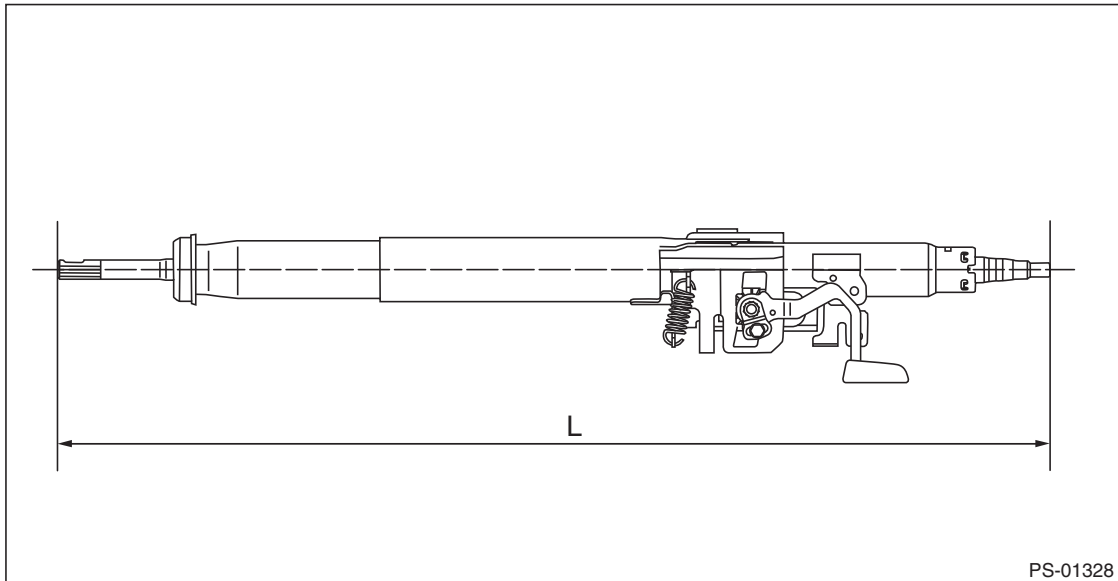
1. UNIT INSPECTION

Measure the overall length of the column assembly - steering. If not within specification, replace it.

Standard: Overall length L

Tilt and telescopic column (measure while minimized):

$819.7^{+1.5}_{-1.5}$ mm ($32.3^{+0.059}_{-0.059}$ in)



2. INSPECTION OF AIRBAG SYSTEM

Refer to "Airbag System" for airbag inspection procedure. <Ref. to AB-38, INSTALLATION, Driver's Airbag Module.>

Electric Power Steering Gearbox

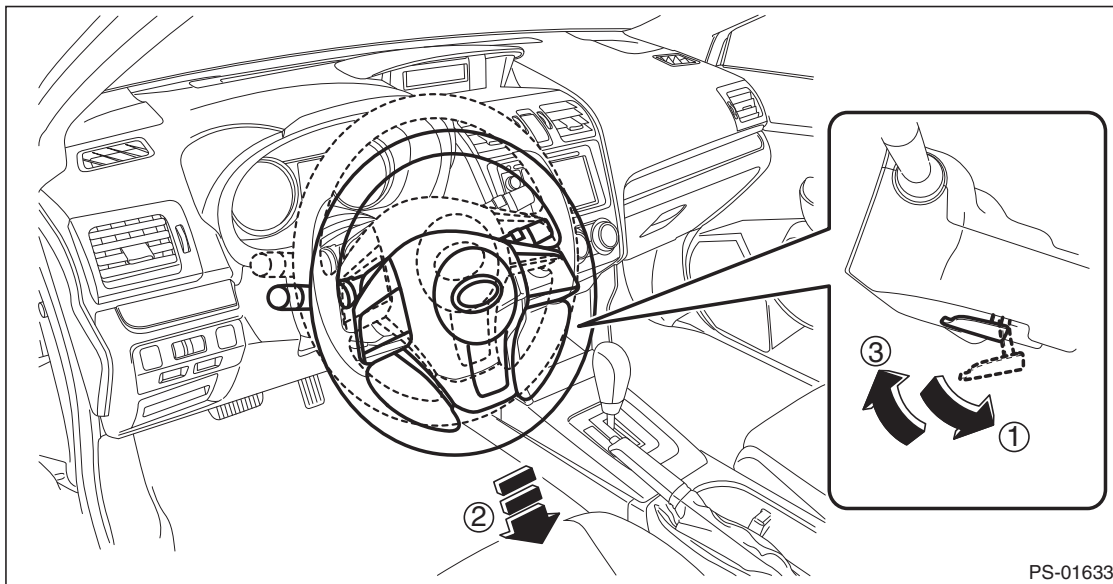
POWER ASSISTED SYSTEM (POWER STEERING)

6. Electric Power Steering Gearbox

A: REMOVAL

CAUTION:

- The power steering control module continues to operate after the engine stops and calculate the temperature in the control module. Therefore, before starting service of the power steering system which requires disconnection of the connector, stop the engine and allow approx. 30 minutes until the control module becomes cold.
 - Before removal or installation, be sure to remove any foreign matter (dust, moisture, oil, etc.) from the power steering control module connector.
- 1) Disconnect the ground cable from battery.
 - 2) Adjust the tilt position of the column assembly - steering to the lowest position and lock the tilt lever.



Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

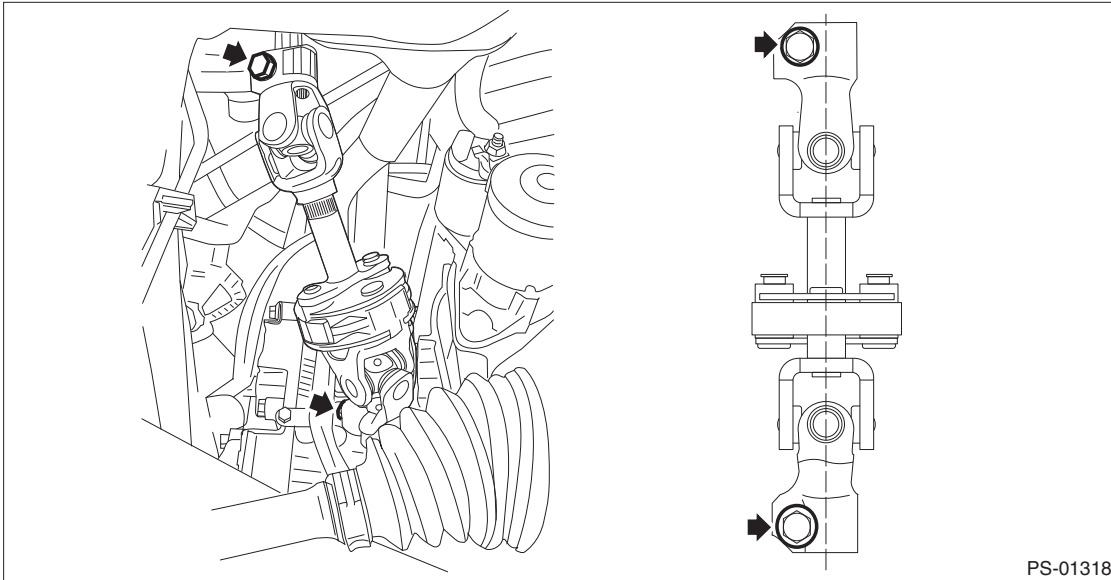
3) Remove the universal joint assembly - steering.

(1) Place alignment marks on the universal joint assembly - steering.

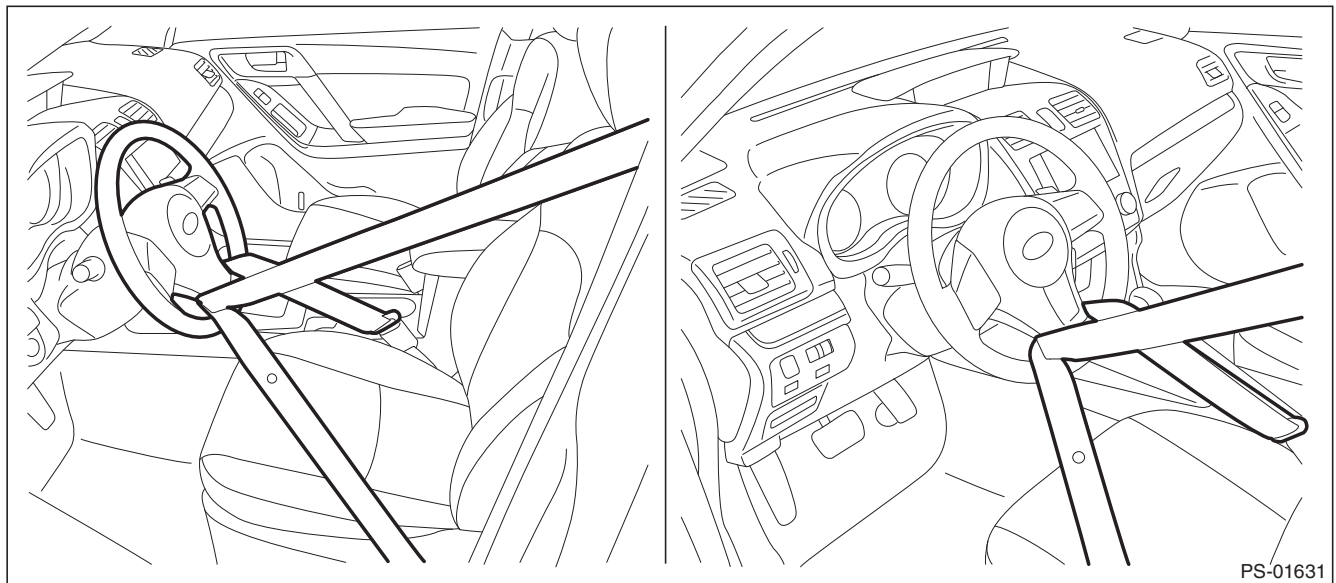
NOTE:

Place alignment marks on the following positions.

- Between the column assembly - steering and the universal joint assembly - steering
 - Between the steering gearbox assembly and the universal joint assembly - steering
- (2) Remove the bolt, and remove the universal joint assembly - steering.



4) Prevent the steering wheel from turning using the seat belt.



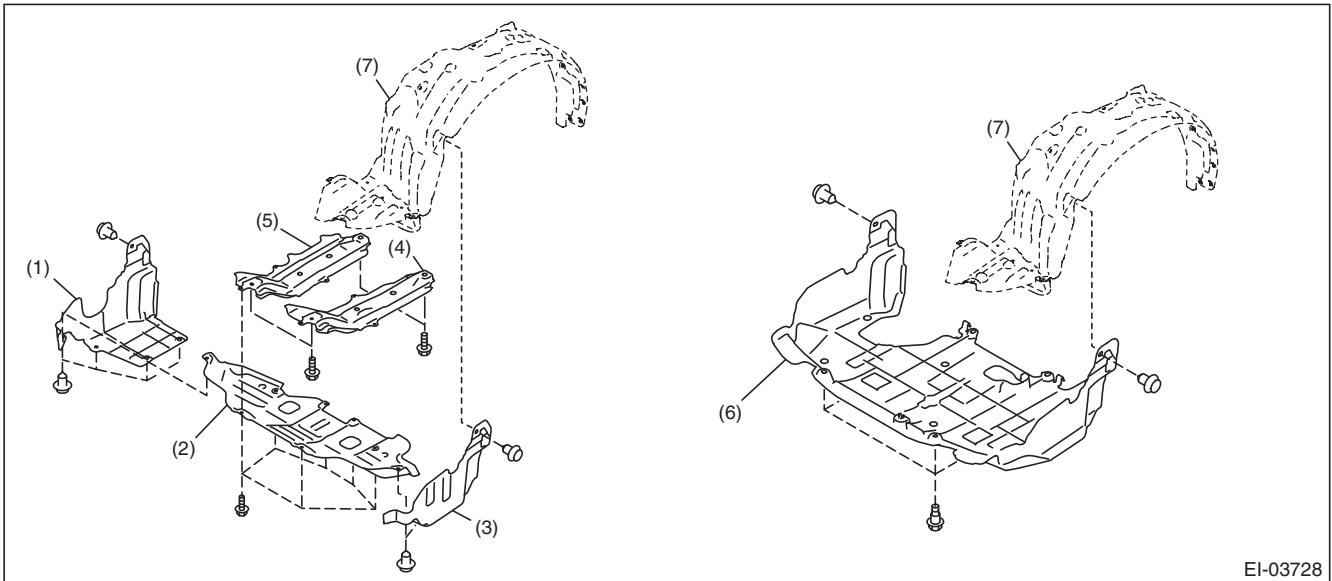
5) Disconnect the connector and harness clamp from power steering control module.

6) Lift up the vehicle.

Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

7) Remove the bolts and clips, and remove the under cover - front.



EI-03728

- | | | |
|--|--|-----------------------|
| (1) Under cover COMPL - front RH (turbo model) | (4) Under cover - front guard RH (turbo model) | (7) Mud guard - front |
| (2) Plate CTR - aluminum (turbo model) | (5) Under cover - front guard LH (turbo model) | |
| (3) Under cover COMPL - front LH (turbo model) | (6) Under cover - front (non-turbo model) | |

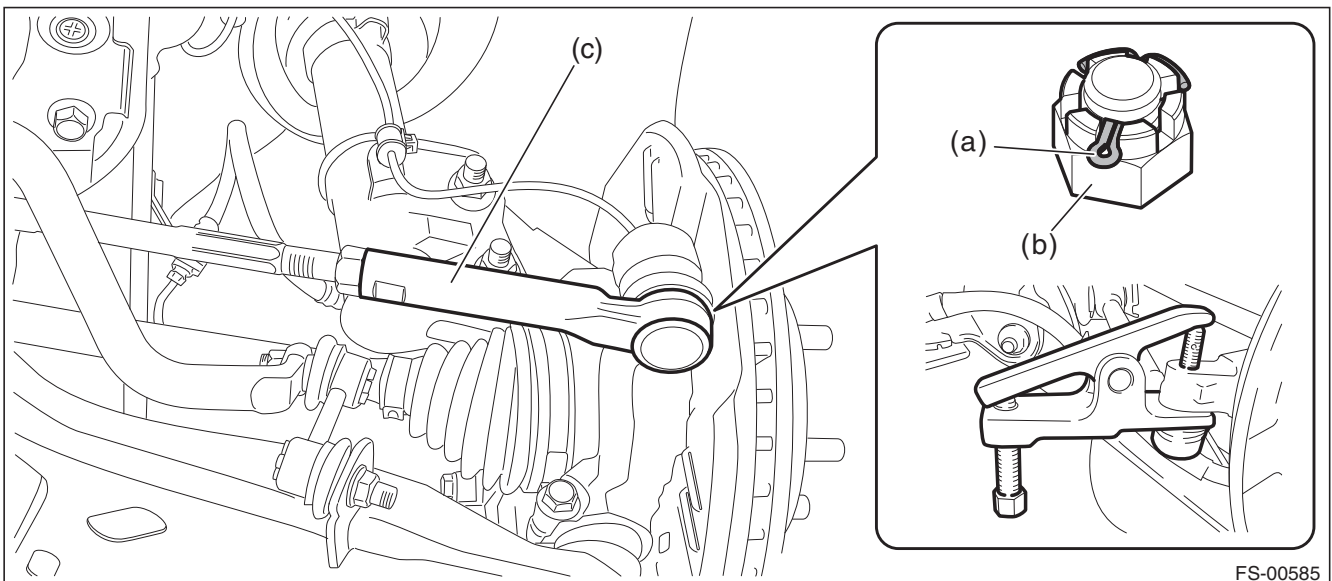
8) Remove the front wheels.

9) Disconnect the tie-rod end.

- (1) Pull out the cotter pin (a).
- (2) Remove the castle nut (b).
- (3) Using a tie-rod ball joint puller, remove the tie-rod end (c).

Preparation tool:

Tie-rod ball joint puller

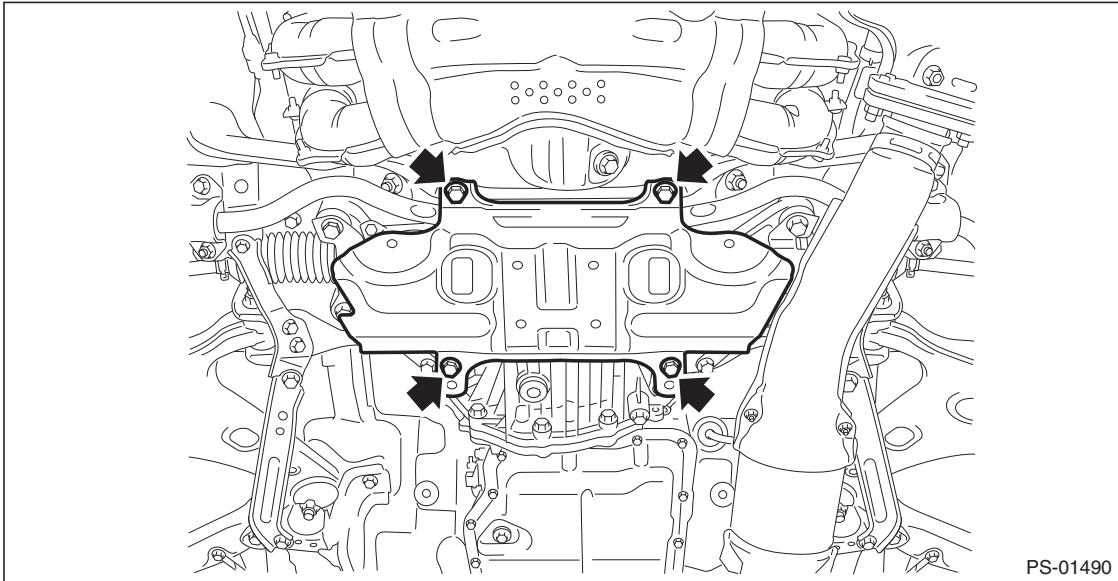


FS-00585

Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

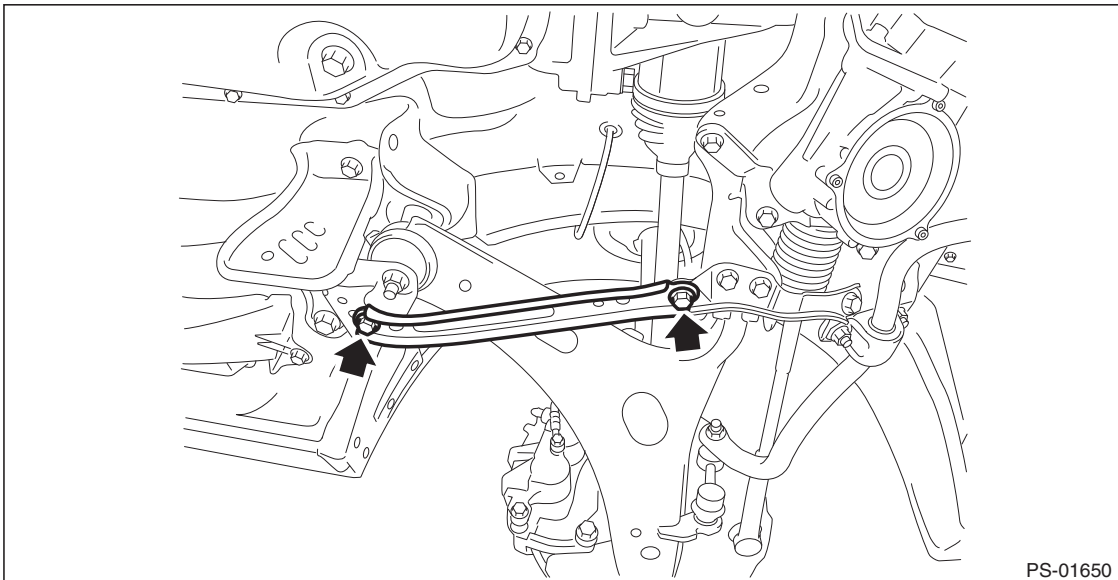
10) Remove the bolt, and remove the front crossmember support.



11) Remove the center exhaust pipe assembly.

- Non-turbo model: <Ref. to EX(H4DO)-14, REMOVAL, Center Exhaust Pipe.>
- Turbo model: <Ref. to EX(H4DOTC)-30, REMOVAL, Center Exhaust Pipe.>

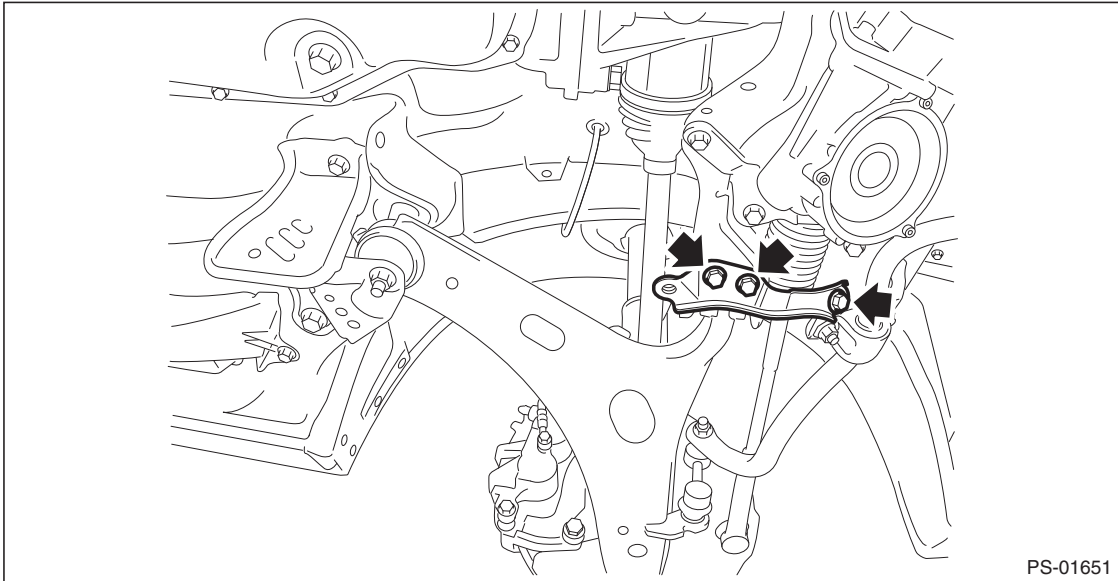
12) Remove the bolt, and then detach the front support.



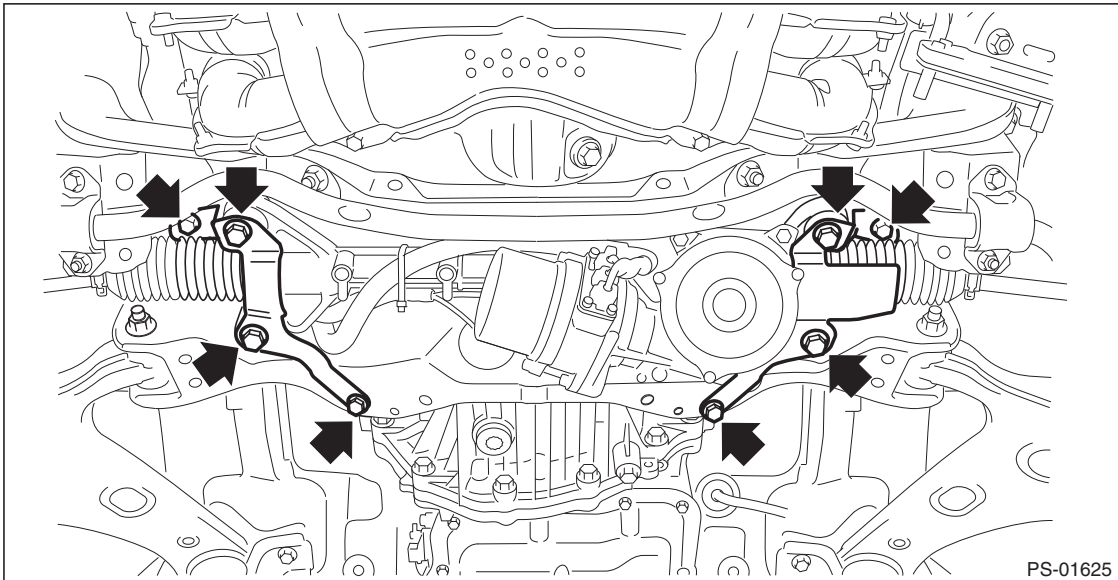
Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

- 13) Remove the bolt, and remove the support plate - front crossmember.



- 14) Remove the bolts securing the steering gearbox assembly, and remove the stiffener and steering gearbox assembly.



Electric Power Steering Gearbox

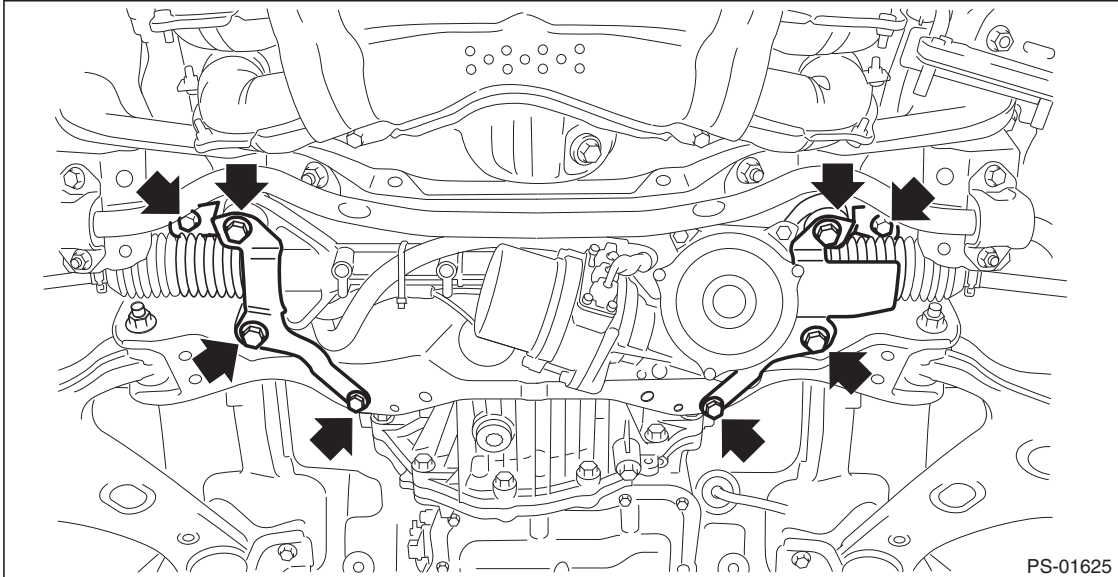
POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

- 1) Insert the steering gearbox assembly into crossmember, being careful not to damage the boot of the steering gearbox assembly.
- 2) Install the steering gearbox assembly to the crossmember by tightening the bolts through the stiffener to the specified torque.

Tightening torque:

60 N·m (6.12 kgf-m, 44.3 ft-lb)

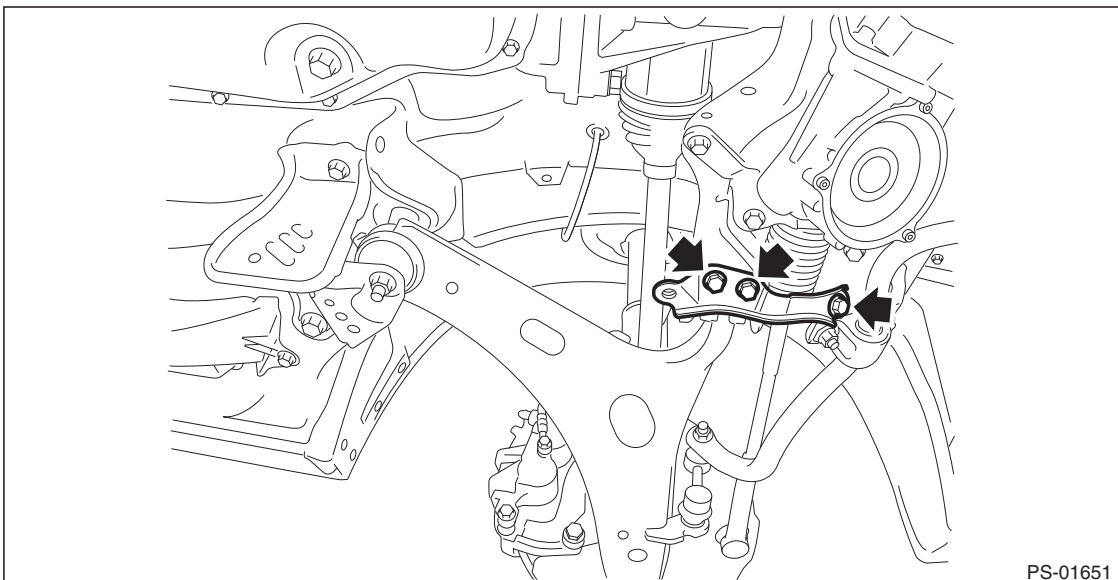


- 3) Install the universal joint assembly - steering. <Ref. to PS-14, INSTALLATION, Universal Joint.>

CAUTION:

Tighten the bolts of the universal joint assembly - steering in the order of steering gearbox side and column shaft side.

- 4) Install the front support.



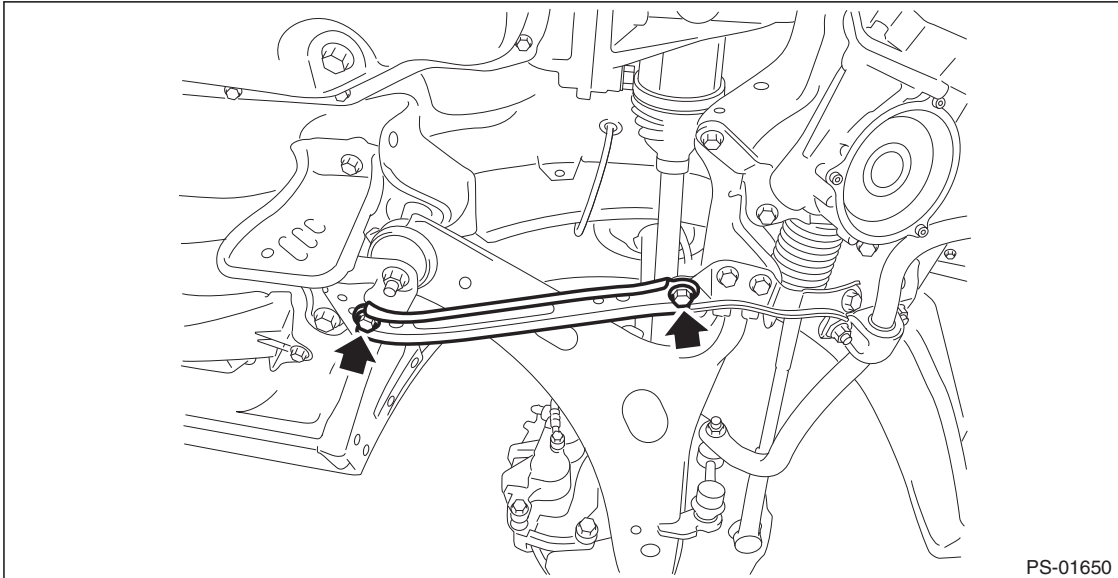
Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

5) Install the support plate - front crossmember.

Tightening torque:

60 N·m (6.12 kgf-m, 44.3 ft-lb)



6) Connect the tie-rod ends and knuckle arm.

(1) Connect the tie-rod end (a) to the housing assembly - front axle.

(2) Tighten the castle nuts (b) to the specified torque.

CAUTION:

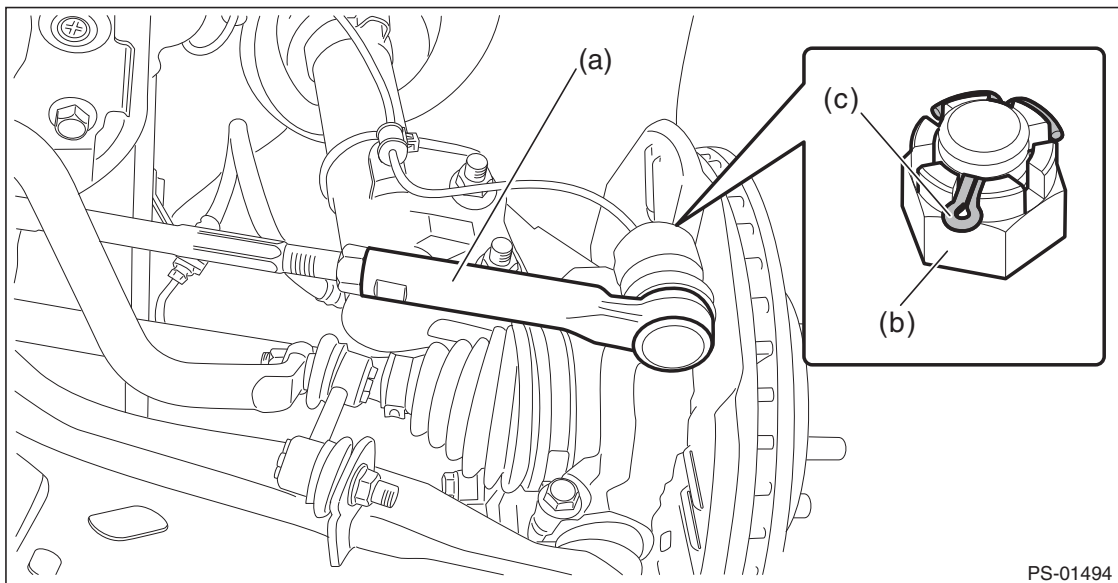
During connection, do not hit the cap at bottom of tie-rod end with a hammer.

Castle nut tightening torque:

27 N·m (2.75 kgf-m, 19.9 ft-lb)

(3) Tighten within the range of 60° so that the cotter pin hole and cutout portion of the castle nut (b) are aligned.

(4) Insert the cotter pin (c), and bend the tip of the pin to fix it.



7) Install the front crossmember - support.

Tightening torque:

60 N·m (6.12 kgf-m, 44.3 ft-lb)



Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

- 8) Install the center exhaust pipe assembly.
 - Non-turbo model: <Ref. to EX(H4DO)-15, INSTALLATION, Center Exhaust Pipe.>
 - Turbo model: <Ref. to EX(H4DOTC)-35, INSTALLATION, Center Exhaust Pipe.>
- 9) Install the under cover - front. <Ref. to EI-22, INSTALLATION, Front Under Cover.>
- 10) Install the front wheels.
- 11) Lower the vehicle.
- 12) Tighten the wheel nuts to the specified torque.

Tightening torque:

120 N·m (12.24 kgf-m, 88.5 ft-lb)

- 13) Connect the power steering control module harness connector.
- 14) Connect the battery ground terminal.

CAUTION:

When the wheel alignment has been adjusted, perform the adjustment of the steering angle sensor.
<Ref. to VDC-23, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

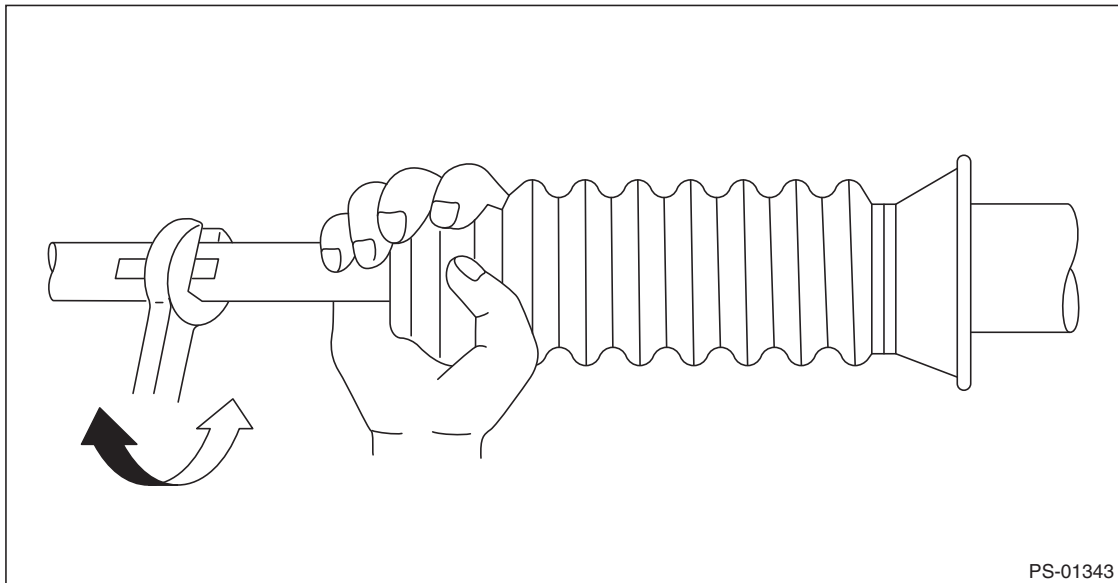
- 15) After adjusting toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:

85 N·m (8.67 kgf-m, 62.7 ft-lb)

NOTE:

When adjusting toe-in, hold the boot - steering gearbox as shown to prevent it from being rotated or twisted. If it becomes twisted, straighten it.



PS-01343

Electric Power Steering Gearbox

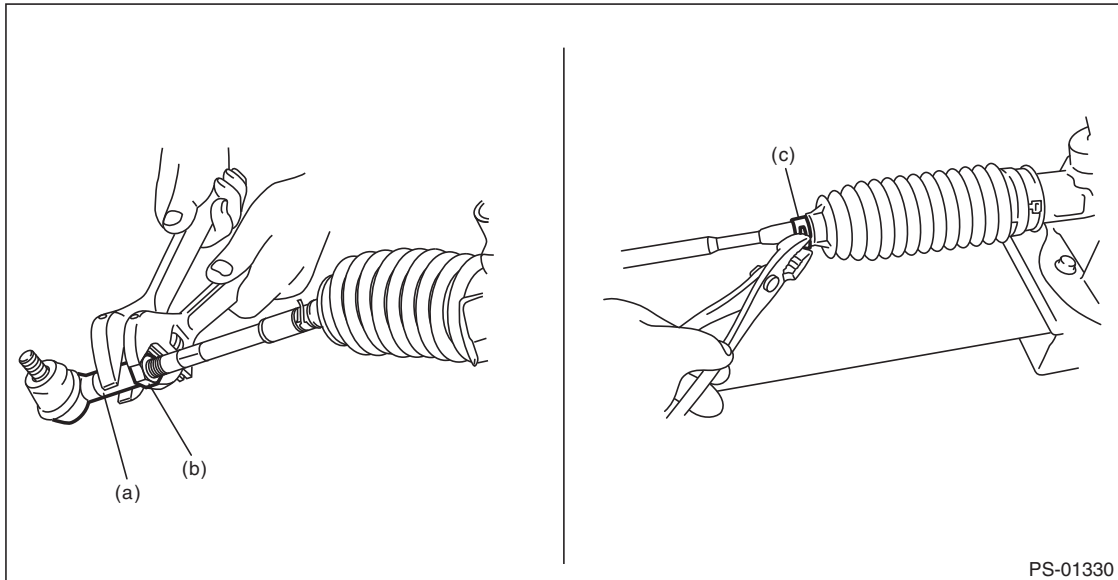
POWER ASSISTED SYSTEM (POWER STEERING)

C: DISASSEMBLY

CAUTION:

- Nut for fixing the rack is on the driver's side only. When removing the tie-rod on the passenger's side, turn over the boot - steering gearbox on the driver's side, and fix the rack during operation.
- When fixing the steering gearbox assembly in a vise, apply a wooden piece on the flange portion.

- 1) Remove the tie-rod end (a) and lock nut (b) from the steering gearbox assembly.
- 2) Remove the clip - boot tie-rod (c) located outside the boot - steering gearbox using the pliers, and then slide the boot - steering gearbox to the tie-rod end side.



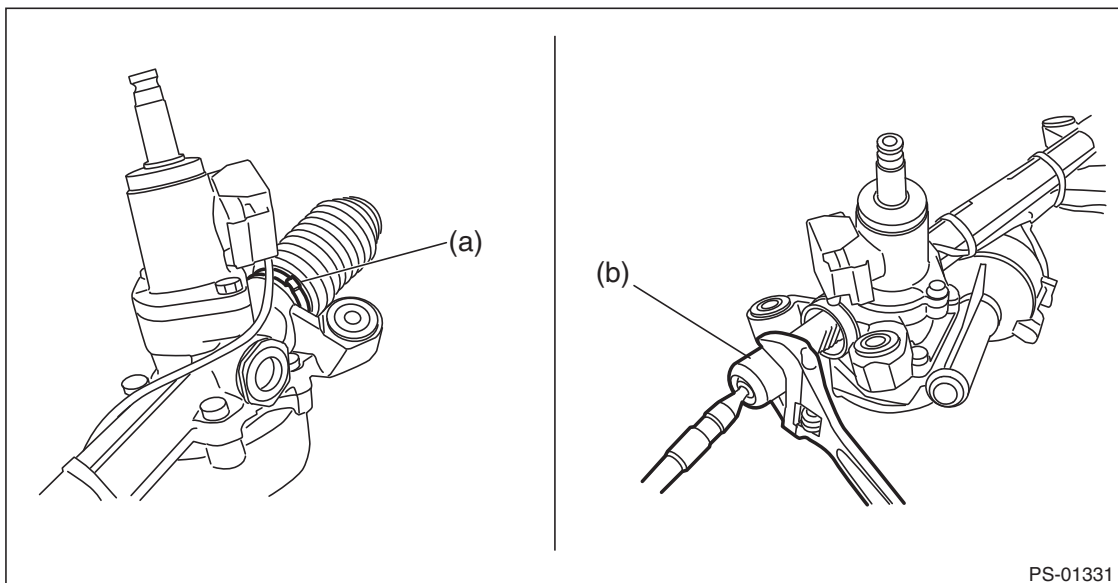
- 3) Remove the tie-rod (b) from the gearbox assembly.

- (1) Using a flat tip screwdriver, remove the band - boot (a) from the boot - steering gearbox.

NOTE:

Replace the boot - steering gearbox or the band - boot (a) if there is damage, cracks or deterioration.

- (2) Remove the tie-rod (b).



Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

D: ASSEMBLY

1) Install the tie-rod into rack.

Tightening torque:

90 N·m (9.18 kgf-m, 66.4 ft-lb)

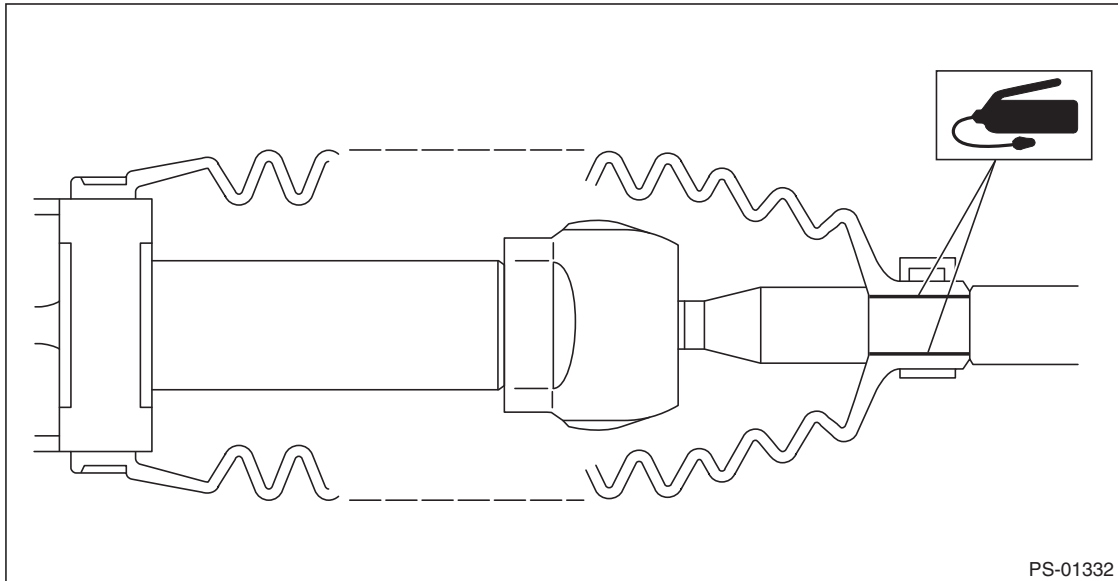
NOTE:

Check the mating face of rack and tie-rod for foreign matter such as dust etc.

2) Apply a coat of grease to the tie-rod groove, and then install the boot - steering gearbox to the housing.

NOTE:

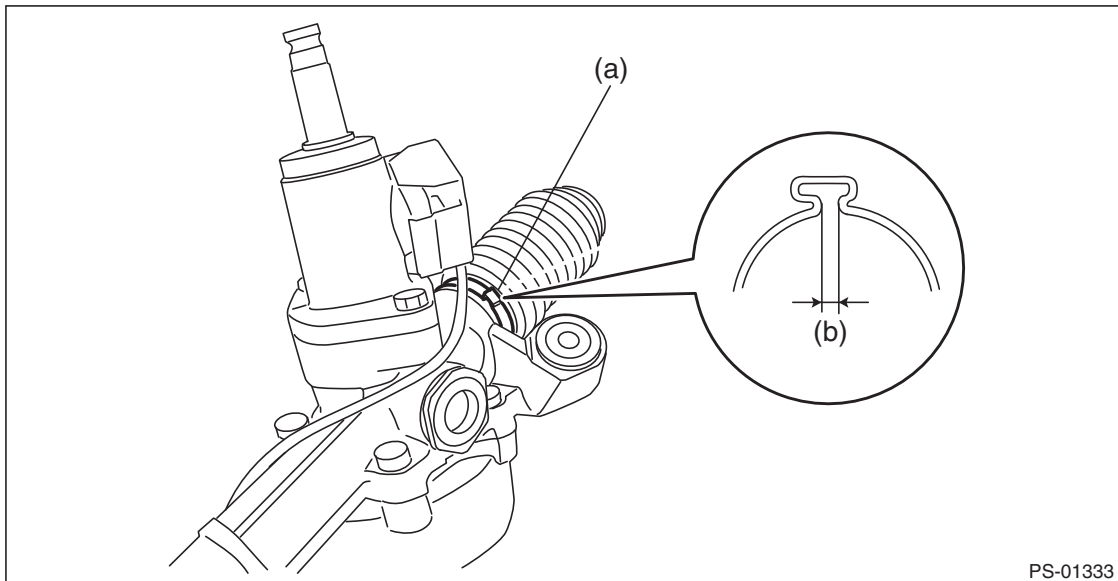
Make sure that the boot - steering gearbox is installed without unusual inflation or deflation.



3) Using the boot clamp pliers, crimp the boot so that the clearance (b) of the band - boot (a) crimp portion becomes 2 mm (0.08 in) or less.

NOTE:

Use a new band - boot.

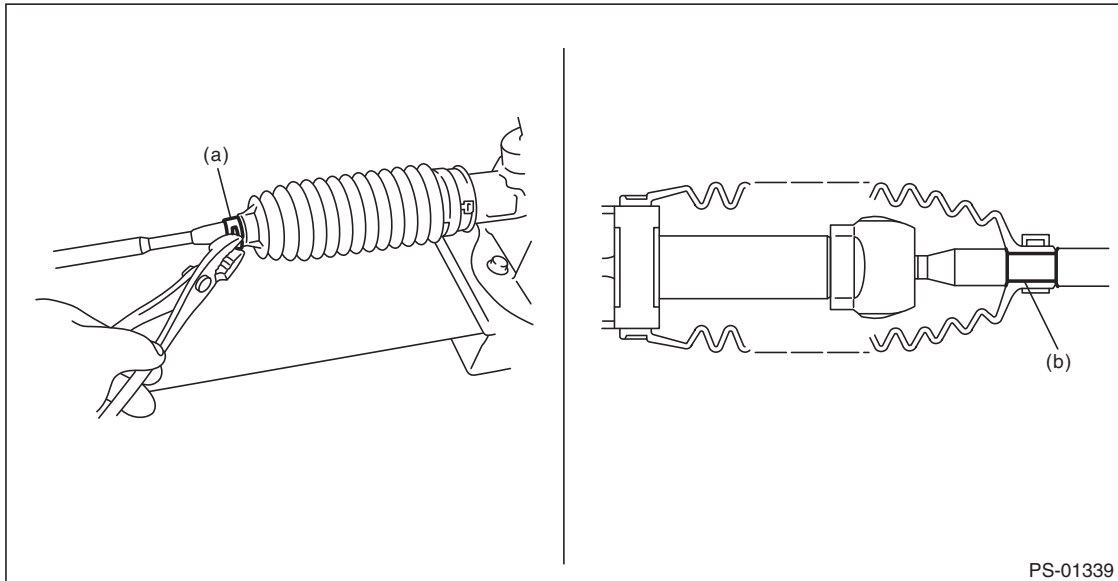


4) Fix the end of the boot - steering gearbox with clip - boot tie-rod (a).

Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

5) After installation, check that the end of the boot - steering gearbox is installed to the groove (b) of the tie-rod.



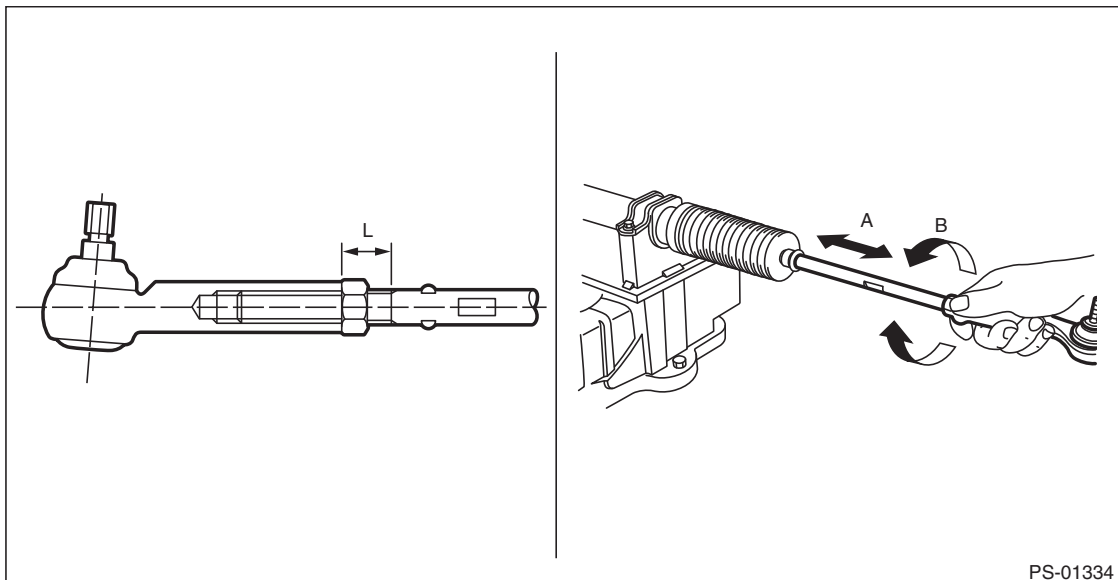
6) If the tie-rod end has been removed, screw in lock nut and tie-rod end to the threaded portion of tie-rod, and tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:

35 mm (1.38 in)

7) Inspect the steering gearbox assembly as follows:

1. "A" Holding the tie-rod end, repeat lock to lock several times as quickly as possible.
2. "B" Holding the tie-rod end, turn it slowly at a radius several times as large as possible.
3. Finally, make sure that the boot - steering gearbox is installed in the specified position without inflating.



8) Remove the steering gearbox assembly from ST.

Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

1. UNIT INSPECTION

Check components for wear, damage or other faults. Adjust or replace if necessary.

2. LIMIT

Make a measurements as follows. If it exceeds the specified service limits, adjust or replace.

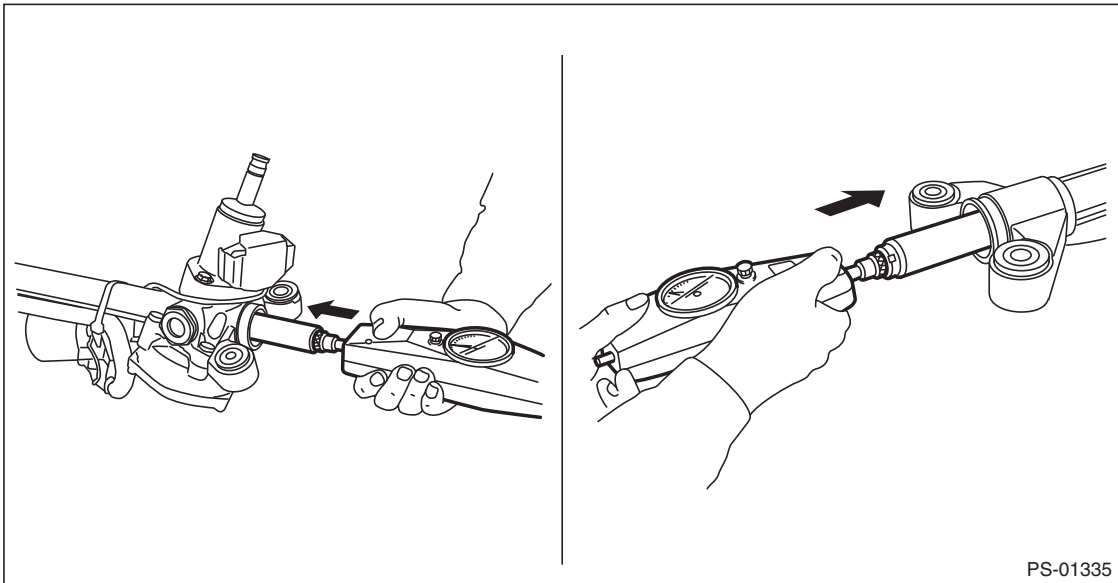
NOTE:

When fixing the steering gearbox assembly in a vise, apply a wooden piece on the flange portion.

Rack shaft sliding resistance:

Limit: 350 N (36 kgf, 79 lbf) or less

Left/right differential of sliding resistance: 20% or less



Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

3. RACK SHAFT PLAY IN THE RADIAL DIRECTION

Right-turn steering:

Service limit:

Direction ◀ ▶ : 0.4 mm (0.016 in) or less

Direction ◁ ▷ : 0.6 mm (0.024 in) or less

Left-turn steering:

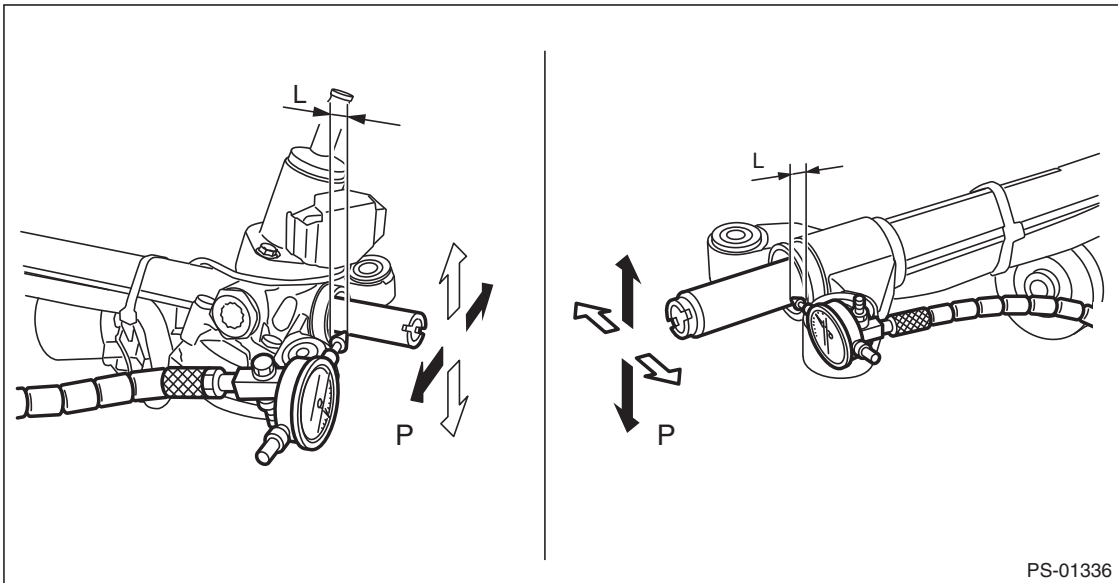
Service limit:

Direction ◁ ▷ ◀ ▶ : 0.4 mm (0.016 in) or less

Condition:

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lbf)



Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

4. INPUT SHAFT PLAY

In radial direction:

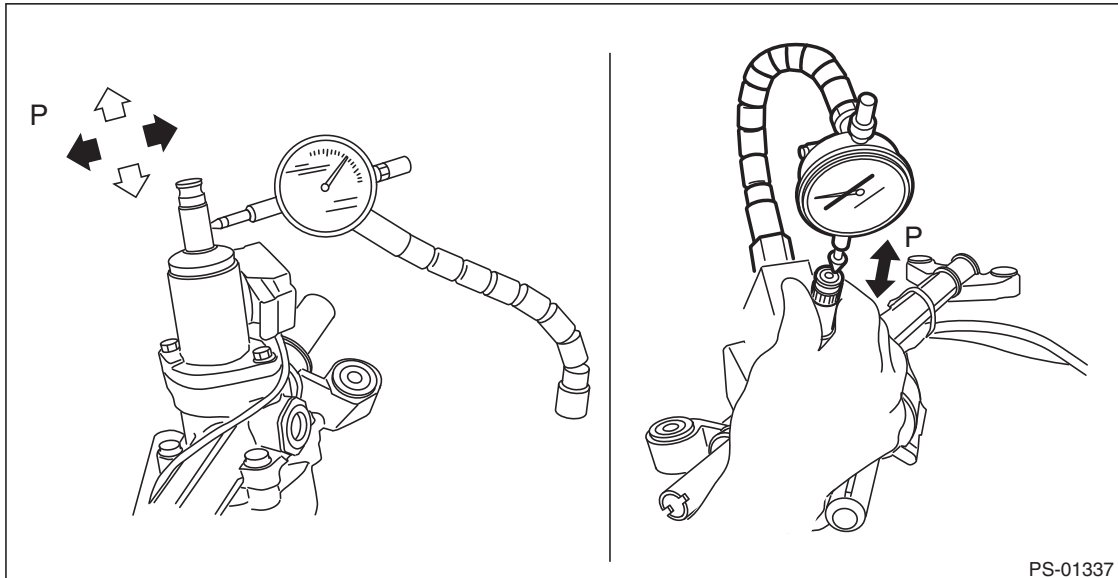
Wear limit: 0.18 mm (0.0071 in) or less

Condition: $P = 98\text{ N}$ (10 kgf, 22 lbf)

In axial direction:

Service limit: 0.27 mm (0.0106 in) or less

Condition: $P = 20 - 49\text{ N}$ (2 - 5 kgf, 4 - 11 lbf)



5. TURNING RESISTANCE OF GEARBOX

1) Using the ST, measure the rotational resistance of the steering gearbox assembly.

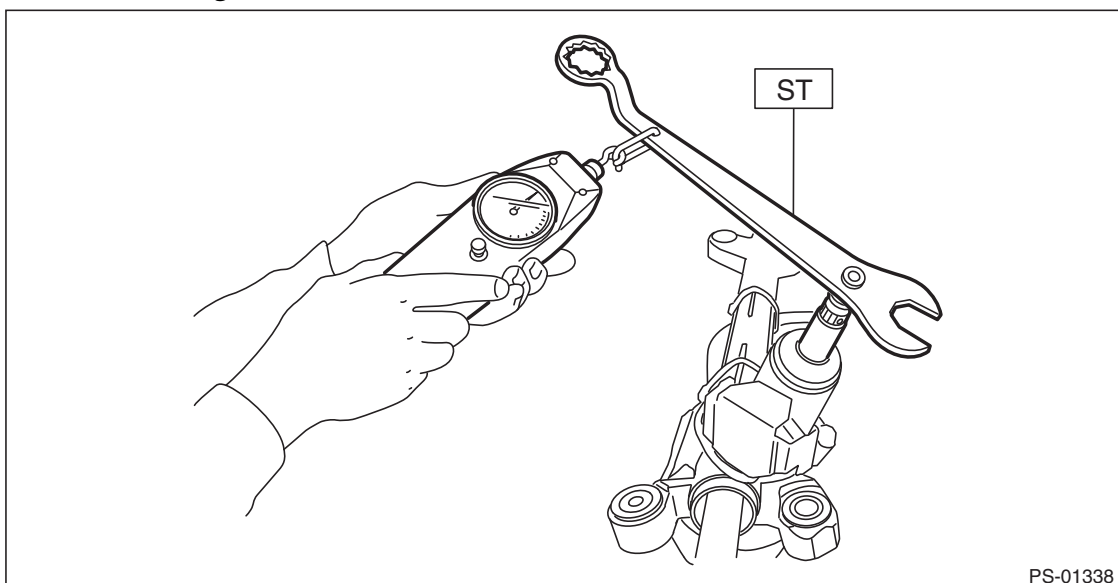
Preparation tool:

ST: SPANNER (34099PA100)

Service limit:

Maximum allowable resistance: 18.3 N (1.9 kgf, 4.1 lbf) or less

Difference between right and left rotational resistance: 20% or less



Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

F: ADJUSTMENT

1. GEARBOX BACKLASH ADJUSTMENT

- 1) Remove the steering gearbox assembly. <Ref. to PS-25, REMOVAL, Electric Power Steering Gearbox.>
- 2) Loosen the lock nut and adjusting screw.
- 3) Apply a coat of grease to the sliding surface (B) of the pad - pressure (a) and seating surface (C) of spring - gearbox (b), and then insert the pad - pressure (a) into steering body.
- 4) Charge the adjusting screw (c) with grease (D), and then insert the spring - gearbox (b) into adjusting screw. Then install on the steering body.

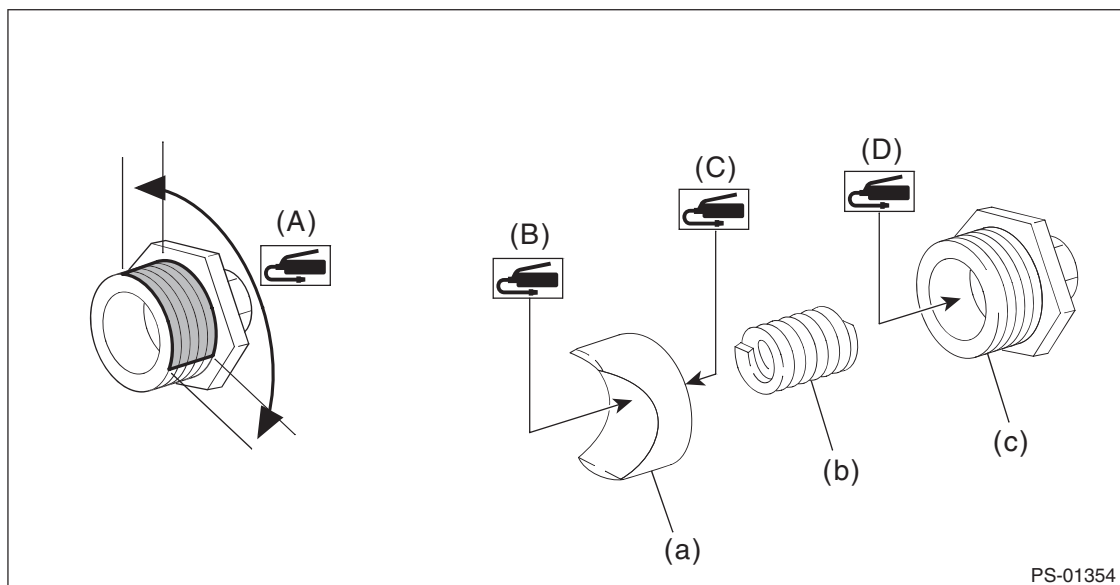
Grease:

Multemp AC-P

- 5) Apply liquid gasket to 1/3 or more (A) of entire perimeter of adjusting screw thread (c).

Liquid gasket:

THREE BOND TB-1111B



- 6) Tighten the adjusting screw to 9.8 N·m (1.0 kgf-m, 7.2 ft-lb), then loosen it.
- 7) Tighten the adjusting screw to 6 N·m (0.6 kgf-m, 4.4 ft-lb).
- 8) Loosen the adjusting screw by 20°.
- 9) While fixing the adjusting screw, tighten the lock nuts.

Tightening torque:

49.4 N·m (5.04 kgf-m, 36.4 ft-lb)

Electric Power Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

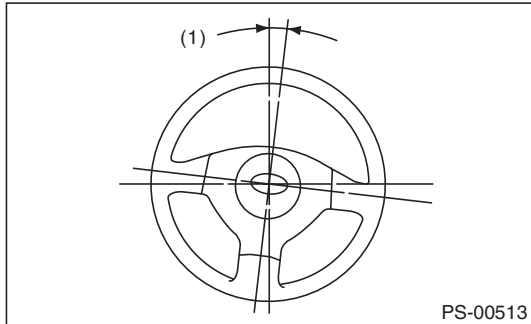
2. FRONT WHEEL ALIGNMENT ADJUSTMENT

- 1) Adjust the front toe. <Ref. to FS-13, FRONT WHEEL TOE-IN, ADJUSTMENT, Wheel Alignment.>
- 2) Check the steering angle of the wheels.

Standard of steering angle:

<i>Inner wheel</i>	<i>$38.4^{\circ} \pm 1.5^{\circ}$</i>
<i>Outer wheel</i>	<i>$33.8^{\circ} \pm 1.5^{\circ}$</i>

- 3) When the steering wheel is in the following condition, perform the steering wheel installation over again.
 - When wheels are set in the straight ahead position, the steering wheel spokes are not horizontal.
 - Error is more than 5° on the periphery of the steering wheel.



(1) 5° or less

- 4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction from each other by the same angle. Also check that there are no abnormal steering force, failure of the steering wheel to return or other faults.

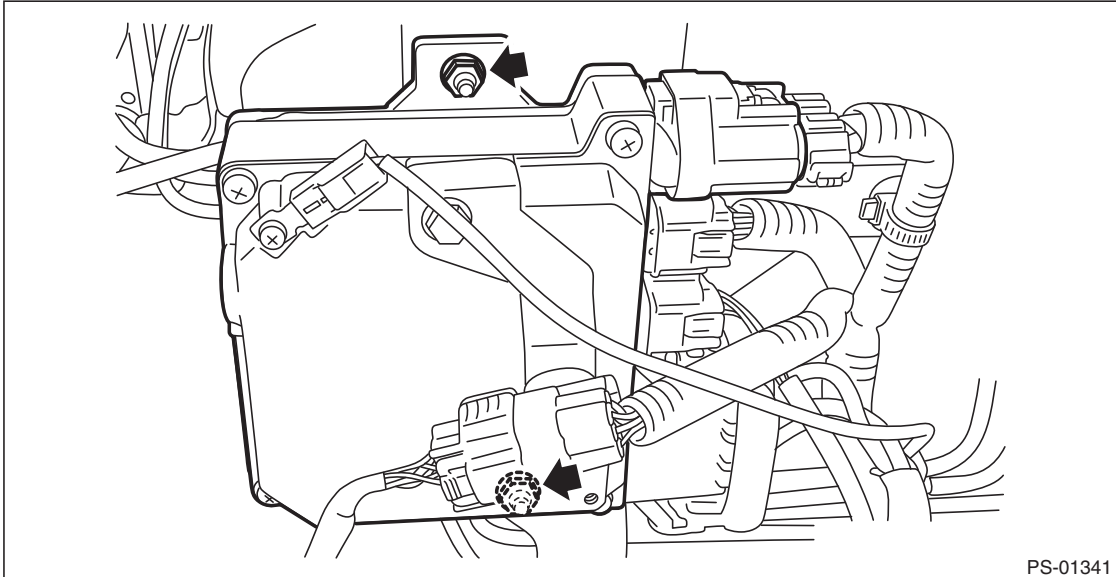
Power Steering Control Module

POWER ASSISTED SYSTEM (POWER STEERING)

7. Power Steering Control Module

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the power steering control module.
 - (1) Disconnect the connector of the power steering control module.
 - (2) Remove the nuts, and remove the power steering control module.



PS-01341

B: INSTALLATION

- 1) Install the power steering control module.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

- 2) Connect the harness connector.

CAUTION:

Make sure that the connector is securely locked.

- 3) Attach the harness bracket.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

8. General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
- Steering effort is heavy in all ranges. - Steering effort is heavy at stand still. - Steering wheel vibrates when turning.	1. Tire and wheel - Improper tire out of specifications - Improper wheel out of specification - Tires not properly inflated	Replace or reinflate.
	2. Measure the steering wheel effort. <Ref. to PS-38, TURNING RESISTANCE OF GEARBOX, INSPECTION, Electric Power Steering Gearbox.>	Adjust or replace.
- Vehicle leads to one side or the other. - Returning force of steering wheel to center is poor. - Steering wheel vibrates when turning.	1. Tire and wheel - Flat tire - Mixed use of different tires - Mixed use of different wheels - Abnormal wear of tire - Unequal tread remaining - Unequal pressure of tire	Adjust, fix or replace.
	2. Front wheel alignment - Improper or unequal caster - Improper or unequal toe-in - Loose suspension connections	Adjust or retighten.
	3. Measure the steering wheel effort. <Ref. to PS-38, TURNING RESISTANCE OF GEARBOX, INSPECTION, Electric Power Steering Gearbox.>	Adjust or replace.

NOTE:

When performing repeated steering operation with the vehicle at standstill, the steering effort may be temporarily heavy because the heat generated in the system activates the power steering protection control. This is not a malfunction caused by the steering system. After a while, it will return to normal steering effort. (In this case, the steering warning light will not come on and there will be no DTC.)

1. NOISE AND VIBRATION

NOTE:

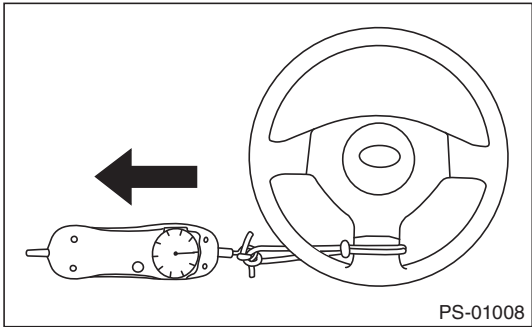
- When turning the steering wheel with the brake applied when the vehicle is parked, a screeching noise may be generated by the brake disc and pads. This is not a fault in the steering system.
- There may be a small vibration around the steering devices when turning the steering wheel at standstill, even though the component parts are operating properly.

Trouble	Possible cause	Corrective action
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary.
	Looseness of linkage, play of steering, improper tightening (looseness) of suspension joint or column assembly - steering	Retighten or replace.
	Noise emitted from inside of the gearbox	Replace the gearbox assembly.
Knocking When turning steering wheel in both directions with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust the backlash. When the noise remains after adjustment, replace the gearbox assembly.
	Insufficient tightening or play in the tie-rod or tie-rod end	Retighten or replace.
Grinding noise (intermittent) While engine is running. (While operating the steering.)	Fault inside of gearbox	Replace the gearbox assembly.
	Faulty bearing of the column assembly - steering	Apply grease or replace.
	Occurs when turning the steering wheel with brakes (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running. (with/without steering turned)	Excessive play in steering, looseness of suspension parts	Retighten.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

2. MEASUREMENT OF STEERING EFFORT

Step	Check	Yes	No
1 CHECK STEERING WARNING LIGHT.	Does the STEERING warning light illuminate?	Read the DTC, and inspect according to it.	Go to step 2.
2 CHECK STEERING WARNING LIGHT. 1) Connect the Subaru Select Monitor, and turn the steering wheel. (One lock to lock) 2) Check the "EPS operation flag" in the current data.	Is the EPS operation flag normal without displaying any DTC code?	Go to step 3.	If the EPS operation flag is "Assist limitation", stop the engine for approx. 10 minutes and perform the procedures from step 1 again.
3 CHECK STEERING EFFORT. 1) Stop the vehicle on paved road. 2) Set the tire air pressure to the specification. 3) Start the engine. 4) Run the engine at idle. 5) Install a spring scale on the steering wheel. 6) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts. 	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lbf)?	Go to step 4.	Go to step 8.
4 CHECK STEERING EFFORT. 1) Stop the engine. 2) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.	Is the steering effort less than 294.2 N (30 kgf, 66.2 lbf)?	Go to step 5.	Perform the inspection or adjustment around the suspension part.
5 CHECK TORQUE SENSOR OUTPUT VALUE. 1) Connect the Subaru Select Monitor. 2) Read the output of torque sensor voltage. NOTE: When measuring, place the steering wheel at the center position.	Is the voltage 2.425 — 2.575 V?	Go to step 6.	Replace the gear-box assembly. <Ref. to PS-25, Electric Power Steering Gear-box.>
6 CHECK TORQUE SENSOR OUTPUT VALUE. 1) Remove the universal joint assembly - steering. 2) Connect the Subaru Select Monitor. 3) Read the output of torque sensor voltage.	Is the voltage 2.425 — 2.575 V?	Go to step 7.	Replace the gear-box assembly. <Ref. to PS-25, Electric Power Steering Gear-box.>

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

Step	Check	Yes	No
7 CHECK TORQUE SENSOR OUTPUT VALUE. 1) Remove the universal joint assembly - steering. NOTE: Check that the universal joint assembly - steering moves up and down smoothly without installing the bolt. Then tighten the bolts first on the gearbox side and then on the column shaft side. 2) Connect the Subaru Select Monitor. 3) Read the output of torque sensor voltage.	Is the voltage 2.425 — 2.575 V?	Go to step 8.	Check the universal joint assembly - steering. <Ref. to PS-25, Electric Power Steering Gearbox.>
8 CHECK STEERING WHEEL EFFORT. 1) Remove the universal joint assembly - steering. 2) Measure the steering wheel effort.	Is the steering effort less than 2.26 N (0.23 kgf, 0.51 lbf)?	Go to step 9.	Replace the column assembly - steering. <Ref. to PS-25, Electric Power Steering Gearbox.>
9 CHECK STEERING WHEEL EFFORT. Measure the steering wheel effort.	Is the difference of steering effort between right and left less than 20%?	Go to step 10.	Replace the column assembly - steering. <Ref. to PS-18, Steering Column.>
10 CHECK UNIVERSAL JOINT ASSEMBLY - STEERING. Measure the swing torque of joint. (Yoke of column assembly - steering side) <Ref. to PS-16, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint assembly - steering less than 8.1 N (0.81 kgf, 1.84 lbf)?	Go to step 11.	Replace the universal joint assembly - steering with a new part. <Ref. to PS-13, Universal Joint.>
11 CHECK UNIVERSAL JOINT ASSEMBLY - STEERING. Measure the swing torque of joint. (Yoke of gearbox side) <Ref. to PS-16, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint assembly - steering less than 6.8 N (0.68 kgf, 1.54 lbf)?	Go to step 12.	Replace the universal joint assembly - steering with a new part. <Ref. to PS-13, Universal Joint.>
12 CHECK FRONT WHEEL. Check the front wheels.	Does the front wheels have unsteady revolution or rattling, or does the brake drag?	Inspect, readjust and replace if necessary.	Go to step 13.
13 CHECK TIE-ROD ENDS. Remove the tie-rod ends.	Does the tie-rod ends of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 14.
14 CHECK BALL JOINT. Remove the ball joint.	Does the ball joints of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 15.
15 CHECK GEARBOX. Measure the rotating of gearbox. <Ref. to PS-36, LIMIT, INSPECTION, Electric Power Steering Gearbox.>	Is the turn resistance of the steering gearbox less than 18.3 N (1.9 kgf, 4.1 lbf)? Is the difference between the right and left rotational resistances less than 20%?	Go to step 16.	Replace the gearbox assembly. <Ref. to PS-25, Electric Power Steering Gearbox.>
16 CHECK GEARBOX. Measure the sliding of gearbox.	Is the sliding resistance of the steering gearbox less than 350 N (35 kgf, 79 lbf)? Is the difference between the right and left sliding resistances less than 20%?	Steering effort is normal.	Replace the gearbox assembly. <Ref. to PS-25, Electric Power Steering Gearbox.>

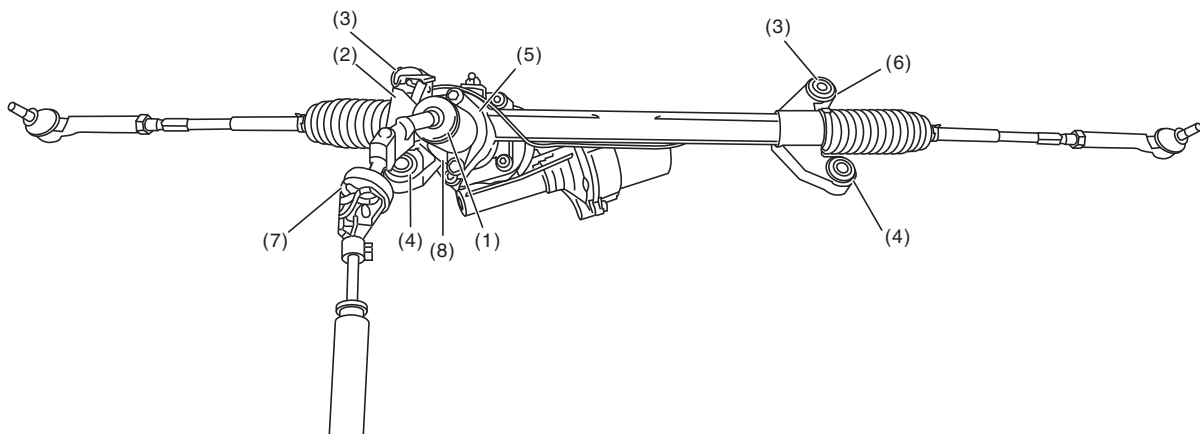
General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

3. CLEARANCE CHECK (ELECTRIC TYPE)

This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

Location	Minimum allowance mm (in)
(1) Stub housing to DOJ (MT model)	15 (0.59)
(2) Torque sensor to crossmember	5 (0.20)
(3) Cannon mount to crossmember	There must be no contact
(4) Cannon mount to crossmember	3 (0.12)
(5) Stub housing to engine mount	15 (0.59)
(6) Canon mount to exhaust pipe	15 (0.59)
(7) Universal joint column side yoke to master cylinder (closest point of approach when the universal joint turns by 360°)	5 (0.20)
(8) Wheel housing to Exhaust pipe (LHD model)	13 (0.51)



PS-00910

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

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by Seller "4SubaruManuals"



POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

PS(diag)

	Page
1. Basic Diagnostic Procedure	2
2. Check List for Interview	4
3. General Description	7
4. Electrical Component Location	8
5. Control Module I/O Signal	9
6. Subaru Select Monitor	11
7. Read Diagnostic Trouble Code (DTC)	15
8. Inspection Mode	16
9. Clear Memory Mode	17
10. STEERING Warning Light	18
11. List of Diagnostic Trouble Code (DTC)	21
12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)	23



Basic Diagnostic Procedure

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:

- The power steering control module continues to operate after the engine stops and calculate the temperature in the control module. Therefore, before starting service of the power steering system which requires disconnection of the connector, stop the engine and allow approx. 10 minutes until the control module becomes cold.
- Before removal or installation, be sure to remove any foreign matter (dust, moisture, oil, etc.) from the power steering control module connector.

NOTE:

- Shake the connector at the suspected trouble location to check for open or short circuits of the harness.
- Refer to "Check List for Interview". <Ref. to PS(diag)-4, Check List for Interview.>

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to PS(diag)-4, Check List for Interview.> 2) Check the illumination status of the STEERING warning light while the engine is running. 3) Before performing diagnostics, check components which might affect power steering problems. <Ref. to PS(diag)-7, INSPECTION, General Description.> 4) Save the data of «Overheating protection intervention history», «IGN count from overheating protection (most recent) (previous) (before previous)», and «Assist limit history (low voltage, high voltage)» using Subaru Select Monitor. <Ref. to PS(diag)-11, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>	Are components that might influence the power steering problem operating properly?	Go to step 2.	Repair or replace each component.
2 CHECK INDICATION OF DTC. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. 4) Read the DTC using the Subaru Select Monitor. <Ref. to PS(diag)-15, OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of the Subaru Select Monitor cannot be executed properly, check the communication circuit. <Ref. to PS(diag)-12, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>	Is DTC displayed?	Record the DTC, time stamp and freeze frame data. Go to step 4. NOTE: • For the time stamp, refer to LAN section. <Ref. to LAN(diag)-6, TIME STAMP, CAUTION, General Description.> • Depending on DTCs, time stamp may not be stored.	Go to step 3.
3 PERFORM GENERAL DIAGNOSTICS. 1) If the STEERING warning light is illuminated while the engine is running, perform the Clear Memory Mode. <Ref. to PS(diag)-17, OPERATION, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to PS(diag)-16, Inspection Mode.> 3) Read the DTC. <Ref. to PS(diag)-15, OPERATION, Read Diagnostic Trouble Code (DTC).> Check the DTC is not displayed.	Does the STEERING warning light illuminate at ignition switch ON, and turn off two seconds after the engine is started?	Finish the diagnosis.	<Ref. to PS(diag)-14, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

PS(diag)-2

Basic Diagnostic Procedure

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

Step	Check	Yes	No
4 PERFORM DIAGNOSIS. 1) Refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to PS(diag)-21, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the cause of trouble. 3) Check the illumination status of the STEERING warning light while the engine is running, and if the warning light is lit, perform Clear Memory Mode. <Ref. to PS(diag)-17, OPERATION, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to PS(diag)-16, Inspection Mode.> 5) Read the DTC. <Ref. to PS(diag)-15, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Repeat step 4 until DTC is not shown.	Finish the diagnosis.



Check List for Interview

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following items regarding condition of the vehicle.

1. TROUBLE STATUS

Phenomenon of the vehicle	☐ Steering is heavy ☐ Steering is not smooth ☐ Steering is unstable (wondering) ☐ Steering does not return to center ☐ Steering is not straight ☐ Steering force required is not the same for right and left turn ☐ Steering force required is not even ☐ Steering is too light ☐ Noise ☐ Vibration ☐ STEERING warning light illuminates ☐ Other
Frequency	☐ Always ☐ Sometimes ☐ Immediately after starting the engine ☐ Only once ☐ Other ☐ Recovers after leaving it for minutes
Steering wheel operation	☐ Dry steering ☐ When turning ☐ Quick steering ☐ Slow steering ☐ Returning the steering wheel ☐ Releasing the steering wheel ☐ Only supporting the steering wheel by hand ☐ Repetitive dry steering
Steering wheel status / direction	☐ Around center position ☐ Near end of lock to lock ☐ When turning the steering to right ☐ When turning the steering to left ☐ Both to right and to left ☐ (1) Steering angle: degrees ☐ (2) Maneuvering time: minutes ☐ Slow steering ☐ Quick steering ☐ While holding the steering ☐ When repeating the dry wheel operation
Vehicle speed	☐ Stall 0 km/h (0 MPH) ☐ Very low speed — 20 km/h (— 12 MPH) ☐ Low speed — 40 km/h (— 25 MPH) ☐ Medium speed — 80 km/h (— 50 MPH) ☐ High speed — 80 km/h or more (— 50 MPH or more) ☐ At starting ☐ While accelerating ☐ While decelerating ☐ When accelerating rapidly ☐ When decelerating rapidly ☐ Other
Engine speed	☐ Idling ☐ (1) Around rpm ☐ (2) rpm — rpm ☐ (3) rpm or more / or less

Check List for Interview

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

2. STATE OF STEERING WARNING LIGHT

STEERING warning light illuminates	☐ Always ☐ Sometimes ☐ Only once ☐ Does not illuminate ☐ Other
Ignition key position	☐ LOCK ☐ ACC ☐ ON (when starting engine) ☐ START ☐ ON (when starting engine, while engine is running) ☐ ON (when starting engine, when engine is at a standstill)
Timing	☐ Immediately after turning the ignition ON ☐ Immediately after turning the ignition to START ☐ Idling ☐ While accelerating ☐ While decelerating ☐ When cruising at — km/h (MPH) ☐ When other electrical parts are operating (parts name: operating condition:)



Check List for Interview

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

3. ENVIRONMENT

a) Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Others:							
b) Outside temperature	☐ °C (°F)							
c) Road	☐ Inner city ☐ Suburbs ☐ Highway ☐ Local street ☐ Alley way ☐ Private road ☐ Parking lot ☐ Mountain road ☐ Paved road ☐ Unpaved road ☐ Gravel road ☐ Sandy place ☐ Muddy road ☐ Concrete road ☐ Stone pavement ☐ Racetrack ☐ Others:							
d) Road surface	☐ Dry ☐ Wet ☐ Covered with fresh snow ☐ Covered with hardened snow ☐ Others:							
e) Tire	☐ Tire chain ☐ Studless tire ☐ T-type tire (front RH, front LH, rear RH, rear LH)							
f) Tire inflation pressure	Front RH:	kPa	Front LH:	kPa	Rear RH:	kPa	Rear LH:	kPa
g) Degree of wear	Front RH:	mm (in)	Front LH:	mm (in)	Rear RH:	mm (in)	Rear LH:	mm (in)
h) Genuine part	☐ Yes ☐ No Record after-market parts if any. (Steering wheel, audio, tires, and similar parts)							
i) Condition of suspension alignment								
j) Electrical load conditions	☐ Audio ☐ Air conditioner ☐ Other							
k) Loaded state	Condition:							
l) Repair parts	☐ None ☐ Provided Contents:							
m) Others								

General Description

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

3. General Description

A: CAUTION

1. SRS AIRBAG SYSTEM

The airbag system wiring harness is routed near the power steering control module.

CAUTION:

- Do not use electrical test equipment on wiring harness and connector circuits of the airbag system.
- Be careful not to damage the airbag system wiring harness during maintenance of the power steering control module.

B: INSPECTION

Before performing diagnosis, check the following items which might be affecting the power steering problem.

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage: 12 V or more (must not drop below 10 V during operation under electrical load)

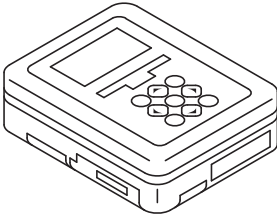
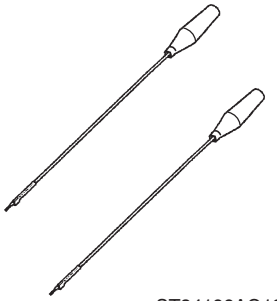
Specific gravity: 1.260 or more

2. TIRES

Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.
 ST34199AG100	34199AG100	SPECIAL TOOL HARNESS	Used for troubleshooting the electrical system.

2. GENERAL TOOL

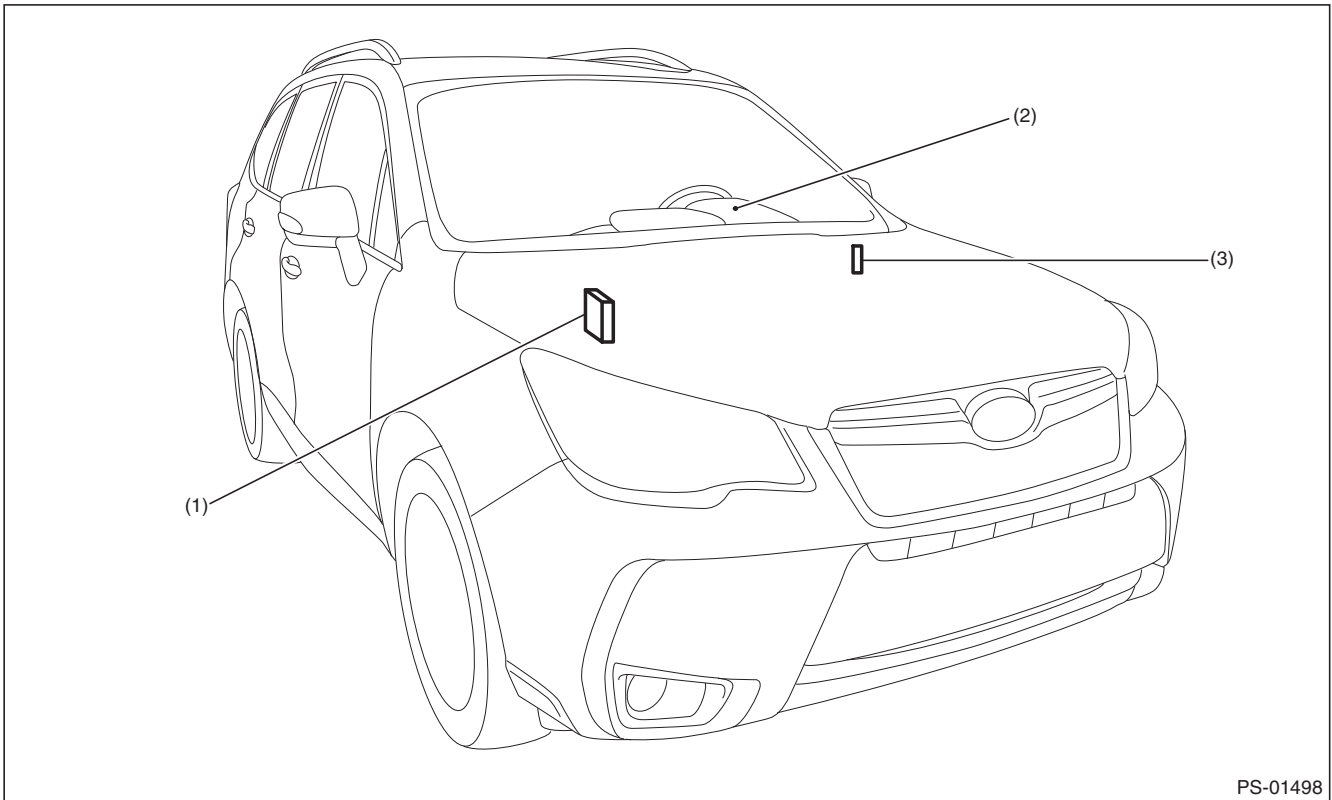
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

Electrical Component Location

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

4. Electrical Component Location

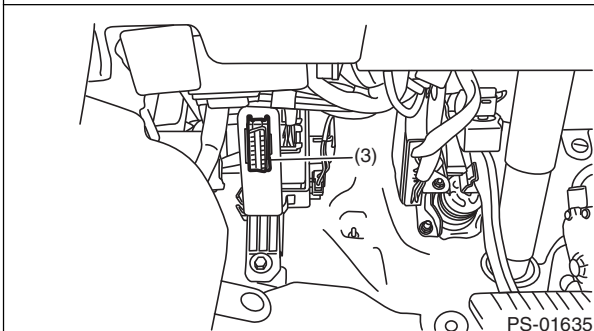
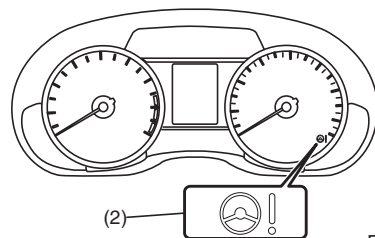
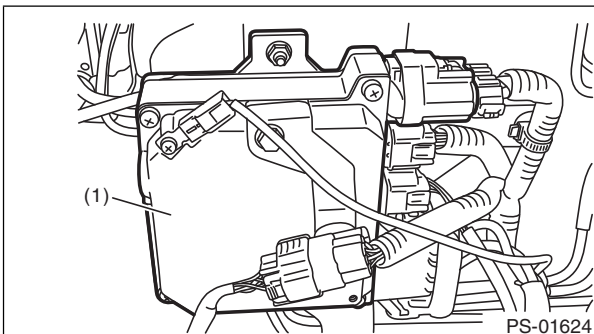
A: LOCATION



(1) Power steering control module

(2) STEERING warning light

(3) Data link connector



SUBARU.

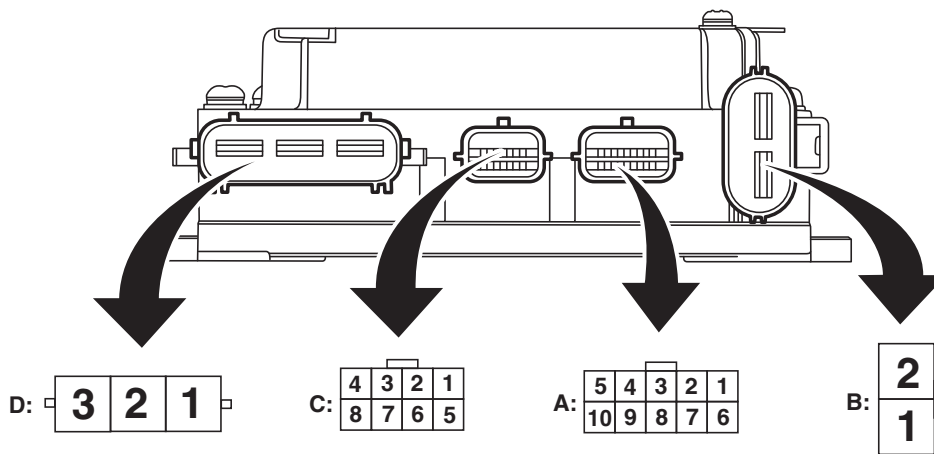


Control Module I/O Signal

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



PS-01241

NOTE:

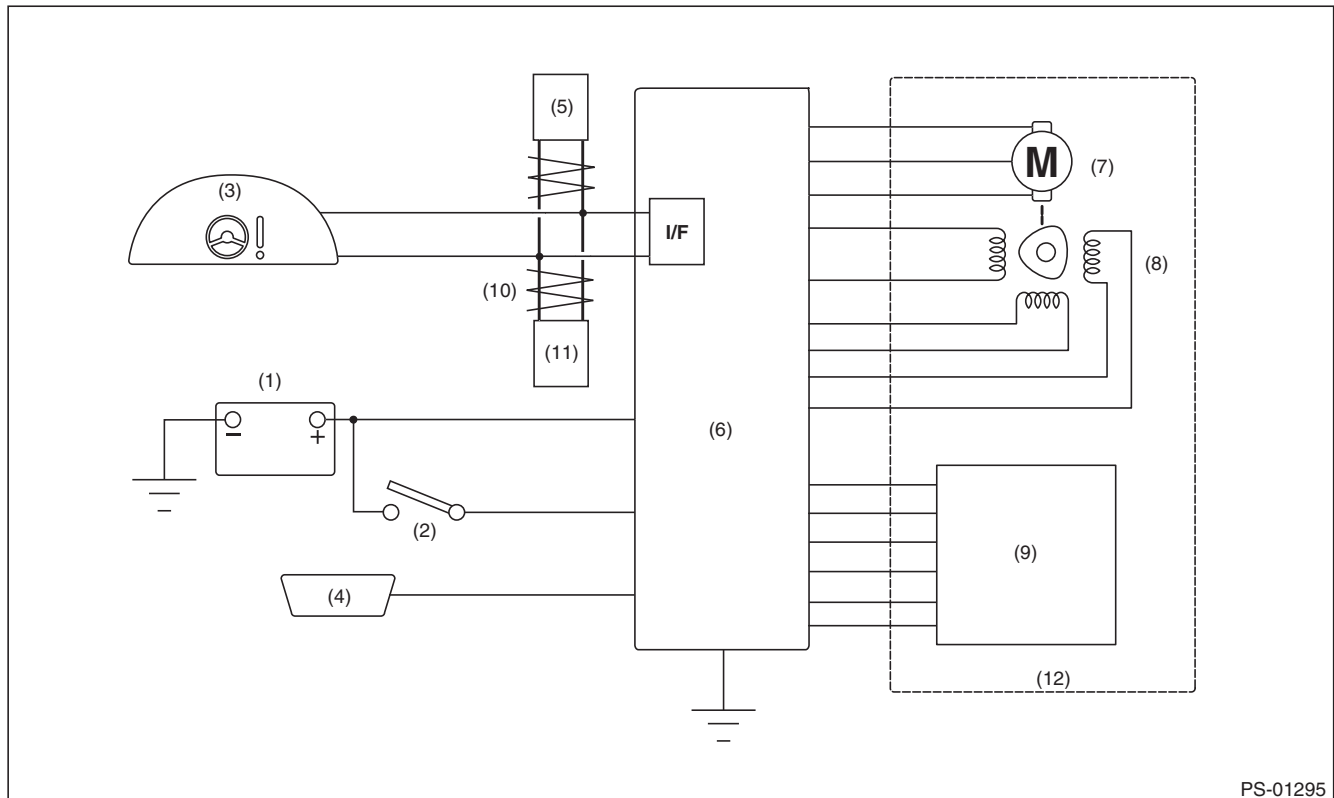
The terminal numbers of the power steering control module connectors are as indicated in the figure.

Content	Terminal No.	Input/output signal
		Measured value and measuring conditions
Power supply (IG SW)	A1	Battery voltage is detected with the ignition switch ON when measuring between A1 — B1.
Shield GND	A3	0 V is constantly detected.
Main torque sensor	A4	The voltage changes when the steering is operated to the right or left with the ignition switch ON.
Sub torque sensor	A5	The voltage changes when the steering is operated to the right or left with the ignition switch ON.
CAN communication	A6	Digital signal; can not be measured
CAN communication	A7	Digital signal; can not be measured
Torque sensor operating power supply	A8	Approximately 8 V is detected with ignition switch ON.
Torque sensor ground	A9	0 V is constantly detected.
Torque sensor standard power supply	A10	Approximately 3 V is detected with ignition switch ON.
Ground	B1	Battery voltage is constantly detected when measuring between B1 — B2.
Power supply	B2	
Resolver S1	C1	Varies depending on the operational status of the motor.
Resolver S3	C2	
Resolver S2	C3	
Resolver S4	C4	
Excitation power supply for resolver	C5	
Common output	C6	
Motor U phase	D1	Varies depending on the motor output.
Motor V phase	D2	
Motor W phase	D3	

Control Module I/O Signal

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

B: WIRING DIAGRAM



- | | | |
|---|-----------------------------------|--------------------------------|
| (1) Battery | (5) Engine control module (ECM) | (9) Torque sensor (main & sub) |
| (2) Ignition switch | (6) Power steering control module | (10) CAN communication |
| (3) STEERING warning light (combination meter) | (7) Motor | (11) VDC CM |
| (4) Data link connector (for Subaru Select Monitor) | (8) Resolver sensor | (12) Steering gearbox |

Subaru Select Monitor

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

6. Subaru Select Monitor

A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

2. READ CURRENT DATA

For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

Display	Contents to be displayed	Range	Unit
Torque sensor main output	Main torque sensor output voltage is displayed.	0 — 5	V
Torque sensor sub output	Sub torque sensor output voltage is displayed.	0 — 5	V
Torque sensor reference voltage	Torque sensor standard voltage is displayed.	0 — 5	V
Power Supply Current	The current flowing to CM is displayed.	-128 — 127	A
Vehicle Speed	Vehicle speed is displayed. (CAN communication data)	0 — 255	km/h
Engine Speed	Engine speed is displayed. (CAN communication data)	0 — 12750	rpm
CU Sensing Current(q)	The current flowing to the motor relay is displayed.	-128 — 127	A
3-phase motor current (U-phase)	The U phase actual current value as calculated by the micro-computer from the torque sensor input is displayed.	-128 — 127	A
3-phase motor current (V-phase)	The V phase actual current value as calculated by the micro-computer from the torque sensor input is displayed.	-128 — 127	A
Motor angular speed	Data from the resolver sensor is displayed.	-4096 — 4064	rpm
CU Temperature	The thermistor temperature of the steering control module is displayed.	-50 — 205	°C
Power Supply Voltage	Battery voltage is displayed.	0 — 25.5	V
Torque Sensor Power Supply	The power supply voltage output to the torque sensor is displayed.	0 — 10.2	V
IG Voltage	The power supply voltage supplied to the ECM is displayed.	0 — 25.5	V
CAN Bus Status	Either Active/Passive/Bus Off is displayed.	Active	—
EPS operating condition	Either Normal/Assist Stop/Assist Limitation is displayed.	Normal	—
CU Target current(q)	The motor target current value required for assist is displayed.	-128 — 127	A
Steering Angle	Steering angle of steering wheel is displayed.	-640 — 635	deg
Reading assist MAP	Either MAP1/MAP2/MAP3 is displayed.	MAP1	—
Overheating protection intervention history	Number of interventions to the overheat protection control (assist limitation for protecting the power steering from overheating)*1	0 — 250	times
IG Count after ECU Overheat Protection(latest)	Number of times the ignition switch is ON from the intervention to overheat protection control (most recent) until now*2	0 — 65000	times
IG Count after ECU Overheat Protection(Previous)	Number of times the ignition switch is ON from the intervention to overheat protection control (previous) until now*2	0 — 65000	times
IG Count after ECU Overheat Protection(Before Previous)	Number of times the ignition switch is ON from the intervention to overheat protection control (before previous) until now*2	0 — 65000	times
Assist limit history (low voltage, high voltage)	Number of intervention to assist limit when the power supply voltage is low or high*1	0 — 250	times

NOTE:

- *1 When the value exceeds the maximum of 250 times, 250 is displayed.
- *2 When there is no intervention of the overheating protection control, "65535" is displayed. If an error such as control unit memory error, etc. occurs, "65534" is displayed.

3. FREEZE FRAME DATA

NOTE:

- Freeze frame data stored at the time of trouble occurrence is shown on the display.
- Information of the oldest trouble is stored as the freeze frame data in memory.
- One freeze frame data is stored.

Subaru Select Monitor

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:

- Defective harness connector
- Defective power steering control module

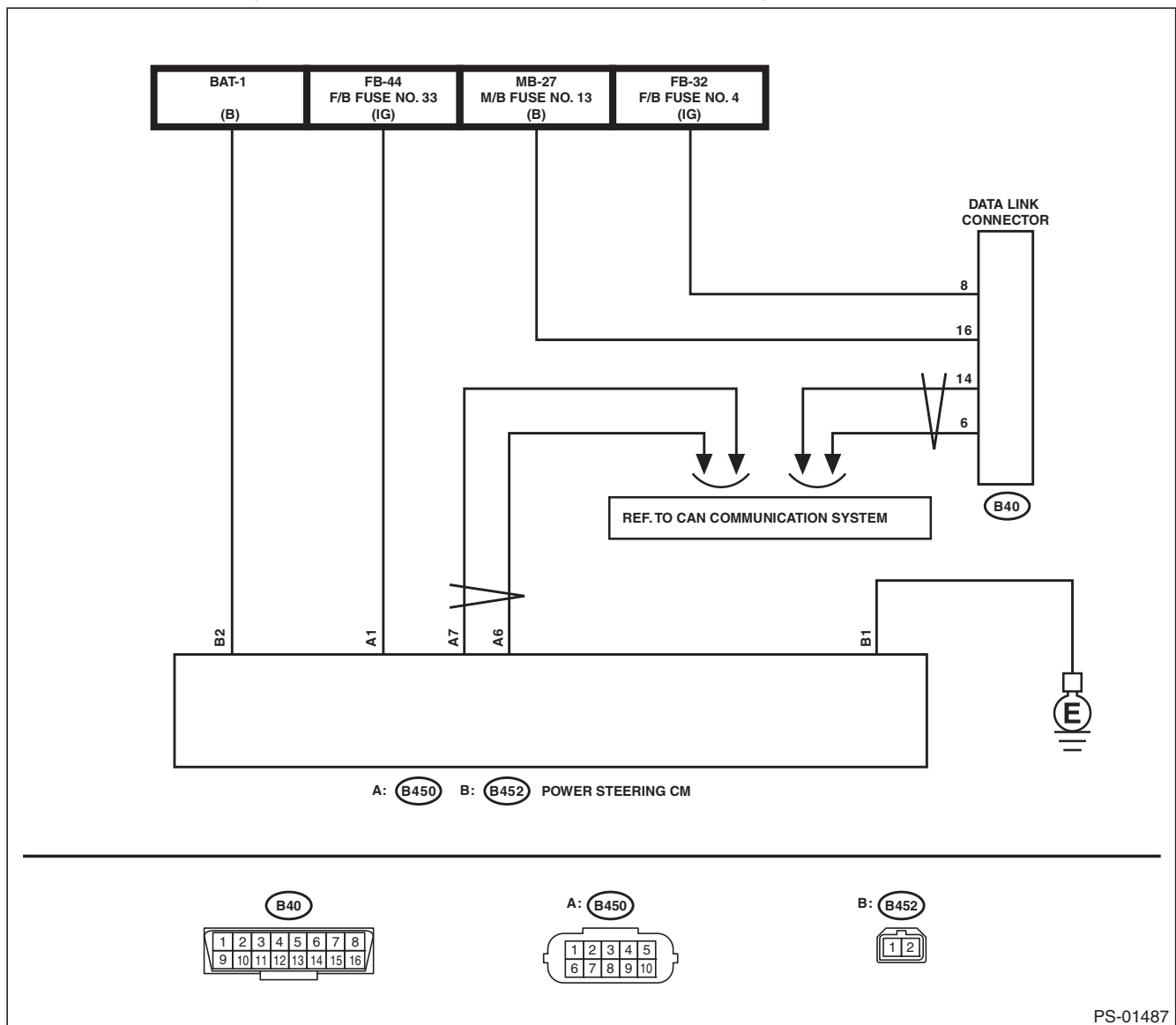
TROUBLE SYMPTOM:

- Communication is impossible between the power steering control module and Subaru Select Monitor.
- After starting the engine, the STEERING warning light does not illuminate but steering effort is heavy.

WIRING DIAGRAM:

Electric power steering system <Ref. to WI-163, Electric Power Steering System.>

CAN communication system <Ref. to WI-96, CAN Communication System.>



Subaru Select Monitor

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK IGNITION SWITCH.	Is the ignition switch ON?	Go to step 2.	Turn the ignition switch to ON, and select the power steering mode using the Subaru Select Monitor.
2	CHECK BATTERY. 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage 11 V or more?	Go to step 3.	Charge or replace the battery.
3	CHECK BATTERY TERMINAL.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step 4.
4	CHECK POWER STEERING CONTROL MODULE CONNECTOR INSTALLATION. Turn the ignition switch to OFF.	Is the power steering control module connector inserted into the power steering control module until the clamp locks?	Go to step 5.	Insert the power steering control module connector into the power steering control module.
5	CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-99, List of Diagnostic Trouble Code (DTC).>	Go to step 6.
6	CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to ON. 2) Check whether communication to electric power steering system can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Check DTC of electric power steering system. <Ref. to PS(diag)-15, Read Diagnostic Trouble Code (DTC).>	Go to step 7.
7	CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power supply voltage between the power steering control module connector and chassis ground. Connector & terminal (B450) No. 1 (+) — Chassis ground (–): (B452) No. 2 (+) — Chassis ground (–):	Is the voltage 10 — 15 V?	Go to step 8.	Repair the open circuit in the harness between the power steering control module and the battery.
8	CHECK HARNESS CONNECTOR BETWEEN POWER STEERING CONTROL MODULE AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the power steering control module. 3) Measure the resistance of harness between power steering control module connector and chassis ground. Connector & terminal (B452) No. 1 — Chassis ground:	Is the resistance less than 10 Ω?	Go to step 9.	Repair the open circuit of the power steering control module ground circuit and the poor contact of connector.
9	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact of power steering control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the power steering control module. <Ref. to PS-41, Power Steering Control Module.>



Subaru Select Monitor

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

2. WITHOUT DTC

DETECTING CONDITION:

- Defective combination meter
- Open circuit of harness

TROUBLE SYMPTOM:

- The STEERING warning light will not turn off.
- "No diagnostic Code Present" will be displayed on the Subaru Select Monitor.

NOTE:

When the STEERING warning light is OFF and "No diagnostic Code Present" is displayed on Subaru Select Monitor when all DTCs are read, the system is operating properly.

Step	Check	Yes	No
1 CHECK LAN SYSTEM. Perform the diagnosis for LAN system using the Subaru Select Monitor. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Is DTC U0131 detected?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-99, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK COMBINATION METER. Check the STEERING warning light when the ignition switch is turned from OFF to ON.	Does the STEERING warning light illuminate at ignition switch ON, and turn off two seconds after the engine is started?	Finish the diagnosis.	Replace the combination meter. <Ref. to IDI-18, Combination Meter.>



Read Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to PS(diag)-21, List of Diagnostic Trouble Code (DTC).>

Inspection Mode

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as much as possible.

Clear Memory Mode

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

9. Clear Memory Mode

A: OPERATION

For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

STEERING Warning Light

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

10. STEERING Warning Light

A: STEERING WARNING LIGHT DOES NOT COME ON

1. POWER STEERING ASSIST ENABLED

DETECTING CONDITION:

- Defective combination meter
- Defective harness

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), the STEERING warning light does not illuminate.

NOTE:

It is operating normally if the warning light illuminates when the ignition switch is turned to ON (engine OFF), and turns off approximately two seconds after engine start.

Step	Check	Yes	No
1 CHECK ILLUMINATION OF OTHER LIGHTS. Turn the ignition switch to ON. (engine OFF)	Do other warning lights illuminate?	Go to step 2.	Check the combination meter. <Ref. to IDI-11, INSPECTION, Combination Meter System.>
2 CHECK LAN SYSTEM. Perform the diagnosis for LAN system using the Subaru Select Monitor. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Is a DTC of the CAN communication system displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-99, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK COMBINATION METER. Perform the self-diagnosis of combination meter. <Ref. to IDI-7, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is the self diagnosis normal?	The combination meter is normal.	Check the combination meter. <Ref. to IDI-11, INSPECTION, Combination Meter System.>



STEERING Warning Light

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

2. POWER STEERING ASSIST DISABLED

DETECTING CONDITION:

CAN communication error (engine rpm signal not received)

TROUBLE SYMPTOM:

The STEERING warning light is normal but there is no power steering assist (steering feels heavy).

NOTE:

- Power steering assist is not started unless an ignition switch ON signal or engine speed signal is input.
- In any of the following cases, the power steering assist is limited and steering wheel operation may become heavy.

If the steering wheel is held to an end for a long time, or the steering wheel turning to right and left at slow speed is repeated during parking, the assist limitation (overheat protection control) may operate to prevent failures by overheat.

In this case, by stopping the engine for approx. 10 minutes for cooling, the assist will start operating. While assist limitation (overheat protection control) is in active, "Assist limitation" is displayed in the «EPS operating condition» in the Subaru Select Monitor "Current Data Display & Save".

- History can be confirmed on «Overheating protection intervention history» or «IGN count from overheating protection» of "Current Data Display & Save".
- The overheat protection control system is normal operation, therefore, the STEERING warning light will not come on and there will be no DTC displayed.
- If the power steering system connector is disconnected while cooling under the overheat protection control, different DTC may be recorded. If there is no DTC and assist limitation is in active, stop the engine for approx. 10 minutes for cooling.

Step	Check	Yes	No
1 CHECK CURRENT DATA. Using the Subaru Select Monitor, display «EPS operating condition». <Ref. to PS(diag)-11, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>	Is "Assist limitation" displayed?	Stop the engine for approx. 10 minutes, and cool down the power steering control module. After cooling down, perform the step 1 again.	Go to step 2.
2 CHECK DTC. Read the DTC of the power steering control module using Subaru Select Monitor. <Ref. to PS(diag)-15, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to PS(diag)-21, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK CURRENT DATA. 1) Using the Subaru Select Monitor, display «Torque sensor main output» and «Torque sensor sub output». 2) Move the steering wheel to the left and right.	Do the torque sensor values change?	Go to step 4.	Check the torque sensor circuit. <Ref. to PS(diag)-23, DTC C2511 TORQUE SENSOR FAILURE 1 (MAIN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
4 CHECK CURRENT DATA. 1) Start the engine. 2) Using the Subaru Select Monitor, display «Engine Speed».	Is the engine speed signal the same as that in the combination meter?	Replace the power steering control module. <Ref. to PS-41, Power Steering Control Module.>	Check the CAN communication. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

STEERING Warning Light

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

B: STEERING WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Open circuit of harness

TROUBLE SYMPTOM:

When starting the engine, the STEERING warning light continues to illuminate.

Step	Check	Yes	No
1	CHECK DTC. Read the DTC of the power steering control module using the Subaru Select Monitor. <Ref. to PS(diag)-15, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to PS(diag)-21, List of Diagnostic Trouble Code (DTC).>
2	CHECK LAN SYSTEM. Perform the diagnosis for LAN system using the Subaru Select Monitor. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Is a DTC related to CAN communication detected?	Go to step 2. Check the combination meter. <Ref. to IDI-11, INSPECTION, Combination Meter System.>



List of Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

11. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Content of diagnosis	Note
None	Without DTC	Normal	<Ref. to PS(diag)-14, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>
	"Assist limitation" is displayed in the current data «EPS operating condition».	Assist limitation is performed due to overheat protection control.	<Ref. to PS(diag)-19, POWER STEERING ASSIST DISABLED, STEERING WARNING LIGHT DOES NOT COME ON, STEERING Warning Light.>
	"Overheating protection intervention history" in current data display shows 1 or more.	There are previous records of intervention to overheat protection control.	<Ref. to PS(diag)-19, POWER STEERING ASSIST DISABLED, STEERING WARNING LIGHT DOES NOT COME ON, STEERING Warning Light.>
C2511	Torque Sensor Failure 1 (Main)	- Poor connector contact - Forgot to connect connector - Faulty torque sensor section circuit - Faulty torque sensor coil	<Ref. to PS(diag)-23, DTC C2511 TORQUE SENSOR FAILURE 1 (MAIN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2512	Torque Sensor Failure 2 (Sub)		<Ref. to PS(diag)-24, DTC C2512 TORQUE SENSOR FAILURE 2 (SUB), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2513	Torque Sensor Failure 3 (Much Tolerance)		<Ref. to PS(diag)-24, DTC C2513 TORQUE SENSOR FAILURE 3 (MUCH TOLERANCE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2514	Torque Sensor Power Supply Failure		<Ref. to PS(diag)-25, DTC C2514 TORQUE SENSOR POWER SUPPLY FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2521	Motor Failure 1 (Motor)	- Poor connector contact - Forgot to connect connector	<Ref. to PS(diag)-26, DTC C2521 MOTOR FAILURE 1 (MOTOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2522	Motor Malfunction 2 (Resolver)	- Harness open/short circuit - Motor open circuit - Power transistor shorted/open - Terminal power supply or ground short	<Ref. to PS(diag)-27, DTC C2522 MOTOR MALFUNCTION 2 (RESOLVER), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2531	ECU Failure 1 (CPU Failure)	Faulty main unit of power steering control module	<Ref. to PS(diag)-28, DTC C2531 ECU FAILURE 1 (CPU FAILURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2532	ECU Failure 2 (Peripheral Circuit Failure)	Faulty main unit of power steering control module	<Ref. to PS(diag)-28, DTC C2532 ECU FAILURE 2 (PERIPHERAL CIRCUIT FAILURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2533	ECM Failure 3 (Board Temperature Sensor Failure)	Faulty main unit of power steering control module	<Ref. to PS(diag)-28, DTC C2533 ECM FAILURE 3 (BOARD TEMPERATURE SENSOR FAILURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2541	Vehicle Speed Is Abnormal	- Poor connector contact - Forgot to connect connector - Harness open/short circuit	<Ref. to PS(diag)-29, DTC C2541 VEHICLE SPEED IS ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2543	Error Passive Status	Defective CAN communication	<Ref. to PS(diag)-30, DTC C2543 ERROR PASSIVE STATUS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C2551	Power Supply Relay Failure	- Power supply voltage malfunction - Faulty relay contact	<Ref. to PS(diag)-31, DTC C2551 POWER SUPPLY RELAY FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

DTC	Item	Content of diagnosis	Note
C2552	Motor Relay Abnormal	Faulty relay	<Ref. to PS(diag)-33, DTC C2552 MOTOR RELAY ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0073	Control Module Communication Bus "A" Off	Defective CAN communication	<Ref. to PS(diag)-33, DTC U0073 CONTROL MODULE COMMUNICATION BUS "A" OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0100	Lost Communication With ECM/PCM "A"	Defective CAN communication	<Ref. to PS(diag)-33, DTC U0100 LOST COMMUNICATION WITH ECM/PCM "A", Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0122	Lost Communication With Vehicle Dynamics Control Module	Defective CAN communication	<Ref. to PS(diag)-33, DTC U0122 LOST COMMUNICATION WITH VEHICLE DYNAMICS CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	Defective CAN communication	<Ref. to PS(diag)-33, DTC U0155 LOST COMMUNICATION WITH INSTRUMENT PANEL CLUSTER (IPC) CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0401	Invalid Data Received From ECM/PCM "A"	Defective CAN communication	<Ref. to PS(diag)-33, DTC U0401 INVALID DATA RECEIVED FROM ECM/PCM "A", Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0416	Invalid Data Received From Vehicle Dynamics Control Module	Defective CAN communication	<Ref. to PS(diag)-33, DTC U0416 INVALID DATA RECEIVED FROM VEHICLE DYNAMICS CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

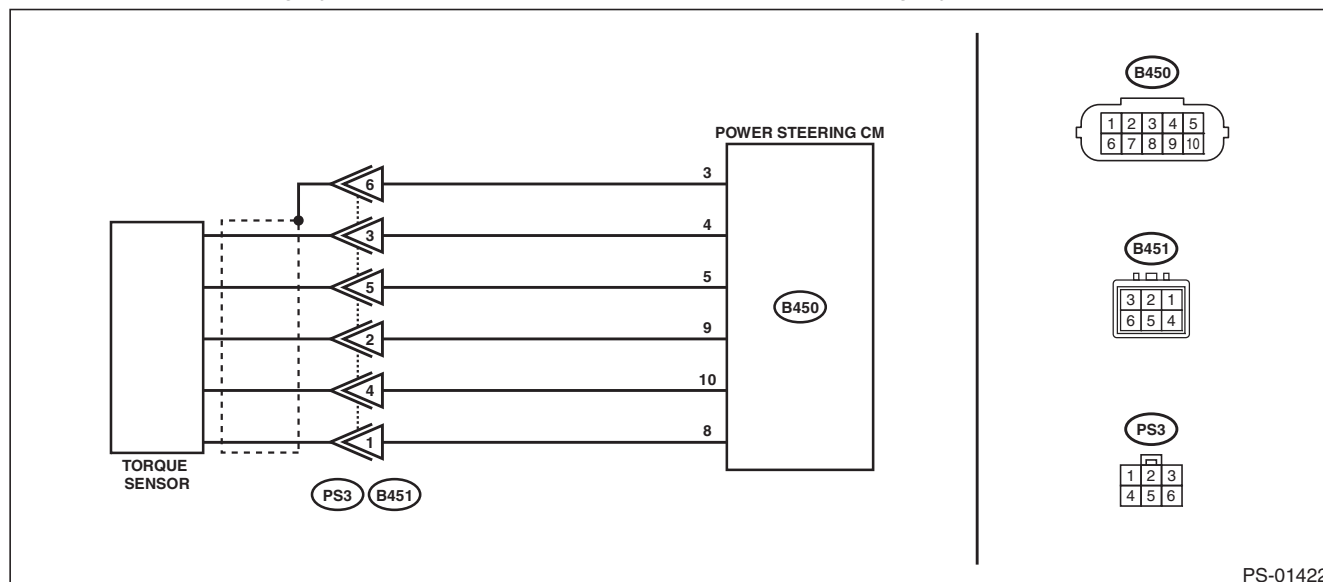
A: DTC C2511 TORQUE SENSOR FAILURE 1 (MAIN)

TROUBLE SYMPTOM:

- The steering wheel operation feels heavy.
- STEERING warning light illuminates.

WIRING DIAGRAM:

Electric power steering system <Ref. to WI-163, Electric Power Steering System.>



PS-01422

Step	Check	Yes	No
1	CHECK TORQUE SENSOR SIGNAL. 1) Display the current data of the power steering control module using the Subaru Select Monitor. 2) Check the voltage of «Torque sensor main output», «Torque sensor sub output», «Torque sensor reference voltage» and «Torque sensor power supply voltage».	Are the voltage of «Torque sensor main output» and «Torque sensor sub output» 2.5 ± 0.1 V? Is the voltage of «Torque sensor reference voltage» 3 ± 0.1 V? Is the voltage of «Torque sensor power supply voltage» 8 ± 0.4 V?	Check for poor contact of the connector, and check the conditions again. If the condition recur, go to the next step. Go to step 2. If it does not recur, complete the inspection.
2	CHECK HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B450, B451). 3) Using a tester and test harness, check the internal resistance of the harness terminals. Connector & terminal (B450) No. 4 — (B451) No. 3: (B450) No. 5 — (B451) No. 5: (B450) No. 8 — (B451) No. 1: (B450) No. 9 — (B451) No. 2: (B450) No. 10 — (B451) No. 4:	Is the resistance less than 10 Ω ?	Go to step 3. Repair or replace the harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK POWER STEERING CONTROL MODULE. 1) Connect the connector (B450) to the power steering control module. 2) Turn the ignition switch to ON. 3) Short circuit between the terminals of the connector (B451). Terminals No. 4 — No. 3: No. 4 — No. 5: 4) Using the Subaru Select Monitor, check the voltage of «Torque sensor main output», «Torque sensor sub output».	Are the voltages of «Torque sensor main output», «Torque sensor sub output» before short circuit 0 ± 0.1 V? Are the voltages of «Torque sensor main output», «Torque sensor sub output» after short circuit 3 ± 0.1 V?	Replace the steering gearbox. <Ref. to PS-25, Electric Power Steering Gearbox.>	Replace the power steering control module. <Ref. to PS-41, Power Steering Control Module.>

B: DTC C2512 TORQUE SENSOR FAILURE 2 (SUB)

NOTE:

For the diagnostic procedures, refer to "DTC 2511 TORQUE SENSOR FAILURE 1 (MAIN)". <Ref. to PS(diag)-23, DTC C2511 TORQUE SENSOR FAILURE 1 (MAIN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC C2513 TORQUE SENSOR FAILURE 3 (MUCH TOLERANCE)

NOTE:

For the diagnostic procedures, refer to "DTC 2511 TORQUE SENSOR FAILURE 1 (MAIN)". <Ref. to PS(diag)-23, DTC C2511 TORQUE SENSOR FAILURE 1 (MAIN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

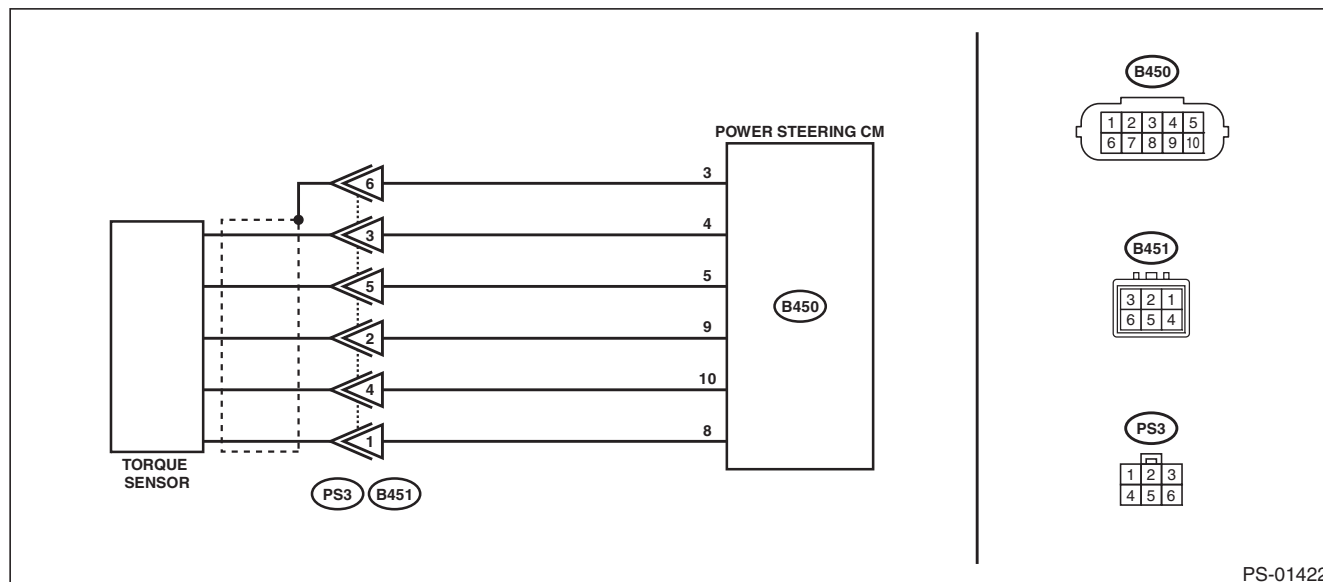
D: DTC C2514 TORQUE SENSOR POWER SUPPLY FAILURE

TROUBLE SYMPTOM:

- The steering wheel operation feels heavy.
- STEERING warning light illuminates.

WIRING DIAGRAM:

Electric power steering system <Ref. to WI-163, Electric Power Steering System.>



PS-01422

Step	Check	Yes	No
1	CHECK TORQUE SENSOR SIGNAL. 1) Display the current data of the power steering control module using the Subaru Select Monitor. 2) Check the voltage of «Torque sensor main output», «Torque sensor sub output», «Torque sensor reference voltage» and «Torque sensor power supply voltage».	Are the voltage of «Torque sensor main output» and «Torque sensor sub output» 2.5 ± 0.1 V? Is the voltage of «Torque sensor reference voltage» 3 ± 0.1 V? Is the voltage of «Torque sensor power supply voltage» 8 ± 0.4 V?	Check for poor contact of the connector, and check the conditions again. If the condition recur, go to the next step. Go to step 2. If it does not recur, complete the inspection.
2	CHECK HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B451). 3) Using a tester and test harness, check the internal resistance of the harness terminals. Connector & terminal (B450) No. 4 — (B451) No. 3: (B450) No. 5 — (B451) No. 5: (B450) No. 8 — (B451) No. 1: (B450) No. 9 — (B451) No. 2: (B450) No. 10 — (B451) No. 4:	Is the resistance less than 10 Ω ?	Replace the power steering control module. <Ref. to PS-41, Power Steering Control Module.> Repair or replace the harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

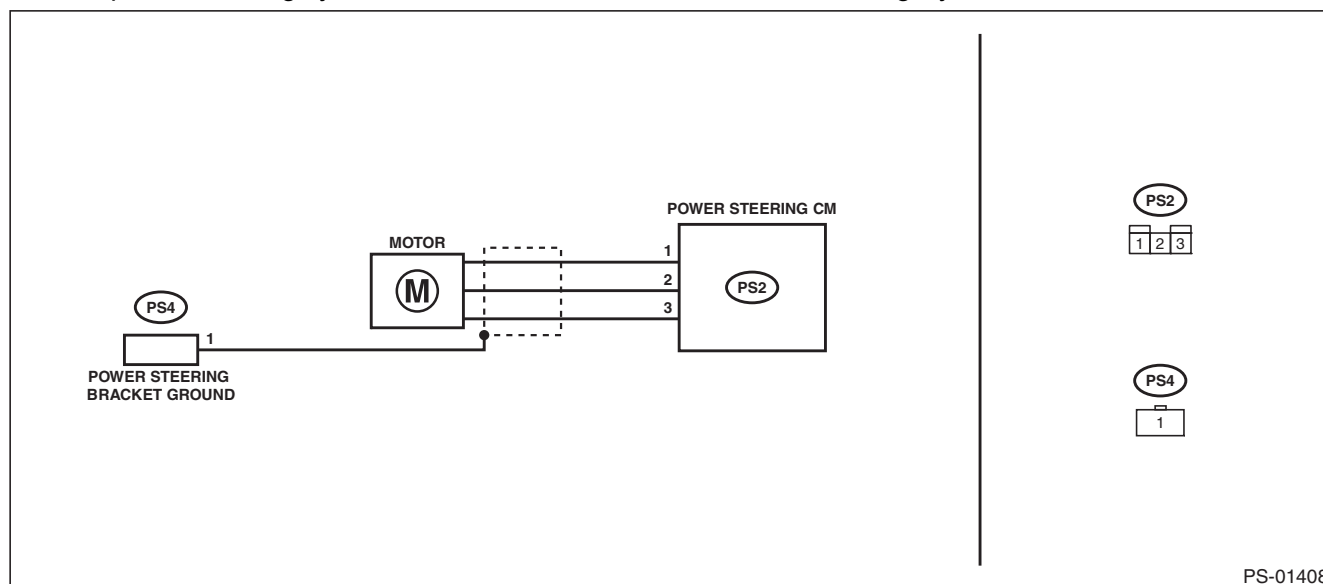
E: DTC C2521 MOTOR FAILURE 1 (MOTOR)

TROUBLE SYMPTOM:

- The steering wheel operation feels heavy.
- STEERING warning light illuminates.

WIRING DIAGRAM:

Electric power steering system <Ref. to WI-163, Electric Power Steering System.>



Step	Check	Yes	No
1 CHECK MOTOR UNIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connector (PS2) from the power steering control module. 3) Use a tester to check for continuity in the motor. Connector & terminal (PS2) No. 1 — No. 2: (PS2) No. 1 — No. 3: (PS2) No. 2 — No. 3:	Is there continuity?	Go to step 2.	Replace the steering gearbox. <Ref. to PS-25, Electric Power Steering Gearbox.>
2 CHECK MOTOR INSULATION. Use a tester to check for short circuits in the motor. Connector & terminal (PS2) No. 1 — Steering gearbox body: (PS2) No. 2 — Steering gearbox body: (PS2) No. 3 — Steering gearbox body:	Is the resistance 1 MΩ or more?	Replace the power steering control module. <Ref. to PS-41, Power Steering Control Module.>	Replace the steering gearbox. <Ref. to PS-25, Electric Power Steering Gearbox.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

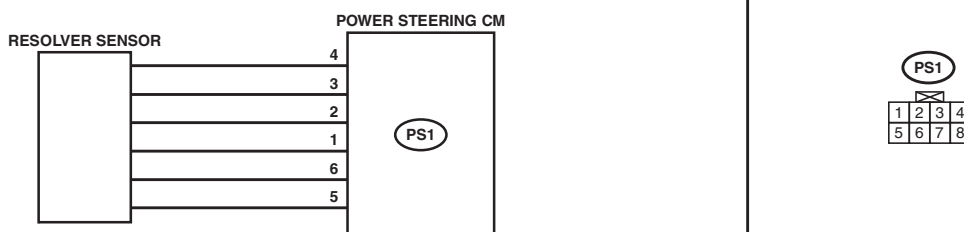
F: DTC C2522 MOTOR MALFUNCTION 2 (RESOLVER)

TROUBLE SYMPTOM:

- The steering wheel operation feels heavy.
- STEERING warning light illuminates.

WIRING DIAGRAM:

Electric power steering system <Ref. to WI-163, Electric Power Steering System.>



PS-01423

Step	Check	Yes	No
1 CHECK MOTOR UNIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connector (PS1) from the power steering control module. 3) Use a tester to check for continuity in the resolver sensor. Connector & terminal (PS1) No. 1 — No. 2 : (PS1) No. 3 — No. 4 : (PS1) No. 5 — No. 6 :	Is there continuity?	Go to step 2.	Replace the steering gearbox. <Ref. to PS-25, Electric Power Steering Gearbox.>
2 CHECK RESOLVER SENSOR INSULATION. Using a tester, check for short circuits in the resolver sensor. Connector & terminal (PS1) No. 1 — Steering gearbox body: (PS1) No. 2 — Steering gearbox body: (PS1) No. 3 — Steering gearbox body: (PS1) No. 4 — Steering gearbox body: (PS1) No. 5 — Steering gearbox body: (PS1) No. 6 — Steering gearbox body:	Is the resistance 1 MΩ or more?	Replace the power steering control module. <Ref. to PS-41, Power Steering Control Module.>	Replace the steering gearbox. <Ref. to PS-25, Electric Power Steering Gearbox.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

G: DTC C2531 ECU FAILURE 1 (CPU FAILURE)

TROUBLE SYMPTOM:

- The steering wheel operation feels heavy.
- STEERING warning light illuminates.

NOTE:

When this code is displayed, replace the power steering control module with new parts. <Ref. to PS-41, Power Steering Control Module.>

H: DTC C2532 ECU FAILURE 2 (PERIPHERAL CIRCUIT FAILURE)

TROUBLE SYMPTOM:

- The steering wheel operation feels heavy.
- STEERING warning light illuminates.

NOTE:

When this code is displayed, replace the power steering control module with new parts. <Ref. to PS-41, Power Steering Control Module.>

I: DTC C2533 ECM FAILURE 3 (BOARD TEMPERATURE SENSOR FAILURE)

TROUBLE SYMPTOM:

The steering wheel operation feels heavy.

NOTE:

When this code is displayed, replace the power steering control module with new parts. <Ref. to PS-41, Power Steering Control Module.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

J: DTC C2541 VEHICLE SPEED IS ABNORMAL

TROUBLE SYMPTOM:

The steering wheel operation feels heavy.

Step	Check	Yes	No
1 CHECK DTC. Read all DTCs using the Subaru Select Monitor.	Is a DTC related to VDC CM or vehicle speed signal detected?	Perform the diagnosis according to the DTC.	Go to step 2.
2 CHECK LAN SYSTEM. Perform the diagnosis for LAN system using the Subaru Select Monitor. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Is a DTC related to CAN communication detected?	Perform the diagnosis according to the DTC. <Ref. to LAN(diag)-99, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK VEHICLE SPEED SIGNAL. 1) Display the current data «Vehicle Speed» of the power steering control module using the Subaru Select Monitor. 2) Lift up the vehicle (so that the wheels turn freely), start the engine, and raise engine speed in gear. CAUTION: Be careful that no one is near the spinning tires and nothing gets caught in them. 3) Check for whether the data changes according to vehicle speed.	Is the data in sync with the vehicle speed?	It is possible that temporary poor communication occurs. Perform memory clear.	Replace the power steering control module. <Ref. to PS-41, Power Steering Control Module.>



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

K: DTC C2543 ERROR PASSIVE STATUS

TROUBLE SYMPTOM:

The steering wheel operation feels heavy.

Step	Check	Yes	No
1 CHECK LAN SYSTEM. Perform the diagnosis for LAN system using the Subaru Select Monitor. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Is a DTC related to CAN communication detected?	Perform the diagnosis according to the DTC. <Ref. to LAN(diag)-99, List of Diagnostic Trouble Code (DTC).>	Check for poor contact of the connector, and check the conditions again. If the condition recurs, perform the diagnosis according to the DTC. <Ref. to LAN(diag)-99, List of Diagnostic Trouble Code (DTC).> If it does not recur, complete the inspection.



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

L: DTC C2551 POWER SUPPLY RELAY FAILURE

TROUBLE SYMPTOM:

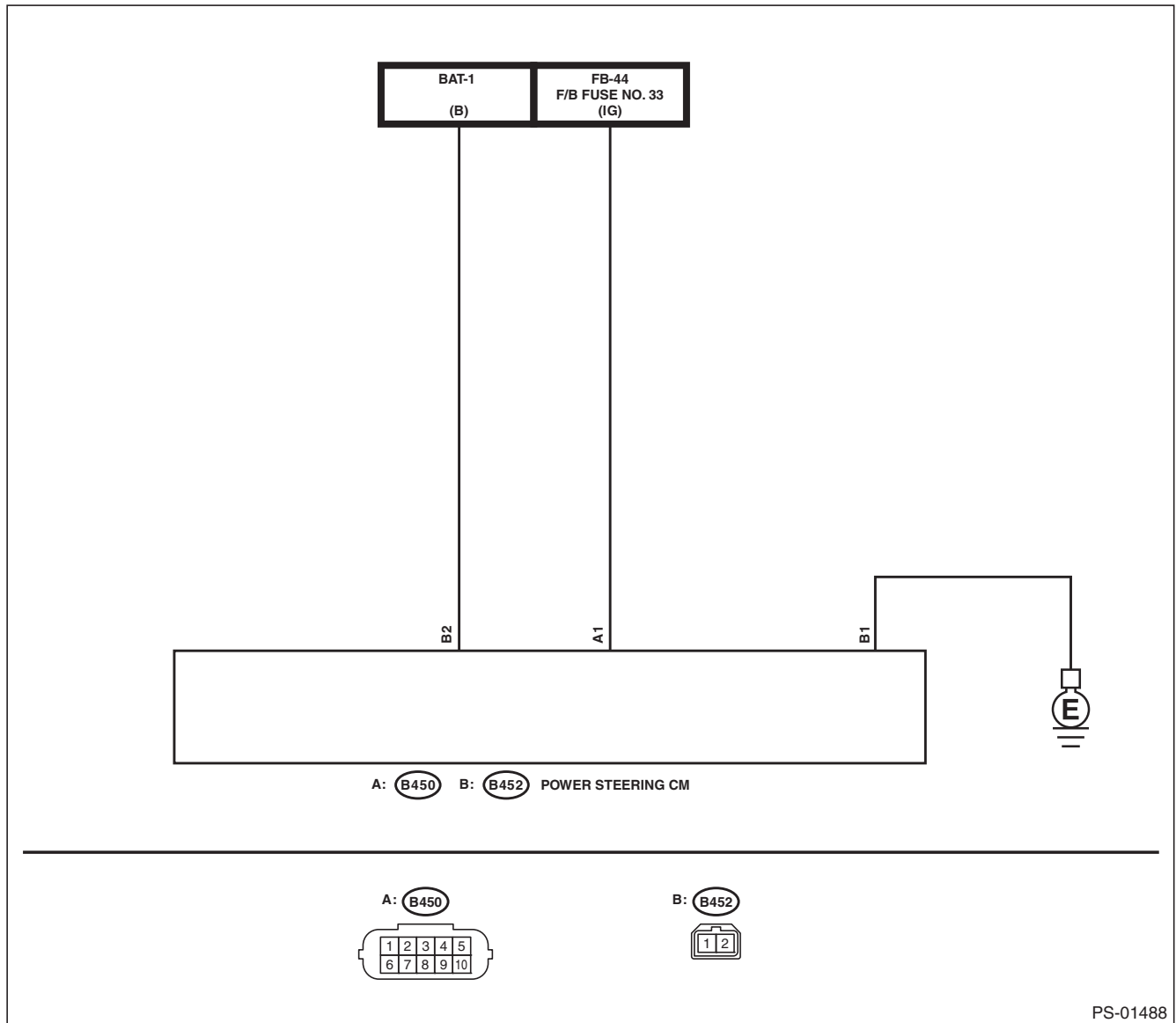
- The steering wheel operation feels heavy.
- STEERING warning light illuminates.

NOTE:

If power supply voltage failure exists at the vehicle side, the warning light goes off if the normal voltage returns.

WIRING DIAGRAM:

Electric power steering system <Ref. to WI-163, Electric Power Steering System.>



PS-01488

Step	Check	Yes	No
1	CHECK BATTERY. 1) Measure the battery voltage. 2) Measure the battery specific gravity.	Is the voltage 12 V or more? Is the specific gravity 1.260 or more?	Go to step 2. Charge or replace the battery.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK WIRING HARNESS. 1) Disconnect the connector of the power steering control module. 2) Turn the ignition switch to ON. 3) Using a tester and test harness, check the voltage between terminals. Connector & terminal (B452) No. 2 (+) — Chassis ground (-):	Is the voltage 12 V or more?	Go to step 3.	Repair the open circuit of harness or the poor contact of connector between the power steering control module and the battery.
3 CHECK GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Using a tester and test harness, check the resistance between terminals. Connector & terminal (B452) No. 1 — Chassis ground:	Is the resistance less than 1 Ω ?	Check for poor contact of terminals in the power steering control module, and if there are no malfunctions, replace the power steering control module. <Ref. to PS-41, Power Steering Control Module.>	Repair the open circuit or poor contact of the harness between the power steering control module and chassis ground.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)

M: DTC C2552 MOTOR RELAY ABNORMAL

TROUBLE SYMPTOM:

- The steering wheel operation feels heavy.
- STEERING warning light illuminates.

NOTE:

When this code is displayed, replace the power steering control module with new parts. <Ref. to PS-41, Power Steering Control Module.>

N: DTC U0073 CONTROL MODULE COMMUNICATION BUS “A” OFF

NOTE:

Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedure. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

O: DTC U0100 LOST COMMUNICATION WITH ECM/PCM “A”

NOTE:

Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedure. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

P: DTC U0122 LOST COMMUNICATION WITH VEHICLE DYNAMICS CONTROL MODULE

NOTE:

Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedure. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

Q: DTC U0155 LOST COMMUNICATION WITH INSTRUMENT PANEL CLUSTER (IPC) CONTROL MODULE

NOTE:

Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedure. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

R: DTC U0401 INVALID DATA RECEIVED FROM ECM/PCM “A”

NOTE:

Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedure. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

S: DTC U0416 INVALID DATA RECEIVED FROM VEHICLE DYNAMICS CONTROL MODULE

NOTE:

Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedure. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)
