CHASSIS SECTION

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WHEEL AND TIRE SYSTEM	WT
DIFFERENTIALS	DI
TRANSFER CASE	TC
DRIVE SHAFT SYSTEM	DS
ABS	ABS
ABS (DIAGNOSTICS)	ABS(diag)
VEHICLE DYNAMICS CONTROL (VDC)	VDC
VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)	VDC(diag)
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G2360GE6

FRONT SUSPENSION

FS

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1. General Description

A: SPECIFICATION

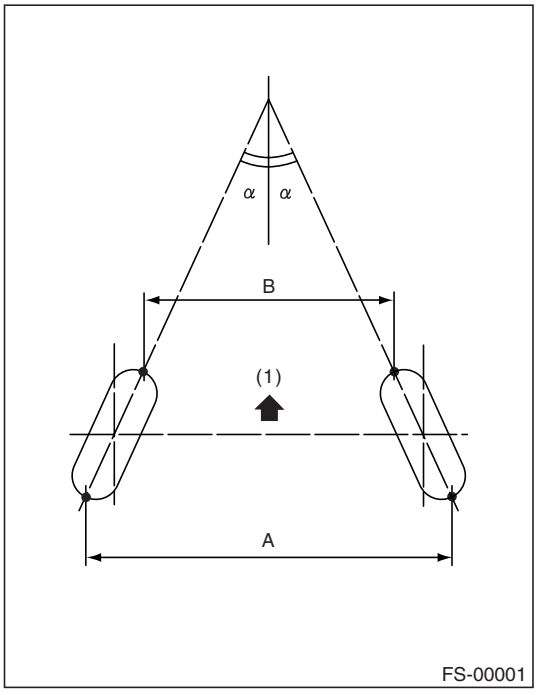
1. SEDAN MODEL

	Model		2.0 i	2.5 i	2.0 GT	3.0 R	3.0 R spec. B
Front	Wheel arch height (Tolerance: $^{+12\ mm}_{-24\ mm}$ mm (in) ($^{+0.47\ in}_{-0.94\ in}$))		376 (14.8)				372 (14.6)
	Camber (Tolerance: ±0°45′Differences between RH and LH 45′ or less)		−0°20′				−0°25′
	Caster (Referential Value)		6°00′				6°05′
	Steering angle (Tolerance: ±1.5°)	Inner wheel	37.2°				37.1°
		Outer wheel	32.9°				32.8°
	Toe-in	mm (in)	0±3 (0±0.12) Toe angle (sum of both wheels): 0°±0°15′				
	Kingpin angle (Referential Value)		13°50′				
	Diameter of stabilizer	mm (in)	20 (0.79)	21 (0.83)			
Rear	Wheel arch height (Tolerance: $^{+12\ mm}_{-24\ mm}$ mm (in) ($^{+0.47\ in}_{-0.94\ in}$))		360 (14.2)				
	Camber (Tolerance: ±0°45′Differences between RH and LH 45′ or less)		−0°45′				
	Toe-in	mm (in)	0±3 (0±0.12) Toe angle (sum of both wheels): 0°±0°15′				
	Thrust angle (Tolerance: ±0°30′)		0°				
	Diameter of stabilizer	mm (in)	17.3 (0.68)		19.1 (0.75)	17.3 (0.68)	

2. WAGON MODEL

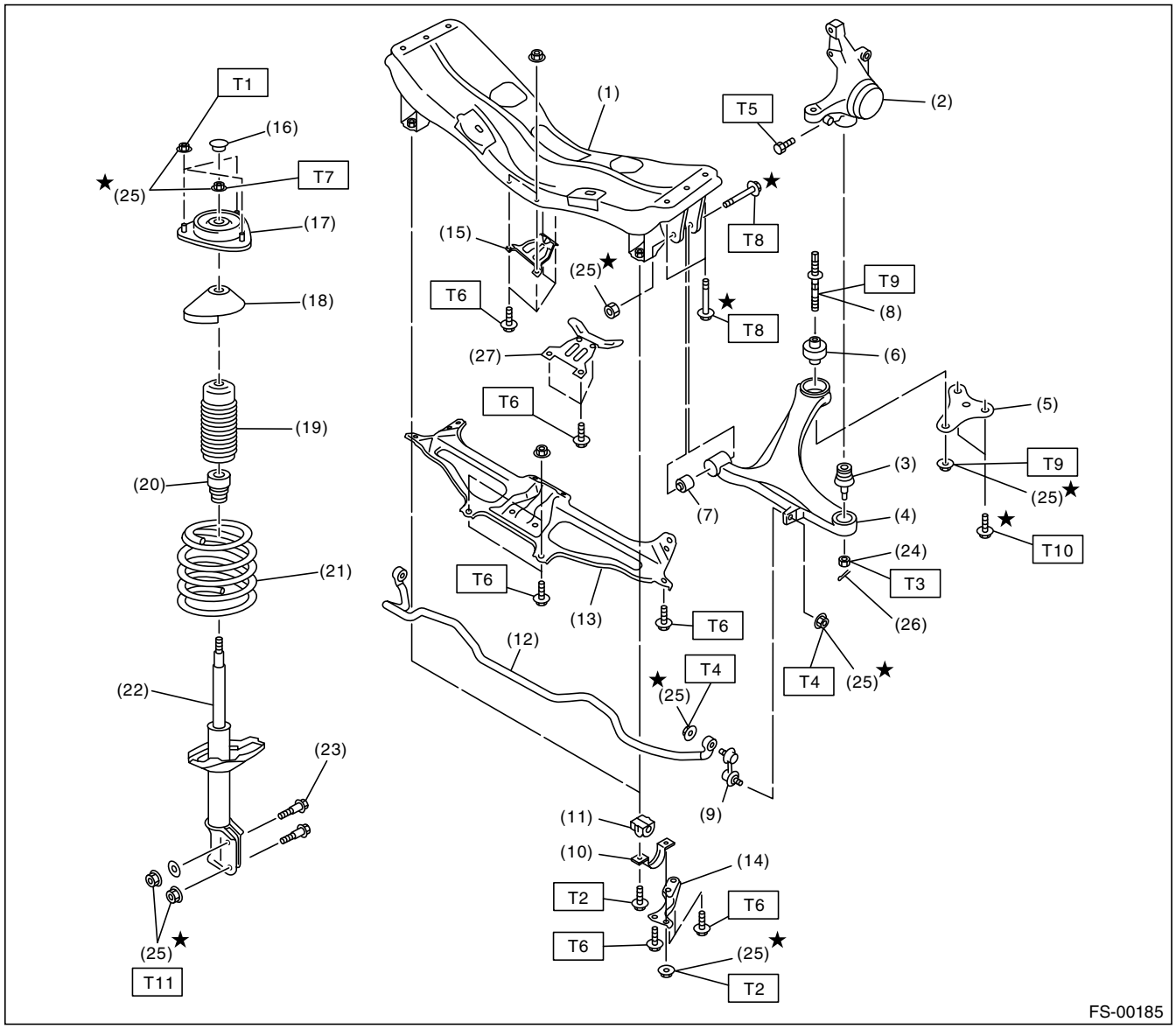
	Model		2.0 i	2.5 i	2.0 GT	3.0 R	3.0 R spec. B	OUTBACK 2.5 i, OUTBACK 3.0 R
Front	Wheel arch height (Tolerance: $^{+12\ mm}_{-24\ mm}$ mm (in) ($^{+0.47\ in}_{-0.94\ in}$))		381 (15.0)		376 (14.8)		372 (14.6)	429 (16.9)
	Camber (Tolerance: ±0°45′Differences between RH and LH 45′ or less)		−0°15′		−0°20′		−0°25′	−0°30′
	Caster (Referential Value)		5°45′				6°05′	5°05′
	Steering angle (Tolerance: ±1.5°)	Inner wheel	37.3°		37.2°		37.1°	37.8°
		Outer wheel	33.0°		32.9°		32.8°	33.5°
	Toe-in	mm (in)	0±3 (0±0.12) Toe angle (sum of both wheels): 0°±0°15′					
	Kingpin angle (Referential Value)		13°45′		13°50′			12°25′
	Diameter of stabilizer	mm (in)	20 (0.79)	21 (0.84)	21 (0.83)			
Rear	Wheel arch height (Tolerance: $^{+12\ mm}_{-24\ mm}$ mm (in) ($^{+0.47\ in}_{-0.94\ in}$))		375 (14.8)				365 (14.4)	430 (16.9)
	Camber (Tolerance: ±0°45′Differences between RH and LH 45′ or less)		−0°30′				−0°40′	0°00′
	Toe-in	mm (in)	0±3 (0±0.12) Toe angle (sum of both wheels): 0°±0°15′					
	Thrust angle (Tolerance: ±0°30′)		0°					
	Diameter of stabilizer	mm (in)	19.1 (0.75)				17.3 (0.68)	

NOTE:
• Front and rear toe-ins and front camber can be adjusted. If the toe-in or camber tolerance exceeds specifications, adjust them.
• Other items indicated in the specification table cannot be adjusted. If other items exceed specifications, check the suspension parts and connections for deformation, and replace with new ones as required.



(1) Front
A − B = Positive: Toe-in, Negative: Toe-out
α = Each toe angle

B: COMPONENT



(1) Front crossmember
(2) Housing
(3) Ball joint
(4) Front arm
(5) Support plate
(6) Rear bushing
(7) Front bushing
(8) Stud bolt
(9) Stabilizer link
(10) Bracket
(11) Bushing
(12) Stabilizer
(13) Crossmember support plate (Large type)
(14) Crossmember support plate (Small type)
(15) Jack-up plate
(16) Dust seal
(17) Strut mount
(18) Upper spring seat
(19) Dust cover
(20) Helper
(21) Coil spring
(22) Damper strut
(23) Adjusting bolt
(24) Castle nut
(25) Self-locking nut
(26) Cotter pin
(27) Jack-up plate (6MT model)

Tightening torque: N·m (kgf-m, ft-lb)

T1: 20 (2.0, 14.5)
T2: 25 (2.5, 18.4)
T3: 39 (4.0, 28.8)
T4: 45 (4.6, 33.2)
T5: 50 (5.1, 36.9)
T6: 60 (6.1, 44.3)
T7: 70 (7.1, 51.6)
T8: 95 (9.7, 70.1)
T9: 110 (11.2, 81.1)
T10: 150 (15.3, 110.6)
T11: 175 (17.8, 129)

C: CAUTION

• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or cloth between the part and the vise.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

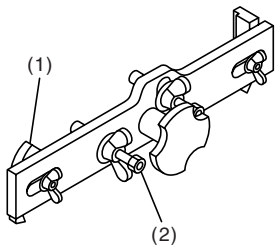
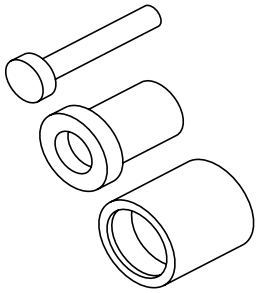
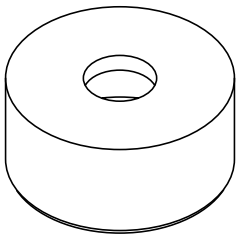
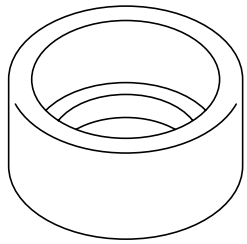
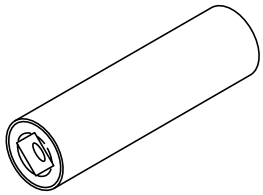
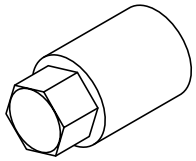
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380002	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing the front arm front bushing.
 ST20299AG000	20299AG000	REMOVER	Used for replacing the front arm rear bushing. Used with BASE (20999AG010).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20299AG010	20299AG010	BASE	Used for replacing the front arm rear bushing. Used with REMOVER (20999AG000).
 ST20299AG020	20299AG020	STUD BOLT SOCKET	Used for removing and installing stud bolt for front arm installing portion.
 ST20399AG000	20399AG000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut mount.

2. GENERAL TOOL

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Dial gauge	Used for damper strut measurement.
Coil spring compressor	Used for strut assembly/disassembly.

2. Wheel Alignment

A: INSPECTION

Check the following items before taking wheel alignment measurement.
Check items before taking wheel alignment measurement:

- Tire inflation pressure
- Unbalanced right and left tire wear, size difference
- Tire runout
- Excessive play and wear in ball joint
- Excessive play and wear in tie rod end
- Excessive play in wheel bearing
- Right and left wheel base imbalance
- Deformation and excessive play in steering link
- Deformation and excessive play in suspension parts

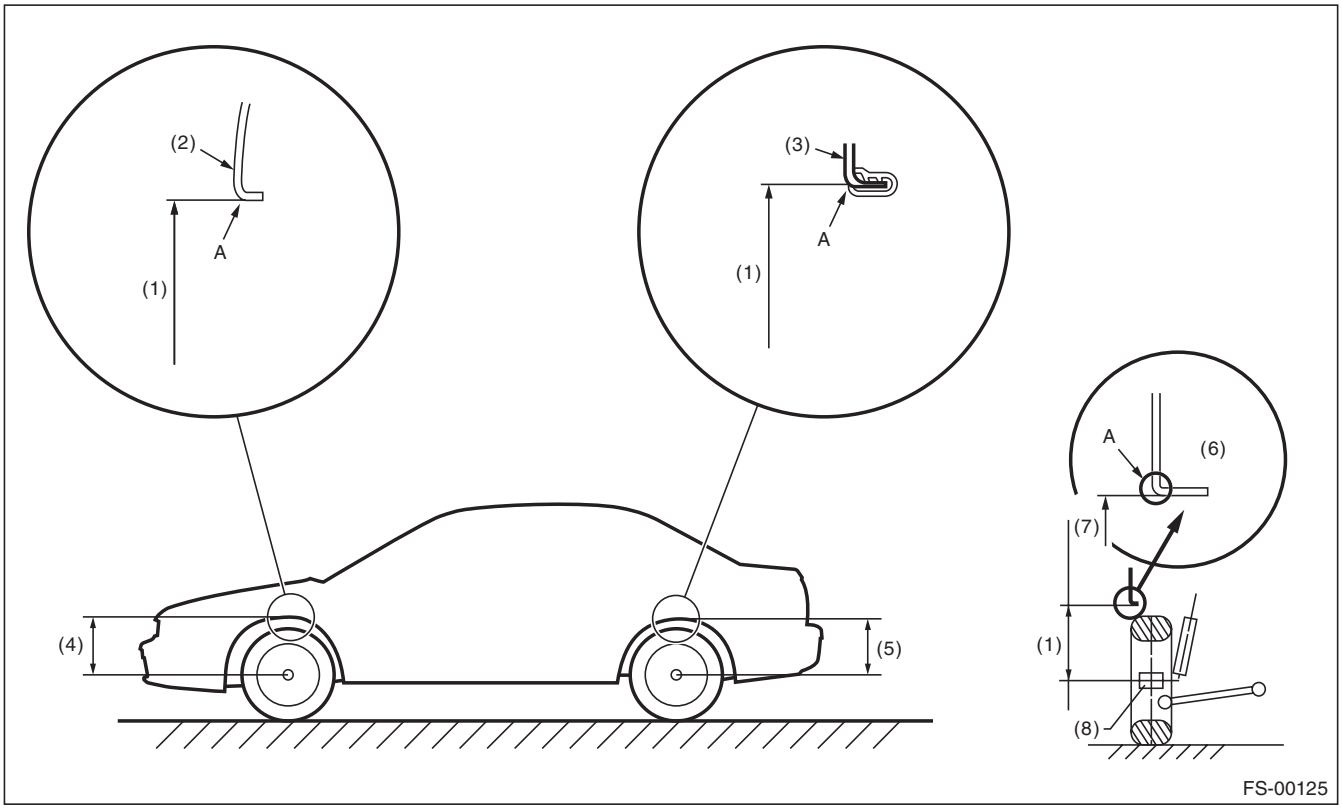
Check, adjust and measure the wheel alignment in accordance with the procedures indicated in the figure.

Wheel arch height (front and rear wheels) <Ref. to FS-7, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (front and rear wheels) <Ref. to FS-9, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (front wheel) <Ref. to FS-10, CASTER, INSPECTION, Wheel Alignment.>
↓
Steering angle <Ref. to FS-11, STEERING ANGLE, INSPECTION, Wheel Alignment.>
↓
Front wheel toe-in <Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Rear wheel toe-in <Ref. to FS-12, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Thrust angle <Ref. to FS-13, THRUST ANGLE, INSPECTION, Wheel Alignment.>

1. WHEEL ARCH HEIGHT

1) Park the vehicle on a level surface.
2) Set the vehicle under “curb weight” condition. (Make the luggage compartment empty, install the spare tire, jack and service tools, and top up the fuel tank.)
3) Set the steering wheel in a straight-ahead position, and stabilize the suspensions by moving the vehicle straight more than 5 m (16 ft).
4) Suspend a thread from wheel arch (point “A” in the figure below) to determine the point directly above the center of wheel.
5) Measure the distance between the point “A” and the center of wheel.

Wheel Alignment



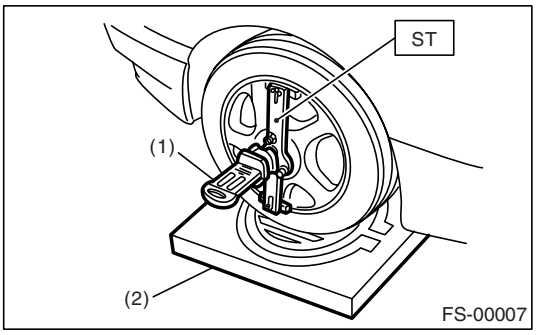
(1) Wheel arch height
(2) Front fender
(3) Rear quarter
(4) Front wheel arch height
(5) Rear wheel arch height
(6) Flange bend line
(7) Point of measurement
(8) Tip end of spindle

Wheel arch height specification mm (in) (Tolerance ±12 mm)								
Model	Sedan				Wagon			
	2.0 i	2.5 i	2.0 GT	3.0 R, 3.0 R spec. B	2.0 i, 2.5 i	2.0 GT, 3.0 R	3.0 R spec. B	OUTBACK 2.5 i, OUTBACK 3.0 R
Front	376 (14.8)			372 (14.6)	381 (15.0)	376 (14.8)	372 (14.6)	429 (16.9)
Rear	360 (14.2)				375 (14.8)		365 (14.4)	430 (16.9)

2. CAMBER

• INSPECTION

1) Place the front wheel on turning radius gauge. Make sure the ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into the center of wheel, and then set the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Measure the camber angle in accordance with the operation manual for wheel alignment gauge.

Model		Camber (Differences between RH and LH 45′ or less)
Sedan	Except for 3.0 R spec. B	−0°20′±0°45′
	3.0 R spec. B	−0°25′±0°45′
Wagon	2.0 i, 2.5 i	−0°15′±0°45′
	2.0 GT, 3.0 R	−0°20′±0°45′
	3.0 R spec. B	−0°25′±0°45′
	OUTBACK 2.5 i, OUTBACK 3.0 R	0°30′±0°45′

• FRONT CAMBER ADJUSTMENT

1) When adjusting the camber, adjust it to the following value.

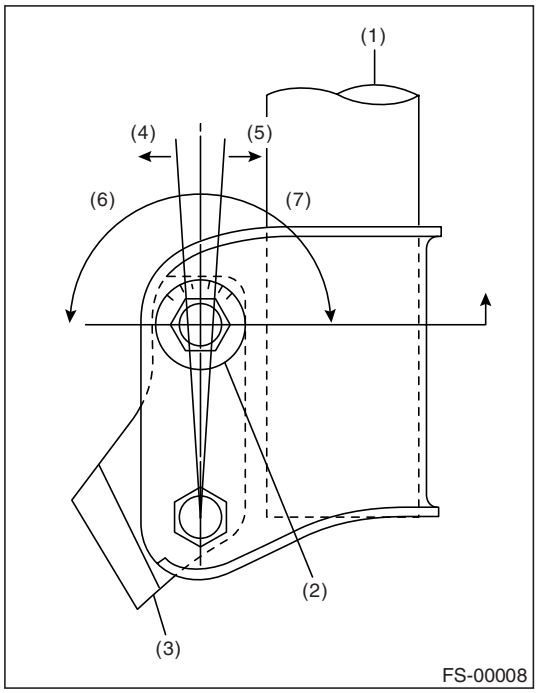
Model		Camber (Differences between RH and LH: 45′ or less)
Sedan	Except for 3.0 R spec. B	−0°20′±0°30′
	3.0 R spec. B	−0°25′±0°30′
Wagon	2.0 i, 2.5 i	−0°15′±0°30′
	2.0 GT, 3.0 R	−0°20′±0°30′
	3.0 R spec. B	−0°25′±0°30′
	OUTBACK 2.5 i, OUTBACK 3.0 R	0°30′±0°30′

2) Loosen the two self-locking nuts located at the lower front portion of strut.

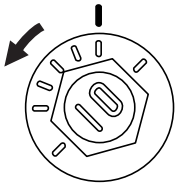
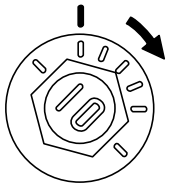
NOTE:
When the adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn the self-locking nut.

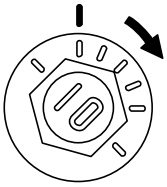
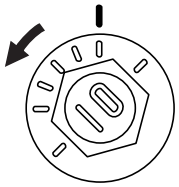
3) Turn the camber adjusting bolt so that the camber is set at specification.

NOTE:
Moving the adjusting bolt by one scale changes the camber by approx. 0°15′.



(1) Strut
(2) Adjusting bolt
(3) Housing
(4) Outer
(5) Inner
(6) Camber is increased
(7) Camber is decreased

To increase camber.	
Rotate the left side counterclockwise.	Rotate the right side clockwise.
 FS-00009	 FS-00010

To decrease camber.	
Rotate the left side clockwise.	Rotate the right side counterclockwise.
 FS-00010	 FS-00009

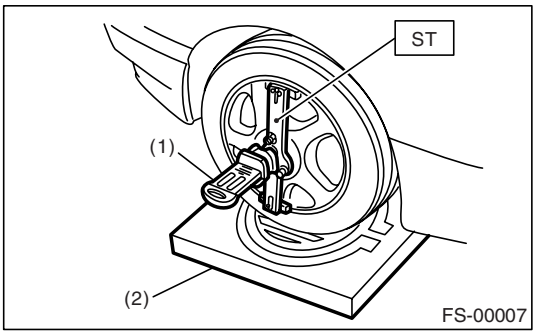
4) Tighten two new self-locking nuts.

Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

3. CASTER

• INSPECTION

1) Place the front wheel on turning radius gauge. Make sure the ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into the center of wheel, and then set the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Measure the caster angle in accordance with the operation manual for wheel alignment gauge.

Model	Caster
Sedan	6°00′
Wagon	5°45′
OUTBACK	5°05′
3.0 R spec. B (sedan & wagon)	6°05′

4. STEERING ANGLE

• INSPECTION

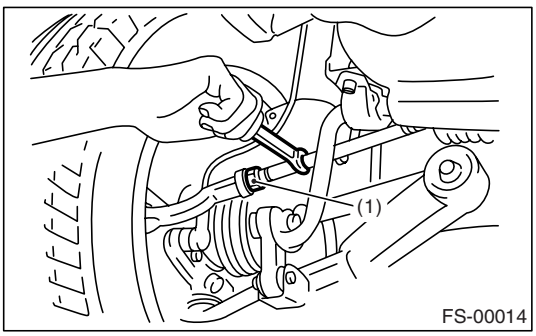
1) Place the vehicle on turning radius gauge.
2) While depressing the brake pedal, turn the steering wheel fully to the left and right. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

Model		Inner wheel	Outer wheel
Sedan	2.0 i 2.5 i 2.0 GT 3.0 R	37.2°±1.5°	32.9°±1.5°
	3.0 R spec. B	37.1°±1.5°	32.8°±1.5°
Wagon	2.0 i 2.5 i	37.3°±1.5°	33.0°±1.5°
	2.0 GT 3.0 R	37.2°±1.5°	32.9°±1.5°
	3.0 R spec. B	37.1°±1.5°	32.8°±1.5°
	OUTBACK	37.8°±1.5°	33.5°±1.5°

• ADJUSTMENT

1) Turn the tie-rod to adjust the steering angle of both inner and outer wheels.
2) Check the toe-in.

NOTE:
Correct the boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• INSPECTION

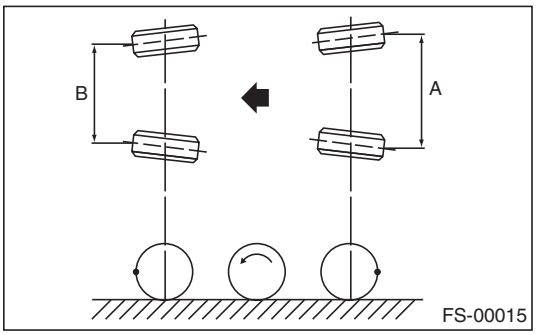
Toe-in:
0±3 mm (0±0.12 in)

1) Set the toe-in gauge in the position at wheel axis center height behind the right and left front tires.
2) Measure the distance “A” between the marks which are put on the centers of left and right tires.
3) Move the vehicle forward and rotate the tires 180°.

NOTE:
Be sure to rotate the tires in the forward direction.

4) Measure the distance “B” between the left and right marks. Detect toe-in by the following calculation formula:

A − B = Toe-in

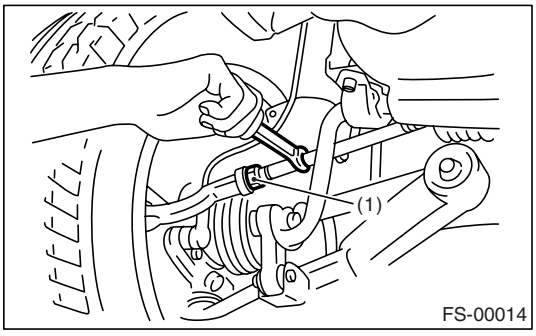


• ADJUSTMENT

When adjusting the toe-in, adjust it to the following value.

Toe-in:
0±2 mm (0±0.08 in)

1) Check that the left and right wheel steering angle is within specification.
2) Loosen the left and right side steering tie-rod lock nuts.
3) Turn the left and right tie-rods equal amounts until the toe-in is at the specification.
Both the left and right tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise by equal amount (viewing from the inside of vehicle).



(1) Lock nut

4) Tighten the tie-rod lock nut.

Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)

NOTE:
Check the tie-rod boot and correct it if it is twisted.

6. REAR WHEEL TOE-IN

• INSPECTION

Toe-in:
0±3 mm (0±0.12 in)

Refer to “FRONT WHEEL TOE-IN” for rear toe-in inspection procedure.
<Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

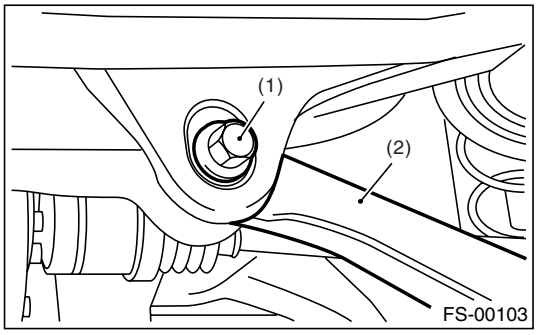
• ADJUSTMENT

When adjusting, adjust it to the following value.

Toe-in:
0±2 mm (0±0.08 in)

1) Loosen the self-locking nut on the inner side of rear link.

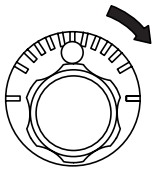
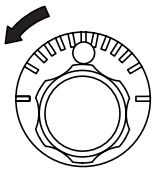
NOTE:
When loosening or tightening the adjusting bolt, hold the bolt head and turn self-locking nut.

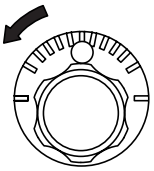
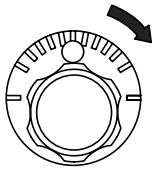


(1) Adjusting bolt
(2) Rear link

2) Turn the adjusting bolt until toe-in is at the specification.

NOTE:
When the left and right wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 0.6 mm (0.02 in).

To increase toe-in.	
Rotate the left side clockwise.	Rotate the right side counterclockwise.
 FS-00018	 FS-00019

To decrease toe-in.	
Rotate the left side counterclockwise.	Rotate the right side clockwise.
 FS-00019	 FS-00018

3) Tighten a new self-locking nut.

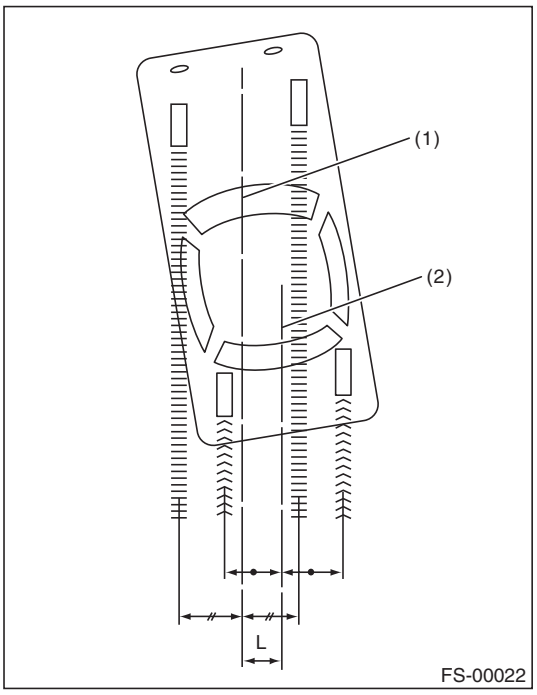
Tightening torque:
120 N·m (12.2 kgf-m, 89 ft-lb)

7. THRUST ANGLE

• INSPECTION

1) Park the vehicle on a level surface.
2) Move the vehicle 3 to 4 meters (10 to 13 feet) directly forward.
3) Draw the center of loci of both the front and rear axles.
4) Measure the distance "L" between center lines of the loci of axles.

Thrust angle:
0°±30′
Less than 30′ when "L" is 23 mm (0.9 in) or less.



(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

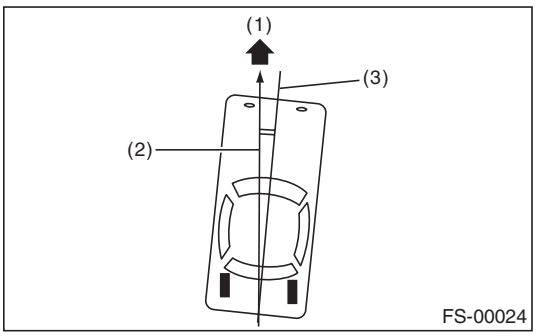
• ADJUSTMENT

When adjusting, adjust it to the following value.

Thrust angle:
0°±20′
Less than 20′ when "L" is 15 mm (0.6 in) or less.

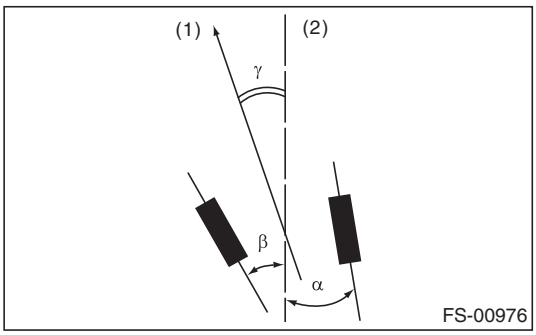
1) Make the thrust angle adjustments by turning the toe-in adjusting bolts of rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make the thrust angle adjustment.
3) When the left and right adjusting bolts are turned by one graduation, the thrust angle will change approx. 17′ ("L" is approx. 13 mm (0.51 in)).

NOTE:
Thrust angle refers to a mean value of left and right rear wheel toe angles in relation to the vehicle body center line. Vehicle is driven straight in the thrust angle direction while slanting in the oblique direction depending on the degree of the mean thrust angle.



(1) Front
(2) Thrust angle
(3) Body center line

Thrust angle: r = ($\alpha - \beta$)/2
α: Rear RH wheel toe-in angle
β: Rear LH wheel toe-in angle
Use only positive toe-in values from each wheel to substitute for α and β in the calculation formula.



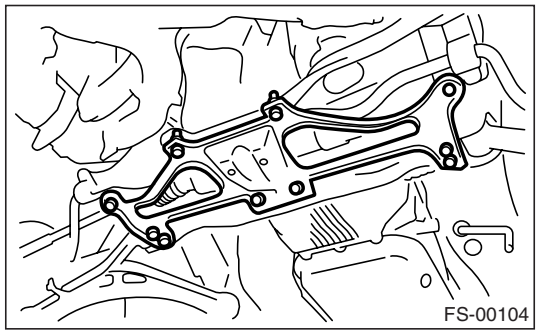
(1) Front
(2) Body center line

3. Front Crossmember Support Plate

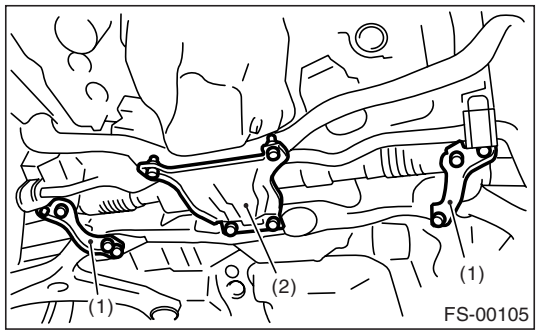
A: REMOVAL

1) Lift-up the vehicle.
2) Remove the front under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
3) Remove the bolt and remove front crossmember support plate.

- Large type

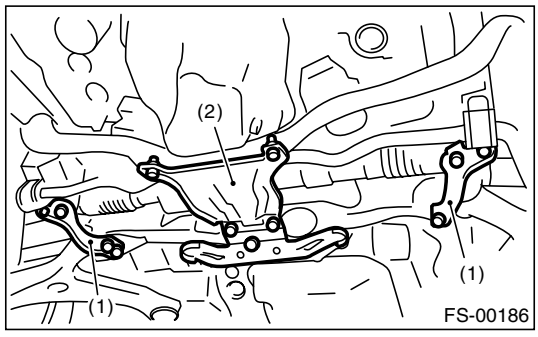


- Small type



(1) Crossmember support plate
(2) Jack-up plate

- Small type (6MT model)



(1) Crossmember support plate
(2) Jack-up plate (6MT model)

B: INSTALLATION

Install in the reverse order of removal.

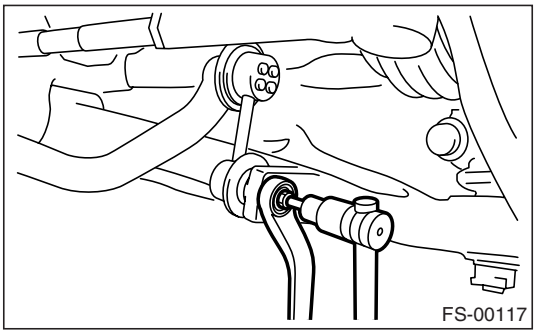
NOTE:
Tighten the small type crossmember support plate together with stabilizer bracket.
After installing the stabilizer bracket to crossmember, tighten the crossmember support plate together.

Tightening torque:
Crossmember support plate
60 N·m (6.1 kgf-m, 44.3 ft-lb)
Crossmember support plate (Joint tightening portion of stabilizer bracket)
25 N·m (2.5 kgf-m, 18.4 ft-lb)
Jack-up plate
60 N·m (6.1 kgf-m, 44.3 ft-lb)

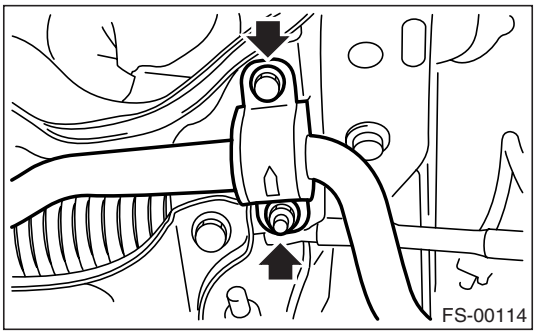
4. Front Stabilizer

A: REMOVAL

1) Lift-up the vehicle, and then remove the front wheels.
2) Remove the front under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
3) Remove the front crossmember support plate. <Ref. to FS-14, REMOVAL, Front Crossmember Support Plate.>
4) Remove the stabilizer link.



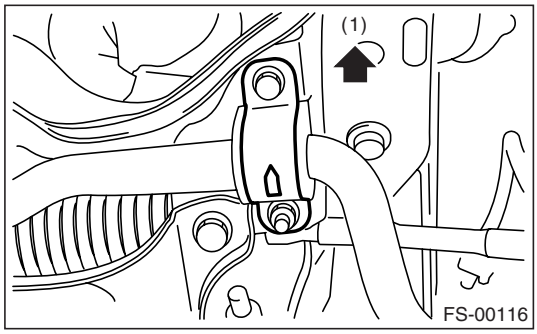
5) Remove the stabilizer bracket.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Use a new self-locking nut.
- Ensure the stabilizer bushing and stabilizer have the same identification colors.
- Install the stabilizer bushing (front crossmember side) while aligning it with the paint mark on stabilizer.
- Stabilizer bracket has an orientation, so install it with the arrow mark faced to the front side of vehicle.



(1) Front side of vehicle

Tightening torque:
Stabilizer link
45 N·m (4.6 kgf-m, 33.2 ft-lb)
Stabilizer bracket
25 N·m (2.5 kgf-m, 18.4 ft-lb)

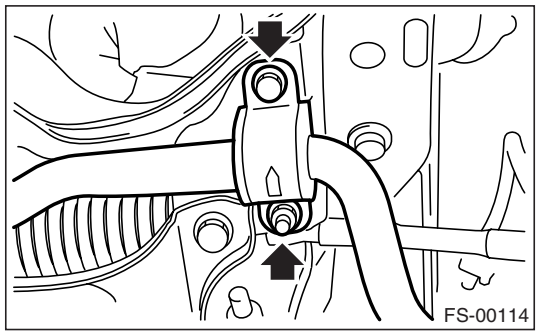
C: INSPECTION

1) Check the bushing for crack, fatigue or damage.
2) Check the stabilizer link for damage.

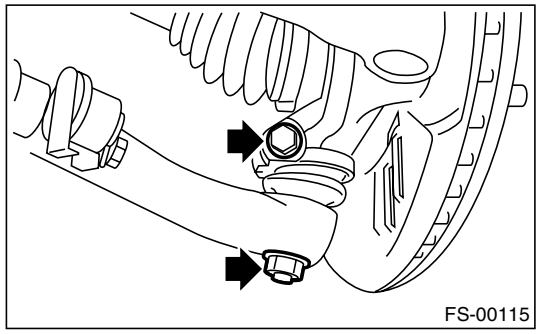
5. Front Ball Joint

A: REMOVAL

1) Lift-up the vehicle, and remove the front wheels.
2) Remove the both sides of stabilizer bracket.



3) Pull out the pin from ball stud, remove the castle nut, and extract the ball stud from front arm.
4) Remove the bolt installing ball joint to housing.



5) Extract the ball joint from housing.

B: INSTALLATION

1) Insert the ball joint into housing.

Tightening torque (Bolt):
50 N·m (5.1 kgf-m, 36.9 ft-lb)

CAUTION:
Do not apply grease to the tapered portion of ball stud.

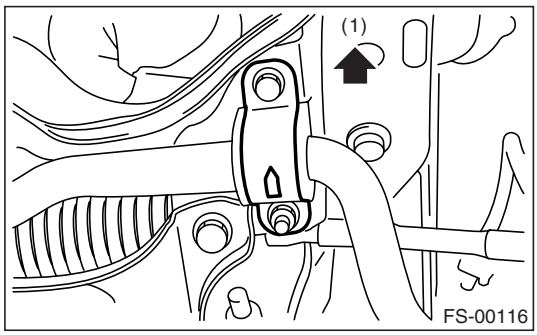
2) Install the ball joint into front arm.

Tightening torque (Castle nut):
39 N·m (4.0 kgf-m, 28.8 ft-lb)

3) Retighten the castle nut further within 60° until the hole in ball stud is aligned with a slot in castle nut. Then, insert a new cotter pin and bend it around castle nut.

4) Install the stabilizer bracket.

NOTE:
Stabilizer bracket has an orientation, so install it with the arrow mark faced to the front side of vehicle.



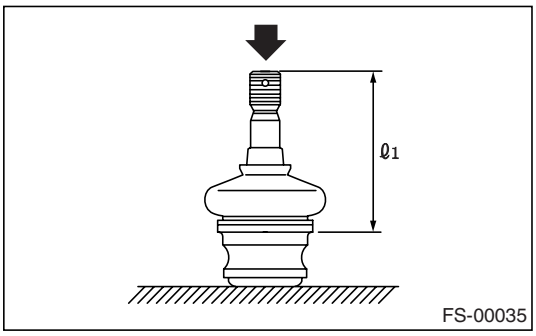
(1) Front side of vehicle

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

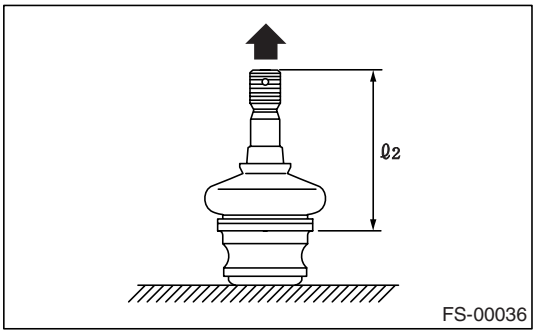
5) Install the front wheels.

C: INSPECTION

1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds specification.
(1) With 686 N (70 kgf, 154 lbf) loaded in direction shown in the figure, measure the dimension ℓ_1.



(2) With 686 N (70 kgf, 154 lbf) loaded in direction shown in the figure, measure the dimension ℓ_2.



(3) Determine the plays from the following calculation formula. $S = \ell_2 - \ell_1$
(4) Replace with a new one when the play exceeds specification.

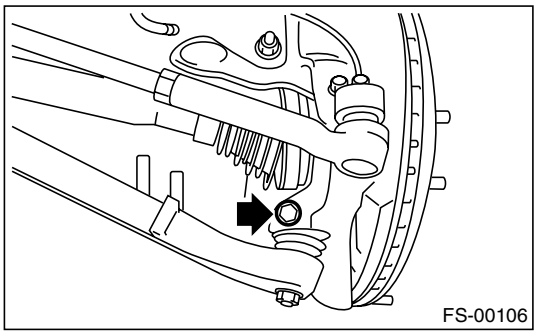
FRONT BALL JOINT
Specification for replacement S:
Less than 0.3 mm (0.012 in)

2) When the play is within specification, visually check the dust cover.
3) Remove the ball joint and cover, check them for wear, damage or cracks, and then replace them if any defective part is found.
4) If the dust cover is damaged, replace with a new ball joint.

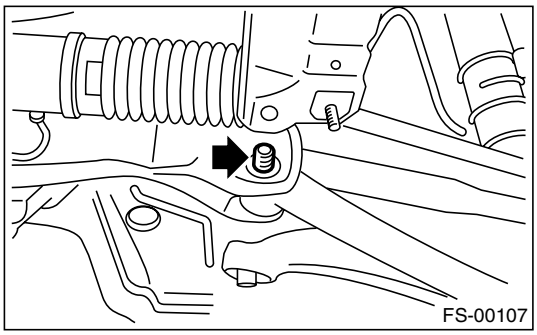
6. Front Arm

A: REMOVAL

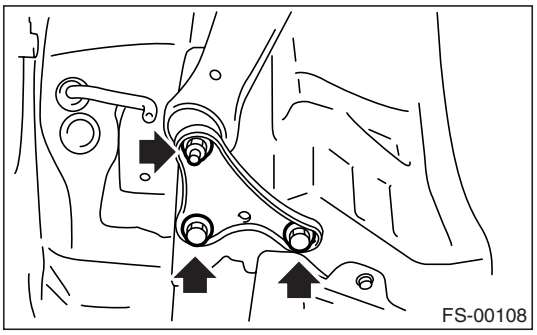
1) Lift-up the vehicle, and then remove the front wheels.
2) Remove the front crossmember support plate. <Ref. to FS-14, REMOVAL, Front Crossmember Support Plate.>
3) Remove the front stabilizer. <Ref. to FS-15, REMOVAL, Front Stabilizer.>
4) Remove the ball joint of front arm.


FS-00106

5) Remove the nut securing the front arm to crossmember. (Do not remove the bolt.)

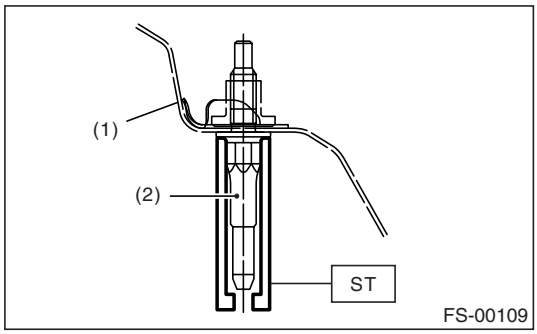

FS-00107

6) Remove the front arm support plate.


FS-00108

7) Remove the bolt securing front arm to crossmember and extract the front arm from crossmember.
8) To remove the stud bolt, use the ST.
ST 20299AG020 STUD BOLT SOCKET

CAUTION:
Do not remove the stud bolt without necessity. Always replace the parts with new ones when removed.



(1) Vehicle body
(2) Stud bolt

B: INSTALLATION

1) Using the ST, install the stud bolt.
ST 20299AG020 STUD BOLT SOCKET

Tightening torque:
110 N·m (11.2 kgf-m, 81.1 ft-lb)

2) Using new bolts and self-locking nuts, temporarily tighten the front arm to crossmember.
3) Secure the front arm to body, and then install the support plate with new bolts and self-locking nuts.

Tightening torque:
Support plate-to-Front arm
110 N·m (11.2 kgf-m, 81.1 ft-lb)
Support plate to Body
150 N·m (15.3 kgf-m, 110.6 ft-lb)

4) Install the ball joint into housing.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

5) Install the stabilizer. <Ref. to FS-15, INSTALLATION, Front Stabilizer.>
6) Lower the vehicle from the lift, and tighten the bolt which secures front arm to crossmember at the state that wheels are in full contact with the ground and the vehicle is curb weight.

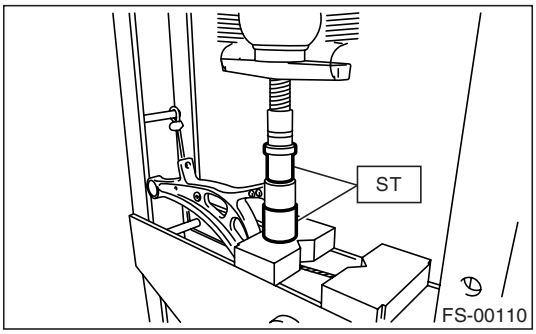
Tightening torque:
95 N·m (9.7 kgf-m, 70.1 ft-lb)

NOTE:
Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

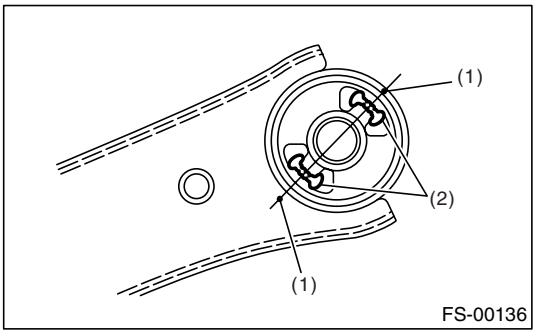
Using the ST and a press, remove the front bushing.
ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

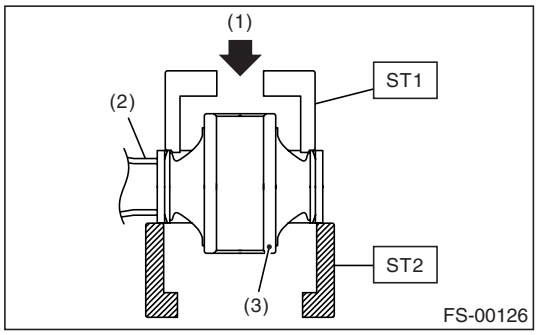
1) Put an alignment mark on the front arm based on the center of rear bushing recess portion.

CAUTION:
Always put an alignment mark for aligning the position on bushing installation.



(1) Put an alignment mark.
(2) Recess portion

2) Using the ST and a press, remove the rear bushing.
ST1 20299AG000 REMOVER
ST2 20299AG010 BASE



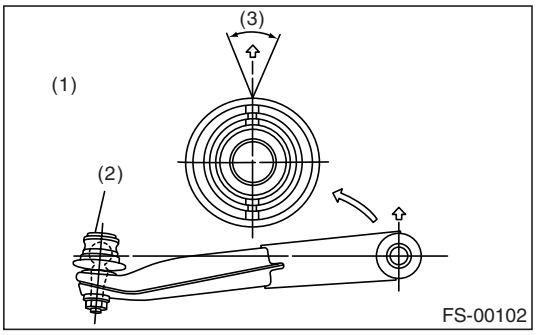
(1) Press
(2) Front arm
(3) Rear bushing

D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

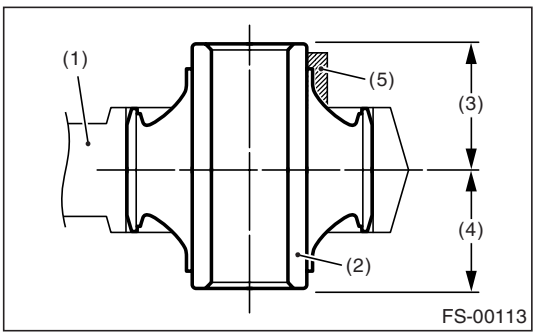
CAUTION:
Install the front bushing in proper direction as shown in the figure.



(1) Face the bushing toward the center of ball joint
(2) Ball joint
(3) ±3°

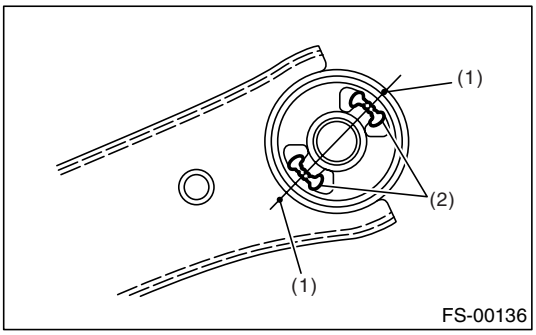
2. REAR BUSHING

1) Install the rear bushing with its longer inner cylinder faced upward and its shorter one faced downward and protruding part rearward as shown in the figure.



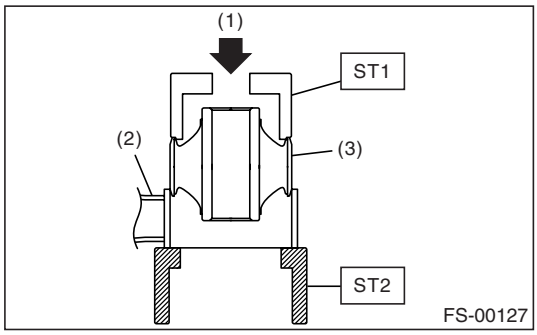
(1) Front arm
(2) Bushing inner cylinder
(3) Longer
(4) Shorter
(5) Protrusion portion

2) Align the center of rear bushing recess portion with the aligning mark on the front arm.



(1) Alignment mark
(2) Recess portion

3) Using the ST and a press, install the rear bushing.
ST1 20299AG000 REMOVER
ST2 20299AG010 BASE



(1) Press
(2) Front arm
(3) Rear bushing

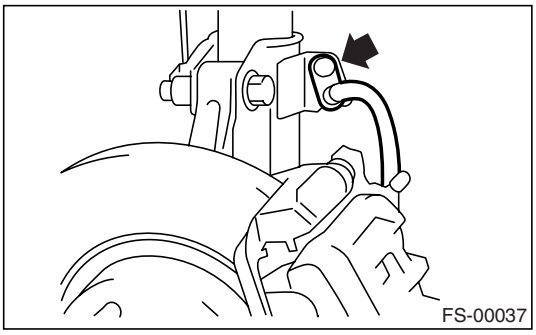
E: INSPECTION

1) Check the front arm for wear, damage or cracks, and correct or replace if defective.
2) Check the bushing for crack, fatigue or damage.

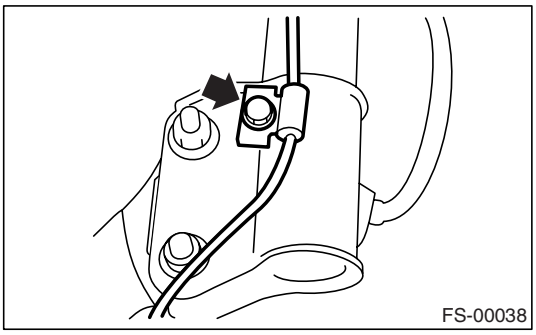
7. Front Strut

A: REMOVAL

1) Lift-up the vehicle, and then remove the front wheels.
2) Put an alignment mark on the camber adjusting bolt and strut.
3) Remove the bolt securing brake hose from strut.



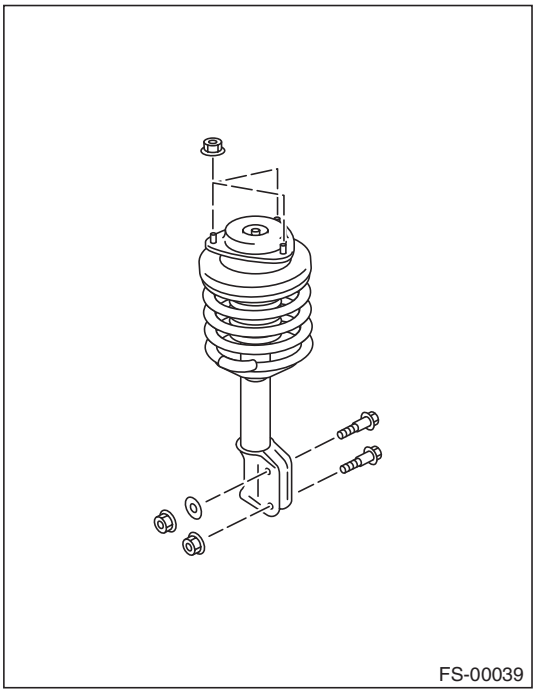
4) Remove the bolt securing ABS wheel speed sensor harness.



5) Remove the two bolts securing housing to strut.

NOTE:
While holding the head of adjusting bolt, loosen the self-locking nut.

6) Remove the three nuts securing strut mount to body.



B: INSTALLATION

1) Install the strut mount at the upper side of strut to body, and tighten it with new self-locking nuts.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Align alignment marks on the camber adjusting bolt and strut.
Using new self-locking nuts, install the strut to housing.

NOTE:
While holding the head of adjusting bolt, tighten the self-locking nut.

Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

3) Secure the ABS wheel speed sensor harness to strut.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

4) Install the bolts which secure brake hose to strut.

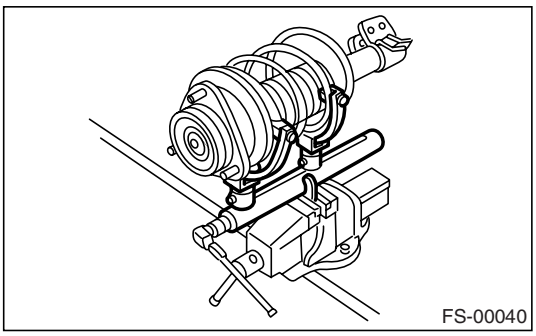
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

5) Install the front wheels.

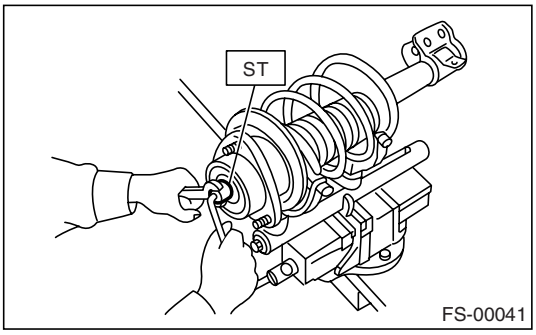
NOTE:
Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1) Using a coil spring compressor, compress the coil spring.



2) Using the ST, remove the self-locking nut.
ST 20399AG000 STRUT MOUNT SOCKET



3) Remove the strut mount and upper spring seat from strut.
4) Gradually decrease the compression force of compressor, and remove the coil spring.
5) Remove the dust cover and helper spring.

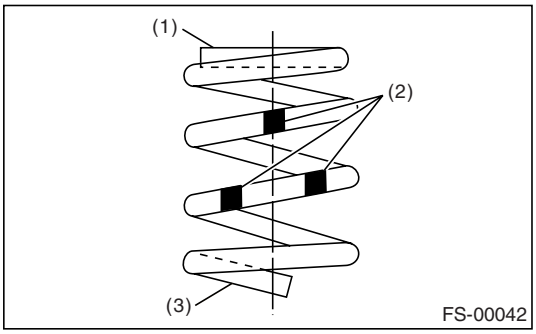
D: ASSEMBLY

1) Before installing the coil spring, strut mount, etc. on strut, check for the presence of air in the dampening force generating mechanism of the strut since air prevents proper dampening force production.
2) Check for presence of air
   (1) Place the strut vertically with the piston rod facing up.
   (2) Move the piston rod to the center of its entire stroke.
   (3) While holding the piston rod end with fingertips, move the rod up and down.
   (4) If the piston rod moves at least 10 mm (0.39 in) in the former step, purge air from the strut.
3) Air purging procedure
   (1) Place the strut vertically with the piston rod facing up.
   (2) Fully extend the piston rod.
   (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.
   (4) Fully contract the piston rod.
   (5) Repeat 3 to 4 times from the step (1).

NOTE:
After completely purging air from the strut, be sure to place the strut with the piston rod facing up. If the strut is laid down and set, check for the entry of air in accordance with “Check for the presence of air”.

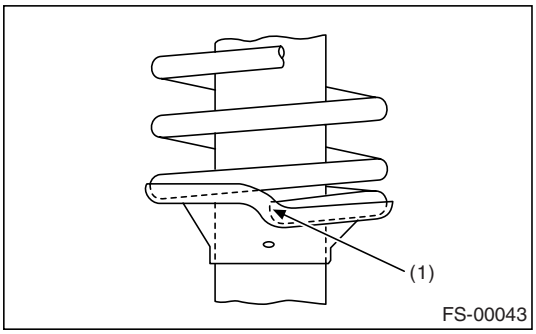
4) Using a coil spring compressor, compress the coil spring.

NOTE:
Make sure that the vertical installing direction of coil spring is as shown in the figure.



(1) Diameter is small (Upper part)
(2) Identification paint
(3) Diameter is large (Bottom part)

5) Set the coil spring correctly so that its end face fits well into the spring seat as shown in the figure.

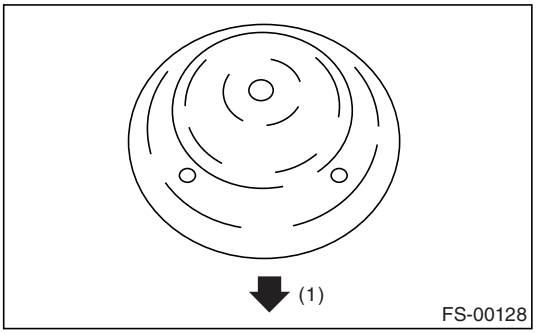


(1) Coil spring end face

6) Install the helper and dust cover to piston rod.

7) Pull the piston rod fully upward, and install the spring seat.

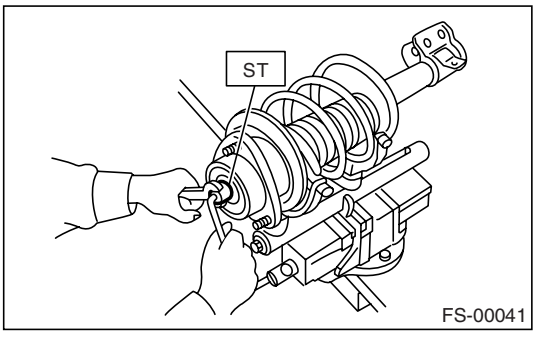
NOTE:
Ensure the upper spring seat is positioned as shown in the figure.



(1) Outside of body

8) Install the strut mount to piston rod, and temporarily tighten a new self-locking nut.
9) Using a hexagon wrench to prevent strut rod from turning, tighten the new self-locking nut with ST.
ST 20399AG000 STRUT MOUNT SOCKET

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



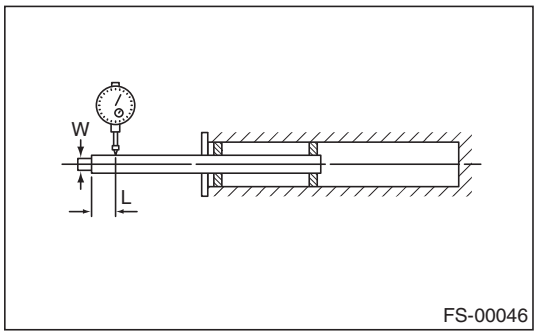
10) Loosen the coil spring carefully.

E: INSPECTION

Check the removed part for wear, damage and cracks, and then repair or replace it if defective.

1. DAMPER STRUT

1) Check for oil leaks.
2) Move the piston rod up and down to check that it operates smoothly without any hitch.
3) Piston rod play
• Measure the play as follows:
Fix the outer shell and fully extend the rod. Set a dial gauge at the end of rod L [10 mm (0.39 in)], and then read the dial gauge indication P_1 while applying a force of W [20 N (2 kgf, 4 lbf)] to threaded end. Apply a force of 20 N (2 kgf, 4 lbf) in the opposite direction of "W", and then read the dial gauge indication P_2.



Play limit ($P_1 + P_2$):
0.8 mm (0.031 in)

If the play exceeds limit, replace the strut.

2. STRUT MOUNT

Check the rubber part for deformation, cracks or deterioration, and then replace it with a new one if defective.

3. DUST COVER

If any cracks or damage are found, replace it with a new one.

4. COIL SPRING

If a permanent strain is found, replaced it with a new one.

5. HELPER

Replace it with a new one if cracked or damaged.

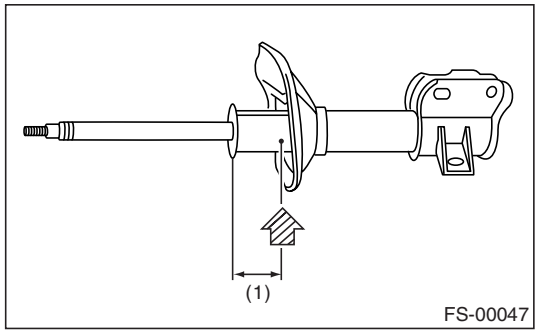
F: DISPOSAL

1. EXCEPT BILSTEIN STRUT

CAUTION:
• Before handling struts, be sure to wear goggles to protect eyes from gas, oil and cutting powder.
• Do not disassemble the strut damper or place into a fire.
• Drill a hole into struts in case of discarding struts filled with gas.

1) Place the strut on a level surface with the piston rod fully expanded.

2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in areas shown in the figure.

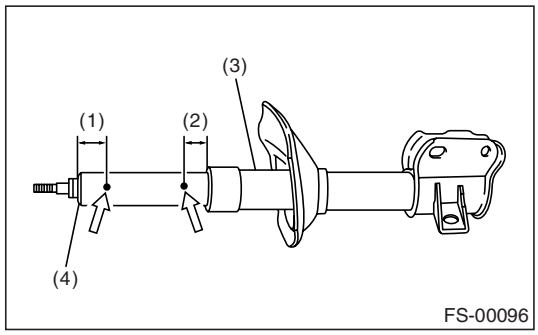


(1) 40 mm (1.57 in)

2. BILSTEIN STRUT

CAUTION:
• Before handling struts filled with gas, be sure to wear goggles to protect eyes from gas, oil and cutting powder.
• Do not disassemble the strut damper or place into a fire.
• Drill a hole into struts in case of discarding struts filled with gas.

1) Place the gas-filled strut on a level surface with the dumping tube fully extended.
2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make a hole at the position (1) first, and then make a hole at the position (2).

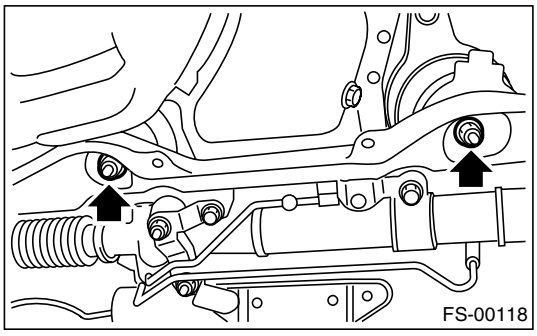


(1) 20 mm (0.78 in)
(2) 10 mm (0.39 in)
(3) Strut
(4) Damping tube

8. Front Crossmember

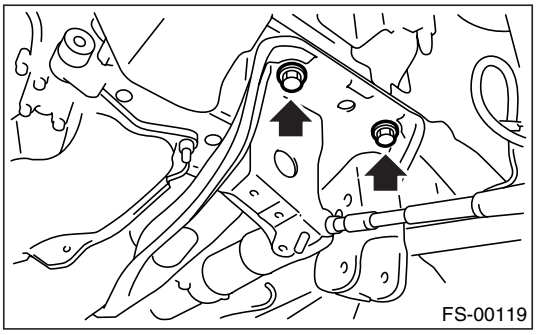
A: REMOVAL

1) Lift-up the vehicle, and then remove the front wheels.
2) Remove the front exhaust pipe.
3) Remove the front crossmember support plate. <Ref. to FS-14, REMOVAL, Front Crossmember Support Plate.>
4) Remove the front stabilizer. <Ref. to FS-15, REMOVAL, Front Stabilizer.>
5) Disconnect the tie-rod end from housing.
6) Remove the front arm. <Ref. to FS-18, REMOVAL, Front Arm.>
7) Remove the nuts attaching the engine mount cushion rubber to crossmember.


FS-00118

8) Remove the steering universal joint.
9) Disconnect the power steering hose from steering gearbox.
10) Lift the engine approx. 10 mm (0.39 in) using chain block.
11) Support the crossmember with a jack, remove the bolts securing crossmember to body, and then gradually lower the crossmember with steering gearbox as a unit.

CAUTION:
When removing the crossmember downward, be careful that the tie-rod end does not interfere with drive shaft boot.


FS-00119

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Use a new bolt and self-locking nut. For not reusable part, refer to "COMPONENT". <Ref. to FS-4, COMPONENT, General Description.>
• Always tighten the bushing in the state that wheels are in full contact with the ground and the vehicle is curb weight.

Tightening torque:
Crossmember to body
95 N·m (9.7 kgf-m, 70.1 ft-lb)
Engine mounting to crossmember
85 N·m (8.7 kgf-m, 62.7 ft-lb)
Front arm-to-Crossmember
95 N·m (9.7 kgf-m, 70.1 ft-lb)
Front arm-to-Support plate
110 N·m (11.2 kgf-m, 81.1 ft-lb)
Support plate body
150 N·m (15.3 kgf-m, 110.6 ft-lb)
Tie-rod end to housing
27 N·m (2.75 kgf-m, 19.9 ft-lb)

Retighten the castle nut further within 60° until the hole in ball stud is aligned with a slot in castle nut after tightening in specified torque.

Tightening torque:
Universal Joint
24 N·m (2.4 kgf-m, 17.4 ft-lb)
Stabilizer bracket
25 N·m (2.5 kgf-m, 18.4 ft-lb)
Stabilizer link
45 N·m (4.6 kgf-m, 33.2 ft-lb)
Power steering hose-to-Steering gearbox
15 N·m (1.5 kgf-m, 10.8 ft-lb)

2) Purge air from the power steering system.
3) Inspect the wheel alignment and adjust if necessary.

C: INSPECTION

Check the crossmember for wear, damage or cracks, and then repair or replace if defective.

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible cause	Corrective action
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Rough operation of damper strut or shock absorber	Replace.
(3) Installation of wrong strut or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

- Large rebound shock
- Rocking of the vehicle continues too long after running over bump and hump.
- Large shock in bumping

Possible cause	Corrective action
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new ones.
(4) Fault in operation of damper strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly or shock absorber	Replace.
(9) Oil leakage of damper strut or shock absorber	Replace.

3. NOISE

Possible cause	Corrective action
(1) Wear or damage of damper strut or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Tighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

REAR SUSPENSION

RS

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4.	Rear Arm	10
5.	Upper Link	14
6.	Rear Shock Absorber	16
7.	Front Link	18
8.	Rear Link	19
9.	Sub Frame Support Arm	21
10.	Sub Frame Support Plate	22
11.	Rear Sub Frame	23
12.	Helper	24
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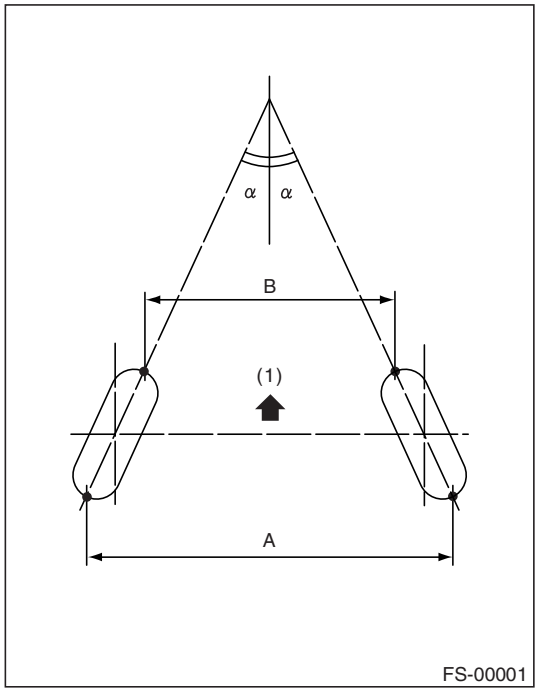
1. General Description

A: SPECIFICATION

Model	Sedan				Wagon			
	2.0 i, 2.5 i	2.0 GT	3.0 R	3.0 R spec. B	2.0 i, 2.5 i	2.0 GT, 3.0 R	3.0 R spec. B	OUTBACK 2.5 i, OUTBACK 3.0 R
Wheel arch height [Tolerance: $^{+12\ mm}_{-24}$ mm ($^{+0.47\ in}_{-0.94\ in}$)] mm (in)	360 (14.2)				375 (14.8)		365 (14.4)	430 (16.9)
Camber (Tolerance: ±0°45′Differences between RH and LH: 45′ or less)	−0°45′				−0°30′		−0°40′	0°00′
Toe-in mm (in)	0±3 (0±0.12) Toe angle (sum of both wheels): 0°±0°15′							
Thrust angle (Tolerance: ±0°30′)	0°							
Diameter of stabilizer mm (in)	17.3 (0.68)	19.1 (0.75)	17.3 (0.68)		19.1 (0.75)		17.3 (0.68)	

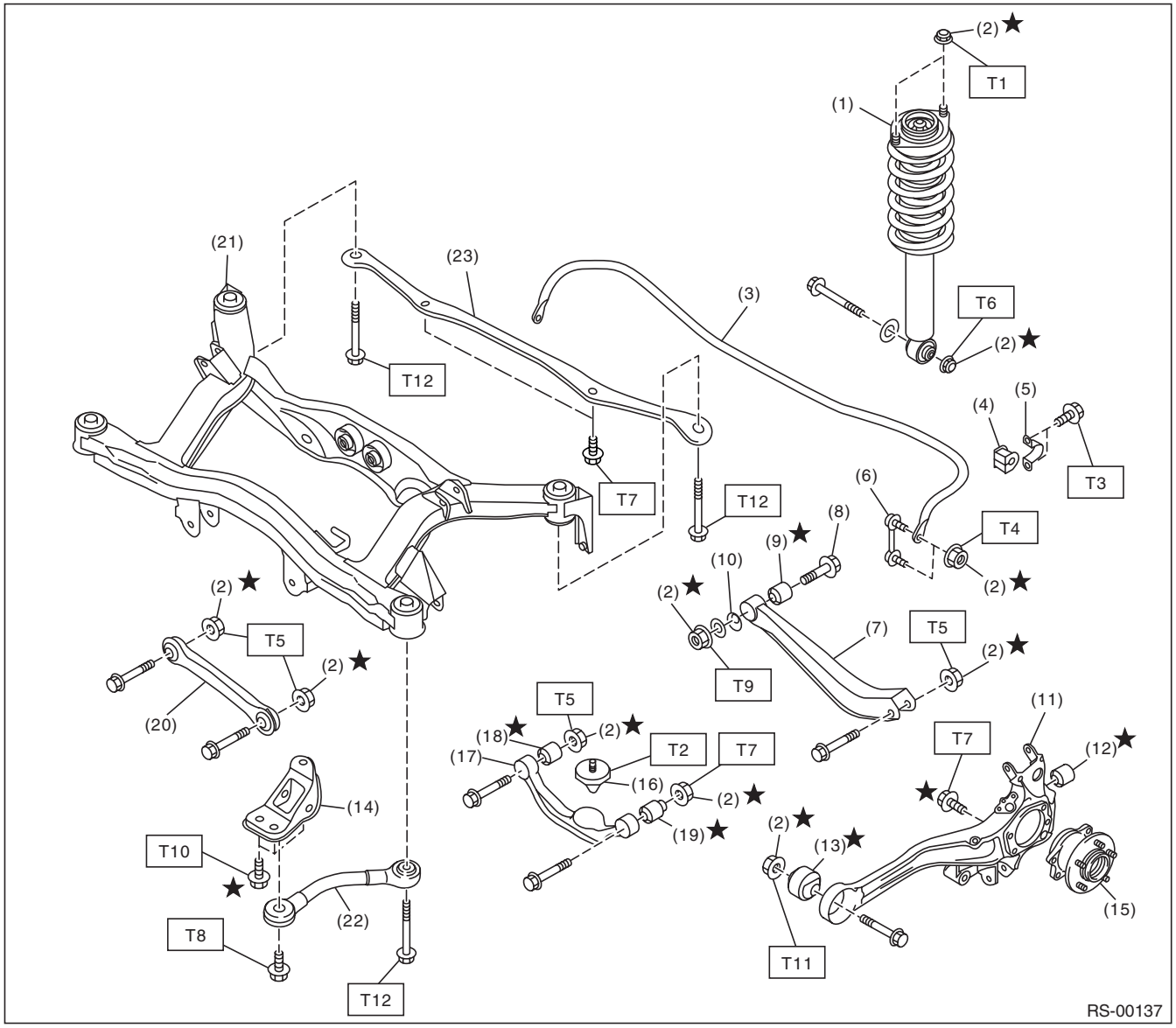
NOTE:
• Front and rear toe-ins and front camber can be adjusted. If the toe-in or camber tolerance exceeds specifications, adjust them.
• Other items indicated in the specification table cannot be adjusted. If other items exceed specifications, check the suspension parts and connections for deformation, and replace with new ones as required.



(1) Front
A − B = Positive: Toe-in, Negative: Toe-out
α = Each toe angle

B: COMPONENT

1. REAR SUSPENSION

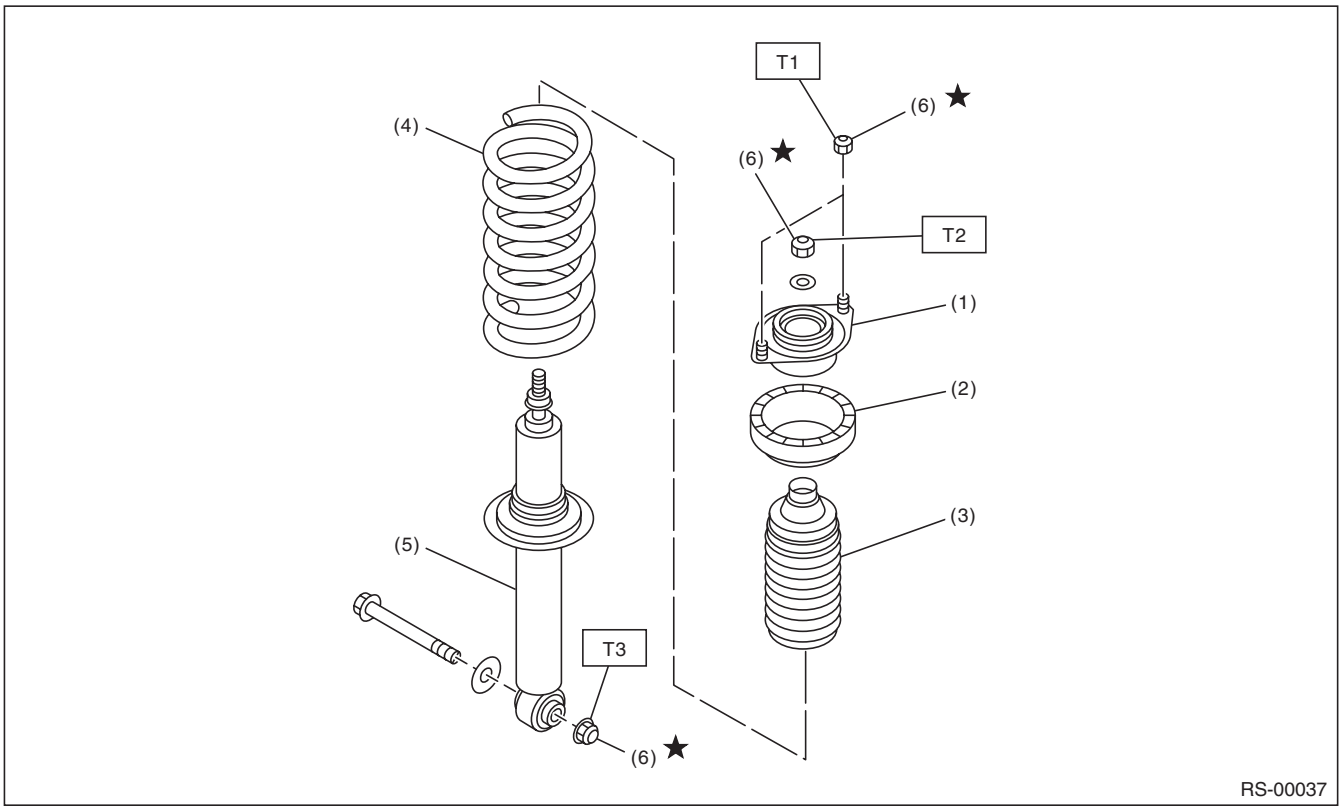


(1)	Shock absorber	(14)	Rear arm bracket
(2)	Self-locking nut	(15)	Hub bearing unit
(3)	Stabilizer	(16)	Helper
(4)	Stabilizer bushing	(17)	Upper link
(5)	Bracket	(18)	Upper link bushing (inner side)
(6)	Stabilizer link	(19)	Upper link bushing (outer side)
(7)	Rear link	(20)	Front link
(8)	Adjusting bolt	(21)	Rear sub frame
(9)	Rear link bushing	(22)	Sub frame support arm
(10)	Adjusting washer	(23)	Sub frame support plate
(11)	Rear arm		
(12)	Rear arm rear bushing		
(13)	Rear arm front bushing		

Tightening torque: N·m (kgf-m, ft-lb)

T1: 30 (3.1, 22.4)
T2: 32 (3.3, 24)
T3: 40 (4.1, 30)
T4: 44 (4.5, 32.5)
T5: 57 (5.8, 42)
T6: 62 (6.3, 46)
T7: 65 (6.6, 48)
T8: 80 (8.2, 59)
T9: 120 (12.2, 89)
T10: 125 (12.7, 92)
T11: 150 (15.3, 111)
T12: 175 (17.8, 129)

2. SHOCK ABSORBER



(1) Mount
(2) Upper rubber sheet
(3) Dust cover
(4) Coil spring
(5) Shock absorber
(6) Self-locking nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22.4)
T2: 35 (3.6, 26)
T3: 62 (6.3, 46)

C: CAUTION

• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Before discarding shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or cloth between the part and the vise.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

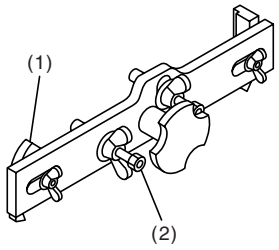
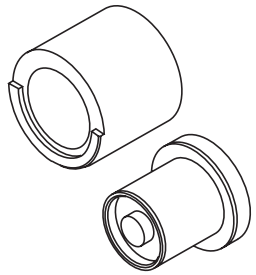
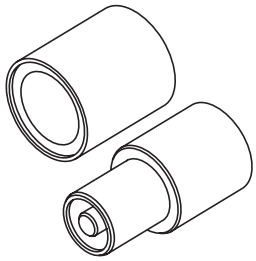
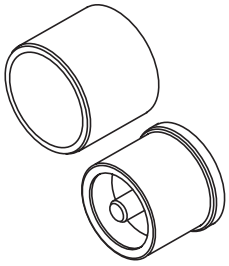
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380002	927380002	ADAPTER	Used for an adapter of camber & caster gauge when measuring the camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST20099AE000	20099AE000	INSTALLER & REMOVER	Used for replacing the rear link bushing.
 ST20099AE010	20099AE010	INSTALLER & REMOVER	Used for replacing the upper link bushing.
 ST20099AE020	20099AE020	INSTALLER & REMOVER SET	Used for replacing the rear arm front bushing.

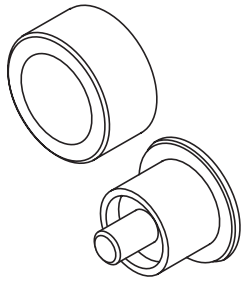
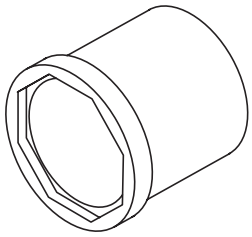
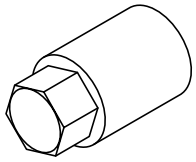
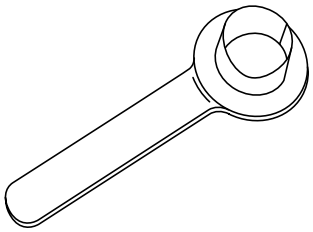
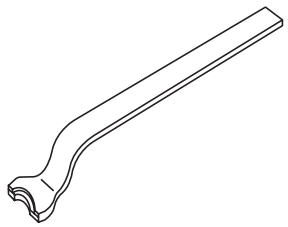
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099AE040	20099AE040	INSTALLER & REMOVER SET	Used for replacing the rear arm rear bushing.
 ST20099AE030	20099AE030	HELPER SOCKET WRENCH	Used for replacing the helper.
 ST20399AG000	20399AG000	STRUT MOUNT SOCKET	Used for removing and installing the shock mount.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to rear differential. • For oil seal protection

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA100	28099PA100	REMOVER	Used for removal of DOJ.

2. GENERAL TOOL

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Transmission jack	Used for removing and installing suspension.
Bearing puller	Used for removing bushings.
Coil spring compressor	Used for disassembling and assembling shock absorber.

2. Wheel Alignment

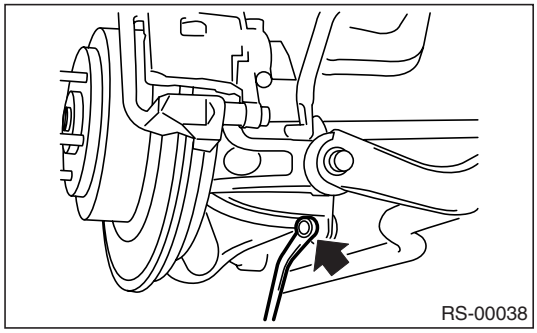
A: INSPECTION

NOTE:
Measure and adjust the front and rear wheel alignment at a time. Refer to “FS” section for measurement and adjustment of wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>

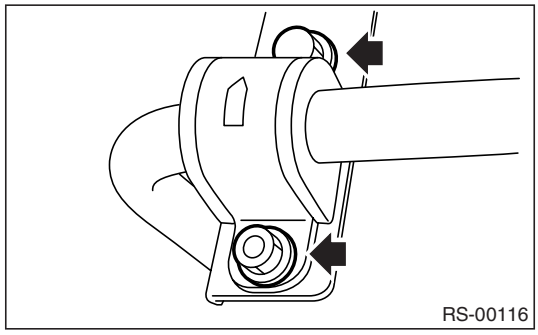
3. Rear Stabilizer

A: REMOVAL

1) Lift-up the vehicle, and then remove the rear wheels.
2) Remove the stabilizer link.



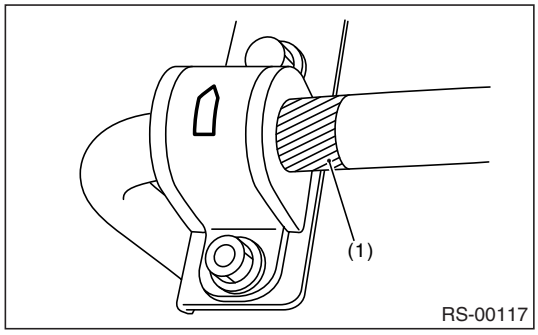
3) Remove the stabilizer bracket.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Use a new self-locking nut.
• Ensure the stabilizer bushing and stabilizer have the same identification colors.
• To install the stabilizer bushing, align the paint mark end of stabilizer to the end of stabilizer bushing.
• Stabilizer bracket has an orientation, so install it with the arrow mark faced to the upper side of vehicle.



(1) Paint mark

2) Always tighten the stabilizer bushing in the state that wheels are in full contact with the ground and the vehicle is curb weight.

Tightening torque:
Stabilizer link
44 N·m (4.5 kgf-m, 32.5 ft-lb)
Stabilizer bracket
40 N·m (4.1 kgf-m, 30 ft-lb)

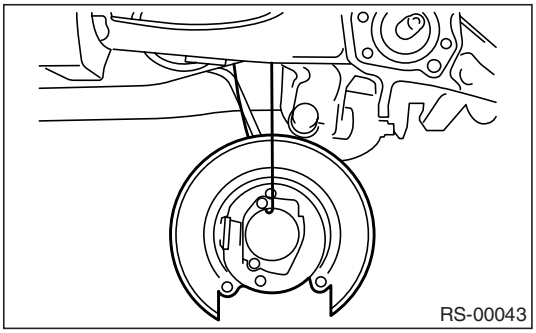
C: INSPECTION

1) Check the bushing for crack, fatigue and damage.
2) Check the stabilizer link for damage.

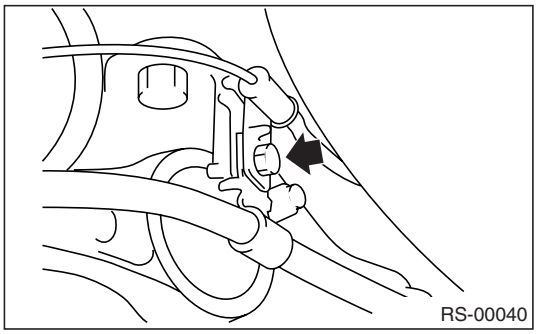
4. Rear Arm

A: REMOVAL

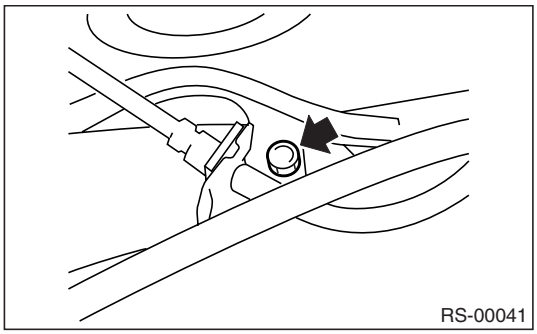
1) Lift-up the vehicle, and then remove the rear wheels.
2) Remove the sub frame support arm.
<Ref. to RS-21, REMOVAL, Sub Frame Support Arm.>
3) Remove the bearing unit.
<Ref. to DS-19, REMOVAL, Rear Hub Unit Bearing.>
4) Hang the back plate from sub frame.


RS-00043

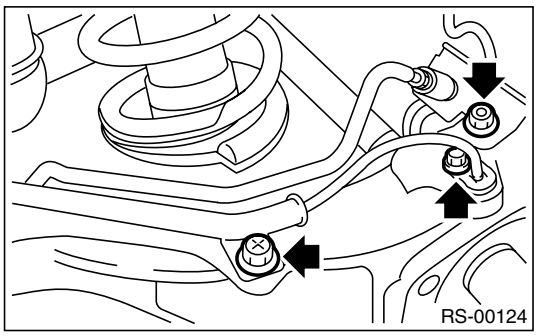
5) Remove the bolt which secure parking brake cable clamp to rear arm bracket.


RS-00040

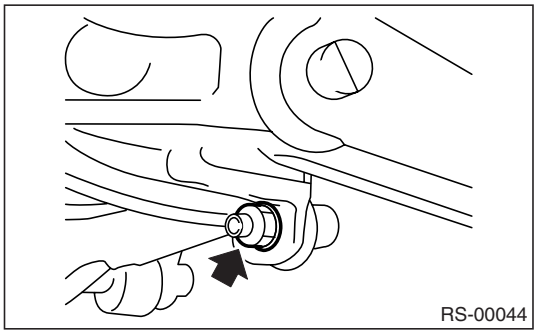
6) Remove the bolt which hold brake hose bracket and ABS wheel speed sensor bracket to rear arm.


RS-00041

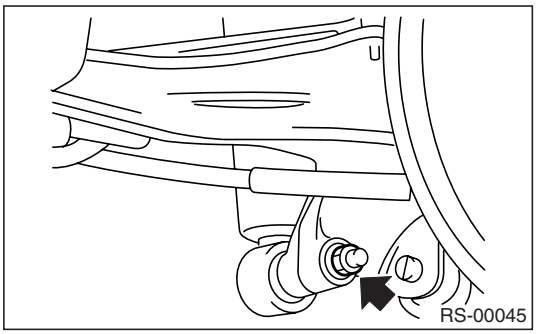
7) Remove the bolts which secure brake hose bracket to rear arm. Remove the bolts which secure ABS wheel speed sensor to rear arm.


RS-00124

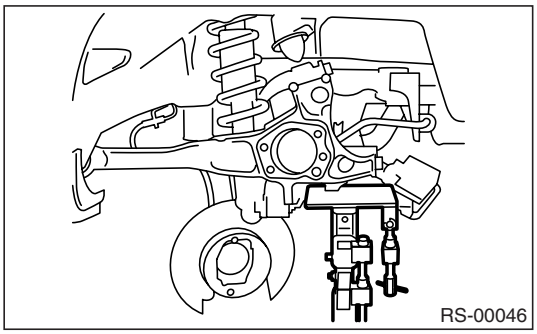
8) Remove the stabilizer link from rear arm.


RS-00044

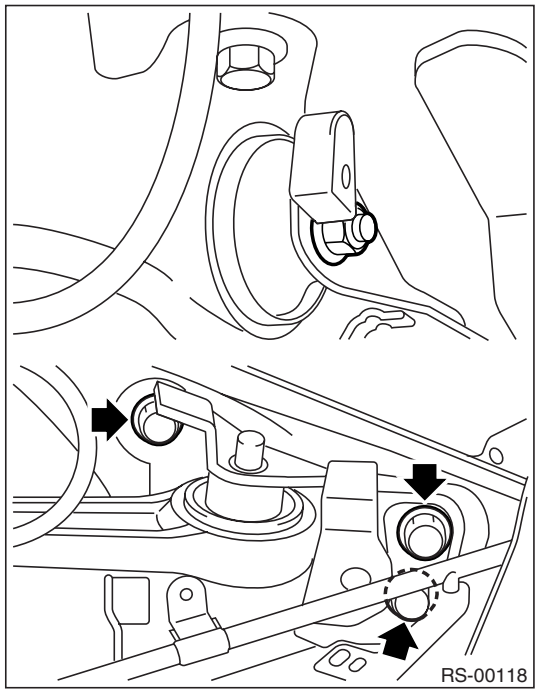
9) Remove the shock absorber from rear arm.


RS-00045

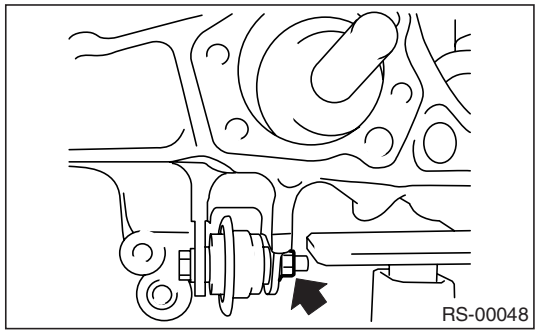
10) Support the rear arm horizontally using transmission jack.


RS-00046

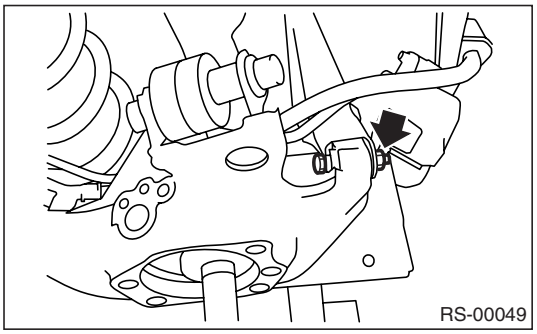
11) Remove the nuts which hold rear arm to bracket. Remove the rear arm bracket.



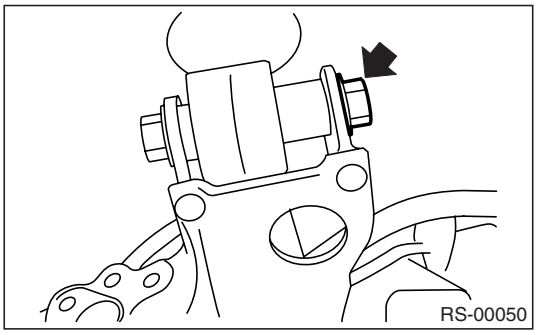
12) Loosen the nut which hold front link to rear arm.



13) Loosen the nut which hold rear link to rear arm.



14) Loosen the nut which hold upper link to rear arm.



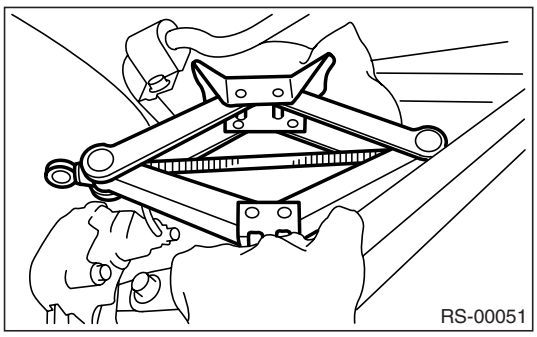
15) Remove the bolt which secure rear arm to the link, and then remove the rear arm.

B: INSTALLATION

NOTE:
Use a new bolt and self-locking nut. For the parts which are not reusable, refer to “COMPONENT”. <Ref. to RS-3, REAR SUSPENSION, COMPONENT, General Description.>

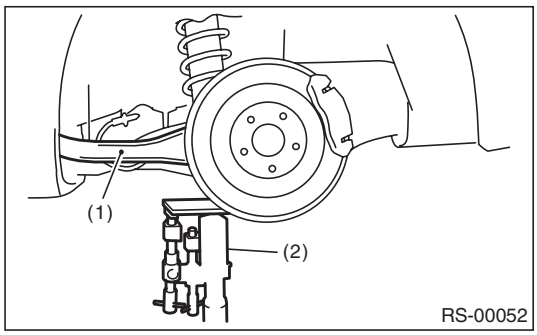
1) Support the rear arm using transmission jack.
2) Install the rear arm and temporarily tighten the bolts which hold rear arm to the link.
3) Install the bearing unit.
<Ref. to DS-20, INSTALLATION, Rear Hub Unit Bearing.>
4) Install the bolts which secure ABS wheel speed sensor to rear arm.
5) Install the bolts which secure brake hose to rear arm.
6) Install the bolts which secure parking brake cable clamp to rear arm bracket.
7) Set the jack which is originally equipped to the vehicle under the upside down situation, and place the jack between rear link and sub frame. Align the installing position of rear shock absorber and rear arm by adjusting the jack position, temporarily tighten the bolt and nut.

CAUTION:
Protect the rear link and sub frame from scratch in the way of putting a cloth between the jack and mating portion.



8) Support the rear arm horizontally using transmission jack.
9) Tighten the nuts and bolts which hold rear arm, front link, rear link, upper link and shock absorber.

NOTE:
Always tighten the bushing in the state that wheels are in full contact with the ground and the vehicle is curb weight.



(1) Rear arm
(2) Transmission jack

10) Install the sub frame support arm.

NOTE:
Inspect the wheel alignment and adjust it if necessary.

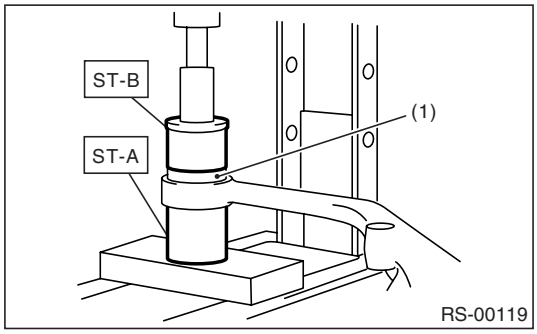
Tightening torque:
Refer to "COMPONENT" of "General Description" for tightening torque. <Ref. to RS-3, REAR SUSPENSION, COMPONENT, General Description.>

C: DISASSEMBLY

1. FRONT BUSHING

1) Set the ST A with the larger side of its inner diameter turned upward.
2) Set the rear arm with the protruding side of bushing turned upward.
3) Place the ST B on bushing, and push the bushing out.

ST A	20099AE020	INSTALLER & REMOVER SET
ST B	20099AE020	INSTALLER & REMOVER SET

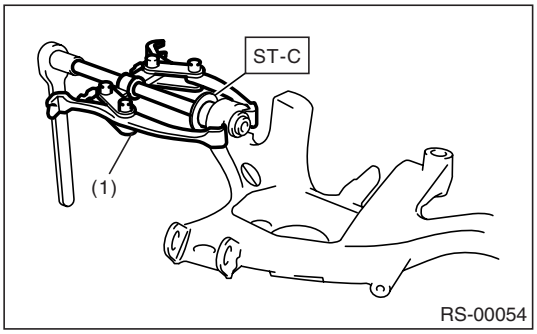


(1) Bushing

2. REAR BUSHING

Using the ST C and bearing puller, press the rear bushing out of place.

ST C	20099AE040	INSTALLER & REMOVER SET



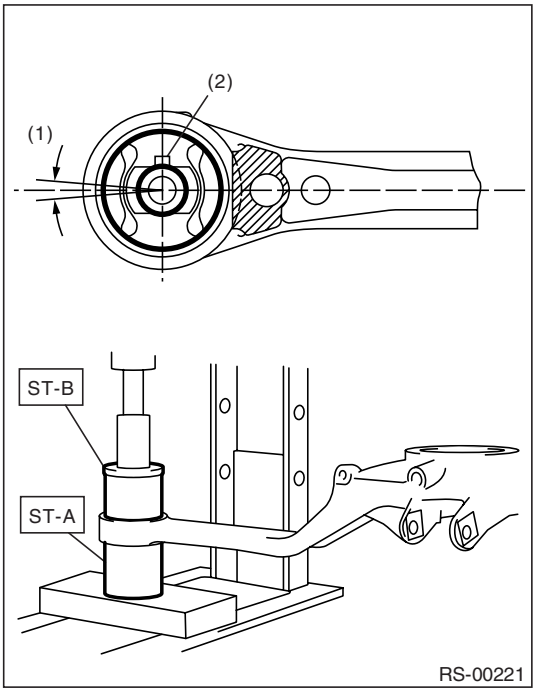
(1) Bearing puller

D: ASSEMBLY

1. FRONT BUSHING

1) Set the ST A with the larger side of its inner diameter turned upward.
2) Set the rear arm with the vehicle inner side of arm turned downward.
3) Place the bushing on rear arm as shown in the figure.
4) Place the ST B on bushing, and press-fit until each edge surface of bushing and rear arm comes to be aligned.

ST A	20099AE020	INSTALLER & REMOVER SET
ST B	20099AE020	INSTALLER & REMOVER SET

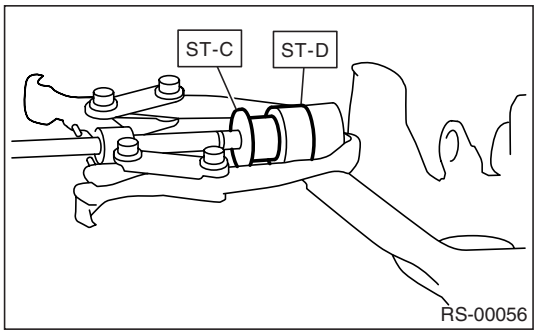


(1) 0±5°
(2) Rubber protrusion: Assemble with the rubber protrusion side faced to the arm inner side

2. REAR BUSHING

1) Press the bushing into the bore inside of ST D.
2) Set the ST C, ST D and bearing puller in the specified position as shown in the figure, and then press-fit the bushing until the outer end of bush and rear end of rear arm in flat.

ST C	20099AE040	INSTALLER & REMOVER SET
ST D	20099AE040	INSTALLER & REMOVER SET



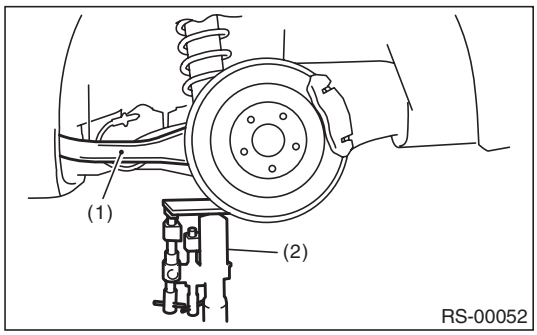
E: INSPECTION

Check the rear arm for bend, corrosion or damage.

5. Upper Link

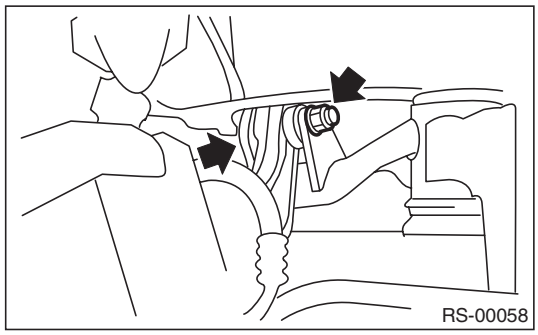
A: REMOVAL

1) Lift-up the vehicle, and then remove the rear wheels.
2) Support the rear arm horizontally using transmission jack.

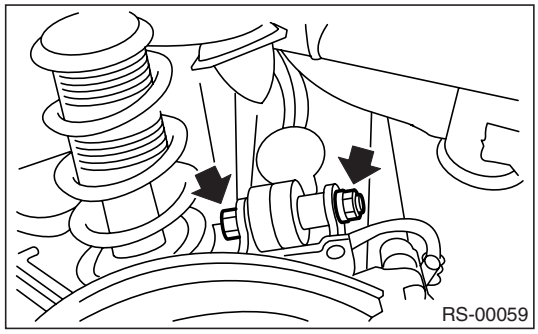


(1) Rear arm
(2) Transmission jack

3) Remove the bolt which secure upper link to sub frame.

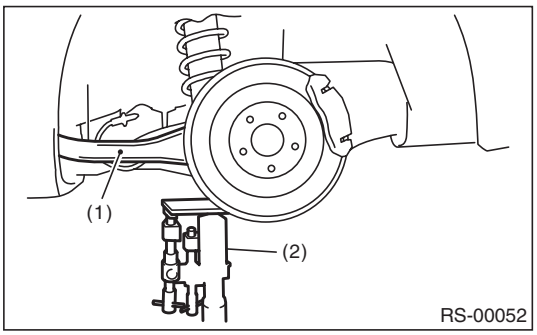


4) Remove the bolts which secure upper link to rear arm, and then remove the upper link.



B: INSTALLATION

1) Support the rear arm horizontally using transmission jack.
2) Using new self-locking nuts, install the upper link.



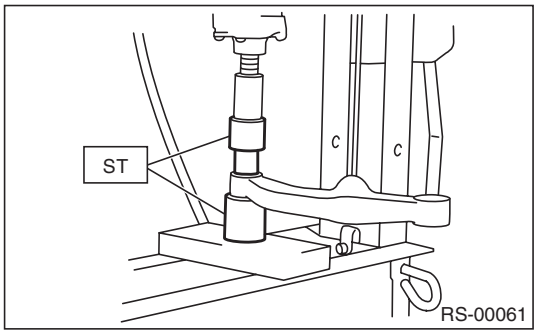
(1) Rear arm
(2) Transmission jack

NOTE:
Inspect the wheel alignment and adjust it if necessary.

Tightening torque:
Upper link to Sub frame
57 N·m (5.8 kgf-m, 42 ft-lb)
Upper link to Rear arm
65 N·m (6.6 kgf-m, 48 ft-lb)

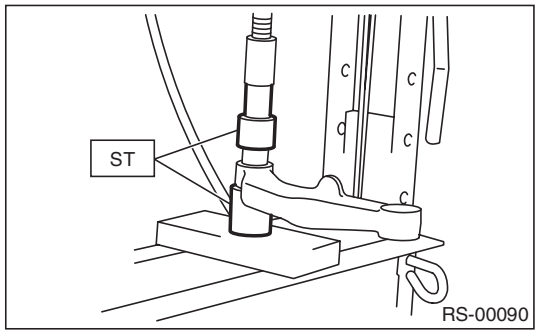
C: DISASSEMBLY

Using the ST, press the bushing out of place.
ST 20099AE010 INSTALLER & REMOVER

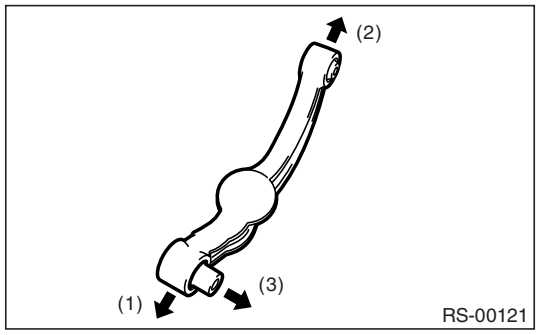


D: ASSEMBLY

Using the ST, press the bushing into place.
ST 20099AE010 INSTALLER & REMOVER



CAUTION:
Outer side bushing has an orientation. Assemble it with the longer protrusion faced to the rear side of vehicle.



(1) Rear arm
(2) Rear sub frame
(3) Rear side of vehicle

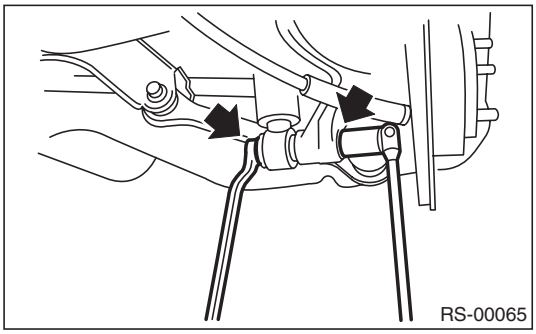
E: INSPECTION

1) Visually check the upper link for damage and deformation.
2) Visually check the bushing for crack, damage and fatigue.

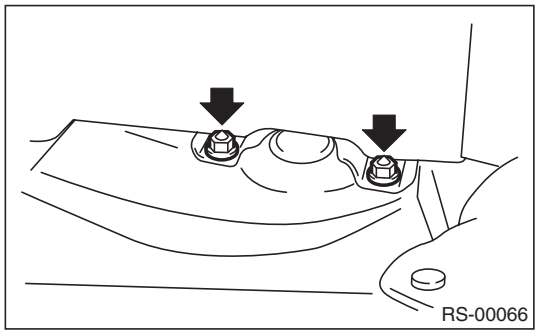
6. Rear Shock Absorber

A: REMOVAL

1) Remove the luggage floor mat. (Wagon model)
2) Roll up the trunk side trim. (Sedan model)
3) Lift-up the vehicle, and then remove the rear wheels.
4) Remove the bolts which secure shock absorber to rear arm.



5) Support the shock absorber using jack.
6) Remove the nuts which secure shock absorber mount to vehicle.



7) Remove the shock absorber.

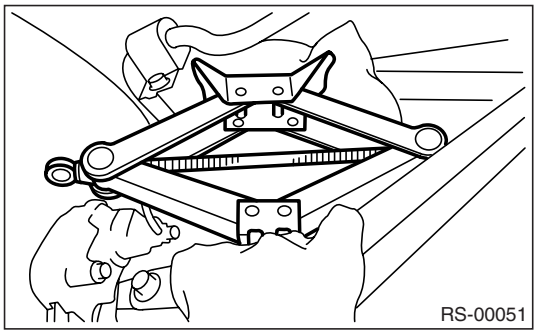
B: INSTALLATION

1) Support the shock absorber using jack.
2) Using new self-locking nuts, secure the shock absorber to vehicle.

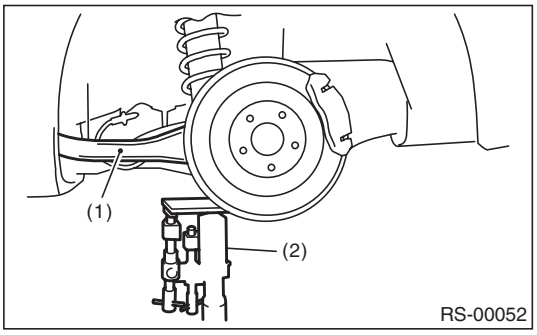
Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

3) Set the jack which is originally equipped to the vehicle under the upside down situation, and place the jack between rear link and sub frame. Align the installing position of rear shock absorber and rear arm by adjusting the jack position. Using new self-locking nuts, temporary tighten the bolt.

CAUTION:
Protect the rear link and sub frame from scratch in the way of putting a shop cloth between the jack and the mating portion.



4) Support the rear arm horizontally using transmission jack.
5) Using new self-locking nuts, tighten the bolt and nut which secure shock absorber.



(1) Rear arm
(2) Transmission jack

Tightening torque:
62 N·m (6.3 kgf-m, 46 ft-lb)

6) Install the floor mat. (Wagon model)
7) Set the trunk side trim. (Sedan model)

NOTE:
Check the wheel alignment and adjust it if necessary.

C: DISASSEMBLY

Refer to “Front Strut” for disassembly procedures.
<Ref. to FS-22, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to “Front Strut” for installation procedures.
<Ref. to FS-22, ASSEMBLY, Front Strut.>

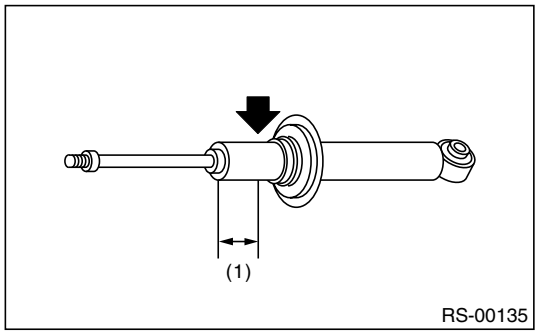
E: INSPECTION

Refer to “Front Strut” for inspection procedures.
<Ref. to FS-23, INSPECTION, Front Strut.>

F: DISPOSAL

CAUTION:
• Before handling the shock absorbers, be sure to wear goggles to protect eyes from gas, oil and cutting powder.
• Do not disassemble the shock absorber or place it into a fire.
• Drill a hole into shock absorbers in case of discarding shock absorbers filled with gas.

1) Place the shock absorber on a level surface with the piston rod fully expanded.
2) Make a hole into the specified position 30 mm (1.18 in) deep using a drill with 2 to 3 mm (0.08 to 0.12 in) diameter.

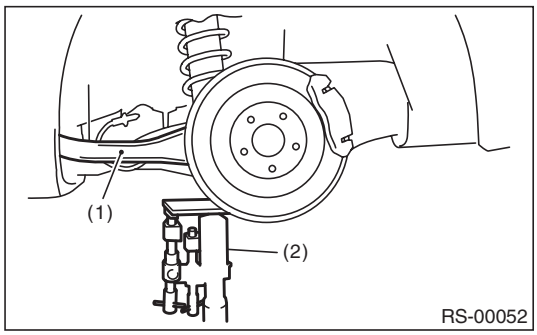


(1) 40 mm (1.57 in)

7. Front Link

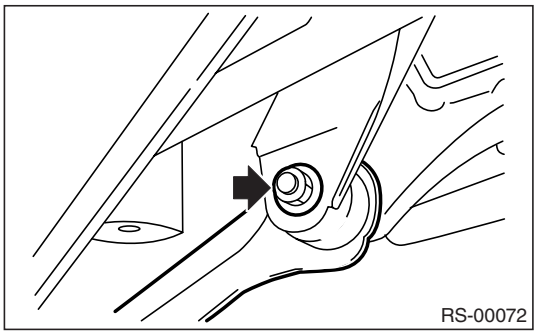
A: REMOVAL

1) Lift-up the vehicle, and then remove the rear wheels.
2) Support the rear arm horizontally using transmission jack.

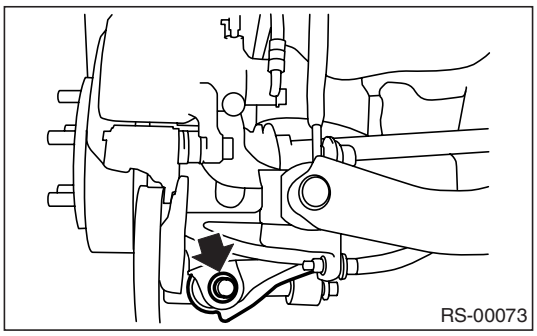


(1) Rear arm
(2) Transmission jack

3) Remove the bolt which secure front link to sub frame.

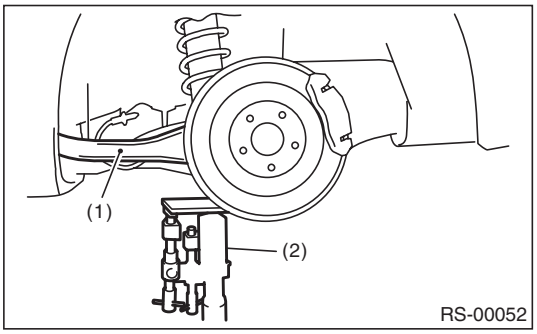


4) Remove the bolt which secure front link to rear arm, and then remove the front link.



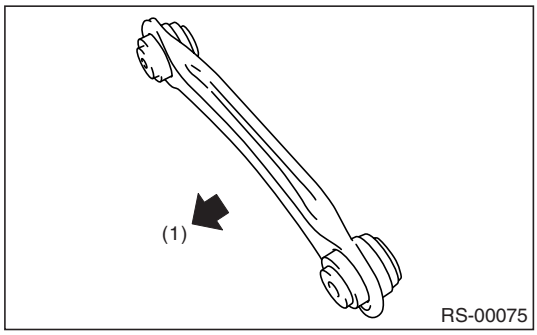
B: INSTALLATION

1) Support the rear arm horizontally using transmission jack.
2) Using new self-locking nuts, install the front link.



(1) Rear arm
(2) Transmission jack

CAUTION:
Install the front link with the protrusion side faced to the front side of vehicle.



(1) Front

NOTE:
Inspect the wheel alignment and adjust it if necessary.

Tightening torque:
57 N·m (5.8 kgf-m, 42 ft-lb)

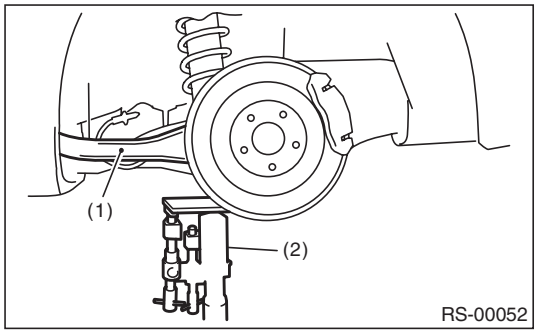
C: INSPECTION

Visually check the front link for damage and deformation.

8. Rear Link

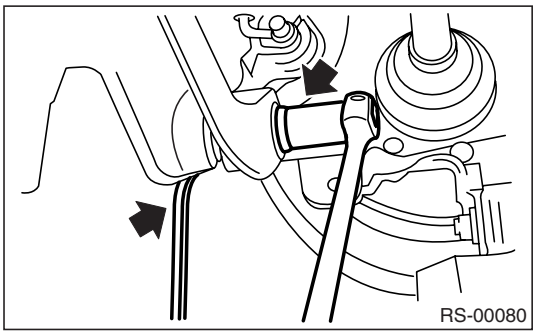
A: REMOVAL

1) Lift-up the vehicle, and then remove the rear wheels.
2) Remove the rear stabilizer. <Ref. to RS-9, REMOVAL, Rear Stabilizer.>
3) Support the rear arm horizontally using transmission jack.



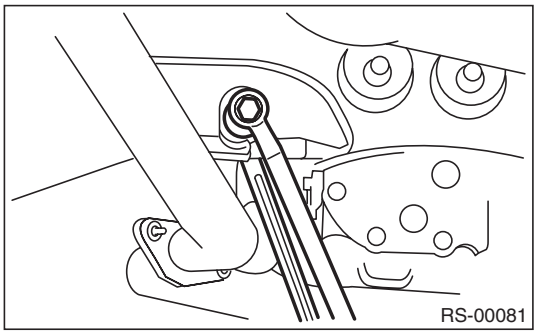
(1) Rear arm
(2) Transmission jack

4) Remove the bolts which secure rear link to rear arm.



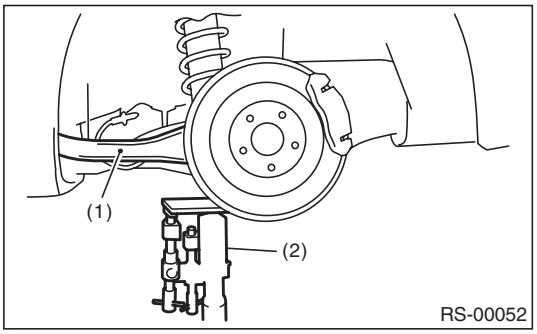
5) Put alignment marks on the rear link adjusting bolt and sub frame.
6) Remove the bolt which secure rear link to sub frame, and then remove the rear link.

CAUTION:
Loosen the nut with the bolt head secured when loosening the adjusting bolt.



B: INSTALLATION

1) Support the rear arm horizontally using transmission jack.
2) Using new self-locking nuts, install the rear link.



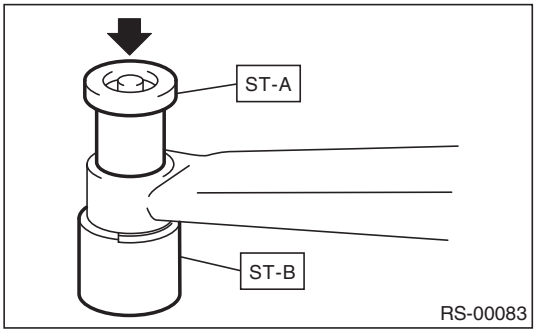
(1) Rear arm
(2) Transmission jack

NOTE:
• Tighten the self-locking nut with the bolt head secured when installing the adjusting bolt.
• Inspect the wheel alignment and adjust it if necessary.

Tightening torque:
Rear link to Sub frame
120 N·m (12.2 kgf-m, 89 ft-lb)
Rear link to Rear arm
57 N·m (5.8 kgf-m, 42 ft-lb)

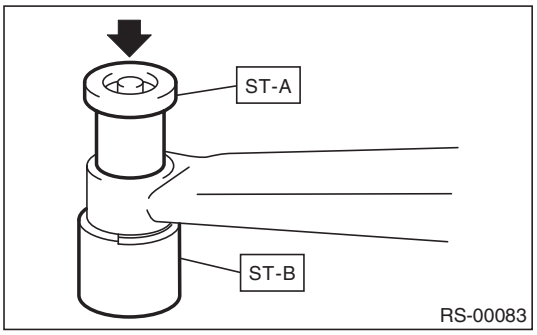
C: DISASSEMBLY

Using the ST A and ST B, press the bushing out of place.
ST A 20099AE000 INSTALLER & REMOVER
ST B 20099AE000 INSTALLER & REMOVER



D: ASSEMBLY

Using the ST A and ST B, press-fit the bushing.
ST A 20099AE000 INSTALLER & REMOVER
ST B 20099AE000 INSTALLER & REMOVER



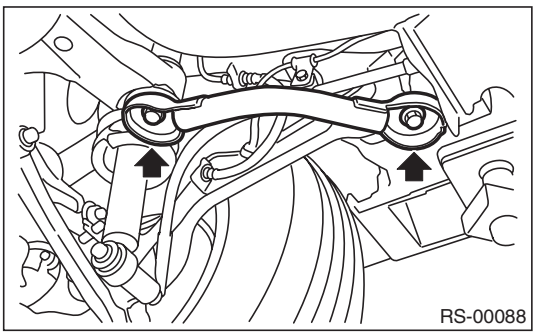
E: INSPECTION

Visually check the rear link for damage and deformation.

9. Sub Frame Support Arm

A: REMOVAL

1) Lift-up the vehicle, and support the rear sub frame with support stand.
2) Remove the sub frame support arm.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Sub frame support arm to Rear arm bracket
80 N·m (8.2 kgf-m, 59 ft-lb)
Sub frame support arm to Rear sub frame
175 N·m (17.8 kgf-m, 129 ft-lb)

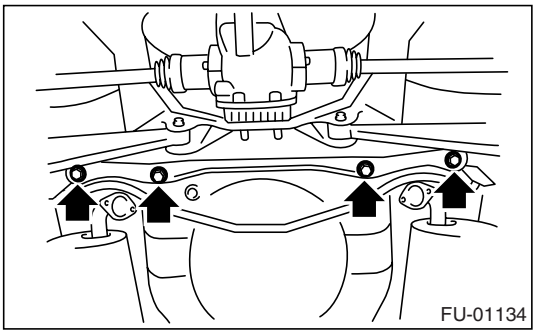
C: INSPECTION

Visually check the sub frame support arm for damage and deformation.

10.Sub Frame Support Plate

A: REMOVAL

1) Lift-up the vehicle, and support the rear sub frame with support stand.
2) Remove the sub frame support plate.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Support plate to Sub frame
175 N·m (17.8 kgf-m, 129 ft-lb)
Support plate to Body
65 N·m (6.6 kgf-m, 48 ft-lb)

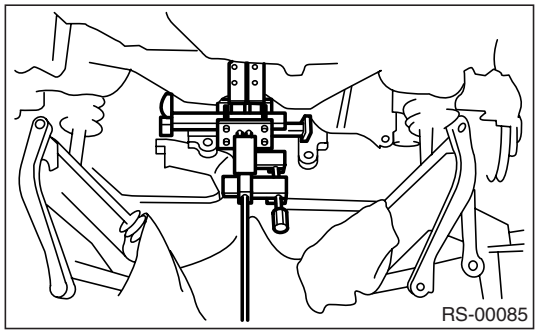
C: INSPECTION

Visually check the support plate for damage.

11.Rear Sub Frame

A: REMOVAL

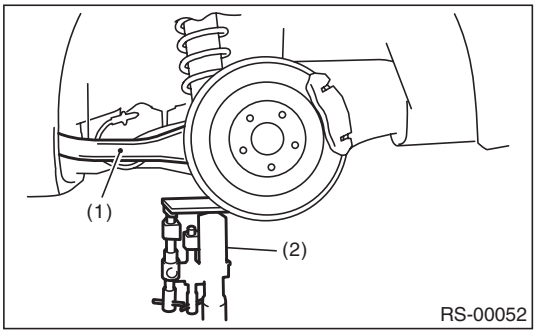
1) Separate the front exhaust pipe and rear exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the rear differential.
T-type
<Ref. to DI-29, REMOVAL, Rear Differential (T-type).>
VA-type
<Ref. to DI-46, REMOVAL, Rear Differential (VA-type).>
4) Remove the rear stabilizer. <Ref. to RS-9, REMOVAL, Rear Stabilizer.>
5) Remove the bolts which secure rear shock absorber to rear arm.
6) Support the sub frame using transmission jack.



7) Remove the front link from sub frame.
<Ref. to RS-18, REMOVAL, Front Link.>
8) Remove the rear link from sub frame.
<Ref. to RS-19, REMOVAL, Rear Link.>
9) Remove the upper link from sub frame.
<Ref. to RS-14, REMOVAL, Upper Link.>
10) Remove the sub frame support arm.
11) After removing the bolt, remove the sub frame and sub frame support plate from vehicle body.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Follow the procedure below for the rear differential installation and tightening torque.
T-type
<Ref. to DI-30, INSTALLATION, Rear Differential (T-type).>
VA-type
<Ref. to DI-47, INSTALLATION, Rear Differential (VA-type).>
3) Support the rear arm horizontally using transmission jack. Tighten the nuts and bolts which hold rear arm, front link, rear link, upper link and shock absorber.



(1) Rear arm
(2) Transmission jack

NOTE:
Check the wheel alignment and adjust it if necessary.

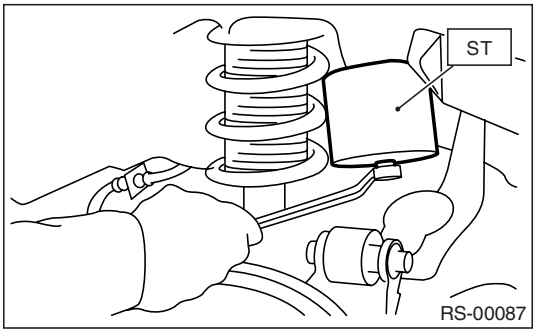
C: INSPECTION

Check the removed parts for wear, damage and crack, and repair or replace them if faulty.

12.Helper

A: REMOVAL

1) Lift-up the vehicle, and then remove the rear wheels.
2) Remove the helper using ST.
ST 20099AE030 HELPER SOCKET WRENCH



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

C: INSPECTION

Check the helper for crack, fatigue and damage.

13.General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible cause	Corrective action
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Rough operation of damper strut or shock absorber	Replace.
(3) Installation of wrong strut or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

- Large rebound shock
- Rocking of the vehicle continues too long after running over bump and hump.
- Large shock in bumping

Possible cause	Corrective action
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new ones.
(4) Fault in operation of damper strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly or shock absorber	Replace.
(9) Oil leakage of damper strut or shock absorber	Replace.

3. NOISE

Possible cause	Corrective action
(1) Wear or damage of damper strut or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Tighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

WHEEL AND TIRE SYSTEM

WT

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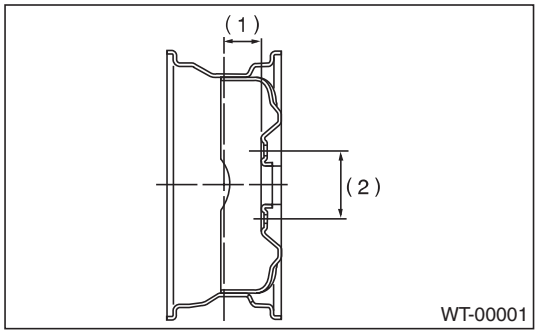
4. Aluminum Wheel 6
5. Wheel Balancing 7
6. “T-type” Tire 9
7. General Diagnostic Table 10

1. General Description

A: SPECIFICATION

1. WHEEL AND TIRE SIZE



(1) Offset
(2) P.C.D.

Specifications		Tire size	Wheel size	Offset mm (in)	P.C.D. mm (in)	Tire inflation pressure kPa (kgf/cm^2, psi)	
						Front wheel	Rear wheel
Sedan	2.0 i, 2.5 i	205/55R16 89V	16 × 6$^1/_2$JJ	55 (2.17)	100 (3.94)	220 (2.2, 32)	220 (2.2, 32)
	2.5 i (OP)	215/45R17 87W	17 × 7JJ			230 (2.3, 33)	220 (2.2, 32)
	2.5 i (KA model)	215/45R17 87W	17 × 7JJ			230 (2.3, 33)	220 (2.2, 32)
	3.0 R	215/45R17 87W	17 × 7JJ			230 (2.3, 33)	220 (2.2, 32)
	3.0 R (EH model)	205/55R16 89V	16 × 6$^1/_2$JJ			220 (2.2, 32)	220 (2.2, 32)
	2.0 GT	215/45R17 87W	17 × 7JJ			230 (2.3, 33)	220 (2.2, 32)
	3.0 R spec. B	215/45R18 89W	18 × 7JJ			230 (2.3, 33)	210 (2.1, 31)
Wagon	2.0 i, 2.5 i	205/55R16 89V	16 × 6$^1/_2$JJ			220 (2.2, 32)	220 (2.2, 32)
	2.5 i (OP)	215/45R17 87W	17 × 7JJ			230 (2.3, 33)	210 (2.1, 31)
	2.5 i (KA model)	215/45R17 87W	17 × 7JJ			230 (2.3, 33)	210 (2.1, 31)
	3.0 R	215/45R17 87W	17 × 7JJ			230 (2.3, 33)	210 (2.1, 31)
	2.0 GT	215/45R17 87W	17 × 7JJ			230 (2.3, 33)	210 (2.1, 31)
	OUTBACK 2.5 i	215/60R16 95V	16 × 6$^1/_2$JJ	48 (1.89)		210 (2.1, 31)	200 (2.0, 29)
	OUTBACK 3.0 R	215/55R17 94V	17 × 7JJ			210 (2.1, 31)	200 (2.0, 29)
	3.0 R spec. B	215/45R18 89W	18 × 7JJ	55 (2.17)		230 (2.3, 33)	210 (2.1, 31)
“T-type” Tire	2.0 GT, 3.0 R	T135/70D17 102M	17 × 4T	40 (1.57)		420 (4.2, 60)	
	2.0 i, 2.5 i, 3.0 R (Sedan EH model)	T135/80D16 101M	16 × 4T	50 (1.97)			
	3.0 R spec. B	T145/70D17 106M	17 × 4T	40 (1.57)			

NOTE:
- Except for KA, KS model, “T-type” tire for temporary use is supplied as a spare tire.
- For KA, KS model, a spare tire of standard tire size is supplied.

2. SERVICE DATA

Part	Axial runout	Radial runout
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

3. ADJUSTING PARTS

Wheel balancing	Specification	Service limit
Dynamic unbalance	10 g (0.35 oz) or less	

Balance weight part number (Knock-on type weight for steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	60 g (2.12 oz)

Balance weight part number (Knock-on type weight for aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG000	5 g (0.18 oz)
28101AG010	7.5 g (0.26 oz)
28101AG020	10 g (0.35 oz)
28101AG030	12.5 g (0.44 oz)
28101AG040	15 g (0.53 oz)
28101AG050	17.5 g (0.62 oz)
28101AG060	20 g (0.71 oz)
28101AG070	22.5 g (0.79 oz)
28101AG080	25 g (0.88 oz)
28101AG090	27.5 g (0.97 oz)
28101AG100	30 g (1.06 oz)
28101AG110	32.5 g (1.15 oz)
28101AG120	35 g (1.23 oz)
28101AG130	37.5 g (1.32 oz)
28101AG140	40 g (1.41 oz)
28101AG150	42.5 g (1.50 oz)
28101AG160	45 g (1.59 oz)
28101AG170	47.5 g (1.68 oz)
28101AG180	50 g (1.76 oz)
28101AG190	52.5 g (1.85 oz)
28101AG200	55 g (1.94 oz)
28101AG210	57.5 g (2.03 oz)
28101AG220	60 g (2.12 oz)
28101AG230	62.5 g (2.20 oz)
28101AG240	65 g (2.29 oz)
28101AG250	67.5 g (2.38 oz)
28101AG260	70 g (2.47 oz)
28101AG270	72.5 g (2.56 oz)
28101AG280	75 g (2.65 oz)
28101AG290	77.5 g (2.73 oz)
28101AG300	80 g (2.82 oz)
28101AG310	82.5 g (2.91 oz)
28101AG320	85 g (3.00 oz)
28101AG330	87.5 g (3.09 oz)
28101AG340	90 g (3.17 oz)
28101AG350	92.5 g (3.26 oz)
28101AG360	95 g (3.35 oz)
28101AG370	97.5 g (3.44 oz)
28101AG380	100 g (3.53 oz)

B: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Air pressure gauge	Used for measuring tire inflation pressure.
Dial gauge with magnet stand	Used for measuring wheel runout.
Wheel balancer	Used for adjusting wheel balance.

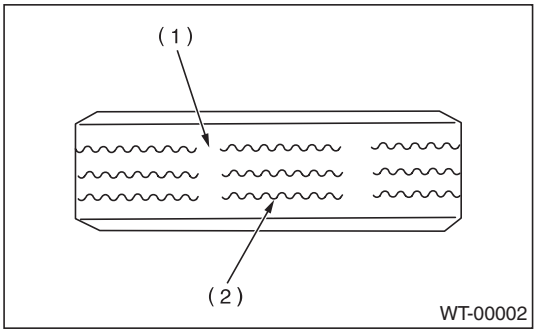
2. Tire

A: INSPECTION

1) Take stones, glass, nails etc. out of the tread groove.
2) Replace the tire if as follows.

CAUTION:
When replacing a tire, make sure to use only the same size, construction and load range as originally installed.

(1) When large crack on side wall, damage or crack on tread is found.
(2) When the “tread wear indicator” appears as a solid band across the tread.



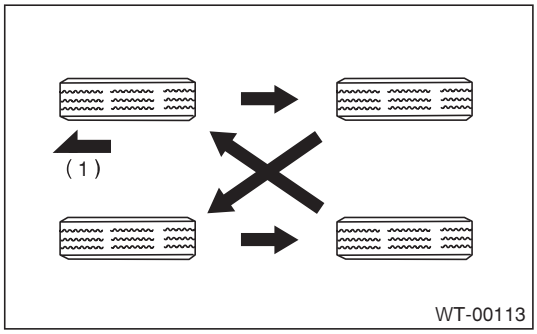
(1) Tread wear indicator
(2) Tire tread

3) When a crack on tire valve is found, replace the tire valve.

1. TIRE ROTATION

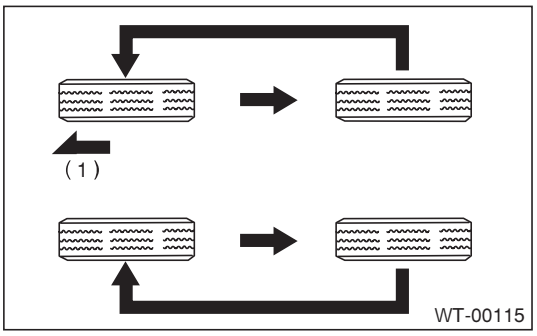
Rotate tires periodically (5,000 km/3,100 miles) as shown in the figure, in order to prevent them from uneven wear and to prolong their life.

• Without instruction for the direction of tire rotation.



(1) Front

• With instruction for the direction of tire rotation.



(1) Front

3. Steel Wheel

A: REMOVAL

1) Apply the parking brake, and position the select lever to “P” or “LOW”.
2) Set the shop jacks or a lift to specified point, and support the vehicle with its wheels slightly contacting the floor.
3) Loosen the wheel nuts.
4) Raise the vehicle until its wheels take off the ground using a jack or a lift.
5) Remove the wheel nuts and wheels.

NOTE:
• When removing the wheels, prevent hub bolts from damage.
• Place the wheels with their outer sides facing upward to prevent wheels from damage.

B: INSTALLATION

1) Remove dirt from the mating surface of wheel and brake rotor.
2) Attach the wheel to the hub by aligning the wheel bolt hole with the hub bolt.
3) Temporarily attach the wheel nuts to the hub bolts. (In the case of aluminum wheel, use SUBARU genuine wheel nut for aluminum wheel.)
4) Manually tighten the nuts making sure the wheel hub hole is aligned correctly to the guide portion of hub.
5) Tighten the wheel nuts in a diagonal selection to the specified torque. Use a wheel nut wrench.

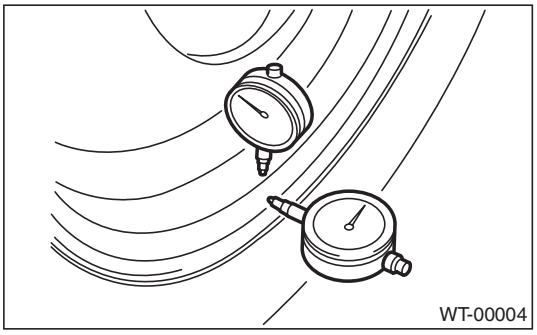
Wheel nut tightening torque:
90 N·m (9.1 kgf-m, 65.7 ft-lb)

CAUTION:
• Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until they reach the specified torque.
• Do not depress the wrench with foot. Always use both hands when tightening.
• Make sure the bolt, nut and the nut seating surface of the wheel are free from oil.

6) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

C: INSPECTION

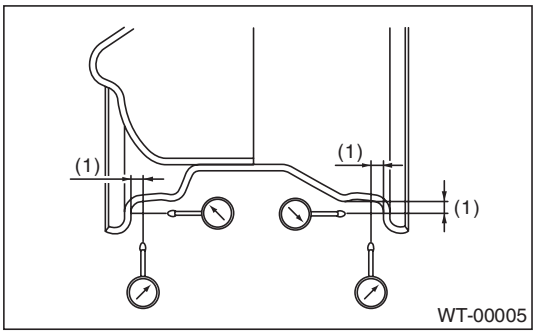
1) Deformation or damage on the rim may cause air leakage. Check the rim flange for deformation, crack or damage, and repair or replace as necessary.
2) Jack-up the vehicle until wheels clear the floor.
3) Slowly rotate the wheel to check rim “runout” using a dial gauge.



Rim runout:

Axial runout specification	Radial runout specification
1.5 mm (0.059 in)	

4) If the rim runout exceeds specification, remove the tire from wheel and check runout while attaching the dial gauge to positions shown in the figure.



(1) Approx. 7 mm (0.28 in)

5) If the measured runout still exceeds specification, replace the wheel.

4. Aluminum Wheel

A: REMOVAL

Refer to “Steel Wheel” for removal procedure of aluminum wheels. <Ref. to WT-5, REMOVAL, Steel Wheel.>

B: INSTALLATION

Refer to “Steel Wheel” for installation procedure of aluminum wheels. <Ref. to WT-5, INSTALLATION, Steel Wheel.>

C: INSPECTION

Refer to “Steel Wheel” for inspection procedure of aluminum wheels. <Ref. to WT-5, INSPECTION, Steel Wheel.>

Rim runout:

Axial runout specification	Radial runout specification
1.0 mm (0.039 in)	

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the followings:
1) Do not damage the aluminum wheels during removal, installation, wheel balancing, etc. After removing the aluminum wheels, place them on a rubber mat, etc.
2) When washing the aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleanser including abrasive, hard brushes or an automatic car washer.

5. Wheel Balancing

A: ADJUSTMENT

NOTE:
Change the setting of wheel balancer to adhesive type weight as adhesive type weight is adopted for outside balance weight of 17-inch and 18-inch wheel.

1) Remove the balance weights.

CAUTION:
• Be careful not to damage the wheel.
• Completely remove the two-sided tape of the adhesive type weight from the wheel.

2) Using the wheel balancer, measure the wheel balance.
3) Select a weight close to the value measured by wheel balancer.

CAUTION:
Use SUBARU genuine balance weight.

Balance weight part number (Knock-on type weight for steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	60 g (2.12 oz)

Balance weight part number (Knock-on type weight for aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

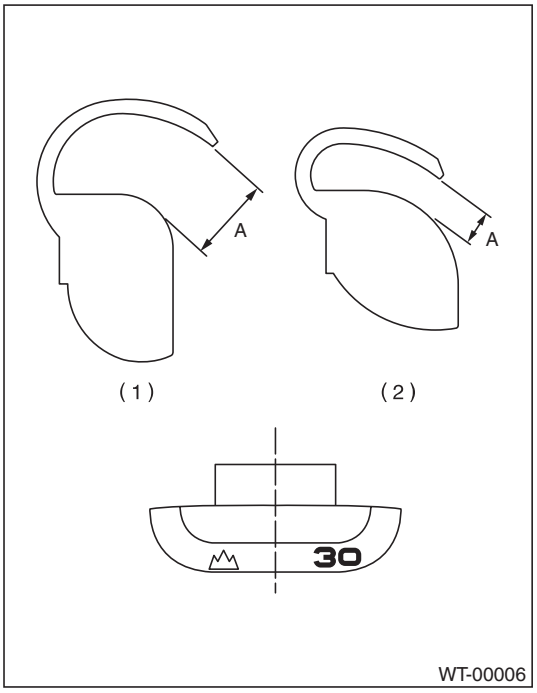
Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG000	5 g (0.18 oz)
28101AG010	7.5 g (0.26 oz)
28101AG020	10 g (0.35 oz)
28101AG030	12.5 g (0.44 oz)
28101AG040	15 g (0.53 oz)
28101AG050	17.5 g (0.62 oz)
28101AG060	20 g (0.71 oz)
28101AG070	22.5 g (0.79 oz)
28101AG080	25 g (0.88 oz)
28101AG090	27.5 g (0.97 oz)
28101AG100	30 g (1.06 oz)
28101AG110	32.5 g (1.15 oz)
28101AG120	35 g (1.23 oz)
28101AG130	37.5 g (1.32 oz)
28101AG140	40 g (1.41 oz)
28101AG150	42.5 g (1.50 oz)
28101AG160	45 g (1.59 oz)
28101AG170	47.5 g (1.68 oz)
28101AG180	50 g (1.76 oz)
28101AG190	52.5 g (1.85 oz)
28101AG200	55 g (1.94 oz)
28101AG210	57.5 g (2.03 oz)
28101AG220	60 g (2.12 oz)
28101AG230	62.5 g (2.20 oz)
28101AG240	65 g (2.29 oz)
28101AG250	67.5 g (2.38 oz)
28101AG260	70 g (2.47 oz)
28101AG270	72.5 g (2.56 oz)
28101AG280	75 g (2.65 oz)
28101AG290	77.5 g (2.73 oz)
28101AG300	80 g (2.82 oz)
28101AG310	82.5 g (2.91 oz)
28101AG320	85 g (3.00 oz)
28101AG330	87.5 g (3.09 oz)
28101AG340	90 g (3.17 oz)
28101AG350	92.5 g (3.26 oz)
28101AG360	95 g (3.35 oz)
28101AG370	97.5 g (3.44 oz)
28101AG380	100 g (3.53 oz)

4) Install the selected weight to the point designated by wheel balancer.

CAUTION:
• Remove grease from adhesive type weight applying surface of wheel.
• Press the adhesive type weight by 25 N (2.5 kgf, 5.6 lbf) or more per 5 g (0.18 oz) for 2 seconds at least to attain close contact.
• Make all amounts of the applied adhesive type weight to be 100 g (3.53 oz) or less.

5) Using the wheel balancer, measure the wheel balance again. Check that wheel balance is correctly adjusted.

NOTE:
• 55 g (1.94 oz) knock-on type weight used with aluminum wheel is not available.
• Balance weights of knock-on type weight for aluminum wheel are available for use with any of 15- to 18-inch aluminum wheels.



(1) Knock-on type weight for aluminum wheel
(2) Knock-on type weight for steel wheel

Service limit: A
Knock-on type weight for steel wheel:
5 — 25 g (0.18 — 0.88 oz) 2.0 mm (0.08 in)
30 g (1.06 oz) or more 1.8 mm (0.07 in)
Knock-on type weight for aluminum wheel:
5 — 25 g (0.18 — 0.88 oz) 5.0 mm (0.20 in)
30 g (1.06 oz) or more 4.5 mm (0.177 in)

6. "T-type" Tire

A: NOTE

"T-type" tire for temporary use is prepared as a spare tire. (Except for KA, KS model)

CAUTION:
• Do not use a tire chain with the "T-type" tire. Because of the smaller tire size, a tire chain will not fit properly and will result in damage to the vehicle and the tire.
• Do not drive at a speed greater than 100 km/h (62 MPH).
• Drive as slowly as possible and avoid passing over bumps.

B: REPLACEMENT

Refer to "Steel Wheel" for installation procedure of "T-type" tire. <Ref. to WT-5, REMOVAL, Steel Wheel.>

CAUTION:
Replace with a conventional tire as soon as possible since the "T-type" tire is only for temporary use.

C: INSPECTION

1) Check the tire air pressure.

Specifications:
420 kPa (4.2 kgf/cm^2, 60 psi)

2) Take the stones, glass, nails, etc. out of the tread groove.
3) Check the tires for deformation, cracks, partial wear or wear.

CAUTION:
Replace the tire with a new one if defective.

7. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Corrective action
Wheel wobble.	Improperly inflated tire.	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure and replace the tire.
	Front wheel alignment	Check the front wheel alignments. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignments. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-23, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-16, INSPECTION, Rear Shock Absorber.>
	Front axle	Check the front axle. <Ref. to DS-15, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-21, INSPECTION, Rear Hub Unit Bearing.>
Vehicle is abnormally out of balance.	Improperly inflated tire.	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure and replace the tire.
	Front stabilizer	Check the front stabilizer. <Ref. to FS-15, INSPECTION, Front Stabilizer.>
	Front wheel alignment	Check the front wheel alignments. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignments. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
Abnormal wheel vibration	Improperly inflated tire.	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure and replace the tire.
	Improper wheel balancing	Check the wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Front axle	Check the front axle. <Ref. to DS-15, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-21, INSPECTION, Rear Hub Unit Bearing.>

Symptom	Possible cause	Corrective action
Abnormal tire wear	Improperly inflated tire.	Adjust the tire pressure.
	Improper wheel balancing	Check the wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignments. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignments. <Ref. to RS-8, INSPECTION, Wheel Alignment.>

DIFFERENTIALS

DI

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1. General Description

A: SPECIFICATION

1. REAR DIFFERENTIAL

When replacing a rear differential assembly, select the correct one according to the following table.

NOTE:
- Using the different rear differential assembly causes the drive line and tires to “drag” or emit noise.
- For option code, refer to “ID” section. <Ref. to ID-2, IDENTIFICATION, Identification.>

Model	Sedan, Wagon						
	2.0 L Non-turbo		2.0 L Turbo	2.5 L		3.0 L	2.0 L Turbo
	4 AT	5 MT	5 MT	4 AT	5 MT	5 AT	
					KA, KS★1 / EC, EK, K4★1		
Rear differential type	VA1-type	T-type				VA2-type	
Classification	XJ	T2	JP	T2	VB	XT	XU
LSD type	—		Viscous coupling	—		Viscous coupling	
Type of gear	Hypoid gear						
Gear ratio (Number of gear teeth)	4.111 (37/9)				3.700 (37/10)	3.083 (37/12)	3.272 (36/11)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)						
Rear differential gear oil	GL-5						

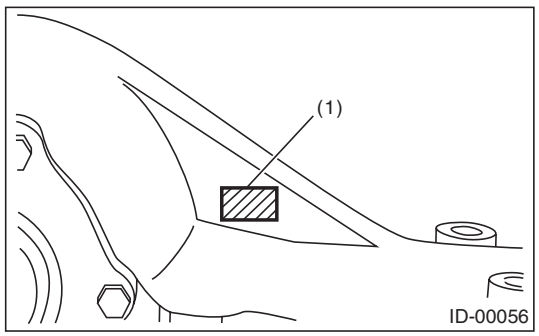
Model	Sedan, Wagon	OUTBACK			
	3.0 L	2.5 L			3.0 L
	6 MT	4 AT	5 MT		5 AT
			EC, EK, K4★1	KS, KA★1	
Rear differential type	T-type				VA2-type
Classification	FM	CF	EZ	JE	XU
LSD type	Viscous coupling				
Type of gear	Hypoid gear				
Gear ratio (Number of gear teeth)	3.545 (39/11)	4.444 (40/9)	3.900 (39/10)	4.111 (37/9)	3.272 (36/11)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)				
Rear differential gear oil	GL-5				

★1: Option code

2. CLASSIFICATION

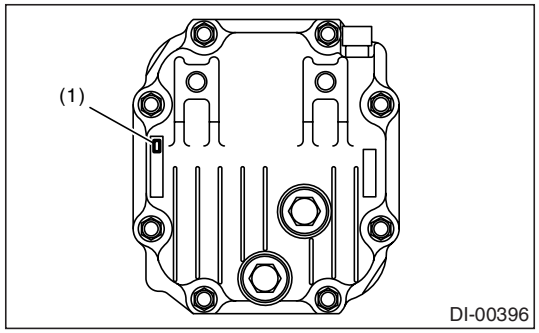
Identification label positions are shown in the following figures. For details concerning identification, refer to “ID” section.

- T-type



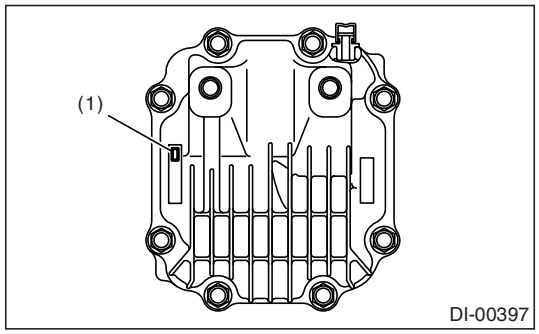
(1) Identification

- VA1-type



(1) Identification

- VA2-type

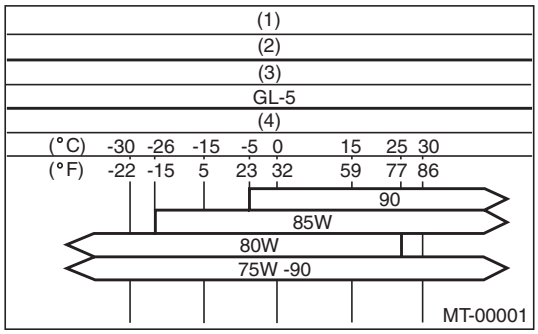


(1) Identification

3. REAR DIFFERENTIAL GEAR OIL

Recommended gear oil:
GL-5 (75W-90)

NOTE:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.



(1) Item
(2) Rear differential gear oil
(3) API standard
(4) SAE viscosity No. and applicable temperature

4. SERVICE DATA

Drive pinion bearing preload (at companion flange bolt hole)	N (kgf, lbf)	T-type	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
		VA-type	12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3)
Side gear backlash	mm (in)	T-type	0.10 — 0.20 (0.0039 — 0.0079)
		VA1-type only	0.05 — 0.15 (0.0020 — 0.0059)
Side bearing standard width		mm (in)	20.00 (0.7874)
Hypoid driven gear to drive pinion backlash	mm (in)	T-type	0.10 — 0.20 (0.0039 — 0.0079)
		VA-type	0.10 — 0.15 (0.0039 — 0.0059)
Hypoid driven gear runout on its back surface	mm (in)	T-type only	0.05 (0.0020)

5. ADJUSTING PART

• T-type

Drive pinion bearing preload (at companion flange bolt hole) N (kgf, lbf)	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)	
Preload adjusting collar	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)
Preload adjusting washer	Part No.	Length mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)

Pinion height adjusting washer	Part No.	Thickness mm (in)
	383495200	3.09 (0.1217)
	383505200	3.12 (0.1228)
	383515200	3.15 (0.1240)
	383525200	3.18 (0.1252)
	383535200	3.21 (0.1264)
	383545200	3.24 (0.1276)
	383555200	3.27 (0.1287)
	383565200	3.30 (0.1299)
	383575200	3.33 (0.1311)
	383585200	3.36 (0.1323)
	383595200	3.39 (0.1335)
	383605200	3.42 (0.1346)
	383615200	3.45 (0.1358)
	383625200	3.48 (0.1370)
	383635200	3.51 (0.1382)
	383645200	3.54 (0.1394)
	383655200	3.57 (0.1406)
	383665200	3.60 (0.1417)
	383675200	3.63 (0.1429)
	383685200	3.66 (0.1441)
Side gear backlash mm (in)	0.1 — 0.2 (0.0039 — 0.0079)	
Side gear thrust washer (Model without LSD)	Part No.	Thickness mm (in)
	383445201	0.75 — 0.80 (0.0295 — 0.0315)
	383445202	0.80 — 0.85 (0.0315 — 0.0335)
	383445203	0.85 — 0.90 (0.0335 — 0.0354)
Side bearing standard width mm (in)	—	20.00 (0.7874)
Side bearing retainer shim	Part No.	Thickness mm (in)
	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)
Hypoid driven gear to drive pinion backlash	Limit mm (in)	0.10 — 0.20 (0.0039 — 0.0079)
Hypoid driven gear runout on its back surface		0.05 (0.0020)

• VA1-type

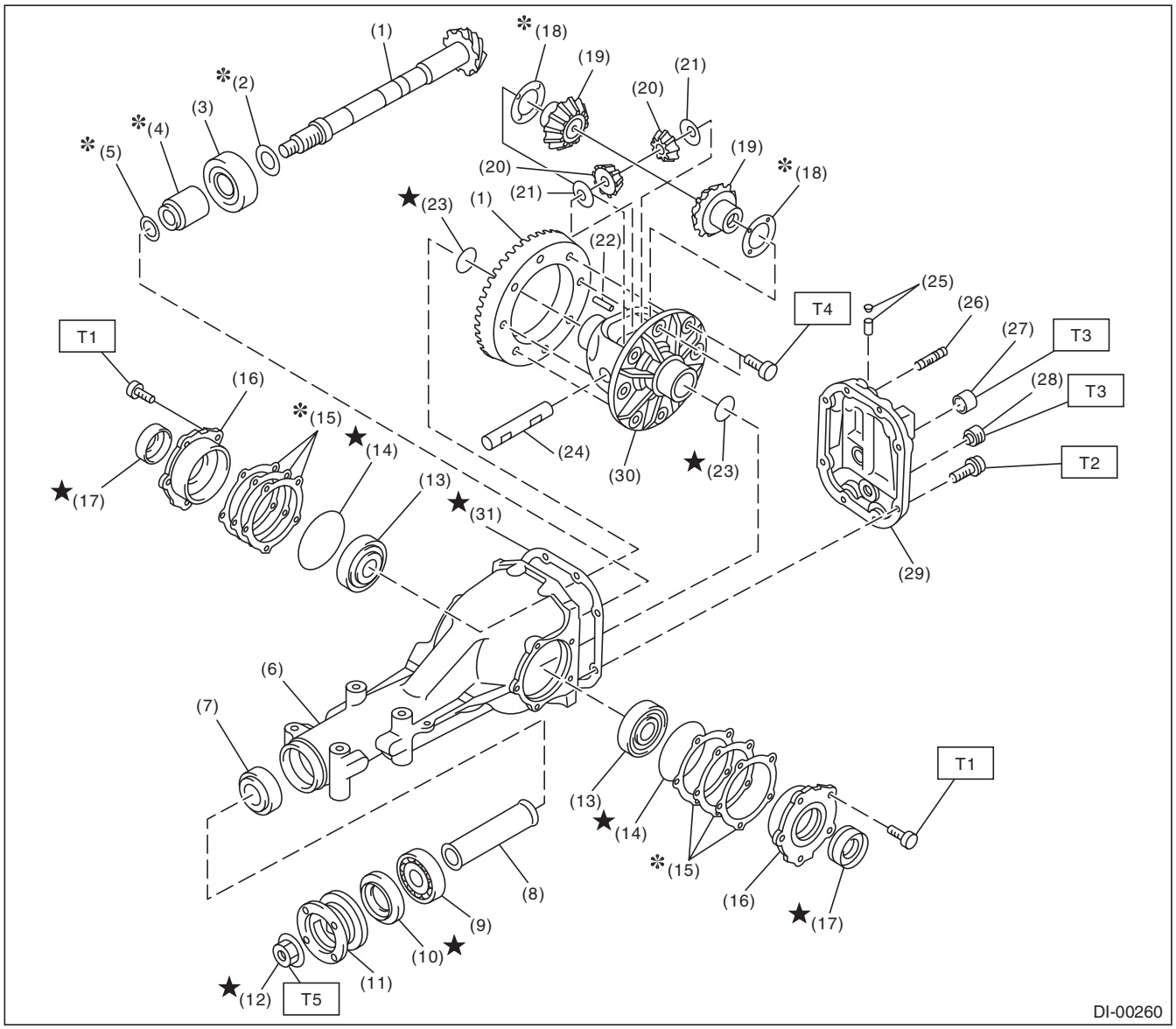
Drive pinion bearing preload (at companion flange bolt hole) N (kgf, lbf)	12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3)	
Preload adjusting collar	Part No.	Length mm (in)
	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)
Preload adjusting washer	Part No.	Thickness mm (in)
	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
Pinion height adjusting washer	Part No.	Thickness mm (in)
	32295AA200	0.150 (0.0059)
	32295AA210	0.175 (0.0069)
	32295AA220	0.200 (0.0079)
	32295AA230	0.225 (0.0089)
	32295AA240	0.250 (0.0098)
	32295AA250	0.275 (0.0108)
Side gear backlash mm (in)	0.05 — 0.15 (0.0020 — 0.0059)	
Side gear thrust washer	803135011	0.925 — 0.950 (0.0364 — 0.0374)
	803135012	0.950 — 0.975 (0.0374 — 0.0384)
	803135013	0.975 — 1.000 (0.0384 — 0.0394)
	803135014	1.000 — 1.025 (0.0394 — 0.0404)
	803135015	1.025 — 1.050 (0.0404 — 0.0413)
Hypoid driven gear to drive pinion backlash	Limit mm (in)	0.10 — 0.15 (0.0039 — 0.0059)

• VA2-type

Drive pinion bearing preload (at companion flange bolt hole) N (kgf, lbf)	12.7 — 32.4 (1.3 — 3.9, 2.9 — 7.3)	
Preload adjusting collar	Part No.	Length mm (in)
	31454AA250	51.05 (2.010)
	31454AA260	51.25 (2.018)
	31454AA270	51.35 (2.022)
	31454AA280	51.45 (2.026)
	31454AA290	51.55 (2.030)
	31454AA300	51.65 (2.033)
	31454AA310	51.75 (2.037)
	31454AA320	51.85 (2.041)
	31454AA330	52.05 (2.049)
Preload adjusting washer	Part No.	Thickness mm (in)
	38336AA430	1.500 (0.0591)
	38336AA440	1.513 (0.0596)
	38336AA450	1.525 (0.0600)
	38336AA460	1.538 (0.0606)
	38336AA470	1.550 (0.0610)
	38336AA480	1.563 (0.0615)
	38336AA490	1.575 (0.0620)
	38336AA500	1.588 (0.0625)
	38336AA510	1.600 (0.0630)
	38336AA520	1.613 (0.0635)
	38336AA530	1.625 (0.0640)
	38336AA540	1.638 (0.0645)
	38336AA550	1.650 (0.0650)
	38336AA560	1.663 (0.0655)
	38336AA570	1.675 (0.0659)
	38336AA580	1.688 (0.0665)
	38336AA590	1.700 (0.0669)
	38336AA600	1.713 (0.0674)
	38336AA610	1.725 (0.0679)
	38336AA620	1.738 (0.0684)
	38336AA630	1.750 (0.0689)
	38336AA640	1.763 (0.0694)
	38336AA650	1.775 (0.0699)
Pinion height adjusting washer	Part No.	Thickness mm (in)
	32295AA350	0.150 (0.0059)
	32295AA360	0.175 (0.0069)
	32295AA370	0.200 (0.0079)
	32295AA380	0.225 (0.0089)
	32295AA390	0.250 (0.0098)
	32295AA400	0.275 (0.0108)
Hypoid driven gear to drive pinion backlash	Limit mm (in)	0.10 — 0.15 (0.0039 — 0.0059)

B: COMPONENT

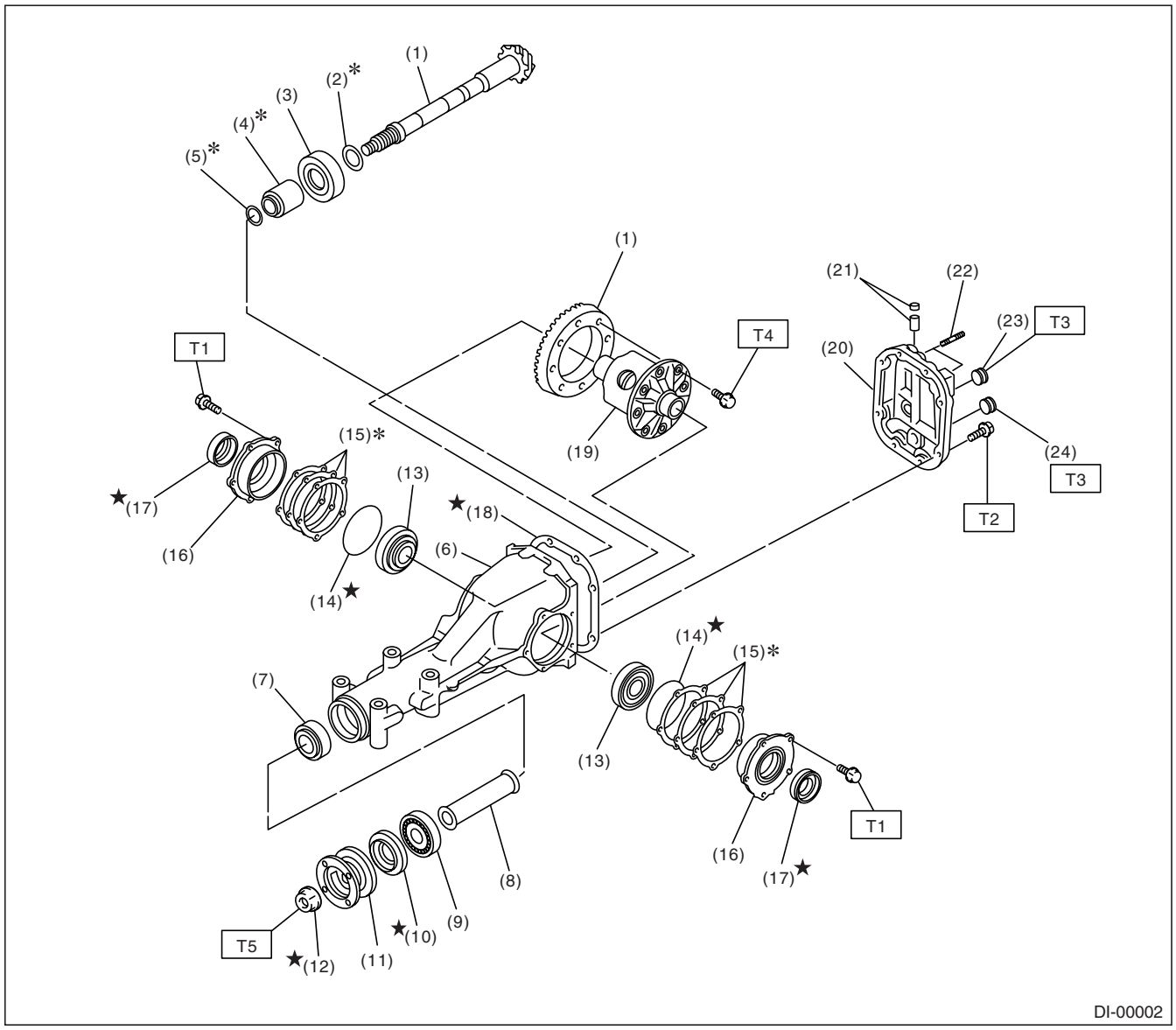
1. REAR DIFFERENTIAL WITHOUT LSD (T-TYPE)



(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting collar
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Side gear thrust washer
(19) Side gear
(20) Pinion mate gear
(21) Pinion mate gear washer
(22) Pinion shaft lock pin
(23) Snap ring
(24) Pinion mate shaft
(25) Air breather cap
(26) Stud bolt
(27) Oil filler plug
(28) Oil drain plug
(29) Rear cover
(30) Differential case
(31) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10.3 (1.05, 7.6)
T2: 29 (3.0, 21.4)
T3: 49 (5.0, 36.2)
T4: 105 (10.7, 77.4)
T5: 181 (18.5, 134)

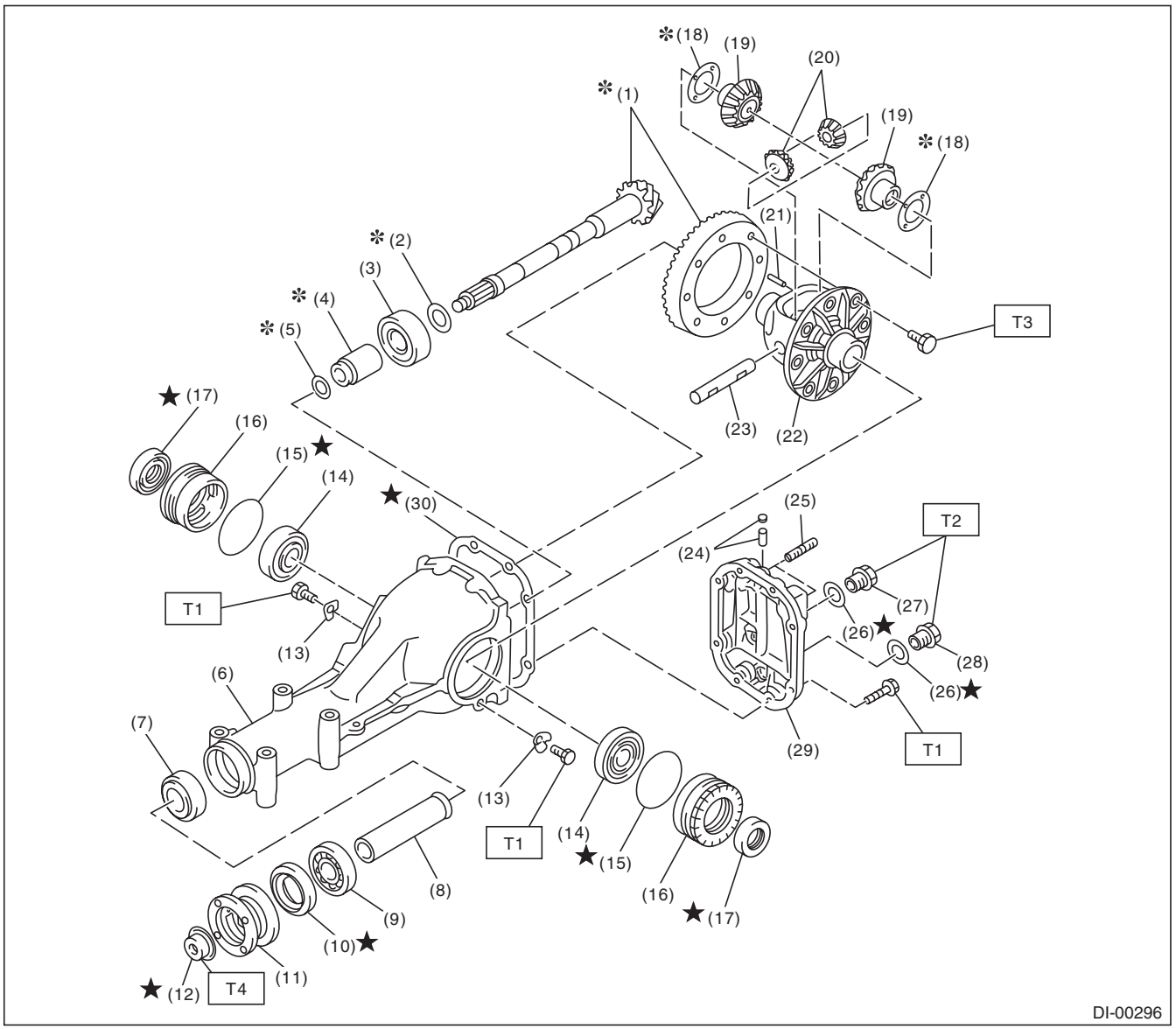
2. REAR DIFFERENTIAL WITH LSD (T-TYPE)



(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting collar
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Gasket
(19) Differential case ASSY
(20) Rear cover
(21) Air breather cap
(22) Stud bolt
(23) Oil filler plug
(24) Oil drain plug

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10.3 (1.05, 7.6)
T2: 29 (3.0, 21.4)
T3: 49 (5.0, 36.2)
T4: 105 (10.7, 77.4)
T5: 181 (18.5, 134)

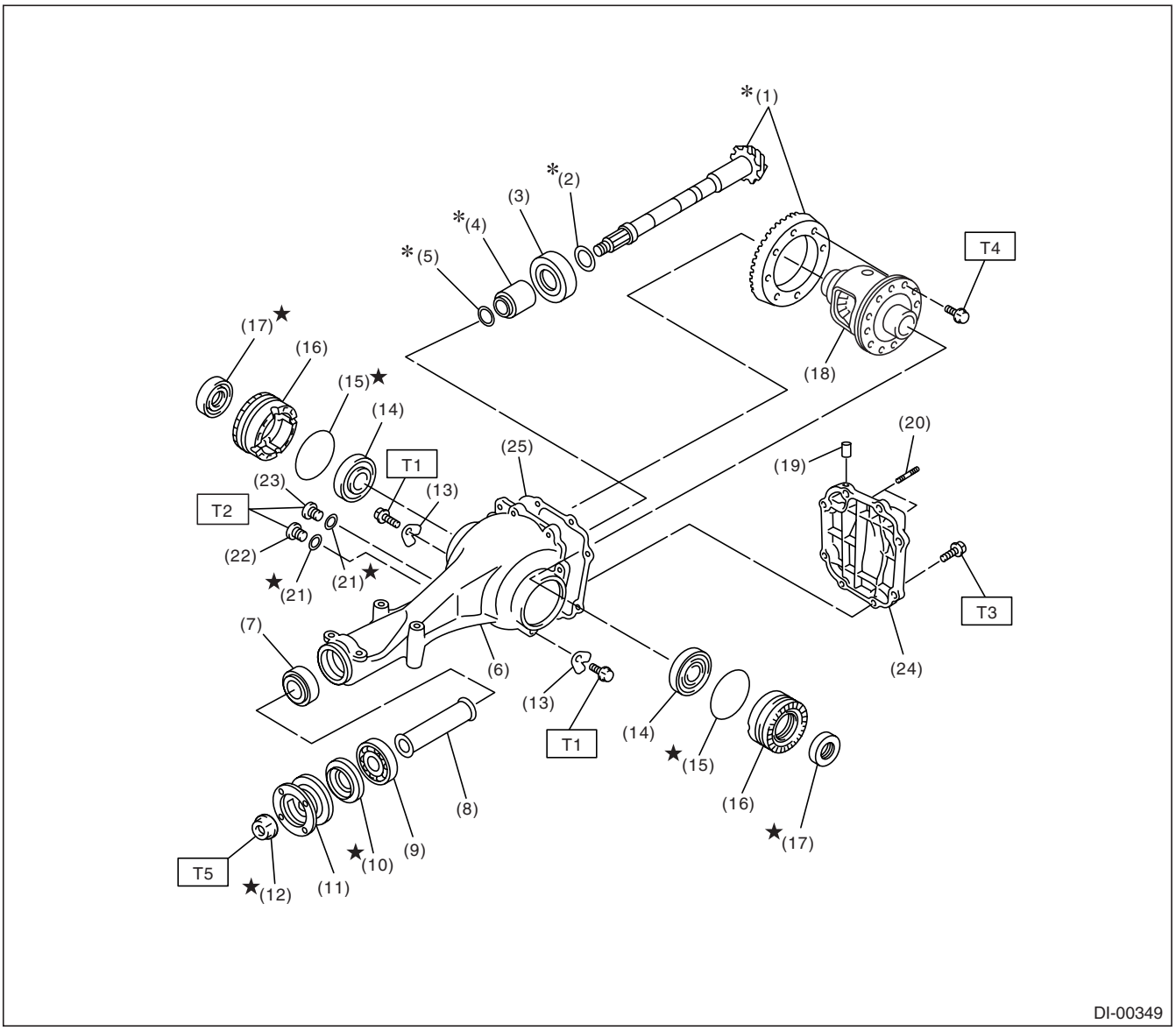
3. REAR DIFFERENTIAL (VA1-TYPE)



(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting collar
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Lock plate
(14) Side bearing
(15) O-ring
(16) Axle shaft holder
(17) Side oil seal
(18) Side gear thrust washer
(19) Side gear
(20) Pinion mate gear
(21) Pinion shaft lock pin
(22) Differential case
(23) Pinion mate shaft
(24) Air breather cap
(25) Stud bolt
(26) Gasket
(27) Oil filler plug
(28) Oil drain plug
(29) Rear cover
(30) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.4)
T2: 34 (3.5, 25.3)
T3: 62 (6.3, 45.6)
T4: 191 (19.5, 141)

4. REAR DIFFERENTIAL (VA2-TYPE)

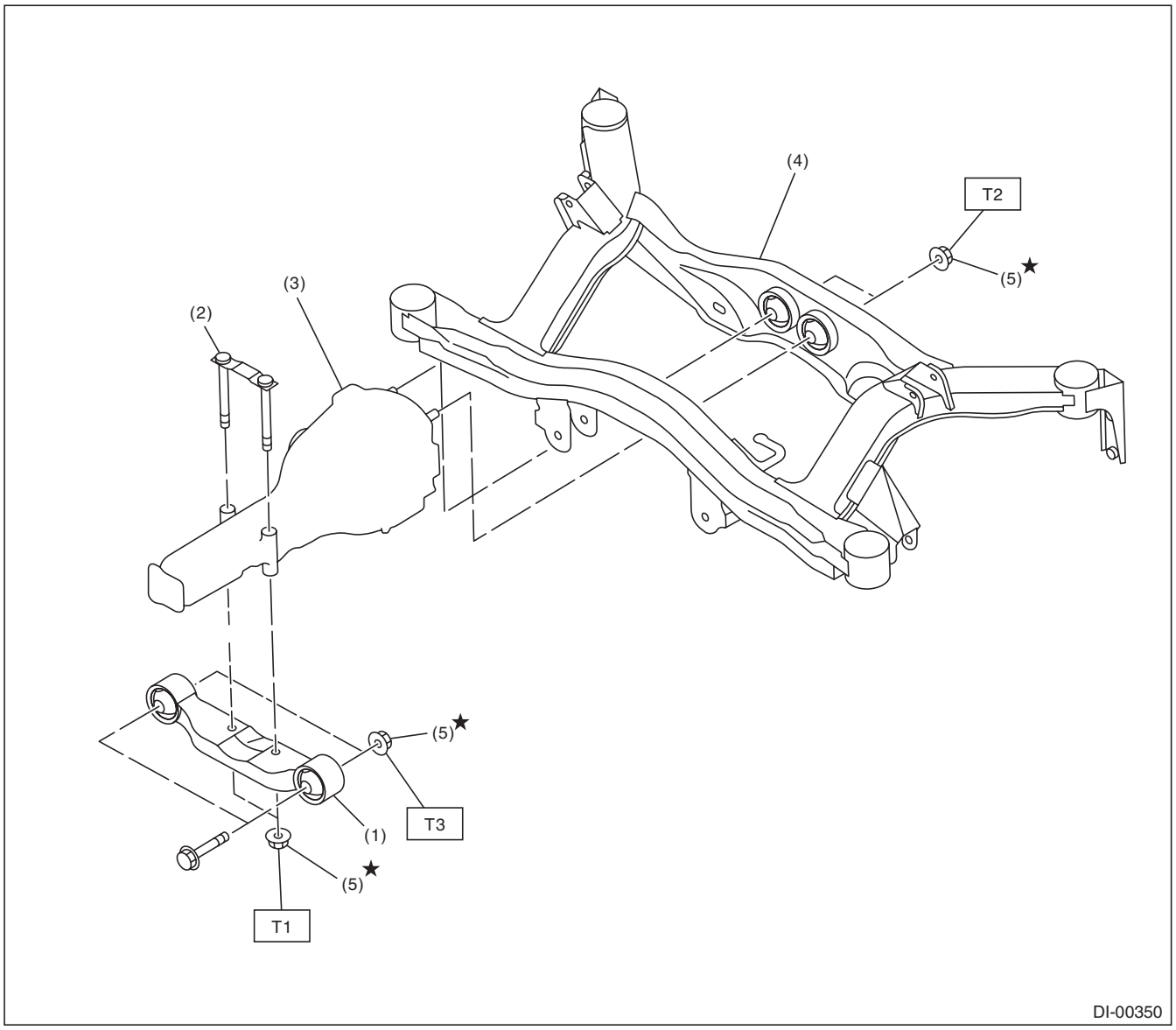


DI-00349

(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting collar
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Lock plate
(14) Side bearing
(15) O-ring
(16) Axle shaft holder
(17) Side oil seal
(18) Differential case ASSY
(19) Air breather cap
(20) Stud bolt
(21) Gasket
(22) Oil filler plug
(23) Oil drain plug
(24) Rear cover
(25) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.4)
T2: 29 (3.0, 21.4)
T3: 34 (3.5, 25.3)
T4: 62 (6.3, 45.6)
T5: 191 (19.5, 141)

5. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Rear differential front member
(2) Rear differential member plate
(3) Rear differential ASSY
(4) Sub frame
(5) Self-locking nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 52 (5.3, 38)
T2: 70 (7.1, 51)
T3: 110 (11.2, 81)

C: CAUTION

• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
• Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
• Avoid damaging the mating surface of the case.

D: PREPARATION TOOL

1. SPECIAL TOOL

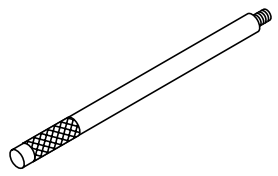
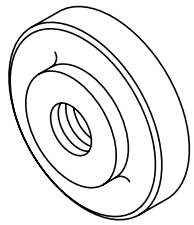
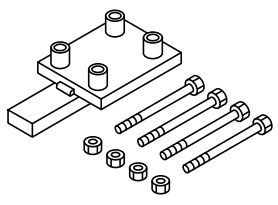
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing front and rear bearing cone.
 ST-398477702	398477702	DRIFT	• Used for press-fitting the bearing race of differential carrier (front). (T-type) • Used for press-fitting the side bearing race. (VA1-type) • Used for press-fitting the bearing race of differential carrier (Rear). (VA1-type)
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.

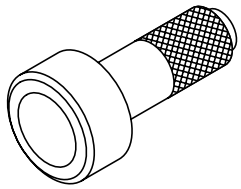
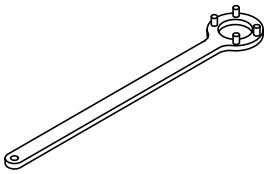
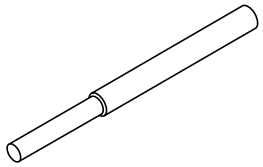
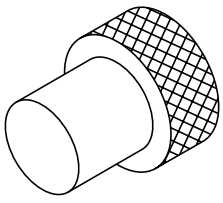
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498447120	498447120	INSTALLER	Used for installing front oil seal.
 ST-498427200	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when removing and tightening self-locking nut.
 ST-398467700	398467700	DRIFT	• Used for removing pinion, pilot bearing and front bearing cone. • For T-type and VA1-type
 ST-399780104	399780104	WEIGHT	Used for installing front bearing cone and pilot bearing companion flange.

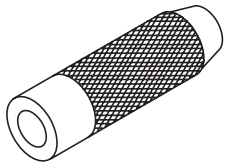
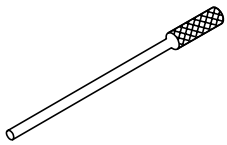
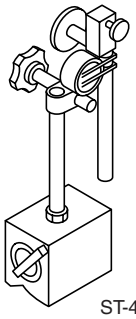
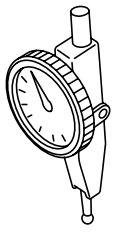
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899580100	899580100	INSTALLER	Used for press-fitting front bearing cone and pilot bearing.
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).

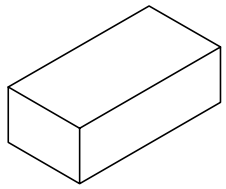
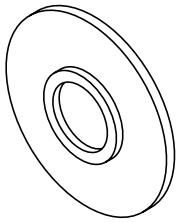
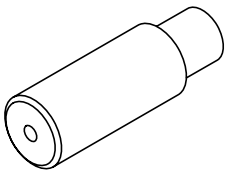
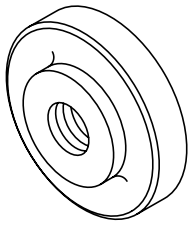
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507704	398507704	BLOCK	• Used for adjusting pinion height and preload. • For T-type and VA1-type
 ST-398177700	398177700	INSTALLER	• Used for installing rear bearing cone. • For T-type and VA2-type
 ST-398457700	398457700	ATTACHMENT	• Used for removal of side bearing retainer. • For T-type
 ST-398477703	398477703	DRIFT 2	• Used for press-fitting bearing race (rear) of differential carrier. • For T-type and VA2-type

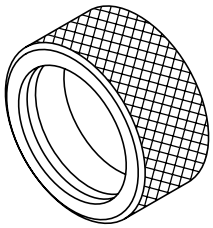
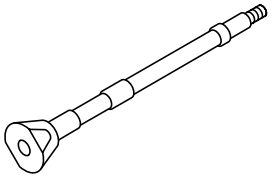
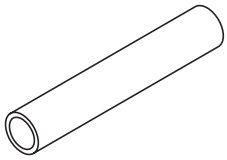
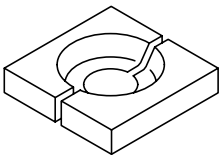
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398437700	398437700	DRIFT	• Used for installing side oil seal. • For T-type and VA2-type
 ST-398507702	398507702	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For T-type
 ST-398507703	398507703	DUMMY COLLAR	• Used for adjusting pinion height and preload. • For T-type
 ST-398517700	398517700	REPLACER	• Used for removing rear bearing cone. • For T-type and VA2-type

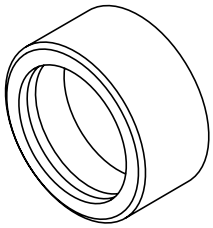
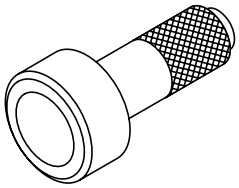
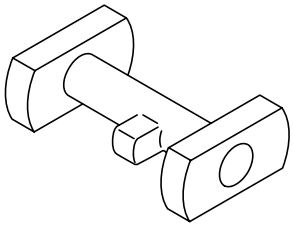
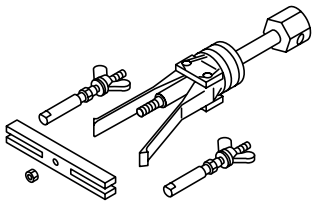
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398487700	398487700	DRIFT	• Used for press-fitting side bearing cone. • For T-type and VA2-type
 ST-398417700	398417700	DRIFT PUNCH	• Used for press-fitting side bearing race. • For T-type and VA2-type
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For T-type
 ST-398527700	398527700	PULLER ASSY	• Used for removing front oil seal. • Used for removing side bearing cup. (T-type)

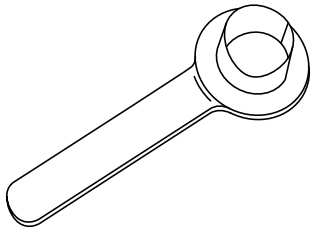
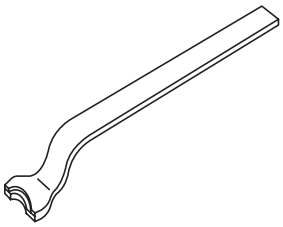
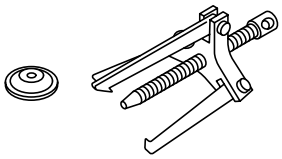
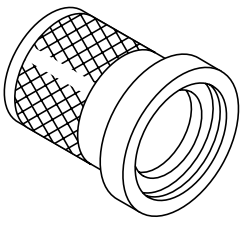
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to rear differential. • For oil seal protection
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	• Used for removing rear drive shaft from rear differential. • For T-type
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-899874100	899874100	INSTALLER	Used for installing companion flange.

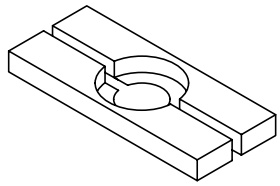
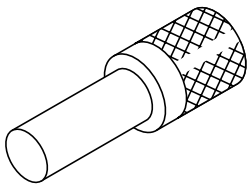
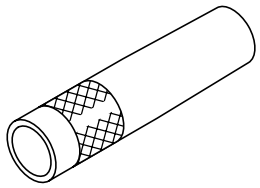
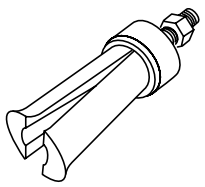
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498077000	498077000	REMOVER	• Used for removing side bearing cone from differential. • For VA2-type
 ST-899864100	899864100	REMOVER	Used for removing differential side bearing.
 ST-499277200	499277200	INSTALLER	• Used for installing front bearing cone. • For VA2-type
 ST18758AA000	18758AA000	PULLER	• Used for removing side bearing cup. • For VA2-type

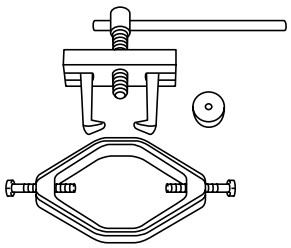
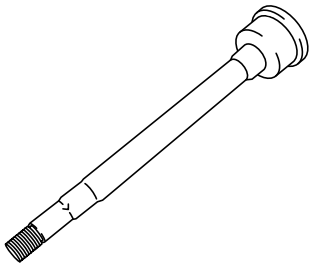
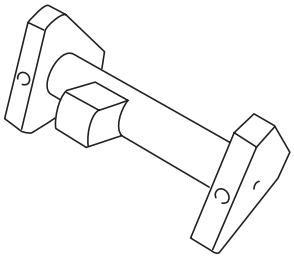
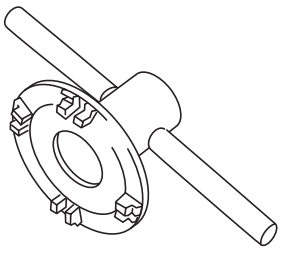
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18759AA000	18759AA000	PULLER ASSY	• Used for removing differential from side bearing cone. • For T-type
 ST18678AA000	18678AA000	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For VA2-type
 ST18831AA010	18831AA010	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For VA2-type
 ST18630AA010	18630AA010	WRENCH ASSY	• Used for removing and installing side oil seal holder. • For VA2-type NOTE: Also available for VA1-type.

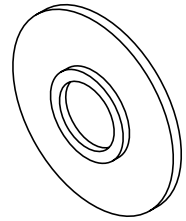
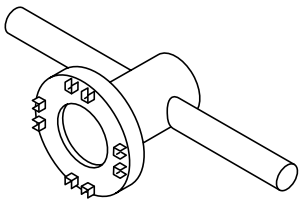
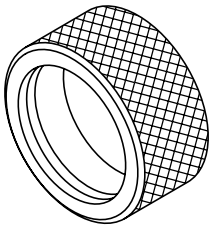
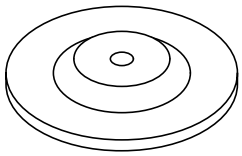
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498175500	498175500	INSTALLER	• Used for installing rear bearing cone. • For VA1-type
 ST-499785500	499785500	WRENCH ASSY	• Used for removing and installing side oil seal holder. • For VA1-type
 ST-498447100	498447100	INSTALLER	• Used for installing oil seal. • For VA1-type
 ST-399520105	399520105	SEAT	• Used for removing side bearing cone. • Used with PULLER SET (899524100). • For VA-type

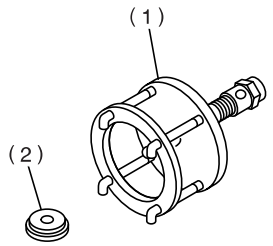
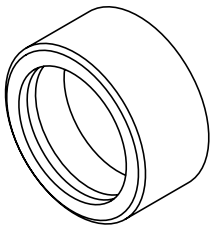
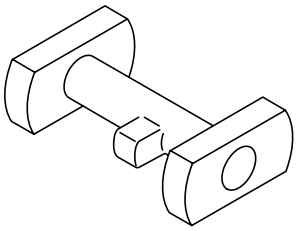
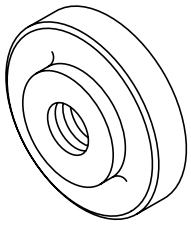
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899524100	899524100	PULLER SET	• Used for removing differential from side bearing cone. • For VA-type (1) PULLER (2) CAP
 ST-498485400	498485400	DRIFT	• Used for installing side bearing cone. • For VA1-type
 ST-498505501	498505501	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For VA1-type
 ST-498447110	498447110	DRIFT	• Used for press-fitting the bearing race (front) of differential carrier. • For VA1-type

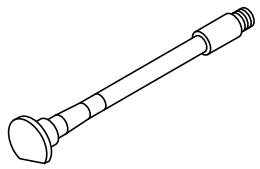
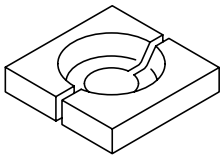
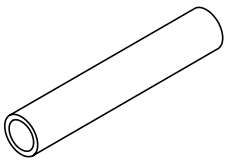
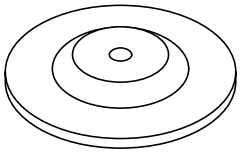
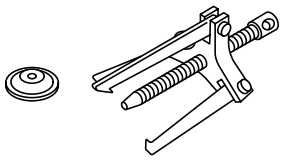
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498447150	498447150	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For VA1-type
 ST-498515500	498515500	REPLACER	• Used for removing rear bearing cone. • For VA1-type
 ST32285AA000	32285AA000	DUMMY COLLAR	• Used for adjusting pinion height and preload. • For VA1-type
 ST-499705404	499705404	SEAT	• Used for removing side bearing race. • Used with PULLER ASSY (499705401). • For VA1-type

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499705401	499705401	PULLER ASSY	• Used for removing side bearing race. • Used with SEAT (499705404). • For VA-type

2. GENERAL PURPOSE TOOL

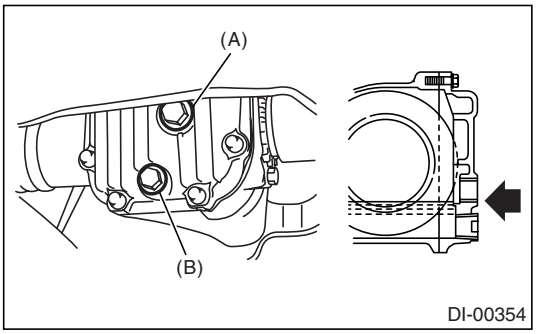
TOOL NAME	REMARKS
Transmission jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer.
Thickness gauge	Used for measuring clearance.
Hexagon wrench	Used for installing and removing filler and drain plug.
Tire lever	Used for removal of rear drive shaft. (VA-type)

2. Differential Gear Oil

A: INSPECTION

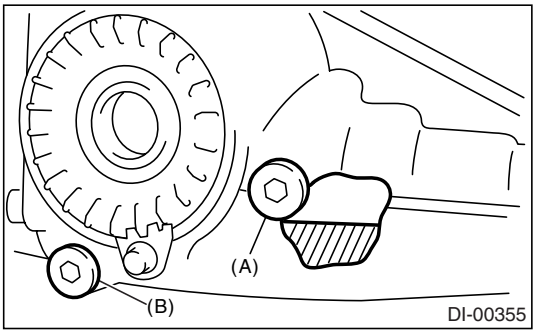
1) Remove the filler plug, and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. <Ref. to DI-26, REPLACEMENT, Differential Gear Oil.>
2) Check that the gear oil level is up to the bottom of filler plug hole. If the level is low, refill up to the bottom of filler plug hole.

• Except for VA2-type



(A) Filler plug
(B) Drain plug

• VA2-type



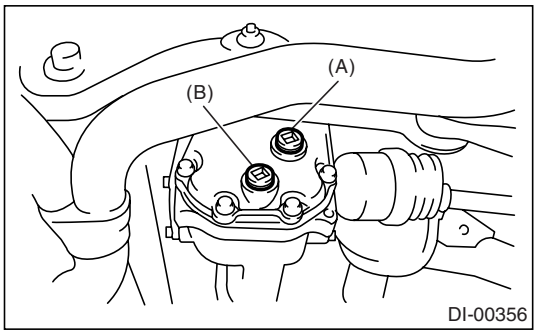
(A) Filler plug
(B) Drain plug

B: REPLACEMENT

1) Lift-up the vehicle.
2) Remove the oil drain plug and filler plug, and drain the gear oil.

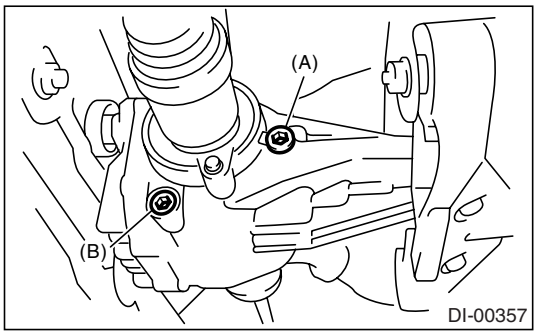
CAUTION:
Be careful not to burn yourself, because gear oil becomes extremely hot after running.

• Except for VA2-type



(A) Filler plug
(B) Drain plug

• VA2-type



(A) Filler plug
(B) Drain plug

3) Tighten the oil drain plug.

NOTE:
• Apply liquid gasket to the drain plug threads for T-type.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

• Use a new aluminum gasket for VA1-type.
• Use a new metal gasket for VA2-type.

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA1-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)
VA2-type
29 N·m (3.0 kgf-m, 21.4 ft-lb)

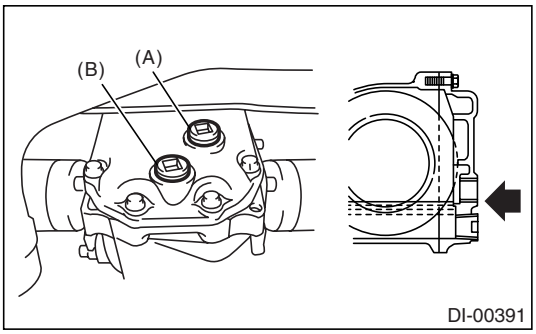
4) Fill the differential carrier with gear oil to the bottom of filler plug.

NOTE:
• Carefully refill oil while watching the level. Excessive or insufficient oil must be avoided.

Recommended gear oil:
<Ref. to DI-2, SPECIFICATION, General Description.>

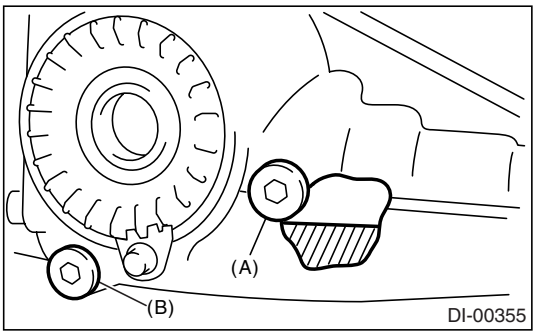
Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)

• Except for VA2-type



(A) Filler plug
(B) Drain plug

• VA2-type



(A) Filler plug
(B) Drain plug

5) Install the filler plug.

NOTE:
• Apply liquid gasket to the filler plug threads for T-type.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

• Use a new aluminum gasket for VA1-type.
• Use a new metal gasket for VA2-type.

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA1-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)
VA2-type
29 N·m (3.0 kgf-m, 21.4 ft-lb)

3. Front Differential Assembly

A: NOTE

1. AT MODEL

• 4AT

For front differential of 4AT model, refer to “4AT” section. <Ref. to 4AT-115, Front Differential Assembly.>

• 5AT

For front differential of 5AT model, refer to “5AT” section. <Ref. to 5AT-92, Front Differential Assembly.>

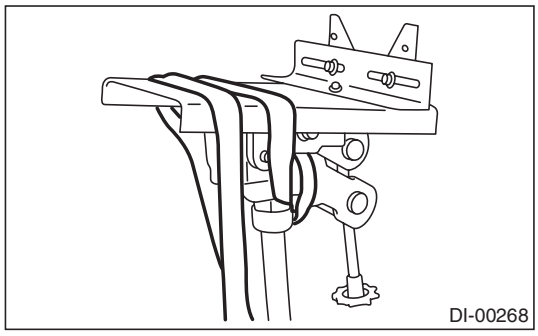
2. MT MODEL

For front differential of manual transmission, refer to “5MT” section. <Ref. to 5MT-84, Front Differential Assembly.>

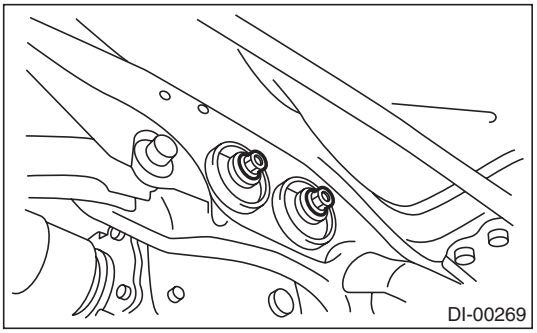
4. Rear Differential (T-type)

A: REMOVAL

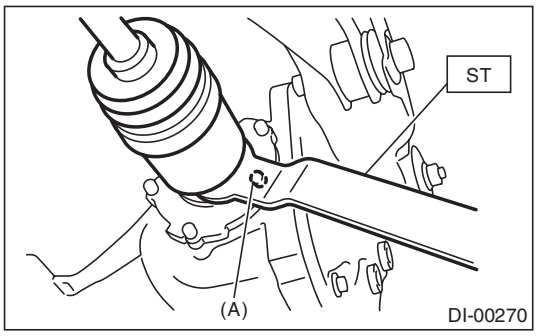
1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to neutral.
3) Loosen the wheel nuts.
4) Release the parking brake.
5) Lift-up the vehicle.
6) Remove the rear wheels.
7) Remove the rear exhaust pipe and muffler.
• 2.0 L SOHC and DOHC non-turbo model
<Ref. to EX(H4SO 2.0)-10, Rear Exhaust Pipe.>
<Ref. to EX(H4SO 2.0)-12, Muffler.>
• 2.0 L DOHC turbo model
<Ref. to EX(H4DOTC)-11, Rear Exhaust Pipe.>
8) Remove the propeller shaft.
<Ref. to DS-10, REMOVAL, Propeller Shaft.>
9) Prepare the transmission jack and band.


DI-00268

10) Loosen the self-locking nuts which hold the rear differential to rear crossmember.


DI-00269

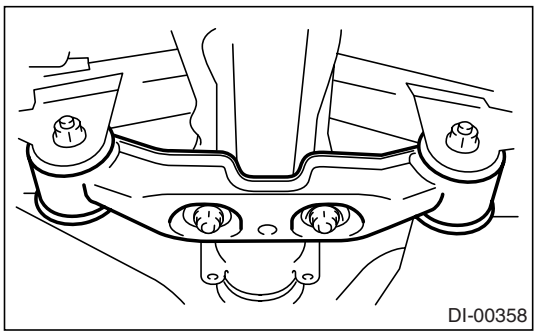
11) Remove the DOJ of rear drive shaft from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER



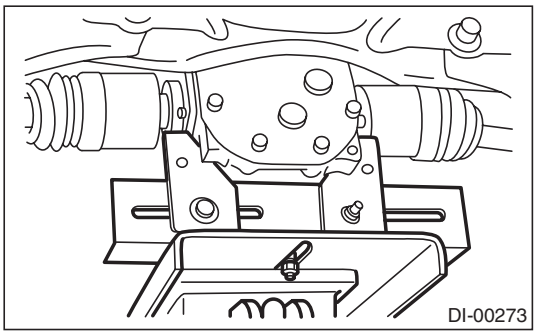
DI-00270

(A) Bolt

12) Remove the rear differential front member.


DI-00358

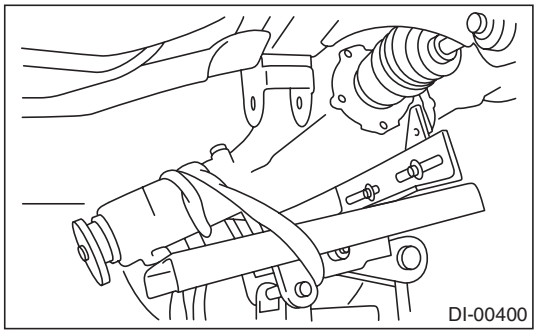
13) Support the rear differential with transmission jack.


DI-00273

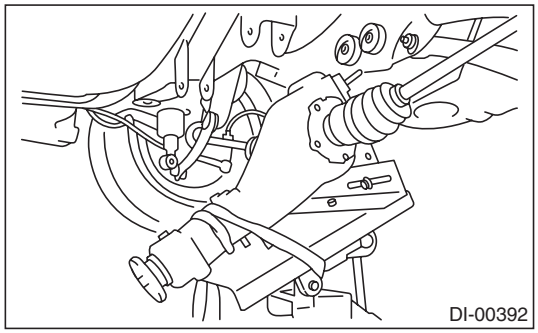
14) Secure the rear differential using band.
15) Remove the self-locking nuts which hold the rear differential to crossmember.

16) Remove the rear differential stud bolt from rear crossmember bushing.

NOTE:
When removing the stud bolt, carefully adjust the angle and location of transmission jack and jack stand, if necessary.



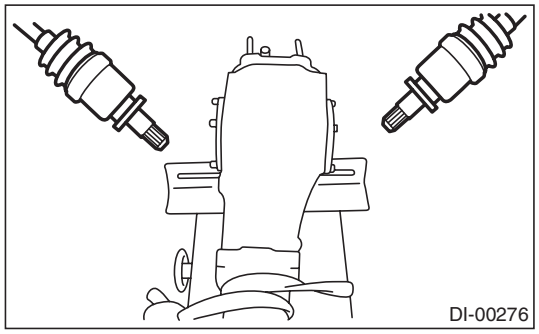
17) Lower the transmission jack stand after removing the rear differential stud bolt from rear crossmember. Rear drive shaft should not come into contact with lateral link bolt.



18) Pull out the axle shaft from rear differential.

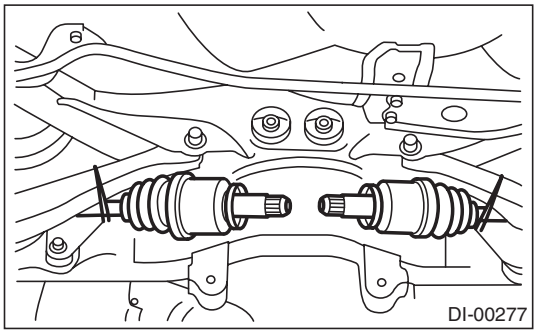
NOTE:
If it is difficult to remove the axle shaft from rear differential, remove it using ST.

ST 28099PA100 DRIVE SHAFT REMOVER

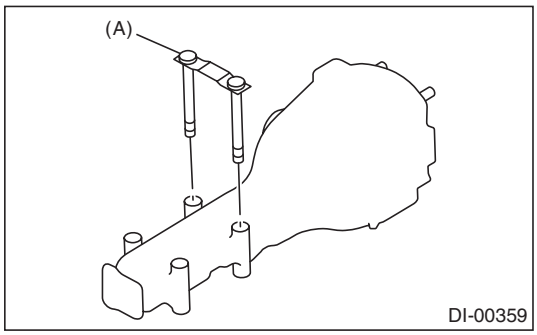


19) Lower the transmission jack.

20) Secure the rear drive shaft to lateral link using wire.



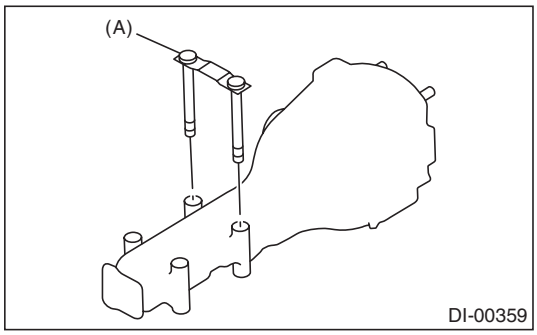
21) Remove the rear differential member plate from rear differential.



(A) Rear differential member plate

B: INSTALLATION

1) Install the rear differential member plate to rear differential.

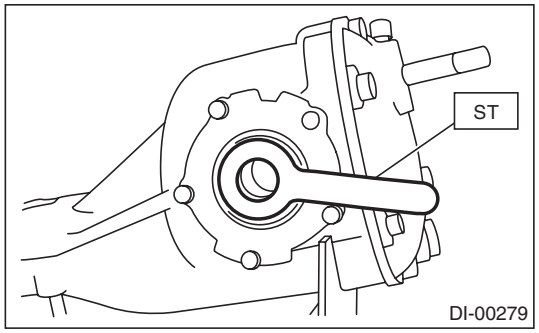


(A) Rear differential member plate

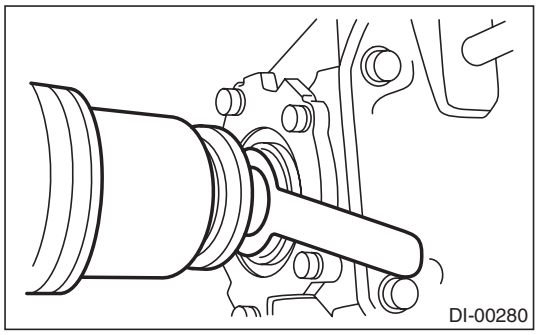
2) Set the rear differential to transmission jack.

NOTE:
Secure the rear differential to transmission jack using band.

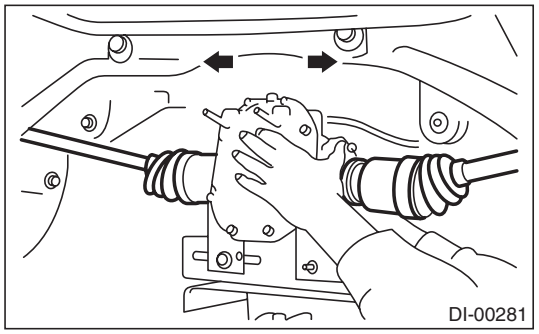
3) Install the ST to rear differential.
ST 28099PA090 OIL SEAL PROTECTOR



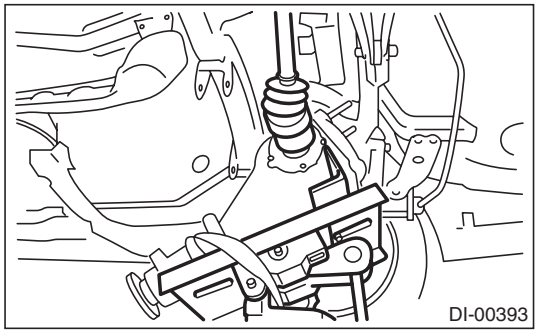
4) Insert the spline shaft until the spline portion comes inside the side oil seal.



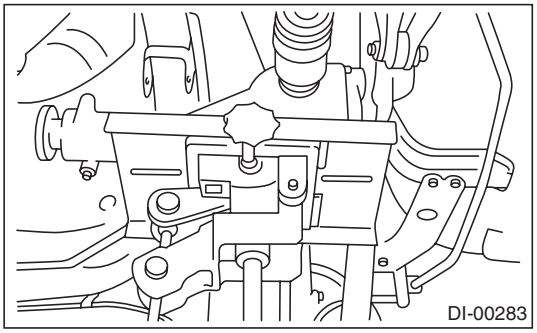
5) Remove ST from rear differential.
ST 28099PA090 OIL SEAL PROTECTOR
6) Push the rear differential to insert the axle shaft into rear differential.



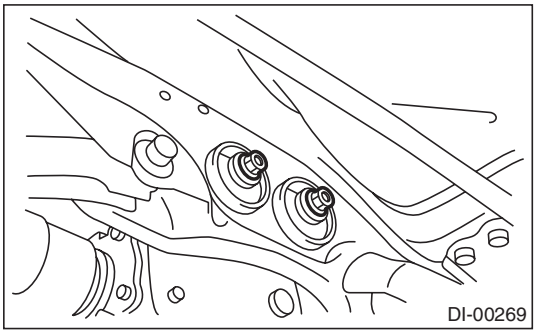
7) Adjust the transmission jack, if necessary, and insert the rear differential stud bolt into rear crossmember bushing properly.



8) After inserting the rear differential stud bolt into rear crossmember bushing, lift up the transmission jack and align the rear differential with its own position.

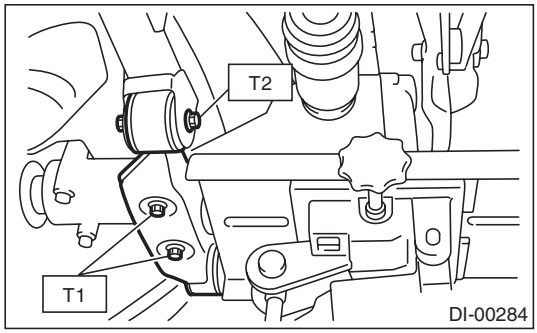


9) Tighten the rear crossmember self-locking nut temporarily.



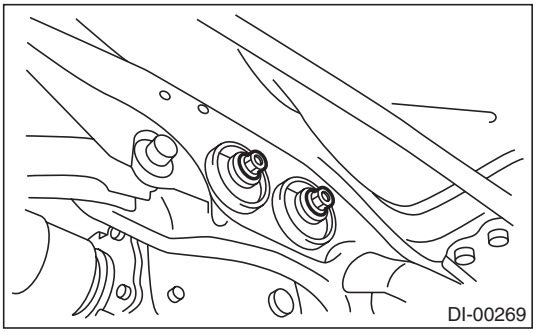
10) Remove the band from rear differential. Lift up the rear differential until the rear differential is separated from the transmission jack.
11) Install the rear differential front member.

Tightening torque:
T1: 52 N·m (5.3 kgf-m, 38 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



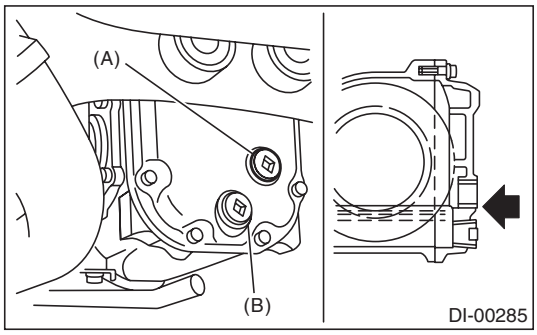
12) Tighten the self-locking nut.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)



13) Lower the transmission jack.
14) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
15) Install the heat shield cover.
16) Install the rear exhaust pipe and muffler.
17) After installing the rear differential carrier to the vehicle, remove the filler plug, and refill the gear oil to the bottom of plug hole.

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)



(A) Filler plug
(B) Drain plug

18) Tighten the filler plug.

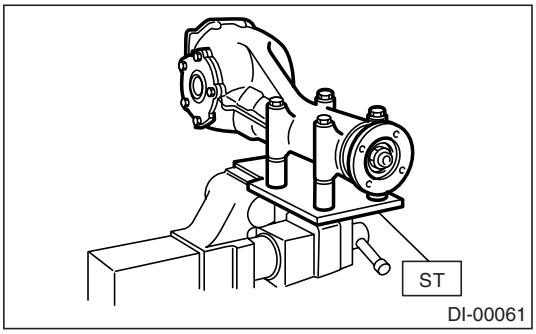
NOTE:
Apply liquid gasket to the drain plug.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

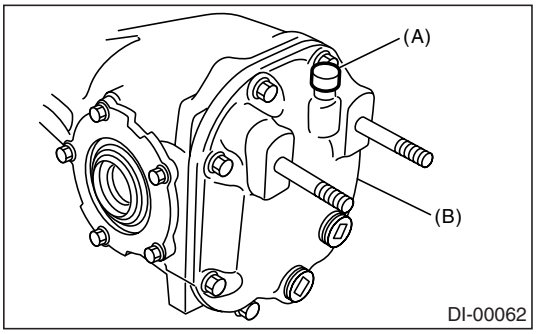
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.
• Tooth contact of hypoid driven gear and drive pinion, and backlash
• Hypoid driven gear runout on its back surface
• Total preload of drive pinion
1) Set the ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT SET



2) Drain the gear oil by removing plug.
3) Remove the air breather cap.

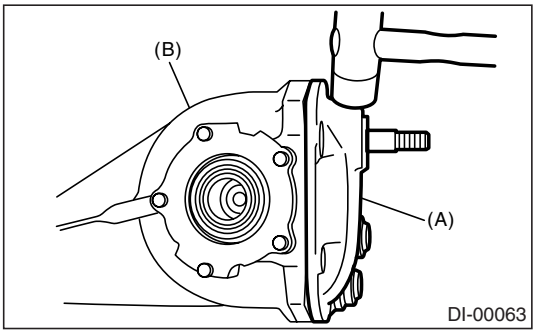
NOTE:
• Do not attempt to replace the air breather cap unless necessary.
• Replace the air breather cap with a new one when removing it.



(A) Air breather cap
(B) Rear cover

4) Remove the bolts, and then remove the rear cover.

NOTE:
Remove it by tapping with plastic hammer.

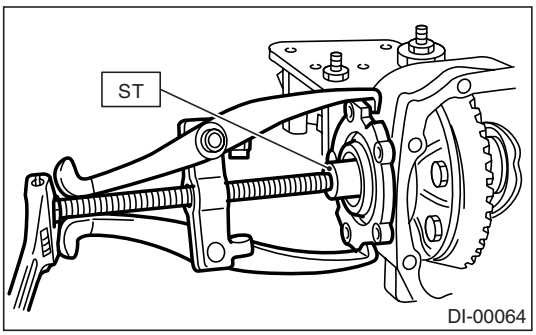


(A) Rear cover
(B) Differential carrier

5) Keep the side bearing retainers RH and LH separately for easier reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract the side bearing retainers RH and LH with a puller.

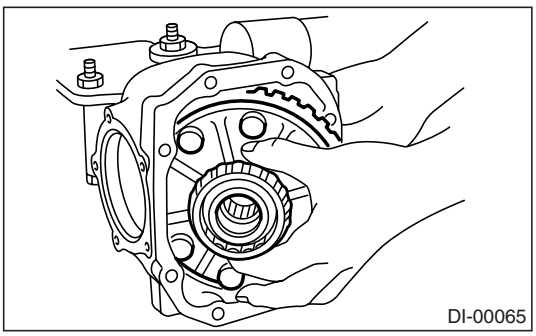
NOTE:
Each shim, which is installed to adjusted the side bearing preload, should be kept together with its mating retainer.

ST 398457700 ATTACHMENT



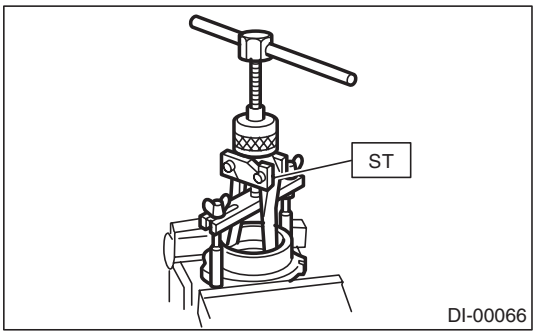
6) Pull out the differential case assembly from differential carrier.

NOTE:
Be careful not to hit the teeth against the case.



7) When replacing the side bearing, remove the bearing cup from side bearing retainer using ST.

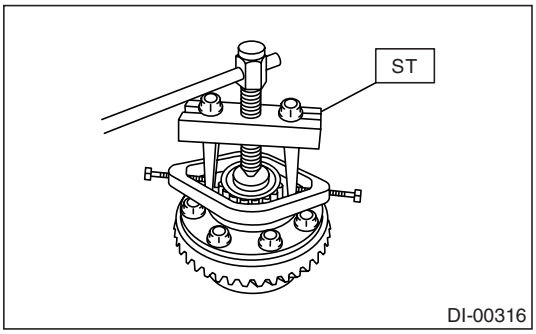
ST 398527700 PULLER ASSY



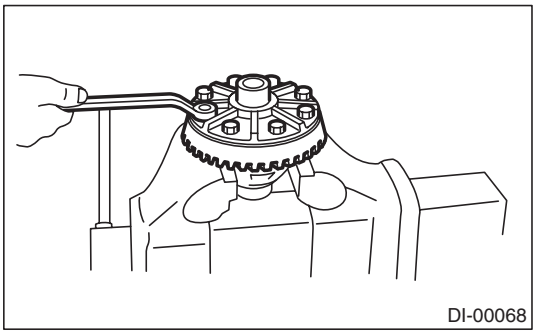
8) Extract the bearing cone with ST.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of the bearing cone.
• Never mix up the bearing races RH and LH and cones.

ST 18759AA000 PULLER ASSY



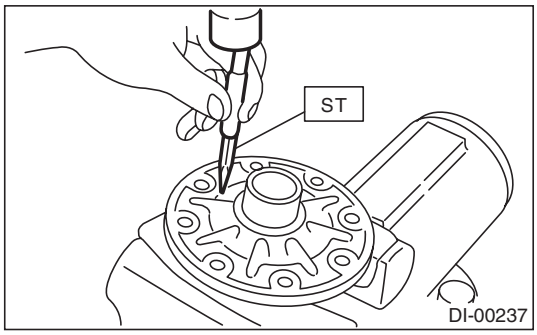
9) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



10) Drive out the pinion shaft lock pin from hypoid driven gear side (Model without LSD).

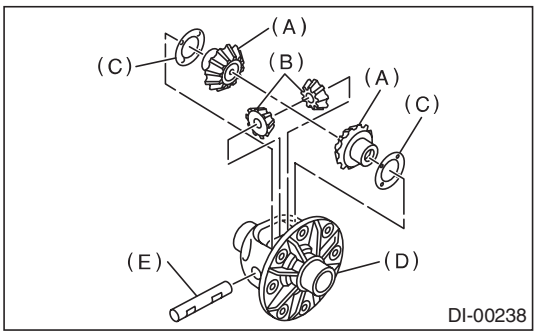
NOTE:
The lock pin is staked at the pin hole end on the differential carrier. Do not drive it out forcibly before removing the stake.

ST 899904100 STRAIGHT PIN REMOVER



11) Draw out the pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Model without LSD)

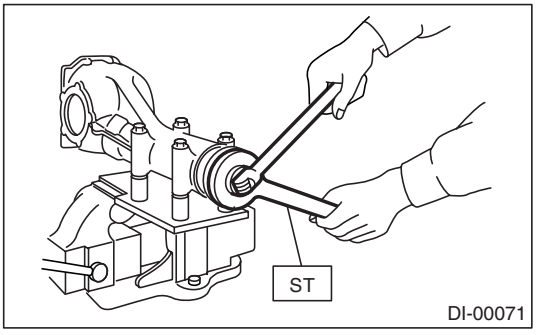
NOTE:
The gears should be marked or kept separated right and left, and front and rear as well as thrust washers.



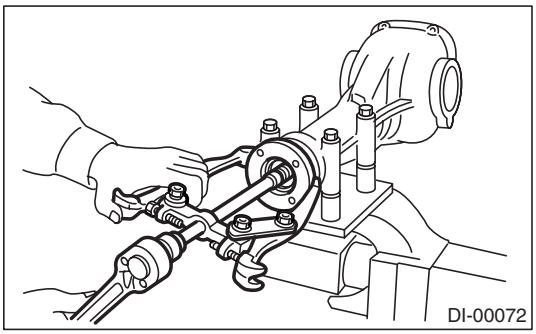
(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

12) Hold the companion flange with ST and remove the self-locking nut.

ST 498427200 FLANGE WRENCH



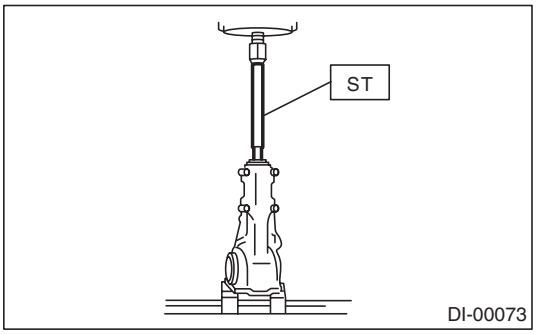
13) Extract the companion flange with a puller.



14) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjust washer and washer.

NOTE:
Hold the drive pinion so as not to drop it.

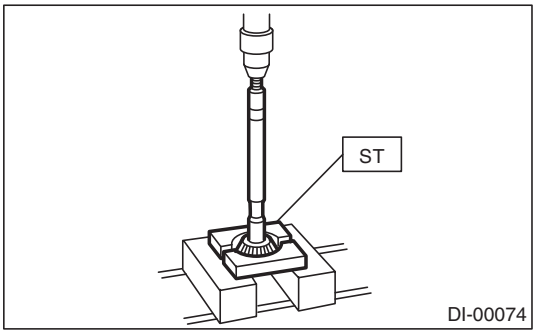
ST 398467700 DRIFT



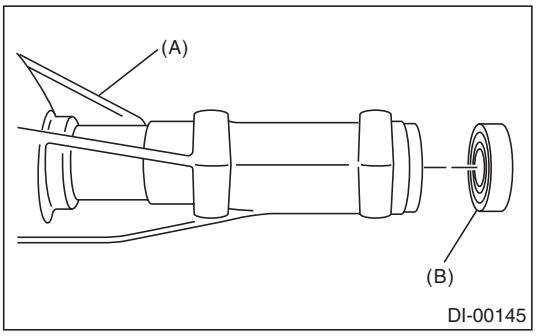
15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER

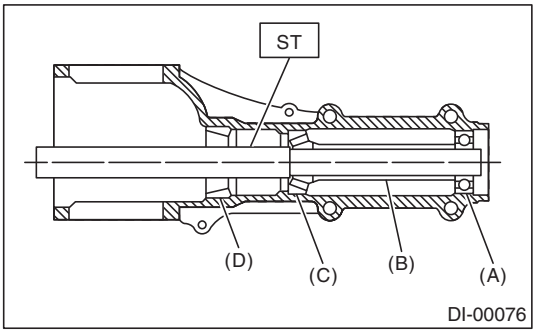


16) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



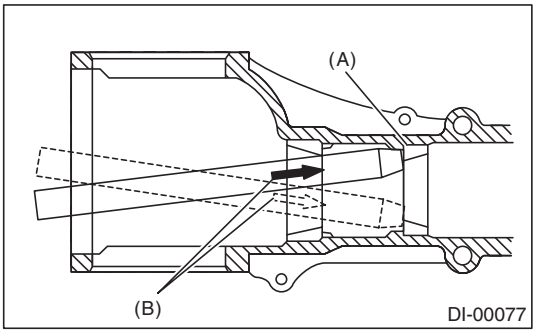
(A) Differential carrier
(B) Front oil seal

17) Remove the pilot bearing together with front bearing cone and collar using ST.
ST 398467700 DRIFT



(A) Pilot bearing
(B) Collar
(C) Front bearing
(D) Rear bearing cup

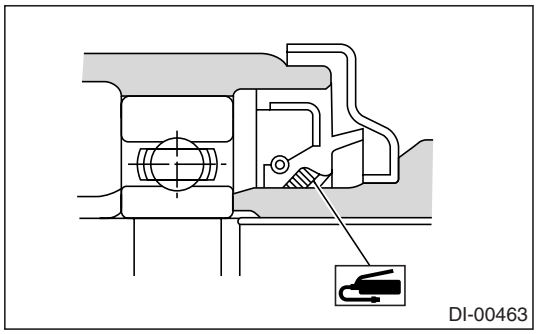
18) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order using a brass bar.



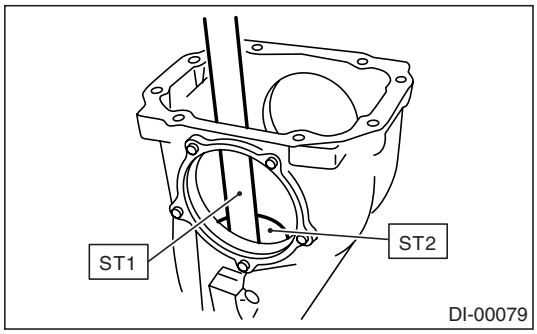
(A) 2 cutouts along diagonal lines
(B) Hit out alternately with brass bar

D: ASSEMBLY

NOTE:
• Assemble in the reverse order of disassembly.
• Check and adjust each part during assembly.
• Keep the shims and washers in order, so that they are not improperly installed.
• Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
• Apply gear oil to the bearings and thrust washers when installing them.
• Be careful not to mix up the bearing races RH and LH.
• Use new O-rings and gasket.
• Replace the oil seals with new ones at every disassembly. Apply grease to the lips when installing the oil seals.
• Be careful not to mix up the differential oil seal RH and LH.



1) Adjusting preload for front and rear bearings:
Adjust the bearing preload with collar and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.
(1) Press the rear bearing race into differential carrier with ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



(2) Install the front bearing race to differential carrier using ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477702 DRIFT

(3) Measure and record the thickness of pinion height adjust washer.

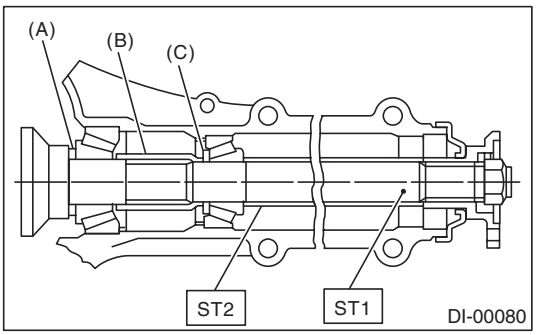
NOTE:
If tooth contact (drive pinion, hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.

(4) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:
Use new rear bearing cone.

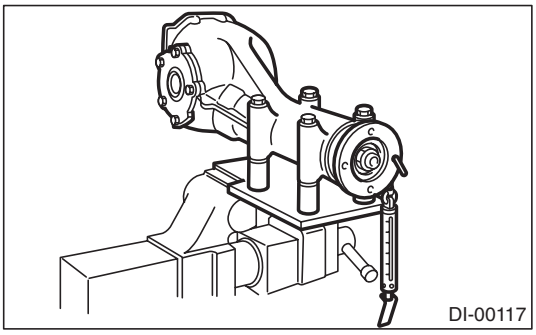
(5) Install the preload adjusting collar and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



(A) Pinion height adjusting washer
(B) Preload adjusting collar
(C) Preload adjusting washer

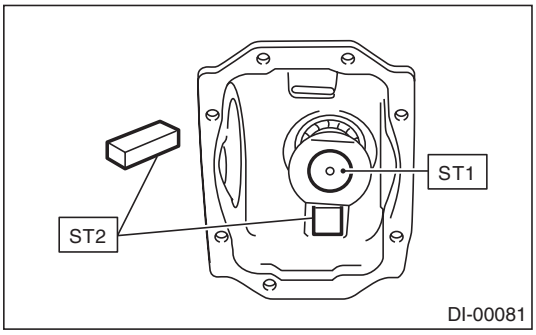
(6) Turn the ST1 with hand to make it seated, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and collar so that the specified preload is obtained when nut is tightened to the specified torque.



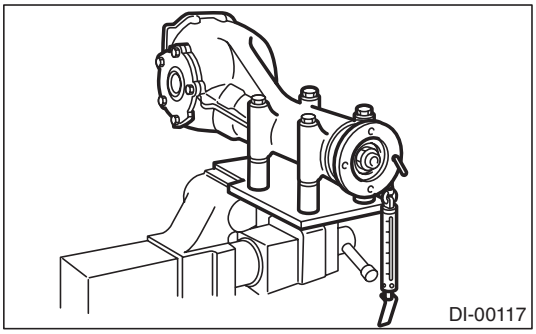
NOTE:
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.
- Measure the preload in direction of tangent to flange.

ST1 398507702 DUMMY SHAFT
ST2 398507704 BLOCK

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



Drive pinion bearing preload
18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lbf) at companion flange bolt hole



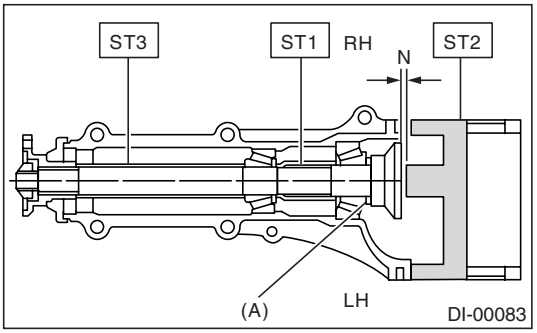
	Part No.	Thickness mm (in)
Preload adjusting washer	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)

	Part No.	Length mm (in)
Preload adjusting collar	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)

2) Adjusting drive pinion height:
Adjust the drive pinion height with washer installed between the rear bearing cone and the back of pinion gear.

(1) Install the ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE
ST3 398507703 DUMMY COLLAR

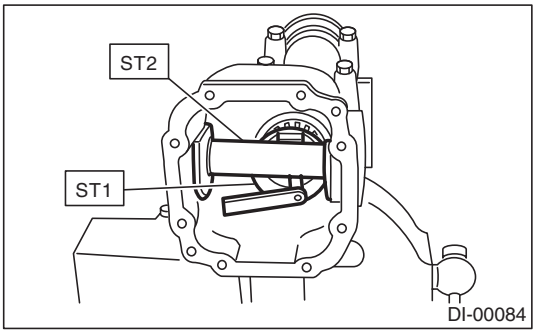


(A) Pinion height adjusting washer

(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.
$T = To + N - (H \times 0.01) - 0.20$ mm

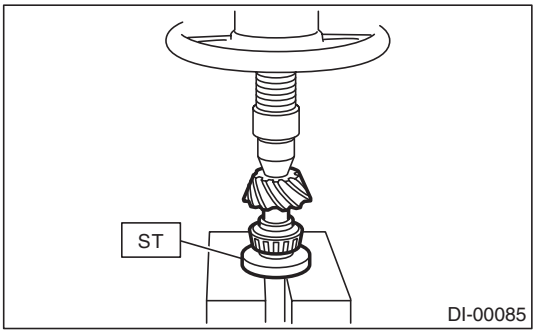
NOTE:
Use copies of this page.

T	Thickness of pinion height adjusting washer mm (in)	
To	Thickness of washer temporally inserted mm (in)	
N	Clearance of thickness gauge mm (in)	
H	Figure marked on drive pinion head	
Memo:		

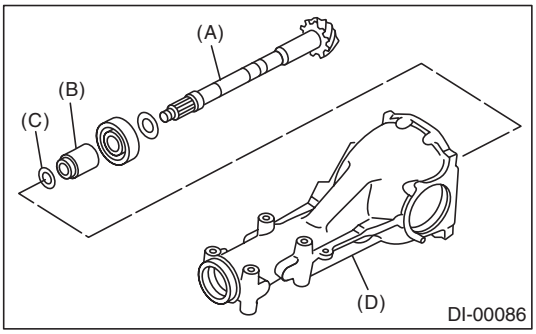
(Example of calculation)
To = 2.20 + 1.20 = 3.40 mm
N = 0.23 mm H = + 1
T = 3.40 + 0.23 − 0.01 − 0.20 = 3.42
Result: Thickness = 3.42 mm
Therefore use the pinion height adjusting washer of part number 383605200.

Pinion height adjusting washer	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

3) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position with ST.
ST 398177700 INSTALLER

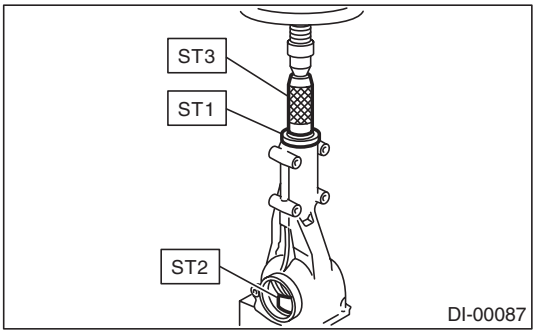


4) Insert the drive pinion into differential carrier, install the selected bearing preload adjusting collar and washer.

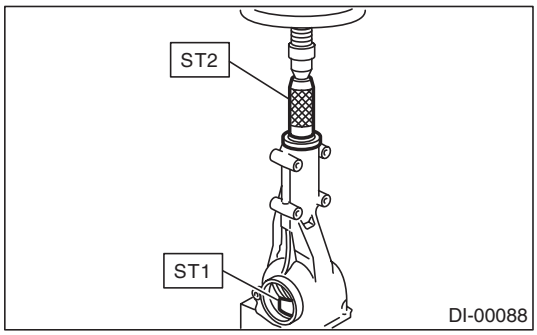


(A) Drive pinion
(B) Bearing preload adjusting collar
(C) Bearing preload adjusting washer
(D) Differential carrier

5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



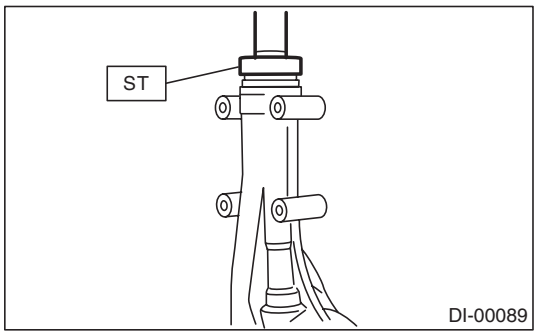
6) Insert the collar, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Fit a new oil seal using ST.

NOTE:
• Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease to the oil seal lips.

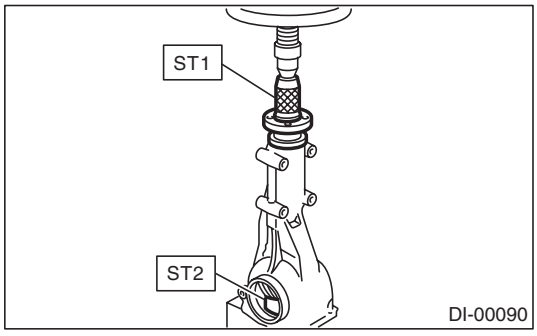
ST 498447120 INSTALLER



8) Press-fit the companion flange with ST1 and ST2.

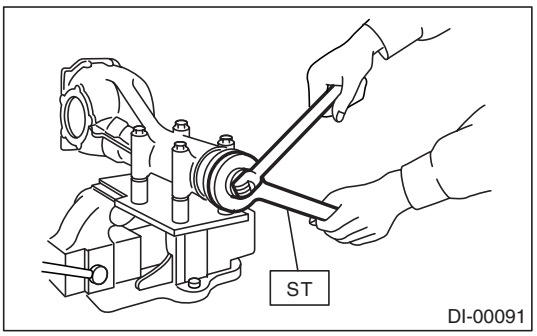
NOTE:
Be careful not to damage the bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



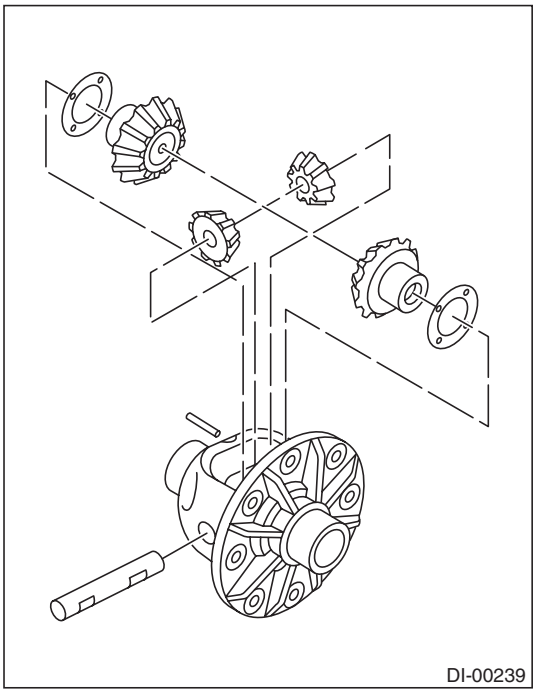
9) Install a new self-locking nut and secure the companion flange using ST and tighten the nut.
ST 498427200 FLANGE WRENCH

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



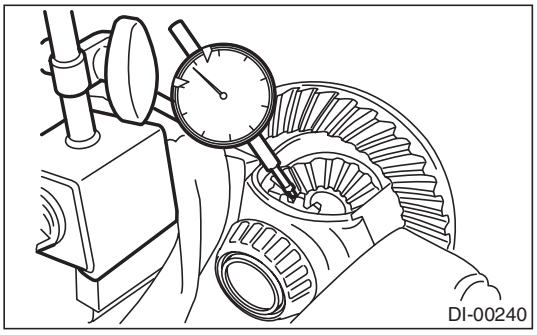
10) Assembling differential case
Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case. (Model without LSD)

NOTE:
• Apply gear oil on both sides of the washer and on the side gear shaft before installing.
• Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

Side gear backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



(2) Adjust the side gear backlash as specified by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
383445201	0.75 — 0.80 (0.0295 — 0.0315)
383445202	0.80 — 0.85 (0.0315 — 0.0335)
383445203	0.85 — 0.90 (0.0335 — 0.0354)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After inserting the pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

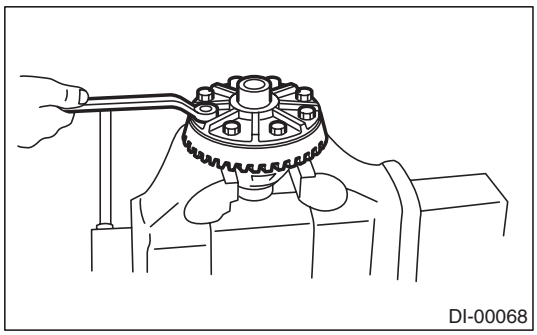
11) Install the hypoid driven gear to differential case.

NOTE:
• Before installing bolts, apply Lock Tite to bolt threads.

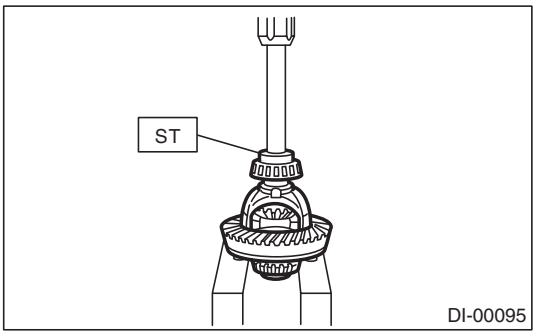
Lock Tite:
THREE BOND 1324 (Part No. 004403042)

• Tighten diagonally while tapping the bolt heads.

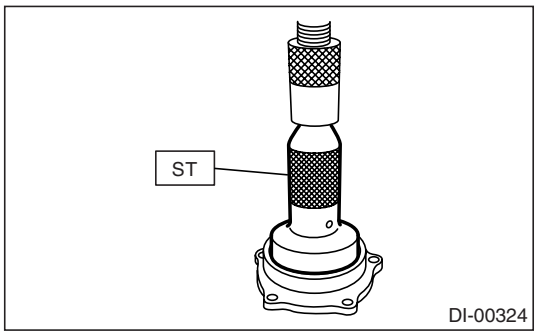
Tightening torque:
105 N·m (10.7 kgf-m, 77.4 ft-lb)



12) Press the side bearing into differential case using ST.
ST 398487700 DRIFT

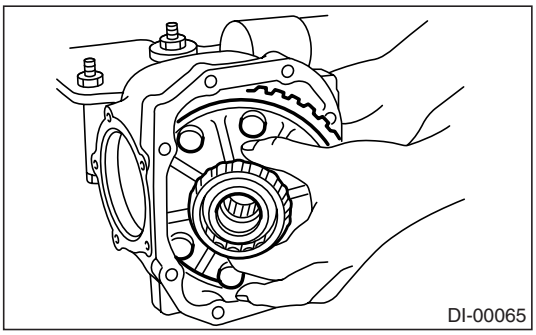


13) Press-fit the side bearing cone to the side bearing retainer using ST.
ST 398417700 DRIFT PUNCH



14) Adjusting the side bearing retainer shims
(1) The hypoid driven gear backlash and side bearing preload can be adjusted by the side bearing retainer shim thickness.
(2) Install the differential assembly into differential carrier in the reverse order of disassembly.

NOTE:
Be careful not to hit the teeth against the cace.



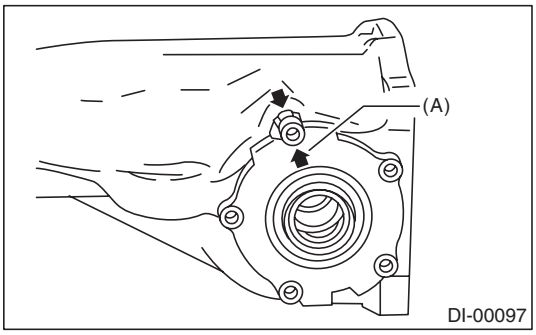
(3) Install the side bearing retainer shims to retainers RH and LH from which they were removed.

NOTE:
Replace the broken or corroded side retainer shim with a new one of same thickness.

Side bearing retainer shim	
Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

(4) Align the arrow mark on differential carrier with the mark on side retainer during installation.

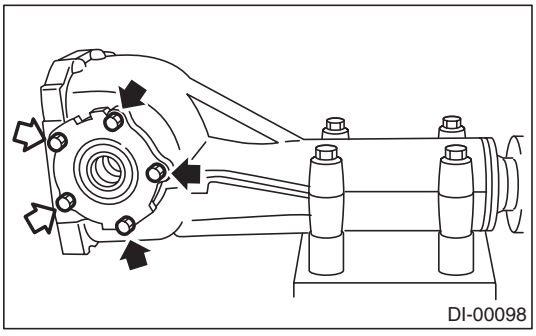
NOTE:
Be careful that side bearing outer race is not damaged by bearing roller.



(A) Arrow mark

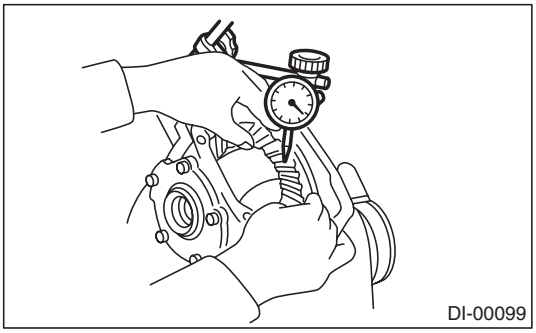
(5) Tighten the side bearing retainer bolts.

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



(6) Measure the hypoid driven gear to drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge. If the backlash exceeds 0.2 mm (0.08 in), reduce the thickness of shim on the back face of hypoid driven gear and increase the thickness of shim on the tooth face of hypoid driven gear. If the backlash is less than 0.1 mm (0.004 in), increase the thickness of shim on the back face of hypoid driven gear and reduce the thickness of shim on the tooth face of hypoid driven gear.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

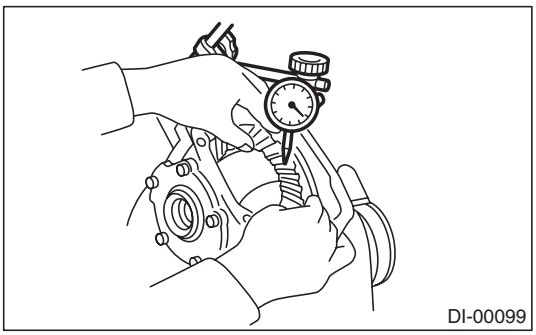


(7) At the same time, measure the total preload of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side bearing retainer shims, increasing/reducing by an even amount at a time.

Total preload:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)

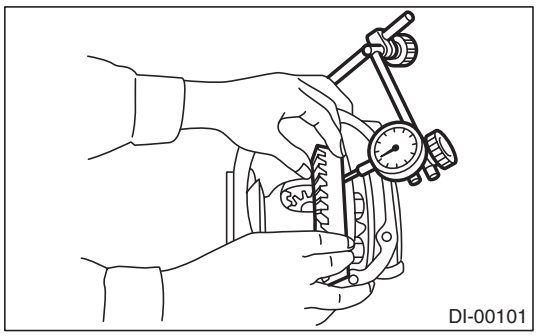
15) Recheck the hypoid driven gear to drive pinion backlash.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



16) Check the hypoid driven gear runout on its back surface, and make sure that pinion and hypoid driven gear rotates smoothly.
If the hypoid driven gear runout on its back surface exceed the specification, verify that there is any foreign material between hypoid driven gear and differential case, and they are not deformed.

Hypoid driven gear runout on its back surface:
0.05 mm (0.0020 in)

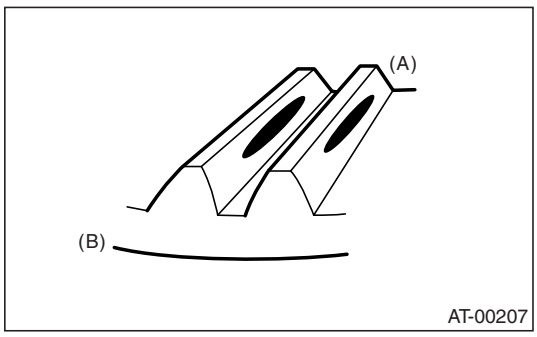


17) Checking and adjusting the tooth contact of hypoid driven gear
(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.
(2) When the contact pattern is incorrect, readjust.

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

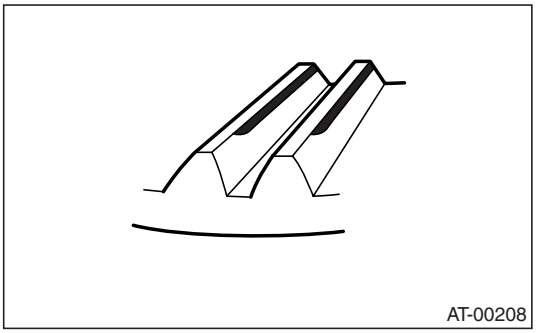
Checking item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



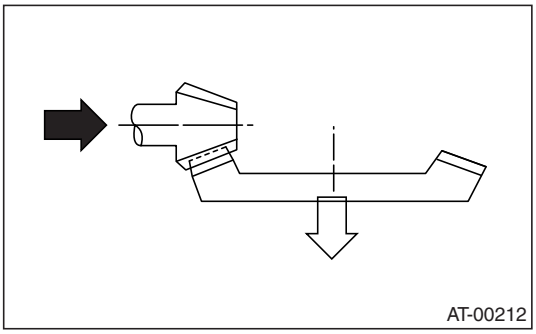
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

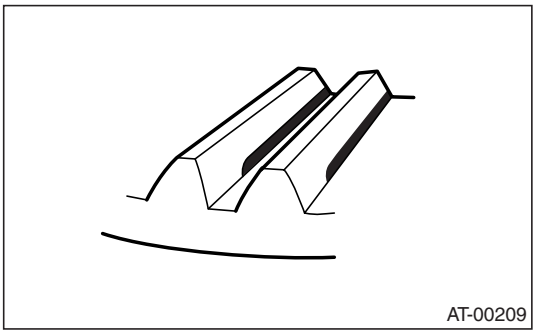


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

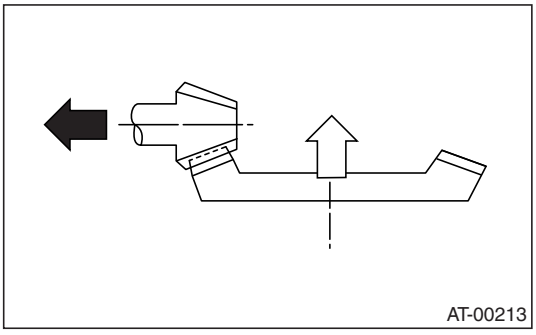


- Flank contact

Checking item: Backlash is too small.
Contact pattern

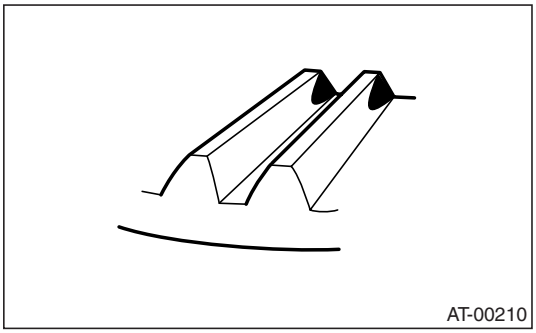


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.

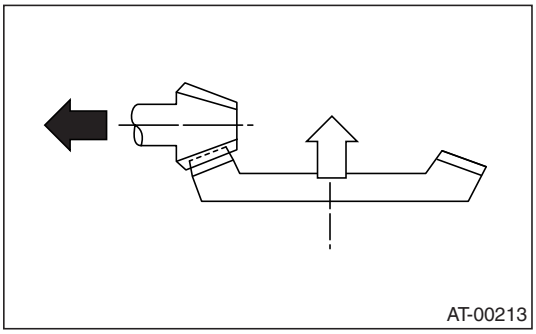


- Toe contact (inside end contact)

Checking item: Contact areas is small
Contact pattern

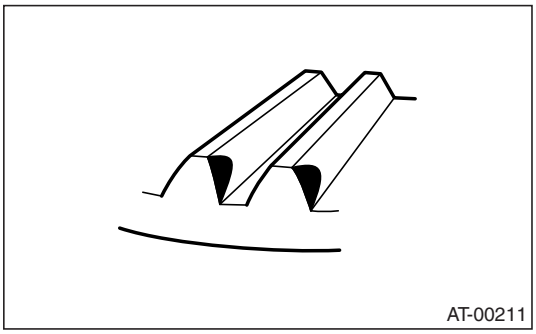


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.

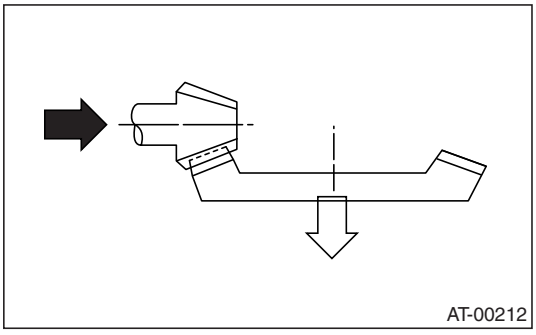


- Heel contact (outside end contact)

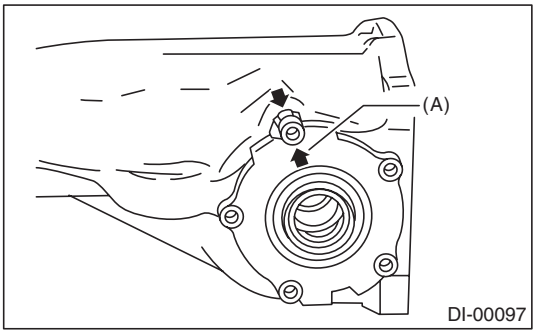
Checking item: Contact areas is small
Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



18) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.
19) Remove the RH and LH side bearing retainer.
20) Install a new O-ring to side bearing retainer of both side.
21) Using the ST, install the oil seal to the side bearing retainer of both side.
ST 398437700 DRIFT
22) Align the arrow mark on differential carrier with the mark on side retainer during installation.

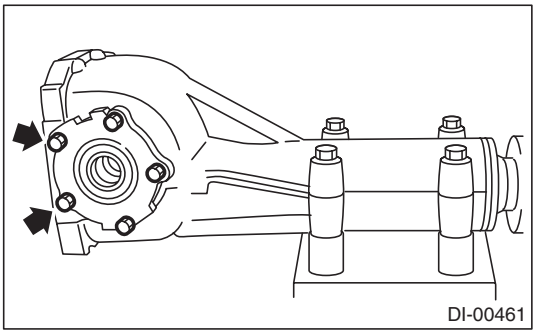


(A) Arrow mark

23) Apply liquid gasket to the bolt of arrow mark, and install the side bearing retainer.

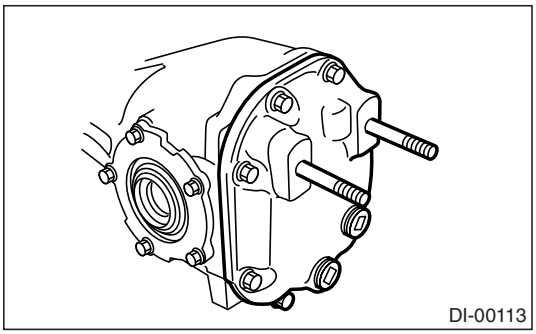
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



24) Install the new gasket and rear cover to the differential carrier, and tighten the bolts to specified torque.

Tightening torque:
29 N·m (3.0 kgf-m, 21.4 ft-lb)



25) Install the breather cap.
26) Install the drain plug and filler plug.

Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage and other defects. Repair or replace the defective parts as necessary.
1) Hypoid driven gear and drive pinion
• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact. Replace the gear if excessively worn or incapable of adjustment.
• If crack, score or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.
2) Side gear and pinion mate gear
• Replace if crack, score or other defects are evident on tooth surface.
• Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.
3) Bearings
Replace if seizure, peeling, wear, rust, dragging during rotation, noise or other defect is evident.
4) Thrust washers of side gear and pinion mate gear:
Replace if seizure, flaw, abnormal wear or other defect is evident.
5) Oil seal
Replace if deformed or damaged, and at every disassembling.
6) Differential carrier
Replace if the bearing bores are worn or damaged.
7) Differential case
Replace if its sliding surfaces are worn or cracked.

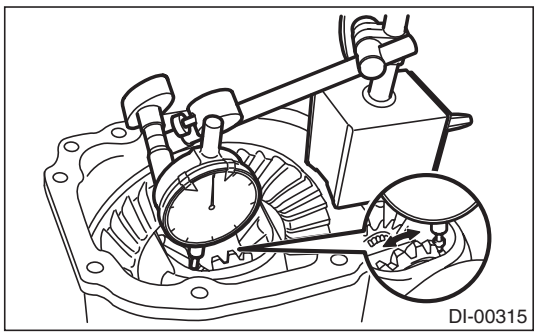
8) Companion flange
Replace if the oil seal lip contacting surfaces have flaws.

1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear. (Model without LSD)

Side gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)

If the side gear backlash is not within the specification, adjust it as specified by selecting side gear thrust washer.

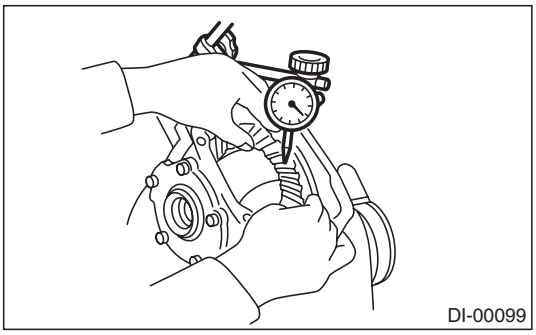

DI-00315

2. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of hypoid driven gear.

Hypoid driven gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)

If the hypoid driven gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.

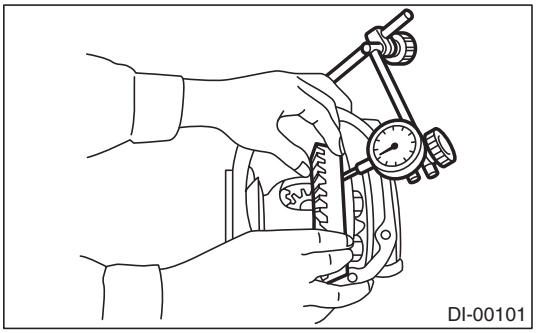

DI-00099

3. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

Using a dial gauge, check the hypoid driven gear runout on its back surface.

Hypoid driven gear runout on its back surface:
0.05 mm (0.0020 in)

If the hypoid driven gear runout exceeds 0.05 mm (0.0020 in), replace the hypoid driven gear.


DI-00101

4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

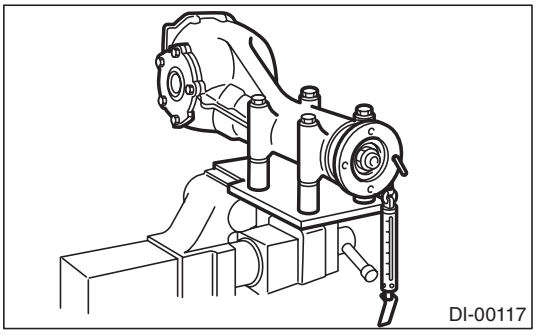
Inspect the tooth contact between hypoid driven gear and drive pinion. <Ref. to DI-35, ASSEMBLY, Rear Differential (T-type).>

5. TOTAL PRELOAD

Using a spring balance, check the total preload.

Total preload:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)

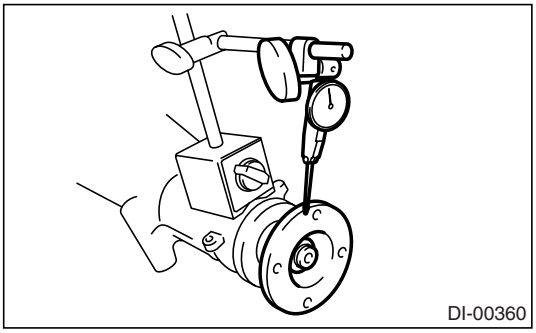
If the total preload is not within the specification, adjust the side bearing retainer shims.


DI-00117

6. COMPANION FLANGE

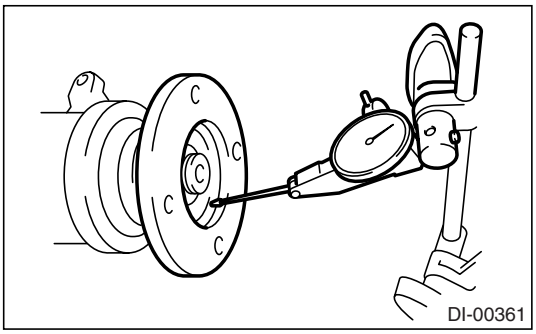
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.0031 in)



3) Set the gauge inside of the companion flange, and measure the runout.

Limit of runout:
0.08 mm (0.0031 in)



4) If either runout exceeds the limit, move the phase of companion flange and drive pinion 90° each, and find the point where the runout is within the limit.
5) If the runout exceeds the limit after changing the phase, replace the companion flange and recheck the runout.
6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash.
<Ref. to DI-35, ASSEMBLY, Rear Differential (T-type).>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash.
<Ref. to DI-35, ASSEMBLY, Rear Differential (T-type).>

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear.
<Ref. to DI-35, ASSEMBLY, Rear Differential (T-type).>

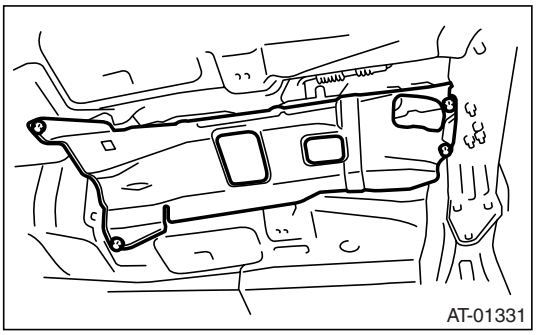
4. TOTAL PRELOAD

Adjust the side bearing shim.
<Ref. to DI-35, ASSEMBLY, Rear Differential (T-type).>

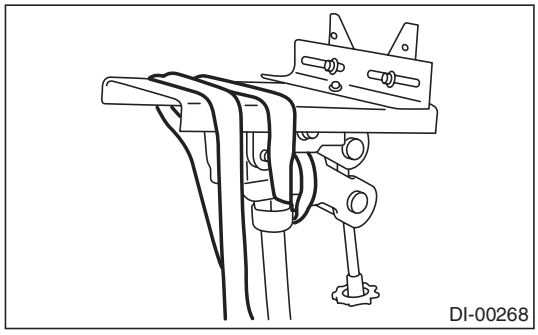
5. Rear Differential (VA-type)

A: REMOVAL

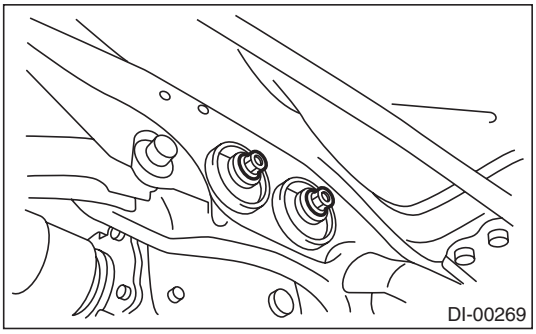
1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to neutral.
3) Loosen the wheel nuts.
4) Release the parking brake.
5) Lift-up the vehicle.
6) Remove the rear wheels.
7) Remove the rear exhaust pipe and muffler.
8) Remove the heat shield cover.



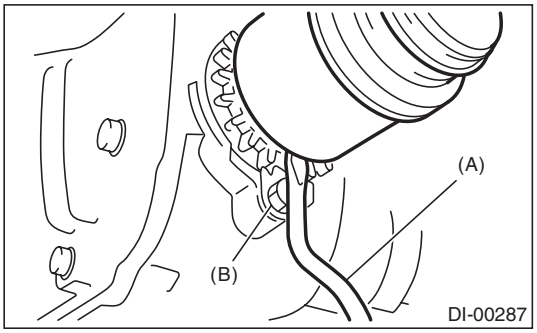
9) Remove the propeller shaft.
<Ref. to DS-10, REMOVAL, Propeller Shaft.>
10) Prepare the transmission jack and band.



11) Loosen the self-locking nuts which hold the rear differential to rear crossmember.

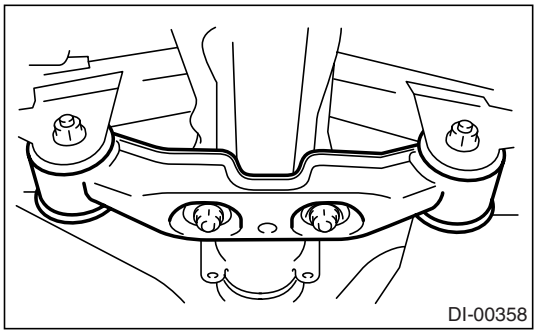


12) Remove the DOJ of rear drive shaft from rear differential.

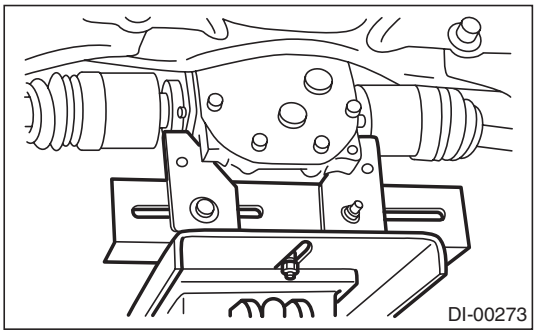


(A) Tire lever
(B) Bolt

13) Remove the nuts which hold the rear differential front member.



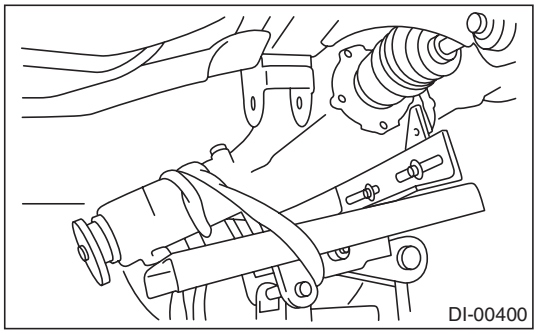
14) Support the rear differential with transmission jack.



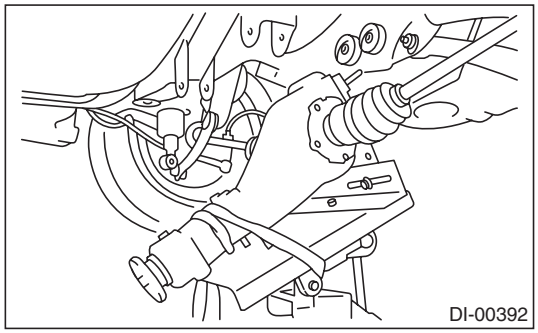
15) Remove the rear differential front member.
16) Secure the rear differential using band.
17) Remove the self-locking nuts which hold the rear differential to rear crossmember.

18) Remove the rear differential stud bolt from rear crossmember bushing.

NOTE:
When removing the stud bolt, carefully adjust the angle and location of transmission jack and jack stand, if necessary.

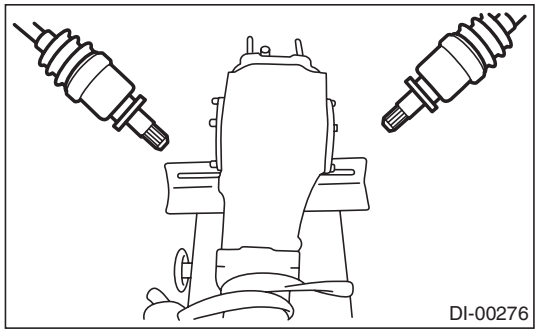


19) Lower the transmission jack stand after removing the rear differential stud bolt from rear crossmember. Rear drive shaft should not come into contact with lateral link bolt.



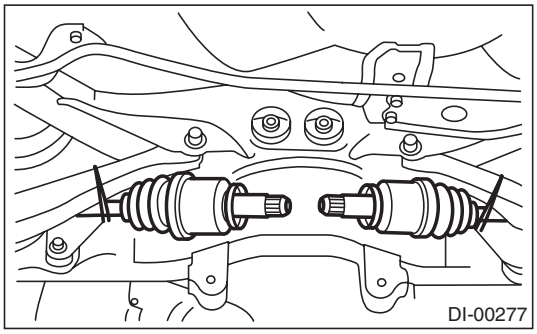
20) Pull out the axle shaft from rear differential.

NOTE:
If it is difficult to remove the axle shaft from rear differential, remove it using tire lever.

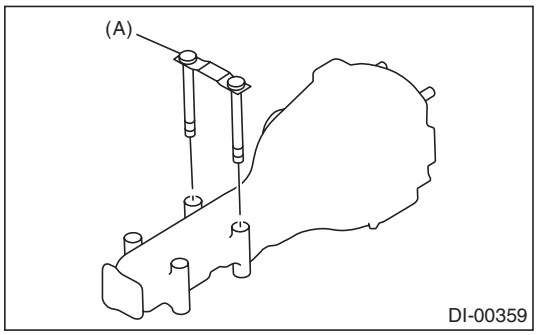


21) Lower the transmission jack.

22) Secure the rear drive shaft to lateral link using wire.



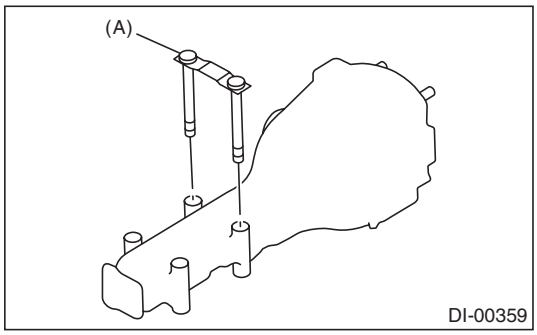
23) Remove the rear differential member plate from rear differential.



(A) Rear differential member plate

B: INSTALLATION

1) Insert the rear differential member plate into rear differential.

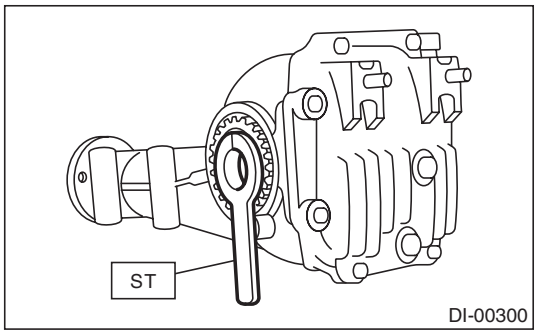


(A) Rear differential member plate

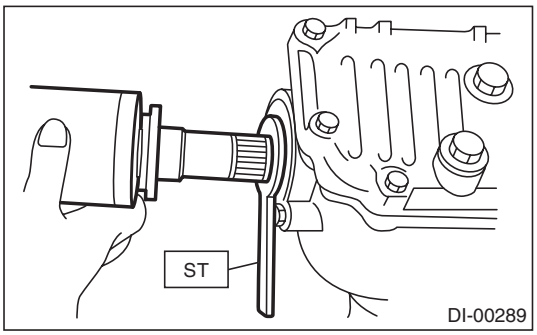
2) Set the rear differential to transmission jack.

NOTE:
Secure the rear differential to transmission jack using band.

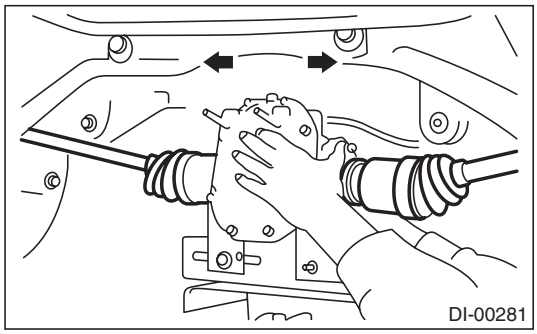
3) Install the ST to rear differential.
ST 28099PA090 OIL SEAL PROTECTOR



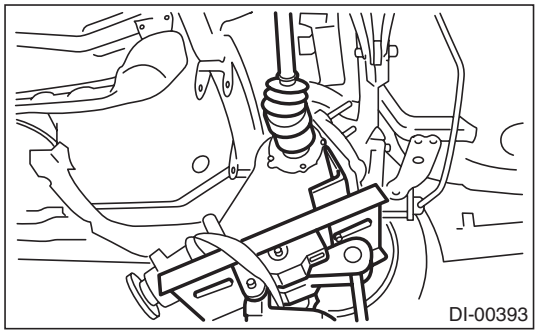
4) Insert the spline shaft until the spline portion comes inside the side oil seal.
ST 28099PA090 OIL SEAL PROTECTOR



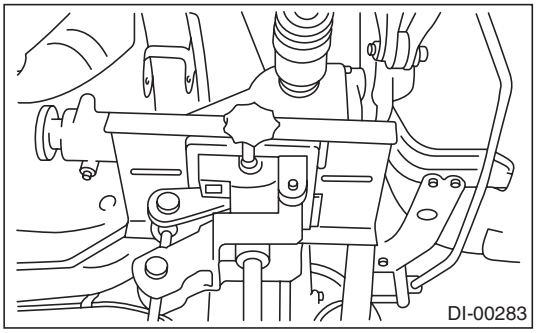
5) Remove ST from rear differential.
ST 28099PA090 OIL SEAL PROTECTOR
6) Push the rear differential to insert the axle shaft into rear differential.



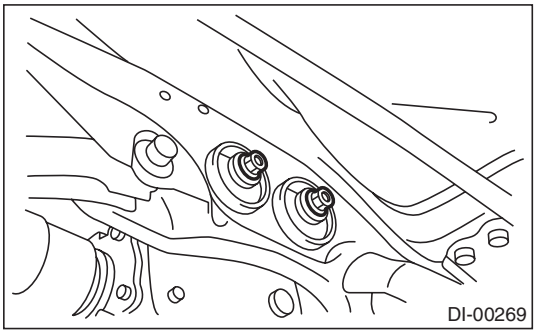
7) Adjust the transmission jack, if necessary, and insert the rear differential stud bolt into rear crossmember bushing properly.



8) After inserting the rear differential stud bolt into rear crossmember bushing, lift up the transmission jack and align the rear differential to the height of rear differential.

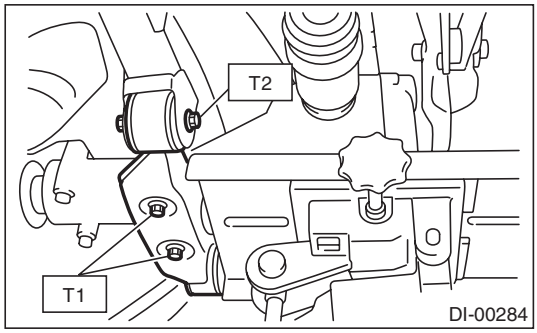


9) Tighten a new self-locking nut temporarily to rear crossmember.



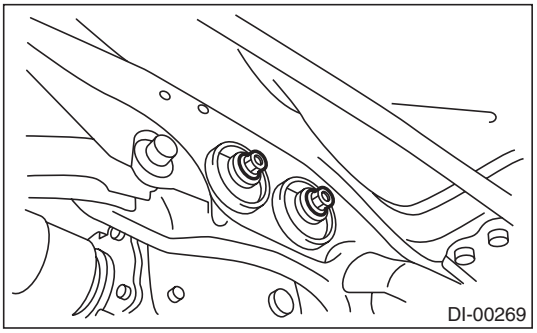
10) Remove the band from rear differential. Lift up the rear differential until the rear differential is left from the transmission jack.
11) Install the rear differential front member with a new self-locking nut.

Tightening torque:
T1: 52 N·m (5.3 kgf-m, 38 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



12) Tighten the self-locking nut.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)

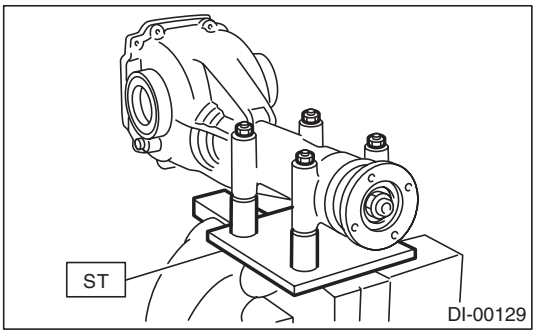


13) Lower the transmission jack.
14) Install the propeller shaft.
<Ref. to DS-11, INSTALLATION, Propeller Shaft.>
15) Install the heat shield cover.
16) Install the rear exhaust pipe and muffler.

C: DISASSEMBLY

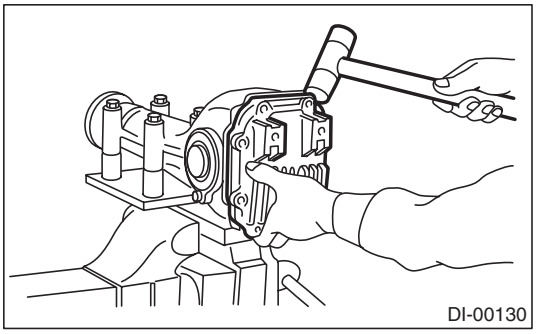
1. VA1-TYPE

To detect the real cause of trouble, inspect the following items before disassembling.
• Tooth contact and backlash between hypoid driven gear and drive pinion
• Hypoid driven gear runout on its back surface
• Total preload of drive pinion
1) Set the ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT SET



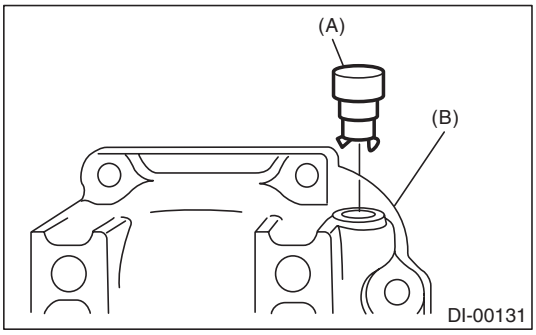
2) Drain the gear oil by removing plug.

3) Remove the rear cover by loosening retaining bolts.



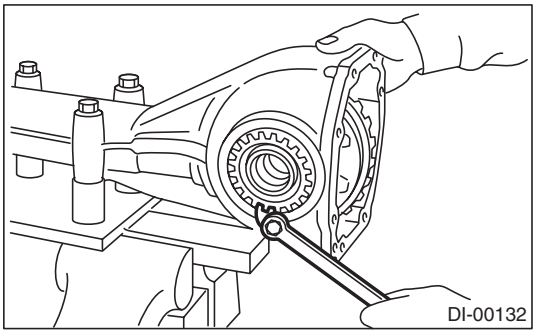
4) Remove the air breather cap.

NOTE:
• Do not attempt to remove the air breather cap unless necessary.
• When removing the air breather cap, replace it with a new one.

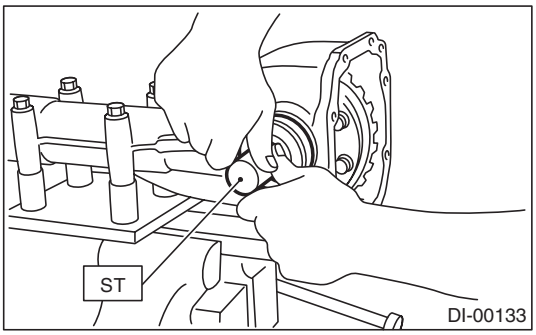


(A) Air breather cap
(B) Rear cover

5) Remove the lock plate RH and LH.

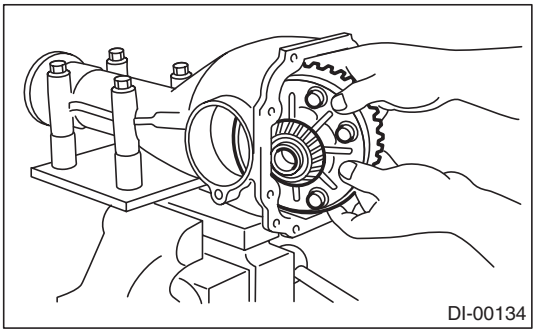


6) Remove the holder RH and LH with ST.
ST 499785500 WRENCH ASSY

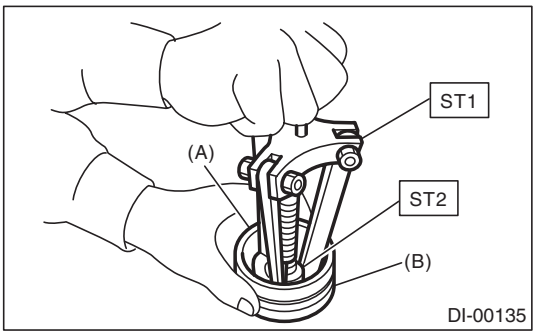


7) Pull out the differential assembly from differential carrier.

NOTE:
Be careful not to hit the teeth against the case.



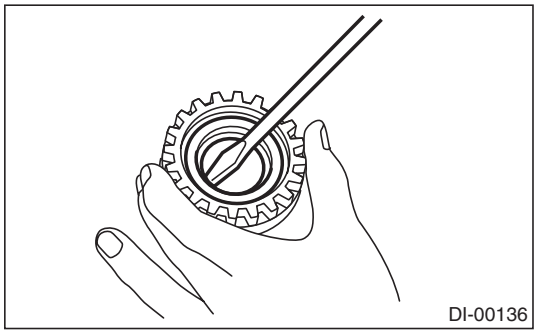
8) Remove the bearing race from holder RH and LH with ST1 and ST2.
ST1 499705401 PULLER ASSY
ST2 499705404 SEAT



(A) Bearing race
(B) Holder

9) Remove the oil seal from holder RH and LH using screwdriver.

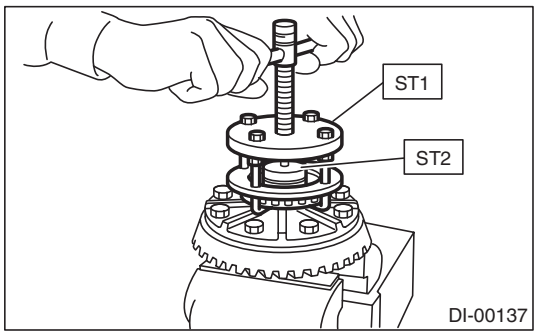
NOTE:
Perform this operation only when replacing oil seal.



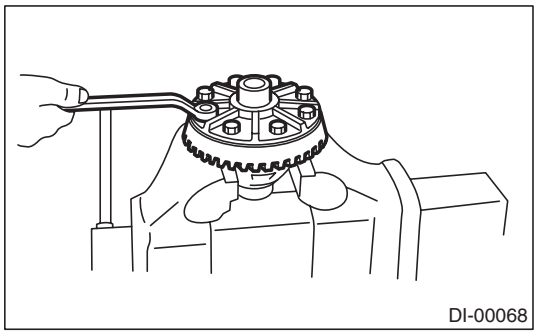
10) Extract the bearing cone with ST1 and ST2.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of the bearing cone.
• Never mix up the bearing races RH and LH and cones.

ST1 899524100 PULLER SET
ST2 399520105 SEAT



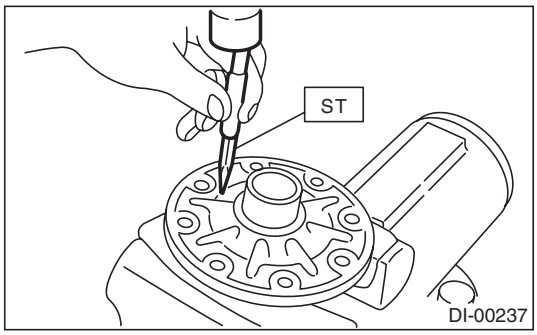
11) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



12) Drive out the pinion shaft lock pin from hypoid driven gear side.

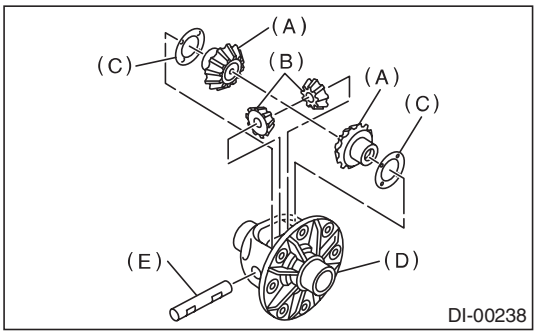
NOTE:
The lock pin is staked at the pin hole end on the differential case. do not drive it out forcibly before unstaking it.

ST 899904100 STRAIGHT PIN REMOVER



13) Draw out the pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

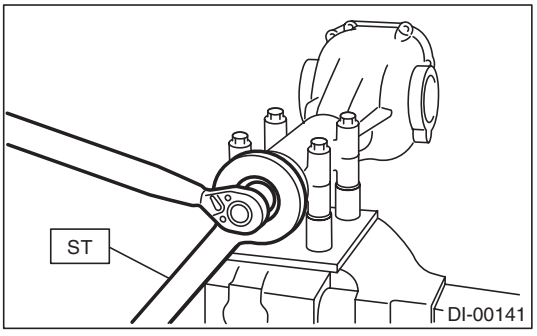
NOTE:
The gears should be marked or kept separated right and left, and front and rear as well as thrust washers.



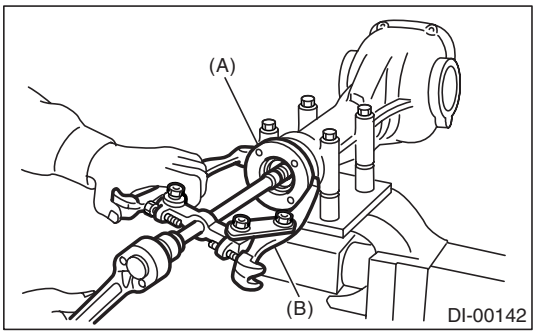
(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

14) Support the companion flange with ST and remove self-locking nut.

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.

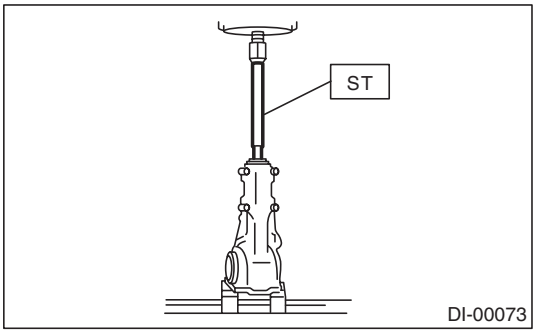


(A) Companion flange
(B) Puller

16) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjust washer and washer.

NOTE:
Hold the drive pinion so as not to drop it.

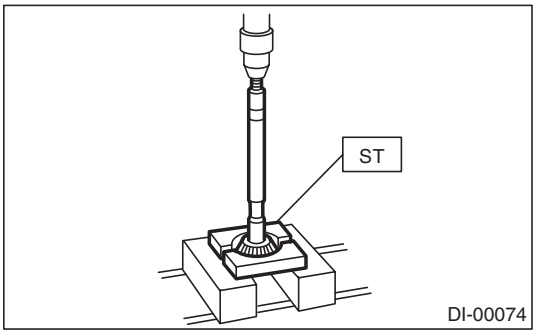
ST 398467700 DRIFT



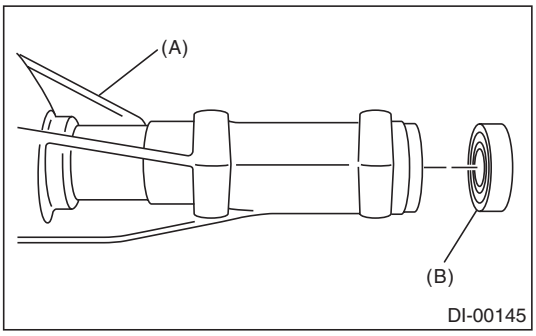
17) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER

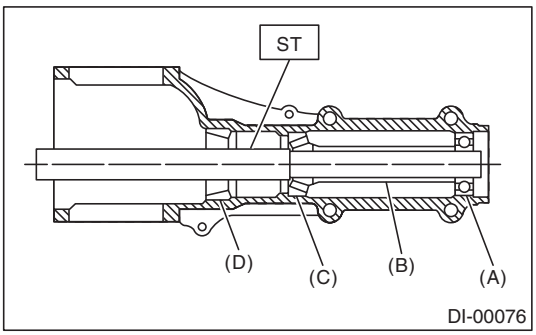


18) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



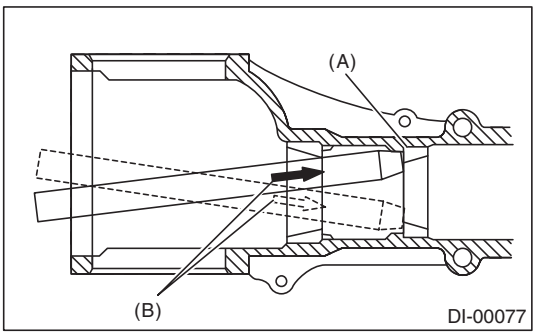
(A) Differential carrier
(B) Front oil seal

19) Remove the pilot bearing together with front bearing cone and collar using ST.
ST 398467700 DRIFT



(A) Pilot bearing
(B) Collar
(C) Front bearing
(D) Rear bearing cup

20) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order by using a brass bar.

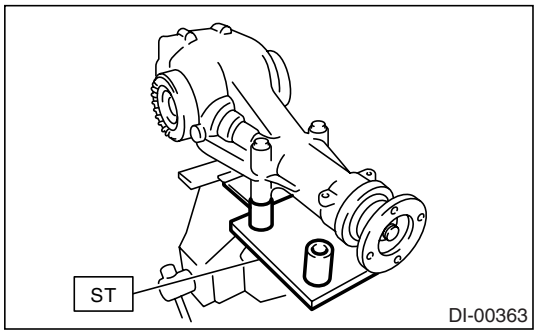


(A) 2 cutouts along diagonal lines
(B) Hit out alternately with brass bar

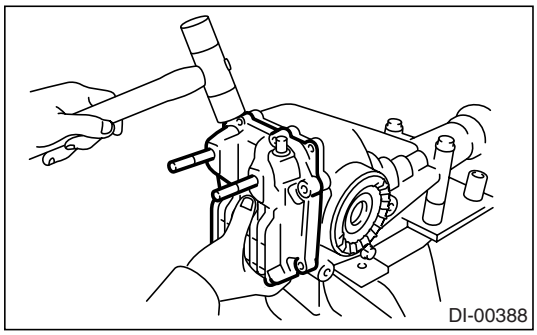
2. VA2-TYPE

To detect the real cause of trouble, inspect the following items before disassembling.
- Tooth contact and backlash between hypoid driven gear and drive pinion
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

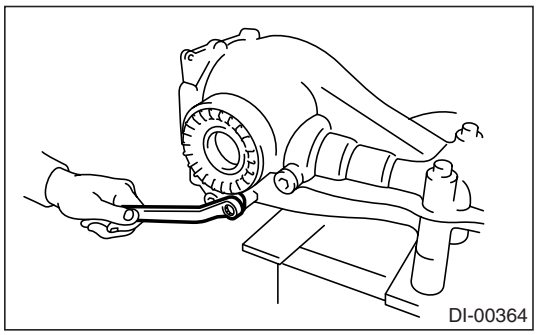
1) Set the ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT SET



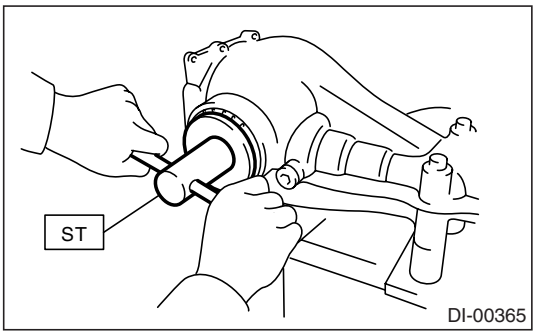
2) Drain the gear oil by removing plug.
3) Remove the rear cover by loosening retaining bolts.



4) Remove the lock plate RH and LH.

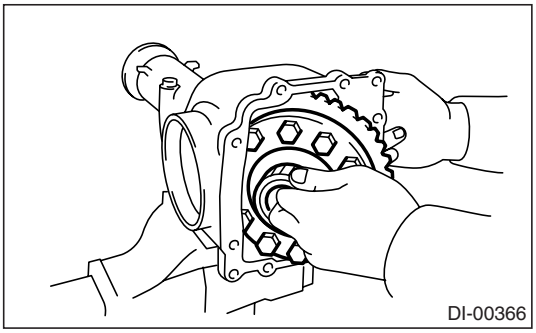


5) Remove the holder RH and LH with ST.
ST 18630AA010 WRENCH ASSY



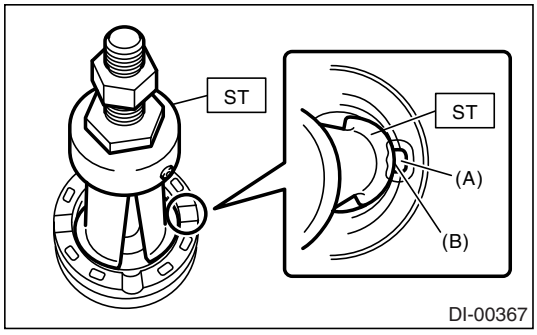
6) Pull out the differential assembly from differential carrier.

NOTE:
Be careful not to hit the teeth against the case.

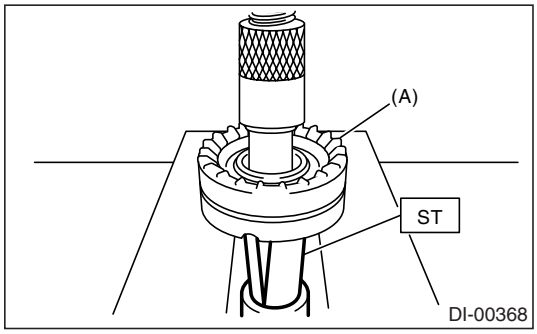


7) Remove the bearing race from holder RH and LH with ST1 and press.
ST 18758AA000 PULLER

NOTE:
• Make sure the bolt of puller turn manually.
• Set the puller so that its claws catch the groove of holder.



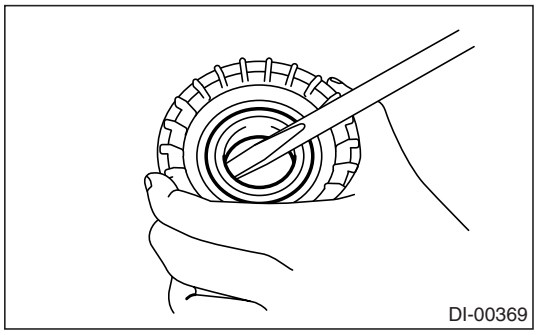
(A) Groove
(B) Claw



(A) Holder

8) Remove the oil seal from holder RH and LH using screwdriver.

NOTE:
Perform this operation only when replacing oil seal.

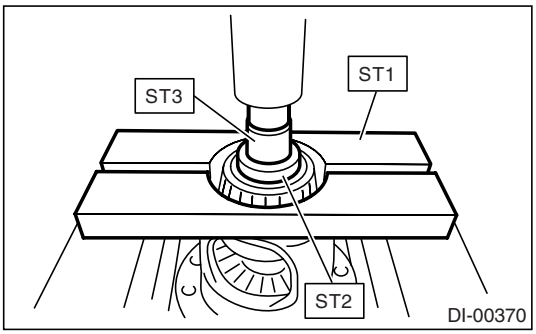


9) Extract the bearing cone with ST1, ST2 and ST3.

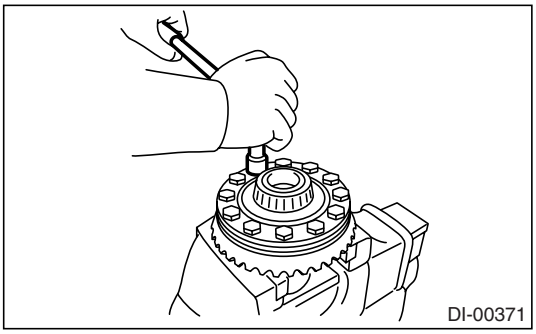
NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Never mix up the bearing races RH and LH and cones.

ST1 498077000 REMOVER
ST2 399520105 SEAT

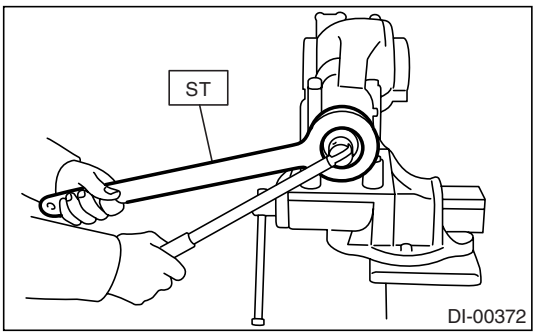
ST3 899864100 REMOVER



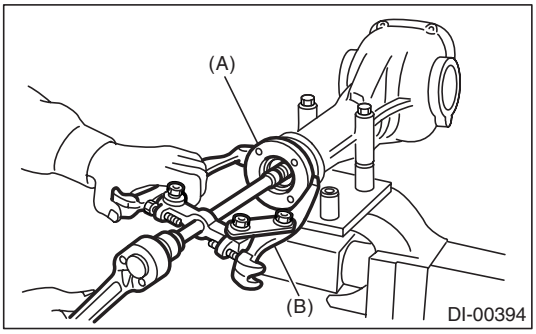
10) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



11) Support the companion flange with ST and remove self-locking nut.
ST 498427200 FLANGE WRENCH



12) Extract the companion flange with a puller.



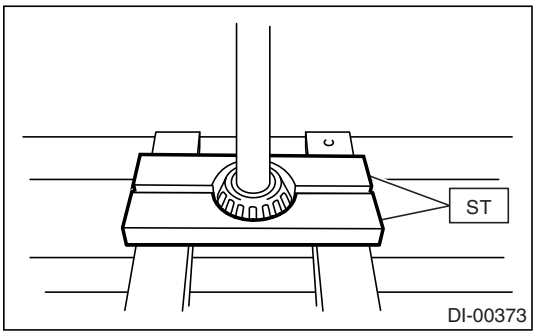
(A) Companion flange
(B) Puller

13) Removes the drive pinion shaft.

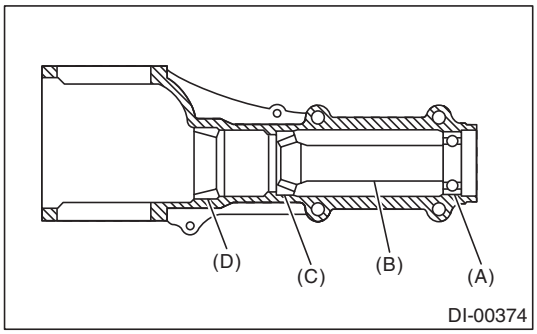
14) Remove the rear bearing cone from drive pinion by supporting cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER

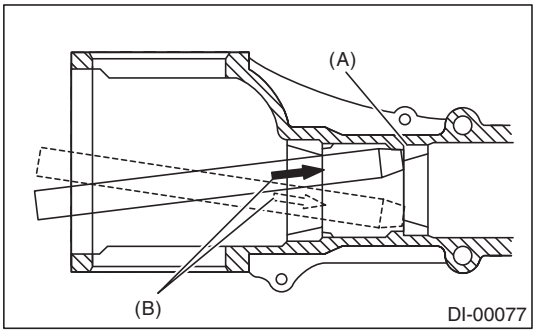


15) Remove the front oil seal from differential carrier using screwdriver.
16) Remove the pilot bearing, front bearing cone and collar.



(A) Pilot bearing
(B) Collar
(C) Front bearing
(D) Rear bearing cup

17) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order by using a brass bar.

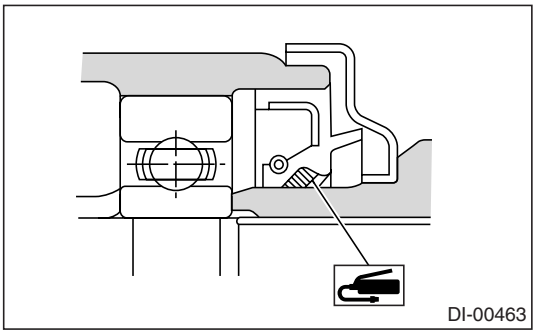


(A) 2 cutouts along diagonal lines
(B) Hit out alternately with brass bar

D: ASSEMBLY

1. VA1-TYPE

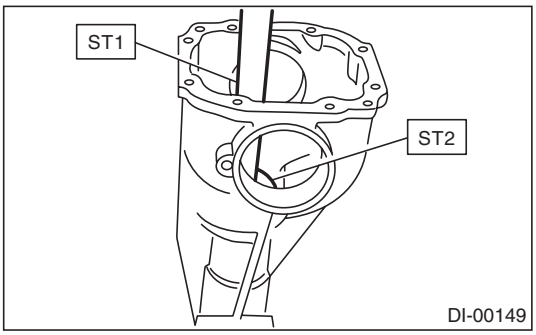
NOTE:
• Assemble in the reverse order of disassembly.
• Check and adjust each part during assembly.
• Use a new gasket.
• Keep the shims and washers in order, so that they are not improperly installed.
• Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
• Apply gear oil when installing the bearings and thrust washers.
• Be careful not to mix up the bearing races RH and LH.
• Replace the oil seal with a new one at every disassembly. Apply grease to the lips when installing the oil seal.
• Be careful not to mix up the differential oil seal RH and LH.


DI-00463

1) Adjusting preload for front and rear bearings:
Adjust the bearing preload with collar and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Install the rear bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 498447110 DRIFT



DI-00149

(2) Install the front bearing race to differential carrier using ST1 and ST2.

ST1 398477701 HANDLE
ST2 498447110 DRIFT

(3) Insert the front bearing cone.

NOTE:
Use new front bearing cone.

(4) Measure and record the thickness of pinion height adjust washer.

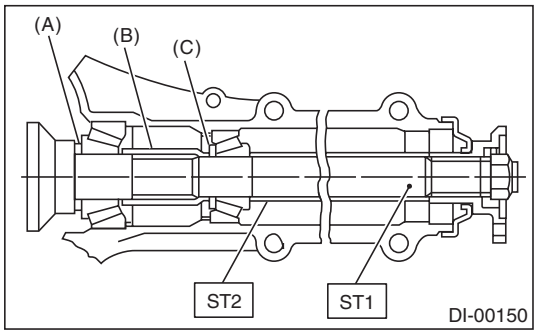
NOTE:
If tooth contact (drive pinion, hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.

(5) Insert the ST1 into the case with pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:
Use new rear bearing cone.

(6) Install the preload adjusting collar and washer, front bearing cone, ST2, companion flange, and washer and self-locking nut.

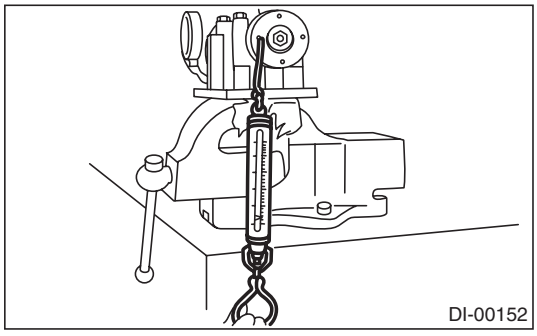
ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR



DI-00150

(A) Pinion height adjusting washer
(B) Preload adjusting collar
(C) Preload adjusting washer

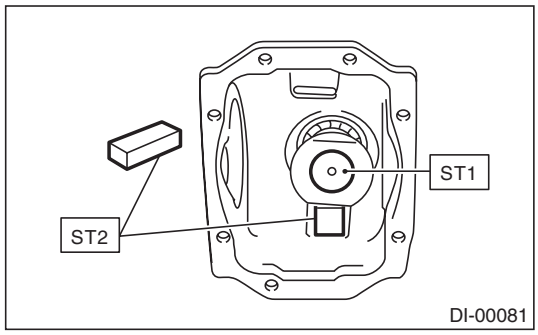
(7) Turn the ST1 with hand to make it seated, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and collar so that the specified preload is obtained when nut is tightened to the specified torque.


DI-00152

NOTE:
• Use a new self-locking nut.
• Be careful not to give excessive preload.
• When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.
• Measure the preload in direction of tangent to flange.

ST1 498447150 DUMMY SHAFT
ST2 398507704 BLOCK

Tightening torque:
191 N·m (19.5 kgf-m, 141 ft-lb)



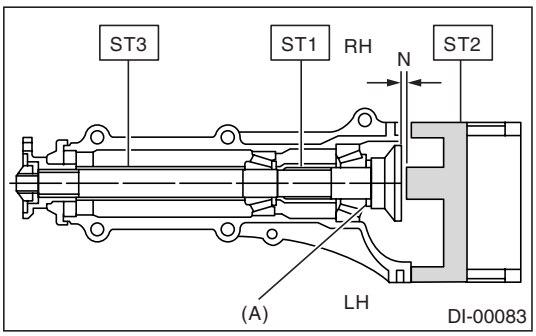
Drive pinion bearing preload
For new bearing: 12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.3 lbf) Measure at companion flange bolt hole

	Part No.	Thickness mm (in)
Preload adjusting washer	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)

	Part No.	Length mm (in)
Preload adjusting collar	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)

2) Adjusting drive pinion height
Adjust the drive pinion height with washer installed between the rear bearing cone and the back of pinion gear.
(1) Install the ST2.

ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE
ST3 32285AA000 DUMMY COLLAR

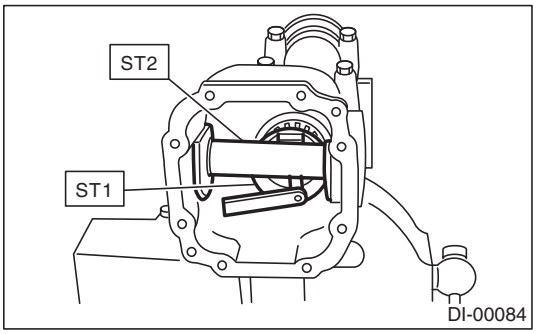


(A) Pinion height adjusting washer

(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST2.

ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.

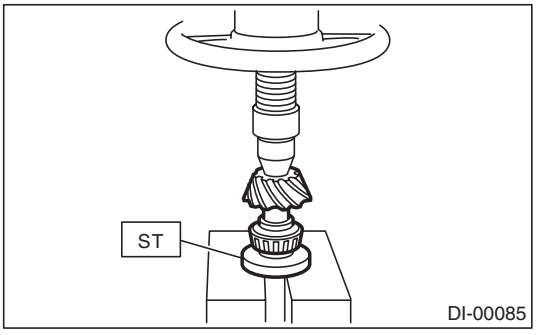
NOTE:
Adjust it using the 1 — 3 washers.
T = To + N − 0.05 (mm)

T	Thickness of pinion height adjusting washer mm (in)	
To	Thickness of washer temporally inserted mm (in)	
N	Clearance of thickness gauge mm (in)	
Memo:		

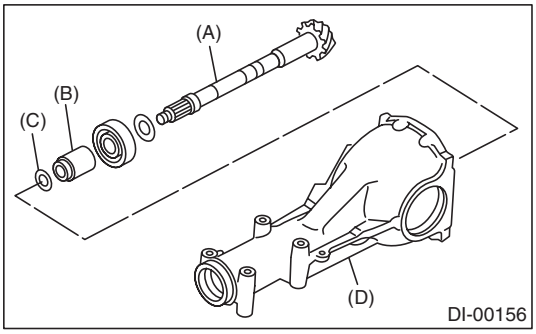
(Example of calculation)
To = 0.15 mm
N = 0.1 mm
T = 0.15 + 0.1 − 0.05 = 0.2 mm
Result: Thickness = 0.2 mm
Therefore use the pinion height adjusting washer of part number 32295AA220.

Pinion height adjusting washer	
Part No.	Thickness mm (in)
32295AA200	0.150 (0.0059)
32295AA210	0.175 (0.0069)
32295AA220	0.200 (0.0079)
32295AA230	0.225 (0.0089)
32295AA240	0.250 (0.0098)
32295AA250	0.275 (0.0108)

3) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position with ST.
ST 498175500 INSTALLER

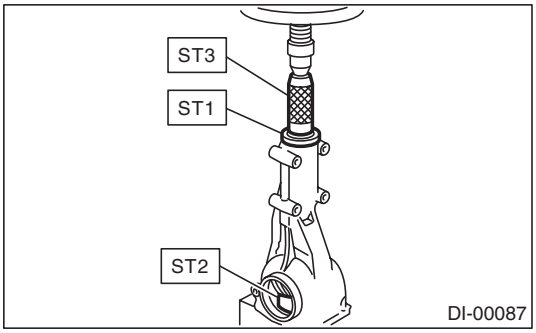


4) Insert the drive pinion into differential carrier, install the selected bearing preload adjusting collar and washer.

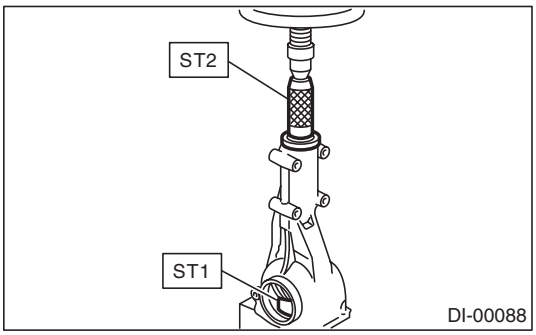


(A) Drive pinion
(B) Bearing preload adjusting collar
(C) Bearing preload adjusting washer
(D) Differential carrier

5) Press-fit the front bearing cone into carrier using ST1, ST2 and ST3.
ST1 32285AA000 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



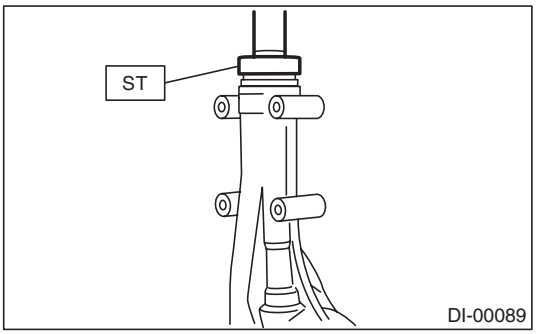
6) Insert the collar, then press-fit the pilot bearing using ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Fit a new oil seal with ST.

NOTE:
• Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease to the oil seal lips.

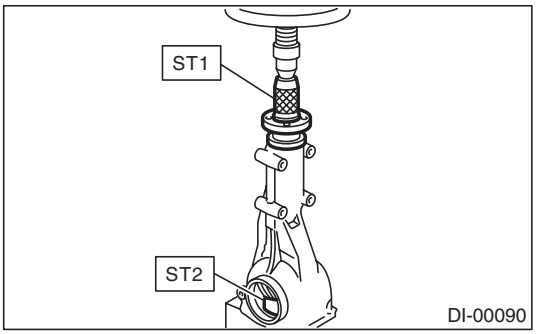
ST 498447120 INSTALLER



8) Press-fit the companion flange using ST1 and ST2.

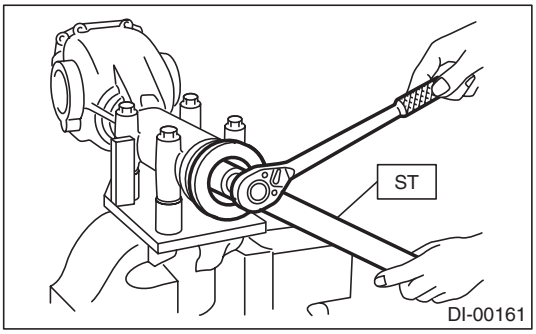
NOTE:
Be careful not to damage the bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



9) Install a new self-locking nut, and secure the companion flange using ST, and tighten the nut.
ST 498427200 FLANGE WRENCH

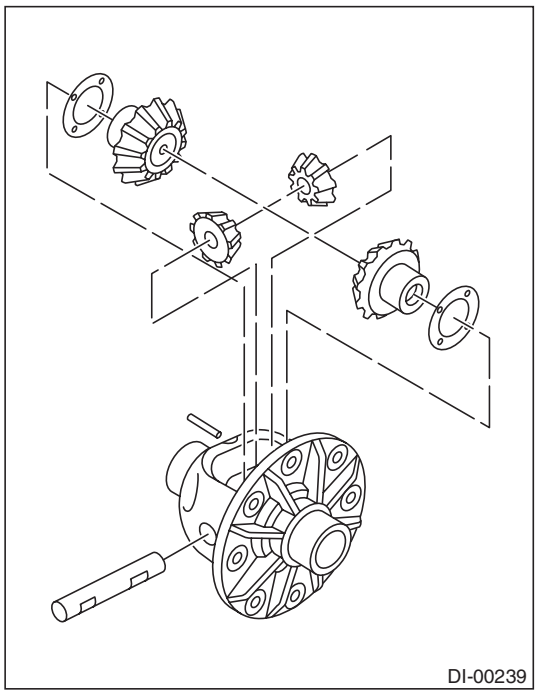
Tightening torque:
191 N·m (19.5 kgf-m, 141 ft-lb)



10) Assembling differential case
Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

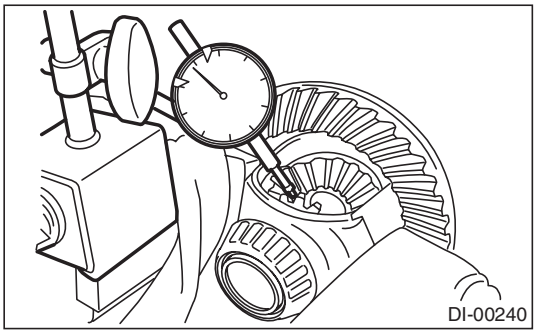
NOTE:
• Apply gear oil to both sides of the washer and the side gear shaft before installing.

• Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

Side gear backlash:
0.05 — 0.15 mm (0.0020 — 0.0059 in)



(2) Adjust the side gear backlash as specified by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
803135011	0.925 — 0.950 (0.0364 — 0.0374)
803135012	0.950 — 0.975 (0.0374 — 0.0384)
803135013	0.975 — 1.000 (0.0384 — 0.0394)
803135014	1.000 — 1.025 (0.0394 — 0.0404)
803135015	1.025 — 1.050 (0.0404 — 0.0413)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After inserting the pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

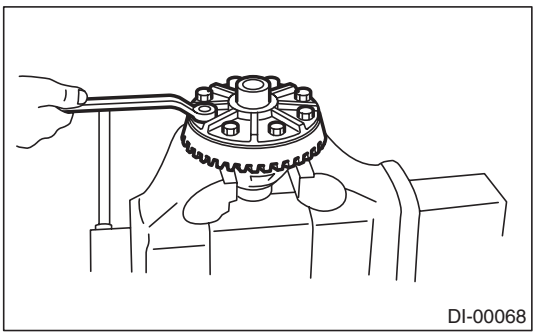
11) Install the hypoid driven gear on differential case.

NOTE:
• Before installing bolts, apply Lock Tite to bolt threads.

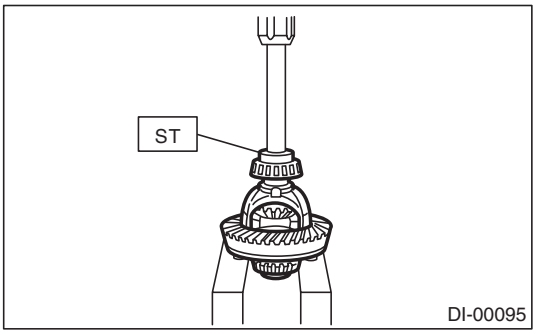
Lock Tite:
THREE BOND 1324 (Part No. 004403042)

• Tighten diagonally while tapping the bolt heads.

Tightening torque:
62 N·m (6.3 kgf-m, 45.6 ft-lb)

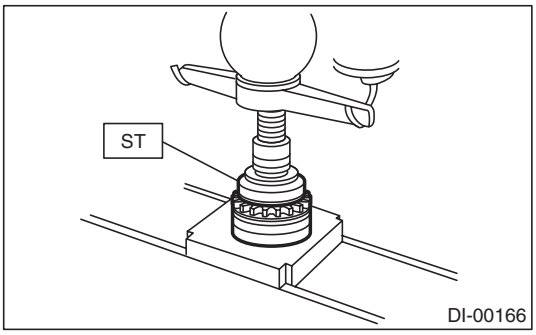

DI-00068

12) Press the side bearing into differential case using ST.
ST 498485400 DRIFT



DI-00095

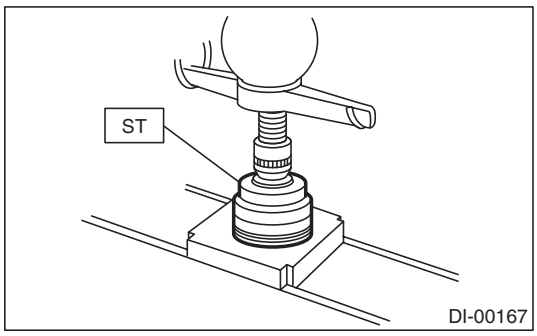
13) Assemble holders.
(1) Install the oil seal into holder RH and LH.
ST 498447100 INSTALLER



DI-00166

(2) Install the bearing race into holder RH and LH.
ST 398477702 DRIFT

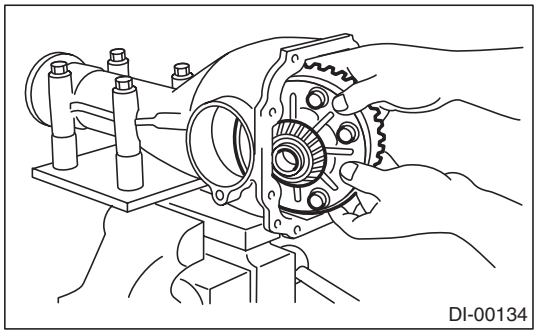
CAUTION:
Make sure that the oil seal, bearing outer race and cone are properly assembled.



DI-00167

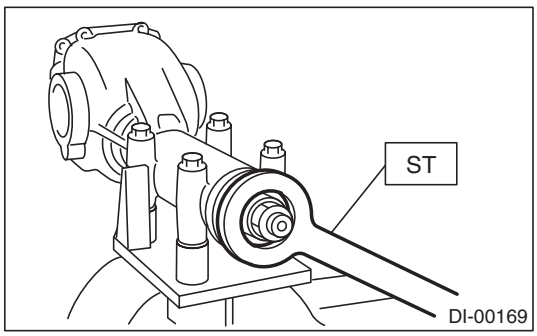
(3) Install the differential assembly into differential carrier in the reverse order of disassembly.

NOTE:
Be careful not to hit the teeth against the case.


DI-00134

(4) Temporally tighten the side holder RH and LH in differential carrier to install.

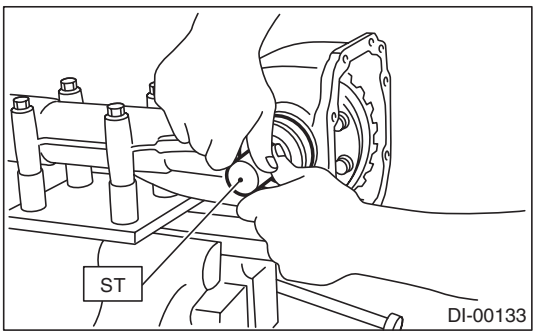
14) Perform the backlash adjustment between the hypoid driven gear and drive pinion, and preload adjustment of differential side bearing.
(1) Turn the drive pinion with ST for better fitting of differential side bearing.
ST 498427200 FLANGE WRENCH



DI-00169

(2) Screw in the side holder LH until light contact is made with ST.

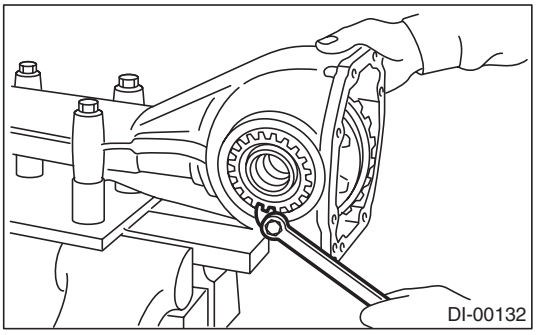
ST 499785500 WRENCH ASSY



(3) Back off the side (hypoid driven gear side) holder approx. 1 1/2 teeth of holder, and tighten the other side holder by approx. 2 teeth (approx. 1 1/2 + 1/2 teeth). [Back off amount of side (hypoid driven gear side) holder + 1/2 tooth.]
This + 1/2 tooth gives preload.

(4) Temporarily tighten the lock plate.

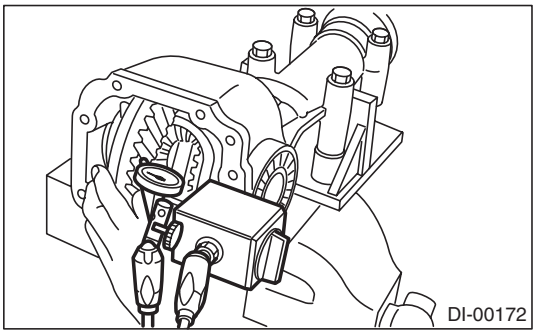
NOTE:
Turn over the lock plate to displace the holder 1/2 tooth.



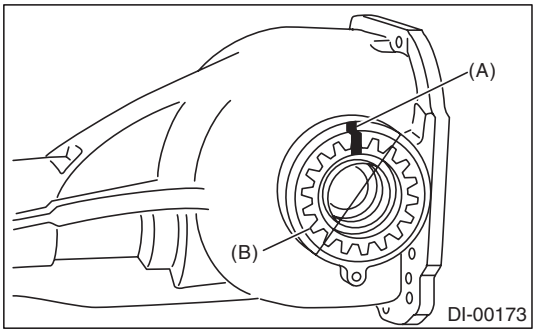
(5) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

NOTE:
If measured backlash is not within specified range, repeat the procedures for pinion driven gear set backlash adjustment and differential side bearing preload adjustment.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)



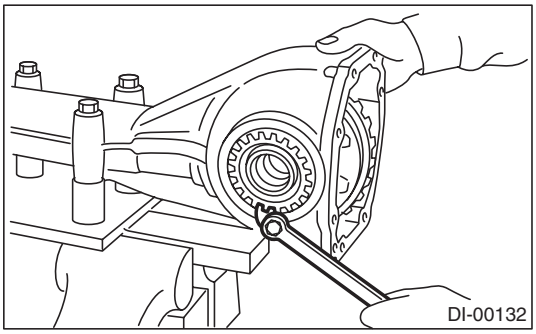
15) Draw a matching mark on both differential carrier and holder. Remove the holder side at a time. Replace in the original position after inserting an O-ring and applying grease to threaded portion.



(A) Alignment mark
(B) Holder

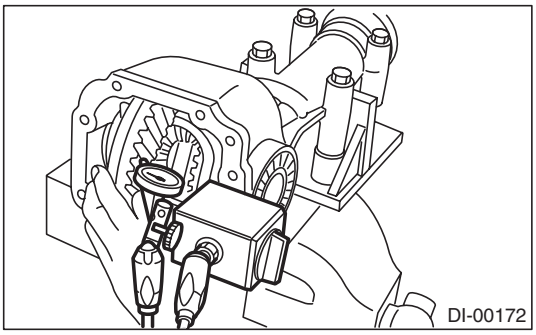
16) Tighten the bolt of lock plate to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



17) Recheck the hypoid driven gear to pinion backlash.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

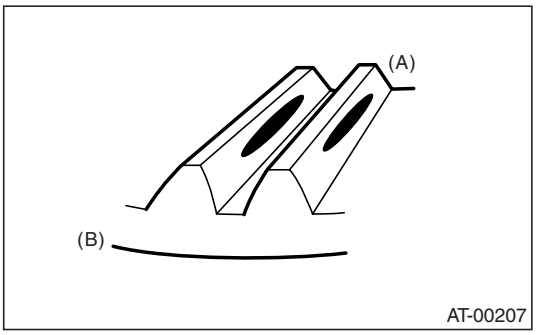


18) Checking and adjusting the tooth contact of hypoid driven gear
(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.
(2) When the contact pattern is incorrect, readjust.

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

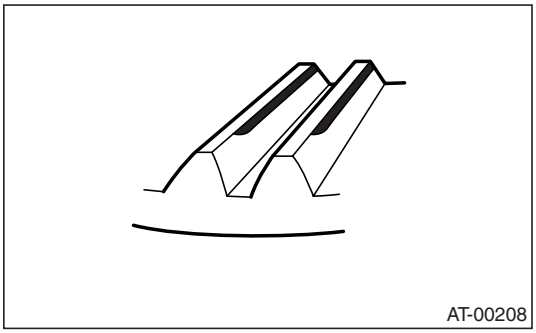
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



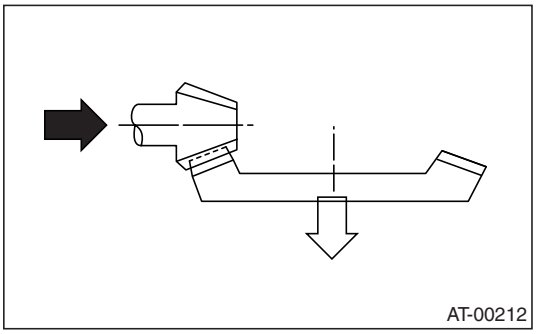
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

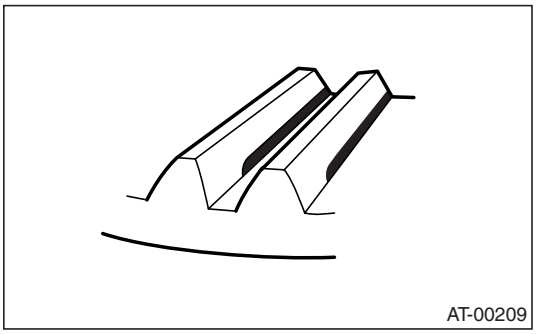


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

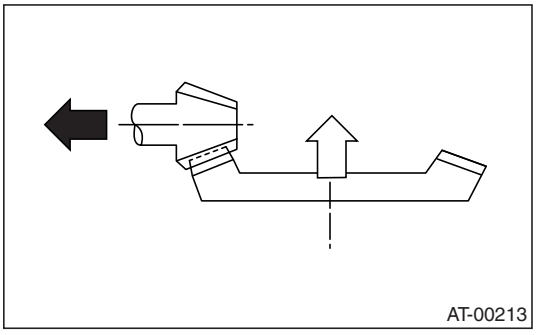


- Flank contact

Checking item: Backlash is too small.
Contact pattern



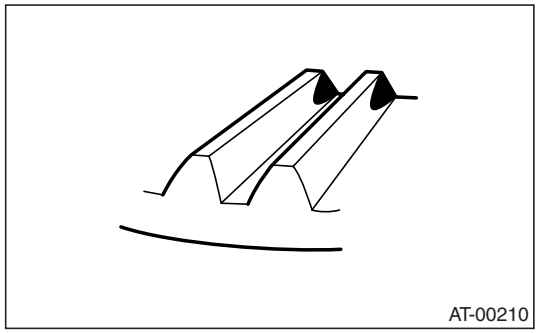
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



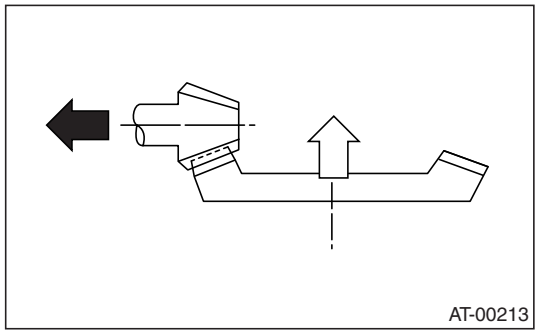
• Toe contact (inside end contact)

Checking item: Contact areas is small

Contact pattern



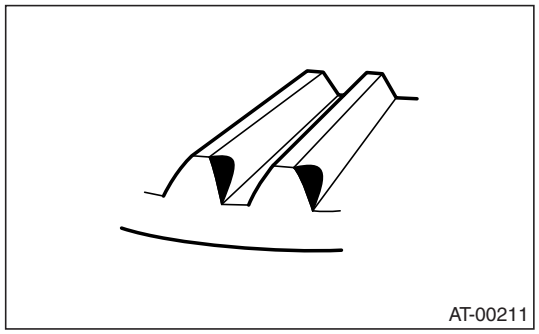
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



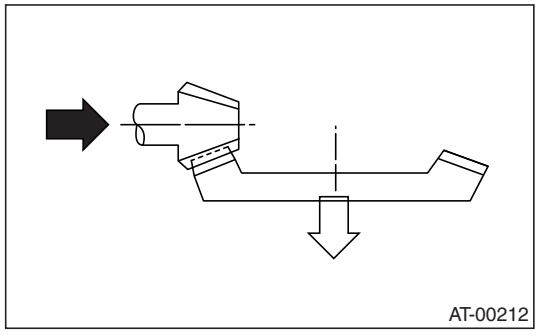
• Heel contact (outside end contact)

Checking item: Contact areas is small

Contact pattern



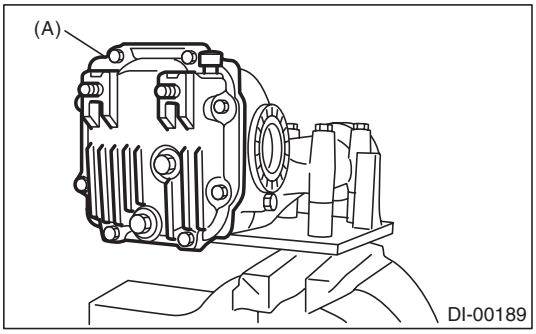
Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



19) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.

20) Install the new gasket and rear cover to differential carrier and tighten the bolts to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

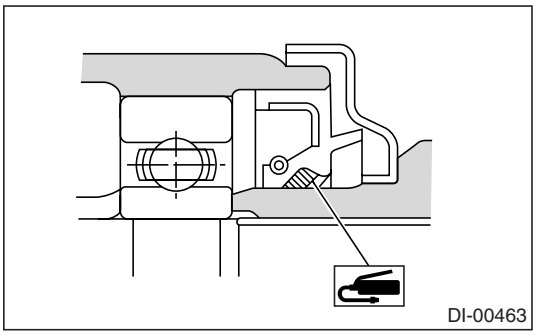


(A) Rear cover

2. VA2-TYPE

NOTE:

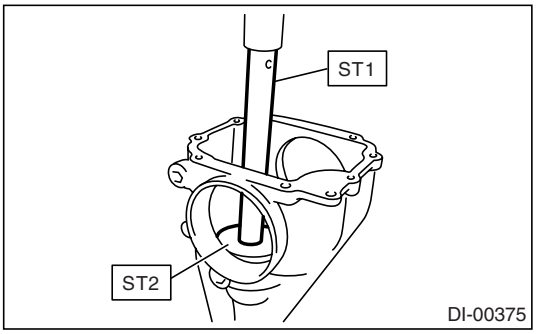
• Assemble in the reverse order of disassembly.
• Check and adjust each part during assembly.
• Use a new gasket.
• Keep the shims and washers in order, so that they are not improperly installed.
• Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
• Apply gear oil when installing the bearings and thrust washers.
• Be careful not to mix up the bearing races RH and LH.
• Replace the oil seal with a new one at every disassembly. Apply grease to the lips when installing the oil seal.
• Be careful not to mix up the differential oil seal RH and LH.



1) Adjusting preload for front and rear bearings:
Adjust the bearing preload with collar and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

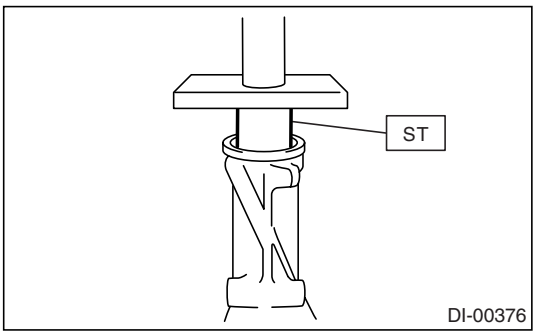
(1) Install the rear bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



(2) Using the ST, install the front bearing race to the differential carrier.

ST 499277200 INSTALLER



(3) Insert the front bearing cone.

NOTE:
Use new front bearing cone.

(4) Measure and record the thickness of pinion adjust washer.

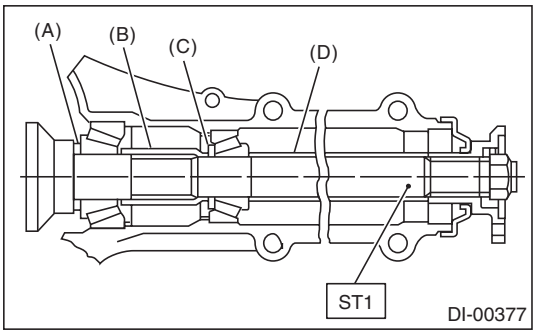
NOTE:
If tooth contact (drive pinion, hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.

(5) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:
Use new rear bearing cone.

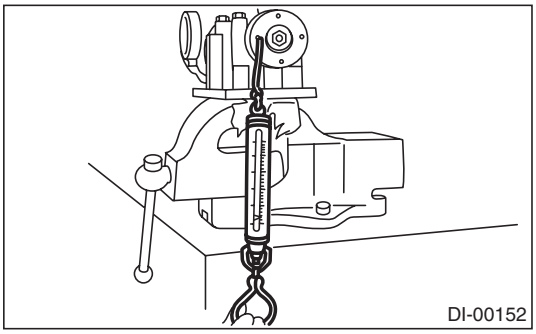
(6) Install the preload adjusting collar and washer, front bearing cone, collar, companion flange, and washer and self-locking nut.

ST1 18678AA000 DUMMY SHAFT



(A) Pinion height adjusting washer
(B) Preload adjusting collar
(C) Preload adjusting washer
(D) Collar

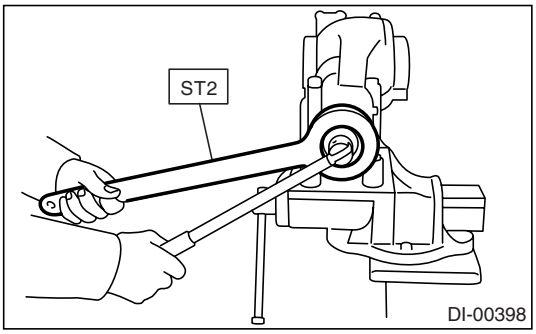
(7) Turn the ST1 with hand to make it seated, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and collar so that the specified preload is obtained when nut is tightened to the specified torque.



NOTE:
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock companion flange using ST2 as shown in the figure.
- Measure the preload in direction of tangent to flange.

ST1 18678AA000 DUMMY SHAFT
ST2 498427200 FLANGE WRENCH

Tightening torque:
191 N·m (19.5 kgf-m, 141 ft-lb)



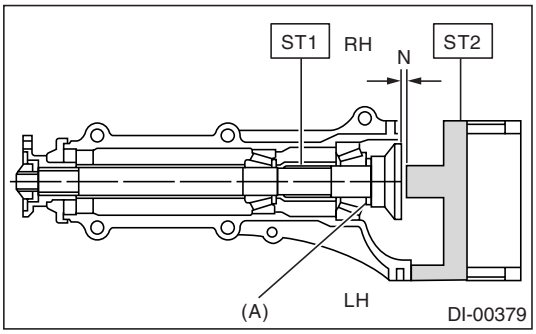
Drive pinion bearing preload
12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lbf) (at companion flange bolt hole)

	Part No.	Thickness mm (in)
Preload adjusting washer	38336AA430	1.500 (0.0591)
	38336AA440	1.513 (0.0596)
	38336AA450	1.525 (0.0600)
	38336AA460	1.538 (0.0606)
	38336AA470	1.550 (0.0610)
	38336AA480	1.563 (0.0615)
	38336AA490	1.575 (0.0620)
	38336AA500	1.588 (0.0625)
	38336AA510	1.600 (0.0630)
	38336AA520	1.613 (0.0635)
	38336AA530	1.625 (0.0640)
	38336AA540	1.638 (0.0645)
	38336AA550	1.650 (0.0650)
	38336AA560	1.663 (0.0655)
	38336AA570	1.675 (0.0659)
	38336AA580	1.688 (0.0665)
	38336AA590	1.700 (0.0669)
	38336AA600	1.713 (0.0674)
	38336AA610	1.725 (0.0679)
	38336AA620	1.738 (0.0684)
	38336AA630	1.750 (0.0689)
	38336AA640	1.763 (0.0694)
	38336AA650	1.775 (0.0699)
	Part No.	Length mm (in)
Preload adjusting collar	31454AA250	51.05 (2.010)
	31454AA260	51.25 (2.018)
	31454AA270	51.35 (2.022)
	31454AA280	51.45 (2.026)
	31454AA290	51.55 (2.030)
	31454AA300	51.65 (2.033)
	31454AA310	51.75 (2.037)
	31454AA320	51.85 (2.041)
	31454AA330	52.05 (2.049)

2) Adjusting drive pinion height
Adjust the drive pinion height with washer installed between the rear bearing cone and the back of pinion gear.

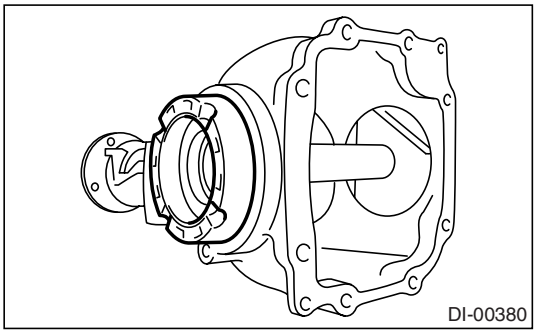
(1) Install the ST2.

ST1 18678AA000 DUMMY SHAFT
ST2 18831AA010 DIFFERENTIAL CARRIER GAUGE



(A) Pinion height adjusting washer

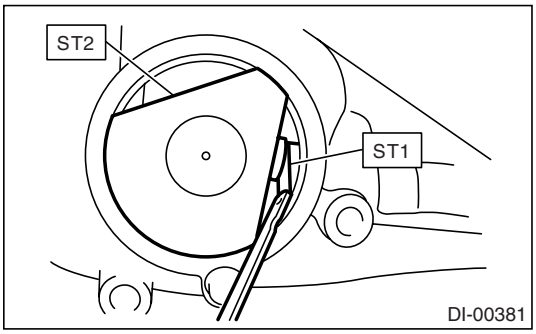
(2) Install the side holder LH to the left side of differential carrier in reverse direction.



(3) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST2.

ST1 18678AA000 DUMMY SHAFT
ST2 18831AA010 DIFFERENTIAL CARRIER GAUGE



(4) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.

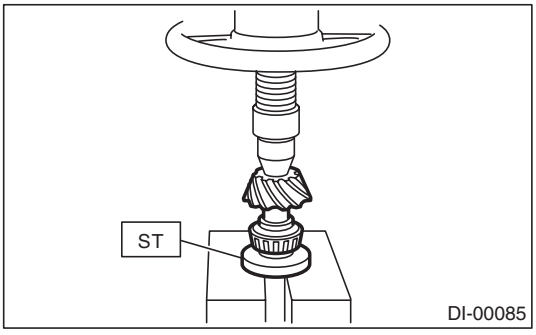
NOTE:
Adjust it using the 1 — 3 washers.
T = To + N − 0.05 (mm)

T	Thickness of pinion height adjusting washer mm (in)	
To	Thickness of washer temporally inserted mm (in)	
N	Clearance of thickness gauge mm (in)	
Memo:		

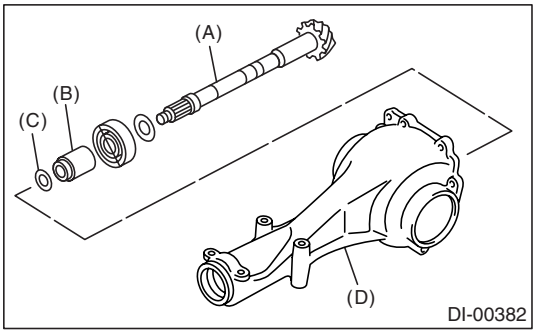
(Example of calculation)
To = 0.15 mm
N = 0.1 mm
T = 0.15 + 0.1 − 0.05 = 0.2 mm
Result: Thickness = 0.2 mm
Therefore use the pinion height adjusting washer of part number 32295AA370.

Pinion height adjusting washer	
Part No.	Thickness mm (in)
32295AA350	0.150 (0.0059)
32295AA360	0.175 (0.0069)
32295AA370	0.200 (0.0079)
32295AA380	0.225 (0.0089)
32295AA390	0.250 (0.0098)
32295AA400	0.275 (0.0108)

3) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position using ST.
ST 398177700 INSTALLER

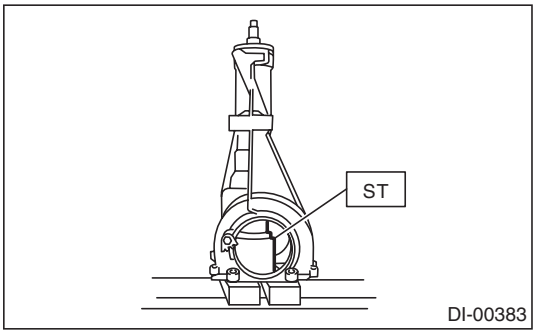


4) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting collar and washer.



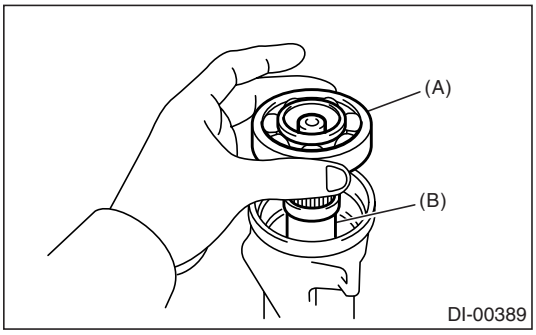
(A) Drive pinion
(B) Bearing preload adjusting collar
(C) Bearing preload adjusting washer
(D) Differential carrier

5) Set ST and differential carrier to the press and install the front bearing cone.
ST 399780104 WEIGHT



NOTE:
Set the carrier to the press until the companion flange is installed.

6) Insert the collar, then install the pilot bearing.

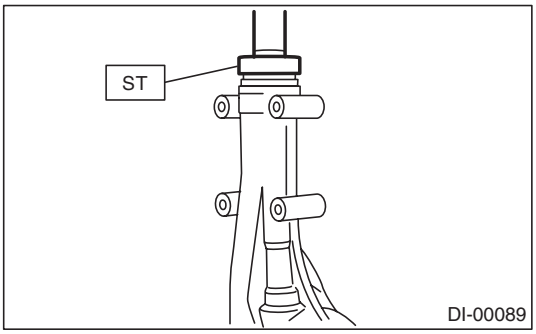


(A) Pilot bearing
(B) Collar

7) Fit a new oil seal using ST.

NOTE:
• Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease to the oil seal lips.

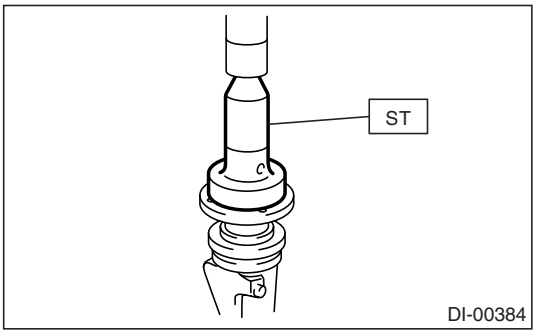
ST 499277200 INSTALLER



8) Press-fit the companion flange using ST.

NOTE:
Be careful not to damage the bearing.

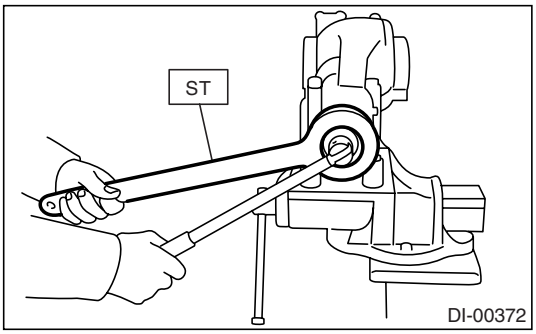
ST 899874100 INSTALLER



9) Install a new self-locking nut, and secure the companion flange using ST, and tighten the nut.

ST 498427200 FLANGE WRENCH

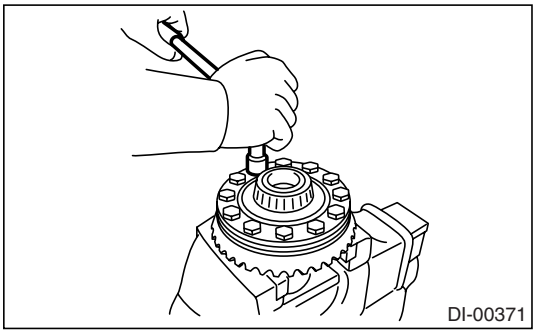
Tightening torque:
191 N·m (19.5 kgf-m, 141 ft-lb)



10) Install the hypoid driven gear on differential case.

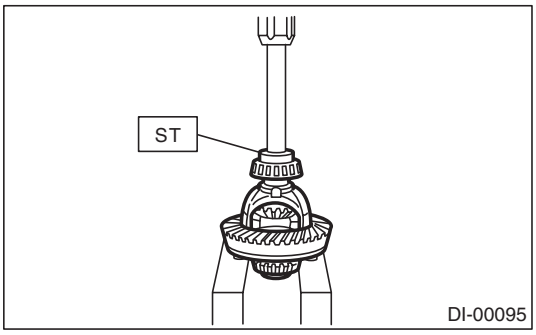
NOTE:
• Tighten diagonally while tapping the bolt heads.
• Set a cushioning such as wooden block, aluminum plate or shop cloth between vise and differential case if the side gear comes into contact with vise.

Tightening torque:
62 N·m (6.3 kgf-m, 45.6 ft-lb)



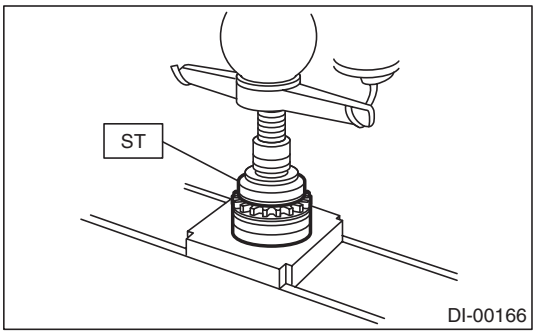
11) Press the side bearing into differential case using ST.

ST 398487700 DRIFT



12) Assemble holders.
(1) Install the new oil seal into holder RH and LH.

ST 498447100 INSTALLER



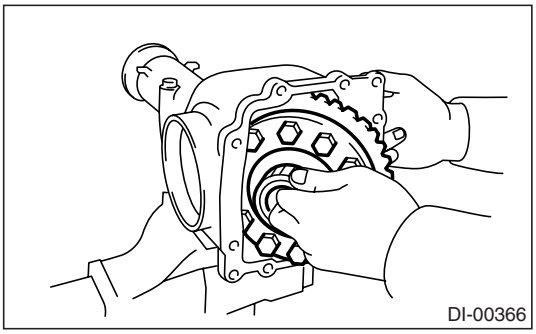
(2) Install the bearing race into holder RH and LH.

ST 398417700 DRIFT PUNCH

CAUTION:
Make sure that the oil seal, bearing outer race and cone are properly assembled.

(3) Install the differential assembly into differential carrier in the reverse order of disassembly.

NOTE:
Be careful not to hit the teeth against the case.

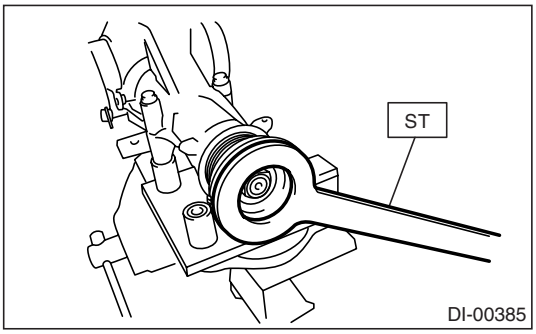

DI-00366

(4) Temporally tighten the side holder RH and LH in differential carrier to install.

13) Perform the backlash adjustment between the hypoid driven gear and drive pinion, and preload adjustment of differential side bearing.

(1) Turn the drive pinion with ST for better fitting of differential side bearing.

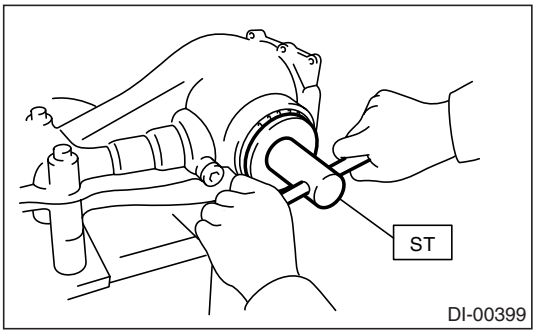
ST 498427200 FLANGE WRENCH



DI-00385

(2) Screw in the side holder LH until light contact is made with ST.

ST 18630AA010 WRENCH ASSY

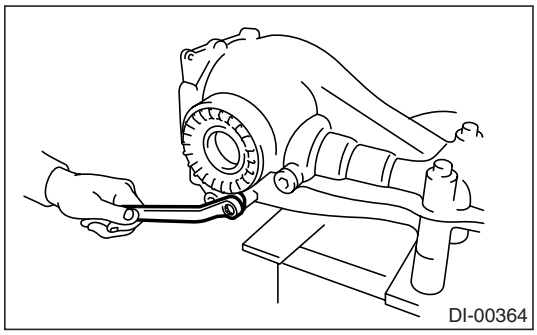


DI-00399

(3) Back off the side (hypoid driven gear side) holder approx.1 1/2 teeth of holder, and tighten the other side holder by approx. 2 teeth (approx. 1 1/2 + 1/2 teeth). [Back off amount of side (hypoid driven gear side) holder + 1/2 tooth.]
This + 1/2 tooth gives preload.

(4) Temporarily tighten the lock plate.

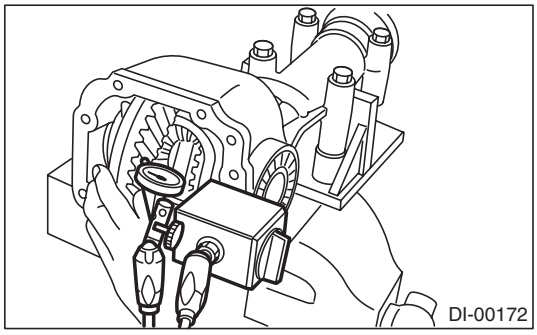
NOTE:
Turn over the lock plate to displace the holder 1/2 tooth.


DI-00364

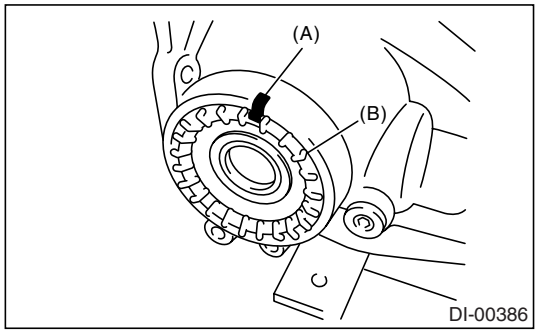
(5) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

NOTE:
If measured backlash is not within specified range, repeat the procedures for pinion driven gear set backlash adjustment and differential side bearing preload adjustment.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)


DI-00172

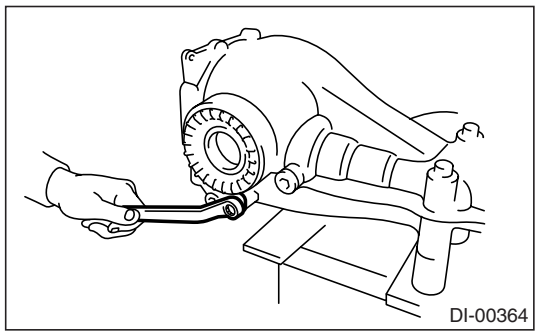
14) Draw a matching mark on both differential carrier and holder. Remove the holder side at a time. Replace in the original position after inserting an O-ring and applying grease to threaded portion.



(A) Alignment mark
(B) Holder

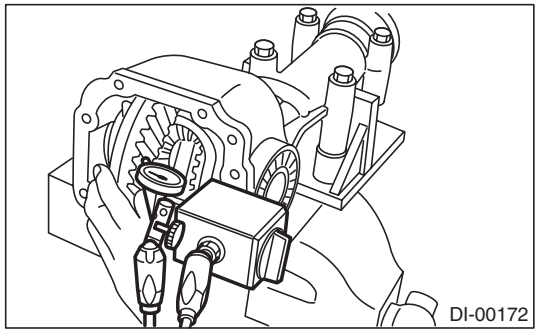
15) Tighten the bolt of lock plate to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



16) Recheck the hypoid driven gear to pinion backlash.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

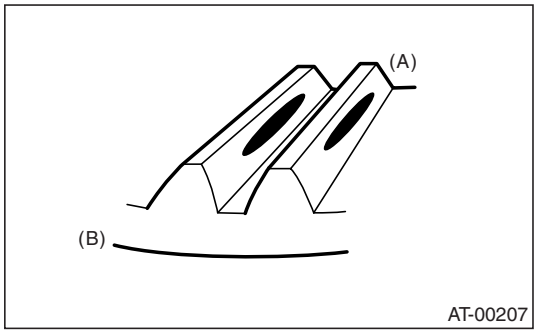


17) Checking and adjusting the tooth contact of hypoid driven gear
(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.
(2) When the contact pattern is incorrect, readjust.

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

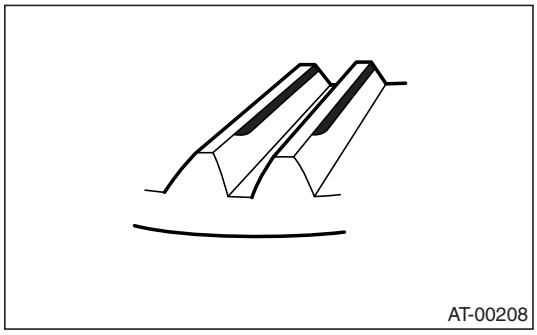
Checking item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



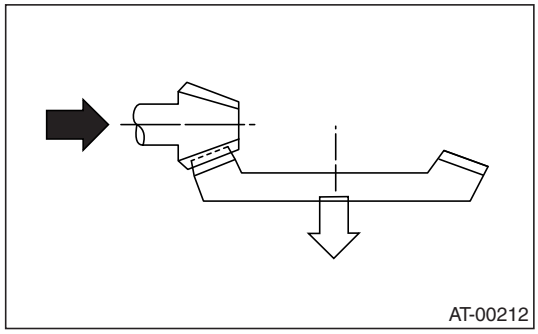
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

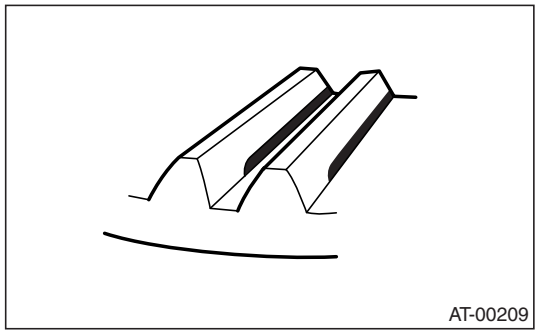


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

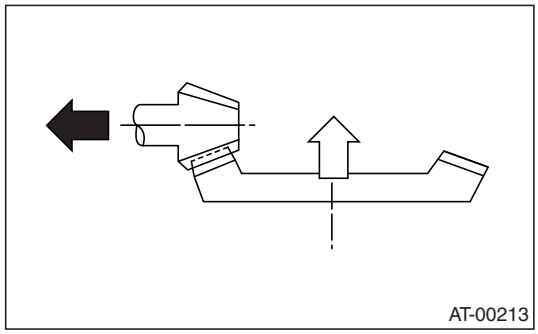


- Flank contact

Checking item: Backlash is too small.
Contact pattern

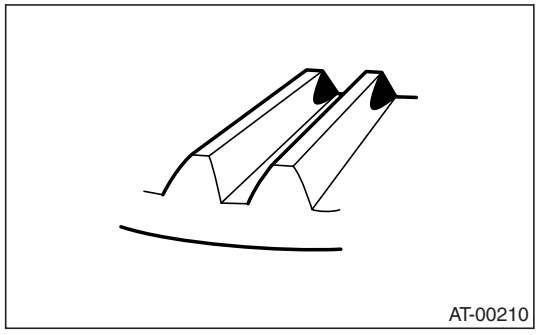


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.

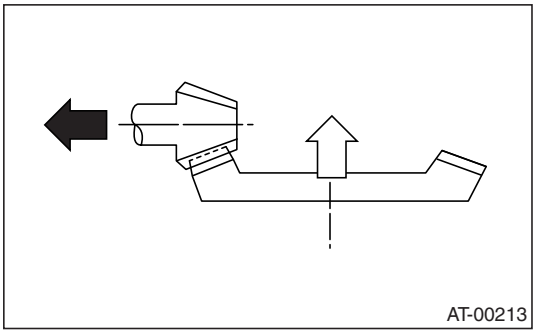


- Toe contact (inside end contact)

Checking item: Contact areas is small
Contact pattern

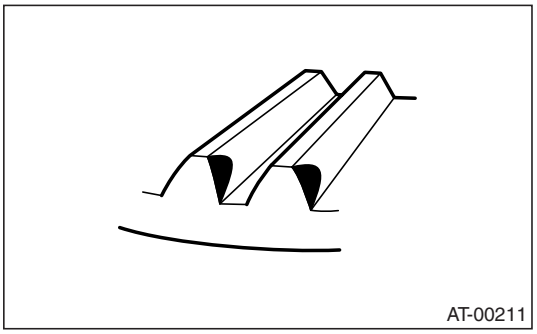


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.

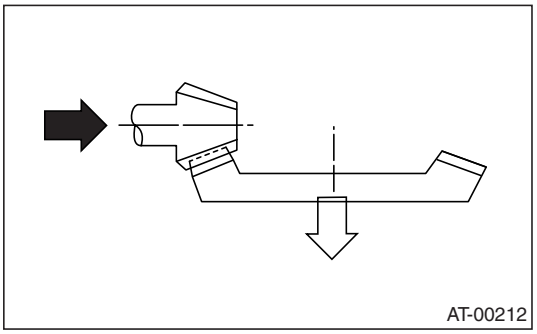


- Heel contact (outside end contact)

Checking item: Contact areas is small
Contact pattern



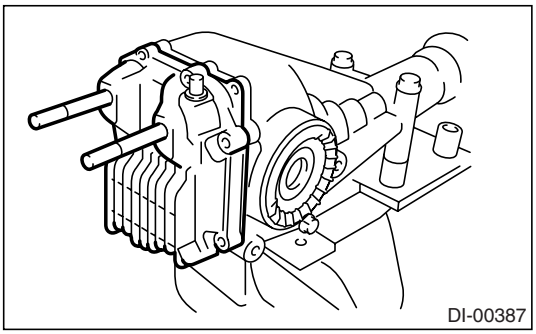
Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



18) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.

19) Install the new gasket and rear cover to differential carrier and tighten the bolts to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)


DI-00387

E: INSPECTION

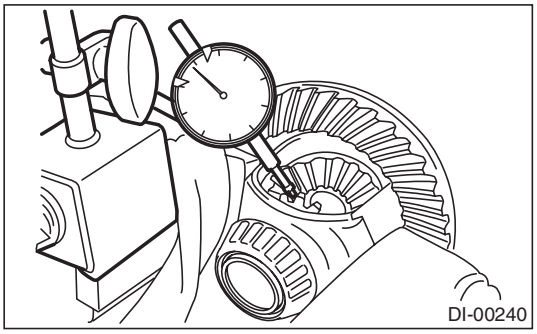
Wash all the disassembled parts clean, and examine them for wear, damage and other defects. Repair or replace the defective parts as necessary.
1) Hypoid driven gear and drive pinion
• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact. Replace the gear if excessively worn or incapable of adjustment.
• If crack, score or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.
2) Side gear and pinion mate gear
• Replace if crack, score or other defects are evident on tooth surface.
• Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.
3) Bearings
Replace if seizure, peeling, wear, rust, dragging during rotation, noise or other defect is evident.
4) Thrust washers of side gear and pinion mate gear:
Replace if seizure, flaw, abnormal wear or other defect is evident.
5) Oil seal
Replace if deformed or damaged, and at every disassembling.
6) Differential carrier
Replace if the bearing bores are worn or damaged.
7) Differential case
Replace if its sliding surfaces are worn or cracked.
8) Companion flange
Replace if the oil seal lip contacting surfaces have flaws.

1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear. (VA1-type only)

Side gear backlash:
0.05 — 0.15 mm (0.0020 — 0.0059 in)

If the side gear backlash is not within the specification, adjust it as specified by selecting side gear thrust washer.

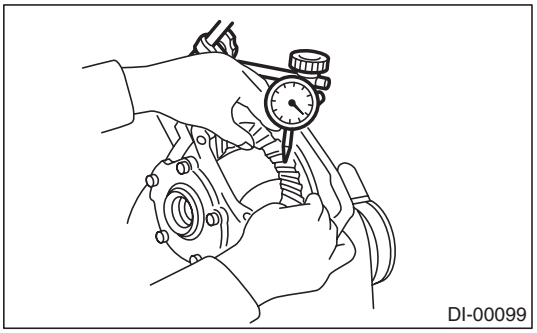

DI-00240

2. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of hypoid driven gear.

Hypoid driven gear backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

If the hypoid driven gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.


DI-00099

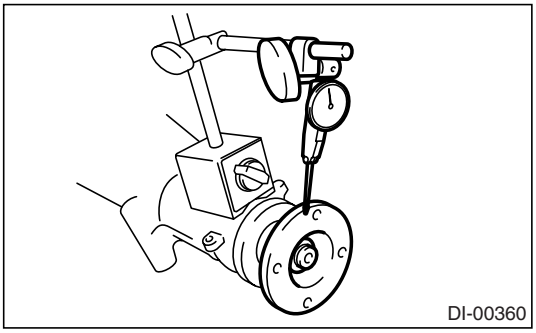
3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between hypoid driven gear and drive pinion. <Ref. to DI-55, ASSEMBLY, Rear Differential (VA-type).>

4. COMPANION FLANGE

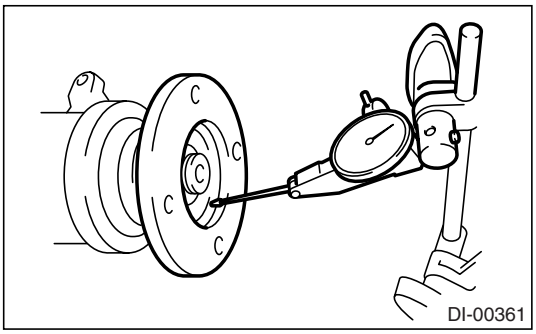
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.003 in)



3) Set the gauge inside of the companion flange, and measure the runout.

Limit of runout:
0.08 mm (0.003 in)



4) If either runout exceeds the limit, move the phase of companion flange and drive pinion 90° each, and find the point that the runout is within the limit.
5) If the runout exceeds the limit after changing the phase, replace the companion flange and recheck the runout.
6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash. (VA1-type)
<Ref. to DI-55, ASSEMBLY, Rear Differential (VA-type).>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash.
<Ref. to DI-55, ASSEMBLY, Rear Differential (VA-type).>

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear.
<Ref. to DI-55, ASSEMBLY, Rear Differential (VA-type).>

6. Rear Differential Front Oil Seal

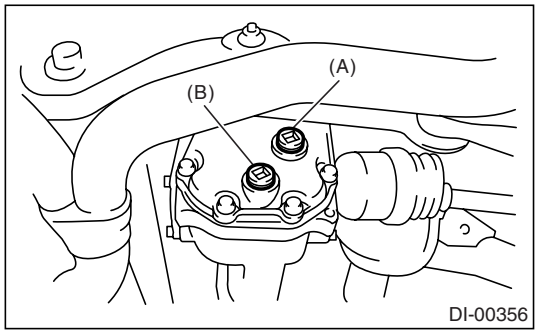
A: INSPECTION

Make sure that there is no leakage from front oil seal portion. If there is any leakage, replace the oil seal and inspect the propeller shaft.

B: REPLACEMENT

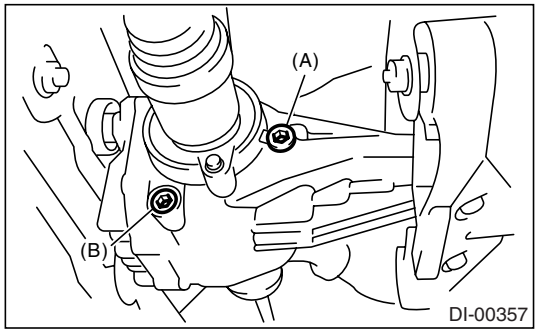
1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to neutral.
3) Release the parking brake.
4) Remove the oil drain plug, and drain gear oil.

- Except for VA2-type



(A) Filler plug
(B) Drain plug

- VA2-type



(A) Filler plug
(B) Drain plug

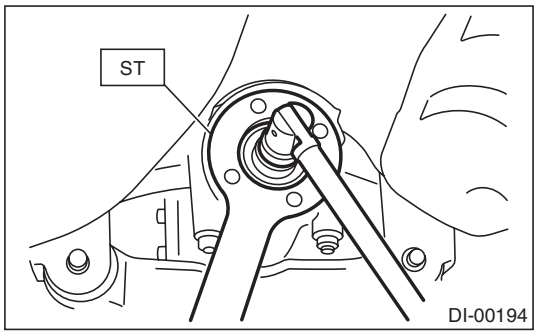
5) Install the oil drain plug.

NOTE:
- Apply liquid gasket to the oil drain plug for T-type.
- Use a new aluminum gasket for VA1-type.
- Use a new metal gasket for VA2-type.

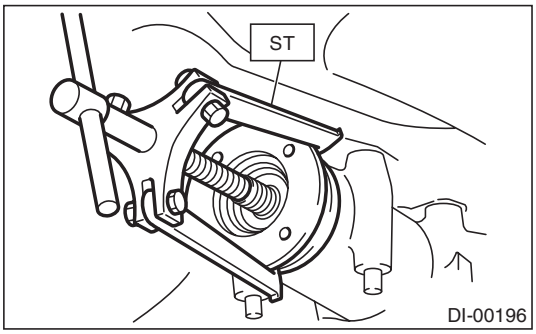
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA1-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)
For VA2-type
29 N·m (3.0 kgf-m, 21.4 ft-lb)

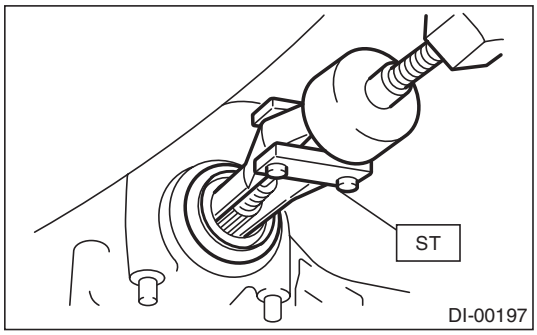
6) Lift-up the vehicle.
7) Remove the rear exhaust pipe and muffler.
8) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
9) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



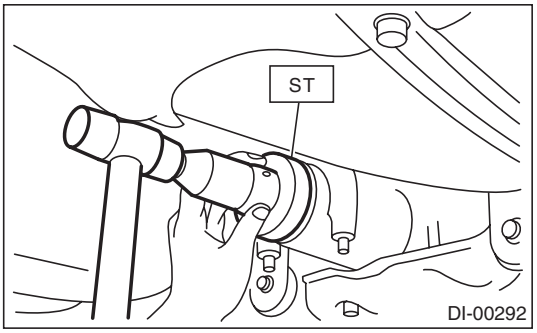
10) Extract the companion flange using ST.
ST 399703600 PULLER ASSY



11) Remove the oil seal using ST or screwdriver.
ST 398527700 PULLER ASSY



12) Install a new oil seal using ST.
ST 498447120 INSTALLER



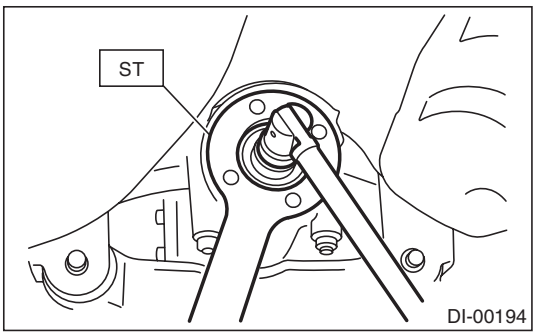
13) Install the companion flange.

NOTE:
Use a plastic hammer to install companion flange.

14) Tighten the self-locking nut within the specified torque range so that the turning resistance of companion flange becomes the same as that of before oil seal replacement.
ST 498427200 FLANGE WRENCH

NOTE:
Use a new self-locking nut.

Tightening torque:
T-type
181 N·m (18.5 kgf-m, 134 ft-lb)
VA-type
191 N·m (19.5 kgf-m, 141 ft-lb)



15) Hereafter, reassemble in the reverse order of disassembly.

7. Rear Differential Side Oil Seal

A: INSPECTION

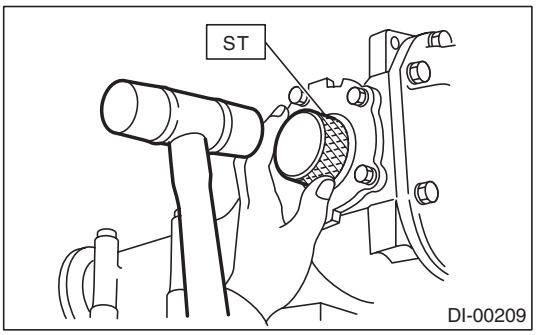
Make sure that there is no leakage from side oil seal. If there is any leakage, replace the oil seal.

B: REPLACEMENT

1) Remove the rear differential. <Ref. to DI-29, REMOVAL, Rear Differential (T-type).> <Ref. to DI-46, REMOVAL, Rear Differential (VA-type).>
2) Remove the rear differential side oil seal using a screwdriver wrapped with vinyl tape to prevent the side retainer from scratches.
3) Using the ST, install the oil seal to the side retainer.

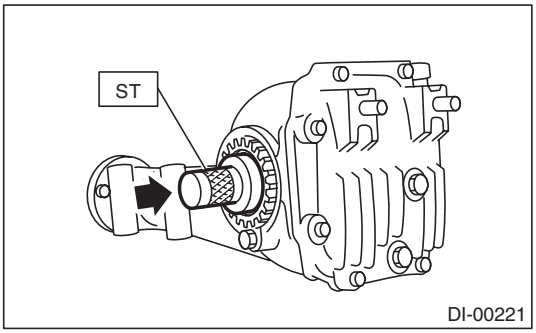
- T-type and VA2-type

ST 398437700 DRIFT



- VA1-type

ST 498447100 INSTALLER

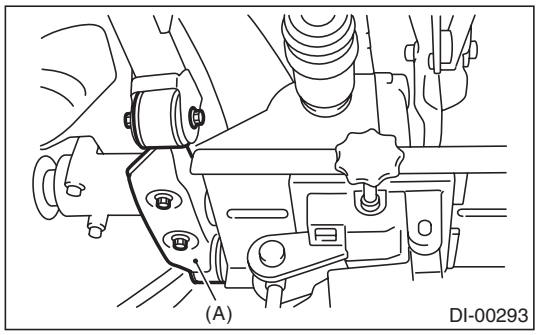


4) Install the rear differential. <Ref. to DI-30, INSTALLATION, Rear Differential (T-type).> <Ref. to DI-47, INSTALLATION, Rear Differential (VA-type).>

8. Rear Differential Front Member

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle.
3) Support the rear differential using transmission jack, and then remove the rear differential front member.

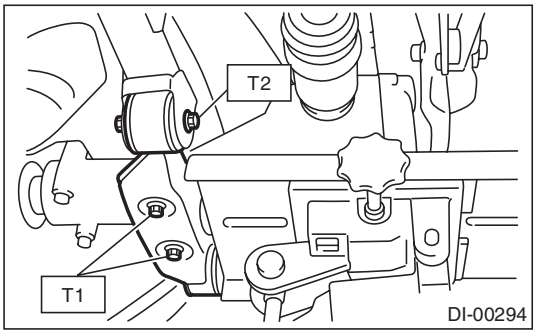


(A) Rear differential front member

B: INSTALLATION

Install the rear differential front member with a new self-locking nut.

Tightening torque:
T1: 52 N·m (5.3 kgf-m, 38 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



C: INSPECTION

1) Check the rear differential front member for damage, bend and corrosion.
If damage, bend or corrosion is excessive, replace the rear differential front member.
2) Check the bushings of rear differential member for cracking, hardening and damage.
If cracking, hardening or damage is excessive, replace rear differential front member.

9. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	(1) Worn, scratched or incorrectly seated front or side oil seal. Scored, battered or excessively worn sliding surface of companion flange.	Correct or replace.
	(2) Clogged or damaged air breather.	Clean, repair or replace.
	(3) Loose bolts on differential spindle or side retainer, or incorrectly fitted O-ring.	Tighten the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attaching bolts or damaged gasket.	Tighten the bolts to specified torque. Replace gasket and apply liquid gasket.
	(5) Loose oil filler or drain plug.	Retighten and apply liquid gasket.
	(6) Wear, damage or incorrectly fitting for spindle, side retainer and oil seal.	Correct or replace.
2. Seizure NOTE: Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Insufficient backlash for hypoid gear.	Readjust or replace.
	(2) Excessive preload for side, rear or front bearing.	Readjust or replace.
	(3) Insufficient or improper oil used.	Replace seized part and fill with specified oil to specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Improper backlash for hypoid gear.	Replace.
	(2) Insufficient or excessive preload for side, rear or front bearing.	Readjust or replace.
	(3) Excessive backlash for differential gear.	Replace gear or thrust washer.
	(4) Loose bolts and nuts such as hypoid driven gear bolt.	Retightening.
	(5) Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembling.	(1) Excessive backlash for hypoid gear.	Readjust.
	(2) Excessive backlash for differential gear.	Replace gear or thrust washer.
	(3) Insufficient preload for front or rear bearing.	Readjust.
	(4) Loose drive pinion nut.	Tighten to specified torque.
	(5) Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace.
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Seized or damaged side bearing.	Replace.

Symptom or trouble	Possible cause	Remedy
6. Gear noise NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	(1) Improper tooth contact of hypoid gear.	Readjust or replace hypoid gear set.
	(2) Improper backlash for hypoid gear.	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
	(4) Seized hypoid gear.	Replace hypoid gear set.
	(5) Improper preload for front or rear bearings.	Readjust.
	(6) Seized, scored or chipped front or rear bearing.	Replace.
	(7) Seized, scored or chipped side bearing.	Replace.
	(8) Vibrating differential carrier.	Replace.

TRANSFER CASE

TC

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1. General Description

A: NOTE

For general description, refer to “4AT”, “5AT” or “5MT” section.
4AT model:
<Ref. to 4AT-2, General Description.>
5AT model:
<Ref. to 5AT-2, General Description.>
5MT model:
<Ref. to 5MT-2, General Description.>

2. Transfer Case and Extension Case Assembly

A: NOTE

For removal, installation and inspection, refer to “5MT” section. <Ref. to 5MT-43, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch

A: NOTE

For removal, installation and inspection, refer to "4AT" or "5AT" section.
4AT model:
<Ref. to 4AT-87, Transfer Clutch.>
5AT model:
<Ref. to 5AT-73, Transfer Clutch.>

4. Extension Case

A: NOTE

For removal, installation and inspection, refer to “4AT” section. <Ref. to 4AT-83, Extension Case.>

5. Extension Case and Intermediate Case

A: NOTE

For removal, installation and inspection, refer to “5AT” section. <Ref. to 5AT-71, Extension Case and Intermediate Case.>

6. Oil Seal

A: NOTE

For replacement and inspection, refer to “4AT”, “5AT” or “5MT” section.
4AT model:
<Ref. to 4AT-49, Extension Case Oil Seal.> <Ref. to 4AT-50, Differential Side Retainer Oil Seal.>
5AT model:
<Ref. to 5AT-49, Extension Case Oil Seal.> <Ref. to 5AT-50, Differential Side Retainer Oil Seal.>
5MT model:
<Ref. to 5MT-38, Oil Seal.> <Ref. to 5MT-39, Differential Side Retainer Oil Seal.>

7. Transfer Drive Gear

A: NOTE

For removal, installation and inspection, refer to “5MT” section. <Ref. to 5MT-47, Transfer Drive Gear.>

8. Transfer Driven Gear

A: NOTE

For removal, installation and inspection, refer to “5MT” section. <Ref. to 5MT-49, Transfer Driven Gear.>

9. Reduction Drive Gear

A: NOTE

For removal, installation and inspection, refer to “4AT” section. <Ref. to 4AT-97, Reduction Drive Gear.>

10.Center Differential Carrier

A: NOTE

For removal, installation and inspection, refer to “4AT” or “5AT” section.
4AT model:
<Ref. to 4AT-99, Center Differential Carrier.>
5AT model:
<Ref. to 5AT-78, Center Differential Carrier.>

11.Reduction Driven Gear

A: NOTE

For removal, installation and inspection, refer to “4AT” or “5AT” section.
4AT model:
<Ref. to 4AT-95, Reduction Driven Gear.>
5AT model:
<Ref. to 5AT-76, Reduction Driven Gear.>

12.Center Differential

A: NOTE

For removal, installation and inspection, refer to “5MT” section. <Ref. to 5MT-51, Center Differential.>

13. Transfer Clutch Pressure Test

A: NOTE

For inspection, refer to “4AT” or “5AT” section.
4AT model:
<Ref. to 4AT-38, Transfer Clutch Pressure Test.>
5AT model:
<Ref. to 5AT-36, Transfer Clutch Pressure Test.>

DRIVE SHAFT SYSTEM

DS

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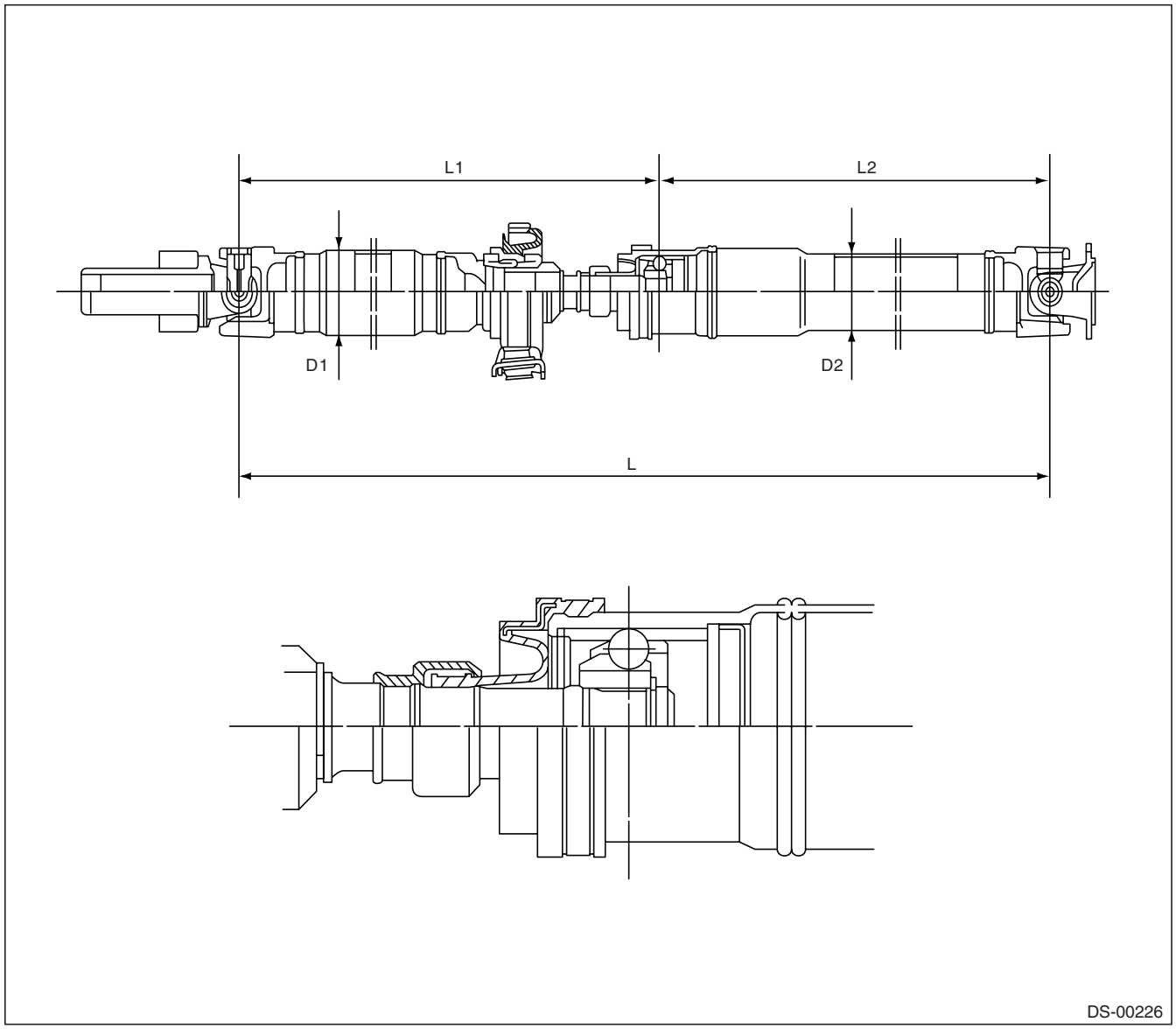
1. General Description

A: SPECIFICATION

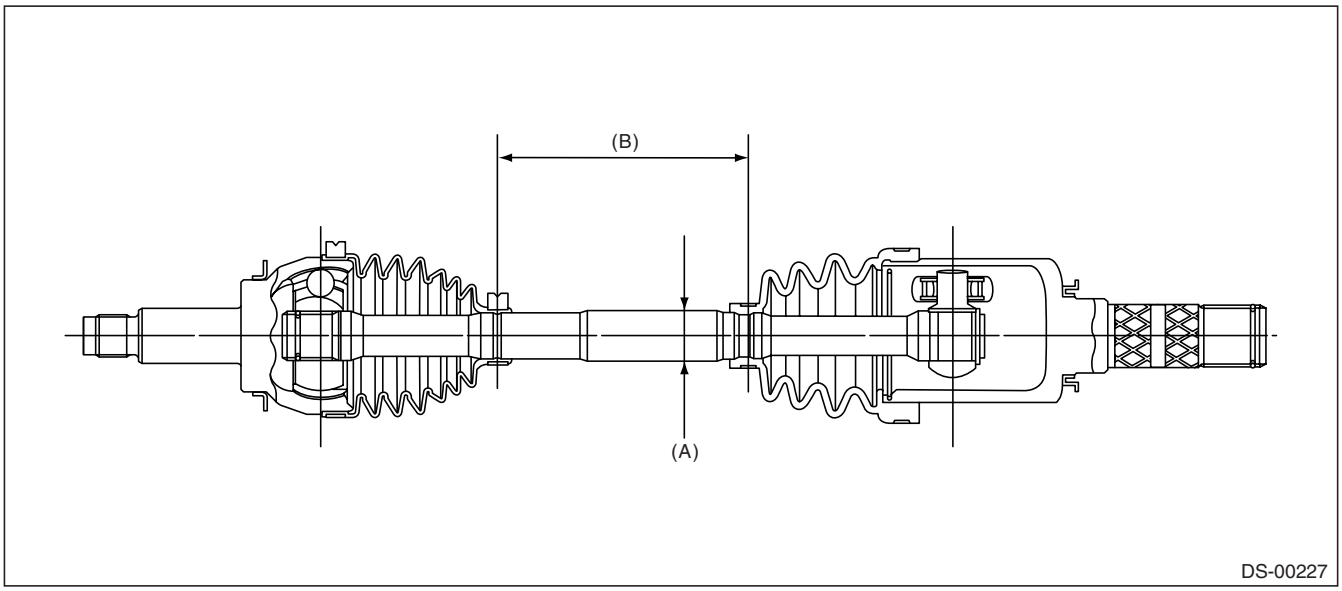
1. PROPELLER SHAFT

Model			5MT	4AT	5AT	6MT
Propeller shaft type			EDJ			
Propeller shaft length: L		mm (in)	1,490 (58.66)	1,430 (56.30)	1,317 (51.85)	1,430 (56.30)
Front propeller shaft Joint-to-joint length: L_1		mm (in)	735 (28.9)	675 (26.6)	562 (22.1)	675 (26.6)
Rear propeller shaft Joint-to-Joint length: L_2		mm (in)	755 (29.7)			
Outer diameter of tube:	mm (in)	D_1	63.5 (2.50)			
		D_2	57.5 (2.26)			



2. FRONT DRIVE SHAFT ASSEMBLY

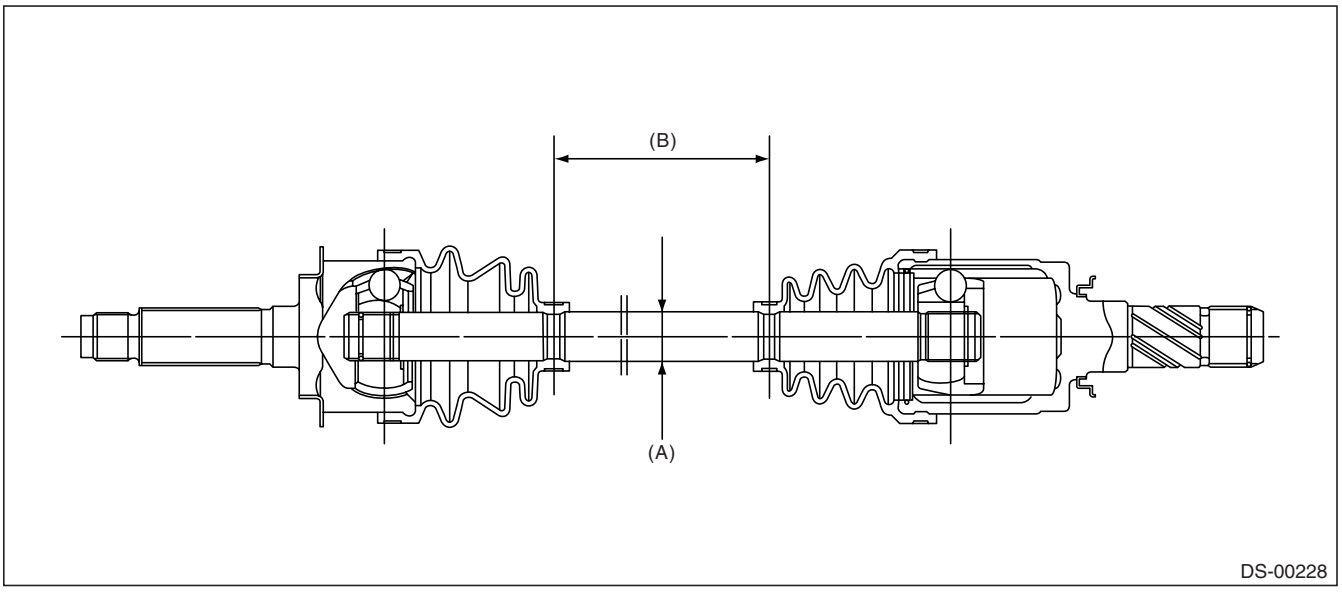
Model	Type of drive shaft	Axle diameter ϕ D mm (in)	Axle length L mm (in)
Turbo AT, 3.0 L AT	EBJ+PTJ	32 (1.3)	349.6 (13.76)
Except for turbo AT, 3.0 L AT	EBJ+PTJ	26 (1.0)	349.6 (13.76)



(A) Axle diameter (B) Axle length

3. REAR DRIVE SHAFT ASSEMBLY

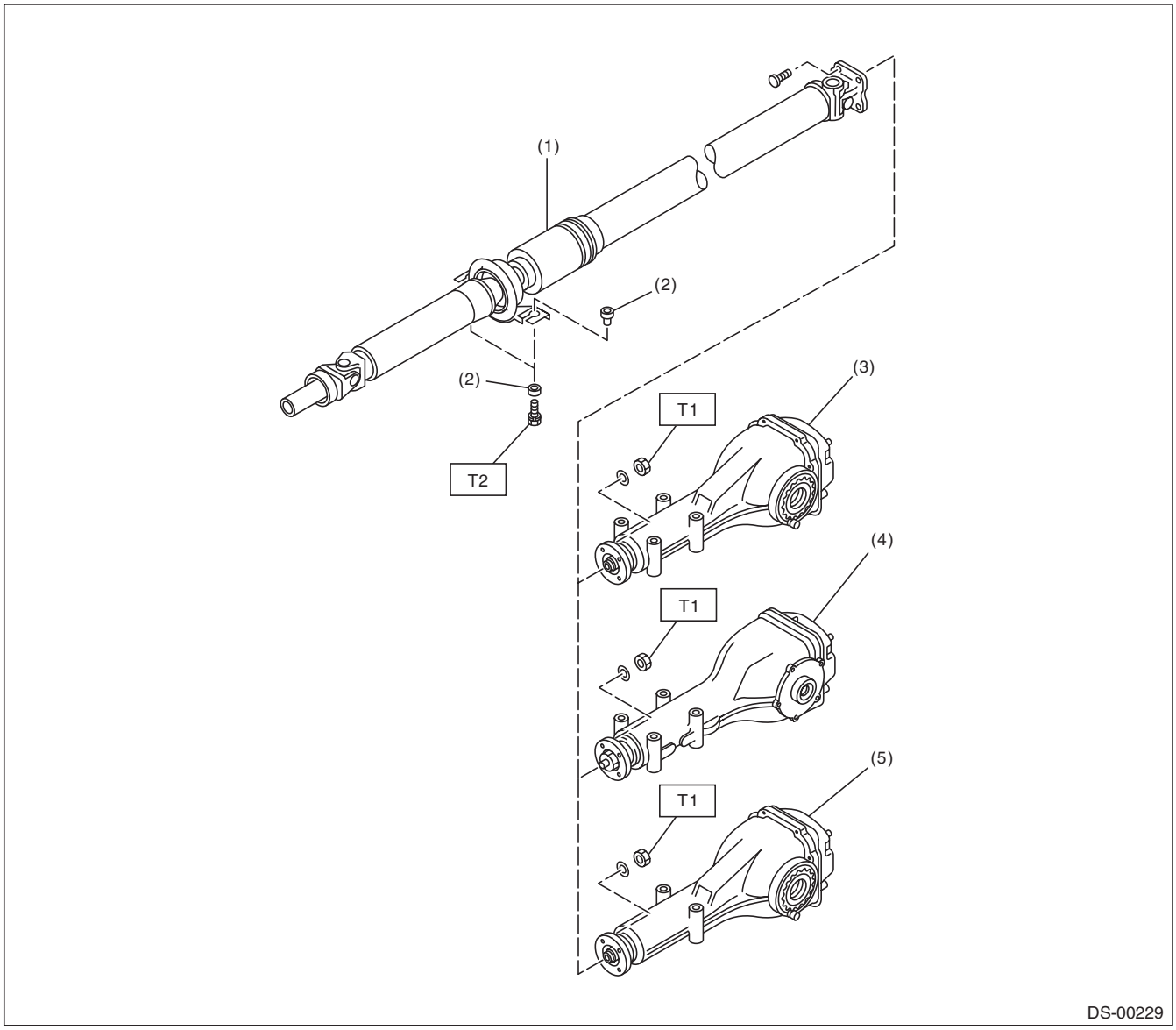
Model	Type of drive shaft	Axle diameter ϕ D mm (in)	Axle length L mm (in)
2.0 L Non-turbo AT	BJ+DOJ	22 (0.87)	382 (15.04)
Except for 2.0 L Non-turbo AT	EBJ+DOJ	22 (0.87)	375.1 (14.77)



(A) Axle diameter (B) Axle length

B: COMPONENT

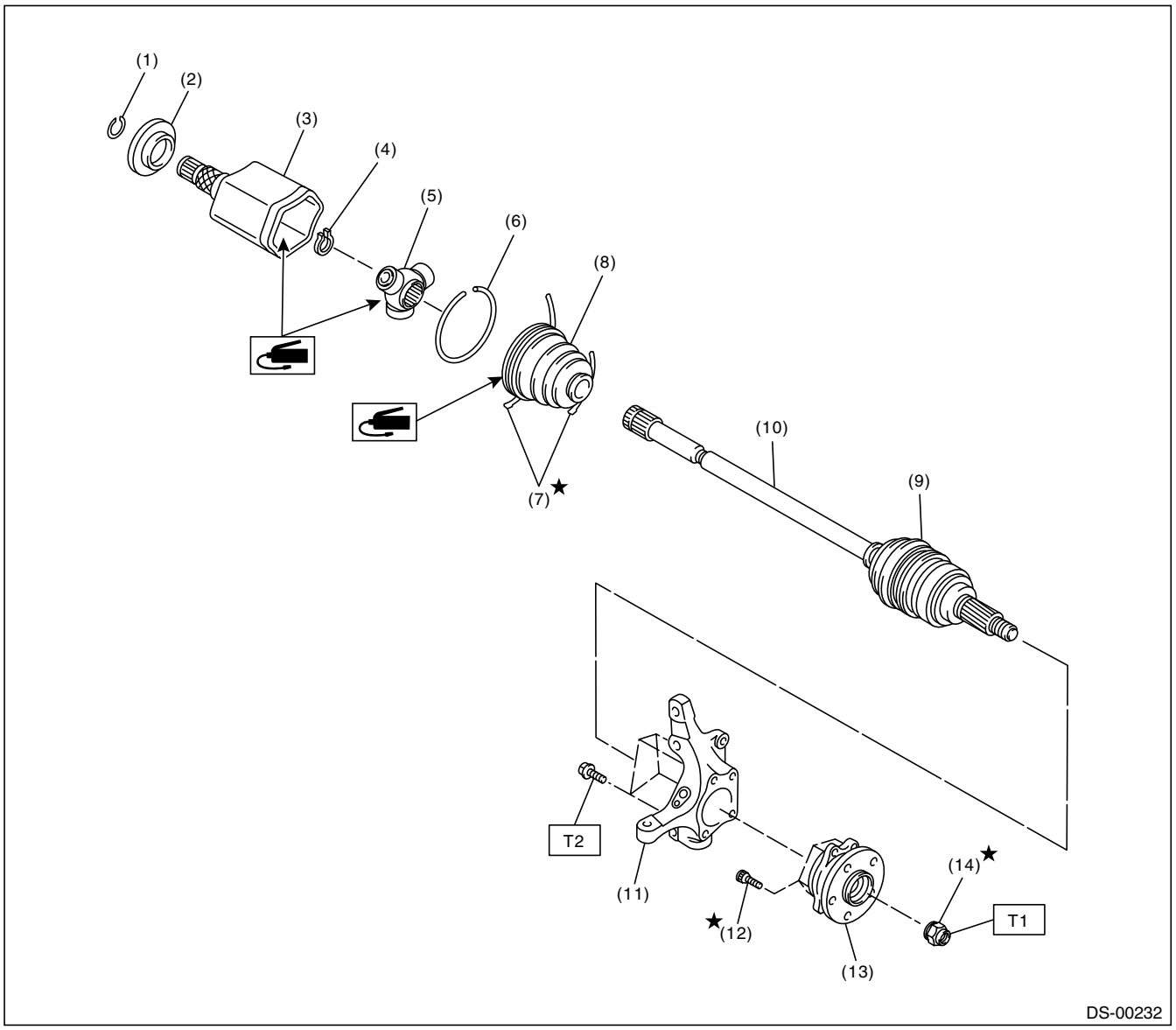
1. PROPELLER SHAFT



(1) Propeller shaft
(2) Bushing
(3) Rear differential (VA1-type)
(4) Rear differential (T-type)
(5) Rear differential (VA2-type)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 31 (3.2, 23.1)
T2: 52 (5.3, 38.3)

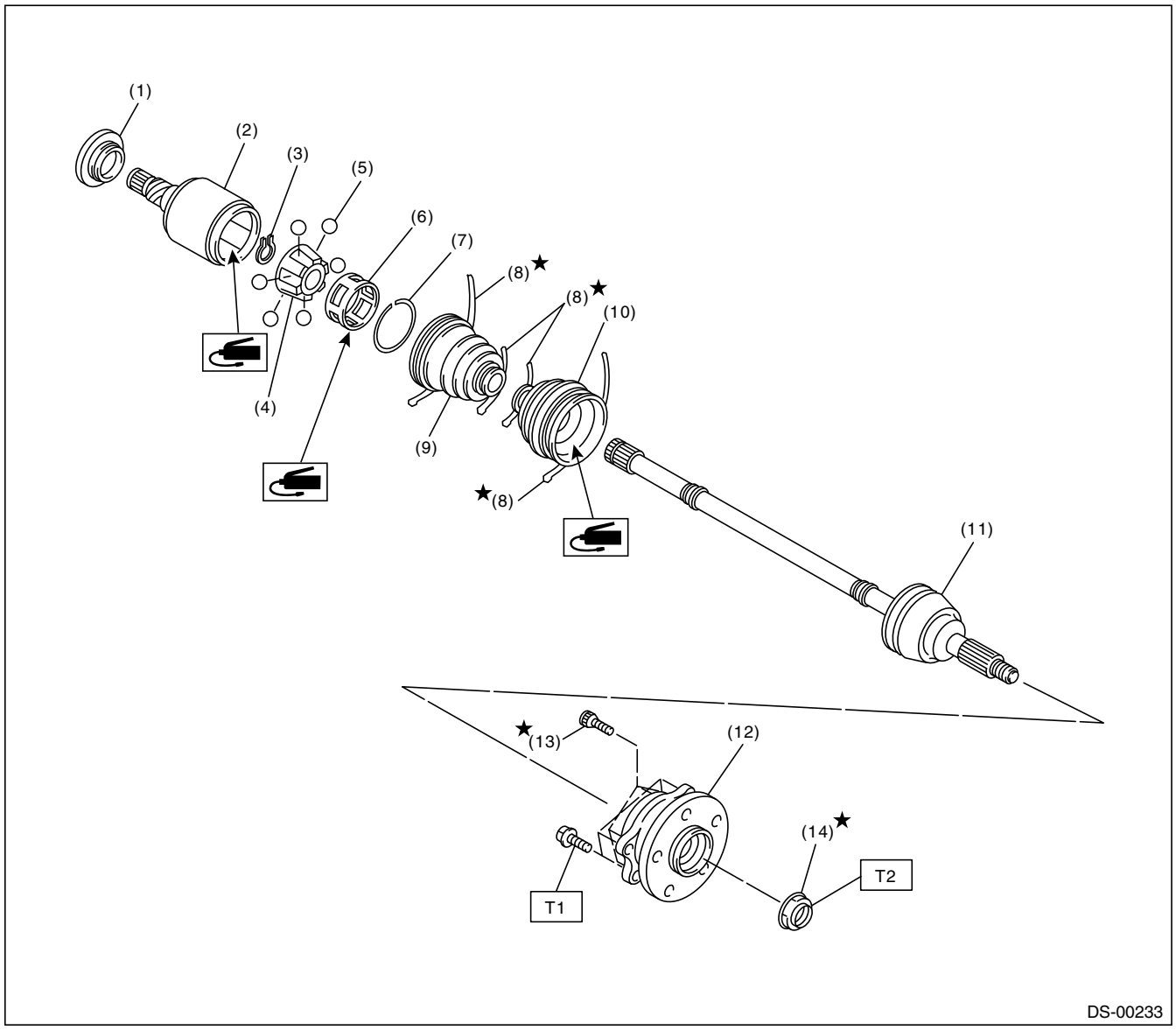
2. FRONT AXLE



(1) Circlip
(2) Baffle plate
(3) Outer race (PTJ)
(4) Snap ring
(5) Trunnion
(6) Snap ring
(7) Boot band
(8) Boot (PTJ)
(9) Boot (EBJ)
(10) EBJ shaft ASSY
(11) Housing
(12) Hub bolt
(13) Front hub unit bearing
(14) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 220 (22.4, 162)
T2: 65 (6.6, 47.9)

3. REAR AXLE



(1) Baffle plate (DOJ)
(2) Outer race (DOJ)
(3) Snap ring
(4) Inner race
(5) Ball
(6) Cage
(7) Snap ring
(8) Boot band
(9) Boot (DOJ)
(10) Boot (BJ)
(11) BJ shaft ASSY (2.0 L Non-turbo AT model)
EBJ shaft ASSY (Except for 2.0 L Non-turbo AT model)
(12) Rear hub unit bearing
(13) Hub bolt
(14) Axle nut (olive color)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 65 (6.6, 47.9)
T2: 190 (19.4, 140)

C: CAUTION

• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease, etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

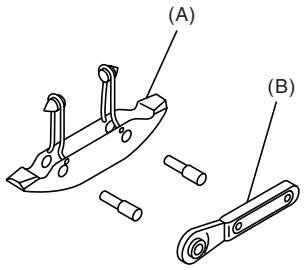
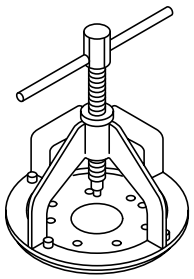
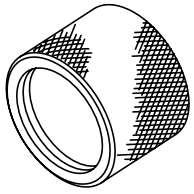
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening boot band. (A) Jig for band (B) Ratchet wrench
 ST-926470000	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.

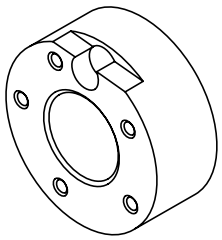
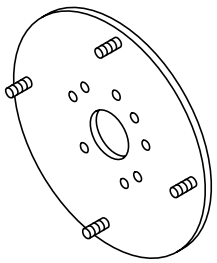
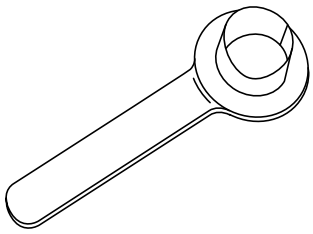
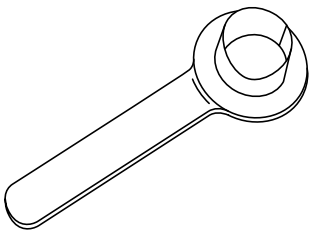
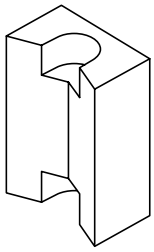
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927080000	927080000	HUB STAND	Used for assembling hub bolt in hub.
 ST-927140000	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	• Used for installing front drive shaft into front differential. • For protecting oil seal.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28399AG000	28399AG000 (Newly adopted tool)	HUB STAND	Used for extracting hub bolt.

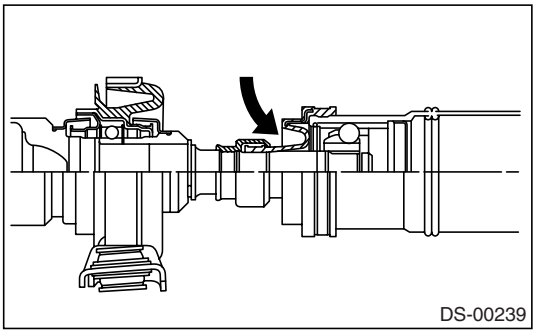
2. GENERAL TOOL

DESCRIPTION	REMARKS
Puller	Used for removing ball joint from knuckle arm.
Dial gauge	Used for inspecting propeller shaft run-out.
Extension cap	Used for preventing leak of gear oil or ATF.
Bar	Used for extracting drive shaft.

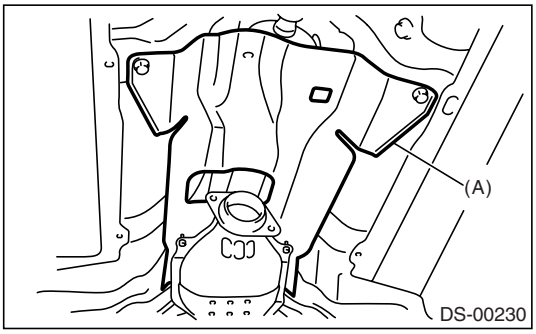
2. Propeller Shaft

A: REMOVAL

NOTE:
• Before removing propeller shaft, wrap metal parts with a cloth or rubber material.
• In case of DOJ type, before removing propeller shaft, wrap metal parts (installed at the rubber boot of center DOJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be damaged due to interference with adjacent metal parts while bending the DOJ during removal.

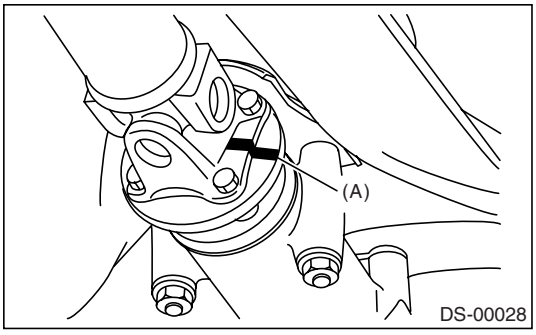


1) Disconnect the ground cable from battery.
2) Shift the select lever or gear shift lever to neutral.
3) Release the parking brake.
4) Lift-up the vehicle.
5) Remove the center exhaust pipe.
6) Remove the rear exhaust pipe and muffler.
7) Remove the heat shield cover.



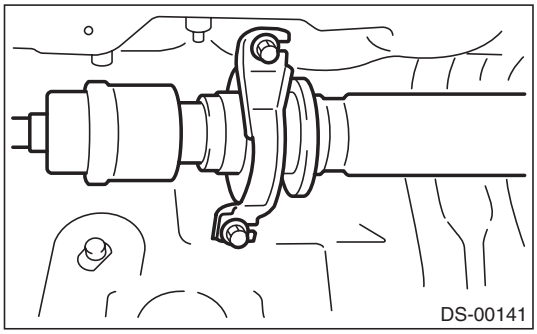
(A) Heat shield cover

8) Make matching marks on the flange yoke and rear differential before removal.



(A) Alignment mark

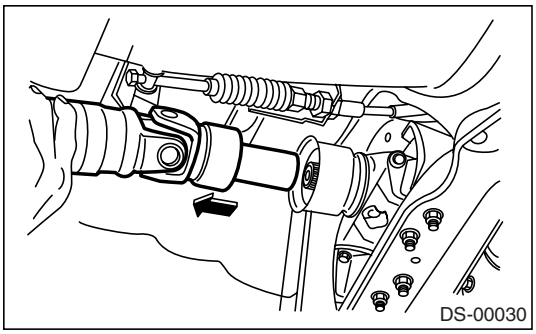
9) Remove the three bolts which hold propeller shaft to rear differential.
10) Remove the remaining bolt.
11) Remove the two bolts which hold center bearing to vehicle body.



12) Remove the propeller shaft from transmission.

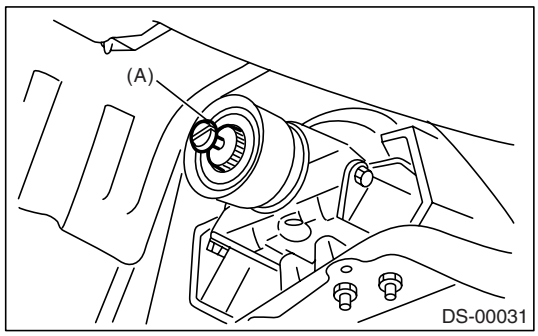
CAUTION:
• Be careful not to damage oil seals and frictional surface of sleeve yoke.
• Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing propeller shaft.

NOTE:
Use a container to catch ATF or oil flowing from propeller shaft.



13) Install the extension cap to transmission.

NOTE:
If extension cap is not available, place vinyl bag over opening and fasten with string to prevent gear oil or ATF from leaking.

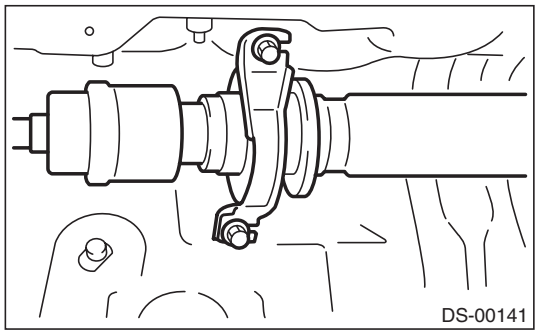


(A) Extension cap

B: INSTALLATION

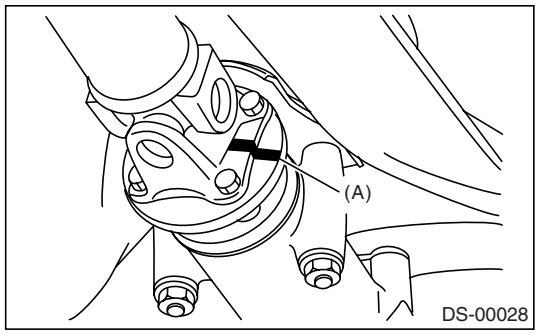
1) Insert the sleeve yoke into the transmission and attach center bearing to body.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)



2) Align the matching marks and connect the flange yoke and rear differential.

Tightening torque:
31 N·m (3.2 kgf-m, 23.1 ft-lb)



(A) Alignment mark

3) Install the heat shield cover.
4) Install the center exhaust pipe.
5) Install the rear exhaust pipe and muffler.
6) Lower the vehicle.
7) Connect the battery ground cable to battery.

C: INSPECTION

NOTE:
Do not disassemble propeller shaft. Check the following and replace if necessary.

- Tube surface for dents of cracks
- Splines for deformation or abnormal wear
- Joints for non-smooth operation or abnormal noise
- Center bearing for free play, noise or non-smooth operation.
- Oil seals for abnormal wear or damage
- Center bearing for breakage

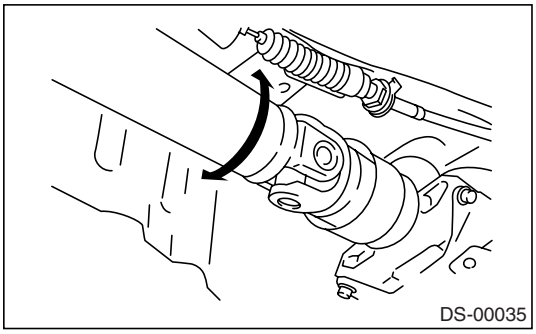
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

1) Remove the center exhaust pipe.
2) Remove the heat shield cover.
3) Check for any looseness of the flange yoke mounting bolts which connect to rear differential and center bearing bracket mounting bolts.

2. SPLINES AND BEARING

1) Remove the center exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to see if abnormal free play exists at spiders and bearings.

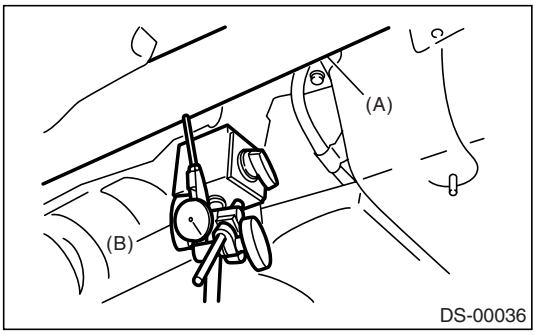


3. RUNOUT OF PROPELLER SHAFT

1) Remove the center exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Set the dial gauge with its indicator stem at center of propeller shaft tube.

5) Turn the propeller shaft slowly by hands to check for “runout” of propeller shaft.

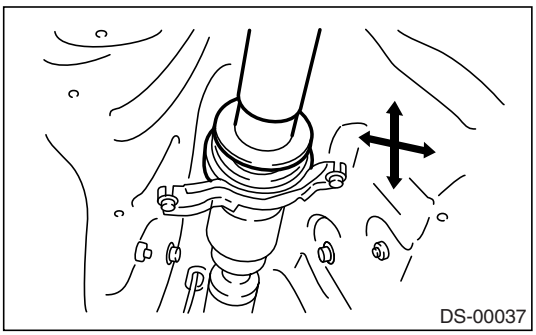
Runout:
Service limit 0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

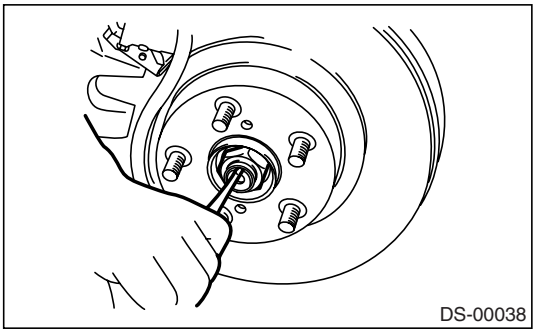
1) Remove the front and center exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Move the propeller shaft near center bearing up and down, and left and right with your hand to check for any abnormal bearing free play.



3. Front Axle

A: REMOVAL

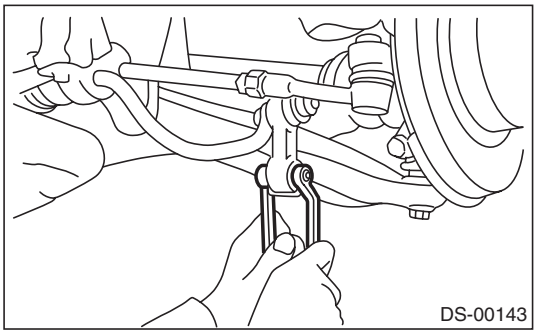
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle and remove the front wheels.
3) Unlock the axle nut.



4) Remove the axle nut using a socket wrench while depressing the brake pedal.

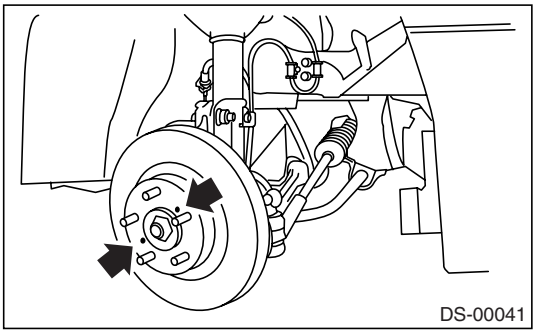
CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

5) Remove the stabilizer link.

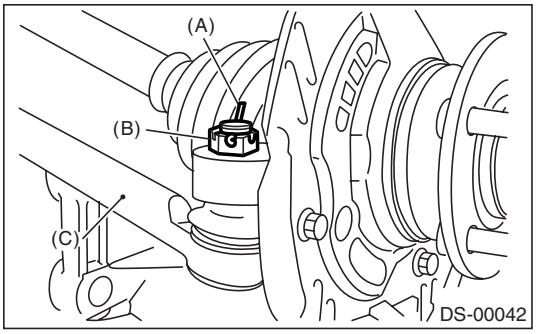


6) Remove the disc brake caliper from housing, and suspend it from strut using a wire.
7) Remove the disc rotor from hub.

NOTE:
If the disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on rotor.

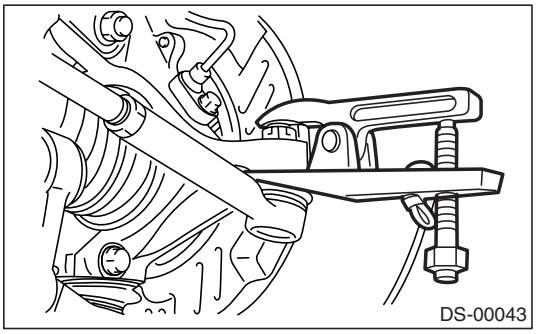


8) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

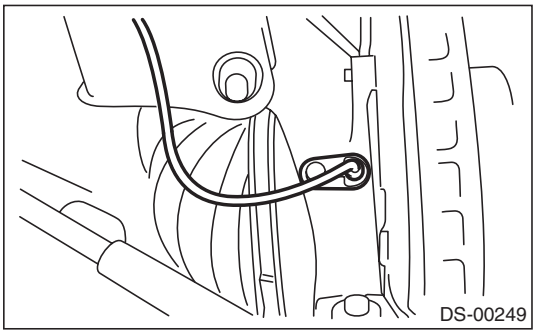


(A) Cotter pin
(B) Castle nut
(C) Tie-rod

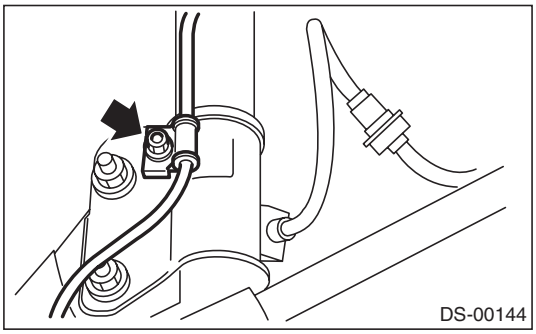
9) Using a puller, remove the tie-rod ball joint from knuckle arm.



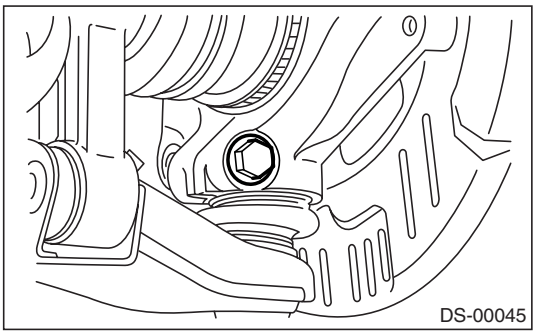
10) Remove the ABS wheel speed sensor assembly and harness.



11) Remove the bolts which secure sensor harness to strut.

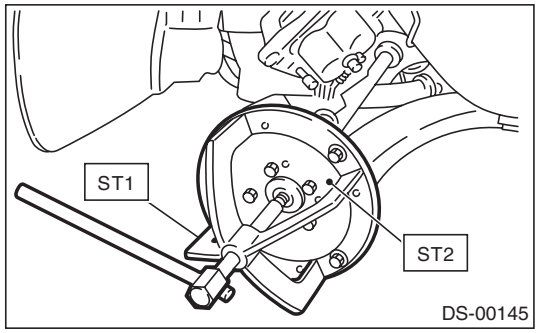


12) Remove the front arm ball joint from housing.

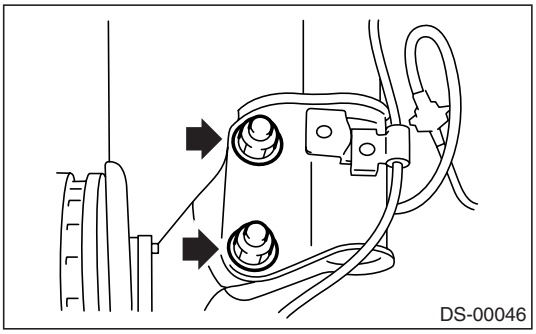


13) Remove the PTJ from transmission.
14) Remove the front drive shaft assembly from hub. If it is hard to remove, use STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE



15) After scribing an alignment mark on camber adjusting bolt head, remove the bolts which connect housing and strut, and disconnect the housing from strut.



B: INSTALLATION

1) While aligning the alignment mark on the camber adjusting bolt head, tighten the housing and strut using a new self-locking nut.

Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

2) Install the front drive shaft. <Ref. to DS-22, INSTALLATION, Front Drive Shaft.>

3) Install the front arm ball joint to housing.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

4) Install the ABS wheel speed sensor harness to strut.
5) Install the ABS wheel speed sensor on housing.

Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

6) Install the disc rotor on hub.
7) Install the disc brake caliper on housing.

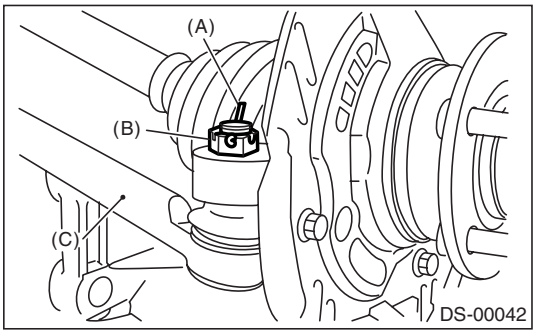
Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

8) Install the stabilizer link.
9) Connect the tie-rod end ball joint to the knuckle arm with a castle nut.

Tightening torque:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit the cap at bottom of tie-rod end with hammer.

10) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



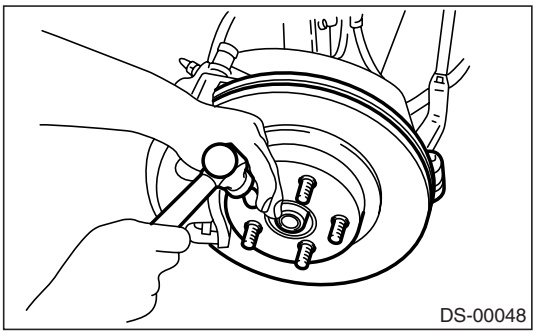
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

11) While depressing the brake pedal, tighten a new axle nut (olive color) to specified torque and lock it securely.

Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
• Install the wheel after installation of axle nut. Failure to follow this rule may damage the wheel bearing.
• Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

12) After tightening the axle nut, lock it securely.

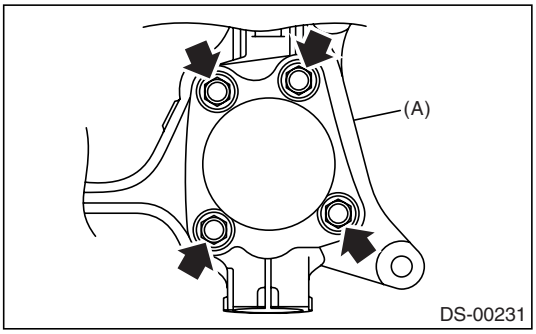


13) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

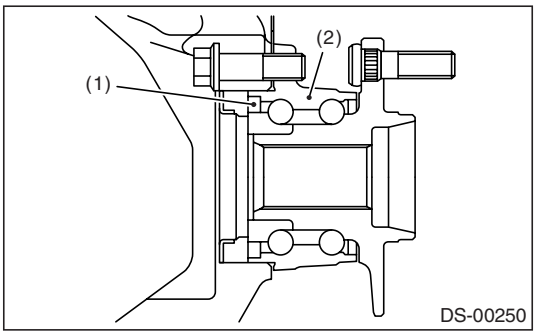
C: DISASSEMBLY

1) Remove the four bolts from housing, and remove the front hub unit bearing and disc cover.



(A) Housing

CAUTION:
• Do not get closer the tool which charged magnetism to magnetic encorder.
• Be careful not to damage the magnetic encoder.



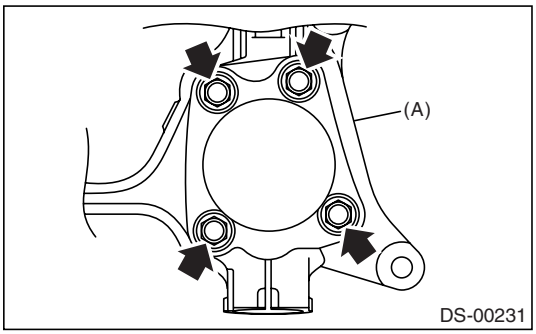
(1) Magnetic encoder
(2) Front hub unit bearing

2) Disassemble the front hub unit bearing. <Ref. to DS-18, DISASSEMBLY, Front Hub Unit Bearing.>

D: ASSEMBLY

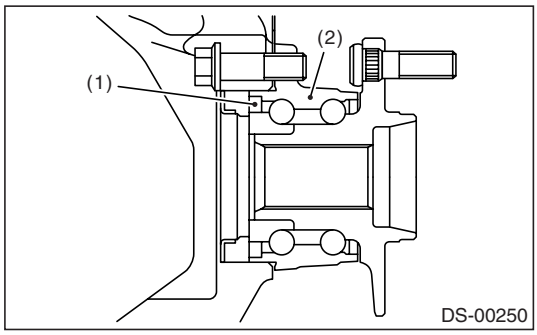
1) Assemble the front hub unit bearing. <Ref. to DS-18, ASSEMBLY, Front Hub Unit Bearing.>
2) Place the disc cover between housing and front hub unit, and tighten the four bolts.

Tightening torque:
65 N·m (6.6 kgf-m, 47.9 ft-lb)



(A) Housing

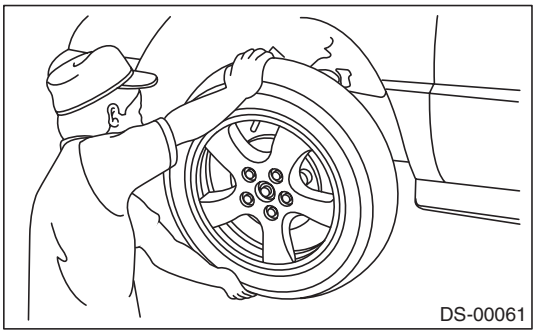
CAUTION:
• Do not get closer the tool which charged magnetism to magnetic encorder.
• Be careful not to damage the magnetic encoder.



(1) Magnetic encoder
(2) Front hub unit bearing

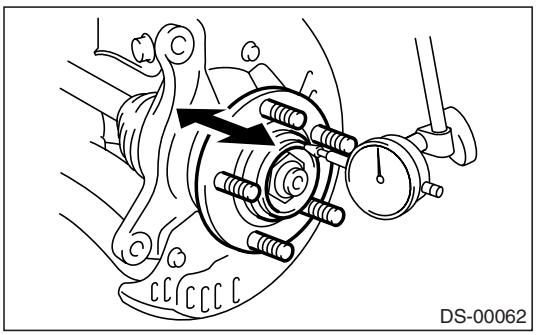
E: INSPECTION

1) Moving the front tire up and down by hand, check there is no play in bearing, and check the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the bearing if the load range exceeds the limitation.

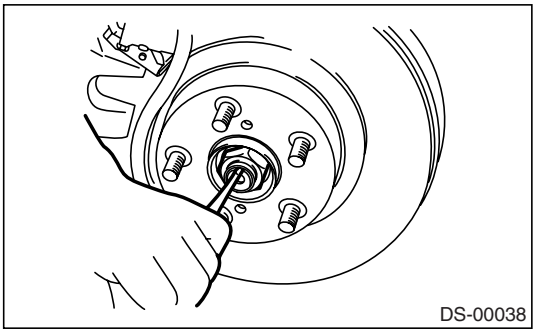
Service limit:
Maximum: 0.05 mm (0.0020 in)



4. Front Hub Unit Bearing

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle and remove the front wheels.
3) Unlock the axle nut.

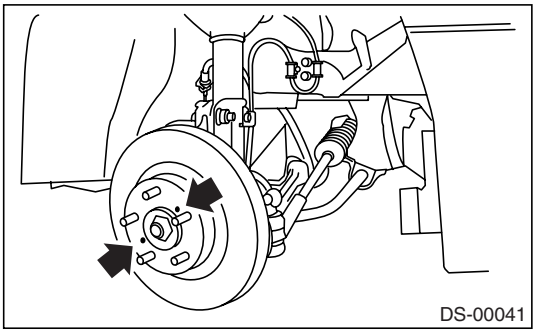


4) Remove the axle nut using a socket wrench while depressing the brake pedal.

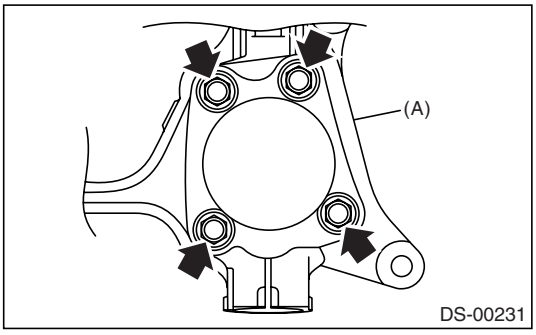
CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.
6) Remove the disc rotor from hub.

NOTE:
If the disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on rotor.

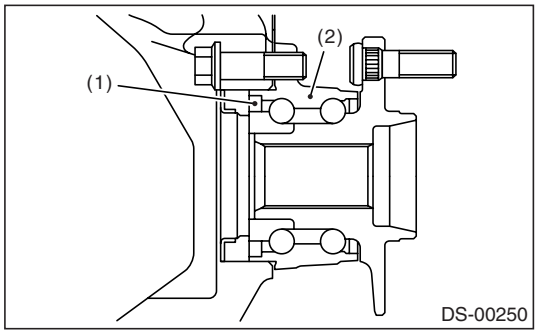


7) Remove four bolts from housing.



(A) Housing

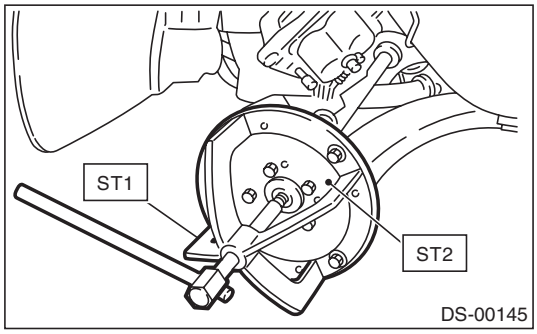
CAUTION:
• Do not get closer the tool which charged magnetism to magnetic encorder.
• Be careful not to damage the magnetic encoder.



(1) Magnetic encoder
(2) Front hub unit bearing

8) Remove the front hub unit bearing. If it is hard to remove, use STs.

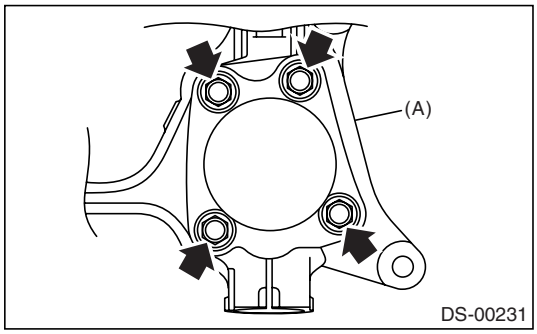
ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE



B: INSTALLATION

1) Place the disc cover between housing and front hub unit, and tighten the four bolts.

Tightening torque:
65 N·m (6.6 kgf-m, 47.9 ft-lb)



(A) Housing

2) Install the front drive shaft. <Ref. to DS-22, INSTALLATION, Front Drive Shaft.>
3) Tighten the axle nut temporarily.
4) Install the disc rotor on hub.
5) Install the disc brake caliper on the housing.

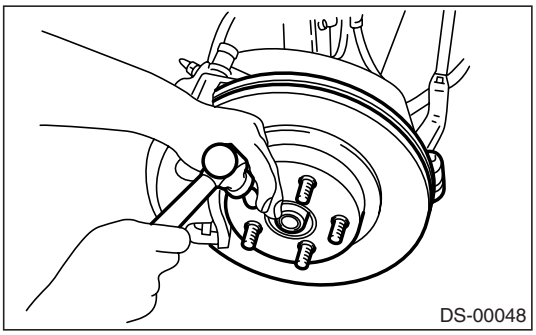
Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

6) While depressing the brake pedal, tighten a new axle nut (olive color) to specified torque and lock it securely.

Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
• Install the wheel after installation of the axle nut. Failure to follow this rule may damage the wheel bearing.
• Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

7) After tightening the axle nut, lock it securely.



8) Install the wheel and tighten the wheel nuts to specified torque.

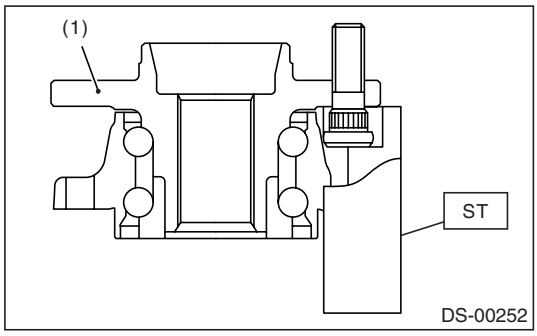
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

Using the ST and a hydraulic press, drive hub bolts out.
ST 28399AG000 HUB STAND

CAUTION:
• Be careful not to hammer the hub bolts. This may deform the hub.
• Do not reuse the hub bolt.

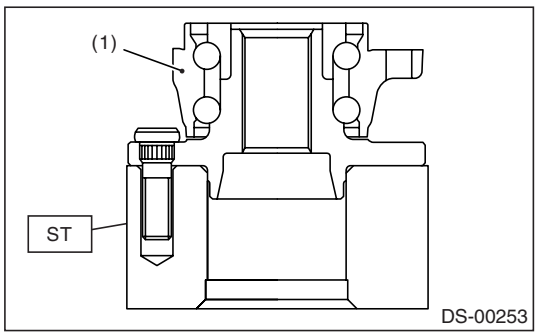
NOTE:
Since the front hub unit bearing can not be disassembled, only hub bolts can be removed.



(1) Front hub unit bearing

D: ASSEMBLY

1) Attach the hub to ST securely.
ST 927080000 HUB STAND



(1) Front hub unit bearing

2) Using a press, press new hub bolts until their seating surfaces contact the hub.

NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

E: INSPECTION

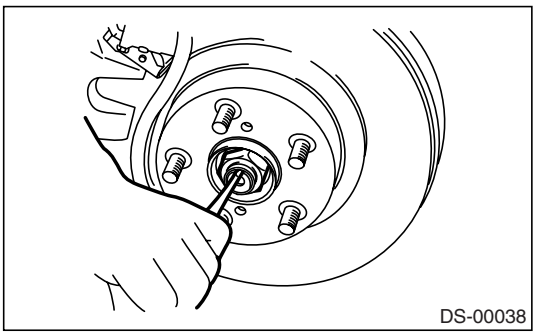
Refer to “FRONT AXLE” for inspection procedures. <Ref. to DS-15, INSPECTION, Front Axle.>

CAUTION:
If there is any fault in the bearing, replace fhe front hub unit bearing.

5. Rear Hub Unit Bearing

A: REMOVAL

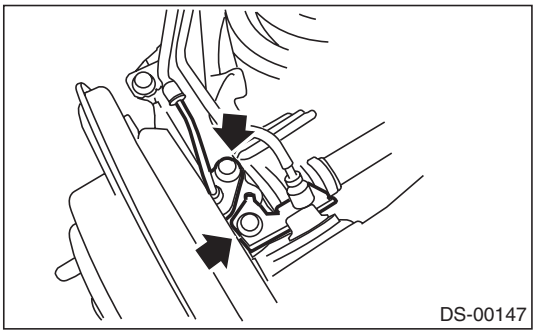
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the rear wheels.
3) Unlock the axle nut.



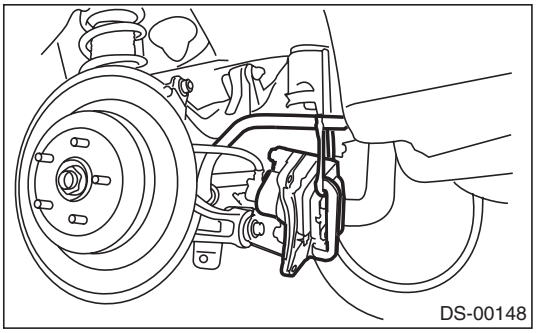
4) While applying the parking brake, remove the axle nut using the socket wrench.

CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

5) Release the parking brake.
6) Remove the rear ABS wheel speed sensor and brake cable bracket.



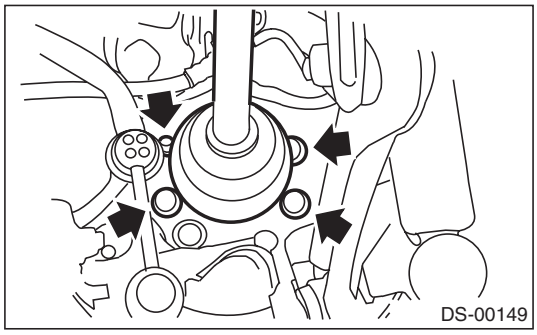
7) Remove the disc brake caliper from back plate, and suspend it from stabilizer using wire.



8) Remove the disc rotor from hub.

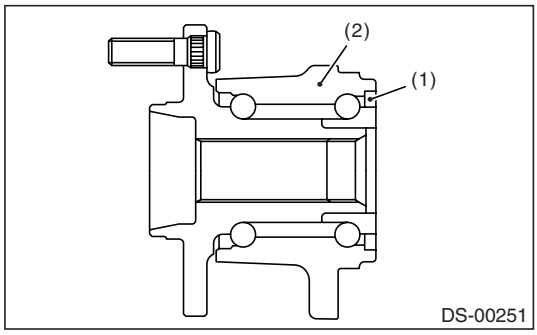
NOTE:
• Mark the mating surface of hub and disc rotor before removing the disc rotor to avoid confusing when installing.
• If the disc rotor seizes up within hub, drive the disc rotor out by installing an 8-mm bolt in screw hole on rotor.

9) Remove the four bolts from rear arm.

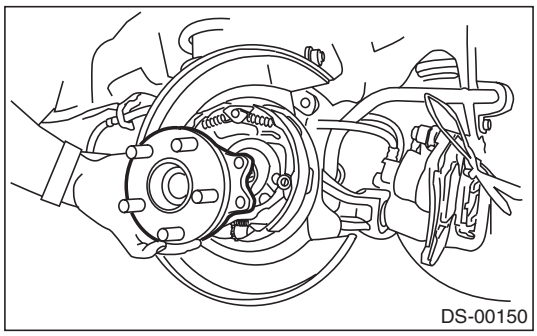


10) Remove the rear hub unit bearing.

CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encorder.

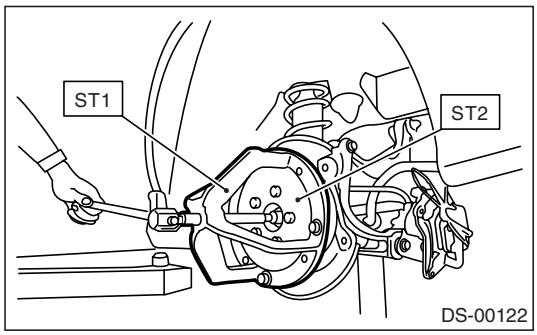


(1) Magnetic encoder
(2) Rear hub unit bearing



NOTE:
If it is hard to remove, use STs.

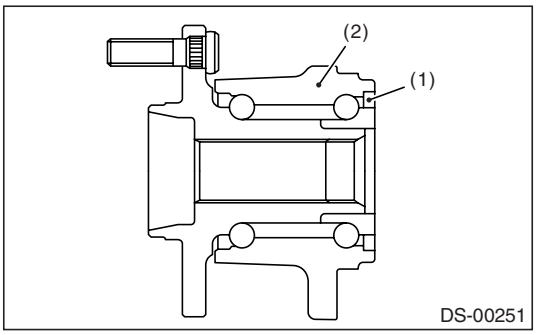
ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE



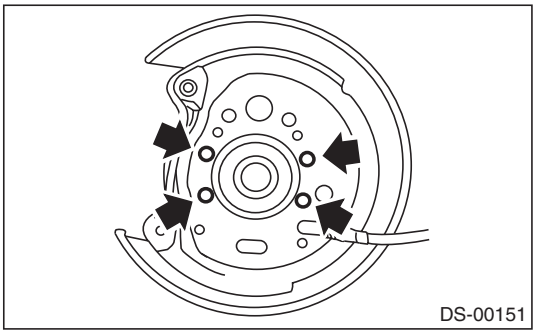
B: INSTALLATION

1) Aligning the rear hub unit bearing to the mounting hole of the back plate, install the hub unit assembly and back plate. Tighten the axle nut temporarily.

CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encorder.

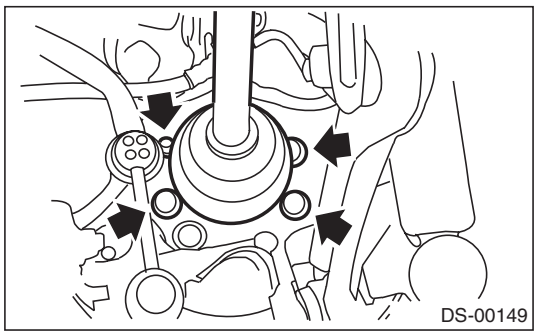


(1) Magnetic encoder
(2) Rear hub unit bearing



2) Tighten the four bolts to the back plate.

Tightening torque:
65 N·m (6.6 kgf-m, 47.9 ft-lb)

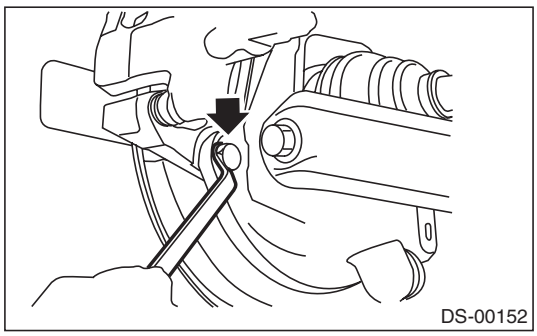


3) Remove the axle nut.
4) Draw the rear drive shaft into specified position.
5) Tighten the new axle nut temporarily.

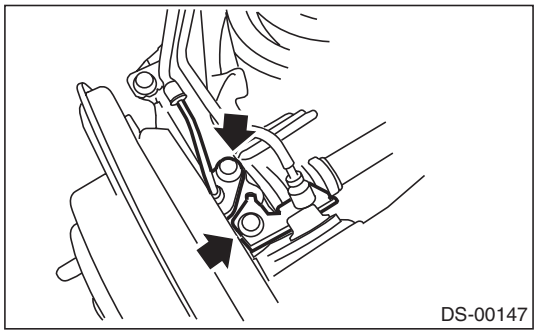
CAUTION:
Use a new axle nut (olive color).

6) Install the disc rotor on hub.
7) Install the disc brake caliper on back plate.

Tightening torque:
53 N·m (5.4 kgf-m, 39.1 ft-lb)



8) Install the rear ABS wheel speed sensor and brake cable bracket.



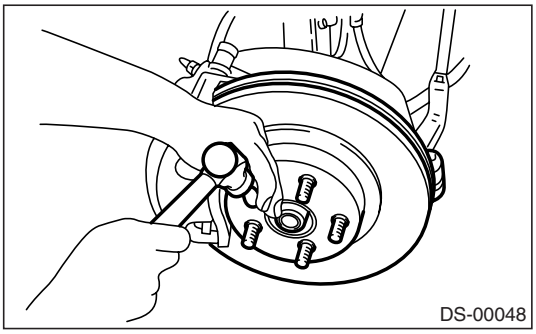
9) Adjust the parking brake lever stroke by turning adjuster. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

10) While applying the parking brake and depressing the brake pedal, tighten a new axle nut (olive color) to the specified torque and lock it securely.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
• Install the wheel after installation of the axle nut. Failure to follow this rule may damage the wheel bearing.
• Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

11) After tightening the axle nut, lock it securely.



12) Install the wheel and tighten the wheel nuts to specified torque.

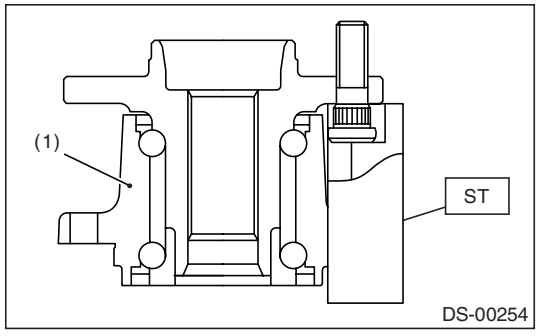
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

Using the ST and a hydraulic press, drive hub bolts out.
ST 28399AG000 HUB STAND

CAUTION:
• Be careful not to hammer the hub bolts. This may deform the hub.
• Do not reuse the hub bolt.

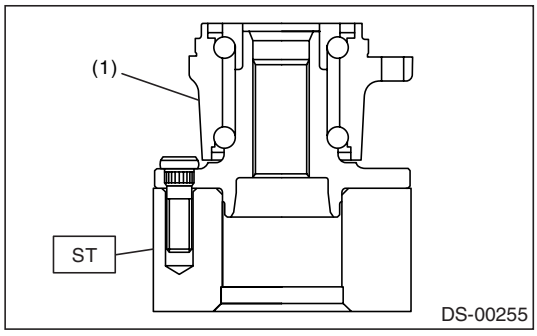
NOTE:
Since the rear hub unit bearing can not be disassembled, only hub bolts can be removed.



(1) Rear hub unit bearing

D: ASSEMBLY

1) Attach the hub to ST securely.
ST 927080000 HUB STAND



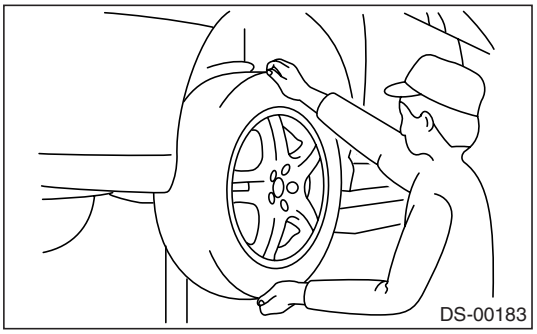
(1) Rear hub unit bearing

2) Using a press, press the new hub bolts until their seating surfaces contact the hub.

NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

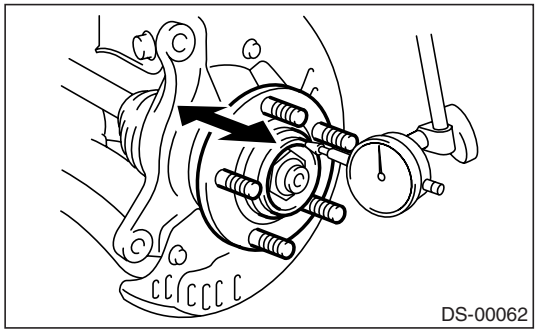
E: INSPECTION

1) Moving the rear tire up and down by hand, check there is no play in rear hub unit bearing, and check the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the rear hub unit hub bearing if the lean range exceed the limitation.

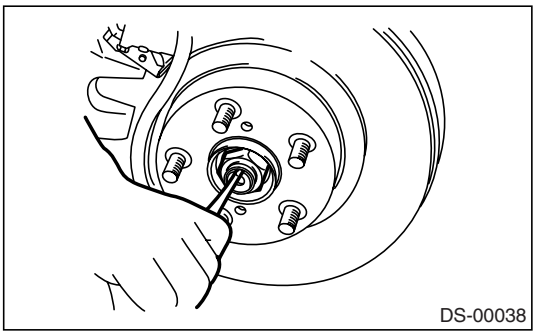
Service limit:
Maximum: 0.05 mm (0.0020 in)



6. Front Drive Shaft

A: REMOVAL

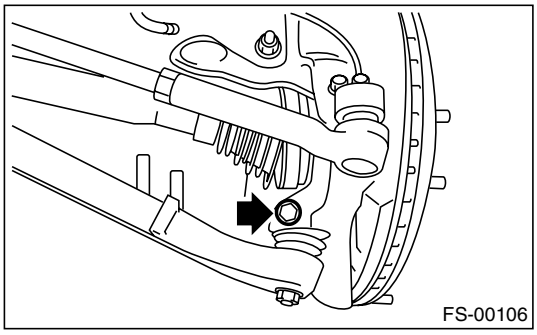
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle and remove the front wheels.
3) Drain the transmission gear oil. (MT model)
4) Drain the differential gear oil. (AT model)
5) Unlock the axle nut.



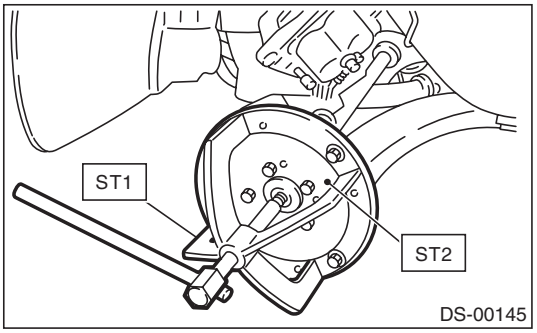
6) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

7) Remove the stabilizer link from front arm.
8) Disconnect the front arm ball joint from housing.



9) Remove the front drive shaft assembly. If it is hard to remove, use ST1 and ST2.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE



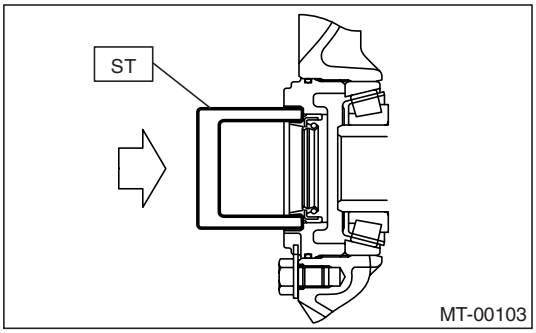
10) Using a bar, remove the front drive shaft from transmission.

CAUTION:
Be careful not to allow the bar to damage holder area.

B: INSTALLATION

1) Using the ST, replace the differential side retainer oil seal with a new one.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

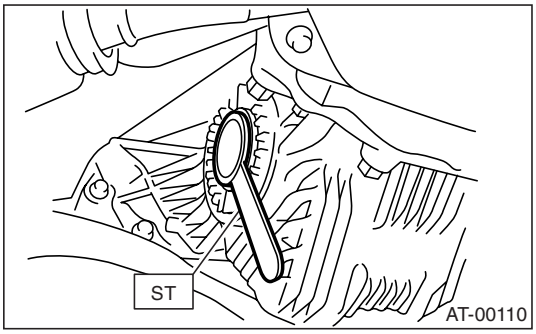
NOTE:
After pulling out the drive shaft, be sure to replace with a new oil seal.



2) Insert the EBJ into hub splines.
3) Draw the drive shaft into specified position.

CAUTION:
Do not hammer drive shaft when installing it.

4) Tighten the axle nut temporarily.
5) Using the ST, install the front drive shaft to transmission.
ST 28399SA010 OIL SEAL PROTECTOR



6) Connect the front arm ball joint to housing.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

7) Install the stabilizer link.

CAUTION:
Be sure to use a new self-locking nut.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

8) While depressing the brake pedal, tighten a new axle nut (olive color) to the specified torque and lock it securely.

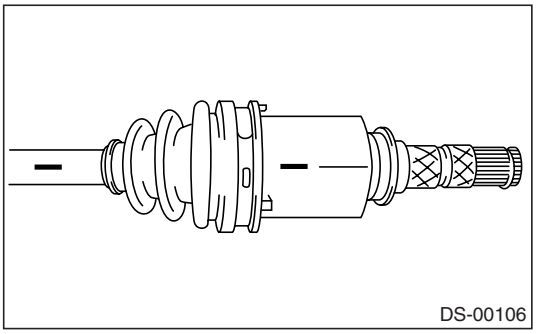
Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
• Install the wheel after installation of the axle nut. Failure to follow this rule may damage the wheel bearing.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

9) After tightening axle nut, lock it securely.
10) Add transmission gear oil. (MT model)
11) Add differential gear oil. (AT model)

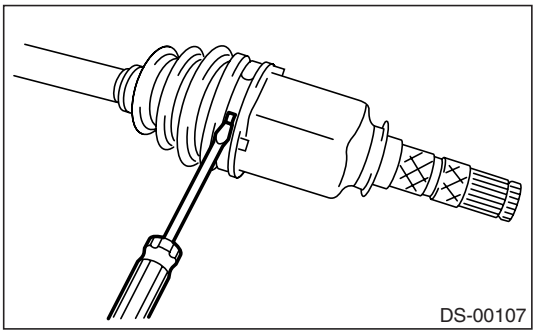
C: DISASSEMBLY

1) Place alignment marks on the shaft and outer race.

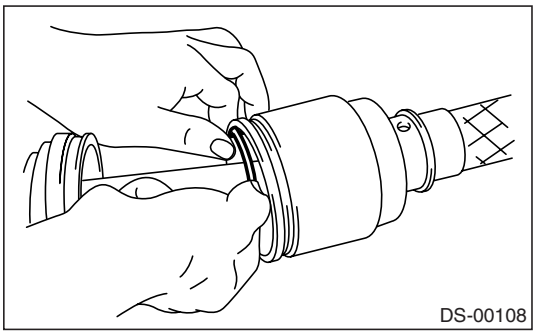

DS-00106

2) Remove the PTJ boot band and boot.

CAUTION:
Be careful not to damage boot.


DS-00107

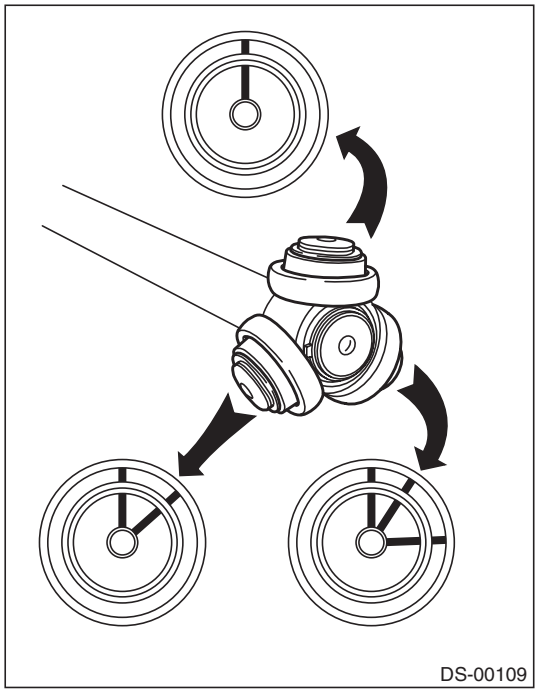
3) Remove the snap ring from PTJ outer race.


DS-00108

4) Remove the PTJ outer race from shaft assembly.
5) Wipe off grease.

CAUTION:
The grease is a special grease. Do not confuse with other greases.

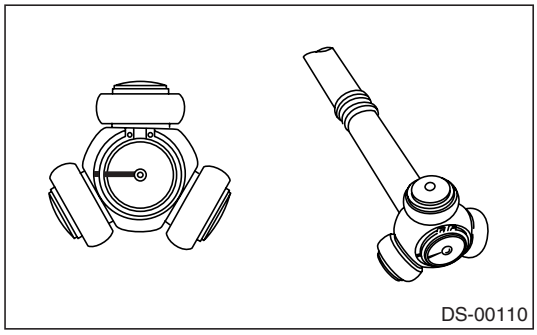
6) Place alignment marks on the roller kit and trunnion.


DS-00109

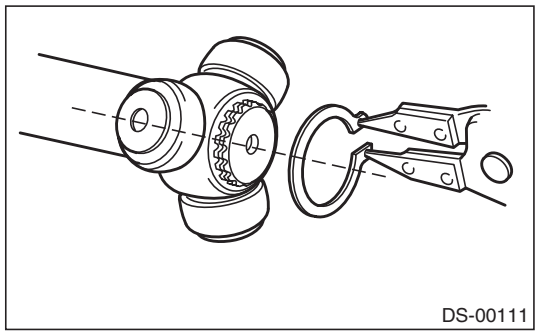
7) Remove the roller kit from trunnion.

CAUTION:
Be careful with the roller kit position.

8) Place alignment marks on the trunnion and shaft.



9) Remove the snap ring and trunnion.



CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

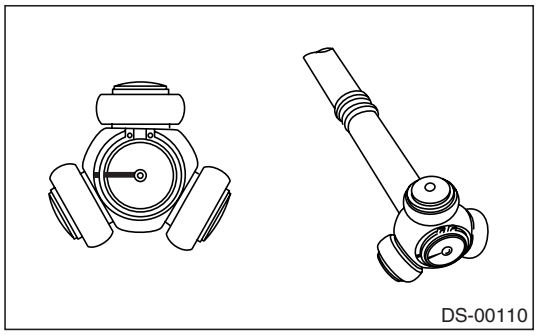
10) Remove the PTJ boot.

NOTE:
Further disassembly of axle is impossible because the EBJ cannot be disassembled.

D: ASSEMBLY

NOTE:
Use specified grease.
PTJ side: NSG301 (Part No. 28395AG020)

1) Place the PTJ boot at the center of shaft.
2) Align alignment marks and install the trunnion on the shaft.

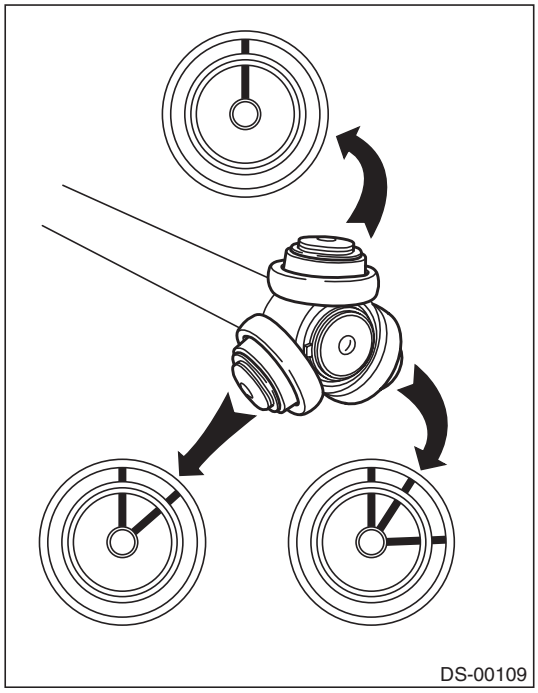


3) Install the snap ring to shaft.

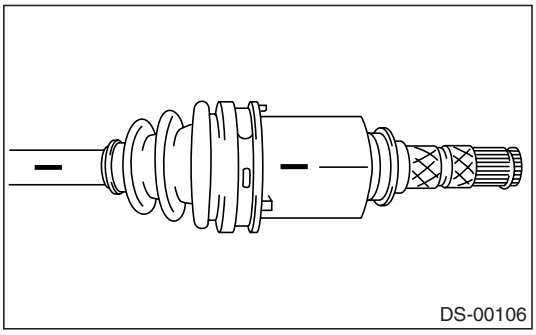
CAUTION:
Confirm that the snap ring is completely fitted in shaft groove.

4) Fill 100 to 110 g (3.53 to 3.88 oz.) of specified grease into the interior of PTJ outer race.
5) Apply a thin coat of specified grease to the roller kit and trunnion.
6) Align alignment marks on roller kit and trunnion and install the roller kit.

CAUTION:
Be careful with the roller kit position.



7) Align alignment marks on the shaft and outer race, and install outer race.



8) Install the snap ring in the groove on PTJ outer race.

CAUTION:
Pull the shaft lightly and assure that the snap ring is completely fitted in the groove.

9) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz.) to the entire inner surface of boot.
10) Install the PTJ boot taking care not to twist it.

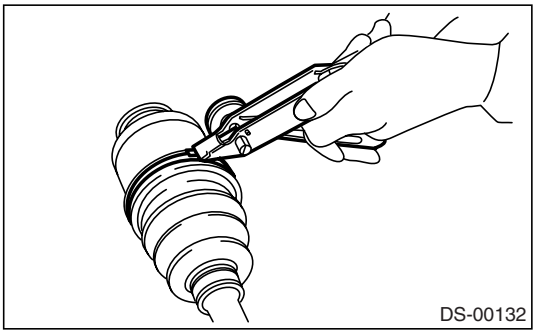
CAUTION:
• The large end of PTJ boot and the boot groove shall be cleaned completely so as to be free from grease and other substances.
• When installing PTJ boot, position outer race of PTJ at center of its travel.

11) Put a new band through the clip and wind twice in alignment with band groove of boot.
12) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:
When tightening boot, use care so that the air within the boot is appropriate.

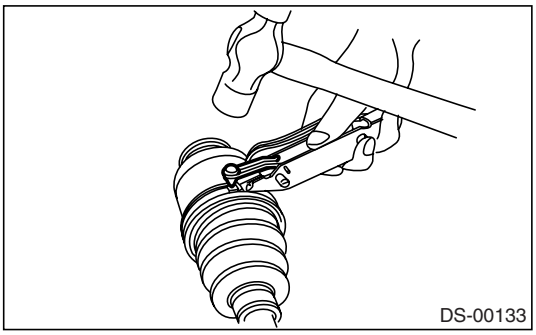
13) Tighten the band using ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.


DS-00132

14) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.


DS-00133

15) Cut off the band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Be careful so that the end of the band is in close contact with clip.

16) Extend and retract the PTJ to provide equal grease coating.

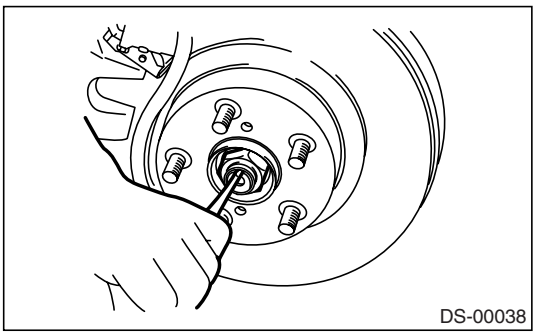
E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
• PTJ (pillow tripod joint)
Check for seizure, corrosion, damage, wear and excessive play.
• EBJ (high-efficiency compact ball fixed joint)
Check for seizure, corrosion, damage and excessive play.
• Shaft
Check for excessive bending, twisting, damage and wear.
• Boot
Check for wear, warping, breakage and scratches.
• Grease
Check for discoloration and fluidity.

7. Rear Drive Shaft

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the rear wheels.
3) Unlock the axle nut.



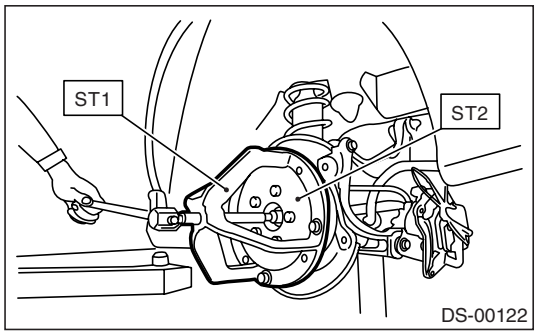
4) While applying the parking brake, remove the axle nut using the socket wrench.

CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

5) Remove the rear differential assembly.
• T-type
<Ref. to DI-29, REMOVAL, Rear Differential (T-type).>
• VA-type
<Ref. to DI-46, REMOVAL, Rear Differential (VA-type).>
6) Remove the axle nut and rear drive shaft. If it is hard to remove, use ST1 and ST2.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

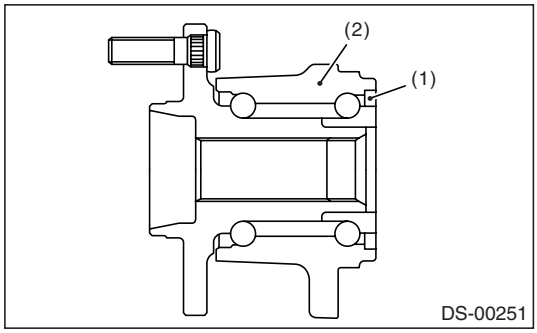
CAUTION:
• Do not hammer drive shaft when removing.
• Do not damage the oil seal and magnetic encoder.



B: INSTALLATION

1) Insert the BJ or EBJ into rear hub splines.

CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encorder.



(1) Magnetic encoder
(2) Rear hub unit bearing

2) Draw the rear drive shaft into specified position.

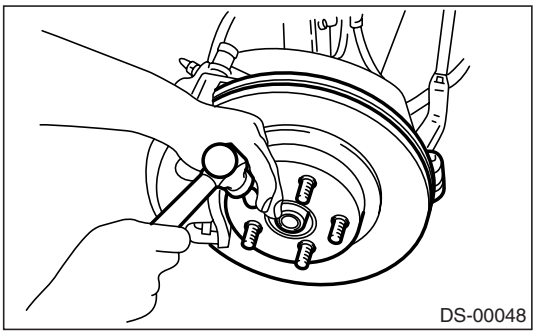
CAUTION:
Do not hammer drive shaft when installing it.

3) Tighten the axle nut temporarily.
4) Install the rear differential assembly.
• T-type
<Ref. to DI-30, INSTALLATION, Rear Differential (T-type).>
• VA-type
<Ref. to DI-47, INSTALLATION, Rear Differential (VA-type).>
5) While applying the parking brake and depressing the brake pedal, tighten a new axle nut (olive color) to specified torque and lock it securely.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
• Install the wheel after installation of the axle nut. Failure to follow this rule may damage the wheel bearing.
• Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

6) Lock the axle nut securely.


DS-00048

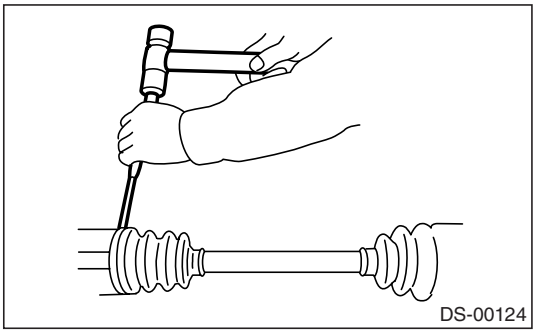
7) Install the wheel.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

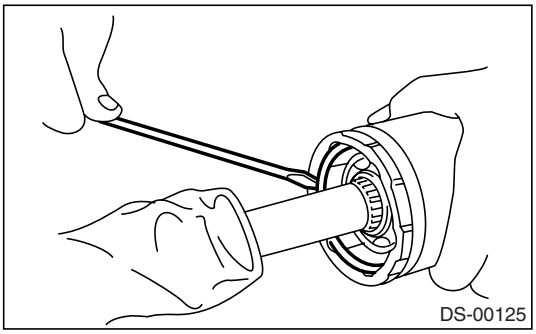
C: DISASSEMBLY

1) Straighten the bent claw of larger end of DOJ boot.
2) Loosen the band by means of screwdriver or pliers.

CAUTION:
Be careful not to damage boot.


DS-00124

3) Remove the boot band on the small end of DOJ boot in the same manner.
4) Remove the larger end of DOJ boot from DOJ outer race.
5) Pry and remove the round circlip located at the neck of DOJ outer race with a screwdriver.

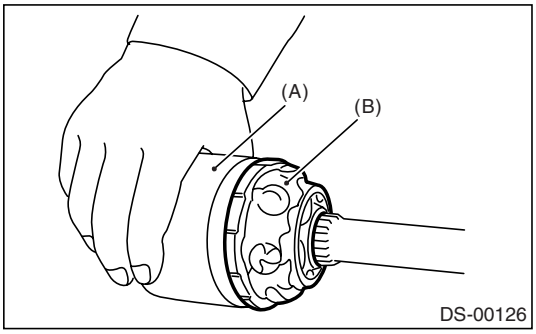

DS-00125

6) Take out the DOJ outer race from shaft assembly.

7) Wipe off the grease and take out balls.

CAUTION:
The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.

NOTE:
Disassemble exercising care not to lose balls (6 pcs).



DS-00126

(A) Outer race
(B) Grease

8) To remove the cage from inner race, turn the cage by a half pitch to the track groove of inner race and shift the cage.
9) Remove the snap ring, which fixes inner race to shaft, using pliers.
10) Take out the DOJ inner race.
11) Take off the DOJ cage from shaft and remove DOJ boot.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

12) Remove the BJ boot or EBJ boot in the same procedure as DOJ boot.

NOTE:
Further disassembly of axle is impossible because the BJ and EBJ cannot be disassembled.

D: ASSEMBLY

NOTE:
Use specified grease.

BJ side:
NTG2218-M (Part No. 28395AG010)

EBJ side:
NTG2218-M (Part No. 28395AG010)

DOJ side:
NKG205 (Part No. 28495AG000)

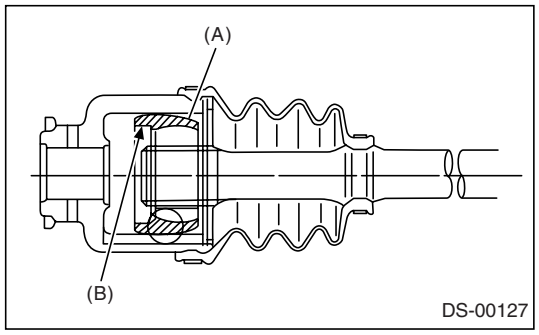
1) Install the BJ or EBJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz.) of specified grease.

2) Place the DOJ boot at the center of shaft.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

3) Insert the DOJ cage onto shaft.

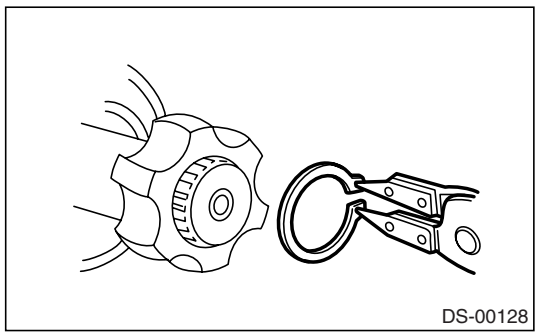
NOTE:
Insert the cage with the cut-out portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cutout

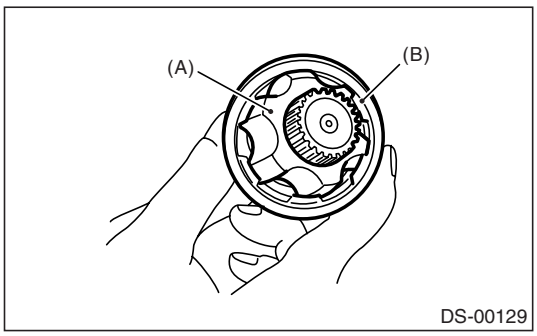
4) Install the DOJ inner race on shaft and fit the snap ring with pliers.

NOTE:
Confirm that the snap ring is completely fitted in the shaft groove.



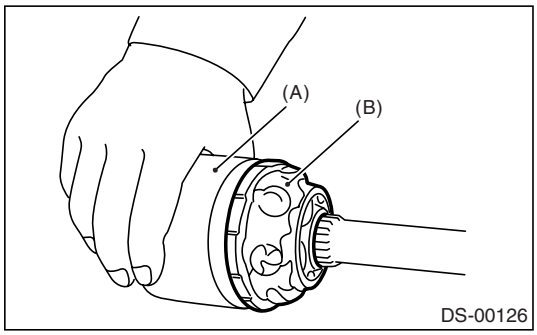
5) Install the cage to inner race fixed upon shaft.

NOTE:
Fit the cage with the protruded part aligned with the track on the inner race and then turn by a half pitch.



(A) Inner race
(B) Cage

6) Fill 80 to 90 g (2.82 to 3.17 oz.) of specified grease into the interior of DOJ outer race.
7) Apply a coat of specified grease to the cage pocket and six balls.
8) Insert six balls into the cage pocket.
9) Align the outer race track and ball positions, and place the shaft, inner race, cage and balls in the original positions and then fit outer race.

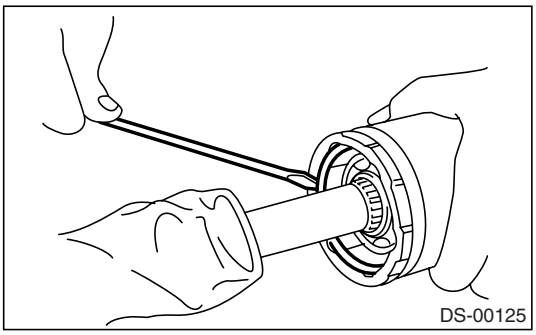


(A) Outer race
(B) Grease

10) Install the snap ring in the groove on DOJ outer race.

NOTE:
• Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
• Use care not to place the matched position of snap ring in the ball groove of outer race.

• Pull the shaft lightly and assure that the circlip is completely fitted in the groove.


DS-00125

11) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz.)] to the entire inner surface of boot. Also apply grease to shaft.
12) Install the DOJ boot taking care not to twist it.

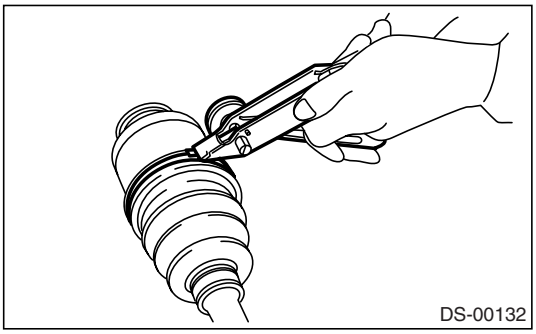
NOTE:
• The inside of the larger end of DOJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.
• When installing DOJ boot, position outer race of DOJ at center of its travel.

13) Put a new band through the clip and wind twice in alignment with band groove of boot.
14) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:
When tightening boot, exercise care so that the air within the boot is appropriate.

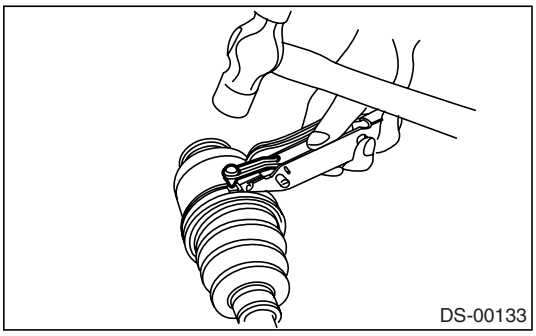
15) Tighten the band by using ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.


DS-00132

16) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tap to an extent that the boot underneath is not damaged.


DS-00133

17) Cut off the band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

NOTE:
Be careful so that the end of the band is in close contact with clip.

18) Install the BJ boot or EBJ boot in the same procedure as DOJ boot.
19) Extend and retract the DOJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. Repair or replace if defective.
• DOJ (Double Offset Joint)
Check for seizure, corrosion, damage, wear and excessive play.
• EBJ (high-efficiency compact ball fixed joint)
Check for seizure, corrosion, damage, wear and excessive play.
• Shaft
Check for excessive bending, twisting, damage and wear.
• BJ (Bell Joint)
Check for seizure, corrosion, damage and excessive play.
• Boot
Check for wear, warping, breakage and scratches.
• Grease
Check for discoloration and fluidity.

8. General Diagnostic Table

A: INSPECTION

NOTE:
Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Corrective action
Noise or vibration from propeller shaft	Center bearing	Check the center bearing. <Ref. to DS-12, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>
	Runout of propeller shaft	Check the vibration of propeller shaft. <Ref. to DS-11, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>
	Loose or free play of connection	Check joint and connector. <Ref. to DS-11, JOINTS AND CONNECTIONS, INSPECTION, Propeller Shaft.>
		Check splines and bearing. <Ref. to DS-11, SPLINES AND BEARING, INSPECTION, Propeller Shaft.>
Abnormal wheel vibration	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-23, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-16, INSPECTION, Rear Shock Absorber.>
	Front drive shaft	Check the front drive shaft. <Ref. to DS-25, INSPECTION, Front Drive Shaft.>
	Rear drive shaft	Check the rear drive shaft. <Ref. to DS-29, INSPECTION, Rear Drive Shaft.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-21, INSPECTION, Rear Hub Unit Bearing.>
Noise from the underbody	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-23, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-16, INSPECTION, Rear Shock Absorber.>

ABS

Page

1. General Description 2
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U) 6
3. ABS Sequence Control 10
4. Front ABS Wheel Speed Sensor 13
5. Rear ABS Wheel Speed Sensor 15
6. Front Magnetic Encoder 16
7. Rear Magnetic Encoder 17
8. G Sensor 18

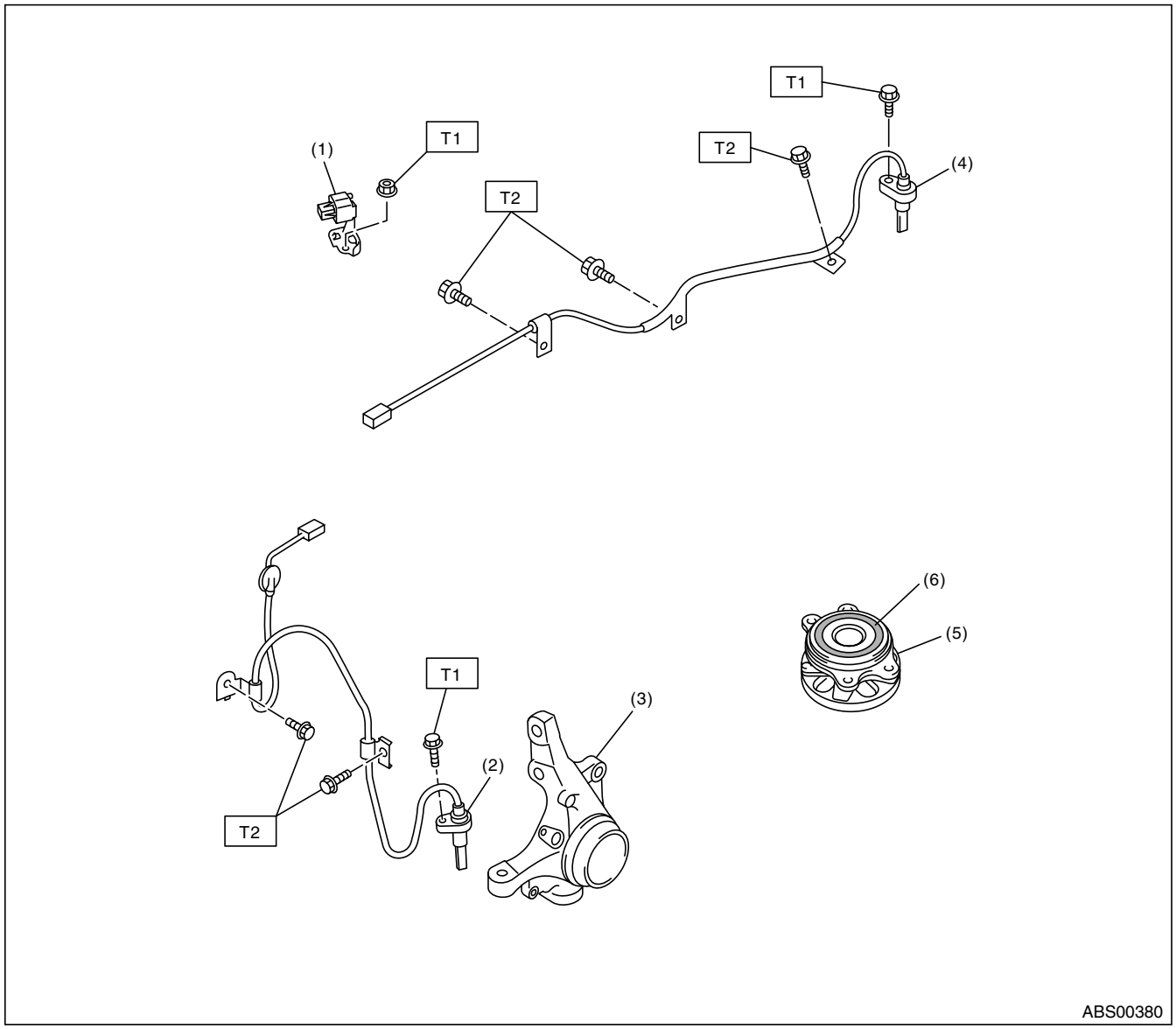
1. General Description

A: SPECIFICATION

Item				Specification or identification
ABS wheel speed sensor	ABS wheel speed sensor gap (for reference)		Front	0.77 — 1.43 mm (0.030 — 0.056 in)
			Rear	0.64 — 1.56 mm (0.025 — 0.061 in)
	Marks of harness (Marks, Color)	Front	RH	K1 (White)
			LH	K2 (Yellow)
		Rear	RH	K5 (White)
			LH	K6 (Yellow)
G sensor	G sensor voltage			2.3±0.2 V
ABSCM&H/U identification	AT (Except for OUTBACK)			J1
	MT (Except for OUTBACK)			J2
	AT (OUTBACK)			J3
	MT (OUTBACK)			J4

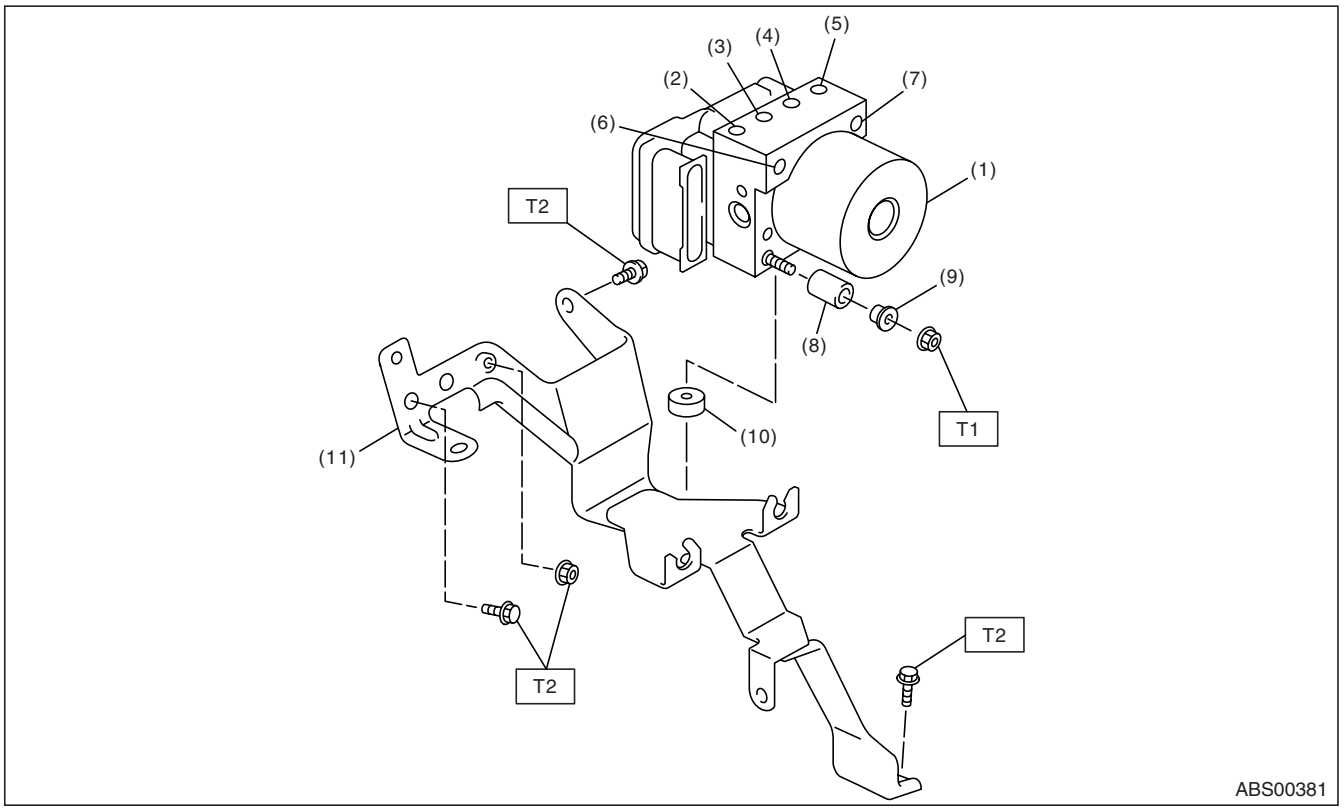
B: COMPONENT

1. ABS WHEEL SPEED SENSOR



(1)	G sensor	(4)	Rear ABS wheel speed sensor LH	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Front ABS wheel speed sensor LH	(5)	Hub unit bearing	***T1: 7.5 (0.76, 5.5)***
(3)	Front housing	(6)	Magnetic encoder	***T2: 33 (3.4, 24.3)***

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



(1)	ABS control module and hydraulic control unit (ABSCM&H/U)	(6)	Primary inlet
		(7)	Secondary inlet
(2)	Front outlet RH	(8)	Damper
(3)	Rear outlet LH	(9)	Spacer
(4)	Rear outlet RH	(10)	Damper
(5)	Front outlet LH	(11)	Bracket

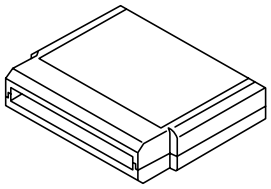
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 24.3)

C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.
TORX® BIT E5	Used for replacing ABS control module.

2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

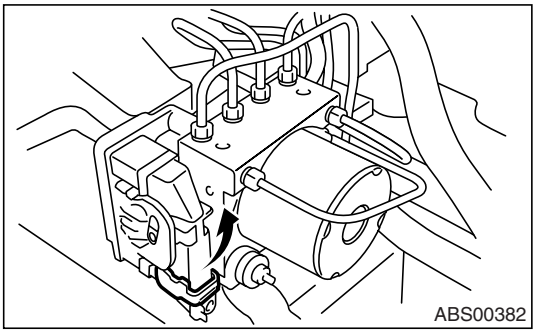
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Use compressed air to get rid of water around the ABSCM&H/U.

NOTE:
When dust and dirt are attached to the terminal, they may cause poor contact.

3) Disconnect the ABSCM&H/U connector pulling up the lock lever.

CAUTION:
Do not pull the harness when disconnecting connector.

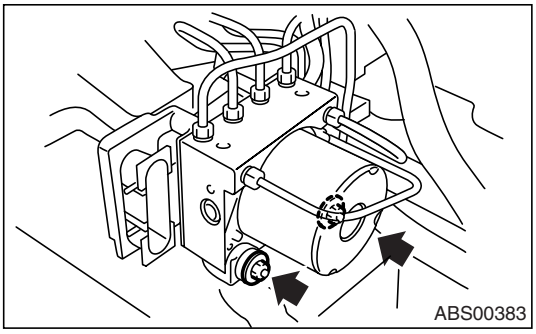

ABS00382

4) Remove the harness clip.
5) Disconnect the brake pipes from ABSCM&H/U.
6) Wrap the brake pipe using a vinyl bag not to spill the brake fluid on the vehicle body.

CAUTION:
When brake fluid is attached to the vehicle body, wash it off with water and wipe the water.

7) Loosen the nuts and remove the ABSCM&H/U.

CAUTION:
- **Do not drop or bump the ABSCM&H/U.**
- **Do not turn ABSCM&H/U upside down or place it sideways for storage.**
- **Be careful that no foreign objects are mixed in ABSCM&H/U.**
- **Be careful that no water enters inside the connectors.**


ABS00383

8) Remove the ABSCM&H/U bracket.

B: INSTALLATION

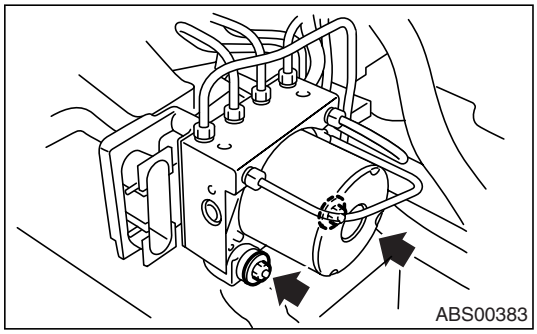
1) Install the ABSCM&H/U bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

2) Install the ABSCM&H/U aligning the groove of damper on ABSCM&H/U side with the pawl of bracket.

NOTE:
Check the identification mark of ABSCM&H/U.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)


ABS00383

3) Connect the brake pipes to their correct ABSCM&H/U positions.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

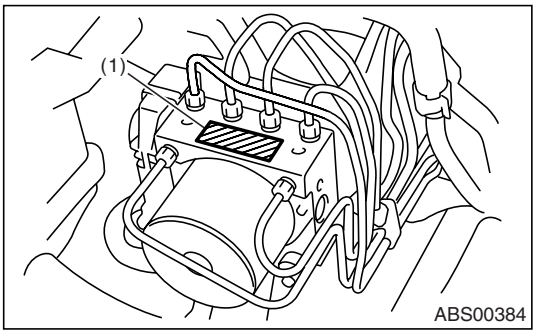
4) Using a harness clip, secure the ABSCM&H/U harness to bracket.
5) Connect the connector to ABSCM&H/U.

NOTE:
- Be sure to remove all foreign matters from inside the connector before connecting.
- Ensure the ABSCM&H/U connector is securely locked.

6) Bleed air from the brake system.

C: INSPECTION

1) Check the connected and fixed condition of connector.
2) Check the mark used for ABSCM&H/U identification.
Refer to “SPECIFICATION” for mark. <Ref. to ABS-2, SPECIFICATION, General Description.>



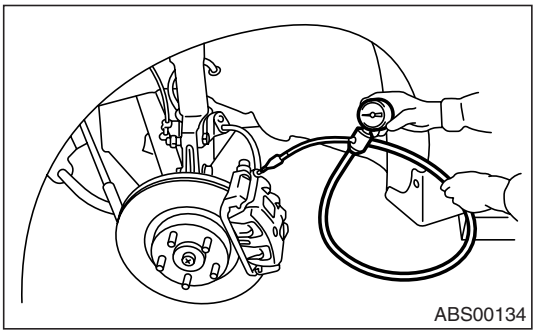
(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle, and then remove the wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not use the pressure gauge for the measurement of transmission oil pressure since the piston seal may be expanded and deformed.

NOTE:
Wrap a sealing tape around the pressure gauge.



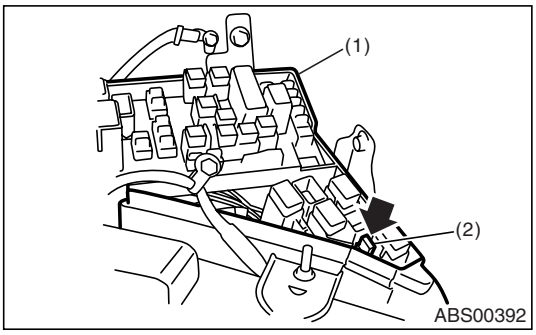
4) Bleed air from the pressure gauges and the FL and FR caliper bodies.
5) Perform ABS sequence control.
<Ref. to ABS-10, ABS Sequence Control.>
6) When the hydraulic unit begins to work, first the FL side performs decompression, holding and compression, and then the FR side performs decompression, holding and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the specification. Depress the brake pedal and check that the kick-back is normal, and tightness is normal.

	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm^2, 511 psi)	3,500 kPa (36 kgf/cm^2, 511 psi)
When decompressed	500 kPa (5 kgf/cm^2, 73 psi) or less	500 kPa (5 kgf/cm^2, 73 psi) or less
When compressed	3,500 kPa (36 kgf/cm^2, 511 psi) or more	3,500 kPa (36 kgf/cm^2, 511 psi) or more

8) Remove the pressure gauges from the FL and FR caliper bodies.
9) Connect the air bleeder screws of the FL and FR caliper bodies.
10) Remove the air bleeder screws from the RL and RR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the brake system.
13) Bleed air from the pressure gauges and the RL and RR caliper bodies.
14) Perform ABS sequence control.
<Ref. to ABS-10, ABS Sequence Control.>
15) When the hydraulic unit begins to work, first the RR side performs decompression, holding and compression, and then the RL side performs decompression, holding and compression.
16) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the specification. Depress the brake pedal and check that the kick-back is normal, and tightness is normal.
17) Remove the pressure gauge from the RL and RR caliper bodies.
18) Connect the air bleeder screws of the RL and RR caliper bodies.
19) Bleed air from the brake system.

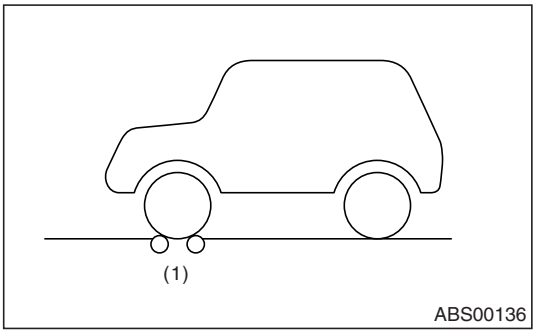
2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

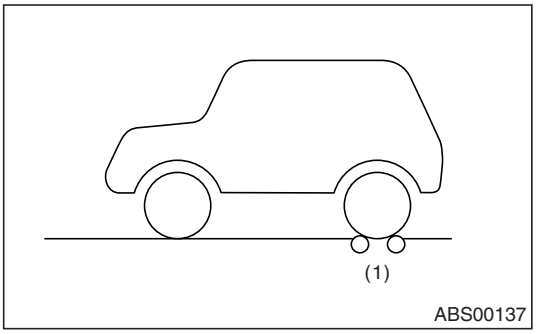
1) Install the spare fuse to the FWD connector located in the main fuse box for the model without AT VTD.



(1) Main fuse box
(2) FWD connector

2) Since the MT model and AT VTD model cannot cut off the AWD circuit forcibly, set the wheels other than measured one onto free rollers.
3) Prepare for the ABS sequence control.
<Ref. to ABS-10, ABS Sequence Control.>
4) Set the front wheels or rear wheels on the brake tester and set the select lever to “neutral”.





(1) Brake tester

5) Operate the brake tester.
6) Perform ABS sequence control.
<Ref. to ABS-10, ABS Sequence Control.>
7) When the hydraulic unit begins to work, check the following working sequence.
(1) The FL wheel performs decompression, holding and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, holding and compression in sequence, and subsequently the RL wheel repeats the cycle.
8) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets the specification.

	Front wheel	Rear wheel
Initial value	1,000 N (102 kgf, 225 lbf)	1,000 N (102 kgf, 225 lbf)
When decompressed	500 N (51 kgf, 112 lbf) or less	500 N (51 kgf, 112 lbf) or less
When compressed	1,000 N (102 kgf, 225 lbf) or more	1,000 N (102 kgf, 225 lbf) or more

9) After the inspection, depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

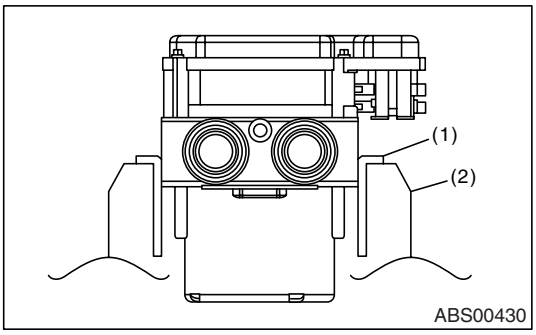
D: REPLACEMENT

CAUTION:
• Because the seal of ABSCM cannot be replaced, do not pull or peel it with lifting up.
• Because the screw part of H/U deteriorates in every replacement procedure, do not perform the replacement more than five times on it. When the malfunction is found though the replacement that performed is less than five times, replace the H/U body.
• Use new screws for installation of ABSCM.
• When the sealing surface of ABSCM or H/U is dirty or damaged and it cannot be removed or repaired, replace it with new one.

1) Remove the ABSCM&H/U. <Ref. to ABS-6, REMOVAL, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2) To prevent entering foreign matter and brake fluid leakage, plug the oil pressure port of ABSCM&H/U using screw plug and etc.

3) Set the pump motor part of removed ABSCM&H/U faces down in the vise.

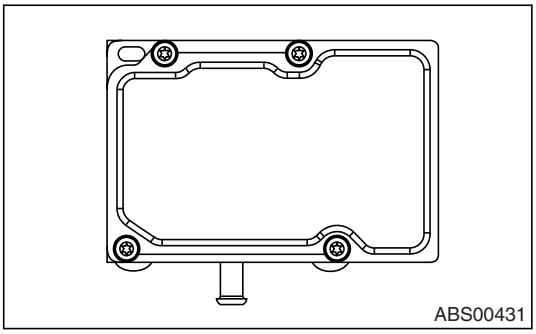
NOTE:
Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate or cloth between the part and vice.



(1) Aluminum plate or etc.
(2) Vise

4) Using TORX® BIT E5, remove the four screws of ABSCM.

NOTE:
Always use new screws.



5) Slowly remove the ABSCM upward from H/U.

NOTE:
To prevent damaging of coil part, remove the ABSCM straightly from H/U.

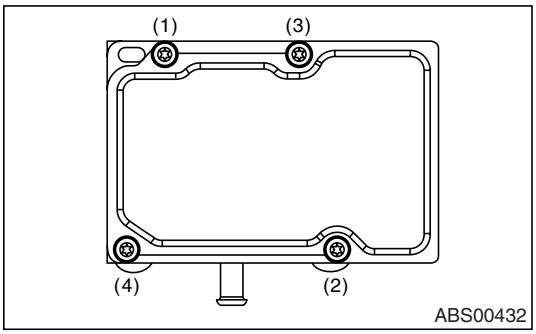
6) Ensure there are no dirt or damage on sealing surface of H/U.

CAUTION:
• Do not clean the ABSCM & H/U with applying compressed air.
• Do not repair the damages of H/U sealing surface using file or metal scraper. To remove the sealing, use resin scraper. Do not use the chemical materials (thinner and etc.).

7) Position the coil of new ABSCM to align H/U valve.
8) To prevent deforming of ABSCM housing cover, hold the corner of ABSCM and install it to the H/U without tilting.
9) Using TORX® BIT E5, tighten the screws stepwise in the order of (1) through (4).

CAUTION:
Always use new screws.

Tightening torque:
1.5 N·m (0.15 kgf-m, 1.1 ft-lb)



10) Check that there is no foreign matter in aligning part between ABSCM and H/U.
11) Using TORX® BIT E5, tighten the screws stepwise in the order of (1) through (4) again.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

12) Check that there is no clearance in aligning part between ABSCM and H/U.
13) Install the ABSCM&H/U to vehicle.

3. ABS Sequence Control

A: OPERATION

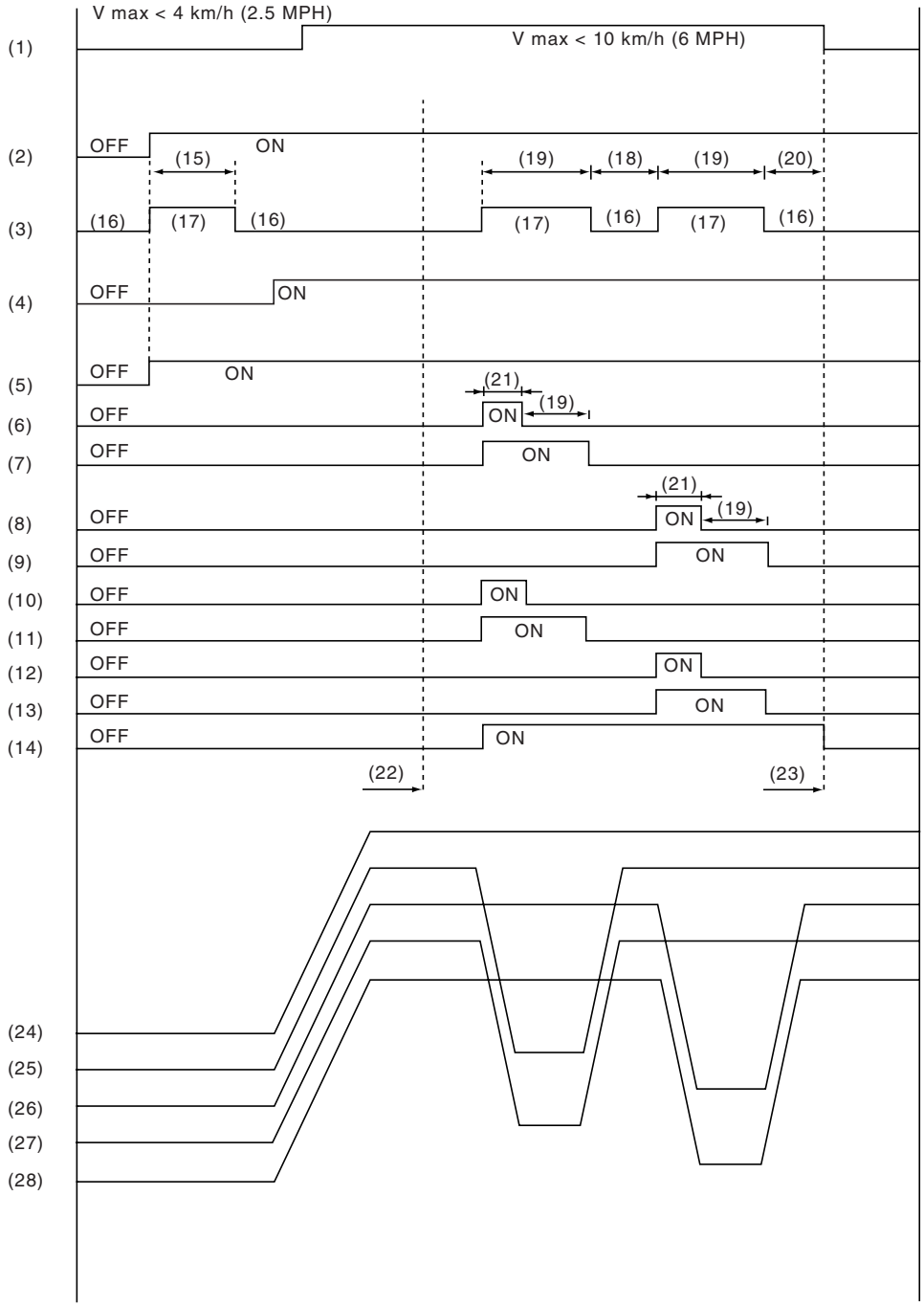
1) While the ABS sequence control is performed, the operation of the hydraulic unit can be checked using the brake tester or pressure gauge after the hydraulic unit solenoid valve operation.
2) ABS sequence control can be started by Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:
In the event of any trouble, the ABS sequence control is not operated.

1) Connect the Subaru Select Monitor to data link connector under the driver's side instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Set the Subaru Select Monitor power switch to ON.
4) Set the Subaru Select Monitor to "Brake Control" mode.
5) When the "Function check sequence" is selected, the "ABS sequence control" will start.
6) Execute the following operations when the message "Press the brake pedal so that the brake pedal force is between 100 and 150 kgf" is displayed.
   (1) When the brake tester is used, press brake pedal pad with a force of 1,000 N (102 kgf, 225 lbf).
   (2) When using the pressure gauge, press the brake pedal so as to make the pressure gauge indicate 3,500 kPa (36 kgf/cm^2, 511 psi).
7) "Press the [YES] key" will be displayed. Press the [YES] key.
8) The brake line being operated is displayed on the Subaru Select Monitor.

2. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00561

(1) All wheel speed
(2) Ignition key
(3) ABS warning light
(4) Stop light switch
(5) Valve relay
(6) FL decompression valve
(7) FL compression valve
(8) FR decompression valve
(9) FR compression valve
(10) RR decompression valve
(11) RR compression valve
(12) RL decompression valve
(13) RL compression valve
(14) Pump motor
(15) 1.5 seconds
(16) Light OFF
(17) Light ON
(18) 1.0 second
(19) 1.4 seconds
(20) 0.6 second
(21) 0.4 second
(22) Point A
(23) Reset
(24) Master cylinder pressure
(25) FL wheel cylinder pressure
(26) FR wheel cylinder pressure
(27) RR wheel cylinder pressure
(28) RL wheel cylinder pressure

NOTE:
The control operation starts from point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

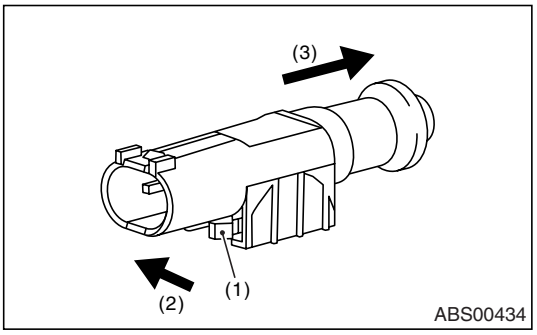
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is released during ABS sequence control and the stop light switch goes OFF.
3) After completion of ABS sequence control.
4) When malfunction is detected.

4. Front ABS Wheel Speed Sensor

A: REMOVAL

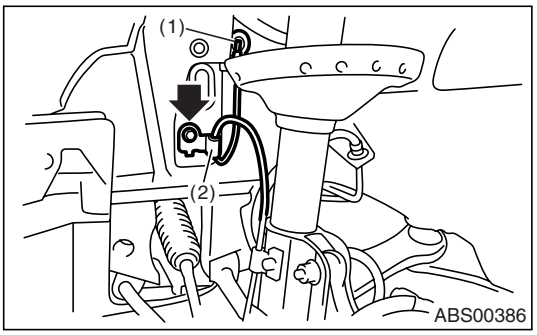
1) Disconnect the ground cable from battery.
2) Disconnect the ABS wheel speed sensor connector located next to the front strut mounting house in engine compartment.
3) Separate the sensor connector and vehicle securing clip. Apply force in the direction of (2) to unlock the pawl, and then slide the connector in the direction of (3). Pull out the connector to the tire side from grommet hole.

CAUTION:
Clip would break when removing the clip without separating sensor connector and clip.



(1) Pawl

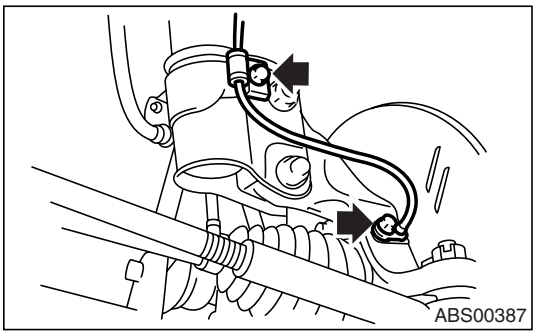
4) Remove the sensor harness bracket.



(1) To front ABS wheel speed sensor connector
(2) Sensor harness bracket

5) Remove the bolts which secure sensor harness to front strut.
6) Remove the front ABS wheel speed sensor from housing.

CAUTION:
• Be careful not to damage the sensor portion.
• Do not apply excessive force to the sensor harness.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Sensor:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Bracket:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

CAUTION:
Be careful not to damage the sensor portion.

NOTE:
• Check the identification (mark) on the harness to make sure that no warp exists. (RH: K1 (White), LH: K2 (Yellow))
• Check if the harness is not pulled and does not come in contact with the suspension or body during steering wheel effort.

C: INSPECTION

1. INSPECTION WITH SUBARU SELECT MONITOR

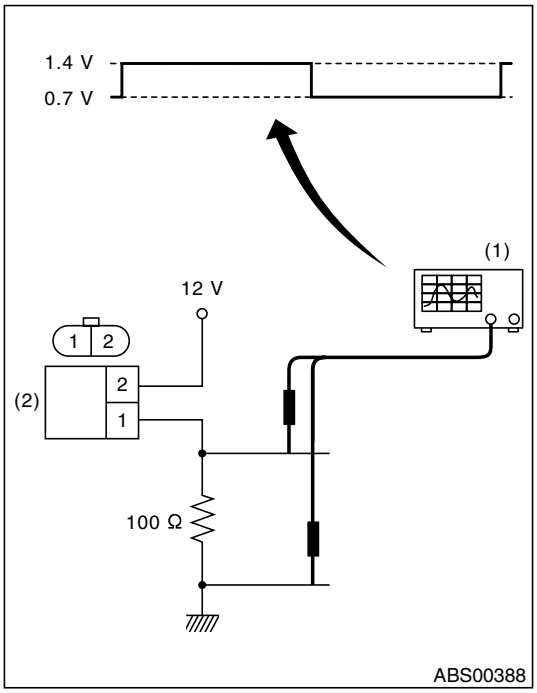
1) Connect the Subaru Select Monitor to data link connector.
2) Select {Current Data Display & Save}. Check if the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position.
3) If the speed indicated on the display does not change, check the ABS wheel speed sensor. <Ref. to ABS-13, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>

2. ABS WHEEL SPEED SENSOR

1) Check the pole piece of the ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace the ABS wheel speed sensor.

2) Charge a 12 V power supply to the No. 2 terminal of sensor connector as shown in the figure, and then install the resistance to No. 1 terminal. Rotate the wheel about 2.75 km/h (2 MPH) or equivalent, measure the voltage using oscilloscope.

Specification of output voltage:
0.7 — 1.4 V



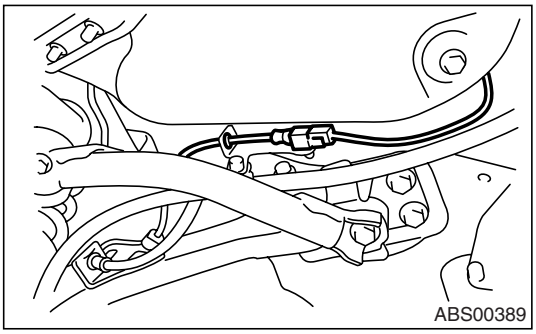
(1) Oscilloscope
(2) ABS wheel speed sensor

NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new one.

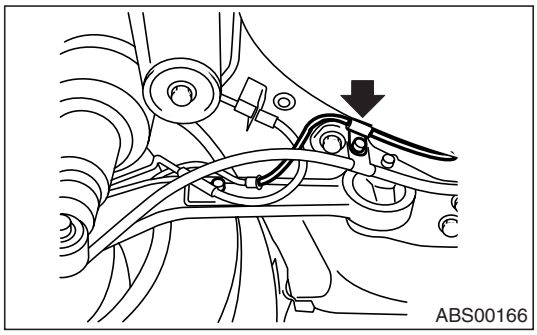
5. Rear ABS Wheel Speed Sensor

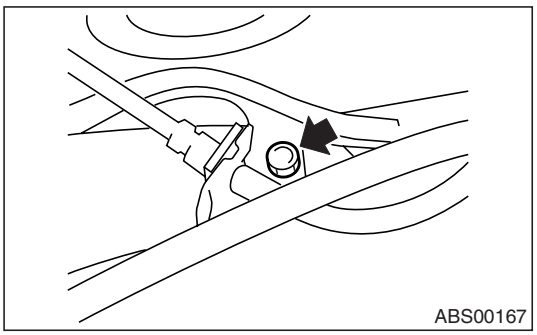
A: REMOVAL

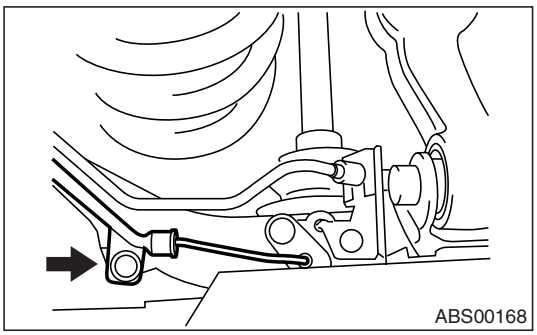
1) Disconnect the ground cable from battery.
2) Disconnect the connector from rear ABS wheel speed sensor.


ABS00389

3) Remove the sensor harness bracket from rear arm.

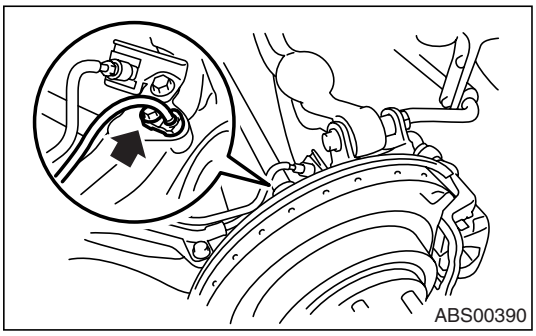

ABS00166


ABS00167


ABS00168

4) Remove the rear ABS wheel speed sensor from rear arm.

CAUTION:
• Be careful not to damage the sensor portion.
• Do not apply excessive force to the sensor harness.


ABS00390

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be careful not to damage the sensor portion.

Tightening torque:
Sensor:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Bracket:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

NOTE:
Check the identification (mark) on the harness to make sure that no warp exists. (RH:K5(White), LH:K6(Yellow))

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

<Ref. to ABS-13, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>

6. Front Magnetic Encoder

A: REMOVAL

Refer to “Front Hub Bearing” for removal, because the front magnetic encoder is integrated with front hub bearing.
<Ref. to DS-17, REMOVAL, Front Hub Unit Bearing.>

B: INSTALLATION

Refer to “Front Hub Bearing” for installation, because the front magnetic encoder is integrated with front hub bearing.
<Ref. to DS-17, INSTALLATION, Front Hub Unit Bearing.>

C: INSPECTION

Visually check the magnetic encoder for any damage. If necessary, replace with a new hub unit bearing.

NOTE:
Replace the hub unit bearing with a new one if there is any defect found on the magnetic encoder, since the magnetic encoder is integrated with hub unit bearing assembly.

7. Rear Magnetic Encoder

A: REMOVAL

Refer to “Rear Hub Unit Bearing” for removal, because the rear magnetic encoder is integrated with rear hub unit bearing.
<Ref. to DS-19, REMOVAL, Rear Hub Unit Bearing.>

B: INSTALLATION

Refer to “Rear Hub Unit Bearing” for installation, because the rear magnetic encoder is integrated with rear hub unit bearing.
<Ref. to DS-20, INSTALLATION, Rear Hub Unit Bearing.>

C: INSPECTION

Visually check the magnetic encoder for any damage. If necessary, replace with a new hub unit bearing.

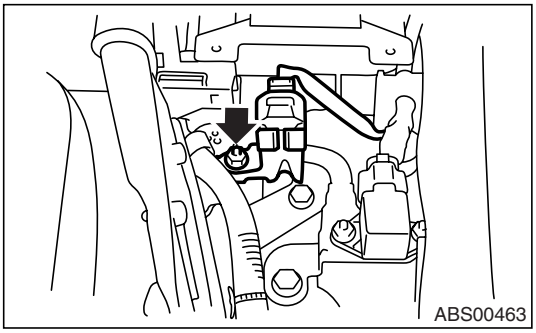
NOTE:
Replace the hub unit bearing with a new one if there is any defect found on the magnetic encoder, since the magnetic encoder is integrated with hub unit bearing assembly.

8. G Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console box.
<Ref. to EI-53, REMOVAL, Console Box.>
3) Disconnect the connector from G sensor.
4) Remove the G sensor from body.

CAUTION:
- **Do not drop or bump the G sensor.**
- **Since G sensor is a unit with the bracket, do not disassemble them.**



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not drop or bump the G sensor.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: INSPECTION

Step		Check	Yes	No
1	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Set the Subaru Select Monitor to the {Brake Control} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output value.	Is the value −1.2 — 1.2 m/s^2 when the vehicle is in horizontal position?	Go to step **2.**	Repair the harness connector between G sensor and ABSCM&H/U. Or replace G sensor.
2	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the G sensor from vehicle. (Do not disconnect connector.) 3) Read the Subaru Select Monitor display.	Is the value 8.1 — 11.2 m/s^2 when G sensor is inclined forward to 90°?	Go to step **3.**	Repair the harness connector between G sensor and ABSCM&H/U. Or replace G sensor.
3	**CHECK G SENSOR.** Read the Subaru Select Monitor display.	Is the value −8.1 — −11.2 m/s^2 when G sensor is inclined backward to 90°?	G sensor is normal.	Repair the harness connector between G sensor and ABSCM&H/U. Or replace G sensor.

ABS (DIAGNOSTICS)

ABS(diag)

		Page
1.	Basic Diagnostic Procedure	2
2.	Check List for Interview	4
3.	General Description	8
4.	Electrical Component Location	10
5.	Control Module I/O Signal	12
6.	Subaru Select Monitor	15
7.	Read Diagnostic Trouble Code (DTC)	24
8.	Inspection Mode	25
9.	Clear Memory Mode	26
10.	ABS Warning Light / Brake Warning Light Illumination Pattern	27
11.	List of Diagnostic Trouble Code (DTC)	38
12.	Diagnostic Procedure with Diagnostic Trouble Code (DTC)	41
13.	General Diagnostic Table	76

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
Remove foreign matters (dust, water, oil, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check harness for broken wires or short circuits, shake trouble spot or connector.
- Refer to “Check List for Interview”. <Ref. to ABS(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 interview checklist. <Ref. to ABS(diag)-4, Check List for Interview.> 2) Before performing diagnostics, check the component which might affect ABS problems. <Ref. to ABS(diag)-8, INSPECTION, General Description.>	Is the component that might influence the ABS problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK 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 Subaru Select Monitor power switch to ON. NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to ABS(diag)-18, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 4) Read the DTC using Subaru Selerct Monitor. <Ref. to ABS(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed on Subaru Select Monitor?	Record all DTCs and Freeze Frame Data. Go to step **4.**	Go to step **3.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostic Table”. <Ref. to ABS(diag)-76, General Diagnostic Table.> 2) Perform clear memory mode. <Ref. to ABS(diag)-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.> 4) Read the DTC. <Ref. to ABS(diag)-15, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Check the DTC does not displayed.	Does the ABS warning light go off after turning the ignition switch to ON?	Finish the diagnosis.	Check in accordance with “Diagnostic Procedure for ABS”. <Ref. to ABS(diag)-20, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

	Step	Check	Yes	No
4	**PERFORM THE DIAGNOSIS.** 1) Refer to the “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, LIST, List of Diagnostic Trouble Code (DTC).> 2) Fix the wrong part. 3) Perform clear memory mode. <Ref. to ABS(diag)-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.> 5) Read the DTC. <Ref. to ABS(diag)-15, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Repeat step 1 to 4 until DTC is not shown.	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on • When / how long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after Engine starting, engine is running) ❑ ON (after Engine starting, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Parts name: • Operating condition:		

2. STATE OF BRAKE WARNING LIGHT

Brake warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on ❑ When pulling the parking brake lever up. ❑ When releasing the parking brake lever down. • When / how long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after Engine starting, engine is running) ❑ ON (after Engine starting, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Parts name: • Operating condition:		

Check List for Interview

3. SYMPTOMS

<table>
<tr><td rowspan="9">ABS operating condition</td><td colspan="3">❑ Does not move.</td></tr>
<tr><td rowspan="2">❑ Operates only when applying an abrupt brake.</td><td rowspan="2">Vehicle speed:</td><td>km/h</td></tr>
<tr><td>MPH</td></tr>
<tr><td colspan="3">• How to step on brake pedal:</td></tr>
<tr><td>a) Operating time:</td><td colspan="2">Sec.</td></tr>
<tr><td colspan="3">b) Operating noise: ❑ Occurs. / ❑ Does not occur.</td></tr>
<tr><td>• What kind of noise?</td><td colspan="2">❑ Knocking
❑ Gong gong
❑ Bong
❑ Buzz
❑ Gong gong buzz
❑ Others:</td></tr>
<tr><td colspan="3">c) Reaction force of brake pedal</td></tr>
<tr><td></td><td colspan="2">❑ Stick
❑ Weak pedal resistance
❑ Strong pedal resistance
❑ Others:</td></tr>
<tr><td rowspan="15">Behavior of vehicle</td><td colspan="3">a) Directional stability cannot be obtained or the steering refuses to work when applying brakes:
❑ Yes / ❑ No</td></tr>
<tr><td>• When:</td><td colspan="2">❑ When turning to the right
❑ When turning to the left
❑ When spinning
❑ Others:</td></tr>
<tr><td colspan="3">b) Directional stability cannot be obtained or the steering refuses to work when accelerating:
❑ Yes / ❑ No</td></tr>
<tr><td>• When:</td><td colspan="2">❑ When turning to the right
❑ When turning to the left
❑ When spinning
❑ Others:</td></tr>
<tr><td colspan="3">c) Poor brake performance: ❑ Yes / ❑ No</td></tr>
<tr><td>• What kind:</td><td colspan="2">❑ Long braking/stopping distance
❑ Brakes lock or drag
❑ Long pedal stroke
❑ Pedal sticks.
❑ Others:</td></tr>
<tr><td colspan="3">d) Poor acceleration: ❑ Yes / ❑ No</td></tr>
<tr><td>• What kind:</td><td colspan="2">❑ Not accelerate
❑ Engine stalls.
❑ Others:</td></tr>
<tr><td colspan="3">e) Occurrence of vibration: ❑ Yes / ❑ No</td></tr>
<tr><td colspan="3">• Where
• What kind:</td></tr>
<tr><td colspan="3">f) Occurrence of noise: ❑ Yes / ❑ No</td></tr>
<tr><td colspan="3">• Where
• What kind:</td></tr>
<tr><td colspan="3">g) Other troubles occurred: ❑ Yes / ❑ No</td></tr>
<tr><td colspan="3">• What kind:</td></tr>
</table>

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others:
	b) Ambient temperature	°C (°F)
	c) Road	❑ Inner city ❑ Suburbs ❑ Highway ❑ Local street ❑ Uphill ❑ Downhill ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Others:
	d) Road surface	❑ Dried ❑ Wet ❑ Covered with fresh snow ❑ Covered with hardened snow ❑ Frozen slope ❑ Others:
Condition	a) Brakes	Deceleration: G
		❑ Intermittent / ❑ Temporary
	b) Accelerator	Acceleration: G
		❑ Intermittent / ❑ Temporary
	c) Vehicle speed	km/h | MPH
		❑ Advancing ❑ When accelerating ❑ When decelerating ❑ At low speed ❑ When turning ❑ Others:
	d) Tire inflation pressure	Front RH tire: kPa
		Front LH tire: kPa
		Rear RH tire: kPa
		Rear LH tire: kPa
	e) Degree of wear	Front RH tire:
		Front LH tire:
		Rear RH tire:
		Rear LH tire:
	f) Genuine parts are used.: ❑ Yes / ❑ No	
	g) Tire chain is attached.: ❑ Yes / ❑ No	
	h) T-type tire is used.: ❑ Yes / ❑ No	
	i) Condition of suspension alignment:	
	j) Loading state:	
	k) Repair parts are used.: ❑ Yes / ❑ No	
	• Contents:	
	l) Others:	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor and ABSCM&H/U.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor and ABSCM&H/U.

B: INSPECTION

Before performing diagnosis, check the following items which might affect ABS problems.

1. BATTERY

Measure battery voltage and check electrolyte.

Standard voltage: 12 V or more

Specific gravity: More than 1.260

2. GROUND

Check the tightening torque of ABS ground (GB-7) bolt.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

3. BRAKE FLUID

1) Check the brake fluid level.
2) Check the brake fluid for leaks.

4. HYDRAULIC UNIT

Check the hydraulic unit.
• With brake tester <Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
• Without brake tester <Ref. to ABS-7, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

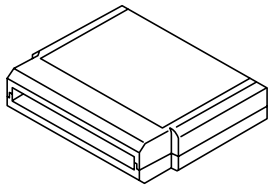
Check the brake pad and rotor.
• FRONT <Ref. to BR-18, INSPECTION, Front Brake Pad.> <Ref. to BR-19, INSPECTION, Front Disc Rotor.>
• REAR <Ref. to BR-25, INSPECTION, Rear Brake Pad.> <Ref. to BR-26, INSPECTION, Rear Disc Rotor.>

7. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOL

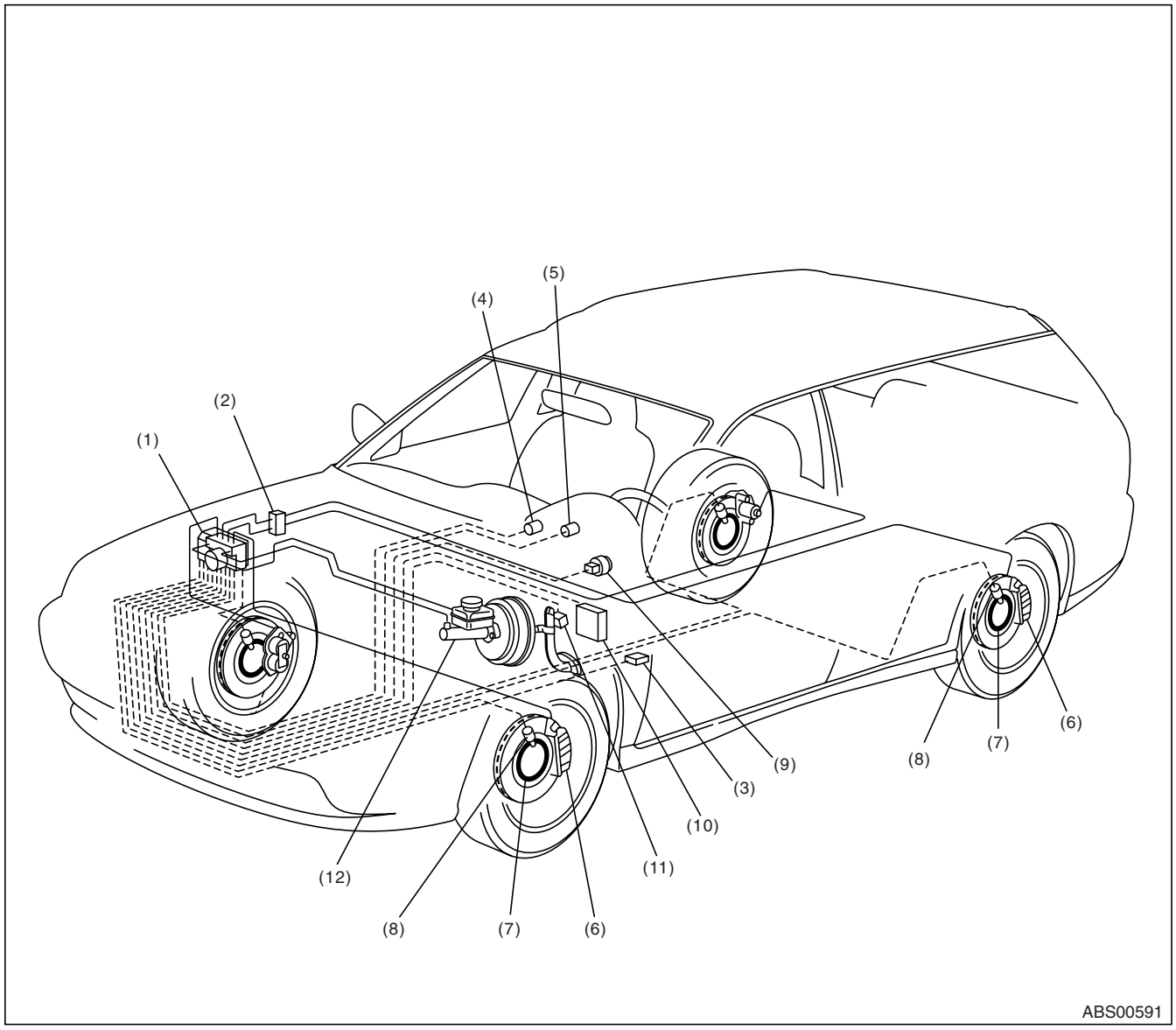
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000 (Newly adapted fool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

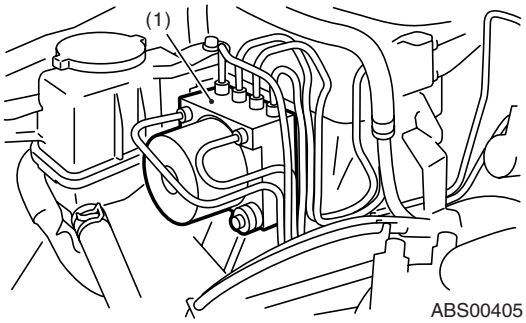
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

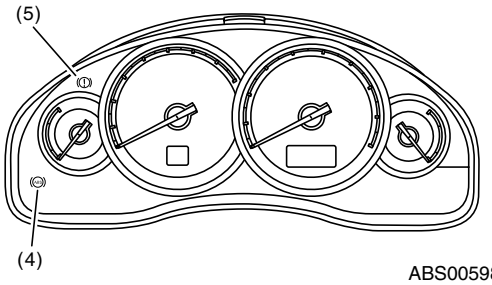
4. Electrical Component Location

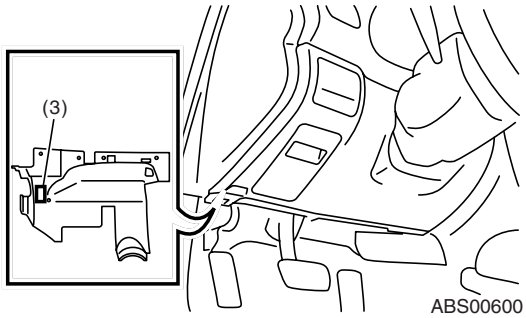
A: LOCATION

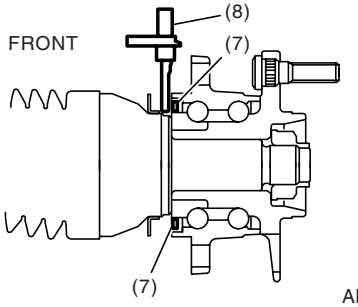


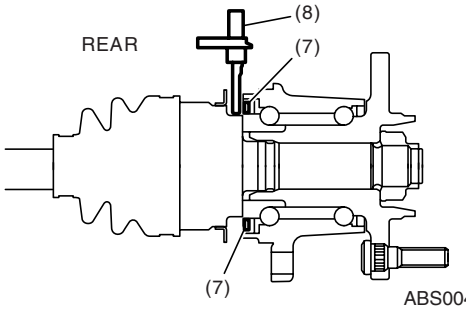
(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) Two-way connector
(3) Data link connector (For Subaru Select Monitor)
(4) ABS warning light
(5) Brake and EBD warning light
(6) Caliper body
(7) Magnetic encoder seal
(8) ABS wheel speed sensor
(9) G sensor
(10) Transmission control module (TCM) (AT model)
(11) Stop light switch
(12) Master cylinder

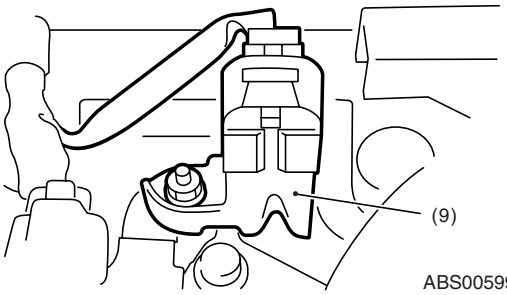

(1)
ABS00405


(5)
(4)
ABS00598


(3)
ABS00600

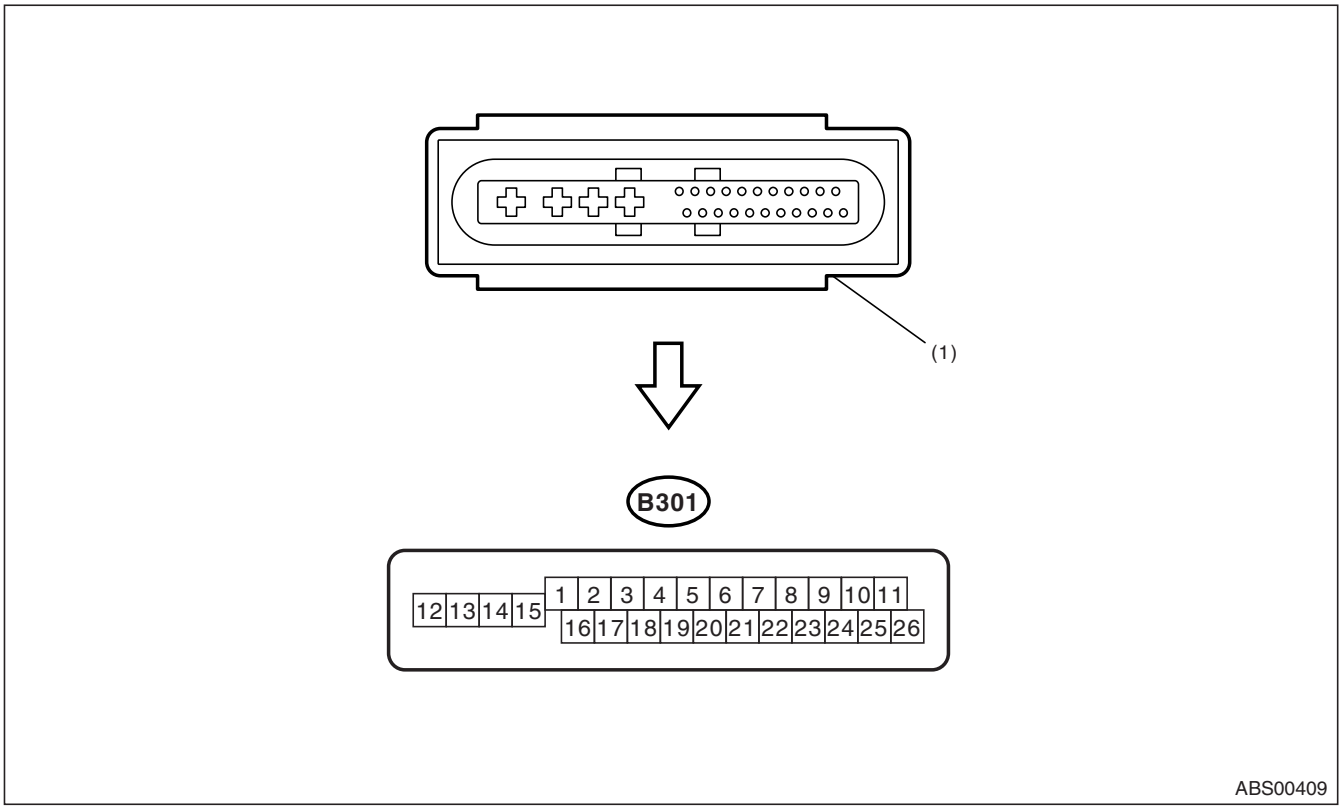

FRONT
(8)
(7)
(7)
ABS00408


REAR
(8)
(7)
(7)
ABS00407


(9)
ABS00599

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



(1) ABS control module and hydraulic control unit (ABSCM&H/U) connector

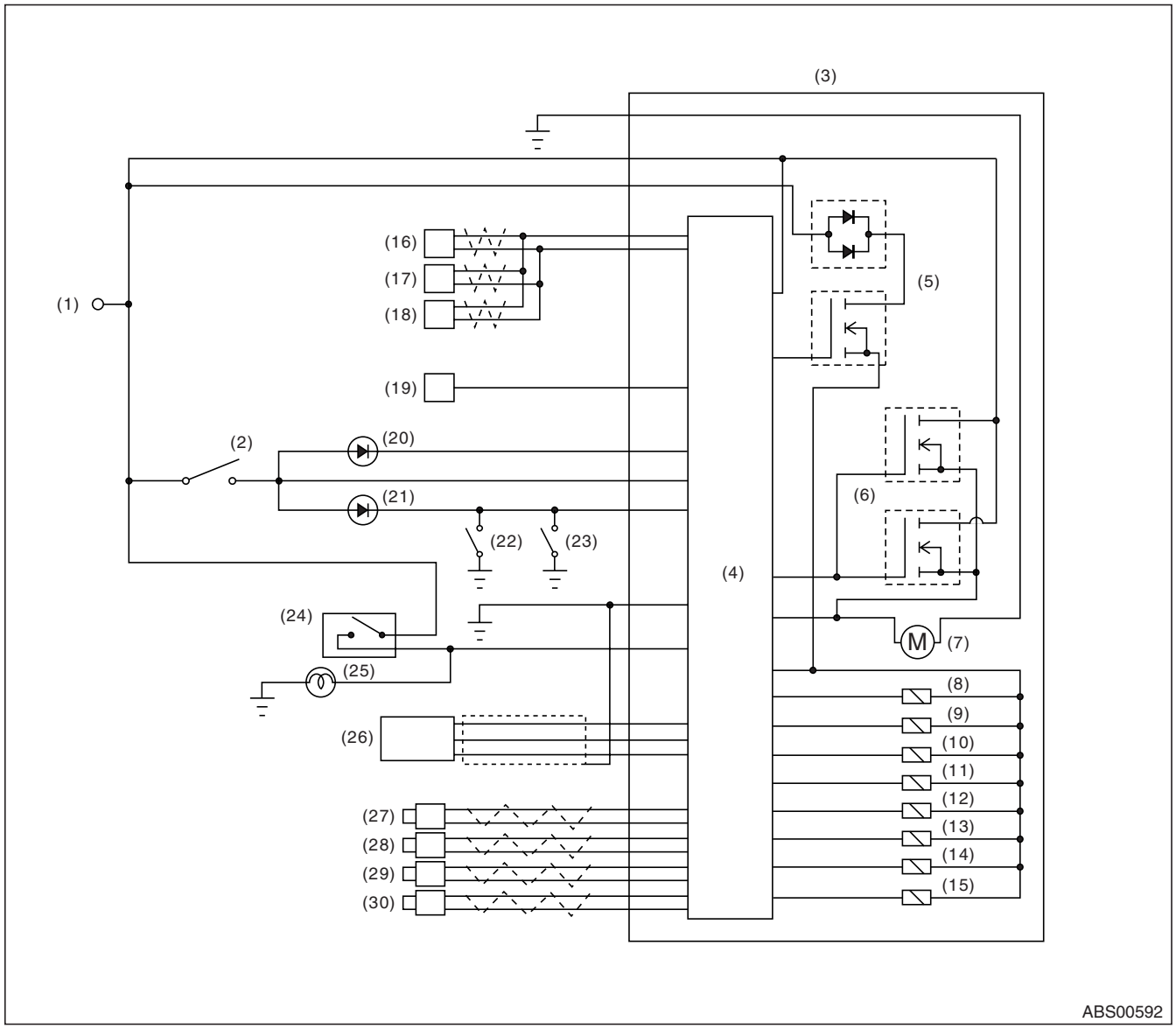
Control Module I/O Signal

NOTE:
- Terminal numbers in ABSCM&H/U connector are as shown in the figure.
- ABS warning light is illuminates when the connector is removed from ABSCM&H/U.

Description			Terminal No. (+) — (–)	Input/Output signal Measured value and measuring conditions
ABS wheel speed sensor (Wheel speed sensor)	Front LH wheel	Power supply	16 — 15	4.5 — 16.5 V
		Signal	1	5.9 — 16.8 mA: Rectangle waveform
	Front RH wheel	Power supply	5 — 15	4.5 — 16.5 V
		Signal	6	5.9 — 16.8 mA: Rectangle waveform
	Rear LH wheel	Power supply	2 — 15	4.5 — 16.5 V
		Signal	17	5.9 — 16.8 mA: Rectangle waveform
	Rear RH wheel	Power supply	3 — 15	4.5 — 16.5 V
		Signal	4	5.9 — 16.8 mA: Rectangle waveform
CAN communication line (+)			26	2.5 — 1.5 V pulse signal
CAN communication line (–)			11	3.5 — 2.5 V pulse signal
Valve relay power supply *1			14 — 15	10 — 15 V
Motor relay power supply *1			13 — 15	10 — 15 V
G sensor	Power supply		24 — 10	4.75 — 5.25 V
	Ground		10	—
	Output		21 — 10	2.1 — 2.5 V when the vehicle is on a level surface
Stop light switch *1			20 — 15	Less than 1.5 V when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.
ABS warning light			22 — 15	After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Brake warning light (EBD warning light)			8 — 15	After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Subaru Select Monitor			7 — 15	Less than 1.5 V when no data is received. 0 ←→ 12 V pulse (in communication)
Power supply *1			18 — 15	When the ignition switch is ON, 10 — 15 V.
Grounding line			15	—
Vehicle speed output signal			23 — 15	0 ←→ 12 V pulse

*1: Measure the I/O signal voltage after disconnecting the connector from the ABSCM&H/U terminal.

B: WIRING DIAGRAM



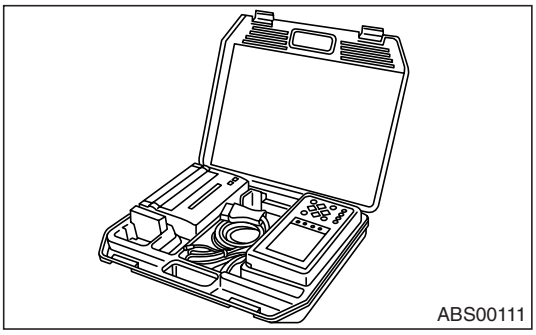
(1) Battery
(2) Ignition switch
(3) ABS control module and hydraulic control unit (ABSCM&H/U)
(4) ABS control module
(5) Valve relay
(6) Motor relay
(7) Motor
(8) Front inlet solenoid valve LH
(9) Front outlet solenoid valve LH
(10) Front inlet solenoid valve RH
(11) Front outlet solenoid valve RH
(12) Rear inlet solenoid valve LH
(13) Rear outlet solenoid valve LH
(14) Rear inlet solenoid valve RH
(15) Rear outlet solenoid valve RH
(16) Body integrated module
(17) Engine control module (ECM)
(18) Transmission control module (TCM)
(19) Data link connector
(20) ABS warning light
(21) Brake warning light
(22) Parking brake switch
(23) Brake fluid level switch
(24) Stop light switch
(25) Stop light
(26) G sensor
(27) Front ABS wheel speed sensor LH
(28) Front ABS wheel speed sensor RH
(29) Rear ABS wheel speed sensor LH
(30) Rear ABS wheel speed sensor RH

6. Subaru Select Monitor

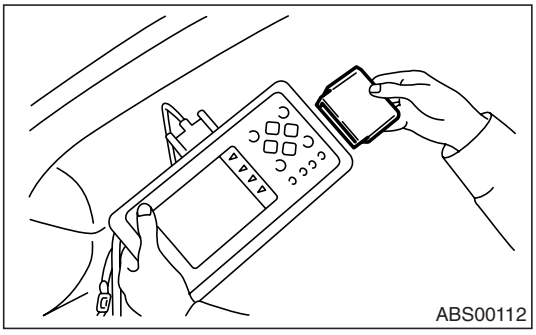
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit. <Ref. to ABS(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>

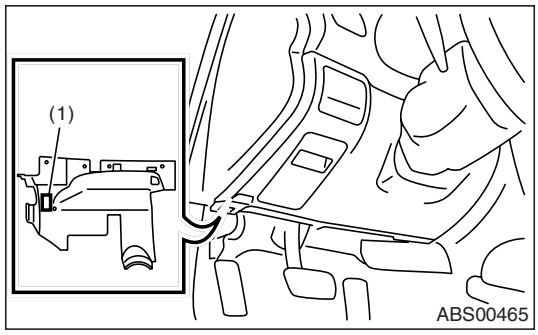


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to ABS(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).

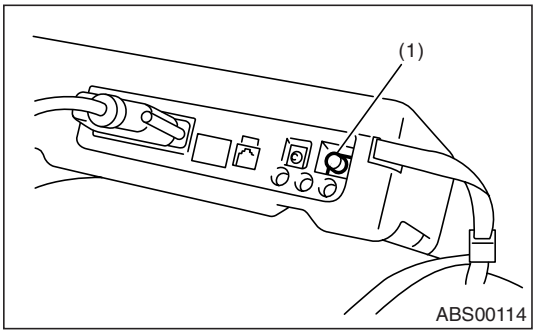


(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF) and turn the Subaru Select Monitor power switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
8) Press the [YES] key after the {ABS} is displayed.
9) On the «ABS Diagnosis» display screen, select the {DTC Display} and press the [YES] key.

NOTE:
• For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTCs, refer to the "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>
• DTCs are displayed up to three in detected order.
• If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) on the occurrence of a problem, the DTC which is suffixed with a question mark "?" appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

10) If ABS and Subaru Select Monitor cannot communicate, check the communication circuit. <Ref. to ABS(diag)-18, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

11) When DTC is not displayed, check the meter circuit or CAN communication circuit. <Ref. to ABS(diag)-20, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

Display	Contents to be monitored
Current	Indicate the latest DTC on the Subaru Select Monitor display.
Old	Indicate the latest DTC in previous trouble on the Subaru Select Monitor display.
Older	Indicate the latest DTC in second previous trouble on the Subaru Select Monitor display.
Before 3	Indicate the latest DTC in third previous trouble on the Subaru Select Monitor display.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
3) Press the [YES] key after the {ABS} is displayed.
4) On the «Brake Control Diagnosis» screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» screen, select the data display style and press the [YES] key.
6) Using a scroll key, move the display screen up or down until necessary data is shown.

- A list of the support data is shown in the following table.

Display	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h or MPH
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h or MPH
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h or MPH
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h or MPH
BLS Signal	Brake ON/OFF is displayed.	ON or OFF
G Sensor	Vehicle acceleration detected by analog G sensor is displayed.	m/s (m/s^2)
Valve Relay Signal	Valve relay operation signal is displayed.	ON or OFF
ABS Warning Light	ON operation of the ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of the EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Motor relay monitor voltage is displayed.	V
IG power supply voltage	Voltage supplied to ABSCM&H/U is displayed.	V
ABS Control Flag	ABS control condition is displayed.	ON or OFF
ABS OK B Signal	ABS system normal/abnormal is displayed.	OK or NG

NOTE:
For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
3) Press the [YES] key after the {ABS} is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.

Display	Contents to be monitored
Clear memory?	Function of clearing DTC.

5) When “Done” and “Turn ignition switch OFF” are shown on the display screen, turn the Subaru Select Monitor power switch and ignition switch to OFF.

NOTE:
For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. ABS SEQUENCE CONTROL

Display	Contents to be monitored	Index No.
ABS sequence control	Operate the valve and pump motor continuously to perform the ABS sequence control.	<Ref. to ABS-10, ABS Sequence Control.>

5. FREEZE FRAME DATA

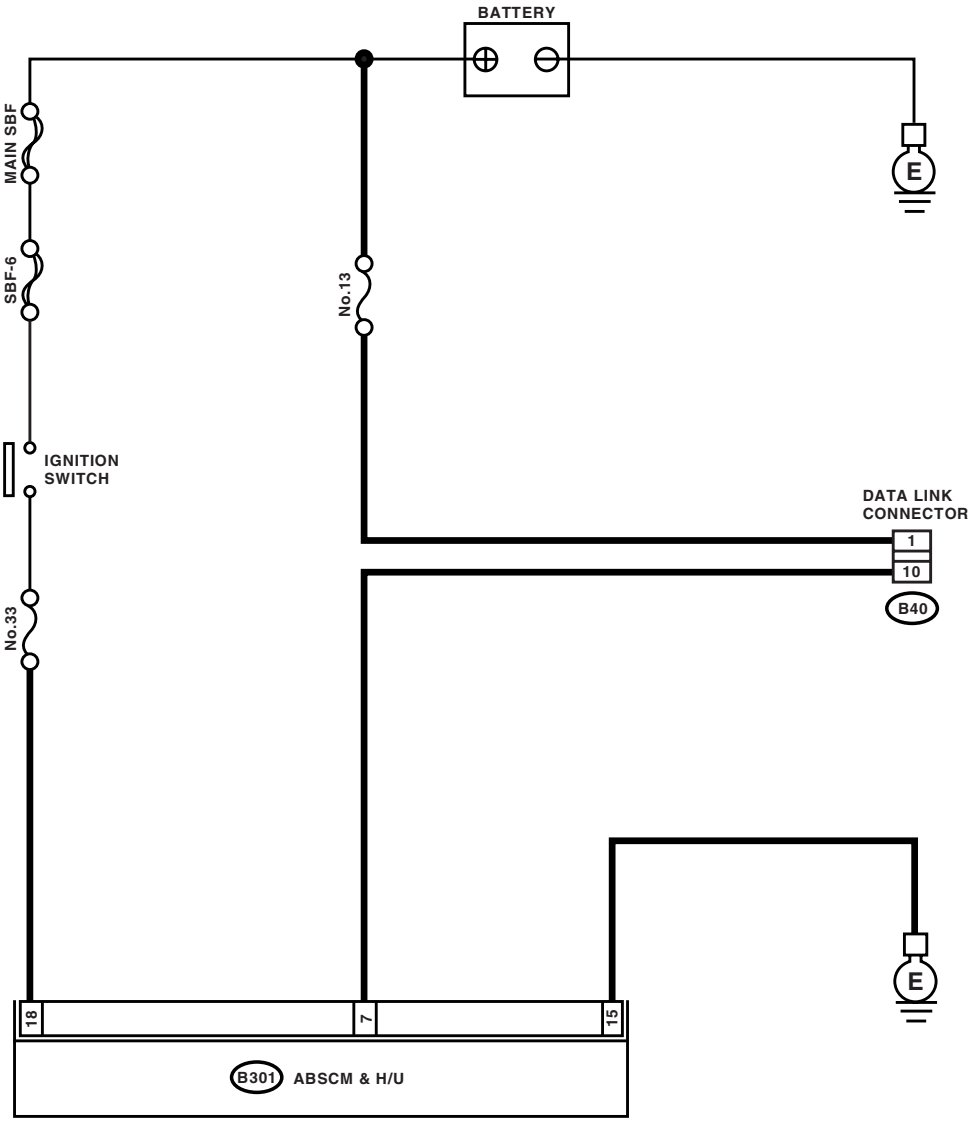
NOTE:
• Data stored at the time of trouble occurrence is shown on display.
• Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
• Freeze frame data will be memorized up to three.
• If a Freeze Frame Data is not properly stored in memory (due to a drop in ABS control module power supply, etc.), the DTC which is suffixed with a question mark “?” appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

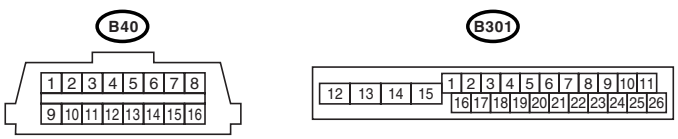
Display	Contents to be monitored
FR Wheel	Wheel speed detected by the Front ABS wheel speed sensor RH is displayed in km/h or MPH.
FL Wheel	Wheel speed detected by the Front ABS wheel speed sensor LH is displayed in km/h or MPH.
RR Wheel	Wheel speed detected by the Rear ABS wheel speed sensor RH is displayed in km/h or MPH.
RL Wheel	Wheel speed detected by the Rear ABS wheel speed sensor LH is displayed in km/h or MPH.
IG power supply voltage	Voltage supplied (V) to ABSCM&H/U is displayed.
G Sensor	Vehicle acceleration detected by analog G sensor is displayed.
Motor relay monitor	Motor relay condition is displayed.
BLS Signal	Brake ON/OFF is displayed.
Vehicle speed	Vehicle speed calculated by ABS control module is displayed.
ABS Control Flag	ABS control condition is displayed.
Power Supply Failure	Whether abnormal voltage occurred or not is displayed during malfunction.

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Communication is impossible between ABS and Subaru Select Monitor.
WIRING DIAGRAM:





ABS00621

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Does the ignition switch turn to ON?	Go to step **2.**	Turn the ignition switch to ON, and select ABS mode using Subaru Select Monitor.
2	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage more than 11 V?	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 SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using Subaru Select Monitor, check whether communication to other system can be executed normally.	Is the system name and model year displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **5.**
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name and model year displayed on Subaru Select Monitor?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect ABSCM&H/U, ECM and TCM. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR ABSCM&H/U.** 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **8.**	Repair the harness and connector between each control module and data link connector.
8	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR.** Measure the resistance between ABSCM&H/U connector and data link connector. ***Connector & terminal*** ***(B301) No. 7 — (B40) No. 10:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness and connector between ABSCM&H/U and data link connector.
9	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn the ignition switch to OFF.	Is the ABSCM&H/U connector inserted into ABSCM&H/U until it is locked by clamps?	Go to step **10.**	Insert ABSCM&H/U connector into ABSCM&H/U.
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **11.**	Repair the open circuit in harness between ABSCM&H/U and battery.

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance of harness between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12.**	Repair the open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2. WITHOUT DTC

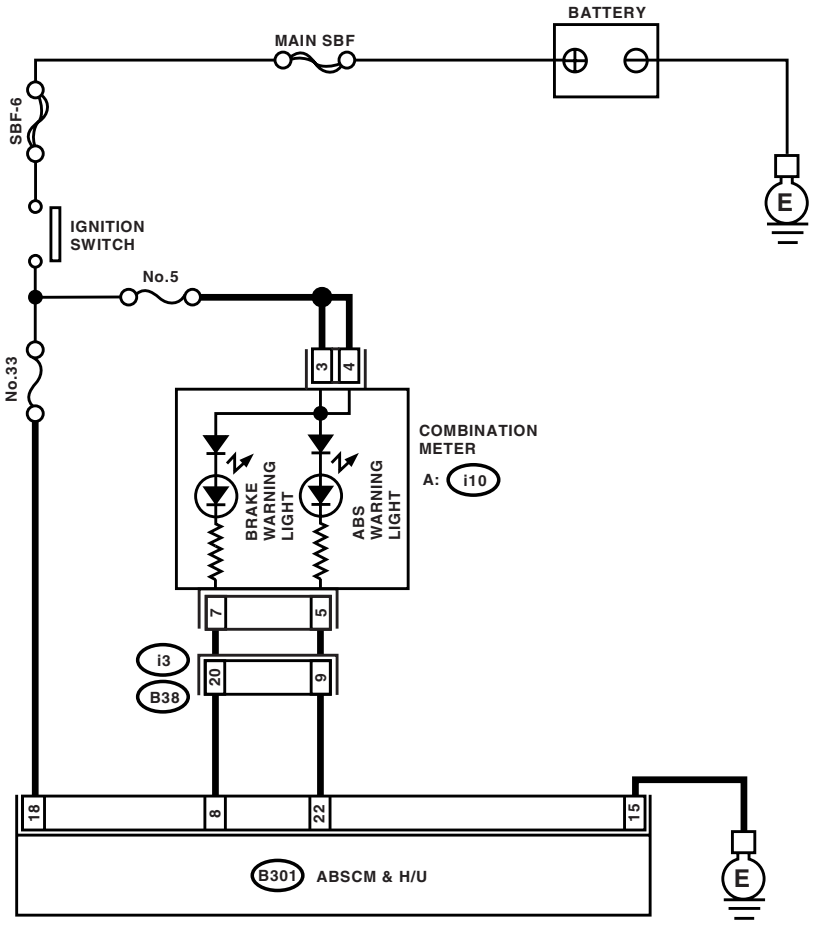
DETECTING CONDITION:
- Defective combination meter
- Open in harness

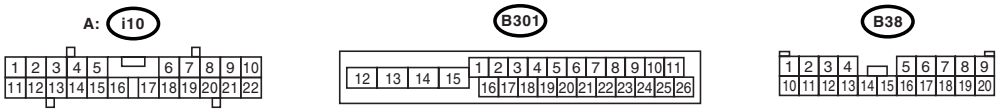
TROUBLE SYMPTOM:
- ABS warning light does not go off.
- “NO TROUBLE CODE” will be displayed on the Subaru Select Monitor.

NOTE:
When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in normal condition.

WIRING DIAGRAM:

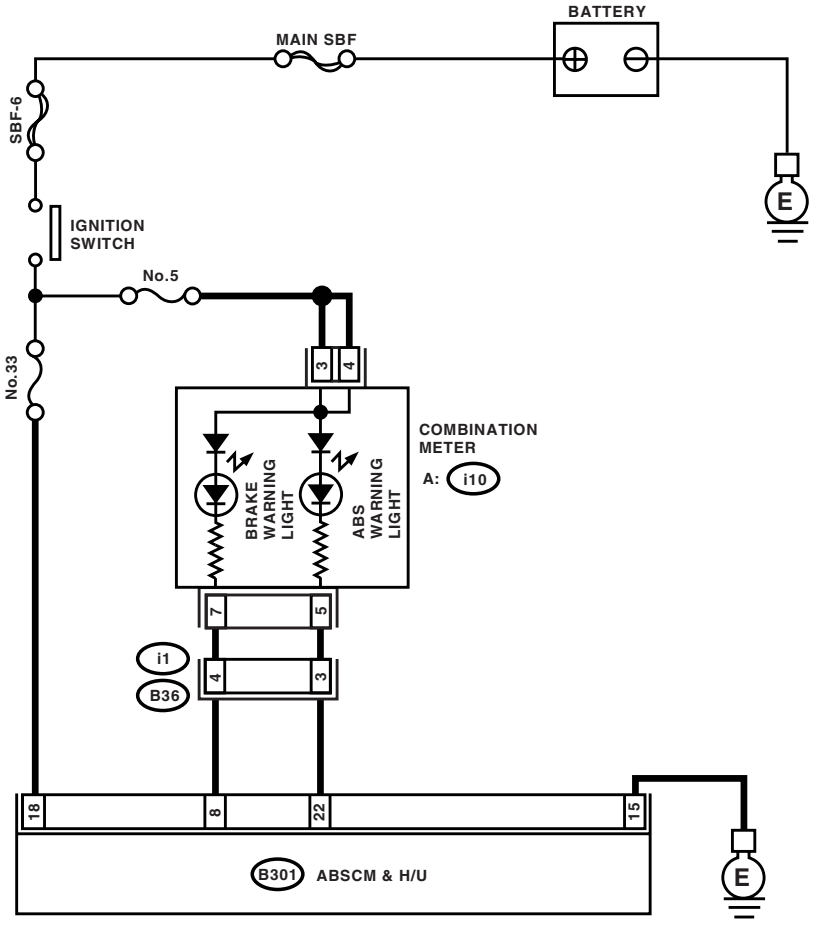
- LHD model

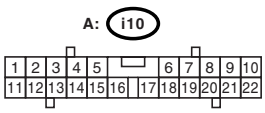


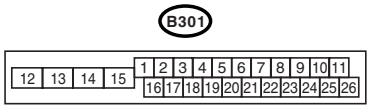


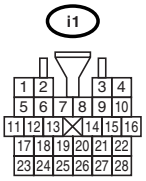
ABS00593

- RHD model









ABS00684

	Step	Check	Yes	No
1	**DATA CHECK SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the condition of “ABS warning light”.	Is “ON” indicated?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **2.**
2	**CHECK WIRING HARNESS.** Measure the resistance between ABSCM&H/U connector and combination meter connector. ***Connector & terminal*** ***(i10) No. 5 — (B301) No. 22:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the harness and connector between ABSCM&H/U and combination meter connector.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in ABSCM&H/U connector and combination meter connector?	Repair the connector.	Check the combination meter.

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details about reading of DTCs, refer to “Subaru Select Monitor”. <Ref. to ABS(diag)-15, Subaru Select Monitor.>

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

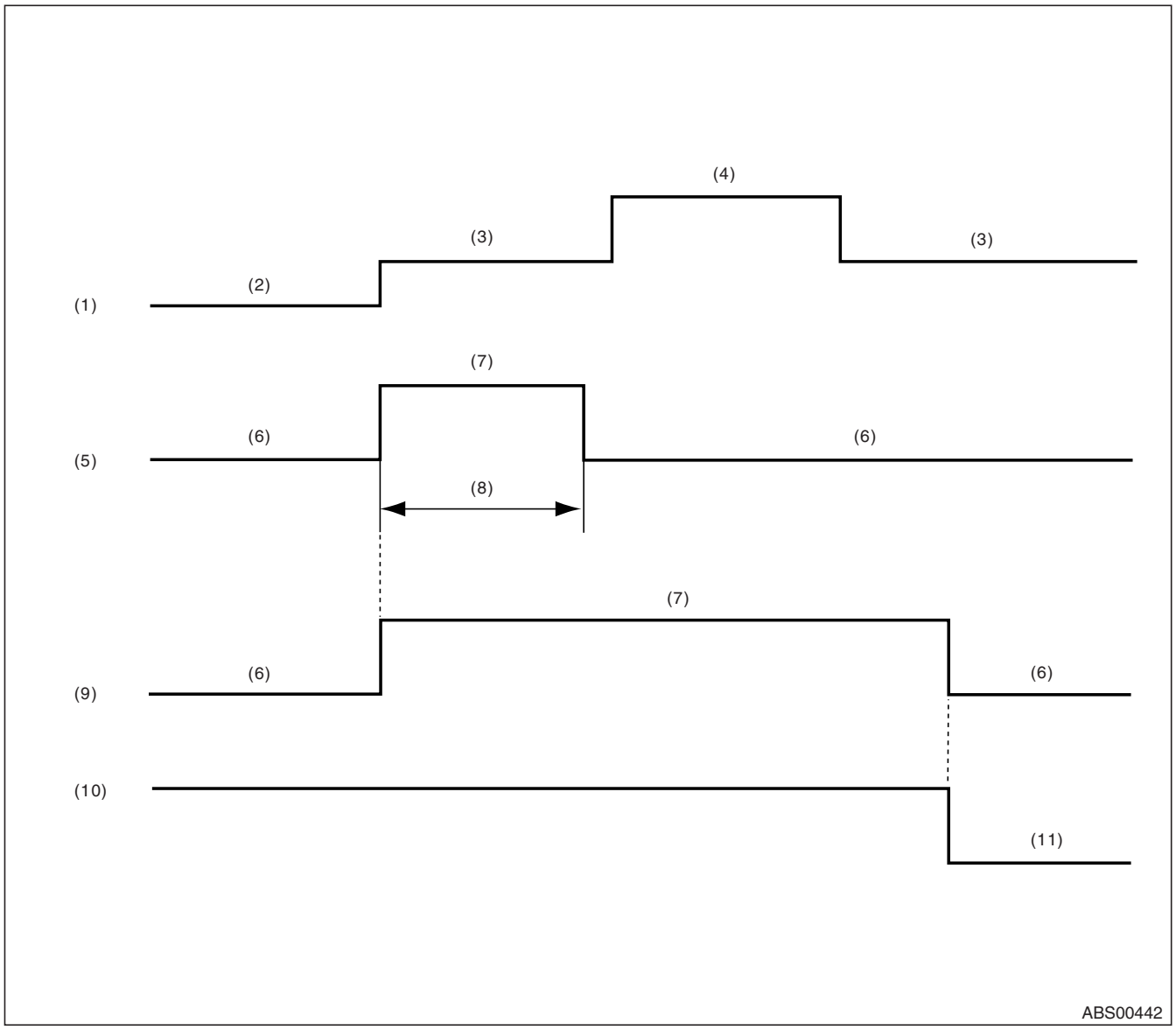
9. Clear Memory Mode

A: OPERATION

For details concerning DTC clear operation, refer to “Subaru Select Monitor”. <Ref. to ABS(diag)-15, Subaru Select Monitor.>

10.ABS Warning Light / Brake Warning Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Engine start
(5) ABS warning light
(6) Light OFF
(7) Light ON
(8) 1.5 seconds
(9) Brake warning light (EBD warning light)
(10) Parking brake
(11) Released

ABS Warning Light / Brake Warning Light Illumination Pattern

1) When the ABS warning light and brake warning light do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When ABS warning light remains constantly OFF, check the combination meter circuit. <Ref. to ABS(diag)-29, ABS WARNING LIGHT DOES NOT COME ON, ABS Warning Light / Brake Warning Light Illumination Pattern.>
3) When ABS warning light does not go off, check the combination meter circuit. <Ref. to ABS(diag)-32, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>
4) When brake warning light does not go off, check the brake warning light circuit, combination meter circuit. <Ref. to ABS(diag)-35, BRAKE WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>

NOTE:
Even though the ABS warning light does not go off after 1.5 seconds from ABS warning light illumination, the ABS function operates normally when the warning light goes off while driving at approximately 12 km/h (7 MPH). However, the ABS function does not operate while the ABS warning light is illuminated.

B: ABS WARNING LIGHT DOES NOT COME ON

DETECTING CONDITION:

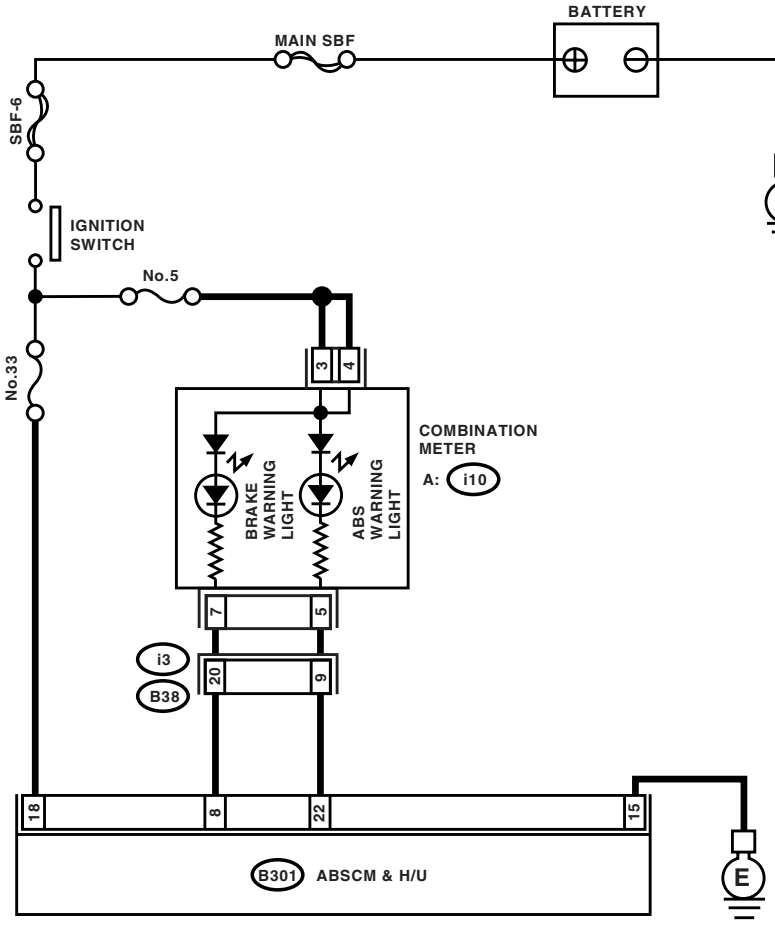
- Defective combination meter
- Defective harness

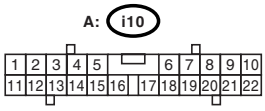
TROUBLE SYMPTOM:

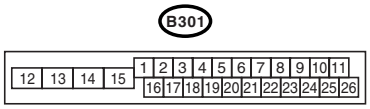
When the ignition switch is turned to ON (engine OFF), ABS warning light does not come on.

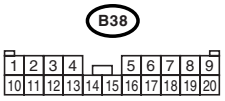
WIRING DIAGRAM:

- LHD model





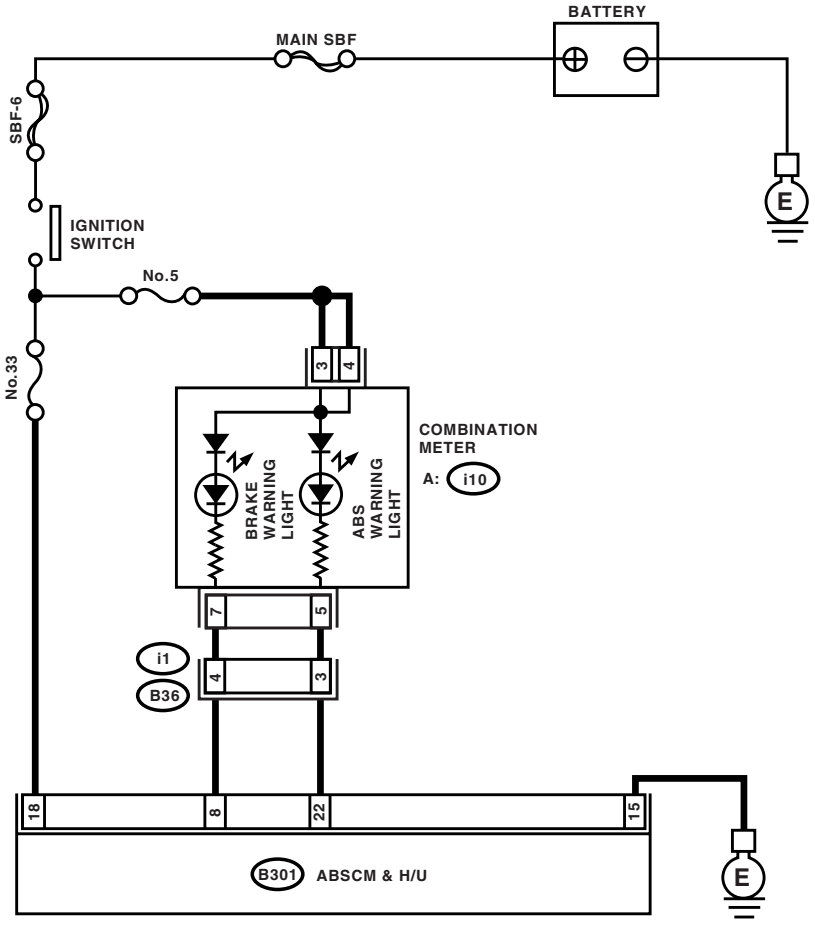


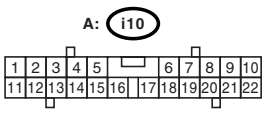


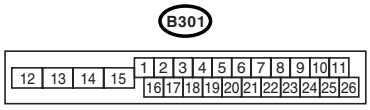
ABS00593

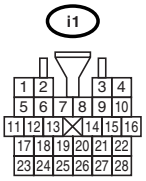
ABS Warning Light / Brake Warning Light Illumination Pattern

- RHD model









ABS00684

ABS Warning Light / Brake Warning Light Illumination Pattern

	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.
2	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3.**
3	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B301) from ABSCM&H/U. 3) Disconnect the connector (i10) from the combination meter. 4) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the harness and connector between ABSCM&H/U and combination meter.
4	**CHECK ABSCM.** 1) Connect the connector (B301) to the ABSCM&H/U. 2) Turn the ignition to ON. 3) Immediately after turning ignition switch to ON (within 1.5 seconds), measure the resistance between the combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

C: ABS WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

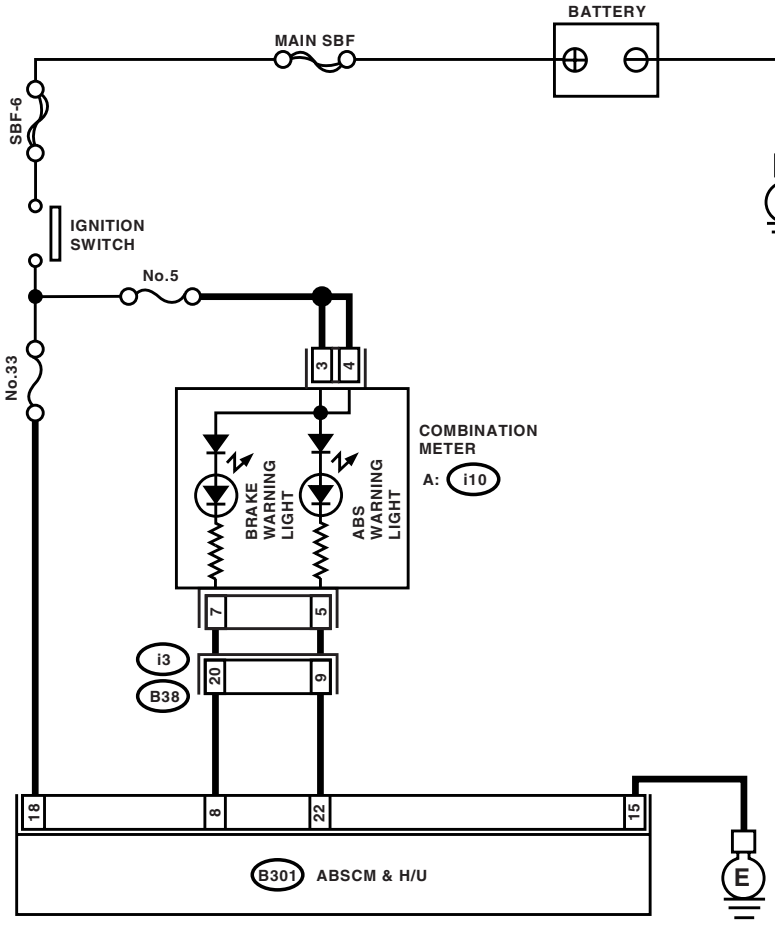
- Defective combination meter
- Open in harness

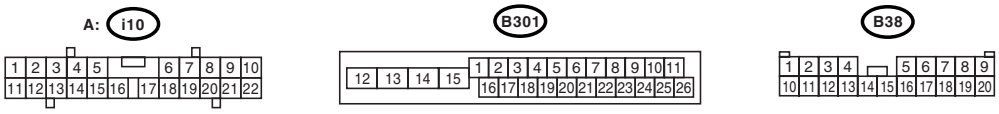
TROUBLE SYMPTOM:

When starting the engine, the ABS warning light is kept on.

WIRING DIAGRAM:

- LHD model

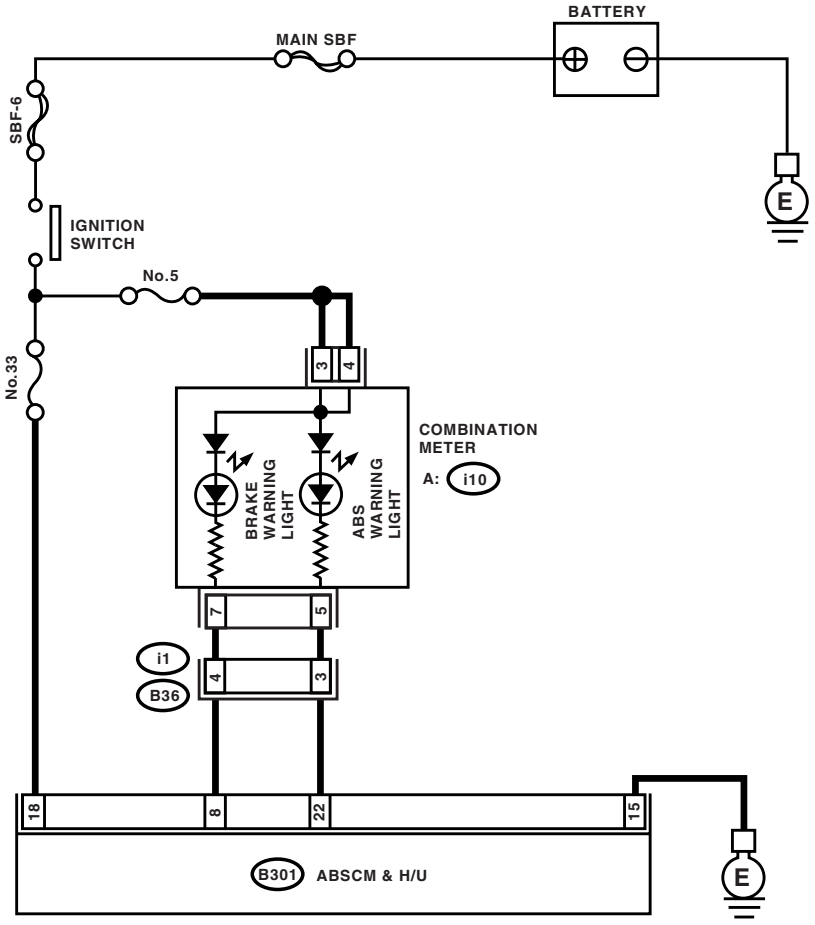


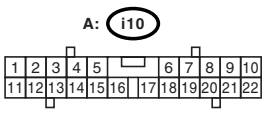


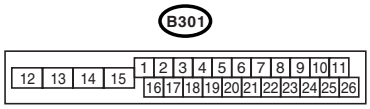
ABS00593

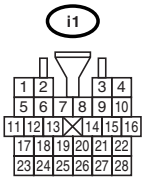
ABS Warning Light / Brake Warning Light Illumination Pattern

- RHD model









ABS00684

ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2.**
2	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B301) from ABSCM&H/U. 3) Disconnect the connector (i10) from the combination meter. 4) Measure the resistance between ABSCM&H/U connector and combination meter connector. ***Connector & terminal*** ***(B301) No. 22 — (i10) No. 5:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the harness and connector between ABSCM&H/U and combination meter.
3	**CHECK POOR CONTACT IN CONNECTOR.** Check poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM.** 1) Connect the connector (B301) to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 5 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: BRAKE WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

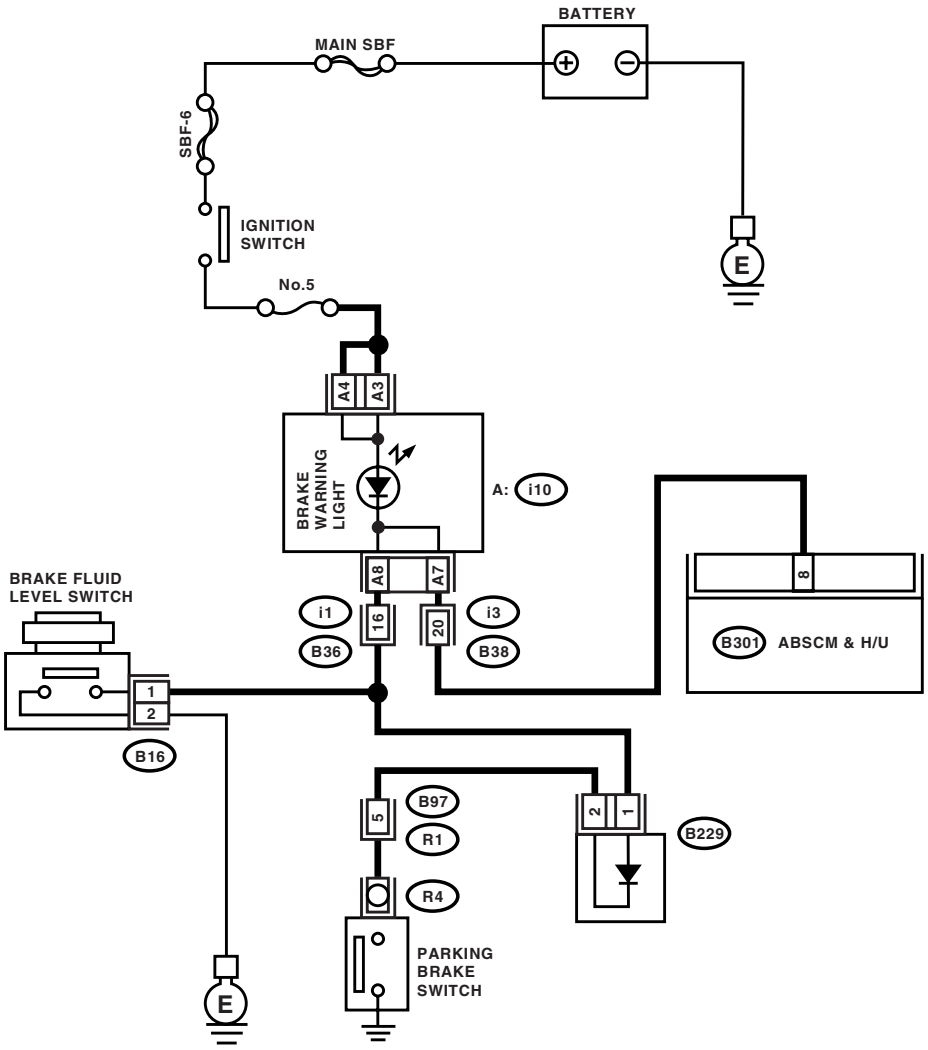
- Brake warning light circuit is shorted.
- Defective sensor/connector

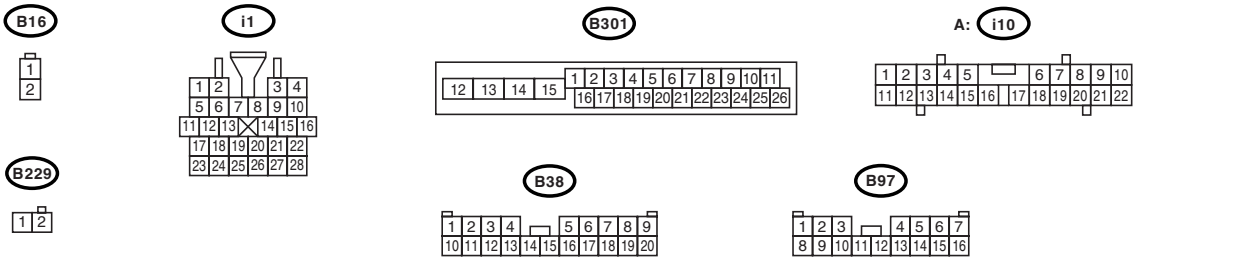
TROUBLE SYMPTOM:

After starting the engine, the brake warning light is kept on though the parking lever is released.

WIRING DIAGRAM:

- LHD model

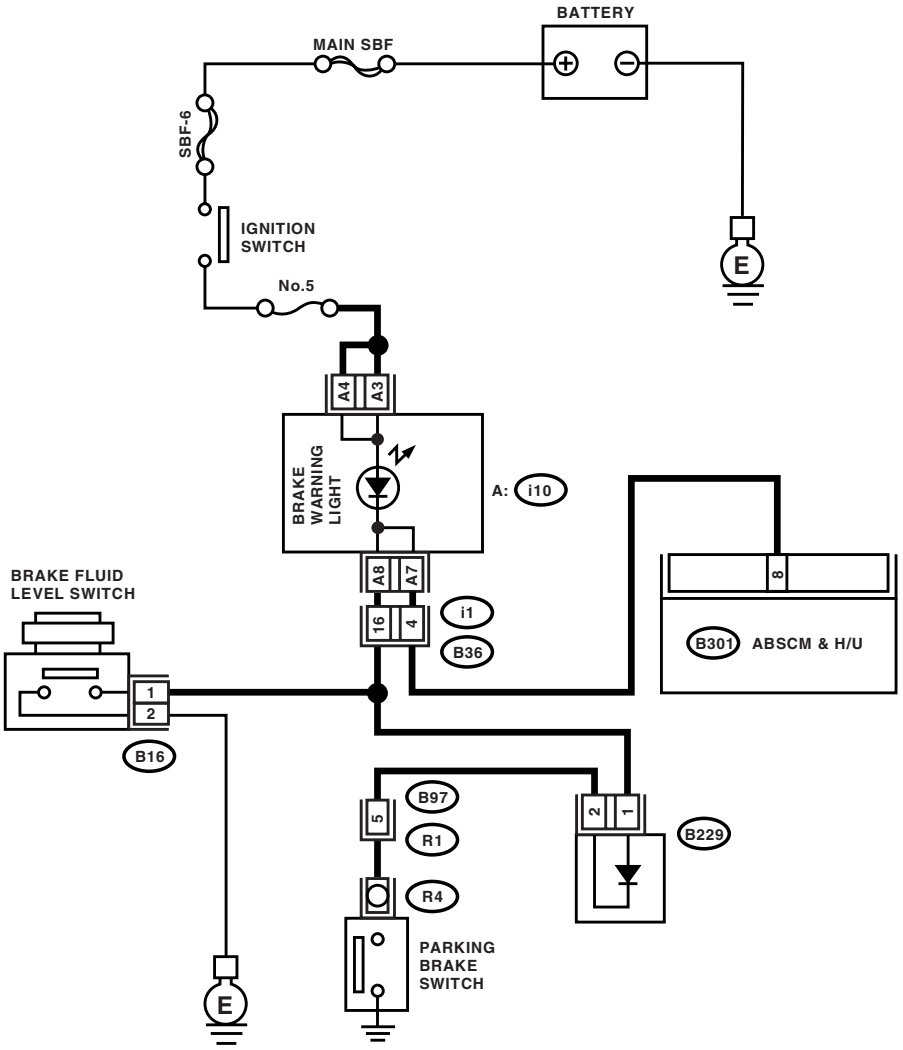


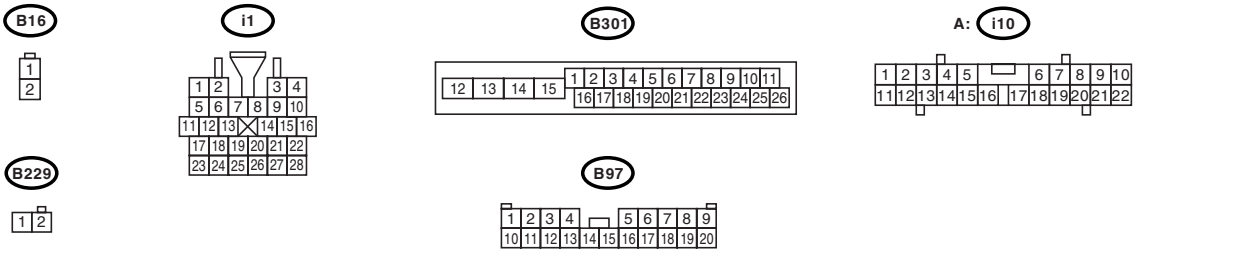


ABS00594

ABS Warning Light / Brake Warning Light Illumination Pattern

- RHD model





ABS00685

ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Check that the ABSCM&H/U connector is inserted to ABSCM&H/U until the clamp locks onto it.	Is the connector correctly inserted?	Go to step **2.**	Insert the ABSCM&H/U connector until the clamp locks onto it.
2	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3.**
3	**CHECK THE BRAKE FLUID AMOUNT.** Check the amount of brake fluid in the reservoir tank of master cylinder.	Is the amount of brake fluid between the lines of MAX and MIN?	Go to step **4.**	Replenish brake fluid to the specified value.
4	**CHECK BRAKE FLUID LEVEL SWITCH.** 1) Disconnect the level switch connector (B16) from master cylinder. 2) Measure the resistance of master cylinder terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the master cylinder.
5	**CHECK PARKING BRAKE SWITCH.** 1) Disconnect the connector (R4) from parking brake switch. 2) Release the parking brake. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the parking brake switch.
6	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connector (i10) from combination meter. 2) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness connector between combination meter and parking brake switch.
7	**CHECK HARNESS.** 1) Disconnect the connector (B301) from ABSCM&H/U. 2) Disconnect the connector (i10) from the combination meter. 3) Measure the resistance between ABSCM&H/U connector and combination meter connector. ***Connector & terminal*** ***(B301) No. 8 — (i10) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **8.**	Repair harness between ABSCM&H/U and combination meter connector.
8	**CHECK POOR CONTACT IN CONNECTOR.** Check poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **9.**
9	**CHECK ABSCM.** 1) Connect the connector to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 7 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Content of diagnosis		Display	Reference target
C0101	ABS wheel speed sensor malfunction (Broken wire, short)	Rear ABS wheel speed sensor RH	Rear Right ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-41, DTC C0101 ABS WHEEL SPEED SENSOR MALFUNCTION RR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0102		Rear ABS wheel speed sensor LH	Rear Left ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-41, DTC C0102 ABS WHEEL SPEED SENSOR MALFUNCTION RL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0103		Front ABS wheel speed sensor RH	Front Right ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-41, DTC C0103 ABS WHEEL SPEED SENSOR MALFUNCTION FR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0104		Front ABS wheel speed sensor LH	Front Left ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-42, DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0105	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of rear ABS wheel speed sensor RH	Rear Right ABS Sensor Signal	<Ref. to ABS(diag)-45, DTC C0105 REAR ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0106		Abnormal signal of rear ABS wheel speed sensor LH	Rear Left ABS Sensor Signal	<Ref. to ABS(diag)-45, DTC C0106 REAR ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0107		Abnormal signal of front ABS wheel speed sensor RH	Front Right ABS Sensor Signal	<Ref. to ABS(diag)-45, DTC C0107 FRONT ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0108		Abnormal signal of front ABS wheel speed sensor LH	Front Left ABS Sensor Signal	<Ref. to ABS(diag)-46, DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0109	Power voltage malfunction		Power Supply Voltage Failure	<Ref. to ABS(diag)-60, DTC C0109 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0110	ABS control module malfunction		ECM	<Ref. to ABS(diag)-59, DTC C0110 ABS CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Content of diagnosis		Display	Reference target
C0111	Motor/motor relay on failure		Motor and Motor Relay	<Ref. to ABS(diag)-66, DTC C0111 MOTOR/MOTOR RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0114	Valve relay on failure		Valve Relay	<Ref. to ABS(diag)-64, DTC C0114 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0115	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal ABS wheel speed sensor on any one of four sensors	Any One of Four ABS Sensors Signal	<Ref. to ABS(diag)-49, DTC C0115 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0116	Stop light switch signal circuit malfunction		Brake Light Switch	<Ref. to ABS(diag)-68, DTC C0116 FAULTY STOP LIGHT SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0118	Faulty G sensor output voltage		G Sensor Failure	<Ref. to ABS(diag)-70, DTC C0118 G SENSOR OUTPUT VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0119	Abnormal G sensor output voltage		G Sensor Signal	<Ref. to ABS(diag)-73, DTC C0119 G SENSOR OUTPUT VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0120	Inlet valve malfunction in hydraulic unit	Front inlet valve LH	FL Hold Valve malfunction	<Ref. to ABS(diag)-53, DTC C0120 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0121	Outlet valve malfunction in hydraulic unit	Front outlet valve LH	FL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-56, DTC C0121 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0122	Inlet valve malfunction in hydraulic unit	Front inlet valve RH	FR Hold Valve malfunction	<Ref. to ABS(diag)-53, DTC C0122 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0123	Outlet valve malfunction in hydraulic unit	Front outlet valve RH	FR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-56, DTC C0123 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0124	Inlet valve malfunction in hydraulic unit	Rear inlet valve LH	RL Hold Valve malfunction	<Ref. to ABS(diag)-53, DTC C0124 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0125	Outlet valve malfunction in hydraulic unit	Rear outlet valve LH	RL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-56, DTC C0125 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Content of diagnosis		Display	Reference target
C0126	Inlet valve malfunction in hydraulic unit	Rear inlet valve RH	RR Hold Valve malfunction	<Ref. to ABS(diag)-53, DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0127	Outlet valve malfunction in hydraulic unit	Rear outlet valve RH	RR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-56, DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0140	CAN communication malfunction		Improper CAN communication	<Ref. to ABS(diag)-63, DTC C0140 CAN COMMUNICATION MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC C0101 ABS WHEEL SPEED SENSOR MALFUNCTION RR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
For the diagnostic procedure, refer to DTC C0104. <Ref. to ABS(diag)-42, DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC C0102 ABS WHEEL SPEED SENSOR MALFUNCTION RL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
For the diagnostic procedure, refer to DTC C0104. <Ref. to ABS(diag)-42, DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC C0103 ABS WHEEL SPEED SENSOR MALFUNCTION FR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
For the diagnostic procedure, refer to DTC C0104. <Ref. to ABS(diag)-42, DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

DTC DETECTING CONDITION:

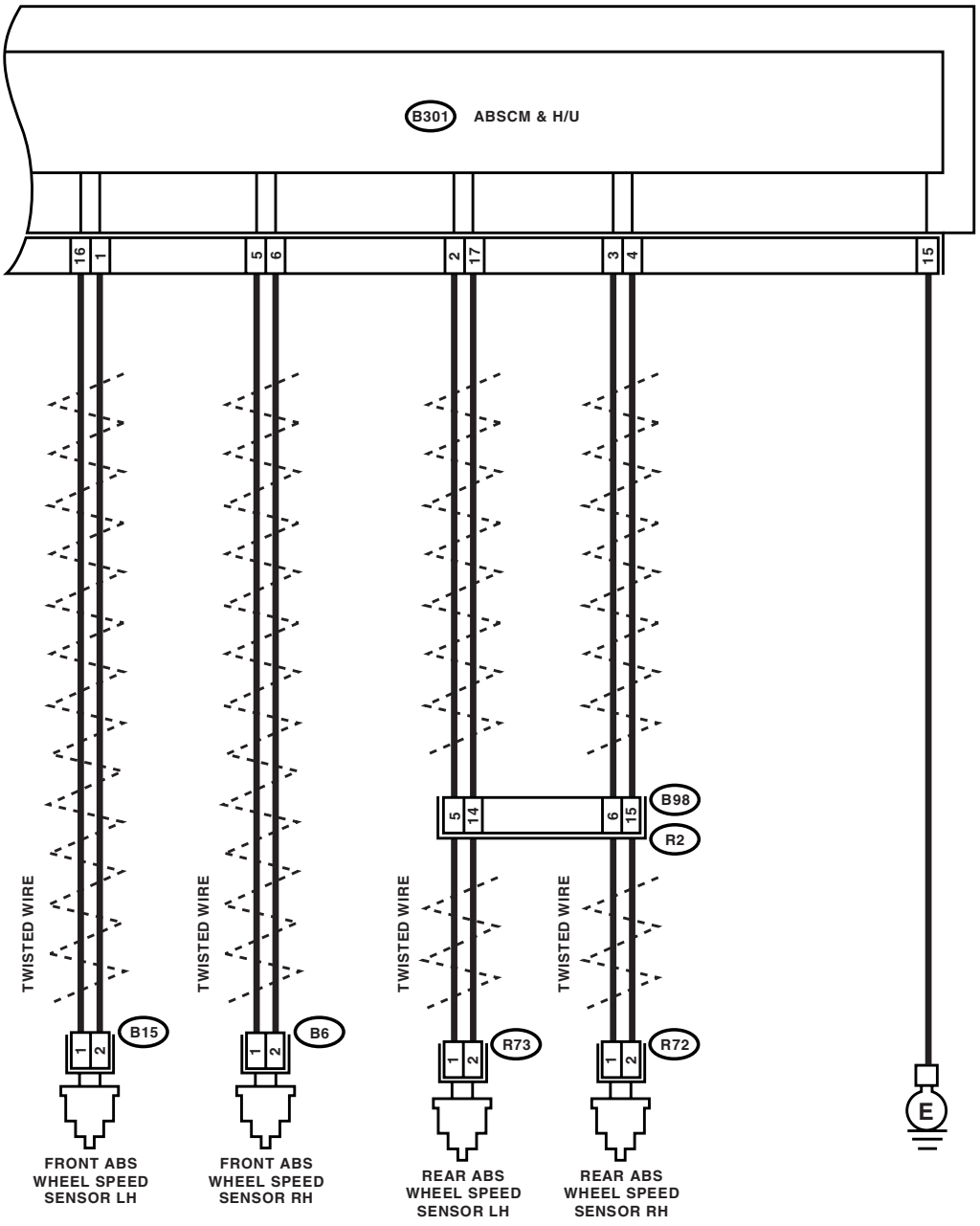
- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

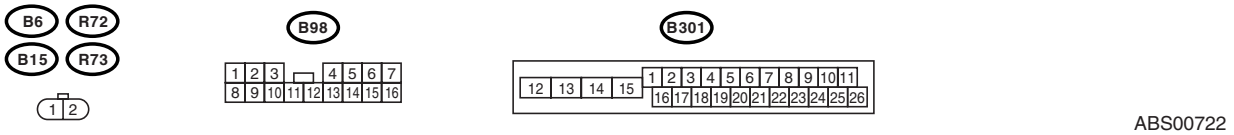
TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:

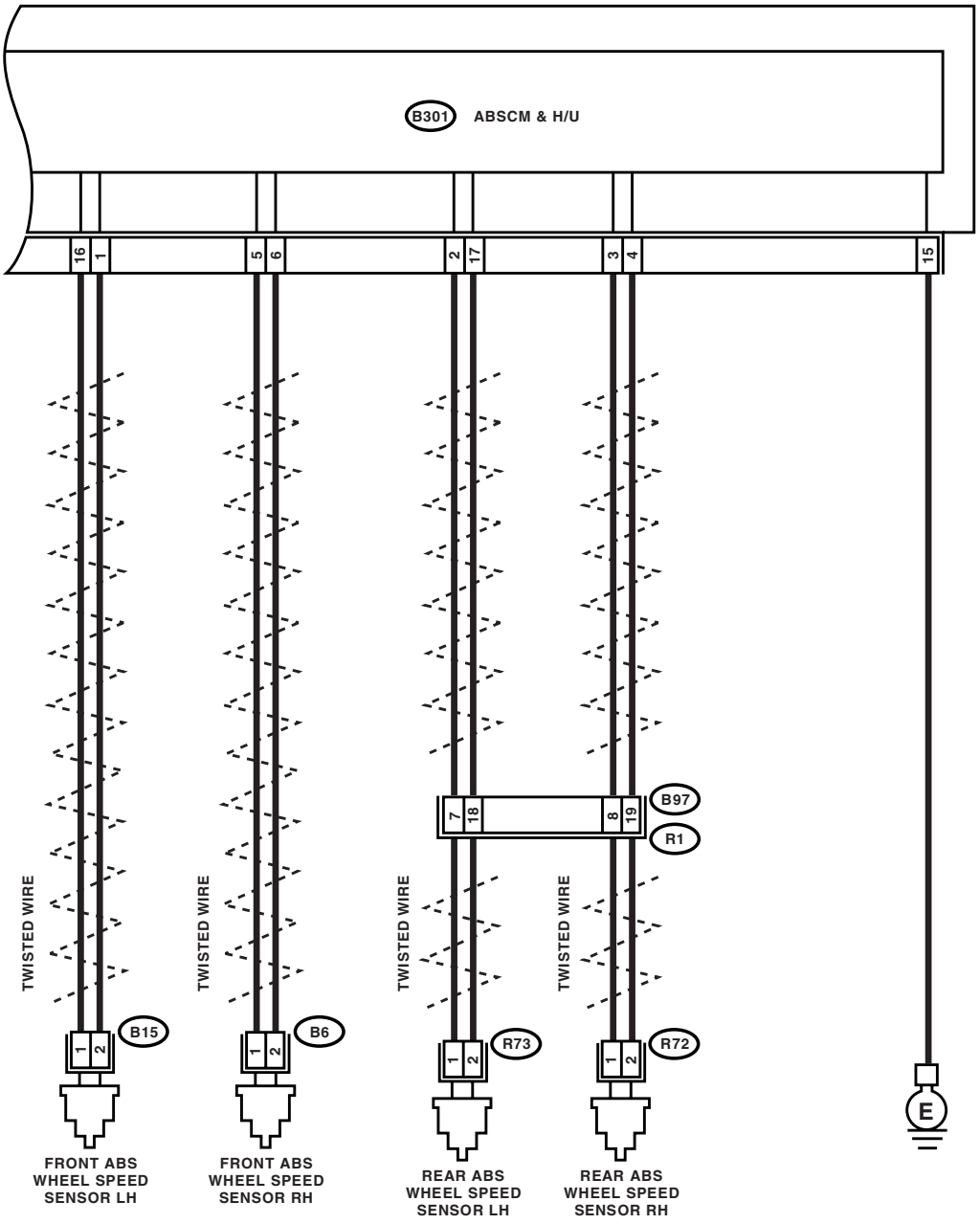
- LHD model

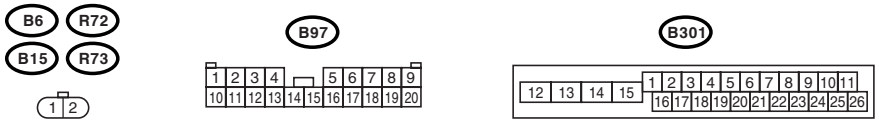




ABS00722

- RHD model





ABS00723

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTOR.** Check the poor contact between ABSCM&H/U and ABS wheel speed sensor.	Is there poor contact?	Repair the connector.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector (B301) from ABSCM&H/U. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector and ABS wheel speed sensor connector. ***Connector & terminal*** ***DTC C0101*** ***(B301) No. 3 — (R72) No. 1:*** ***(B301) No. 4 — (R72) No. 2:*** ***DTC C0102*** ***(B301) No. 2 — (R73) No. 1:*** ***(B301) No. 17 — (R73) No. 2:*** ***DTC C0103*** ***(B301) No. 5 — (B6) No. 1:*** ***(B301) No. 6 — (B6) No. 2:*** ***DTC C0104*** ***(B301) No. 16 — (B15) No. 1:*** ***(B301) No. 1 — (B15) No. 2:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
3	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC C0101*** ***(B301) No. 4 — Chassis ground:*** ***DTC C0102*** ***(B301) No. 17 — Chassis ground:*** ***DTC C0103*** ***(B301) No. 6 — Chassis ground:*** ***DTC C0104*** ***(B301) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
4	**CHECK ABS WHEEL SPEED SENSOR POWER SUPPLY CIRCUIT.** 1) Connect the ABSCM&H/U connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ABS wheel speed sensor connector and chassis ground. ***Connector & terminal*** ***DTC C0101*** ***(R72) No. 1 — Chassis ground (−):*** ***DTC C0102*** ***(R73) No. 1 — Chassis ground (−):*** ***DTC C0103*** ***(B6) No. 1 (+) — Chassis ground (−):*** ***DTC C0104*** ***(B15) No. 1 (+) — Chassis ground (−):***	Is the voltage 5 — 16 V?	Go to step **6.**	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK ABSCM&H/U POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — (B301) No. 15 (−):***	Is the voltage 10 — 15 V?	Go to step **6.**	Check the generator, battery, ABSCM&H/U power circuit.
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check ABS wheel speed sensor. <Ref. to ABS-13, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Is the pattern the same waveform as shown in the figure?	Go to step **7.**	Replace the speed sensor.
7	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8.**
8	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

E: DTC C0105 REAR ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
For the diagnostic procedure, refer to DTC C0108. <Ref. to ABS(diag)-46, DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC C0106 REAR ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
For the diagnostic procedure, refer to DTC C0108. <Ref. to ABS(diag)-46, DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC C0107 FRONT ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
For the diagnostic procedure, refer to DTC C0108. <Ref. to ABS(diag)-46, DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

DTC DETECTING CONDITION:

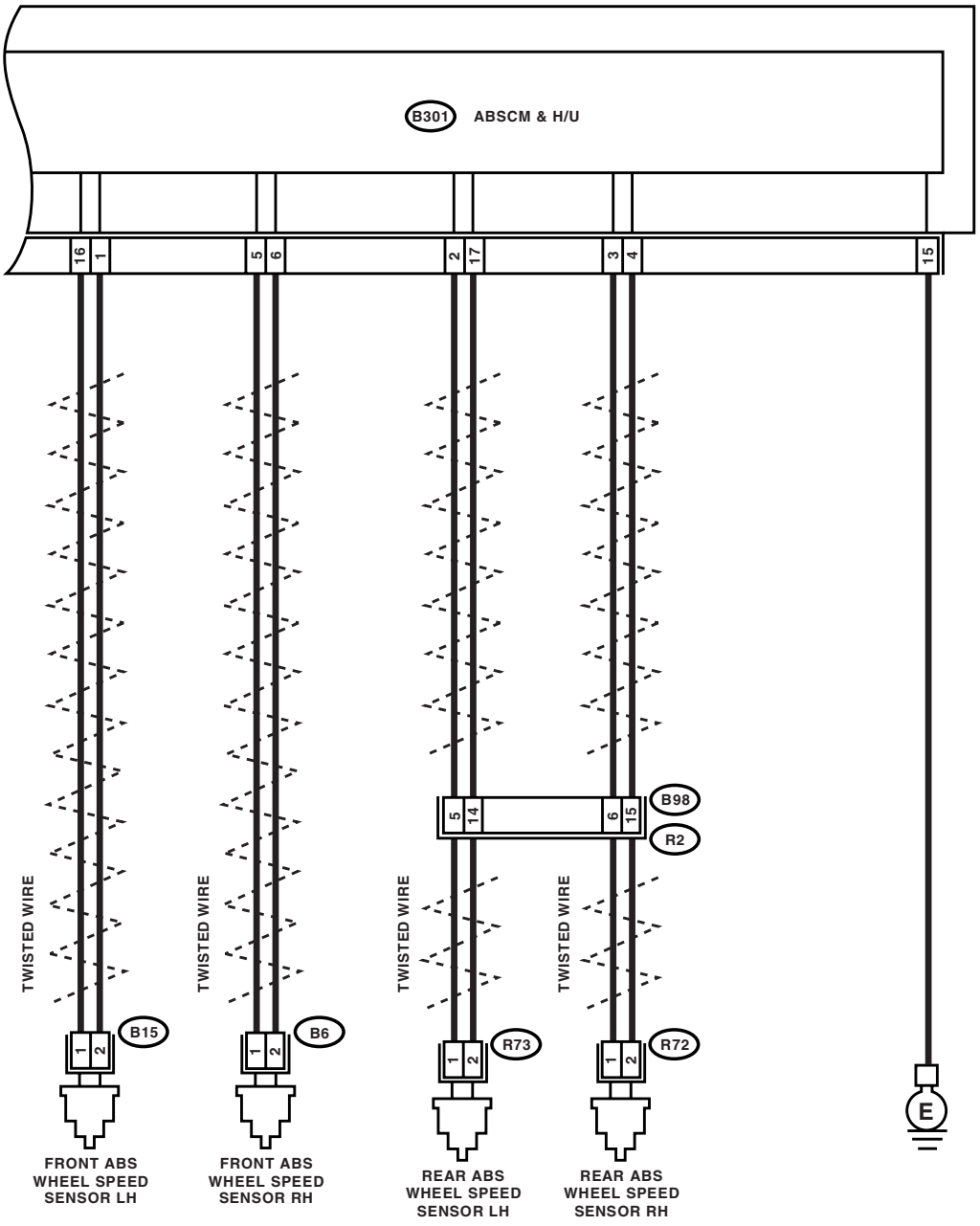
- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective harness connector

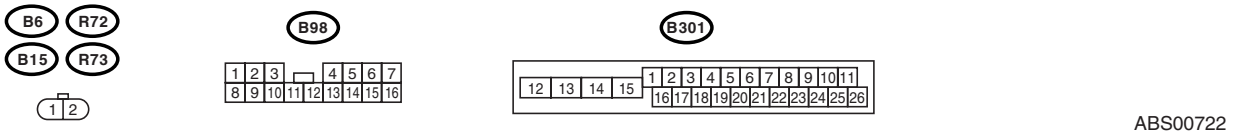
TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:

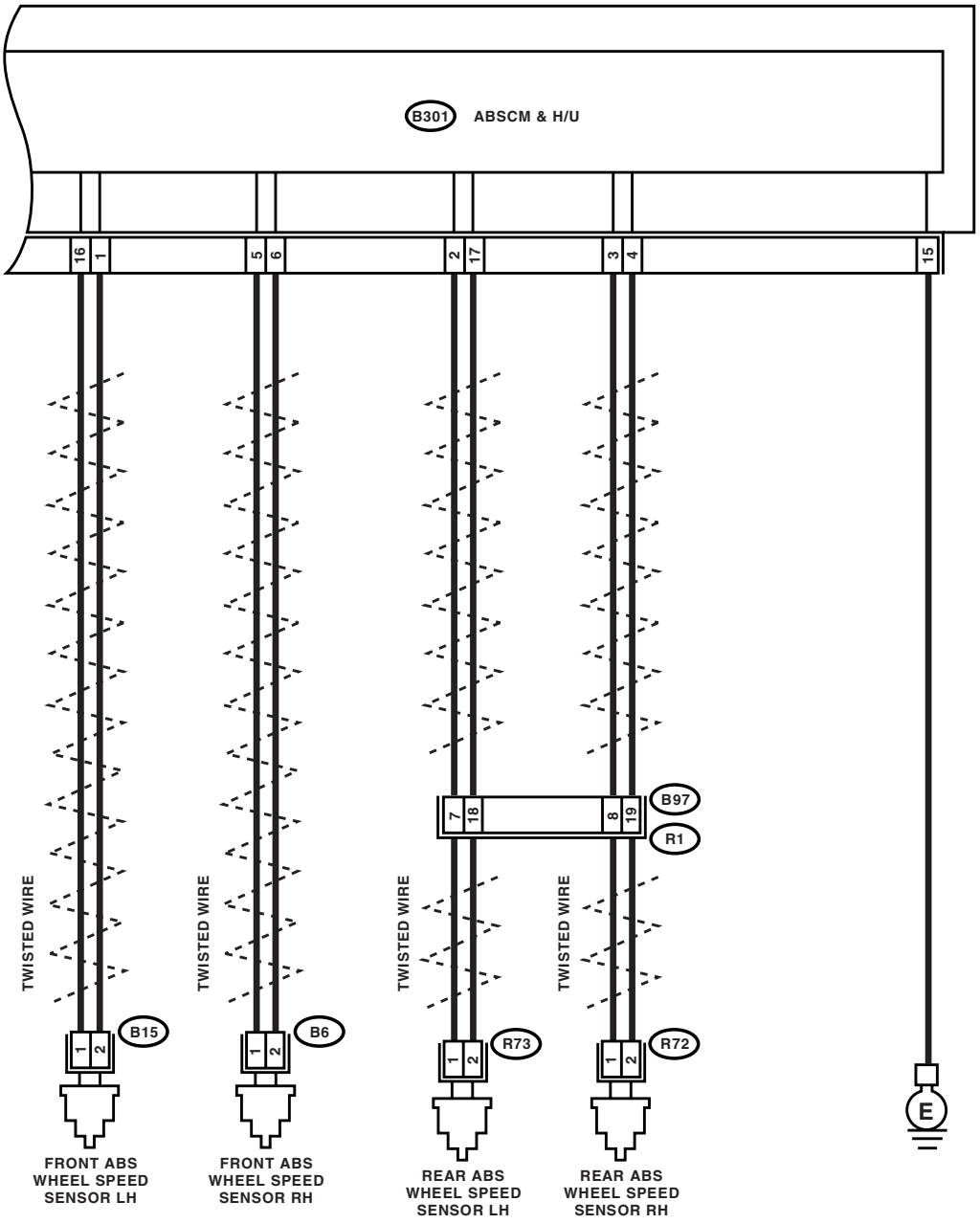
- LHD model

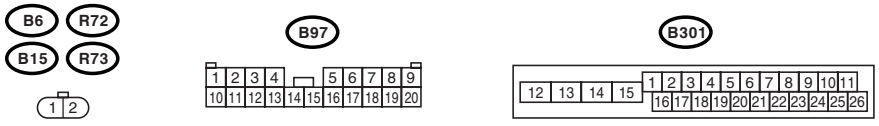




ABS00722

- RHD model





ABS00723

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to the faulty wheel in Subaru Select Monitor data display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step **2.**	Go to step **7.**
2	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.** Make sure the radio wave devices and electric components are installed correctly.	Are the radio wave devices and electric components installed correctly?	Go to step **4.**	Install the radio wave device and electric components properly.
4	**CHECK SOURCES OF SIGNAL NOISE.** Check that the noise sources are (such as an antenna) installed near the sensor harness.	Is the noise sources installed?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.
7	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **8.**	Tighten the ABS wheel speed sensor installation bolts.
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check ABS wheel speed sensor. <Ref. to ABS-13, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for more one rotation?	Go to step **10.**	Go to step **9.**
9	**CHECK ABS WHEEL SPEED SENSOR AND MAGNETIC ENCODER.**	Is there foreign particles, breakage or damage in the pole piece of ABS wheel speed sensor or magnetic encoder?	Remove dirt completely. Replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing when it is broken or damaged.	Go to step **10.**
10	**CHECK SOURCES OF SIGNAL NOISE.** Make sure the radio wave devices and electric components are installed correctly.	Are the radio wave devices and electric components installed correctly?	Go to step **11.**	Install the radio wave device and electric components properly.

	Step	Check	Yes	No
11	**CHECK SOURCES OF SIGNAL NOISE.** Check if the noise sources are (such as an antenna) installed near the sensor harness.	Are noise sources installed?	Go to step **12.**	Install the noise sources apart from the sensor harness.
12	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference. NOTE: Though ABS warning light remains to illuminate at this time, it is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to make ABS warning light go off. Be sure to drive the vehicle and check the warning light goes off.

I: DTC C0115 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS

DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective magnetic encoder
- When a wheel is turned freely for a long time

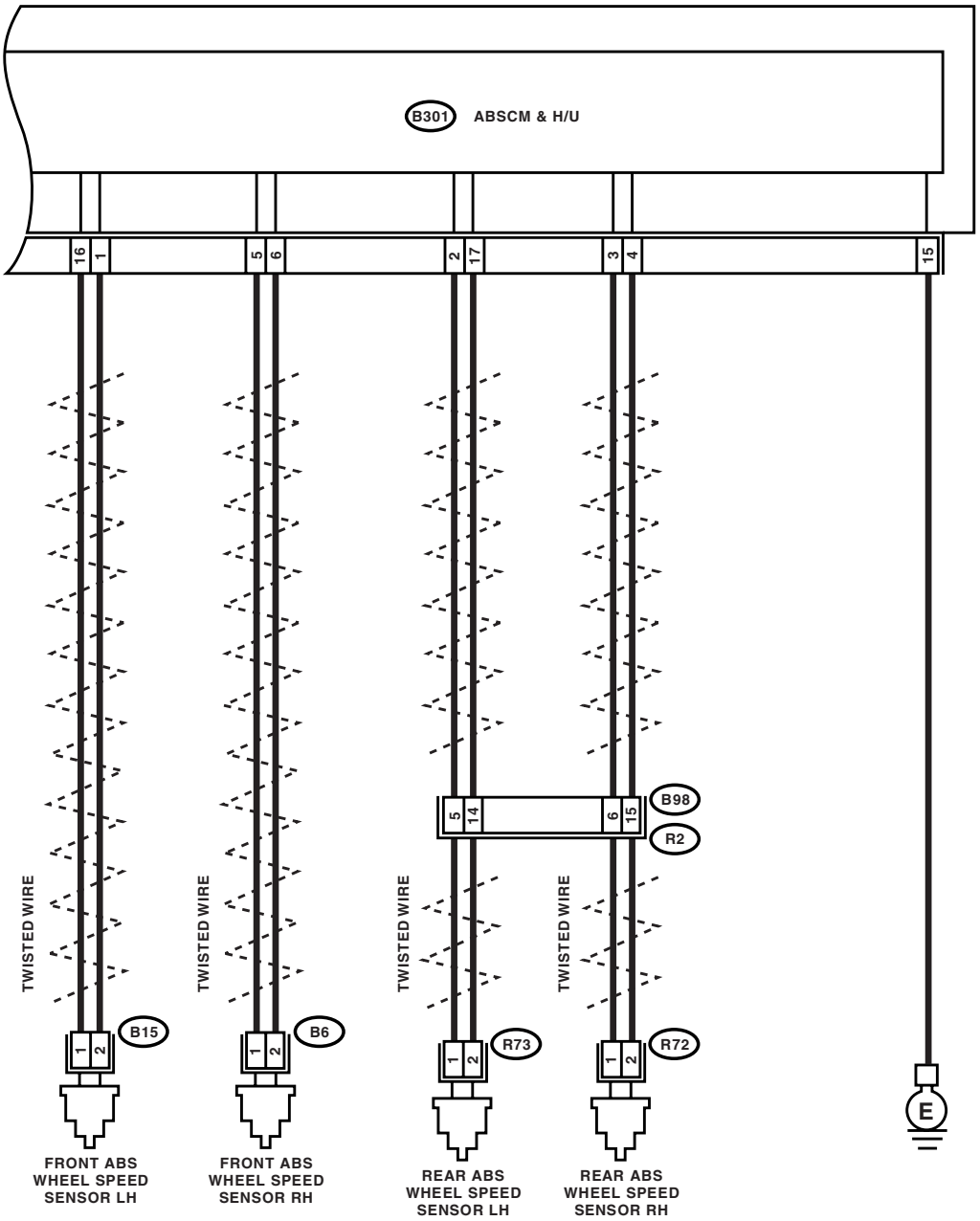
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light comes on as well as ABS warning light.

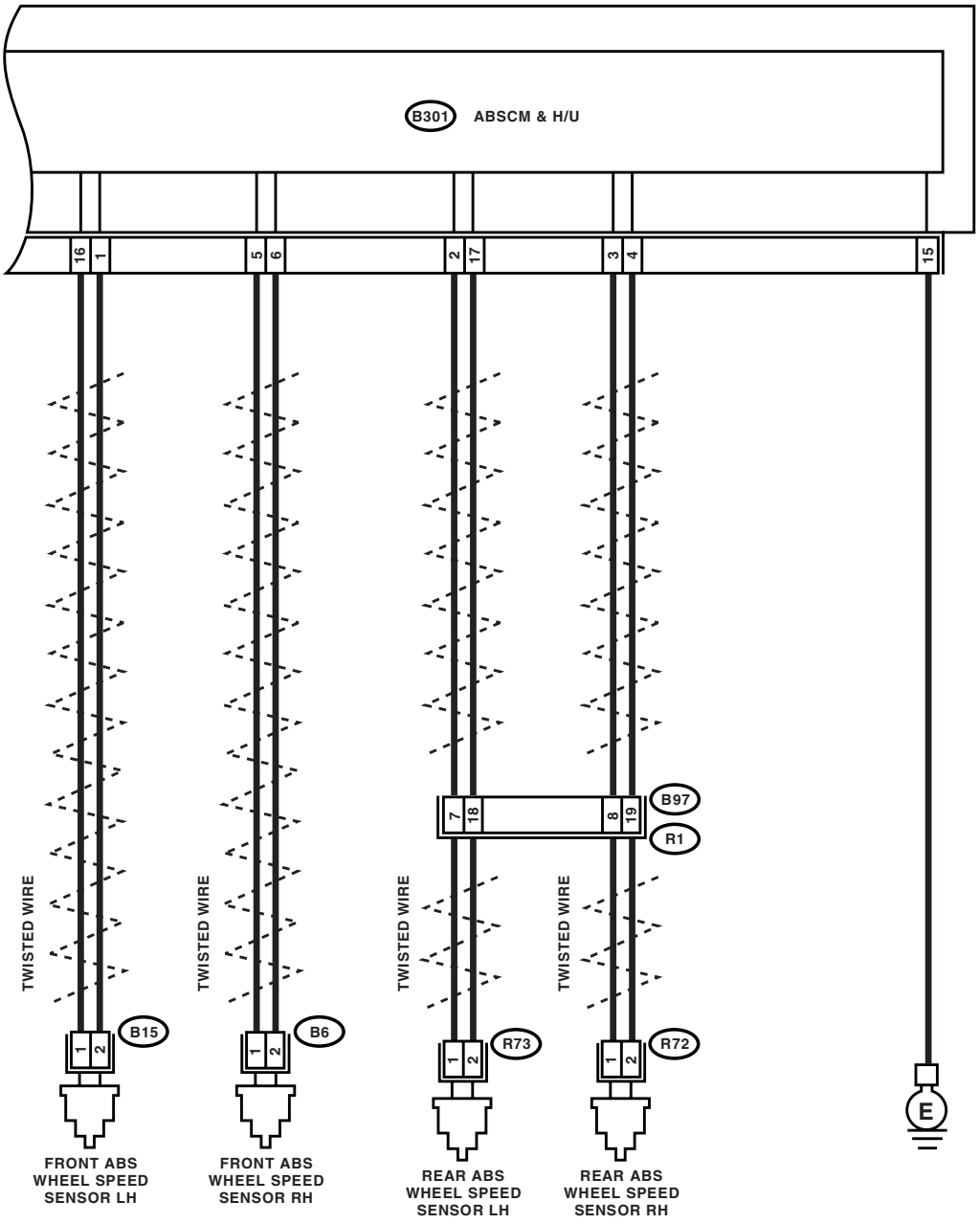
WIRING DIAGRAM:

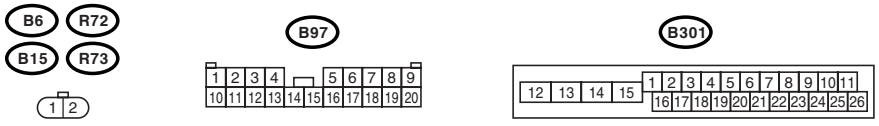
- LHD model



ABS00722

- RHD model





ABS00723

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.** Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface.	Did the wheels turn freely?	ABS is normal. Erase the memory. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this diagnostic trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3.**	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4.**
4	**CHECK TIRE INFLATION PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)? (four of them)	Go to step **6.**	Tighten the ABS wheel speed sensor installation bolts.
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check ABS wheel speed sensor. <Ref. to ABS-13, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for more one rotation?	Go to step **8.**	Go to step **7.**
7	**CHECK ABS WHEEL SPEED SENSOR AND MAGNETIC ENCODER.**	Is there foreign particles, breakage or damage in the pole piece of ABS wheel speed sensor or magnetic encoder?	Remove dirt completely. Replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing when it is broken or damaged.	Go to step **8.**
8	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **9.**

Step		Check	Yes	No
9	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference. NOTE: Though ABS warning light remains to illuminate at this time, it is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to make ABS warning light go off. Be sure to drive the vehicle and check the warning light goes off.

J: DTC C0120 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC C0126. <Ref. to ABS(diag)-53, DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC C0122 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC C0126. <Ref. to ABS(diag)-53, DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC C0124 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC C0126. <Ref. to ABS(diag)-53, DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

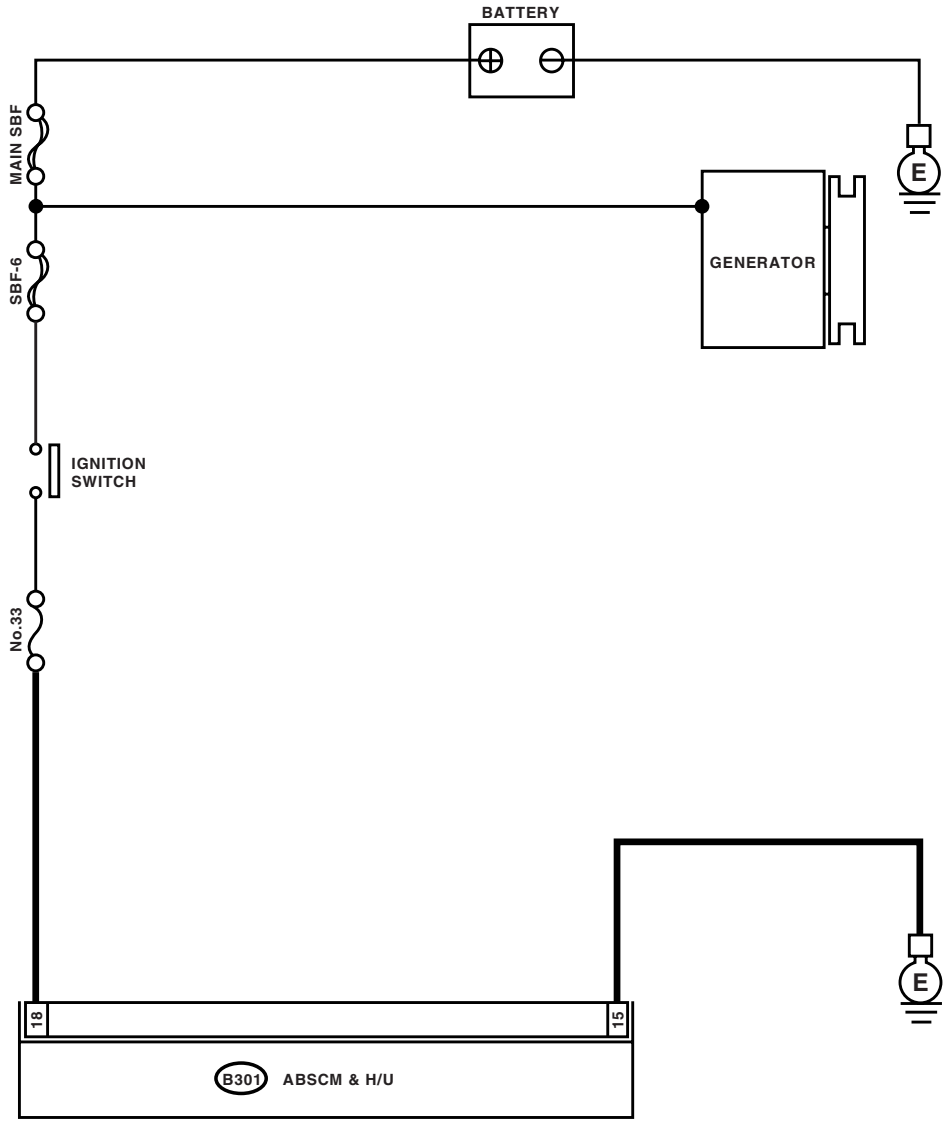
M: DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

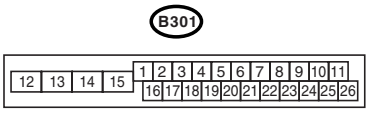
DTC DETECTING CONDITION:
- Defective harness connector
- Defective inlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:





ABS00622

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the ABSCM&H/U power circuit.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

N: DTC C0121 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC C0127. <Ref. to ABS(diag)-56, DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC C0123 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC C0127. <Ref. to ABS(diag)-56, DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC C0125 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC C0127. <Ref. to ABS(diag)-56, DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

DTC DETECTING CONDITION:

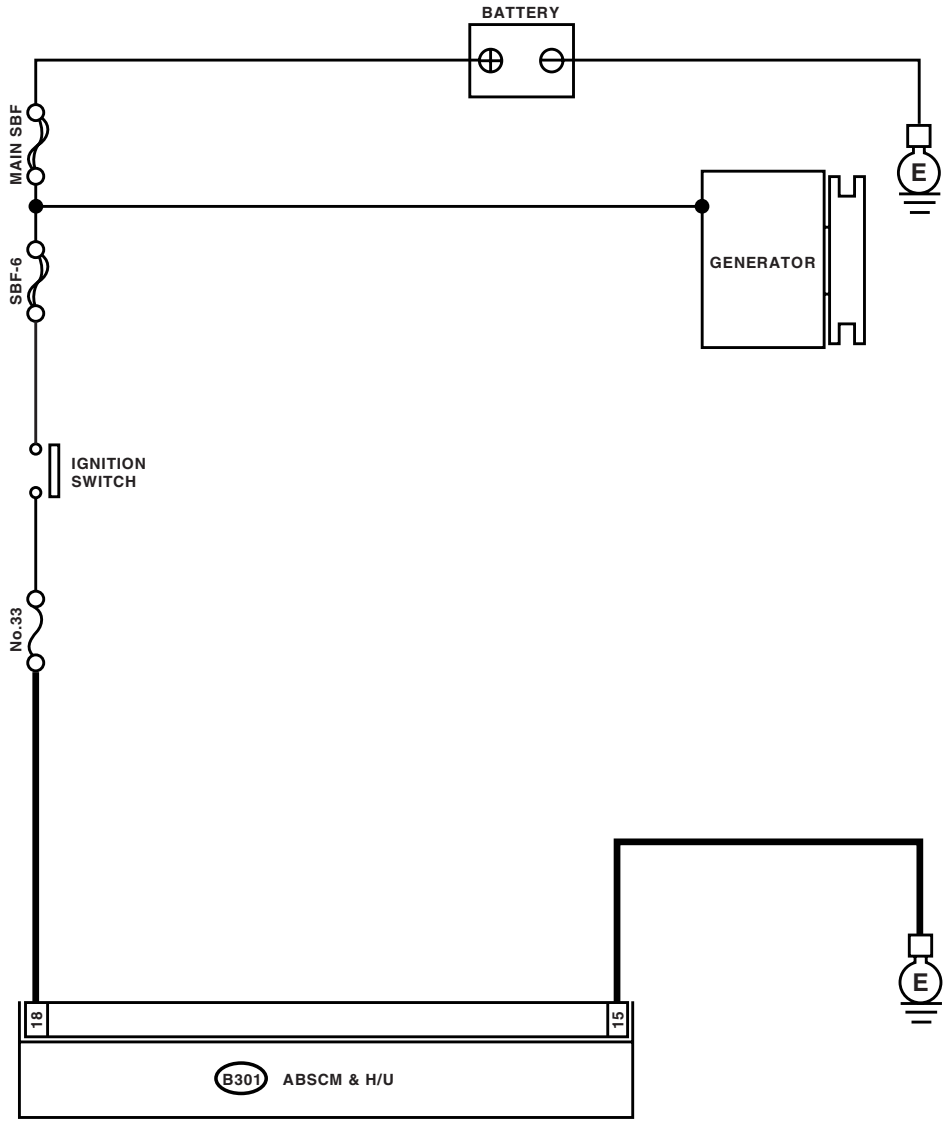
- Defective harness connector
- Defective outlet solenoid valve in ABSCM&H/U

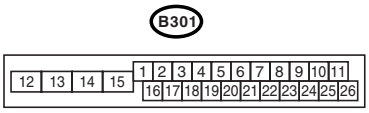
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:





ABS00622

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the ABSCM&H/U power circuit.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

R: DTC C0110 ABS CONTROL MODULE MALFUNCTION

DTC DETECTING CONDITION:

Defective ABSCM&H/U

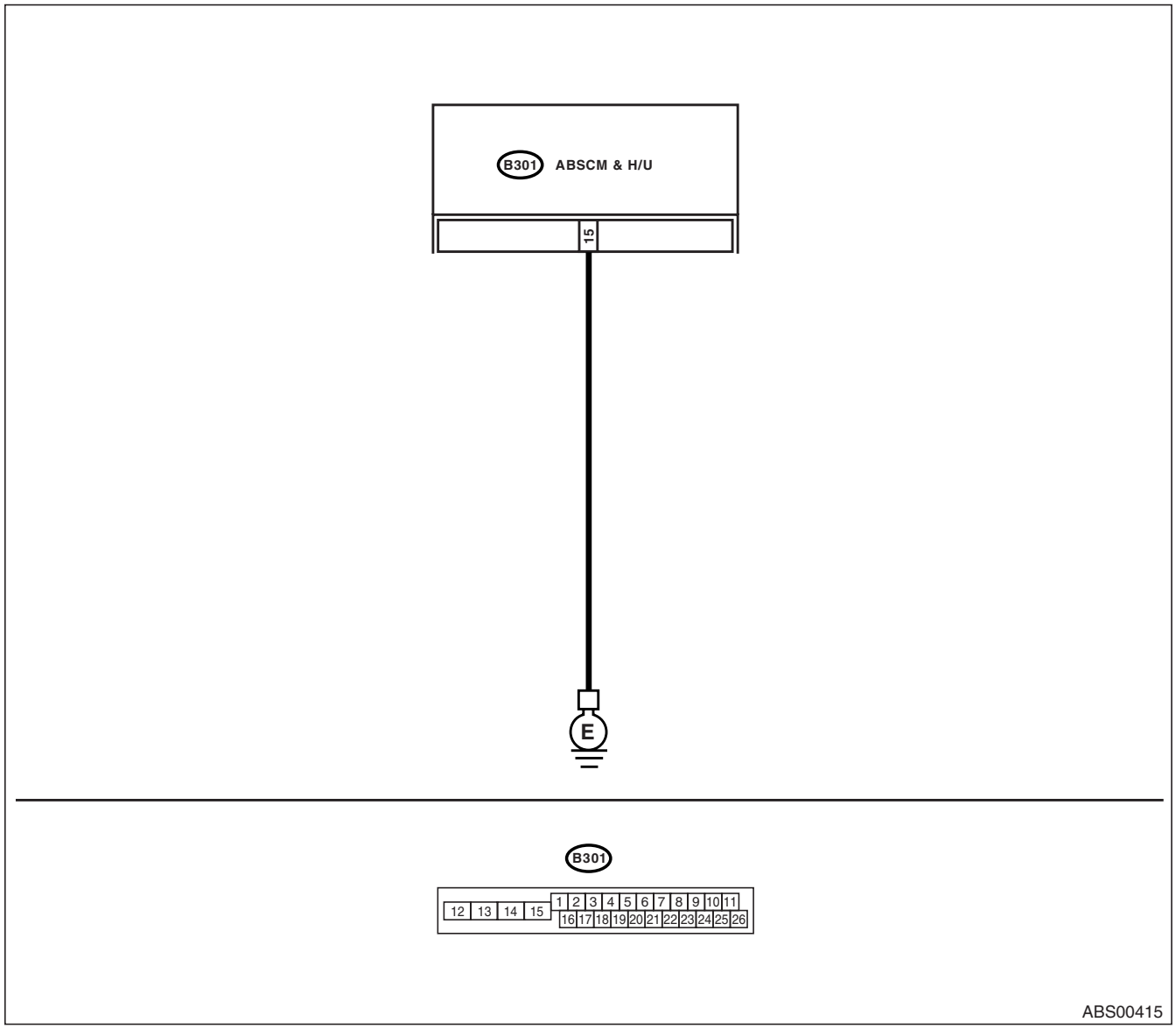
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:

Brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Repair the ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Are the radio wave devices and electric components installed correctly?	Go to step **4.**	Install the radio wave device and electric components properly.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

S: DTC C0109 POWER VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:

Power voltage of the ABSCM&H/U is too low or too high.

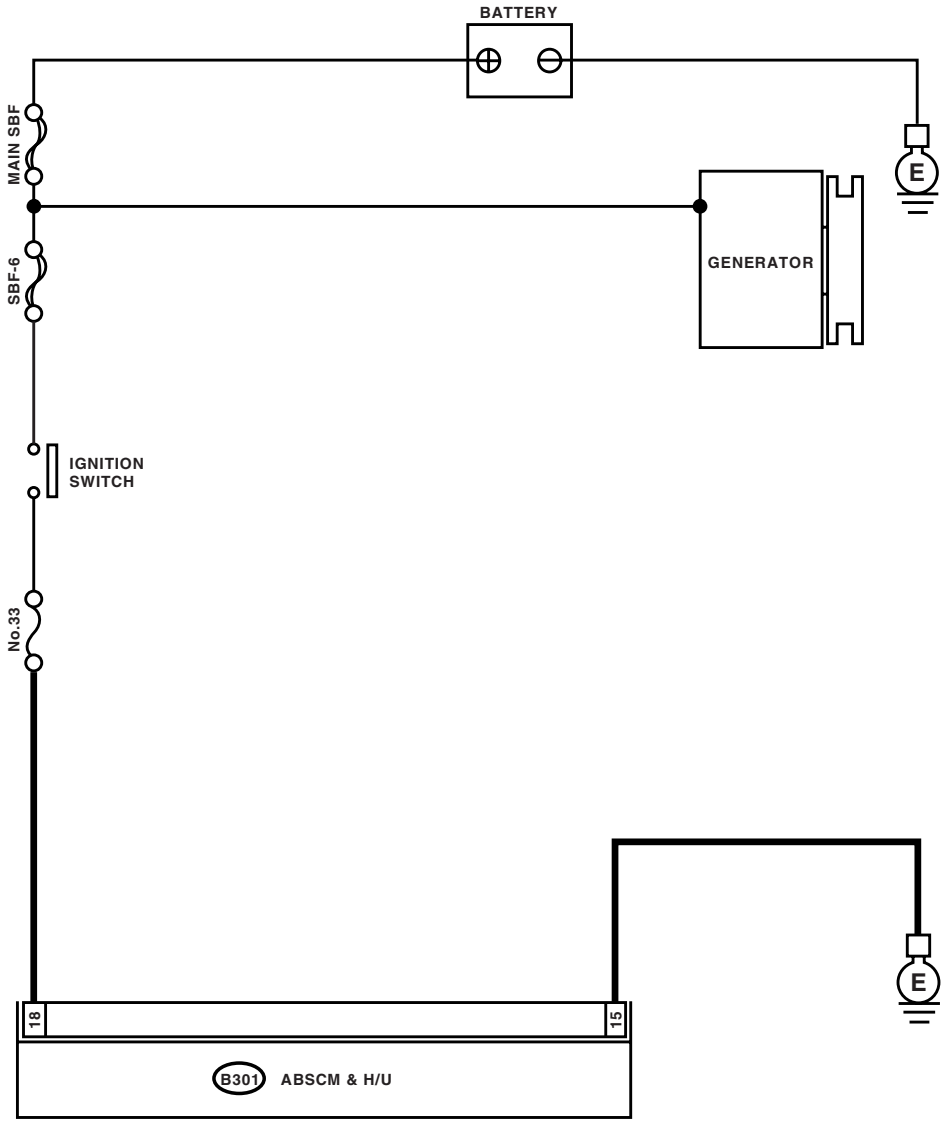
TROUBLE SYMPTOM:

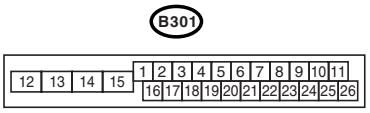
- ABS does not operate.
- EBD may not operate.

NOTE:

If EBD does not operate, brake warning light comes on as well as ABS warning light. Both warning lights go off if voltage returns.

WIRING DIAGRAM:





ABS00622

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the generator.
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals clamped tightly?	Go to step **3.**	Tighten the terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect the connector from ABSCM&H/U. 2) Run the engine at idle. 3) Operate the devices such as headlights, air conditioner, defogger, etc. which produce much electrical loading. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the ABSCM&H/U power circuit.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

T: DTC C0140 CAN COMMUNICATION MALFUNCTION

DTC DETECTING CONDITION:

Defective CAN communication

TROUBLE SYMPTOM:

Possibly the vehicle speed cannot output on CAN.

	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Repair it according to DTC of LAN system.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

U: DTC C0114 VALVE RELAY MALFUNCTION

DTC DETECTING CONDITION:

Defective valve relay

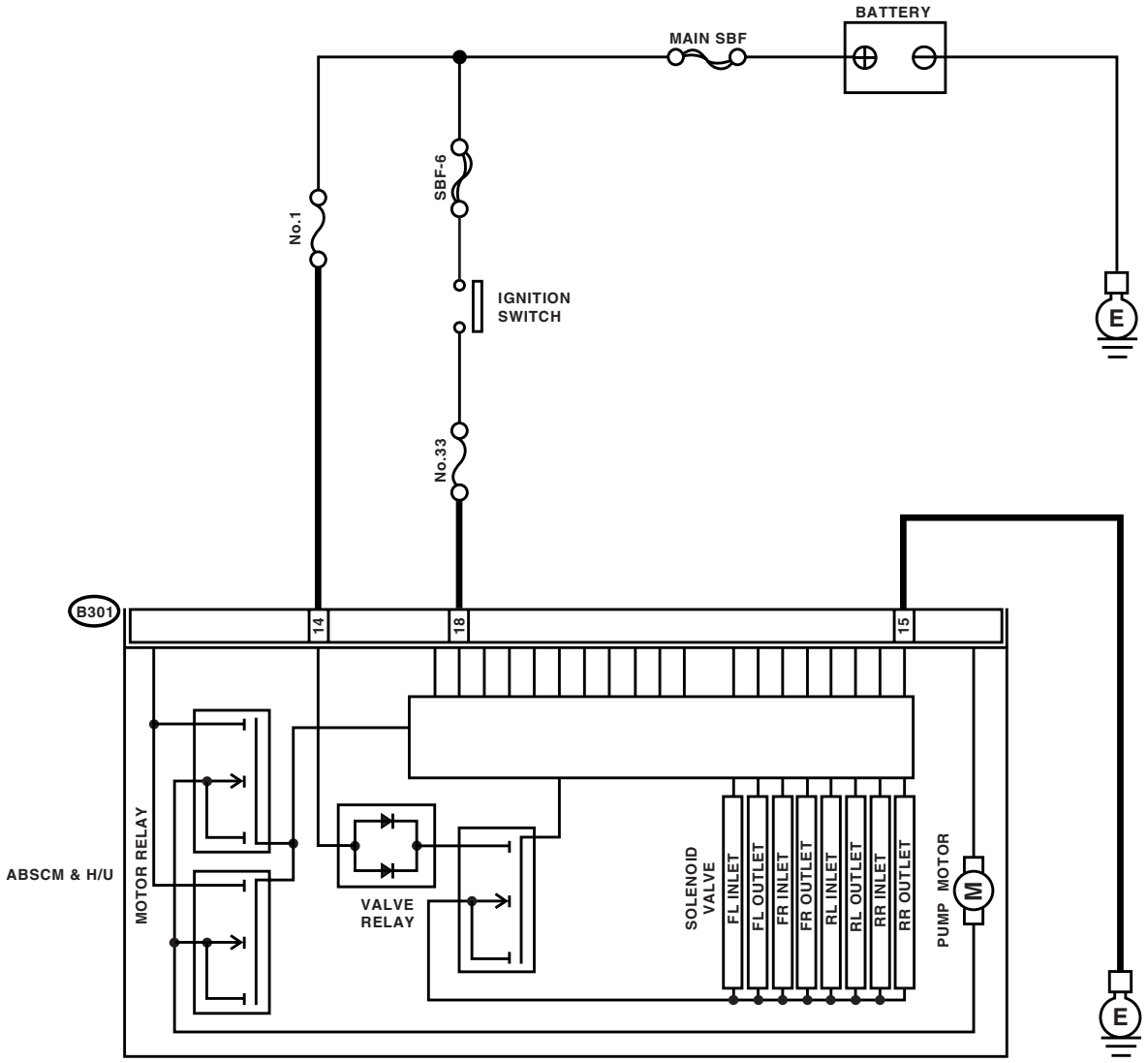
TROUBLE SYMPTOM:

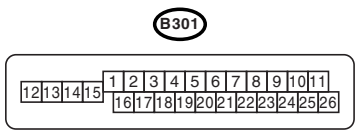
- ABS does not operate.
- EBD does not operate depending on the trouble contents.

NOTE:

Brake warning light comes on as well as ABS warning light when EBD does not operate.

WIRING DIAGRAM:





ABS00686

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***(B301) No. 14 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 14 — No. 15:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

V: DTC C0111 MOTOR/MOTOR RELAY MALFUNCTION

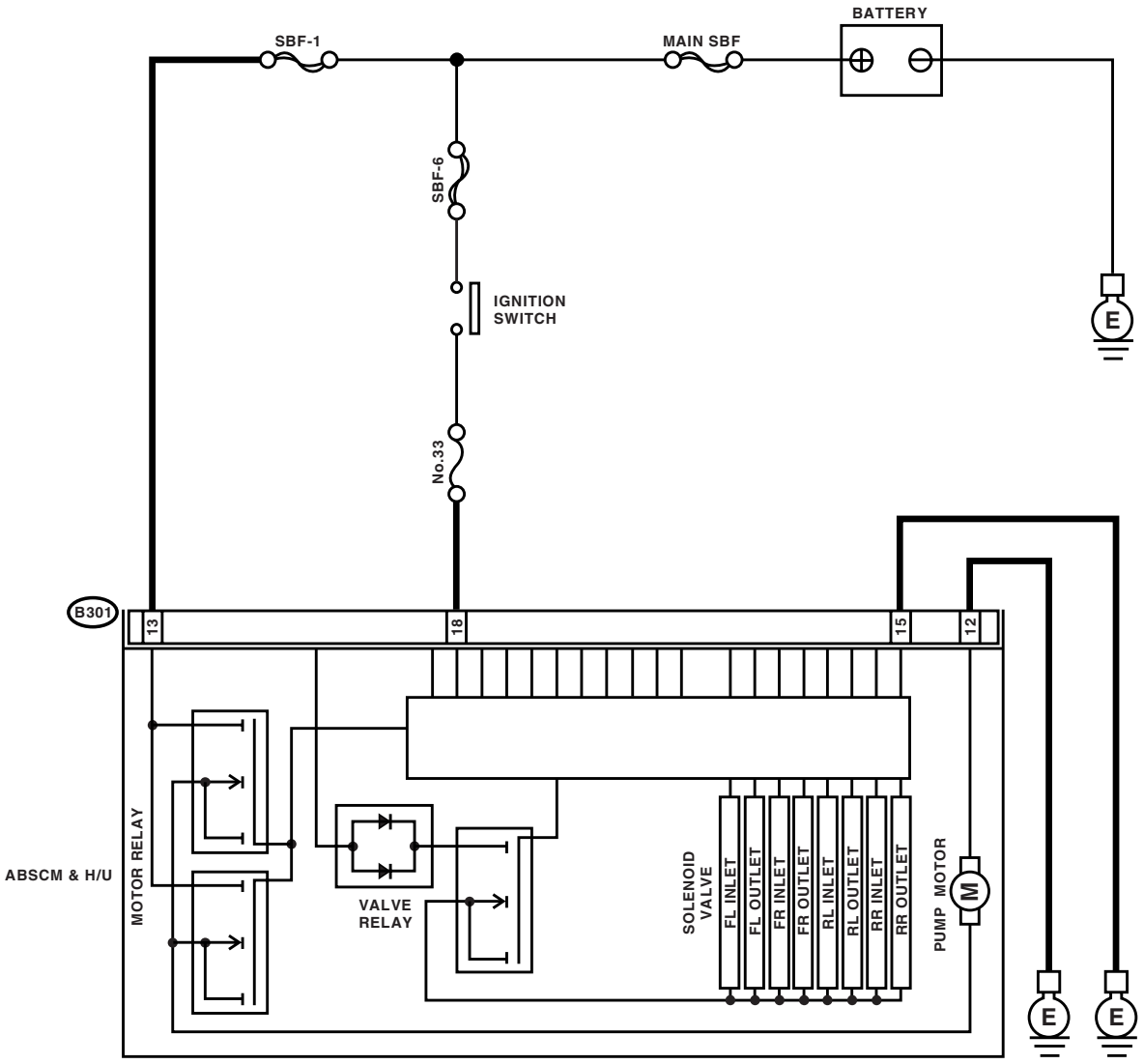
DTC DETECTING CONDITION:

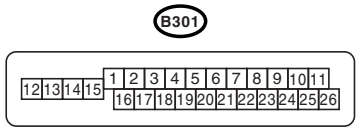
- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:





ABS00741

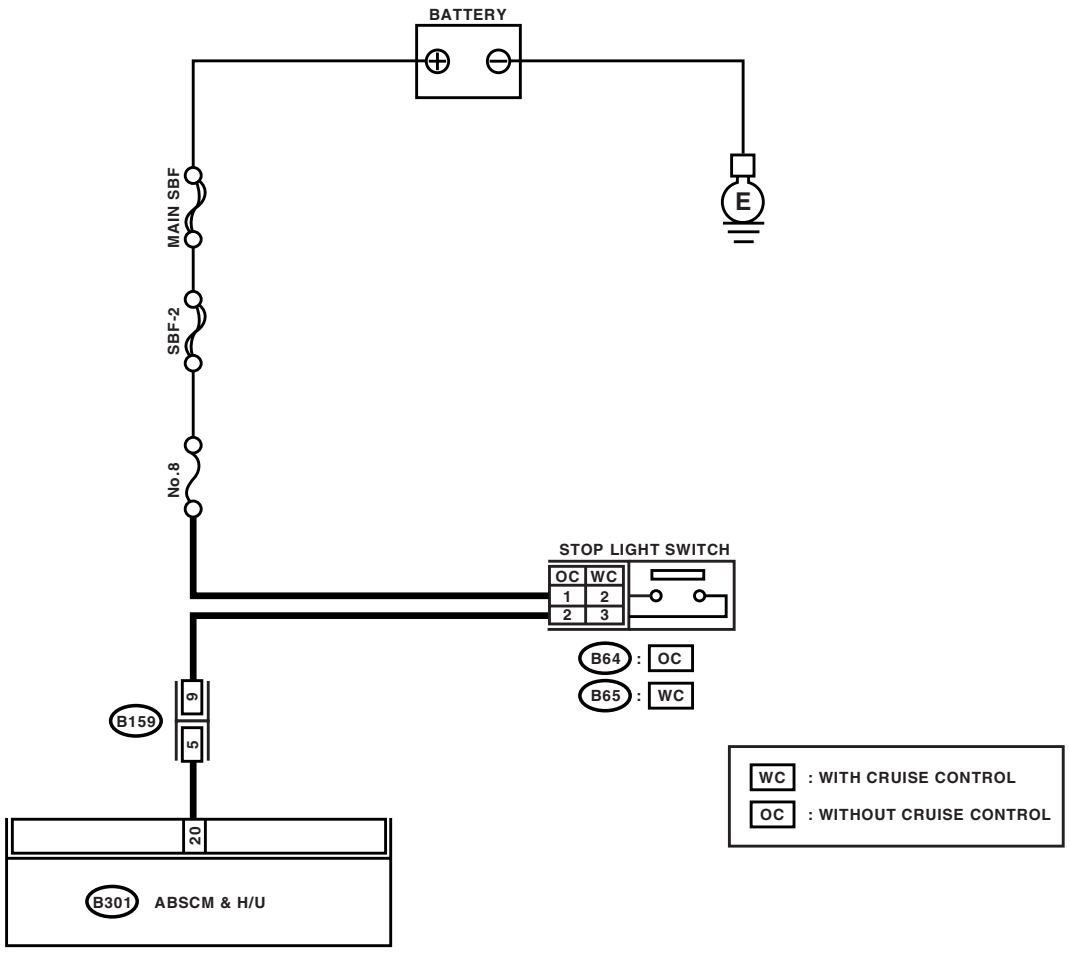
	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 13 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 12 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though ABS warning light remains to illuminate at this time, it is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to make ABS warning light go off. Be sure to drive the vehicle and check the warning light goes off.

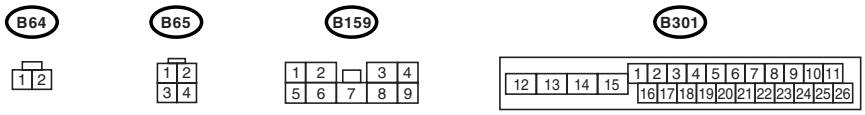
W: DTC C0116 FAULTY STOP LIGHT SWITCH

DTC DETECTING CONDITION:

Defective stop light switch

WIRING DIAGRAM:



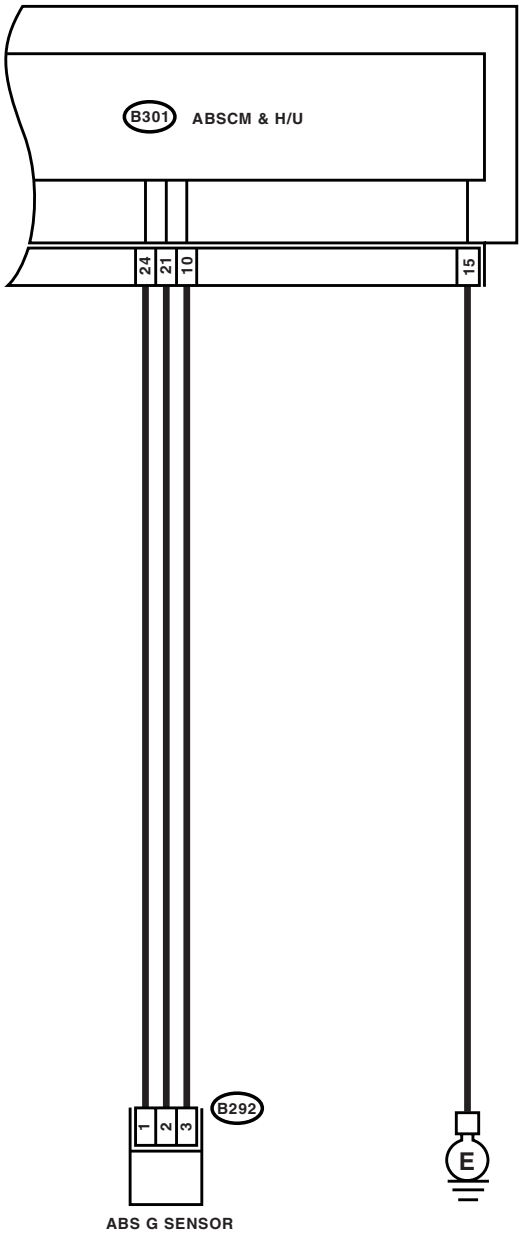


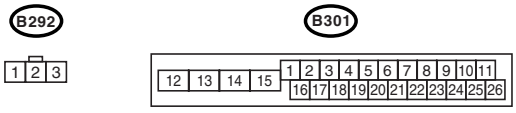
ABS00688

	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch signal in Subaru Select Monitor.	Is "OFF" displayed on the display?	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor.	Is "ON" displayed on the display?	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal.	Does the stop light illuminate?	Go to step **4.**	Repair the stop lights circuit.
4	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 20 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Repair harness between stop light switch and ABSCM&H/U connector.
5	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Go to step **6.**	Repair the connector.
6	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

X: DTC C0118 G SENSOR OUTPUT VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:
Defective G sensor
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





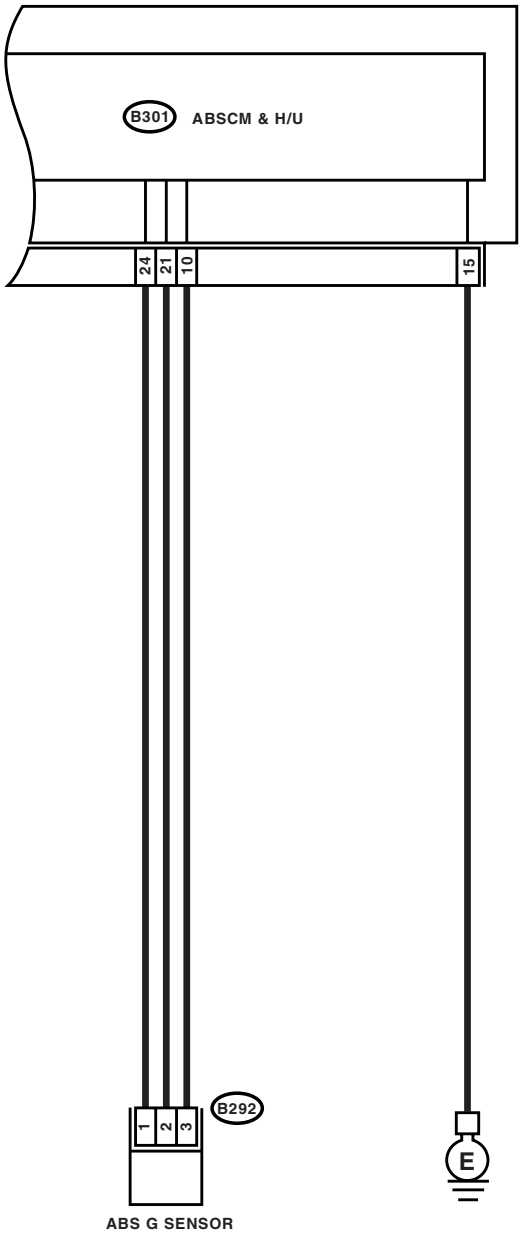
ABS00419

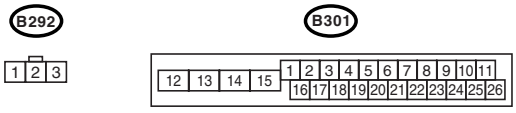
	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the G sensor output on Subaru Select Monitor.	Is the reading indicated on display −1.2 — 1.2 m/s when G sensor is horizontal?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
5	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 1 (+) — No. 3 (−):***	Is the voltage 4.75 — 5.25 V?	Go to step **6.**	Repair the harness connector between G sensor and ABSCM&H/U.
6	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 21 — No. 10:***	Is the resistance 1.8 — 2.4 kΩ?	Go to step **7.**	Repair the harness connector between G sensor and ABSCM&H/U.
7	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between G sensor and ABSCM&H/U.
8	**CHECK G SENSOR.** 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when G sensor is on a level?	Go to step **9.**	Replace G sensor. <Ref. to ABS-18, G Sensor.>

	Step	Check	Yes	No
9	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 3.6 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **10.**	Replace G sensor. <Ref. to ABS-18, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 1.0 V when G sensor is inclined backward to 90°?	Go to step **11.**	Replace G sensor. <Ref. to ABS-18, G Sensor.>
11	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **12.**
12	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Y: DTC C0119 G SENSOR OUTPUT VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:
Defective G sensor output signal
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





ABS00419

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.**	Have the wheels been turned freely when the vehicle is lifted up or drove on a rolling road?	ABS is normal. Erase the memory.	Go to step **2.**
2	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the Subaru Select Monitor display.	Is the reading indicated on display −1.2 — 1.2 m/s when G sensor is on a level?	Go to step **3.**	Go to step **8.**
3	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Select {Current Data Display & Save} in Subaru Select Monitor. 6) Read the Subaru Select Monitor display.	Is the reading indicated on display 8.1 — 11.2 m/s when G sensor is inclined forward to 90°?	Go to step **4.**	Replace G sensor. <Ref. to ABS-18, G Sensor.>
4	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** Read the Subaru Select Monitor display.	Is the reading indicated on display −8.1 — −11.2 m/s when G sensor is inclined backward to 90°?	Go to step **5.**	Replace G sensor. <Ref. to ABS-18, G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Perform clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 21 — No. 10:***	Is the resistance 1.8 — 2.4 kΩ?	Go to step **9.**	Repair the harness connector between G sensor and ABSCM&H/U.
9	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the harness connector between G sensor and ABSCM&H/U.

	Step	Check	Yes	No
10	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when G sensor is on a level?	Go to step **11.**	Replace G sensor. <Ref. to ABS-18, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 3.6 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **12.**	Replace G sensor. <Ref. to ABS-18, G Sensor.>
12	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 1.0 V when G sensor is inclined backward to 90°?	Go to step **13.**	Replace G sensor. <Ref. to ABS-18, G Sensor.>
13	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

13.General Diagnostic Table

A: INSPECTION

Symptom		Problem parts
Vehicle instability during braking	Vehicle is pulled to either right or left side.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pads) • Wheel Alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor brake performance	Long braking/stopping distance	• ABSCM&H/U (solenoid valve) • Brake (pads) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	• ABSCM&H/U (solenoid valve, motor) • ABS wheel speed sensor • Incorrect wiring or piping connections
	Brake drag	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Master cylinder • Brake (caliper and piston) • Parking Brake • Axle and wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle vertical pitching	• Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Excessive pedal vibration	• Incorrect wiring or piping connections • Road surface (uneven)
	Noise from ABSCM&H/U	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Brake line
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Master cylinder • Brake (caliper, piston, pads and rotor) • Brake line • Brake booster and check valve • Suspension play or fatigue
	Noise from rear of vehicle	• ABS wheel speed sensor • Brake (caliper, piston, pads and rotor) • Parking Brake • Brake line • Suspension play or fatigue

VEHICLE DYNAMICS CONTROL (VDC)

VDC

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1.	General Description	2
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4.	VDC Sequence Control	12
5.	Yaw Rate and Lateral G Sensor	15
6.	Steering Angle Sensor	17
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9.	Front Magnetic Encoder	21
10.	Rear Magnetic Encoder	22
11.	VDC OFF Switch	23

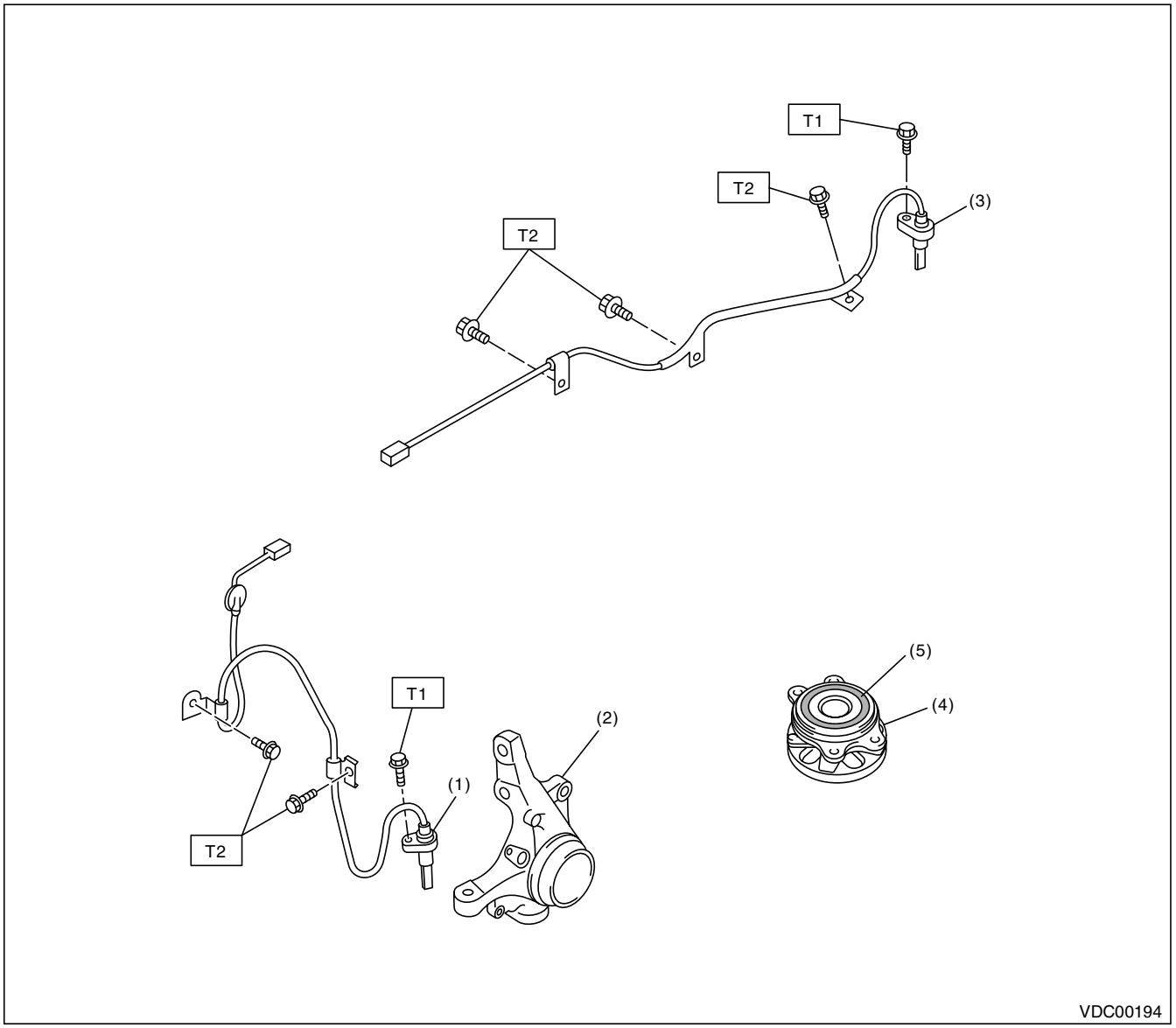
1. General Description

A: SPECIFICATION

Item				Specification or identification
ABS wheel speed sensor	ABS wheel speed sensor gap (for reference)	Front		0.77 — 1.43 mm (0.030 — 0.056 in)
		Rear		0.64 — 1.56 mm (0.025 — 0.061 in)
	Marks of harness (Marks, Color)	Front	RH	K1 (White)
			LH	K2 (Yellow)
		Rear	RH	K5 (White)
			LH	K6 (Yellow)
Yaw rate & lateral G sensor	Lateral G sensor voltage			2.5± 0.2 V
Marks of VDCCM&H/U		OUTBACK 3.0 R		G2
		Wagon 2.5 i		G3
		Wagon 3.0 R (AT)		G4
		Sedan 2.5 i		G9
		Sedan 3.0 R (AT)		GA
		OUTBACK 2.5 i		GE
		Wagon 3.0 R (MT)		GH
		Sedan 3.0 R (MT)		GJ

B: COMPONENT

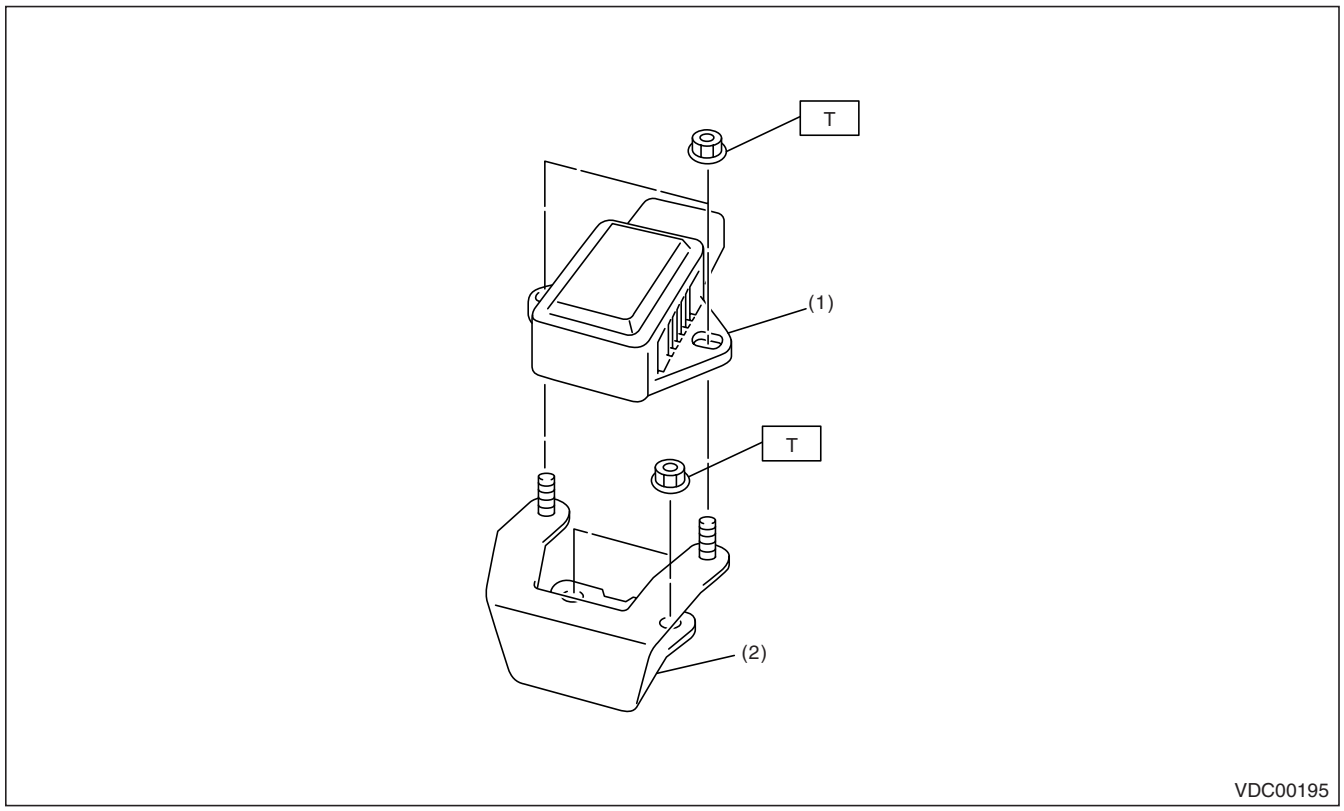
1. ABS WHEEL SPEED SENSOR



(1) Front ABS wheel speed sensor
(2) Front housing
(3) Rear ABS wheel speed sensor
(4) Hub unit bearing
(5) Magnetic encoder

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 24.3)

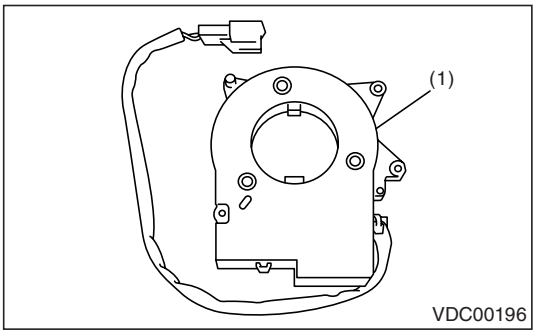
2. YAW RATE & LATERAL G SENSOR



(1) Yaw rate & lateral G sensor (2) Bracket

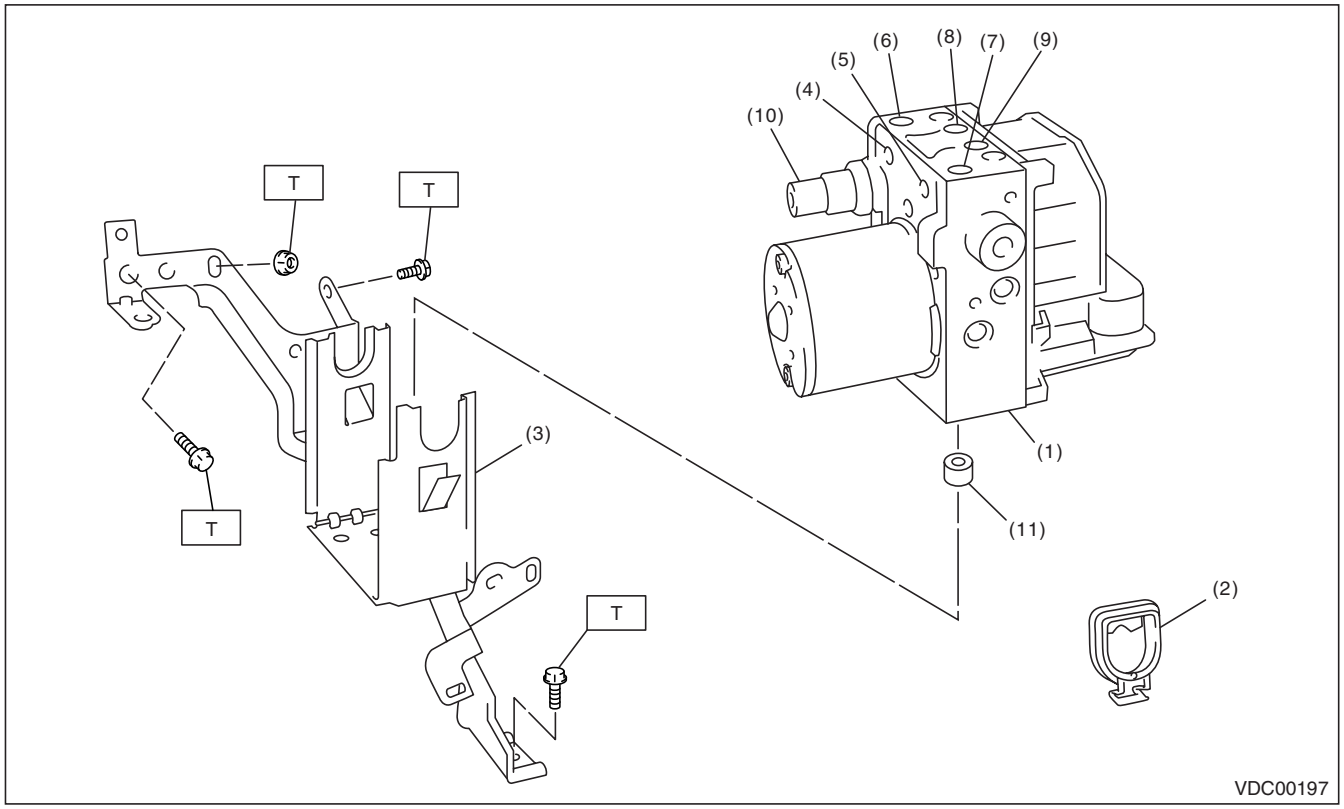
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

3. STEERING ANGLE SENSOR



(1) Steering angle sensor

4. VDC CONTROL MODULE AND HYDRAULIC CONTROL UNIT (VDCCM&H/U)



(1) VDC control module & hydraulic control unit (VDCCM&H/U)
(2) Clip
(3) Bracket
(4) Rear RH outlet
(5) Rear LH outlet
(6) Secondary inlet
(7) Primary inlet
(8) Front LH outlet
(9) Front RH outlet
(10) Pressure sensor
(11) Damper

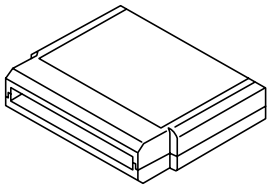
Tightening torque: N·m (kgf-m, ft-lb)
T: 33 (3.4, 24.3)

C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

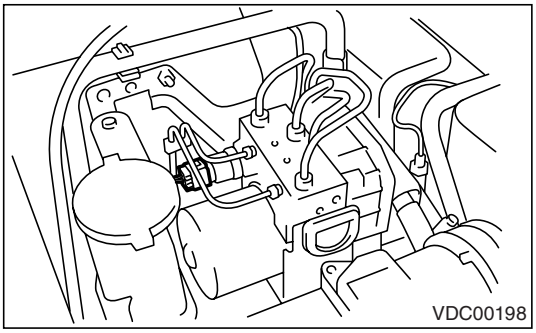
2. VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Use compressed air to get rid of water and dust around the VDCCM&H/U.

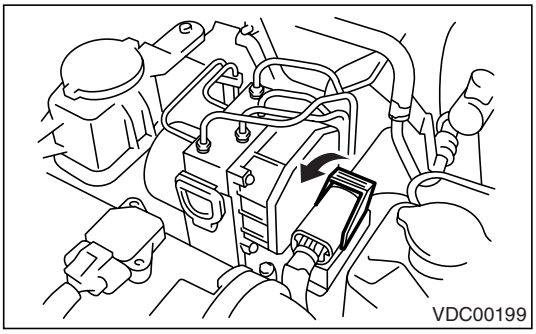
NOTE:
When dust and dirt are attached to the terminal, they may cause poor contact.

3) Disconnect the pressure sensor connector.


VDC00198

4) Disconnect the VDCCM&H/U connector with pulling up the lock lever.

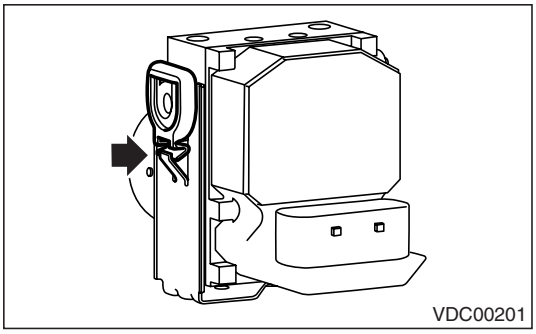
CAUTION:
Do not pull the harness when disconnecting connector.


VDC00199

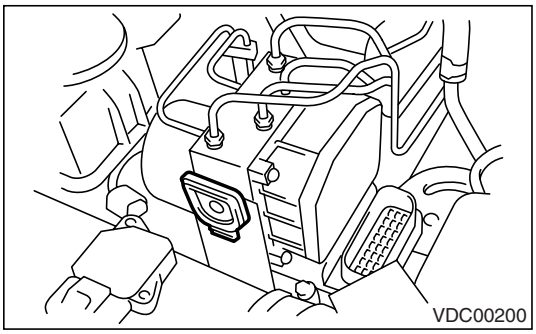
5) Disconnect the brake pipes from VDCCM&H/U.
6) Wrap the brake pipe using a vinyl bag not to spill the brake fluid on the vehicle body.

CAUTION:
When brake fluid is attached to the vehicle body, wash it off with water and wipe the water.

7) Remove the clips, and then remove the VDCCM&H/U.


VDC00201

CAUTION:
• VDCCM&H/U cannot be disassembled. Do not attempt to loosen the bolts and nuts.
• Do not drop or bump the VDCCM&H/U.
• Do not turn VDCCM&H/U upside down or place it sideways for storage.
• Be careful that no foreign objects are mixed in VDCCM&H/U.
• Be careful that no water enters inside the connectors.


VDC00200

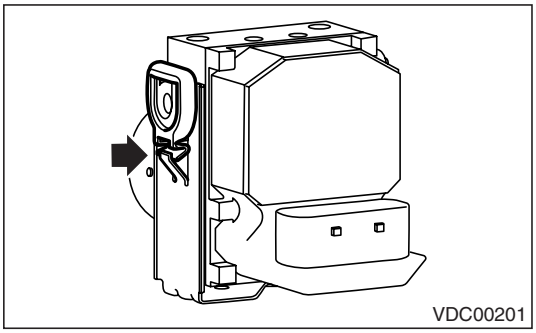
8) Remove the VDCCM&H/U bracket.

B: INSTALLATION

1) Install the VDCCM&H/U bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

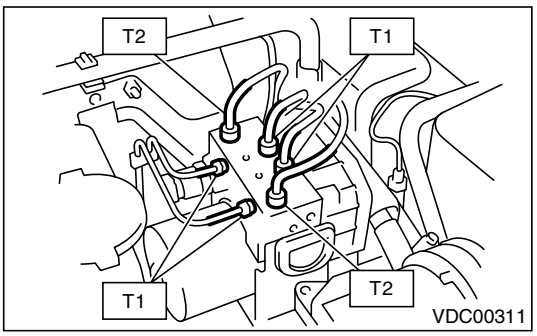
2) Install the VDCCM&H/U to bracket.
3) Install the clip.


VDC00201

NOTE:
Hook the clip on the pawl of bracket securely.

4) Connect the brake pipes to their specified VDC-CM&H/U positions.

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 11.1 ft-lb)
T2: 19 N·m (1.9 kgf-m, 14 ft-lb)



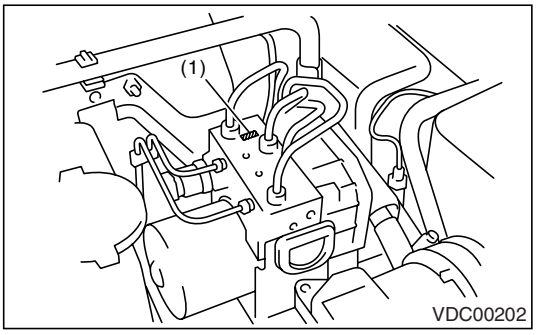
5) Connect the VDCCM&H/U connector.

NOTE:
• Be sure to remove all foreign matters from inside the connector before connecting.
• Ensure that the VDCCM&H/U connector is securely locked.

6) Connect the pressure sensor connector.
7) Bleed air from brake system.

C: INSPECTION

1) Check the connected and fixed condition of connector.
2) Check the mark used for VDCCM&H/U identification.
Refer to “SPECIFICATION” for mark. <Ref. to VDC-2, SPECIFICATION, General Description.>



(1) Identification mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

<Ref. to ABS-7, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

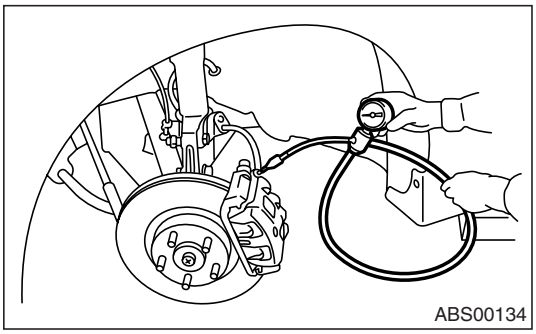
<Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

3. CHECKING THE HYDRAULIC UNIT VDC OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle, and then remove the wheels.
2) Remove the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not use the pressure gauge for the measurement of transmission oil pressure since the piston seal may be expanded and deformed.

NOTE:
Wrap a sealing tape around the pressure gauge.



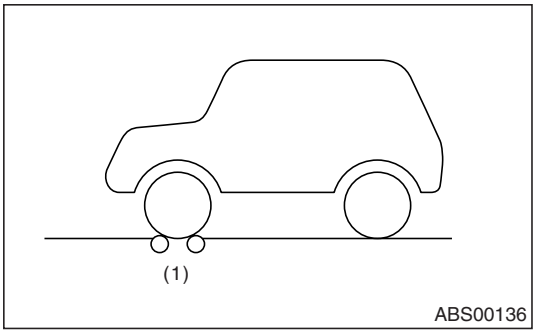
4) Bleed air from the pressure gauges.
5) Perform VDC sequence control.
<Ref. to VDC-12, VDC Sequence Control.>
6) When the hydraulic unit begins to work, first the FL side performs compression, holding, and decompression, and then the FR side performs compression, holding, and decompression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets specification. Depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

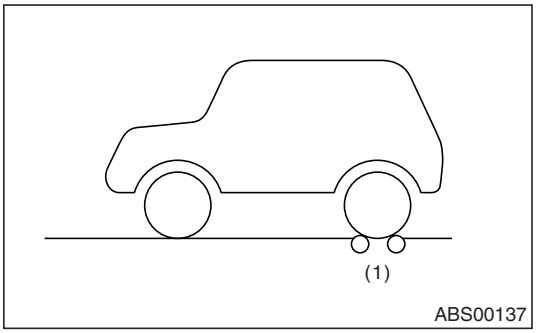
	Front wheel	Rear wheel
When compressed	3,000 kPa (31 kgf/cm^2, 441 psi) or more	3,000 kPa (31 kgf/cm^2, 441 psi) or more
When decompressed	500 kPa (5 kgf/cm^2, 73 psi) or less	500 kPa (5 kgf/cm^2, 73 psi) or less

8) Disconnect the pressure gauges from FL and FR caliper bodies.
9) Install the air bleeder screws of FL and FR caliper bodies.
10) Remove the air bleeder screws from the RL and RR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the RL and RR caliper bodies.
13) Perform VDC sequence control.
<Ref. to VDC-12, VDC Sequence Control.>
14) When the hydraulic unit begins to work, first the RR side performs compression, holding, and decompression, and then the RL side performs compression, holding, and decompression.
15) Read the values indicated on the pressure gauges and check it within specification. Depress the brake pedal and check that it is not abnormally hard, and tightness is normal.
16) Disconnect the pressure gauge from the RL and RR caliper bodies.
17) Install the air bleeder screws of RL and RR caliper bodies.
18) Bleed air from the brake line.

4. CHECK HYDRAULIC UNIT VDC OPERATION WITH BRAKE TESTER

1) Set the wheels other than the measured one on free rollers.
2) Prepare for operating the VDC sequence control. <Ref. to VDC-12, VDC Sequence Control.>
3) Set the front wheels or rear wheels on the brake tester and set the select lever position to “N” range.





(1) Brake tester

4) Operate the brake tester.
5) Perform VDC sequence control.
<Ref. to VDC-12, VDC Sequence Control.>
6) When the hydraulic unit begins to work, check the following working sequence.
(1) The FL wheel performs compression, holding and decompression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs compression, holding and decompression in sequence, and subsequently the RL wheel repeats the cycle.
7) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets specification.

	Front wheel	Rear wheel
When compressed	2,000 N (203 kgf, 447 lbf) or more	1,000 N (102 kgf, 225 lbf) or more
When decompressed	500 N (51 kgf, 112 lbf) or less	500 N (51 kgf, 112 lbf) or less

8) After the inspection, depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

D: ADJUSTMENT

When the following replacement, removal and installation is performed, be sure to perform the centering setting of steering angle sensor and zero point setting of yaw rate & lateral G sensor.

- VDCCM&H/U
- Steering angle sensor
- Yaw rate & lateral G sensor
- Steering wheel parts (Including airbag)
- Suspension parts
- Wheel alignment adjustment

1) Park the vehicle straight on a level surface. (Engine operation on “P” or “N” range)
2) Check that steering wheels are positioned in center. (When the center position is not correct, adjust the wheel alignment.)
3) Set the Subaru Select Monitor to vehicle, select the {Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point} on “Function check sequence” display. (Follow the step on display.)
4) On the “Brake Control System” display screen, select the {Current Data Display & Save}, and check that the steering angle sensor is displayed “0 deg”.
5) When the “0 deg” is not displayed, repeat the above steps and check that the “0 deg” is displayed.
6) Drive the vehicle for 10 minutes, and check that the ABS and VDC warning light is not illuminated.
7) Check that the unnecessary operation of VDC, or losing control of steering is not occurred. And when the malfunction occurred, repeat the above steps.

3. ABS Sequence Control

A: OPERATION

<Ref. to ABS-10, OPERATION, ABS Sequence Control.>

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

<Ref. to ABS-10, ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR, OPERATION, ABS Sequence Control.>

2. CONDITIONS FOR ABS SEQUENCE CONTROL

<Ref. to ABS-11, CONDITIONS FOR ABS SEQUENCE CONTROL, OPERATION, ABS Sequence Control.>

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

<Ref. to ABS-12, CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL, SPECIFICATION, ABS Sequence Control.>

4. VDC Sequence Control

A: OPERATION

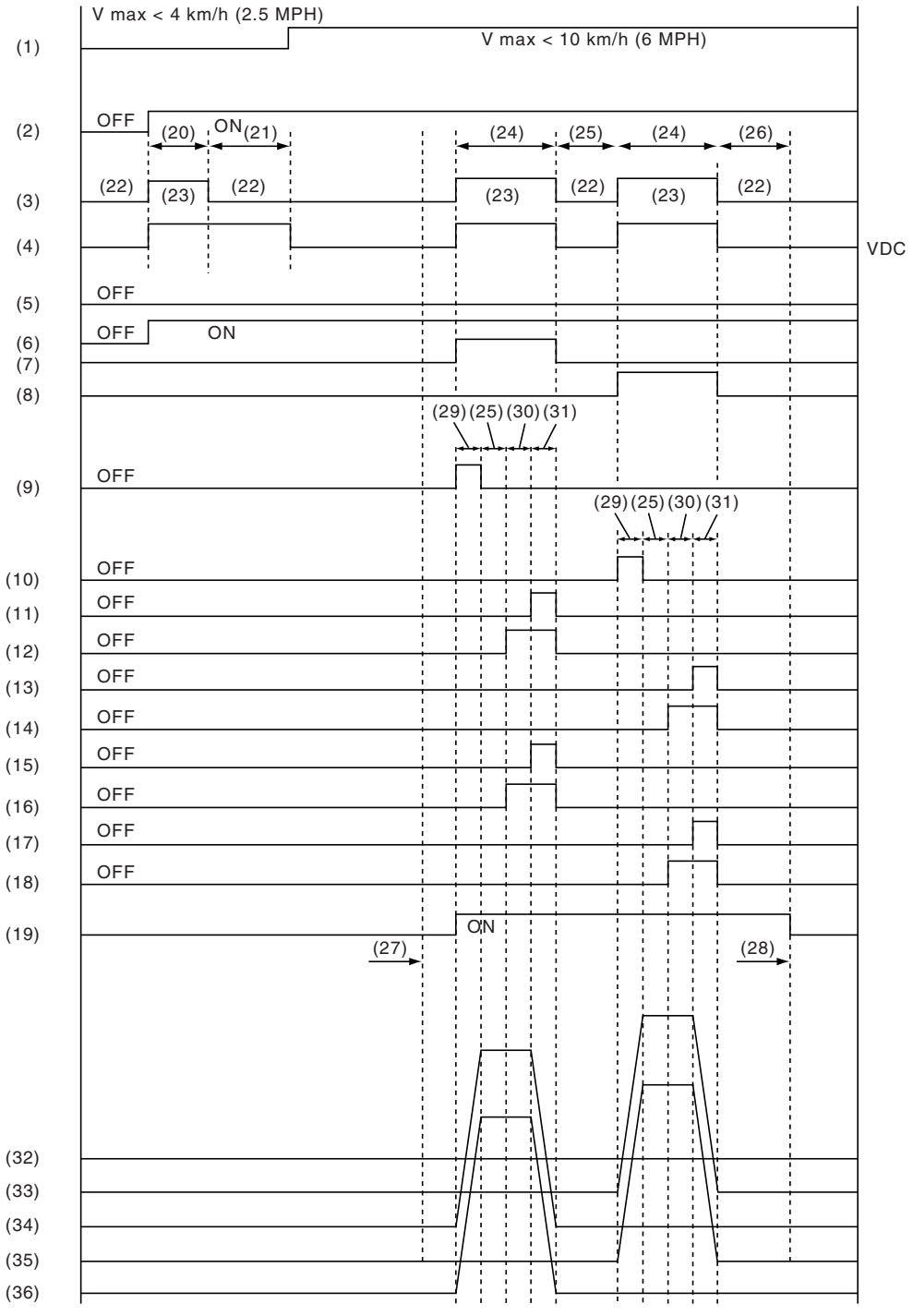
1) While the VDC sequence control is performed, the operation of the hydraulic unit can be checked using the brake tester or pressure gauge after the hydraulic unit solenoid valve is operated.
2) VDC sequence control can be started by Subaru Select Monitor.

1. VDC SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:
In the event of any trouble, the sequence control does not operate.

1) Connect the Subaru Select Monitor to data link connector under the driver's side instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Set the Subaru Select Monitor power switch to ON.
4) Set the Subaru Select Monitor to "Brake Control" mode.
5) When the "VDC Inspection Mode" is selected from the "Function check sequence" menu, the "VDC sequence control" will start.
6) Since "Press the [YES] key" is displayed, press the YES key.
7) Operation points will be displayed on the Subaru Select Monitor.

2. CONDITIONS FOR VDC SEQUENCE CONTROL



VDC00275

(1) All wheel speed
(2) Ignition key
(3) ABS warning light
(4) VDC warning light
(5) Stop light switch
(6) Valve relay
(7) VDC switching valve 1 FL
(8) VDC switching valve 1 FR
(9) VDC switching valve 2 FL
(10) VDC switching valve 2 FR
(11) FL decompression valve
(12) FL compression valve
(13) FR decompression valve
(14) FR compression valve
(15) RR decompression valve
(16) RR compression valve
(17) RL decompression valve
(18) RL compression valve
(19) Pump motor
(20) 1.5 sec.
(21) Approx. 3 sec.
(22) Light OFF
(23) Light ON
(24) 3.4 sec.
(25) 1 sec.
(26) 1.6 sec.
(27) Point A
(28) Reset
(29) 0.8 sec.
(30) 1.2 sec.
(31) 0.4 sec.
(32) Master cylinder pressure
(33) FR wheel cylinder pressure
(34) FL wheel cylinder pressure
(35) RL wheel cylinder pressure
(36) RR wheel cylinder pressure

NOTE:
The control operation starts from point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

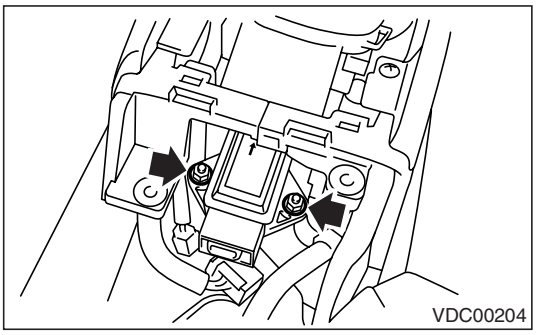
When the following conditions develop, the VDC sequence control stops and VDC operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is pressed during sequence control and the stop light switch is set to ON.
3) After completion of VDC sequence control.
4) When malfunction is detected.

5. Yaw Rate and Lateral G Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console box. <Ref. to EI-53, Console Box.>
3) Disconnect the connector from yaw rate & lateral G sensor.
4) Remove the yaw rate & lateral G sensor.

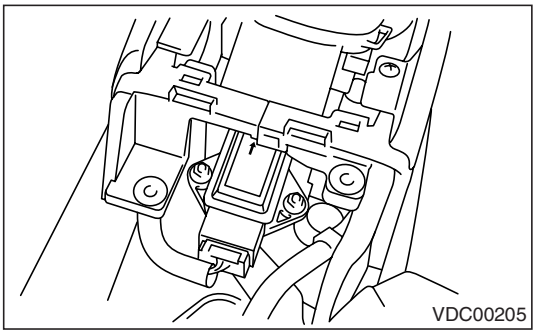
CAUTION:
Do not drop or bump the yaw rate & lateral G sensor.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Install the yaw rate & lateral G sensor to body with directing the arrow mark on sensors to vehicle front.



Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

CAUTION:
After completion of installation, set the following two positions.
• Positioning to the center of steering angle sensor
• Positioning of the yaw rate & lateral G sensor to zero
The above procedure is required VDCCM&H/U to identify the vehicle position afterward. For the setting procedures of step 2 above, refer to "VDC Control Module & Hydraulic Control Unit (VDCCM&H/U)". <Ref. to VDC-10, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

C: INSPECTION

1. YAW RATE & LATERAL G SENSOR SIGNAL

	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor connector to data link connector. 3) Turn the ignition switch to ON. 4) Set the Subaru Select Monitor to {Brake Control} mode. 5) Select {Current Data Display & Save}. 6) Read the output voltage of yaw rate & lateral G sensor.	Are the indicated values when the vehicle is placed horizontally Lateral G sensor: −1.5 — 1.5 m/s Yaw rate sensor: −4 — 4 deg/s?	Go to step **2.**	Repair the harness connector between yaw rate & lateral G sensor and VDCCM&H/U. Or replace the yaw rate & lateral G sensor.
2	**CHECK LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the yaw rate & lateral G sensor from vehicle. (Do not disconnect the connector.) 3) Read the display of Subaru Select Monitor. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the value 6.8 — 12.8 m/s when the yaw rate & lateral G sensors are inclined rightward to 90°?	Go to step **3.**	Repair the harness connector between yaw rate & lateral G sensor and VDCCM&H/U. Or replace the yaw rate & lateral G sensor.
3	**CHECK LATERAL G SENSOR.** Read the display of Subaru Select Monitor. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the value −6.8 — −12.8 m/s when the yaw rate & lateral G sensors are inclined leftward to 90°?	Yaw rate & lateral G sensors are normal.	Repair the harness connector between yaw rate & lateral G sensor and VDCCM&H/U. Or replace the yaw rate & lateral G sensor.

6. Steering Angle Sensor

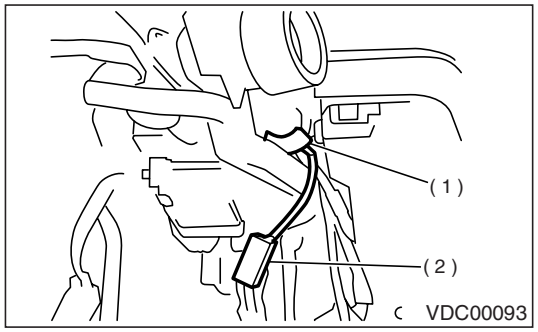
A: REPLACEMENT

CAUTION:
• Do not perform the removal except when the replacement.
• When replacing more than three times, replace the combination switch as assembly to protect screw part.

1) Set the steering wheel in a wheel-forward position.
2) Disconnect the ground cable from battery.
3) Remove the airbag module.
<Ref. to AB-16, REMOVAL, Driver's Airbag Module.>

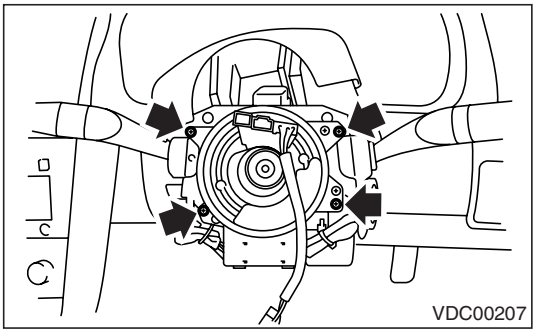
WARNING:
Always refer to "Airbag System" when performing the airbag module repair service.
<Ref. to AB-5, CAUTION, General Description.>

4) Remove the steering wheel.
<Ref. to PS-21, REMOVAL, Steering Wheel.>
5) Remove the screws and remove the steering column lower cover.
6) Remove the two screws securing the steering column upper cover.
7) Unlock the harness band and disconnect the connector of steering angle sensor.

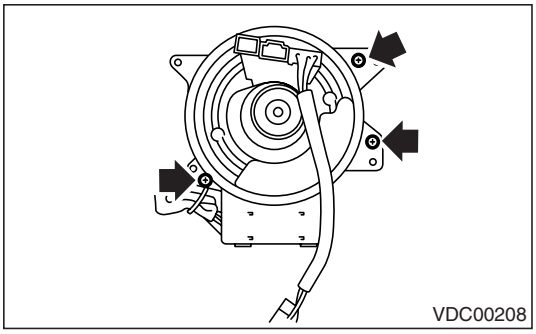


(1) Harness band
(2) Connector

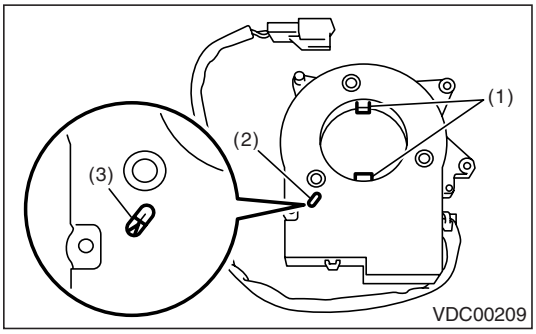
8) Remove the screws which secure the roll connector to steering column.



9) Remove the steering angle sensor from roll connector.



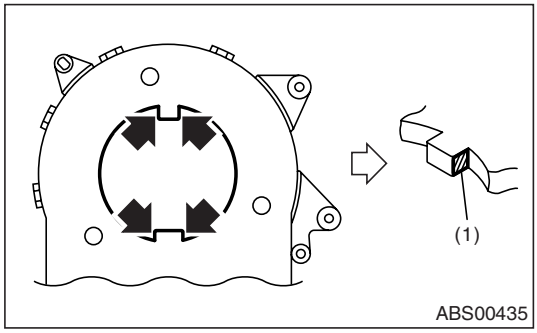
10) Turn the protrusion portion of new steering angle sensor to match the alignment mark of inspection hole.



(1) Protrusion portion
(2) Inspection hole
(3) Alignment mark

CAUTION:
Be careful not to allow foreign particles to enter from inspection hole.

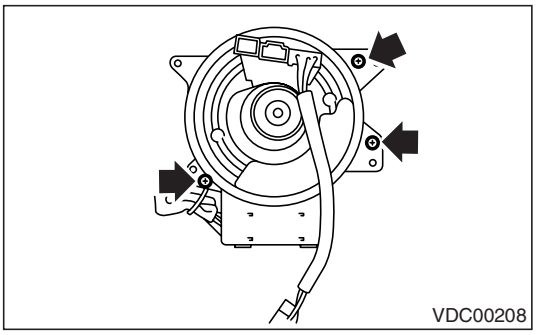
11) Align the center of roll connector.
<Ref. to AB-25, INSTALLATION, Roll Connector.>
12) Apply thin coat of grease which enclosed with new part to the protruding parts (four) of steering angle sensor.



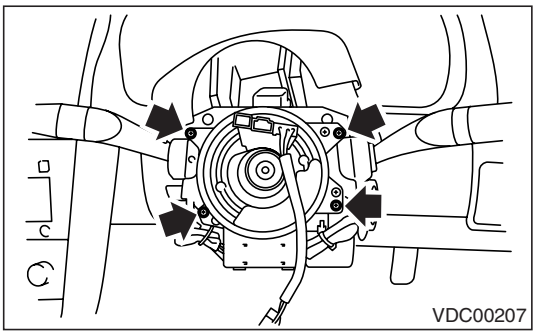
(1) Apply grease.

13) Align the position of protrusion portion and install the roll connector to the steering angle sensor.

Tightening torque:
0.5 N·m (0.05 kgf-m, 0.36 ft-lb)



14) Install the roll connector to combination switch.



15) Install the steering wheel.
<Ref. to PS-21, INSTALLATION, Steering Wheel.>

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

16) Install the airbag module to steering wheel.
<Ref. to AB-16, INSTALLATION, Driver's Airbag Module.>

WARNING:
Always refer to "Air Bag System" before performing the service operation.
<Ref. to AB-5, CAUTION, General Description.>

17) Connect the ground cable to battery.

CAUTION:
After completion of installation, adjust the following two positions.
• Positioning to the center of steering angle sensor
• Positioning of the yaw rate & lateral G sensor to zero
The above procedure is required VDCCM&H/U to identify the vehicle position afterward. For the setting procedures of step 2 above, refer to 2VDC Control Module & Hydraulic Control Unit (VDCCM&H/U)". <Ref. to VDC-10, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

7. Front ABS Wheel Speed Sensor

A: NOTE

For the vehicle equipped with VDC, it has the same ABS wheel speed sensor as installed to the vehicle equipped with ABS. For removal, installation and inspection procedure, refer to “Front ABS Wheel Speed Sensor”. <Ref. to ABS-13, Front ABS Wheel Speed Sensor.>

8. Rear ABS Wheel Speed Sensor

A: NOTE

For the vehicle equipped with VDC, it has the same ABS wheel speed sensor as installed to the vehicle equipped with ABS. For removal, installation and inspection procedure, refer to “Rear ABS Wheel Speed Sensor”. <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>

9. Front Magnetic Encoder

A: NOTE

For the vehicle equipped with VDC, it has the same magnetic encoder as installed to the vehicle equipped with ABS. For removal, installation and inspection procedure, refer to “Front Magnetic Encoder”. <Ref. to ABS-16, Front Magnetic Encoder.>

10.Rear Magnetic Encoder

A: NOTE

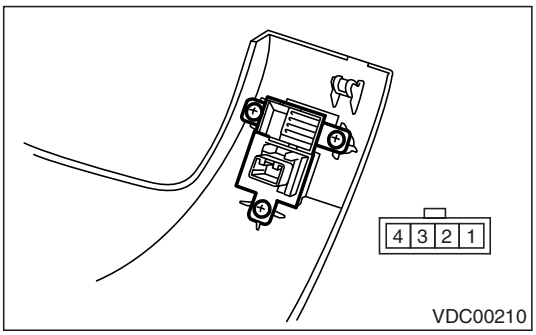
For the vehicle equipped with VDC, it has the same magnetic encoder as installed to the vehicle equipped with ABS. For removal, installation and inspection procedure, refer to “Rear Magnetic Encoder”. <Ref. to ABS-17, Rear Magnetic Encoder.>

11.VDC OFF Switch

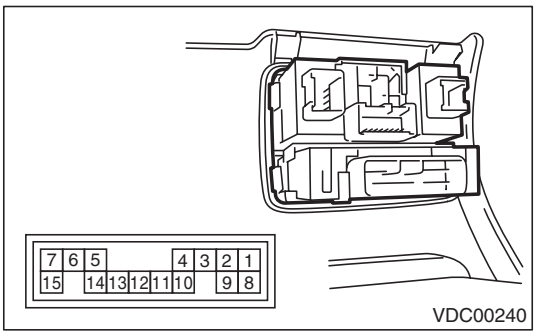
A: REMOVAL

1) Remove the instrument panel lower cover.
2) Remove the screws, and then remove the VDC OFF switch.

- RHD model



- LHD model



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the resistance between VDC OFF switch terminals.

- RHD model

Switch position	Terminal No.	Standard
OFF	2 — 3	More than 1 MΩ
ON	2 — 3	Less than 1 Ω

- LHD model

Switch position	Terminal No.	Standard
OFF	2 — 15	More than 1 MΩ
ON	2 — 15	Less than 1 Ω

If it is out of standard, replace the VDC OFF switch.

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

VDC(diag)

		Page
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1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
When the Subaru Select Monitor is communicating (except when displaying the data), the ABS warning light flashes and VDC warning light illuminates in the combination meter. Do not communicate with the Subaru Select Monitor while driving, because the ABS and VDC functions are disabled. Carefully drive the vehicle, when you have to communicate with the Subaru Select Monitor. When the data is displayed by the {Current Data Display & Save} menu, both the ABS and VDC warning lights are turned off and ABS and VDC functions are enabled.

NOTE:
- To check the harness for broken wires or short circuits, shake problem spot or connector.
- Refer to “Check List for Interview”. <Ref. to VDC(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 checklist. <Ref. to VDC(diag)-4, Check List for Interview.> 2) Before performing diagnostics, check the component which might affect VDC problems. <Ref. to VDC(diag)-8, INSPECTION, General Description.>	Is the component that might influence the VDC problem normal?	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 the Subaru Select Monitor power switch to ON. 4) Read the DTC using Subaru Select Monitor. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to VDC(diag)-20, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>	Is DTC displayed on the Subaru Select Monitor?	Record DTC and freeze frame data. Go to step **4.**	Go to step **3.**
3	**PERFORM GENERAL DIAGNOSTICS.** 1) Inspect using a “General Diagnostic Table”. <Ref. to VDC(diag)-132, INSPECTION, General Diagnostic Table.> 2) Perform the clear memory mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 4) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Check the DTC is not displayed.	Do the VDC warning light and ABS warning light go off after starting the engine?	Finish the diagnosis.	Check the combination meter circuit. <Ref. to VDC(diag)-31, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-34, VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.>

	Step	Check	Yes	No
4	**PERFORM DIAGNOSIS.** 1) Refer to “List of Diagnostic Trouble Code (DTC)”. NOTE: For the DTC list, refer to the “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-38, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the wrong part. 3) Perform the clear memory mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 5) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Repeat step 4 until DTC is not shown.	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on • When / How long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after engine starting, engine is running) ❑ ON (after engine starting, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition switch to ON ❑ Immediately after turning the ignition switch to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Part name: • Operating condition:		

2. STATE OF VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT

VDC warning light and VDC OFF indicator light come on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on • When / How long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after engine starting, engine is running) ❑ ON (after engine starting, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition switch to ON ❑ Immediately after turning the ignition switch to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Part name: • Operating condition:		

3. STATE OF VDC OPERATION INDICATOR LIGHT

VDC operation indicator light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on • When / How long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after engine starting, engine is running) ❑ ON (after engine starting, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition switch to ON ❑ Immediately after turning the ignition switch to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Part name: • Operating condition:		

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others:
	b) Ambient temperature	°C (°F)
	c) Road	❑ Inner city ❑ Suburbs ❑ Highway ❑ Local street ❑ Uphill ❑ Downhill ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Straight road ❑ Sharp curve ❑ Gentle curve ❑ S-curve ❑ Road with a slope on both sides ❑ Others:
	d) Road surface	❑ Dried ❑ Wet ❑ Covered with fresh snow ❑ Covered with hardened snow ❑ Frozen slope ❑ Others:

Check List for Interview

Condition	a) Brakes	Deceleration: G
		❑ continuous / ❑ intermittent
	b) Accelerator	Acceleration: G
		❑ continuous / ❑ intermittent
	c) Vehicle speed	km/h | MPH
		❑ Advancing ❑ When accelerating ❑ When decelerating ❑ At low speed ❑ When turning ❑ Others:
	d) Tire inflation pressure	Front RH tire: kPa
		Front LH tire: kPa
		Rear RH tire: kPa
		Rear LH tire: kPa
	e) Degree of wear	Front RH tire:
		Front LH tire:
		Rear RH tire:
		Rear LH tire:
	f) Steering wheel	❑ Sharp turning ❑ Gentle turning ❑ Straight forward motion ❑ Gentle return ❑ Sharp return
	g) Tire/Wheel size	❑ Specified size ❑ Except specification ( )
	h) Tire variation	❑ Summer tire ❑Studless tire (Brand:)
	i) Tire chains are fitted: ❑ Yes / ❑ No	
	j) T-type tire is used: ❑ Yes / ❑ No	
	k) Condition of suspension alignment:	
	l) Loading state:	
	m) Repair parts are used: ❑ Yes / ❑ No	
	• Contents:	
	n) Others:	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor and VDCCM&H/U.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor and VDCCM&H/U.

B: INSPECTION

Before performing diagnosis, check the following items which might affect VDC problems.

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage: 12 V or more

Specific gravity: 1.260 or more

2. GROUND

Check the tightening torque of ground (GB-7) bolt of VDC.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

3. BRAKE FLUID

1) Check the brake fluid level.
2) Check the brake fluid for leaks.

4. HYDRAULIC UNIT

Check the hydraulic unit.
• With brake tester <Ref. to VDC-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
• Without brake tester <Ref. to VDC-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

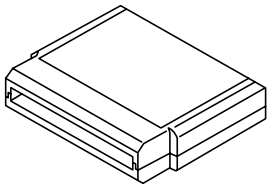
Check the brake pad and rotor.
• FRONT <Ref. to BR-18, INSPECTION, Front Brake Pad.> <Ref. to BR-19, INSPECTION, Front Disc Rotor.>
• REAR <Ref. to BR-25, INSPECTION, Rear Brake Pad.> <Ref. to BR-26, INSPECTION, Rear Disc Rotor.>

7. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOL

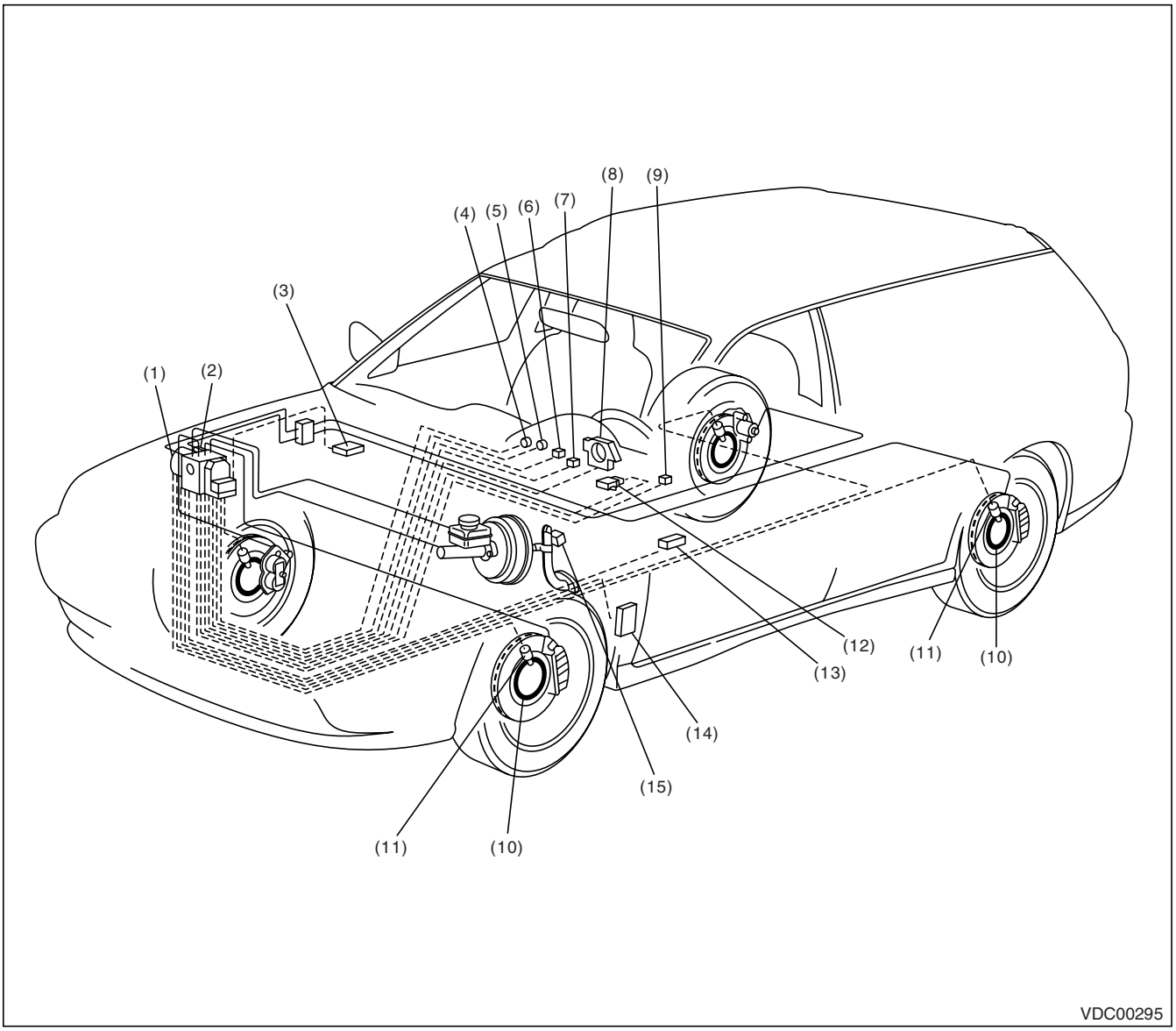
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

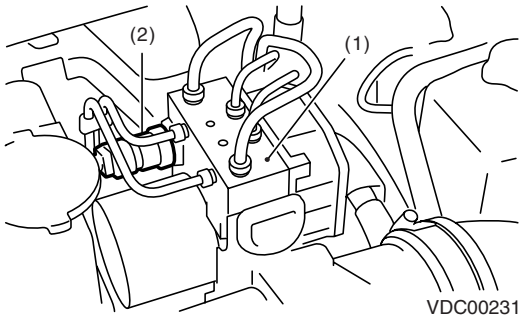
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring sensor.

4. Electrical Component Location

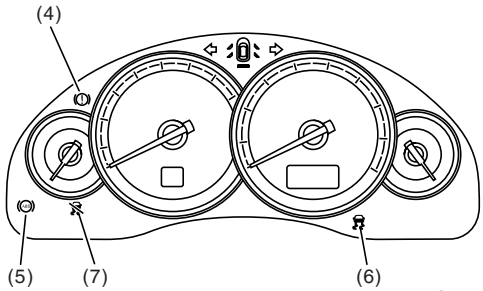
A: LOCATION



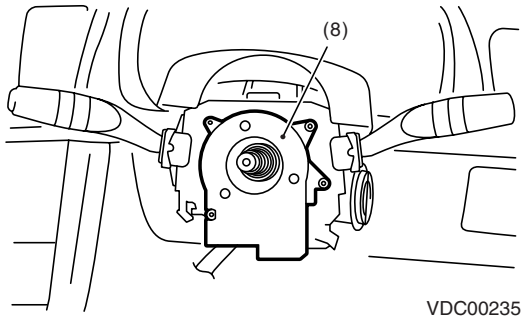
(1) VDC control module & hydraulic control unit (VDCCM&H/U)
(2) Pressure sensor
(3) Engine control module (ECM)
(4) Brake warning light (EBD warning light)
(5) ABS warning light
(6) VDC indicator light
(7) VDC warning light and VDC OFF indicator light
(8) Steering angle sensor
(9) VDC OFF Switch
(10) Magnetic encoder
(11) ABS wheel speed sensor
(12) Yaw rate & lateral G sensor
(13) Data link connector
(14) Transmission control module (TCM)
(15) Stop light switch



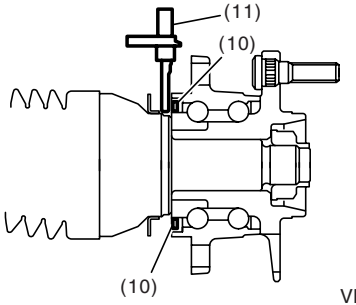
VDC00231



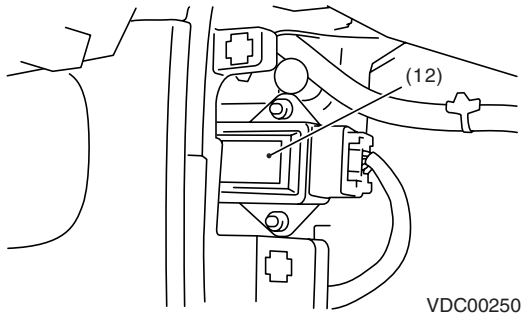
VDC00251



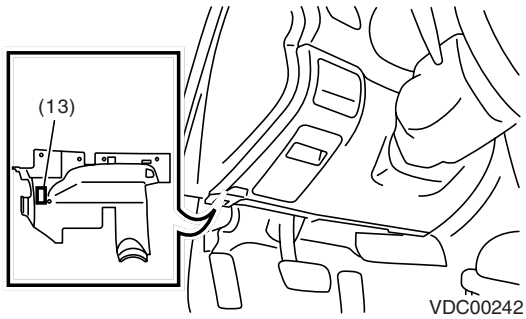
VDC00235



VDC00234



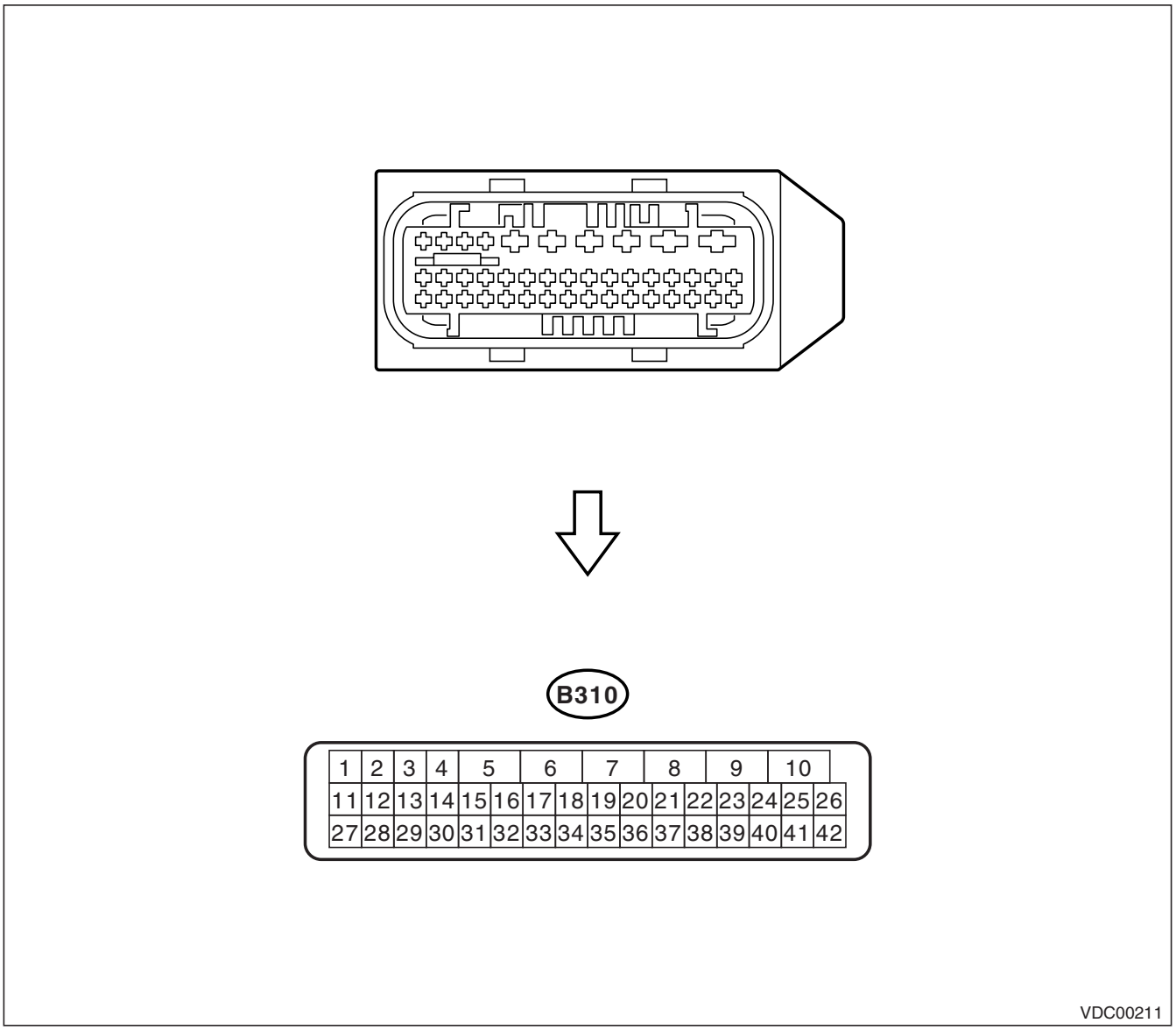
VDC00250



VDC00242

5. Control Module I/O Signal

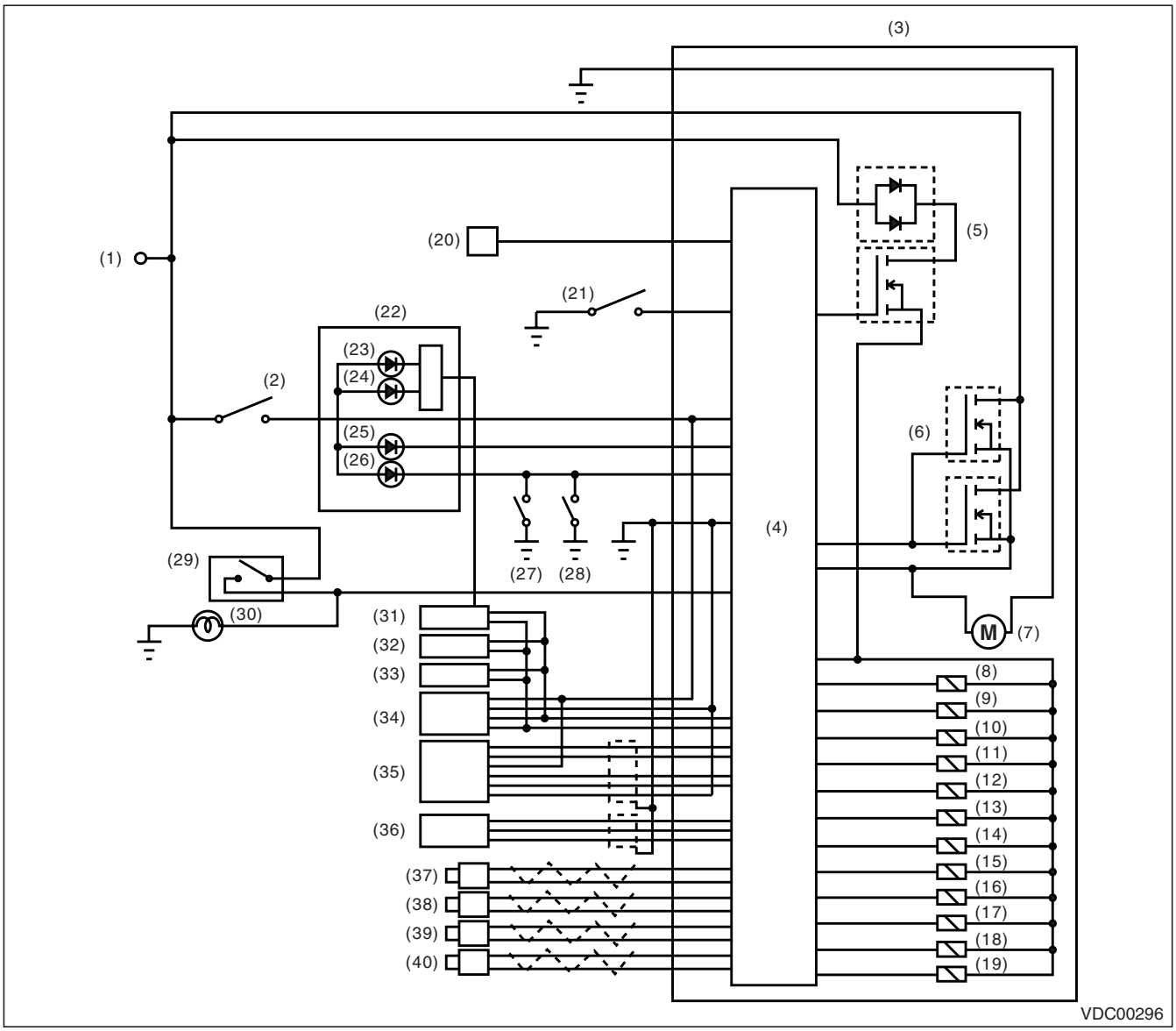
A: ELECTRICAL SPECIFICATION



NOTE:
- Terminal numbers in VDCCM&H/U connector are shown in the figure.
- When the connector is removed from VDCCM&H/U, the ABS warning light, VDC warning light and VDC OFF indicator light illuminate.

Content			Terminal No. (+) — (–)	Input/Output signal Measured value and measuring conditions
Power supply			14 — 6	When the ignition switch is ON, 10 — 15 V.
ABS wheel speed sensor	Front LH wheel	Power supply	41 — 6	4.5 — 16.5 V
		Signal	25	5.9 — 16.8 mA: Rectangle waveform
	Front RH wheel	Power supply	22 — 6	4.5 — 16.5 V
		Signal	21	5.9 — 16.8 mA: Rectangle waveform
	Rear LH wheel	Power supply	24 — 6	4.5 — 16.5 V
		Signal	40	5.9 — 16.8 mA: Rectangle waveform
	Rear RH wheel	Power supply	23 — 6	4.5 — 16.5 V
		Signal	38	5.9 — 16.8 mA: Rectangle waveform
Yaw rate & lateral G sensor	Output (Lateral G sensor)		3 — 16	When the vehicle is on level, 2.35 — 2.65 V.
	Power supply		30 — 16	When the ignition switch is ON, 8 — 16 V.
	Output (Yaw rate sensor)		28 — 16	WAVEFORM <Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Specification (Yaw rate sensor)		1 — 16	2.1 — 2.9 V
	Test		2 — 16	5 — 1 V cycle for 40 ms pulse signal. <Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Ground		16	—
CAN Communication Line (+)			13	2.5 — 1.5 V pulse signal
CAN Communication Line (–)			29	3.5 — 2.5 V pulse signal
Valve relay power supply			5 — 6	When the ignition switch is ON, 10 — 15 V.
Motor relay power supply			9 — 10	When the ignition switch is ON, 10 — 15 V.
Pressure sensor	Power supply		27 — 12	When the ignition switch is ON, 4.75 — 5.25 V.
	Output voltage		11 — 12	0.48 — 0.72 V (when releasing the brake pedal)
	Ground		12	—
ABS warning light			35 — 6	After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Brake warning light (EBD warning light)			20 — 6	After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Stop light switch			37 — 6	Less than 1.5 V when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.
Subaru Select Monitor			26 — 6	0 ←→ 12 V pulse (in communication)
Vehicle speed output signal			36	0 ←→ 12 V pulse
Ground			6	—

B: WIRING DIAGRAM

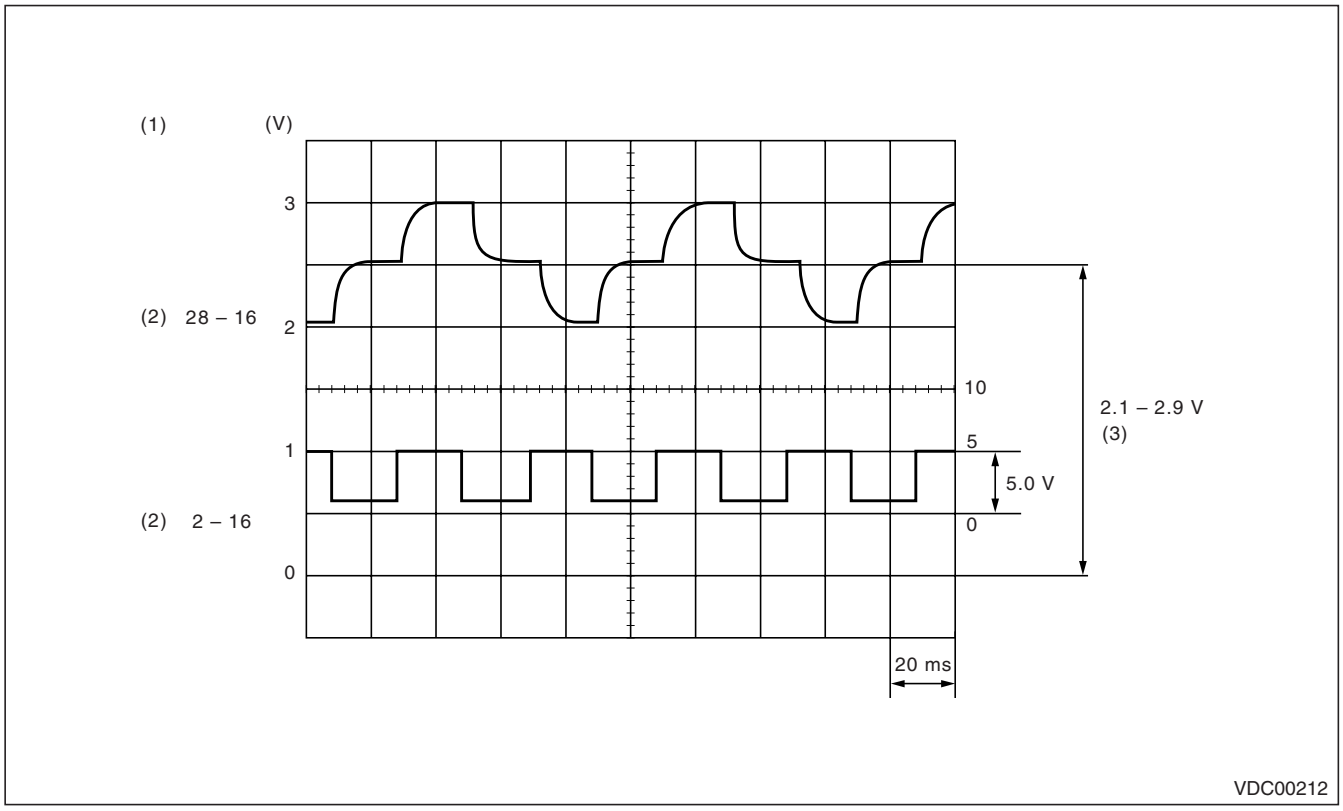


(1) Battery
(2) Ignition switch
(3) VDC control module & hydraulic control unit (VDCCM&H/U)
(4) VDC control module
(5) Valve Relay
(6) Motor relay
(7) Motor
(8) Front inlet solenoid valve LH
(9) Front outlet solenoid valve LH
(10) Front inlet solenoid valve RH
(11) Front outlet solenoid valve RH
(12) Rear inlet solenoid valve LH
(13) Rear outlet solenoid valve LH
(14) Rear inlet solenoid valve RH
(15) Rear outlet solenoid valve RH
(16) Primary cut solenoid valve
(17) Primary suction solenoid valve
(18) Secondary cut solenoid valve
(19) Secondary suction solenoid valve
(20) Data link connector
(21) VDC OFF switch
(22) Combination meter
(23) VDC indicator light
(24) VDC warning light and VDC OFF indicator light
(25) ABS warning light
(26) Brake warning light
(27) Parking brake switch
(28) Brake fluid level switch
(29) Stop light switch
(30) Stop light
(31) Body integrated module
(32) Engine control module (ECM)
(33) Transmission control module (TCM)
(34) Steering angle sensor
(35) Yaw rate & lateral G sensor
(36) Pressure sensor
(37) Front ABS wheel speed sensor LH
(38) Front ABS wheel speed sensor RH
(39) Rear ABS wheel speed sensor LH
(40) Rear ABS wheel speed sensor RH

C: MEASUREMENT

Measure input and output signal voltage.

1. WAVEFORM



(1) Yaw rate sensor
(2) Terminal No.
(3) Vehicle is at a standstill.

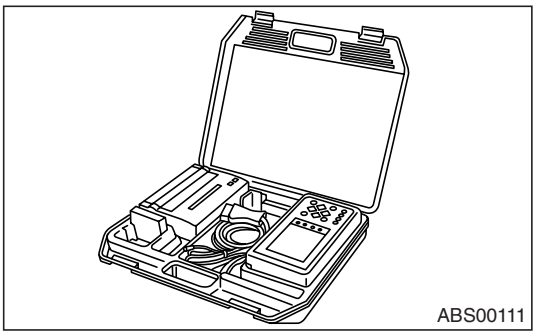
6. Subaru Select Monitor

A: OPERATION

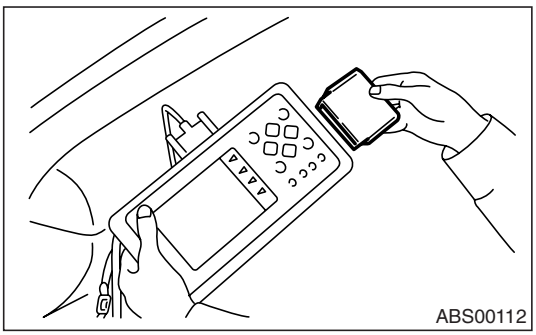
CAUTION:
When the Subaru Select Monitor is communicating (except when displaying the data), the ABS warning light flashes and VDC warning light illuminates in the combination meter. Do not communicate with the Subaru Select Monitor while driving, because the ABS and VDC functions are disabled. Carefully drive the vehicle, when you have to communicate with the Subaru Select Monitor. When the data is displayed by the {Current Data Display & Save} menu, both the ABS and VDC warning lights are turned off and ABS and VDC functions are enabled.

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit. <Ref. to VDC(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>

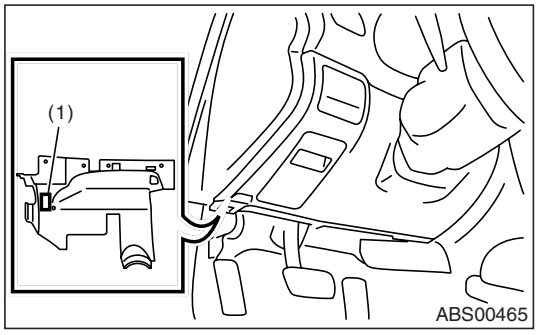


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to VDC(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).

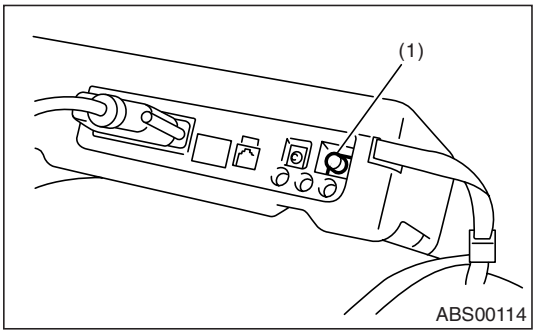


(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF), and the Subaru Select Monitor power switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
8) Press the [YES] key after the {VDC} is displayed.
9) On the «VDC Diagnosis» display screen, select the {Diagnostic Code(s) Display}, and then press the [YES] key.

NOTE:
• For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTCs, refer to the "List of Diagnostic Trouble Code (DTC)". <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>
• DTCs are displayed up to three in detected order.
• If a particular DTC is not properly stored in memory (due to a drop in VDCCM&H/U power supply,

etc.) on the occurrence of a problem, the DTC which is suffixed with a question mark "?" appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

10) If VDC and Subaru Select Monitor cannot communicate, check the communication circuit. <Ref. to VDC(diag)-20, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

Display	Contents to be monitored
Current	Indicate the latest DTC on the Subaru Select Monitor display.
Old	Indicate the latest DTC in previous trouble on the Subaru Select Monitor display.
Older	Indicate the latest DTC in second previous trouble on the Subaru Select Monitor display.
Before 3	Indicate the latest DTC in third previous trouble on the Subaru Select Monitor display.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
3) Press the [YES] key after the {VDC} is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» display screen, select the data display method, and press the [YES] key.
6) Using a scroll key, scroll the display screen up or down until necessary data is shown.
• A list of the support data is shown in the following table.

Display	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h or MPH
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h or MPH
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h or MPH
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h or MPH
Steering Angle Sensor	Steering angle detected by steering angle sensor is displayed.	deg
Yaw Rate Sensor	Vehicle angular speed detected by yaw rate sensor is displayed.	deg/s
Pressure Sensor	Brake fluid pressure detected by pressure sensor is displayed.	bar
Lateral G Sensor	Vehicle lateral acceleration detected by lateral G sensor is displayed.	m/s (m/s^2)
IG power supply voltage	Voltage supplied to VDCCM&H/U is displayed.	V
EAM signal	Engine control command signal is displayed.	1 or 0
TCS Operation Light	TCS operation condition is displayed.	ON or OFF
VDC Operation Light	VDC operation condition is displayed.	ON or OFF
VDC OFF Light	ON/OFF condition of VDC OFF indicator light is displayed.	ON or OFF
EBD Warning Light	ON operation of the EBD warning light is displayed.	ON or OFF
ABS Warning Light	ON operation of the ABS warning light is displayed.	ON or OFF
VDC Warning Light	ON operation of the VDC warning light is displayed.	ON or OFF
VDC OK-B signal	Malfunction of VDC sensor (except for vehicle speed sensor) is displayed.	1 or 0
Valve Relay Signal	Valve relay operation signal is displayed.	ON or OFF
Motor Relay Signal	Motor relay operation signal is displayed.	ON or OFF
Motor Relay Monitor	Motor relay monitor signal is displayed.	ON or OFF
PATA Signal	Operation condition of VDC OFF switch is displayed.	ON or OFF
BLS Signal	Brake ON/OFF is displayed.	ON or OFF
Gear position	Present gear position is displayed.	—
Engine Speed	Current engine speed is displayed.	rpm
PW Signal	Acceleration opening is displayed.	%

NOTE:
For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
3) Press the [YES] key after the {VDC} is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.

Display	Contents to be monitored
Clear Memory?	DTC deleting function

5) When “Done” and “Turn ignition switch OFF” are shown on the display screen, turn the Subaru Select Monitor power switch and ignition switch to OFF.

NOTE:
For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. ABS SEQUENCE CONTROL

Display	Contents to be monitored	Reference target
ABS sequence control	Operate the valve and pump motor continuously to perform the ABS sequence control.	<Ref. to ABS-10, ABS Sequence Control.>
VDC confirmation mode	Operate the valve and pump motor continuously to perform the VDC sequence control.	<Ref. to VDC-12, VDC Sequence Control.>

5. FREEZE FRAME DATA

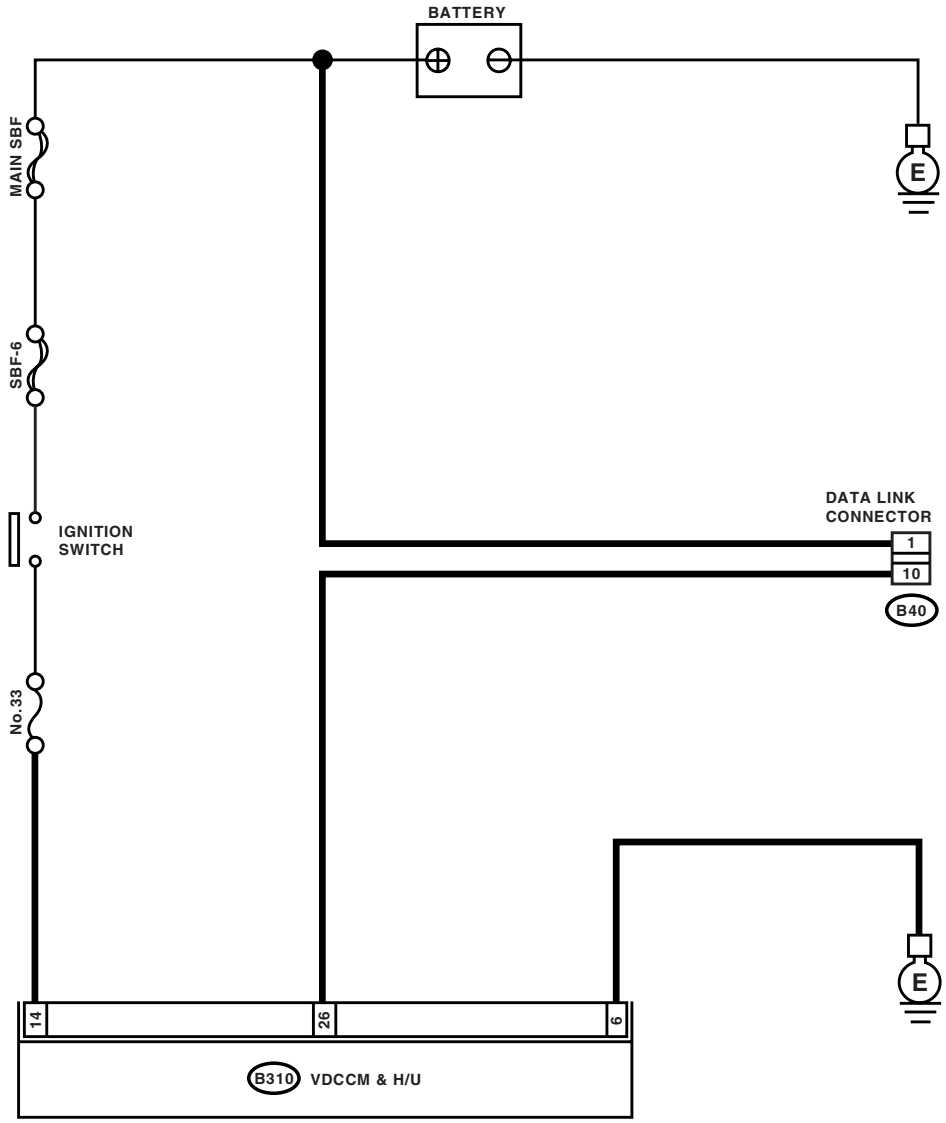
NOTE:
• Data stored at the time of trouble occurrence is shown on display.
• Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
• If a freeze frame data is not properly stored in memory (due to a drop in VDC control module power supply, etc.), the DTC which is suffixed with a question mark “?” appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

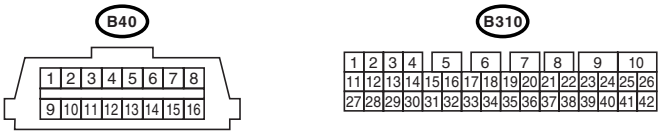
Display	Contents to be monitored
Steering angle sensor	Steering angle detected by steering angle sensor is displayed.
Yaw rate sensor	Vehicle angular speed detected by yaw rate sensor is displayed.
Lateral G sensor	Vehicle lateral acceleration detected by lateral G sensor is displayed.
Pressure sensor	Brake fluid pressure detected by pressure sensor is displayed.
Vehicle Speed	Vehicle speed calculated by VDC control module is displayed.
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed in km/h or MPH.
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed in km/h or MPH.
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed in km/h or MPH.
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed in km/h or MPH.
Required torque	Engine required torque is displayed.
Current torque	Current engine torque on malfunction occurrence is displayed.
Target torque	Engine target torque is displayed.
PW signal	Acceleration opening is displayed.
Engine Speed	Engine speed on malfunction occurrence is displayed.
Gear position	Gear position on malfunction occurrence is displayed.
IG power supply voltage	Voltage supplied to VDC control module is displayed.
Absolute angle recognition flag	Whether the absolute angle was determined is displayed.
Decreasing required torque	Whether the torque decrease is required to engine is displayed.
EAM signal	Engine control command signal is displayed.
VDC O control flag	VDC oversteer control condition is displayed.
VDC U control flag	VDC understeer control condition is displayed.
BMR control flag	Brake control condition is displayed.
AMR control flag	Engine control condition is displayed.
ABS control flag	ABS control condition is displayed.
VDC OFF light	ON/OFF condition of VDC OFF indicator light is displayed.
Valve Relay Signal	Valve relay operation signal is displayed.
Motor Relay Monitor	Motor relay monitor signal is displayed.
BLS signal	Brake ON/OFF is displayed.

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Communication is impossible between VDC and Subaru Select Monitor.
WIRING DIAGRAM:





VDC00297

	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 VDC mode using Subaru Select Monitor.
2	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage more than 11 V?	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 SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other system can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **5.**
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U, ECM and TCM. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR VDCCM&H/U.** 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **8.**	Repair the harness and connector between each control module and data link connector.
8	**CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND DATA LINK CONNECTOR.** Measure the resistance between VDCCM&H/U connector and data link connector. ***Connector & terminal*** ***(B310) No. 26 — (B40) No. 10:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness and connector between VDCCM&H/U and data link connector.
9	**CHECK INSTALLATION OF VDCCM&H/U CONNECTOR.** Turn the ignition switch to OFF.	Is the VDCCM&H/U connector inserted into VDCCM&H/U until the clamp locks onto it?	Go to step **10.**	Insert the VDCCM&H/U connector into VDCCM&H/U.

	Step	Check	Yes	No
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power supply voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 14 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **11.**	Repair open circuit in harness between VDCCM&H/U and battery.
11	**CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Measure the resistance of harness between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12.**	Repair open circuit in harness between VDCCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details concerning DTC reading procedure, refer to “Subaru Select Monitor”. <Ref. to VDC(diag)-16, Subaru Select Monitor.>

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as possible.
Drive the vehicle at least ten minutes.

NOTE:
Make sure the vehicle is not dragged to one side under usual driving condition.

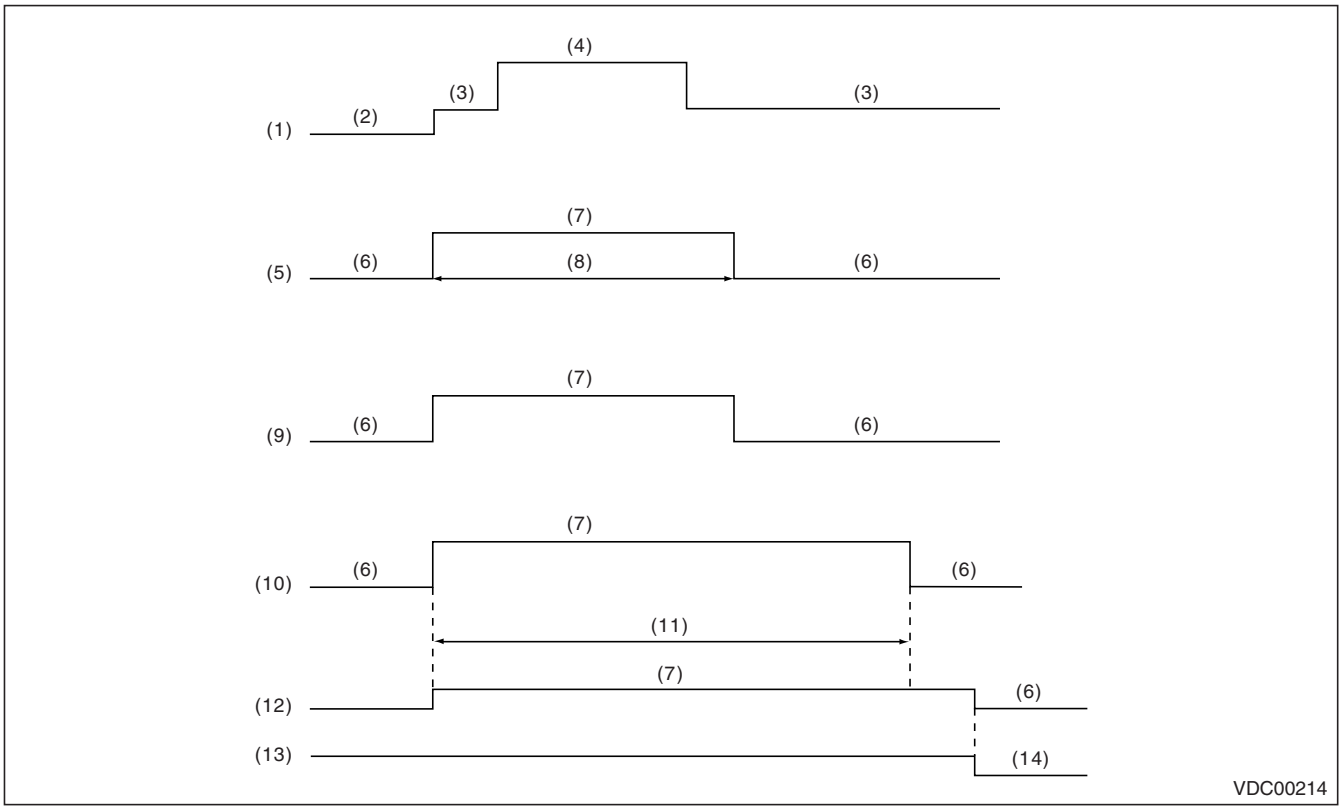
9. Clear Memory Mode

A: OPERATION

For details concerning DTC clear operation, refer to the “Subaru Select Monitor”. <Ref. to VDC(diag)-16, Subaru Select Monitor.>

10.Warning Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Engine start
(5) ABS warning light
(6) Light OFF
(7) Light ON
(8) 1.5 sec.
(9) VDC indicator light
(10) VDC warning light and VDC OFF indicator light
(11) Several seconds (depending on engine coolant temperature)
(12) Brake warning light (EBD warning light)
(13) Parking brake
(14) Released

1) When warning lights or indicator lights do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When warning lights or indicator lights remain constantly OFF, check the combination meter circuit or CAN communication circuit. <Ref. to VDC(diag)-27, VDC WARNING LIGHT, VDC OFF INDICATOR LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON, Warning Light Illumination Pattern.>
3) When ABS warning light does not go off, check the combination meter circuit. <Ref. to VDC(diag)-31, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>
4) When the VDC indicator light, VDC warning light and VDC OFF indicator light do not go off, check the combination meter circuit or CAN communication circuit. <Ref. to VDC(diag)-33, VDC INDICATOR LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>

NOTE:
• Even though the ABS warning light does not go off after 1.5 seconds from ABS warning light illumination, the ABS system operates normally when the warning light goes off while driving at approximately 12 km/h (7 MPH). However, the ABS system does not work while the ABS warning light is illuminated.
• It may take several minutes before VDC warning light and VDC OFF indicator light goes off if the vehicle is parked under low temperature for a specified time. This is not defective because it is resulted from low engine coolant temperature.
• With the vehicle jack-up/lift-up or set on free rollers, when the wheels lock or spin after starting the engine, ABS warning light, VDC warning light and VDC OFF indicator light may illuminate because VDCCM&H/U detects the abnormal conditions from ABS wheel speed sensors. In this case, this is not a malfunction. Perform the clear memory mode.

B: VDC WARNING LIGHT, VDC OFF INDICATOR LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), VDC indicator light, VDC warning light and VDC OFF indicator light do not come on.

NOTE:
When pressing the VDC OFF switch for more than 10 seconds, the VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the OFF operation enabled status is restored.

	Step	Check	Yes	No
1	**CHECK OTHER INDICATOR LIGHT.** Turn the ignition switch to ON.	Does other indicator light illuminate soon after “ON”?	Go to step **2.**	Perform the self-diagnosis of combination meter.
2	**CHECK VDCCM.** When the engine does not start, display the current data of VDCCM using Subaru Select Monitor.	Is “VDC warning light” output set to “ON”?	Go to step **3.**	Replace the VDCCM&H/U.
3	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **4.**
4	**CHECK COMBINATION METER.** Check the combination meter.	Is combination meter OK?	Replace the VDCCM&H/U.	Repair the combination meter assembly.

C: ABS WARNING LIGHT DOES NOT COME ON

DETECTING CONDITION:

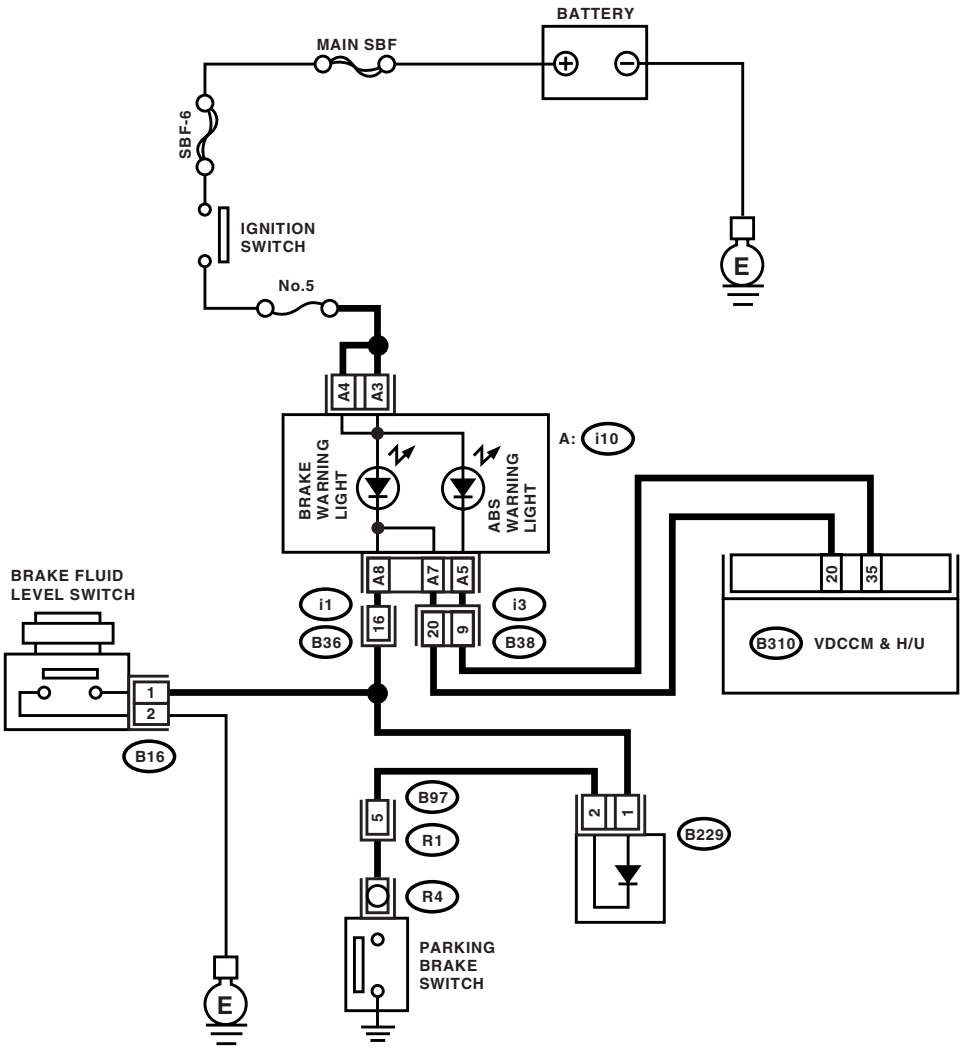
- Defective combination meter
- Defective harness

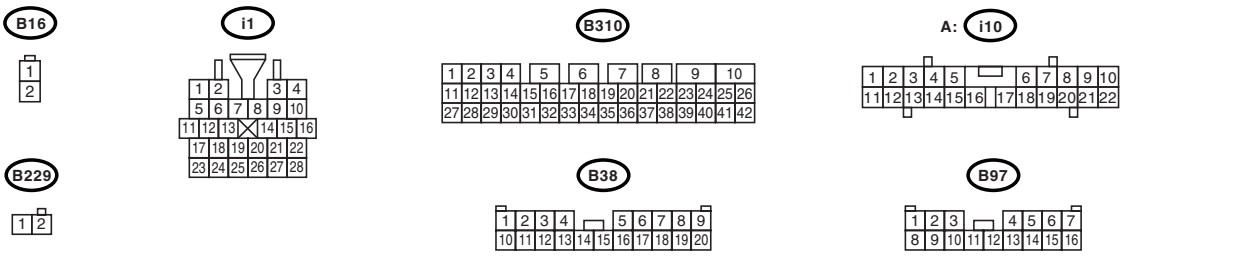
TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:

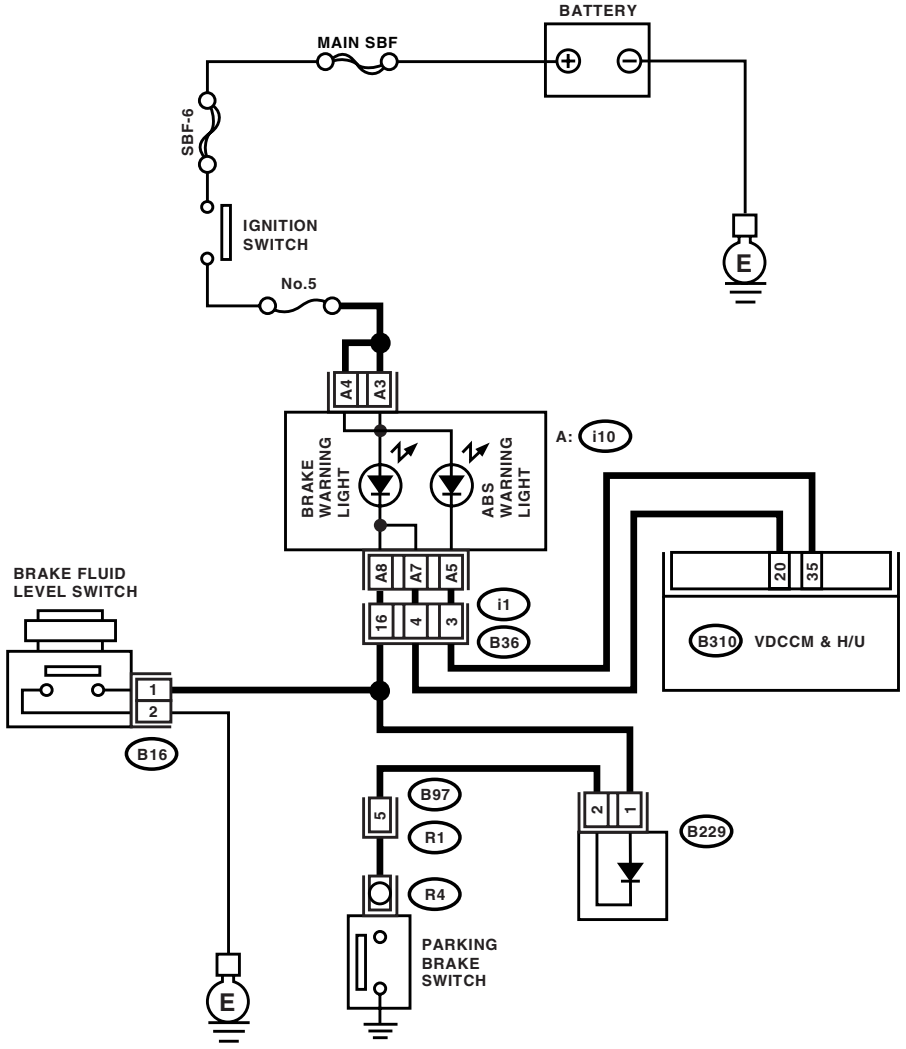
- LHD model

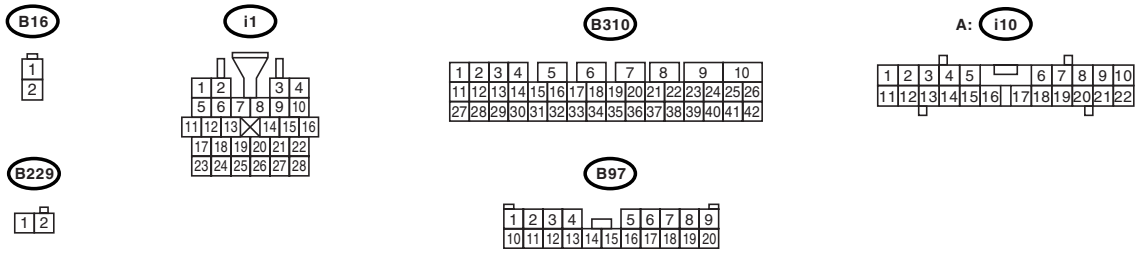




VDC00298

- RHD model





VDC00318

	Step	Check	Yes	No
1	**CHECK OTHER LIGHTS TURN ON.** Turn the ignition switch to ON. (engine OFF)	Do other warning lights illuminate?	Go to step **2.**	Check the combination meter.
2	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3.**
3	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B310) from VDCCM&H/U. 3) Disconnect the connector (i10) from combination meter. 4) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the harness connector between VDCCM&H/U and combination meter.
4	**CHECK VDCCM.** 1) Connect the connector (B310) to VDCCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between the combination meter connector and chassis ground soon after the ignition switch is turned to ON (within 1.5 seconds). ***Connector & terminal*** ***(i10) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Check the combination meter.	Replace the VDCCM&H/U.

D: ABS WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

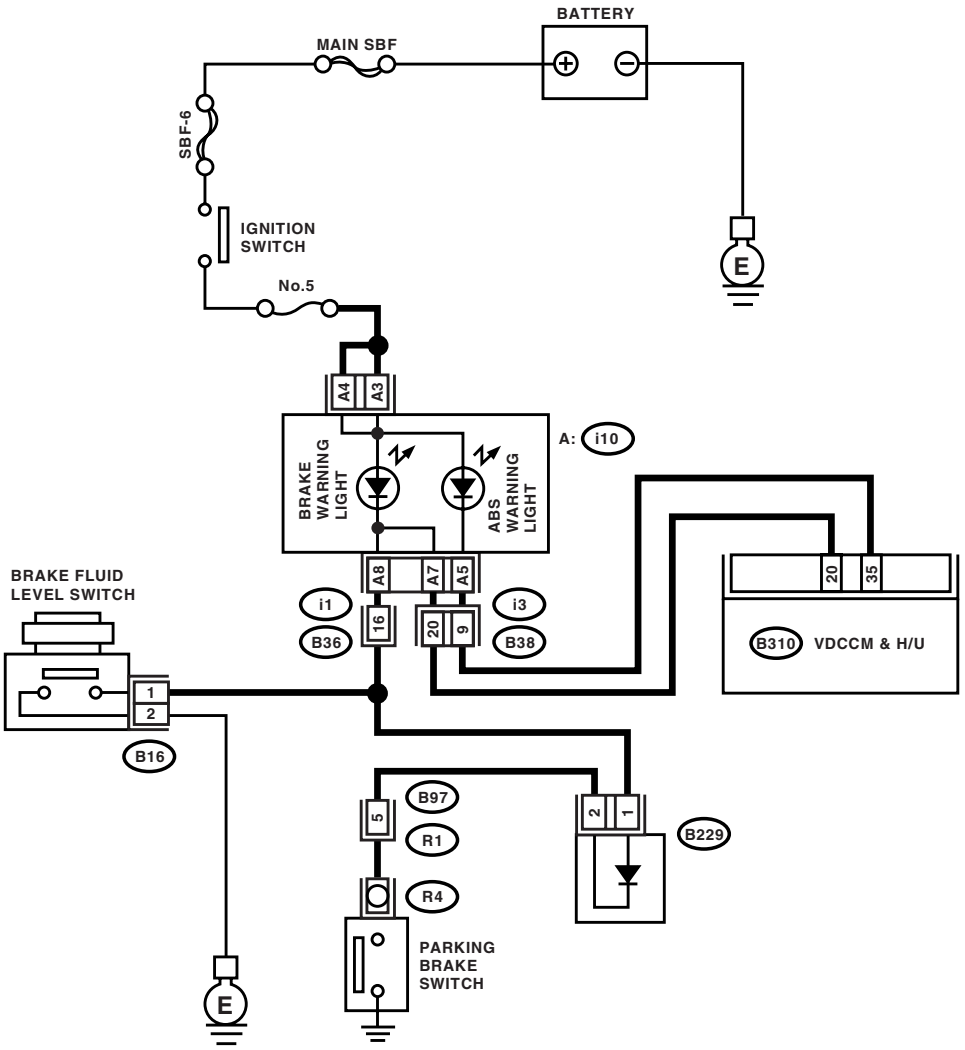
- Defective combination meter
- Open circuit of harness

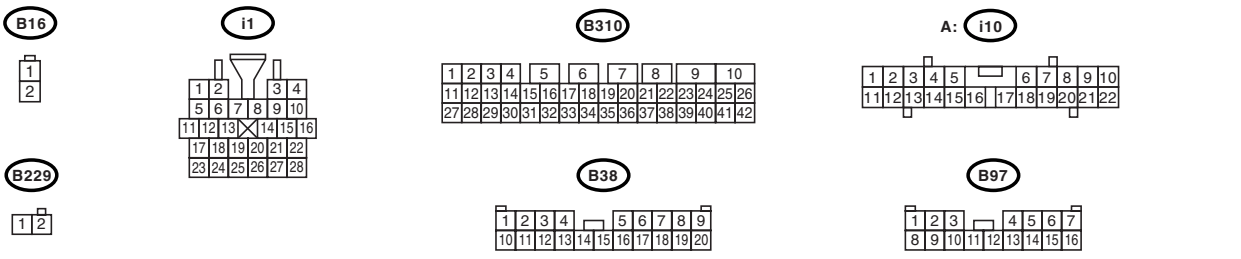
TROUBLE SYMPTOM:

When starting the engine, the ABS warning light is kept ON.

WIRING DIAGRAM:

- LHD model

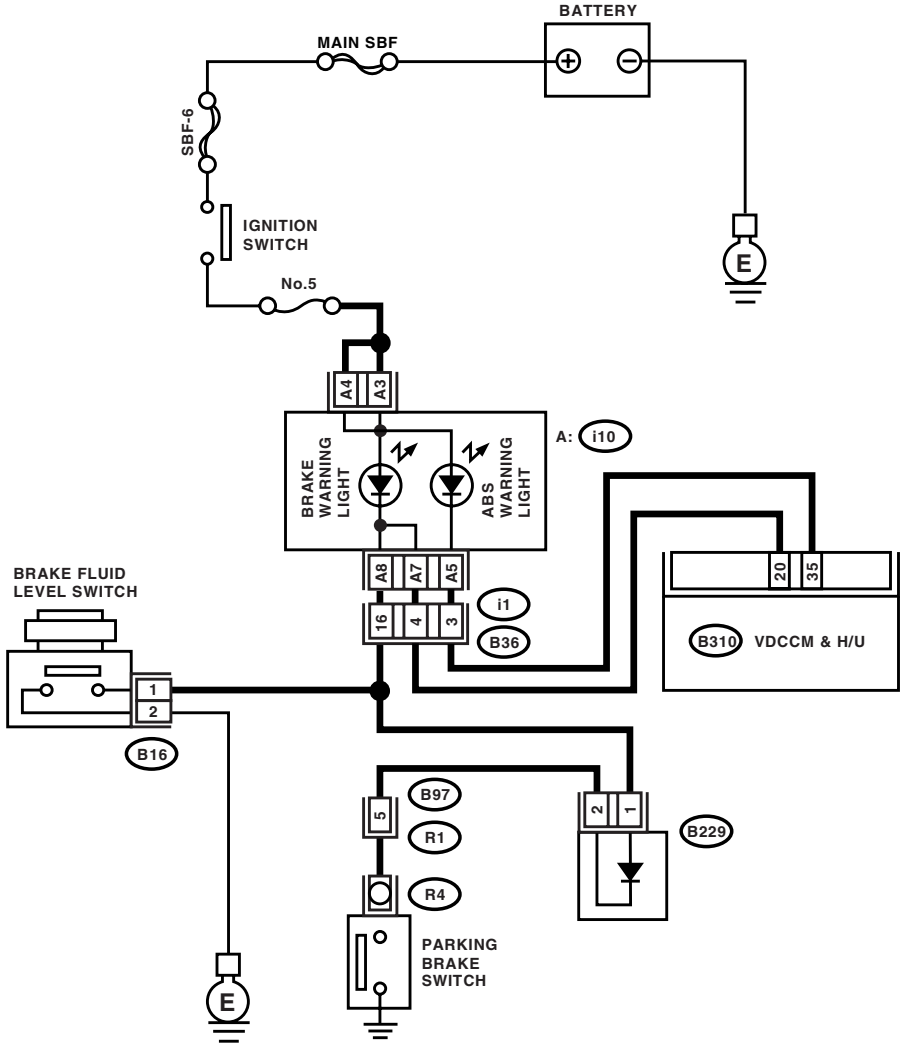


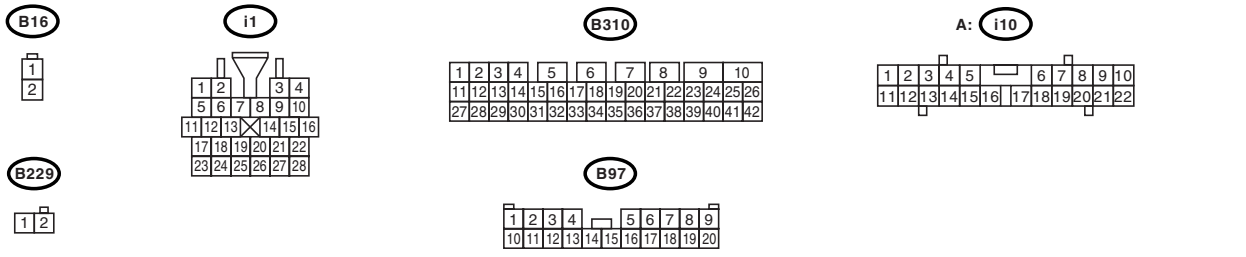


VDC00298

Warning Light Illumination Pattern

- RHD model





VDC00318

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2.**
2	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B310) from VDCCM&H/U. 3) Disconnect the connector (i10) from combination meter. 4) Measure the resistance between VDCCM&H/U connector and combination meter connector. ***Connector & terminal*** ***(B310) No. 35 — (i10) No. 5:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the harness connector between VDCCM&H/U and combination meter.
3	**CHECK POOR CONTACT IN CONNECTOR.** Check poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **4.**
4	**CHECK VDCCM.** 1) Connect the connector (B310) to VDCCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 5 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the VDCCM&H/U.

E: VDC INDICATOR LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When starting the engine, VDC indicator light is kept ON.

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2.**
2	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **3.**
3	**CHECK COMBINATION METER.** Check the combination meter.	Is combination meter OK?	Replace the VDCCM&H/U.	Repair the combination meter.

F: VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT DO NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication
- Defective engine
- VDC OFF switch is shorted.

TROUBLE SYMPTOM:

When starting the engine, VDC OFF indicator light is kept ON.

NOTE:

When pressing the VDC OFF switch for more than 10 seconds, the VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the OFF operation enabled status is restored.

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2.**
2	**CHECK ENGINE.**	Does the malfunction indicator light illuminate?	Repair the engine.	Go to step **3.**
3	**CHECK ENGINE COOLANT TEMPERATURE.** Warm up the engine and check if VDC warning light and VDC OFF indicator light illumination condition changes.	When the engine coolant temperature is too low, VDC warning light and VDC OFF indicator light illuminate. Do the lights go off when the engine is warmed-up?	Normal Operation	Go to step **4.**
4	**CHECK VDC OFF SWITCH.** Remove and check VDC OFF switch.	Is VDC OFF switch normal?	Go to step **5.**	Replace the VDC OFF switch.
5	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **6.**
6	**CHECK COMBINATION METER.** Check the combination meter.	Is combination meter OK?	Replace the VDCCM&H/U.	Repair the combination meter.

G: BRAKE WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

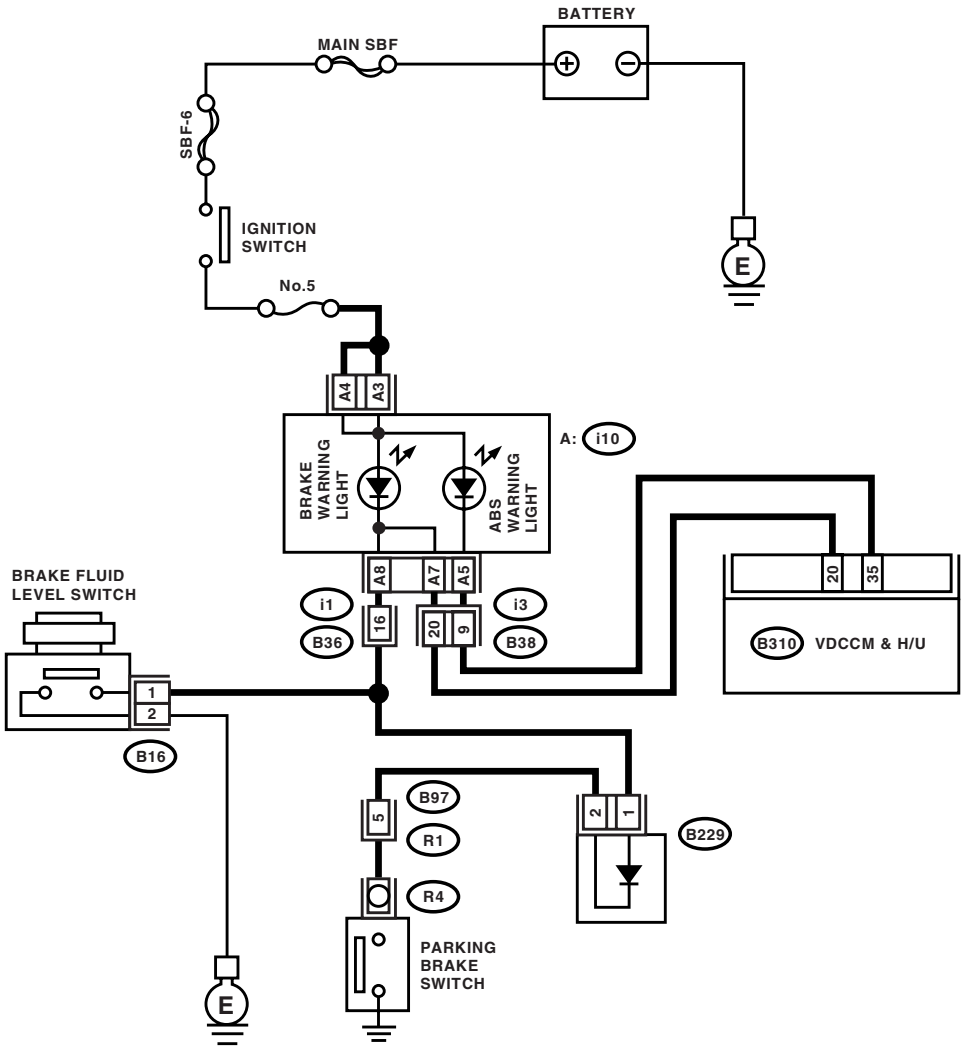
- Brake warning light circuit is shorted.
- Defective sensor/connector

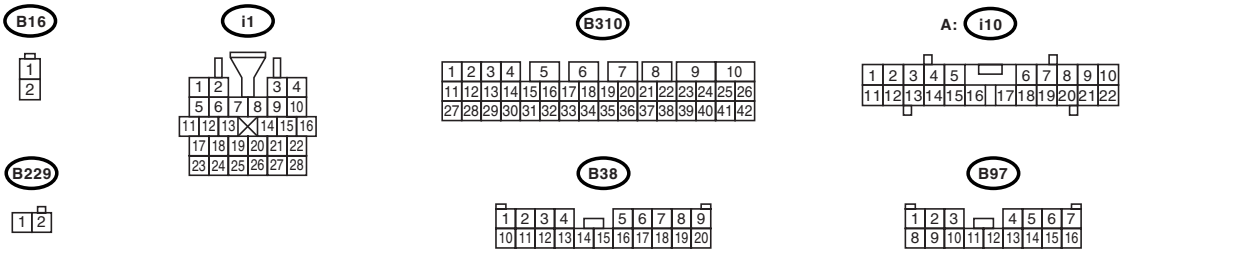
TROUBLE SYMPTOM:

After starting the engine, the brake warning light is kept on though the parking lever is released.

WIRING DIAGRAM:

- LHD model

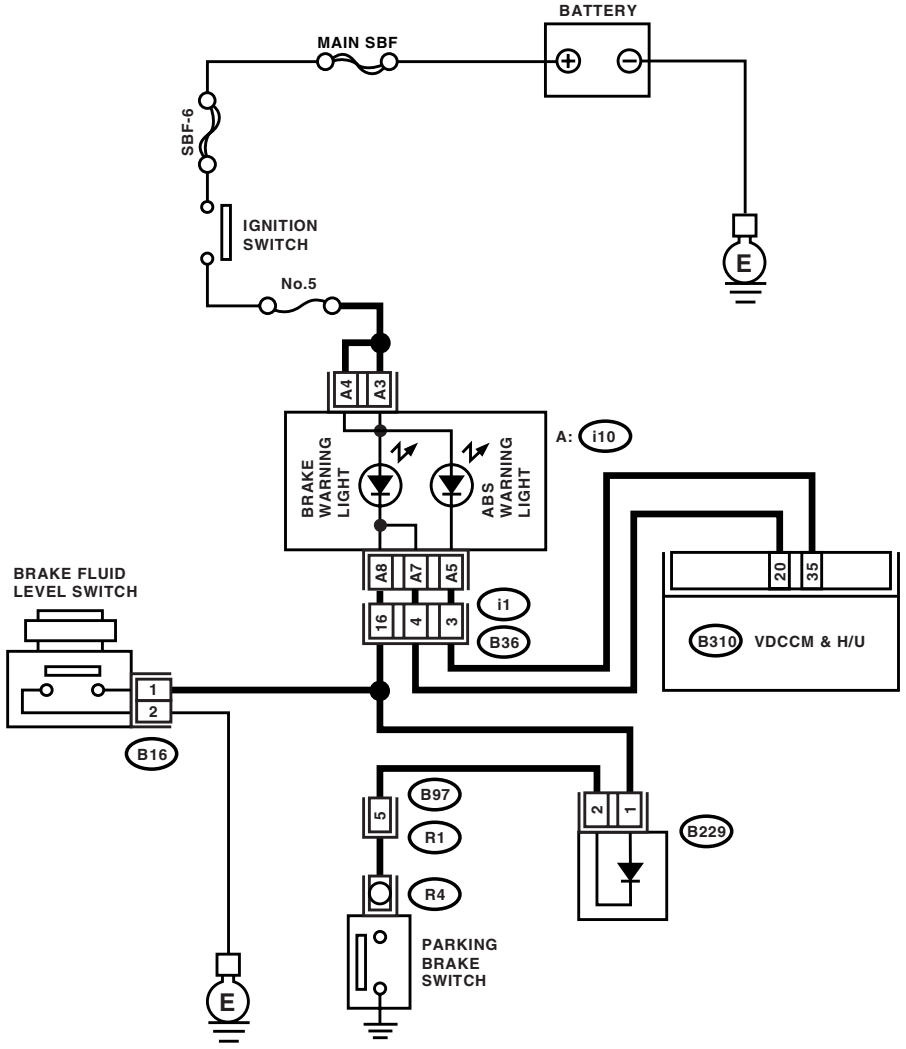


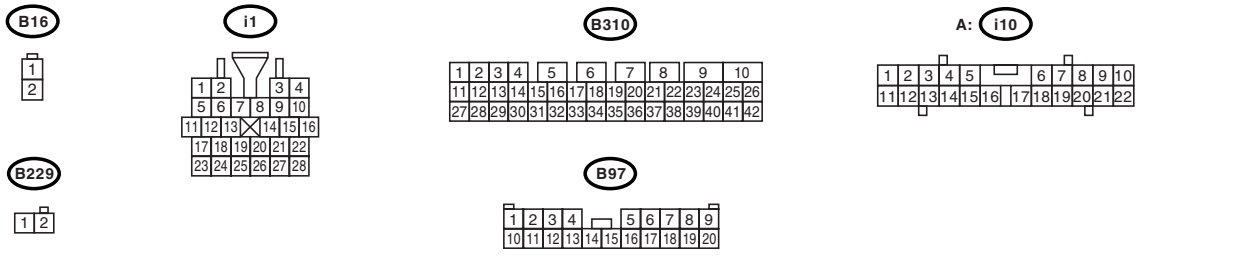


VDC00298

Warning Light Illumination Pattern

- RHD model





VDC00318

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF VDCCM&H/U CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Check that VDCCM&H/U connector is inserted until it is locked by clamp.	Is the connector firmly inserted?	Go to step **2.**	Insert VDCCM&H/U connector until it is locked by clamp.
2	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3.**
3	**CHECK BRAKE FLUID AMOUNT.** Check the amount of brake fluid in the reservoir tank of master cylinder.	Is the amount of brake fluid between the lines of “MAX” and “MIN”?	Go to step **4.**	Replenish brake fluid to the specified value.
4	**CHECK BRAKE FLUID LEVEL SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the level switch connector (B16) from master cylinder. 3) Measure the resistance of master cylinder terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the master cylinder.
5	**CHECK PARKING BRAKE SWITCH.** 1) Disconnect the connector (R4) from parking brake switch. 2) Release the parking brake. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the parking brake switch.
6	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connector (i10) from combination meter. 2) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness connector between combination meter brake fluid level switch and parking brake switch.
7	**CHECK HARNESS CONNECTOR.** 1) Disconnect the connector (B310) from VDCCM&H/U. 2) Disconnect the connector (i10) from combination meter. 3) Measure the resistance between VDCCM&H/U connector and combination meter connector. ***Connector & terminal*** ***(B310) No. 20 — (i10) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **8.**	Repair the harness connector between VDCCM&H/U and combination meter.
8	**CHECK POOR CONTACT IN CONNECTOR.** Check poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **9.**
9	**CHECK VDCCM.** 1) Connect the connector (B310) to VDCCM&H/U. 2) Turn the ignition to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 7 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the VDCCM&H/U.

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Detailed code	Display	Contents of diagnosis	Reference target
C0021	698XH	FR sensor power supply failure	Abnormal power supply of front ABS wheel speed sensor RH	<Ref. to VDC(diag)-44, DTC C0021 FRONT ABS WHEEL SPEED SENSOR RH POWER SUPPLY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	6A0XH	Front Right ABS Sensor Circuit Open or Shorted Battery	Open / high input of front ABS wheel speed sensor RH	<Ref. to VDC(diag)-46, DTC C0021 OPEN/HIGH INPUT OF FRONT ABS WHEEL SPEED SENSOR RH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0022	68CXH 68EXH 690XH 694XH 696XH	Front Right ABS Sensor Signal	Front ABS wheel speed sensor RH signal malfunction	<Ref. to VDC(diag)-51, DTC C0022 FRONT ABS WHEEL SPEED SENSOR RH SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0023	618XH	FL sensor power supply failure	Front ABS wheel speed sensor LH power supply malfunction	<Ref. to VDC(diag)-44, DTC C0023 FRONT ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	620XH	Front Left ABS Sensor Circuit Open or Shorted Battery	Open / high input of front ABS wheel speed sensor LH	<Ref. to VDC(diag)-46, DTC C0023 OPEN/HIGH INPUT OF FRONT ABS WHEEL SPEED SENSOR LH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0024	60CXH 60EXH 610XH 614XH 616XH	Front Left ABS Sensor Signal	Front ABS wheel speed sensor LH signal malfunction	<Ref. to VDC(diag)-51, DTC C0024 FRONT ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0025	658XH	RR sensor power supply failure	Rear ABS wheel speed sensor RH power supply malfunction	<Ref. to VDC(diag)-44, DTC C0025 REAR ABS WHEEL SPEED SENSOR RH POWER SUPPLY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	660XH	Rear Right ABS Sensor Circuit Open or Shorted Battery	Open / high input of rear ABS wheel speed sensor RH	<Ref. to VDC(diag)-46, DTC C0025 OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR RH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0026	64CXH 64EXH 650XH 654XH 656XH	Rear Right ABS Sensor Signal	Rear ABS wheel speed sensor RH signal malfunction	<Ref. to VDC(diag)-51, DTC C0026 REAR ABS WHEEL SPEED SENSOR RH SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0027	6D8XH	RL sensor power supply failure	Rear ABS wheel speed sensor LH power supply malfunction	<Ref. to VDC(diag)-45, DTC C0027 REAR ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	6E0XH	Rear Left ABS Sensor Circuit Open or Shorted Battery	Open / high input of rear ABS wheel speed sensor LH	<Ref. to VDC(diag)-47, DTC C0027 OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR LH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0028	6CCXH 6CEXH 6D0XH 6D4XH 6D6XH	Rear Left ABS Sensor Signal	Rear ABS wheel speed sensor LH signal malfunction	<Ref. to VDC(diag)-51, DTC C0028 REAR ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Contents of diagnosis	Reference target
C0029	608XH 648XH 688XH 6C8XH 704XH 606XH 646XH 686XH 6C6XH 702XH 604XH 644XH 684XH 6C4XH 70CXH 720XH 710XH	Any One of Four ABS Sensors Signal	ABS wheel speed sensor signal malfunction in one of four wheels	<Ref. to VDC(diag)-55, DTC C0029 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0031	320XH	FR hold valve malfunction	Front inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-59, DTC C0031 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0032	360XH	FR pressure reducing valve malfunction	Front outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-59, DTC C0032 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0033	220XH	FL hold valve malfunction	Front inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-59, DTC C0033 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0034	260XH	FL pressure reducing valve malfunction	Front outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-59, DTC C0034 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0035	2A0XH	RR hold valve malfunction	Rear inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-59, DTC C0035 REAR INLET SOLENOID VALVE RH MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0036	2E0XH	RR pressure reducing valve malfunction	Rear outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-60, DTC C0036 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0037	3A0XH	RL hold valve malfunction	Rear inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-60, DTC C0037 REAR INLET SOLENOID VALVE LH MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0038	3E0XH	RL pressure reducing valve malfunction	Rear outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-60, DTC C0038 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Detailed code	Display	Contents of diagnosis	Reference target
C0041	000XH 002XH 004XH 006XH 010XH 012XH 014XH 016XH 018XH 01AXH 01EXH 024XH 026XH 028XH 02AXH 02CXH 02EXH 030XH 03AXH 03CXH 03DXH 03EXH 034XH 036XH 038XH	ECM	VDC control module (VDCCM) malfunction	<Ref. to VDC(diag)-63, DTC C0041 VDC CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0042	7CEXH 7D0XH	Power supply voltage failure	Power voltage malfunction	<Ref. to VDC(diag)-64, DTC C0042 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	7CCXH	Speed sen. power supply failure	ABS wheel speed sensor power malfunction	<Ref. to VDC(diag)-66, DTC C0042 ABS WHEEL SPEED SENSOR POWER MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0044	9A0XH	TCM communication circuit	CAN communication malfunction of transmission control module	<Ref. to VDC(diag)-67, DTC C0044 AT COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0045	970XH 822XH	Incorrect VDC Control Module specifications	Different VDC control module specification	<Ref. to VDC(diag)-68, DTC C0045 DIFFERENT VDC CONTROL MODULE SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	972XH	TCM malfunction	AT control module malfunction	<Ref. to VDC(diag)-69, DTC C0045 AT CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0047	788XH 78CXH 7A0XH 7A4XH	Improper CAN communication	Improper CAN communication	<Ref. to VDC(diag)-70, DTC C0047 IMPROPER CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0051	048XH	Valve relay OFF failure	Valve relay OFF malfunction	<Ref. to VDC(diag)-73, DTC C0051 VALVE RELAY OFF MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	04AXH 04CXH	Valve relay	Valve relay system	<Ref. to VDC(diag)-75, DTC C0051 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	06AXH	Valve relay test failure	Valve relay test malfunction	<Ref. to VDC(diag)-77, DTC C0051 VALVE RELAY TEST MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	00DXH	Valve relay ON failure	Valve relay ON malfunction	<Ref. to VDC(diag)-79, DTC C0051 VALVE RELAY ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Contents of diagnosis	Reference target
C0052	58AXH	Motor and motor relay	Motor/motor relay system	<Ref. to VDC(diag)-81, DTC C0052 MOTOR/ MOTOR RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5A0XH	Motor and motor relay OFF failure	Motor/motor relay OFF malfunction	<Ref. to VDC(diag)-83, DTC C0052 MOTOR/ MOTOR RELAY OFF MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	58EXH	Motor and motor relay ON failure	Motor/motor relay ON malfunction	<Ref. to VDC(diag)-84, DTC C0052 MOTOR/ MOTOR RELAY ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	58CXH	Motor malfunction	Motor	<Ref. to VDC(diag)-85, DTC C0052 MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0054	0A0XH	Brake Light Switch	BLS open circuit	<Ref. to VDC(diag)-86, DTC C0054 BLS OPEN CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	08CXH	BLS ON malfunction	BLS ON malfunction	<Ref. to VDC(diag)-88, DTC C0054 BLS ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0057	820XH	ECM communication circuit	CAN communication malfunction of engine control module	<Ref. to VDC(diag)-90, DTC C0057 ECM COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	740XH	ECM control system	Cooperation control prohibition of engine control module	<Ref. to VDC(diag)-90, DTC C0057 ECM CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0061	4A0XH	Normal opening valve 1 malfunction	Secondary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-60, DTC C0061 SECONDARY CUT VALVE MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0062	4E0XH	Normal opening valve 2 malfunction	Primary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-60, DTC C0062 PRIMARY CUT VALVE MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0063	520XH	Normal closing valve 1 malfunction	Secondary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-60, DTC C0063 SECONDARY SUCTION VALVE MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0064	560XH	Normal closing valve 2 malfunction	Primary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDCCM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Detailed code	Display	Contents of diagnosis	Reference target
C0071	148XH	Steering angle sensor offset is too big	Excessive steering angle sensor output offset	<Ref. to VDC(diag)-91, DTC C0071 EXCESSIVE STEERING ANGLE SENSOR OUTPUT OFFSET, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	14AXH	Change range of steering angle sensor is too big	Excessive variation amount of steering angle sensor output	<Ref. to VDC(diag)-94, DTC C0071 EXCESSIVE VARIATION AMOUNT OF STEERING ANGLE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	142XH 144XH 146XH 14EXH 158XH 15AXH 15CXH 15EXH 14CXH 164XH 166XH 16AXH 16CXH 16EXH 170XH	Steering angle sensor malfunction	Steering angle sensor output	<Ref. to VDC(diag)-97, DTC C0071 STEERING ANGLE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	160XH	No signal from steering angle sensor	Steering angle sensor communication	<Ref. to VDC(diag)-100, DTC C0071 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	764XH	Steering angle sensor malfunction	Steering angle sensor power supply malfunction	<Ref. to VDC(diag)-103, DTC C0071 STEERING ANGLE SENSOR POWER SUPPLY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0072	184XH 188XH 18EXH	Abnormal yaw rate sensor output	Yaw rate sensor output	<Ref. to VDC(diag)-107, DTC C0072 YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	180XH 182XH 186XH 190XH 194XH 196XH 198XH 19AXH	Abnormal yaw rate sensor output	Yaw rate sensor output	<Ref. to VDC(diag)-107, DTC C0072 YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	192XH	Abnormal yaw rate sensor output	Yaw rate sensor output	<Ref. to VDC(diag)-107, DTC C0072 YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1A0XH 18BXH	Voltage inputted to yaw rate sensor exceeds specification	Yaw rate sensor power supply/output	<Ref. to VDC(diag)-109, DTC C0072 YAW RATE SENSOR POWER/OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	19CXH	Abnormal yaw rate sensor reference voltage	Yaw rate sensor reference	<Ref. to VDC(diag)-112, DTC C0072 YAW RATE SENSOR REFERENCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	18CXH	Change range of yaw rate sensor signal is too big	Excessive variation amount of yaw rate sensor output	<Ref. to VDC(diag)-115, DTC C0072 EXCESSIVE VARIATION AMOUNT OF YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Contents of diagnosis	Reference target
C0073	1C8XH 1CAXH	Lateral G sensor offset is too big	Excessive amount of lateral G sensor output offset	<Ref. to VDC(diag)-118, DTC C0073 EXCESSIVE AMOUNT OF LATERAL G SENSOR OUTPUT OFFSET, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1C0XH 1C6XH 1D8XH	Abnormal lateral G sensor output	Lateral G sensor output	<Ref. to VDC(diag)-118, DTC C0073 LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1CCXH	Change range of lateral G sensor is too big	Excessive variation amount of lateral G sensor output	<Ref. to VDC(diag)-118, DTC C0073 EXCESSIVE VARIATION AMOUNT OF LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D2XH	Excessive lateral G sensor signal	Excessive lateral G sensor output	<Ref. to VDC(diag)-119, DTC C0073 EXCESSIVE LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1E0XH	Voltage inputted to lateral G sensor exceeds specification	Lateral G sensor power/output	<Ref. to VDC(diag)-121, DTC C0073 LATERAL G SENSOR POWER/OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0074	118XH	Pressure sensor test failure	Pressure sensor test malfunction	<Ref. to VDC(diag)-124, DTC C0074 PRESSURE SENSOR TEST MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	110XH	Pressure sensor offset is too big	Excessive pressure sensor output offset	<Ref. to VDC(diag)-126, DTC C0074 EXCESSIVE PRESSURE SENSOR OUTPUT OFFSET, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	120XH 113XH	Pressure sensor power/output	Pressure sensor power/output	<Ref. to VDC(diag)-127, DTC C0074 PRESSURE SENSOR POWER/OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	102XH 108XH	Pressure sensor output	Pressure sensor output	<Ref. to VDC(diag)-128, DTC C0074 PRESSURE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	124XH	Pressure sensor power supply malfunction	Pressure sensor power supply malfunction	<Ref. to VDC(diag)-130, DTC C0074 PRESSURE SENSOR POWER MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0081	746XH	System failure	System malfunction	<Ref. to VDC(diag)-131, DTC C0081 SYSTEM MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC C0021 FRONT ABS WHEEL SPEED SENSOR RH POWER SUPPLY MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0027 REAR ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION. <Ref. to VDC(diag)-45, DTC C0027 REAR ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC C0023 FRONT ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0027 REAR ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION. <Ref. to VDC(diag)-45, DTC C0027 REAR ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC C0025 REAR ABS WHEEL SPEED SENSOR RH POWER SUPPLY MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0027 REAR ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION. <Ref. to VDC(diag)-45, DTC C0027 REAR ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC C0027 REAR ABS WHEEL SPEED SENSOR LH POWER SUPPLY MALFUNCTION

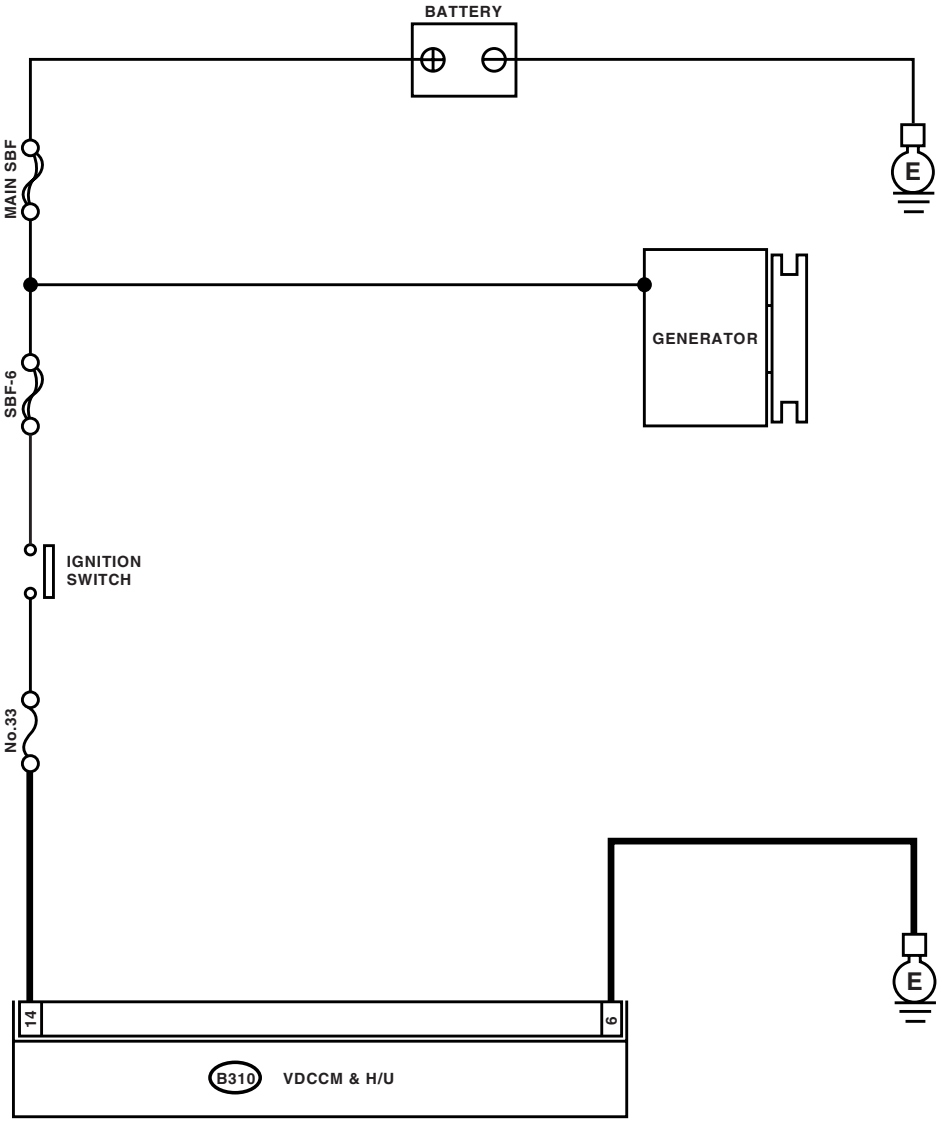
DTC DETECTING CONDITION:

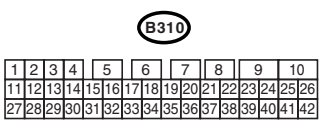
Defective ABS wheel speed sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00309

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTOR.** Check if there is poor contact in VDCCM&H/U power supply circuit.	Is there poor contact?	Repair the connector.	Go to step **2.**
2	**CHECK VDCCM&H/U POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector terminals. ***Terminals*** ***(B310) No. 14 (+) — (B310) No. 6 (−):***	Is the voltage 10 — 15 V?	Go to step **3.**	Check the generator, battery and VDCCM&H/U power supply circuit.
3	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U.	Go to step **4.**
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

E: DTC C0021 OPEN/HIGH INPUT OF FRONT ABS WHEEL SPEED SENSOR RH

NOTE:
For the diagnostic procedure, refer to DTC C0027 “OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR LH”. <Ref. to VDC(diag)-47, DTC C0027 OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR LH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC C0023 OPEN/HIGH INPUT OF FRONT ABS WHEEL SPEED SENSOR LH

NOTE:
For the diagnostic procedure, refer to DTC C0027 “OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR LH”. <Ref. to VDC(diag)-47, DTC C0027 OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR LH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC C0025 OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR RH

NOTE:
For the diagnostic procedure, refer to DTC C0027 “OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR LH”. <Ref. to VDC(diag)-47, DTC C0027 OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR LH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC C0027 OPEN/HIGH INPUT OF REAR ABS WHEEL SPEED SENSOR LH

DTC DETECTING CONDITION:

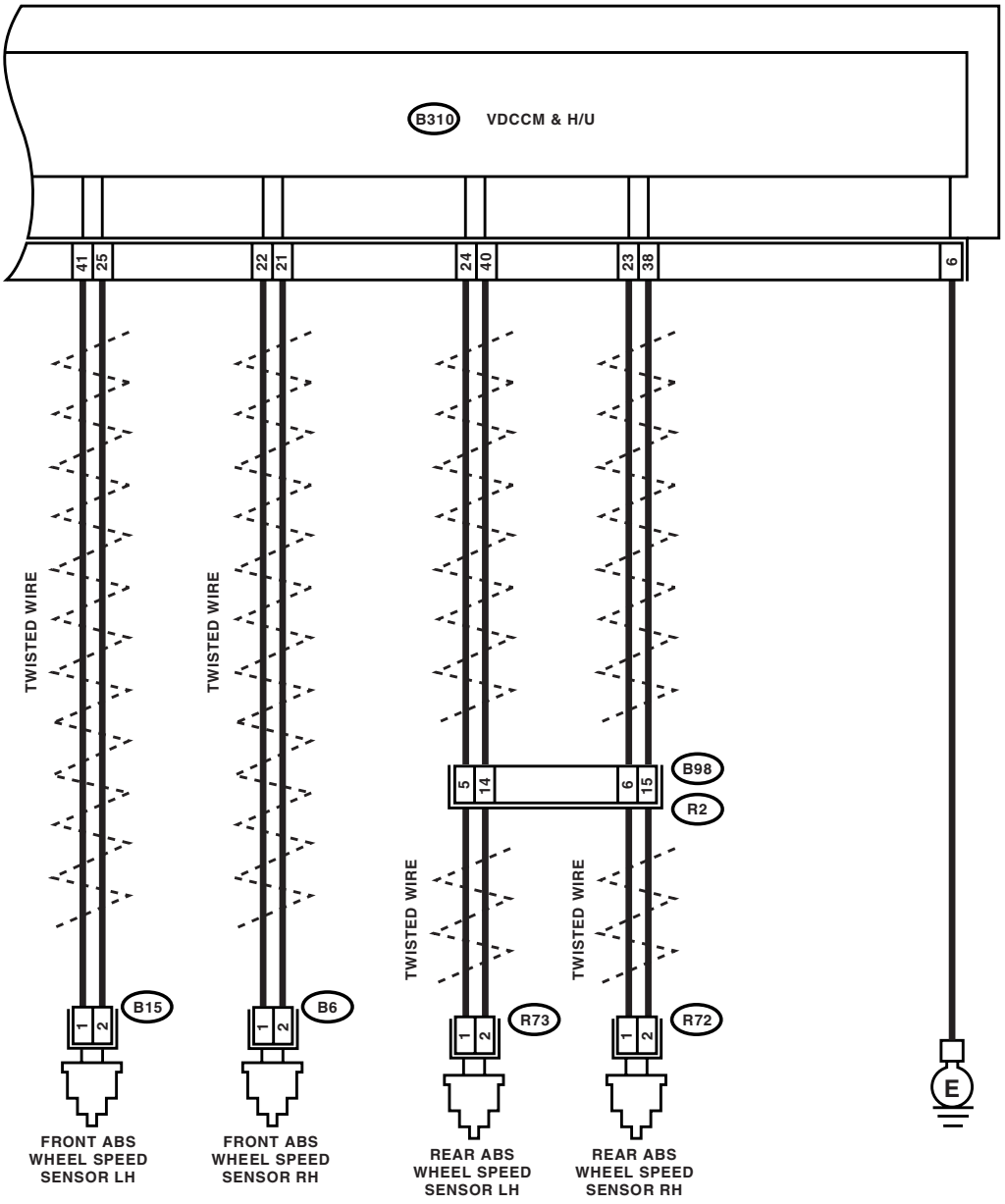
- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

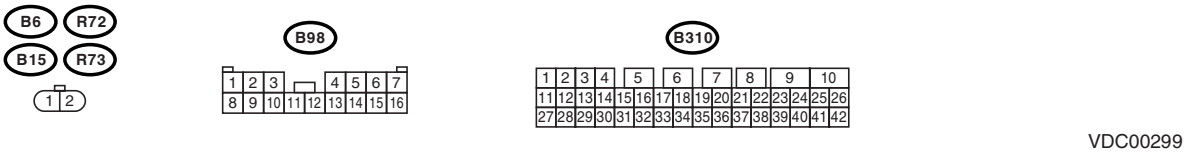
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:

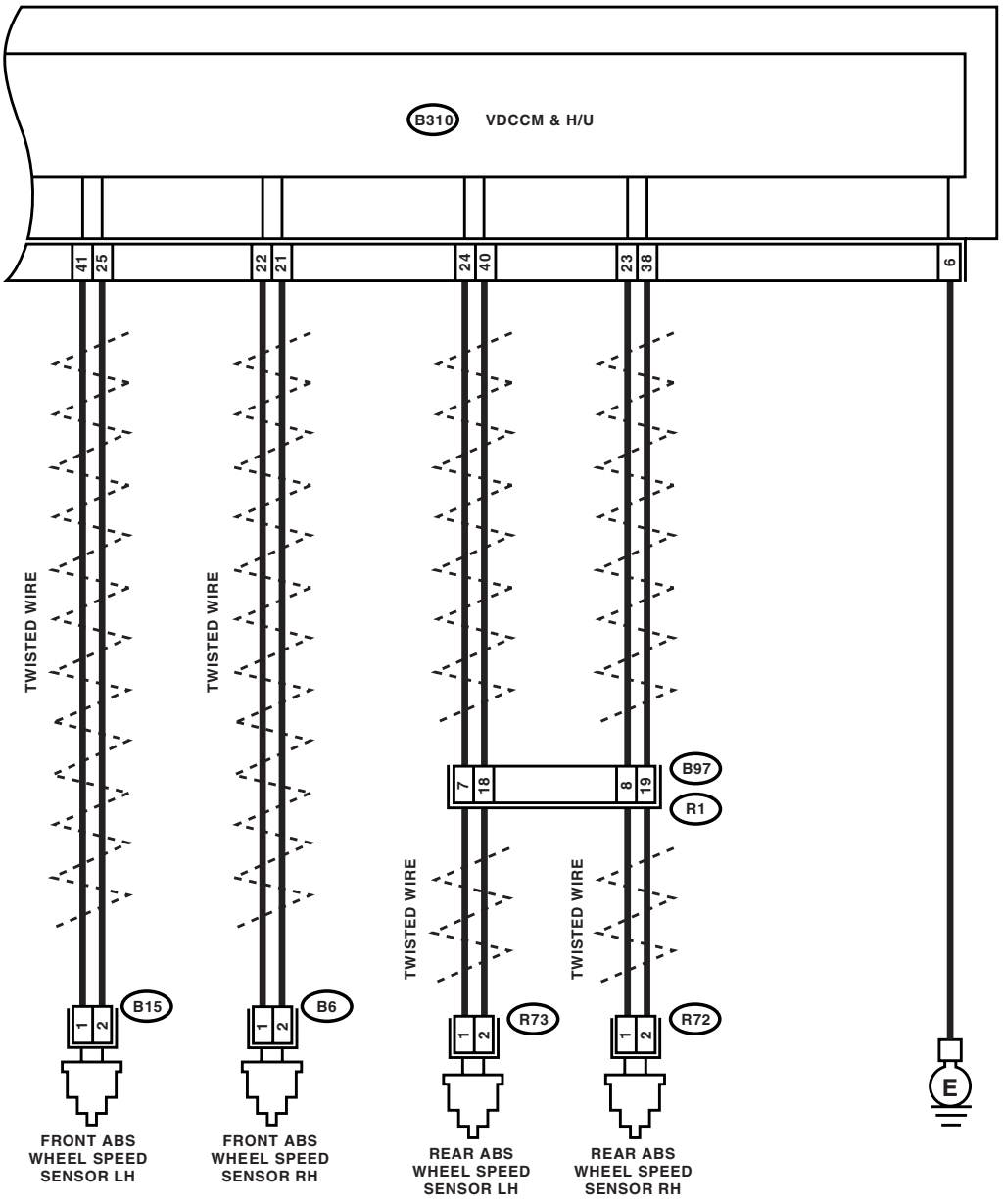
- LHD model

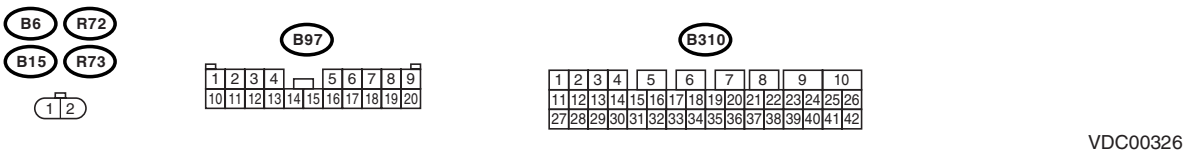




VDC00299

- RHD model





VDC00326

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTOR.** Check if there is poor contact between VDCCM&H/U and ABS wheel speed sensor.	Is there poor contact?	Repair the connector.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector (B310) from VDCCM&H/U. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between VDCCM&H/U connector and ABS wheel speed sensor connector. ***Connector & terminal*** ***DTC C0021*** ***(B310) No. 22 — (B6) No. 1:*** ***(B310) No. 21 — (B6) No. 2:*** ***DTC C0023*** ***(B310) No. 41 — (B15) No. 1:*** ***(B310) No. 25 — (B15) No. 2:*** ***DTC C0025*** ***(B310) No. 23 — (R72) No. 1:*** ***(B310) No. 38 — (R72) No. 2:*** ***DTC C0027*** ***(B310) No. 24 — (R73) No. 1:*** ***(B310) No. 40 — (R73) No. 2:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the harness connector between VDCCM&H/U and ABS wheel speed sensor.
3	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC C0021*** ***(B310) No. 21 — Chassis ground:*** ***DTC C0023*** ***(B310) No. 25 — Chassis ground:*** ***DTC C0025*** ***(B310) No. 38 — Chassis ground:*** ***DTC C0027*** ***(B310) No. 40 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the harness connector between VDCCM&H/U and ABS wheel speed sensor.
4	**CHECK ABS WHEEL SPEED SENSOR POWER SUPPLY CIRCUIT.** 1) Connect the VDCCM&H/U connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ABS wheel speed sensor connector and chassis ground. ***Connector & terminal*** ***DTC C0021*** ***(B6) No. 1 (+) — Chassis ground (−):*** ***DTC C0023*** ***(B15) No. 1 (+) — Chassis ground (−):*** ***DTC C0025*** ***(R72) No. 1 (+) — Chassis ground (−):*** ***DTC C0027*** ***(R73) No. 1 (+) — Chassis ground (−):***	Is the voltage 5 — 16 V?	Go to step **6.**	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK VDCCM&H/U POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector terminals. ***Connector & terminal*** ***(B310) No. 14 (+) — (B310) No. 6 (–):***	Is the voltage 10 — 15 V?	Go to step **8.**	Check the generator, battery and VDCCM&H/U power supply circuit.
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to ABS-15, ABS WHEEL SPEED SENSOR, INSPECTION, Rear ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for more one rotation?	Go to step **8.**	Go to step **7.**
7	**CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.**	Are there foreign materials, breakage or damage in the protrusion of ABS wheel speed sensor or magnetic encoder?	Remove dirt throughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step **8.**
8	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **9.**
9	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

I: DTC C0022 FRONT ABS WHEEL SPEED SENSOR RH SIGNAL MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0028 “REAR ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0028 REAR ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC C0024 FRONT ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0028 “REAR ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0028 REAR ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC C0026 REAR ABS WHEEL SPEED SENSOR RH SIGNAL MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0028 “REAR ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0028 REAR ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

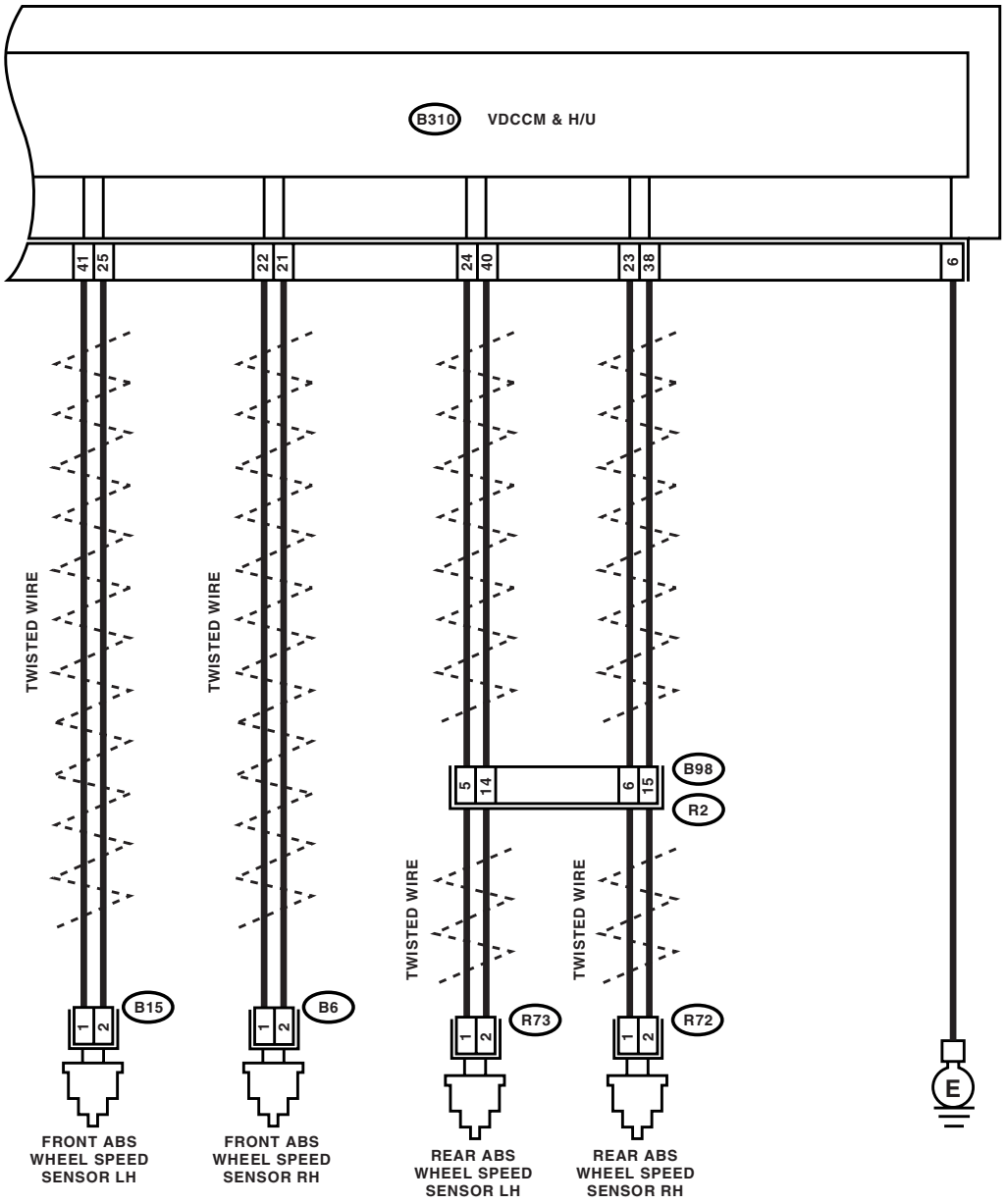
L: DTC C0028 REAR ABS WHEEL SPEED SENSOR LH SIGNAL MALFUNCTION

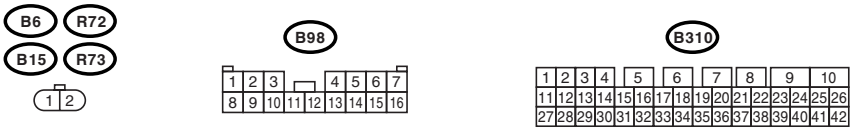
DTC DETECTING CONDITION:
- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Defective harness connector

TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:

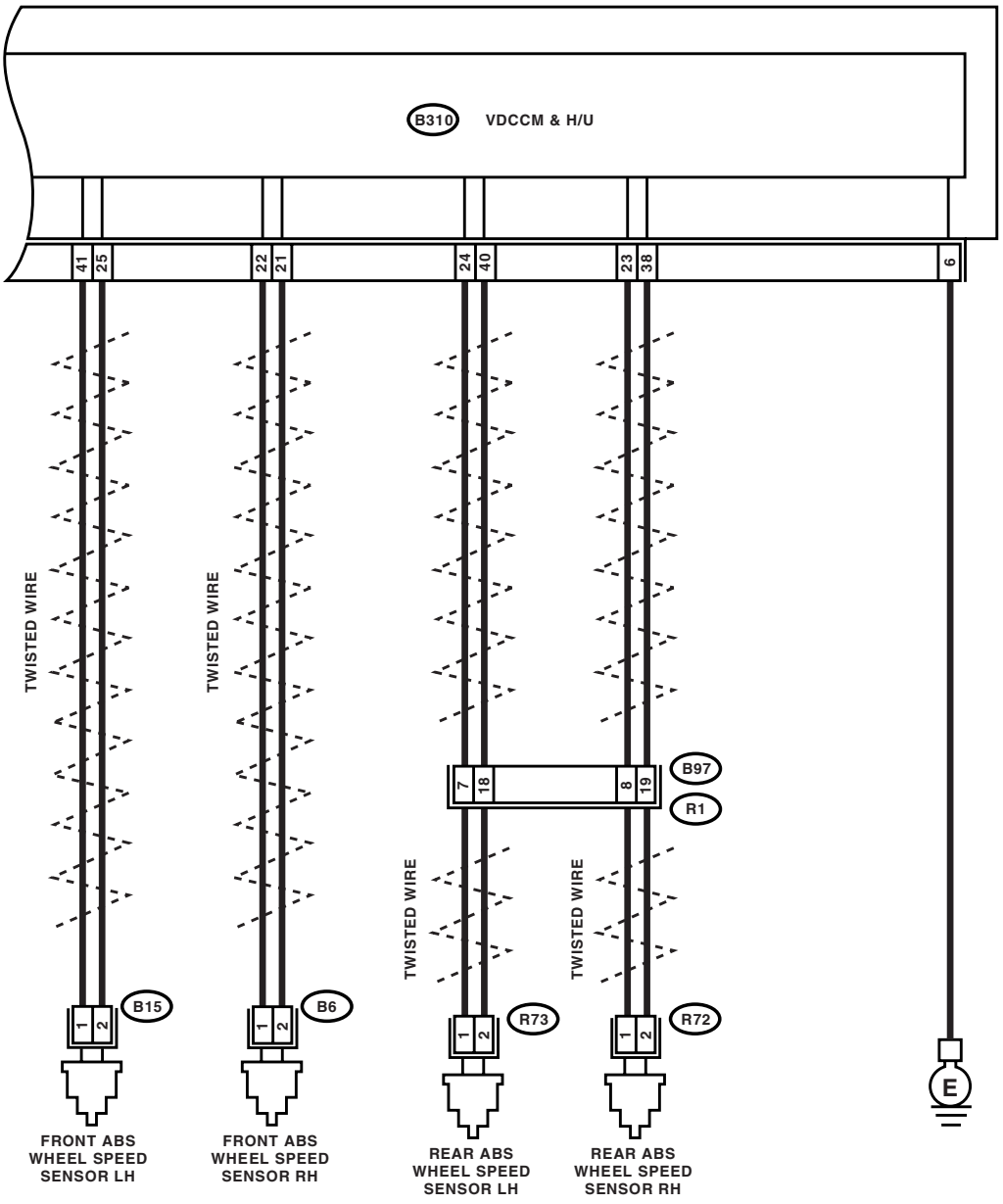
- LHD model

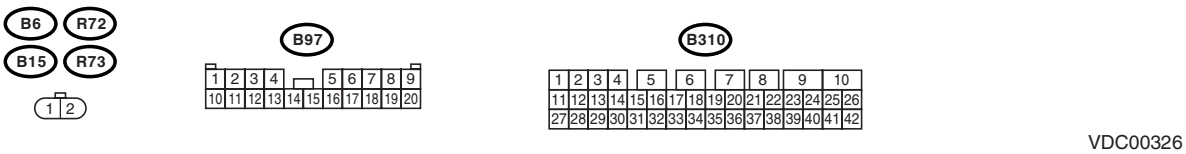




VDC00299

- RHD model





VDC00326

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to the faulty wheel in Subaru Select Monitor data display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step **2.**	Go to step **7.**
2	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.** Make sure the radio wave devices and electric components are installed correctly.	Are the radio wave devices and electric components installed correctly?	Go to step **4.**	Install the radio wave device and electric device properly.
4	**CHECK SOURCES OF SIGNAL NOISE.** Check if the noise sources (such as an antenna) are installed near the sensor harness.	Are noise sources installed?	Install the noise sources apart from sensor harness.	Go to step **5.**
5	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6.**
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.
7	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **8.**	Tighten the ABS wheel speed sensor installation bolts.
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to ABS-13, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for more one rotation?	Go to step **10.**	Go to step **9.**
9	**CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.**	Are there foreign materials, breakage or damage in the protrusion of ABS wheel speed sensor or magnetic encoder?	Remove dirt throughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step **10.**
10	**CHECK SOURCES OF SIGNAL NOISE.** Make sure the radio wave devices and electric components are installed correctly.	Are the radio wave devices and electric components installed correctly?	Go to step **11.**	Install the radio wave device and electric device properly.
11	**CHECK SOURCES OF SIGNAL NOISE.** Check if the noise sources (such as an antenna) are installed near the sensor harness.	Is the noise sources installed?	Go to step **12.**	Install the noise sources apart from sensor harness.

	Step	Check	Yes	No
12	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **13.**
13	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, it is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to turn ABS warning light off. Be sure to drive the vehicle and check the warning light goes off.

M: DTC C0029 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS

DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Defective magnetic encoder
- When a wheel is turned freely for a long time

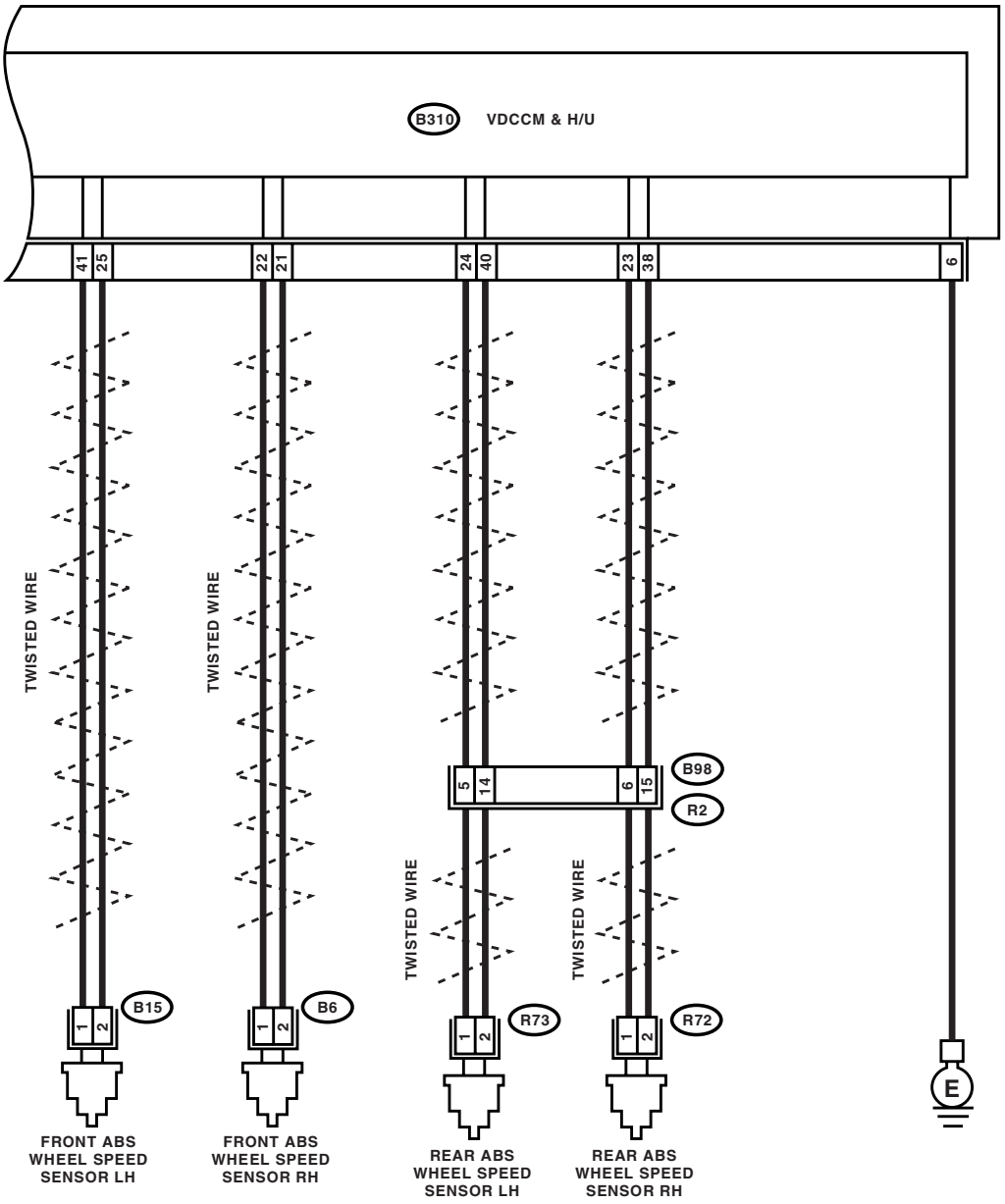
TROUBLE SYMPTOM:

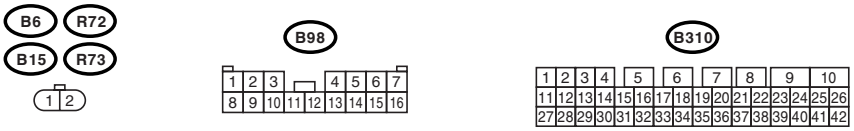
- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

NOTE:
Brake warning light comes on as well as ABS warning light when EBD does not operate.

WIRING DIAGRAM:

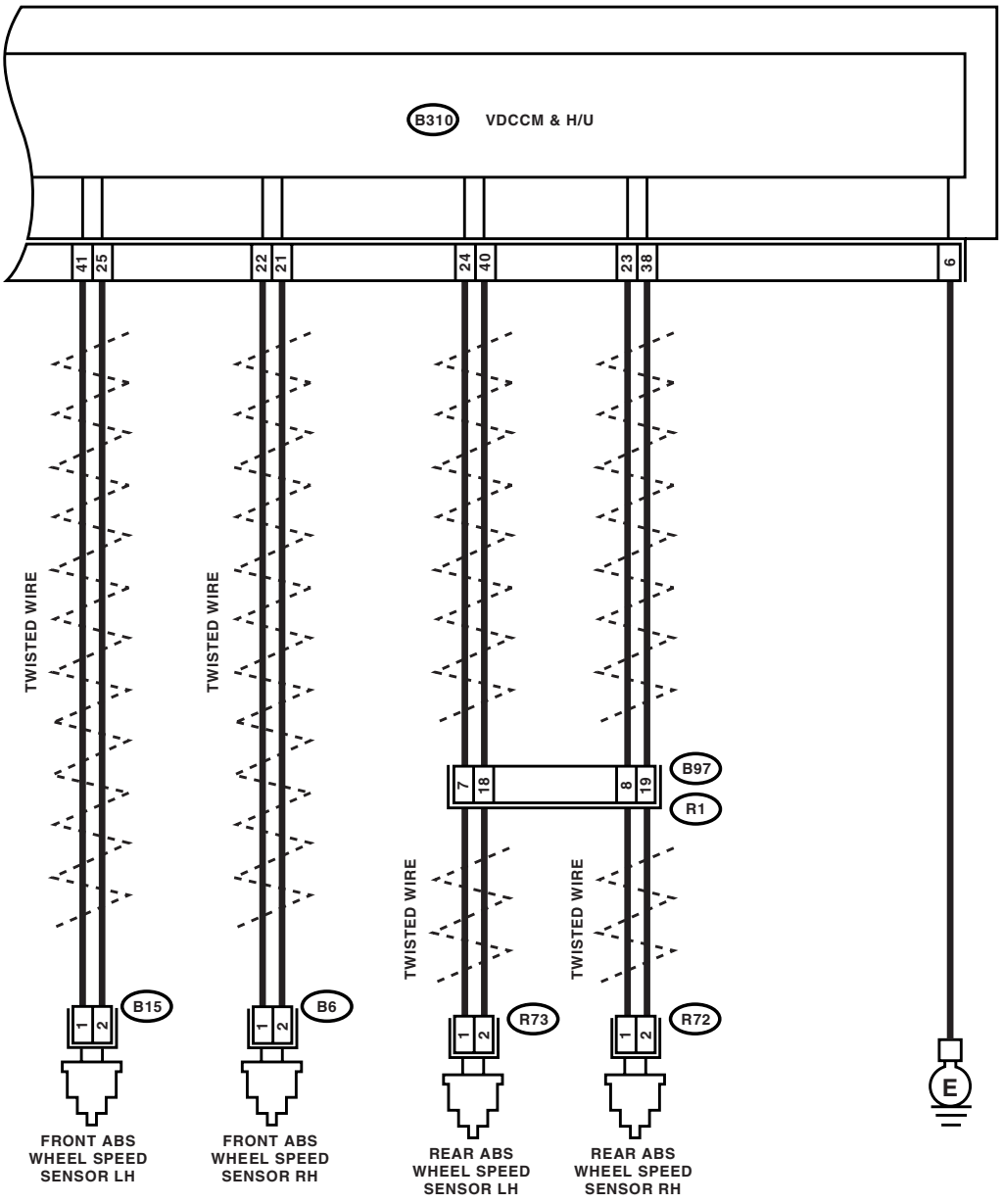
- LHD model

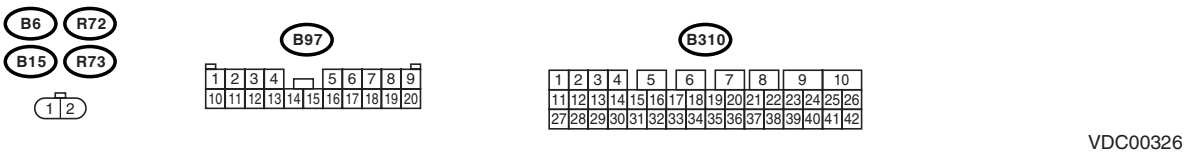




VDC00299

- RHD model





VDC00326

	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.** Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface.	Did the wheels turn freely?	VDC is normal. Perform the clear memory mode. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this diagnostic trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3.**	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4.**
4	**CHECK TIRE INFLATION PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)? (For four wheels)	Go to step **6.**	Tighten the ABS wheel speed sensor installation bolts.
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to ABS-13, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for more one rotation?	Go to step **8.**	Go to step **7.**
7	**CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.**	Are there foreign materials, breakage or damage in the protrusion of ABS wheel speed sensor or magnetic encoder?	Remove dirt throughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step **8.**
8	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **9.**

Step		Check	Yes	No
9	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, it is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to turn ABS warning light off. Be sure to drive the vehicle and check the warning light goes off.

N: DTC C0031 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN VDC-CM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC C0032 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN VDC-CM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC C0033 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN VDC-CM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC C0034 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN VDC-CM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC C0035 REAR INLET SOLENOID VALVE RH MALFUNCTION IN VDC-CM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

S: DTC C0036 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN VDC-CM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

T: DTC C0037 REAR INLET SOLENOID VALVE LH MALFUNCTION IN VDC-CM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC C0038 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN VDC-CM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

V: DTC C0061 SECONDARY CUT VALVE MALFUNCTION IN VDCCM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

W: DTC C0062 PRIMARY CUT VALVE MALFUNCTION IN VDCCM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

X: DTC C0063 SECONDARY SUCTION VALVE MALFUNCTION IN VDCCM&H/U

NOTE:
For the diagnostic procedure, refer to DTC C0064 “PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U”. <Ref. to VDC(diag)-60, DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDC-CM&H/U, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Y: DTC C0064 PRIMARY SUCTION VALVE MALFUNCTION IN VDCCM&H/U

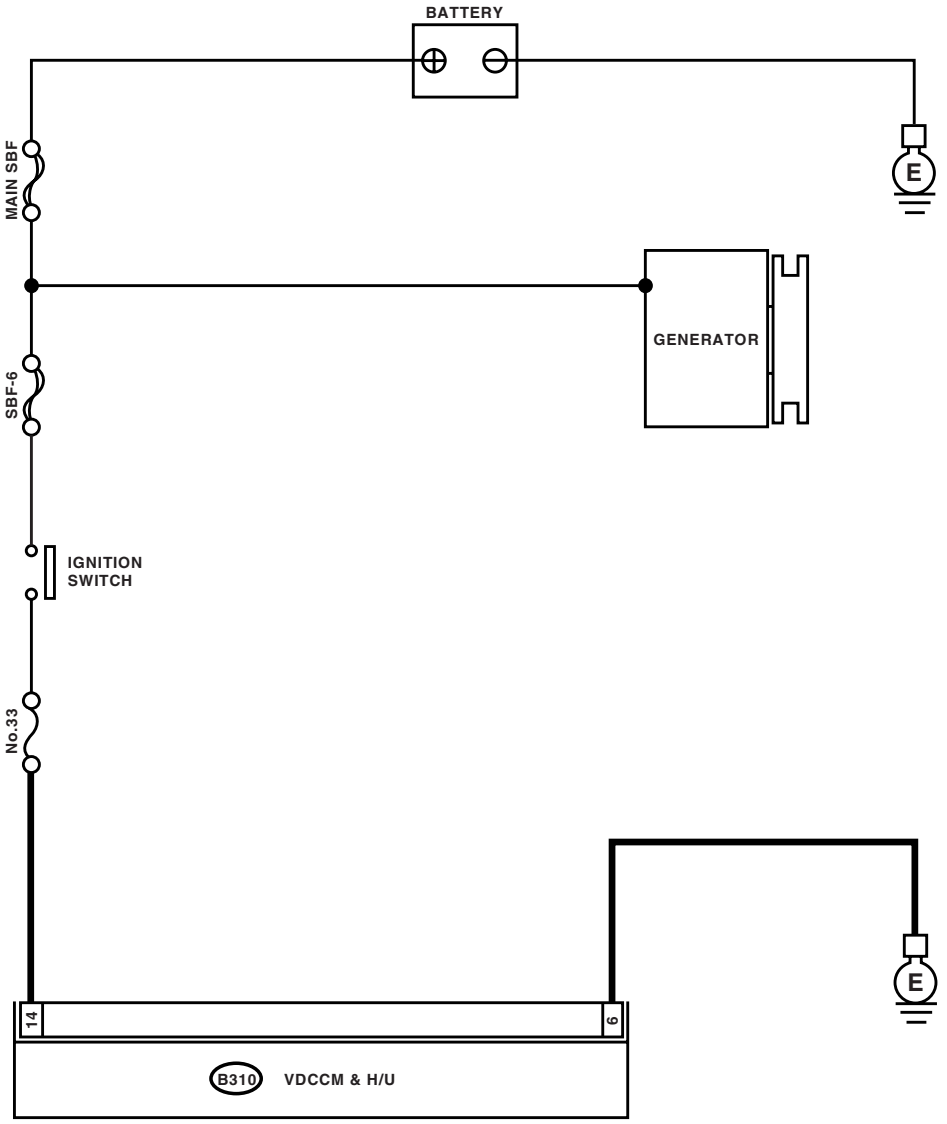
DTC DETECTING CONDITION:

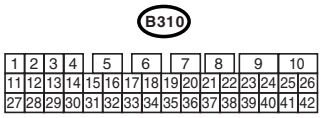
- Defective harness connector
- Defective VDCH/U solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00309

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE FOR VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 14 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the power supply circuit.
2	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the VDCCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5.**
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

Z: DTC C0041 VDC CONTROL MODULE MALFUNCTION

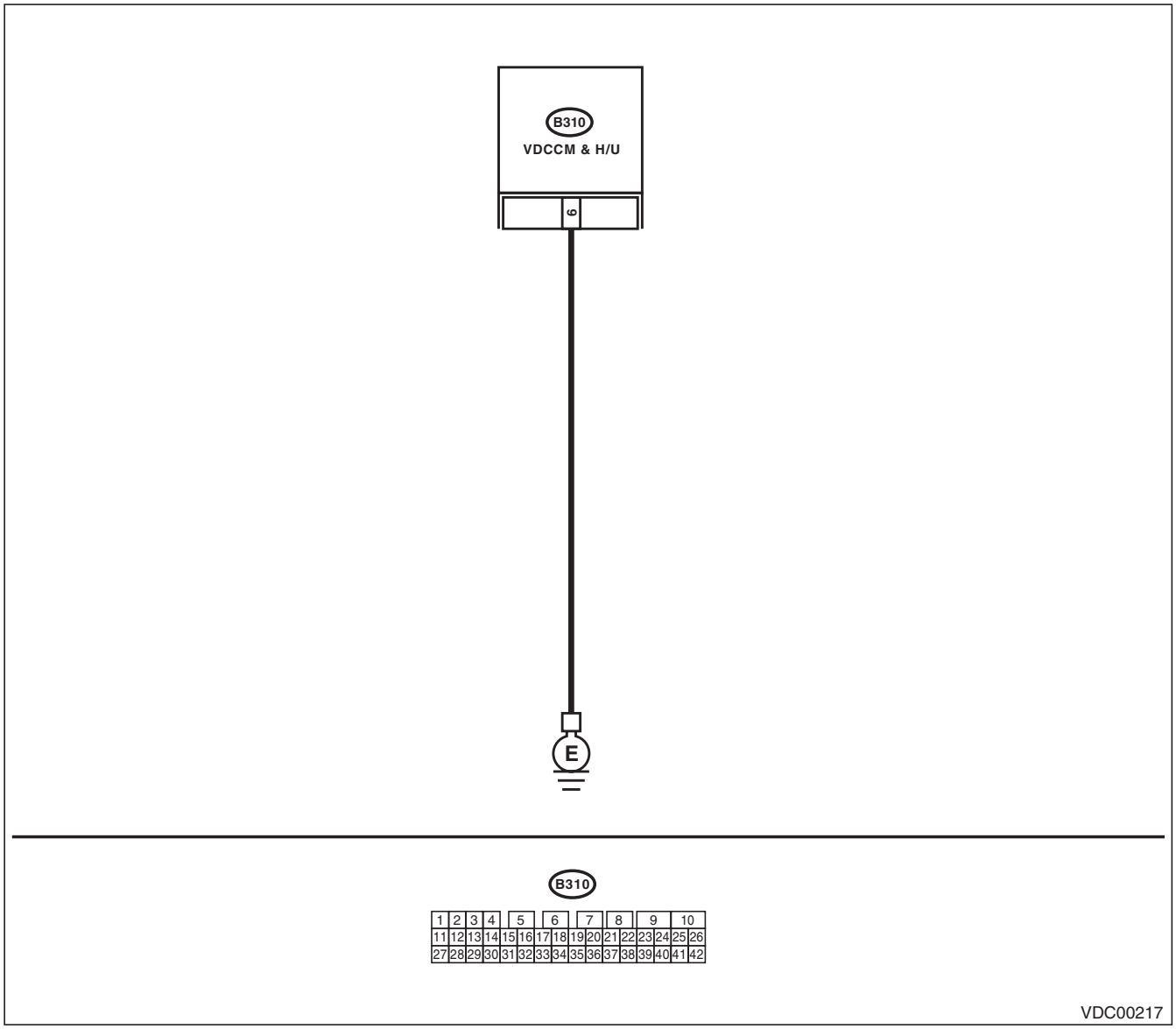
DTC DETECTING CONDITION:

Defective VDCCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Measure the resistance between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Repair the VDCCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between battery, ignition switch and VDCCM&H/U?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Are the radio wave devices and electric components installed correctly?	Go to step **4.**	Install the radio wave devices and electric components properly.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness.	Go to step **5.**
5	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6.**
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AA:DTC C0042 POWER VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:

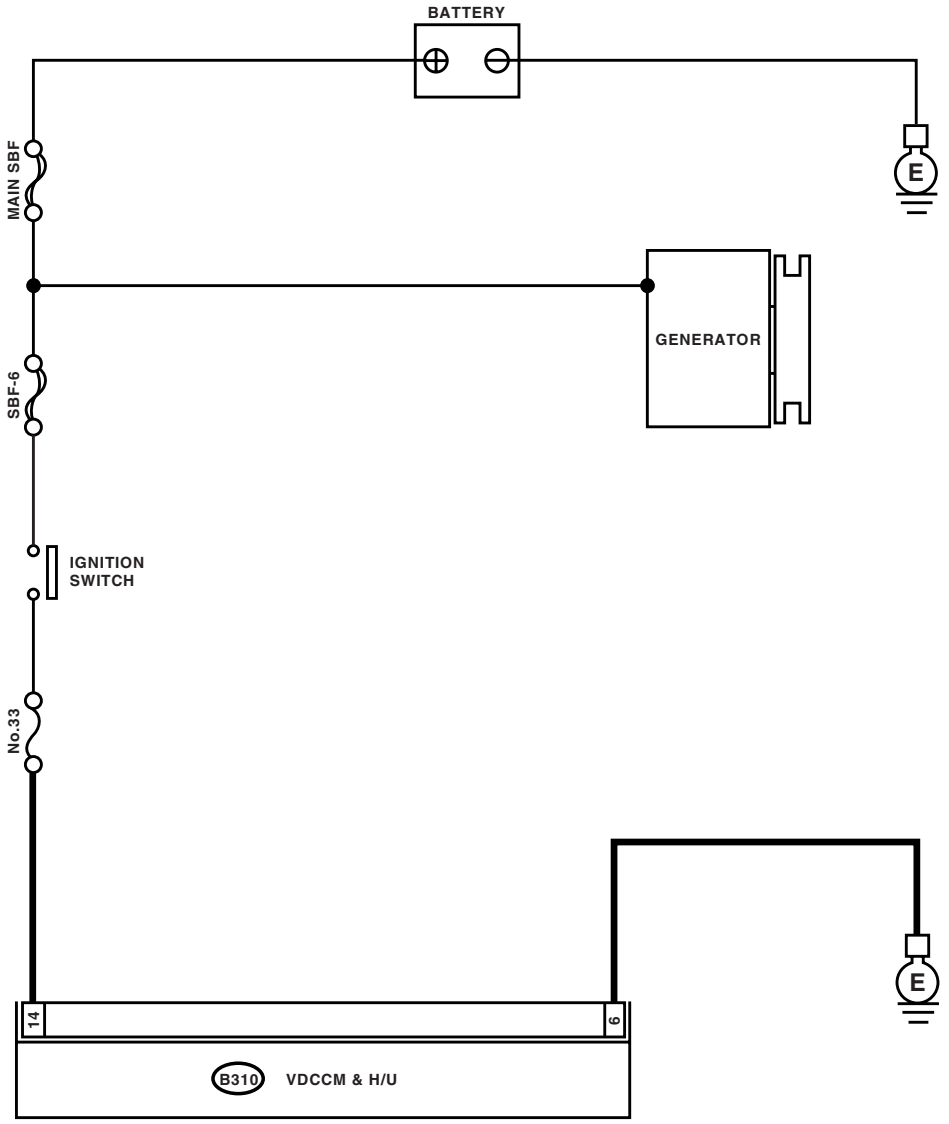
Defective VDCCM&H/U power voltage

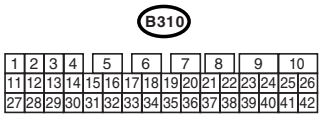
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD may not operate.
- VDC does not operate.

NOTE:
Warning lights go off if voltage returns.

WIRING DIAGRAM:





VDC00309

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO 2.0)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals clamped tightly?	Go to step **3.**	Tighten the terminal.
3	**CHECK INPUT VOLTAGE FOR VDCCM&H/U.** 1) Disconnect the connector from VDCCM&H/U. 2) Run the engine at idle. 3) Operate the devices such as headlights, air conditioner, defogger, etc. which produce much electrical loading. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 14 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the power supply circuit.
4	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the VDCCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7.**
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AB:DTC C0042 ABS WHEEL SPEED SENSOR POWER MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0042 “POWER VOLTAGE MALFUNCTION”. <Ref. to VDC(diag)-64, DTC C0042 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AC:DTC C0044 AT COMMUNICATION

DTC DETECTING CONDITION:

No CAN signal from TCM.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **2.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in TCM connector?	Repair the connector.	Go to step **3.**
3	**CHECK TCM.**	Is the TCM normal?	Go to step **4.**	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).> <Ref. to 5AT-61, Transmission Control Module (TCM).>
4	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U.	Go to step **5.**
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

AD:DTC C0045 DIFFERENT VDC CONTROL MODULE SPECIFICATION

DTC DETECTING CONDITION:

Different control module specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK VDCCM&H/U SPECIFICATION.** Check the identification mark of VDCCM&H/U. ***Identification mark of VDCCM&H/U*** ***OUTBACK 3.0 R: G2*** ***Wagon model 2.5 i: G3*** ***Wagon model 3.0 R (AT model): G4*** ***Sedan model 2.5 i: G9*** ***Sedan model 3.0 R (AT model): GA*** ***OUTBACK 2.5 i: GE*** ***Wagon model 3.0 R (MT model): GH*** ***Sedan model 3.0 R (MT model): GJ***	Is the identification mark of VDCCM&H/U the same as vehicle specification?	Go to step **2.**	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
2	**CHECK TCM SPECIFICATION.** Check the TCM specification.	Is the specification of TCM same as vehicle specification?	Go to step **3.**	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).> <Ref. to 5AT-61, Transmission Control Module (TCM).>
3	**CHECK AT SYSTEM.** 1) Start the engine. 2) Check the DTC in AT system.	Is DTC of AT system displayed?	Repair the AT system.	Go to step **4.**
4	**CHECK ECM SPECIFICATION.** Check the ECM specification.	Is the specification of ECM same as vehicle specification?	Go to step **5.**	Replace the ECM. <Ref. to FU(H4SO 2.0)-34, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).> <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
5	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U.	Go to step **6.**
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

AE:DTC C0045 AT CONTROL MODULE MALFUNCTION

DTC DETECTING CONDITION:

Defective TCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK AT SYSTEM.** 1) Start the engine. 2) Check the DTC in AT system.	Is DTC of AT system displayed?	Repair the AT system.	Go to step **2.**
2	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U.	Go to step **3.**
3	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

AF:DTC C0047 IMPROPER CAN COMMUNICATION

DTC DETECTING CONDITION:

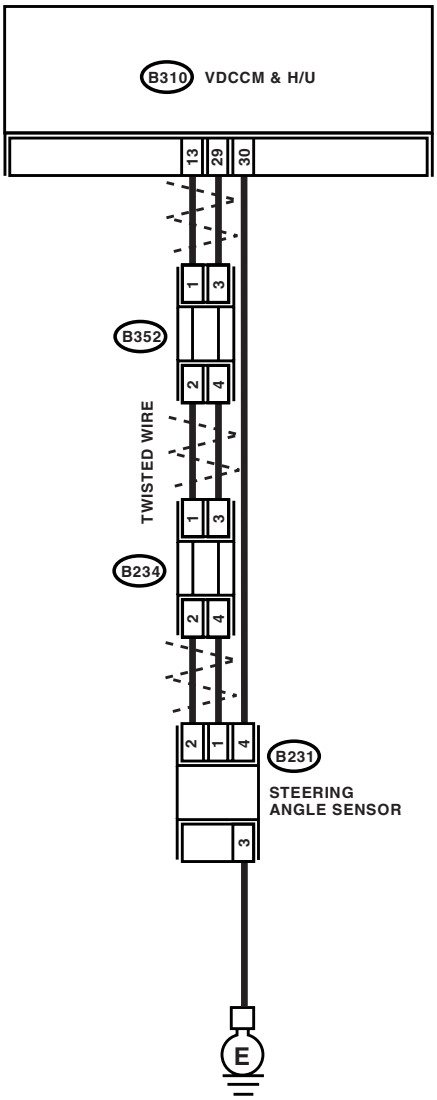
CAN communication line circuit is open or shorted.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

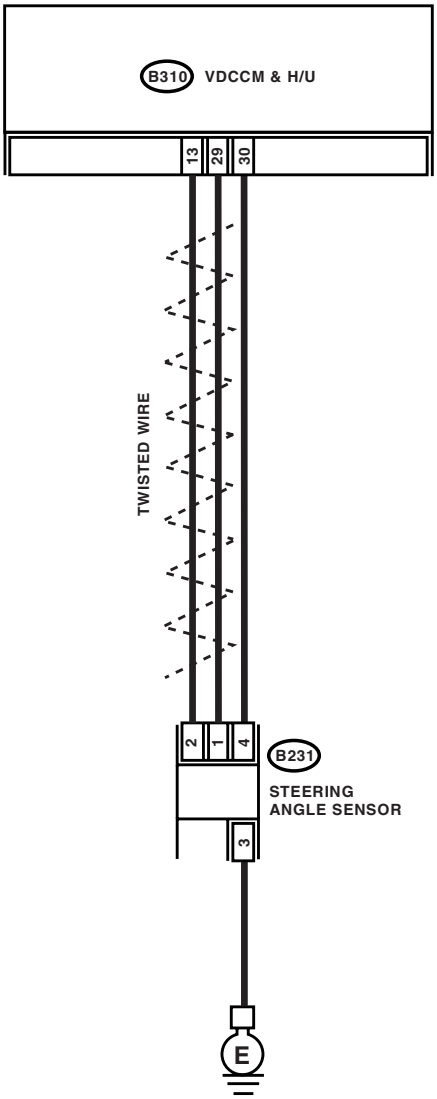
WIRING DIAGRAM:

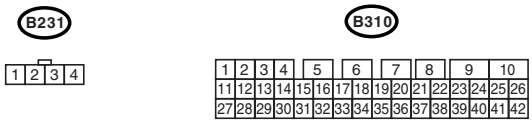
- LHD model



VDC00327

- RHD model





VDC00247

	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **2.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM&H/U connector?	Repair the connector.	Go to step **3.**
3	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Temporary poor contact occurs.

AG:DTC C0051 VALVE RELAY OFF MALFUNCTION

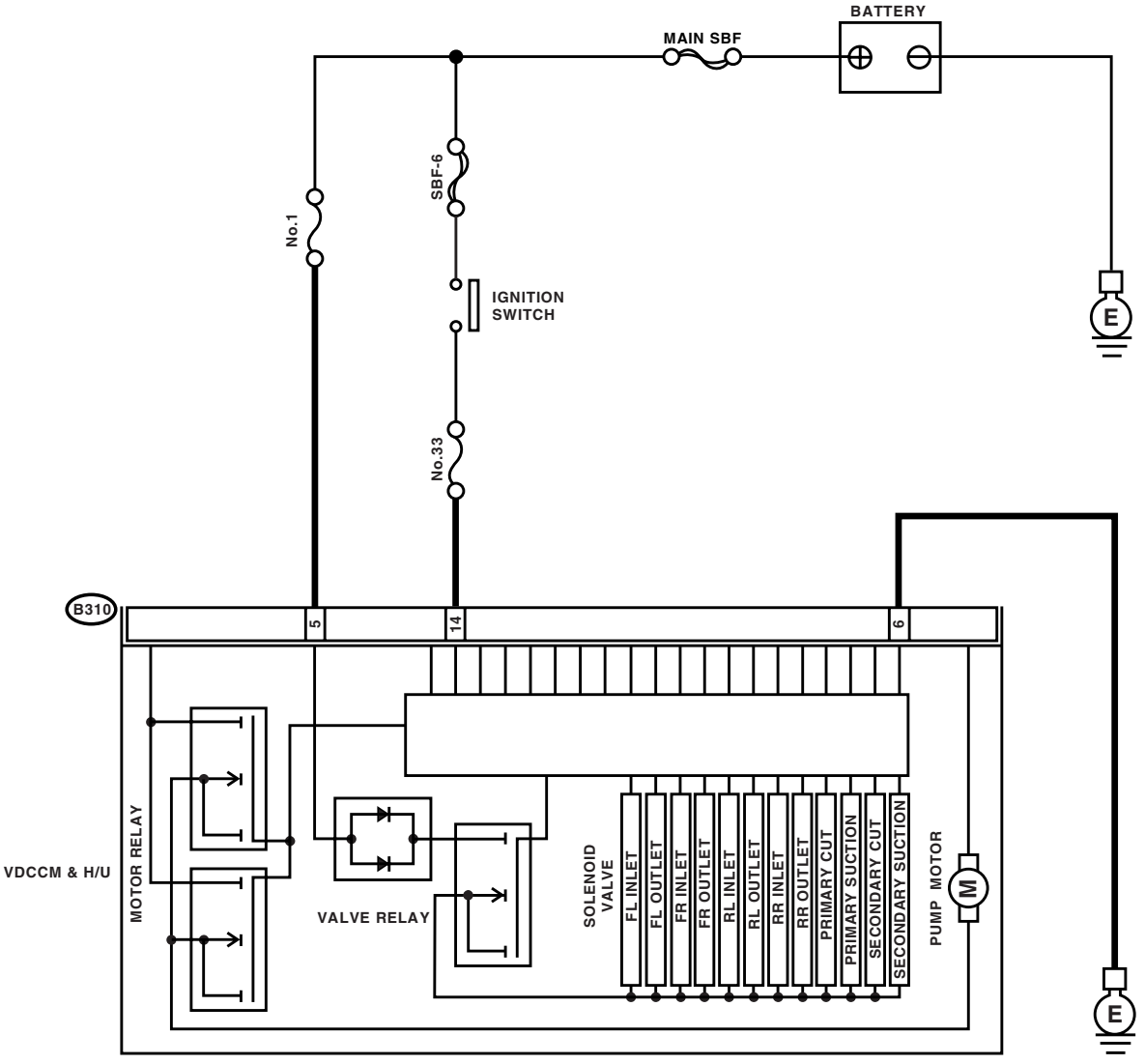
DTC DETECTING CONDITION:

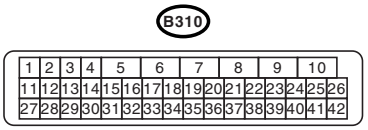
Defective valve relay

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00320

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE FOR VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 5 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery and VDCCM&H/U.
2	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the VDCCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5.**
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

AH:DTC C0051 VALVE RELAY MALFUNCTION

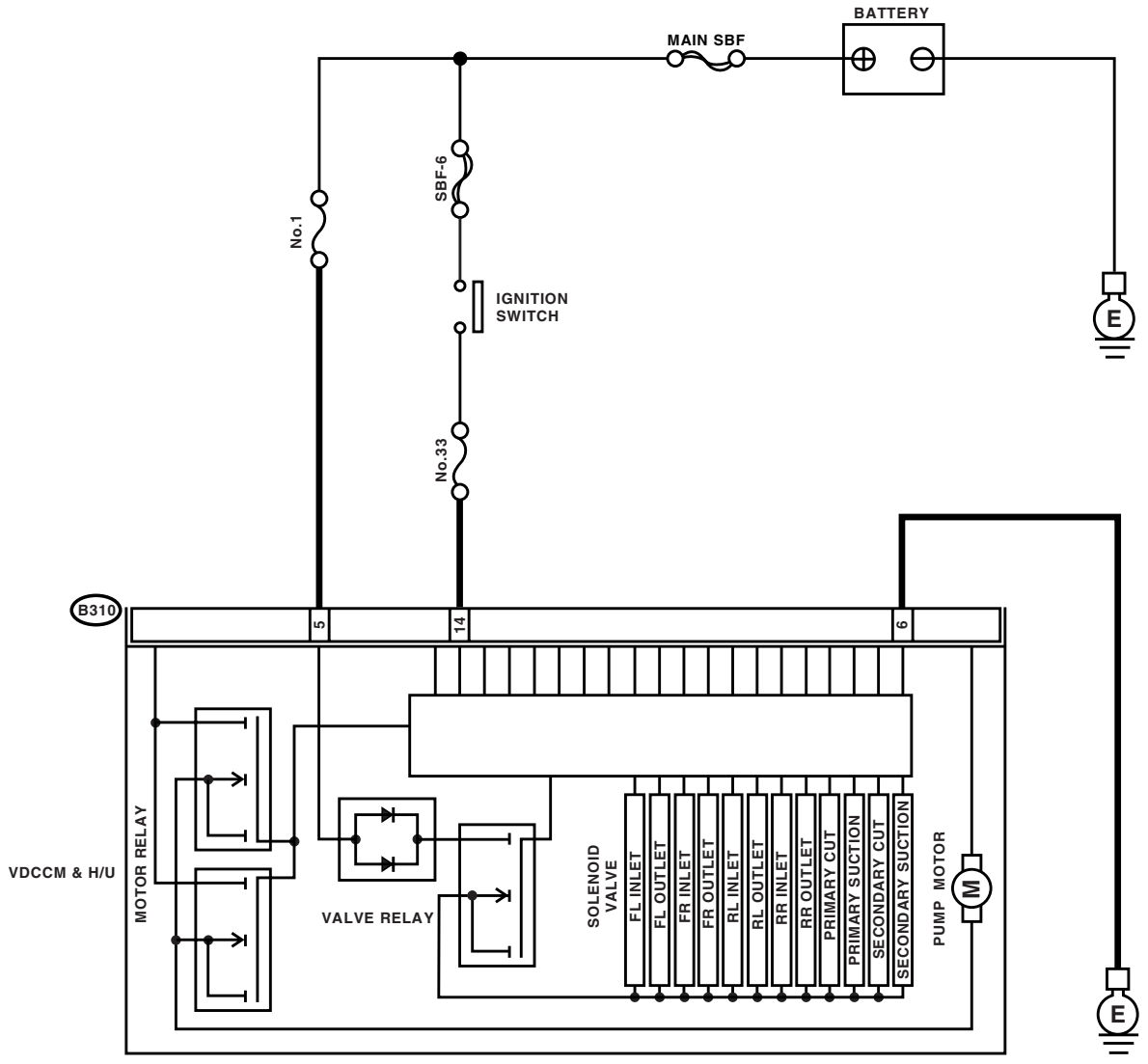
DTC DETECTING CONDITION:

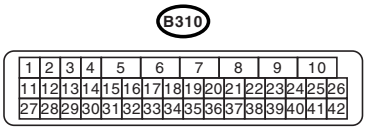
Defective valve relay

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00320

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE FOR VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 14 (+) — Chassis ground (–):*** ***(B310) No. 5 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the power supply circuit.
2	**CHECK INPUT VOLTAGE FOR VDCCM&H/U.** Calculate the voltage difference measured in step 1. A:(B310) No. 14 (+) — Chassis ground (–): B:(B310) No. 5 (+) — Chassis ground (–):	Is the voltage difference between A and B more than 2 V?	Repair the power supply circuit.	Go to step **3.**
3	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4.**	Repair the VDCCM&H/U ground harness.
4	**CHECK VALVE RELAY FOR VDCCM&H/U.** Measure the resistance between VDCCM&H/U connector terminals. ***Connector & terminal*** ***(B310) No. 5 — (B310) No. 6:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the VDCCM&H/U.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7.**
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

AI: DTC C0051 VALVE RELAY TEST MALFUNCTION

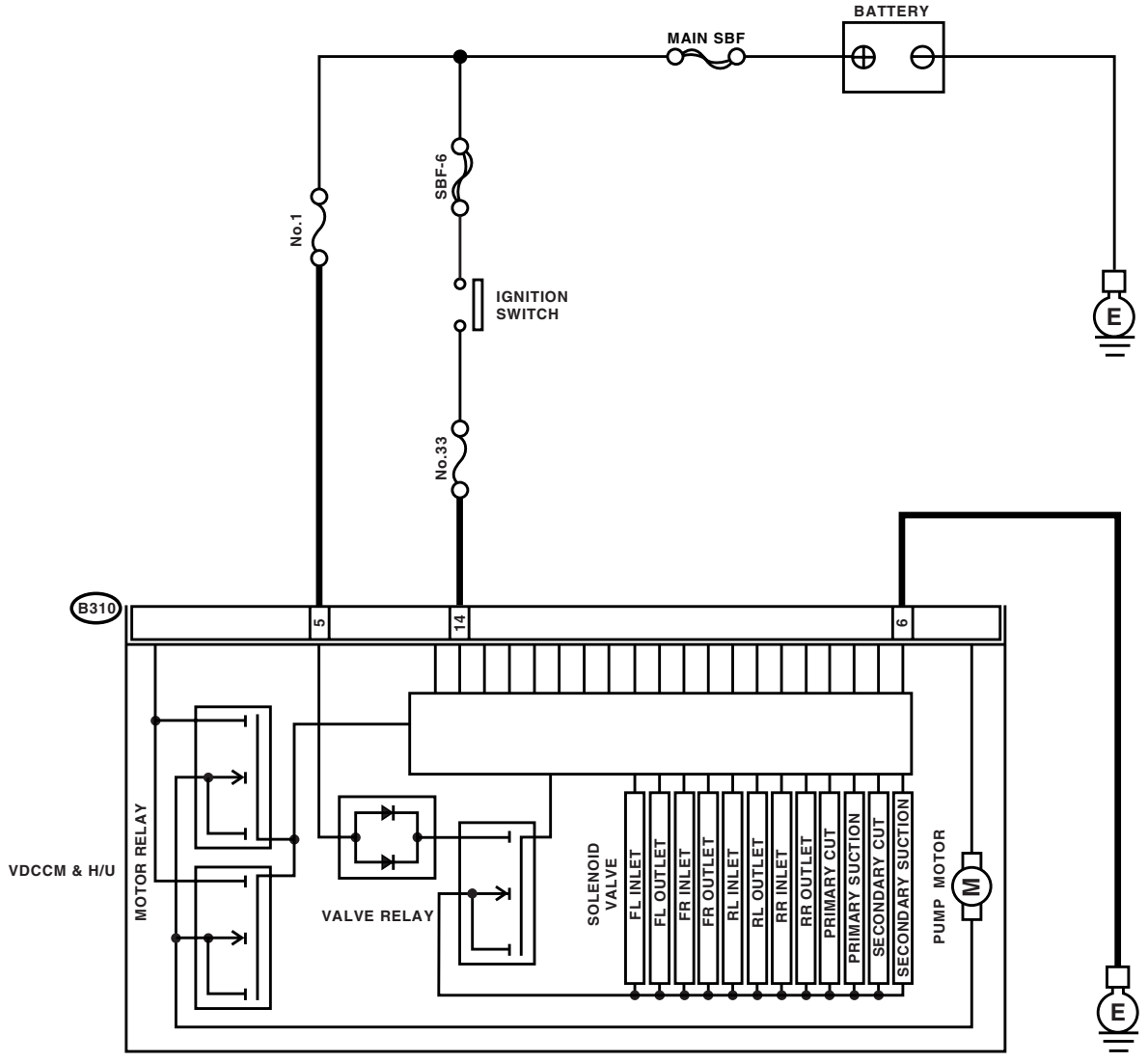
DTC DETECTING CONDITION:

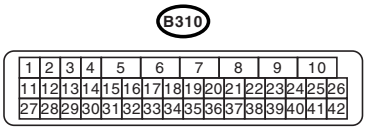
Defective valve relay

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00320

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE FOR VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 5 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the power supply circuit in VDCCM&H/U.
2	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ground circuit in VDCCM&H/U.
3	**CHECK VALVE RELAY FOR VDCCM&H/U.** Measure the resistance between VDCCM&H/U connector terminals. ***Connector & terminal*** ***(B310) No. 5 — (B310) No. 6:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the VDCCM&H/U.
4	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **5.**
5	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6.**
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

AJ:DTC C0051 VALVE RELAY ON MALFUNCTION

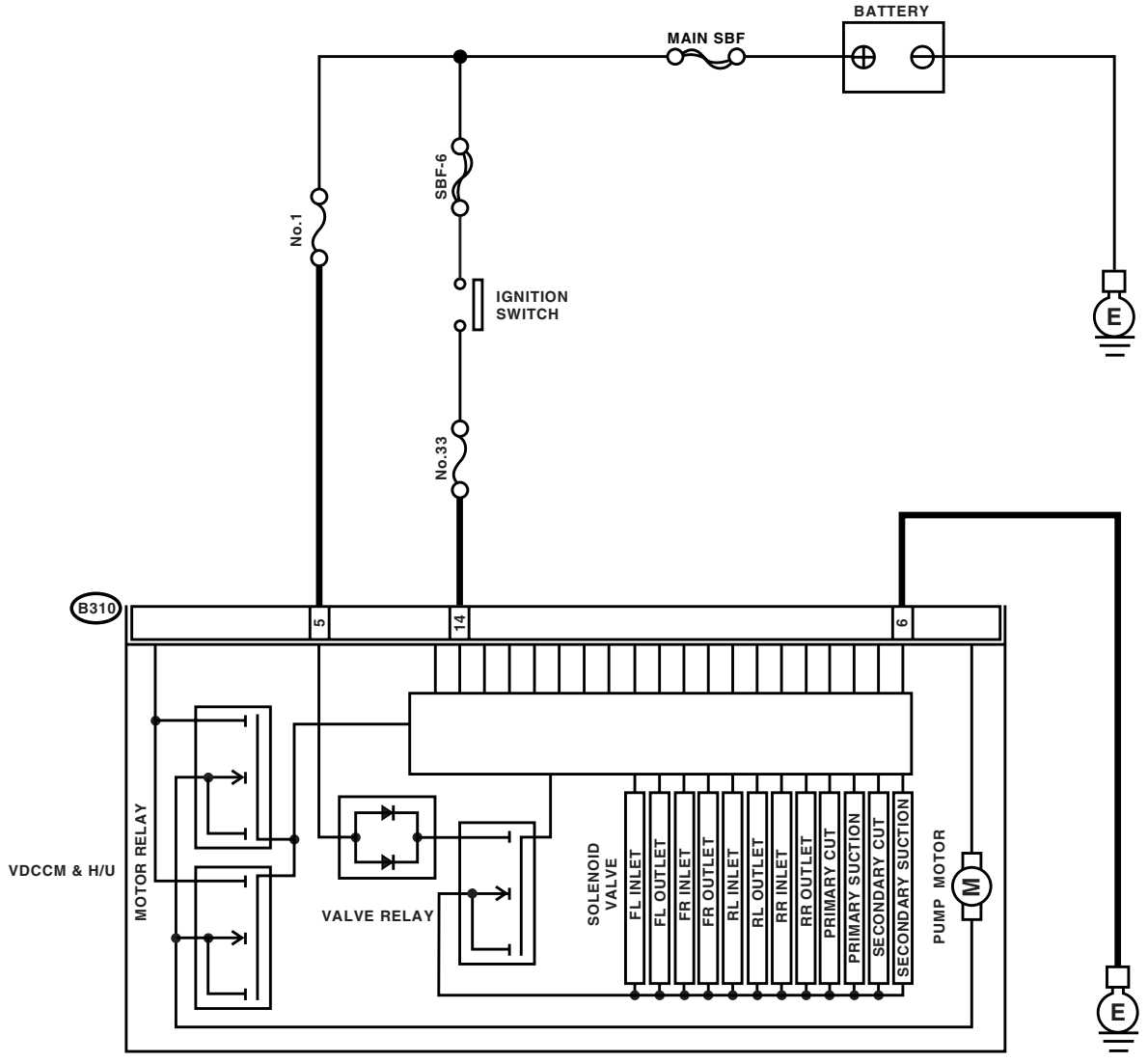
DTC DETECTING CONDITION:

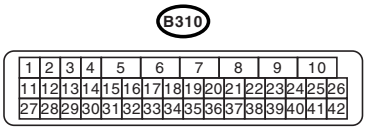
Defective valve relay

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

WIRING DIAGRAM:





VDC00320

	Step	Check	Yes	No
1	**CHECK VALVE RELAY FOR VDCCM&H/U.** 1) Disconnect the connector from VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U connector terminals. ***Terminals*** ***No. 5 — No. 6:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **3.**
3	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **4.**
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AK:DTC C0052 MOTOR/MOTOR RELAY MALFUNCTION

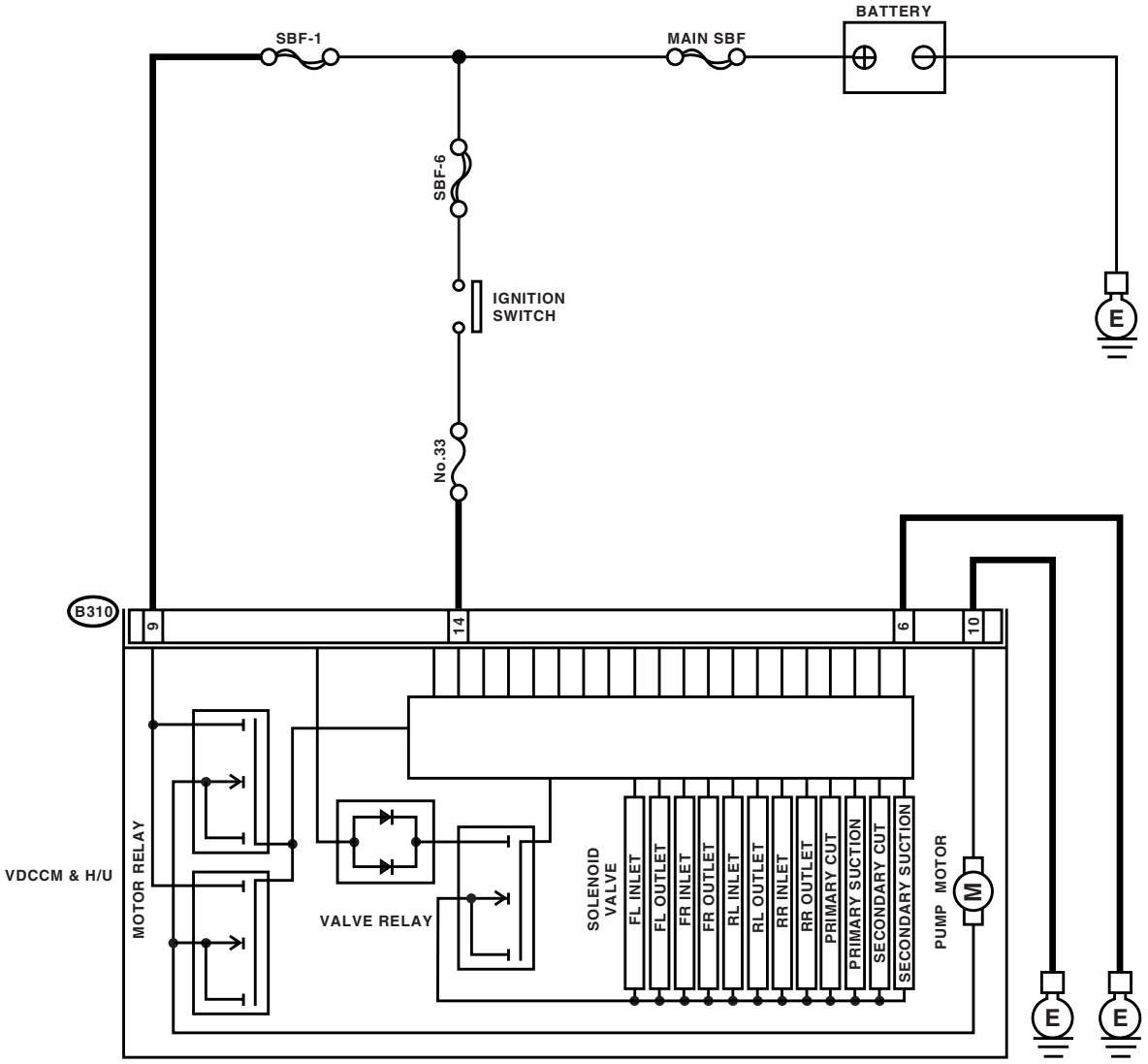
DTC DETECTING CONDITION:

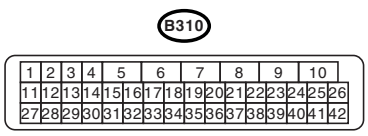
- Defective motor and motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

WIRING DIAGRAM:





VDC00321

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE FOR VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 9 (+) — Chassis ground (−):*** ***(B310) No. 14 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the power supply circuit in VDCCM&H/U.
2	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 6 — Chassis ground:*** ***(B310) No. 10 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the VDCCM&H/U ground harness.
3	**CHECK MOTOR RELAY FOR VDCCM&H/U.** Measure the resistance between VDCCM&H/U connector terminals. ***Terminals*** ***No. 9 — No. 10:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the VDCCM&H/U.
4	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **5.**
5	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6.**
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light remains on at this time, it is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to turn ABS warning light off. Be sure to drive the vehicle and check the warning light goes off.

AL:DTC C0052 MOTOR/MOTOR RELAY OFF MALFUNCTION

DTC DETECTING CONDITION:

- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

NOTE:
For the diagnostic procedure, refer to DTC C0052 “MOTOR / MOTOR RELAY MALFUNCTION” <Ref. to VDC(diag)-81, DTC C0052 MOTOR/MOTOR RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AM:DTC C0052 MOTOR/MOTOR RELAY ON MALFUNCTION

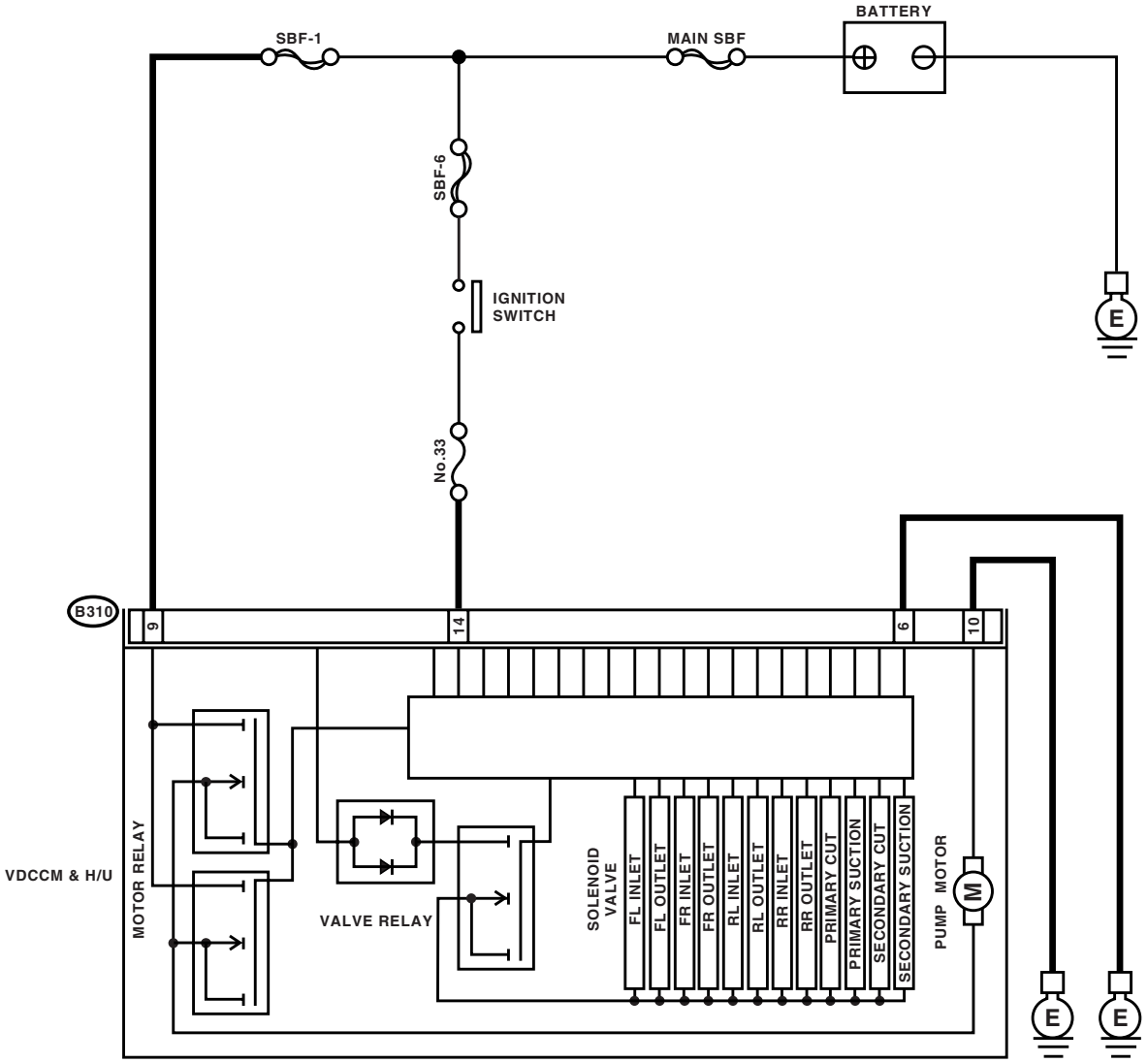
DTC DETECTING CONDITION:

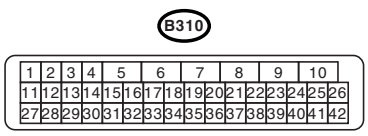
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

WIRING DIAGRAM:





VDC00321

	Step	Check	Yes	No
1	**CHECK MOTOR RELAY FOR VDCCM&H/U.** 1) Disconnect the connector from VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U connector terminals. ***Terminals*** ***No. 9 — No. 10:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
2	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **3.**
3	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light remains on at this time, it is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to turn ABS warning light off. Be sure to drive the vehicle and check the warning light goes off.

AN:DTC C0052 MOTOR

DTC DETECTING CONDITION:

- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

NOTE:
For the diagnostic procedure, refer to DTC C0052 “MOTOR / MOTOR RELAY MALFUNCTION” <Ref. to VDC(diag)-81, DTC C0052 MOTOR/MOTOR RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AO:DTC C0054 BLS OPEN CIRCUIT

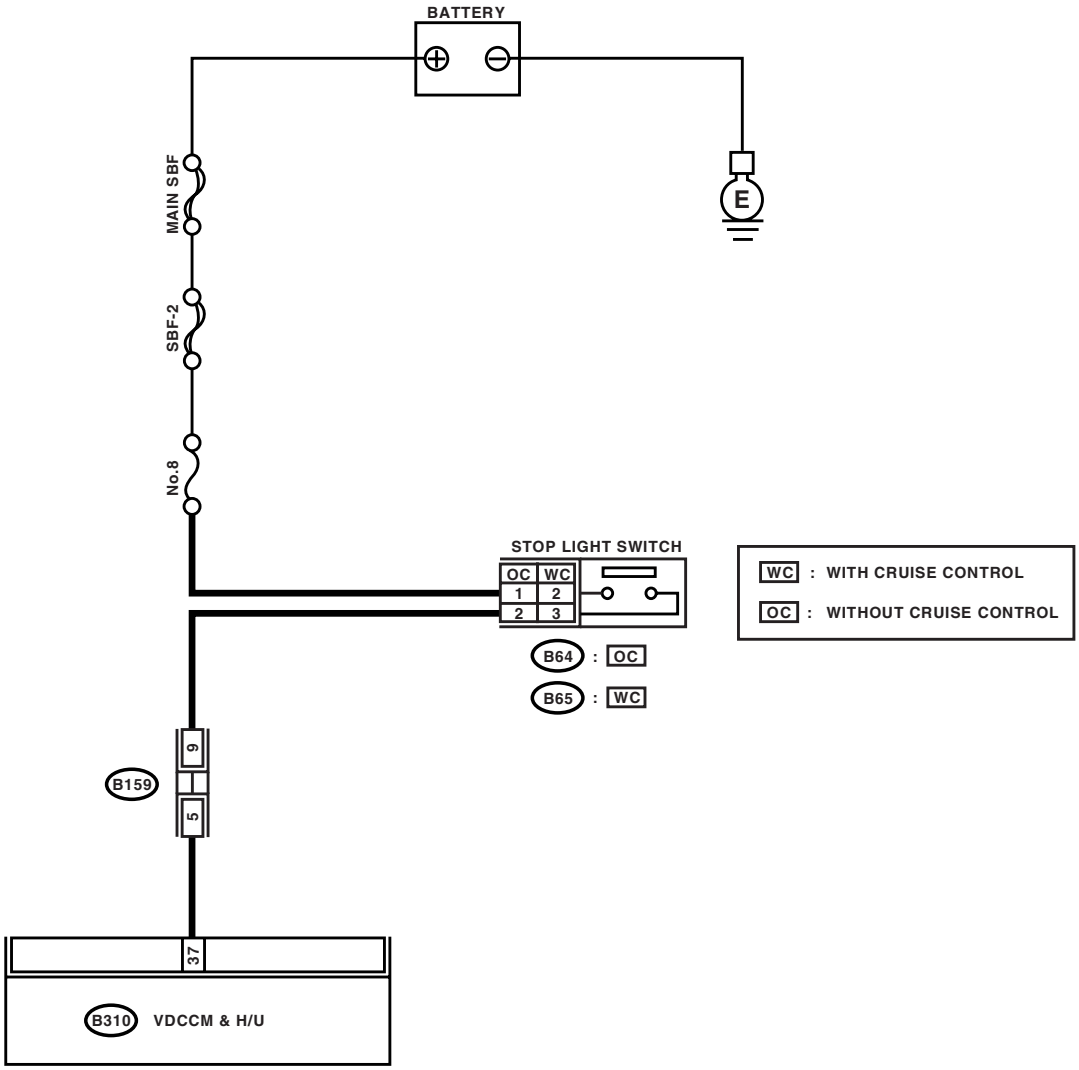
DTC DETECTING CONDITION:

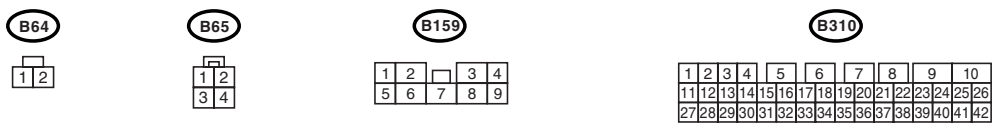
Defective stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00322

	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH WITH SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch output in Subaru Select Monitor.	Is OFF displayed on the display screen?	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT OF STOP LIGHT SWITCH WITH SUBARU SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor.	Is ON displayed on the display screen?	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal.	Does the stop light illuminate?	Go to step **4.**	Repair the stop lights circuit.
4	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 37 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Repair the harness between stop light switch and VDCCM&H/U connector.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between stop light switch and VDCCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7.**
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

AP:DTC C0054 BLS ON MALFUNCTION

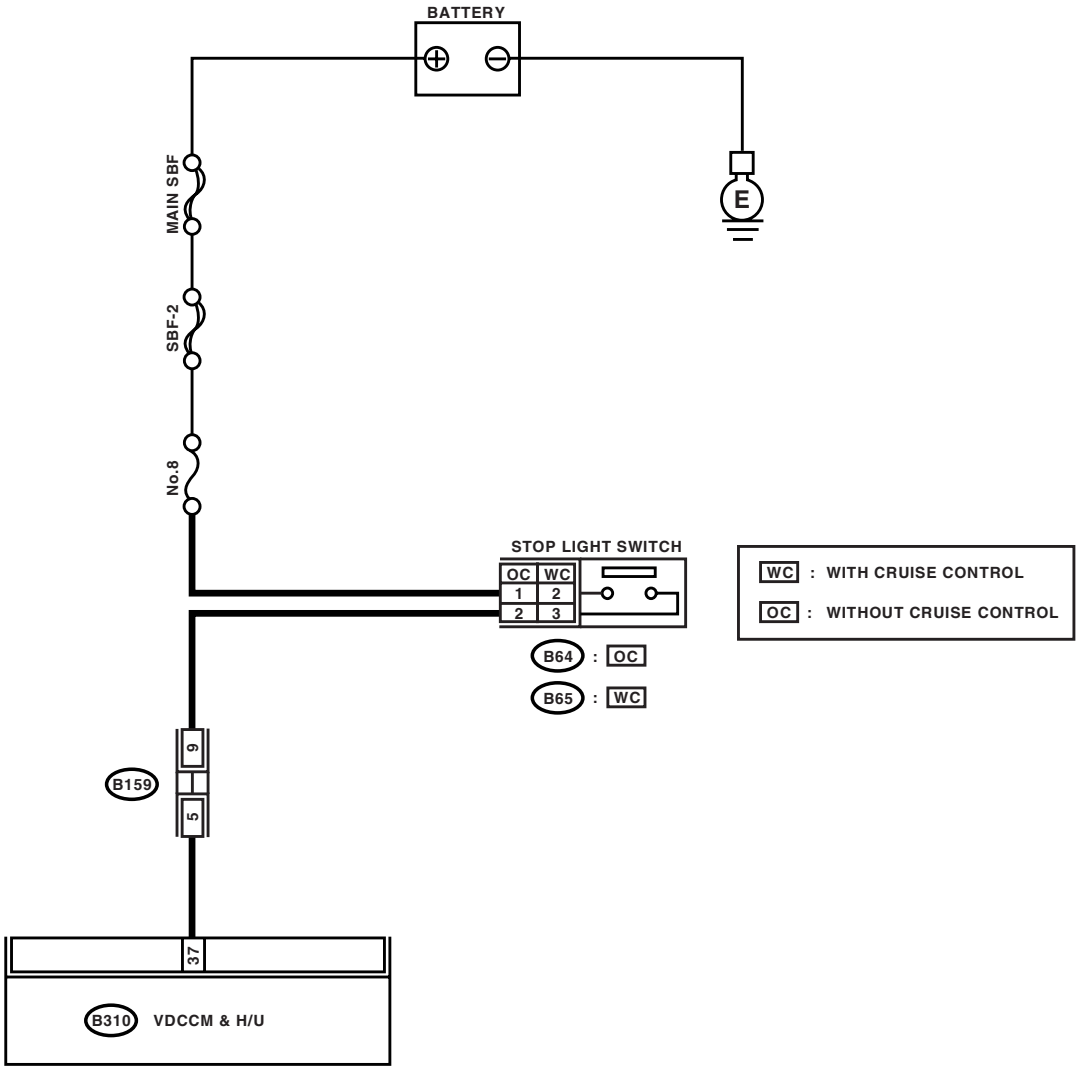
DTC DETECTING CONDITION:

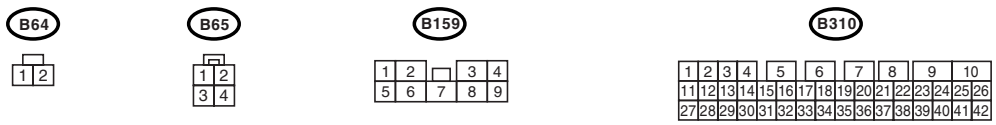
Defective stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00322

	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch connector. 3) Measure the resistance of stop light switch terminals.	Is the resistance more than 1 MΩ when switch is OFF (when pedal is not depressed)?	Go to step **2.**	Replace the stop light switch.
2	**INTERVIEWING CUSTOMERS.** Make sure that the operation was performed in which accelerator pedal and brake pedal were depressed simultaneously (with depressing brake pedal with left foot).	Were the acceleration pedal and brake pedal depressed simultaneously during driving?	System is in good order. (DTC may be recorded while brake is applied during driving.)	Go to step **3.**
3	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **4.**
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AQ:DTC C0057 ECM COMMUNICATION

DTC DETECTING CONDITION:

No CAN signal from ECM.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **2.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in ECM connector?	Repair the connector.	Go to step **3.**
3	**CHECK ECM.**	Is ECM normal?	Go to step **4.**	Replace the ECM.
4	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5.**
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

AR:DTC C0057 ECM CONTROL

DTC DETECTING CONDITION:

Cooperation control prohibition of ECM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

NOTE:
Warning light goes off if the cooperation control of ECM returns.

	Step	Check	Yes	No
1	**CHECK WARNING LIGHT.** Drive the vehicle at speed of 10 km/h or more for one minute or more, check the VDC warning light illuminates.	Does the VDC warning light illuminate?	Go to step **2.**	VDC is normal. Perform the clear memory mode. NOTE: DTC may be recorded when cranking during driving.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in ECM connector?	Repair the connector.	Go to step **3.**
3	**CHECK ECM.**	Is ECM normal?	Go to step **4.**	Replace the ECM.
4	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5.**
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

AS:DTC C0071 EXCESSIVE STEERING ANGLE SENSOR OUTPUT OFFSET

DTC DETECTING CONDITION:

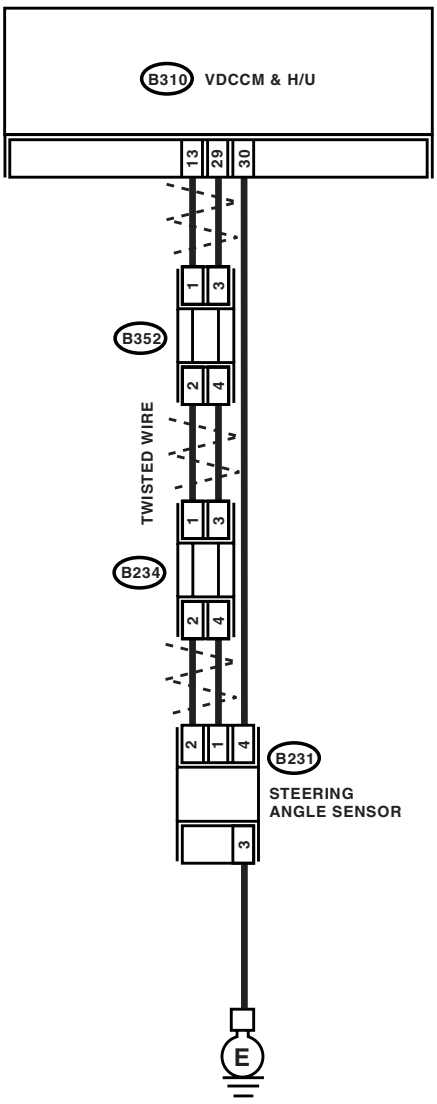
Defective steering angle sensor

TROUBLE SYMPTOM:

VDC does not operate.

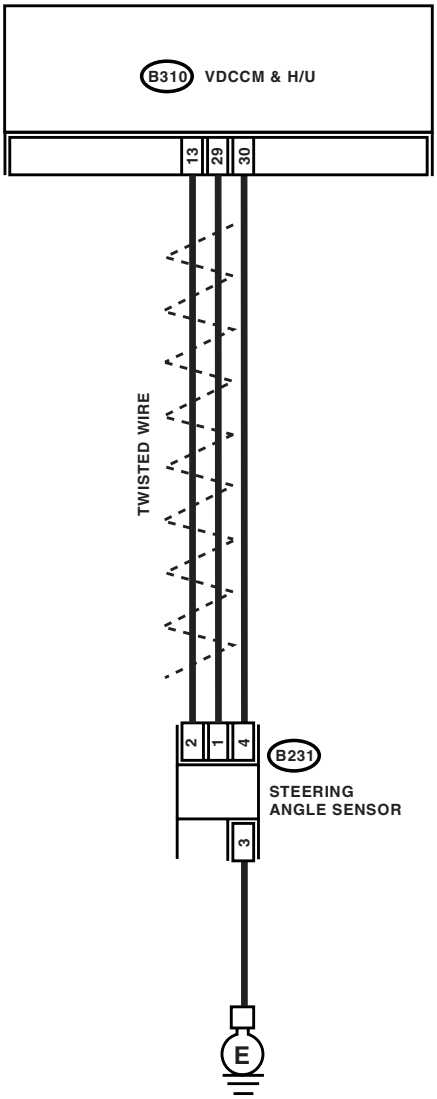
WIRING DIAGRAM:

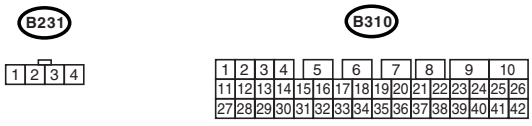
- LHD model



VDC00327

- RHD model



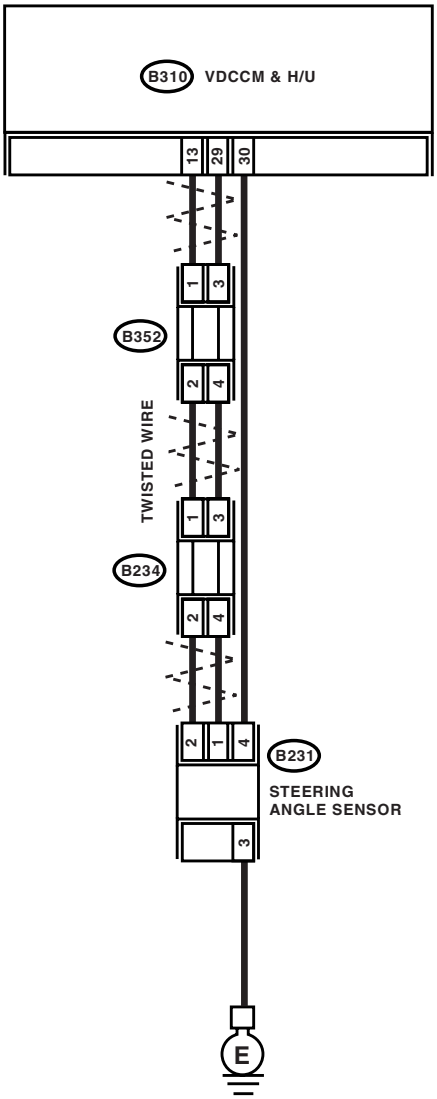


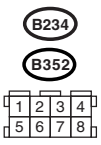
VDC00247

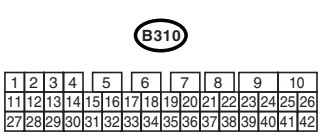
	Step	Check	Yes	No
1	**CHECK STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Check the steering wheel for deviation from center.	Is the deviation from the center of steering wheel less than 5°?	Go to step **2.**	Perform the centering adjustment of steering wheel.
2	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **3.**
3	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AT:DTC C0071 EXCESSIVE VARIATION AMOUNT OF STEERING ANGLE SENSOR OUTPUT

DTC DETECTING CONDITION:
Defective steering angle sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:
- LHD model

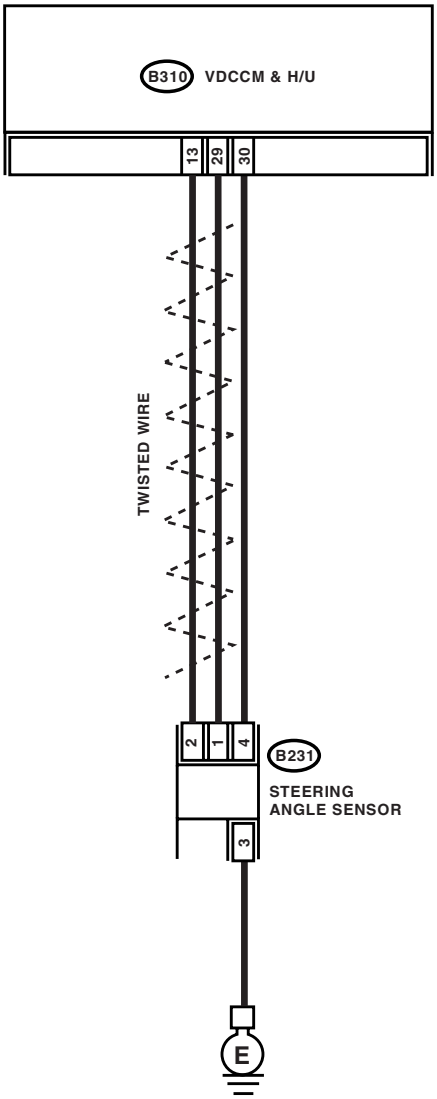






VDC00327

- RHD model

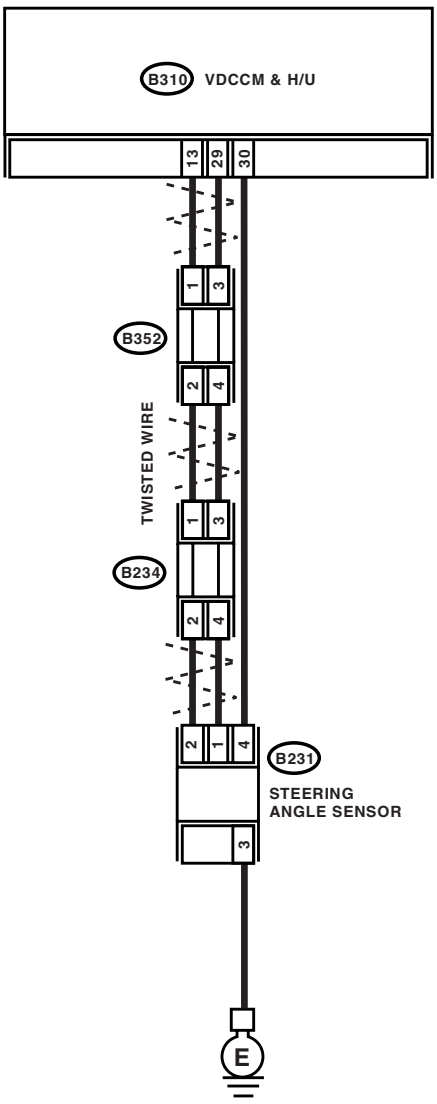


VDC00247

	Step	Check	Yes	No
1	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **2.**
2	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

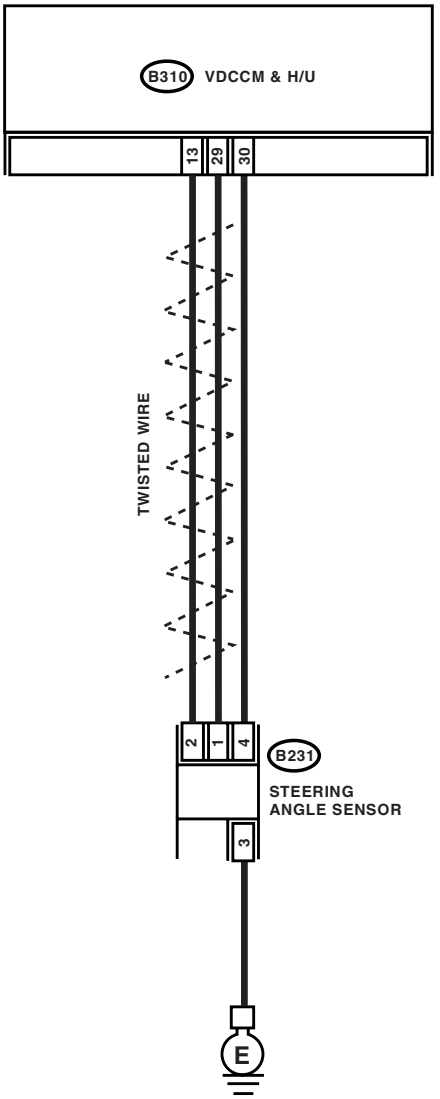
AU:DTC C0071 STEERING ANGLE SENSOR OUTPUT

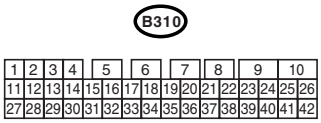
DTC DETECTING CONDITION:
Defective steering angle sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:
- LHD model



VDC00327

- RHD model





VDC00247

	Step	Check	Yes	No
1	**CHECK STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Check the steering wheel for deviation from center.	Is the deviation from the center of steering wheel less than 5°?	Go to step **2.**	Perform the centering adjustment of steering wheel.
2	**CHECK DRIVING PLACE.** Check if the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Did the vehicle run the road with banks or sandy surface (which does not mean a dirt road)?	VDCCM&H/U may record DTC when the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Go to step **3.**
3	**CHECK OUTPUT OF STEERING ANGLE SENSOR WITH SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the steering angle sensor output displayed on display.	Does the steering angle sensor output value on the display vary in accordance with steering operation when turning the steering wheel to the right or left?	Go to step **4.**	Replace the steering angle sensor.
4	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5.**
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

AV:DTC C0071 STEERING ANGLE SENSOR COMMUNICATION

DTC DETECTING CONDITION:

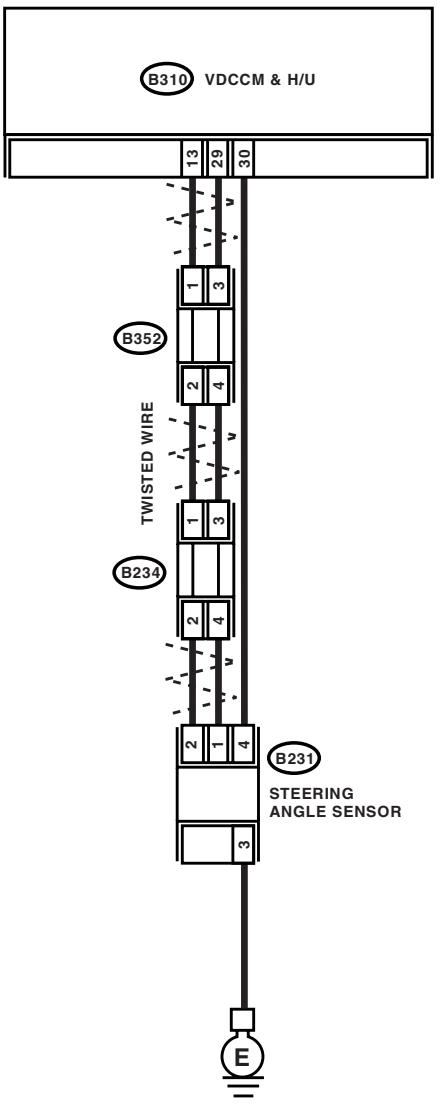
Signal does not come from steering angle sensor.

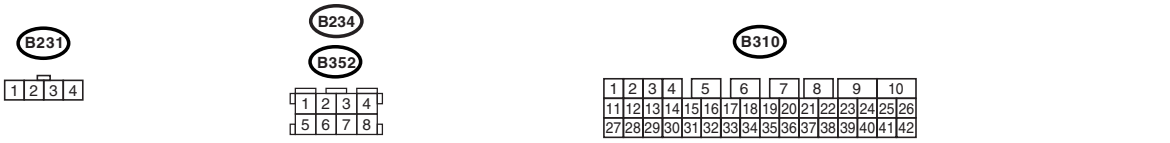
TROUBLE SYMPTOM:

VDC does not operate.

WIRING DIAGRAM:

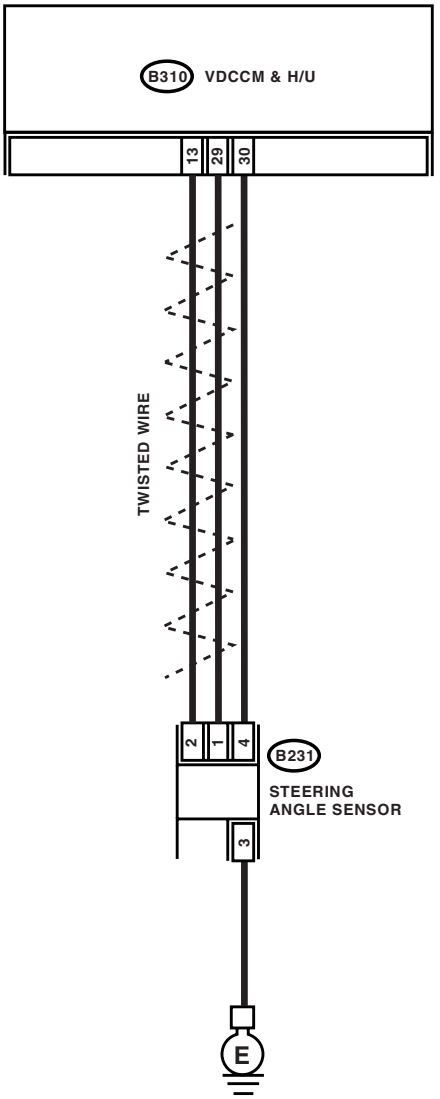
- LHD model

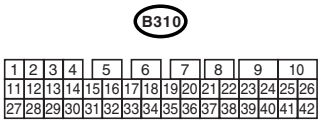




VDC00327

- RHD model





VDC00247

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from steering angle sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM&H/U.** Measure the voltage between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 30 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Repair the harness between steering angle sensor and VDCCM&H/U.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **9.**
4	**CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.** Measure the resistance between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair ground circuit in the steering angle sensor.
5	**CHECK STEERING ANGLE SENSOR HARNESS.** 1) Disconnect the connector from VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and steering angle sensor. ***Connector & terminal*** ***(B231) No. 1 — (B310) No. 29:*** ***(B231) No. 2 — (B310) No. 13:***	Is the resistance less than 0.5 Ω?	Go to step **6.**	Repair the harness between steering angle sensor and VDCCM&H/U.
6	**CHECK GROUND SHORT CIRCUIT OF STEERING ANGLE SENSOR HARNESS.** Measure the resistance between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 1 — Chassis ground:*** ***(B231) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness between steering angle sensor and VDCCM&H/U.
7	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Go to step **8.**	Go to step **10.**
8	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **11.**

	Step	Check	Yes	No
9	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **10.**
10	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.
11	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Original steering angle sensor malfunction

AW:DTC C0071 STEERING ANGLE SENSOR POWER SUPPLY MALFUNCTION

DTC DETECTING CONDITION:

Defective steering angle sensor

TROUBLE SYMPTOM:

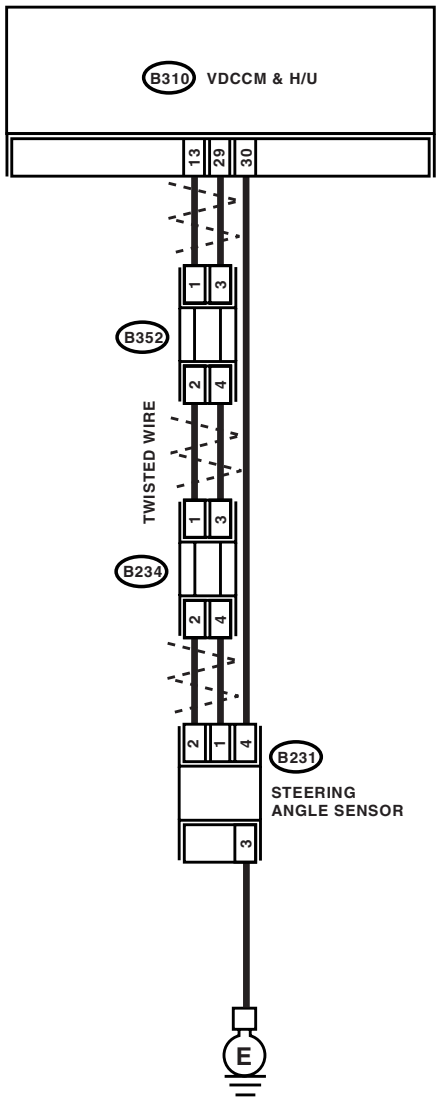
- ABS does not operate.
- VDC does not operate.

NOTE:

- Warning light does not illuminate though problem is detected.
- The ABS and VDC operate normally if voltage returns.

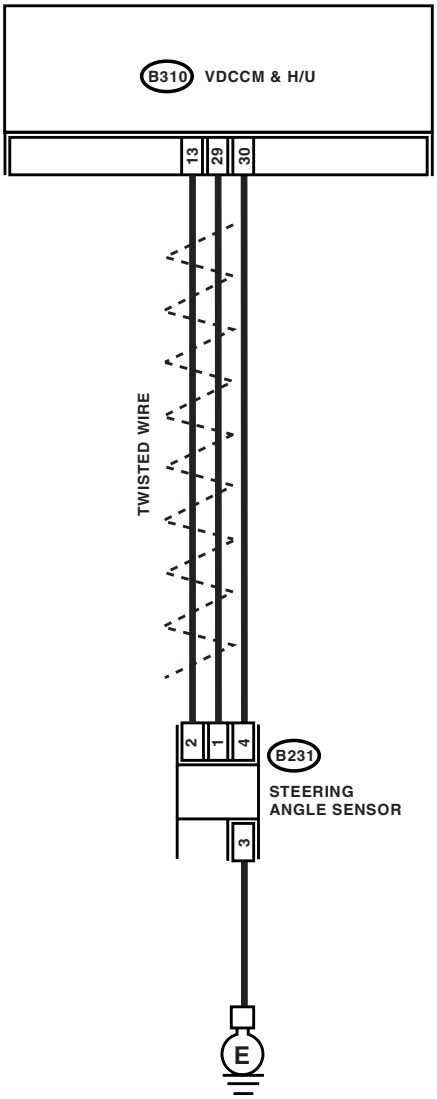
WIRING DIAGRAM:

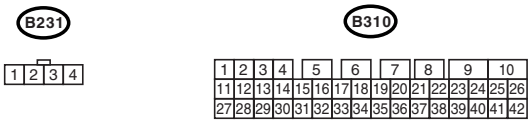
- LHD model



VDC00327

- RHD model



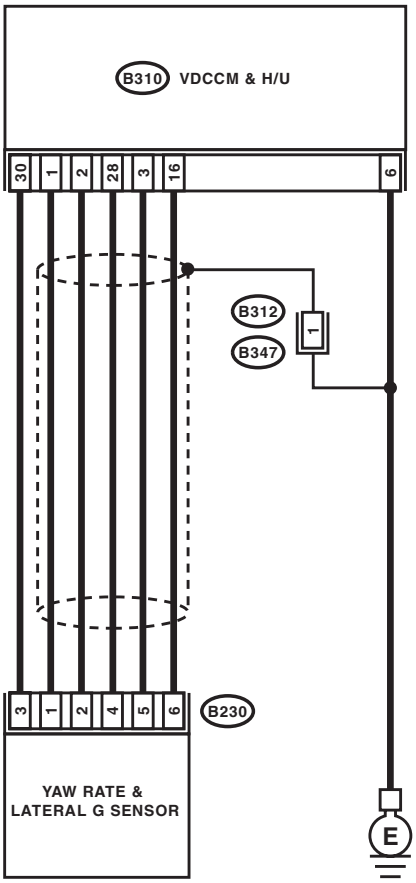


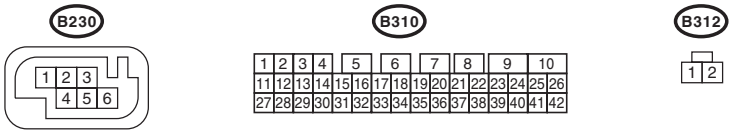
VDC00247

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from steering angle sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM&H/U.** Measure the voltage between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 30 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Repair the harness between steering angle sensor and VDCCM&H/U.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **7.**
4	**CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.** Measure the resistance between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair ground circuit in the steering angle sensor.
5	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Go to step **6.**	Go to step **8.**
6	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **9.**
7	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8.**
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.
9	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Original steering angle sensor malfunction

AX:DTC C0072 YAW RATE SENSOR OUTPUT

DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



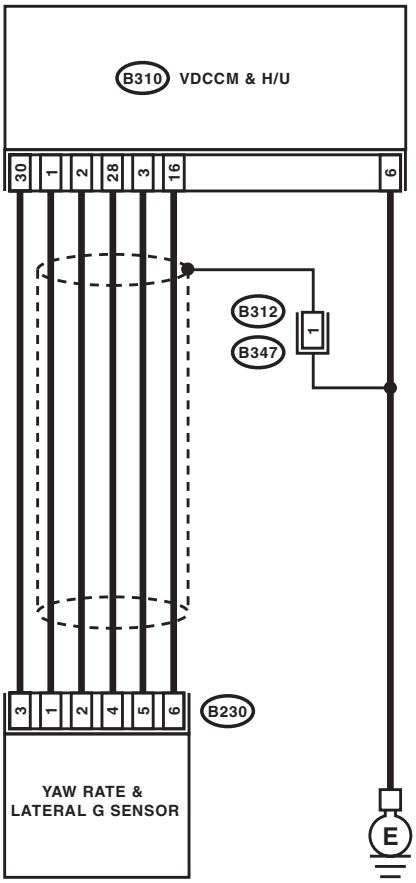


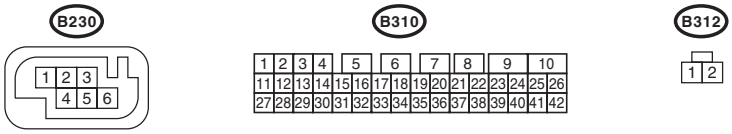
VDC00222

	Step	Check	Yes	No
1	**CHECK DRIVING PLACE.** Check if the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Did the vehicle run the road with banks or sandy surface (which does not mean a dirt road)?	VDCCM&H/U may record DTC when the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Go to step **2.**
2	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.**	Is the yaw rate & lateral G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **3.**	Tighten the yaw rate & lateral G sensor installation bolt.
3	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR WITH SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the yaw rate output displayed on display.	Is the reading indicated on monitor display −4 — 4 deg/s?	Go to step **4.**	Replace the yaw rate & lateral G sensor.
4	**CHECK OUTPUT OF STEERING ANGLE SENSOR WITH SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the steering angle sensor output displayed on display.	Is the reading indicated on monitor display −5 — 5°?	Go to step **5.**	Perform the centering adjustment of steering wheel.
5	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Go to step **6.**	Go to step **7.**
6	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & lateral G sensor. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8.**
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Malfunction is found in original yaw rate & lateral G sensor.

AY:DTC C0072 YAW RATE SENSOR POWER/OUTPUT

DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:





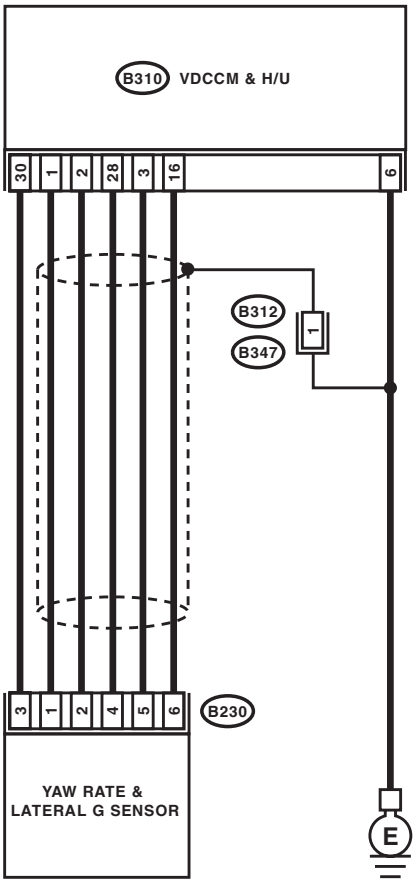
VDC00222

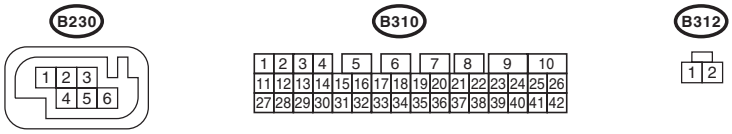
	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 3 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM&H/U.** Measure the voltage between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 30 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **10.**
4	**CHECK GROUND CIRCUIT OF YAW RATE & LATERAL G SENSOR.** Measure the resistance between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **7.**	Go to step **5.**
5	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** Measure the resistance between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 16 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **10.**
7	**CHECK YAW RATE & LATERAL G SENSOR HARNESS.** 1) Disconnect the connector from VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 28 — (B230) No. 4:***	Is the resistance less than 0.5 Ω?	Go to step **8.**	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.
8	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.
9	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Check the signal pattern of oscilloscope between VDCCM&H/U connector terminals. <Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> ***Connector & terminal*** ***(B310) No. 2 — No. 16:*** ***(B310) No. 28 — No. 16:***	Is the oscilloscope pattern the same waveform as shown in the figure?	Go to step **10.**	Replace the yaw rate & lateral G sensor.

	Step	Check	Yes	No
10	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **11.**
11	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

AZ:DTC C0072 YAW RATE SENSOR REFERENCE

DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:





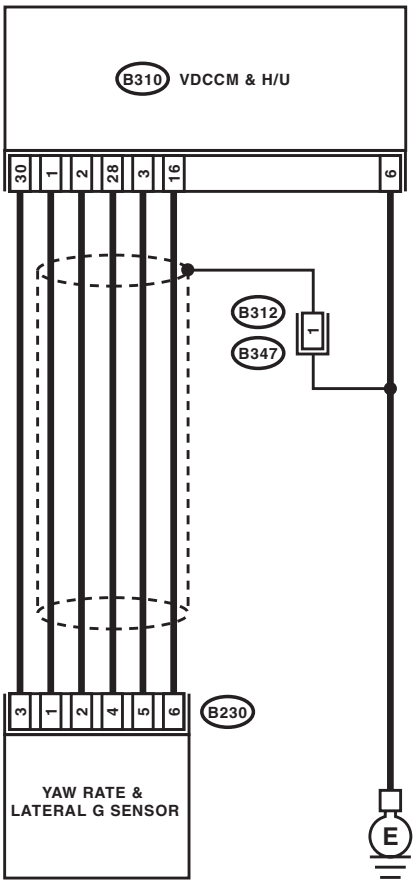
VDC00222

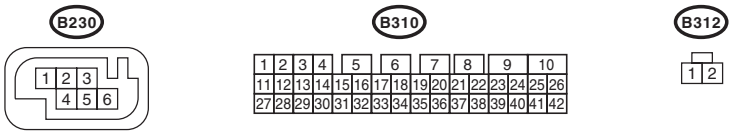
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 3 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **3.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM&H/U.** Measure the voltage between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 30 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.	Go to step **5.**
3	**CHECK GROUND CIRCUIT OF YAW RATE & LATERAL G SENSOR.** Measure the resistance between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **6.**	Go to step **4.**
4	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** Measure the resistance between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 16 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.	Go to step **5.**
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **9.**
6	**CHECK HARNESS OF YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Measure the resistance between VDCCM&H/U and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 1 — (B230) No. 1:***	Is the resistance less than 0.5 Ω?	Go to step **7.**	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.
7	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.
8	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Install the yaw rate & lateral G sensor to body. 3) Connect all the connectors. 4) Turn the ignition switch to ON. 5) Measure the voltage between VDCCM&H/U connector terminals. ***Connector & terminal*** ***(B310) No. 1 (+) — No. 16 (−):***	Is the voltage 2.1 — 2.9 V?	Go to step **9.**	Replace the yaw rate & lateral G sensor. <Ref. to VDC-15, Yaw Rate and Lateral G Sensor.>

	Step	Check	Yes	No
9	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **10.**
10	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

BA:DTC C0072 EXCESSIVE VARIATION AMOUNT OF YAW RATE SENSOR OUTPUT

DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:





VDC00222

	Step	Check	Yes	No
1	**CHECK DRIVING PLACE.** Check if the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Did the vehicle run the road with banks or sandy surface (which does not mean a dirt road)?	VDCCM&H/U may record DTC when the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Go to step **2.**
2	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.**	Is the yaw rate & lateral G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **3.**	Tighten the yaw rate & lateral G sensor installation bolt.
3	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 3 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT VOLTAGE OF VDCCM&H/U.** Measure the voltage between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 30 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.	Go to step **7.**
5	**CHECK GROUND CIRCUIT OF YAW RATE & LATERAL G SENSOR.** Measure the resistance between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **8.**	Go to step **6.**
6	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** Measure the resistance between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 16 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.	Go to step **7.**
7	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **14.**
8	**CHECK HARNESS OF YAW RATE & LATERAL G SENSOR.** 1) Disconnect the connector from VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 1 — (B230) No. 1:*** ***(B310) No. 2 — (B230) No. 2:*** ***(B310) No. 28 — (B230) No. 4:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.
9	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:*** ***(B310) No. 2 — Chassis ground:*** ***(B310) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.

	Step	Check	Yes	No
10	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector terminals. ***Connector & terminal*** ***(B310) No. 1 (+) — No. 16 (–):***	Is the voltage 2.1 — 2.9 V?	Go to step **11.**	Replace the yaw rate & lateral G sensor.
11	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to ON. 2) Check the signal pattern of oscilloscope between VDCCM&H/U connector terminals. <Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> ***Connector & terminal*** ***(B310) No. 2 — No. 16:*** ***(B310) No. 28 — No. 16:***	Is the oscilloscope pattern the same waveform as shown in the figure?	Go to step **12.**	Replace the yaw rate & lateral G sensor.
12	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Go to step **13.**	Go to step **15.**
13	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & lateral G sensor. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **16.**
14	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **15.**
15	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.
16	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Malfunction is found in original yaw rate & lateral G sensor.

BB:DTC C0073 EXCESSIVE AMOUNT OF LATERAL G SENSOR OUTPUT OFFSET

NOTE:
For the diagnostic procedure, refer to DTC C0073. <Ref. to VDC(diag)-119, DTC C0073 EXCESSIVE LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC C0073 LATERAL G SENSOR OUTPUT

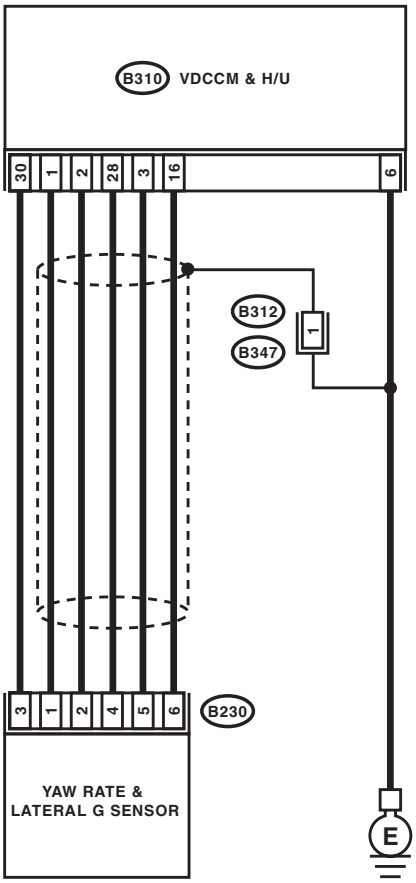
NOTE:
For the diagnostic procedure, refer to DTC C0073. <Ref. to VDC(diag)-119, DTC C0073 EXCESSIVE LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

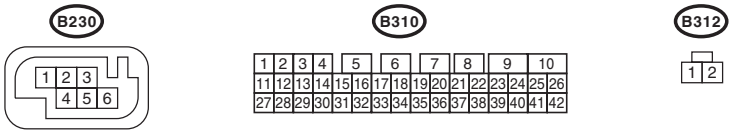
BD:DTC C0073 EXCESSIVE VARIATION AMOUNT OF LATERAL G SENSOR OUTPUT

NOTE:
For the diagnostic procedure, refer to DTC C0073. <Ref. to VDC(diag)-119, DTC C0073 EXCESSIVE LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BE:DTC C0073 EXCESSIVE LATERAL G SENSOR OUTPUT

DTC DETECTING CONDITION:
Defective lateral G sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



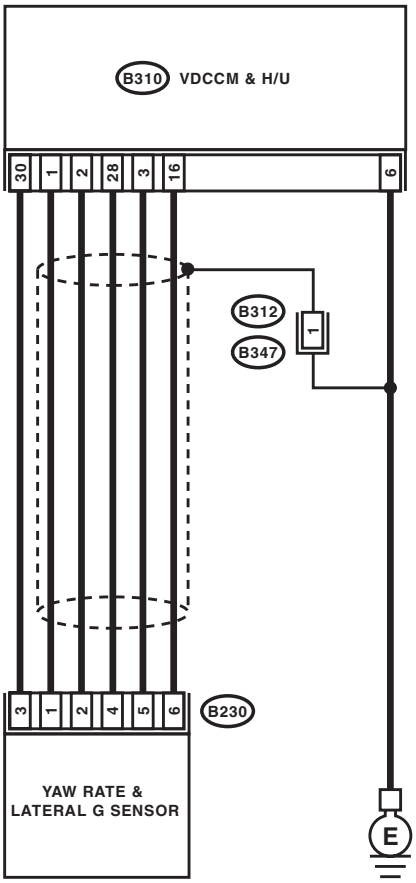


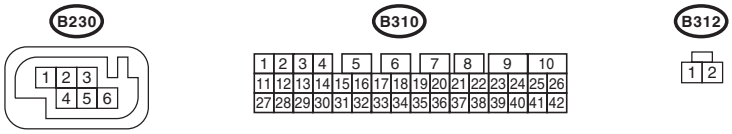
VDC00222

	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.**	Is the yaw rate & lateral G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **2.**	Tighten the yaw rate & lateral G sensor installation bolt.
2	**CHECK LATERAL G SENSOR OUTPUT.** 1) Park the vehicle on a level surface. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the lateral G sensor output displayed on display screen.	Is the indicated reading on the monitor display −1.5 —1.5 m/s^2?	Go to step **3.**	Replace the yaw rate & lateral G sensor.
3	**CHECK LATERAL G SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & lateral G sensor from vehicle. 3) Turn the ignition switch to ON, and select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the lateral G sensor output displayed on display.	When the yaw rate & lateral G sensor is inclined 90° to the right, is the indicated value 6.8 — 12.8 m/s^2?	Go to step **4.**	Replace the yaw rate & lateral G sensor.
4	**CHECK LATERAL G SENSOR.** Read the lateral G sensor output displayed on display.	When the yaw rate & lateral G sensor is inclined 90° to the left, is the indicated value −6.8 — −12.8 m/s^2?	Go to step **5.**	Replace the yaw rate & lateral G sensor.
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between VDCCM&H/U and yaw rate & lateral G sensor?	Repair the connector.	Go to step **6.**
6	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7.**
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

BF:DTC C0073 LATERAL G SENSOR POWER/OUTPUT

DTC DETECTING CONDITION:
Defective lateral G sensor
DTC DETECTING CONDITION:
VDC does not operate.
WIRING DIAGRAM:





VDC00222

	Step	Check	Yes	No
1	**CHECK LATERAL G SENSOR OUTPUT.** 1) Park the vehicle on a level surface. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the lateral G sensor output displayed on display.	Is the indicated reading on the monitor display −1.5 —1.5 m/s^2?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between VDCCM&H/U and yaw rate & lateral G sensor?	Repair the connector.	Go to step **10.**
3	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 3 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT VOLTAGE OF VDCCM&H/U.** Measure the voltage between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 30 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM&H/U.	Go to step **5.**
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **10.**
6	**CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from yaw rate & lateral G sensor. 2) Disconnect the connector from VDCCM&H/U. 3) Measure the resistance between VDCCM&H/U and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 3 — (B230) No. 5:***	Is the resistance less than 0.5 Ω?	Go to step **7.**	Repair the harness connector between yaw rate & lateral G sensor and VDCCM&H/U.
7	**CHECK GROUND SHORT CIRCUIT FOR YAW RATE & LATERAL G SENSOR HARNESS.** Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness connector between yaw rate & lateral G sensor and VDCCM&H/U.
8	**CHECK LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & lateral G sensor from vehicle. 3) Connect the connector to the yaw rate & lateral G sensor. 4) Connect the connector to VDCCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B230) No. 5 (+) — No. 6 (−):***	Is the voltage 2.35 — 2.65 V when yaw rate & lateral G sensor is on level?	Go to step **9.**	Replace the yaw rate & lateral G sensor.

	Step	Check	Yes	No
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between VDCCM&H/U and yaw rate & lateral G sensor?	Repair the connector.	Go to step **10.**
10	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **11.**
11	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

BG:DTC C0074 PRESSURE SENSOR TEST MALFUNCTION

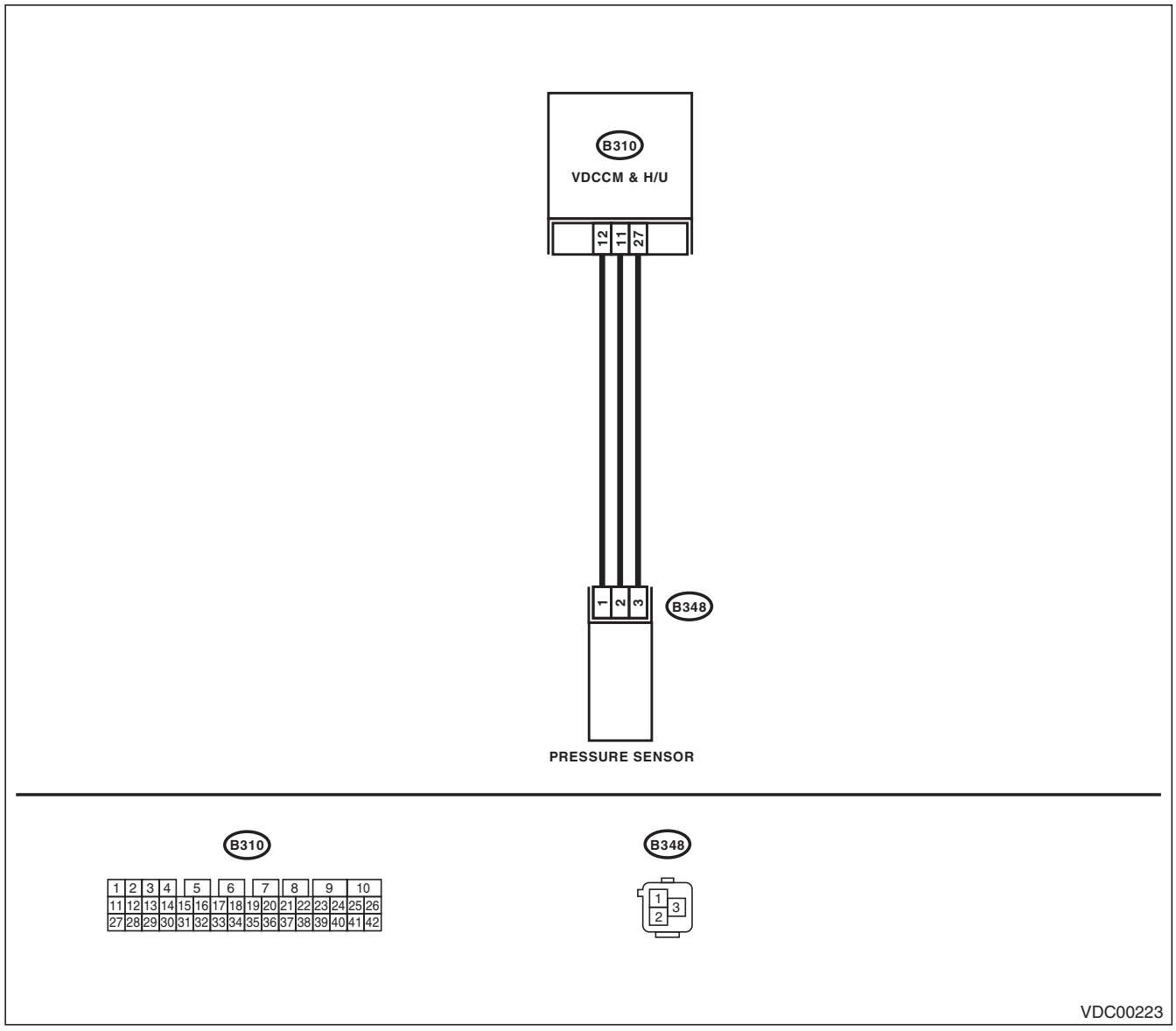
DTC DETECTING CONDITION:

Defective pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PRESSURE SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between pressure sensor connector and chassis ground. ***Connector & terminal*** ***(B348) No. 3 (+) — Chassis ground (−):***	Is the voltage 4.75 — 5.25 V?	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM&H/U.** Measure the voltage between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 27 (+) — Chassis ground (−):***	Is the voltage 4.75 — 5.25 V?	Repair the harness between pressure sensor and VDCCM&H/U.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **9.**
4	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** Measure the resistance between pressure sensor and chassis ground. ***Connector & terminal*** ***(B348) No. 1 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **7.**	Go to step **5.**
5	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** Measure the resistance between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 12 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Repair the harness between pressure sensor and VDCCM&H/U.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **9.**
7	**CHECK PRESSURE SENSOR HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Measure the resistance between VDCCM&H/U and pressure sensor. ***Connector & terminal*** ***(B310) No. 11 — (B348) No. 2:***	Is the resistance less than 0.5 Ω?	Go to step **8.**	Repair the harness between pressure sensor and VDCCM&H/U.
8	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the harness between pressure sensor and VDCCM&H/U.
9	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **10.**
10	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

BH:DTC C0074 EXCESSIVE PRESSURE SENSOR OUTPUT OFFSET

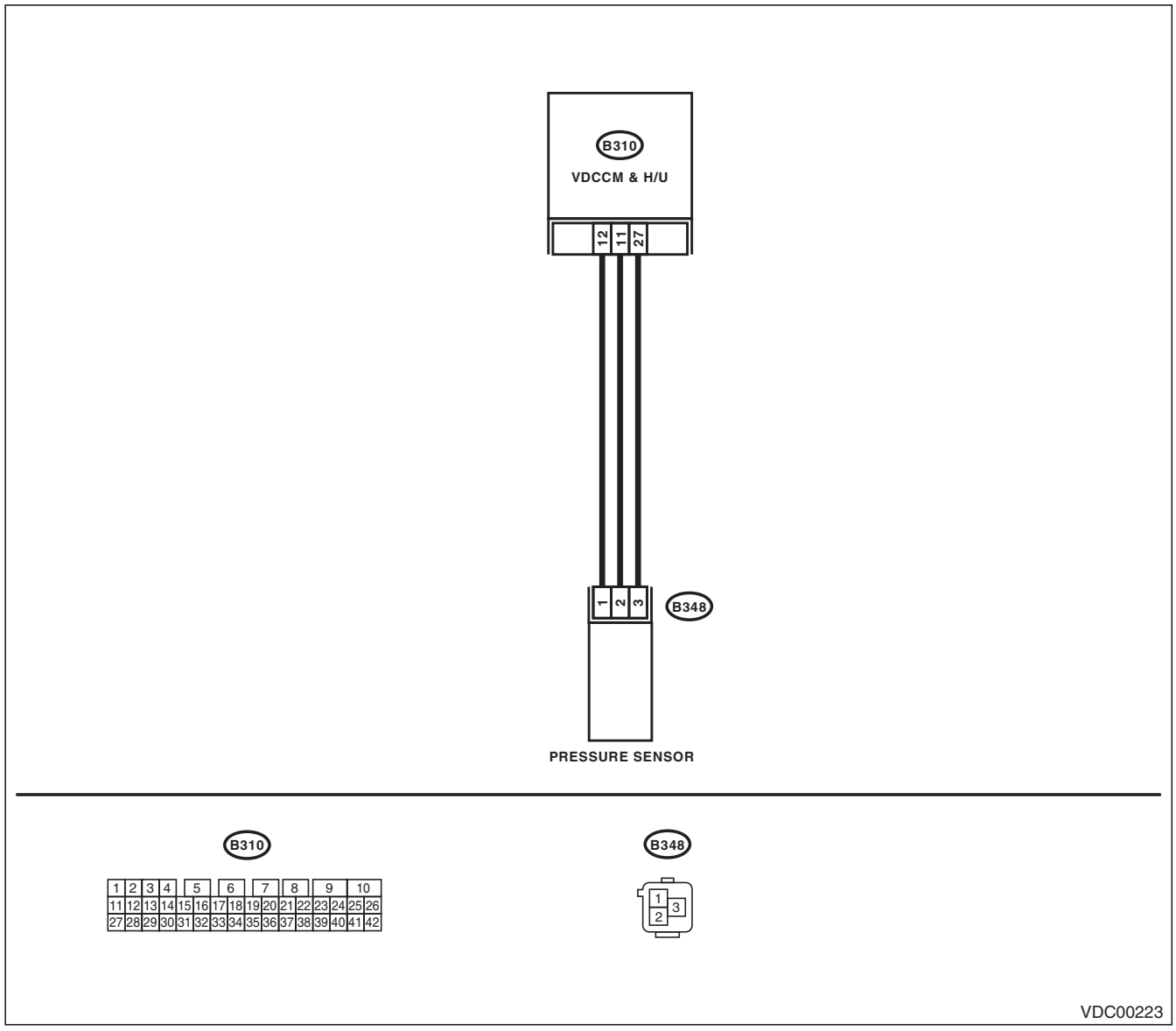
DTC DETECTING CONDITION:

Defective pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH CIRCUIT.** Check stop light switch open circuit.	Is the stop light switch circuit OK?	Go to step **2.**	Repair the stop light switch circuit.
2	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **3.**
3	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-38, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

BI: DTC C0074 PRESSURE SENSOR POWER/OUTPUT

DTC DETECTING CONDITION:

Defective pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

NOTE:

For the diagnostic procedure, refer to DTC C0074 “PRESSURE SENSOR TEST MALFUNCTION”. <Ref. to VDC(diag)-124, DTC C0074 PRESSURE SENSOR TEST MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BJ:DTC C0074 PRESSURE SENSOR OUTPUT

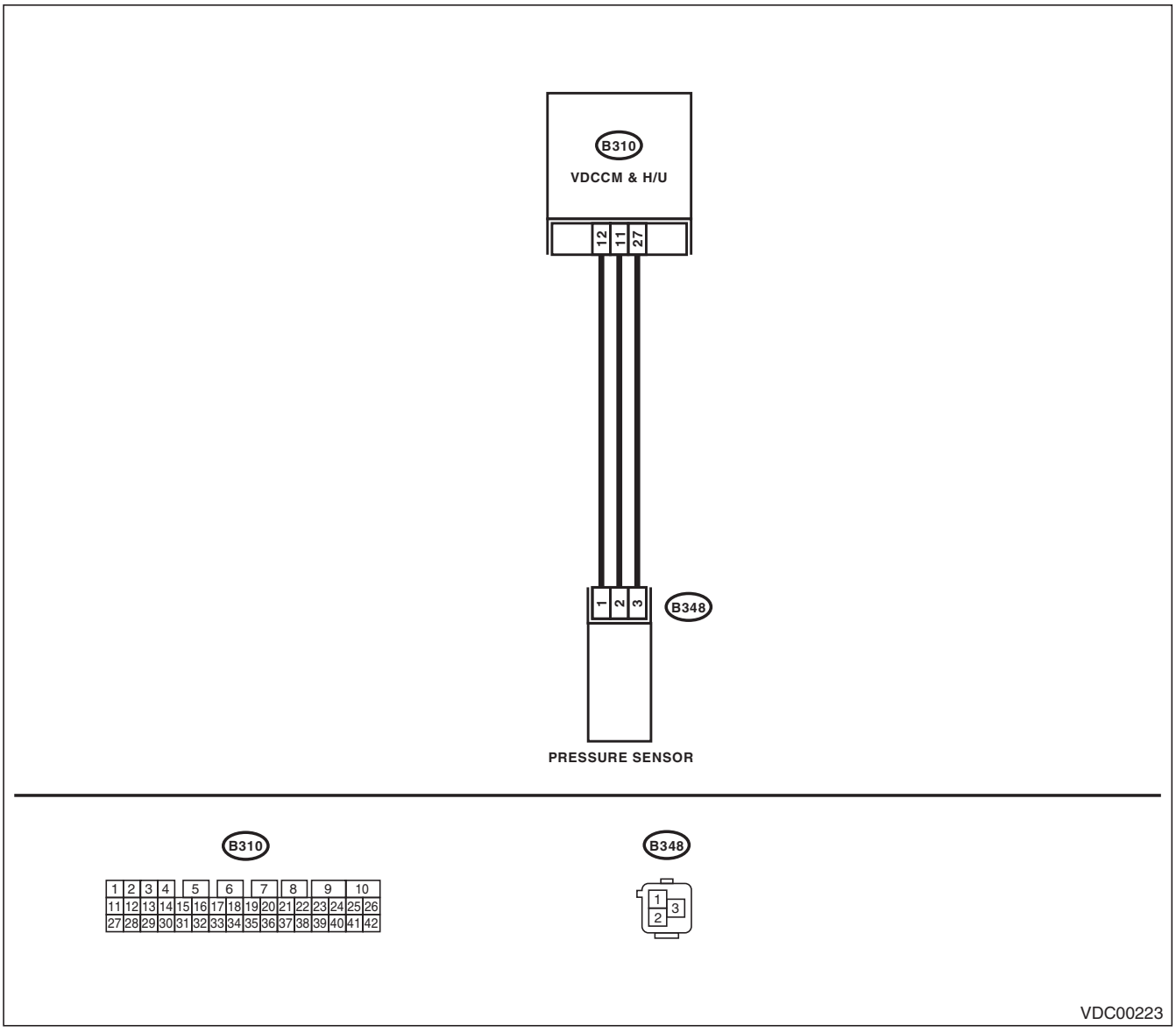
DTC DETECTING CONDITION:

Defective pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH CIRCUIT.** Check stop light switch open circuit.	Is the stop light switch circuit OK?	Go to step **2.**	If there is malfunction in the stop light switch circuit, DTC may be recorded in the memory.

	Step	Check	Yes	No
2	**CHECK PRESSURE SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between pressure sensor connector and chassis ground. ***Connector & terminal*** ***(B348) No. 3 (+) — Chassis ground (−):***	Is the voltage 4.75 — 5.25 V?	Go to step **5.**	Go to step **3.**
3	**CHECK OUTPUT VOLTAGE OF VDCCM&H/U.** Measure the voltage between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 27 (+) — Chassis ground (−):***	Is the voltage 4.75 — 5.25 V?	Repair the harness between pressure sensor and VDCCM&H/U.	Go to step **4.**
4	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **10.**
5	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** Measure the resistance between pressure sensor and chassis ground. ***Connector & terminal*** ***(B348) No. 1 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **8.**	Go to step **6.**
6	**CHECK GROUND CIRCUIT OF VDCCM&H/U.** Measure the resistance between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 12 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Repair the harness between pressure sensor and VDCCM&H/U.	Go to step **7.**
7	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector?	Correct or replace the connector.	Go to step **10.**
8	**CHECK PRESSURE SENSOR HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM&H/U. 3) Measure the resistance between VDCCM&H/U and pressure sensor. ***Connector & terminal*** ***(B310) No. 11 — (B348) No. 2:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness between pressure sensor and VDCCM&H/U.
9	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the harness between pressure sensor and VDCCM&H/U.
10	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **11.**
11	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

BK:DTC C0074 PRESSURE SENSOR POWER MALFUNCTION

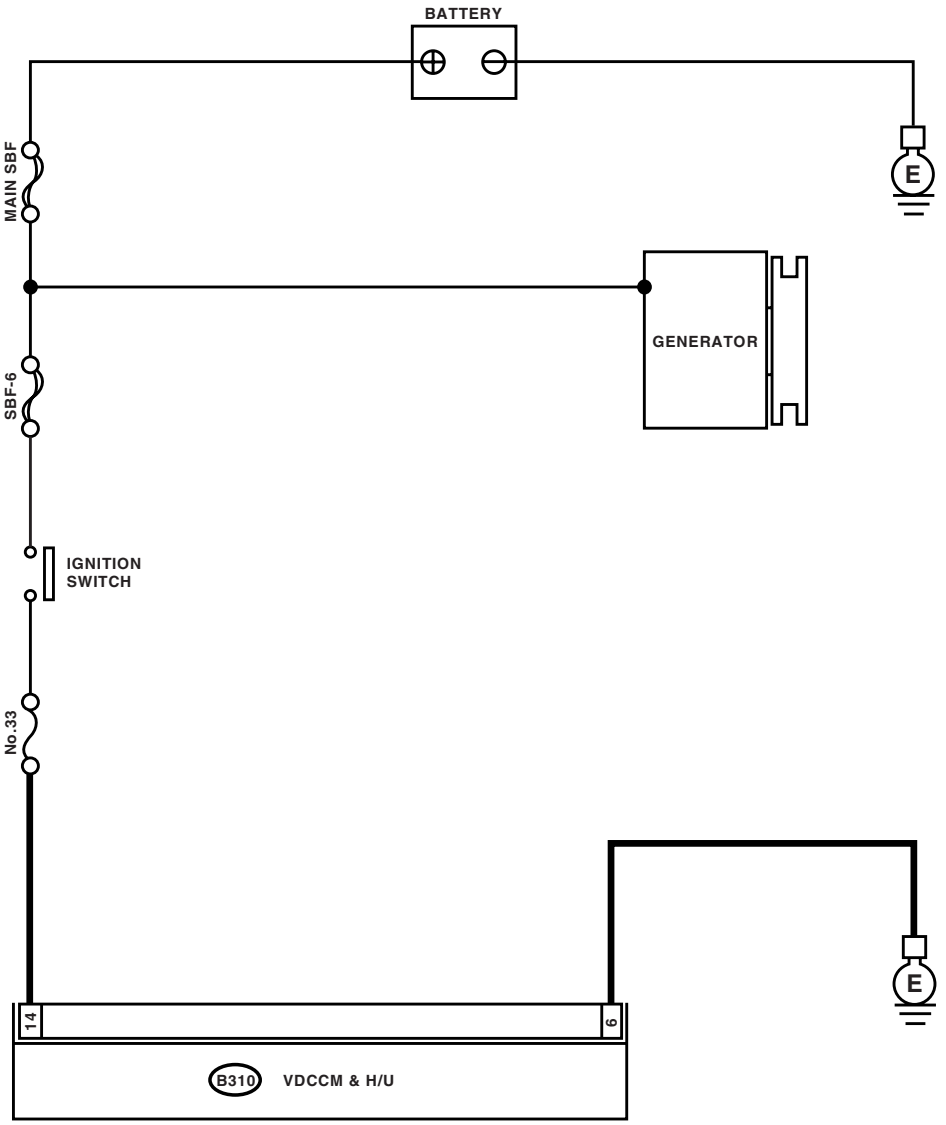
DTC DETECTING CONDITION:

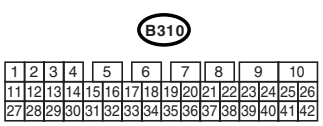
Defective pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00309

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS.** Check if there is poor contact in VDCCM&H/U power supply circuit.	Is there poor contact?	Repair the connector.	Go to step **2.**
2	**CHECK VDCCM&H/U POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector terminals. ***Connector & terminal (B310) No. 14 (+) — (B310) No. 6 (–):***	Is the voltage 10 — 15 V?	Go to step **3.**	Check the power supply circuit in VDCCM&H/U.
3	**CHECK VDCCM&H/U.** 1) Connect all the connectors. 2) Perform the clear memory mode. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **4.**
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

BL:DTC C0081 SYSTEM MALFUNCTION

DTC DETECTING CONDITION:

VDC long time sequential control

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in the VDCCM&H/U connector and yaw rate & lateral G sensor connector?	Repair the connector.	Go to step **2.**
2	**CHECK VDCCM&H/U.** 1) Replace the yaw rate & lateral G sensor. 2) Connect all the connectors. 3) Perform the clear memory mode. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U.	Malfunction is found in original yaw rate & lateral G sensor.

13.General Diagnostic Table

A: INSPECTION

Symptom		Main probable cause	Other probable cause
Poor brake performance	Long braking/ stopping distance	• VDCCM&H/U • Brake pad • Aeration to brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Master cylinder • Brake caliper • Disc rotor • Brake pipe • Brake booster
	Wheel lock	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Incorrect wiring or piping connections	• Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake caliper • Brake pipe
	Brake drag	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Parking brake • Axle and wheels • Brake pedal play	• Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake pad • Brake pipe
	Long brake pedal stroke	• Aeration to brake line • Brake pedal play	• VDCCM&H/U • Master cylinder • Brake caliper • Brake pad • Brake pipe • Brake booster
	Vehicle vertical pitching	• VDCCM&H/U • Road surface (uneven) • Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation
Poor brake performance	Unstable or uneven braking	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Brake caliper • Brake pad • Road surface (uneven) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Master cylinder • Disc rotor • Brake pipe • Axle and wheels • Road with crowns or banks • Suspension play or fatigue (poor damping)

Symptom		Main probable cause	Other probable cause
Vibration or noise • When braking suddenly • When accelerating suddenly • While driving on a slippery road	Excessive brake pedal vibration	• Road surface (uneven) • Incorrect wiring or piping connections	• VDCCM&H/U • Brake booster • Suspension play or fatigue (poor damping)
	Noise from VDCCM&H/U	• VDCCM&H/U (mount bushing) • Defective ABS wheel speed sensor or sensor gap • Brake pipe	• VDCCM&H/U • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation
	Noise from the front side of vehicle	• VDCCM&H/U (mount bushing) • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Brake pad • Disc rotor • Brake pipe • Brake booster • Suspension play or fatigue (poor damping)	• Axle and wheels • Tire specifications, tire wear and air pressures
	Noise inside passenger seat		• VDCCM&H/U • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation
	Noise from the rear side of vehicle	• Defective ABS wheel speed sensor or sensor gap • Brake caliper • Brake pad • Disc rotor • Parking brake • Brake pipe • Suspension play or fatigue (poor damping)	• Axle and wheels • Tire specifications, tire wear and air pressures
Engine does not accelerate or goes into a stall when accelerating suddenly or driving on a slippery surface.		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Parking brake • Incorrect wiring or piping	• Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake pad • Brake pipe

General Diagnostic Table

Symptom		Main probable cause	Other probable cause
Poor change-direction-operation stability of TCS	Deviation to right or left direction	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake caliper • Brake pad • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Disc rotor • Brake pipe • Axle and wheels • Suspension play or fatigue (poor damping)
	Vehicle spin	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake pad • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Brake caliper • Brake pipe
Steering wheel drag while driving		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Incorrect wiring or piping connections • Power steering system	• Brake caliper • Brake pad • Disc rotor • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Suspension play or fatigue (poor damping) • Tire specifications, tire wear and air pressures
VDC operates while driving normally.		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Suspension play or fatigue (poor damping) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Power steering system	

Symptom	Main probable cause	Other probable cause
VDC OFF indicator light does not come on when the VDC OFF switch is depressed. NOTE: When pressing VDC OFF switch for more than 10 seconds, VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the previous status is restored.	• Harness • Indicator light bulb • VDC OFF switch	

BRAKE

BR

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1. General Description

A: SPECIFICATION

Model			2.0 i, 2.5 i	3.0 R (EH model), OUTBACK 2.5 i, OUTBACK 3.0 R	2.0 GT, 3.0 R (Except for EH model)
Front disc brake	Size		15-inch type	16-inch type	17-inch type
	Type		Disc (Floating type, ventilated)		
	Effective disc diameter	mm (in)	228 (8.98)	244 (9.61)	261 (10.28)
	Disc thickness × Outer diameter	mm (in)	24 × 277 (0.94 × 10.91)	24 × 294 (0.94 × 11.57)	30 × 316 (1.18 × 12.44)
	Effective cylinder diameter		42.8 (1.685) × 2		
	Pad dimensions (length × width × thickness)	mm (in)	117.8 × 50.5 × 11.0 (4.638 × 1.988 × 0.433)		130.0 × 53.5 × 11.0 (5.118 × 2.106 × 0.433)
	Clearance adjustment		Automatic adjustment		
Rear disc brake	Size		15-inch type		
	Type		Disc (Floating type, solid)		Disc (Floating type, ventilated)
	Effective disc diameter	mm (in)	238 (9.37)		254 (10.0)
	Disc thickness × Outer diameter	mm (in)	10 × 274 (0.39 × 10.79)		18 × 290 (0.71 × 11.42)
	Effective cylinder diameter	mm (in)	38.1 (1.500)		
	Pad dimensions (length × width × thickness)	mm (in)	92.0 × 33.0 × 9.0 (3.622 × 1.299 × 0.354)		82.4 × 33.7 × 9.0 (3.244 × 1.327 × 0.354)
	Clearance adjustment		Automatic adjustment		
Master cylinder	Type		Tandem		
	Effective diameter	mm (in)	23.8 (15/16)		
	Reservoir type		Sealed type		
	Brake fluid reservoir capacity	cm^3 (cu in)	205 (12.51)		
Brake booster	Type		Vacuum suspended		
	Effective diameter	mm (in)	208 + 229 (8.19 + 9.02)		
Brake line			Dual circuit system		
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.** **• When filling brake fluid, be careful not to allow any dust into the reservoir.** **• Use fresh brake fluid when replacing or refilling fluid.**			FMVSS No. 116, DOT3		

NOTE:
Refer to “PB” section for parking brake specifications. <Ref. to PB-2, SPECIFICATION, General Description.>

Item			Specification	Limit
Front brake	Pad thickness mm (in)	Except 17-inch type	11 (0.43)	1.5 (0.059)
		17-inch type	11 (0.43)	1.5 (0.059)
	Disc thickness mm (in)	Except 17-inch type	24 (0.94)	22 (0.87)
		17-inch type	30 (1.18)	28 (1.10)
	Disc runout mm (in)		—	0.05 (0.0020)
Rear brake (Disc type)	Pad thickness mm (in)	Solid disc	9.0 (0.354)	1.5 (0.059)
		Ventilated disc	9.0 (0.354)	1.5 (0.059)
	Disc thickness mm (in)	Solid disc	10 (0.39)	8.5 (0.335)
		Ventilated disc	18 (0.71)	16 (0.63)
	Disc runout mm (in)		—	0.05 (0.0020)
Parking brake	Inside diameter mm (in)		170 (6.69)	171 (6.73)
	Lining thickness mm (in)		3.2 (0.126)	1.5 (0.059)
	Lever stroke		5 — 6 notches/200 N (20 kgf, 45 lbf)	

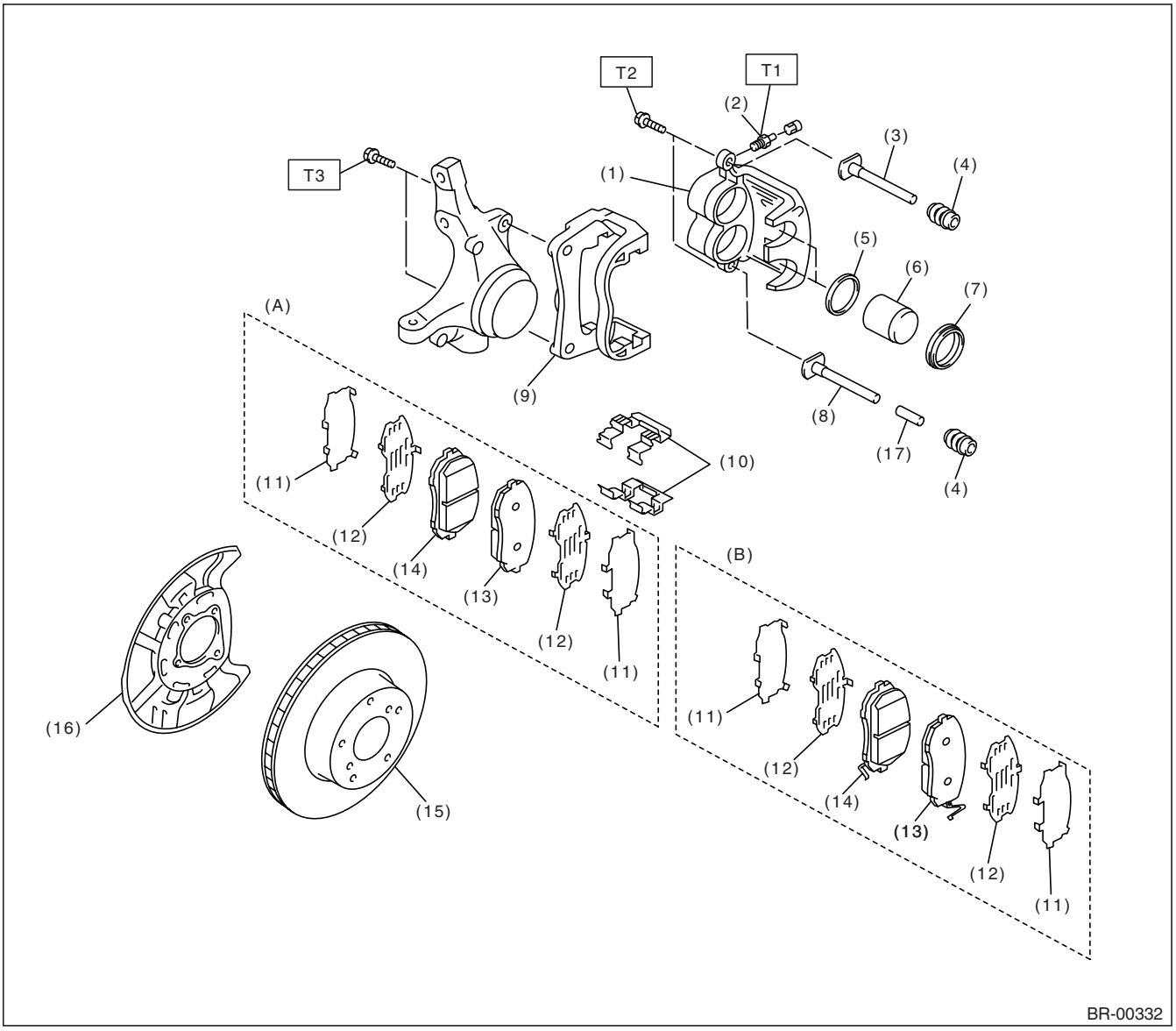
		Brake pedal force N (kgf, lbf)	Fluid pressure kPa (kgf/cm^2, psi)		
			15-inch type	16-inch type	17-inch type
Brake booster	Brake fluid pressure without engine running	147 (15, 33)	545 (6, 79)		
		294 (30, 66)	1,564 (16, 227)		
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 (15, 33)	6,003 (61, 871)	5,381 (55, 780)	4,963 (51, 720)
		294 (30, 66)	11,273 (115, 1,635)	10,982 (112, 1,593)	10,055 (103, 1,458)

Brake pedal	Free play mm (in)	0.5 — 2 (0.02 — 0.08) [When pulling the brake pedal upward with a force of less than 10 N (1 kgf, 2 lbf).]

B: COMPONENT

1. FRONT DISK BRAKE

- Except for EC, EK, OUTBACK model

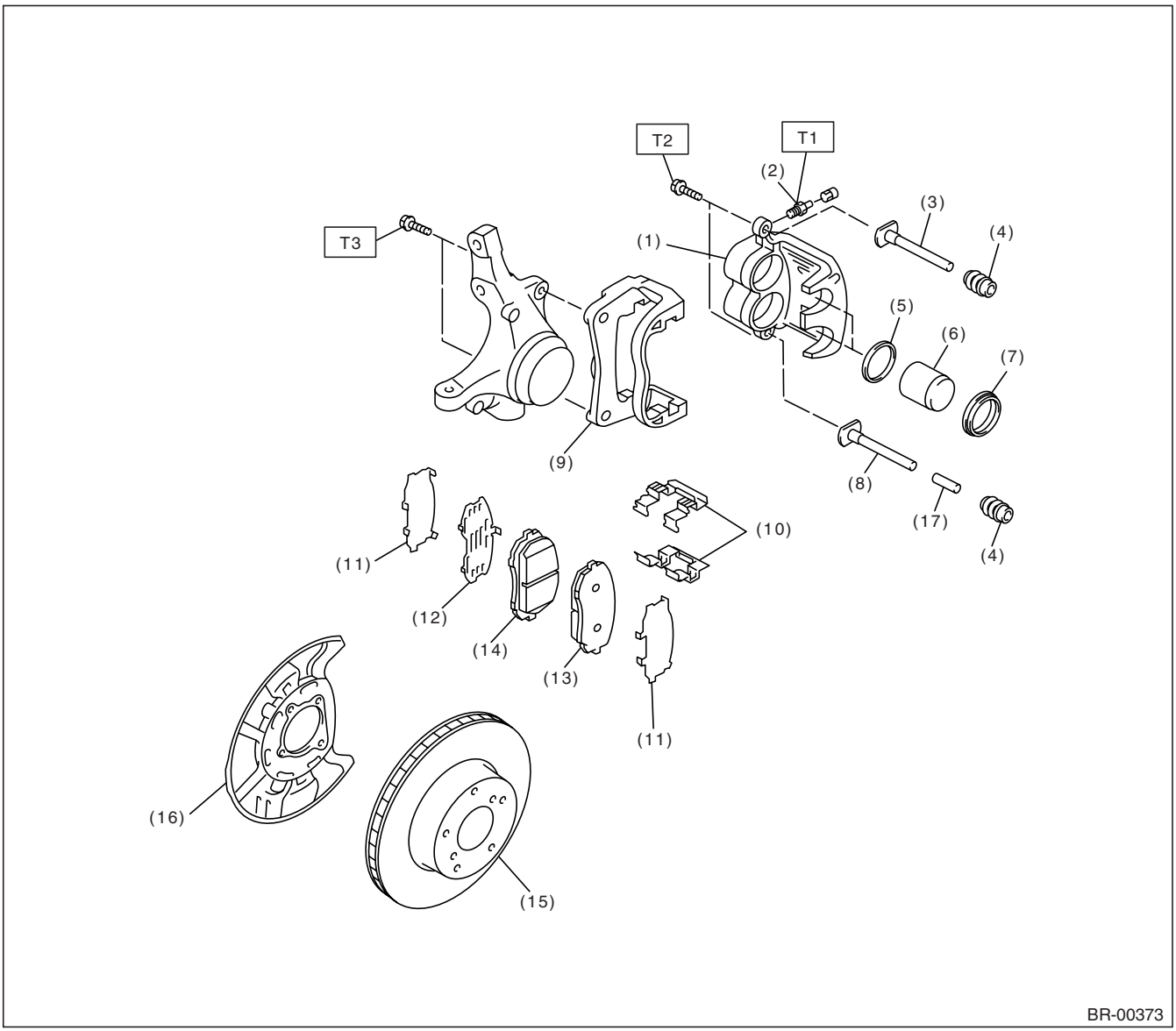


(A) 15, 16-inch type
(B) 17-inch type

(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Support
(10) Pad clip
(11) Outer shim
(12) Inner shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Disc rotor
(16) Disc cover
(17) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.9)
T2: 27 (2.8, 19.9)
T3: 80 (8.2, 59)

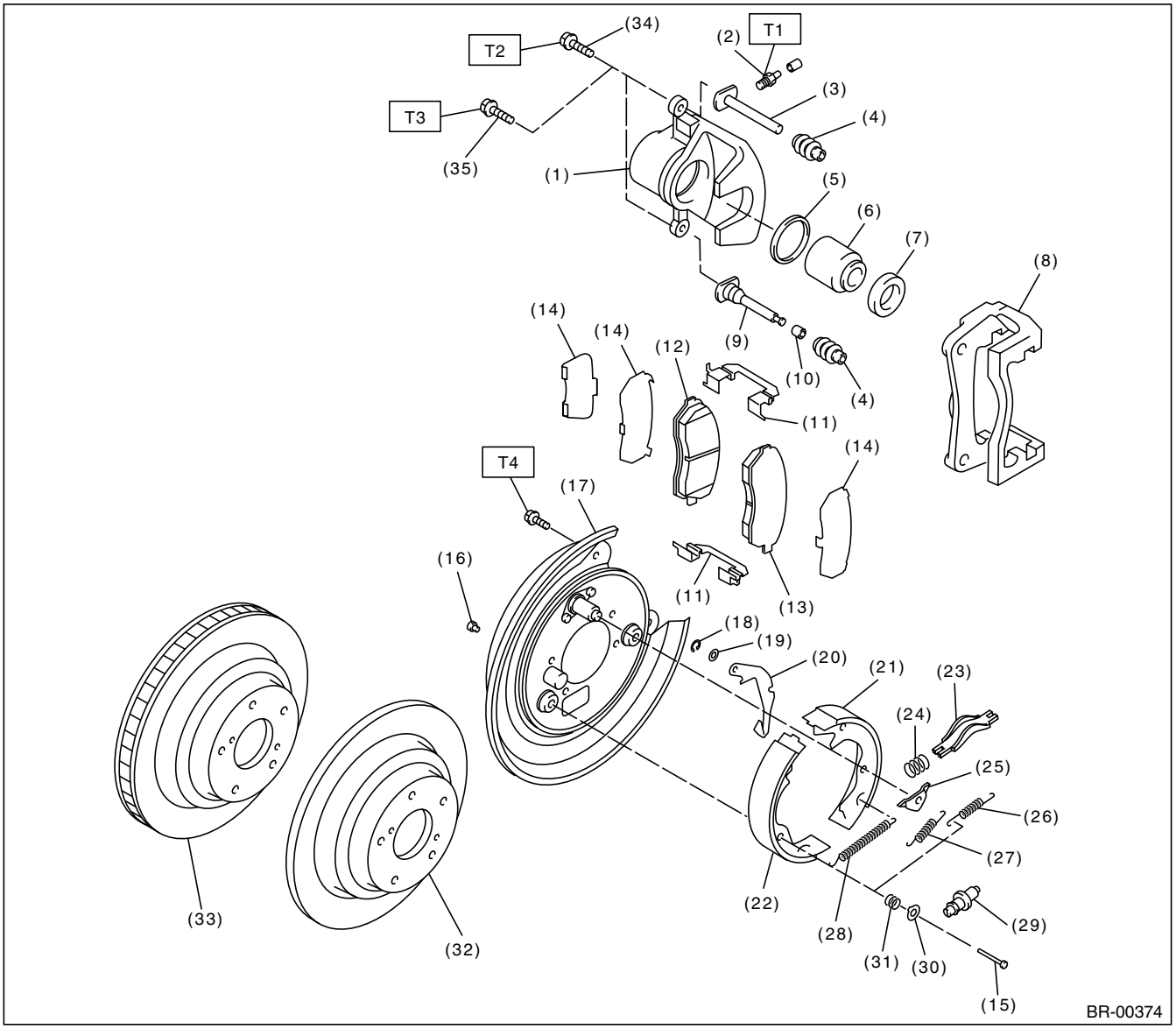
- EC, EK, OUTBACK model



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Support
(10) Pad clip
(11) Outer shim
(12) Inner shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Disc rotor
(16) Disc cover
(17) Bushing

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*8 (0.8, 5.9)*
T2:	*27 (2.8, 19.9)*
T3:	*80 (8.2, 59)*

2. REAR DISC BRAKE

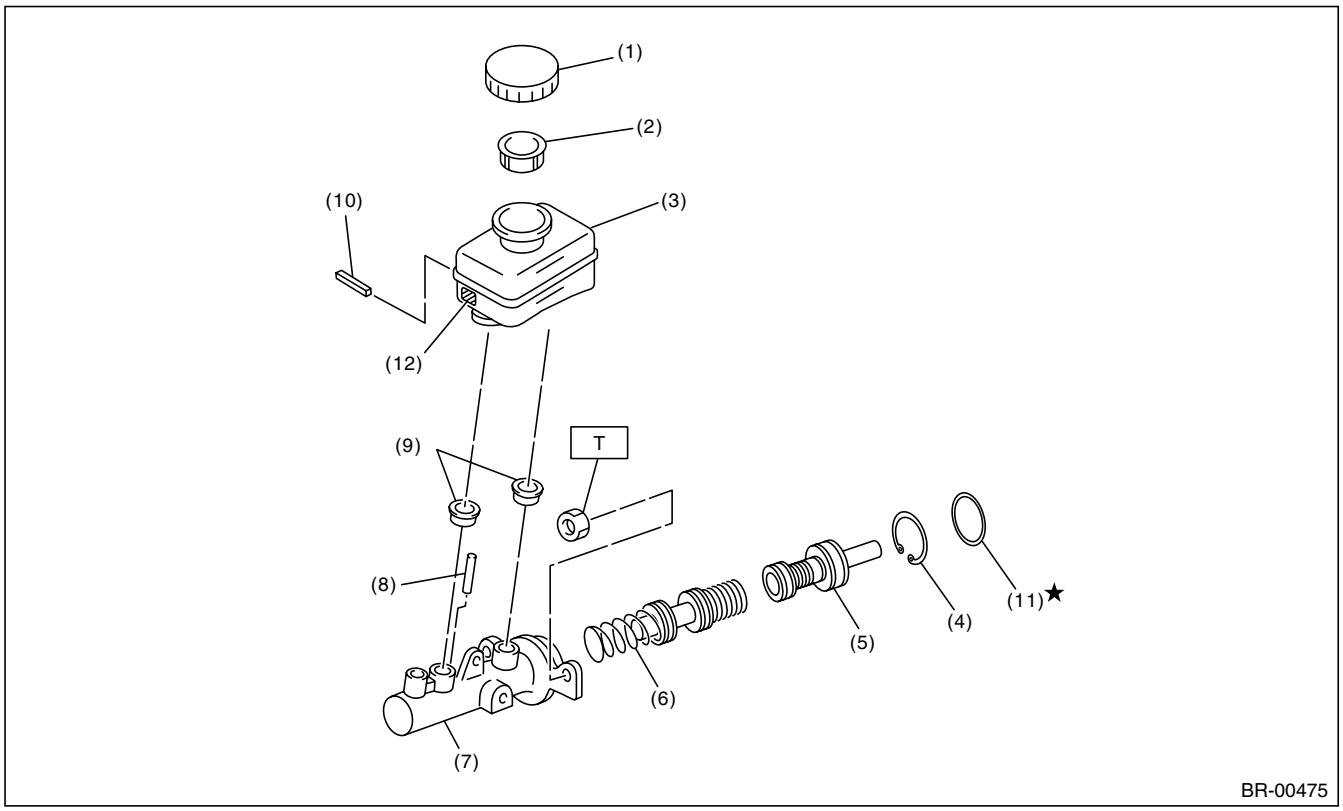


(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Support
(9) Lock pin (Yellow)
(10) Bushing
(11) Pad clip
(12) Inner pad
(13) Outer pad
(14) Shim
(15) Shoe hold-down pin
(16) Cover
(17) Back plate
(18) Retainer
(19) Spring washer
(20) Parking brake lever
(21) Parking brake shoe (Secondary)
(22) Parking brake shoe (Primary)
(23) Strut
(24) Strut shoe spring
(25) Shoe guide plate
(26) Secondary shoe return spring
(27) Primary shoe return spring
(28) Adjusting spring
(29) Adjuster
(30) Shoe hold-down cup
(31) Shoe hold-down spring
(32) Disc rotor (Solid type)
(33) Disc rotor (Ventilated type)
(34) Bolt (For solid disc brake)
(35) Bolt (For ventilated disc brake)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 27 (2.8, 19.9)
T3: 37 (3.8, 27.3)
T4: 53 (5.4, 39.1)

3. MASTER CYLINDER

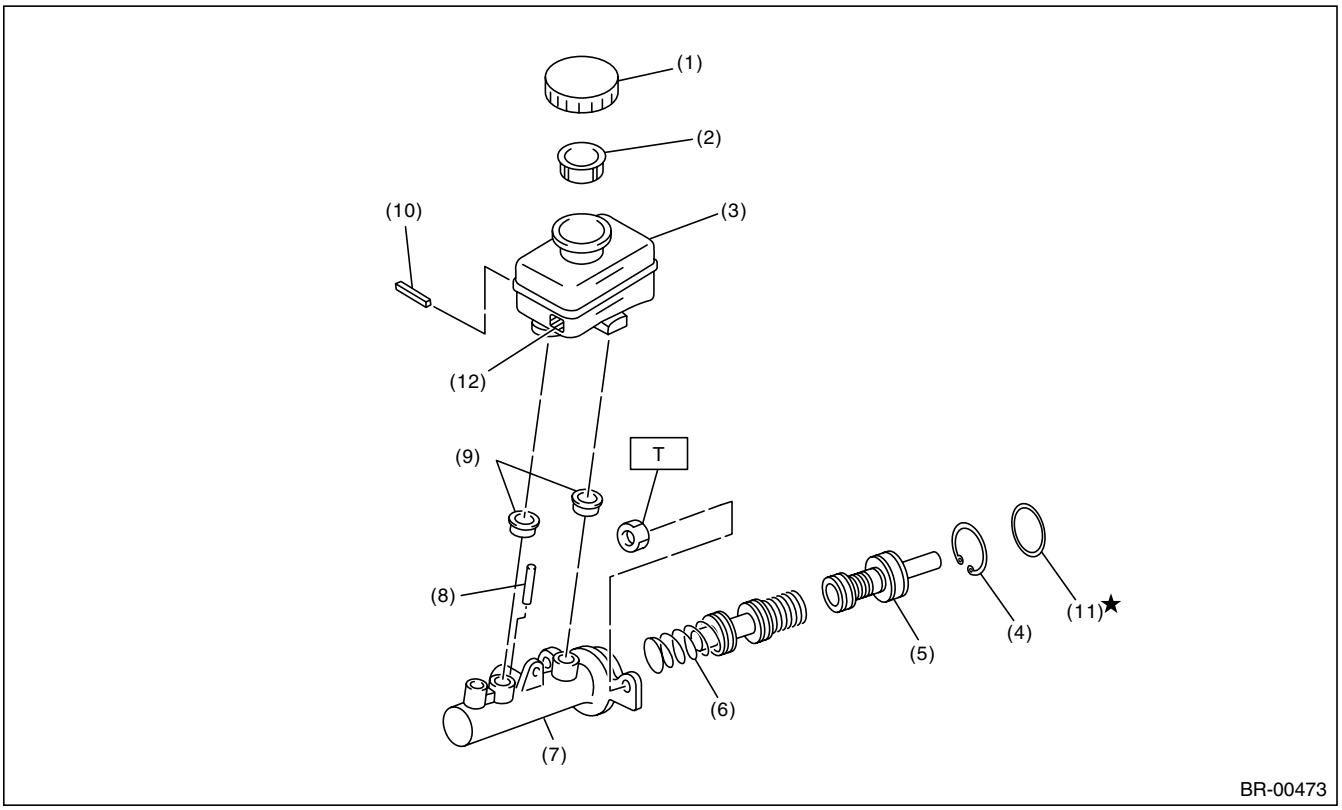
- LHD model



(1) Cap
(2) Filter
(3) Reservoir tank
(4) C-ring
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin
(9) Seal
(10) Pin
(11) O-ring
(12) Label

Tightening torque: N·m (kgf-m, ft-lb)
T: 13 (1.3, 9.6)

- RHD model

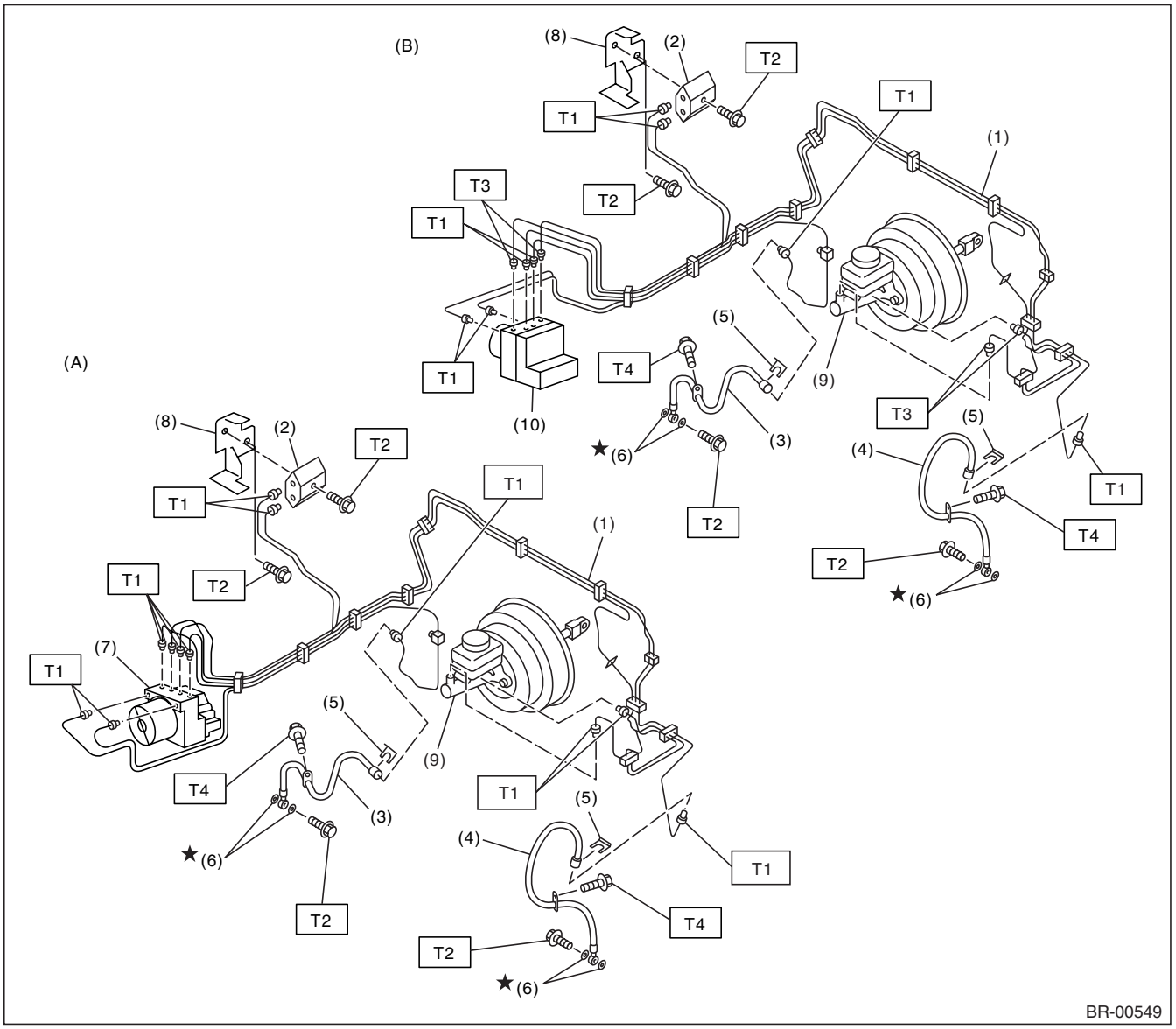


(1) Cap
(2) Filter
(3) Reservoir tank
(4) C-ring
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin
(9) Seal
(10) Pin
(11) O-ring
(12) Label

Tightening torque: N·m (kgf-m, ft-lb)
T: 13 (1.3, 9.6)

4. FRONT BRAKE PIPES AND HOSE

- LHD model



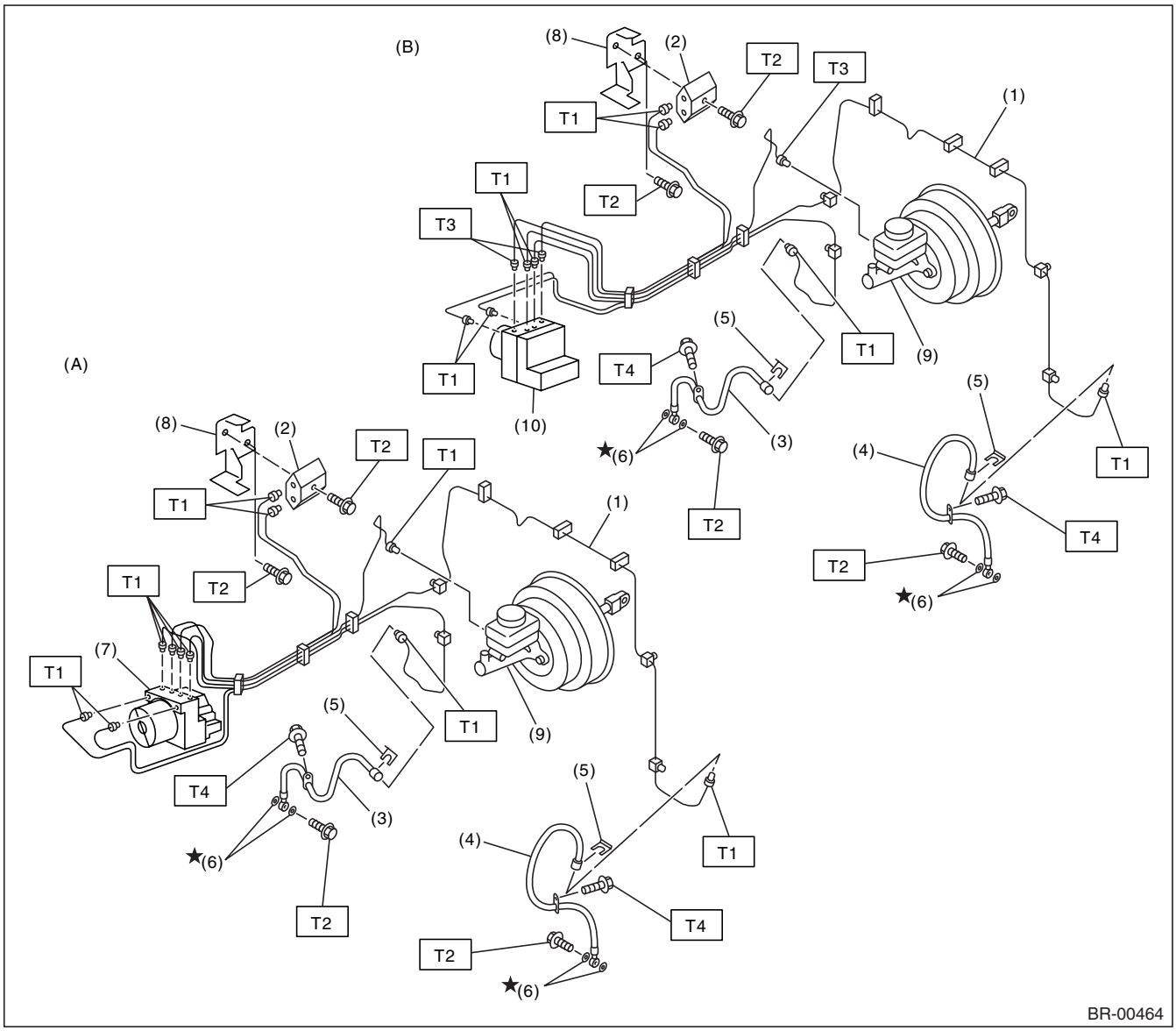
(A) Model with ABS

(B) Model with vehicle dynamics control (VDC)

(1) Front brake pipe ASSY
(2) Two-way connector
(3) Front brake hose RH
(4) Front brake hose LH
(5) Clamp
(6) Gasket
(7) ABS control module and hydraulic control unit (ABSCM&H/U)
(8) Bracket
(9) Master cylinder
(10) VDC control module & hydraulic control unit (VDCCM&H/U)

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*15 (1.5, 10.8)*
T2:	*18 (1.8, 13.0)*
T3:	*19 (1.9, 14.0)*
T4:	*33 (3.4, 24.3)*

- RHD model



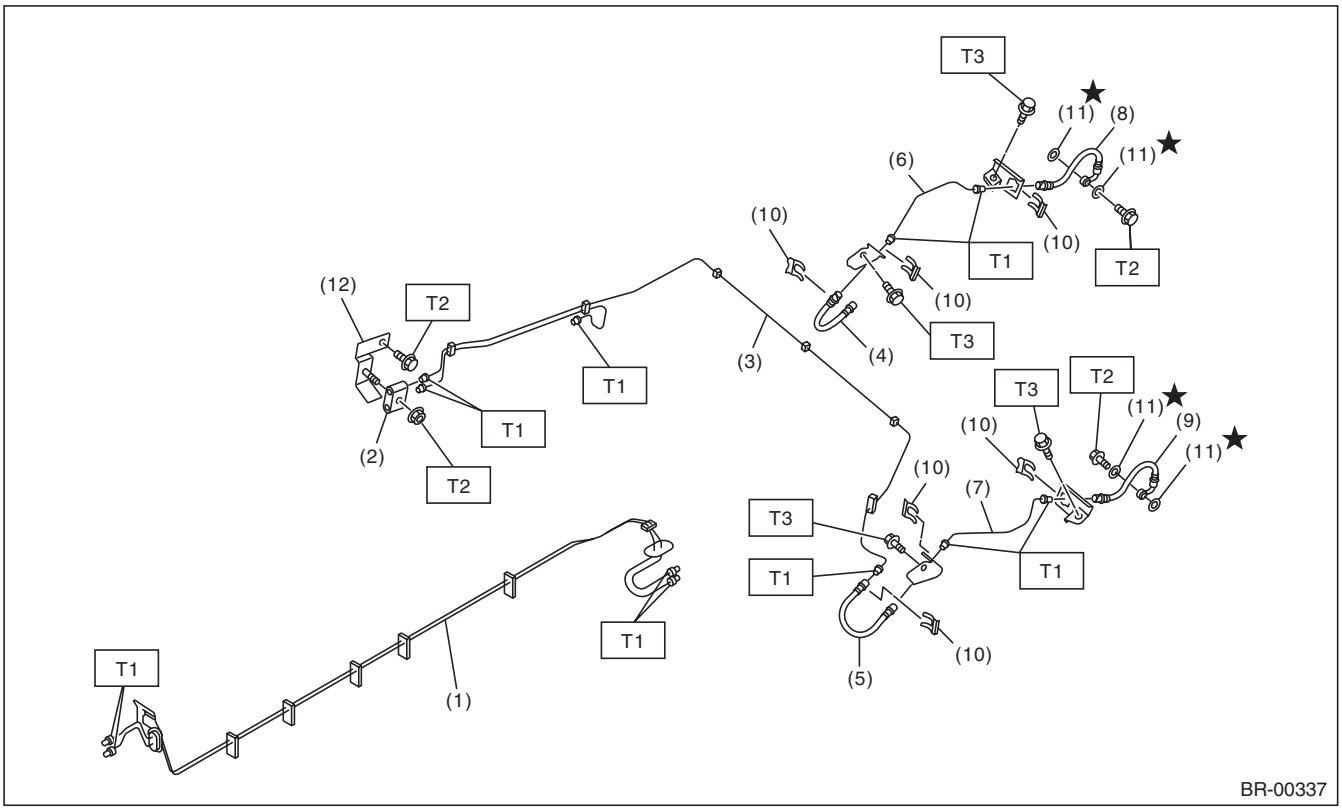
(A) Model with ABS

(B) Model with vehicle dynamics control (VDC)

(1) Front brake pipe ASSY
(2) Two-way connector
(3) Front brake hose RH
(4) Front brake hose LH
(5) Clamp
(6) Gasket
(7) ABS control module and hydraulic control unit (ABSCM&H/U)
(8) Bracket
(9) Master cylinder
(10) VDC control module & hydraulic control unit (VDCCM&H/U)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 19 (1.9, 14.0)
T4: 33 (3.4, 24.3)

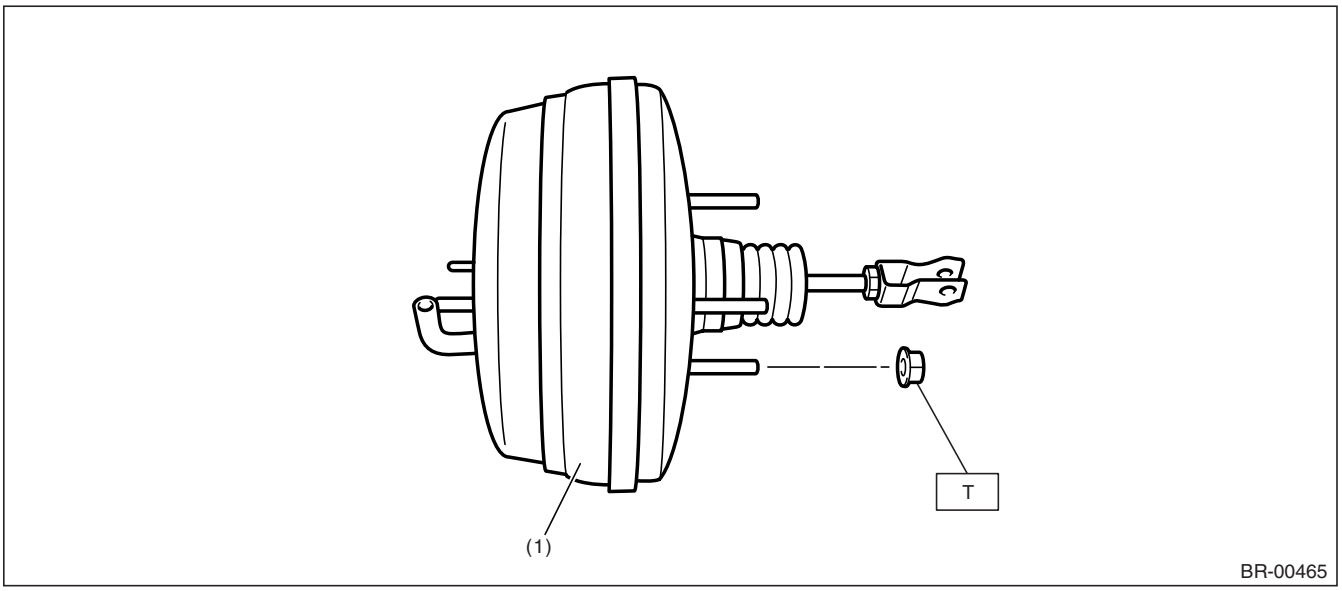
5. CENTER AND REAR BRAKE PIPES AND HOSE



(1)	Center brake pipe ASSY	(7)	Rear brake pipe LH
(2)	Two-way connector	(8)	Rear brake hose rear RH
(3)	Rear brake pipe ASSY	(9)	Rear brake hose rear LH
(4)	Rear brake hose RH	(10)	Clamp
(5)	Rear brake hose LH	(11)	Gasket
(6)	Rear brake pipe RH	(12)	Bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 24.3)

6. BRAKE BOOSTER

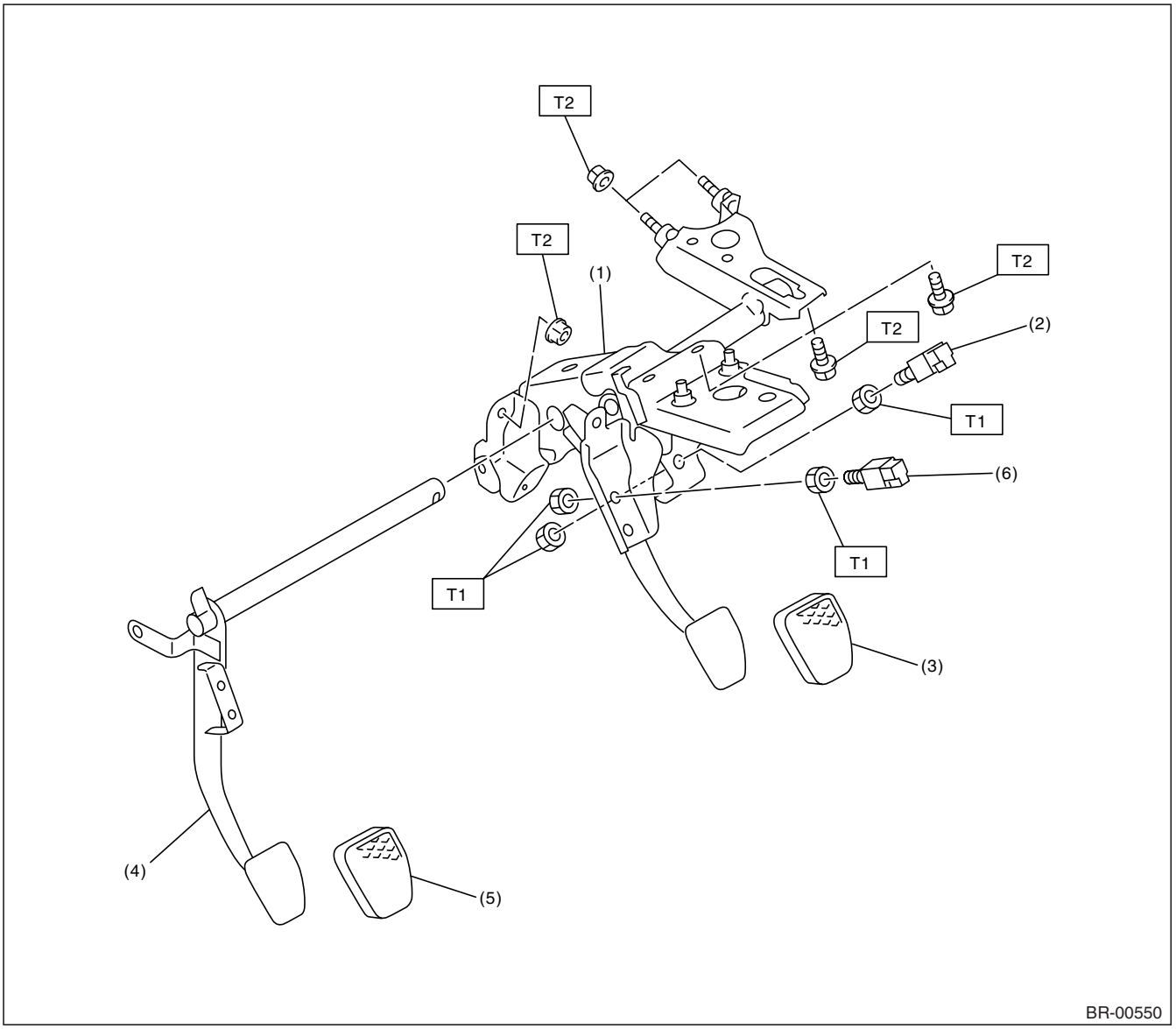


(1) Brake booster

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.0)

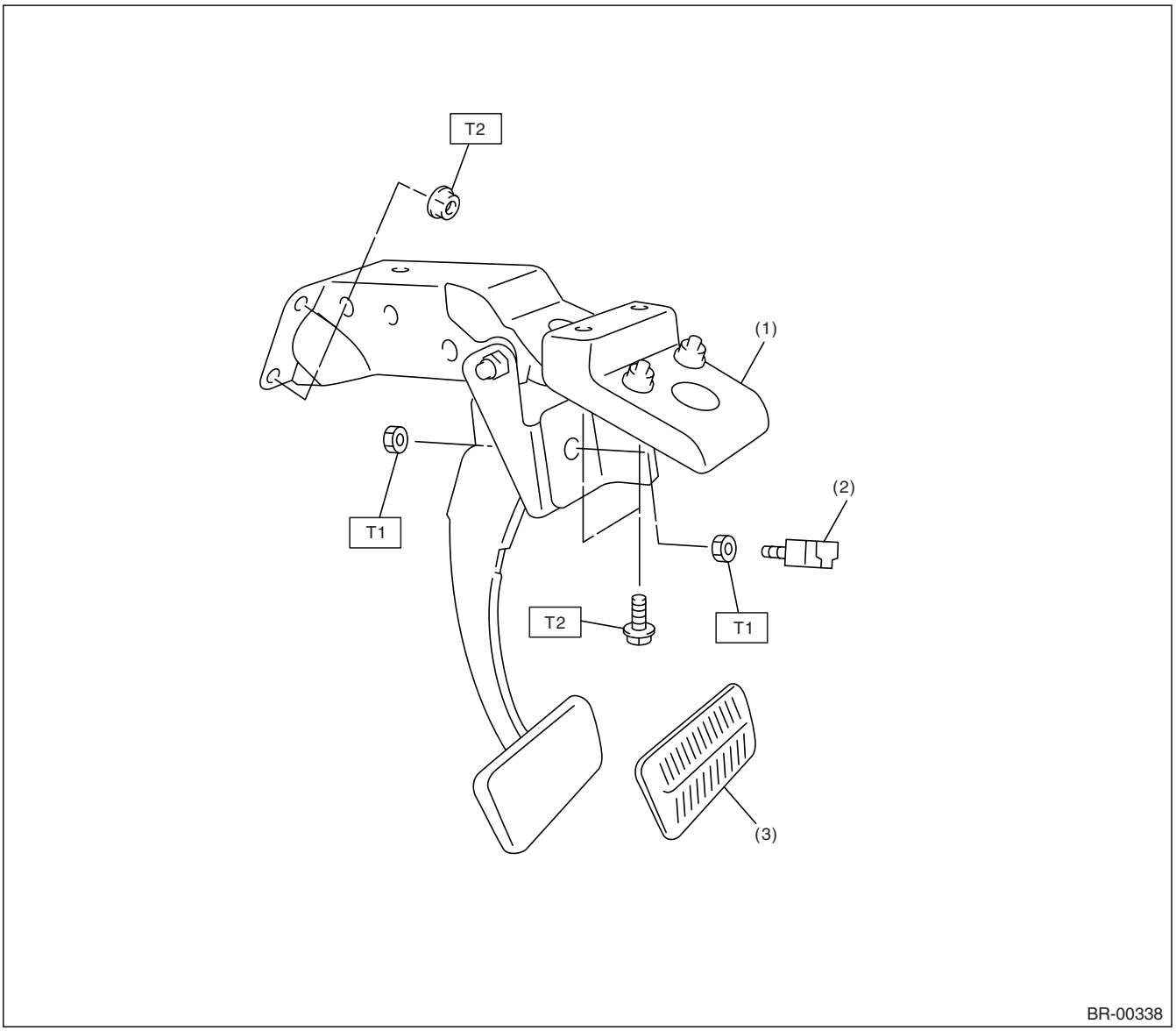
7. BRAKE PEDAL

- LHD MT model



(1)	Brake pedal ASSY	(4)	Clutch pedal	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Stop light switch	(5)	Clutch pedal pad	***T1: 8 (0.8, 5.9)***
(3)	Brake pedal pad	(6)	Clutch switch	***T2: 18 (1.8, 13.0)***

• LHD AT model, RHD model



(1) Brake pedal ASSY
(2) Stop light switch
(3) Brake pedal pad

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.9)
T2: 18 (1.8, 13.0)

C: CAUTION

• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Use SUBARU genuine grease or the equivalent. Do not mix grease, etc. with that of another grade or from other manufacturers.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate or cloth between the part and the vise.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. GENERAL TOOL

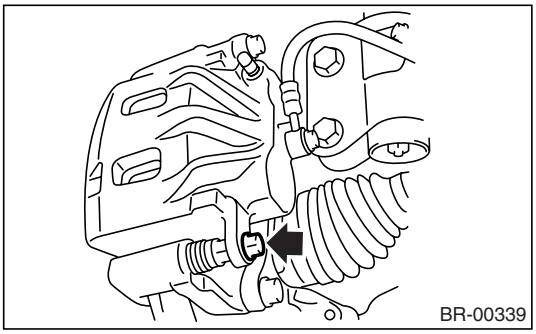
TOOL NAME	REMARKS
Snap ring pliers	Used for removing and installing snap ring.

2. Front Brake Pad

A: REMOVAL

1. 15-INCH TYPE

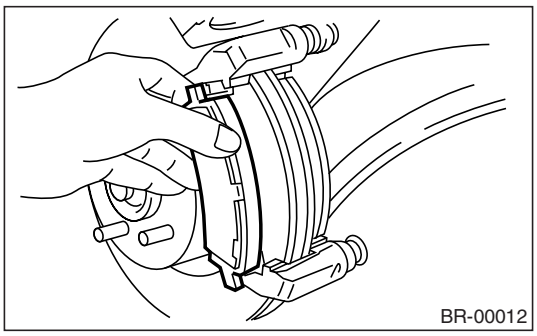
1) Lift-up the vehicle, and remove the front wheels.
2) Remove the caliper bolt.



3) Raise the caliper body and support it.

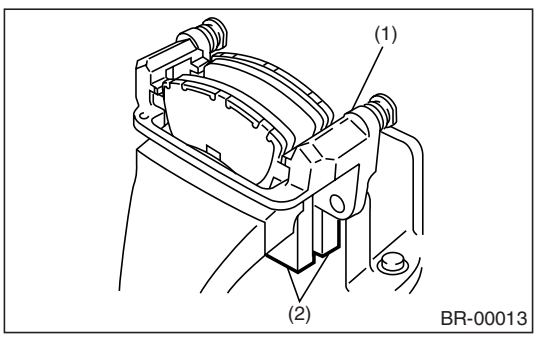
NOTE:
Do not disconnect the brake hose from caliper body.

4) Remove the pad.



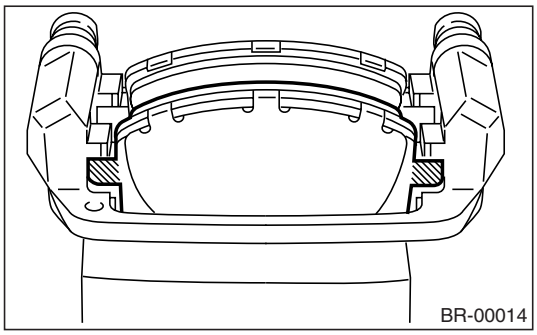
NOTE:
If the brake pad is difficult to remove, proceed as follows:

(1) Remove the caliper body from support.
(2) Remove the support.
(3) Place the support in a vise between wooden blocks.



(1) Support
(2) Wooden block

(4) Attach a rod of less than 12 mm (0.47 in) diameter to the shaded area of the brake pad, and strike the rod with a hammer to drive brake pad out of place.



2. 16-INCH TYPE

Refer to 15-inch type. <Ref. to BR-16, 15-INCH TYPE, REMOVAL, Front Brake Pad.>

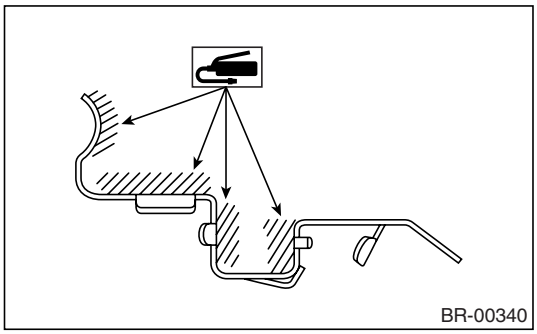
3. 17-INCH TYPE

Refer to 15-inch type. <Ref. to BR-16, 15-INCH TYPE, REMOVAL, Front Brake Pad.>

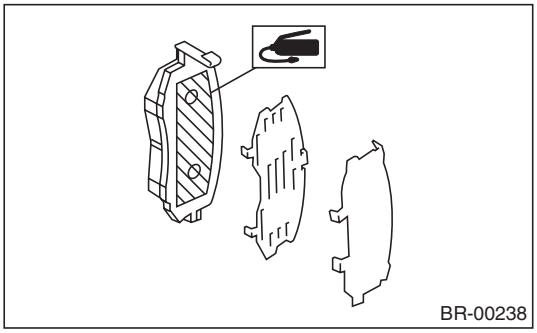
B: INSTALLATION

1. 15-INCH TYPE

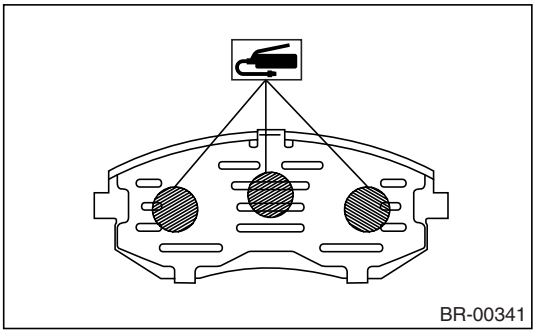
1) Apply a thin coat of Molykote M7439 to pad clip.



2) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) to the frictional portion between pad and pad inner shim.



3) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) to the three frictional portions between inner shim and outer shim of outer pads.



4) Install the pad on support.
5) Install the caliper body on support.

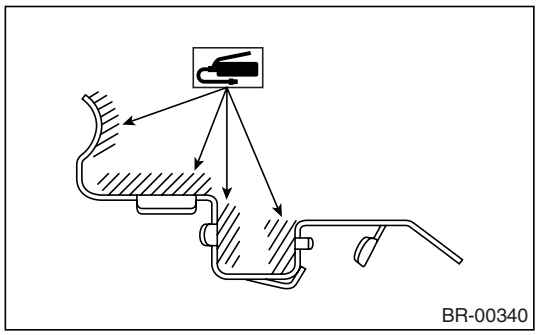
Tightening torque:
27 N·m (2.8 kgf-m, 19.9 ft-lb)

2. 16-INCH TYPE

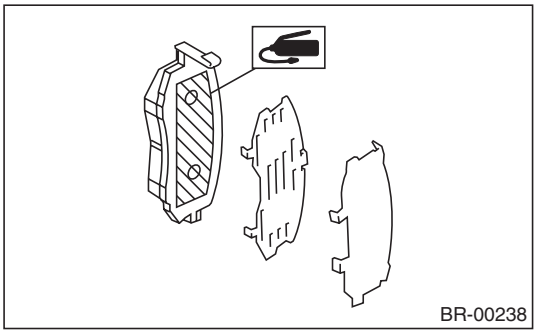
Refer to 15-inch type. <Ref. to BR-16, 15-INCH TYPE, INSTALLATION, Front Brake Pad.>

3. 17-INCH TYPE

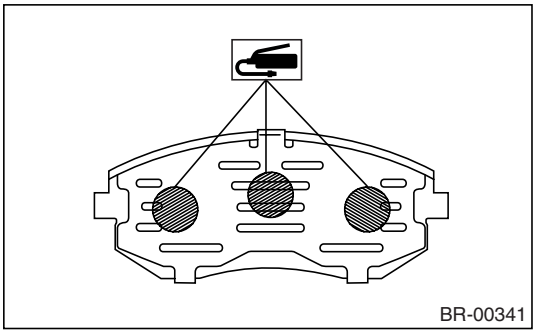
1) Apply a thin coat of Molykote M7439 to pad clip.



2) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) to the frictional portion between pad and pad inner shim.

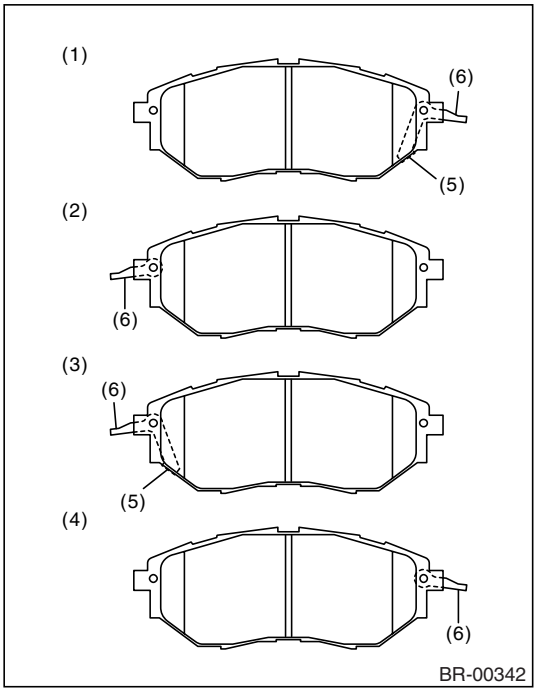


3) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) to the three frictional portions between inner shim and outer shim of outer pads.



4) Install the pad on support.

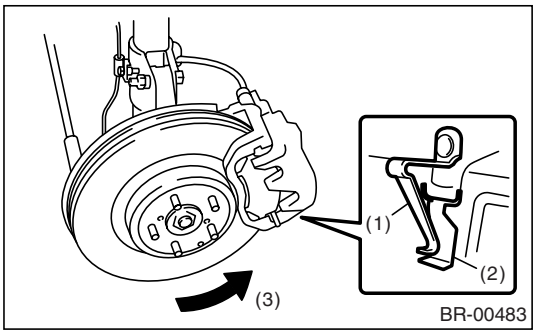
NOTE:
Install the pad indicator in proper direction.



(1) LH – IN
(2) LH – OUT
(3) RH – IN
(4) RH – OUT
(5) Pad indicator
(6) Pad return spring

CAUTION:
• Be sure to install so that the direction of pad return spring faces to the input side of brake rotor rotation direction as shown in the figure.
• Correctly install the pad return spring to supporting surface of pad clip as shown in the figure.

• When the pad return spring is deformed or damaged, replace the brake pad with new one.



(1) Pad return spring
(2) Supporting surface of pad clip
(3) Brake rotor rotation direction

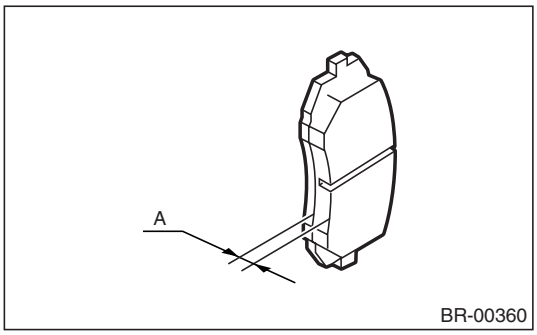
5) Install the caliper body on support.

Tightening torque:
27 N·m (2.8 kgf-m, 19.9 ft-lb)

C: INSPECTION

1. 15-INCH TYPE

Check the pad thickness A.



Pad thickness mm (in)	Specification	11 (0.43)
	Wear limit	1.5 (0.059)

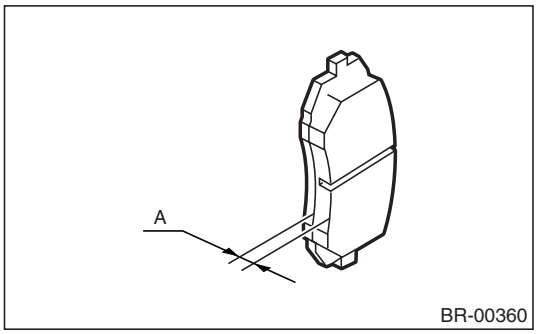
NOTE:
• Always replace the pads for both wheels LH and RH as a set.
• Also replace pad clips if they are twisted or worn.
• Replace the pad if there is oil or grease on it.

2. 16-INCH TYPE

Refer to 15-inch type. <Ref. to BR-18, 15-INCH TYPE, INSPECTION, Front Brake Pad.>

3. 17-INCH TYPE

Check the pad thickness A.



Pad thickness mm (in)	Specification	11 (0.43)
	Wear limit	1.5 (0.059)

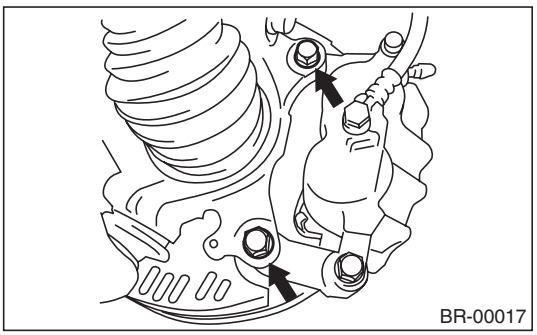
NOTE:
• Always replace the pads for both wheels LH and RH as a set.
• Replace the pad if there is oil or grease on it.

3. Front Disc Rotor

A: REMOVAL

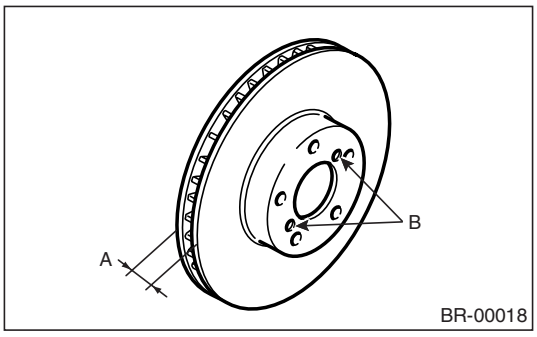
1. 15-INCH TYPE

1) Lift-up the vehicle, and remove the front wheels.
2) Remove the caliper body and the support from housing, and suspend it from strut using a wire.



3) Remove the disc rotor.

NOTE:
If the disc rotor seizes up within hub, drive the disc rotor out by pushing with an 8 mm bolt in holes B on the rotor.



4) Clean mud and foreign particles from the caliper body assembly and the support.

2. 16-INCH TYPE

Refer to 15-inch type. <Ref. to BR-19, 15-INCH TYPE, REMOVAL, Front Disc Rotor.>

3. 17-INCH TYPE

Refer to 15-inch type. <Ref. to BR-19, 15-INCH TYPE, REMOVAL, Front Disc Rotor.>

B: INSTALLATION

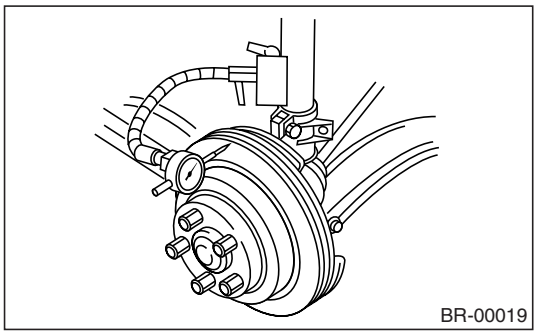
1) Install the disc rotor.
2) Install the caliper body and the support to housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

3) Install the front wheels.

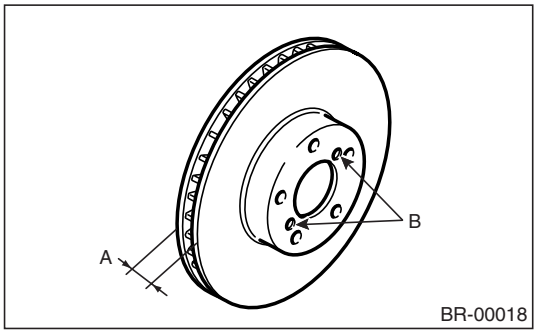
C: INSPECTION

1) Check front wheel bearing play and axial hub runout before disc rotor runout limit inspection. <Ref. to DS-15, INSPECTION, Front Axle.>
2) Secure the disc rotor by tightening five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward of disc rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout exceeds the limit, replace with a new disc rotor.



Disc rotor runout limit:
0.05 mm (0.0020 in)

4) Set a micrometer 10 mm (0.39 in) inward of the disc rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



		Specification	Limit	Disc rotor outer diameter
Disc rotor thickness A mm (in)	15″	24 (0.94)	22 (0.87)	277 (10.91)
	16″	24 (0.94)	22 (0.87)	294 (11.57)
	17″	30 (1.18)	28 (1.10)	316 (12.44)

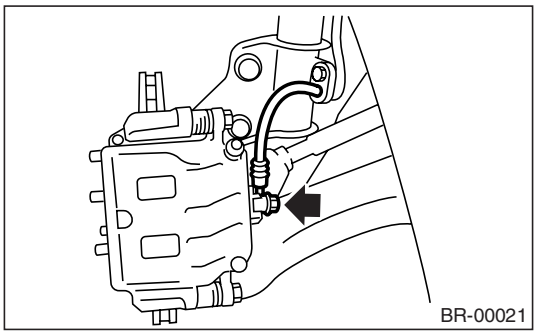
4. Front Disc Brake Assembly

A: REMOVAL

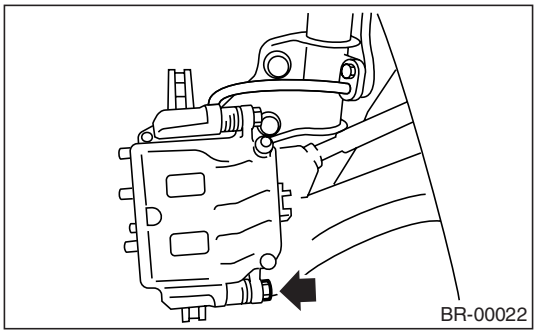
1. 15-INCH TYPE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Lift-up the vehicle, and remove the front wheels.
2) Remove the union bolt, and disconnect the brake hose from caliper body assembly.

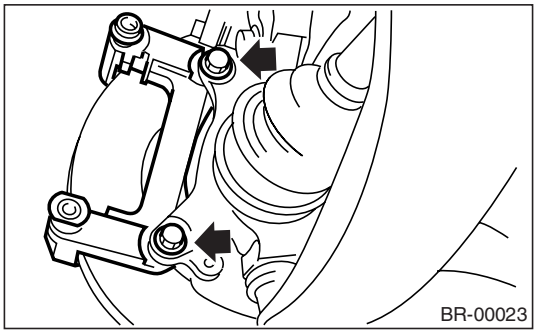


3) Remove the bolt securing lock pin to caliper body.



4) Raise the caliper body, and then move it toward vehicle center to separate it from the support.
5) Remove the support from housing.

NOTE:
Remove the support only when replacing itself or rotor. It need not be removed when servicing the caliper body assembly.



6) Clean mud and foreign particles from the caliper body assembly and the support.

2. 16-INCH TYPE

Refer to 15-inch type. <Ref. to BR-20, 15-INCH TYPE, REMOVAL, Front Disc Brake Assembly.>

3. 17-INCH TYPE

Refer to 15-inch type. <Ref. to BR-20, 15-INCH TYPE, REMOVAL, Front Disc Brake Assembly.>

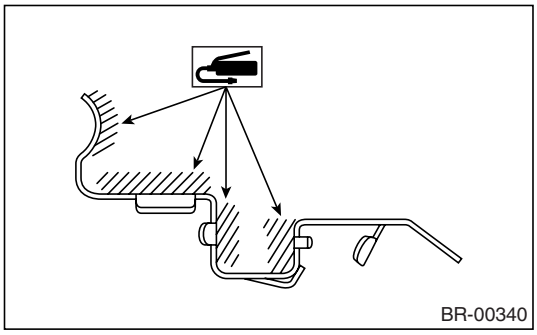
B: INSTALLATION

1. 15-INCH TYPE

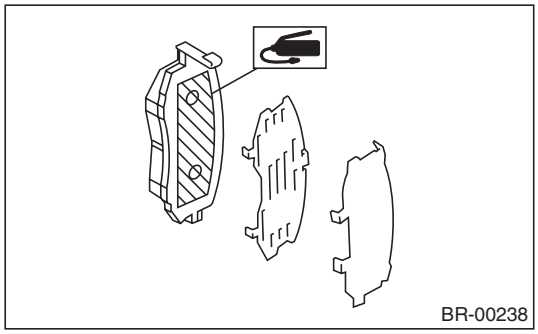
1) Install the support on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

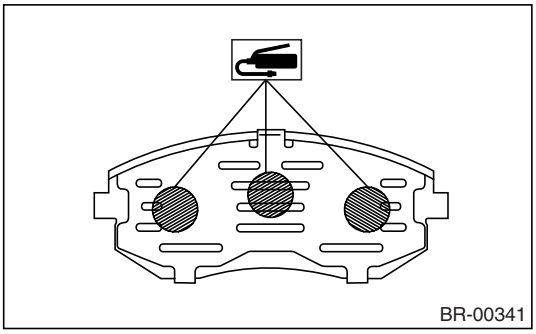
2) Apply a thin coat of Molykote M7439 to pad clip.



3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and inner shim.



4) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the three frictional portions between inner shim and outer shim of outer pads.



5) Install the pad on support.
6) Install the caliper body on support.

Tightening torque:
27 N·m (2.8 kgf-m, 19.9 ft-lb)

7) Connect the brake hose using new brake hose gaskets.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

8) Bleed air from the brake system.

2. 16-INCH TYPE

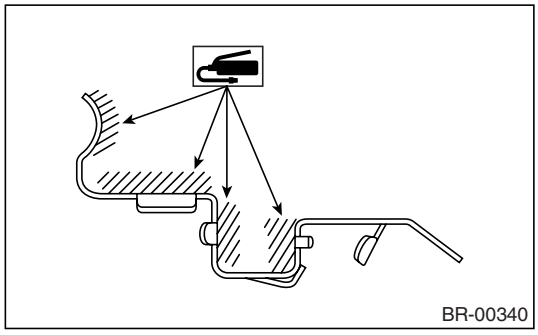
Refer to 15-inch type. <Ref. to BR-20, 15-INCH TYPE, INSTALLATION, Front Disc Brake Assembly.>

3. 17-INCH TYPE

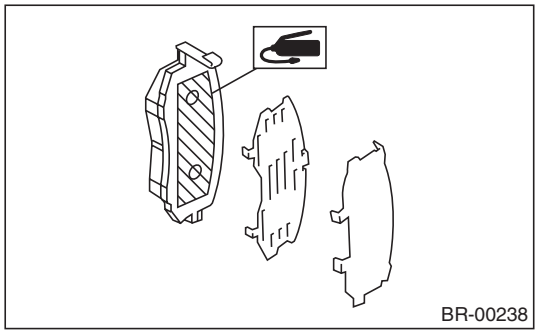
1) Install the support on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

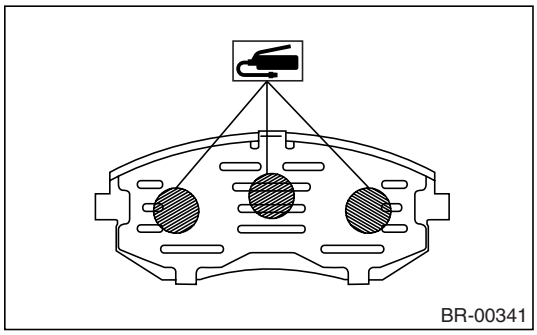
2) Apply a thin coat of Molykote M7439 to pad clip.



3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and inner shim.

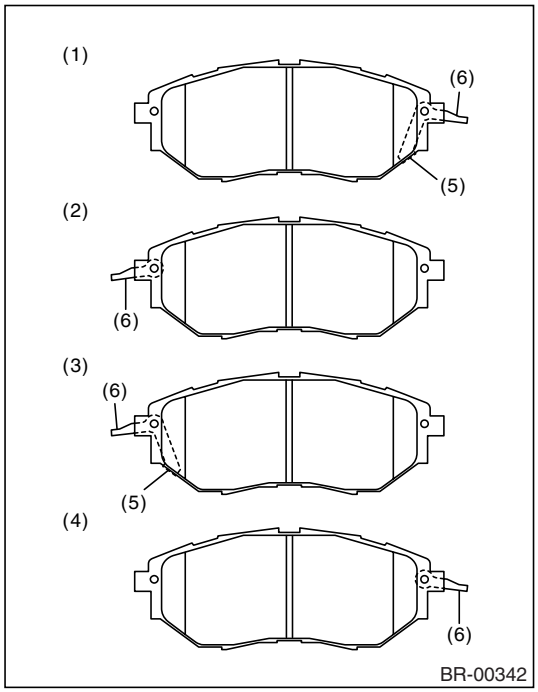


4) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) to the three frictional portions between inner shim and outer shim of outer pads.



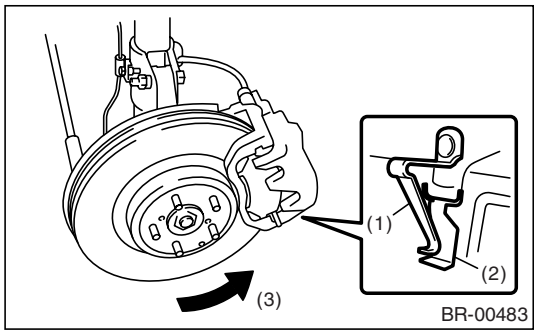
5) Install the pad on support.

NOTE:
Install the pad indicator in proper direction.



(1) LH – IN
(2) LH – OUT
(3) RH – IN
(4) RH – OUT
(5) Pad indicator
(6) Pad return spring

CAUTION:
• Be sure to install so that the direction of pad return spring faces to the input side of brake rotor rotation direction as shown in the figure.
• Correctly install the pad return spring to supporting surface of pad clip as shown in the figure.
• When the pad return spring is deformed or damaged, replace the brake pad with new one.



(1) Pad return spring
(2) Supporting surface of pad clip
(3) Brake rotor rotation direction

6) Install the caliper body on support.
7) Connect the brake hose using new brake hose gaskets.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

8) Bleed air from the brake system.

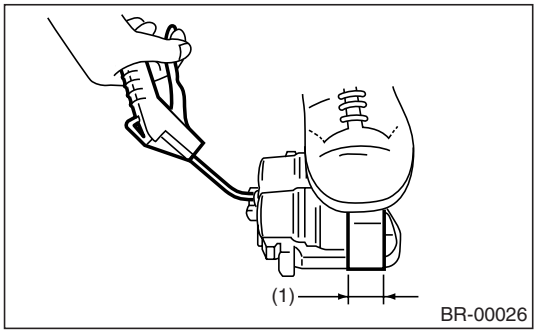
C: DISASSEMBLY

1. 15-INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly and the support.

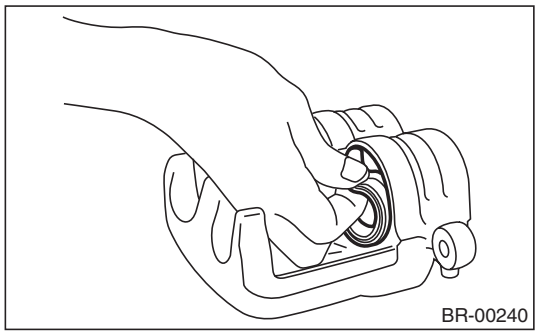
CAUTION:
Be careful not to allow foreign particles to enter the brake hose connector.

2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
3) Gradually supply compressed air via installation hole of brake hose to force the piston out.



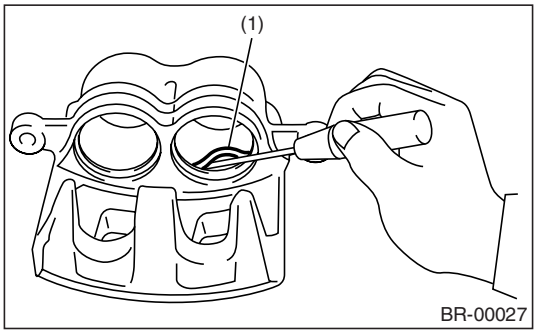
(1) Place a 30 mm (1.18 in) wide wood block here.

4) Remove the piston boot.



5) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



(1) Piston seal

6) Remove the guide pin and boot from caliper body.

2. 16-INCH TYPE

Refer to 15-inch type. <Ref. to BR-22, 15-INCH TYPE, DISASSEMBLY, Front Disc Brake Assembly.>

3. 17-INCH TYPE

Refer to 15-inch type. <Ref. to BR-22, 15-INCH TYPE, DISASSEMBLY, Front Disc Brake Assembly.>

D: ASSEMBLY

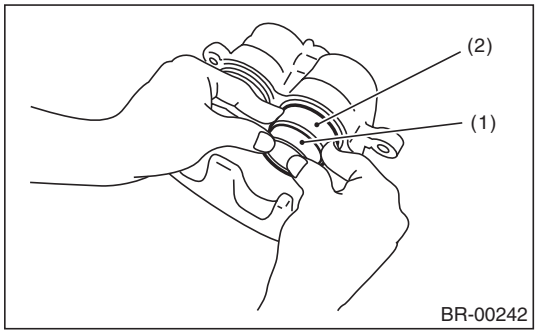
1. 15-INCH TYPE

1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and fit in to the groove on ends of cylinder.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

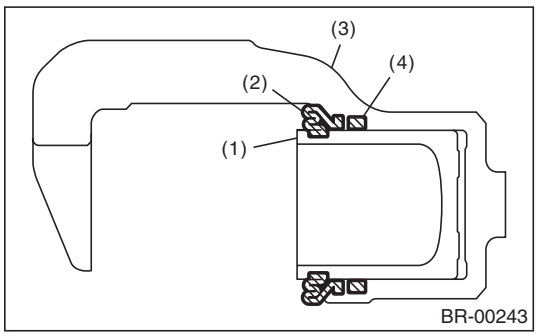
5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



(1) Piston
(2) Piston boot

6) Position the boot in the grooves on cylinder and piston.

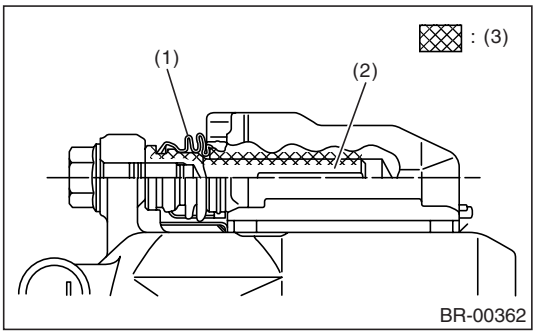


(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply a coat of specified grease to inner surface of cylinder, lock pin, guide pin, periphery of bushing and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

8) Install the lock pin and guide pin boot on support.



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

2. 16-INCH TYPE

Refer to 15-inch type. <Ref. to BR-23, 15-INCH TYPE, ASSEMBLY, Front Disc Brake Assembly.>

3. 17-INCH TYPE

Refer to 15-inch type. <Ref. to BR-23, 15-INCH TYPE, ASSEMBLY, Front Disc Brake Assembly.>

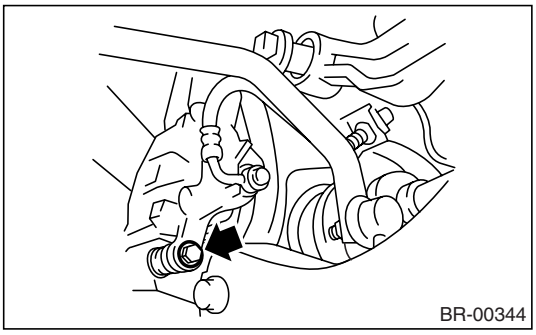
E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

1) Lift-up the vehicle, and then remove the rear wheels.
2) Remove the caliper bolt.

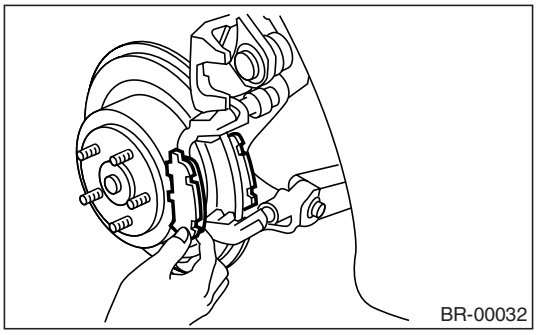


3) Raise the caliper body and support it.

NOTE:
Do not disconnect the brake hose from caliper body.

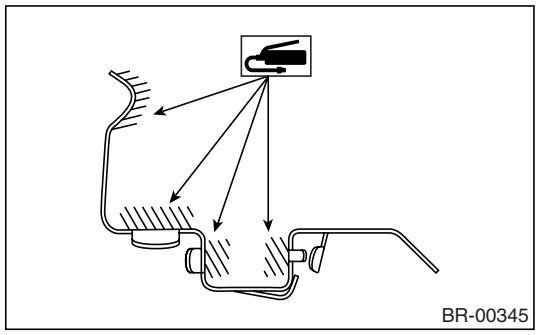
4) Remove the pad.

NOTE:
If the brake pad is difficult to remove, use the same procedure as for front disc brake pad.
<Ref. to BR-16, REMOVAL, Front Brake Pad.>



B: INSTALLATION

1) Apply a thin coat of Molykote M7439 to pad clip.

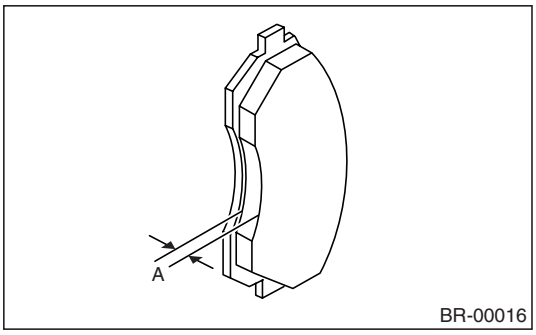


2) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and shim.
3) Install the pad on support.
4) Install the caliper body on support.

Tightening torque:
Solid disc brake model
27 N·m (2.8 kgf-m, 19.9 ft-lb)
Ventilated disc brake model
37 N·m (3.8 kgf-m, 27.3 ft-lb)

C: INSPECTION

Check the pad thickness A.



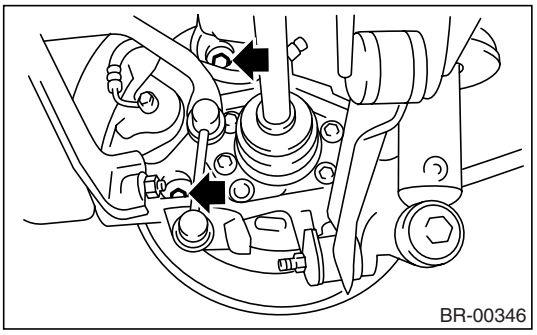
Type of disc rotor		Solid	Ventilated
Pad thickness mm (in)	Specification	9.0 (0.35)	9.0 (0.35)
	Wear limit	1.5 (0.059)	1.5 (0.059)

NOTE:
• Always replace the pads for both wheels LH and RH as a set.
• Also replace pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

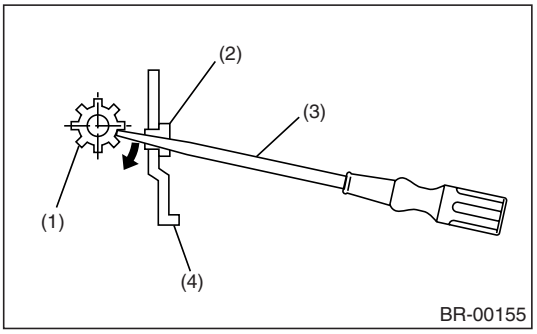
1) Lift-up the vehicle, and then remove the rear wheels.
2) Release the parking brake.
3) Remove the two mounting bolts, and remove the disc brake assembly.



4) Suspend the disc brake assembly so that the hose is not stretched.
5) Remove the disc rotor.

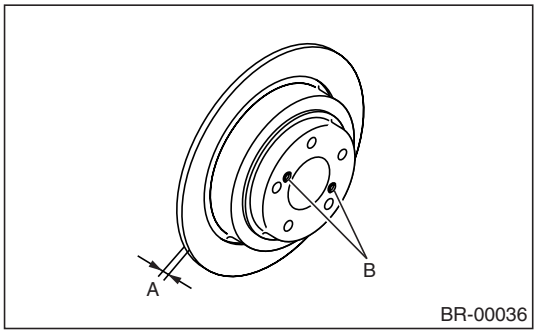
NOTE:
If the disc rotor is difficult to remove, try following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until the brake shoe gets away enough from the disc rotor.



(1) Adjusting screw
(2) Cover
(3) Flat tip screwdriver
(4) Back plate

(2) If the disc rotor seizes up within hub, drive the disc rotor out by pushing with an 8 mm bolt in holes B on the rotor.

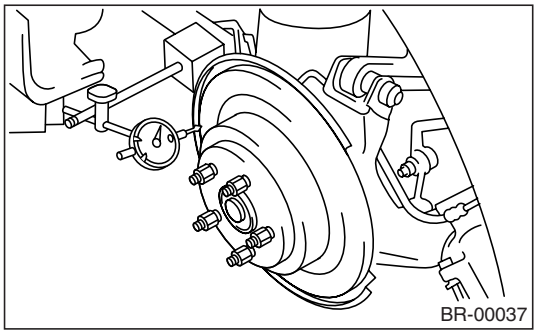


B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

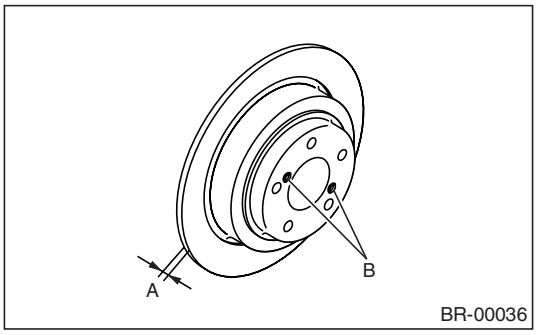
C: INSPECTION

1) Check rear wheel bearing play and axial hub runout before disc rotor runout limit inspection. <Ref. to DS-21, INSPECTION, Rear Hub Unit Bearing.>
2) Secure the disc rotor by tightening five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward of disc rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout exceeds limit, replace with a new disc rotor.



Disc rotor runout limit:
0.05 mm (0.0020 in)

4) Set a micrometer 10 mm (0.39 in) inward of the disc rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



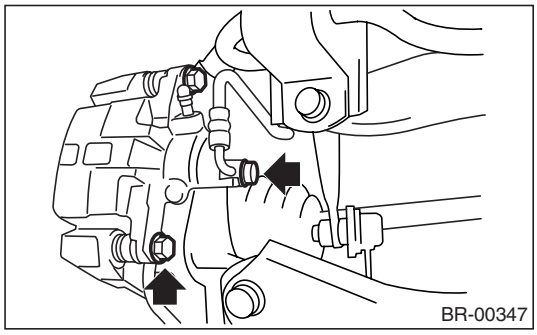
		Specification	Limit	Disc outer dia.
Disc rotor thickness A	Solid disc	10 (0.39)	8.5 (0.335)	274 (10.79)
mm (in)	Ventilated disc	18 (0.71)	16 (0.63)	290 (11.42)

7. Rear Disc Brake Assembly

A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Lift-up the vehicle, and then remove the rear wheels.
2) Disconnect the brake hose from caliper body assembly.
3) Remove the caliper lower bolts.



4) Raise the caliper body, and then move it toward vehicle center to separate it from the support.
5) Remove the support from housing.

NOTE:
Remove the support only when replacing itself or rotor. It need not be removed when servicing the caliper body assembly.

6) Clean mud and foreign particles from the caliper body assembly and the support.

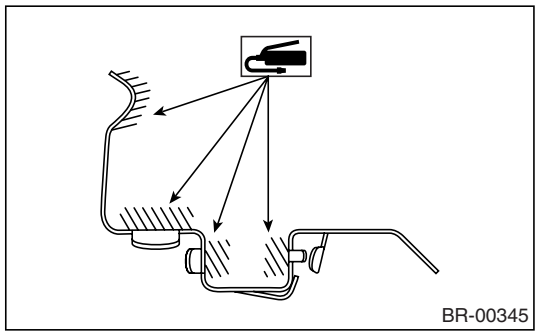
CAUTION:
Be careful not to allow foreign particles to enter the brake hose connector.

B: INSTALLATION

1) Install the support on housing.

Tightening torque:
53 N·m (5.4 kgf-m, 39.1 ft-lb)

2) Apply a thin coat of Molykote M7439 to pad clip.



3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and shim.
4) Install the pad on support.
5) Install the caliper body on support.

Tightening torque:
Solid disc brake model
27 N·m (2.8 kgf-m, 19.9 ft-lb)
Ventilated disc brake model
37 N·m (3.8 kgf-m, 27.3 ft-lb)

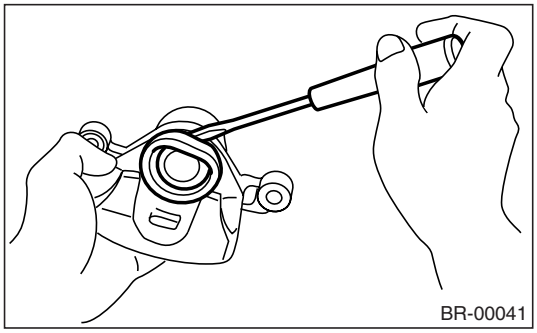
6) Connect the brake hose using new brake hose gaskets.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

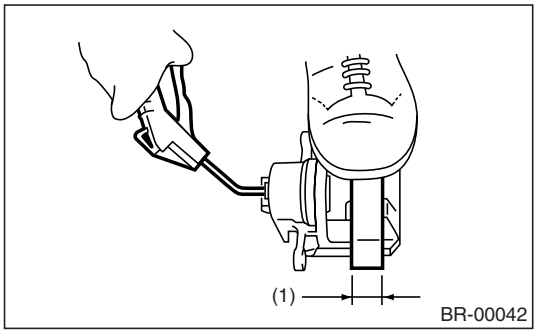
7) Bleed air from the brake system.

C: DISASSEMBLY

1) Remove the piston boot.



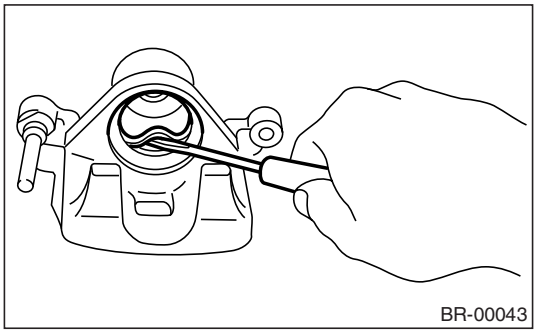
2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
3) Gradually supply compressed air via installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



5) Remove the lock pin sleeve and boot from caliper body.
6) Remove the guide pin boot.

D: ASSEMBLY

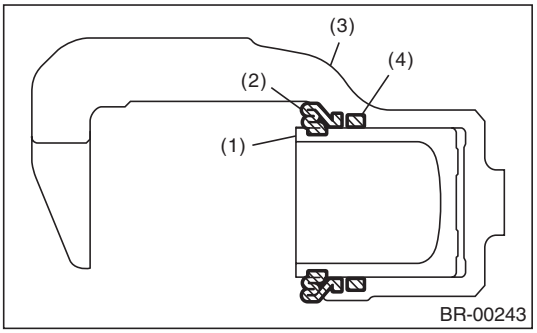
1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and fit in to the groove on the ends of cylinder.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.

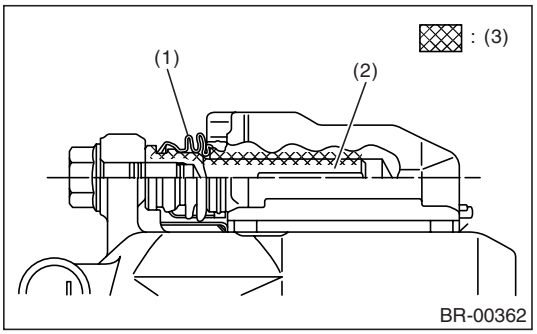
6) Position the boot in the grooves on cylinder and piston.



(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply a coat of specified grease to inner surface of cylinder, guide pin, lock pin, periphery of bushing and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

8) Install the guide pin boot on support.
9) Install the lock pin boot on support, and then insert the lock pin sleeve into specified point.

E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

8. Master Cylinder

A: REMOVAL

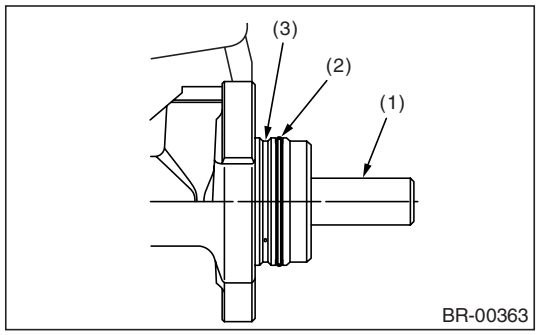
CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Thoroughly drain the brake fluid from reservoir tank.
2) Disconnect the fluid level gauge harness connector.
3) Remove the brake pipes from master cylinder.
4) Remove the master cylinder mounting nuts, and take out the master cylinder from brake booster.

B: INSTALLATION

1) Replace the O-ring for the master cylinder with a new one.

CAUTION:
Do not install the O-ring in wrong place.



(1) Primary piston
(2) O-ring
(3) Do not install the O-ring on this groove.

2) Install in the reverse order of removal.

Tightening torque:
Master cylinder mounting nut
13 N·m (1.3 kgf-m, 9.6 ft-lb)
Piping flare nut
Model with ABS
15 N·m (1.5 kgf-m, 10.8 ft-lb)
Model with VDC
19 N·m (1.9 kgf-m, 14.0 ft-lb)

CAUTION:
Be sure to use recommended brake fluid.

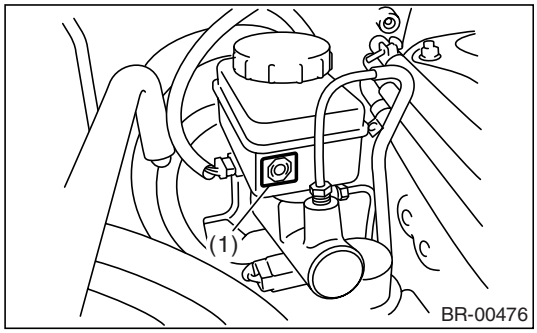
3) Bleed air from brake system. <Ref. to BR-38, PROCEDURE, Air Bleeding.>

C: REPLACEMENT

CAUTION:
When the master cylinder assembly is replaced, be sure to put the label on reservoir tank at the specified position as shown in the figure.

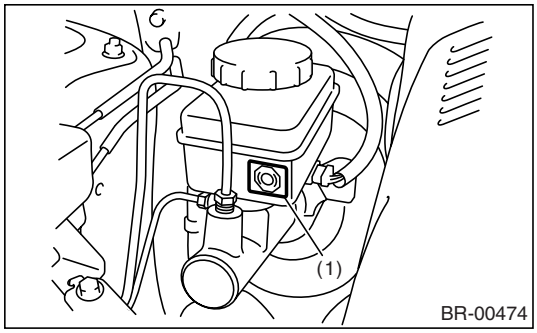
Label
Parts No. 26191TA000

- LHD model



(1) Label

- RHD model

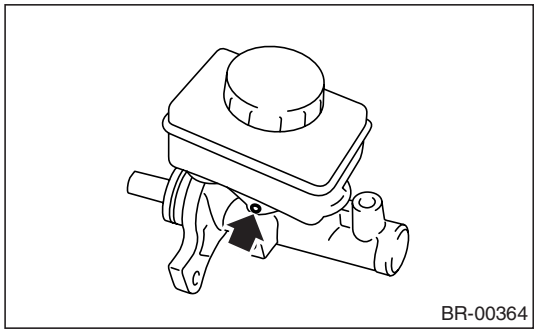


(1) Label

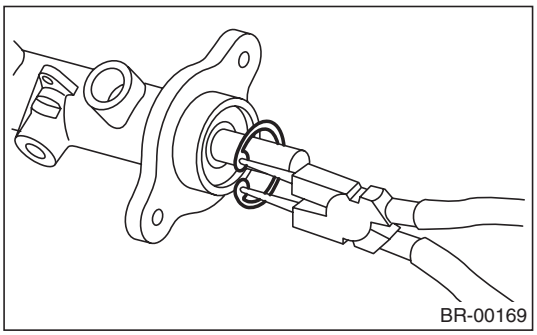
1) Remove mud and dirt from the surface of brake master cylinder.
2) Secure the master cylinder on a vise.

NOTE:
To avoid damaging master cylinder, use aluminum plate while holding with vise.

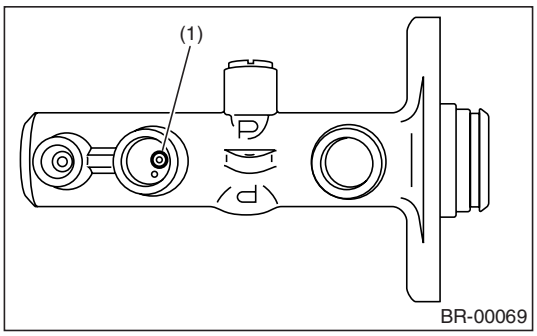
3) Remove the pin which secures the reservoir tank to master cylinder, and then remove the reservoir tank and seal.



4) With pushing-in the primary piston, remove the C-ring using pliers.

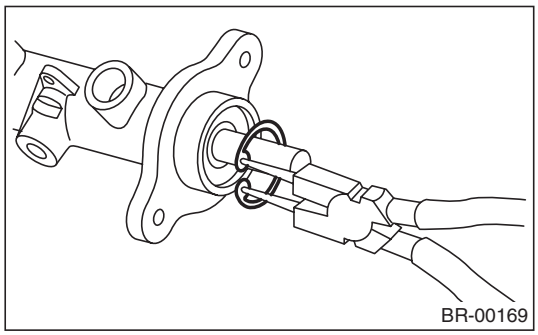


5) With pushing-in the primary piston, remove the straight pin from the port on installation part of reservoir tank using magnet pick-up tool.

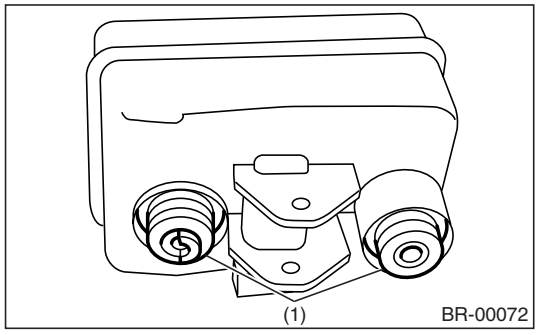


(1) Straight pin

6) Extract the primary piston assembly and secondary piston assembly straight out, while taking care not to scratch the inner surface of cylinder.
7) Clean the inside of master cylinder with brake fluid. Check the inside of cylinder for damage, deform, wear and rust. Replace the master cylinder as assembly if faulty.
8) Apply brake fluid to the inner surface of master cylinder and piston assembly.
9) Ensure that the inner surface of master cylinder and piston assembly are free of dirt before assembling. Install the primary piston assembly and secondary piston assembly to master cylinder, while taking care not to scratch the master cylinder inner surface.
10) With pushing-in the primary piston, install the cylinder pin.
11) With pushing-in the primary piston, install the C-ring to groove using pliers.

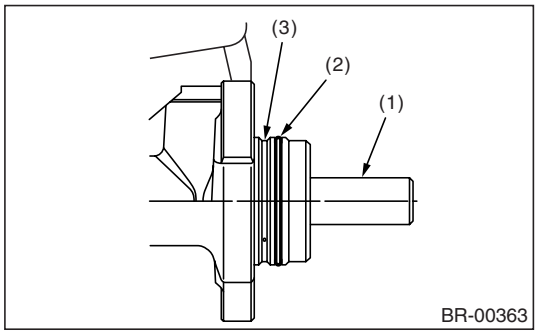


CAUTION:
Ensure the secure installation to the groove.
12) Install the seal to reservoir tank.



(1) Seal

13) Install the reservoir tank to master cylinder, and secure with pin.
14) Replace the O-ring for the master cylinder with a new one.



(1) Primary piston
(2) O-ring
(3) Do not install the O-ring on this groove.

D: INSPECTION

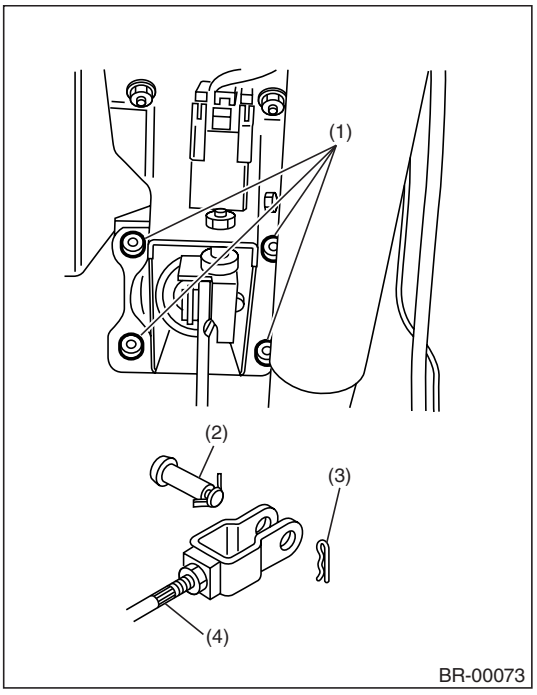
Inspect for oil leakage from the master cylinder.

NOTE:
After replacing piston kit; when the oil leakage is found without damaging or scratching the inside of cylinder, wear of master cylinder inner wall may be the cause. In this case, replace the master cylinder as assembly.

9. Brake Booster

A: REMOVAL

1) Remove or disconnect the following parts at engine compartment.
   (1) Disconnect the connector for brake fluid level gauge.
   (2) Remove the brake pipes from master cylinder.
   (3) Remove the master cylinder installing nuts.
   (4) Disconnect the vacuum hose from brake booster.
2) Remove the following parts from pedal bracket.
   (1) Snap pin and clevis pin
   (2) Four brake booster installing nuts

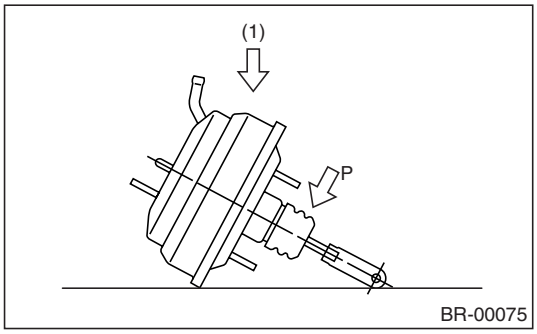


(1) Nut
(2) Clevis pin
(3) Snap pin
(4) Operating rod

3) Remove the brake booster while shunning brake pipes.

NOTE:
• Do not apply strong impact to booster shell and vacuum pipe.
• Be careful not to drop the brake booster. The brake booster should be replaced if it has been dropped.
• Use special care when handling the operating rod. If excessive force is applied to operating rod, sufficient to cause a change in the angle in excess of ±3°, it may result in damage to the power piston cylinder.
• Use care when placing the brake booster on the floor.
• Do not change the push rod length.

CAUTION:
• Do not disassemble the brake booster.
• If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by "P" may be damaged.



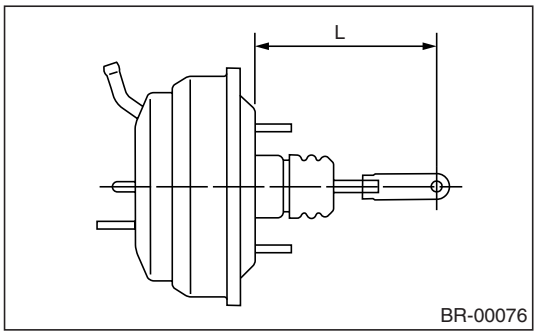
(1) Force

B: INSTALLATION

1) Check and adjust the operating rod of brake booster.

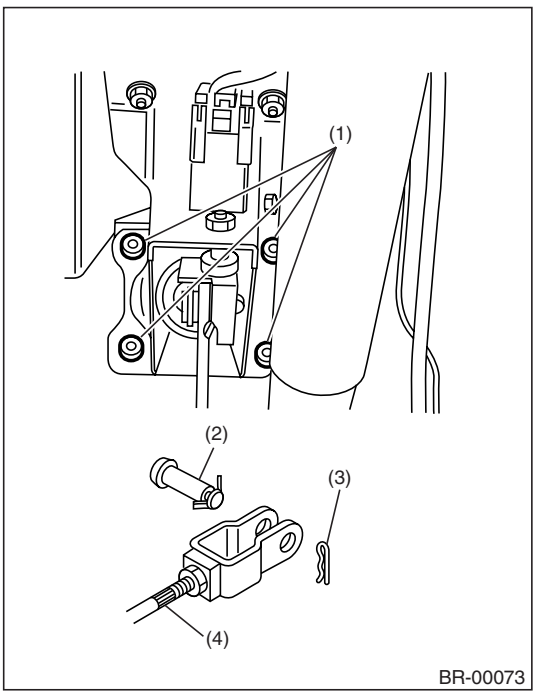
Specification L:
LHD
136.3 mm (5.38 in)
RHD
155.2 mm (6.11 in)

If it is not within the specification, adjust it by the brake booster operating rod.



2) Mount the brake booster in position.

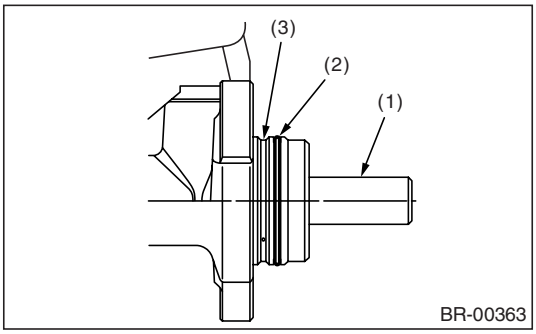
3) Connect the operating rod to brake pedal with clevis pin and snap pin.



(1) Nut
(2) Clevis pin
(3) Snap pin
(4) Operating rod

NOTE:
Apply a thin coat of grease [SUNLIGHT 2 (Part No. 003602010)] to clevis pin.

4) Connect the vacuum hose to brake booster.
5) After replacing the O-ring with a new one, install the master cylinder to brake booster.

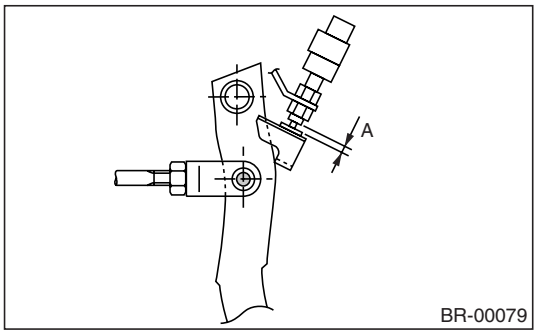


(1) Primary piston
(2) O-ring
(3) Do not install the O-ring on this groove.

6) Connect the brake pipes to master cylinder.
7) Connect the connector for brake fluid level gauge.
8) Measure the clearance between the threaded end of stop light switch and stopper.
If it is not within specification, adjust the position of stop light switch. <Ref. to BR-46, ADJUSTMENT, Stop Light Switch.>

CAUTION:
Be careful not to rotate the stop light switch.

Stop light switch clearance A:
0.3 mm (0.012 in)



9) Apply grease to the operating rod connecting pin to prevent it from wearing.
10) Bleed air from brake system.

Tightening torque (Air bleeder screw):
8 N·m (0.8 kgf-m, 5.9 ft-lb)

11) Conduct road tests to ensure brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

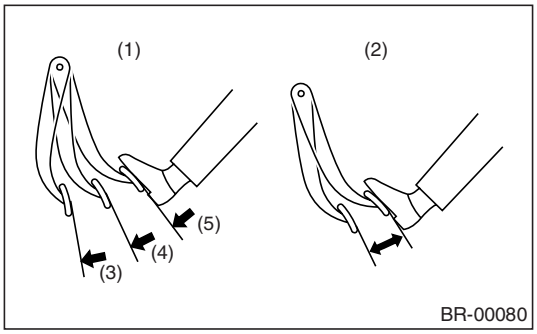
CAUTION:
When checking operation, be sure to securely apply the parking brake.

• CHECKING WITHOUT GAUGES

This method cannot determine the exact portion which has failed. But it can provide a rough understanding of the nature of failure if checking is conducted in accordance with the following procedures.

• AIR TIGHTNESS CHECK

Start the engine, and idle it for 1 to 2 minutes, then turn it OFF. Depress the brake pedal several times applying the same pedal force as that used in ordinary braking operations. The pedal stroke should be the greatest on the 1st depression, and it should become smaller with each successive depression. If no change occurs in the pedal height while in a depressed state, the brake booster is faulty.

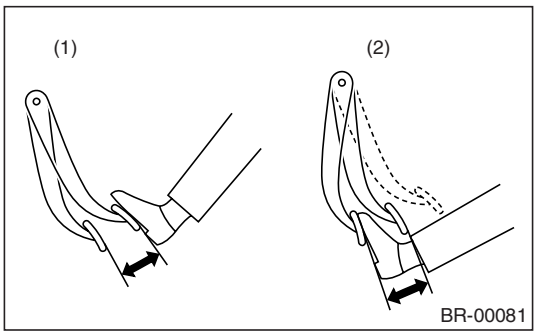


(1) Normal
(2) Not OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In the event of defective operation, also inspect the condition of the check valve and vacuum hose.
• Replace them if faulty and conduct the test again.
• If no improvement is observed, check precisely with gauges.

• OPERATION CHECK

1) With the engine OFF, depress the brake pedal several times applying the same pedal force and make sure that the pedal height does not vary with each depression of the pedal.



(1) When engine is stopped
(2) When engine is started

2) With the brake pedal depressed, start the engine.

3) As engine starts, the brake pedal should move slowly toward the floor. If no change occurs in the pedal height, the brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

• LOADED AIR TIGHTNESS CHECK

Depress the brake pedal while engine is running, and turn OFF the engine while the pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, the brake booster is functioning normally. If the pedal height increases, it is faulty.

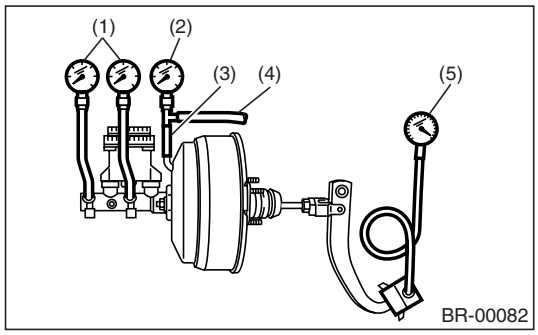
NOTE:
If faulty, check precisely with gauges.

2. OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to securely apply the parking brake.

• CHECKING WITH GAUGES

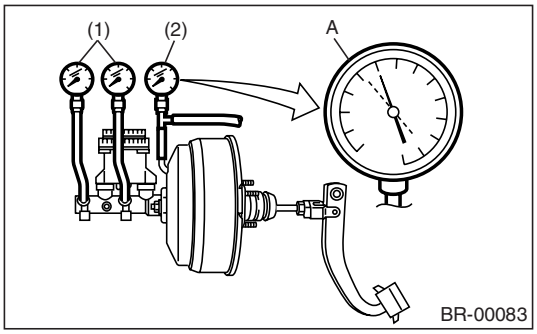
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



(1) Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

• AIR TIGHTNESS CHECK

1) Start the engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress the brake pedal at this moment.



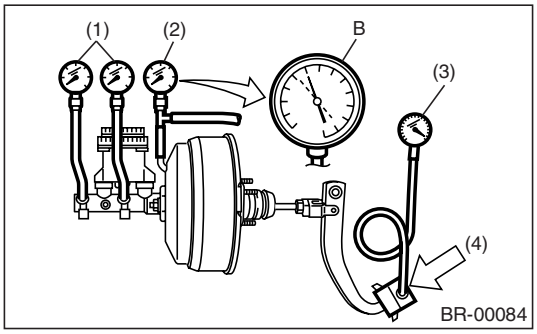
(1) Pressure gauge
(2) Vacuum gauge

2) Stop the engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping the engine, brake booster is functioning properly.
If defective, the cause may be one of those listed below.

- Check valve malfunction
- Leak from vacuum hose
- Leak from shell jointed portion or stud bolt welded portion
- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion

• LOADED AIR TIGHTNESS CHECK

1) Start the engine and depress the brake pedal with pedal force of 196 N (20 kgf, 44 lbf). Keep the engine running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point B is indicated on vacuum gauge while the pedal is still depressed.



(1) Pressure gauge
(2) Vacuum gauge
(3) Pedal force gauge
(4) Depressed

2) Stop the engine and watch vacuum gauge.
If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping the engine, brake booster is functioning properly.
If defective, refer to "AIR TIGHTNESS CHECK".
<Ref. to BR-34, INSPECTION, Brake Booster.>
3) If any fault is found on brake booster, replace the brake booster with a new one.

• LACK OF BOOSTING ACTION CHECK

Turn OFF the engine, and set the vacuum gauge reading at "0". Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the specification listed.

Brake pedal force N (kgf, lbf)	147 (15, 33)	294 (30, 66)
Fluid pressure kPa (kgf/cm^2, psi)	545 (6, 79)	1,564 (16, 227)

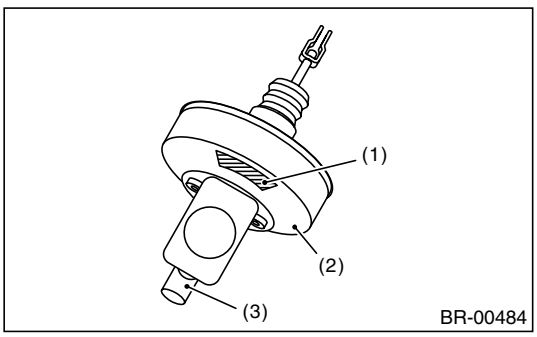
• BOOSTING ACTION CHECK

Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the specification listed.

Brake pedal force N (kgf, lbf)		147 (15, 33)	294 (30, 66)
Fluid pressure kPa (kgf/cm^2, psi)	15″ 16″ OUTBACK	6,003 (61, 871)	11,273 (115, 1,635)
	16″ (Except for OUTBACK)	5,381 (55, 780)	10,982 (112, 1,593)
	17″	4,963 (51, 720)	10,055 (103, 1,458)

CAUTION:
When the brake booster is replaced, be sure to put the label in figure. (KS model)

Label:
parts No. 26171AG000



(1) Label
(2) Brake booster
(3) Master cylinder

10. Brake Fluid

A: INSPECTION

1) Check that the brake fluid level remains between “MIN” and “MAX”. If out of the specified range, refill or drain fluid. If the fluid level becomes close to “MIN”, check the brake pad for wear and refill fluid.
2) Check the fluid for discoloration. If the fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

CAUTION:
• Keep the brake fluid away from painted surfaces of vehicle body. Wash away with water and wipe off if spilled.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
• During the operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approximately 500 m ℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

1) Either lift-up the vehicle and place rigid racks under it, or lift-up the vehicle and keep it.
2) Remove both the front and rear wheels.
3) Drain brake fluid from the reservoir tank.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
Refer to the specification of General Description. <Ref. to BR-2, SPECIFICATION, General Description.>

Perform the same procedure as bleeding operation of brake line until new brake fluid comes out from vinyl tube. <Ref. to BR-38, PROCEDURE, Air Bleeding.>

NOTE:
Perform the brake fluid replacement in the order from the farthest wheel cylinder from master cylinder.

11. Air Bleeding

A: PROCEDURE

CAUTION:
• Keep the brake fluid away from painted surfaces of vehicle body. Wash away with water and wipe off if spilled.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

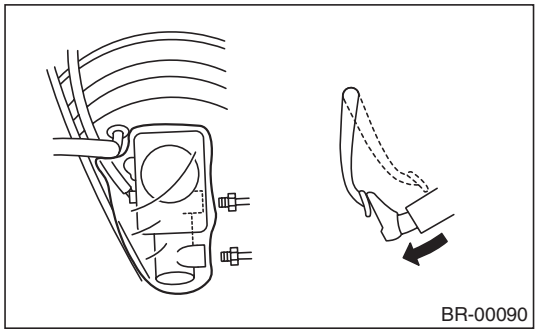
1. MASTER CYLINDER

NOTE:
• If the master cylinder is disassembled or reservoir tank is empty, bleed the master cylinder.
• If bleeding of master cylinder is not necessary, bleed the brake line by skipping the procedure below. <Ref. to BR-38, BRAKE LINE, PROCEDURE, Air Bleeding.>

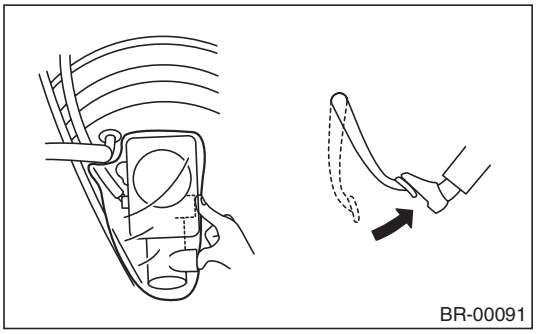
1) Fill the reservoir tank of master cylinder with brake fluid.

NOTE:
During the operation, keep the reservoir tank filled with brake fluid to eliminate entry of air.

2) Disconnect the brake line at primary and secondary sides.
3) Put a plastic bag cover on master cylinder.
4) Slowly depress the brake pedal and hold it.


BR-00090

5) Close the outlet plug with your finger, and then release the brake pedal.


BR-00091

6) Repeat the step 4) to 5) several times.
7) Remove the plastic bag.
8) Install the brake pipes to master cylinder.

Tightening torque:
Model with ABS
15 N·m (1.5 kgf-m, 10.8 ft-lb)
Model with VDC
19 N·m (1.9 kgf-m, 14.0 ft-lb)

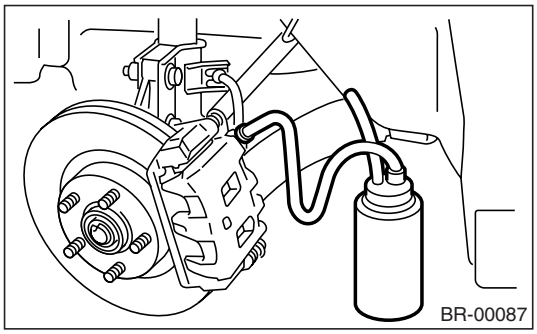
9) Bleed air from the brake line. <Ref. to BR-38, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

1) When the master cylinder has been disassembled or the reservoir tank is empty, bleed the master cylinder before bleeding brake line. <Ref. to BR-38, Air Bleeding.>
2) Fill the reservoir tank of master cylinder with brake fluid.

NOTE:
During the bleeding operation, keep the reservoir tank filled with brake fluid to eliminate entry of air.

3) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.


BR-00087

4) Depress the brake pedal several times, and hold it depressed.
5) Loosen the air bleeder screws to discharge brake fluid. With the air bleeder tightened quickly, release the brake pedal.
6) Repeat the steps 4) to 5) until there are no more air bubbles in the vinyl tube.
7) Repeat the steps above from 2) to 6) to bleed air from each wheel.

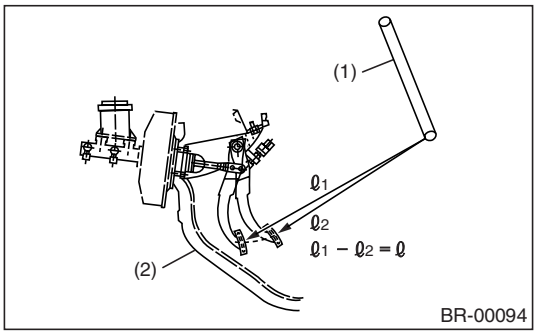
NOTE:
Perform the operation in the order from closest wheel cylinder to master cylinder.

8) Tighten the air bleeder screws securely.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

9) Check that there is no brake fluid leak evident in the entire system.

10) Check the pedal stroke.
While the engine is idling after warmed-up, depress the brake pedal with a 500 N (51 kgf, 112 lbf) load and measure the distance between the brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again.



(1) Steering wheel
(2) Toe board

Specified pedal stroke:
When pressing brake pedal with a force of 500 N (51 kgf, 112 lbf).
Less than 95 mm (3.74 in)

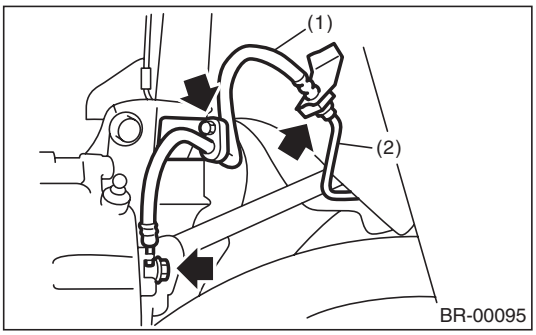
11) If the distance is more than specified, there is a possibility that air is in the brake line. Bleed the brake line until pedal stroke meets the specification.
12) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-10, ABS Sequence Control.>
13) Recheck the pedal stroke.
14) If the distance is more than specified, there is a possibility that air is in the hydraulic unit. Repeat above steps 2) to 9) until pedal stroke meets the specification.
15) Add brake fluid to the required level (“MAX” level) of reservoir tank.
16) Test run the vehicle and ensure that brakes provide normal braking action.

12.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

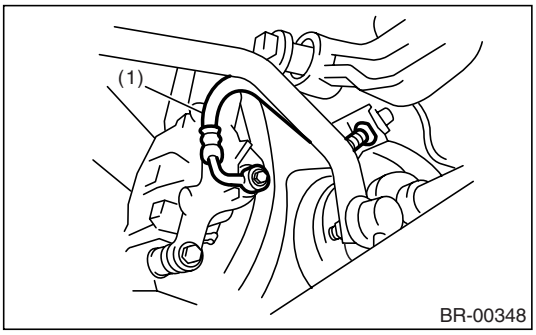
1) Separate the brake pipe from brake hose using a flare nut wrench.
2) Remove the clamp, bolt at strut mount, and union bolt.



(1) Brake hose
(2) Brake pipe

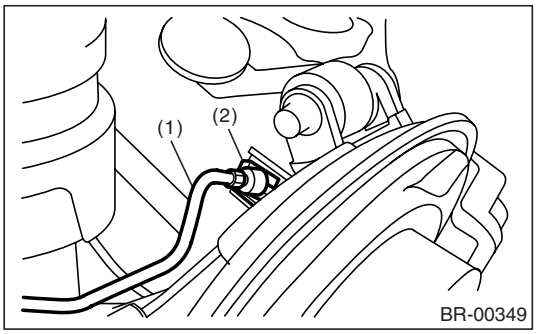
2. REAR BRAKE HOSE

1) Remove the union bolt from rear brake caliper.

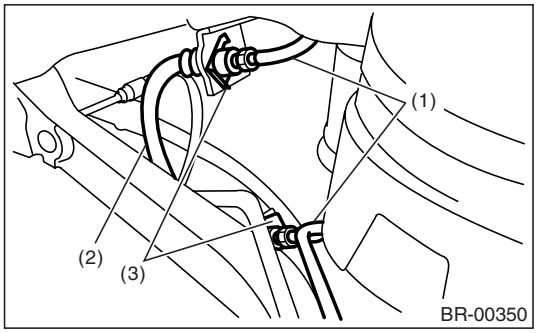


(1) Brake hose

2) Separate the brake pipe from brake hose using a flare nut wrench.
3) Remove the clamp and remove the brake hose.



(1) Brake pipe
(2) Brake hose clamp



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

B: INSTALLATION

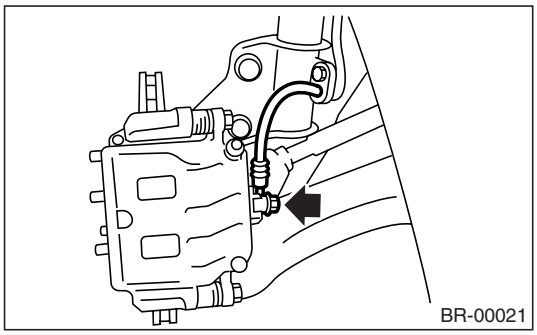
1. FRONT BRAKE HOSE

1) Secure the brake hose to strut mount.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

2) Install the brake hose to caliper using a new gasket.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.0 ft-lb)



3) Position the disc in straight-forward direction and route the brake hose through the hole in bracket on wheel apron side.

CAUTION:
Be sure the brake hose is not twisted.

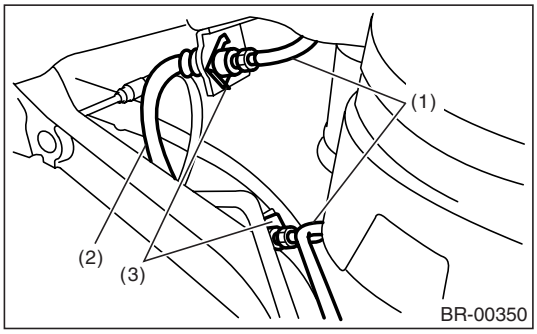
4) Temporarily tighten the flare nut to connect the brake pipe and hose.
5) Fix the brake hose with clamp at wheel apron bracket.
6) Tighten the flare nut to specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

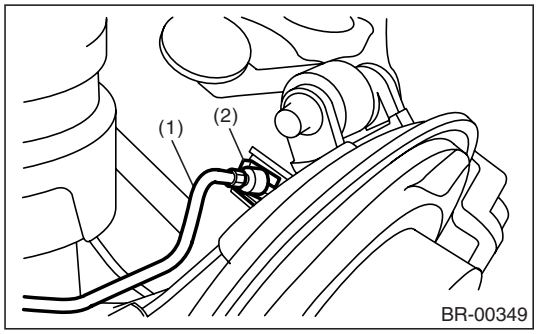
7) Bleed air from brake system.

2. Rear brake hose

1) Pass the brake hose through the hole of bracket, and lightly tighten the flare nut to connect brake pipe.
2) Insert the clamp upward to fix brake hose.



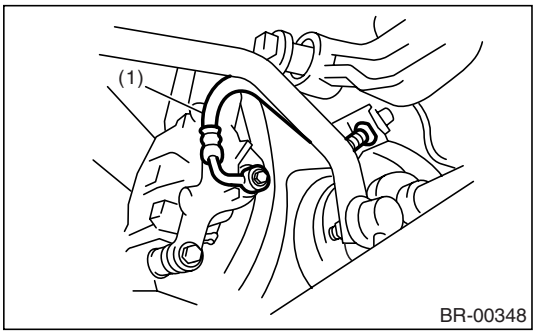
(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp



(1) Brake pipe
(2) Brake hose clamp

3) Install the brake hose to rear brake caliper using a new gasket.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(1) Brake hose

4) Tighten the flare nut to specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

5) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage or damage on hoses. Check joints for fluid leakage. If any cracks, breakage, damage or fluid leakage is found, repair or replace the hose.

13.Brake Pipe

A: REMOVAL

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When removing the brake pipe, make sure that it is not bent.

B: INSTALLATION

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When installing the brake pipe, make sure that it is not bent.
• After installing the brake pipe and hose, bleed air.
• After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

Brake pipe tightening torque:
<Ref. to BR-9, FRONT BRAKE PIPES AND HOSE, COMPONENT, General Description.>
<Ref. to BR-11, CENTER AND REAR BRAKE PIPES AND HOSE, COMPONENT, General Description.>

C: INSPECTION

Ensure there are no cracks, breakage or damage on pipes. Check joints for fluid leakage. If any cracks, breakage, damage or fluid leakage is found, repair or replace the pipes.

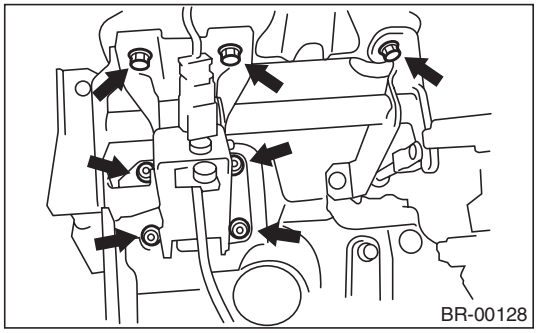
NOTE:
Use a mirror when inspecting the low-visible part or backside.

14.Brake Pedal

A: REMOVAL

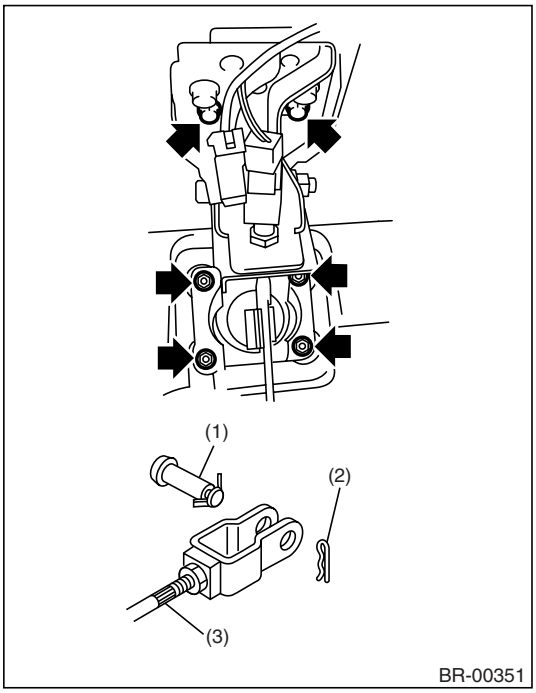
1. LHD MT MODEL

1) Remove the steering shaft.
2) Disconnect the connectors (stop light switch) from pedal bracket.
3) Remove the clevis pin which secures lever to push rod.
4) Remove the nuts which secure clutch master cylinder.
5) Remove the bolts and nuts which secure pedal bracket.



2. LHD AT MODEL

1) Remove the steering shaft.
2) Disconnect the connectors (stop light switch) from pedal bracket.
3) Remove the clevis pin which secures lever to push rod.
4) Remove the bolts and nuts which secure pedal bracket.



(1) Clevis pin
(2) Snap pin
(3) Operating rod

3. RHD MODEL

Refer to LHD AT model. <Ref. to BR-43, LHD AT MODEL, REMOVAL, Brake Pedal.>

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Always use new clevis pins.

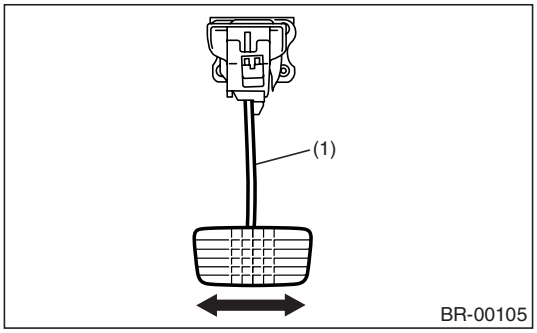
2) Inspect the brake pedal after installation. <Ref. to BR-44, INSPECTION, Brake Pedal.>

C: INSPECTION

1) Move the brake pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lbf) to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushing with a new one.

Deflection of brake pedal:
Limit
Less than 5.0 mm (0.197 in)

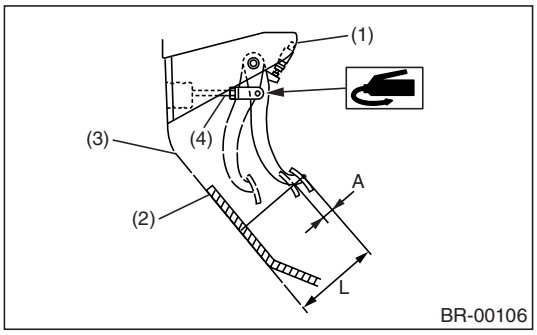


(1) Brake pedal

2) Check the position of pedal pad.

Pedal height L:
LHD
150 — 160 mm (5.91 — 6.30 in)
RHD
162 — 172 mm (6.38 — 6.77 in)

Brake pedal free play A:
0.5 — 2 mm (0.02 — 0.08 in) [When pulling the brake pedal upward with a force of less than 10 N (1 kgf, 2 lbf).



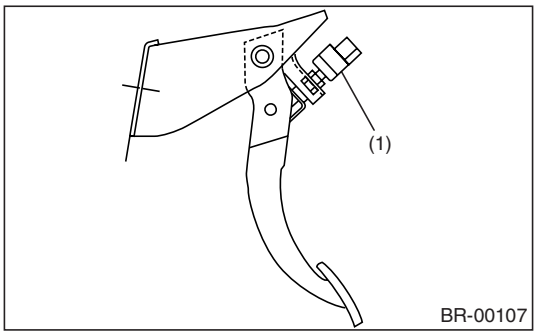
(1) Stop light switch
(2) Mat
(3) Toe board
(4) Brake booster operating rod

3) If it is not within the specification, adjust it by adjusting the brake booster operating rod length.

15.Stop Light Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the stop light switch connector.
3) Loosen the nuts, unscrew the stop light switch, and remove stop light switch.

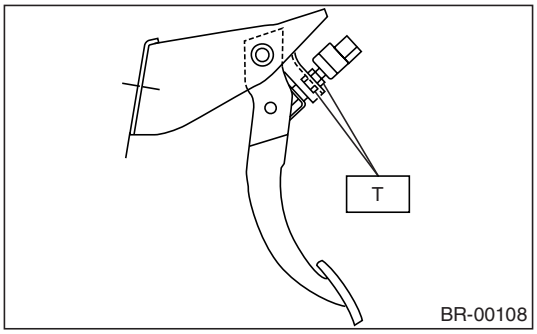


(1) Stop light switch

B: INSTALLATION

1) Screw the stop light switch onto a bracket and secure it temporarily with a nut.
2) Adjust the stop light switch position, and then tighten the nut.
<Ref. to BR-46, ADJUSTMENT, Stop Light Switch.>

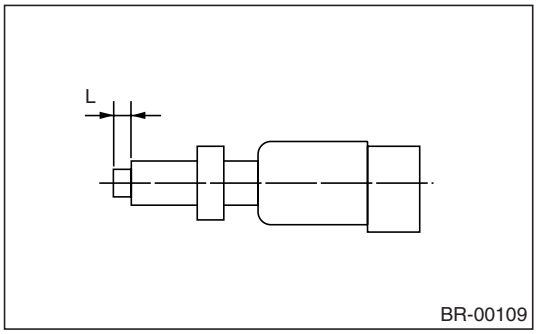
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



C: INSPECTION

1) If the stop light switch does not operate properly (or if it does not fix at the specified position), replace with a new one.

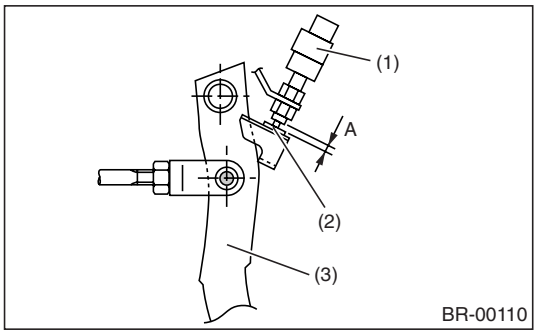
Specified position L:
2 mm (0.079 in)



2) Measure the clearance between the threaded end of stop light switch and stopper.

CAUTION:
Be careful not to rotate the stop light switch.

Stop light switch clearance A:
0.3 mm (0.012 in)



(1) Stop light switch
(2) Stopper
(3) Brake pedal

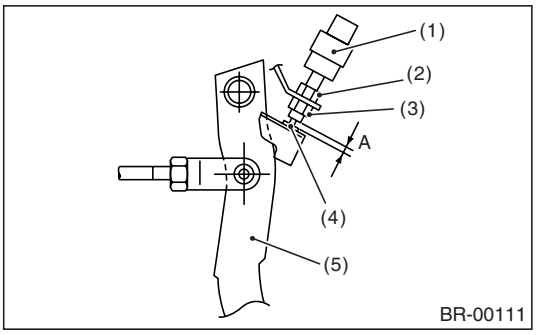
3) If it is not within the specification, adjust it by adjusting the position of stop light switch.

CAUTION:
Be careful not to rotate the stop light switch.

D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance between the threaded end of the stop light switch and stopper (A) becomes 0.3 mm (0.012 in). Then, tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(1) Stop light switch
(2) Lock nut A
(3) Lock nut B
(4) Stopper
(5) Brake pedal

NOTE:
Tighten the lock nut B until the clearance between the threaded end of stop light switch and stopper becomes 0 mm (0 inch). Hold the stop light switch to prevent turning, and then loosen the lock nut B approx. 60°. The clearance (A) becomes 0.3 mm (0.012 in).

16.General Diagnostic Table

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(2) Entry of air into the hydraulic mechanism	Bleed air.
	(3) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(4) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining or rotor	Eliminate cause of fluid leakage, and clean or replace.
	(2) Rotor eccentricity	Correct or replace the rotor.
	(3) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(4) Deformed back plate	Rectify or replace.
	(5) Improper tire inflation	Adjust to correct pressure.
	(6) Disordered wheel alignment	Adjust alignment.
	(7) Loosened back plate or the support installing bolts	Retighten to specified torque.
	(8) Faulty wheel bearing	Replace.
	(9) Trouble in hydraulic system	Replace the cylinder, brake pipe or hose.
	(10) Uneven effect of the parking brake	Check, adjust, or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(4) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Correct or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Improper disc caliper operation	Correct or replace.
	(7) Faulty wheel bearing	Replace.
5. Brake noise (1) (creak sound)	(1) Hardened or deteriorated brake pad	Replace the pad.
	(2) Worn brake pad	Replace the pad.
	(3) Loosened back plate or the support installing bolts	Retighten to specified torque.
	(4) Loose wheel bearing	Retighten to specified torque.
	(5) Dirty rotor	Clean the rotor, or clean and replace brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn brake pad	Replace the pad.
	(2) Improper installed pad	Correct or replace the pad.
	(3) Loose or bent rotor	Retighten or replace.
7. Brake noise (3) (click sound)	Excessively worn pad or the support	Replace the pad or the support.

PARKING BRAKE

PB

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4. Parking Brake Assembly (Rear Disc Brake) 6
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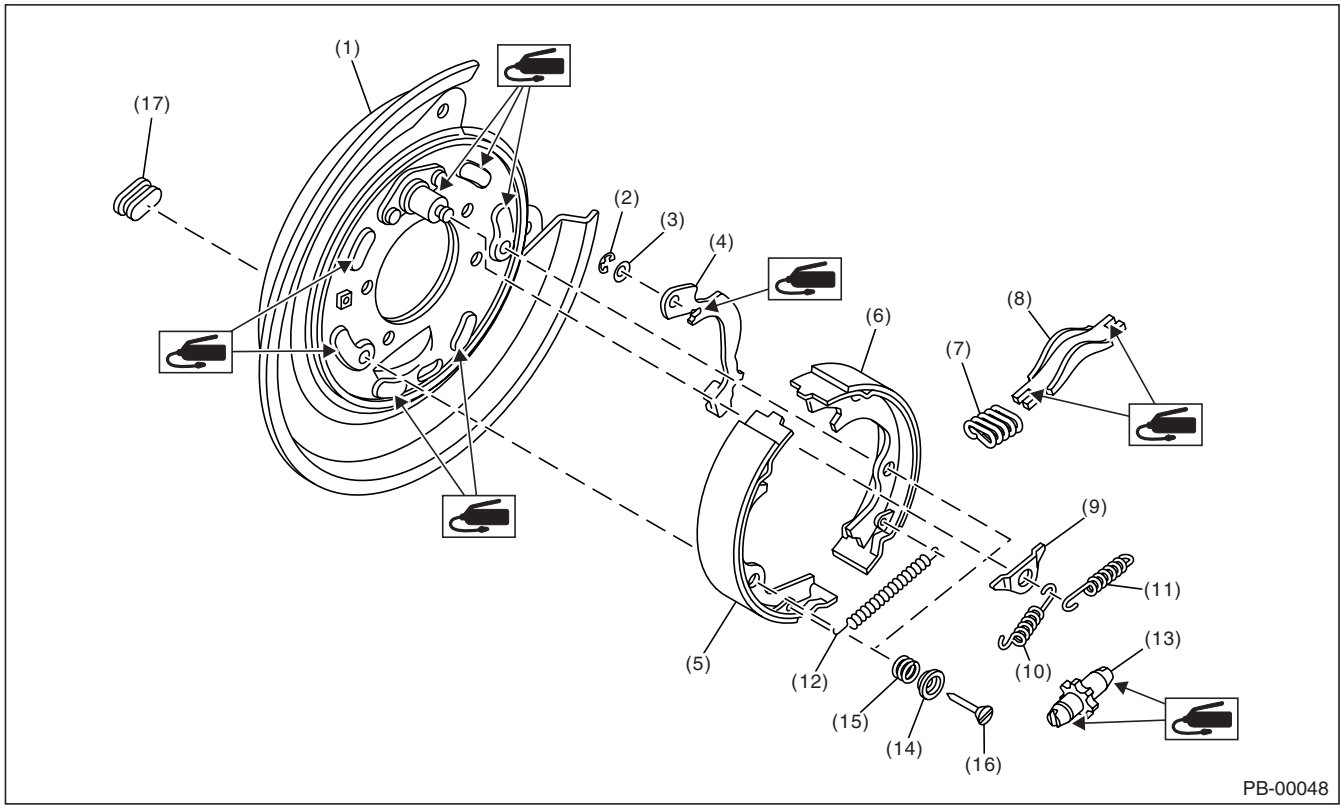
1. General Description

A: SPECIFICATION

Type	Mechanical on rear brakes, drum in disc
Effective drum diameter mm (in)	170 (6.69)
Lining dimensions (length × width × thickness) mm (in)	163.1 × 30.0 × 3.2 (6.421 × 1.181 × 0.126)
Clearance adjustment	Manual adjustment
Lever stroke notches/N (kgf, lbf)	5 to 6/200 (20.4, 45)

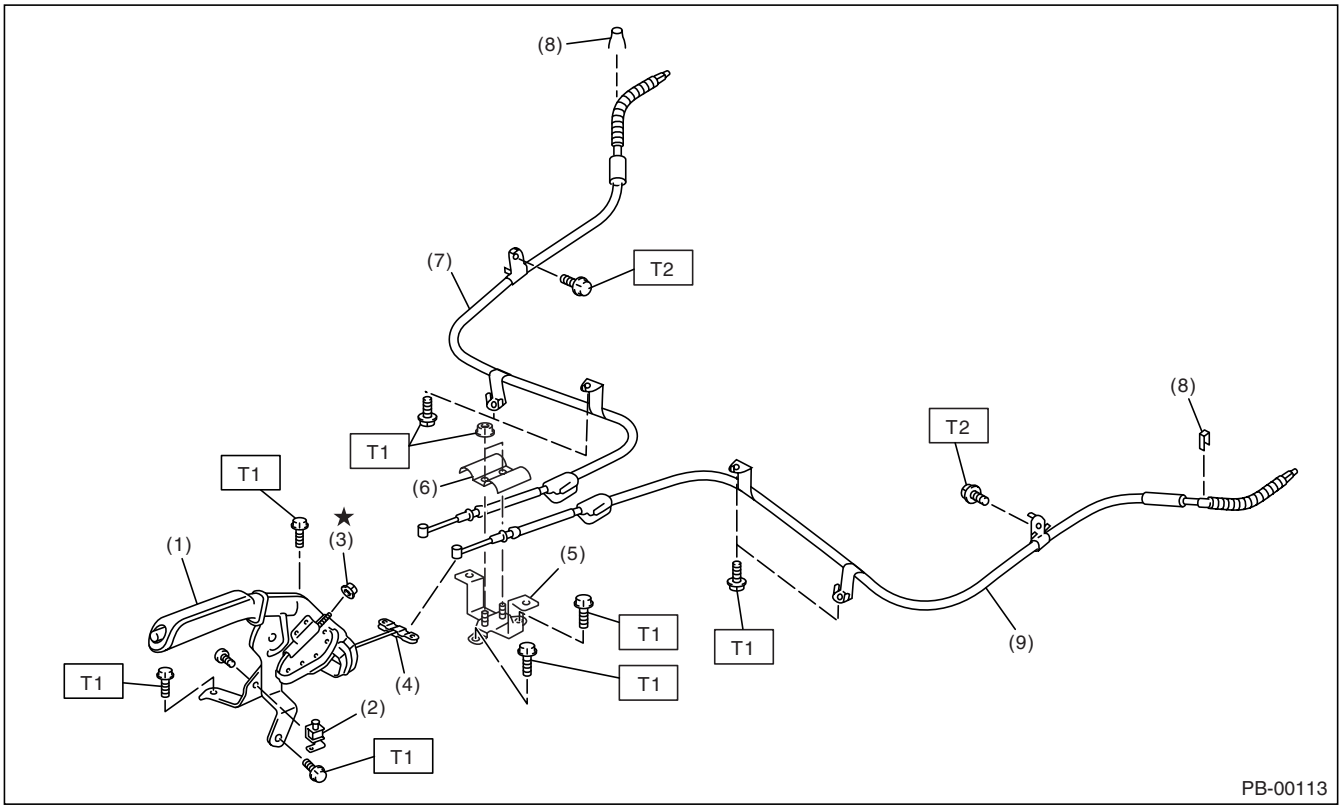
B: COMPONENT

1. PARKING BRAKE (REAR DISC BRAKE)



(1) Back plate
(2) Retainer
(3) Spring washer
(4) Lever
(5) Parking brake shoe (Primary)
(6) Parking brake shoe (Secondary)
(7) Strut spring
(8) Strut
(9) Shoe guide plate
(10) Primary return spring
(11) Secondary return spring
(12) Adjusting spring
(13) Adjuster
(14) Shoe hold-down cup
(15) Shoe hold-down spring
(16) Shoe hold-down pin
(17) Adjusting hole cover

2. PARKING BRAKE CABLE



(1) Parking brake lever
(2) Parking brake switch
(3) Adjusting nut (Self-locking nut)
(4) Equalizer
(5) Bracket
(6) Clamp
(7) Parking brake cable RH
(8) Clamp
(9) Parking brake cable LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13)
T2: 33 (3.4, 24.3)

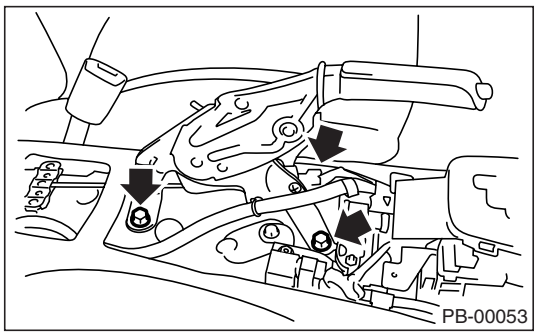
C: CAUTION

• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
• Keep grease etc. away from parking brake shoes.

2. Parking Brake Lever

A: REMOVAL

1) Set the wheel stoppers to tires.
2) Remove the console box.
3) Disconnect the parking brake switch connector.
4) Remove the parking cable adjusting nut (self-locking nut).
5) Remove the parking brake lever.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
Parking brake lever;
18 N·m (1.8 kgf-m, 13 ft-lb)

2) Install a new adjusting nut (self-locking nut).
3) Adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

1) Operate the parking brake lever 3 to 4 times and return the lever fully.
2) While pulling the parking brake lever upward, count the notches.

Lever stroke:
5 to 6 notches when pulled with a force of 200 N (20.4 kgf, 45 lbf)

If it is not within the specification, adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

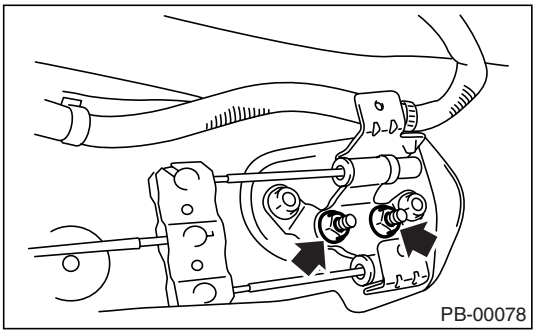
D: ADJUSTMENT

Adjust the parking lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

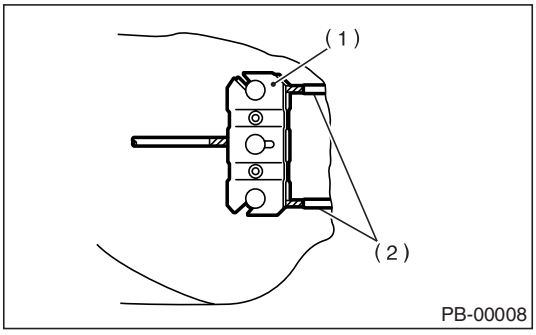
3. Parking Brake Cable

A: REMOVAL

1) Remove the rear seat cushion.
2) Remove the console box.
3) Remove the parking cable adjusting nut (self-locking nut).
4) Remove the parking brake lever. <Ref. to PB-4, REMOVAL, Parking Brake Lever.>
5) Roll up the floor mat and remove the clamps.

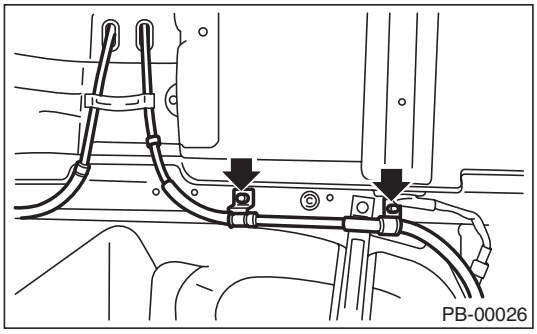


6) Remove the inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

7) Lift-up the vehicle, and then remove the rear wheels.
8) Remove the parking brake cable from rear brake. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
9) Remove the clamp from rear brake.
10) Remove the cable clamp from rear arm bracket.
11) Remove the cable clamp from rear floor.



12) Remove the cable assembly.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Be sure to pass the cable through the cable guide inside tunnel.

2) Adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

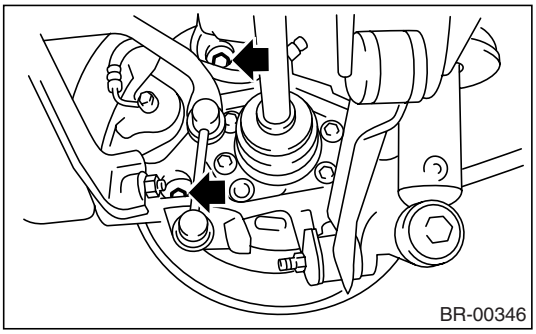
C: INSPECTION

Check and replace the removed cable if damaged, rusty or faulty.
1) Check the cable for smooth operation.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends and cracks.
4) Check the boot for damage, cracks and corrosion.

4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

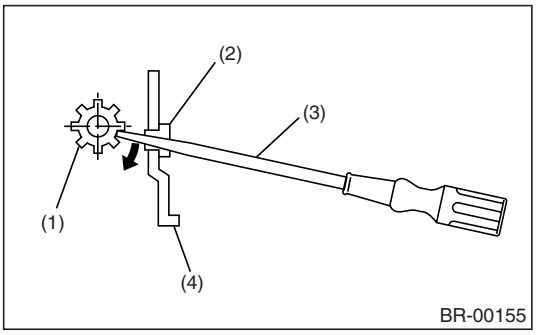
1) Release the parking brake.
2) Remove the two mounting bolts and remove the brake caliper assembly.



3) Suspend the brake caliper assembly so that the hose is not stretched.
4) Remove the disc rotor.

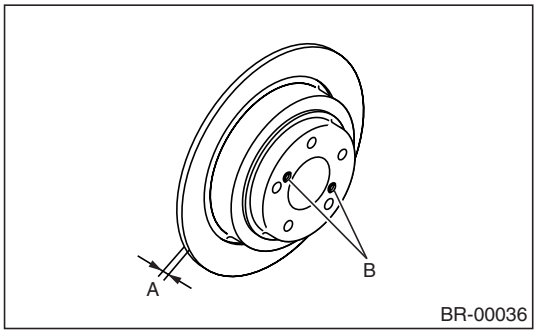
NOTE:
If the disc rotor is difficult to remove, try the following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until the brake shoe gets away enough from the disc rotor.

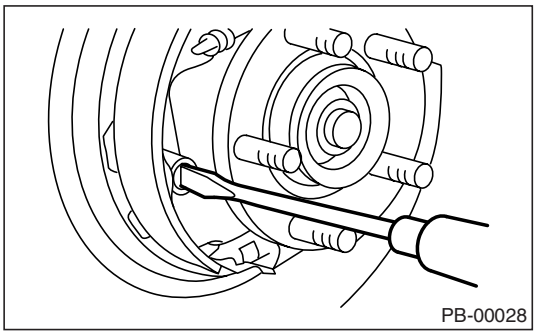


(1) Adjuster
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

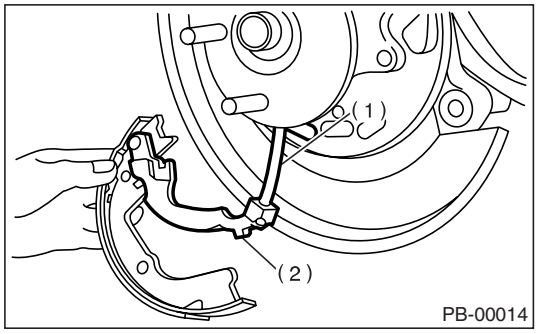
(2) If disc rotor seizes up within hub, drive disc rotor out by pushing two 8-mm bolts in holes B on rotor.



5) Remove the shoe return spring from parking brake assembly.
6) Remove the front shoe hold down spring and pin.



7) Remove the strut and strut spring.
8) Remove the adjuster assembly from parking brake assembly.
9) Remove the brake shoe.
10) Remove the rear shoe hold down spring and pin with pliers.
11) Remove the parking brake cable from lever.



(1) Parking brake cable
(2) Lever

12) Using a flat tip screwdriver, raise the retainer. Remove the parking lever and washer from brake shoe.

B: INSTALLATION

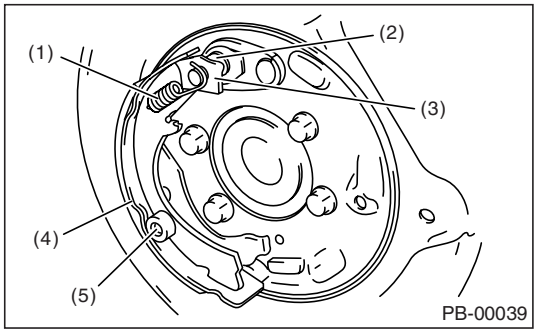
CAUTION:
Be sure the lining surface is free from oil and grease contamination.

1) Apply brake grease to the following places.

Brake grease:
Brake Grease (Part No. 003602002)

- Six contact surfaces of shoe rim and back plate packing
- Contact surface of shoe wave and anchor pin
- Contact surface of lever and strut
- Contact surface of shoe wave and adjuster assembly
- Contact surface of shoe wave and strut
- Contact surface of lever and shoe wave

2) Insert the primary side brake shoe into anchor pin groove.
3) Secure the brake shoe with shoe hold-down pin and cup.
4) Install the plate to anchor pin, and then assemble the primary return spring to anchor pin.

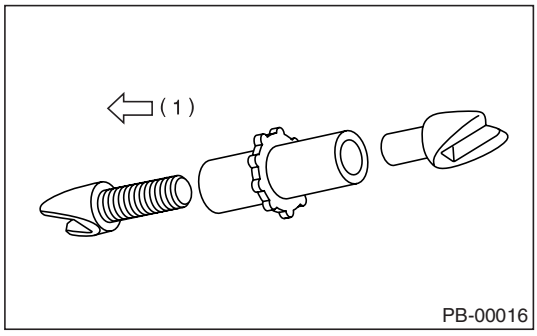


(1) Primary return spring
(2) Anchor pin
(3) Plate
(4) Primary shoe
(5) Shoe hold-down pin and cup

5) Install the parking brake cable to parking brake lever.
6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with shoe hold-down pin & cup.

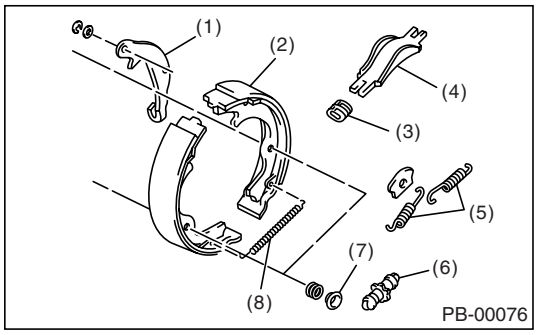
NOTE:
- Install the strut spring of both right and left wheel facing vehicle front.

- Install the adjuster assembly with screw on left side.



(1) LH

7) Install the secondary return spring and adjusting spring.



(1) Lever
(2) Secondary brake shoe
(3) Strut spring
(4) Strut
(5) Return spring
(6) Adjuster
(7) Shoe hold-down cup
(8) Adjusting spring

8) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
9) Drive the vehicle for parking brake lining “break-in”.
(1) Drive the vehicle at about 35 km/h (22 MPH).
(2) With the parking brake release button pushed in, pull the parking brake lever gently.
(3) Drive the vehicle for about 200 m (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down.
Repeat once more from step (1).
(5) After breaking-in, re-adjust the parking brakes.

C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

Disc rotor inside diameter:
Specification:
170 mm (6.69 in)
Service limit:
171 mm (6.73 in)

2) Measure the lining thickness. If it exceeds the limit, replace shoe assembly.

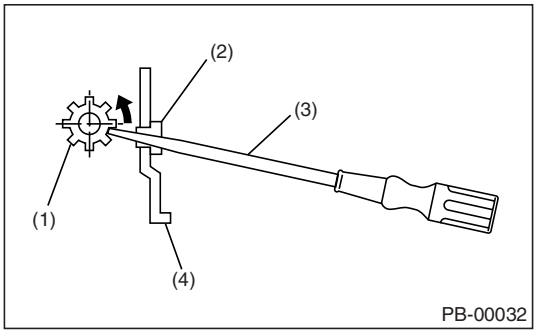
Lining thickness:
Specification:
3.2 mm (0.126 in)
Service limit:
1.5 mm (0.059 in)

NOTE:
Replace the right and left brake shoe as a set.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Return the parking brake lever fully.
2) Remove the adjusting hole cover from back plate.
3) Turn the adjusting screw using a flat tip screwdriver until the brake shoe is in close contact with disc rotor.



(1) Adjusting screw
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

4) Turn back (downward) the adjusting screw 3 to 4 notches.

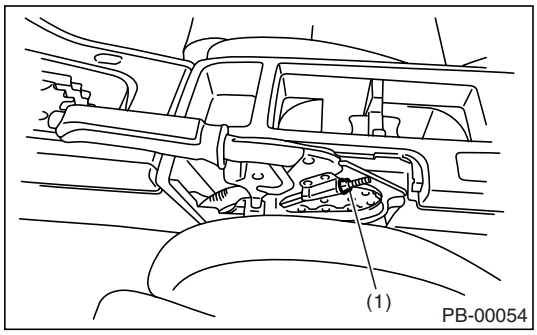
CAUTION:
Check there is no brake drag.

5) Install the adjusting hole cover to back plate.
6) Adjust the parking lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

2. LEVER STROKE

1) Adjust the shoe clearance before lever stroke adjustment. <Ref. to PB-8, SHOE CLEARANCE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
2) Remove the parking lever cover.
3) Operate the parking brake lever 3 to 4 times.
4) Turn the adjusting nut until lever stroke is at the specification.

Lever stroke:
5 to 6 notches when pulled with a force of 200 N (20.4 kgf, 45 lbf)



(1) Adjusting nut (Self-locking nut)

5) Check there is no brake drag.
6) Install the parking lever cover.

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Brake drag	Parking brake lever is maladjusted.	Adjustment.
	Parking brake cable does not move.	Repair or replace.
	Parking brake shoe clearance is maladjusted.	Adjustment.
	Return spring is faulty.	Replace.
Noise from brake	Return spring is faulty.	Replace.
	Shoe hold-down spring is faulty.	Replace.

POWER ASSISTED SYSTEM (POWER STEERING)

PS

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1. General Description

A: SPECIFICATION

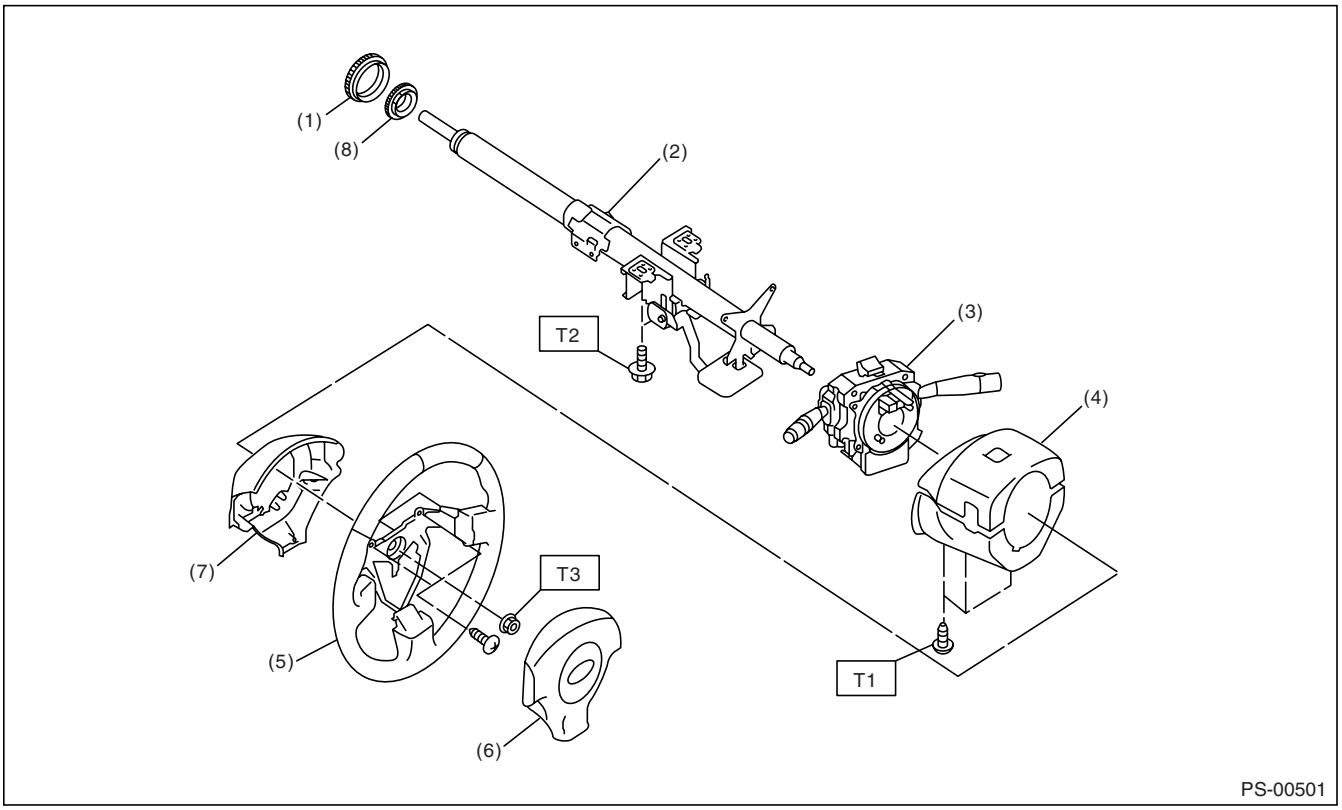
Model			Non-turbo (Except for 3.0 R)	Turbo	3.0 R
Whole system	Minimum turning radius m (ft)		5.4 (17.8)		
	Steering angle	Inner wheel	2.0 i (Wagon), 2.5 i (Wagon): 37.3°±1.5°, 2.0 i (Sedan), 2.5 i (Sedan), 2.0 GT, 3.0 R: 37.2°±1.5°, 3.0 R spec. B: 37.1°±1.5°, OUTBACK: 37.8°±1.5°		
		Outer wheel	2.0 (Wagon), 2.5 i (Wagon): 33.0°±1.5°, 2.0 i (Sedan), 2.5 i (Sedan), 2.0 GT, 3.0 R: 32.9°±1.5°, 3.0 R spec. B: 32.8°±1.5°, OUTBACK: 33.5°±1.5°		
	Steering wheel diameter mm (in)		375 (14.76)		
	Overall gear ratio (Turns, lock to lock.Gearbox)		3.2	2.8	
Gearbox	Type		Rack and Pinion, Integral		
	Backlash		0 (Automatically adjustable)		
	Valve (Power steering system)		Rotary valve		
Pump (Power steering system)	Type		Vane pump		
	Oil tank		Installed on body		
	Specific output cm^3 (cu in)/rev.		7.2 (0.439)	8.5 (0.519)	9.6 (0.586)
	Relief pressure kPa (kgf/cm^2, psi)		6,767 — 7,453 (69 — 76, 981 — 1,081)	7,350 — 8,036 (75 — 82, 1,067 — 1,165)	8,300 — 9,000 (85 — 92, 1,204 — 1,305)
	Hydraulic fluid control		Dropping in response to increased engine revolutions		
	Hydraulic fluid ℓ (US qt, Imp qt)		1,000 rpm: 6.5 (6.9, 5.7) 3,000 rpm: 5 (5.3, 4.4)	1,000 rpm: 6.15 (6.5, 5.4) 3,000 rpm: 5.5 (5.8, 4.8)	1,000 rpm: 6.5 (6.9, 5.7) 3,000 rpm: 5.5 (5.8, 4.8)
	Range of revolution rpm		680 — 9,800	680 — 9,600	
	Revolving direction		Clockwise		
Working fluid (Power steering system)	Fluid		ATF DEXRON III or equivalent		
	Capacity ℓ (US qt, Imp qt)	Oil tank	0.2 (0.2, 0.2)		
		Whole system	0.7 (0.7, 0.6)		

Steering wheel	Free play		mm (in)	17 (0.67)
Steering shaft	Clearance between steering wheel and column cover		mm (in)	2 — 4 (0.08 — 0.16)
Steering gearbox (Power steering system)	Sliding resistance		N (kgf, lbf) LHD	400 (41, 90) or less Difference between right and left sliding resistance: Less than 20%
			N (kgf, lbf) RHD	314 (32, 71) or less Difference between right and left sliding resistance: Less than 20%
	Rack shaft play in radial direction	Right-turn steering	mm (in) LHD	0.19 (0.007) or less
			mm (in) RHD	Horizontal movement: 0.6 (0.024) or less Vertical movement: 0.4 (0.016) or less
		Left-turn steering	mm (in) LHD	Horizontal movement: 0.15 (0.006) or less Vertical movement: 0.3 (0.012) or less
			mm (in) RHD	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) LHD	0.5 (0.020) or less
			mm (in) RHD	0.27 (0.0106) or less
	Resistance to rotation		N (kgf, lbf) LHD	Maximum allowable value: 10.5 (1.1, 2.4) or less Difference between right and left rotating resistance: Less than 20%
			N (kgf, lbf) RHD	Maximum allowable value: 13 (1.3, 2.9) or less Difference between right and left rotating resistance: Less than 20%
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less
		Axial play	mm (in)	0.9 (0.035) or less
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less
		Resistance to rotation	N (kgf, lbf)	9.22 (0.94, 2.07) or less
	Regular pressure (Unloaded)		kPa (kgf/cm^2, psi)	981 (10, 142) or less
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road		N (kgf, lbf)	29.4 (3.0, 6.6) or less
	At standstill with engine stalled on a concrete road		N (kgf, lbf)	294.2 (30, 66.2) or less

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

B: COMPONENT

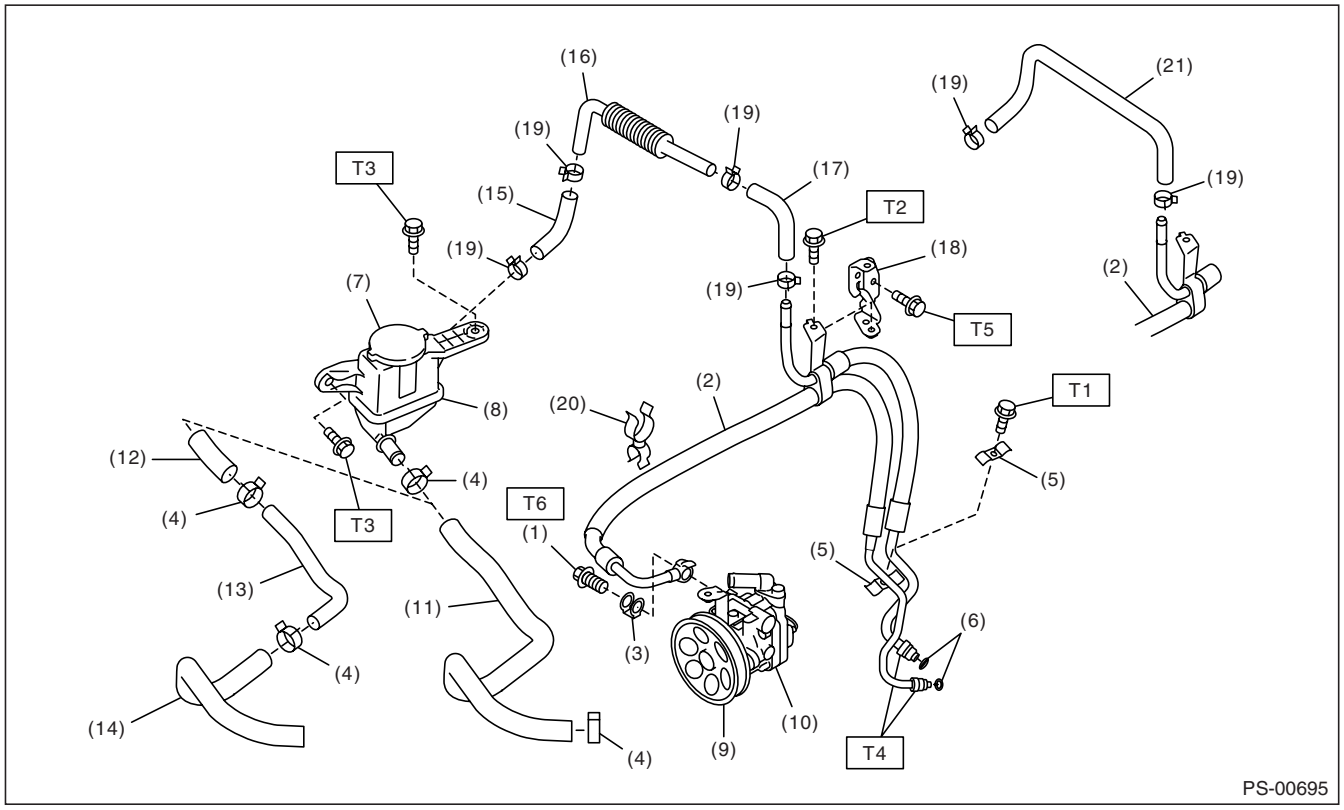
1. STEERING WHEEL AND COLUMN



(1)	Bushing	(5)	Steering wheel	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Steering shaft	(6)	Airbag module	***T1: 1.2 (0.12, 0.9)***
(3)	Steering roll connector	(7)	Steering wheel lower cover	***T2: 25 (2.5, 18.4)***
(4)	Column cover	(8)	Insulator	***T3: 45 (4.6, 33.2)***

2. POWER ASSISTED SYSTEM

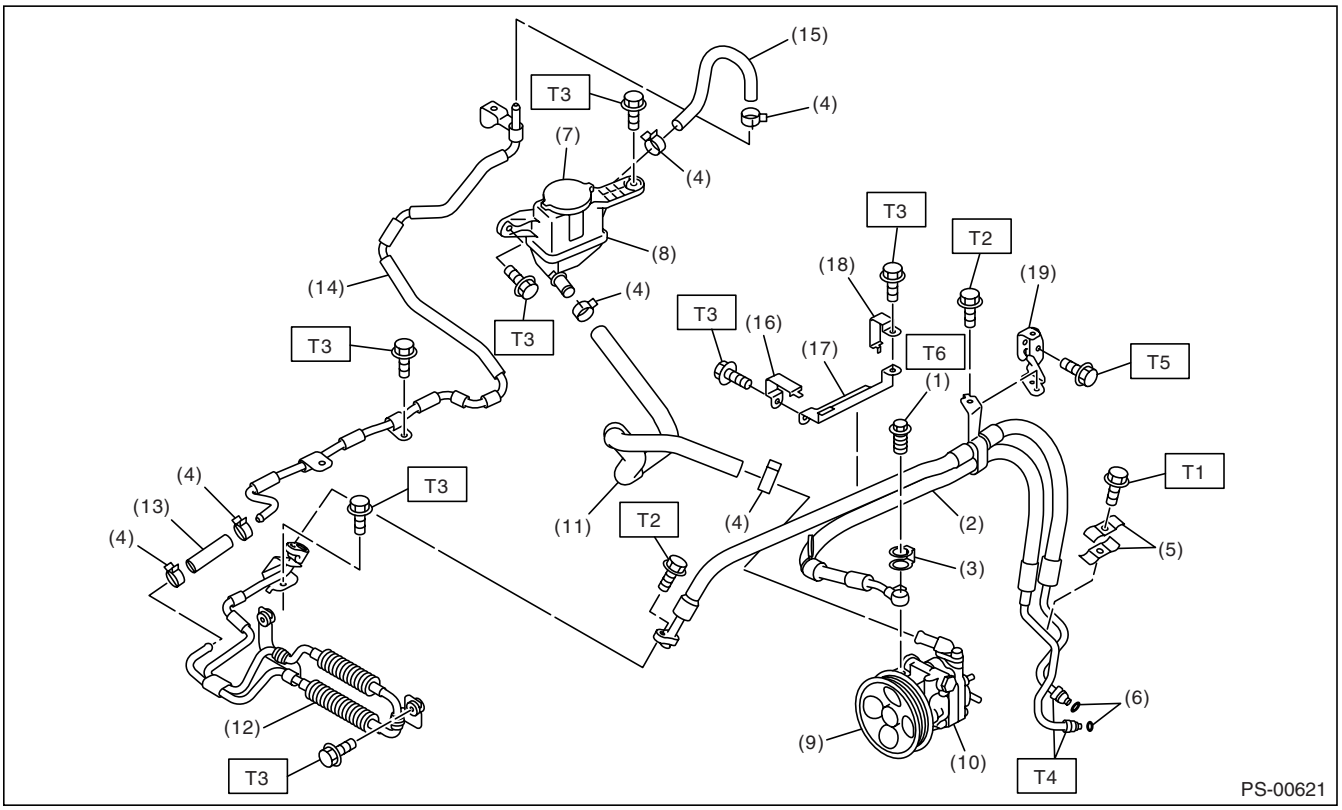
• Hose and tank (H4 model)



(1) Eye bolt
(2) Hose
(3) Eye bolt gasket
(4) Clip
(5) Clamp E
(6) O-ring
(7) Cap
(8) Reservoir tank
(9) Pulley
(10) Oil pump
(11) Suction hose (Non-turbo model)
(12) Suction hose (Turbo model)
(13) Suction hose (Turbo model)
(14) Suction hose (Turbo model)
(15) Return hose (Turbo model)
(16) Oil cooler (Turbo model)
(17) Return hose (Turbo model)
(18) Hose bracket
(19) Clip
(20) Clip
(21) Return hose (Non-turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 10 (1.0, 7.4)
T3: 13 (1.3, 9.6)
T4: 15 (1.5, 10.8)
T5: 18 (1.84, 13.3)
T6: 39 (4.0, 28.9)

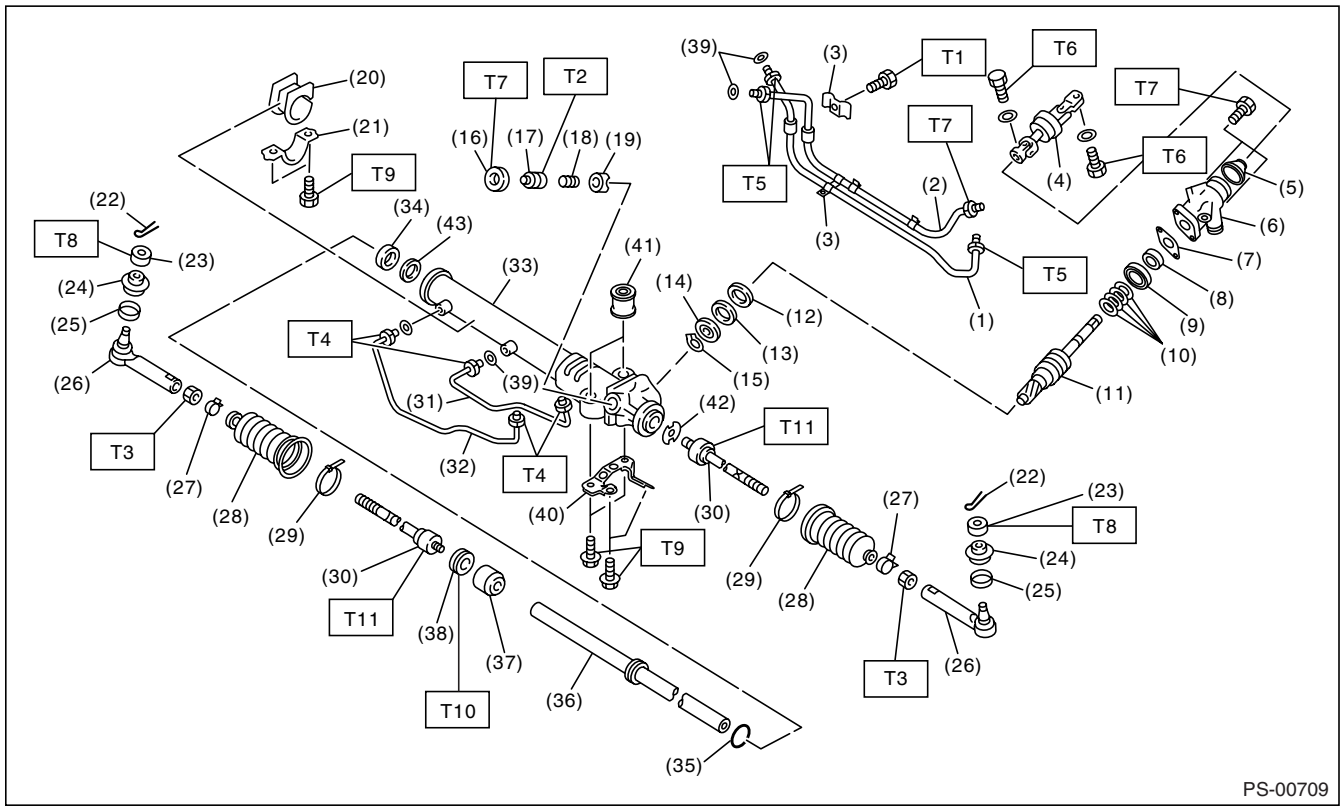
- Hose and tank (H6 model)



(1) Eye bolt
(2) Hose
(3) Eye bolt gasket
(4) Clip
(5) Clamp E
(6) O-ring
(7) Cap
(8) Reservoir tank
(9) Pulley
(10) Oil pump
(11) Suction hose
(12) Cooler pipe
(13) Return hose
(14) Return pipe
(15) Return hose
(16) Hose bracket A
(17) Hose bracket B
(18) Hose bracket C
(19) Hose bracket D

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*7.4 (0.75, 5.4)*
T2:	*10 (1.0, 7.4)*
T3:	*13 (1.3, 9.6)*
T4:	*15 (1.5, 10.8)*
T5:	*18 (1.8, 13.3)*
T6:	*39 (4.0, 28.9)*

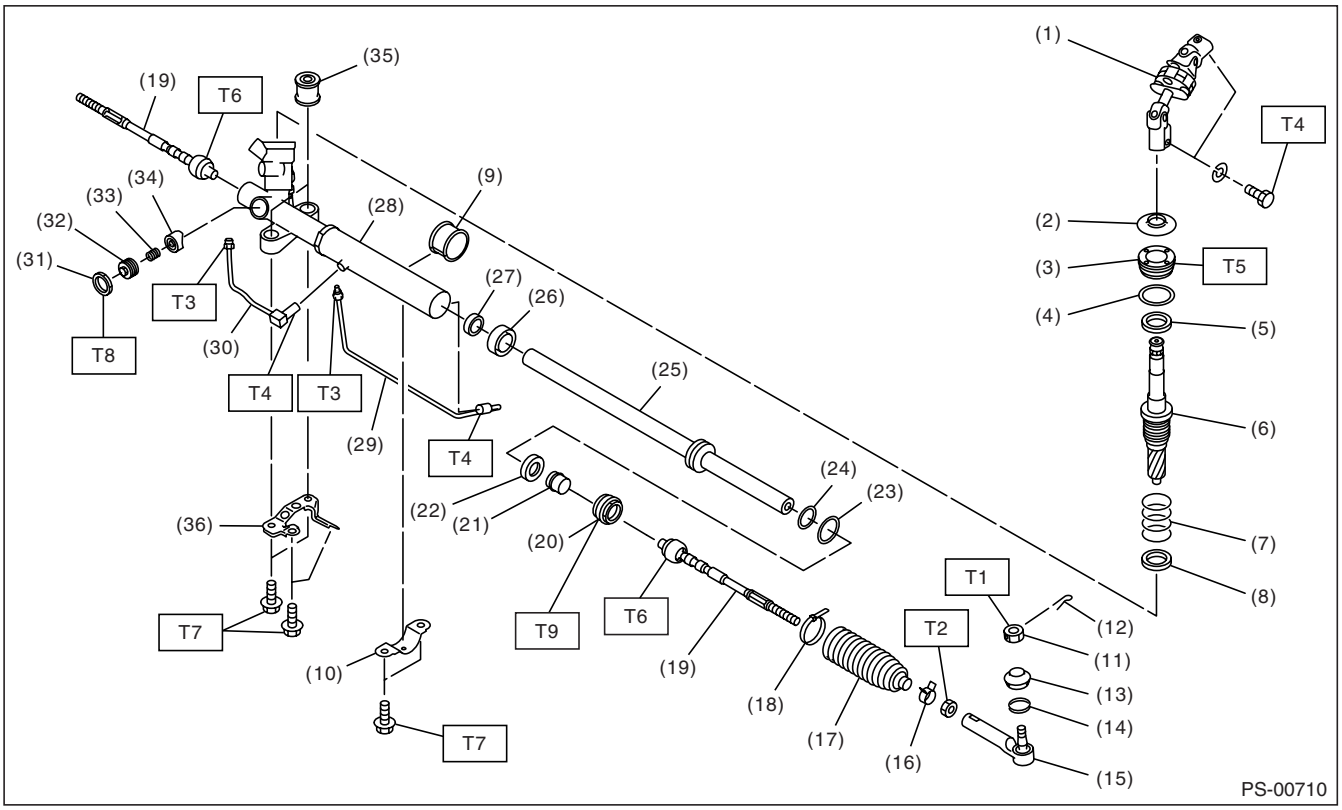
- Gearbox (LHD model)



(1) Pipe C
(2) Pipe D
(3) Clamp plate
(4) Universal joint
(5) Dust seal
(6) Valve housing
(7) Gasket
(8) Oil seal
(9) Bushing
(10) Seal ring
(11) Pinion & valve ASSY
(12) Oil seal
(13) Back-up washer
(14) Ball bearing
(15) Snap ring
(16) Lock nut
(17) Adjusting screw
(18) Spring
(19) Sleeve
(20) Adapter
(21) Clamp
(22) Cotter pin
(23) Castle nut
(24) Dust cover
(25) Clip
(26) Tie-rod end
(27) Clip
(28) Boot
(29) Band
(30) Tie-rod
(31) Pipe B
(32) Pipe A
(33) Steering body
(34) Oil seal
(35) Piston ring
(36) Rack
(37) Rack bushing
(38) Holder
(39) O-ring
(40) Bracket
(41) Bushing
(42) Lock washer
(43) Back-up washer

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6 (0.6, 4.3)
T2: 3.9 (0.4, 2.9)
T3: 85 (8.7, 62.7)
T4: 13 (1.3, 9.6)
T5: 15 (1.5, 10.8)
T6: 24 (2.4, 17.4)
T7: 25 (2.5, 18.4)
T8: 27 (2.75, 19.9)
T9: 60 (6.1, 44.1)
T10: 70 (7.1, 51.6)
T11: 78 (8.0, 57.9)

- Gearbox (RHD model)

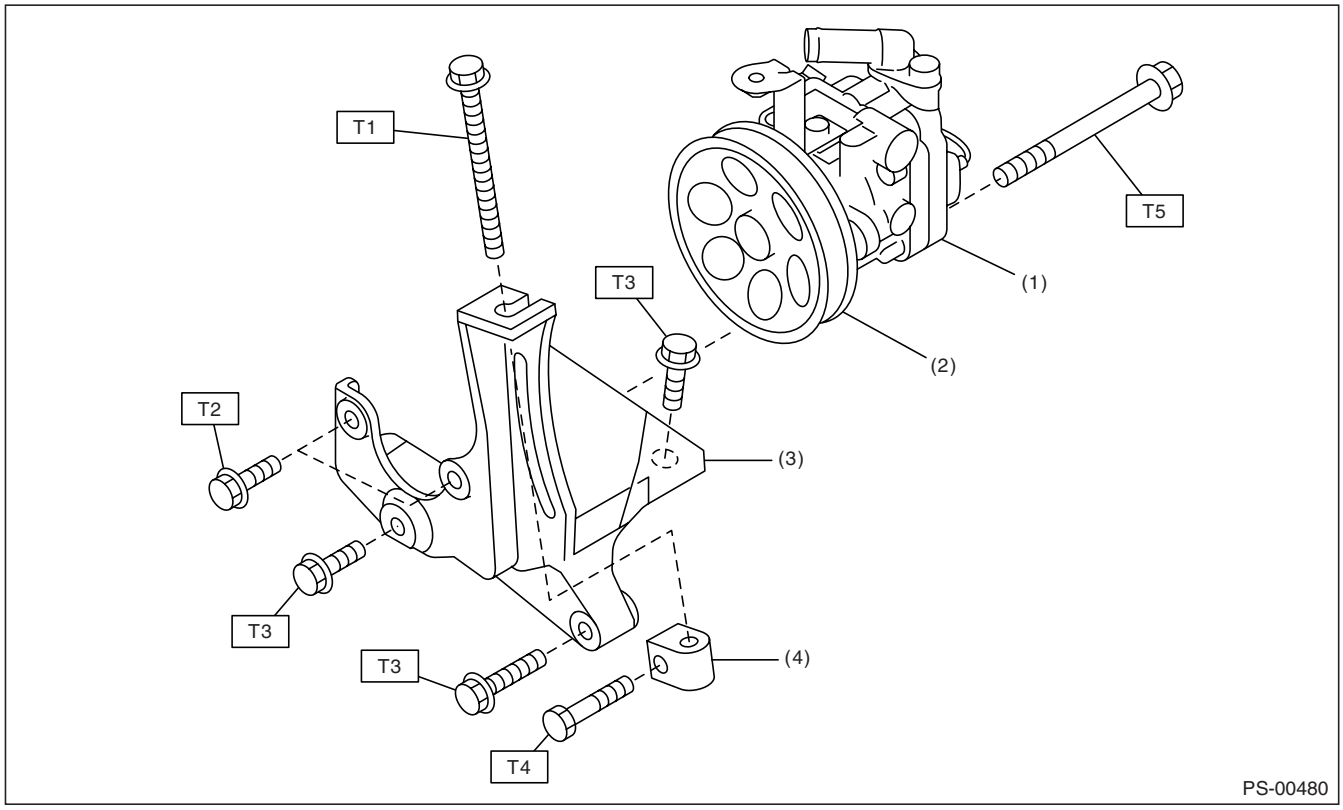


(1) Universal joint
(2) Dust cover
(3) Plug
(4) O-ring
(5) Oil seal
(6) Control valve
(7) Seal ring
(8) Oil seal
(9) Adapter
(10) Clamp
(11) Castle nut
(12) Cotter pin
(13) Dust seal
(14) Clip
(15) Tie-rod end
(16) Clip
(17) Boot
(18) Band
(19) Tie-rod
(20) Holder (Turbo, 3.0 R model)
(21) Bushing
(22) Oil seal
(23) Oil seal
(24) O-ring
(25) Rack
(26) Oil seal
(27) Back-up washer
(28) Steering body
(29) Pipe A
(30) Pipe B
(31) Lock nut
(32) Adjusting screw
(33) Spring
(34) Sleeve
(35) Bushing
(36) Bracket
(37) Holder (Except for turbo, 3.0 R model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 27 (2.75, 19.9)
T2: 85 (8.7, 62.7)
T3: 20 (2.0, 14.5)
T4: 24 (2.4, 17.4)
T5: 64 (6.5, 47.0)
T6: 90 (9.2, 66.4)
T7: 60 (6.1, 44.1)
T8: 39 (4.0, 28.9)
T9: 75 (7.6, 55.3)

3. OIL PUMP

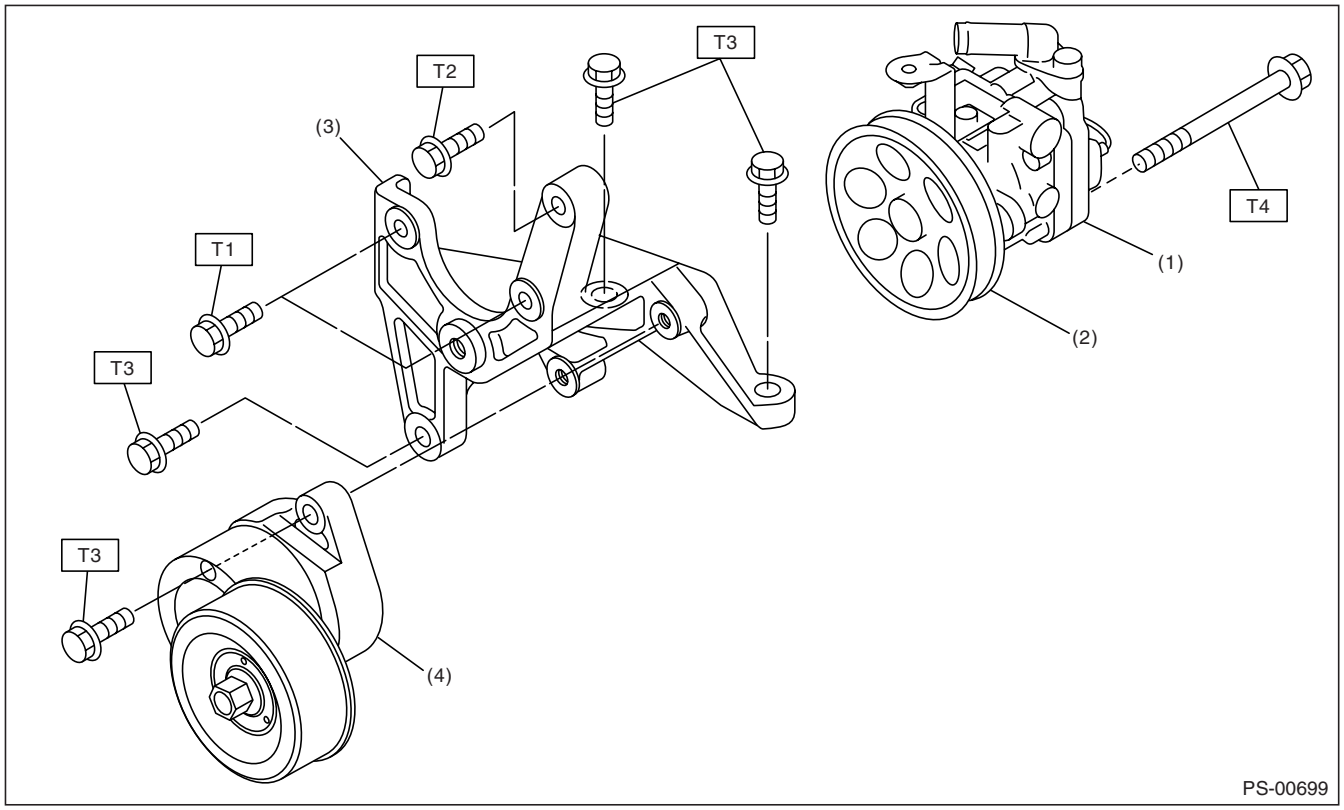
- H4 model



(1) Oil pump
(2) Pulley
(3) Bracket
(4) Belt tension nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 15.7 (1.6, 11.6)
T3: 22 (2.2, 15.9)
T4: 25 (2.5, 18.4)
T5: 37.3 (3.8, 27.5)

• H6 model



(1) Oil pump
(2) Pulley
(3) Bracket
(4) Belt tensioner

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15.7 (1.6, 11.6)
T2: 25 (2.5, 18.4)
T3: 33 (3.4, 24.3)
T4: 37.3 (3.8, 27.5)

C: CAUTION

• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Use SUBARU genuine power steering fluid, grease etc. or the equivalent.Do not mix fluid, grease etc. with that of another grade or from other 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.

D: PREPARATION TOOL

1. SPECIAL TOOL

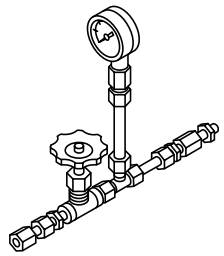
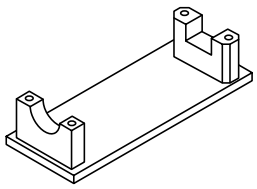
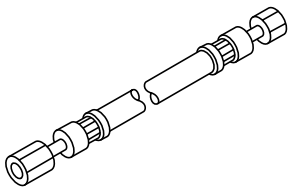
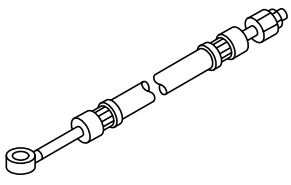
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	• Used when inspecting characteristic of gear-box assembly and disassembling it. • Used with BOSS D (34199AG000).
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).

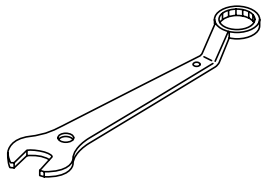
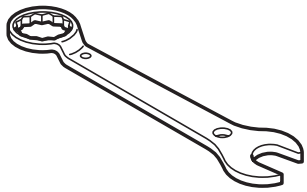
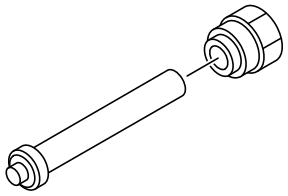
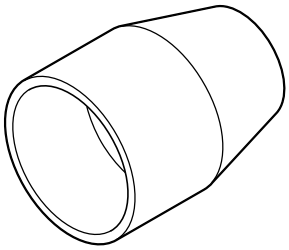
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gearbox.
 ST34099PA100	34099PA100	SPANNER	Used when measuring the rotating resistance of gearbox assembly.
 ST-926420000	926420000	PLUG	Used when fluid leaks from pinion side of gearbox assembly, the pipe B is removed from valve housing, and then this tool is installed to check the fluid leaking point.
 ST-926250000	926250000	GUIDE	• Used for installing holder assembly into rack housing. • Except for turbo and 3.0 R model.

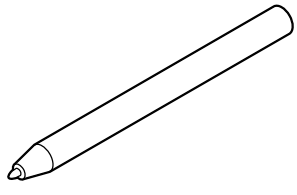
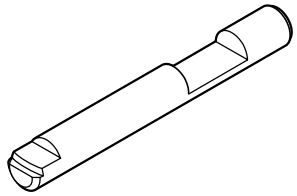
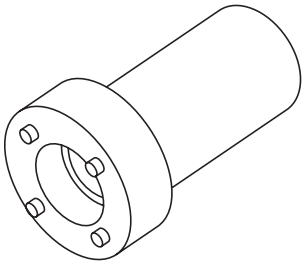
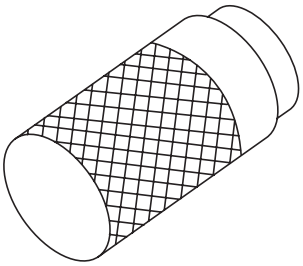
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA060	34099FA060	PUNCH HOLDER	Used for caulking.
 ST34099FA080	34099FA080	PUNCH	• Used for removing caulking. • For RHD model.
 ST34199AE090	34199AE090	PLUG WRENCH	• Used for removing plug. • For RHD model.
 ST34199AE100	34199AE100	OIL SEAL PLUG REMOVER	• Used for removing oil seal plug. • For RHD model.

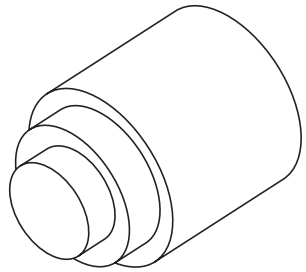
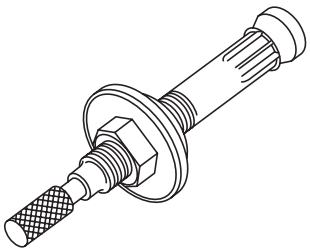
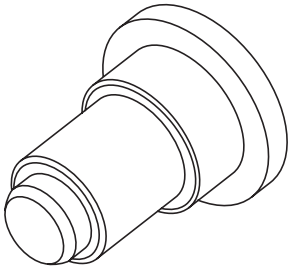
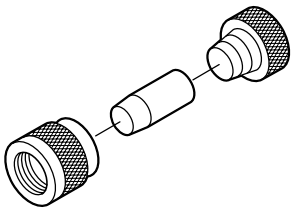
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE110	34199AE110	OIL SEAL PLUG INSTALLER	• Used for installing oil seal plug. • For RHD model.
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	• Used for removing gearbox oil seal. • For RHD model.
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	• Used for installing gearbox oil seal. • For RHD model.
 ST34199FE040	34199FE040	INSTALLER A, B, C	• Used for installing oil seal to rack assembly. • For turbo and 3.0 R model.

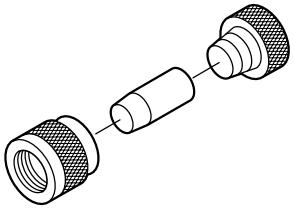
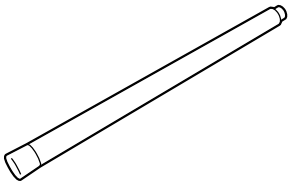
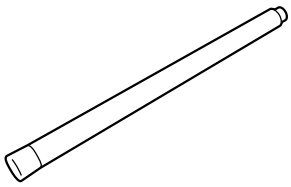
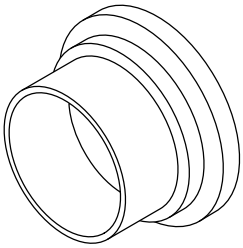
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927490000	927490000	INSTALLER A, B, C	• Used for installing oil seal to rack assembly. • Except for turbo and 3.0 R model.
 ST34199FE010	34199FE010	REMOVER	• Used for removing back-up ring and oil seal. • For turbo and 3.0 R model.
 ST-927580000	927580000	REMOVER	• Used for removing back-up ring and oil seal. • Except for turbo and 3.0 R model.
 ST34199FE050	34199FE050	GUIDE	• Used for installing rack and seal into housing assembly. • For turbo and 3.0 R model.

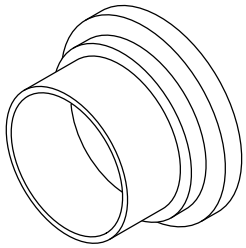
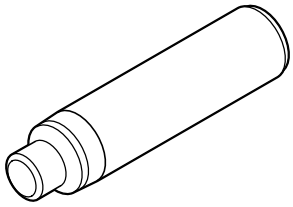
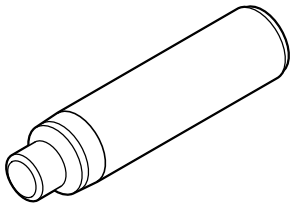
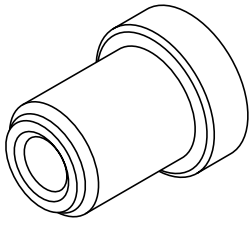
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE000	34199AE000	GUIDE	• Used for installing rack and seal into housing assembly. • Except for turbo and 3.0 R model.
 ST34199FE000	34199FE000	INSTALLER & REMOVER	• Used for removing and installing rack oil seal (outer & inner). • For turbo and 3.0 R model.
 ST34099FA030	34099FA030	INSTALLER & REMOVER	• Used for removing and installing rack oil seal (outer & inner). • Except for turbo and 3.0 R model.
 ST34199FE060	34199FE060	INSTALLER	• Used for installing rack oil seal (outer). • For turbo and 3.0 R model. • For RHD model.

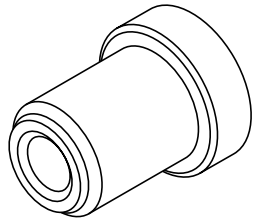
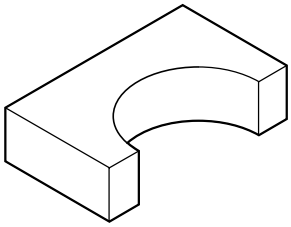
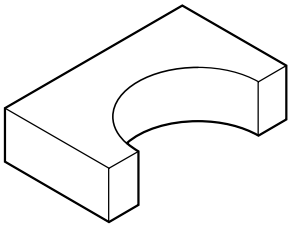
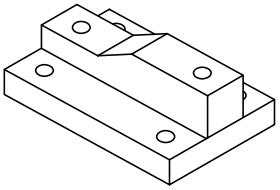
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE010	34199AE010	INSTALLER	• Used for installing rack oil seal (outer). • Except for turbo and 3.0 R model. • For RHD model.
 ST34199FE020	34199FE020	BASE	• Used for support housing assembly. • For turbo and 3.0 R model. • For RHD model.
 ST34099FA070	34099FA070	BASE	• Used for support housing assembly. • Except for turbo and 3.0 R model. • For RHD model.
 ST34199AG000	34199AG000	BOSS D	• Used when inspecting characteristic of gear-box assembly and disassembling it. • Used with STAND (926200000).

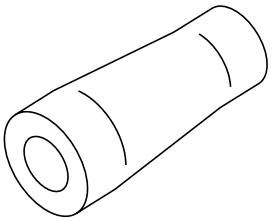
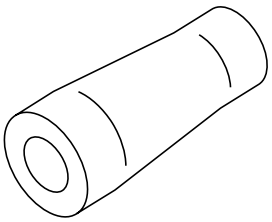
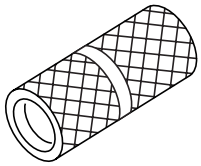
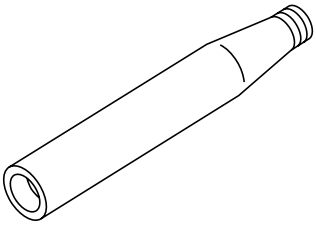
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AG040	34199AG040	GUIDE	• Used for installing seal ring of rack. • For 3.0 R model. • For LHD model.
 ST34199AG030	34199AG030	GUIDE	• Used for installing seal ring of rack. • Except for 3.0 R model. • For LHD model.
 ST34199AG070	34199AG070	FORMER	• Used for forming seal ring of pinion. • For LHD model.
 ST34199AG020	34199AG020	GUIDE	• Used for installing seal ring of pinion. • For LHD model.

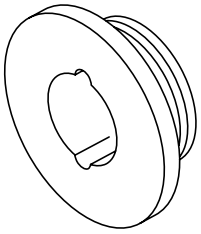
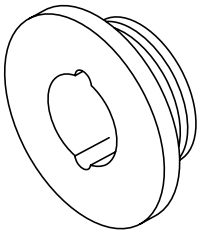
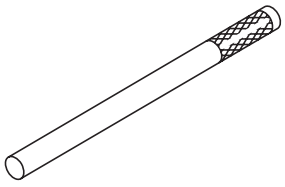
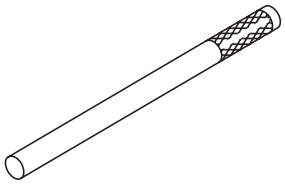
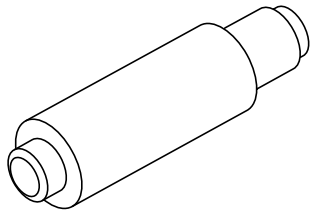
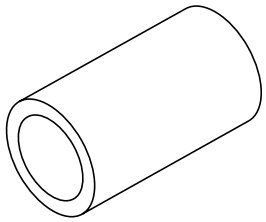
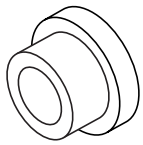
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AG060	34199AG060	GUIDE G (26)	• Used for forming seal ring of rack. • For 3.0 R model. • For LHD model. • Used with FORMER PISTON (34199AG080).
 ST34199AG050	34199AG050	GUIDE G (24)	• Used for forming seal ring of rack. • Except for 3.0 R model. • For LHD model. • Used with FORMER PISTON (34199AG080).
 ST34199AE050	34199AE050	OIL SEAL REMOVER	• Used for removing oil seal. • Except for 3.0 R model. • For LHD model.
 ST34099PA010	34099PA010	OIL SEAL REMOVER	• Used for removing oil seal. • For 3.0 R model. • For LHD model.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AG090	34199AG090	INSTALLER & REMOVER	• Used for installing oil seal of valve housing. • Used with SEAL INSTALLER.(34099FA130) • Used for installing ball bearing of valve housing. • Used for removing oil seal and ball bearing from valve housing. • For LHD model.
 ST34199AG080	34199AG080	FORMER PISTON	• Used for forming seal ring of rack. • For LHD model. • Used with GUIDE G (26) (34199AG060) or GUIDE G (24) (34199AG050).
 ST34199AG010	34199AG010	INSTALLER	• Used for pressing-fit oil seal of gearbox cylinder. • For LHD model.

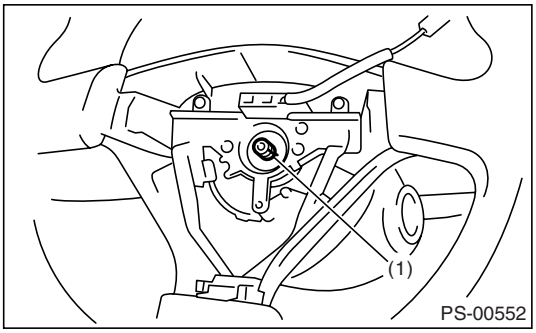
2. Steering Wheel

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tire to the straight-ahead position.
3) Remove the airbag module. <Ref. to AB-16, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-5, CAUTION, General Description.>

4) Place alignment marks on the steering wheel and steering shaft.



(1) Alignment mark

5) Remove the steering wheel nut, and then draw out the steering wheel from shaft using steering puller.

B: INSTALLATION

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-5, CAUTION, General Description.>

1) Align the center of roll connector. <Ref. to AB-25, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align the alignment marks on the steering wheel and steering shaft.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

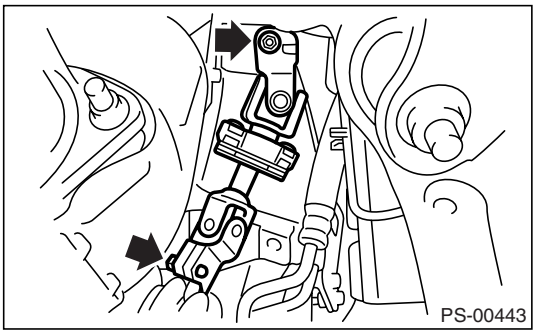
C: INSPECTION

1) Check the steering wheel for deformation. If the deformation is excessive, replace the steering wheel.
2) Check the splines on the steering wheel for damage. If the damage is excessive, replace the steering wheel.

3. Universal Joint

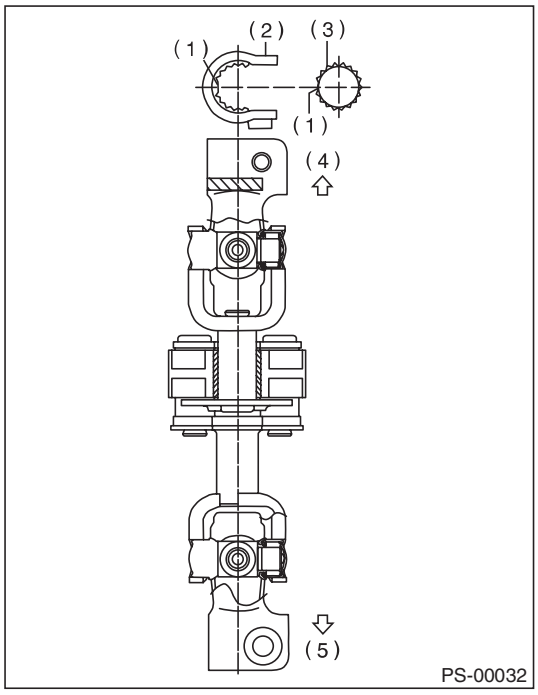
A: REMOVAL

1) Remove the steering wheel. <Ref. to PS-21, REMOVAL, Steering Wheel.>
2) Place alignment marks on universal joint.
3) Remove the universal joint bolts and then remove the universal joint.



B: INSTALLATION

1) Align the cutout at serrated section of the column shaft and yoke, then install the universal joint into column shaft.



(1) Cutout
(2) Yoke
(3) Column shaft
(4) Column shaft side
(5) Gearbox side

2) Install the universal joint to the serrations of gearbox assembly by matching alignment marks.
3) Tighten the bolt.

Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

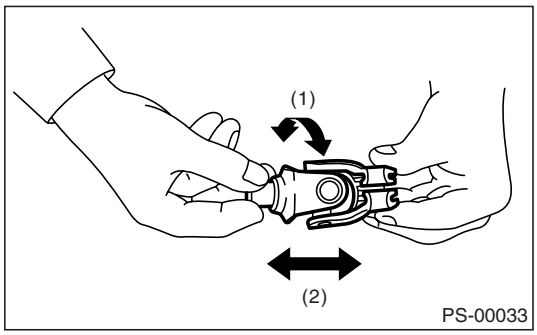
Clearance between coupling of universal joint to turbo cover:
15 mm (0.59 in) or more

4) Align the center of roll connector. <Ref. to AB-25, ADJUSTMENT, Roll Connector.>
5) Install the steering wheel. <Ref. to PS-21, INSTALLATION, Steering Wheel.>

C: INSPECTION

Check for wear, damage or any other faults. If necessary, replace it.

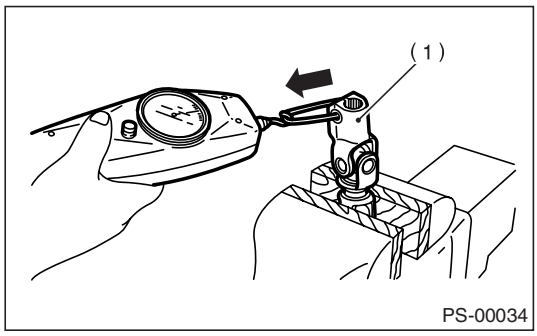
Service limit:
Universal joint play: 0 mm (0 in)
Maximum swing torque: 0.3 N (0.03 kgf, 0.07 lbf)



(1) Swing torque
(2) Play

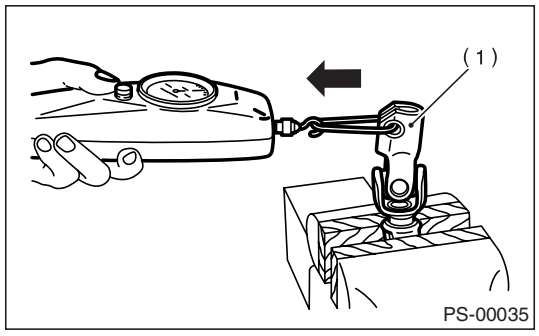
Measure the swing torque of universal joint.

Service limit:
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



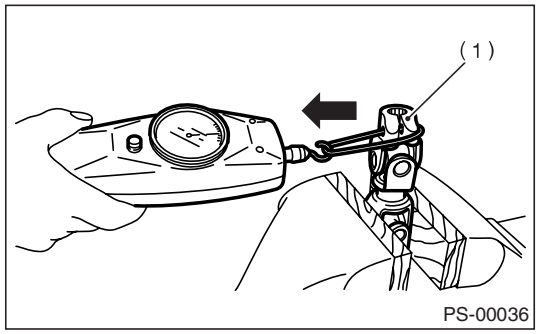
(1) Yoke (Gearbox side)

Service limit:
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



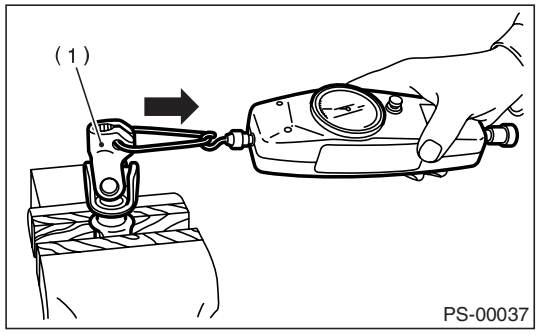
(1) Yoke (Gearbox side)

Service limit:
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

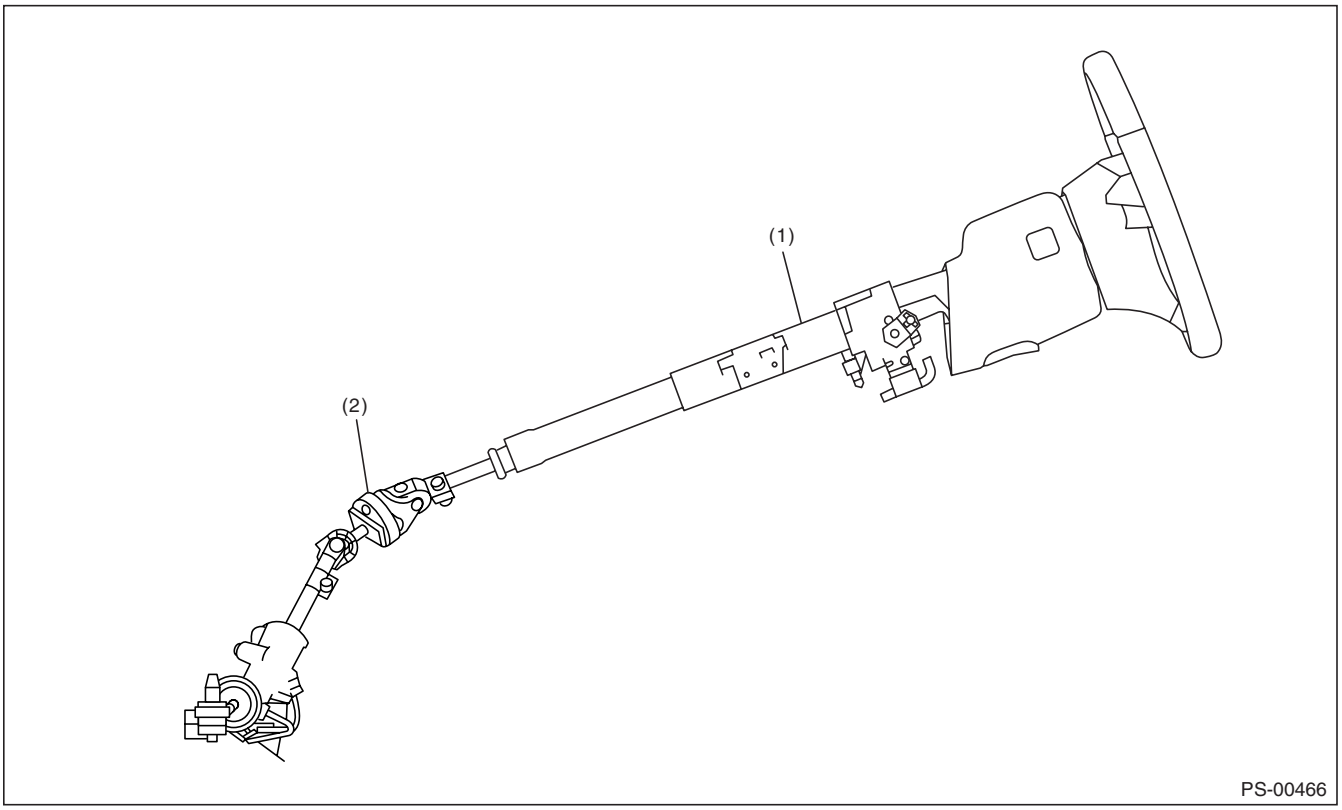
Service limit:
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

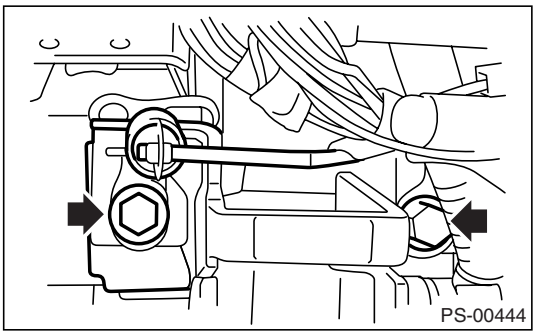
4. Tilt Steering Column

A: REMOVAL



(1) Tilt steering column (2) Universal joint

1) Remove the steering wheel. <Ref. to PS-21, REMOVAL, Steering Wheel.>
2) Remove the universal joint. <Ref. to PS-22, REMOVAL, Universal Joint.>
3) Remove the instrument panel lower cover under.
4) Remove the instrument panel lower cover upper.
5) Remove all connectors from the steering column.
6) Remove the two bolts under instrument panel securing steering column.

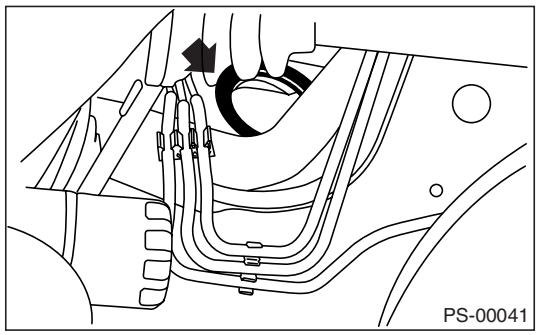


7) Pull out the steering shaft assembly from the hole on toe board.

CAUTION:
• Be sure to remove the universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing of other parts.
• Do not loosen the tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

1) Install the grommet to toe board.



2) Insert the end of steering shaft into toe board grommet.
3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

4) Connect all the connectors under instrument panel.
5) Connect the airbag system connector at the harness spool.

NOTE:
Make sure to apply double lock.

6) Install the instrument panel lower cover with tilt lever held in the lowered position.
7) Install the universal joint. <Ref. to PS-22, INSTALLATION, Universal Joint.>
8) Align the center of roll connector. <Ref. to AB-25, ADJUSTMENT, Roll Connector.>
9) Install the steering wheel. <Ref. to PS-21, INSTALLATION, Steering Wheel.>

CAUTION:
Insert roll connector guide pin into guide hole on lower end of steering wheel surface to prevent damage.

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and the two screws securing combination switch, and then remove the related parts.

D: ASSEMBLY

Insert the combination switch to the upper column shaft, and install the upper column cover. Then route the ignition key harness and combination switch harness between column cover mounting bosses.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

CAUTION:
Do not overtorque the screw.

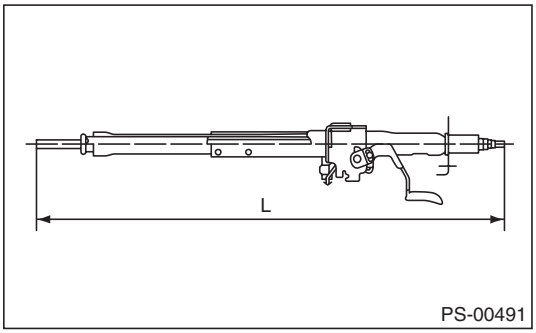
E: INSPECTION

1. BASIC INSPECTION

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

Overall length L:

Specification
Except for OUTBACK model
833.6 $^{+1.3}_{-0.3}$ mm (32.82 $^{+0.051}_{-0.012}$ in)
OUTBACK model
825.4 $^{+1.3}_{-0.3}$ mm (32.50 $^{+0.051}_{-0.012}$ in)



2. AIRBAG SYSTEM INSPECTION

WARNING:
For airbag inspection procedures, refer to "Airbag System". <Ref. to AB-5, CAUTION, General Description.>

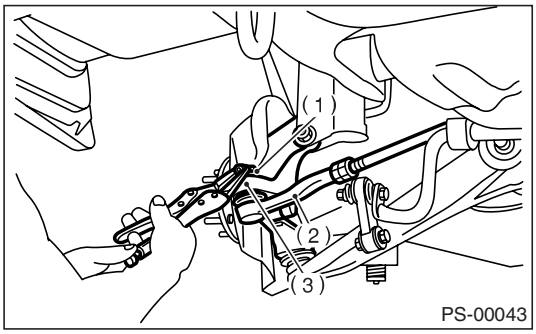
5. Steering Gearbox [LHD Model]

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nuts.
4) Lift-up the vehicle, and remove the front wheels.
5) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
6) Remove the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO 2.0)-6, REMOVAL, Front Exhaust Pipe.>

WARNING:
Be careful, not to burn yourself because the exhaust pipe is hot directly after driving.

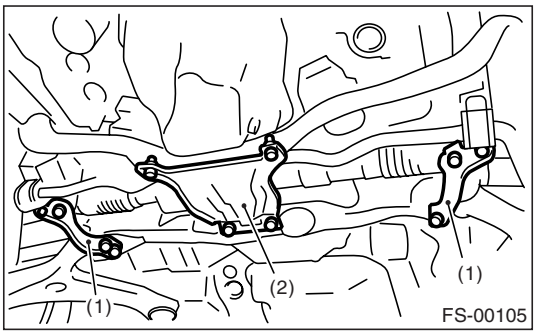
7) Using a puller, remove the tie-rod end from the knuckle arm after pulling off cotter pin and removing castle nut.



(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

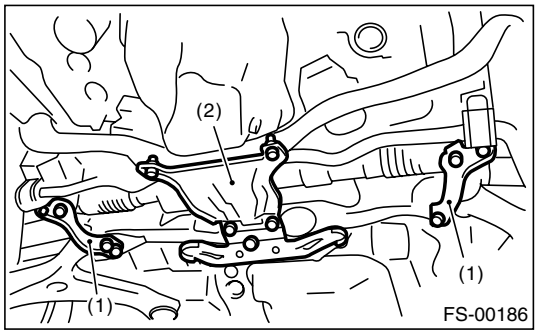
8) Remove the front crossmember support plate, jack-up plate and front stabilizer. <Ref. to FS-15, REMOVAL, Front Stabilizer.>

- Small type



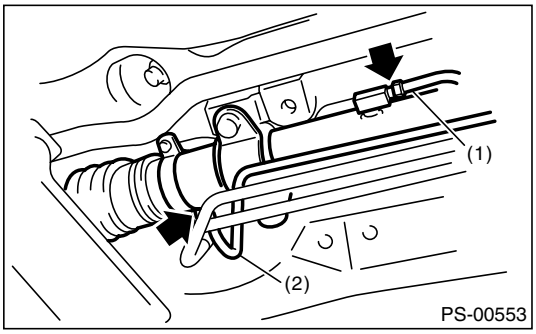
(1) Crossmember support plate
(2) Jack-up plate

- Small type (6MT model)



(1) Crossmember support plate
(2) Jack-up plate

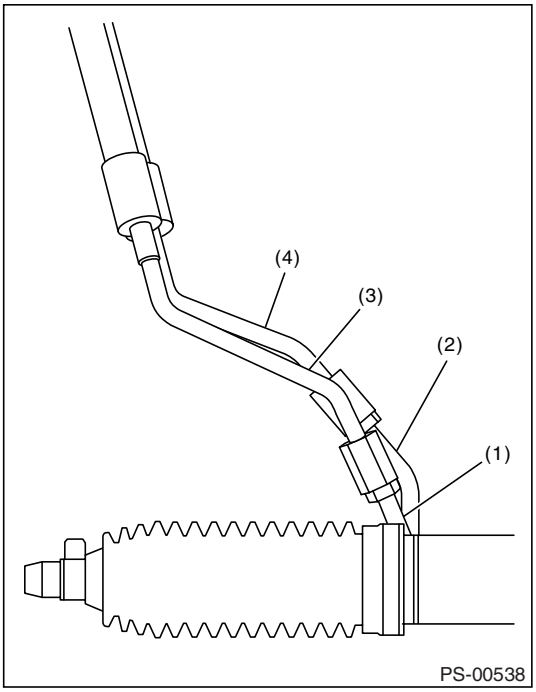
9) Remove the one pipe joint at the center of gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



(1) Pipe A
(2) Pipe B

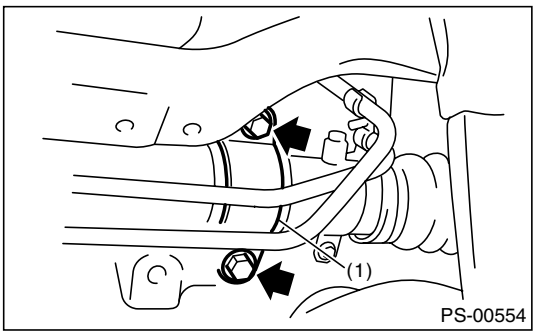
10) Remove the universal joint. <Ref. to PS-22, REMOVAL, Universal Joint.>

11) Disconnect the pipe C from pressure hose first, and pipe D from return hose second.



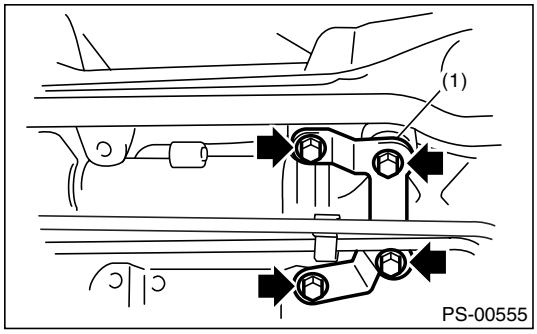
(1) Pipe C
(2) Pipe D
(3) Pressure hose
(4) Return hose

12) Remove the clamp bolts securing gearbox to crossmember, and remove the clamp.



(1) Clamp

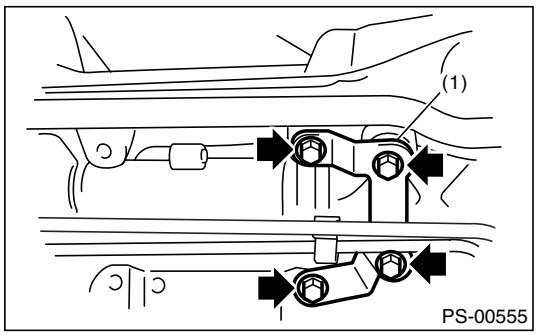
13) Remove the bolts which secure gearbox bracket, and remove the bracket and gearbox.



(1) Bracket

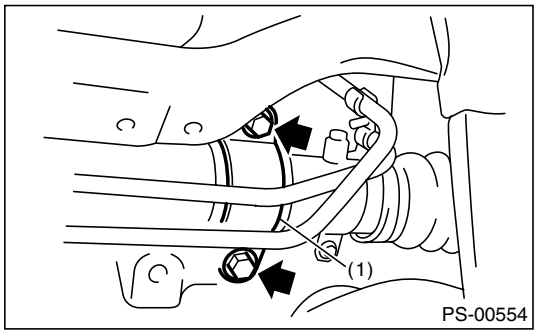
B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage gearbox boot.
2) Install the gearbox and bracket. Tighten the bolt temporarily.



(1) Bracket

3) Tighten the gearbox to the crossmember bracket via clamp with bolt temporarily.



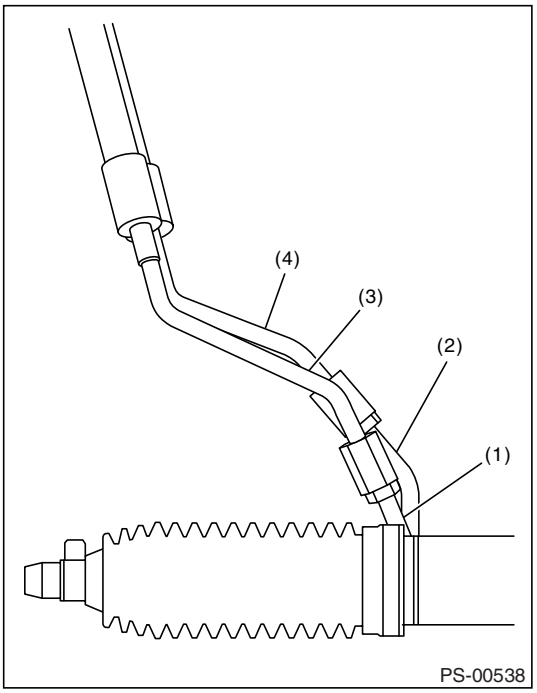
(1) Clamp

4) Tighten the bolts which temporary tightening the clamp and bracket of gearbox to specified torque.

Tightening torque:
60 N·m (6.1 kgf-m, 44.1 ft-lb)

5) Connect the pipe D to return hose first, and the pipe C to pressure hose second.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



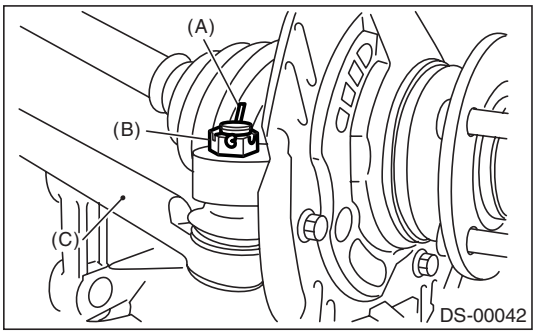
(1) Pipe C
(2) Pipe D
(3) Pressure hose
(4) Return hose

6) Install the universal joint. <Ref. to PS-22, INSTALLATION, Universal Joint.>
7) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

Castle nut tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit cap at the bottom of tie-rod end with hammer.

8) After tightening the castle nut to the specified tightening torque, tighten it further within 60 ° until cotter pin hole is aligned with slot in the nut. Fit the cotter pin into nut, and then bend the pin to lock.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

9) Install the front stabilizer. <Ref. to FS-15, INSTALLATION, Front Stabilizer.>
10) Install the front crossmember support plate and jack-up plate.
11) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO 2.0)-7, INSTALLATION, Front Exhaust Pipe.>
12) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
13) Install the front wheels.
14) Tighten the wheel nuts to the specified torque.

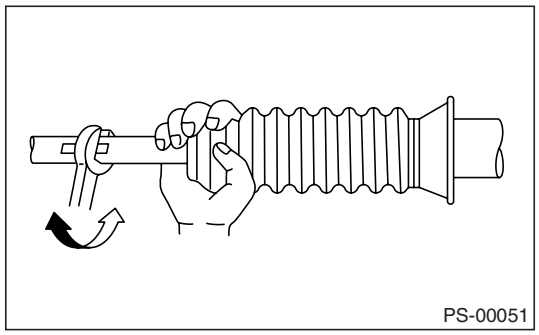
Tightening torque:
90 N·m (9.2 kgf-m, 65.7 ft-lb)

15) Lower the vehicle.
16) Remove the steering wheel. <Ref. to PS-21, REMOVAL, Steering Wheel.>
17) Align the center of roll connector. <Ref. to AB-25, ADJUSTMENT, Roll Connector.>
18) Install the steering wheel. <Ref. to PS-21, INSTALLATION, Steering Wheel.>
19) Connect the ground cable to battery.
20) Pour fluid into the oil tank, and bleed air. <Ref. to PS-91, Power Steering Fluid.>
21) Check for fluid leaks.
22) Check the fluid level in oil tank.

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

Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)

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



C: DISASSEMBLY

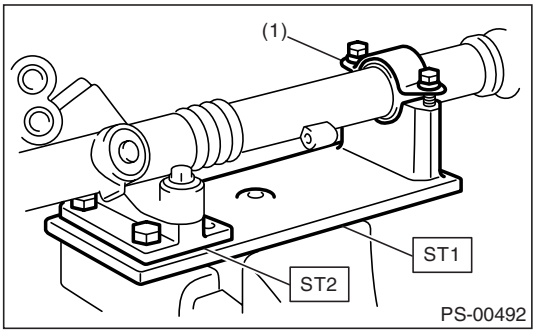
1. RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes C and D, which are fixed to clamp plate, as a unit.

2) Secure the gearbox removed from vehicle in a vise using ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

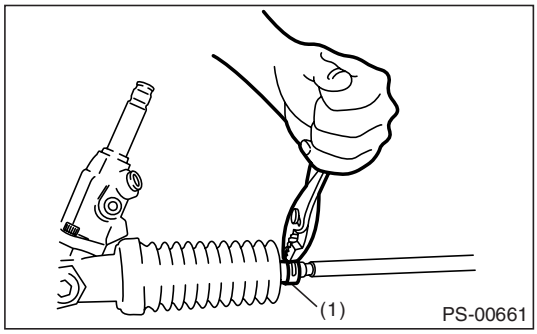
CAUTION:
Secure the gearbox in a vise using ST as shown. Do not secure the gearbox assembly without this ST.



(1) Clamp

3) Remove the tie-rod end and lock nut from gearbox.

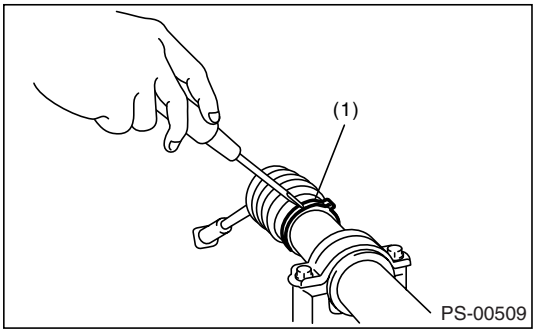
4) Remove the small clip from the boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

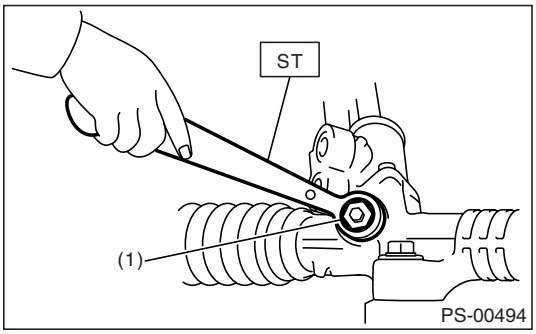
5) Using a flat tip screwdriver, remove the band from boot.

NOTE:
Replace the boot if there is damage, cracks or deterioration.



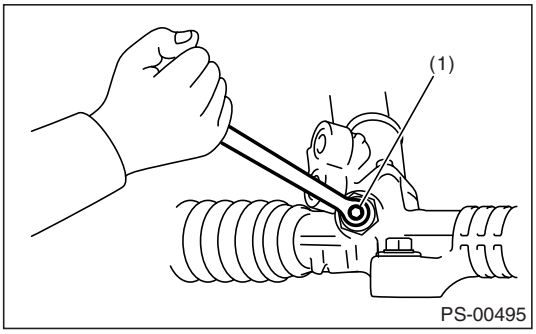
(1) Band

6) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



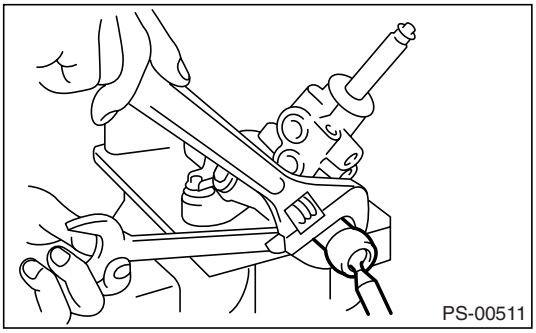
(1) Lock nut

7) Tighten the adjusting screw until it no longer tightens.

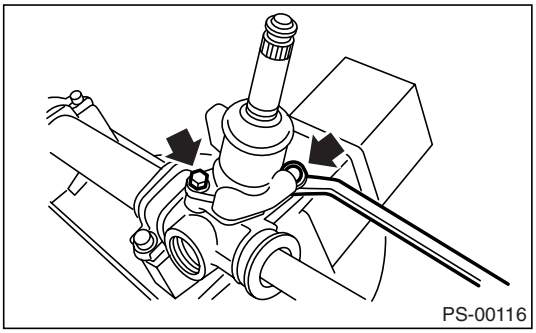


(1) Adjusting screw

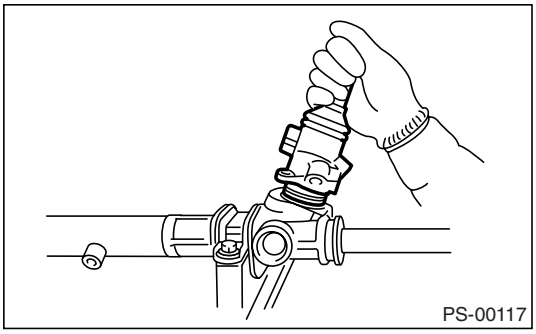
8) While securing the rack with a wrench (22 mm), remove the tie-rod using a wrench (32 mm (1.26 in)) or adjustable wrench.



9) Loosen the adjusting screw and remove the spring and sleeve.
10) Remove the two bolts securing valve assembly.

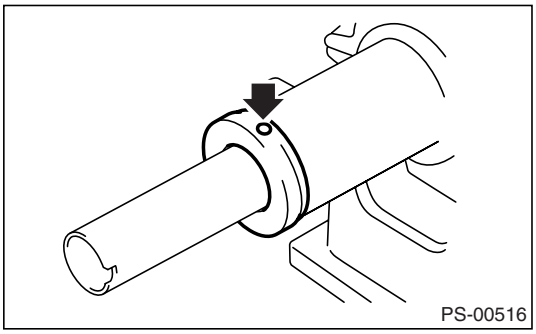


11) Carefully draw out the input shaft and remove the valve assembly.

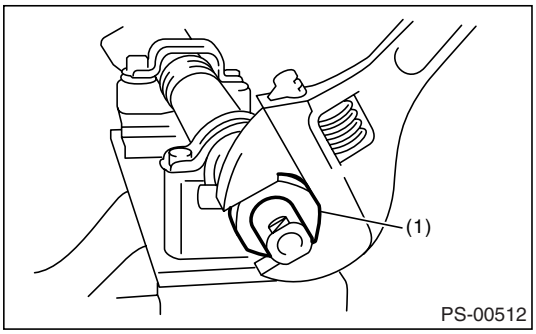


12) Using a drill, release the caulking of holder.

CAUTION:
Make a hole of 2 mm (0.08 in) depth using a drill with 3 mm (0.12 in) diameter.



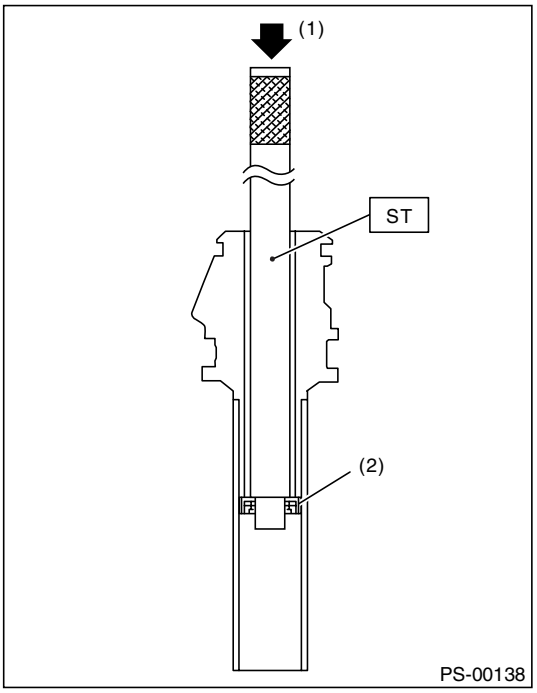
13) Remove the holder using a 36 mm spanner or adjustable wrench.



(1) Holder

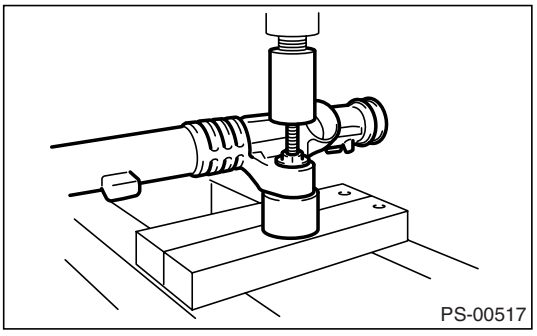
14) Remove the rack bushing and rack stopper from rack assembly.
15) Remove the oil seal from rack.

16) Insert the ST from pinion housing side and remove the oil seal using press.
ST 34099PA010 OIL SEAL REMOVER (3.0 R model)
ST 34199AE050 OIL SEAL REMOVER (Except for 3.0 R model)



(1) Press
(2) Oil seal

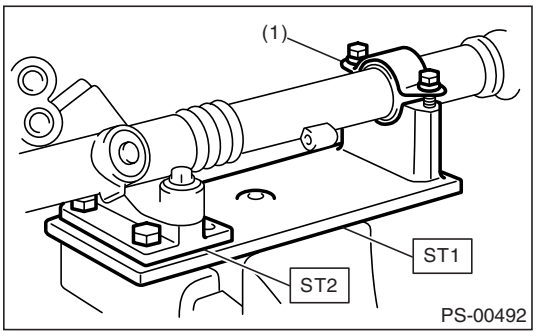
17) Using a press, remove the bushing of gearbox installation portion.



2. CONTROL VALVE

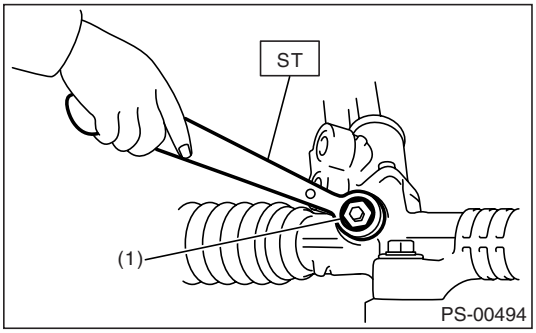
1) Disconnect the pipes A and B from gearbox.
2) Secure the gearbox removed from vehicle in a vise using ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

CAUTION:
Secure the gearbox in a vise using the ST as shown. Do not secure the gearbox assembly without this ST.



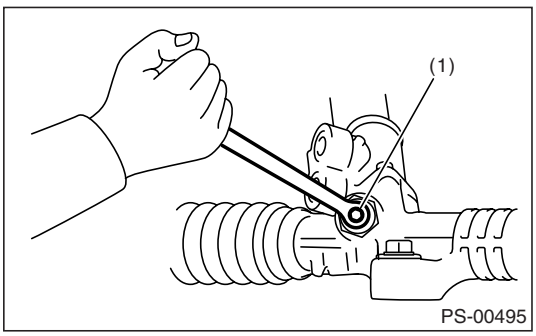
(1) Clamp

3) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



(1) Lock nut

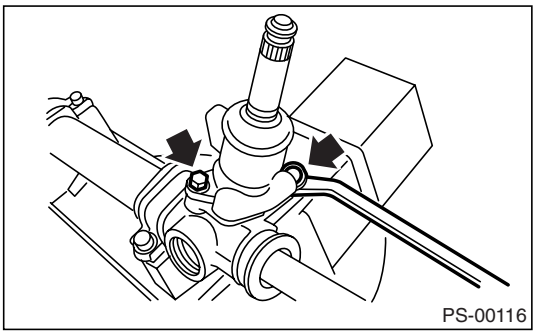
4) Tighten the adjusting screw until it no longer tightens.



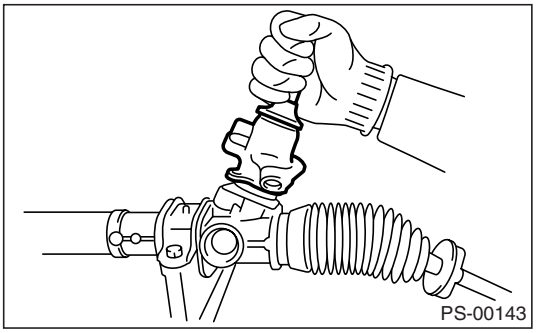
(1) Adjusting screw

5) Loosen the adjusting screw and remove the spring and sleeve.

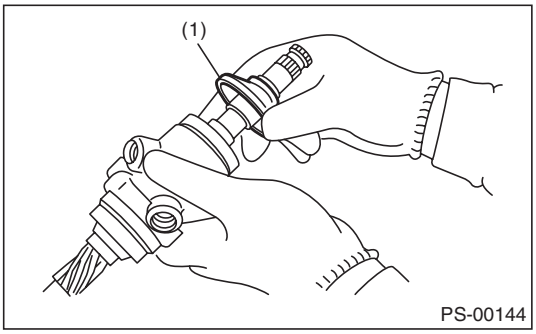
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft and remove the valve assembly.

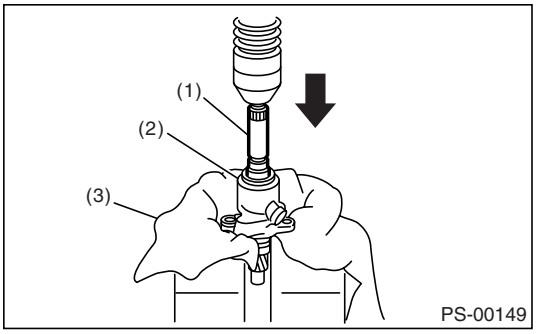


8) Put a vinyl tape around the spline portion, and slide the dust cover to remove.



(1) Dust cover

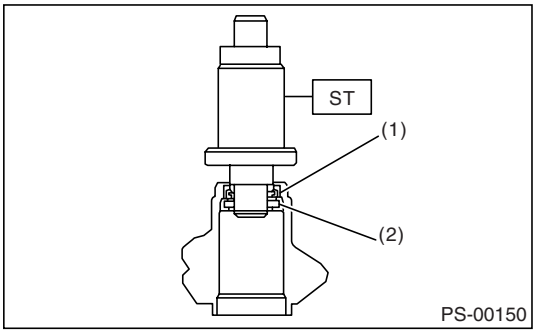
9) Using a press remove the pinion & valve assembly from valve housing.



(1) Pinion & valve ASSY
(2) Valve housing
(3) Cloth

10) Using the ST and a press, remove the bushing and oil seal from the valve housing.
ST 34199AG090 INSTALLER & REMOVER

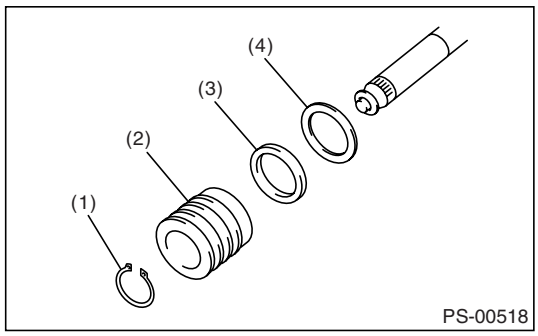
CAUTION:
• Do not apply a force to the end surface of valve housing.
• Do not reuse oil seal after removal.



(1) Oil seal
(2) Bushing

11) Using a snap ring pliers, remove the snap ring, valve, oil seal and back-up washer.

CAUTION:
Be careful not to scratch pinion and valve assembly.

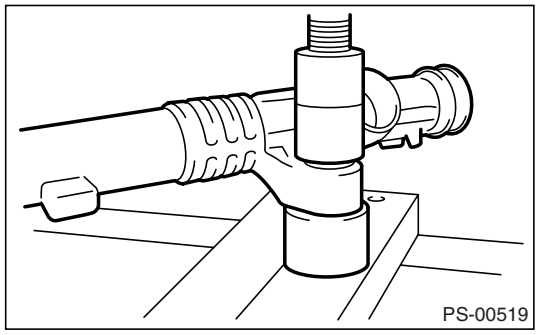


(1) Snap ring
(2) Valve
(3) Oil seal
(4) Back-up ring

D: ASSEMBLY

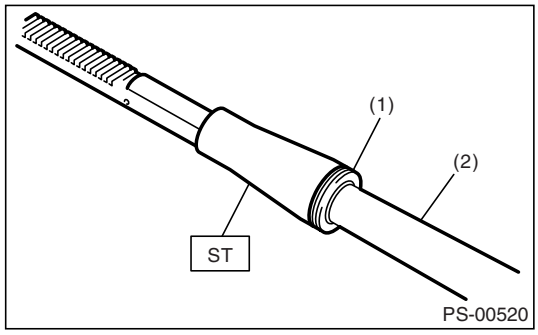
1. RACK HOUSING ASSEMBLY

1) Using a press, install the bushing to gearbox installation portion.



2) Insert the ST to rack.

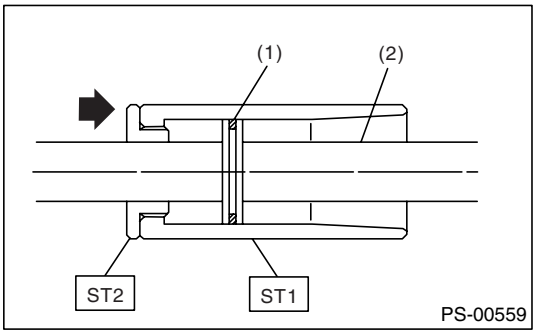
ST 34199AG040 GUIDE (3.0 R model)
ST 34199AG030 GUIDE (Except for 3.0 R model)



(1) Seal ring
(2) Rack

3) Install the seal ring to piston portion of rack.
(1) Using the ST, form the seal ring properly.

ST1 34199AG080 FORMER PISTON
ST2 34199AG060 GUIDE G (26) (3.0 R model)
ST2 34199AG050 GUIDE G (24) (Except for 3.0 R model)

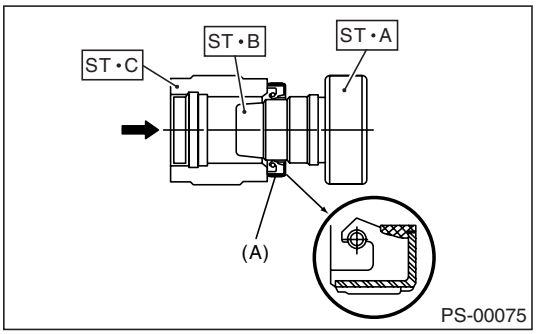


(1) Seal ring
(2) Rack

(2) Using the ST-B and ST-C, install the oil seal to ST-A.

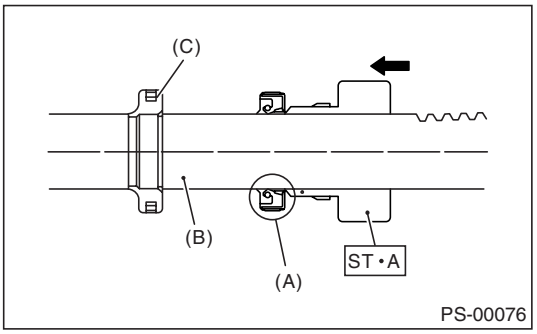
ST 34199FE040 INSTALLER A, B, C (3.0 R model)
ST 927490000 INSTALLER A, B, C (Except for 3.0 R model)

NOTE:
Face the oil seal in the direction as shown in the figure.



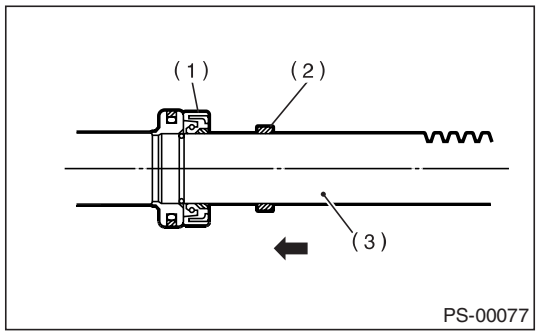
(A) Oil seal

(3) Insert the ST-A with oil seal assembled from the gear side of rack. Remove the oil seal from ST-A near piston, and then remove the ST-A from rack.



(A) Oil seal
(B) Rack
(C) Piston

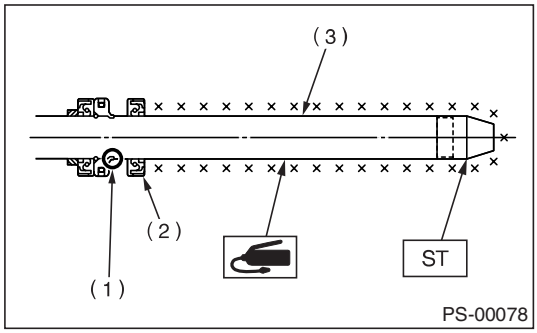
4) Install the back-up washer from the gear side of rack.



(1) Oil seal
(2) Back-up washer
(3) Rack

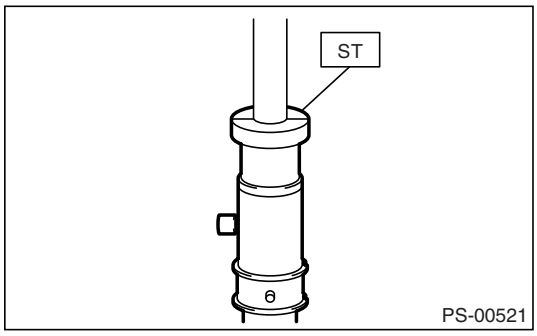
5) Install the ST on rack, equally apply a thin coat of grease to the rack and ST, and then install the oil seal.
ST 926250000 GUIDE

CAUTION:
Be careful not to scratch the oil seal lips with the inner ring section of piston.



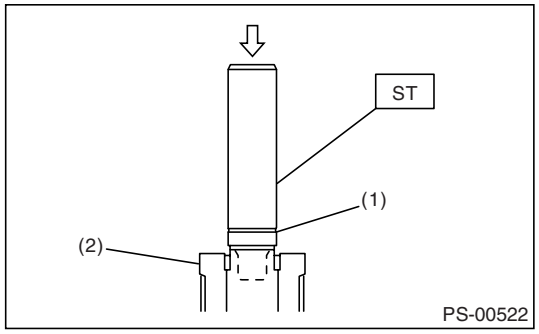
(1) Rack piston inner ring
(2) Outer side oil seal
(3) Rack

6) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Then insert the rack into steering body from cylinder side.
7) Check the threaded end of holder and gearbox cylinder end for burrs, damage and etc. Correct it if faulty.
8) Insert the ST into gearbox cylinder, and then press-fit the oil seal.
ST 34199AG010 INSTALLER



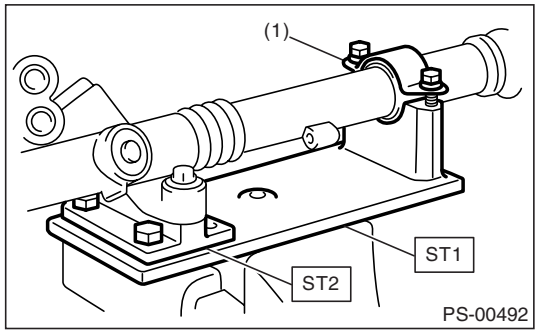
9) Temporarily tighten the holder to gearbox cylinder.
10) Set the ST to the end of rack.
ST 34199FE000 INSTALLER & REMOVER (3.0 R model)
ST 34099FA030 INSTALLER & REMOVER (Except for 3.0 R model)

11) Using a press, press-fit until the groove of ST are aligned to the end surface of holder.



(1) Groove
(2) Holder

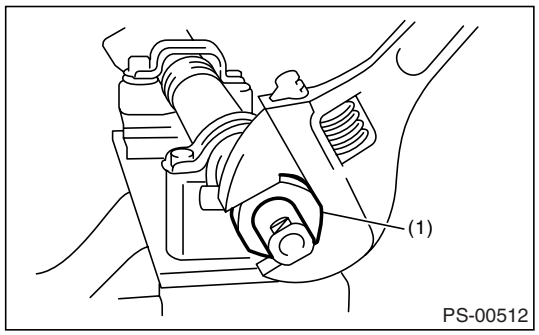
12) Secure the gearbox in a vise using ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D



(1) Clamp

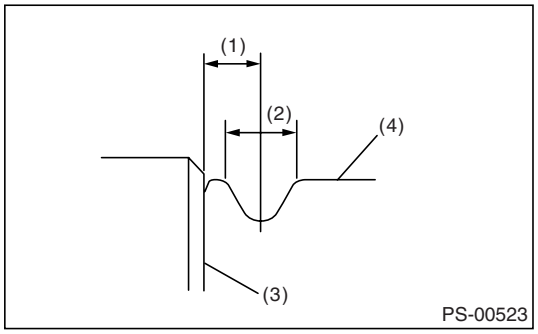
13) Tighten the holder.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



(1) Holder

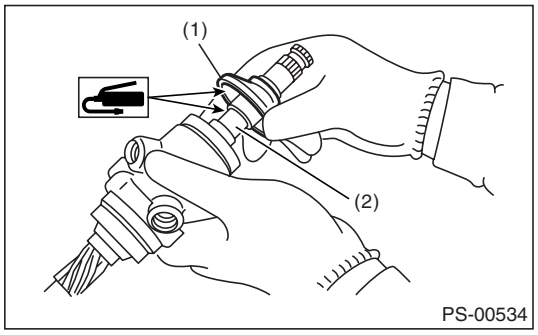
14) Using the ST, caulk so that the diameter of punch hole is 2 — 2.5 mm (0.08 — 0.10 in) and is aligned to the position of 2 mm from gearbox cylinder end surface.
ST 34099FA060 PUNCH HOLDER



(1) 2 mm (0.08 in)
(2) Diameter: 2 — 2.5 mm (0.08 — 0.10 in)
(3) End of cylinder
(4) Holder

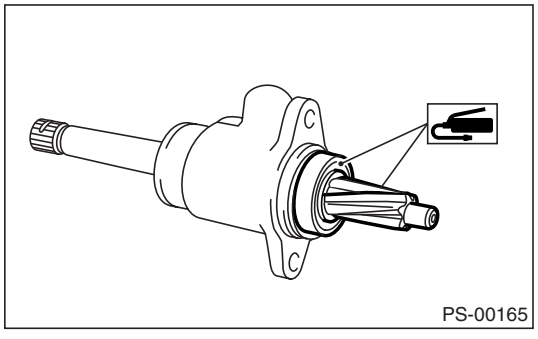
15) Put a vinyl tape around the spline portion and apply genuine grease to the dust cover and install to valve assembly.

CAUTION:
Be sure to install the dust cover to groove of shaft.

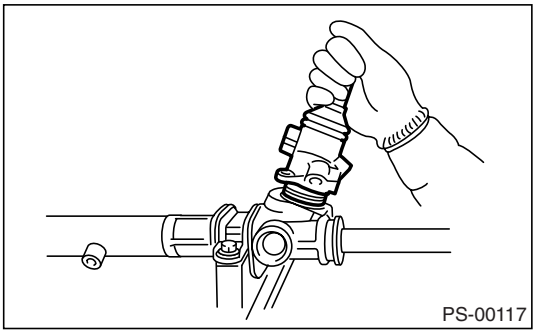


(1) Dust cover
(2) Groove

16) Apply genuine grease to the pinion gear and bearing of valve assembly.



17) Install a new gasket on valve assembly. Insert the valve assembly into place while facing the rack teeth toward pinion.



18) Tighten the bolts alternately to secure the valve assembly.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.

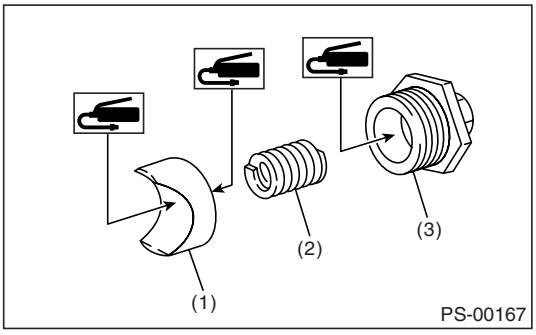
19) Temporarily install the tie-rod to the rack end, and then operate the rack from lock to lock for two or three times to make it fit in. Remove the grease blocking air vent hole.

CAUTION:
If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

20) Apply liquid gasket around the center of adjusting screw threads.

Liquid gasket:
THREE BOND 1141 (Part No. 004403006)

21) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



(1) Sleeve
(2) Spring
(3) Adjusting screw

22) Tighten the adjusting screw to specified torque, then loosen it.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

23) After tightening the adjusting screw with the specified tightening torque, loosen it by 20°.

Tightening torque:
3.9 N·m (0.4 kgf-m, 2.9 ft-lb)

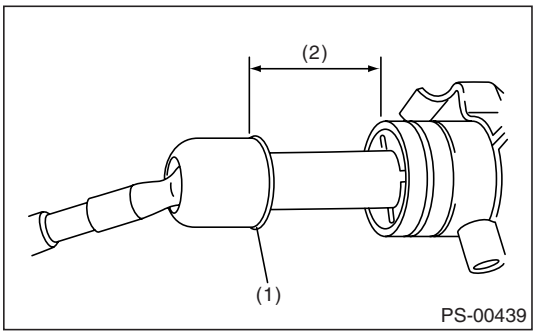
24) Remove the tie-rod.
25) Verify that play is within the specification. <Ref. to PS-43, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].>
26) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
25 N·m (2.5 kgf-m, 18.4 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

27) Extend the rack approx. 40 mm (1.57 in) from steering body.
28) Install the tie-rod and new lock washer into rack.

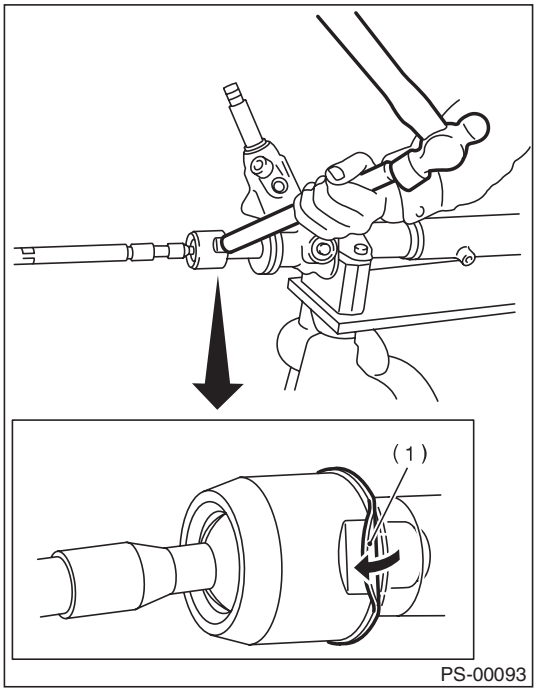
Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



(1) Lock washer
(2) Approx. 40 mm (1.57 in)

29) Bend the lock washer and caulk it.

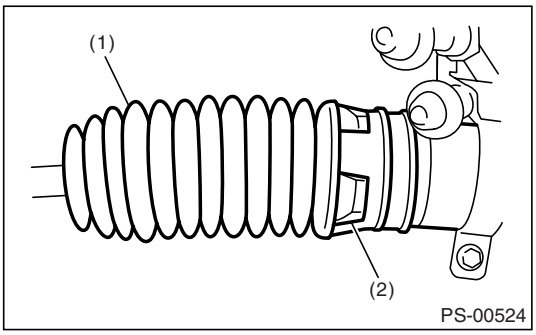
CAUTION:
Be careful not to scratch the rack when caulking lock washer.



(1) Lock washer

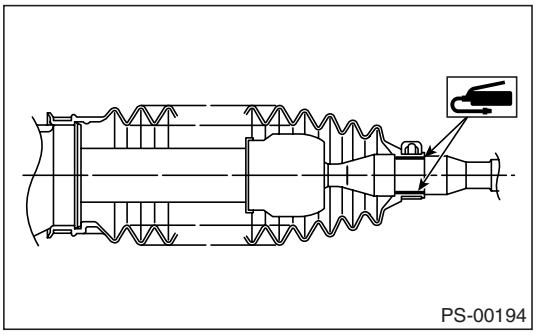
30) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

CAUTION:
Right side boot has groove for identification, be sure to install the right and left of boot.

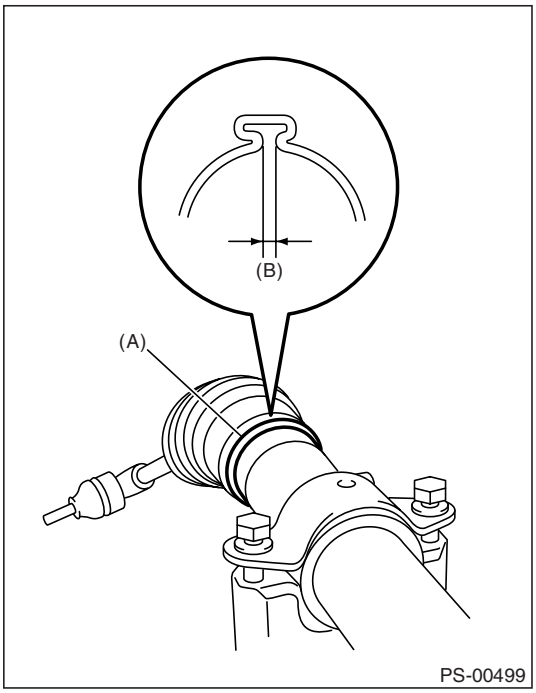


(1) Right side boot
(2) Groove for identification

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.

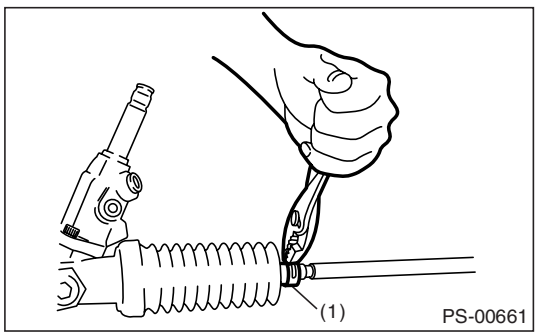


31) Install a new boot band. Using band clamp pliers, caulk it so that the clearance of caulking portion becomes 2 mm (0.079 in) or less.



(A) Boot band
(B) 2 mm (0.079 in) or less

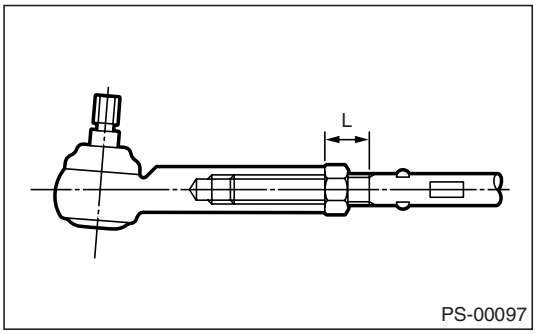
32) Fix the boot end with clip (small).



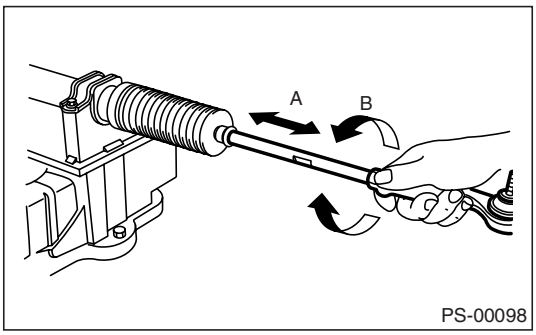
(1) Clip

33) After installing, check the boot end is installed to the groove of tie-rod.
34) If the tie-rod end has been removed, screw in the lock nut and tie-rod end to the screwed portion of tie-rod, and tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:
31 mm (1.22 in)



35) Inspect the gearbox as follows:
"A" Holding tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that the boot is installed in the specified position without deflation.

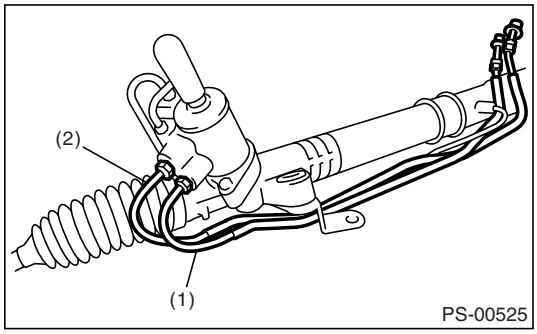


36) Remove the gearbox from ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D
37) Install the four pipes on gearbox.
(1) Connect the pipes A and B to the four pipe joints of gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

(2) Connect the pipes C and D to gearbox.

Tightening torque:
Pipe C: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe D: 25 N·m (2.5 kgf-m, 18.4 ft-lb)

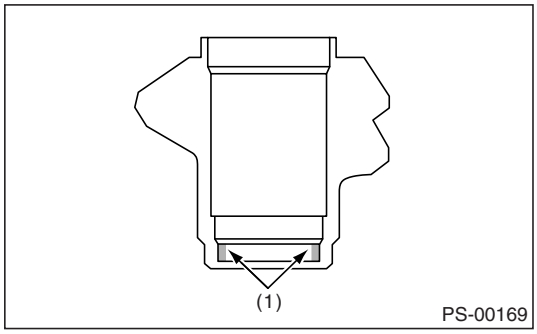


(1) Pipe C
(2) Pipe D

2. CONTROL VALVE ASSEMBLY

Steering grease:
VALIANT GREASE M2 (Part No. 003608001)

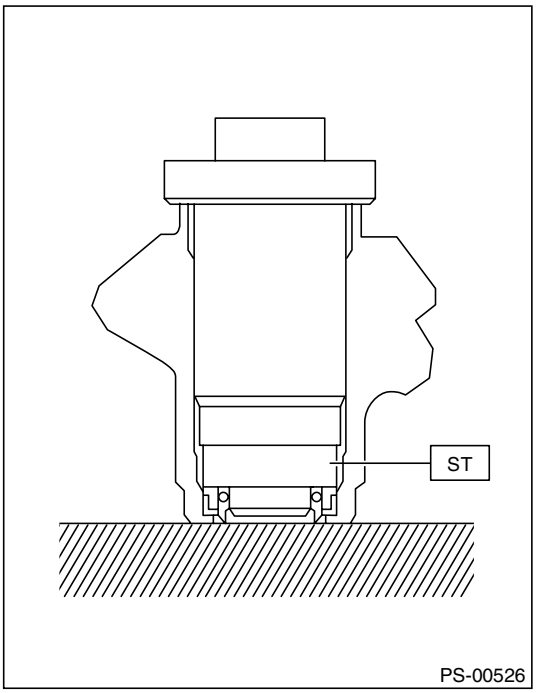
1) Clean all parts and tools before reassembling.
2) Apply a coat of specified power steering fluid to the inner wall of valve housing.



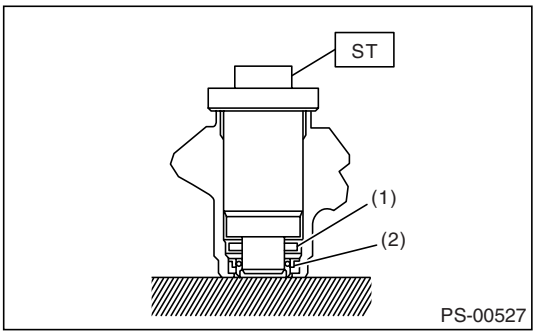
(1) Apply fluid.

3) To avoid scratching oil seal, apply a coat of grease to the contact surface of installer and oil seal.
4) Verify the direction of oil seal. Install the oil seal to installer and position it to valve housing.

5) Press the oil seal into position using press.
ST 34199AG090 INSTALLER & REMOVER



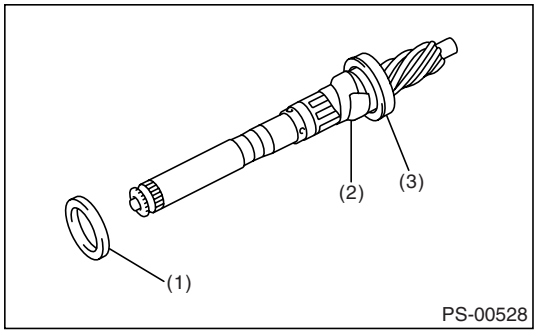
6) Install the bearing to ST and position it to housing. Using the ST and a press, install the special bearing in valve housing.
ST 34199AG090 INSTALLER & REMOVER



(1) Special bearing
(2) Oil seal

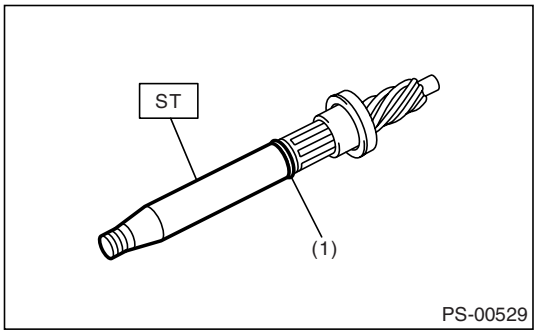
7) Apply vinyl tape to the groove of pinion.

8) Install the back-up ring and oil seal to pinion, and then remove the vinyl tape.



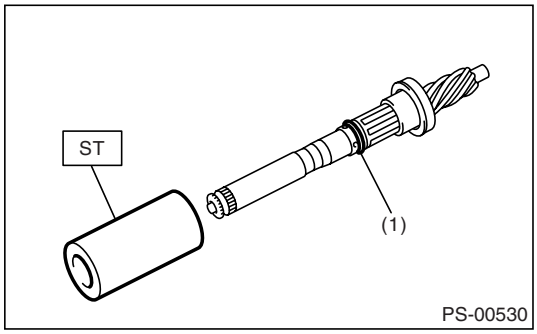
(1) Oil seal
(2) Vinyl tape
(3) Back-up ring

9) Install the ST to pinion, and install the seal ring.
ST 34199AG020 GUIDE



(1) Seal ring

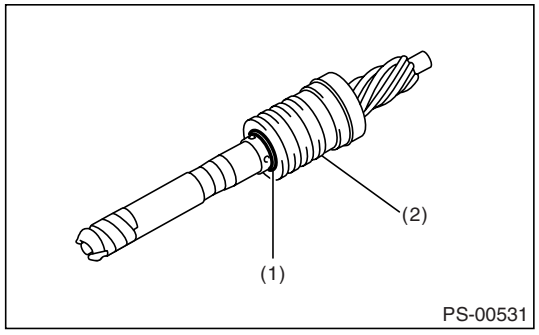
10) Remove the ST GUIDE, and form the seal ring properly using ST FORMER.
ST 34199AG070 FORMER



(1) Seal ring

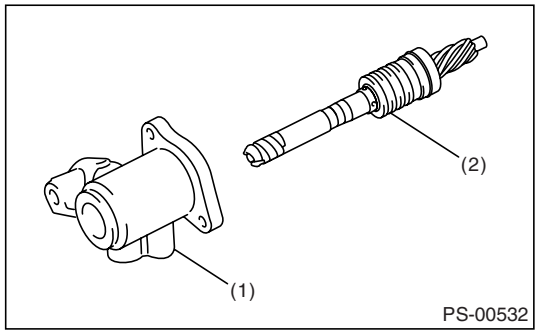
11) Put vinyl tape around pinion shaft spline to protect oil seal from damage.

12) Install the valve to pinion, and install the snap ring.



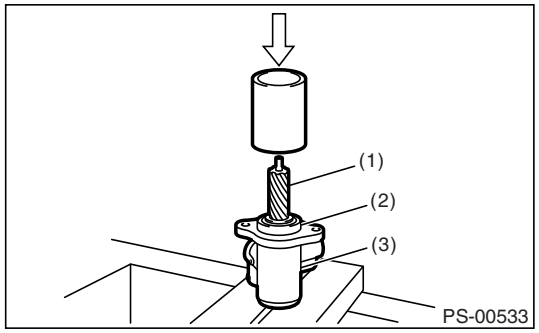
(1) Snap ring
(2) Valve

13) Install the pinion & valve assembly into valve housing.



(1) Valve housing
(2) Pinion & valve ASSY

14) Using a press, push the outer race of bearing and press-fit the pinion & valve assembly into housing.

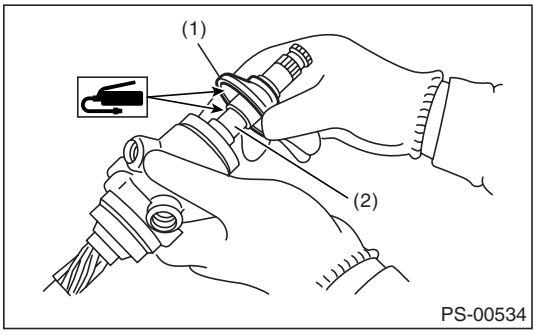


(1) Pinion & valve ASSY
(2) Bearing
(3) Housing

15) Apply the specified grease to dust cover.

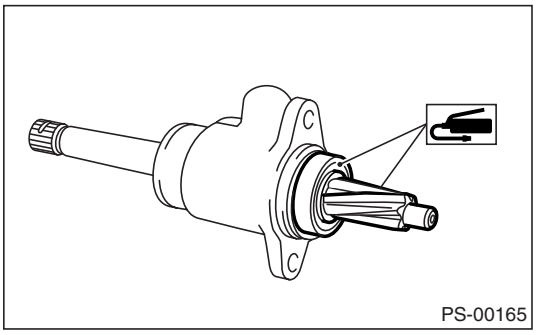
16) Install the dust cover on valve assembly.

CAUTION:
Be sure to install the dust cover to groove of shaft.

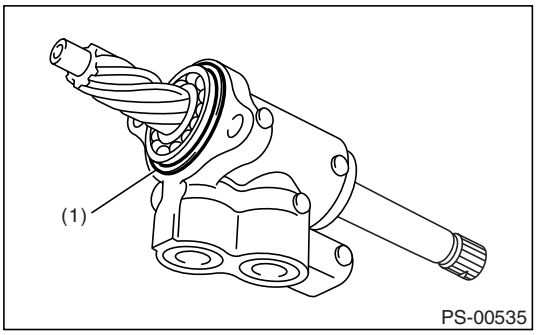


(1) Dust cover
(2) Groove

17) Apply genuine grease to the pinion gear and bearing of valve assembly.

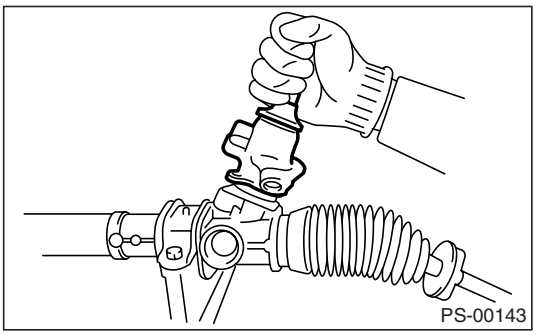


18) Install new O-ring to valve assembly.



(1) O-ring

19) Insert the valve assembly into place while facing the rack teeth toward pinion.



20) Tighten the bolts alternately to secure the valve assembly.

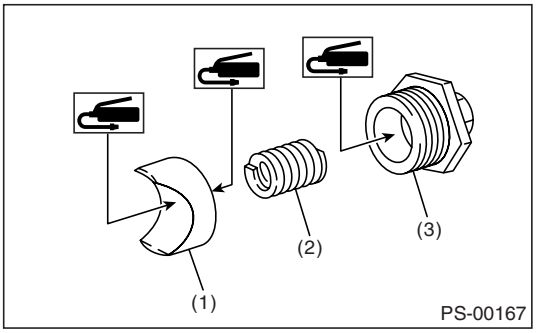
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.

21) Apply liquid gasket around the center of adjusting screw threads.

Liquid gasket:
THREE BOND 1141 (Part No. 004403006)

22) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



(1) Sleeve
(2) Spring
(3) Adjusting screw

23) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

24) After tightening the adjusting screw with the specified tightening torque, loosen it by 20°.

Tightening torque:
3.9 N·m (0.4 kgf-m, 2.9 ft-lb)

25) Verify that play is within the specification. <Ref. to PS-43, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].>
26) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
25 N·m (2.5 kgf-m, 18.4 ft-lb)

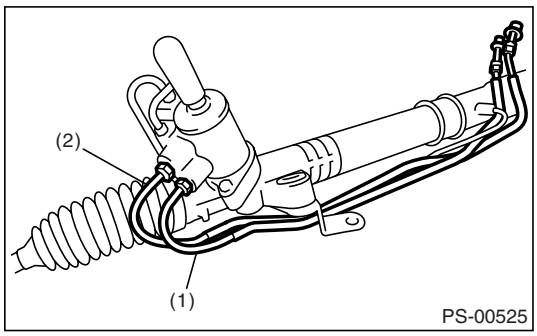
NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

27) Remove the gearbox from ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D
28) Install the four pipes on gearbox.
(1) Connect the pipes A and B to gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

(2) Connect the pipes C and D to gearbox.

Tightening torque:
Pipe C: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe D: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



(1) Pipe C
(2) Pipe D

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage or any other faults, then repair or replace as necessary.
2) When disassembling, check the inside of gearbox for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of gearbox and sliding resistance of rack, check if rack & pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free play of input shaft in radial and axial direction is out of the specified range, replace the gearbox with a new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipe	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT

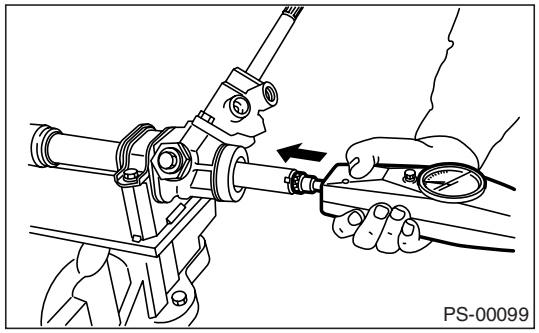
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

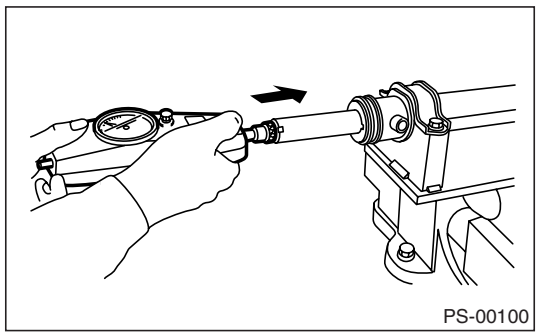
NOTE:
When making a measurement, vise the gearbox using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST1 926200000 STAND
ST2 34199AG000 BOSS D

Sliding resistance of rack shaft:

Service limit
400 N (41 kgf, 90 lbf) or less



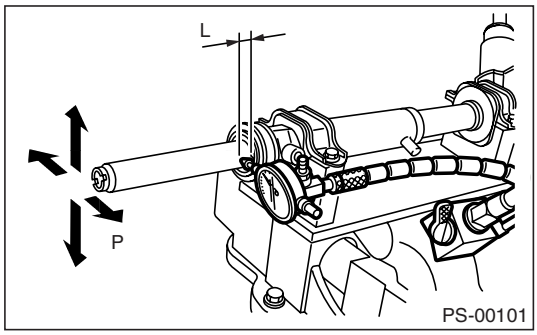


3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

Service limit
0.19 mm (0.0075 in) or less

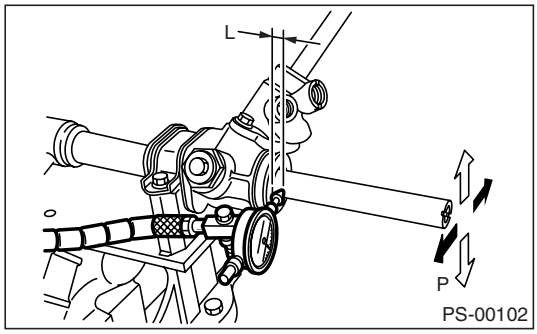
On condition
L: 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lbf)



Left-turn steering:

Service limit
Direction ⇦ ⇨
0.3 mm (0.012 in) or less
Direction ⬅ ➡
0.15 mm (0.0059 in) or less

On condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lbf)

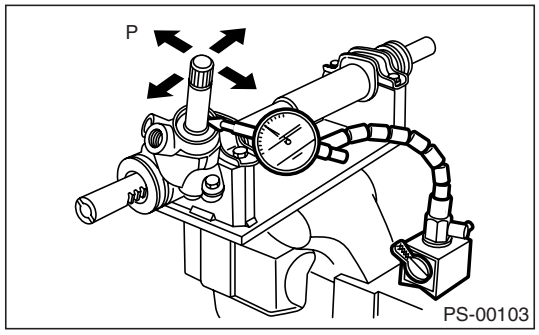


4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

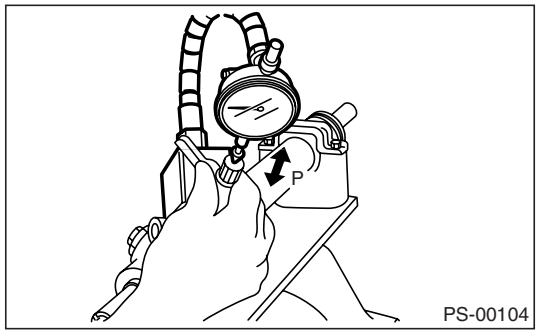
On condition
P: 98 N (10 kgf, 22 lbf)



In axial direction:

Service limit
0.5 mm (0.020 in) or less

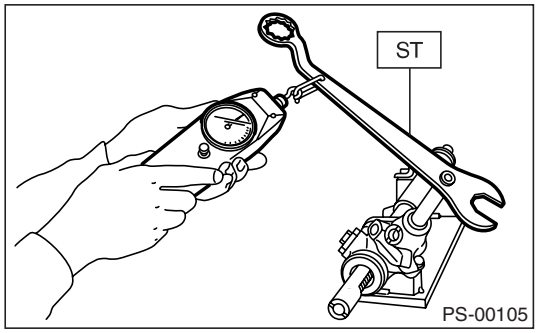
On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)



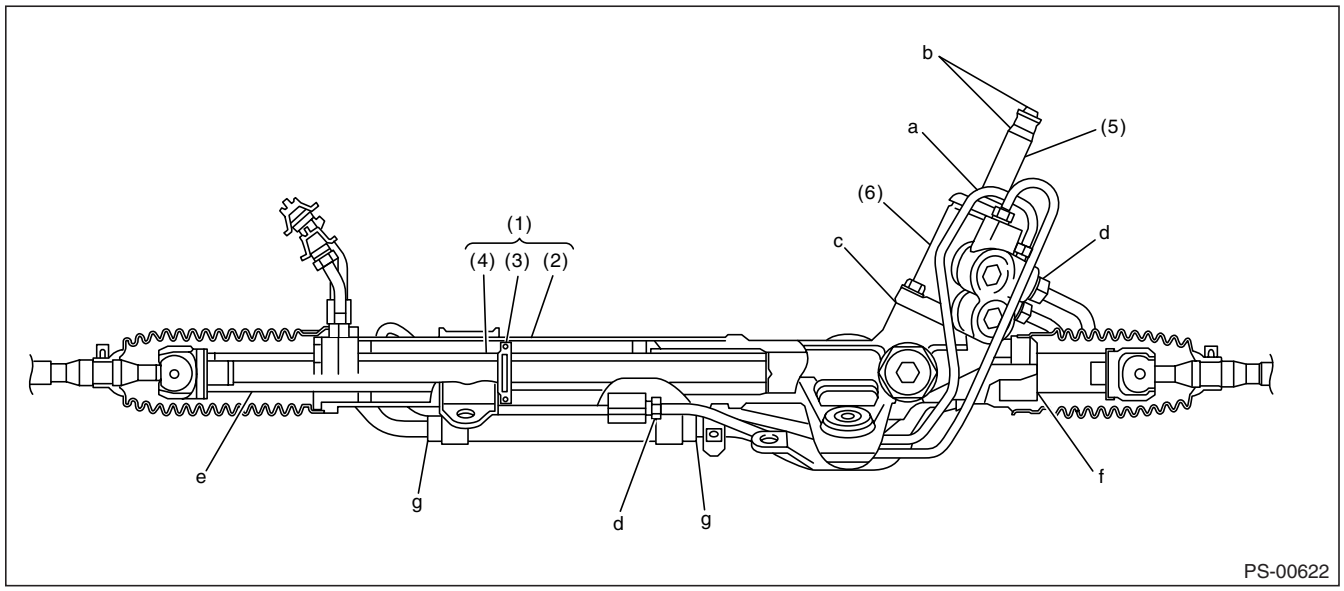
5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit:
Maximum allowable resistance:
10.5 N (1.1 kgf, 2.4 lbf) or less
Difference between right and left turning resistance:
20% or less



6. OIL LEAKAGE



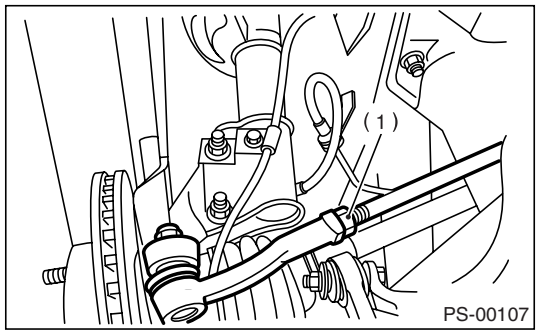
(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

1) Lift-up the vehicle.
2) Even if the location of leak can be easily found by observing leaking condition, it is necessary to thoroughly remove fluid from suspected portion and turn the steering wheel from lock to lock about 30 to 40 times with engine running, then re-inspect the suspected portion immediately after and several hours after this operation.
3) Cause and measure for oil leakage from “a”
The oil seal is damaged. Replace the valve assembly with a new one.
4) Cause and measure for oil leakage from “b”.
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
5) Cause and measure for oil leakage from “c”.
The oil seal is damaged. Replace the valve assembly or oil seal with a new one.
6) Cause and measure for oil leakage from “d”.
The pipe is damaged. Replace the faulty pipe or O-ring.
7) Cause and measure for oil leakage from “g”.
The hose is damaged. Replace the hose with a new one.
8) If leak is other than a, b, c, d or g, or if oil is leaking from gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then re-inspect the leaked portion immediately after and several hours after this operation.
(1) Leakage from “e”
The cylinder seal is damaged. Replace the rack bush with a new one.
(2) Leakage from “f”
There are two possible causes. Perform the following step first. Remove the pipe assembly B from the valve housing, and close the circuit using ST.
ST 926420000 PLUG
Turn the steering wheel from lock to lock 30 to 40 times with the engine running, then inspect the leaked portion immediately after and several hours after this operation.
• If leakage from “f” is noted again:
The oil seal of pinion and valve assembly is damaged. Replace the pinion and valve assembly with a new one. Or replace the oil seal and the parts that are damaged during disassembly with new ones.
• If oil stops leaking from “f”:
The oil seal of rack housing is damaged. Replace the oil seal and parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust the front toe.
<Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



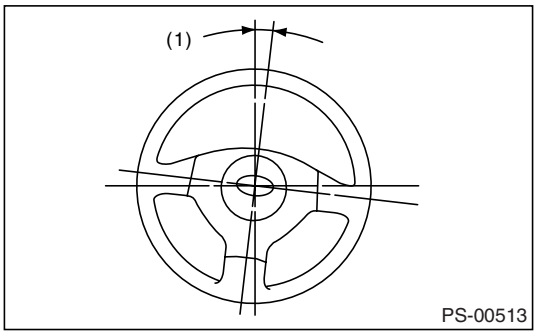
(1) Lock nut

2) Adjust the steering angle of wheels.

Specification of steering angle:

Model	2.0 i, 2.5 i	3.0 R	3.0 R spec. B	OUTBACK
Inner wheel	37.3°±1.5°	37.2°±1.5°	37.1°±1.5°	37.8°±1.5°
Outer wheel	33.0°±1.5°	32.9°±1.5°	32.8°±1.5°	33.5°±1.5°

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



(1) Within 5°

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 each other by the same angle.

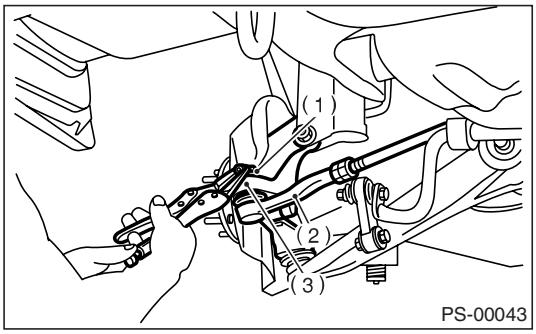
6. Steering Gearbox [RHD Model]

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nuts.
4) Lift-up the vehicle, and remove the front wheels.
5) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
6) Remove the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO 2.0)-6, REMOVAL, Front Exhaust Pipe.>

WARNING:
Be careful, not to burn yourself because the exhaust pipe is hot directly after driving.

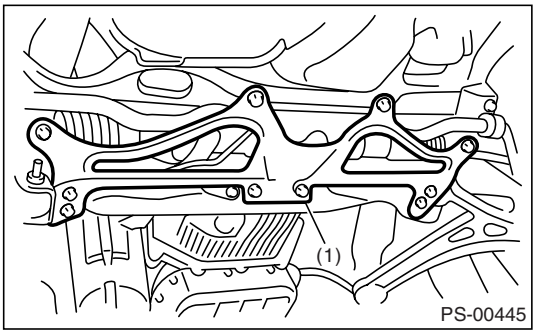
7) Using a puller, remove the tie-rod end from the knuckle arm after pulling off cotter pin and removing castle nut.



(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

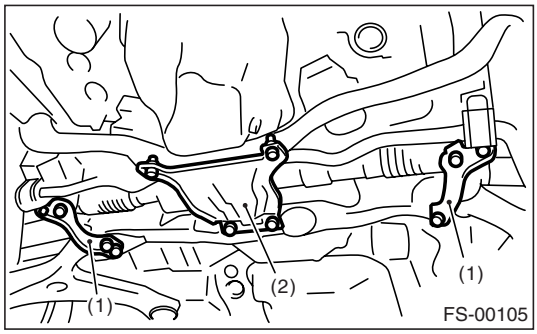
8) Remove the front crossmember support plate, jack-up plate and front stabilizer. <Ref. to FS-15, REMOVAL, Front Stabilizer.>

- Large type



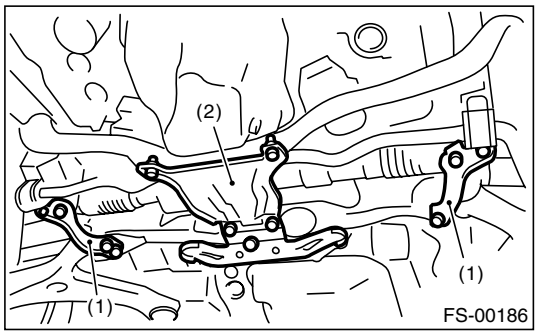
(1) Front crossmember support plate

- Small type



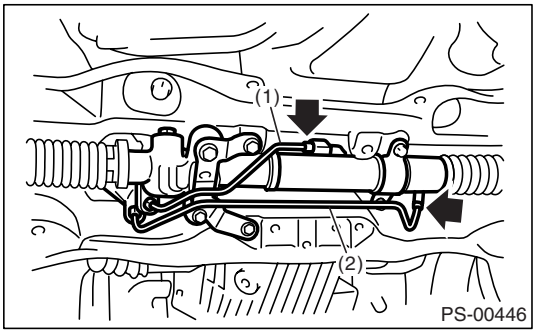
(1) Front crossmember support plate
(2) Jack-up plate

- Small type (6MT model)



(1) Crossmember support plate
(2) Jack-up plate

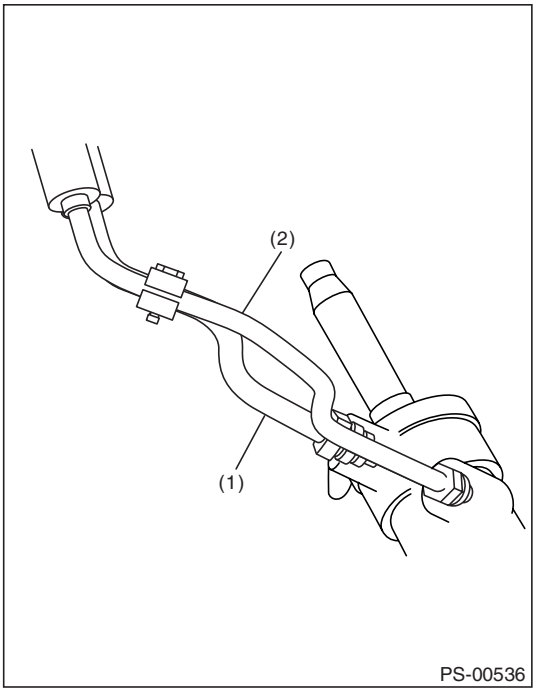
9) Remove one pipe joint at the center of gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



(1) Pipe A
(2) Pipe B

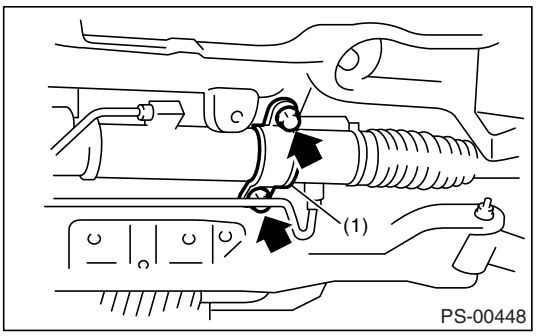
10) Remove the universal joint. <Ref. to PS-22, REMOVAL, Universal Joint.>

11) Disconnect the return hose and pressure hose from gearbox.



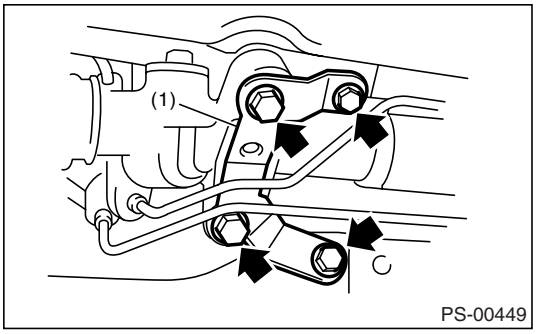
(1) Return hose
(2) Pressure hose

12) Remove the clamp bolts securing gearbox to the crossmember, and remove the clamp.



(1) Clamp

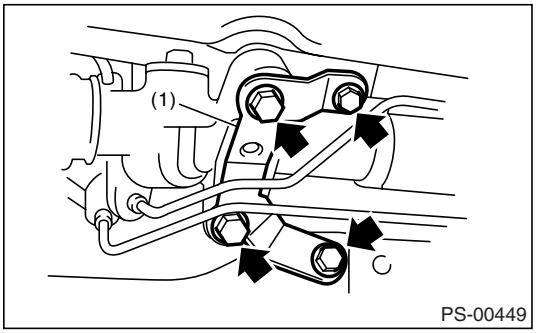
13) Remove the bolts which secure gearbox bracket, and remove the bracket and gearbox.



(1) Bracket

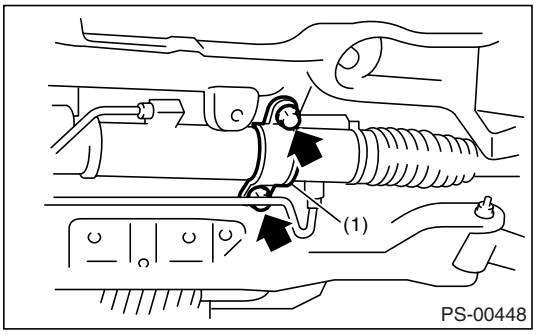
B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage gearbox boot.
2) Install the gearbox and bracket. Tighten the bolt temporarily.



(1) Bracket

3) Tighten the gearbox to the crossmember bracket via clamp with bolt temporarily.



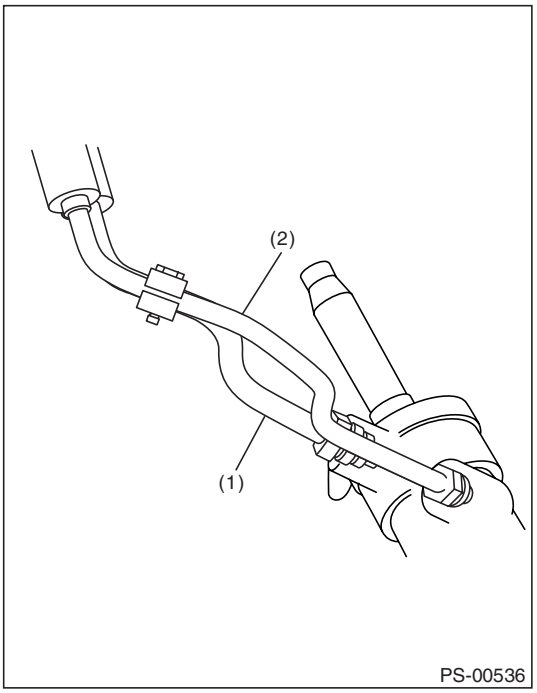
(1) Clamp

4) Tighten the bolts which temporary tightening the clamp and bracket of gearbox to specified torque.

Tightening torque:
60 N·m (6.1 kgf-m, 44.1 ft-lb)

5) Connect the return hose and pressure hose to gearbox.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



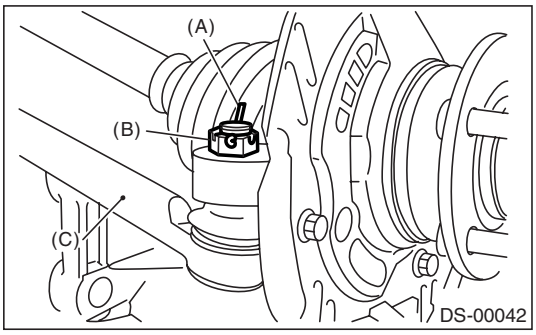
(1) Return hose
(2) Pressure hose

6) Install the universal joint. <Ref. to PS-22, INSTALLATION, Universal Joint.>
7) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

Castle nut tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit cap at the bottom of tie-rod end with hammer.

8) After tightening the castle nut to the specified tightening torque, tighten it further within 60 ° until cotter pin hole is aligned with slot in the nut. Fit the cotter pin into nut, and then bend the pin to lock.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

9) Install the front stabilizer. <Ref. to FS-15, INSTALLATION, Front Stabilizer.>
10) Install the front crossmember support plate and jack-up plate.
11) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO 2.0)-7, INSTALLATION, Front Exhaust Pipe.>
12) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
13) Install the front wheels.
14) Tighten the wheel nuts to the specified torque.

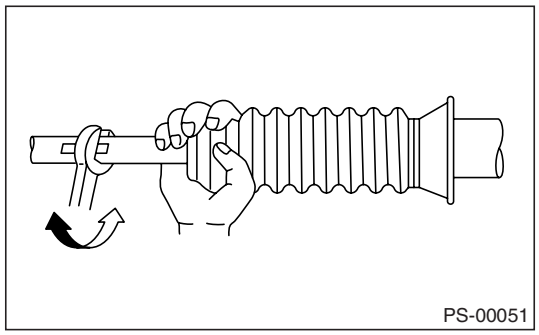
Tightening torque:
90 N·m (9.2 kgf-m, 66.4 ft-lb)

15) Lower the vehicle.
16) Remove the steering wheel. <Ref. to PS-21, REMOVAL, Steering Wheel.>
17) Align the center of roll connector. <Ref. to AB-25, ADJUSTMENT, Roll Connector.>
18) Install the steering wheel. <Ref. to PS-21, INSTALLATION, Steering Wheel.>
19) Connect the ground cable to battery.
20) Pour fluid into the oil tank, and bleed air. <Ref. to PS-91, Power Steering Fluid.>
21) Check for fluid leaks.
22) Check the fluid level in oil tank.

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

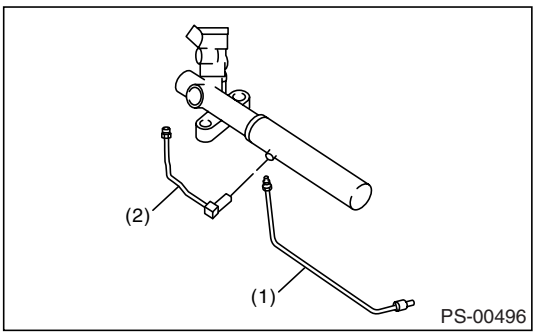
Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)

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



C: DISASSEMBLY

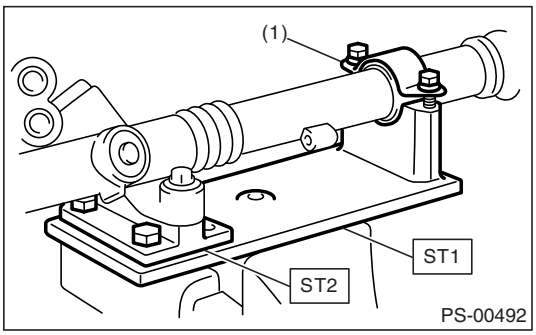
1) Disconnect the pipes A and B from steering body and control valve housing.



(1) Pipe A
(2) Pipe B

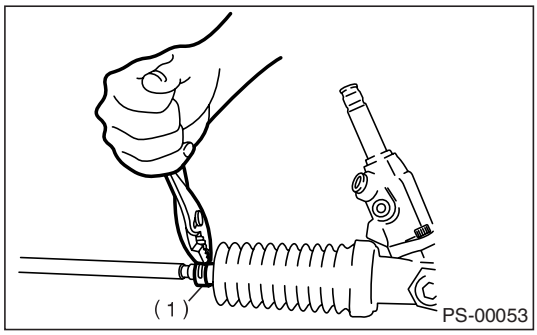
2) Secure the gearbox removed from vehicle in a vise using ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

CAUTION:
Secure the gearbox assembly in a vise using the ST as shown. Do not secure the gearbox without this ST.



(1) Clamp

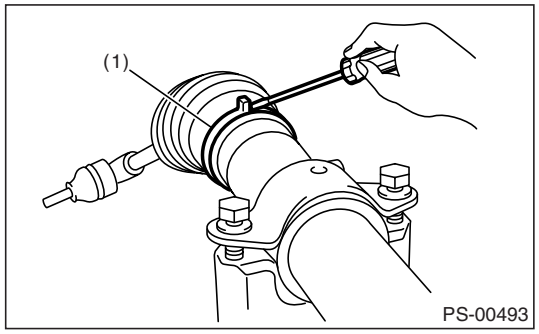
3) Remove the tie-rod end and lock nut from gearbox.
4) Remove the clip from outside boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

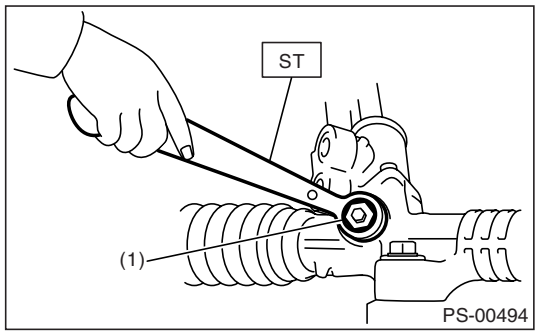
5) Using a flat tip screwdriver, remove the band from boot.

NOTE:
Replace the boot if there is damage, cracks or deterioration.



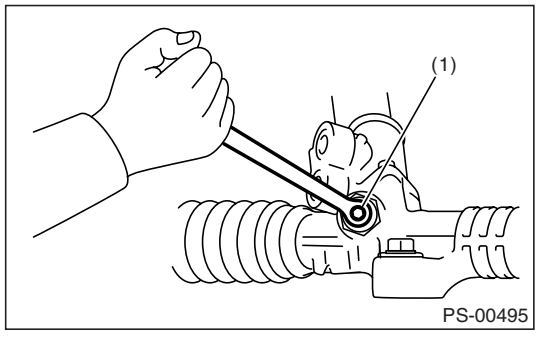
(1) Band

6) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



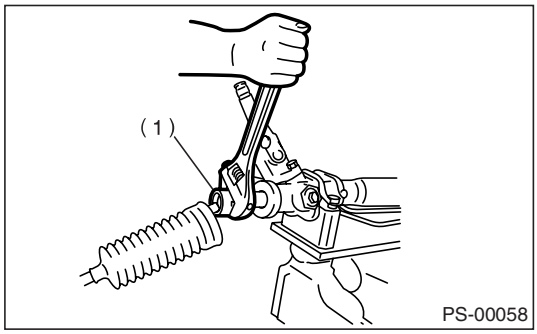
(1) Lock nut

7) Tighten the adjusting screw until it no longer tightens.



(1) Adjusting screw

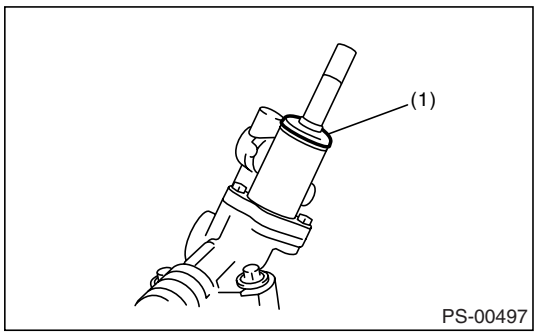
8) Using a 32 mm spanner or adjustable wrench with cinching boot, remove the tie-rod.



(1) Tie-rod

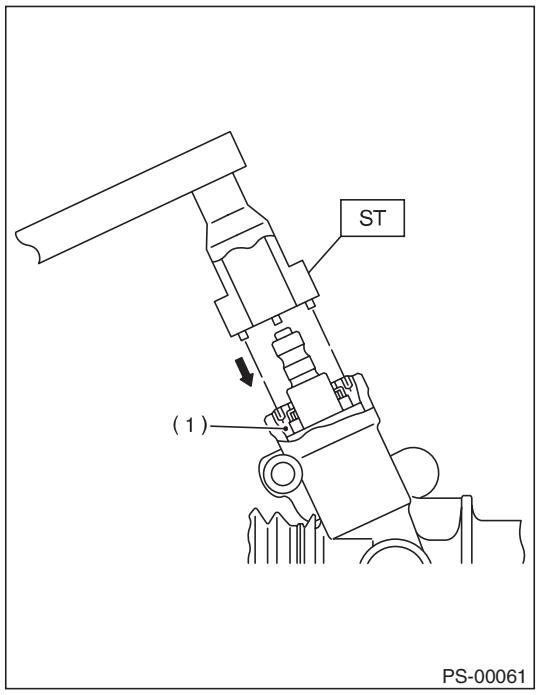
9) Loosen the adjusting screw and remove the spring and sleeve.
10) Clean the dirt adherent to the input shaft. Remove the dust cover paying attention not to scratch the housing or input shaft and not to allow foreign matter to enter the gear box interior.

CAUTION:
Wrap the tape to the spline part of input shaft to avoid damaging dust cover.



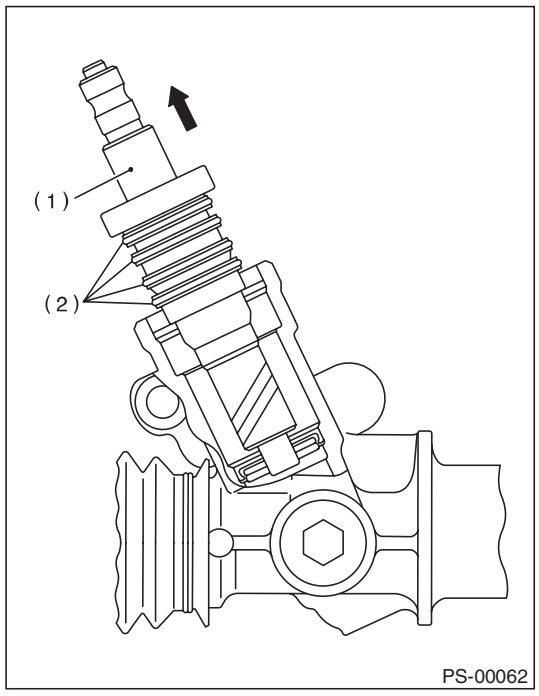
(1) Dust cover

11) Align the ST pin with the plug hole to install. Rotate the ST counterclockwise to remove the plug.
ST 34199AE090 PLUG WRENCH



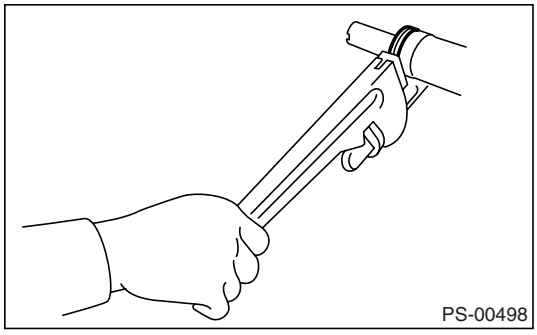
(1) Plug

12) Remove the valve assembly paying attention not to scratch seal ring or valve housing inner surface.



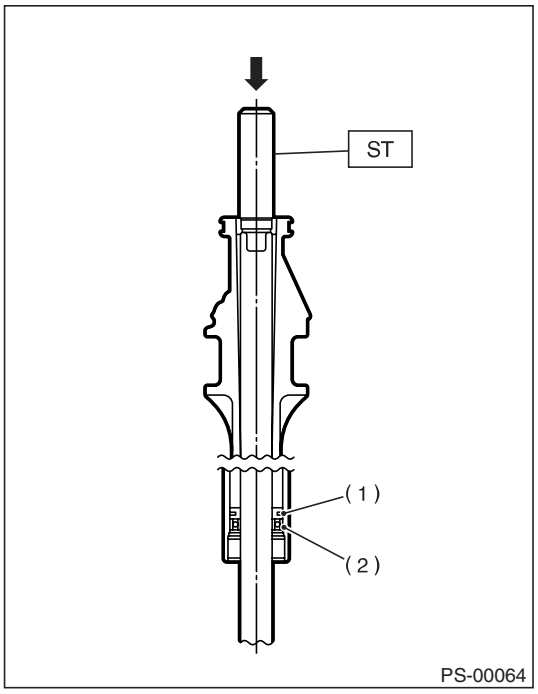
(1) Valve ASSY
(2) Seal ring

13) Remove the holder using a 36 mm spanner or adjustable wrench.



14) Install the ST on valve side of rack and press outer side oil seal out taking care not to contact rack with steering body inner surface.
ST 34199FE000 INSTALLER & REMOVER (Turbo and 3.0 R model)
ST 34099FA030 INSTALLER & REMOVER (Except for turbo and 3.0 R model)

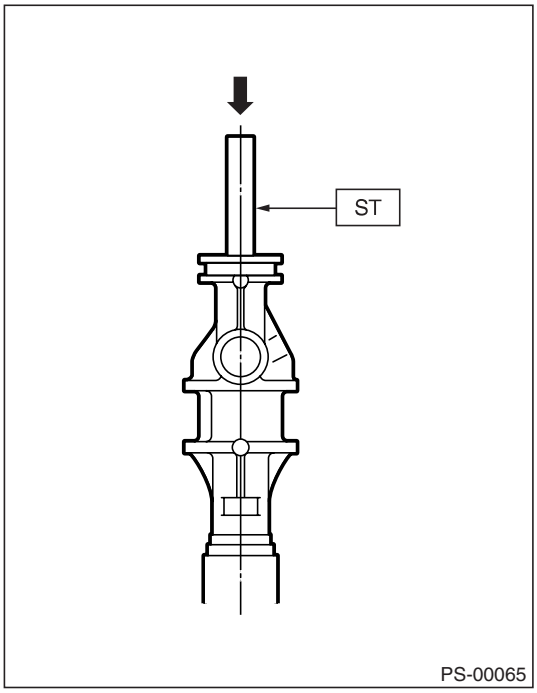
NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.



(1) Rack piston
(2) Outer side oil seal

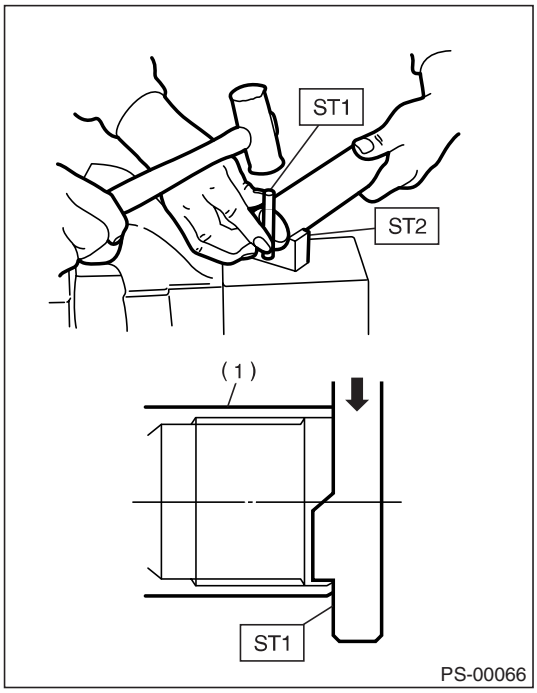
15) Insert the ST from the valve side and press the back-up ring and oil seal out.

ST 34199FE010 REMOVER (Turbo and 3.0 R model)
ST 927580000 REMOVER (Except for turbo and 3.0 R model)



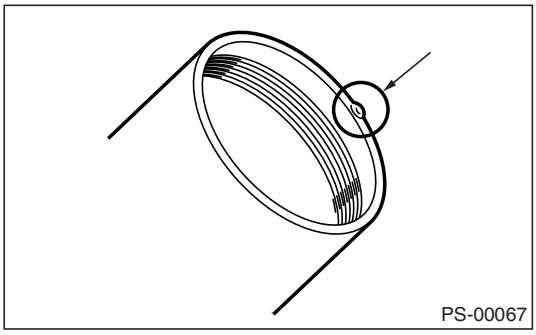
16) Using the ST1 and ST2, repair the caulking portion of cylinder.

ST1 34099FA080 PUNCH
ST2 34199FE020 BASE (Turbo and 3.0 R model)
ST2 34099FA070 BASE (Except for turbo and 3.0 R model)



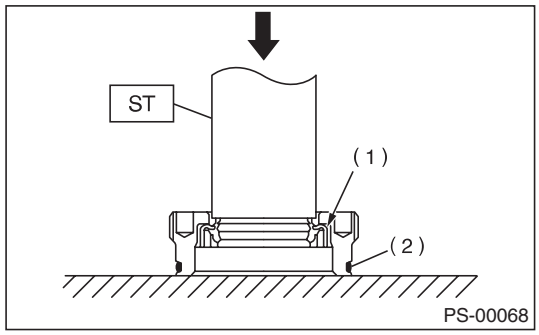
(1) Cylinder

17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



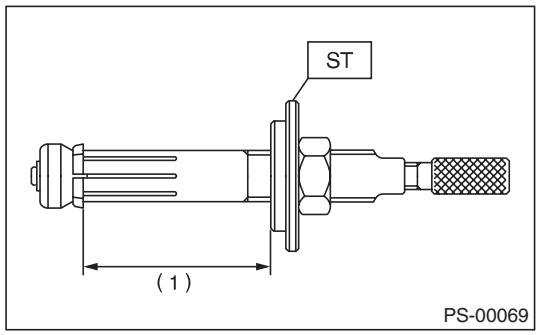
18) Remove the oil seal using ST and press from plug.
ST 34199AE100 OIL SEAL PLUG REMOVER

NOTE:
Do not apply force on the plug edge surface.



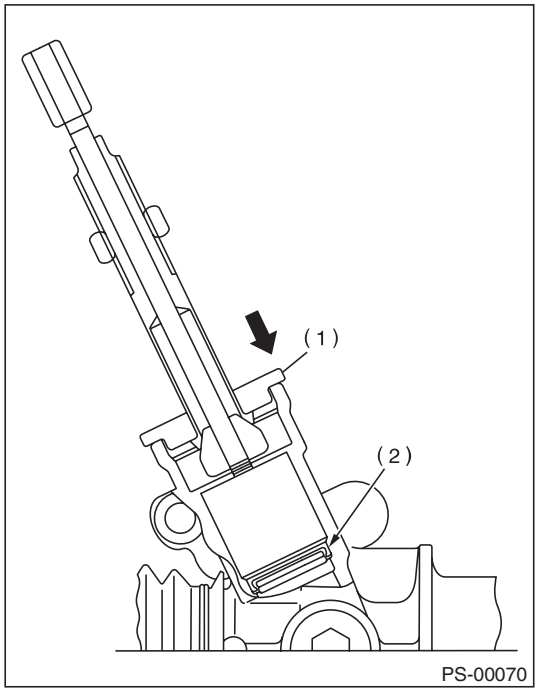
(1) Oil seal
(2) O-ring

19) Set the ST in the dimension as shown in the figure.
ST 34199AE120 GEARBOX OIL SEAL REMOVER



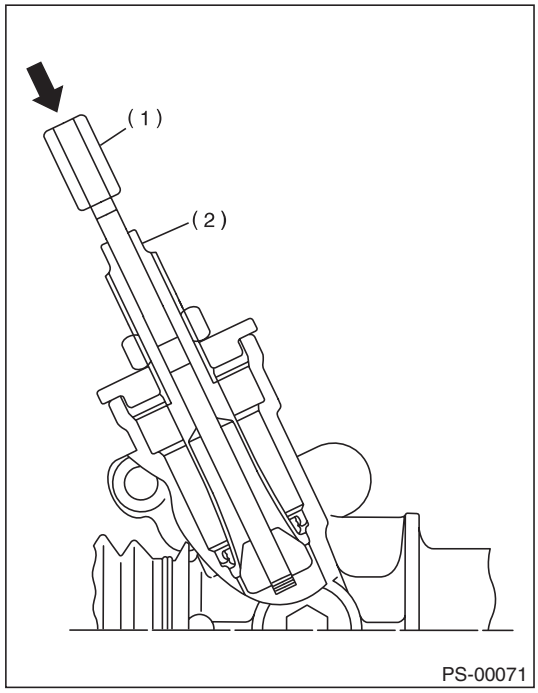
(1) 70 mm (2.76 in)

20) Set the stopper to gearbox, and then insert the tip of ST to gearbox.



(1) Stopper
(2) Oil seal

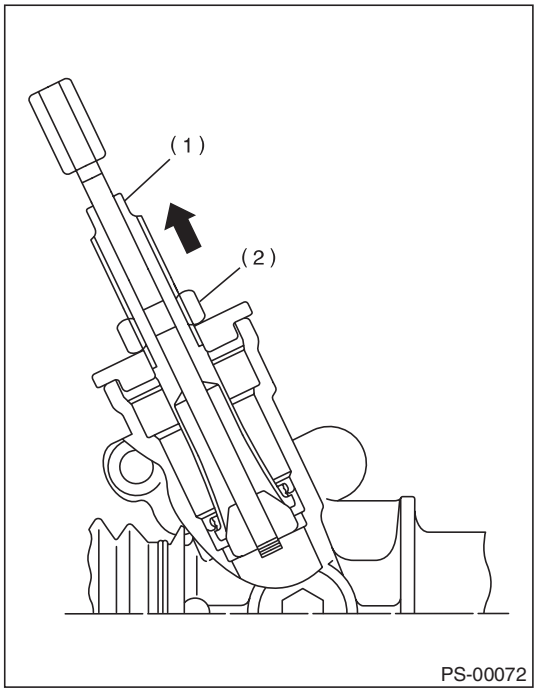
21) By fixing the 2-surface width, press-in by rotating the rod and attach to oil seal.



(1) Rod
(2) 2-surface width

22) While fixing the 2-surface width, pull out the oil seal by rotating nut.

CAUTION:
Take care not to scratch the gearbox inner surface.



(1) 2-surface width
(2) Nut

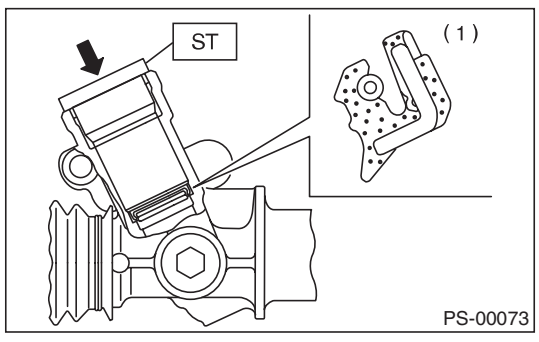
D: ASSEMBLY

1) Apply a coat of grease to the inside and outside of new oil seal.

Steering grease:
VALIANT GREASE M2 (Part No. 003608001)

2) Verify the direction of oil seal and installation position. Using the ST and press, press-fit the oil seal to gearbox.

ST 34199AE130 GEARBOX OIL SEAL INSTALLER

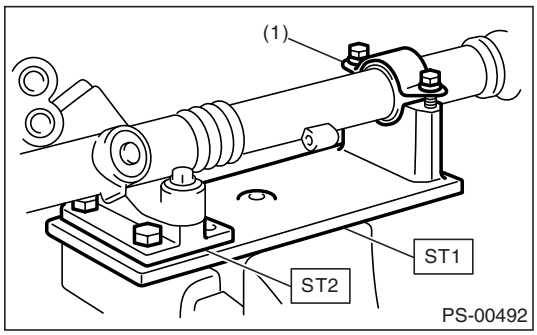


(1) Oil seal

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.

ST1 926200000 STAND
ST2 34199AG000 BOSS D

CAUTION:
Ensure the needle bearing is free from defects. If it is faulty, replace the steering body with a new one.

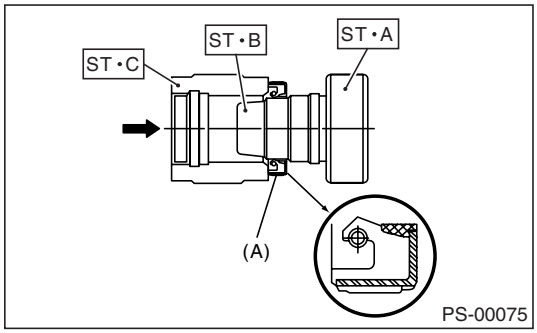


(1) Clamp

4) Using the ST-B and ST-C, install the oil seal to ST-A.

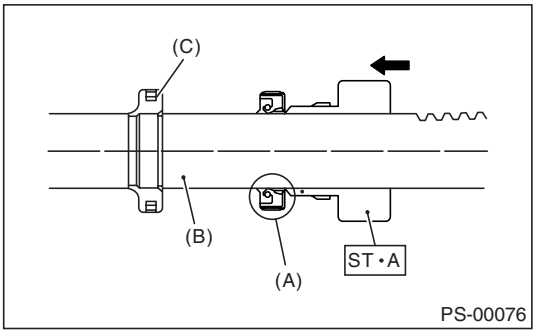
ST 34199FE040 INSTALLER A, B, C (Turbo and 3.0 R model)
ST 927490000 INSTALLER A, B, C (Except for turbo and 3.0 R model)

NOTE:
Face the oil seal in the direction as shown in the figure.



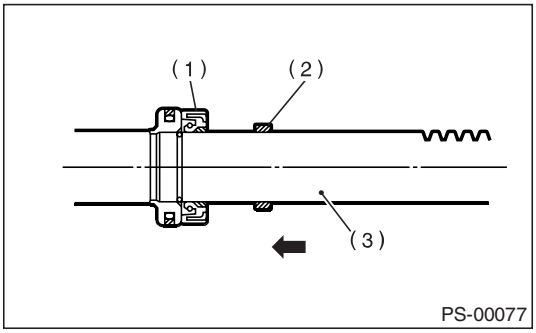
(A) Oil seal

5) Insert the ST-A with oil seal assembled from the gear side of rack. Remove the oil seal from ST-A near piston, and then remove the ST-A from rack.



(A) Oil seal
(B) Rack
(C) Piston

6) Install the back-up washer from the gear side of rack.

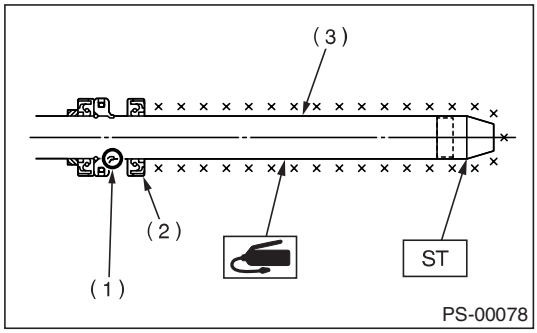


(1) Oil seal
(2) Back-up washer
(3) Rack

7) Install the ST on rack, equally apply a thin coat of grease to the rack and ST, and then install the oil seal.
ST 926250000 GUIDE

CAUTION:
Be careful not to scratch the oil seal lips with the inner ring section of piston.

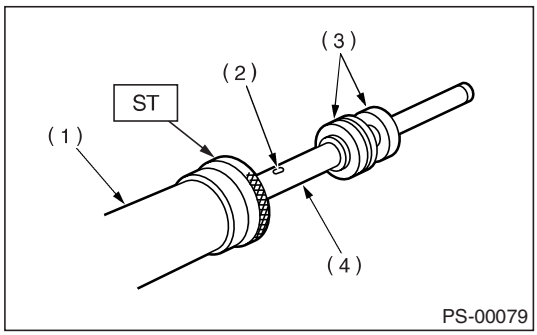
NOTE:
Do not use this ST for turbo model.



(1) Rack piston inner ring
(2) Outer side oil seal
(3) Rack

8) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Install ST on the end of steering body cylinder. Then insert the rack into steering body from cylinder side.
ST 34199FE050 GUIDE (Turbo and 3.0 R model)
ST 34199AE000 GUIDE (Except for turbo and 3.0 R model)

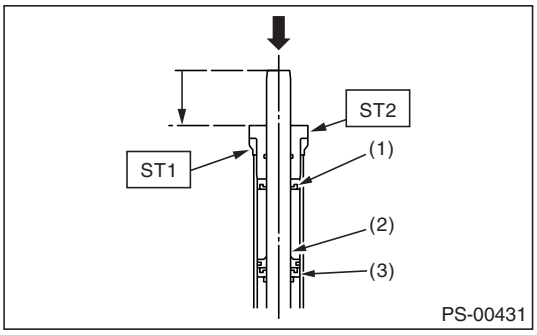
CAUTION:
Do not allow grease to block the air vent hole on rack.



(1) Cylinder side of steering body
(2) Air vent hole
(3) Oil seal
(4) Rack

9) Make the ST2 pass through rack, and then press-in the rack and ST2 using press.
Press-in the rack until ST1 comes in contact with ST2 and the edge surface of rack is aligned with that of ST2.

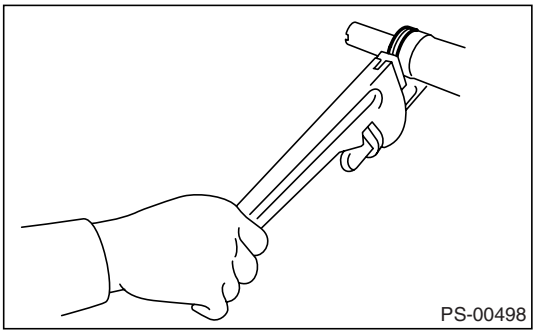
ST1 34199FE050 GUIDE (Turbo and 3.0 R model)
ST1 34199AE000 GUIDE (Except for turbo and 3.0 R model)
ST2 34199FE060 INSTALLER (Turbo and 3.0 R model)
ST2 34199AE010 INSTALLER (Except for turbo and 3.0 R model)



(1) Outer side oil seal
(2) Rack piston
(3) Inner side oil seal

10) Install a new holder to the cylinder side of steering body.

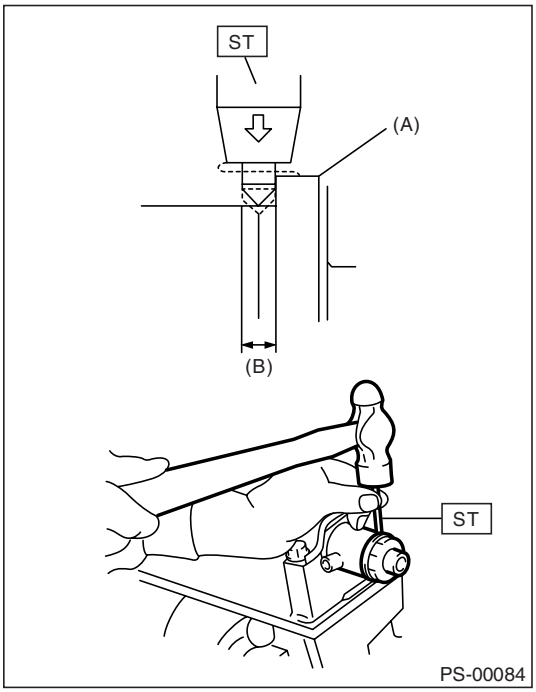
Tightening torque:
75 N·m (7.6 kgf-m, 55.3 ft-lb)



11) Using the ST, caulk the steering body at one point less than 3 mm (0.12 in) from holder.

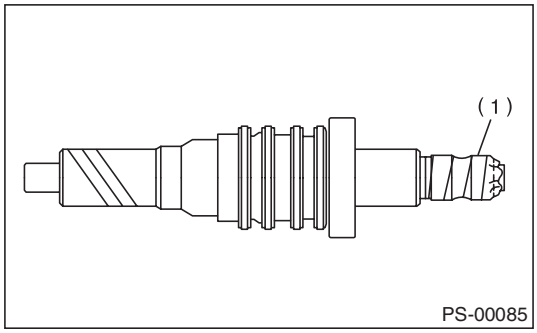
CAUTION:
Be careful not to deform the holder.

ST 34099FA060 PUNCH HOLDER



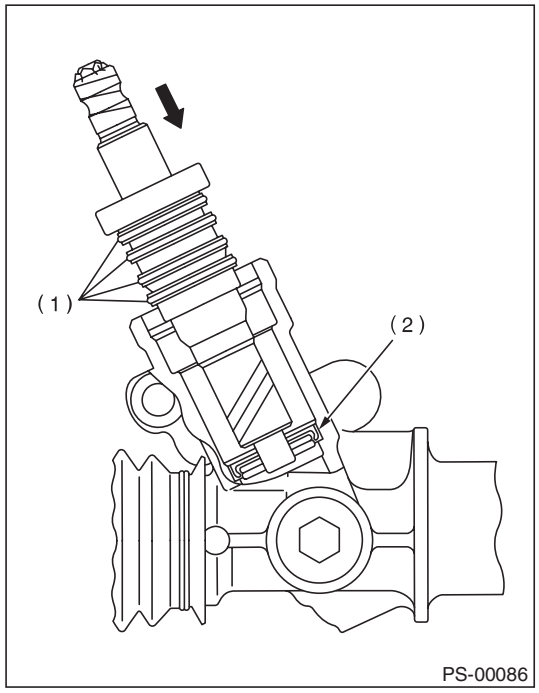
(A) Holder
(B) 3 mm (0.12 in)

12) Roll the vinyl tape on serration part of valve assembly, and then apply grease on the tape surface.



(1) Vinyl tape

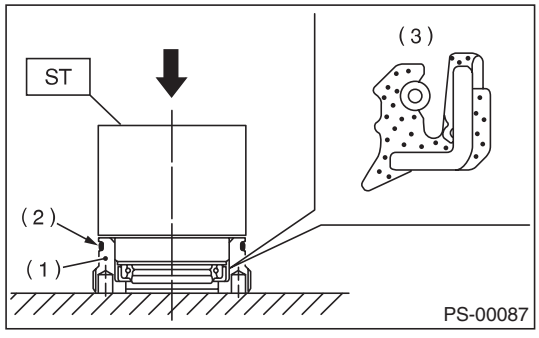
13) Apply a coat of grease on the gear teeth of valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.



(1) Seal ring
(2) Oil seal

14) Apply grease on the oil seal circumference, and then press it into the plug using ST and a press. Replace the O-rings of plug circumference with new ones.
ST 34199AE110 OIL SEAL PLUG INSTALLER

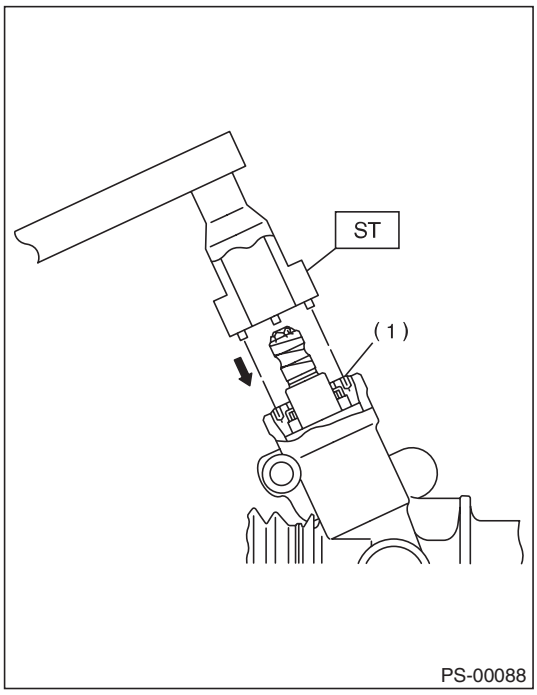
CAUTION:
Install the oil seal paying attention to its direction.



(1) Plug
(2) O-ring
(3) Oil seal

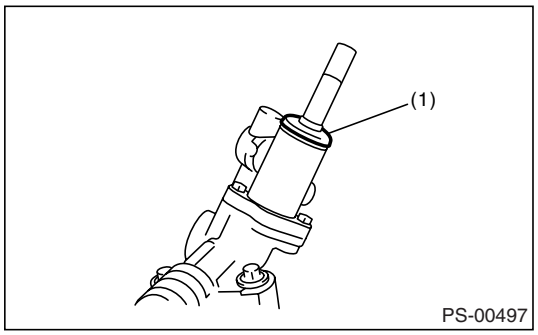
15) Using the ST, install the plug.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf-m, 47.0 ft-lb)



(1) Plug

16) Install the dust cover and remove the vinyl tape.



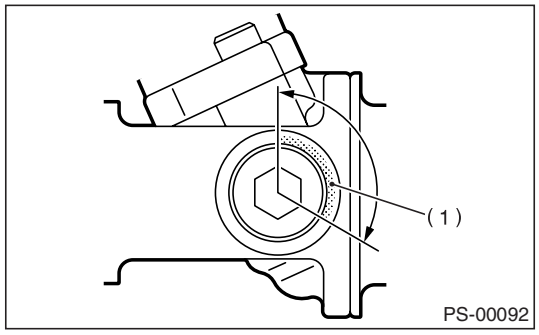
(1) Dust cover

17) Temporarily install the tie-rod to the rack, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

CAUTION:
If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

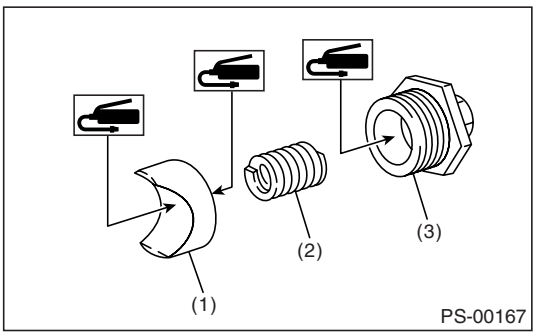
18) Apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141 (Part No. 004403006)



(1) Apply liquid gasket to at least 1/3 of entire perimeter

19) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the sleeve into spring body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



(1) Sleeve
(2) Spring
(3) Adjusting screw

20) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)

21) After tightening the adjusting screw with the specified tightening torque, loosen it by 30°.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

22) Remove the tie-rod.
23) Verify that play is within the specification. <Ref. to PS-43, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].>

24) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

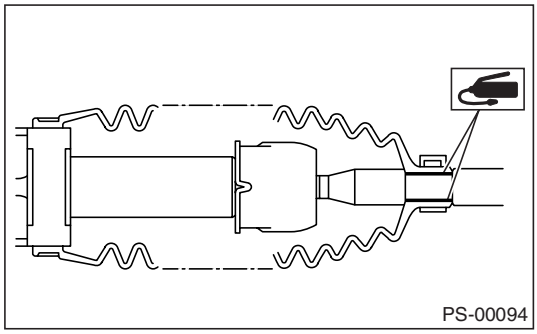
25) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.2 kgf-m, 66.4 ft-lb)

NOTE:
Check the mating face of rack and tie-rod for foreign material, dirt and etc.

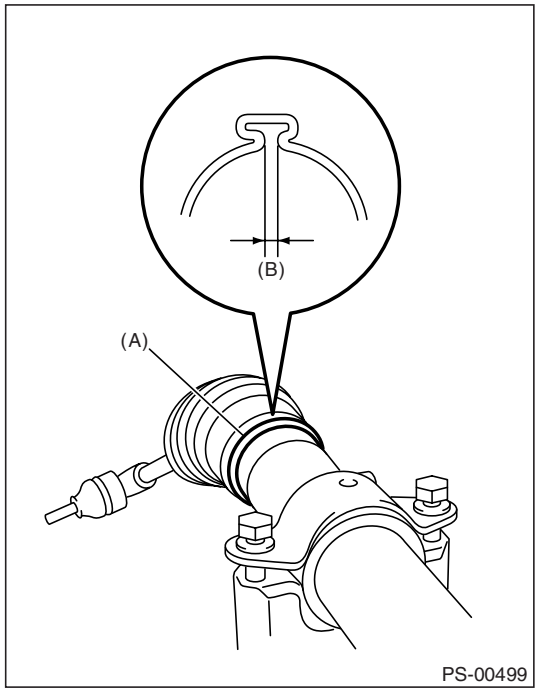
26) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.



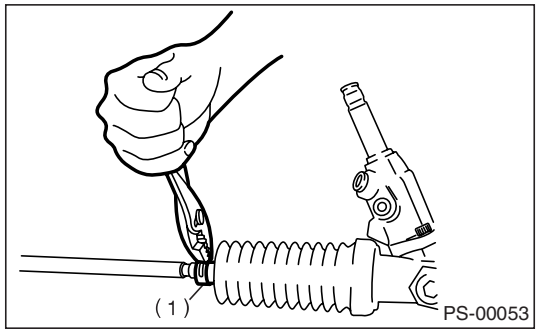
27) Caulk the boot so that the clearance of boot band caulking portion becomes 2 mm (0.08 in) or less.

NOTE:
Use a new boot band.



(A) Boot band
(B) 2 mm (0.08 in) or less

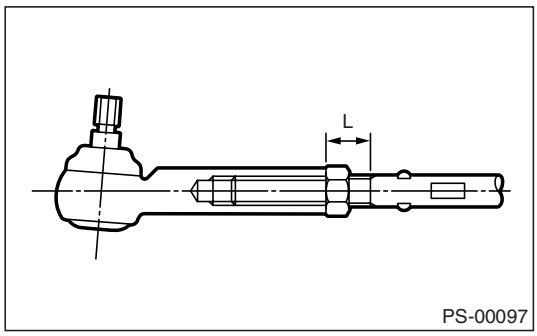
28) Fix the boot end with clip (small).



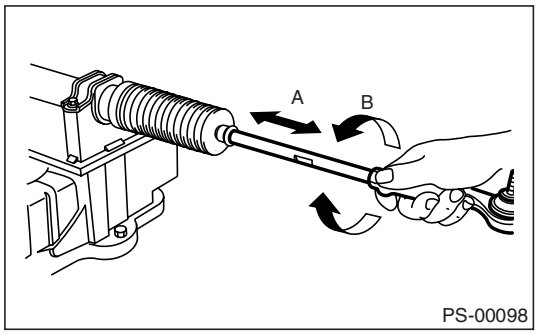
(1) Clip

29) After installing, check that the boot end is positioned into groove on tie-rod.
30) If the tie-rod end has been removed, screw in lock nut and tie-rod end to the screwed portion of tie-rod, and tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:
31 mm (1.22 in)

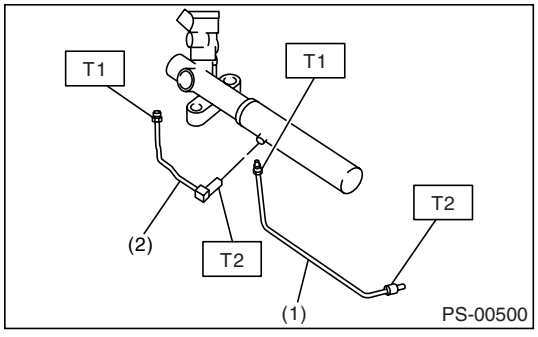


31) Inspect the gearbox as follows:
"A" Holding tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that the boot is installed in the specified position without deflation.



32) Remove the gearbox from ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D
33) Install the pipe A and B to steering body and control valve housing.

Tightening torque:
T1: 20 N·m (2.0 kgf-m, 14.5 ft-lb)
T2: 24 N·m (2.4 kgf-m, 17.4 ft-lb)



(1) Pipe A
(2) Pipe B

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage or any other faults, then repair or replace as necessary.
2) When disassembling, check the inside of gearbox for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new one.
3	Rack & Pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of gearbox and sliding resistance of rack, check if rack & pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free play of rack shaft in radial and axial direction is out of the specified range, replace the gearbox with a new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipe	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

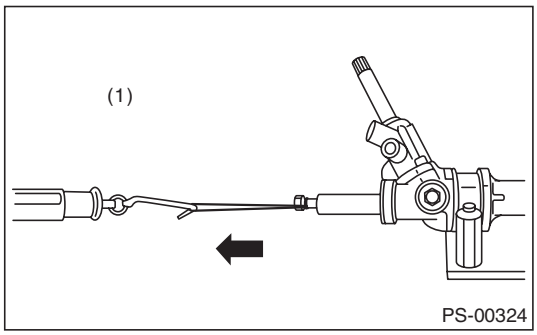
NOTE:
When making a measurement, vise the gearbox using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST1 926200000 STAND
ST2 34199AG000 BOSS D

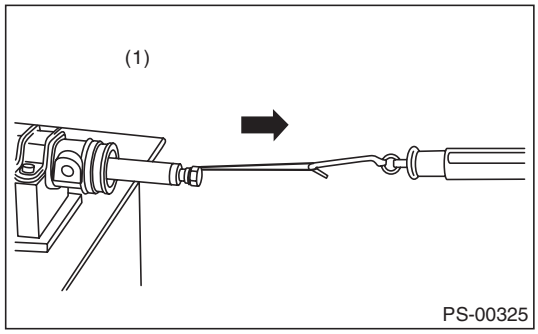
Sliding resistance of rack shaft:

Service limit
314 N (32 kgf, 71 lbf) or less

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



(1) Right-turn steering



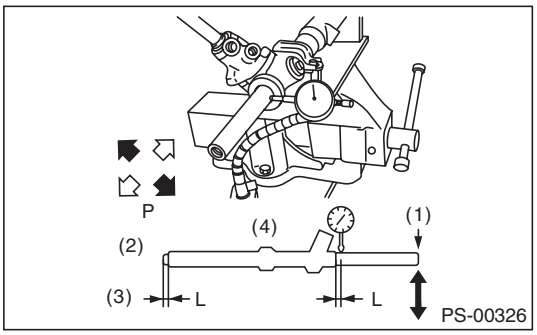
(1) Left-turn steering

3. RACK SHAFT PLAY IN 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

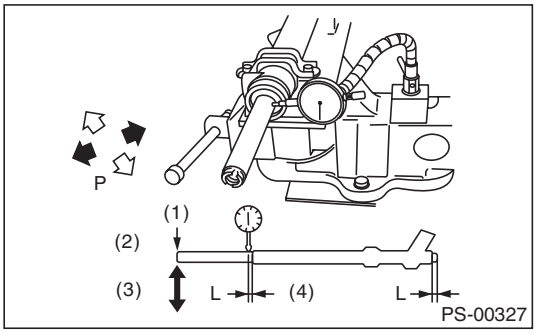
On condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lbf)



(1) Under the step
(2) Right-turn steering
(3) Measure point
(4) Right

Left-turn steering:

Service limit
Direction ⇦ ⇨ ⬅ ➡
0.4 mm (0.016 in) or less



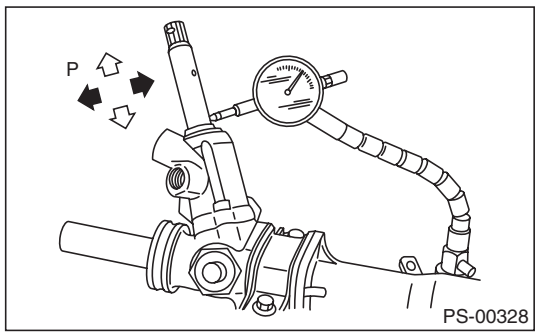
(1) Under the step
(2) Left-turn steering
(3) Measure point
(4) Left

4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

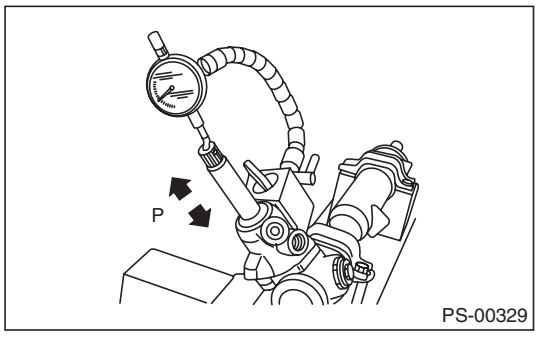
On condition
P: 98 N (10 kgf, 22 lbf)



In axial direction:

Service limit
0.27 mm (0.0106 in) or less

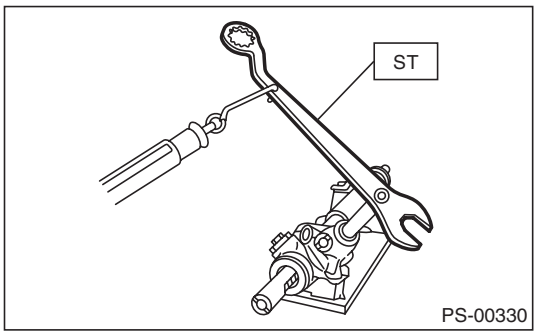
On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)



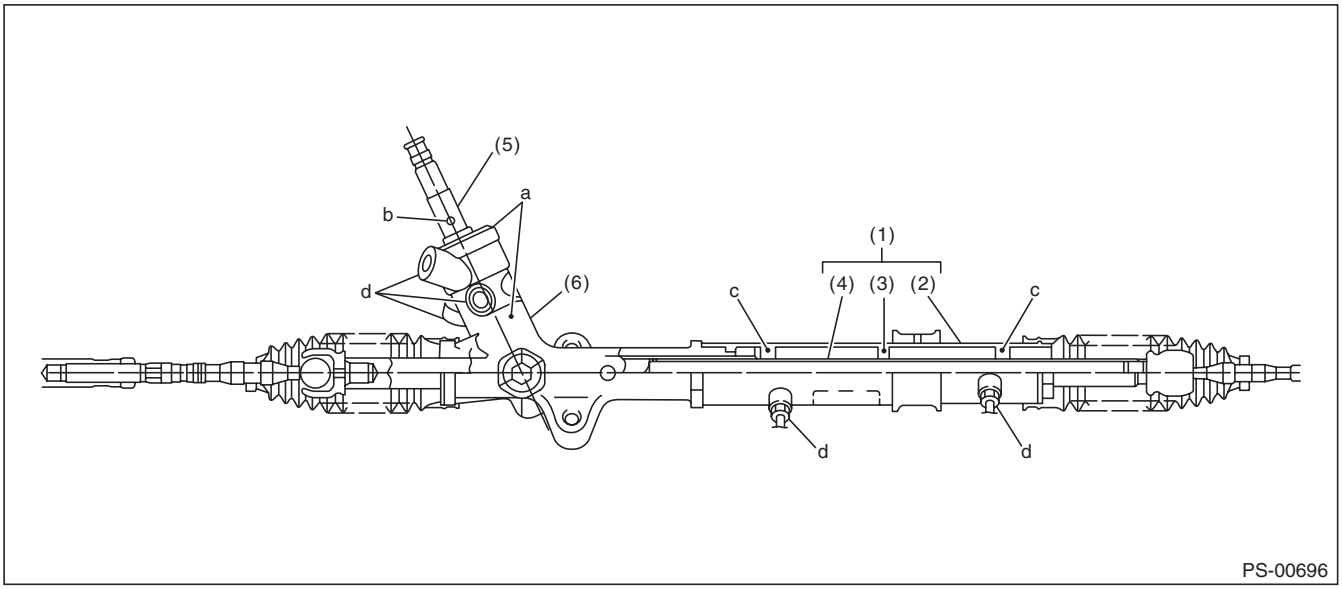
5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit:
Maximum allowable resistance:
13 N (1.3 kgf, 9.6 lbf) or less
Difference between right and left turning resistance:
20% or less



6. OIL LEAKAGE



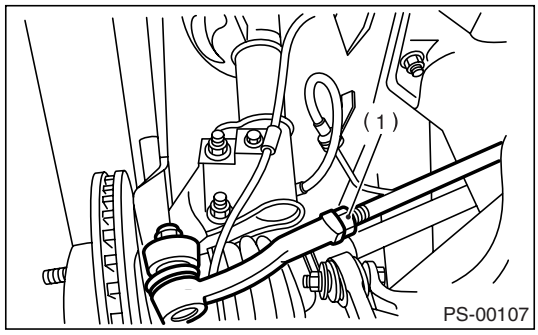
(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

1) Lift-up the vehicle.
2) Even if the location of leak can be easily found by observing leaking condition, it is necessary to thoroughly remove fluid from suspected portion and turn the steering wheel from lock to lock about 30 to 40 times with engine running, then reinspect the suspected portion immediately after and several hours after this operation.
3) Cause and measure for oil leakage from “a”
The oil seal is damaged. Replace the valve assembly with a new one.
4) Cause and measure for oil leakage from “b”
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
5) Cause and measure for oil leakage from “c”
The oil seal is damaged. Replace the oil seal with a new one.
6) Cause and measure for oil leakage from “d”
The pipe is damaged. Replace the faulty pipe or O-ring.

F: ADJUSTMENT

1) Adjust the front toe.
<Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



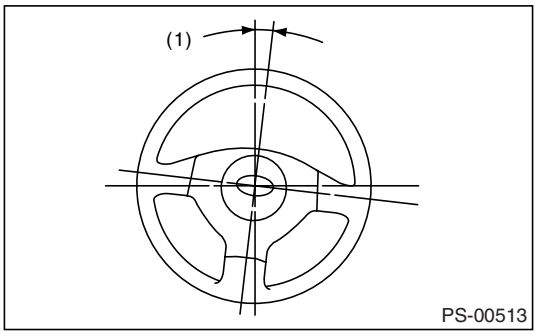
(1) Lock nut

2) Adjust the steering angle of wheels.

Specification of steering angle:

Model	2.0 i, 2.5 i	2.0 GT, 3.0 R	3.0 R spec. B	OUTBACK
Inner wheel	37.3°±1.5°	37.2°±1.5°	37.1°±1.5°	37.8°±1.5°
Outer wheel	33.0°±1.5°	32.9°±1.5°	32.8°±1.5°	33.5°±1.5°

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



(1) 5° or less

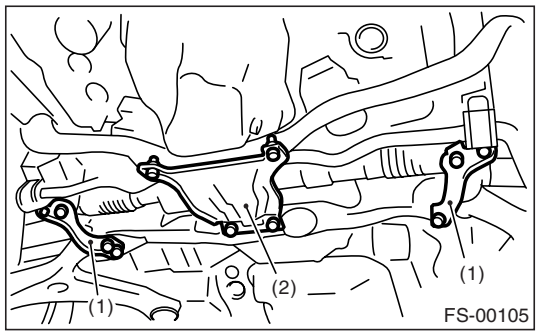
4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction each other by the same angle.

7. Pipe Assembly [LHD Model]

A: REMOVAL

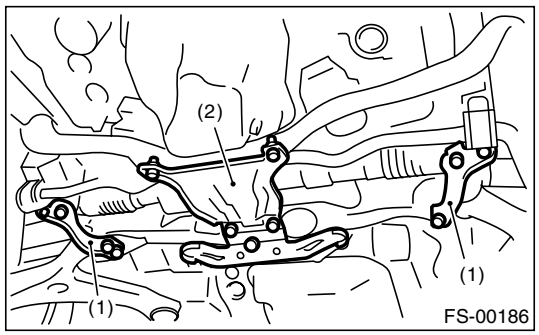
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the front crossmember support plate and jack-up plate.

- Small type



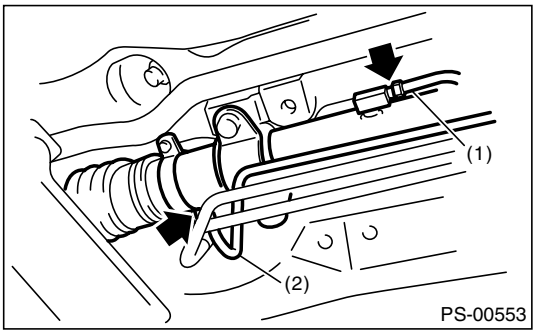
(1) Front crossmember support plate
(2) Jack-up plate

- Small type (6MT model)



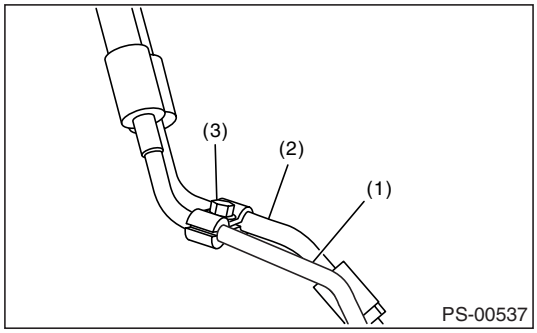
(1) Front crossmember support plate
(2) Jack-up plate

3) Remove one pipe joint at the center of gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



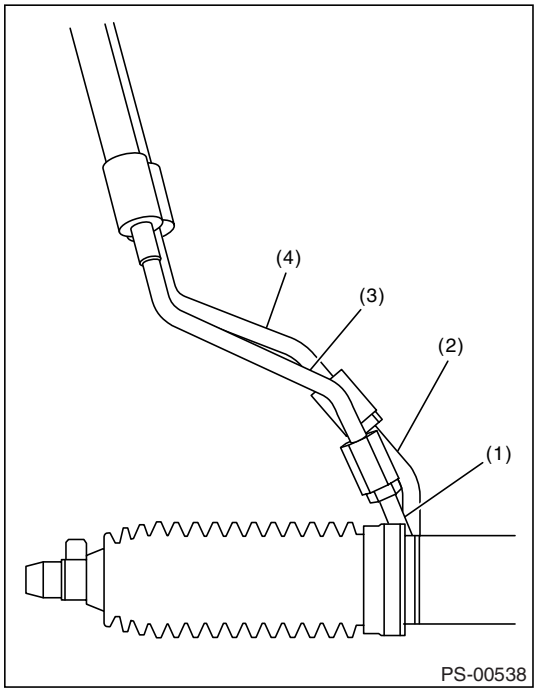
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from the return hose and pressure hose.



(1) Return hose
(2) Pressure hose
(3) Clamp E

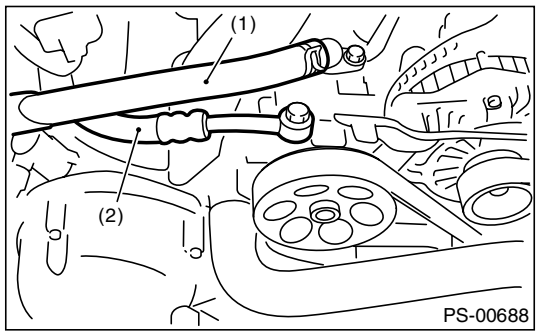
5) Disconnect the pipe D from the return hose and pipe C from pressure hose.



(1) Pipe C
(2) Pipe D
(3) Pressure hose
(4) Return hose

6) Remove the air intake duct. <Ref. to IN(H4SO 2.0)-8, REMOVAL, Air Intake Duct.>

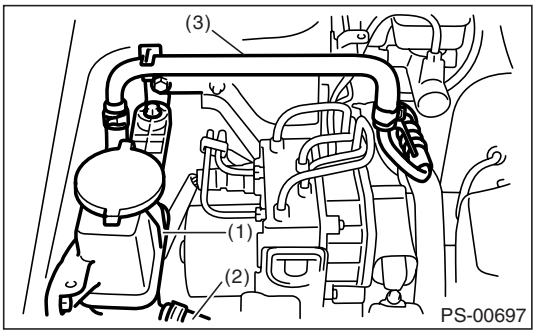
7) Disconnect the suction hose and pressure hose from oil pump.



(1) Suction hose
(2) Pressure hose

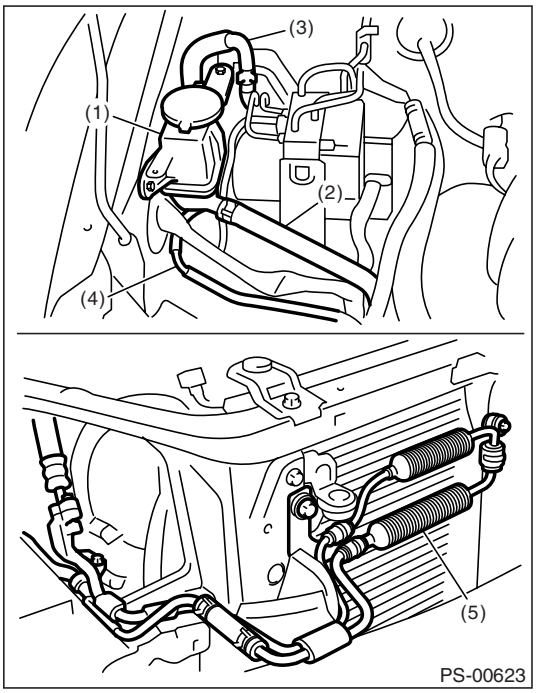
8) Disconnect the suction hose and return hose from reservoir tank. Remove the oil cooler from oil cooler bracket.

• H4 model



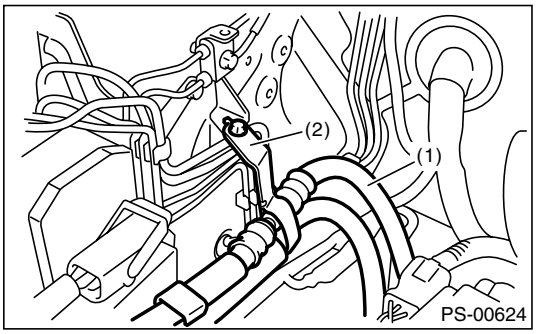
(1) Reservoir tank
(2) Suction hose
(3) Return hose

• H6 model



(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler pipe
(5) Oil cooler

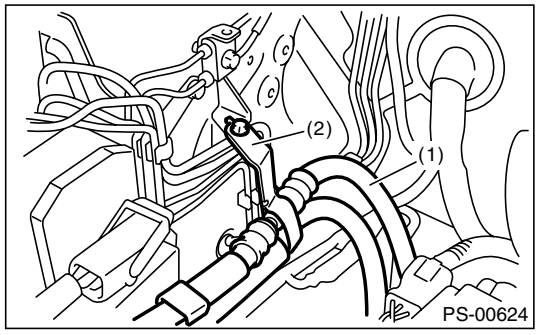
9) Remove the hose bracket and take out the hose assembly from vehicle.



(1) Hose ASSY
(2) Hose bracket

B: INSTALLATION

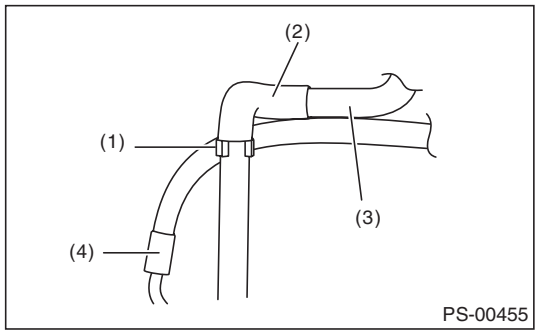
1) Temporarily tighten the bolt of hose bracket.



(1) Hose ASSY
(2) Hose bracket

2) Install the resin clip to the pressure hose and suction hose.

CAUTION:
Align the installation position of the resin clip with the protector edge of suction hose.

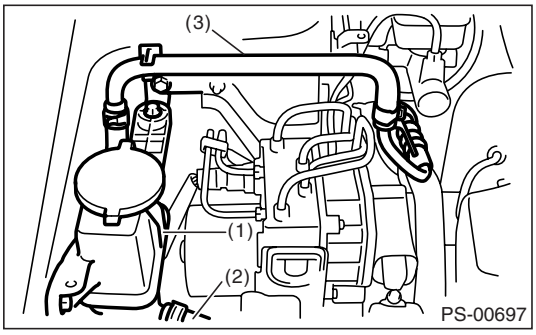


(1) Resin clip
(2) Protector
(3) Suction hose
(4) Pressure hose

3) Connect the suction hose and return hose to reservoir tank. Install the oil cooler to oil cooler bracket.

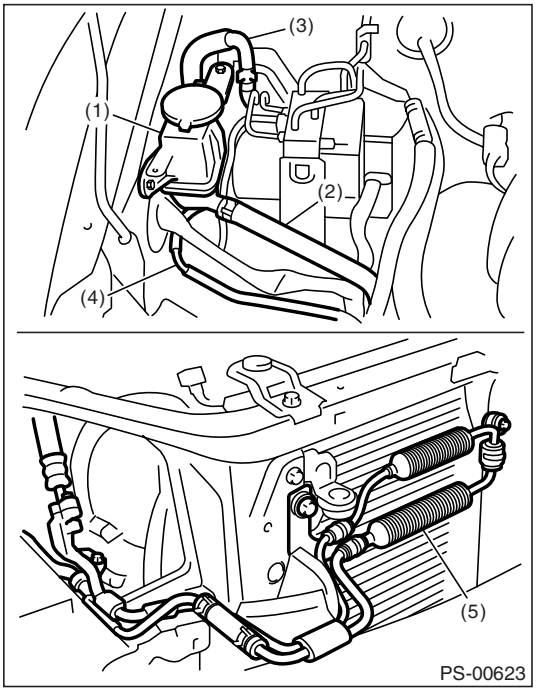
CAUTION:
Firmly insert the resin clip of return hose to bracket.

- H4 model



(1) Reservoir tank
(2) Suction hose
(3) Return hose

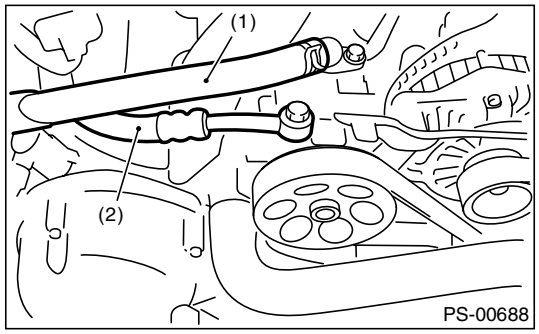
- H6 model



(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler pipe
(5) Oil cooler

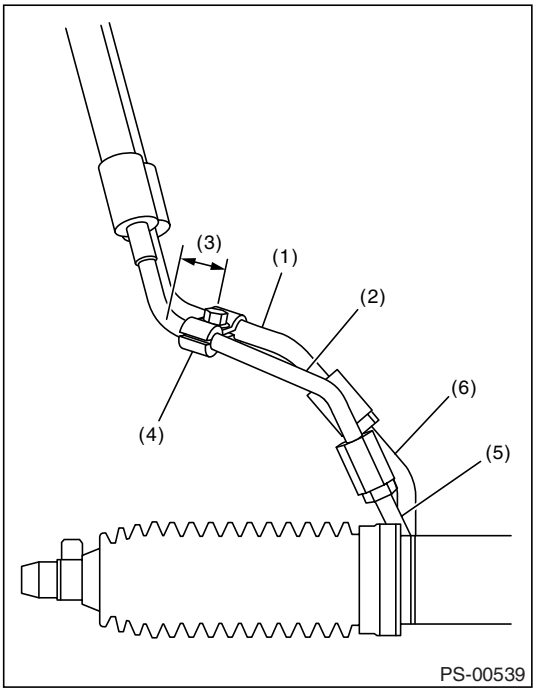
4) Connect the suction hose and pressure hose to oil pump. Tighten the eye bolt of pressure hose.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



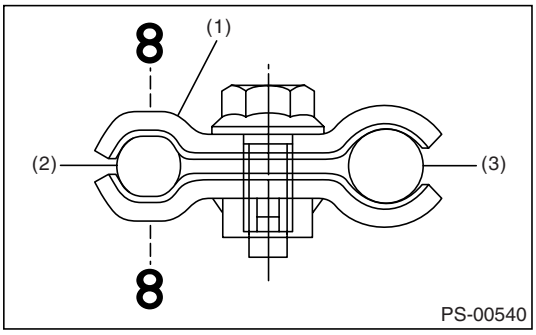
(1) Suction hose
(2) Pressure hose

5) Temporarily connect the pressure hose to pipe C and the return hose to pipe D. Place the clamp E in the position shown in the figure, and tighten the bolt temporarily.



(1) Return hose
(2) Pressure hose
(3) Approx. 18 mm (0.71 in)
(4) Clamp E
(5) Pipe C
(6) Pipe D

NOTE:
Ensure that the letter “8” on each clamp are diagonally opposite each other as shown in the figure.



(1) Clamp E
(2) Pressure hose
(3) Return hose

6) Tighten the clamp E.

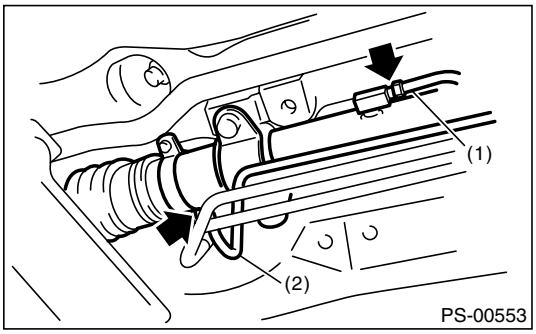
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

7) Tighten the pressure hose to pipe C and the return hose to pipe D.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

8) Connect the pipe A and B to the four pipe joints of gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

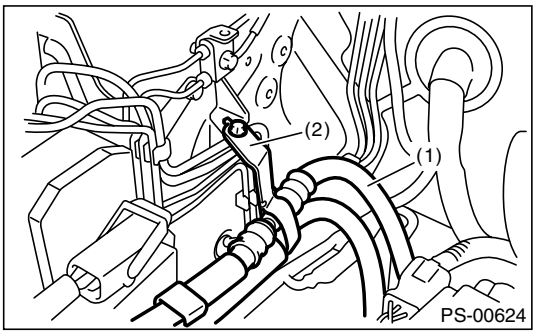


(1) Pipe A
(2) Pipe B

9) Install the front crossmember support plate and jack-up plate.
10) Lower the vehicle.

11) Tighten the bolts which hold the hose bracket.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



(1) Hose ASSY
(2) Hose bracket

12) Install the air intake duct<Ref. to IN(H4SO 2.0)-8, INSTALLATION, Air Intake Duct.>
13) Connect the ground cable to battery.
14) Feed the specified fluid.

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

15) Finally, check clearance between pipes or hoses as shown in the figure indicated in “General Diagnostic Table”. <Ref. to PS-96, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>

C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace the defective parts as necessary.

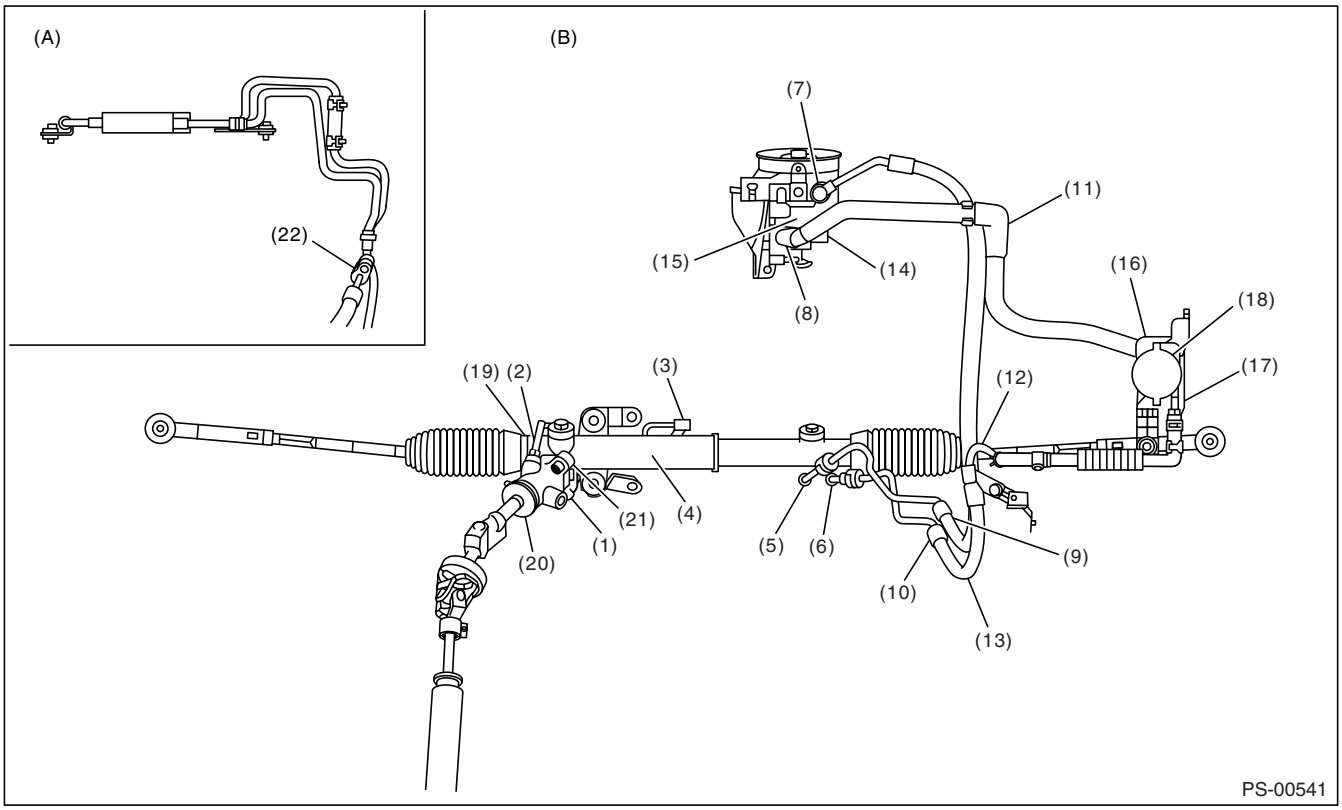
Parts	Maintenance Parts	Corrective action
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with a new one.
Clamp	• Clamps for weak clamping force	Replace with a new one.
Hose	• Flare surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for deformation	Replace with a new one.

CAUTION:
Although surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. Wipe out immediately when the hoses are adhered with the fluids.
Since resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather areas and a driving condition in which many steering operations are required in short time.
Particularly continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Repair.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the parts if defective.
	Improper stop position of pitching stopper	Replace the parts if defective.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customers.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct customers.

Pipe Assembly [LHD Model]

NOTE:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



(A) 3.0 L model (B) Except for 3.0 L model

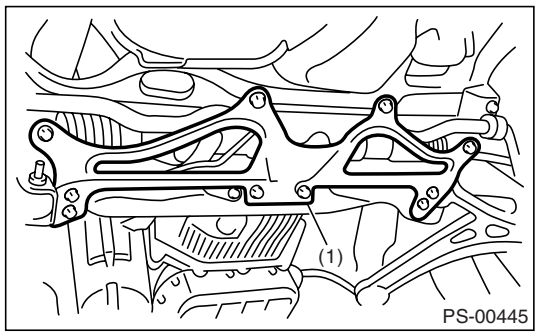
Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (8) in the figure	Insufficient tightening of flare nut, adhesion of dirt, damage to flare or flare nut or eye bolt	Loosen and retighten. Replace if ineffective.
	Poor insertion of hose or clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace O-ring or gasket pipe or hose with new one, if ineffective, replace the gearbox also.
Leakage from hose (9) through (13) in the figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (14) and (15) in the figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank (16) and (17) in the figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in the figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gearbox (20) and (21) in the figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.
(22) Leakage from the joints between cooler pipe and hose.	Insufficient tightening of connecting portion.	Loosen and retighten.

8. Pipe Assembly [RHD Model]

A: REMOVAL

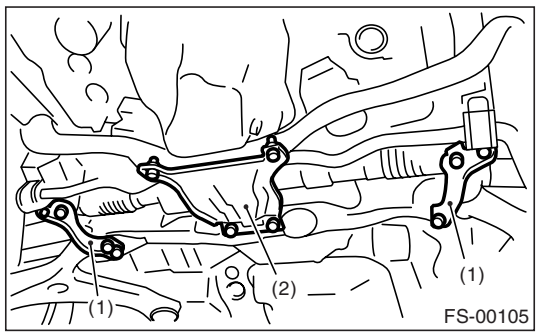
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the front crossmember support plate and jack-up plate.

- Large type



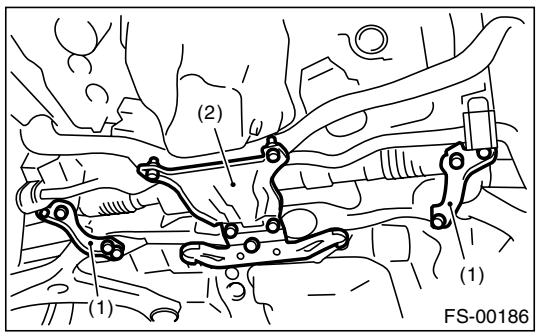
(1) Front crossmember support plate

- Small type



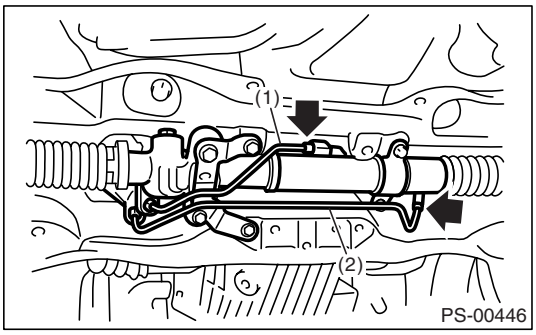
(1) Front crossmember support plate
(2) Jack-up plate

- Small type (6MT model)



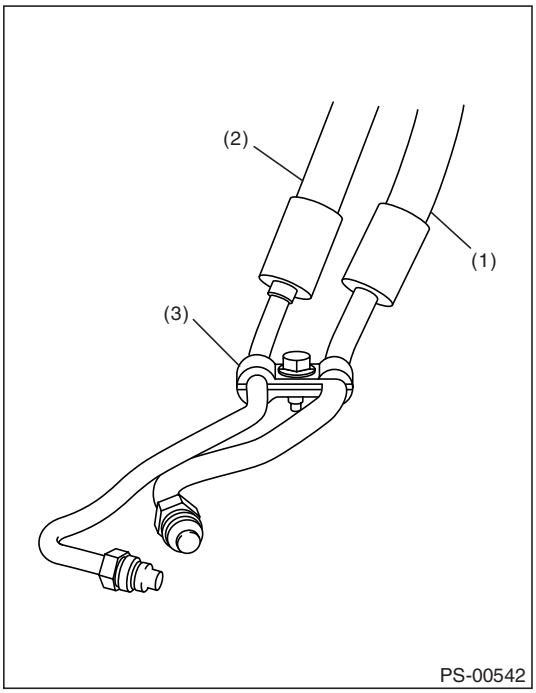
(1) Front crossmember support plate
(2) Jack-up plate

3) Remove one pipe joint at the center of gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



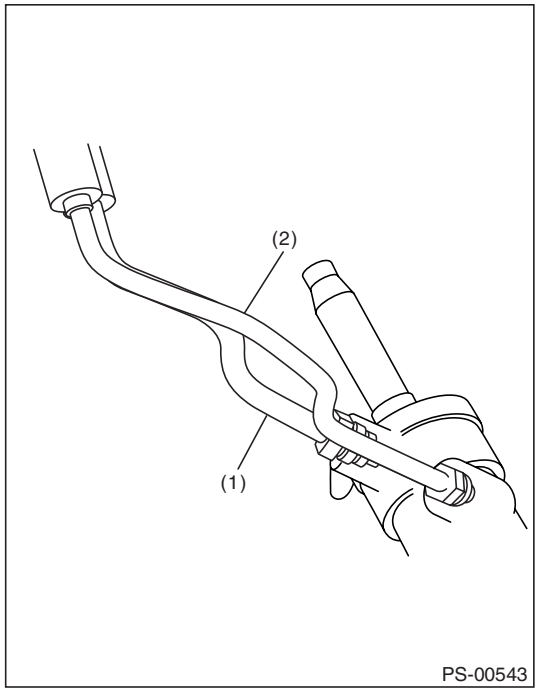
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from the return hose and pressure hose.



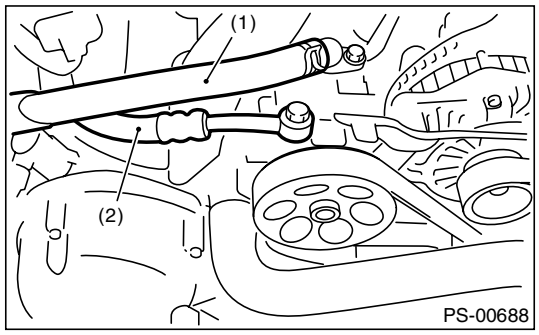
(1) Return hose
(2) Pressure hose
(3) Clamp E

5) Disconnect the return hose and pressure hose from gearbox.



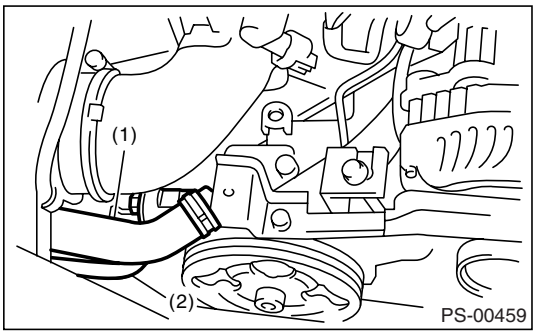
(1) Return hose
(2) Pressure hose

6) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.> <Ref. to IN(H4SO 2.0)-8, REMOVAL, Air Intake Duct.>
7) Disconnect the suction hose and pressure hose from oil pump.
• Non-turbo model



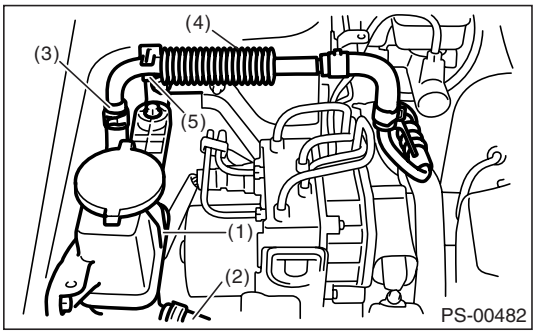
(1) Suction hose
(2) Pressure hose

• Turbo model



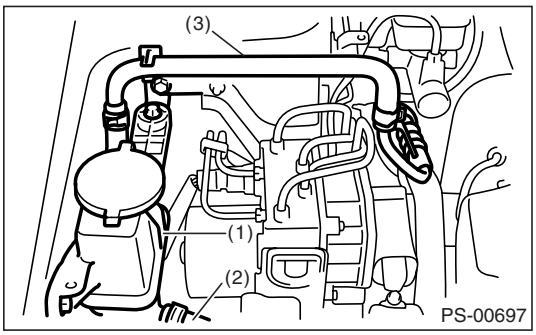
(1) Suction hose
(2) Pressure hose

8) Disconnect the suction hose and return hose from reservoir tank. Remove the oil cooler from oil cooler bracket.
• H4 turbo model



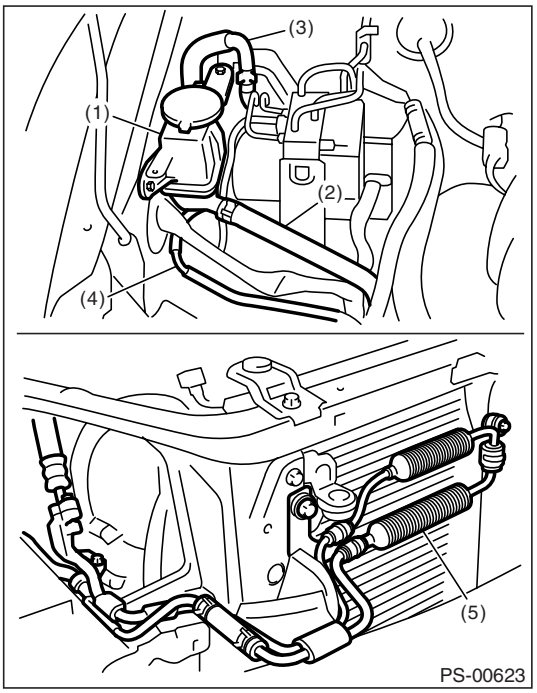
(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler
(5) Oil cooler bracket

• H4 non-turbo model



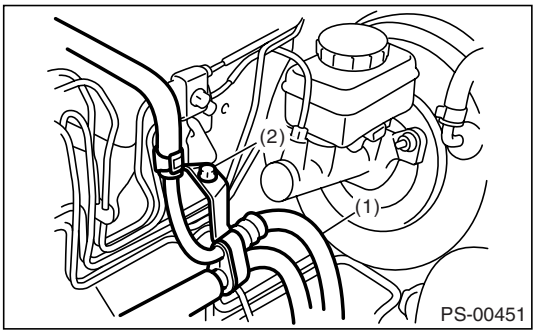
(1) Reservoir tank
(2) Suction hose
(3) Return hose

• H6 model



(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler pipe
(5) Oil cooler

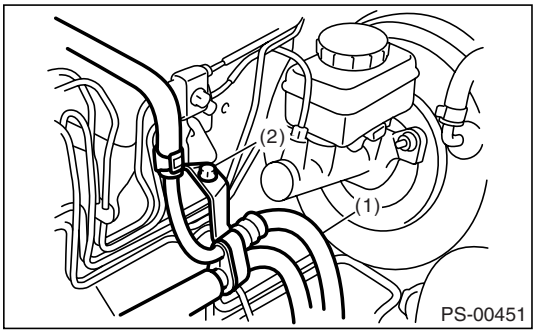
9) Remove the hose bracket and take out the hose assembly from vehicle.



(1) Hose ASSY
(2) Hose bracket

B: INSTALLATION

1) Temporarily tighten the bolt of hose bracket.

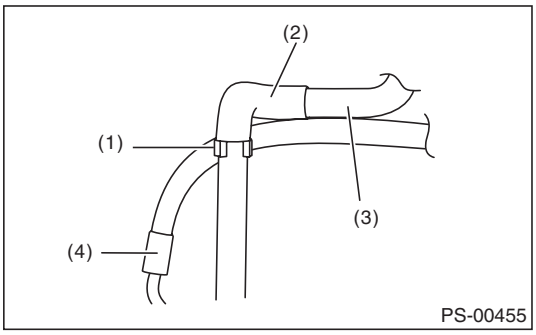


(1) Hose ASSY
(2) Hose bracket

2) Install the resin clip to the pressure hose and suction hose.

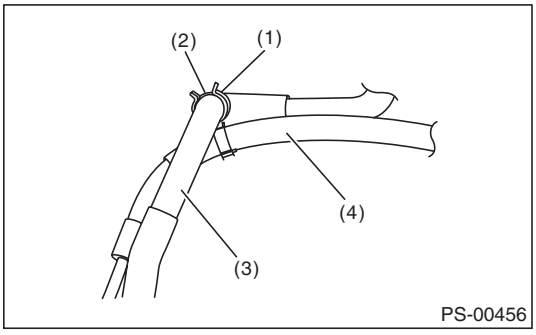
CAUTION:
Align the installation position of the resin clip with the protector edge of suction hose.

• Non-turbo model



(1) Resin clip
(2) Protector
(3) Suction hose
(4) Pressure hose

• Turbo model

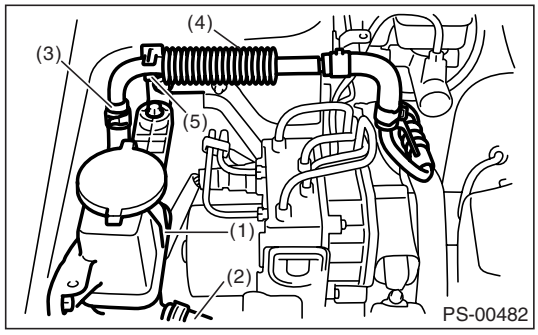


(1) Resin clip
(2) Protector
(3) Suction hose
(4) Pressure hose

3) Connect the suction hose and return hose to reservoir tank. Install the oil cooler to oil cooler bracket.

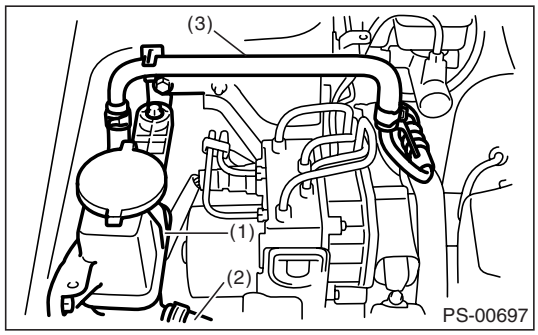
CAUTION:
Firmly insert the resin clip of return hose to bracket.

- H4 turbo model



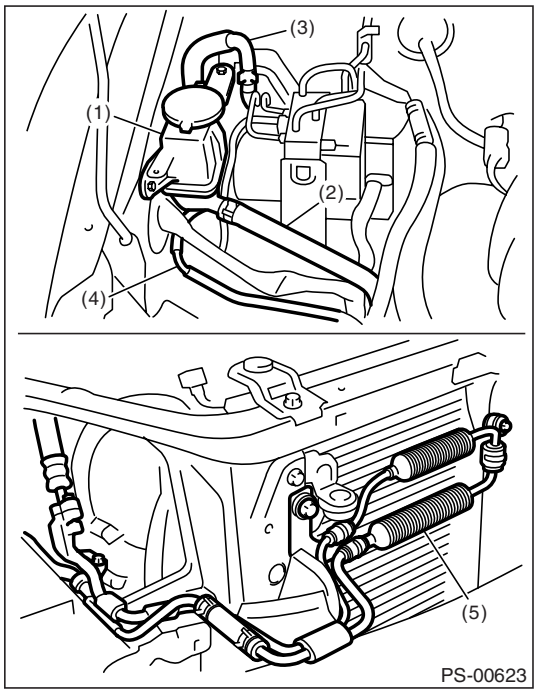
(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler
(5) Oil cooler bracket

- H4 non-turbo model



(1) Reservoir tank
(2) Suction hose
(3) Return hose

- H6 model

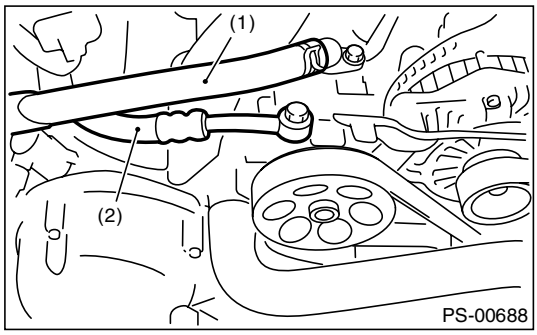


(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler pipe
(5) Oil cooler

4) Connect the suction hose and pressure hose to oil pump. Tighten the eye bolt of pressure hose.

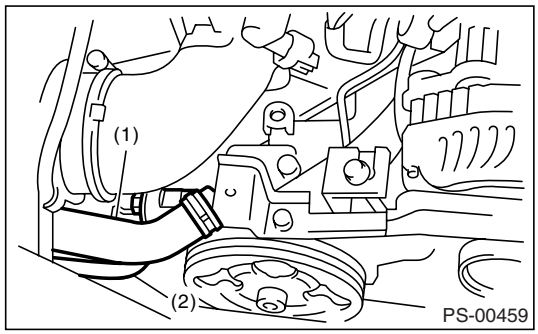
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

- Non-turbo model



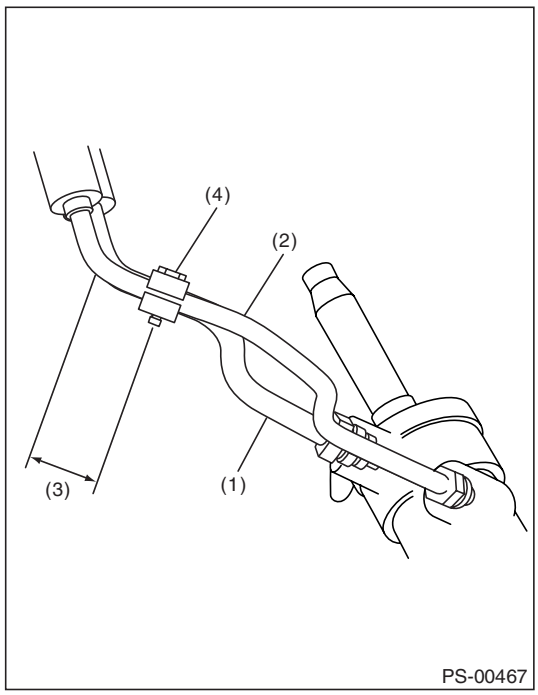
(1) Suction hose
(2) Pressure hose

• Turbo model



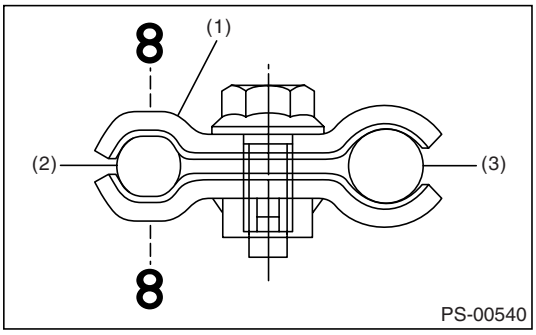
(1) Suction hose
(2) Pressure hose

5) Temporarily connect the return hose and pressure hose to gearbox. Place the clamp E in the position shown in the figure, and tighten the bolt temporarily.



(1) Return hose
(2) Pressure hose
(3) Approx. 27 mm (1.06 in)
(4) Clamp E

NOTE:
Ensure that the letter “8” on each clamp are diagonally opposite each other as shown in the figure.



(1) Clamp E
(2) Pipe C
(3) Return hose

6) Tighten the clamp E.

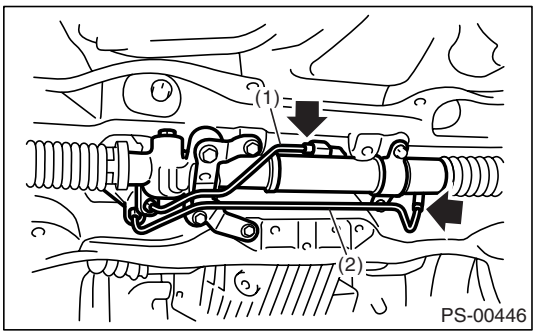
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

7) Tighten the joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

8) Connect the pipe A and B to the four pipe joints of gearbox.

Tightening torque:
Housing side
20 N·m (2.0 kgf-m, 14.5 ft-lb)
Cylinder side
24 N·m (2.4 kgf-m, 17.4 ft-lb)

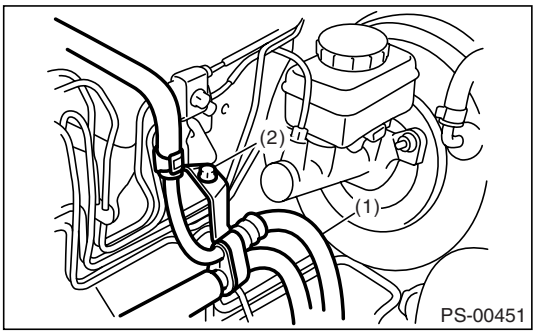


(1) Pipe A
(2) Pipe B

9) Install the front crossmember support plate and jack-up plate.
10) Lower the vehicle.

11) Tighten the bolts which hold the hose bracket.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



(1) Hose ASSY
(2) Hose bracket

12) Install the air intake duct.
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.> <Ref. to IN(H4SO 2.0)-8, INSTALLATION, Air Intake Duct.>
13) Connect the ground cable to battery.
14) Feed the specified fluid.

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

15) Finally, check clearance between pipes or hoses as shown in the figure indicated in “General Diagnostic Table”. <Ref. to PS-96, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>

C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace the defective parts as necessary.

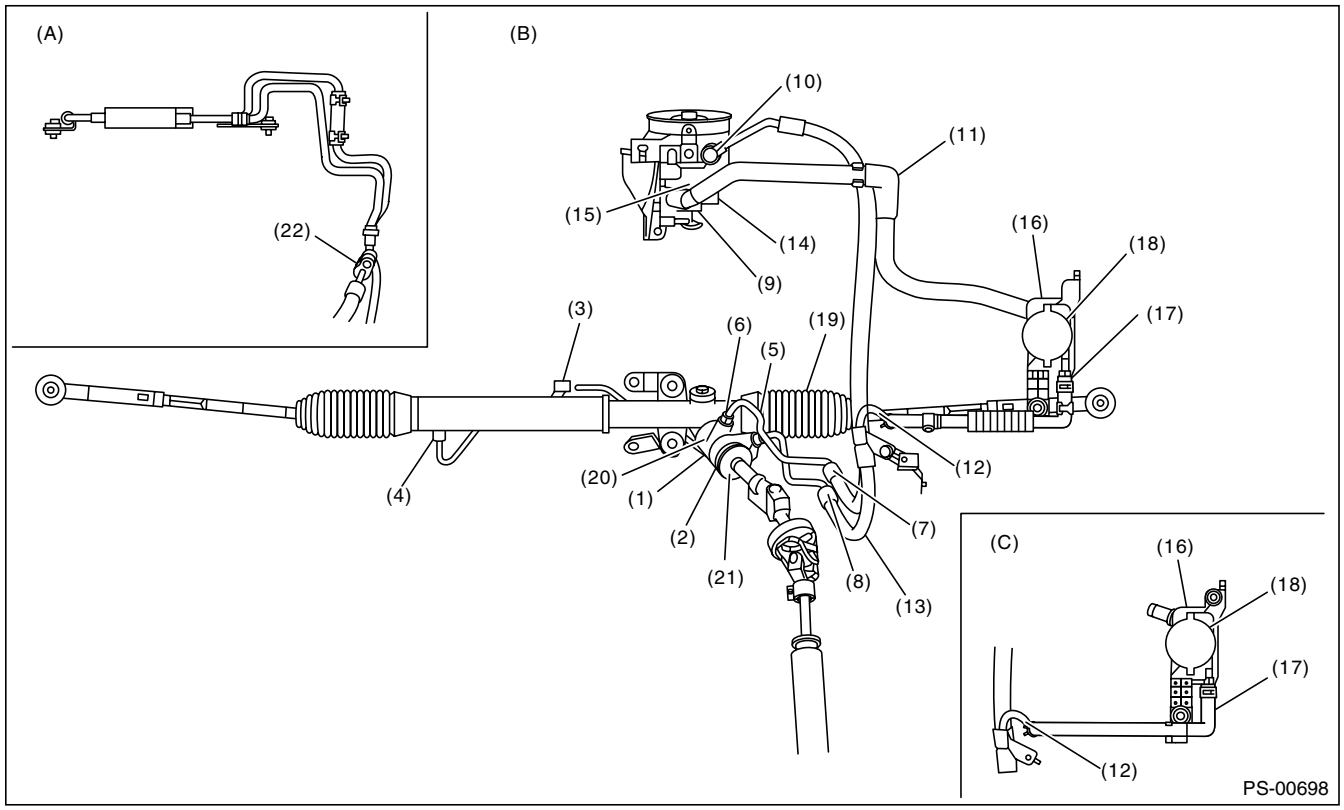
Parts	Maintenance Parts	Corrective action
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with a new one.
Clamp	• Clamps for weak clamping force	Replace with a new one.
Hose	• Flare surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for deformation	Replace with a new one.

CAUTION:
Although surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. Wipe out immediately when the hoses are adhered with the fluids.
Since resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather areas and a driving condition in which many steering operations are required in short time.
Particularly continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Repair.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the parts if defective.
	Improper stop position of pitching stopper	Replace the parts if defective.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customers.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct customers.

Pipe Assembly [RHD Model]

NOTE:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



(A) H6 model (B) H4 turbo model (C) H4 non-turbo model

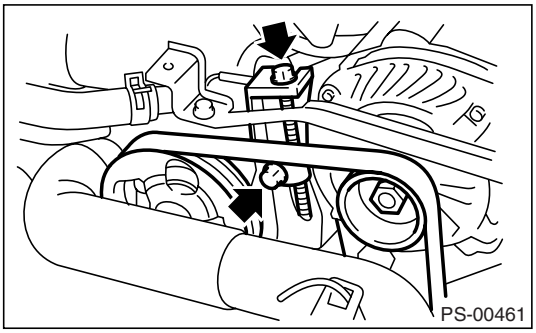
Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in the figure	Insufficient tightening of flare nut, adhesion of dirt, damage to flare or flare nut or eye bolt	Loosen and retighten. Replace if ineffective.
	Poor insertion of hose or clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace O-ring or gasket pipe or hose with new one, if ineffective, replace the gearbox also.
Leakage from hose (11), (12) and (13) in the figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (14) and (15) in the figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank (16) and (17) in the figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in the figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gearbox (20) and (21) in the figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.
(22) Leakage from the joints between cooler pipe and hose.	Insufficient tightening of connecting portion.	Loosen and retighten.

9. Oil Pump

A: REMOVAL

1. H4 MODEL

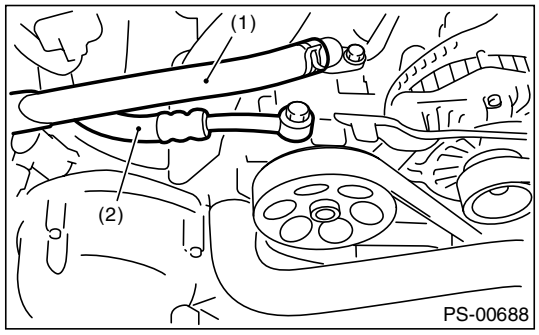
1) Disconnect the ground cable from battery.
2) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.> <Ref. to IN(H4SO 2.0)-8, REMOVAL, Air Intake Duct.>
3) Remove the pulley belt cover.
4) Loosen the belt tension securing bolt and generator securing bolt, and then remove the power steering pump V-belt.



5) Disconnect the connector from power steering pump switch.
6) Disconnect the pressure hose and suction hose from oil pump.

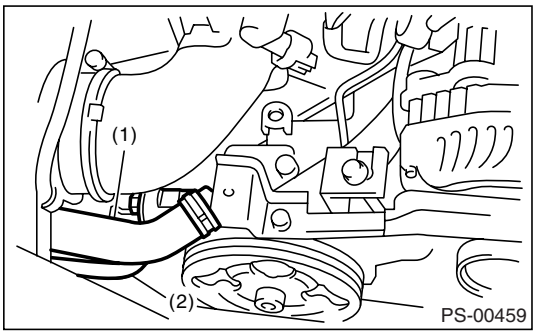
CAUTION:
• Do not allow fluid to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends with a clean cloth.

• Non-turbo model



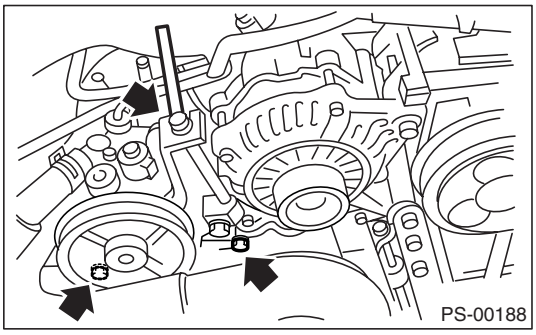
(1) Suction hose
(2) Pressure hose

• Turbo model



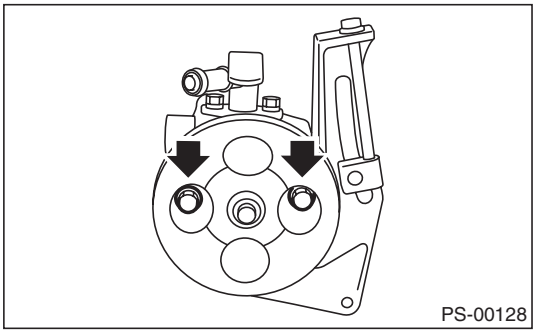
(1) Suction hose
(2) Pressure hose

7) Remove the bolts which hold the power steering pump bracket.



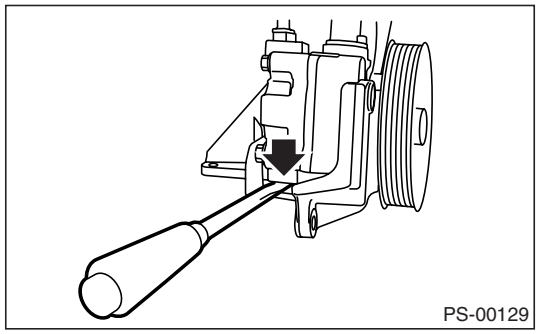
8) Place the oil pump bracket in a vise, and remove the two bolts from the front side of oil pump.

CAUTION:
When securing the oil pump bracket in a vise, hold the oil pump bracket with the least possible force between two wood pieces.



9) Remove the bolt from the rear side of oil pump.

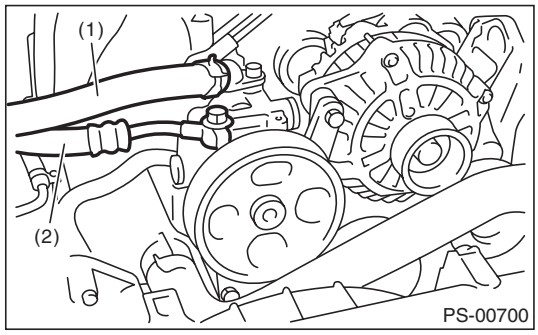
10) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



2. H6 MODEL

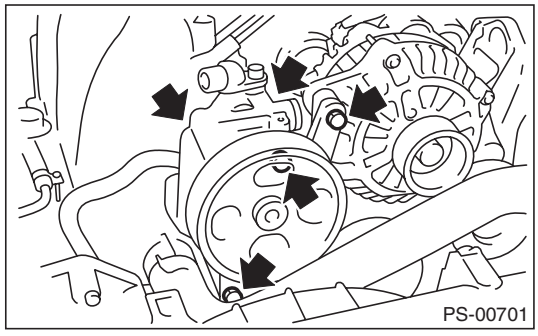
1) Disconnect the ground cable from battery.
2) Remove the cover of pully belt.
3) Remove the V-belt.
4) Remove the power steering pressure switch connector.
5) Remove the tensioner adjuster.
6) Disconnect the pressure hose and suction hose from the oil pump.

CAUTION:
• Do not allow fluid to flow from the hose end and to contact pully belt.
• To prevent entering foreign matter into hose, cover the hose opening with clean cloth.



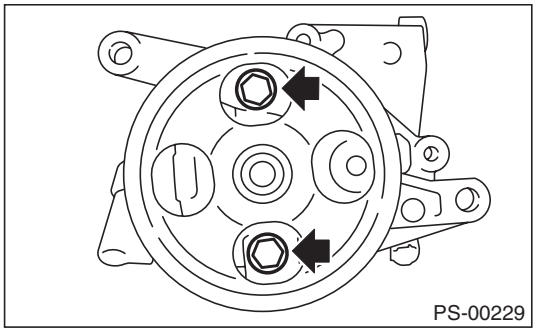
(1) Suction hose
(2) Pressure hose

7) Remove the bolts which install power steering pump bracket.

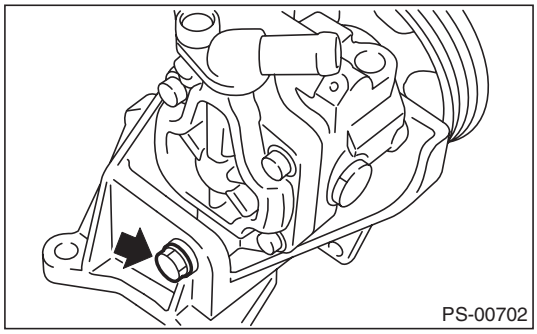


8) Place the oil pump bracket in a vise, and remove the two bolts from the front side of oil pump.

CAUTION:
When securing the oil pump bracket in a vise, hold the oil pump bracket with the least possible force between two wood pieces.



9) Remove the bolt from back side of oil pump.



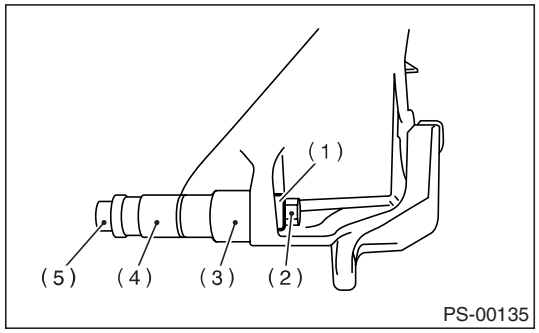
10) Remove the oil pump from bracket.

B: INSTALLATION

1. H4 MODEL

1) Install the oil pump to bracket.
(1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2″) type 14- and 21-mm box wrench until it is in contact with oil pump mounting surface.

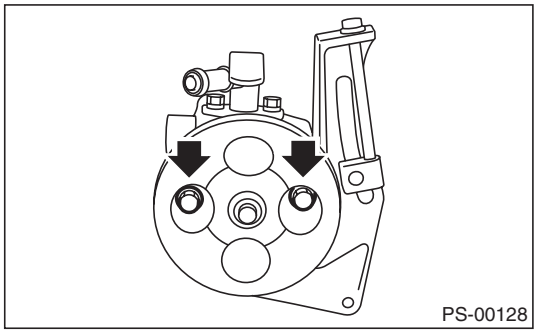
CAUTION:
When securing the oil pump bracket in a vise, hold the oil pump bracket with the least possible force between two wood pieces.



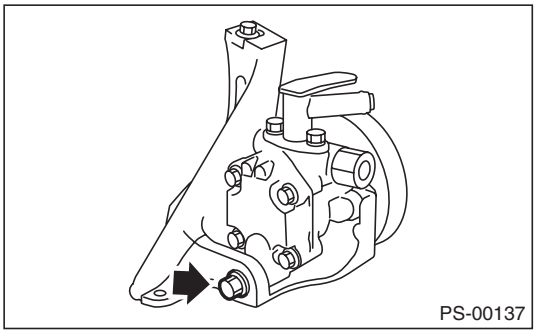
(1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten the bolt which holds the oil pump to bracket.

Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

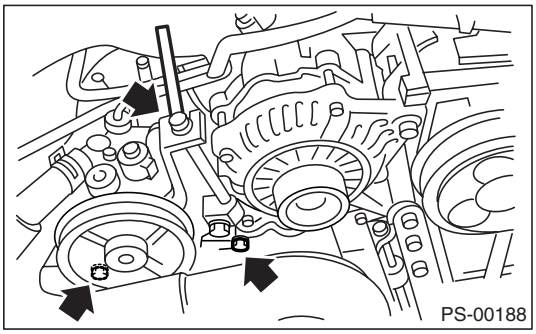


Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten the bolts which hold the power steering pump bracket.

Tightening torque:
<Ref. to PS-9, OIL PUMP, COMPONENT, General Description.>

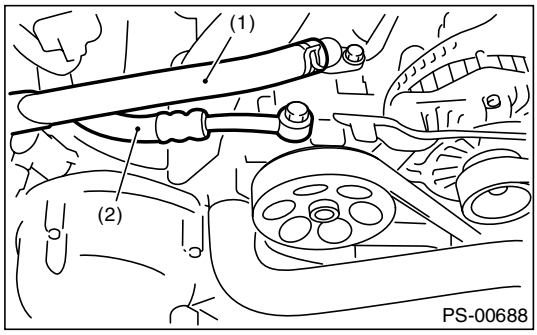


3) Interconnect the pressure hose and suction hose.

Tightening torque:
Eye bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)

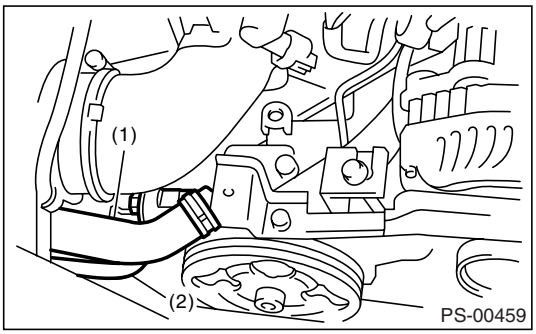
CAUTION:
If a hose is twisted at this step, take care the hose may come into contact with some other parts.

- Non-turbo model



(1) Suction hose
(2) Pressure hose

• Turbo model



(1) Suction hose
(2) Pressure hose

4) Connect the connector to power steering pump switch.
5) Install the V-belts to oil pump.
6) Check the tension of V-belt.
<Ref. to ME(H4SO 2.0)-38, INSPECTION, V-belt.>
7) Tighten the belt tension bolt.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

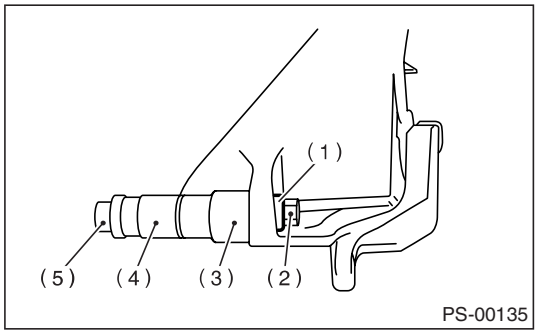
8) Install the pulley belt cover.
9) Install the air intake duct.
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.> <Ref. to IN(H4SO 2.0)-8, INSTALLATION, Air Intake Duct.>
10) Connect the ground cable to battery.
11) Feed the specified power steering fluid. <Ref. to PS-91, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid otherwise vane pump might be seized up.

2. H6 MODEL

1) Install the oil pump to bracket.
(1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2″) type 14- and 21-mm box wrench until it is in contact with oil pump mounting surface.

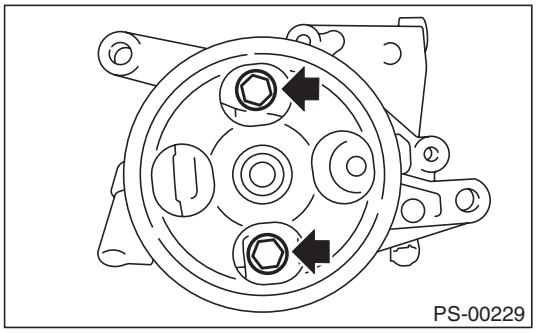
CAUTION:
When securing the oil pump bracket in a vise, hold the oil pump bracket with the least possible force between two wood pieces.



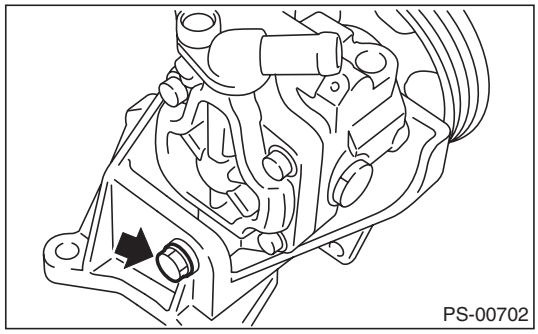
(1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten the bolt which installs oil pump to bracket.

Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

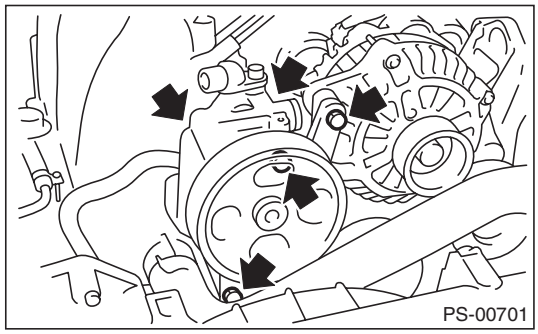


Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten the bolts which install power steering pump bracket.

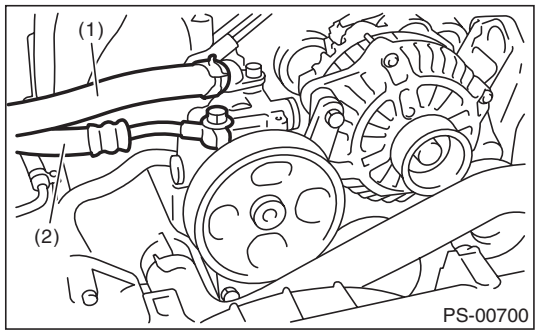
Tightening torque:
<Ref. to PS-9, OIL PUMP, COMPONENT, General Description.>



3) Connect the pressure hose and suction hose each other.

Tightening torque:
Eye bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)

CAUTION:
If a hose is twisted at this step, take care the hose may come into contact with some other parts.



(1) Suction hose
(2) Pressure hose

4) Connect the connector to power steering oil pressure switch.
5) Install the tensioner adjuster.
6) Install the V-belts.
7) Install the cover of pully belt.
8) Connect the battery ground cable to battery.
9) Pour the specified power steering fluid. <Ref. to PS-91, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and replace defective parts.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new one.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new one.
2	Pulley	(1) Damage	Replace with a new one.
		(2) Bend	Measure the V ditch deflection. If it exceeds the service limit, replace the pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check the resistance to the rotation of pulley. If it exceeds the service limit, replace the oil pump with a new one.
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning its pulley which is put around with a string, replace the oil pump with a new one.
4	O-ring	Crack or deterioration	Replace with a new one.
5	Bracket	Crack	Replace with a new one.

2. SERVICE LIMIT

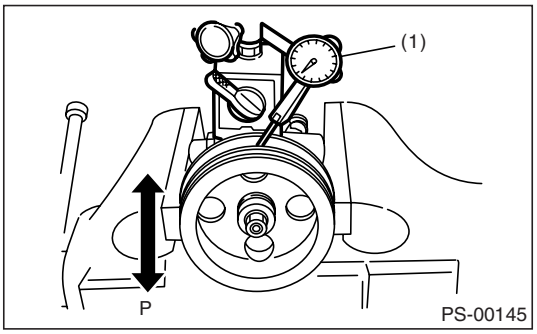
Make a measurement as follows. If it exceeds the service limit, replace with a new one.

CAUTION:
• When securing the oil pump on a vise, hold the oil pump with the least possible force between two wood pieces.
• Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

1) Play of the pulley shaft

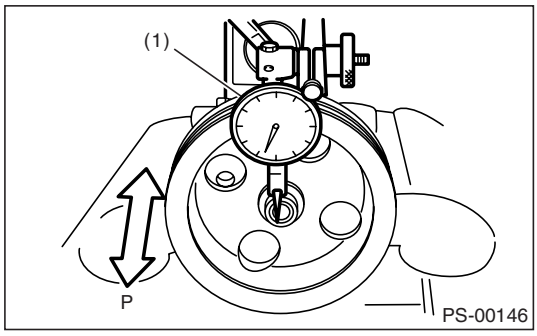
Condition:
P: When applying the force of 9.8 N (1.0 kgf, 2.2 lbf)

Service limit:
Radial play (Direction ⇦ ⇨)
0.4 mm (0.016 in) or less



(1) Dial gauge

Axial play (Direction ⇦ ⇨)
0.9 mm (0.035 in) or less

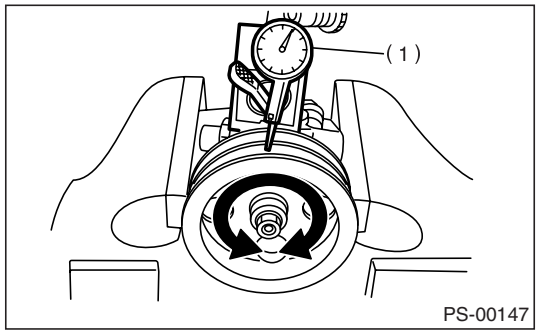


(1) Dial gauge

2) Ditch deflection of pulley

Service limit:
1.0 mm (0.039 in) or less

NOTE:
Read the value for one surface of V ditch, and then the value for another off the dial.

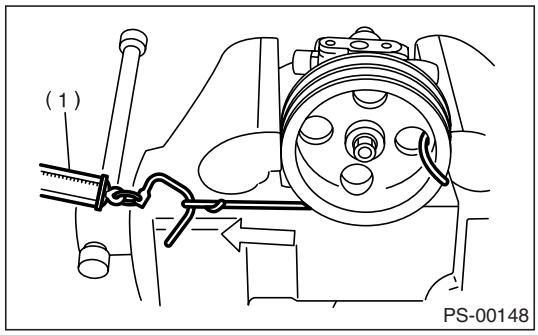


(1) Dial gauge

3) Resistance to rotation of pulley

Service limit:
Maximum load: 9.22 N (0.94 kgf, 2.07 lbf) or less

NOTE:
• A rather higher value may be indicated when pulley starts turning.
• Measure the load during rotation to make a judgment.



(1) Spring balance

3. HYDRAULIC PRESSURE

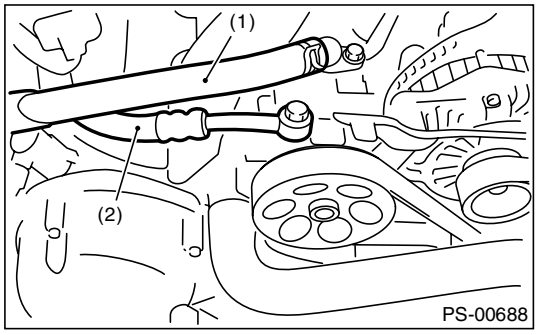
NOTE:
• Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure cannot be measured correctly. <Ref. to PS-92, INSPECTION, General Diagnostic Table.>
• Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
• Put cloth at a place where fluid drops before pressure gauge is installed. Wipe off spilt fluid thoroughly after the measurement.

1) Regular pressure measurement
(1) Connect ST1, ST2 and ST3.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

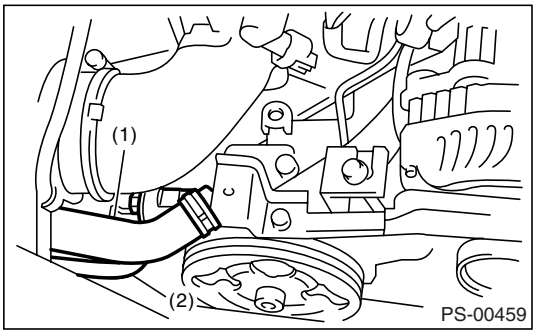
(2) Remove the air intake duct.
(3) Disconnect the pipe C from pump.
(4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to pump instead of pressure hose.

• Non-turbo model



(1) Suction hose
(2) Pressure hose

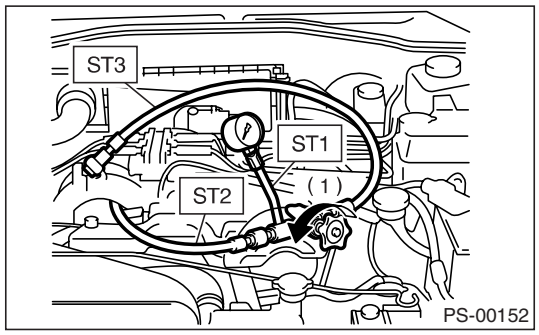
• Turbo model



(1) Suction hose
(2) Pressure hose

(5) Install the ST3 to the end of pressure hose which is removed from pump.
(6) Replenish the power steering fluid up to specified level.
(7) Open the valve, and start the engine.
(8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



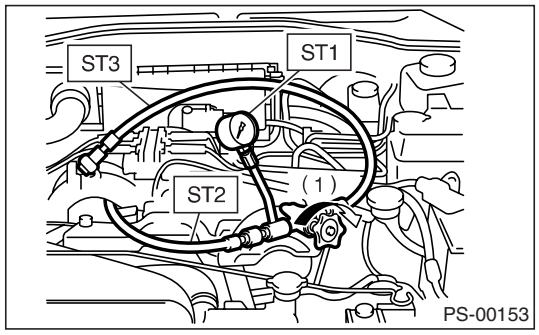
(1) Valve

Service limit:
981 kPa (10 kgf/cm^2, 142 psi) or less

(9) If it is not within the specification, replace the troubled part caused by following symptoms. (Pipe or hose clogged, leaks from fluid line, and mixture of foreign matters in fluid line)

2) Measure the relief pressure.
(1) Using the ST, measure the relief pressure.
(2) Close the valve.
(3) Measure the relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



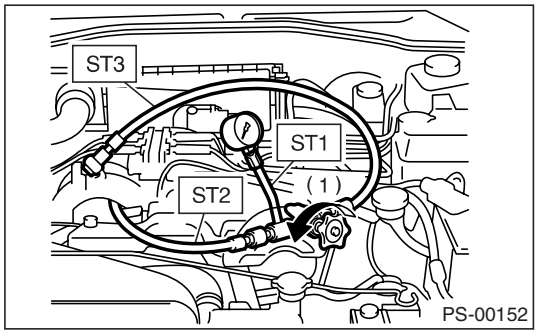
(1) Valve

Service limit:
Non-turbo model (Except for 3.0 R model):
6,767 — 7,453 kPa (69 — 76 kgf/cm^2, 981 — 1,081 psi)
Turbo model:
7,350 — 8,036 kPa (75 — 82 kgf/cm^2, 1,067 — 1,165 psi)
3.0 R model:
8,300 — 9,000 kPa (85 — 92 kgf/cm^2, 1,204 — 1,305 psi)

(4) If it is not within the specification, replace the oil pump.

3) Measure working pressure.
(1) Using the ST, measure the working pressure.
(2) Open the valve.
(3) Measure the working pressure of control valve by turning steering wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



(1) Valve

Service limit:
7,650 — 8,330 kPa (78 — 85 kgf/cm^2, 1,110 — 1,208 psi)

(4) If it is not within the specification, measure the steering effort. <Ref. to PS-95, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within the specification, replace the control valve itself or control valve and pinion as a single unit with new ones.

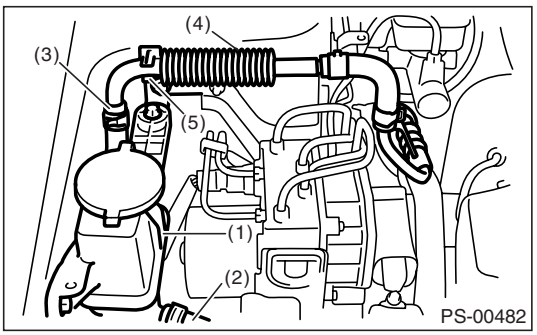
10.Reservoir Tank

A: REMOVAL

1) Drain fluid from the reservoir tank.
2) Disconnect the hose from reservoir tank.

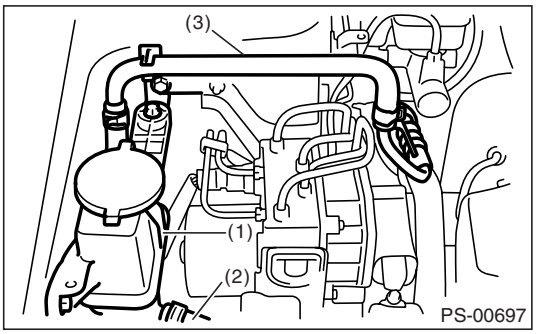
CAUTION:
To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

- H4 turbo model



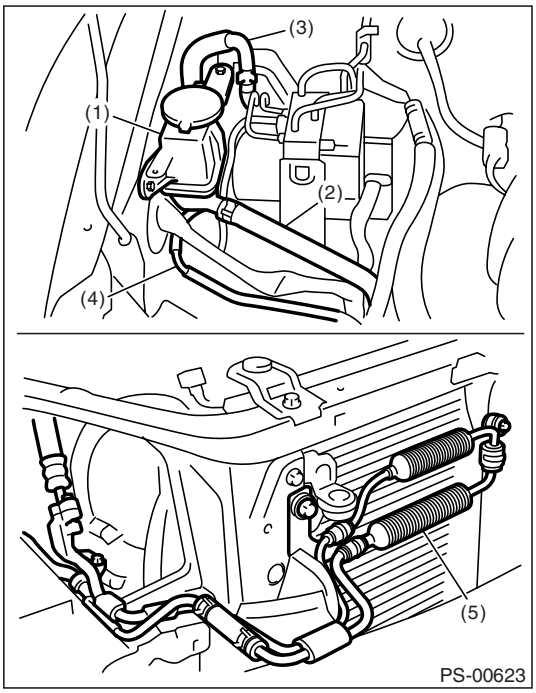
(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler
(5) Oil cooler bracket

- H4 non-turbo model



(1) Reservoir tank
(2) Suction hose
(3) Return hose

- H6 model



(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler pipe
(5) Oil cooler

3) Remove the reservoir tank from body.

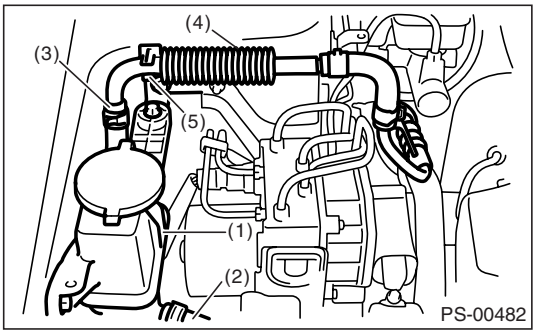
B: INSTALLATION

1) Install the reservoir tank to body.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

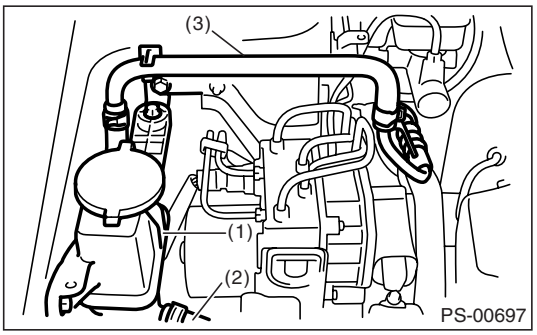
2) Connect the hose to reservoir tank.

- H4 turbo model



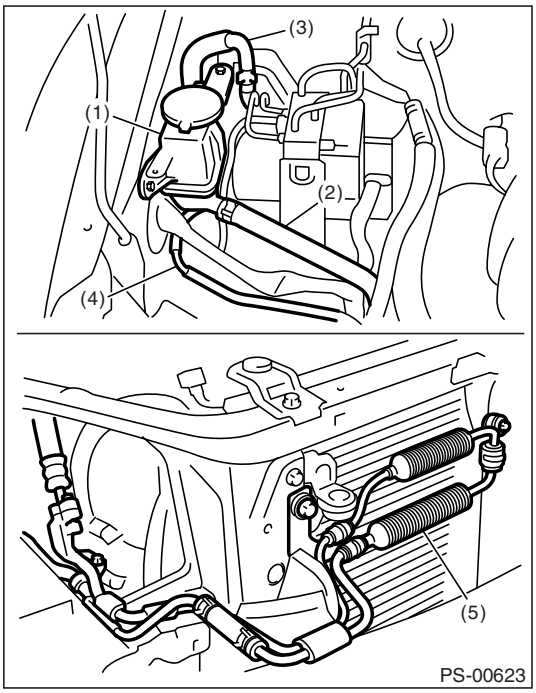
(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler
(5) Oil cooler bracket

- H4 non-turbo model



(1) Reservoir tank
(2) Suction hose
(3) Return hose

- H6 model



(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Oil cooler pipe
(5) Oil cooler

3) Feed the power steering fluid to specified level. <Ref. to PS-91, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage or damage. If a failure is found, replace the reservoir tank.

11.Power Steering Fluid

A: SPECIFICATION

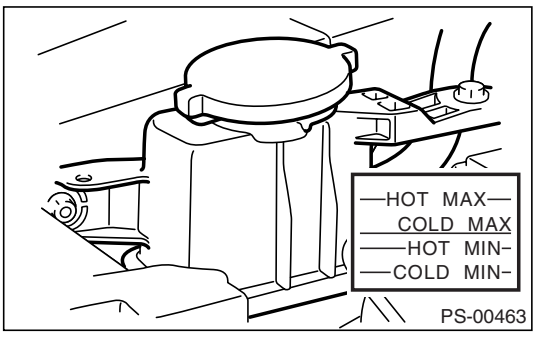
Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.
3) Inspect the fluid level on flat and level surface with engine "OFF" by indicator of reservoir tank.
If the level is at "MIN." point or below, add fluid to keep the level in the specified range of the indicator. If at "MAX." point or above, drain fluid by using a syringe or the like.

(1) Check at power steering fluid temperature 20°C (68°F); read the fluid level on the "COLD" side.

(2) Check at power steering fluid temperature 80°C (176°F); read the fluid level on the "HOT" side.



C: REPLACEMENT

1) Lift-up the vehicle.
2) Remove the crossmember support.
3) Remove the pipe joint in the center of gearbox, and connect the vinyl hose to the pipe and joint. Wipe fluid off while turning the steering wheel.
4) Add the specified fluid to reservoir tank at MAX level.
5) Continue to turn the steering wheel slowly from lock to lock until the bubbles stop appearing on oil surface while keeping the fluid at the level in the Step 4).
6) If turning the steering wheel in low fluid level condition, air will be sucked in pipe. In this case, leave it about half an hour and then do the step 5) again.
7) Start the engine and let it idle.
8) Continue to turn the steering wheel slowly from lock to lock again until the bubbles stop appearing on oil surface while keeping the fluid at the level in Step 4).
Normally bubbles stop appearing after three times turning of steering wheel from lock to lock.
9) In case bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 4) all over again.
10) Lower the vehicle, and then idle the engine.
11) Continue to turn the steering wheel from lock to lock until the bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.

(1) The fluid level changes over 3 mm (0.12 in).

(2) Bubbles remain on the upper surface of the fluid.

(3) Grinding noise is generated from oil pump.

13) Check the fluid leakage after turning steering wheel from lock to lock with engine running.

12.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning.	1. Pulley belt • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys except oil pump pulley • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and wheel • Improper tires out of specification*1 • Improper wheel out of specification*1 • Tires not properly inflated	Replace or reinflate.
	3. Fluid • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idle speed • Lower idle speed • Excessive drop of idle speed at start or at turning steering wheel *3	Adjust or instruct customer.
	5. Measure hydraulic pressure. <Ref. to PS-86, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure steering effort. <Ref. to PS-95, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other • Poor return of steering wheel to center • Steering wheel surges when turning.	1. Fluid line • Folded hose • Flattened pipe	Correct or replace.
	2. Tire and wheel • Flat tire • Mix use of different tires • Mix use of different wheels • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure	Adjust, fix or replace.
	3. Front alignment • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • Unbalanced weight	Replace, adjust or instruct customer.
	5. Measure steering effort. <Ref. to PS-95, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If the tires or wheels are wider than standard, the load to power steering system is increased. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When the measured hydraulic pressure is normal, there is no abnormal thing.
*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn the steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.

*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

1. NOISE AND VIBRATION

CAUTION:
Do not keep the relief valve operated over five seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
• Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still, there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
• When turning the steering wheel with service brake and/or parking brake applied, the noise is generated by creaking between disc and pads. However this does not indicate abnormal function in system.
• There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts are properly adjusted and have no defects.
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
These phenomena do not indicate there are some abnormal functions in the system.
Confirm the vibration by turning the steering wheel repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in “D” range for AT model.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Do not keep this condition over five seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is defective.	Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-71, INSPECTION, Pipe Assembly [LHD Model].>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace the faulty parts of the gearbox or oil pump.
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 and retighten.
	Loosened tightening or play of tie-rod, tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten the fluid line connection. Refill the fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Pulley bearing seizing of oil pump	Replace the oil pump.
	Folded hose, flattened pipe	Replace.

General Diagnostic Table

Trouble	Possible cause	Corrective action
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Runout or defacement of V-groove surface of oil pump pulley	Clean or replace.
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the wrong part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Abnormal inside of hose or pipe Flattened hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace the faulty parts of the gearbox or hose.
Whine or growl (intermittent or continuous) While engine is running with/ without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace the oil pump or hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and confirm.
Grinding noise (continuous) While engine is running with the steering turned.	Abnormal inside of gearbox	Replace the faulty parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (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.	Too low engine speed	Adjust and instruct customers.
	Vane pump aeration	Fix the wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace the oil pump, faulty parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

2. MEASUREMENT OF STEERING EFFORT

	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on a concrete road. 2) Start the engine. 3) Run the engine at idle. 4) Install a spring scale on the steering wheel. 5) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts. NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not defective.	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lbf)?	Go to step **2.**	Adjust the backlash.
2	**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 **3.**	Perform adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove the universal joint. 2) Measure steering wheel effort.	Is the steering effort less than 2.26 N (0.23 kgf, 0.51 lbf)?	Go to step **4.**	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure steering wheel effort.	Is the difference of steering effort between clockwise and counterclockwise less than 20%?	Go to step **5.**	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of steering column side). <Ref. to PS-22, INSPECTION, Universal Joint.>	Is the swing torque of universal joint less than 7.3 N (0.74 kgf, 1.64 lbf)?	Go to step **6.**	Replace with a new one.
6	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-22, INSPECTION, Universal Joint.>	Is the swing torque of universal joint less than 3.8 N (0.39 kgf, 0.86 lbf)?	Go to step **7.**	Replace with a new one.
7	**CHECK FRONT WHEEL.** Check the front wheel.	If the front wheels have unsteady revolution or rattling and brake for dragging?	Inspect, readjust and replace if necessary.	Go to step **8.**
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends.	If the tie-rod ends of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **9.**
9	**CHECK BALL JOINT.** Remove the ball joint.	If the ball joints of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **10.**
10	**CHECK GEARBOX.** Measure the rotating of gearbox. <Ref. to PS-44, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [LHD Model].> or <Ref. to PS-63, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [RHD Model].>	Is the rotating resistance of steering gearbox less than LHD model: 10.5 N (1.1 kgf, 2.4 lbf) or RHD model: 13 N (1.3 kgf, 2.9 lbf)? Is the difference between clockwise and counterclockwise less than 20%?	Go to step **11.**	Readjust the backlash, and if ineffective, replace the faulty parts.

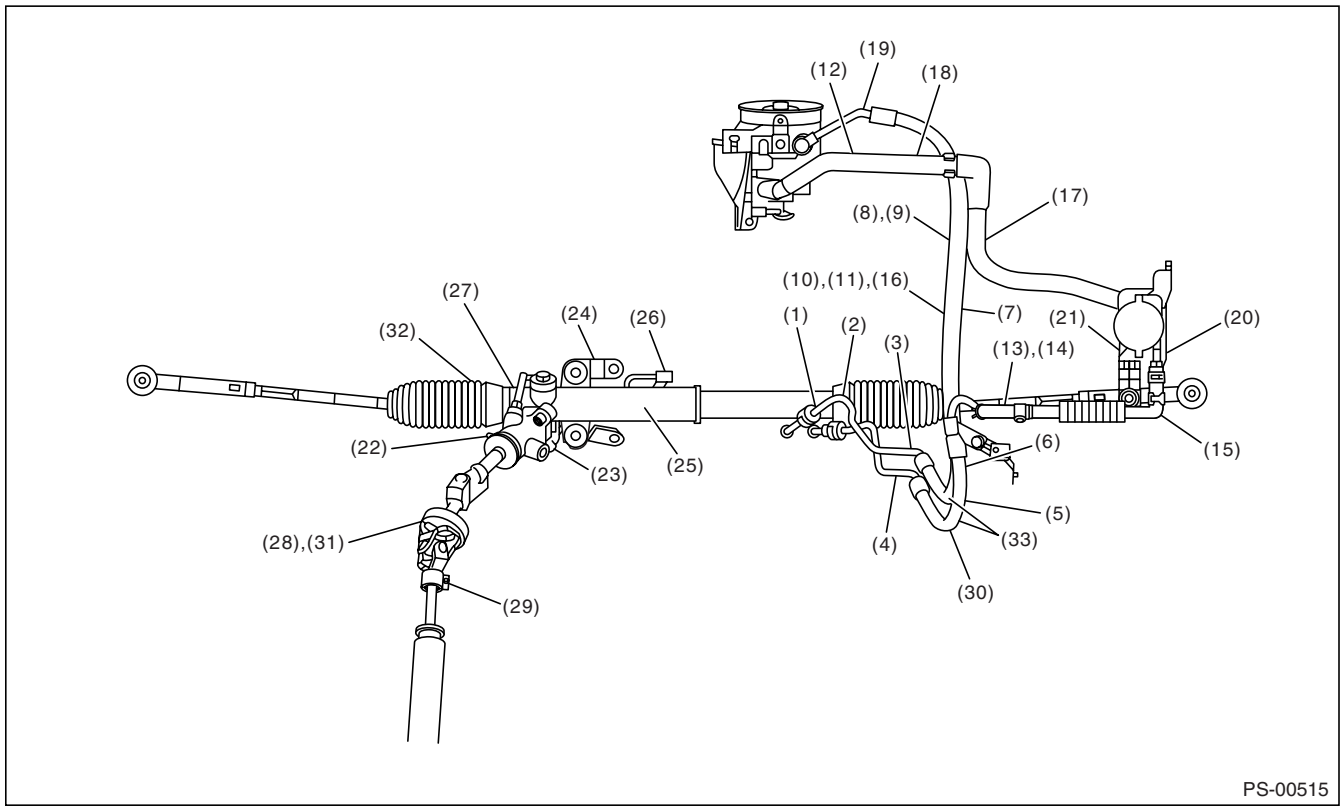
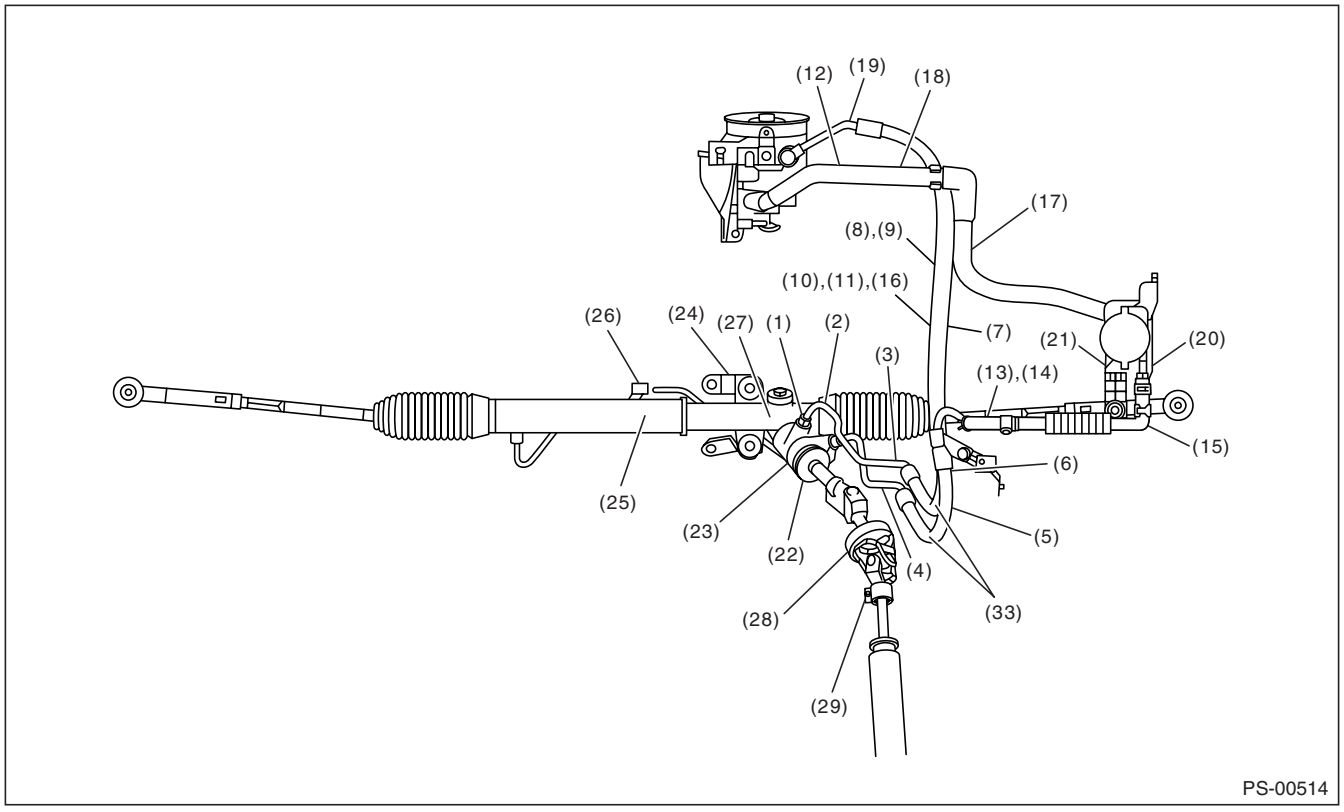
Step		Check	Yes	No
11	**CHECK GEARBOX.** Measure the sliding of gearbox. <Ref. to PS-43, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].> or <Ref. to PS-62, SERVICE LIMIT, INSPECTION, Steering Gearbox [RHD Model].>	Is the sliding resistance of steering gearbox less than LHD model: 400 N (41 kgf, 90 lbf) or RHD model: 314 N (32 kgf, 71 lbf)? Is the difference between right and left sliding resistances less than 20%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

3. INSPECTION OF CLEARANCE

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) Crossmember-to-Hose ASSY	3 (0.12)
(2) Front exhaust pipe-to-Hose ASSY (Turbo model)	15 (0.59)
(3) Front frame side-to-Hose ASSY	10 (0.39)
(4) Turbo cover-to-Hose ASSY (Turbo model)	10 (0.39)
(5) Master cylinder-to-Return hose (Turbo model)	10 (0.39)
(6) Master cylinder-to-Hose clip (Model with vehicle dynamics control (VDC))	10 (0.39)
(7) VDC H/U-to-Hose ASSY (Model with vehicle dynamics control (VDC))	5 (0.20)
(8) Air cleaner-to-Hose ASSY (Turbo model)	5 (0.20)
(9) Air boot-to-Hose ASSY	10 (0.39)
(10) Protector-to-Hose ASSY (Turbo model, DOHC non-turbo model)	10 (0.39)
(11) Blow-by hose-to-Hose ASSY (Turbo model)	8 (0.31)
(12) Over flow hose-to-Hose ASSY (Turbo model)	8 (0.31)
(13) Brake pipe-to-Return hose (Model with ABS)	10 (0.39)
(14) Front suspension bracket-to-Return hose	5 (0.20)
(15) Front wheel apron-to-Return hose	5 (0.20)
(16) VDC H/U bracket-to-Suction hose (Model with vehicle dynamics control (VDC))	5 (0.20)
(17) Air cleaner case-to-Suction hose	5 (0.20)
(18) Air intake duct-to-Suction hose (Turbo model)	10 (0.39)
(19) Air duct-to-Suction hose (Turbo model)	10 (0.39)
(20) Front wheel apron-to-Reservoir tank	5 (0.20)
(21) VDC H/U-to-Reservoir tank (Model with vehicle dynamics control (VDC))	5 (0.20)
(22) Valve housing-to-DOJ (MT model)	12 (0.47)
(23) Valve housing-to-Crossmember (Hole portion)	1 (0.04)
(24) Bracket-to-Crossmember	1 (0.04)
(25) Cylinder-to-Crossmember	5 (0.20)
(26) Elbow-to-Crossmember	1 (0.04)
(27) Cylinder-to-Exhaust pipe	18 (0.71)
(28) Universal joint coupling-to-Turbo cover (Turbo model)	15 (0.59)
(29) Universal joint column side yoke-to-Master cylinder (Closest approach point when universal joint turns by 360°) (OUTBACK model)	5 (0.20)
(30) Cruise control-to-Hose ASSY (Model with cruise control)	10 (0.39)
(31) Universal joint coupling-to-ATF level gauge (LHD model)	10 (0.39)
(32) Boot-to-Exhaust pipe (LHD model)	18 (0.71)
(33) Return hose-to-Pressure hose	No contact between hoses

• LHD model



• RHD model