CHASSIS SECTION

FRONT SUSPENSION	FS
REAR SUSPENSION	RS
WHEEL AND TIRE SYSTEM	WT
DIFFERENTIALS	DI
TRANSFER CASE	TC
DRIVE SHAFT SYSTEM	DS
ABS	ABS
ABS (DIAGNOSTICS)	ABS(diag)
ABS (5.3i) (DIAGNOSTICS)	ABS (5.3i) (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. G1880GE5

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FRONT SUSPENSION

FS

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1. General Description

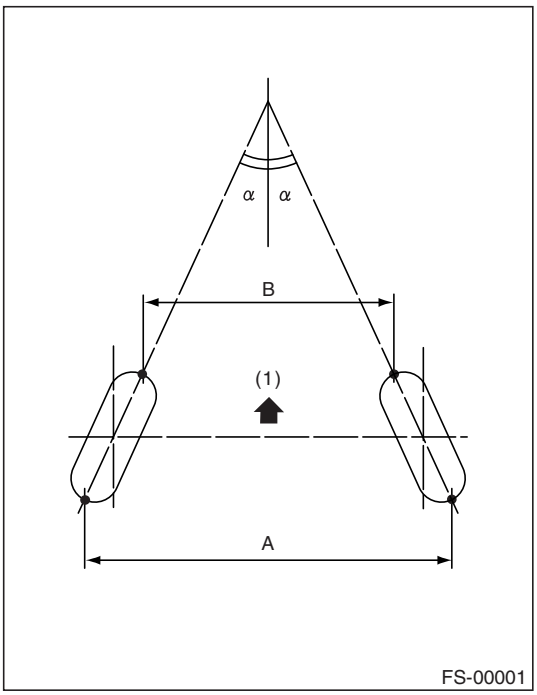
A: SPECIFICATION

	Model	Sedan			Wagon		OUT-BACK
		Non-turbo	Turbo	STi	Non-turbo	Turbo	
Front	Camber (tolerance: ±0°45′ adjustment standard: ±0°30′)	–0°15′	–0°25′	–0°25′	–0°10′	–0°20′	–0°05′
	Caster (Referential Value)	3°25′	3°35′	4°45′	3°25′	3°35′	3°25′
	Toe-in	Tolerance: 0±3 mm (0±0.12 in), Toe angle (The sum of both wheels): 0°±15′ Adjustment standard: 0±2 mm (0±0.08 in), Toe angle (The sum of both wheels): 0°±10′					
	Kingpin anglet (Referential Value)	14°20′	14°50′	14°35′	13°30′	13°45′	13°20′
	Wheel arch height [tolerance: +12/–24 mm (+0.47/–0.94 in)]	406 mm (15.98 in)	396 mm (15.59 in)	396 mm (15.59 in)	397 mm (15.63 in)	387 mm (15.24 in)	402 mm (15.83 in)
	Diameter of stabilizer	20 mm (0.79 in)	20 mm (0.79 in)	20 mm (0.79 in)	20 mm (0.79 in)	20 mm (0.79 in)	20 mm (0.79 in)
Rear	Camber (tolerance: ±0°45′ adjustment standard: ±0°30′)	–1°25′	–1°30′	–1°30′	–1°15′	–1°20′	–1°10′
	Toe-in	Tolerance: 0±3 mm (0±0.12 in), Toe angle (The sum of both wheels): 0°±15′ Adjustment standard: 0±2 mm (0±0.08 in), Toe angle (The sum of both wheels): 0°±10′					
	Thrust angle	Tolerance: ±0°30′, Adjustment standard: 0°±20′					
	Wheel arch height [tolerance: +12/–24 mm (+0.47/–0.94 in)]	381 mm (15.0 in)	376 mm (14.80 in)	373 mm (14.69 in)	381 mm (15.0 in)	376 mm (14.80 in)	386 mm (15.20 in)
	Diameter of stabilizer	*1	20 mm (0.79 in)	20 mm (0.79 in)	*2	17 mm (0.67 in)	—

*1 RS, GX (Model with 205 tire): 17 mm (0.67 in)
Except RS, GX (Model with 205 tire): None
*2 GX (Model with 205 tire): 17 mm (0.67 in)
Except GX (Model with 205 tire): None

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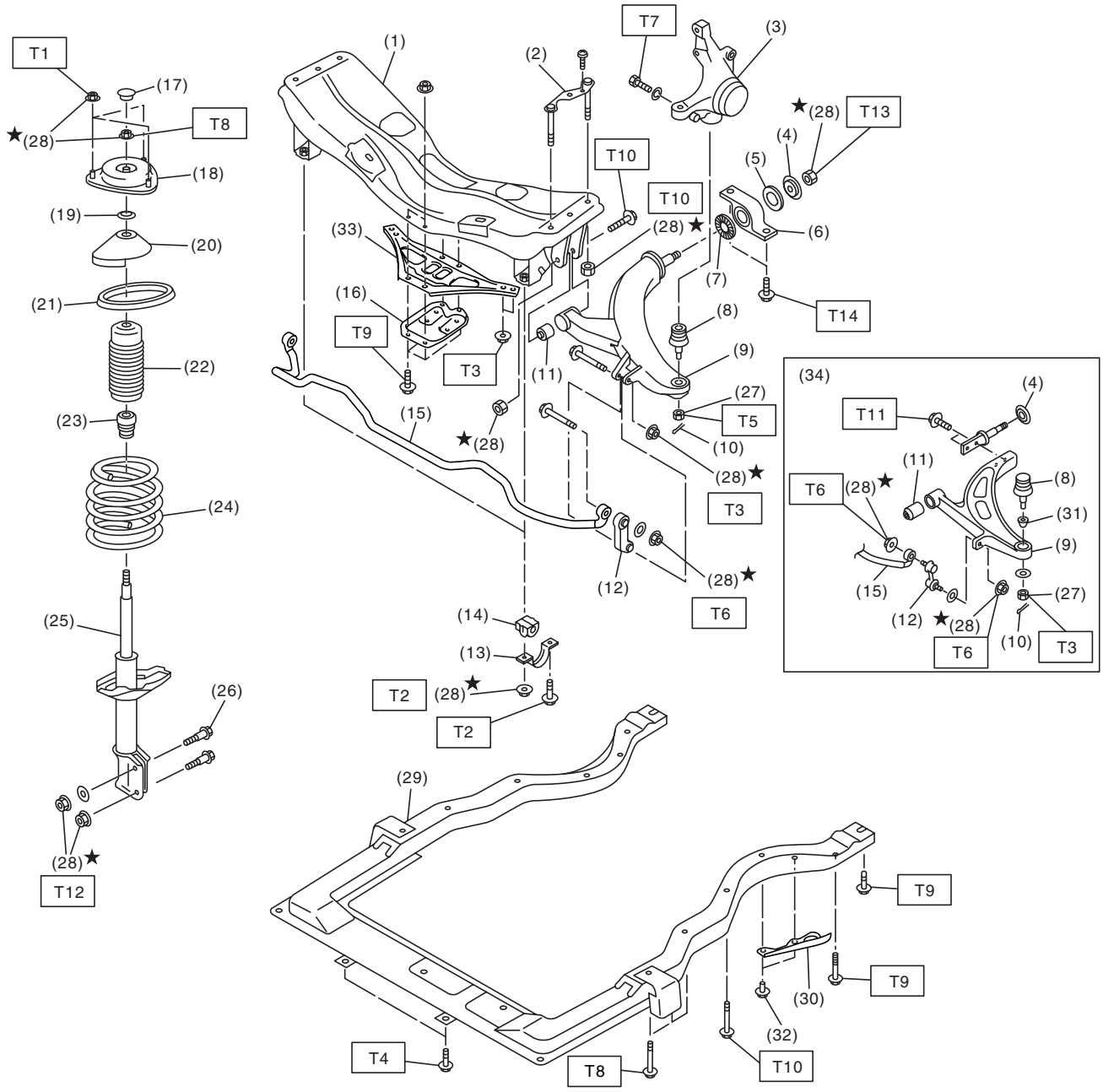
NOTE:
• Front and rear toe-in and front camber can be adjusted. If toe-in or camber exceeds tolerance, adjust toe-in and camber to the adjustment standard.
• The other items indicated in the specification table cannot be adjusted. If the other items exceeds specifications, check suspension parts and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



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

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B: COMPONENT



FS-00189

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(1) Front crossmember
(2) Bolt ASSY
(3) Housing
(4) Washer
(5) Stopper rubber (Rear)
(6) Rear bushing
(7) Stopper rubber (Front)
(8) Ball joint
(9) Transverse link
(10) Cotter pin
(11) Front bushing
(12) Stabilizer link
(13) Clamp
(14) Bushing
(15) Stabilizer
(16) Jack-up plate (NA model)
(17) Dust seal
(18) Strut mount
(19) Spacer
(20) Upper spring seat
(21) Rubber seat
(22) Dust cover
(23) Helper
(24) Coil spring
(25) Damper strut
(26) Adjusting bolt
(27) Castle nut
(28) Self-locking nut
(29) Sub frame
(30) Cover
(31) Boss
(32) Clip
(33) Jack-up plate (Turbo model and STi model)
(34) Sedan turbo model

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*20 (2.0, 14.5)*
T2:	*25 (2.5, 18.1)*
T3:	*30 (3.1, 22)*
T4:	*34 (3.5, 25)*
T5:	*40 (4.1, 30)*
T6:	*45 (4.6, 33)*
T7:	*50 (5.1, 37)*
T8:	*55 (5.6, 41)*
T9:	*70 (7.1, 52)*
T10:	*95 (9.7, 70)*
T11:	*155 (15.8, 114)*
T12:	*175 (17.8, 129)*
T13:	*186 (19.0, 137)*
T14:	*250 (25.5, 184)*

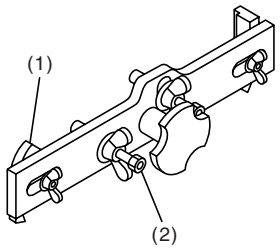
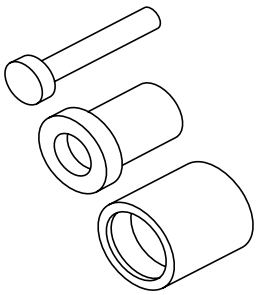
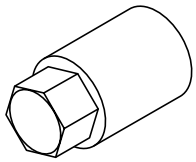
C: CAUTION

• Wear working 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 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 shop 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.

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D: PREPARATION TOOL

1. SPECIAL TOOLS

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 transverse link bushing.
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

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 disassembly/assembly.

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2. Wheel Alignment

A: INSPECTION

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

- tire air pressure
- unbalanced right and left tire wear, size difference
- tire run-out
- ball joint excessive play, wear
- tie rod end excessive play, wear
- wheel bearing excessive play
- right and left wheel base imbalance
- steering link part deformed, excessive play
- suspension part deformed, excessive play

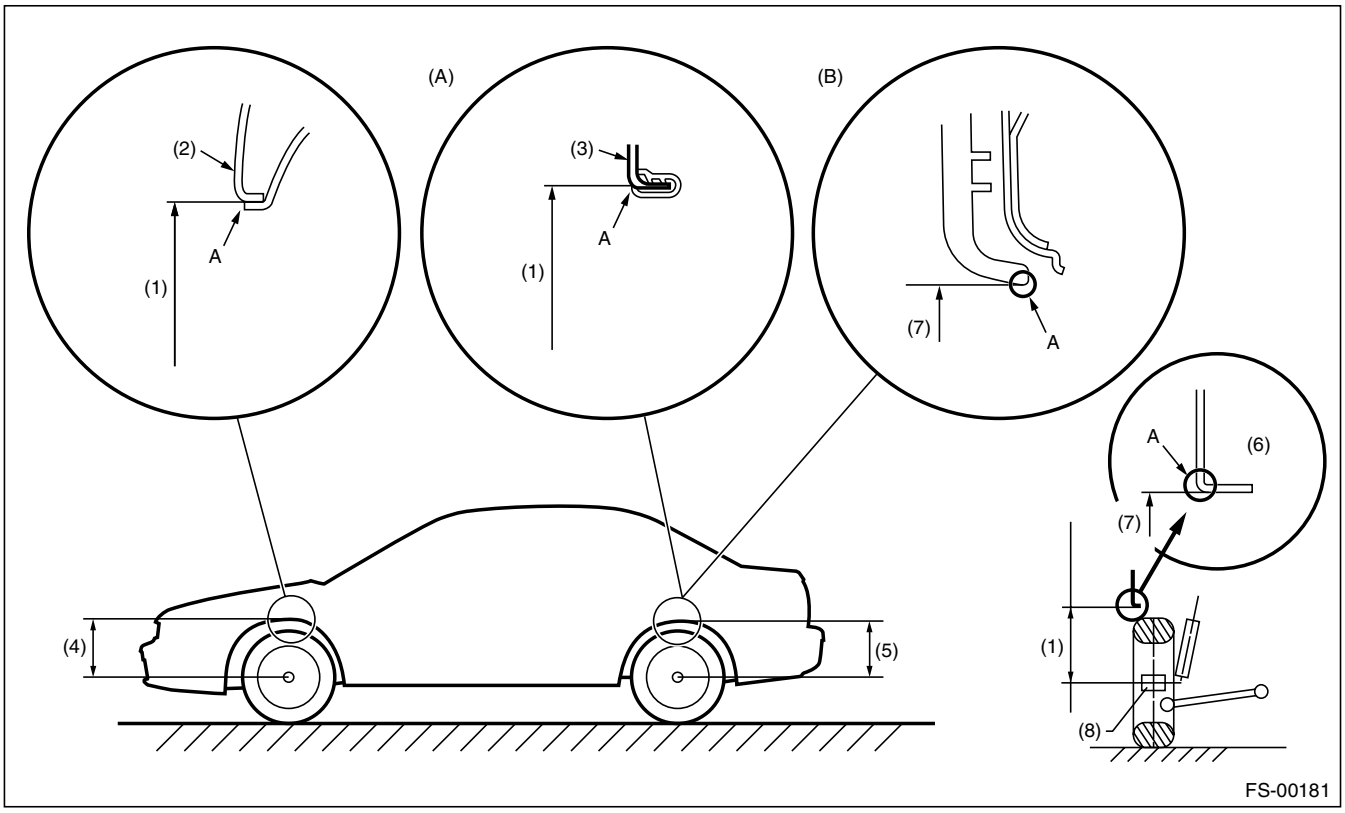
Check, adjust and/or measure the wheel alignment in accordance with procedures indicated in the figure:

Wheel arch height (Front and rear) <Ref. to FS-8, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (Front and rear) <Ref. to FS-9, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (Front) <Ref. to FS-10, CASTER, INSPECTION, Wheel Alignment.>
↓
Steering angle <Ref. to FS-10, 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-11, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Thrust angle <Ref. to FS-13, THRUST ANGLE, INSPECTION, Wheel Alignment.>

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1. WHEEL ARCH HEIGHT

1) Set the vehicle on a level surface.
2) Set the vehicle to “curb weight” conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
3) Set the steering wheel in a straight line, then remove the vehicle straight ahead more than 5 m (16 ft) to settle the suspension.
4) Suspend the thread from wheel arch (point “A” in figure below) to determine a point directly above center of wheel.
5) Measure the distance between measuring point “A” and center of wheel.



(A) Except STi model
(B) STi model

(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) Measuring point
(8) End of spindle

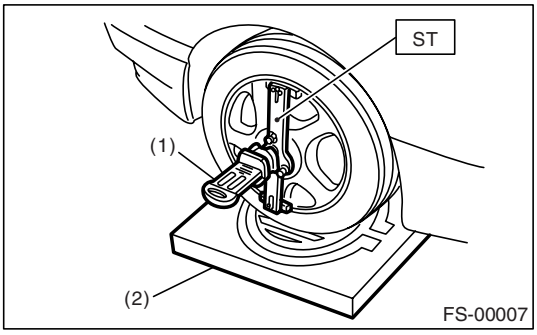
Model		Specified wheel arch height mm (in) (tolerance: $^{+12}_{-24}$ mm ($^{+0.47}_{-0.94}$ in))	
		Non-turbo	Turbo
Sedan	Front	406 (15.98)	396 (15.59)
	Rear	381 (15.0)	376 (14.80)
Wagon	Front	397 (15.63)	387 (15.24)
	Rear	381 (15.0)	376 (14.80)
OUTBACK	Front	402 (15.83)	—
	Rear	386 (15.20)	—
STi	Front	—	396 (15.59)
	Rear	—	373 (14.69)

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2. CAMBER

• Inspection

1) Place the front wheel on turning radius gauge. Make sure 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 install the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure camber angle.

Model		Camber (Differences between RH and LH: 45′ or less)
Sedan	Non-turbo	–0°15′±0°45′
	Turbo	–0°25′±0°45′
Wagon	Non-turbo	–0°10′±0°45′
	Turbo	–0°20′±0°45′
OUTBACK		–0°05′±0°45′

• Front Camber Adjustment

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

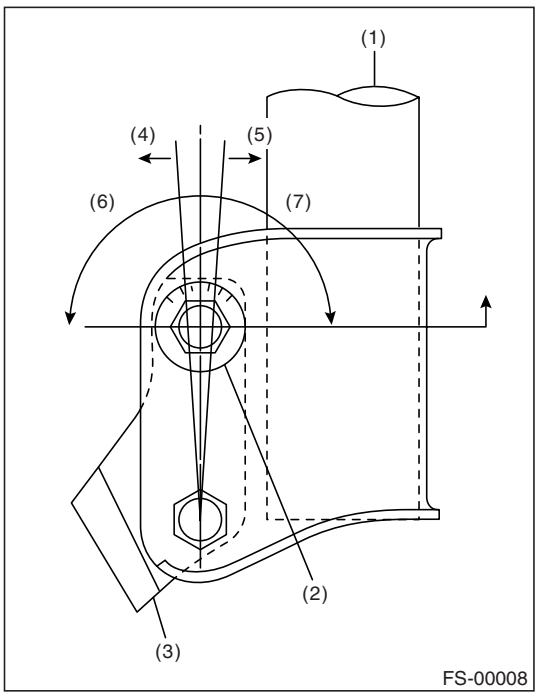
Model		Camber (Differences between RH and LH: 45′ or less)
Sedan	Non-turbo	–0°15′±0°30′
	Turbo	–0°25′±0°30′
Wagon	Non-turbo	–0°10′±0°30′
	Turbo	–0°20′±0°30′
OUTBACK		–0°05′±0°30′

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

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

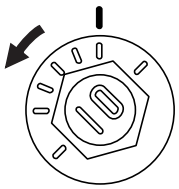
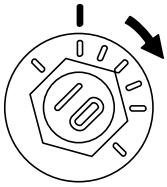
3) Turn the camber adjusting bolt so that camber is set at the specification.

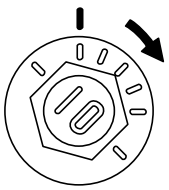
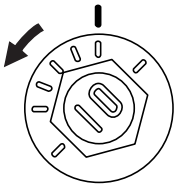
NOTE:
Moving the adjusting bolt by one scale graduation changes camber by approx. 0°15′.



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

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Camber is increased.	
Rotate camber adjusting bolt LH counterclockwise.	Rotate camber adjusting bolt RH clockwise.
 FS-00009	 FS-00010

Camber is decreased.	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00010	 FS-00009

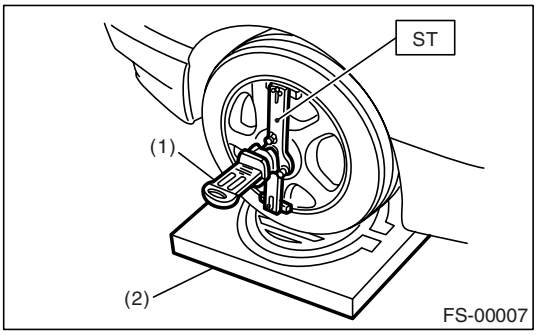
4) Tighten the new two self-locking nuts.

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 ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into center of wheel, and then install the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure caster angle.

NOTE:
Refer to “SPECIFICATION” for caster values. <Ref. to FS-2, SPECIFICATION, General Description.>

4. STEERING ANGLE

• Inspection

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

Steering angle:

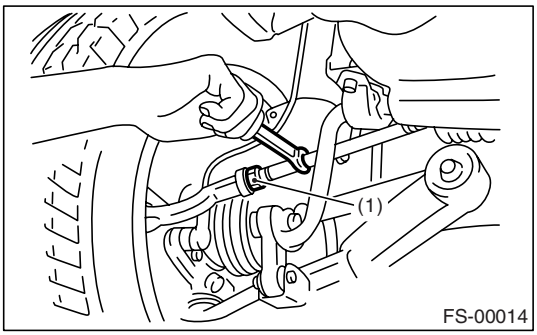
Model	Turbo and OUTBACK	Others
Inner wheel	34.5°±1.5°	37.3°±1.5°
Outer wheel	30.3°±1.5°	32.4°±1.5°

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• Adjustment

1) Turn the tie-rod to adjust 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

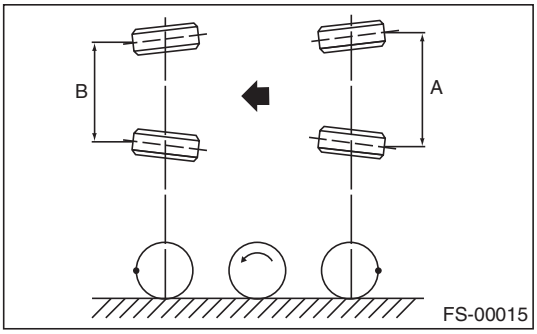
Toe-in:
0±3 mm (0±0.12 in) (Tolerance)

1) Set the toe-in gauge to rear sides of right and left front tires at height corresponding to center of spindle.
2) Mark each right and left tires at height corresponding to center of spindle and measure the distance “A” between marks.
3) Move the vehicle forward to rotate wheels 180°.

NOTE:
Whenever rotating the wheels, drive the vehicle forward.

4) Measure the distance “B” between right and left marks. Toe-in can then be obtained by the following equation:

A − B = Toe-in

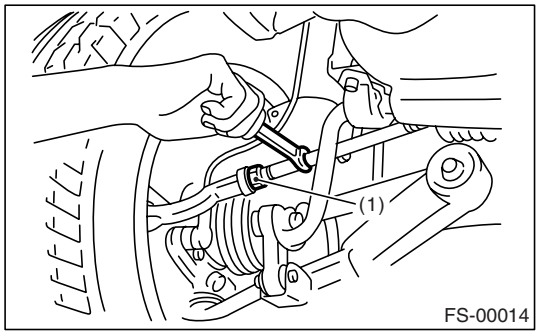


• Adjustment

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

Toe-in:
0±2 mm (0±0.08 in) (Adjustment standard)

1) Make sure that the right and left steering angles are within specified value.
2) Loosen the right and left side steering tie-rods lock nuts.
3) Turn the right and left tie rods equal amounts until the toe-in is at the specification.
Both the right and left tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from inside of the vehicle).



(1) Lock nut

4) Tighten the tie-rod lock nut.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

NOTE:
Correct the tie-rod boot, if it is twisted.

6. REAR WHEEL TOE-IN

• Inspection

Toe-in:
0±3 mm (0±0.12 in) (Tolerance)

For rear toe-in inspection procedure, refer to FRONT WHEEL TOE-IN procedure.
<Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

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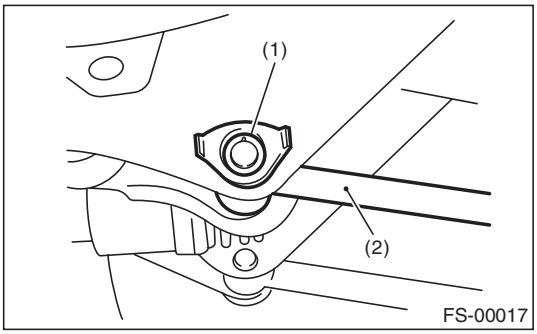
• Adjustment

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

Toe-in:
0±2 mm (0±0.08 in) (Adjustment standard)

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

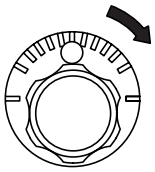
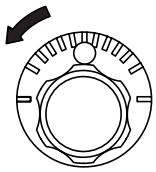
NOTE:
When loosening or tightening the adjusting bolt, hold the bolt head and turn self-locking nut.

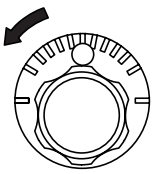
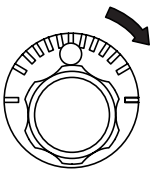


(1) Adjusting bolt
(2) Link rear

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

NOTE:
When the right and left wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.8 mm (0.07 in).

Toe-in is increased.	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00018	 FS-00019

Toe-in is decreased.	
Rotate camber adjusting bolt LH counterclockwise.	Rotate camber adjusting bolt RH clockwise.
 FS-00019	 FS-00018

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3) Tighten a new self-locking nut.

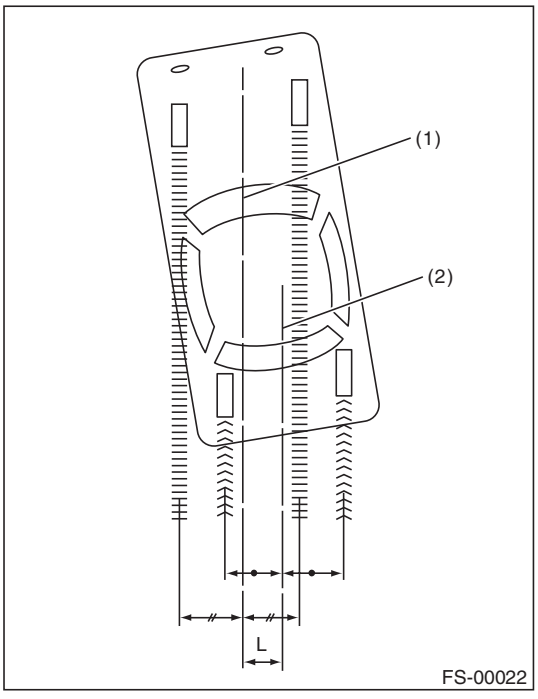
Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)

7. THRUST ANGLE

• Inspection

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

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

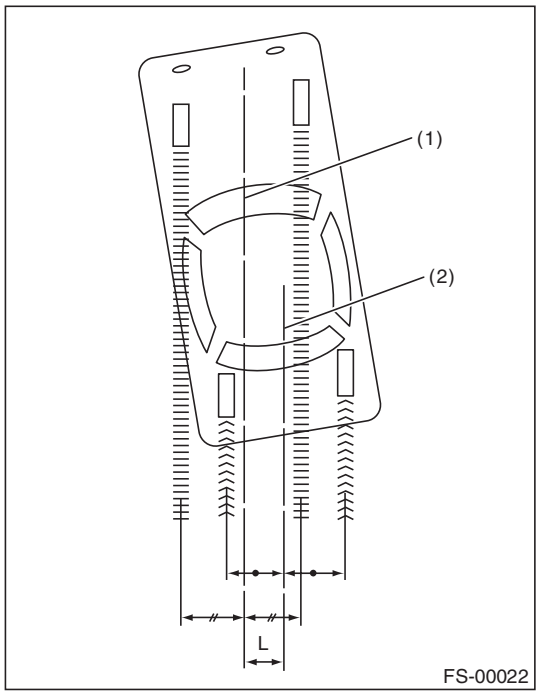


(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

• Adjustment

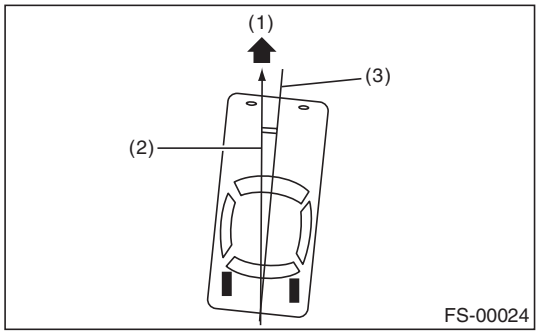
1) Make the thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.
3) When the right and left adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approx. 16′ ["L" is almost equal to 12 mm (0.472 in)].

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



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

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

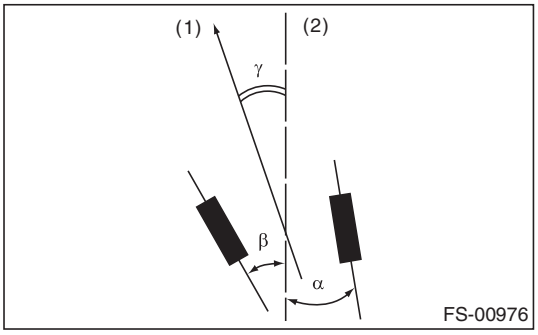


(1) Front
(2) Thrust angle
(3) Body center line

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Thrust angle: r = ($\alpha - \beta$)/2

α: Right rear wheel toe-in angle
β: Left rear wheel toe-in angle
Here, use only positive toe-in values from each wheel to substitute for α and β in the equation.



(1) Front
(2) Body center line

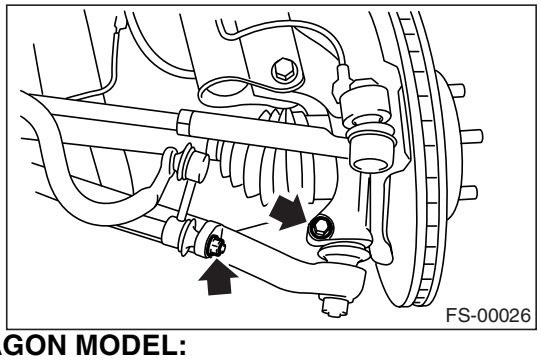
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3. Front Transverse Link

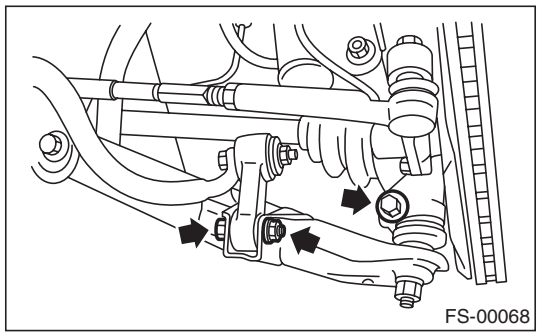
A: REMOVAL

1) Set the vehicle on a lift.
2) Lift-up the vehicle and remove the wheel.
3) Remove the sub frame.
4) Disconnect the stabilizer link from transverse link.
5) Remove the bolt securing ball joint of transverse link to housing.

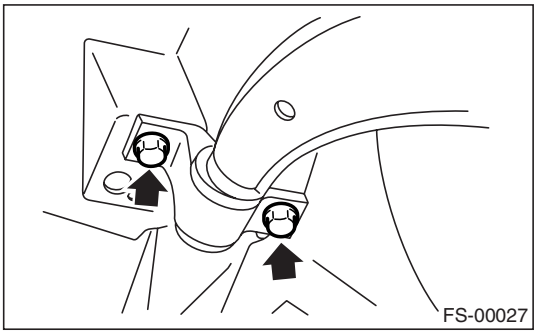
SEDAN MODEL:



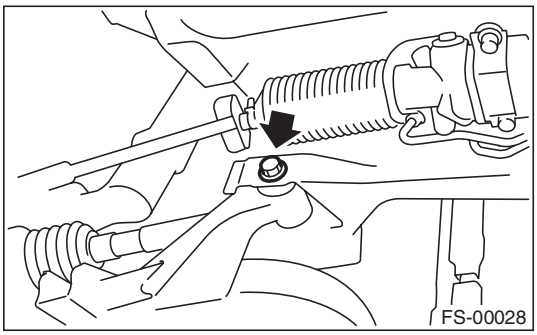
WAGON MODEL:



6) Remove the nut (do not remove bolt) securing transverse link to crossmember.
7) Remove the two bolts securing bushing bracket of transverse link to the vehicle body at rear bushing location.



8) Extract the ball joint from housing.
9) Remove the bolt securing transverse link to crossmember, and then extract the transverse link from crossmember.



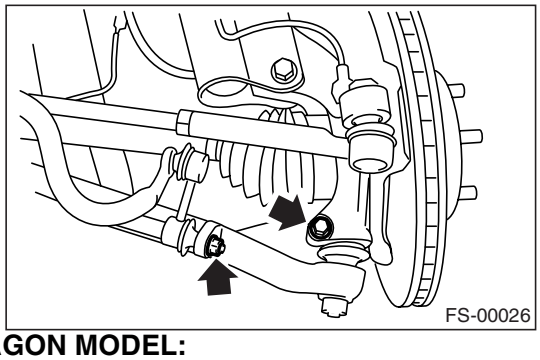
B: INSTALLATION

1) Temporarily tighten the two bolts used to secure rear bushing of transverse link to body.

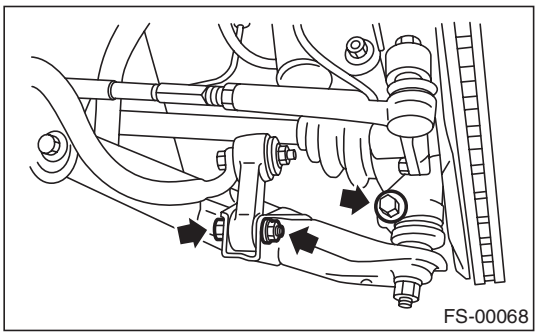
NOTE:
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

2) Install the bolts used to connect transverse link to crossmember and temporarily tighten with a new self-locking nut.
3) Insert the ball joint into housing.
4) Connect the stabilizer link to transverse link, and then temporarily tighten a new self-locking nut.

SEDAN MODEL:



WAGON MODEL:



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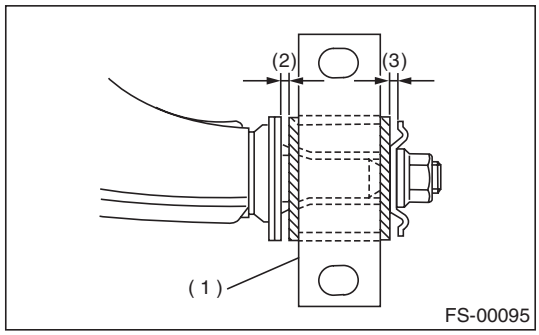
5) Tighten the following points in the order shown below when tires are in full contact with the ground and vehicle is curb weight.
(1) Transverse link and stabilizer

Tightening torque:
Sedan model:
45 N·m (4.6 kgf-m, 33 ft-lb)
Wagon model:
30 N·m (3.1 kgf-m, 22 ft-lb)
(2) Transverse link and crossmember

Tightening torque:
95 N·m (9.7 kgf-m, 70 ft-lb)
(3) Transverse link rear bushing and body

Tightening torque:
250 N·m (25.5 kgf-m, 184 ft-lb)

NOTE:
Move the rear bushing back and forth until transverse link-to-rear bushing clearance is established (as indicated in the figure) before tightening.



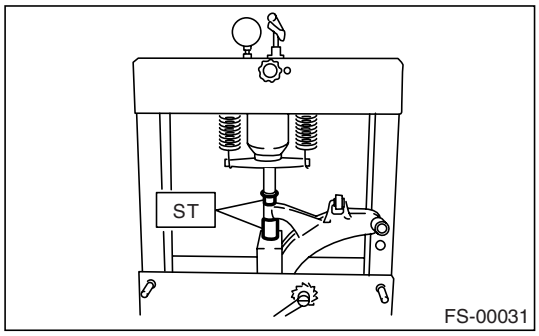
(1) Rear bushing
(2) 1 mm (0.04 in)
(3) 1.5 mm (0.059 in)

6) Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

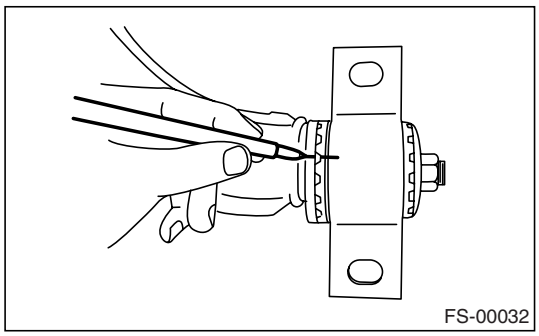
1. FRONT BUSHING

Using the ST, press the front bushing out of place.
ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

1) Scribe an aligning mark on the transverse link and rear bushing.
2) Loosen the nut, and then remove the rear bushing.



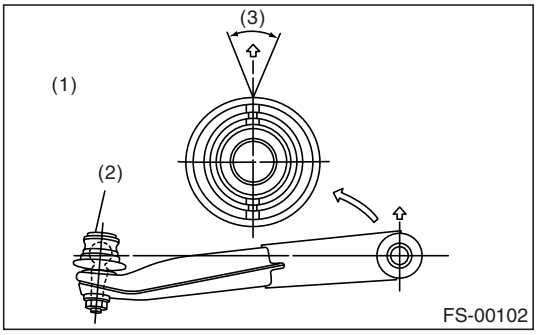
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D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

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



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

2. REAR BUSHING

1) Install the rear bushing to transverse link, and then align the aligning marks scribed on the two.
2) Tighten the new self-locking nut.

NOTE:
While holding the rear bushing so as not to change position of aligning marks, tighten the self-locking nut.

Tightening torque:
186 N·m (19.0 kgf-m, 137 ft-lb)

E: INSPECTION

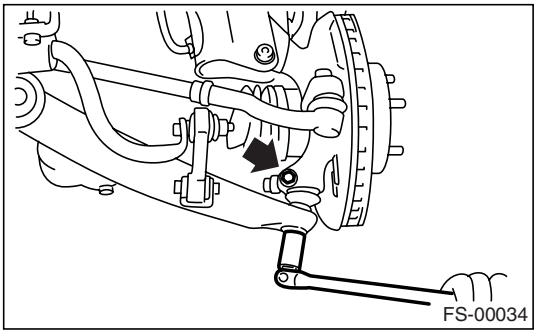
1) Check the transverse link for wear, damage and cracks, and correct or replace if defective.
2) Check the bushings for cracks, fatigue or damage.
3) Check the rear bushing for oil leaks.

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4. Front Ball Joint

A: REMOVAL

1) Remove the wheel.
2) Pull out the cotter pin from ball stud, remove the castle nut, and extract the ball stud from transverse link.
3) Remove the bolt securing ball joint to housing.



4) Extract the ball joint from housing.

B: INSTALLATION

1) Install the ball joint onto housing.

Tightening torque (Bolt):
50 N·m (5.1 kgf-m, 37 ft-lb)

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

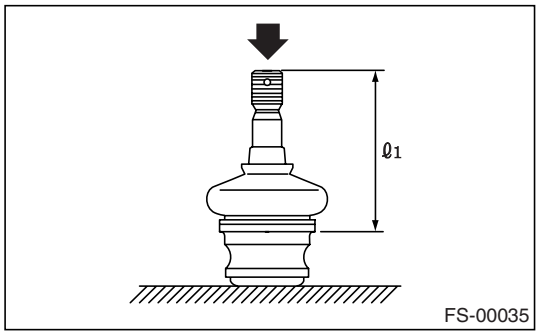
2) Connect the ball joint to transverse link.

Tightening torque (Castle nut):
Sedan turbo model:
30 N·m (3.1 kgf-m, 22 ft-lb)
Except sedan turbo model:
40 N·m (4.1 kgf-m, 30 ft-lb)

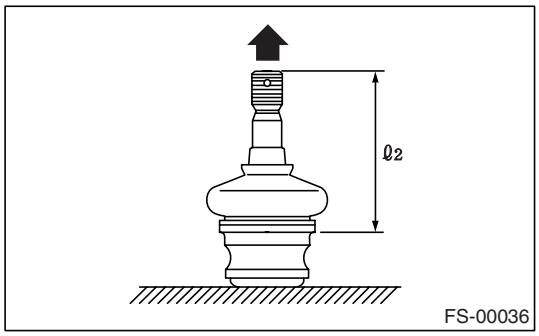
3) Retighten the castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert a new cotter pin and bend it around castle nut.
4) Install the front wheel.

C: INSPECTION

1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds specified value.
(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 opposite direction shown in the figure, measure the dimension ℓ_2.



(3) Calculate plays from the following formula.
$S = \ell_2 - \ell_1$
(4) When plays are larger than the following value, replace with a new one.

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

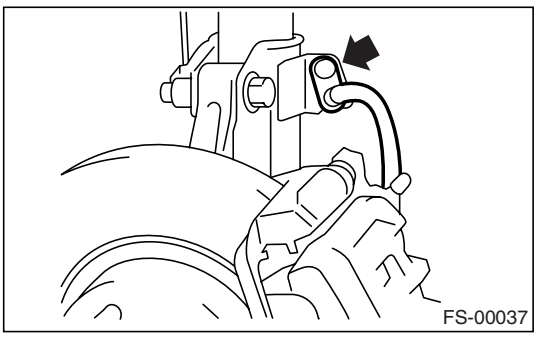
2) When the play is smaller than specified value, visually inspect the dust cover.
3) The ball joint and cover that have been removed must be checked for wear, damage or cracks, and any defective part must be replaced.
4) If the dust cover is damaged, replace with a new ball joint.

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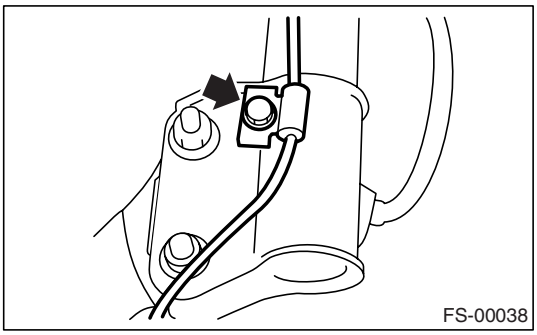
5. Front Strut

A: REMOVAL

1) Remove the wheel.
2) Remove the bolt securing the brake hose from strut.



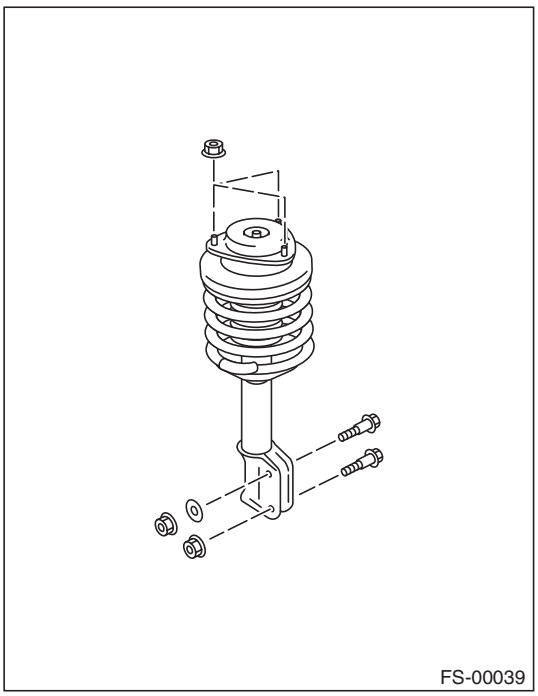
3) Scribe an alignment mark on the camber adjusting bolt which secures the strut to housing.
4) Remove the bolt securing ABS wheel speed sensor harness.



5) Remove the two bolts securing housing to strut.

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

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



B: INSTALLATION

1) Install the strut mount at upper side of strut to body, and then tighten with the nuts.

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

2) Position the aligning mark on camber adjustment bolt with aligning mark on lower side of strut. Install the strut to housing with a new self-locking nut.

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) Install 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 the brake hose to strut.

Tightening torque:
32 N·m (3.3 kgf-m, 23.6 ft-lb)

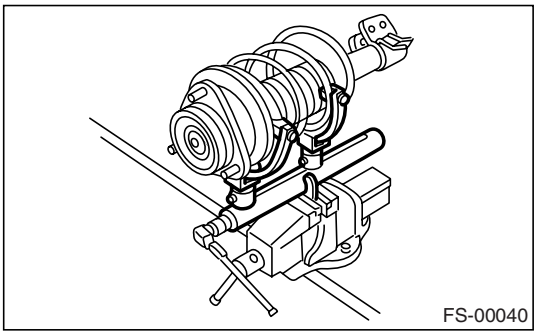
5) Install the wheels.

NOTE:
Check the wheel alignment and adjust if necessary.

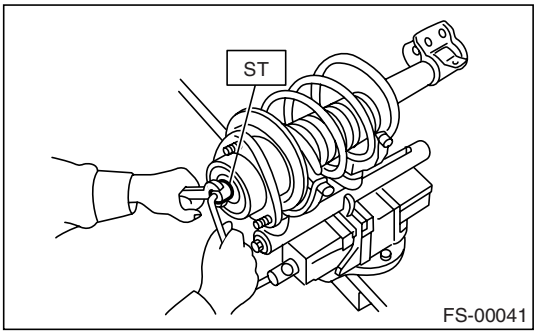
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C: DISASSEMBLY

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



2) Using the ST, remove the self-locking nut.
ST 927760000 STRUT MOUNT SOCKET



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

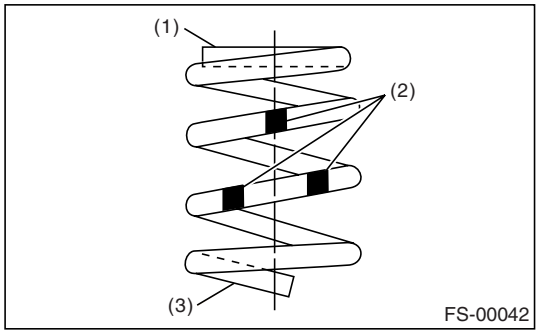
D: ASSEMBLY

1) Before installing the coil spring, strut mount, etc., on strut, check for the presence of air in the damping force generating mechanism of strut since air prevents proper damping force from being produced.
2) Checking for the presence of air
   (1) Place the strut vertically with piston rod facing up.
   (2) Move the piston rod to 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 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 three or four times from first step.

NOTE:
After completely purging air from strut, be sure to place the strut with piston rod facing up. If it is laid down, check for entry of air in the strut as outlined under “Checking for the presence of air”.

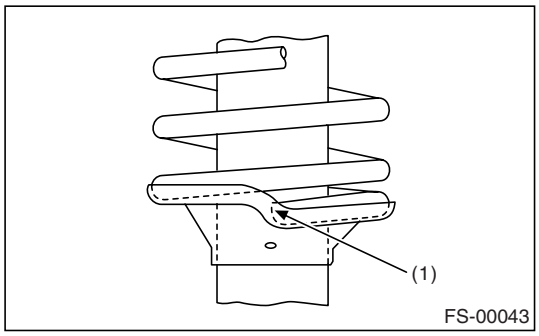
4) Using a coil spring compressor, compress the coil spring.

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



(1) Flat (top side)
(2) Identification paint
(3) Inclined (bottom side)

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



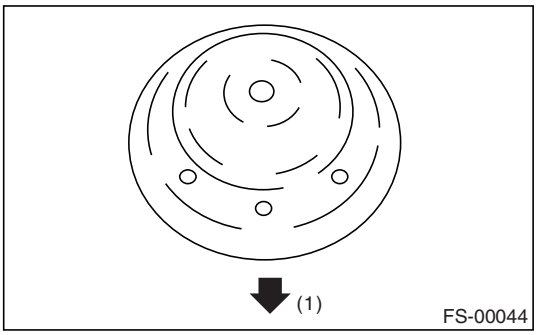
(1) Coil spring end face

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

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

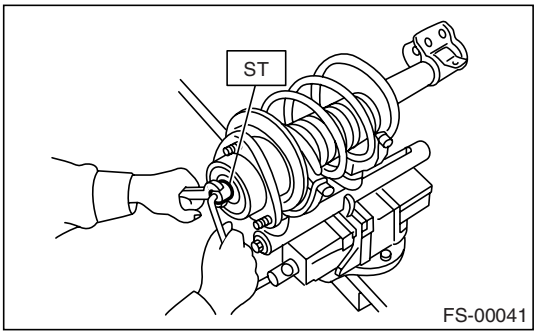
NOTE:
Ensure that the upper spring seat is positioned as shown in the figure.



(1) Outside of body

8) Install the strut mount to the piston rod, and then tighten a new self-locking nut temporarily.
9) Using a hexagon wrench to prevent strut rod from turning, tighten the self-locking nut with ST.
ST 927760000 STRUT MOUNT SOCKET

Tightening torque:
55 N·m (5.6 kgf-m, 41 ft-lb)



10) Loosen the coil spring carefully.

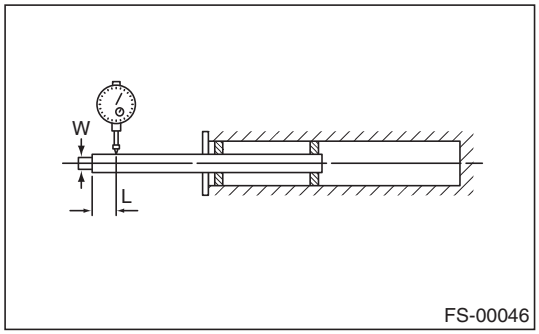
E: INSPECTION

Check the disassembled parts for cracks, damage and wear, and replace with new parts if defective.

1. DAMPER STRUT

1) Check for oil leakage.
2) Move the piston rod up and down to check that it operates smoothly without any binding.
3) Play of piston rod

• Measure the play as follows:
Fix outer shell and fully extend the rod. Set a dial gauge at the end of rod: L [10 mm (0.39 in)], then apply a force of W [20 N (2 kgf, 4 lbf)] to threaded portion. With the force of 20 N (2 kgf, 4 lbf) applied, read dial gauge indication: P_1. Apply a force of 20 N (2 kgf, 4 lbf) in the opposite direction of “W”, then read dial gauge indication: P_2.



Limit of play ($P_1 + P_2$):
0.8 mm (0.031 in)

If the play is greater than limit, replace the strut.

2. STRUT MOUNT

Check the rubber part for creep, cracks and deterioration, and 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

One having permanent strain should be replaced with a new one. When the vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check the coil spring for its free length referring to specifications, cracks, etc., and replace it with a new one if defective.

5. HELPER

Replace it with a new one if cracked or damaged.

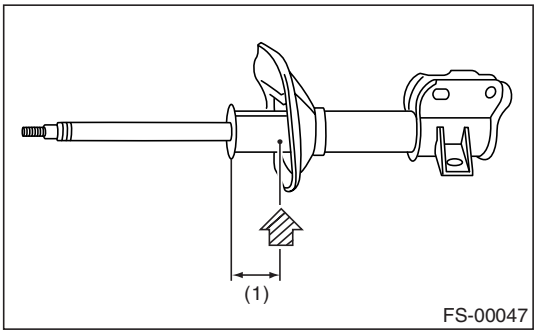
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F: DISPOSAL

1. EXCEPT STi MODEL

CAUTION:
• Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and filings.
• Do not disassemble the strut damper or place into a fire.
• Drill holes before disposing of gas filled struts.

1) Place the gas filled strut on a flat and level surface with piston rod fully extended.
2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in areas shown in the figure.

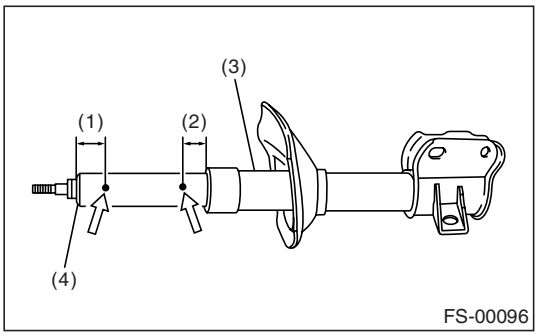


(1) 40 mm (1.57 in)

2. STi MODEL

CAUTION:
• Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and filings.
• Do not disassemble the strut damper or place into a fire.
• Drill holes before disposing of gas filled struts.

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



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

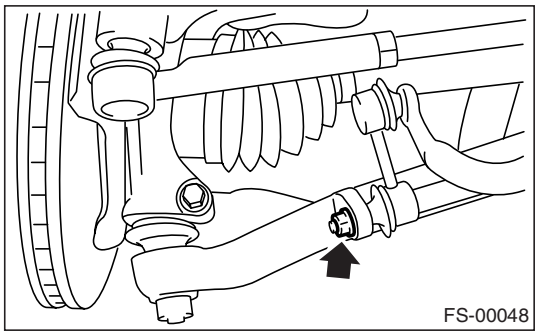
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6. Front Stabilizer

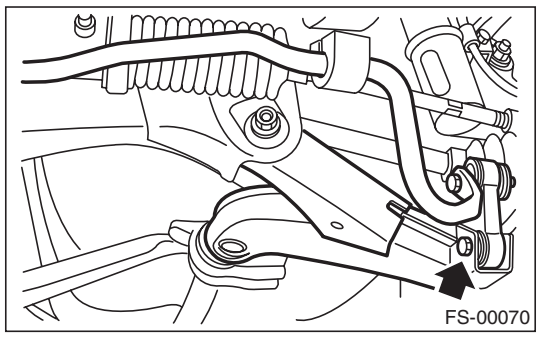
A: REMOVAL

1) Jack-up the front part of the vehicle and support it with rigid racks.
2) Remove the jack-up plate from lower part of crossmember.
3) Remove the sub frame.
4) Remove the nut which secures stabilizer link to front transverse link.

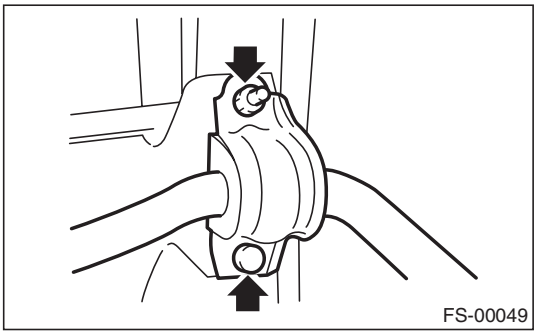
SEDAN MODEL:



WAGON MODEL:



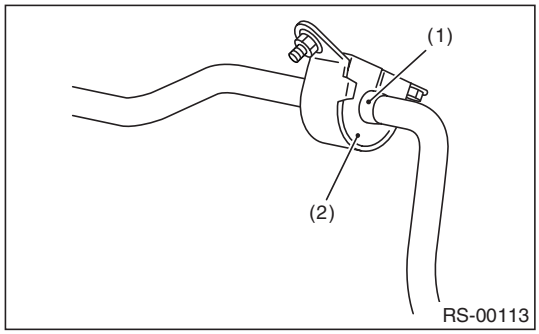
5) Remove the bolts which secure stabilizer to crossmember.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Install the bushing (on front crossmember side) while aligning it with paint mark on stabilizer.
• Ensure that bushing and stabilizer have the same identification colors when installing.



(1) Mark stamped on stabilizer
(2) Bushing identification color

2) Always tighten the bushing location when tires are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Jack-up plate to crossmember:
70 N·m (7.1 kgf-m, 52 ft-lb)
Stabilizer link to front transverse link (Sedan model):
45 N·m (4.6 kgf-m, 33 ft-lb)
Stabilizer link to front transverse link (Wagon model):
30 N·m (3.1 kgf-m, 22 ft-lb)
Stabilizer to crossmember:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

C: INSPECTION

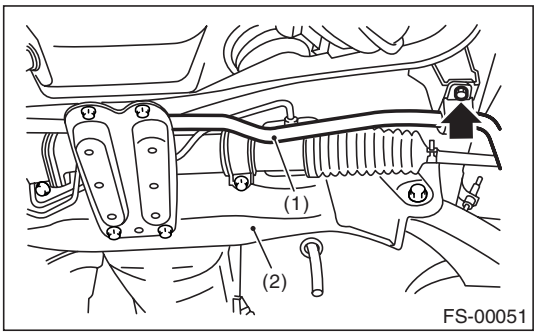
1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer link for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

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7. Front Crossmember

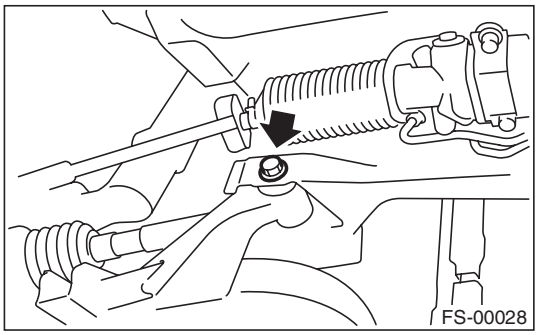
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the front wheels.
3) Remove the sub frame.
4) Remove both the stabilizer and jack-up plate.



(1) Front stabilizer
(2) Front crossmember

5) Disconnect the tie-rod end from housing.
6) Remove the front exhaust pipe.
7) Remove the front transverse link from front crossmember and body.



8) Remove the nuts attaching engine mount cushion rubber to crossmember.
9) Remove the steering universal joint.
10) Disconnect the power steering pipe from steering gear box.
11) Lift the engine by approx. 10 mm (0.39 in) by using chain block.
12) Support the crossmember with a jack, remove nuts securing crossmember to body and lower the crossmember gradually along with steering gearbox.

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

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Always tighten the bushing when tires are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Transverse link bushing to crossmember:
95 N·m (9.7 kgf-m, 70 ft-lb) (Tighten bolt)
Stabilizer to bushing:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Tie-rod end to housing:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)
Front cushion rubber to crossmember:
85 N·m (8.7 kgf-m, 62.7 ft-lb)
Universal joint to pinion shaft:
24 N·m (2.4 kgf-m, 17.4 ft-lb)
Crossmember to body:
105 N·m (10.7 kgf-m, 77 ft-lb)

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

C: INSPECTION

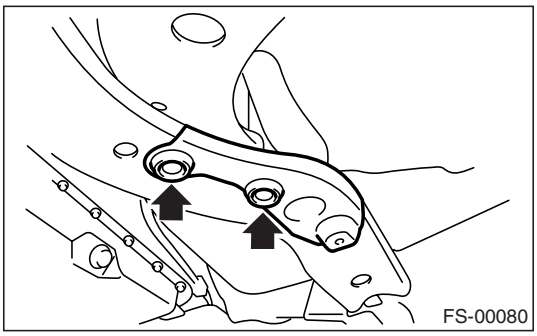
Check the crossmember for wear, damage and cracks, and correct or replace if defective.

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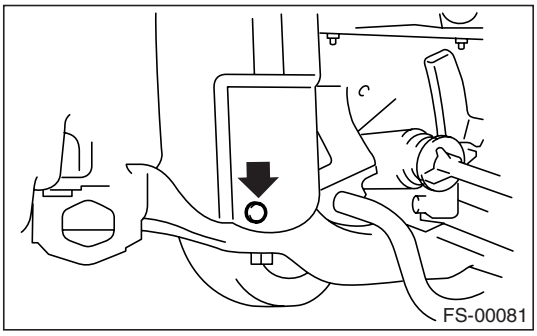
8. Sub Frame

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the bolt cover.

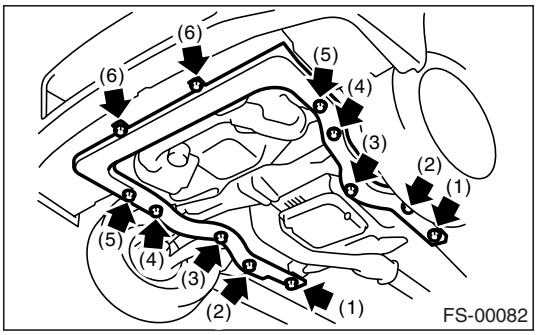


4) Remove the clip.



5) Remove the sub frame.

NOTE:
Loosen bolt (1) and leave a few threads caught, then remove the bolts in the order of (2), (3), (4), (5), and (6).



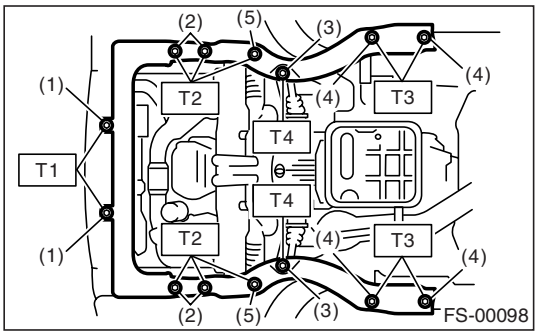
(4) Only for STi

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the M12 bolt with a new one.

Tightening torque:
T1: 34 N·m (3.5 kgf-m, 25 ft-lb)
T2: 55 N·m (5.6 kgf-m, 41 ft-lb)
T3: 70 N·m (7.1 kgf-m, 52 ft-lb)
T4: 95 N·m (9.7 kgf-m, 70 ft-lb)

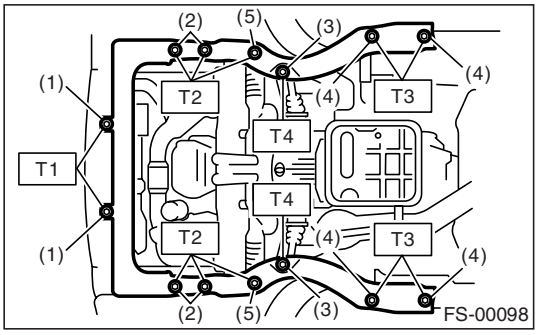


(1) M8 bolt
(2) M12 bolt (with wax)
(3) M12 bolt (with oil)
(4) M10 bolt
(5) M12 bolt (Only for STi)

C: INSPECTION

1) Check that there is no damage and distortion at the sub frame.
2) Check that the bolts are tightened with the specified torque. If there is looseness, tighten to the specified torque.

Tightening torque:
T1: 34 N·m (3.5 kgf-m, 25 ft-lb)
T2: 55 N·m (5.6 kgf-m, 41 ft-lb)
T3: 70 N·m (7.1 kgf-m, 52 ft-lb)
T4: 95 N·m (9.7 kgf-m, 70 ft-lb)



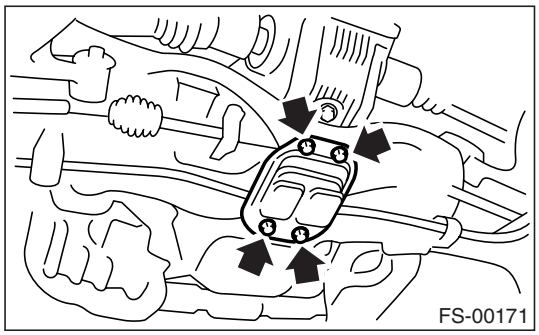
(1) M8 bolt
(2) M12 bolt
(3) M12 bolt
(4) M10 bolt
(5) M12 bolt (Only for STi)

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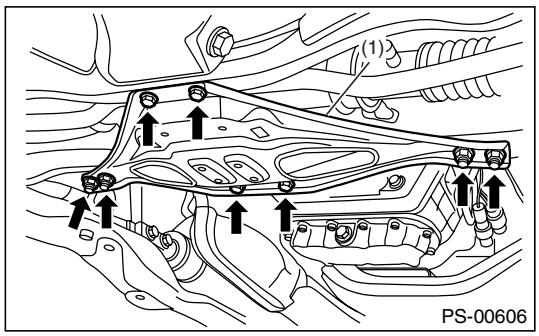
9. Jack-up Plate

A: REMOVAL

1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the jack-up plate.



5) Remove the two nuts at both ends of arm respectively.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Jack-up plate to crossmember:
70 N·m (7.1 kgf-m, 52 ft-lb)

Turbo model

Tightening torque:
Jack-up plate and both side of support arm to crossmember:
30 N·m (3.1 kgf-m, 22 ft-lb)

C: INSPECTION

Check the front support arm for wear, damage and cracks, and correct or replace if defective.

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10.General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut and/or shock absorber	Replace.
(3) Installation of wrong strut and/or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of the vehicle continues too long after running over bump and/or hump.
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflating 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 and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or shock absorber mount	Replace.
(6) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut and/or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut and/or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut and/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.

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REAR SUSPENSION

RS

		Page
1.	General Description	2
2.	Wheel Alignment	9
3.	Rear Stabilizer	10
4.	Rear Trailing Link	11
5.	Rear Strut	15
6.	Lateral Link	16
7.	Rear Crossmember	20
8.	General Diagnostic Table	21

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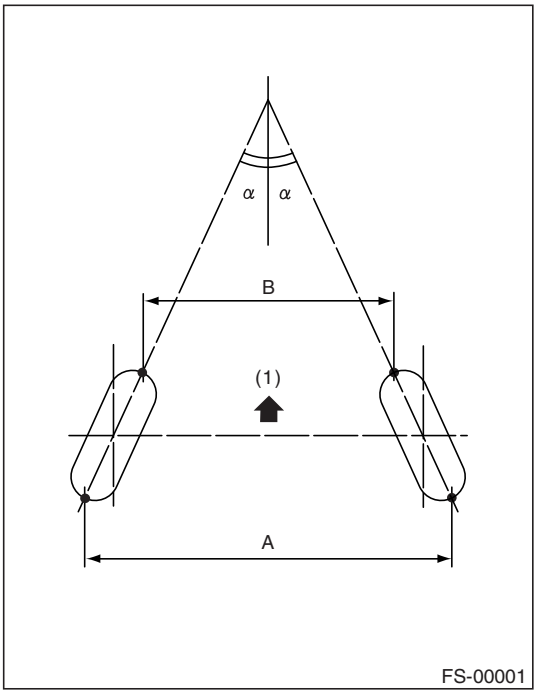
1. General Description

A: SPECIFICATION

Model	Sedan			Wagon		OUTBACK
	Non-turbo	Turbo	STi	Non-turbo	Turbo	
Camber (Tolerance: ±0°45′ Adjustment standard: ±0°30′)	−1°25′	−1°30′	−1°30′	−1°15′	−1°20′	−1°10′
Toe-in	Tolerance: 0±3 mm (0±0.12 in), Toe angle (The sum of both wheels): ±0°15′ Tolerance: 0±2 mm (0±0.08 in), Toe angle (The sum of both wheels): ±0°10′					
Wheel arch height [Tolerance: +12/−24 mm (+0.47/−0.94 in)]	381 mm (15.0 in)	376 mm (14.80 in)	373 mm (14.69 in)	381 mm (15.0 in)	376 mm (14.80 in)	386 mm (15.20 in)
Thrust angle	Tolerance: ±0°30′, Adjustment standard: ±0°20′					
Diameter of stabilizer	*1	20 mm (0.79 in)	20 mm (0.79 in)	*2	17 mm (0.67 in)	—

*1 RS, GX (Model with 205 tire): 17 mm (0.67 in)
Except RS, GX (Model with 205 tire): None
*2 GX (Model with 205 tire): 17 mm (0.67 in)
Except GX (Model with 205 tire): None

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



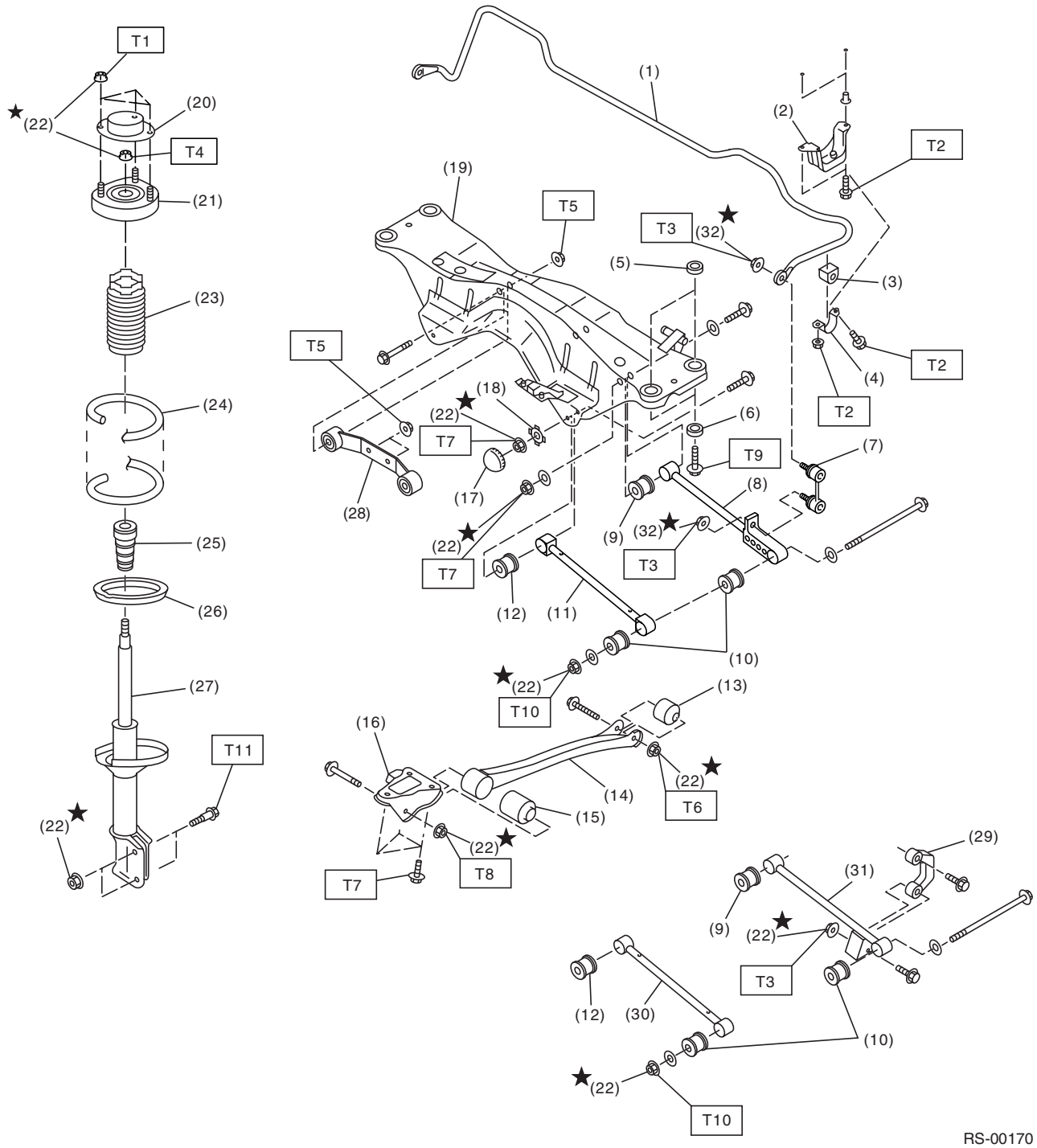
(1) Front
A − B = Positive: Toe-in, Negative: Toe-out
α = Each toe angle

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B: COMPONENT

1. REAR SUSPENSION

• AWD MODEL



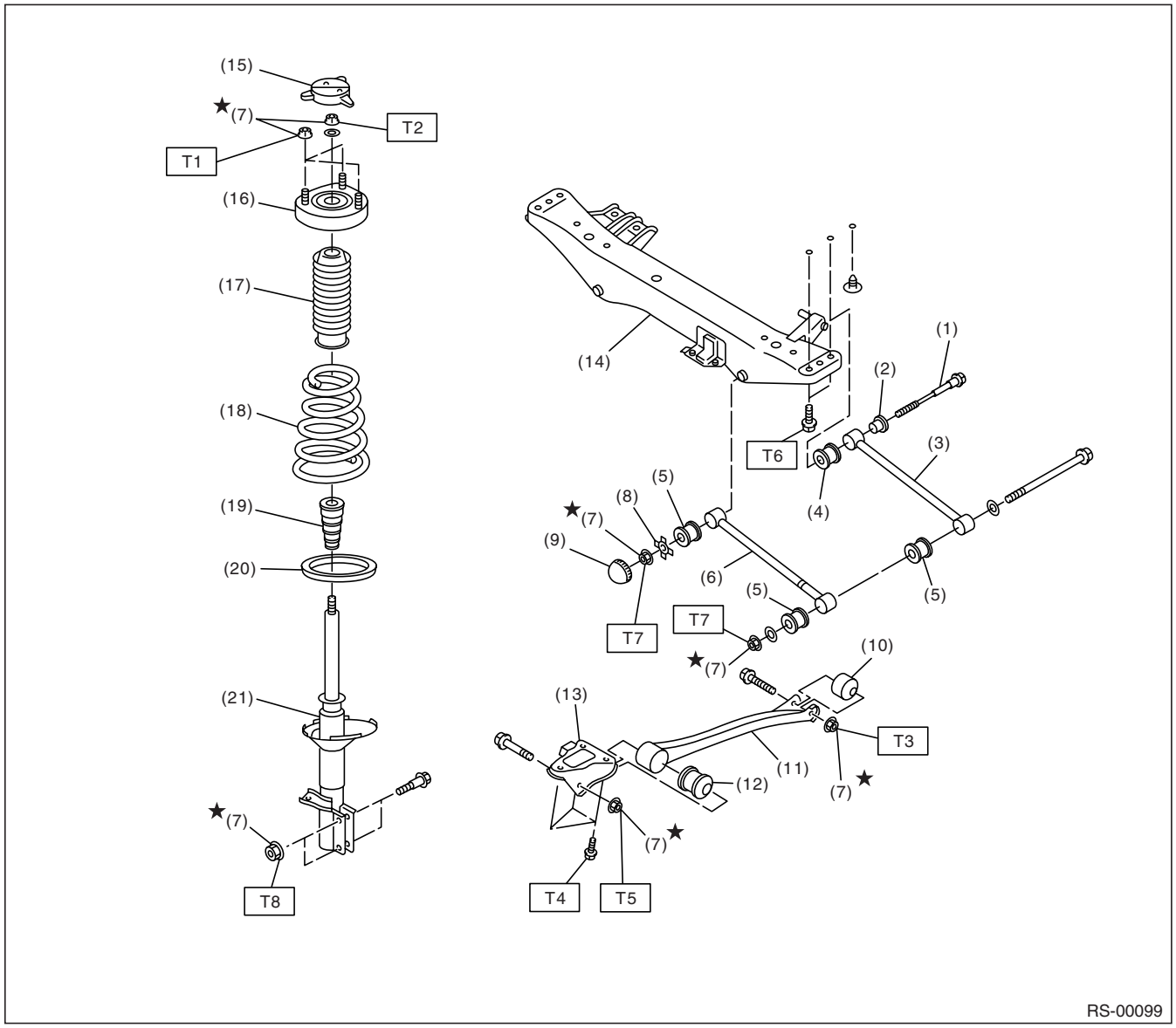
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(1) Stabilizer
(2) Stabilizer bracket
(3) Stabilizer bushing
(4) Clamp
(5) Floating bushing
(6) Stopper
(7) Stabilizer link (STi model)
(8) Rear lateral link (STi model)
(9) Bushing (C)
(10) Bushing (A)
(11) Front lateral link (STi model)
(12) Bushing (B)
(13) Trailing link rear bushing
(14) Trailing link
(15) Trailing link front bushing
(16) Trailing link bracket
(17) Cap (Protection)
(18) Washer
(19) Rear crossmember
(20) Strut mount cap
(21) Strut mount
(22) Self-locking nut
(23) Dust cover
(24) Coil spring
(25) Helper
(26) Lower rubber seat
(27) Damper strut
(28) Rear differential member rear
(29) Stabilizer link (Except STi model)
(30) Front lateral link (Except STi model)
(31) Rear lateral link (Except STi model)
(32) Flange nut

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***20 (2.0, 14.5)***
T2:	***25 (2.5, 18.1)***
T3:	***45 (4.6, 33.2)***
T4:	***60 (6.1, 44)***
T5:	***70 (7.1, 52)***
T6:	***90 (9.2, 66)***
T7:	***100 (10.2, 74)***
T8:	***115 (11.7, 85)***
T9:	***130 (13.3, 96)***
T10:	***140 (14.3 103)***
T11:	***200 (20.0, 145)***

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• FWD model



(1) Adjusting bolt
(2) Adjusting wheel
(3) Rear lateral link
(4) Bushing (D)
(5) Bushing (A)
(6) Front lateral link
(7) Self-locking nut
(8) Washer
(9) Cap (Protection)
(10) Trailing link rear bushing
(11) Trailing link
(12) Trailing link front bushing
(13) Trailing link bracket
(14) Rear crossmember
(15) Strut mount cap
(16) Strut mount
(17) Dust cover
(18) Coil spring
(19) Helper
(20) Lower rubber seat
(21) Damper strut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 55 (5.6, 41)
T3: 90 (9.2, 66)
T4: 100 (10.2, 74)
T5: 115 (11.7, 85)
T6: 130 (13.3, 96)
T7: 140 (14.3, 104)
T8: 200 (20.4, 148)

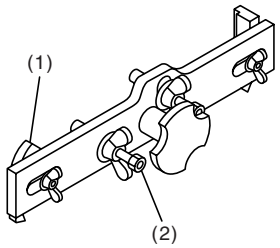
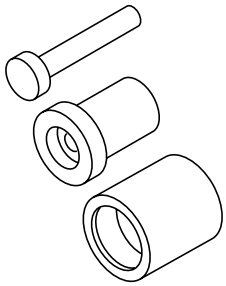
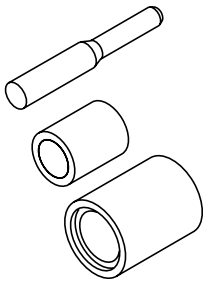
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C: CAUTION

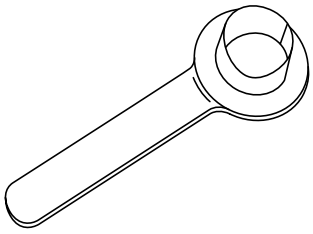
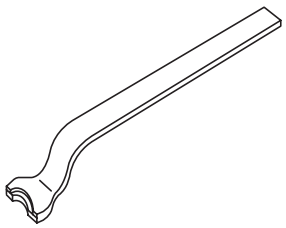
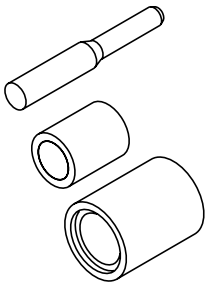
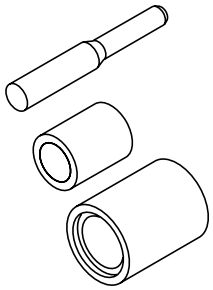
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease etc. or 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 vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

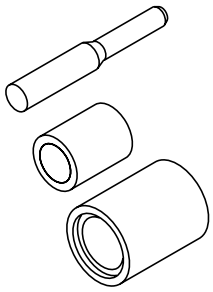
1. SPECIAL TOOLS

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-927720000	927720000	INSTALLER & REMOVER	Used for replacing front bushing.
 ST-927730000	927730000	INSTALLER & REMOVER	Used for replacing rear bushing.

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft to rear differential. • For protecting oil seal.
 ST28099PA100	28099PA100	REMOVER	Used for removing DOJ.
 ST-927710000	927710000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 ST-927700000	927700000	INSTALLER & REMOVER	Used for replacing lateral link bushing.

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927690000	927690000	INSTALLER & REMOVER	Used for replacing lateral link bushing.

2. GENERAL PURPOSE TOOLS

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 suspension assembly/disassembly.
Bearing puller	Used for removing bushings.
Coil spring compressor	Used for strut assembly/disassembly.

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2. Wheel Alignment

A: INSPECTION

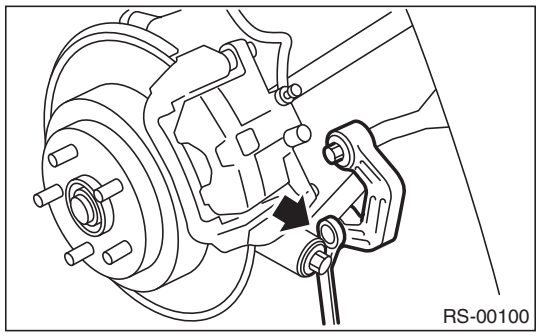
NOTE:
Front and rear wheel alignment must be simultaneously measured and/or adjusted. Follow the procedure in “FS” section “Wheel Alignment” for measurement and/or adjustment of wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>

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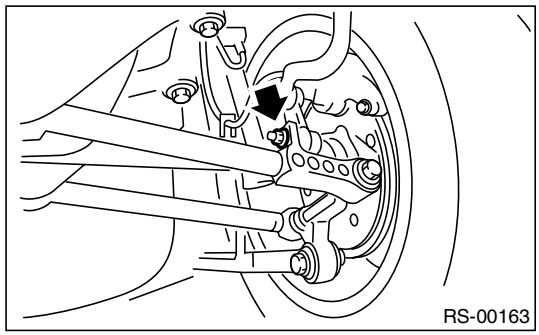
3. Rear Stabilizer

A: REMOVAL

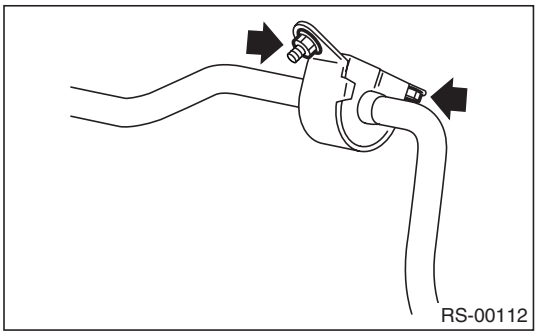
1) Lift-up the vehicle.
2) Remove the stabilizer link.
• Except STi MODEL



• STi MODEL



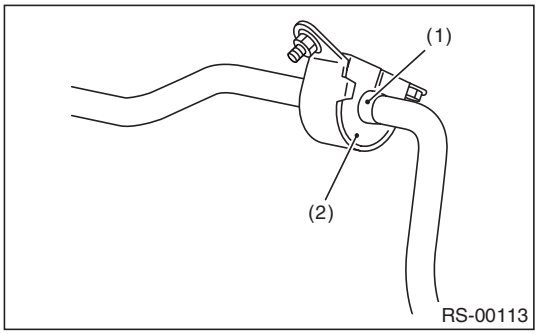
3) Remove the bolt and nut which secure the stabilizer to stabilizer bracket.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Install the stabilizer bushing while aligning it with paint mark on stabilizer.
• Ensure the stabilizer bushing and stabilizer have the same identification colors when installing.



(1) Mark painted on stabilizer
(2) Bushing identification color

2) Always tighten the stabilizer bushing location when tires are in full contact with the ground and the vehicle is curb weight.

Tightening torque:
Stabilizer link to rear lateral link
45 N·m (4.6 kgf-m, 33.2 ft-lb)
Stabilizer to stabilizer bracket
25 N·m (2.5 kgf-m, 18.1 ft-lb)

C: INSPECTION

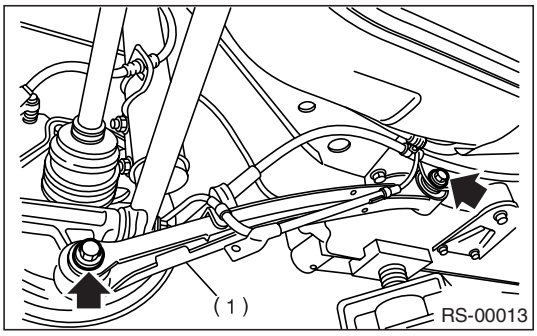
1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer links for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

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4. Rear Trailing Link

A: REMOVAL

1) Loosen the rear wheel nuts.
2) Lift-up the vehicle, and then remove the rear wheels.
3) Remove both the rear parking brake clamp and ABS wheel speed sensor harness.
4) Remove the bolt which secures the trailing link to trailing link bracket.



(1) Trailing link

5) Remove the bolt which secures the trailing link to rear housing.

B: INSTALLATION

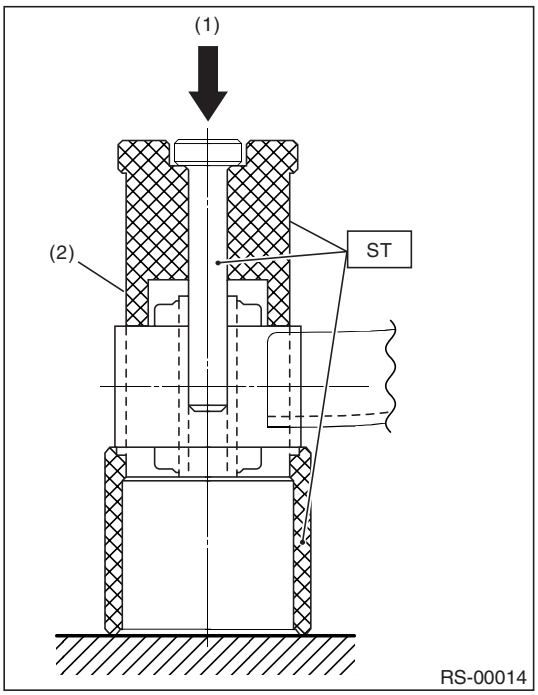
1) Install in the reverse order of removal.
2) Always tighten the bushing location when tires are in full contact with the ground and the vehicle is at curb weight condition.

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

Using the ST, press the front bushing out of place.
ST 927720000 INSTALLER & REMOVER SET

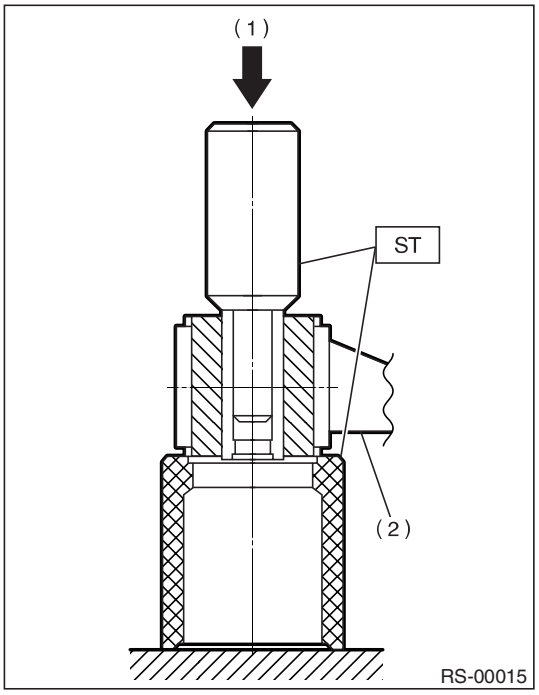


(1) Press
(2) Trailing link

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2. REAR BUSHING

Using the ST, press the rear bushing out of place.
ST 927730000 INSTALLER & REMOVER SET



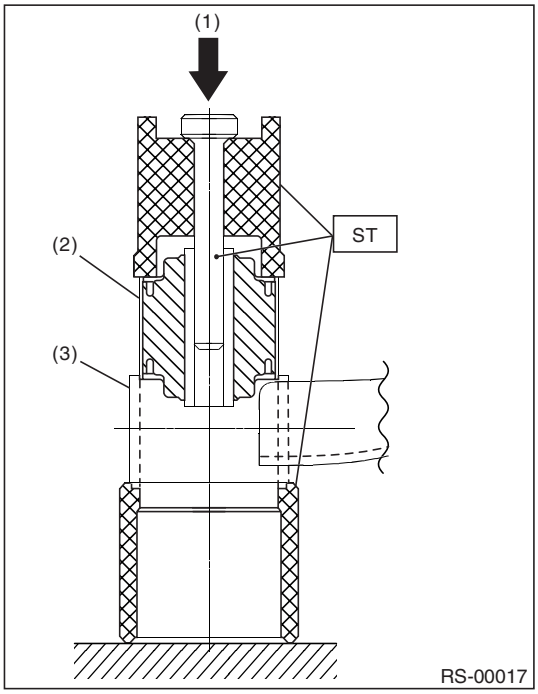
(1) Press
(2) Housing

D: ASSEMBLY

1. FRONT BUSHING

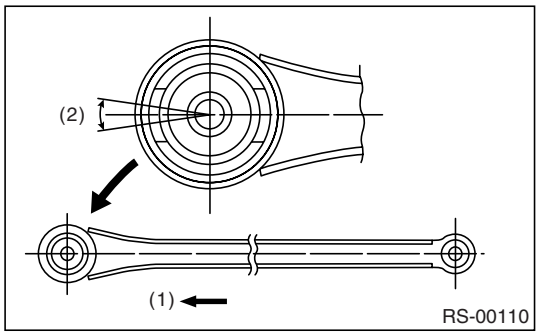
Using the ST, press the bushing into trailing link.
ST 927720000 INSTALLER & REMOVER SET

CAUTION:
Turn the ST plunger upside down and press it until the plunger end surface contacts the trailing link end surface.



(1) Press
(2) Front bushing
(3) Trailing link

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



(1) Front
(2) ±5°

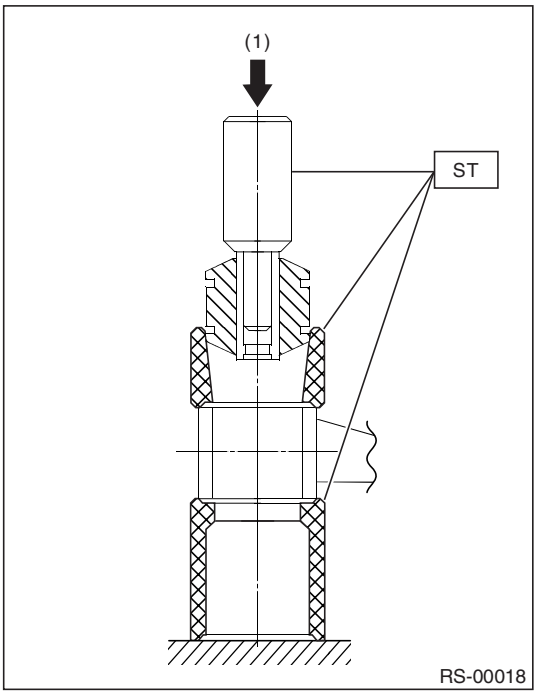
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2. REAR BUSHING

1) Using the ST, press the bushing into trailing link.
ST 927730000 INSTALLER & REMOVER SET

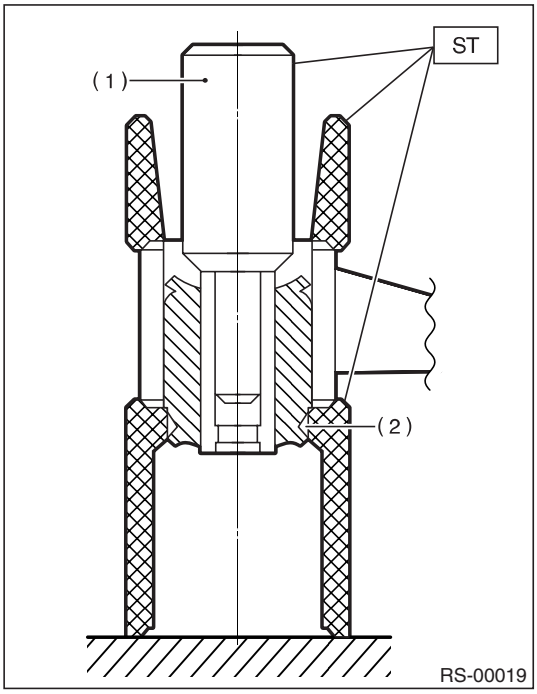
NOTE:
If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

Specified lubricant:
TIRE LUBE: water = 1 : 3



(1) Press

2) Press the ST plunger until the bushing flange protrudes beyond trailing link.
ST 927730000 INSTALLER & REMOVER SET

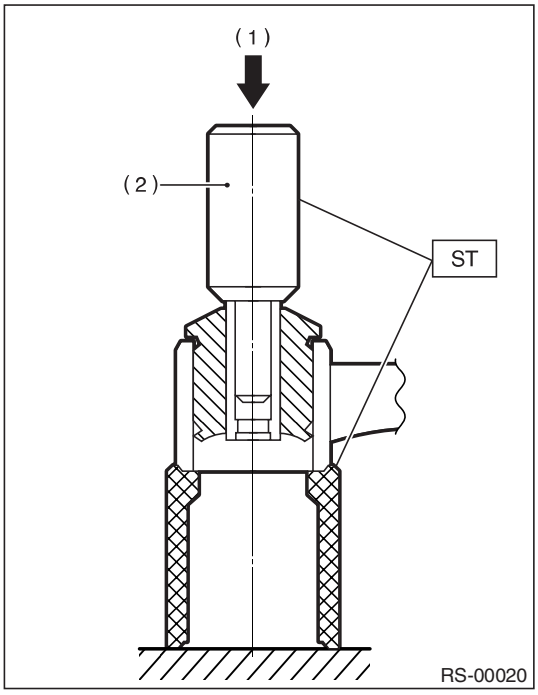


(1) Plunger
(2) Flange

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3) Turn the trailing link upside down. Press the ST plunger in the opposite direction that outlines in the former procedure until bushing is correctly positioned in trailing link.

ST 927730000 INSTALLER & REMOVER SET



(1) Press
(2) Plunger

E: INSPECTION

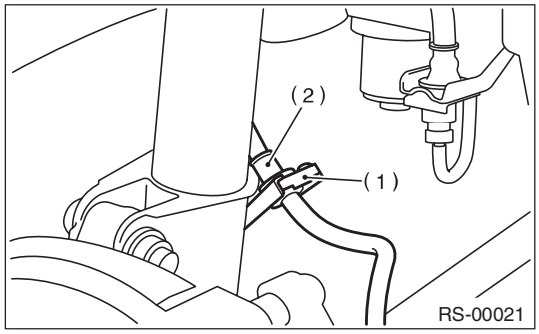
Check the trailing links for bends, corrosion or damage.

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5. Rear Strut

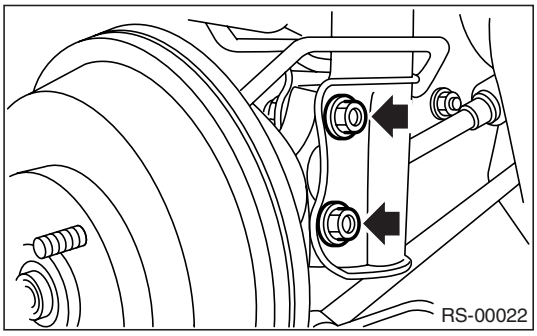
A: REMOVAL

1) Remove the rear seat cushion and backrest. (Sedan model)
2) Remove the strut cap of quarter trim. (Wagon model)
3) Loosen the rear wheel nuts.
4) Lift-up the vehicle, and remove rear wheels.
5) Remove the brake hose clip, and then remove the brake hose from rear strut.



(1) Brake hose clip
(2) Brake hose

6) Remove the bolts which secure the rear strut to housing.



7) Remove the nuts securing strut mount to body.

B: INSTALLATION

1) Secure the strut mount to vehicle body using a new self-locking nut.

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

2) Secure the rear strut to housing using a new self-locking nut.

Tightening torque:
200 N·m (20.0 kgf-m, 145 ft-lb)

3) Install the brake hose to lower side of strut, then insert the brake hose clip.

CAUTION:
• Check the hose clip is positioned properly.
• Check the brake hose for twisting, or excessive tension.
• Do not subject the ABS wheel speed sensor harness to excessive tension.

4) Lower the vehicle and tighten wheel nut.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

5) Install the rear seat backrest and rear seat cushion. (Sedan model)
6) Install the strut cap to rear quarter trim. (Wagon model)

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

For disassembly of rear strut, refer to procedures outlined under front strut as a guide. <Ref. to FS-20, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures. <Ref. to FS-20, ASSEMBLY, Front Strut.>

E: INSPECTION

Refer to Front Strut as a guide for inspection procedures. <Ref. to FS-21, INSPECTION, Front Strut.>

F: DISPOSAL

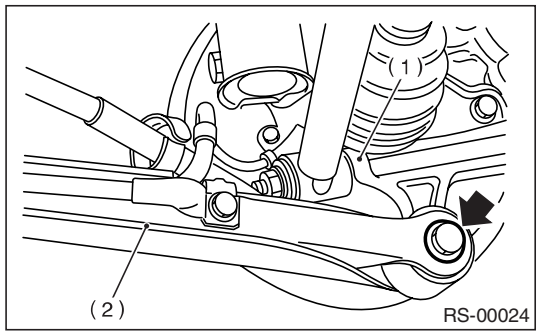
Refer to Front Strut as a guide for disposal procedures. <Ref. to FS-22, DISPOSAL, Front Strut.>

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6. Lateral Link

A: REMOVAL

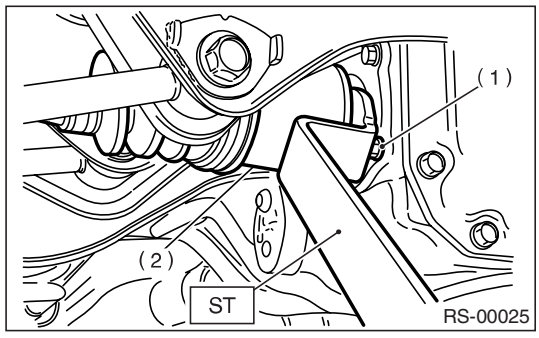
1) Loosen the wheel nuts. Lift-up the vehicle and remove wheel.
2) Remove the stabilizers.
3) Remove the ABS wheel speed sensor harness from trailing link.
4) Remove the bolt securing trailing link to rear housing.



(1) Rear housing
(2) Trailing link

5) Remove the bolts which secure the lateral link assembly to rear housing.
6) Remove the DOJ from rear differential using ST. (T-type)
ST 28099PA100 DRIVE SHAFT REMOVER

NOTE:
The side spline shaft circlip comes out together with the shaft.

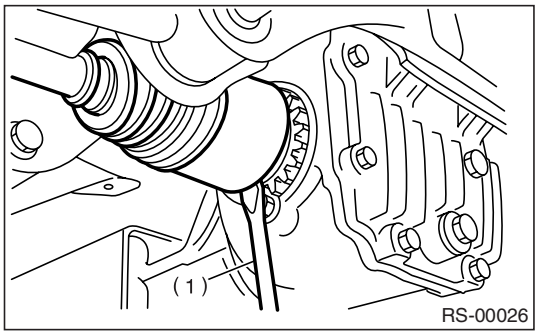


(1) Bolt
(2) DOJ

CAUTION:
Be careful not to damage the side bearing retainer. Always use bolt (1) shown in the figure, as supporting point for ST during removal.

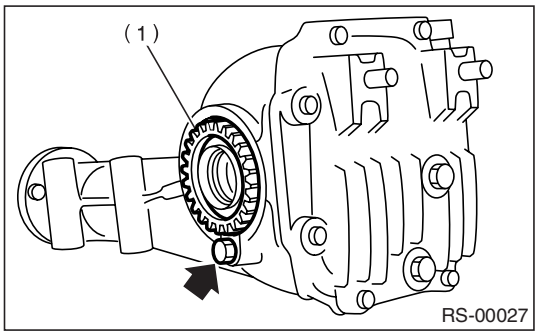
7) Remove the DOJ from rear differential using tire lever. (VA-type)

NOTE:
The side spline shaft circlip comes out together with the shaft.



(1) Tire lever

CAUTION:
When removing the DOJ from rear differential, fit tire lever to the bolt as shown in the figure so as not to damage axle shaft holder.



(1) Axle shaft holder

8) Scribe an alignment mark on the rear lateral link adjusting bolt and crossmember.
9) Remove the bolts securing front and rear lateral links to crossmember, detach lateral links.

CAUTION:
To loosen the adjusting bolt, always loosen the nut while holding head of adjusting bolt.

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B: INSTALLATION

Install in the reverse order of removal. Observe the following instructions.

- Installation of DOJ to differential: <Ref. to DS-49, INSTALLATION, Rear Drive Shaft.>

CAUTION:

- **Replace the self-locking nut and DOJ circlip with new ones.**
- **Always use the special tool not to allow the DOJ splines to damage the side oil seal.**

ST 28099PA090 OIL SEAL PROTECTOR

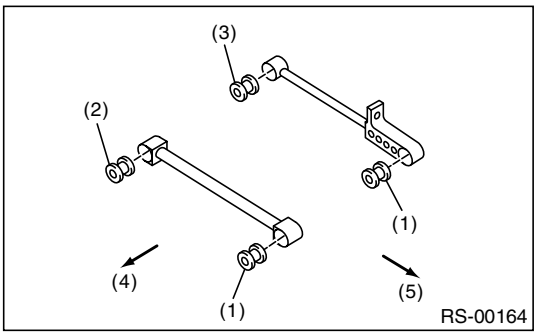
- **Always tighten the bushing location when tires are in full contact with the ground and vehicle is curb weight.**
- **Secure the bolt head and tighten the nut when installing the adjusting bolt.**

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

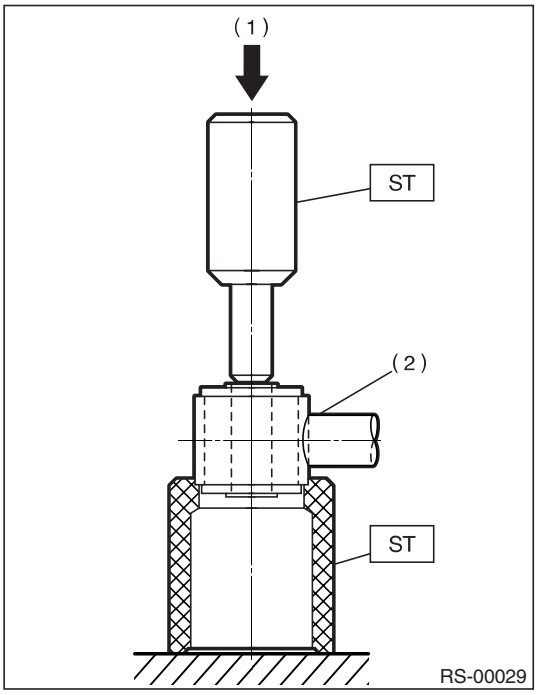
1) Using the following table as a guide, verify the type of bushings.
2) Select the ST according to type of bushings used.

Bushing	ST: INSTALLER & REMOVER SET
Bushing A	927700000
Bushing B	927690000
Bushing C	927700000
Bushing D	927710000



(1) Bushing A
(2) FWD: Bushing A, AWD: Bushing B
(3) FWD: Bushing D, AWD: Bushing C
(4) Front
(5) Outside of body

3) Using the ST, press the bushing out of place.



(1) Press
(2) Lateral link

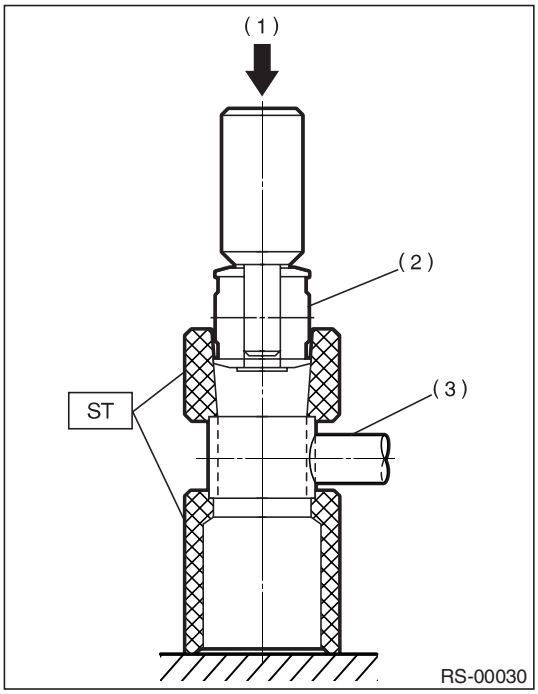
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D: ASSEMBLY

1) Use the same ST that was used during disassembly.
2) If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

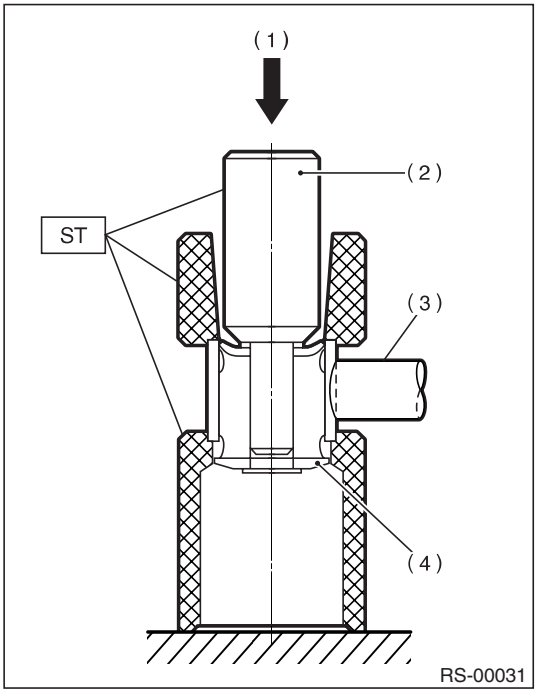
Specified lubricant:
TIRE LUBE: water = 1 : 3

3) Using the ST, press the bushing into place.



(1) Press
(2) Bushing
(3) Lateral link

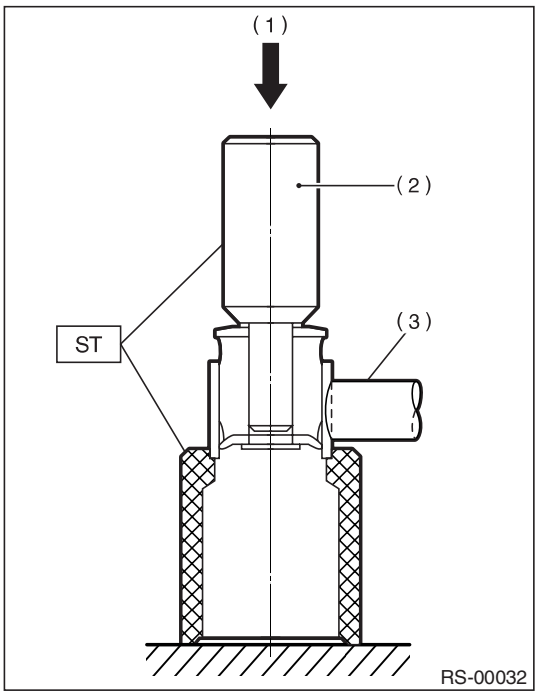
4) Press the ST plunger until bushing flange protrudes beyond lateral link.



(1) Press
(2) Plunger
(3) Lateral link
(4) Flange

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5) Turn the lateral link upside down. Press the ST plunger in opposite direction that outlined in the former procedure until bushing is correctly positioned in trailing link.



(1) Press
(2) Plunger
(3) Lateral link

E: INSPECTION

Visually check the lateral links for damage or bends.

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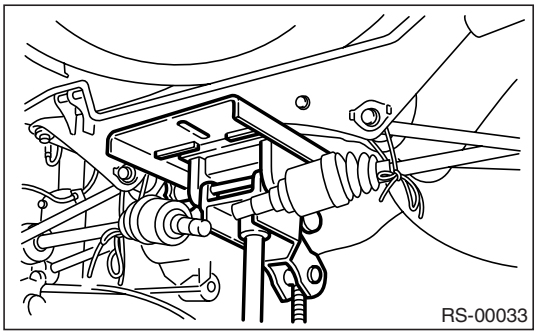
7. Rear Crossmember

A: REMOVAL

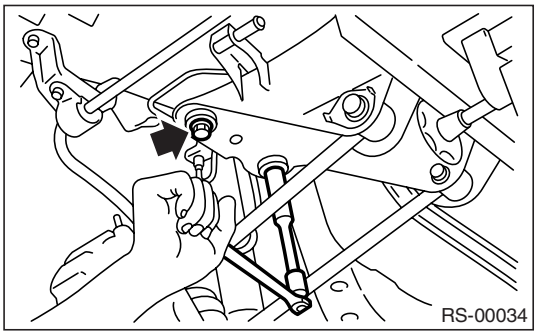
1. AWD MODEL

CAUTION:
Do not subject the ABS wheel speed sensor harness to excessive tension.

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-27, REMOVAL, Rear Differential (T-type).>
VA-type
<Ref. to DI-54, REMOVAL, Rear Differential (VA-type).>
4) Place the transmission jack under rear crossmember.



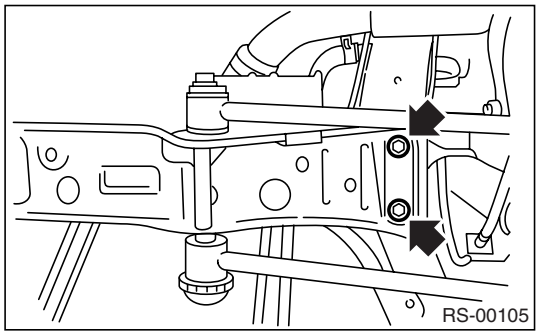
5) Remove the bolts securing crossmember to vehicle body, and then remove the crossmember.



6) Scribe an alignment mark on the rear lateral link cam bolt and crossmember.
7) Remove the front and rear lateral links by loosening nuts.

2. FWD MODEL

1) Remove the bolts which secure the lateral link assembly to rear housing.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Remove the bolt securing crossmember to body, and then remove the crossmember.



B: INSTALLATION

1. AWD MODEL

CAUTION:
Discard the loosened self-locking nut and replace it with a new one.

NOTE:
Always secure the bolt head and tighten the nut when tightening the adjusting bolt.

1) Install in the reverse order of removal.
2) For installation and tightening torque of rear differential;
T-type
<Ref. to DI-29, INSTALLATION, Rear Differential (T-type).>
VA-type
<Ref. to DI-56, INSTALLATION, Rear Differential (VA-type).>
3) Always tighten the rubber bushing when tires are in full contact with the ground and vehicle is curb weight.
4) Check the wheel alignment and adjust if necessary.

2. FWD MODEL

CAUTION:
Discard the loosened self-locking nut and replace it with a new one.

NOTE:
Always secure the bolt head and tighten the nut when tightening adjusting bolt.

1) Install in the reverse order of removal.
2) Always tighten the rubber bushing when tires are in full contact with the ground and vehicle is curb weight.
3) Check the wheel alignment and adjust if necessary.

C: INSPECTION

Check the removed parts for wear, damage and cracks, and correct or replace if defective.

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8. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth 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

1) Large rebound shock
2) Rocking of the vehicle continues too long after running over bump and/or hump
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflating 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 causes	Countermeasures
(1) Wear or damage of damper strut or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten 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.

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WHEEL AND TIRE SYSTEM

WT

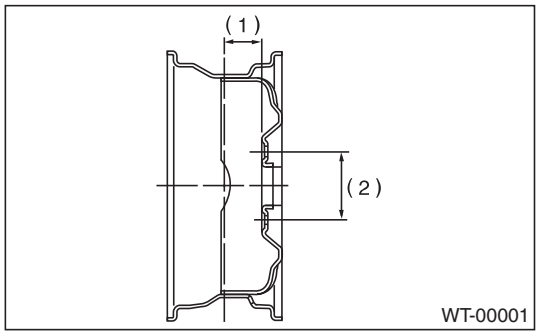
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3. Steel Wheel 5
4. Aluminum Wheel 6
5. Wheel Balancing 7
6. “T-type” Tire 8
7. Full Wheel Cap 9
8. General Diagnostic Table 10

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1. General Description

A: SPECIFICATION



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

Specifications		Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Front and rear	BASE, TS	185/70R14 88H	14 × 5 1/2JJ	55 (2.17)	100 (3.94)
	GX	195/60R15 88H	15 × 6JJ		
		205/50R16 87V	16 × 6 1/2JJ		
	RS	205/50R16 87V	16 × 6 1/2JJ		
	WRX	215/45R17 87W	17 × 7JJ		
	STi	225/45R17 90W	17 × 8JJ	53 (2.09)	114.3 (4.50)
	OBK	P205/55R16 89V	16 × 6 1/2JJ	55 (2.17)	100 (3.94)
T-type tire		T125/70D15 95M	15 × 4T	53 (2.09)	
		T135/70D16 100M	16 × 4T	50 (1.97)	
		T135/70D17 102M	17 × 4T	40 (1.57)	114.3 (4.50)

Specifications		Tire size	Tire air pressure kPa (kgf/cm^2, psi)	
			Light load	Full load
Front and rear	BASE, TS	185/70R14 88H	Fr : 220 (2.2, 32) Rr : 200 (2.0, 29)	Fr : 220 (2.2, 32) Rr : 220 (2.2, 32)
	GX	195/60R15 88H		
		205/50R16 87V		
	RS	205/50R16 87V	Fr : 220 (2.2, 32) Rr : 200 (2.0, 29)	
	WRX	215/45R17 87W	Fr : 230 (2.3, 33) Rr : 220 (2.2, 32)	
	STi	225/45R17 90W	Fr : 230 (2.3, 33) Rr : 190 (1.9, 28)	
	OBK	P205/55R16 89V	Fr : 220 (2.2, 32) Rr : 200 (2.0, 29)	
T-type tire		T125/70D15 95M	420 (4.2, 60)	
		T135/70D16 100M		
		T135/70D17 102M		

NOTE:
- “T-type” tire is a spare tire for temporary use.
- Depending on destination, standard size tire or T-type tire is equipped as spare tire.
- At trailer towing, rear inflation pressure is 250 kPa (2.5 kgf/cm^2, 36 psi).

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1. SERVICE DATA

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

2. ADJUSTING PARTS

Wheel balance	Standard	Service limit
Dynamic unbalance	Less than 5 g (0.18 oz)	

Balance weight part number (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 (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)

B: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Air pressure gauge	Used for measuring tire air pressure.
Dial gauge	Used for measuring wheel runout.
Wheel balancer	Used for adjusting wheel balance.

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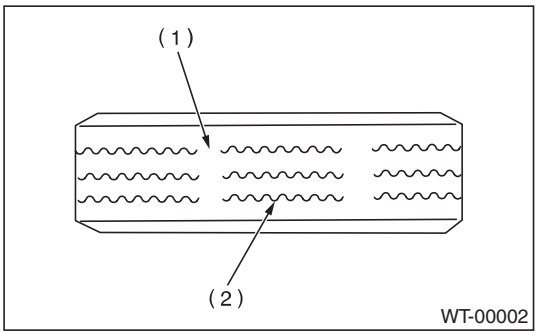
2. Tire

A: INSPECTION

1) Take stone, glass, nail etc. off from 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 tire as originally installed.

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

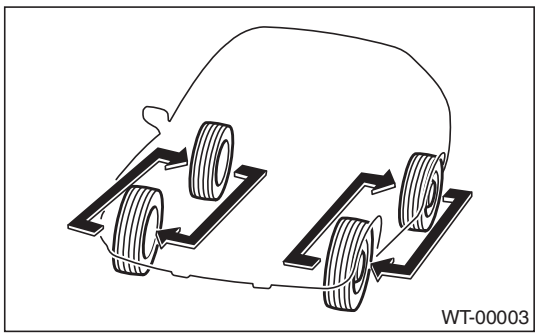


(1) Tread wear indicator
(2) Tire tread

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

1. TIRE ROTATION

Rotate tires periodically (10,000 km/6,200 miles) as shown in the figure, in order to prevent them from uneven wear and to prolong their life.



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3. Steel Wheel

A: REMOVAL

1) Apply parking brake, and position the select lever to “P” or “LOW”.
2) Set jacks or a lift to the specified point, and support the vehicle with its tire 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:
• While removing the wheels, prevent the hub bolts from damage.
• Place the wheels with their outer sides facing upward to prevent the wheels from damage.

B: INSTALLATION

1) Remove dirt from the mating surface of wheel and brake rotor.
2) Attach the wheel to hub by aligning the wheel bolt hole with hub bolt.
3) Temporarily attach the wheel nuts to 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 guide portion of hub.
5) Tighten the wheel nuts in a diagonal selection to specified torque. Use a wheel nut wrench.

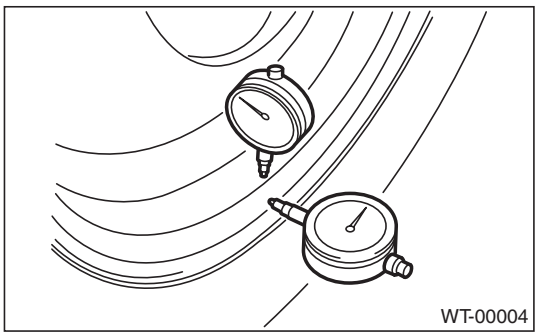
Wheel nut tightening torque:
90 N·m (9.2 kgf-m, 66.4 ft-lb)

CAUTION:
• Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached. For drum brake models, excess tightening of wheel nuts may cause wheels to “judder”.
• Do not depress the wrench with foot; Always use both hands when tightening.
• Make sure the bolt, nut and nut seating surface of the wheel are free from oils.

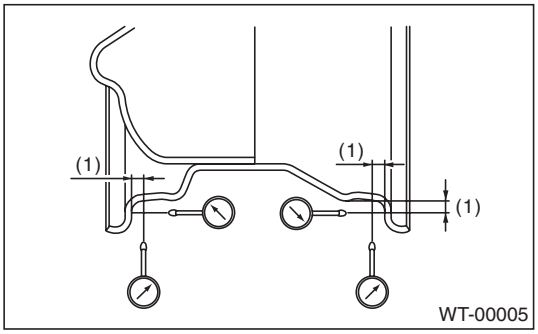
6) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

C: INSPECTION

1) Deformation or damage on the rim can 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 the rim “runout” using a dial gauge.



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



(1) Approx. 7 mm (0.28 in)

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

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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 limit	Radial runout limit
1.0 mm (0.039 in)	

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the following:
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) While the vehicle is being driven, be careful not to ride over sharp obstacles or allow the aluminum wheels to contact the shoulder of road.
3) When installing a tire chain, be sure to install it properly not to have slack; otherwise it may hit the wheel while driving.
4) When washing the aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleanser including abrasive, hard brushes or an automatic car washer.

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5. Wheel Balancing

A: REPLACEMENT

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

Balance weight part number (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)

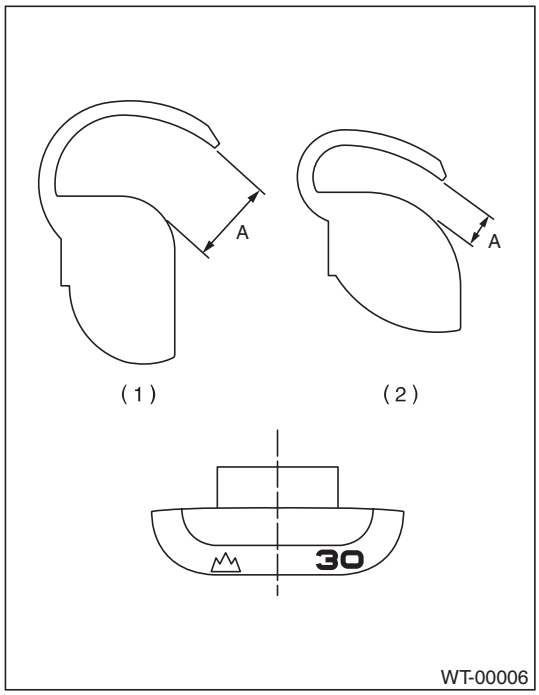
Balance weight part number (For aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50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

4) Install the selected weight to the point designated by wheel balancer.
5) Using wheel balancer, measure the wheel balance again. Check the wheel balance is correctly adjusted.

B: INSPECTION

1) Proper wheel balance may be lost if the tire is repaired or if it wears. Check the tire for dynamic balance, and repair as necessary.
2) To check for dynamic balance, use a wheel balancer. Drive in the balance weight on both the top and rear sides of rim.
3) Some types of balancer can cause damage to the wheel. Use an appropriate balancer when adjusting the wheel balance.
4) Use genuine balance weights.

NOTE:
• 55 g (1.94 oz) weight used with the aluminum wheel is not available.
• Balance weights are available for use with any of 14- to 17-inch wheels.



(1) Weight for aluminum wheel
(2) Weight for steel wheel

Service limit A:

Weight for steel wheel;
5 g (0.18 oz) — 25 g (0.88 oz) 2.0 mm (0.08 in)
30 g (1.06 oz) or more 1.8 mm (0.07)

Weight for aluminum wheel;
5 g (0.18 oz) — 25 g (0.88 oz) 5.0 mm (0.20 in)
30 g (1.06 oz) or more 4.5 mm (0.177 in)

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6. "T-type" Tire

A: NOTE

"T-type" tire for temporary use is prepared as a spare tire.

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 80 km/h (50 MPH).
• Drive as slowly as possible and avoid passing over bumps.

B: REPLACEMENT

Refer to Removal and Installation of Steel Wheel for removal/installation of "T-type" tires. <Ref. to WT-5, 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 inflation pressure.

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

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

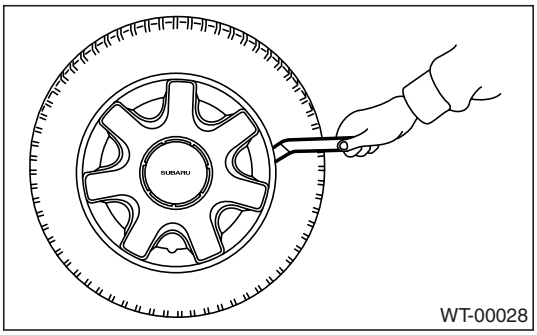
CAUTION:
Replace the tire with a new one.

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7. Full Wheel Cap

A: REMOVAL

Pry off the full wheel cap with a wheel cap remover inserted between openings on cap.



B: INSTALLATION

Align the valve hole in wheel cap with the valve on wheel and secure the wheel cap by tapping four points by hand.

C: INSPECTION

1) Check the wheels for missing wheel caps.
2) Check the pawls of wheel caps for damage or bend.
3) Check the wheel caps for cracks.

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8. 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.
	Wheel alignment	Check the wheel alignments. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-21, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-15, INSPECTION, Rear Strut.>
	Front axle	Check the front axle. <Ref. to DS-25, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-36, INSPECTION, Rear Axle [AWD Model].> <Ref. to DS-38, INSPECTION, Rear Axle [FWD Model].>
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-23, INSPECTION, Front Stabilizer.>
	Wheel alignment	Check the wheel alignments. <Ref. to FS-7, 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, INSPECTION, Wheel Balancing.>
	Front axle	Check the front axle. <Ref. to DS-25, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-36, INSPECTION, Rear Axle [AWD Model].> <Ref. to DS-38, INSPECTION, Rear Axle [FWD Model].>
Abnormal tire wear	Improperly inflated tire	Adjust the tire pressure.
	Improper wheel balancing	Check the wheel balance. <Ref. to WT-7, INSPECTION, Wheel Balancing.>
	Wheel alignment	Check the wheel alignments. <Ref. to FS-7, INSPECTION, Wheel Alignment.>

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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 abnormal noise.

MODEL	1.6 L		2.0 L	
	AT	MT	AT	MT
Rear differential type	VA-type model without LSD			T-type model without LSD
Identification	XP	XN		EG
Type of gear	Hypoid gear			
Gear ratio (Number of gear teeth)	4.444 (40/9)	4.111 (37/9)		3.900 (39/10)
Oil capacity	0.7 — 0.9 ℓ (0.7 — 1.0 US qt, 0.6 — 0.8 Imp qt)			
Rear differential gear oil	GL-5 (75W-90)			

MODEL	2.5 L		2.0 L Turbo		
	AT	MT	AT	MT	
	Australia			Except Australia	Australia
Rear differential type	T-type model with LSD				
LSD type	Viscous coupling		SURETRAC®	Viscous coupling	SURETRAC®
Identification	EJ		EM	EF	EM
Type of gear	Hypoid gear				
Gear ratio (Number of gear teeth)	4.111 (37/9)		4.444 (40/9)	3.545 (39/11)	4.444 (40/9)
Oil capacity	0.7 — 0.9 ℓ (0.7 — 1.0 US qt, 0.6 — 0.8 Imp qt)				
Rear differential gear oil	GL-5 (75W-90)				

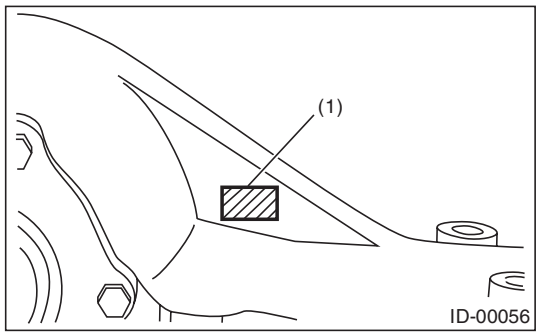
MODEL	2.0 L Turbo STi			
	6MT			
	Except Australia	Australia	Except Australia	Australia
Rear differential type	T-type model with LSD			
LSD type	SURETRAC®		Mechanical	
Identification	HJ	HG	HS	HW
Type of gear	Hypoid gear			
Gear ratio (Number of gear teeth)	3.545 (39/11)	3.900 (39/10)	3.545 (39/11)	3.900 (39/10)
Oil capacity	0.9 — 1.12 (1.0 — 1.2 US qt, 0.8 — 1.0 Imp qt)			
Rear differential gear oil	GL-5 (75W-90)		GL-5 (90)	

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2. IDENTIFICATION

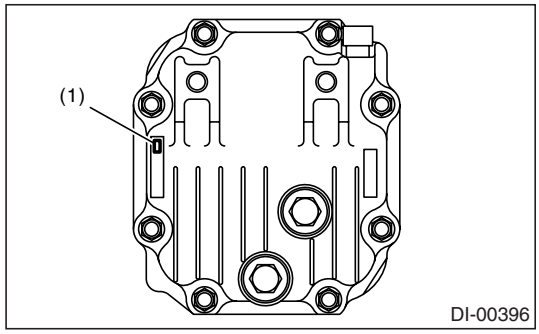
Identification label positions are shown in the following figures. For details concerning identification, refer to “ID” section.

- T-type



(1) Identification

- VA-type



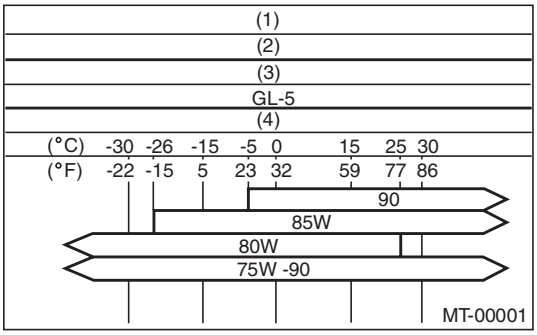
(1) Identification

3. REAR DIFFERENTIAL GEAR OIL

NOTE:
Use gear oil for the mechanical LSD for mechanical LSD model.

Recommended oil
Model without mechanical LSD:
GL-5 (75W-90)
Model with mechanical LSD:
GL-5 (90)

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



(1) Item
(2) Differential gear oil
(3) API Standard
(4) SAE viscosity No. and application temperature

4. SERVICE DATA

Front and rear bearing preload at companion flange bolt hole N (kgf, lbf)	New bearing	T-type	Except STi model	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
			STi model	24.1 — 38.6 (2.5 — 3.9, 5.4 — 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)
		VA-type		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 (T-type) mm (in)				0.05 (0.0020)

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5. ADJUSTING PARTS

• VA-type

Front and rear bearing preload at companion flange bolt hole N (kgf, lbf)	New bearing	12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3)
Preload adjusting spacer	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 shim	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)	

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Side gear thrust washer	Part No.	Length 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)
Hypoid driven gear to drive pinion backlash mm (in)	Limit	0.10 — 0.15 (0.0039 — 0.0059)

• T-type

Front and rear bearing preload at companion flange bolt hole N (kgf, lbf)	New bearing	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
Preload adjusting spacer	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)

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Pinion height adjusting shim		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	mm (in)	Limit	0.10 — 0.20 (0.0039 — 0.0079)
Hypoid driven gear runout on its back surface	mm (in)		0.05 (0.0020)

• STi model

Front and rear bearing preload at companion flange bolt hole	N (kgf, lbf)	24.1 — 38.6 (2.5 — 3.9, 5.4 — 8.7)	
Preload adjusting spacer		Part No.	Length mm (in)
		31454AA130	52.2 (2.055)
		31454AA140	52.4 (2.063)
		31454AA150	52.6 (2.071)
		31454AA160	52.8 (2.079)
		31454AA170	53.0 (2.087)
		31454AA180	53.2 (2.094)

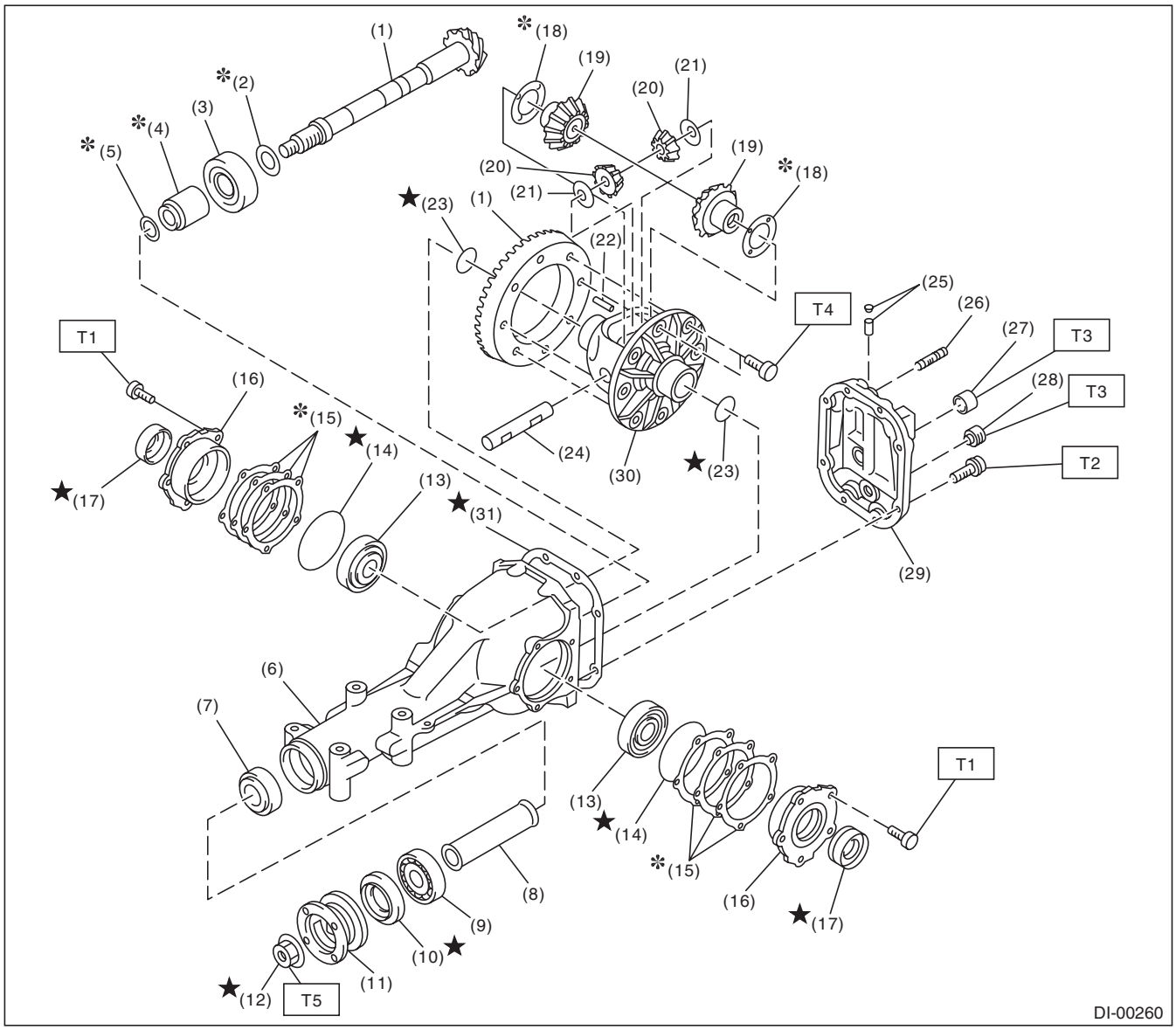
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Preload adjusting washer	Part No.	Length mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	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 shim	Part No.	Length mm (in)
	38336AA230	3.09 (0.1217)
	38336AA240	3.12 (0.1228)
	38336AA250	3.15 (0.1240)
	38336AA260	3.18 (0.1252)
	38336AA270	3.21 (0.1264)
	38336AA280	3.24 (0.1276)
	38336AA290	3.27 (0.1287)
	38336AA300	3.30 (0.1299)
	38336AA310	3.33 (0.1311)
	38336AA320	3.36 (0.1323)
	38336AA330	3.39 (0.1335)
	38336AA340	3.42 (0.1346)
	38336AA350	3.45 (0.1358)
	38336AA360	3.48 (0.1370)
	38336AA370	3.51 (0.1382)
	38336AA380	3.54 (0.1394)
	38336AA390	3.57 (0.1406)
	38336AA400	3.60 (0.1417)
	38336AA410	3.63 (0.1429)
	38336AA420	3.66 (0.1441)
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 mm (in)	Limit	0.10 — 0.20 (0.0039 — 0.0079)
Hypoid driven gear runout on its back surface mm (in)		0.05 (0.0020)

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B: COMPONENT

1. REAR DIFFERENTIAL FOR T-TYPE WITHOUT LSD

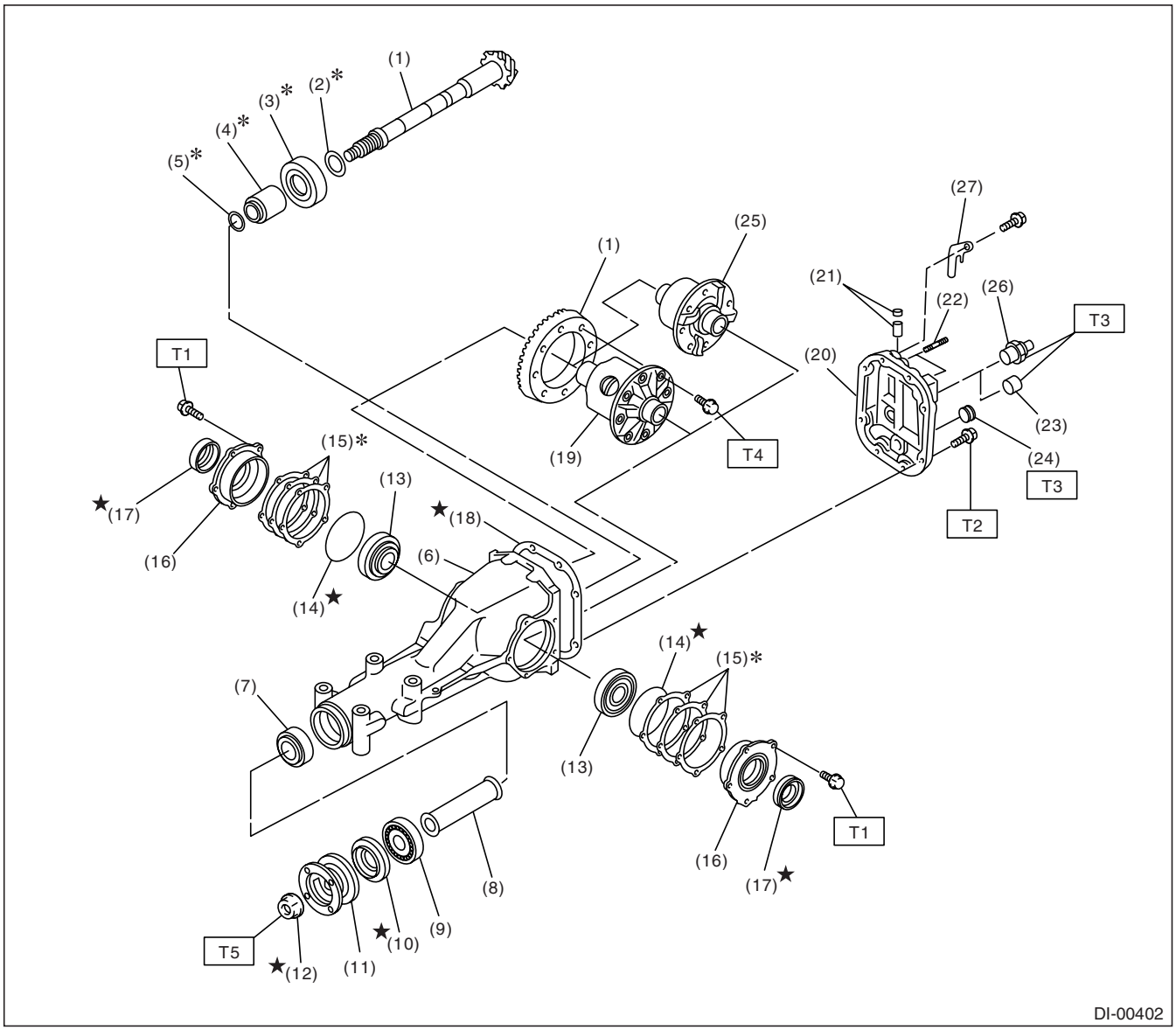


(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting shim
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Spacer
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(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) Circlip
(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, 21.7)
T3: 49 (5.0, 36.2)
T4: 105 (10.7, 77.4)
T5: 181 (18.5, 134)

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2. REAR DIFFERENTIAL FOR T-TYPE WITH LSD

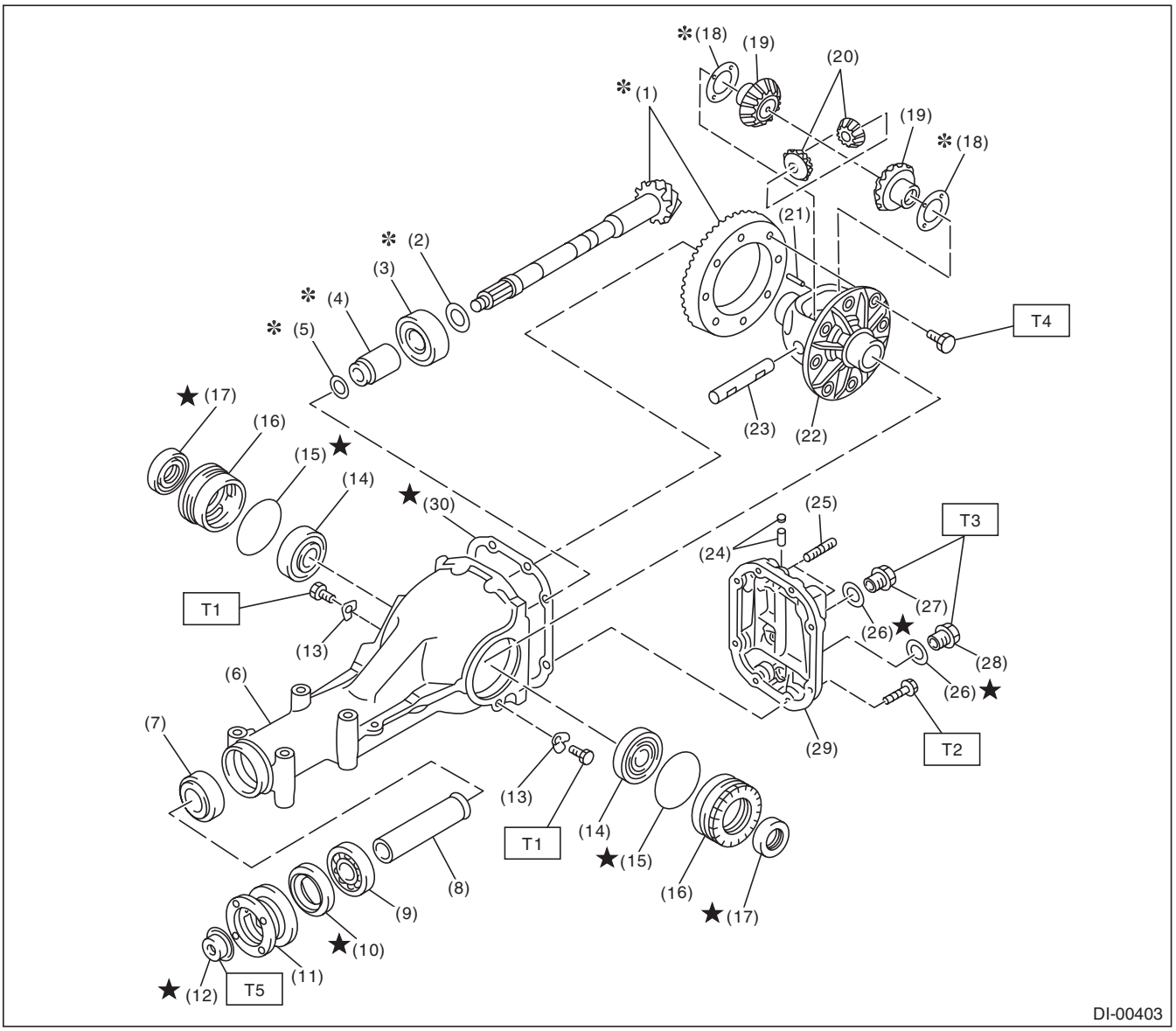


(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting shim
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut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

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*10.3 (1.05, 7.6)*
T2:	*29 (3.0, 21.7) (Except STi model)*
	44 (4.5, 32.5) (STi model)
T3:	*49 (5.0, 36.2)*
T4:	*105 (10.7, 77.4)*
T5:	*181 (18.5, 134)*

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3. REAR DIFFERENTIAL FOR VA-TYPE

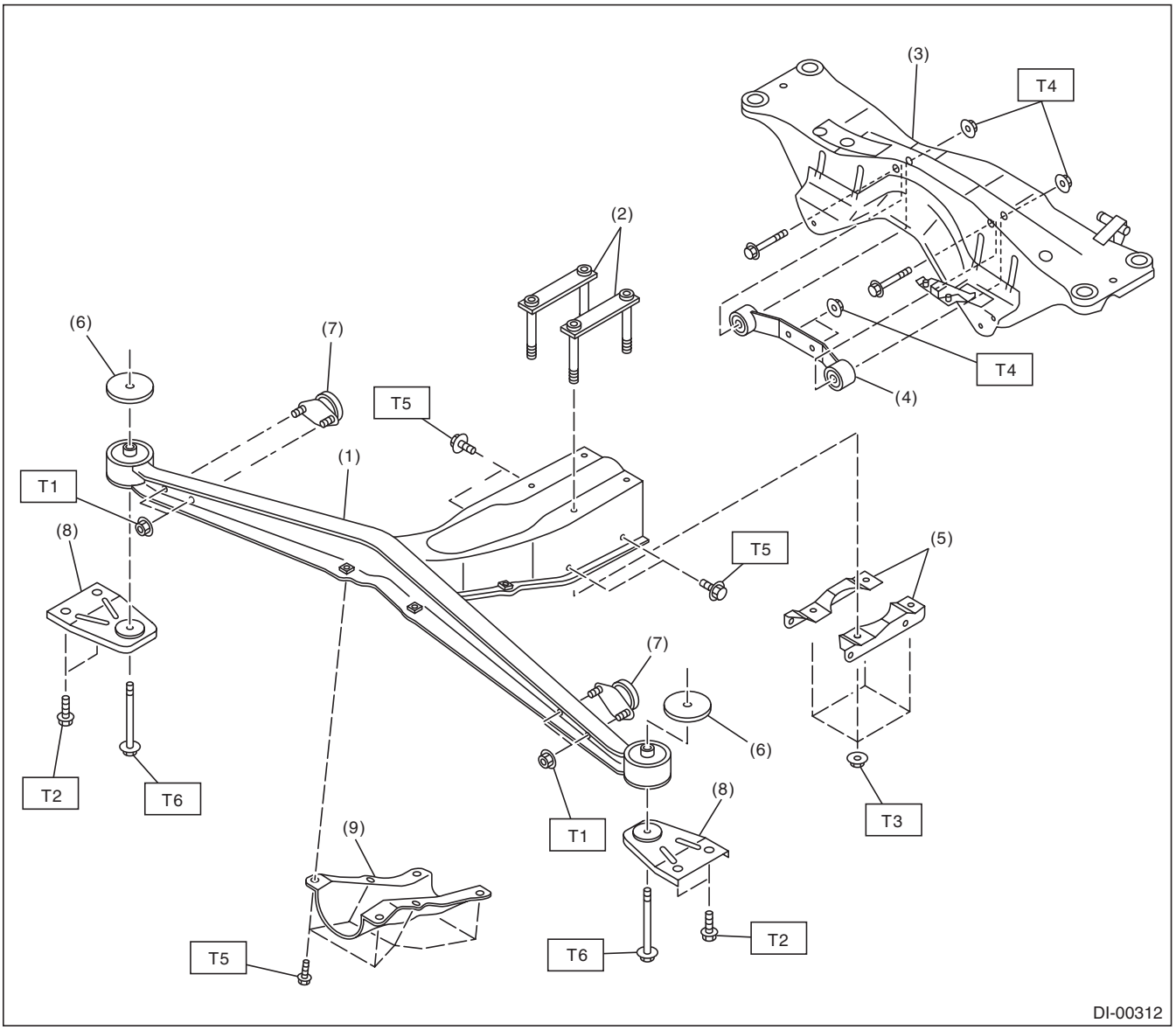


(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting shim
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(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, 18.1)
T2: 25 (2.5, 18.1)
T3: 34 (3.5, 25.3)
T4: 62 (6.3, 45.6)
T5: 191 (19.5, 141)

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4. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Differential front member
(2) Plate
(3) Crossmember
(4) Differential rear member
(5) Differential mount lower bracket
(6) Stopper
(7) Dynamic damper
(8) Differential mount bracket
(9) Differential mount front cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 33 (3.4, 24.3)
T3: 50 (5.1, 36.9)
T4: 70 (7.1, 51.6)
T5: 90 (9.2, 66.4)
T6: 100 (10.2, 73.8)

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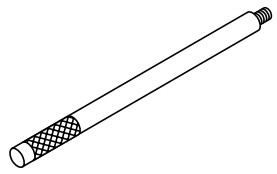
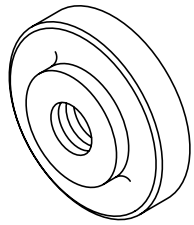
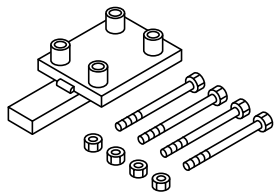
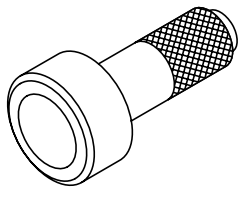
C: CAUTION

- Wear working 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 or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn, because each part on the vehicle is hot after running.
- Use specified 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 vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating face of the case.

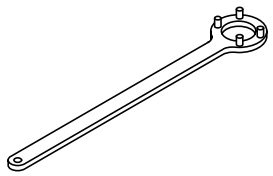
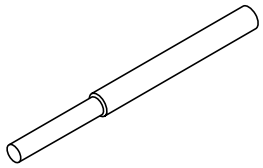
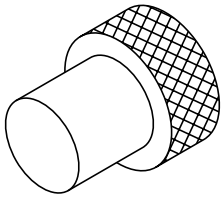
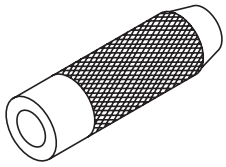
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D: PREPARATION TOOL

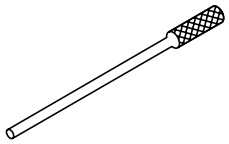
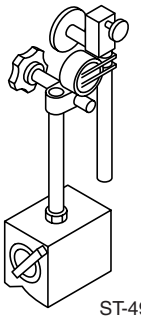
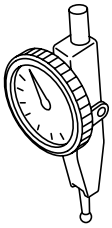
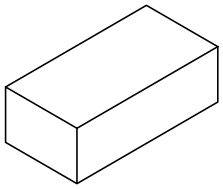
1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing front and rear bearing cone.
 ST-398477702	398477702	DRIFT	Used press-fitting the bearing cone of differential carrier (rear).
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 ST-498447120	498447120	INSTALLER	Used for installing front oil seal.

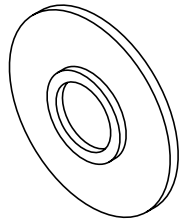
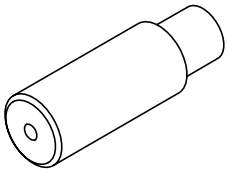
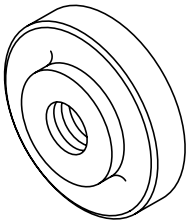
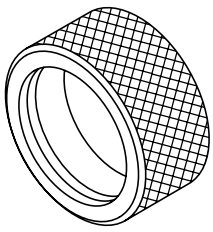
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498427200	498427200	FLANGE WRENCH	• Used for stopping rotation of companion flange when loosening and tightening self-lock nut. • For T-type. (Except STi model with mechanical LSD)
 ST-398467700	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 ST-399780104	399780104	WEIGHT	Used for installing front bearing cone, pilot bearing companion flange.
 ST-899580100	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.

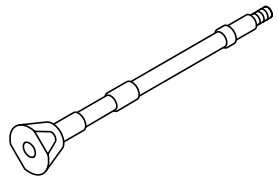
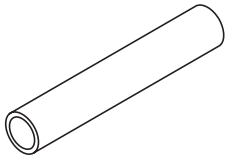
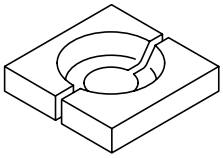
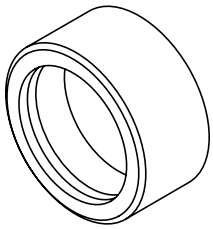
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used measuring backlash between side gear and pinion, hypoid gear. • Used with MAGNET BASE (498247001).
 ST-398507704	398507704	BLOCK	Used for adjusting pinion height and preload.

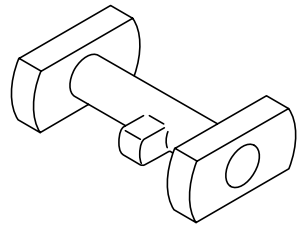
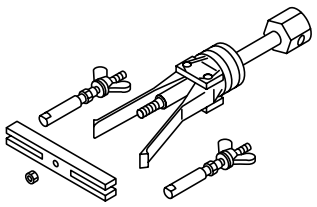
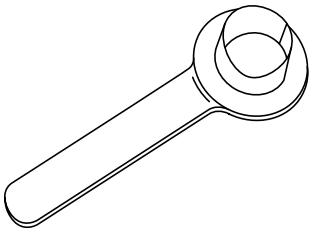
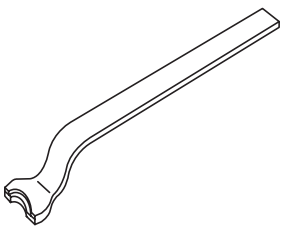
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398177700	398177700	INSTALLER	• Used for installing rear bearing cone. • For T-type.
 ST-398457700	398457700	ATTACHMENT	• Used for removing side bearing retainer. • For T-type.
 ST-398477703	398477703	DRIFT2	• Used for press-fitting the bearing race (rear) of differential carrier. • For T-type.
 ST-398437700	398437700	DRIFT	• Used for installing side oil seal. • For T-type.

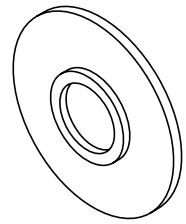
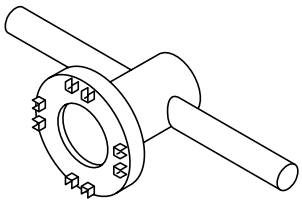
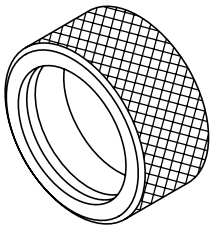
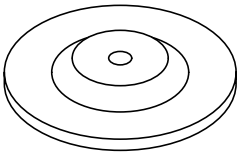
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507702	398507702	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For T-type.
 ST-398507703	398507703	DUMMY COLLAR	• Used for adjusting pinion height and preload. • For T-type.
 ST-398517700	398517700	REPLACER	• Used for removing rear bearing cone. • For T-type.
 ST-398487700	398487700	DRIFT	• Used for press-fitting the side bearing cone. • For T-type.

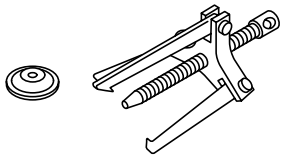
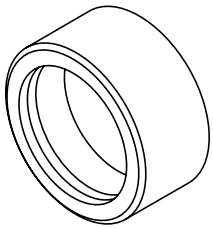
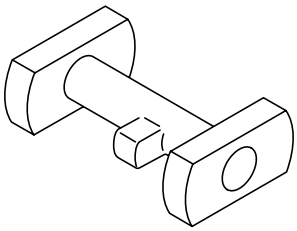
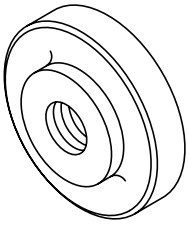
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For T-type.
 ST-398527700	398527700	PULLER ASSY	• Used for removing front oil seal. • Used for removing side bearing cup.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	• Used for removing rear drive shaft from rear differential. • For T-type.

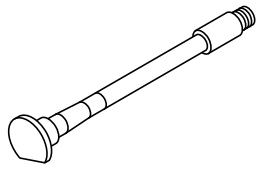
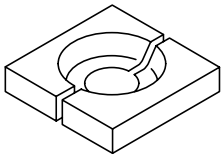
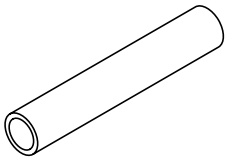
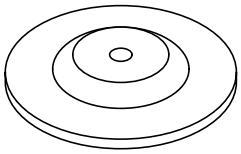
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498175500	498175500	INSTALLER	• Used for installing rear bearing cone. • For VA-type.
 ST-499785500	499785500	WRENCH ASSY	• Used for removing and installing side oil seal holder. • For VA-type.
 ST-498447100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

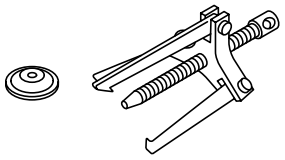
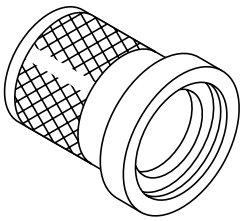
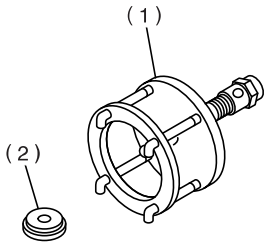
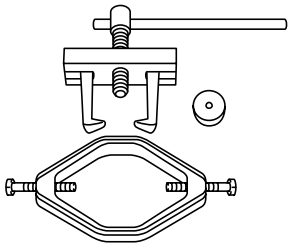
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-498485400	498485400	DRIFT	• Used for installing side bearing cone. • For VA-type.
 ST-498505501	498505501	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For VA-type.
 ST-498447110	498447110	DRIFT	• Used for press-fitting the bearing race (front) of differential carrier. • For VA-type.

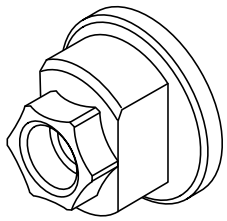
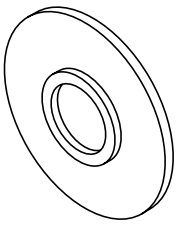
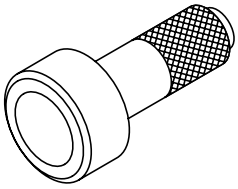
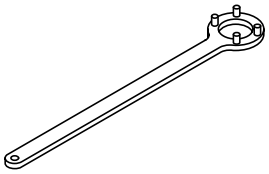
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498447150	498447150	DUMMY SHAFT	• Used for adjusting pinion height and Pre-load. • For VA-type.
 ST-498515500	498515500	REPLACER	• Used for removing rear bearing cone. • For VA-type.
 ST32285AA000	32285AA000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

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499705401	499705401	PULLER ASSY	• Used for removing side bearing race. • Used with SEAT (499705404). • For VA-type.
 ST-899874100	899874100	INSTALLER	Used for installing companion flange.
 ST-899524100	899524100	PULLER SET	• Used for removing side bearing cone of differential. • For VA-type. (1) Puller (2) Cap
 ST18759AA000	18759AA000	PULLER ASSY	• Used for removing side bearing cone of differential. • For T-type.

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937110	498937110	HOLDER DRIVE PINION (This special tool is used for current automatic transmission.)	• Used for installing pilot bearing. • For T-type. (STi model)
 ST18674AA000	18674AA000	INSTALLER	• Used for installing rear bearing cone. • For T-type. (STi model)
 ST-398417700	398417700	DRIFT (This special tool was prepared for the vehicles of 92MY and before.)	Used for installing side bearing race.
 ST18633AA000	18633AA000	WRENCH COMPL	• Used for stopping rotation of companion flange when loosening and tightening self-lock nut. • For T-type. (STi model with mechanical LSD)

2. GENERAL PURPOSE TOOLS

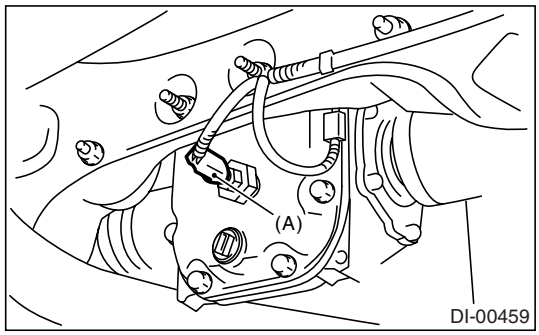
TOOL NAME	REMARKS
Transmission jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer.
Thickness gauge	Used for measuring clearance.
Tire lever	Used for removal of rear drive shaft. (VA-type)

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2. Differential Gear Oil

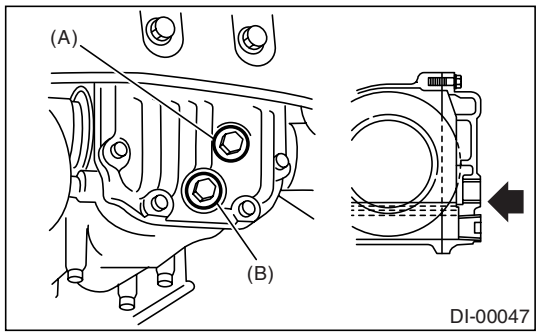
A: INSPECTION

1) Disconnect the oil temperature switch connector (Mechanical LSD model).



(A) Connector

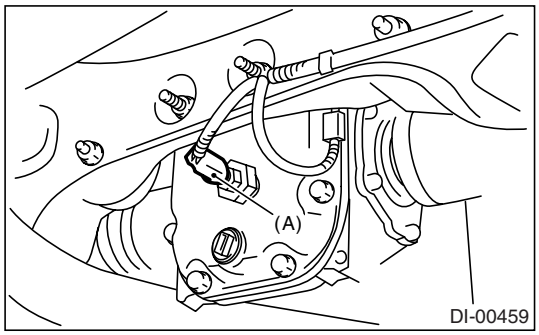
2) Remove the filler plug or oil temperature switch, and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. <Ref. to DI-24, REPLACEMENT, Differential Gear Oil.>
3) Check the gear oil level is up to the bottom part of filler bolt or oil temperature switch. If the level is low, make sure the no oil leak, and then refill up to the bottom of filler bolt.



(A) Filler plug
(B) Drain plug

B: REPLACEMENT

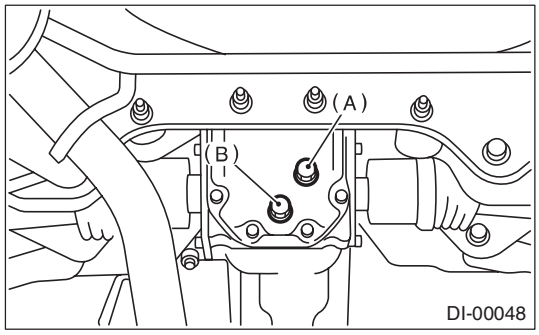
1) Jack-up the vehicle and support it with sturdy racks.
2) Disconnect the oil temperature switch connector (Mechanical LSD model).



(A) Connector

3) Remove the oil drain plug and filler plug or oil temperature switch, and drain the gear oil.

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



(A) Filler plug
(B) Drain plug

4) Tighten the oil drain plug.

NOTE:
• Apply liquid gasket to the drain plug or oil temperature switch for T-type.
• Use a new aluminum gasket for VA-type.

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

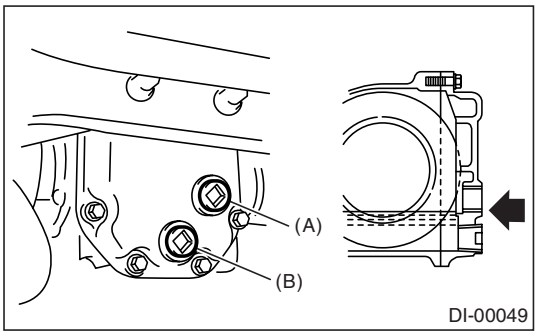
Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

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5) Fill the differential carrier with gear oil to the upper plug level.

NOTE:
• Carefully refill oil while watching the level. Excess or insufficient oil must be avoided.
• Use gear oil for the mechanical LSD for mechanical LSD model.

Oil capacity:
Except STi model:
0.7 — 0.9 ℓ (0.7 — 1.0 US qt, 0.6 — 0.8 Imp qt)
STi model:
0.9 — 1.1 ℓ (1.0 — 1.2 US qt, 0.8 — 1.0 Imp qt)



(A) Filler plug
(B) Drain plug

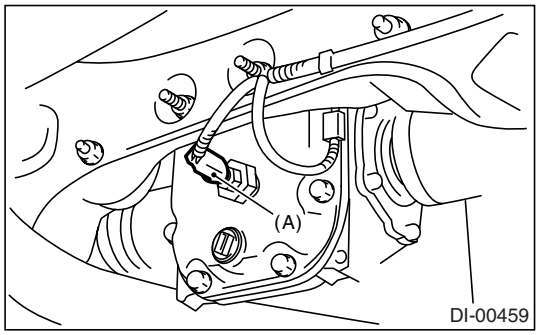
6) Install the filler plug or oil temperature switch.

NOTE:
• Apply liquid gasket to the filler plug or oil temperature switch for T-type.
• Use a new aluminum gasket for VA-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)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

7) Connect the oil temperature switch connector (Mechanical LSD model).



(A) Connector

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3. Front Differential Assembly

A: NOTE

1. AT MODEL

For front differential of automatic transmission, refer to “AT” section. <Ref. to 4AT-120, Front Differential Assembly.>

2. MT MODEL

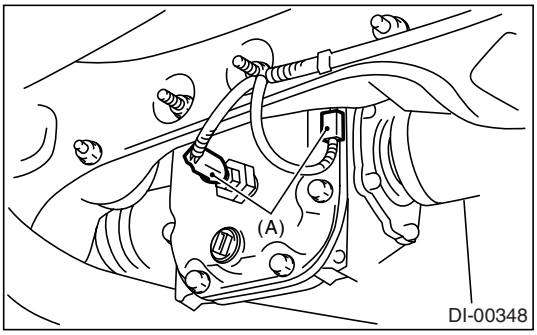
For front differential of manual transmission, refer to “5MT” or “6MT” section. <Ref. to 5MT-104, Front Differential Assembly.> or <Ref. to 6MT-105, Front Differential Assembly.>

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4. Rear Differential (T-type)

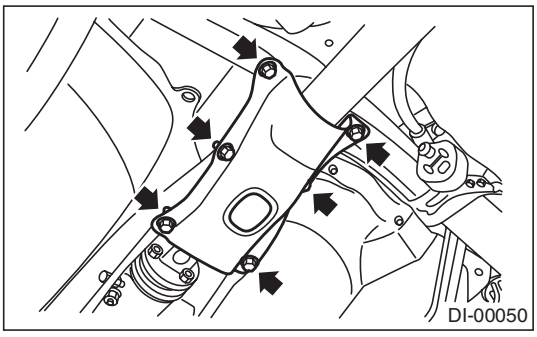
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with sturdy racks.
7) Remove the wheels.
8) Disconnect the connector from oil temperature switch. (Mechanical LSD model)

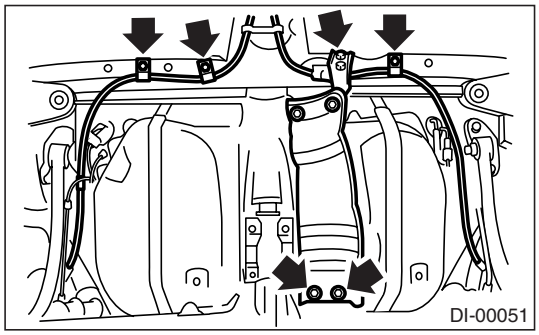


(A) Connector

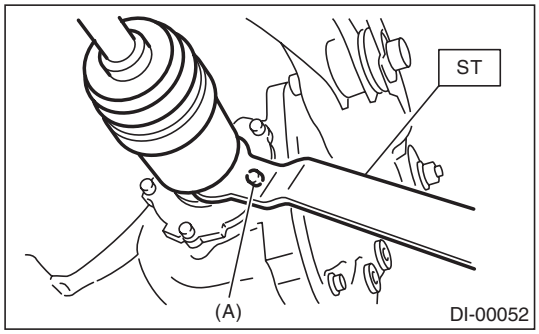
9) Remove the rear exhaust pipe and muffler.
Non-turbo model without OBD
<Ref. to EX(H4SOw/oOBD)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-11, INSTALLATION, Muffler.>
Non-turbo model with OBD
<Ref. to EX(H4SO)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-12, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
10) Remove the heat shield cover. (If equipped)
11) Remove the front cover of rear differential mount.



12) Remove the propeller shaft. <Ref. to DS-17, REMOVAL, Propeller Shaft.>
13) Remove the clamps and bracket of parking brake cable.

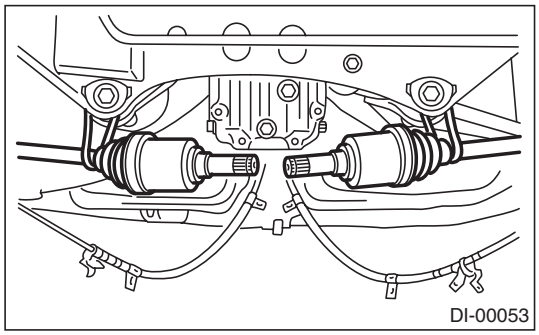


14) Remove the DOJ of rear drive shaft from rear differential using ST. <Ref. to DI-71, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA100 DRIVE SHAFT REMOVER



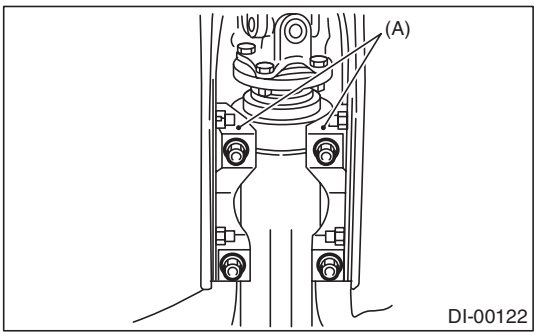
(A) Bolt

15) Secure the rear drive shaft to rear crossmember using wire.



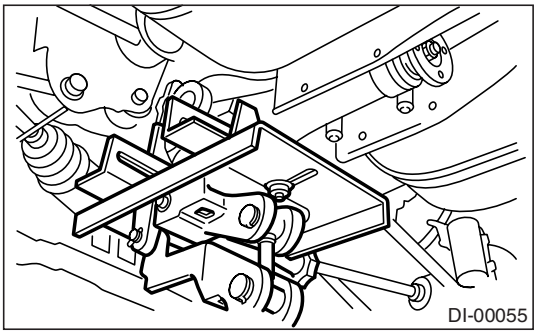
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16) Remove the lower bracket.

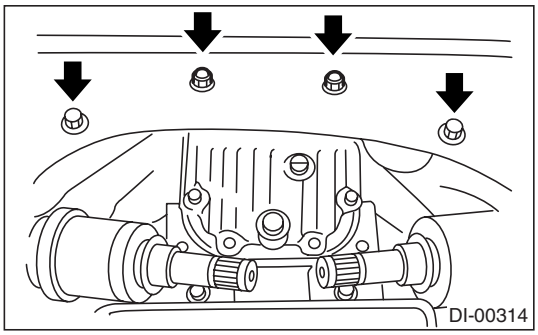


(A) Lower bracket

17) Support the rear differential with transmission jack.

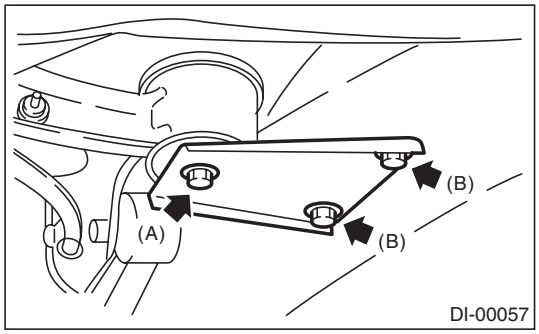


18) Remove the self-locking nuts and bolts.



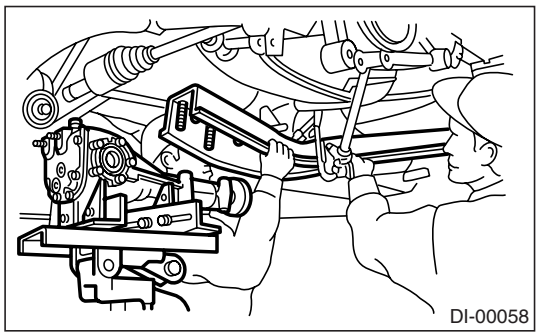
19) Remove the bolts which secure the rear differential front member to body.
Loosen the bolt A first, then remove the bolts B.

NOTE:
Support the front member with use of a helper to prevent it from dropping.

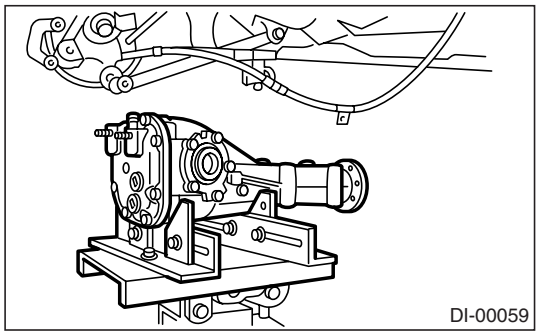


(A) Bolt A
(B) Bolt B

20) Remove the bolt A.
21) While slowly lowering the transmission jack, move the rear differential forward and remove front member from vehicle.



22) Remove the rear differential from vehicle.



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B: INSTALLATION

Install in the reverse order of removal.

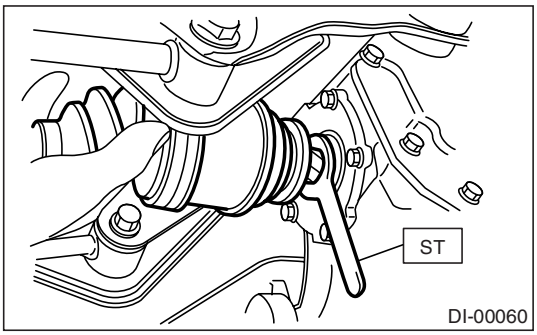
1) Install the air breather cap tapping with a plastic hammer.

NOTE:
Be sure to install a new air breather cap.

2) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:
When installing the rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

3) Install the DOJ of drive shaft into rear differential. <Ref. to DI-71, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA090 OIL SEAL PROTECTOR



4) Installing procedure hereafter is in the reverse order of removal.

5) After installation, fill the differential carrier with gear oil to the filler plug level. <Ref. to DI-24, Differential Gear Oil.>

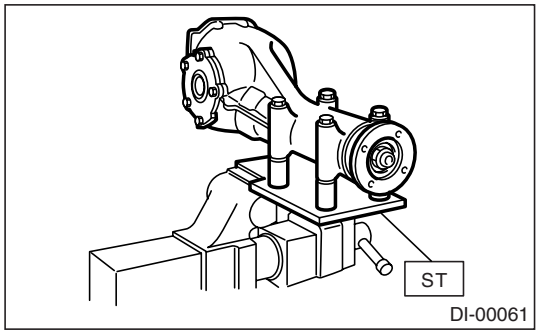
C: DISASSEMBLY

1. EXCEPT STi MODEL

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact of hypoid driven gear and pinion, and backlash
- Runout of hypoid driven gear at its back surface
- Turning resistance of drive pinion

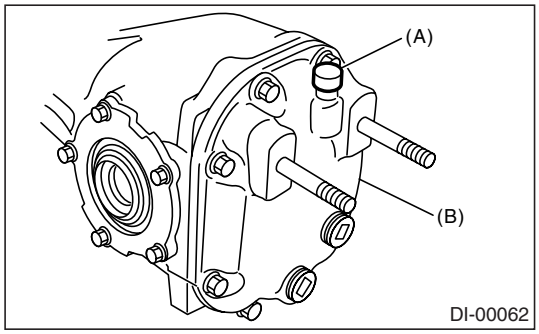
1) Set the ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT SET



2) Drain the gear oil by removing the plug.

3) Remove the air breather cap.

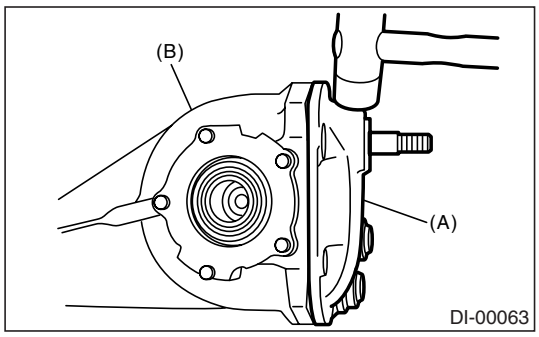
NOTE:
- Do not attempt to remove the air breather cap unless necessary.
- When removing the air breather cap, replace the air breather cap with a new one.



(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.



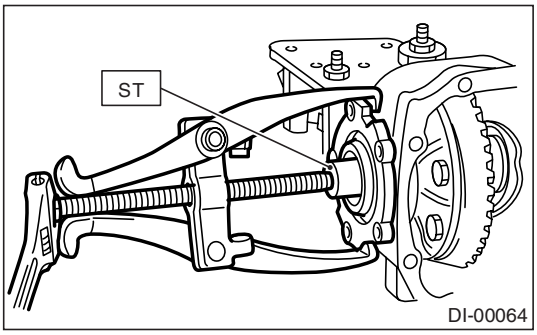
(A) Rear cover
(B) Differential carrier

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5) Make right and left side bearing retainers in order to identify them at reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract right and left side bearing retainers with a puller.

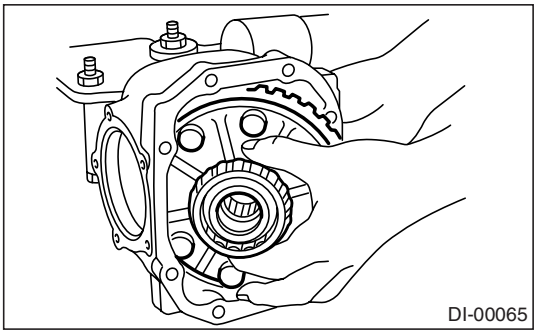
NOTE:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

ST 398457700 ATTACHMENT



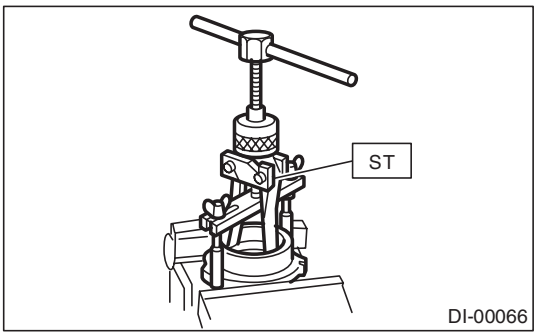
6) Pull out the differential case assembly from differential carrier.

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



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

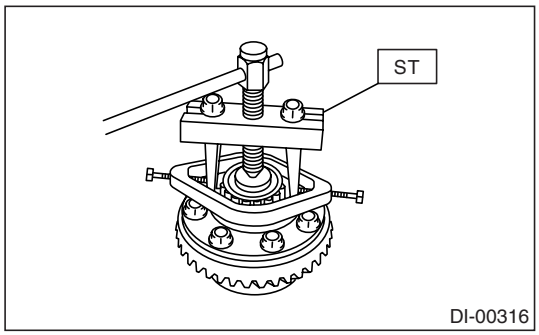
ST 398527700 PULLER ASSY



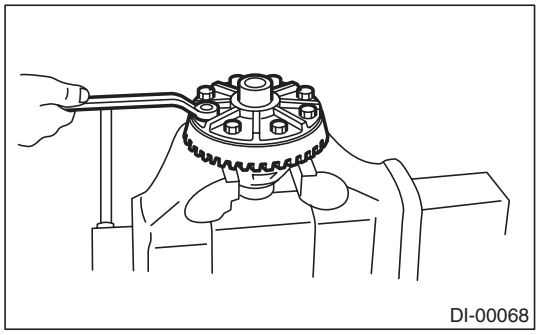
8) Extract the bearing cone with ST.

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

ST 18759AA000 PULLER ASSY



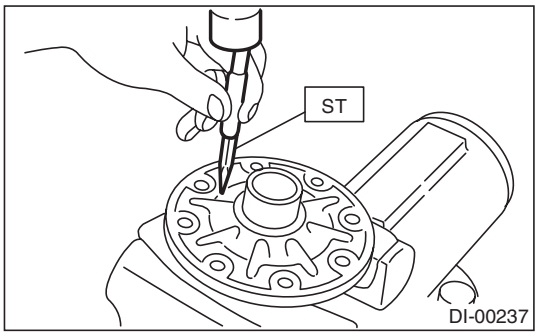
9) Remove the hypoid driven gear by loosening the hypoid driven gear bolts.



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 unstaking it.

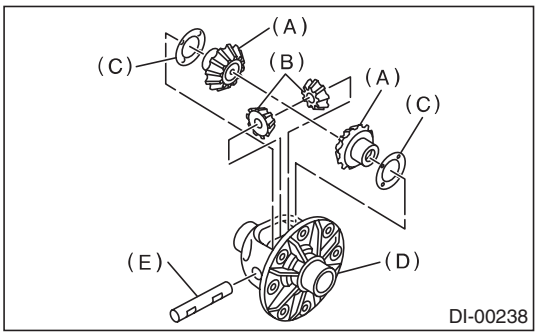
ST 899904100 STRAIGHT PIN REMOVER



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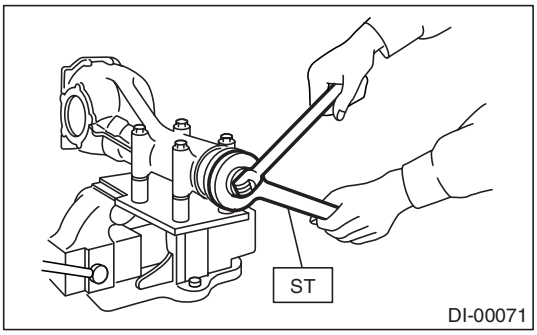
11) Draw out the pinion mate shaft and remove the pinion mate gears, side gears and thrust washers. (Model without LSD)

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

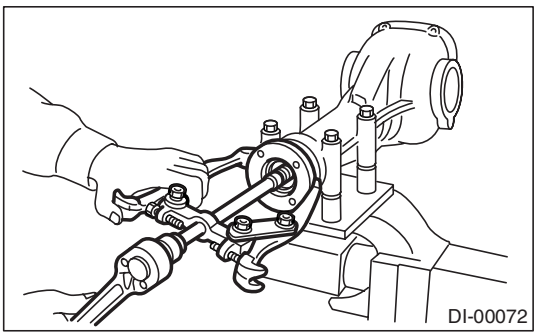


(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

12) Hold the companion flange with ST and remove the drive pinion nut.
ST 498427200 FLANGE WRENCH

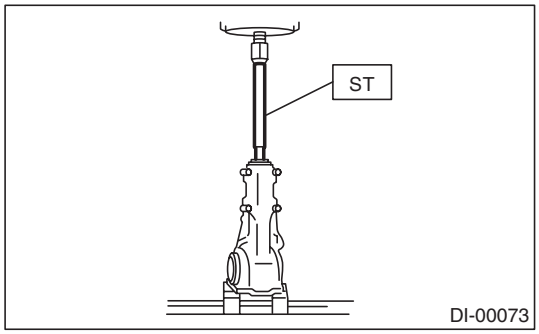


13) Extract the companion flange with a puller.



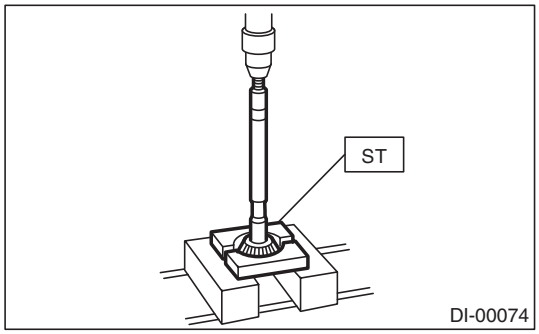
14) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

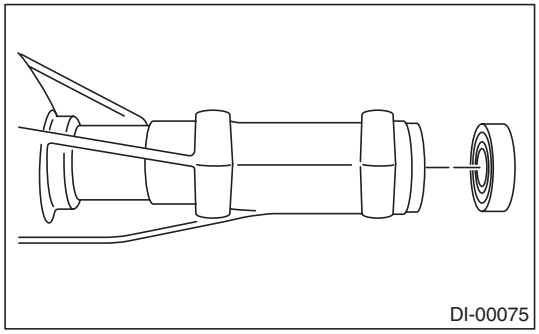


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 398517700 REPLACER

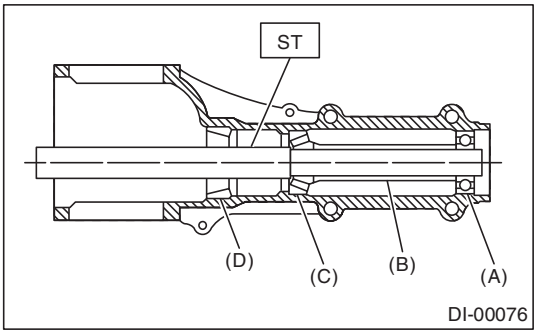


16) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



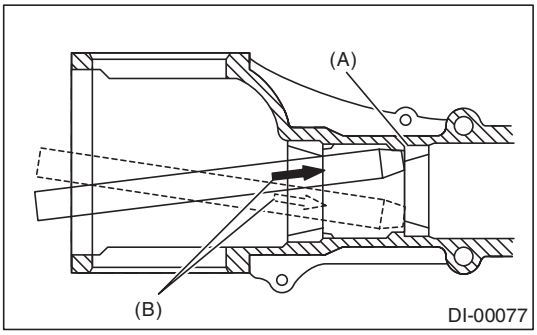
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17) Remove the pilot bearing together with front bearing cone and spacer using ST.
ST 398467700 DRIFT



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

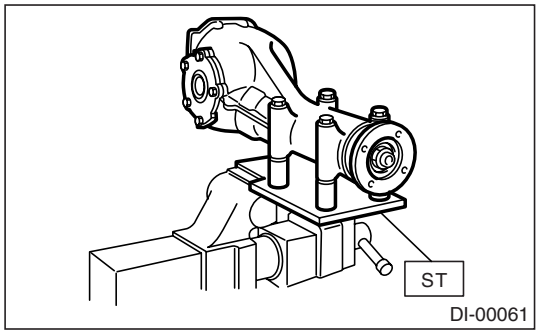
18) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



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

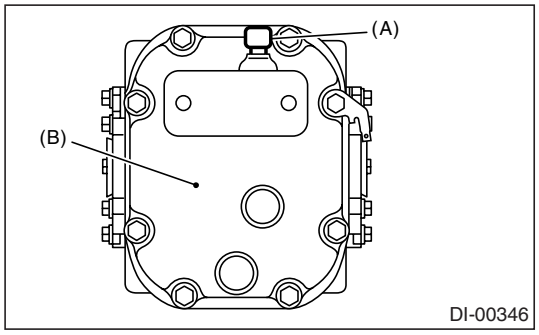
2. STi MODEL

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



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

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

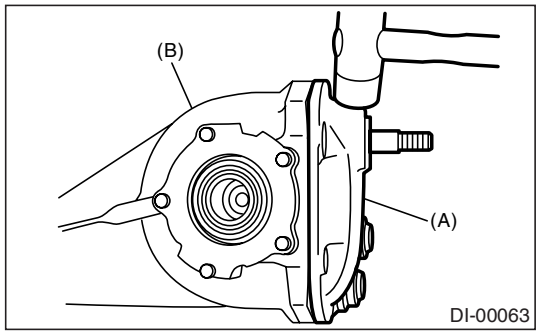


(A) Air breather cap
(B) Rear cover

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

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NOTE:
Remove it by tapping with plastic hammer.

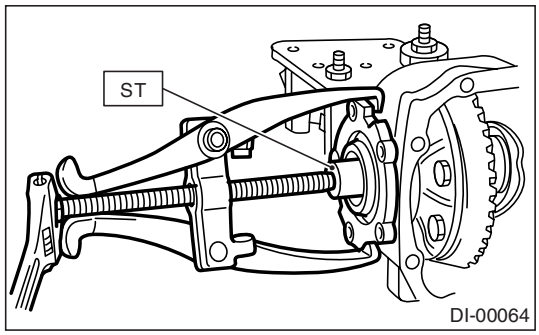


(A) Rear cover
(B) Differential carrier

5) Make right and left side bearing retainers in order to identify them at reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract right and left side bearing retainers with a puller.

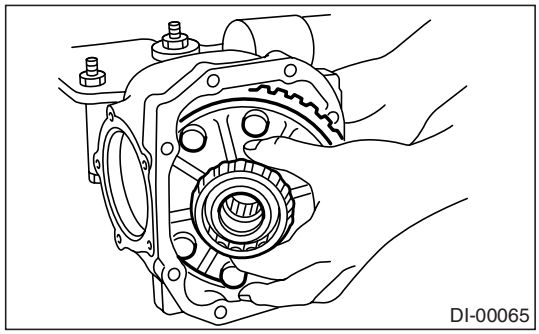
NOTE:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

ST 398457700 ATTACHMENT



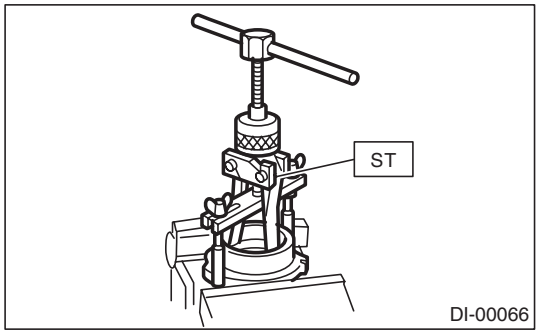
6) Pull out the differential case assembly from differential carrier.

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



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

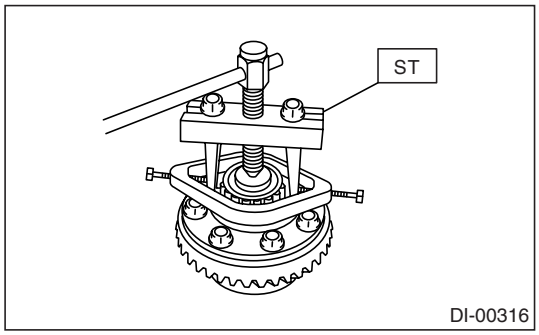
ST 398527700 PULLER ASSY



8) Extract the bearing cone with ST.

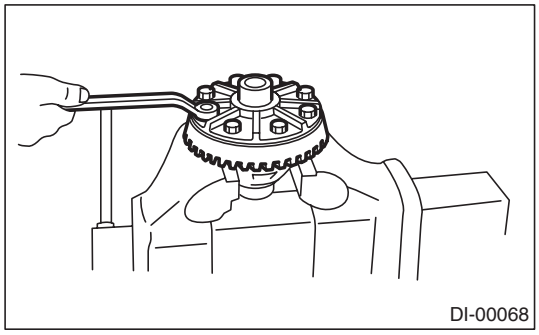
NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of bearing cone.
• Never mix up the right and left hand bearing races and cones.

ST 18759AA000 PULLER ASSY



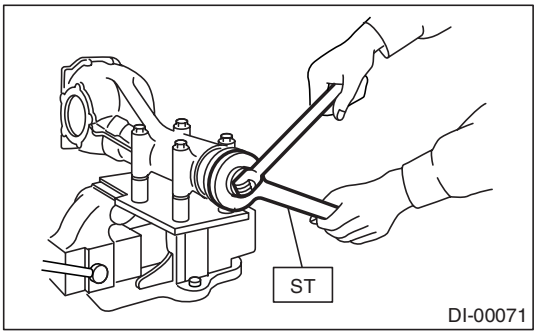
9) Remove the hypoid driven gear by loosening the hypoid driven gear bolts.

NOTE:
Do not disassemble the differential case.

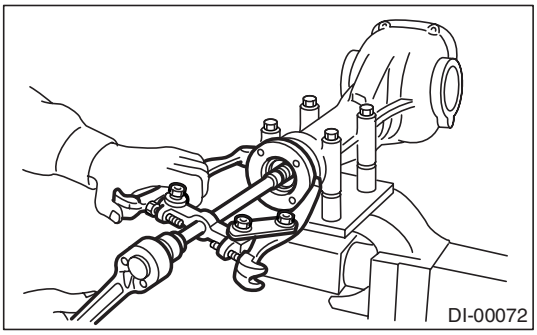


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10) Hold the companion flange with ST and remove the drive pinion nut.
ST (MODEL WITH MECHANICAL LSD)
18633AA000 WRENCH COMPL
ST (MODEL WITHOUT MECHANICAL LSD)
498427200 FLANGE WRENCH

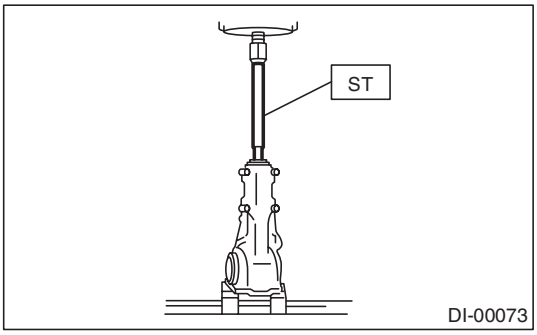


11) Extract the companion flange with a puller.

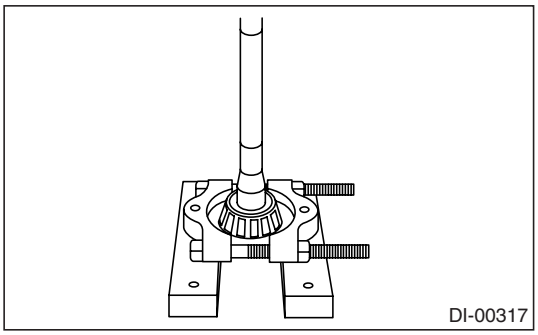


12) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

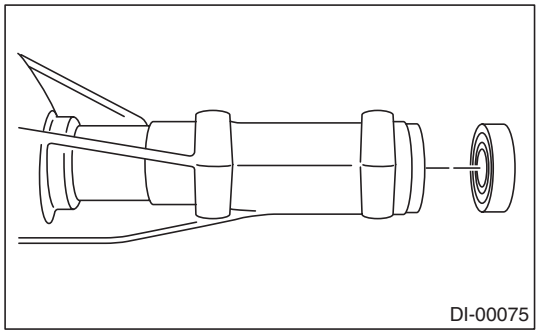
NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT



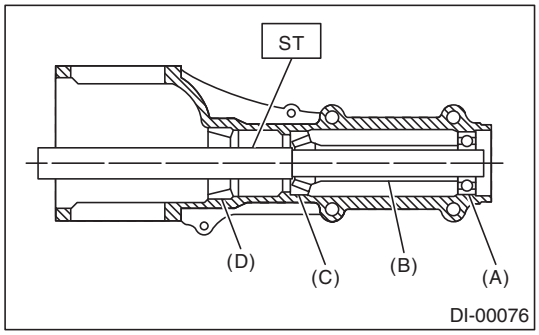
13) Remove the rear bearing cone from drive pinion.



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



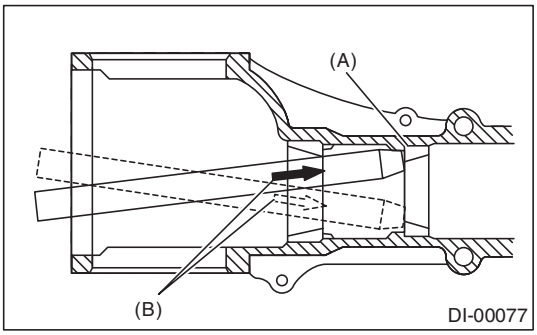
15) Remove the pilot bearing together with front bearing cone using ST.
ST 398467700 DRIFT



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

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16) When replacing the bearings, tap the front bearing cup and rear bearing cup in this order out of case by using a brass bar.

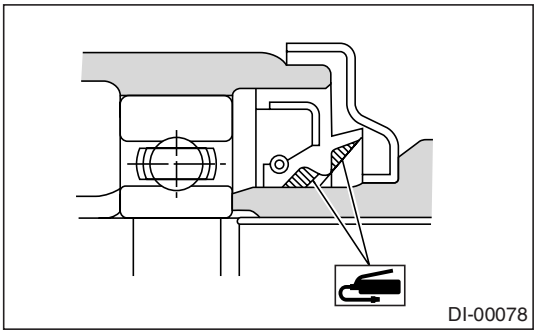


(A) 2 cutouts along diagonal lines
(B) Hit out alternately with brass bar.

D: ASSEMBLY

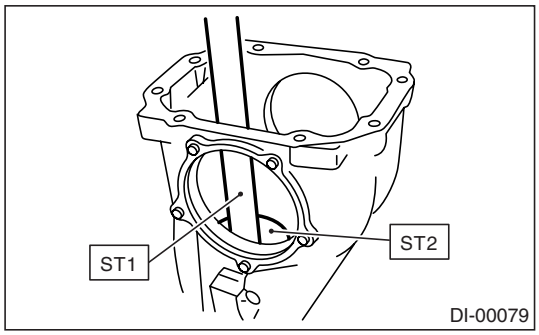
1. EXCEPT STi MODEL

NOTE:
• Assemble in the reverse order of disassembling.
• 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 when installing the bearings and thrust washers.
• Be careful not to mix up the right and left hand races of the bearings.
• Use a new O-ring and gasket.
• Replace the oil seal with a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.
• Be careful not to mix up the right and left hand oil seal.



1) Adjusting preload for front and rear bearings
Adjust the bearing preload with spacer 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 front and rear bearing race into differential carrier using ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477703 DRIFT 2

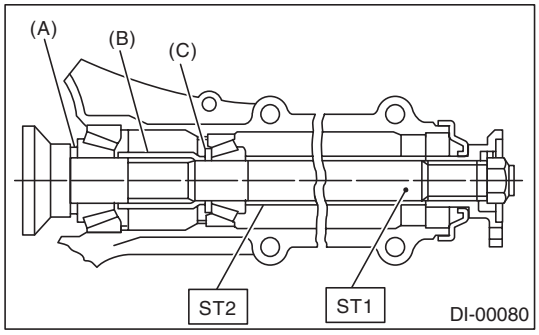


(2) Install the front bearing race to differential carrier using ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477703 DRIFT 2

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

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 reuse the used washer.
• Use a new rear bearing cone.

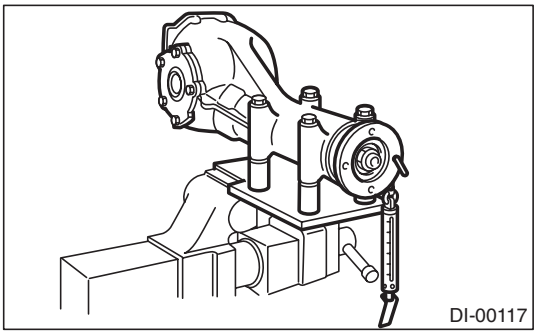
(4) Then install the preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.
ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



(A) Pinion height adjusting shim
(B) Preload adjusting spacer
(C) Preload adjusting washer

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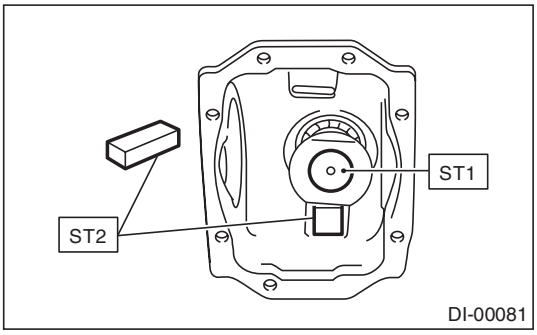
(5) Turn the ST1 with hand to make bearing fitted, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.



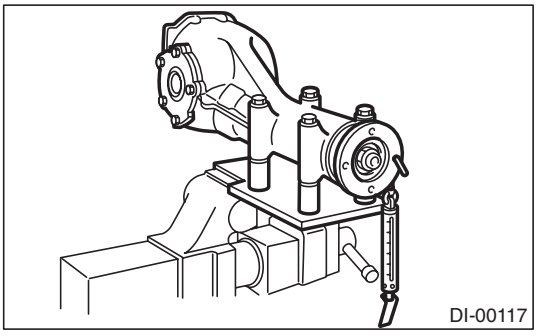
NOTE:
- Use a new lock nut.
- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.
- Measure the preload in direction of tangent to flange.

ST1 398507702 DUMMY SHAFT
ST2 398507704 BLOCK

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



Front and rear bearing preload
For new bearing: 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 spacer	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 shim installed between the rear bearing cone and back of pinion gear.

(1) Install the ST2.

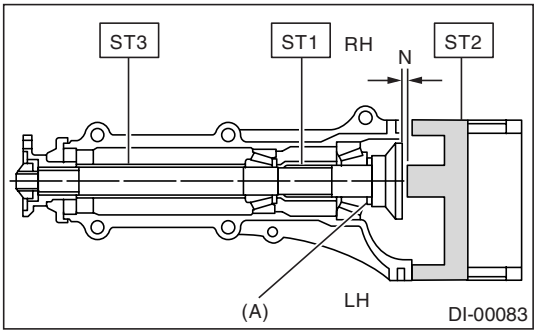
Front and rear bearing preload
For new bearing: 18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lbf) at companion flange bolt hole

NOTE:
At this time, install a pinion height adjusting shim which is temporarily selected or the same as that used before. Measure and record the thickness.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE

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ST3 398507703 DUMMY COLLAR

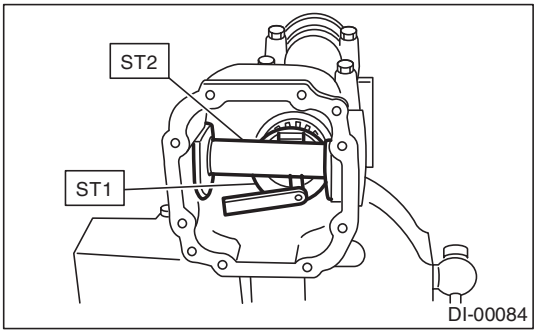


(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST2 and 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 shim to be inserted from the following formula, and replace the temporarily installed shim with this one.

$T = To + N - (H \times 0.01) - 0.20$ mm (0.0079 in)

NOTE:
Use copies of this page.

T	Thickness of pinion height adjusting shim mm (in)	
To	Thickness of shim temporarily inserted mm (in)	
N	Reading of thickness gauge mm (in)	
H	Figure marked on drive pinion head	
Memo:		

(Example of calculation)

To = 2.20 mm (0.0866 in) + 1.20 mm (0.0472 in) = 3.40 mm (0.1339 in)

N = 0.23 mm (0.0090 in)

H = + 1

T = 3.40 mm (0.1339 in) + 0.23 mm (0.0090 in) − 0.01 − 0.20 mm (0.0079 in) = 3.42 mm (0.1346 in)

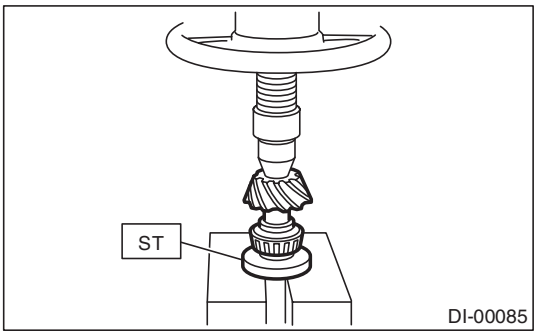
Result: Thickness = 3.42 mm

Therefore use the shim 383605200.

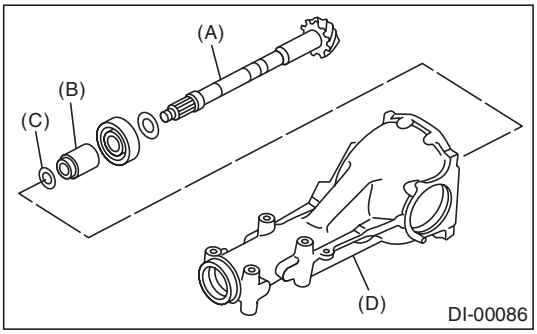
Pinion height adjusting shim	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	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)

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

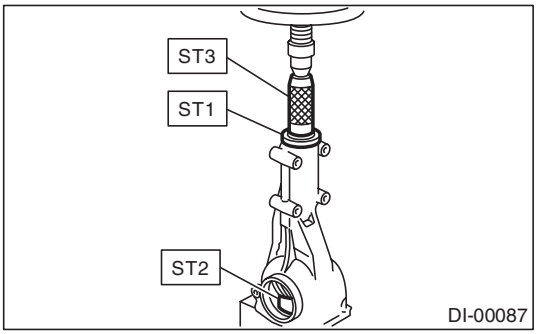


4) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.

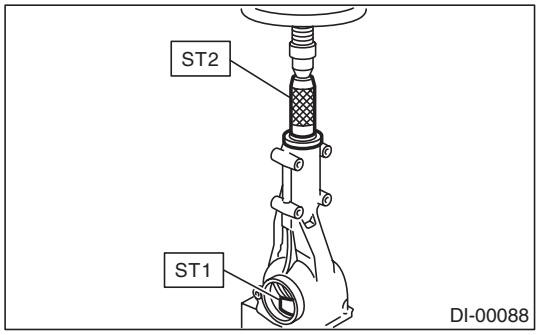


(A) Drive pinion
(B) Bearing adjusting spacer
(C) Washer
(D) Differential carrier

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



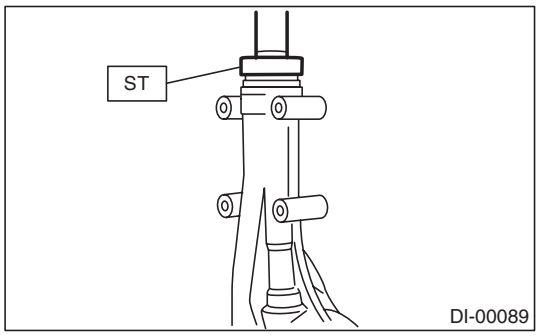
6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Fit a new oil seal with ST.

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

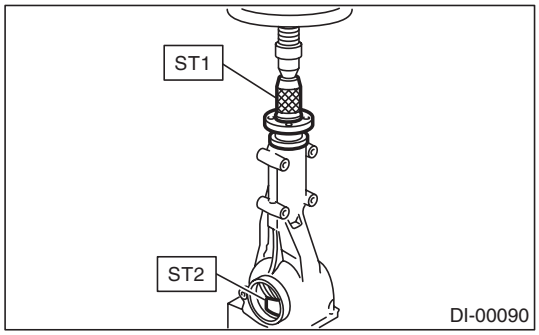
ST 498447120 INSTALLER



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

NOTE:
Be careful not to damage the bearing.

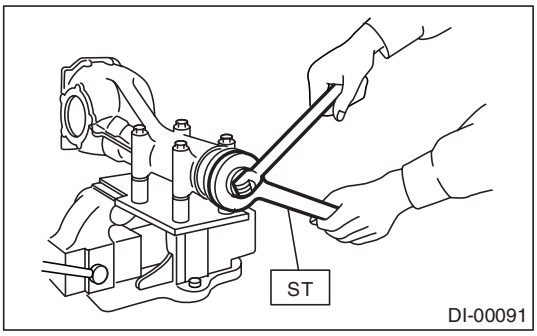
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



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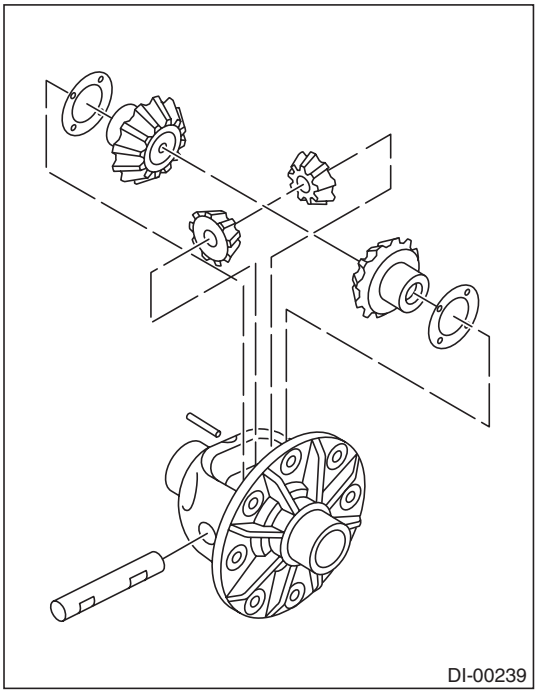
9) Install a new self-locking nut. Then tighten it with the ST.
ST 498427200 FLANGE WRENCH

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



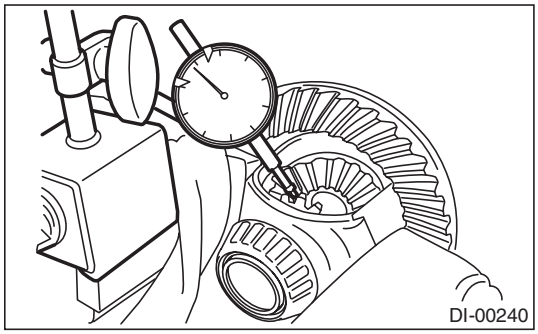
10) Assembling differential case
Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case. (Model without LSD)

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 backlash as specified by selecting the 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)

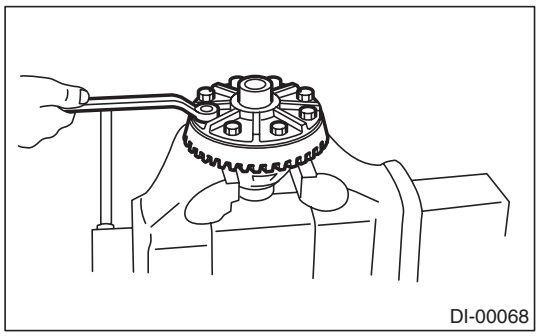
(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust washer surfaces.
(4) After inserting the pinion shaft lock pin into differential case, stake both sides of the hole to prevent pin from falling off.

11) Apply Lock Tite to bolt thread and install the hypoid driven gear on differential case.

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

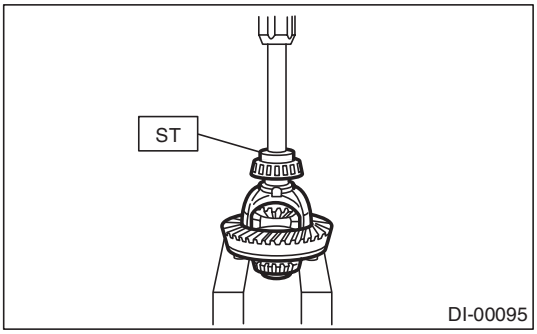
NOTE:
Tighten diagonally while tapping the bolt heads.

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

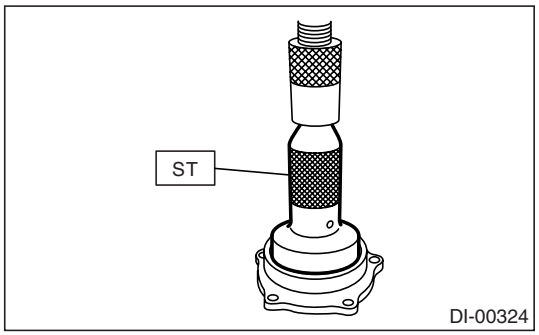


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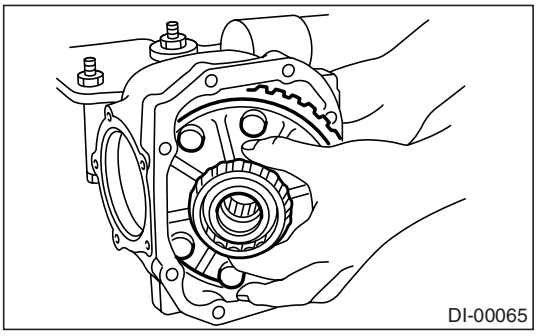
12) Press the side bearing into differential case using ST.
ST 398487700 DRIFT



13) Press the side bearing outer race into bearing retainer using ST.
ST 398417700 DRIFT



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



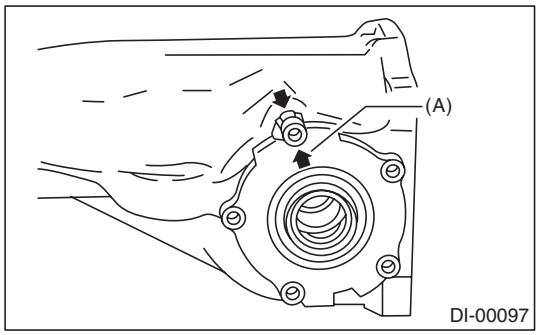
(3) Install the side retainer shims and O-rings to the right and left retainers from which they were removed.

NOTE:
• Replace the broken or cracked O-ring with new one.
• 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.

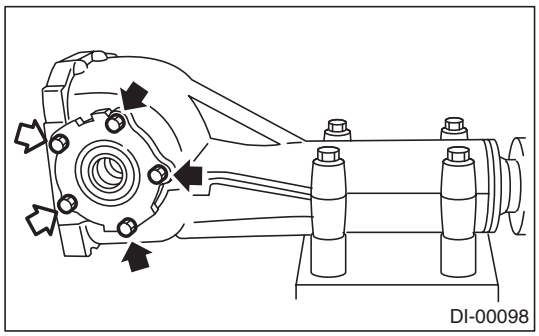
NOTE:
Be careful that side bearing outer race is not damaged by bearing roller.



(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

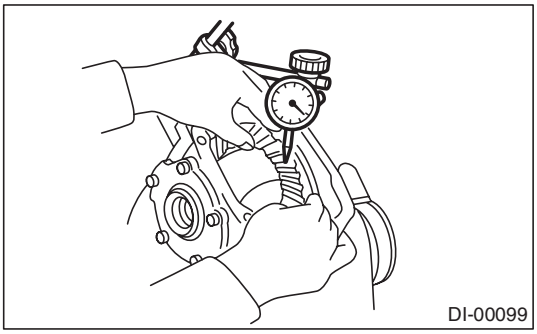
Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



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(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 the hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

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

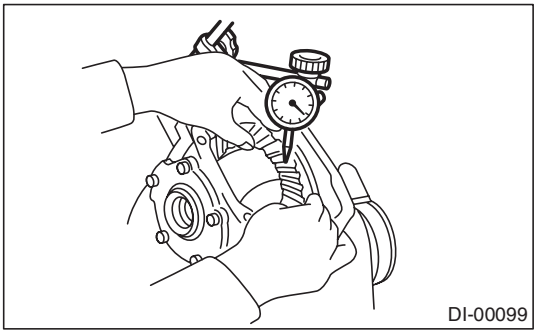


(7) At the same time, measure the total preload of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side bearing retainer shims, increasing/reducing by an even amount at a time.

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

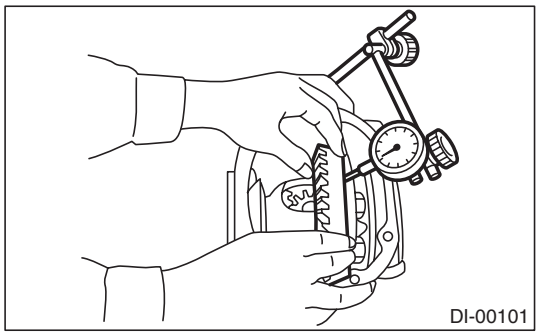
15) Re-check the hypoid driven gear-to-pinion backlash.

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 rotate 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.

Limit of runout:
0.05 mm (0.0020 in)

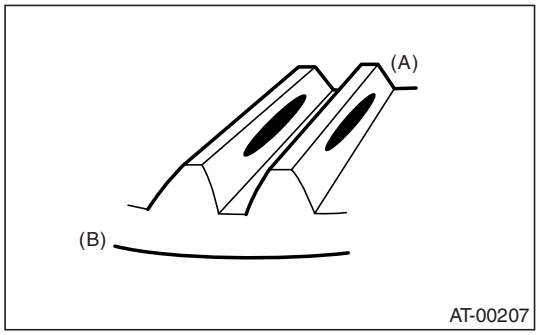


17) Checking and adjusting tooth contact of hypoid driven gear
(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears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

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)

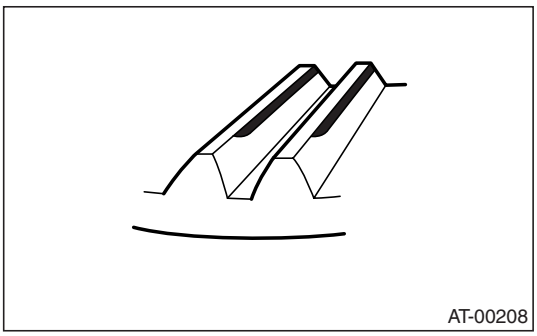


(A) Toe side
(B) Heel side

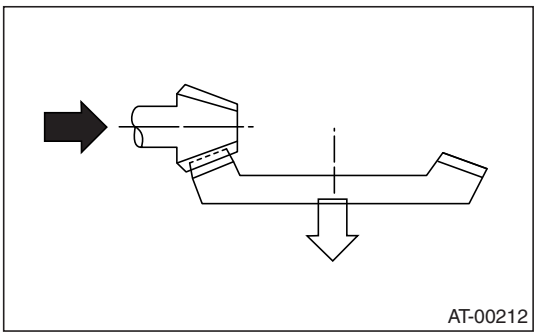
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- Face contact

Checking item: Backlash is too large.
Contact pattern

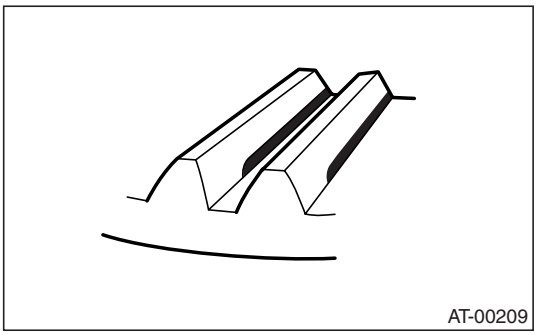


Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to hypoid driven gear.

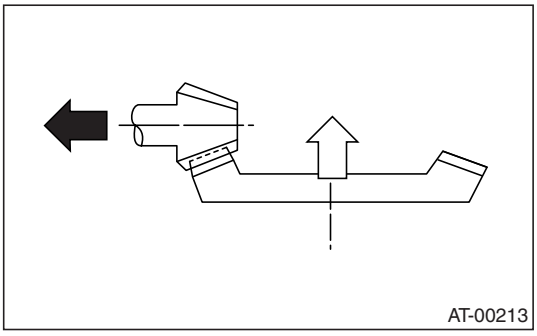


- Flank contact

Checking item: Backlash is too small.
Contact pattern

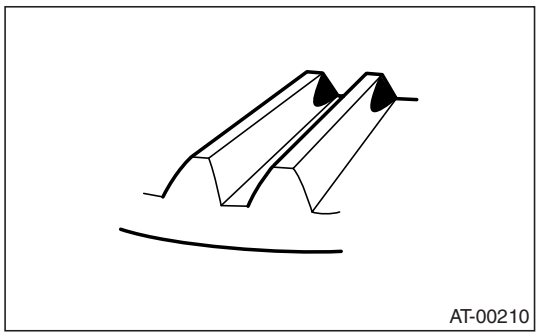


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from hypoid driven gear.

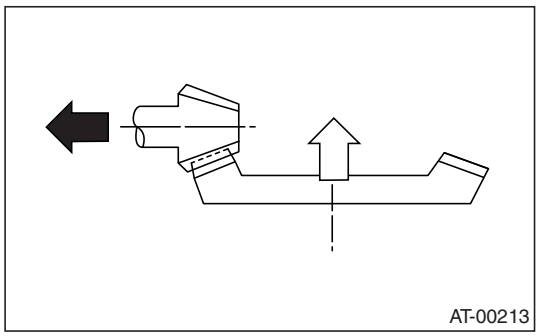


- Toe contact (Inside end contact)

Checking item: Contact area is small.
Contact pattern

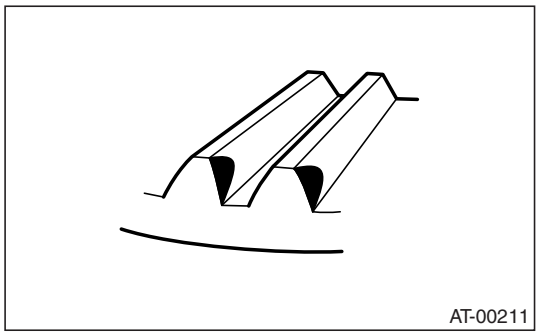


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from hypoid driven gear.

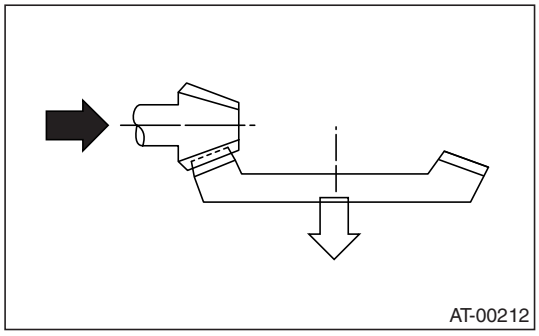


- Heel contact (Outside end contact)

Checking item: Contact area is small.
Contact pattern

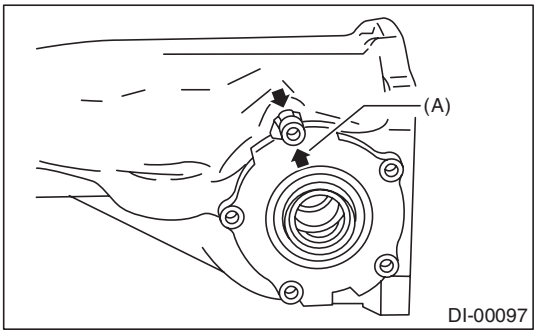


Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to hypoid driven gear.



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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 side bearing retainers on right and left side.
20) Install new O-rings to side bearing retainers on right and left side.
21) Install the oil seals to the right and left side bearing retainers. <Ref. to DI-71, REPLACEMENT, Rear Differential Side Oil Seal.>
22) Align the arrow mark on differential carrier with the mark on side retainer during installation.

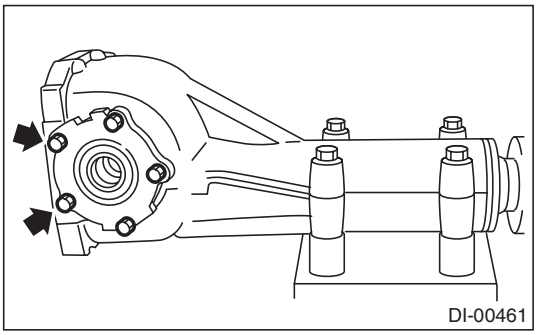


(A) Arrow mark

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

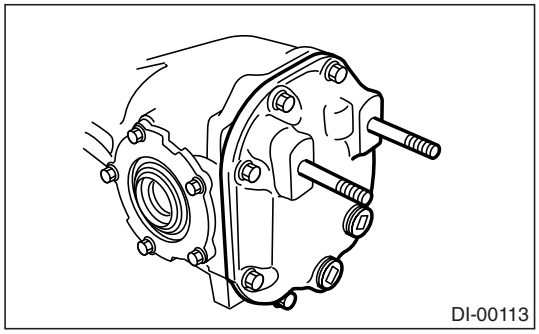
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

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



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

Tightening torque:
29 N·m (3.0 kgf-m, 21.7 ft-lb)

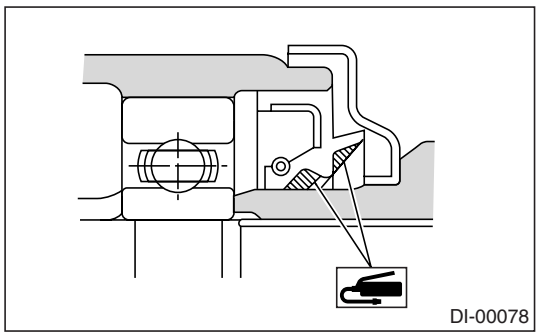


25) Install the breather cap.
26) Install the drain plug and filler plug.

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

2. STi MODEL

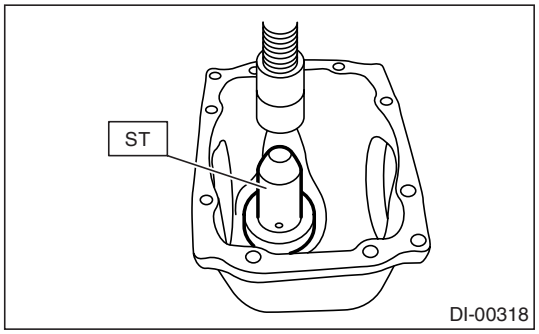
1) Precautions for assembling
- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the right and left hand races of the bearings.
- Replace the oil seal with a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



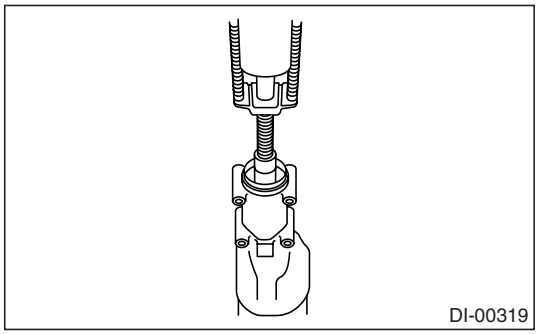
- Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting shim are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

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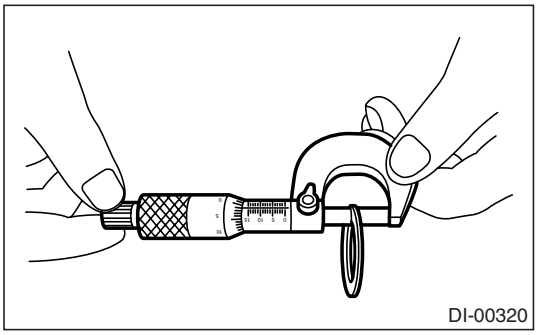
2) Press-fit the rear bearing race into differential carrier using ST.
ST 398417700 DRIFT



3) Press-fit the front bearing race into differential carrier using ST.
ST 398477702 DRIFT

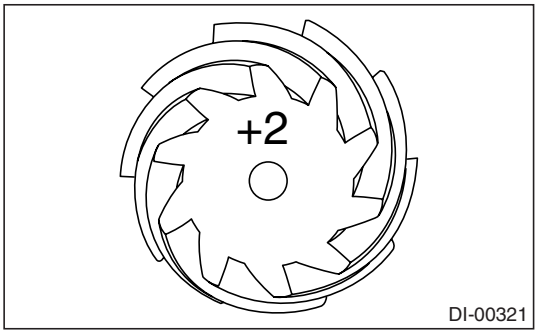


4) Pinion height adjusting shim selection.
(1) Measure the thickness of inserted pinion height adjusting shim.



(2) Read the punch mark of installed drive pinion gear and new one.

NOTE:
If there is no punch mark, it means 0 (zero).



(3) Obtain the thickness of pinion height adjust shim to be inserted from the following formula, and replace the inserted shim with this one.
$T = T1 + (T2 \times 0.01 - T3 \times 0.01)$

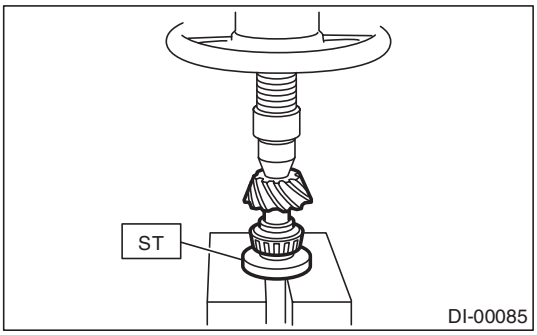
T mm (in)	Thickness of selected pinion height adjusting shim.
T1 mm (in)	Thickness of inserted pinion height adjusting shim.
T2 mm	Punch mark number on installed drive pinion gear.
T3 mm	Punch mark number on new drive pinion gear.

(Example of calculation)
$T1 = 3.30$ mm (0.1299 in), $T2 = +2$, $T3 = -1$
$T = 3.30$ mm (0.1299 in) + $\{(2 \times 0.01) - (-1 \times 0.01)\} = 3.33$ mm (0.1311 in)
Result: Thickness = 3.33 mm (0.1311 in)
Therefore use the shim 38336AA310.

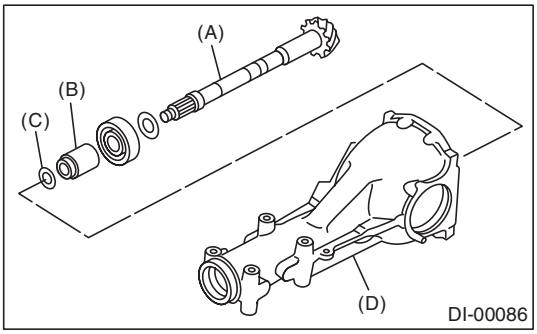
Pinion height adjusting shim	
Part No.	Thickness T mm (in)
38336AA230	3.09 (0.1217)
38336AA240	3.12 (0.1228)
38336AA250	3.15 (0.1240)
38336AA260	3.18 (0.1252)
38336AA270	3.21 (0.1264)
38336AA280	3.24 (0.1276)
38336AA290	3.27 (0.1287)
38336AA300	3.30 (0.1299)
38336AA310	3.33 (0.1311)
38336AA320	3.36 (0.1323)
38336AA330	3.39 (0.1335)
38336AA340	3.42 (0.1346)
38336AA350	3.45 (0.1358)
38336AA360	3.48 (0.1370)
38336AA370	3.51 (0.1382)
38336AA380	3.54 (0.1394)
38336AA390	3.57 (0.1406)
38336AA400	3.60 (0.1417)
38336AA410	3.63 (0.1429)
38336AA420	3.66 (0.1441)

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5) Install the selected pinion height adjusting shim on drive pinion, and press-fit the rear bearing cone into position with ST.
ST 18674AA000 INSTALLER

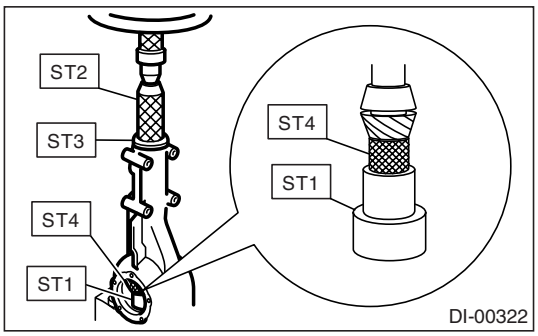


6) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



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

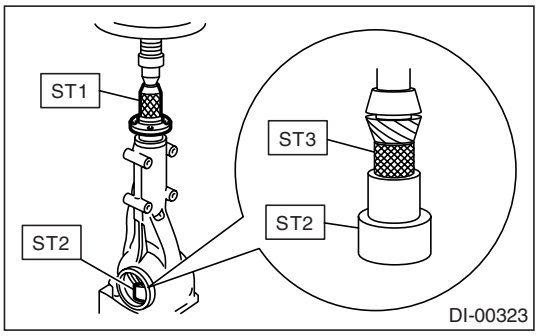
7) Insert the spacer, then press-fit the pilot bearing with STs.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER
ST3 398507703 DUMMY COLLER
ST4 498937110 HOLDER DRIVE PINION



8) Press-fit the companion flange with ST1, ST2 and ST3.

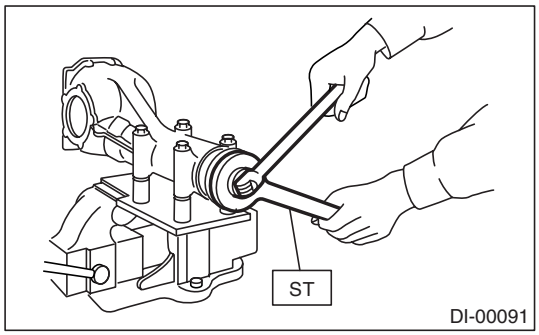
NOTE:
Be careful not to damage the bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT
ST3 498937110 HOLDER DRIVE PINION



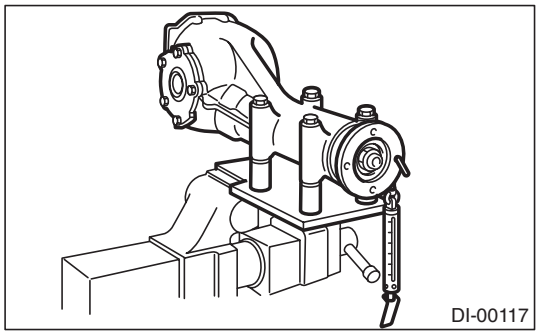
9) Install the self-locking nut. Then tighten it with the ST.
ST (MODEL WITH MECHANICAL LSD)
18633AA000 WRENCH COMPL
ST (MODEL WITHOUT MECHANICAL LSD)
498427200 FLANGE WRENCH

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



10) Rotate the drive pinion shaft more than ten times to accustom each taper roller bearing, and then measure the preload.

Bearing preload:
24.1 — 38.6 N (2.46 — 3.94 kgf, 5.42 — 9.68 lbf)

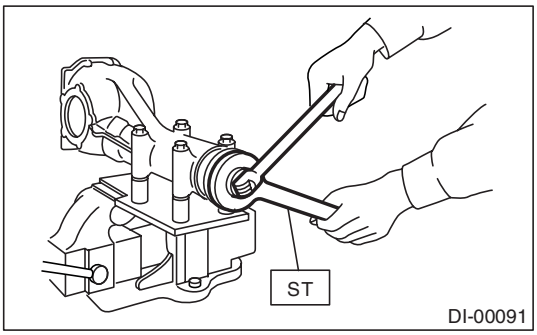


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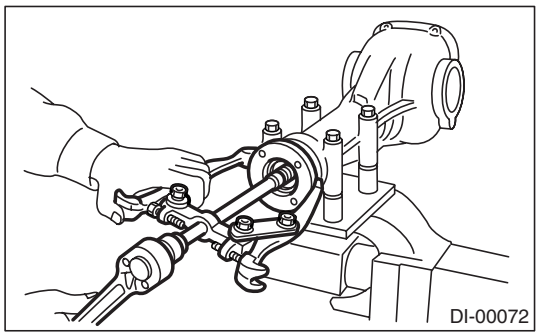
11) If bearing preload is out of specification, adjust to specification by selecting preload adjusting washer and spacer from the following table.

	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 spacer	31454AA130	52.2 (2.055)
	31454AA140	52.4 (2.063)
	31454AA150	52.6 (2.071)
	31454AA160	52.8 (2.079)
	31454AA170	53.0 (2.087)
	31454AA180	53.2 (2.094)

12) Hold the companion flange with ST and remove the self-lock nut.
ST (MODEL WITH MECHANICAL LSD)
18633AA000 WRENCH COMPL
ST (MODEL WITHOUT MECHANICAL LSD)
498427200 FLANGE WRENCH



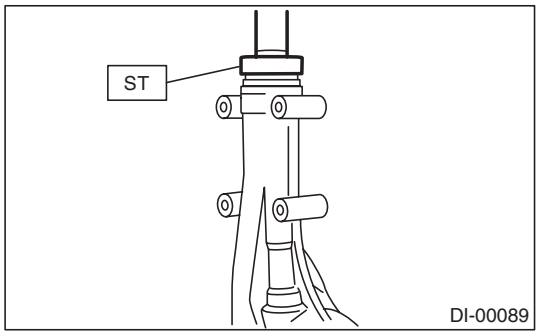
13) Extract the companion flange with a puller.



14) Fit a new oil seal with ST.

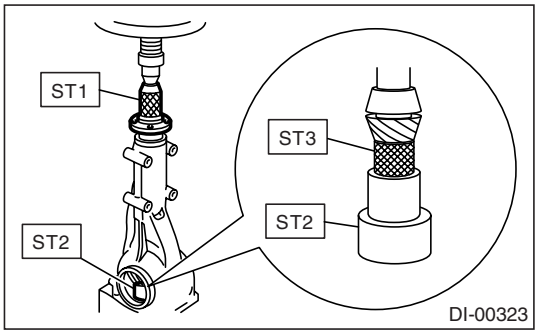
NOTE:
• Press-fit until the end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease between the oil seal lips.

ST 498447120 INSTALLER



15) Press-fit the companion flange with ST1, ST2 and ST3.
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT
ST3 498937110 HOLDER DRIVE PINION

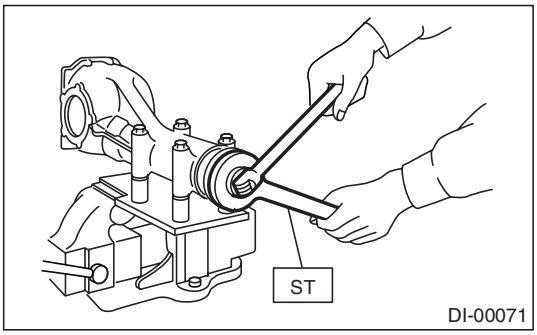
NOTE:
Be careful not to damage the bearing.



16) Install the self-lock nut. Then tighten it with the ST.
ST (MODEL WITH MECHANICAL LSD)
18633AA000 WRENCH COMPL

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ST (MODEL WITHOUT MECHANICAL LSD)
498427200 FLANGE WRENCH

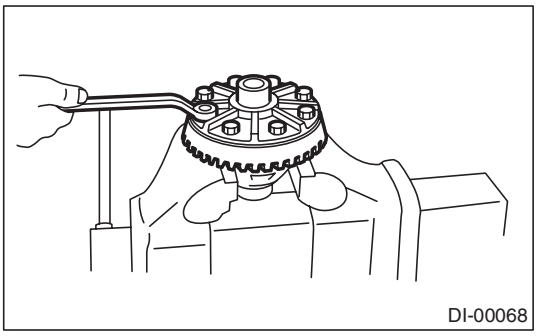


17) Apply Lock Tite to bolt threads, and install the hypoid driven gear on differential case.

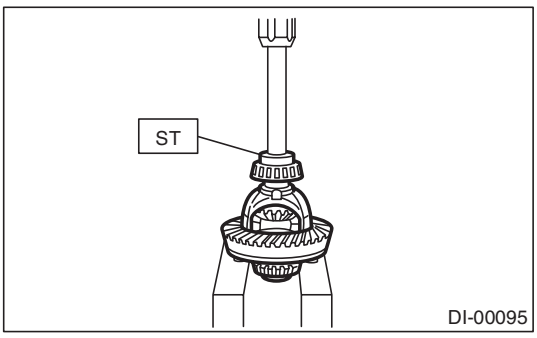
Lock Tite:
THREE BOND 1324 (Part No.004403042) or equivalent

NOTE:
Tighten diagonally while tapping the bolt heads.

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

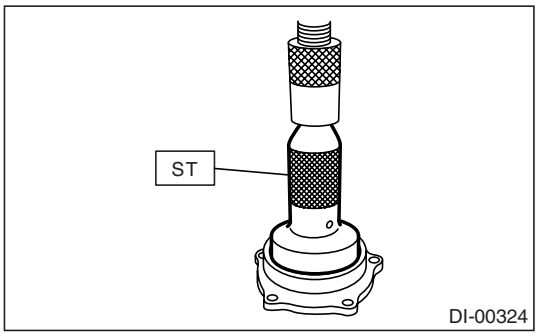


18) Press-fit the side bearing onto differential case with ST.
ST 398487700 DRIFT



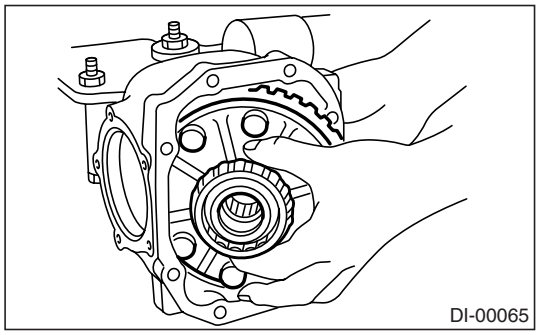
19) Assembling side retainer.
(1) Press-fit the side bearing outer race with press and ST.

ST 398417700 DRIFT



(2) Install the oil seal. <Ref. to DI-71, REPLACEMENT, Rear Differential Side Oil Seal.>

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



(3) Install the side retainer shims to the right and left retainers from which they were removed.

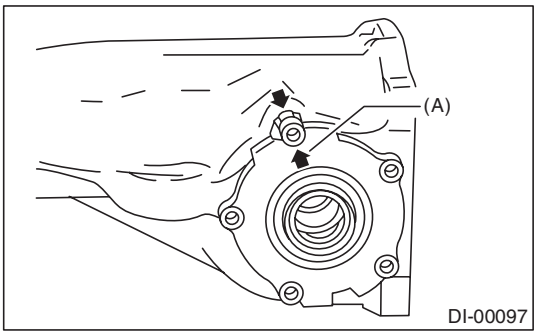
NOTE:
Replace the broken or corroded side retainer shim with a new one of same thickness.

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)

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

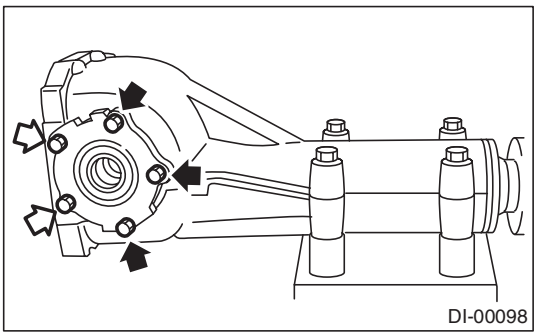
NOTE:
Be careful that side bearing outer race is not damaged by bearing roller.



(A) Arrow mark

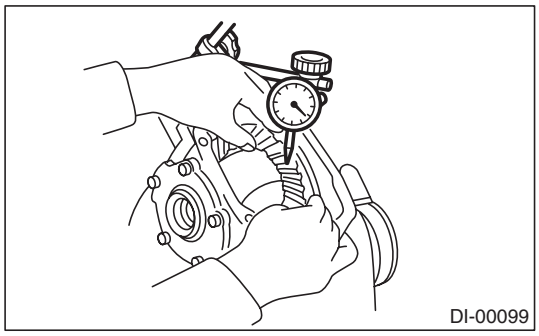
(5) Tighten the side bearing retainer bolts.

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 the 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)

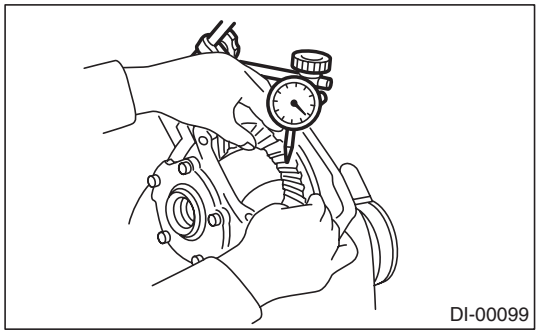


(7) At the same time, measure the total preload of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within the specified range, readjust side bearing retainer shims, increasing/reducing by an even amount at a time.

Total preload:
27.0 — 53.9 N (2.75 — 5.50 kgf, 6.07 — 12.12 lbf)

21) Re-check the hypoid driven gear-to-pinion backlash.

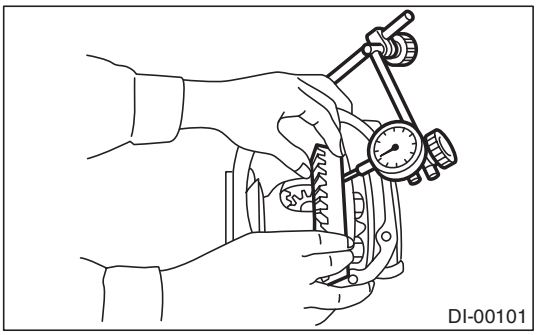
Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



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22) Check the hypoid driven gear runout on its back surface, and make sure that pinion and hypoid driven gear rotate 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.

Limit of runout:
0.05 mm (0.0020 in)

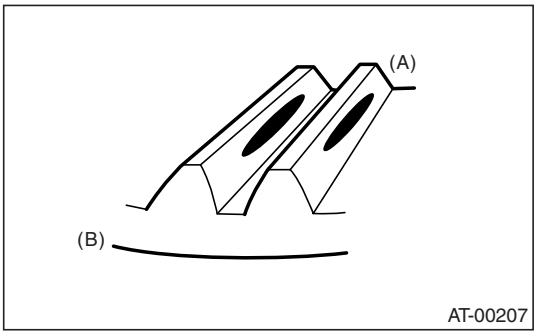


23) Checking and adjusting tooth contact of hypoid driven gear
(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears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

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

- Correct tooth contact

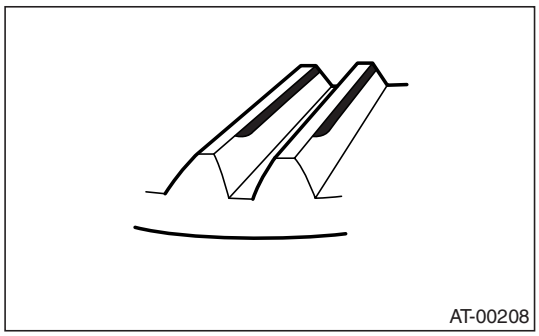
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)



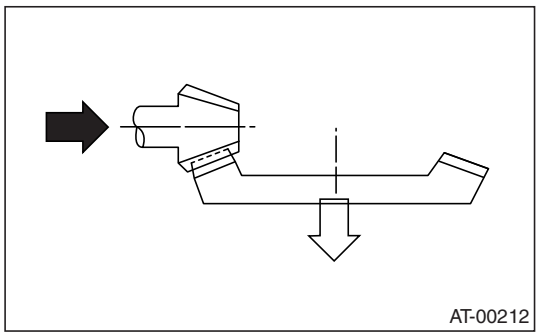
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

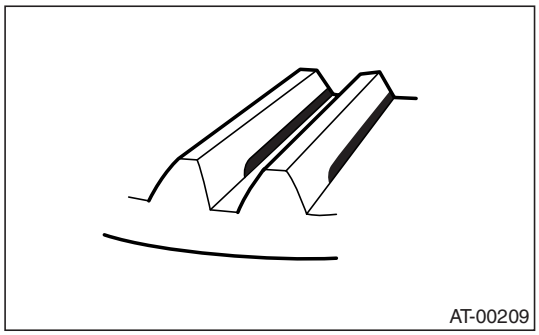


Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to hypoid driven gear.

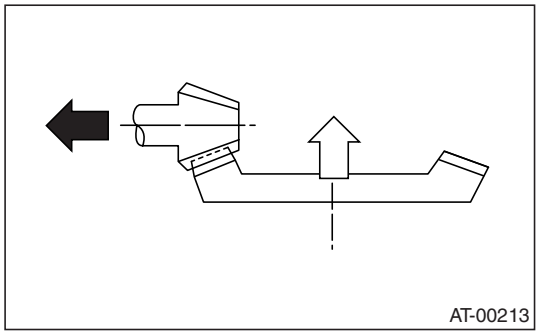


- Flank contact

Checking item: Backlash is too small.
Contact pattern



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

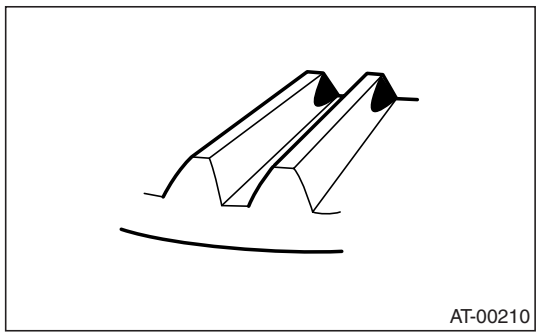


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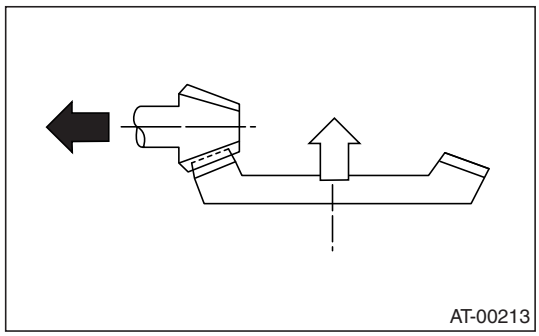
• Toe contact (Inside end contact)

Checking item: Contact area is small.

Contact pattern



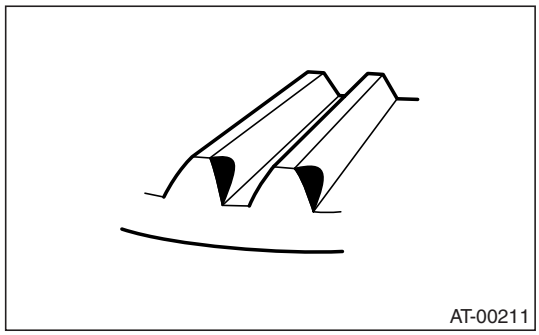
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from hypoid driven gear.



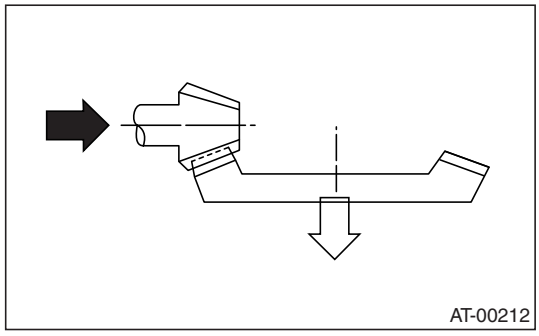
• Heel contact (Outside end contact)

Checking item: Contact area is small.

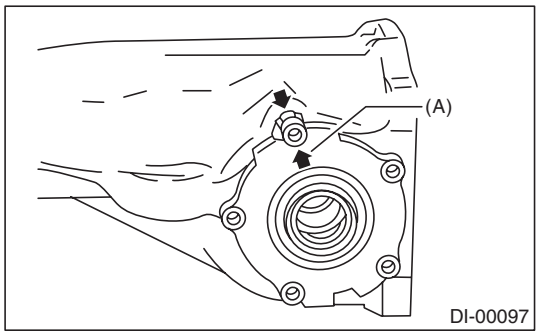
Contact pattern



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



24) 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.
25) Remove the side bearing retainers on right and left side.
26) Install new O-rings to side bearing retainers on right and left side.
27) Install the oil seals to the right and left side bearing retainers. <Ref. to DI-71, REPLACEMENT, Rear Differential Side Oil Seal.>
28) Align the arrow mark on differential carrier with the mark on side retainer during installation.

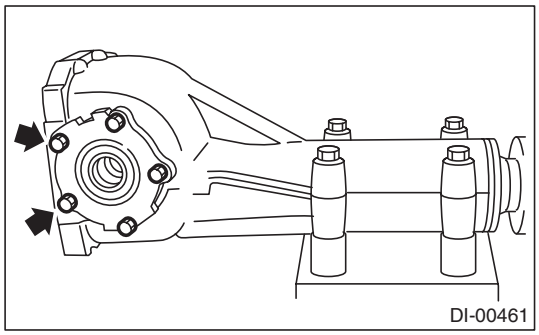


(A) Arrow mark

29) Apply liquid gasket bolt of arrow 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)

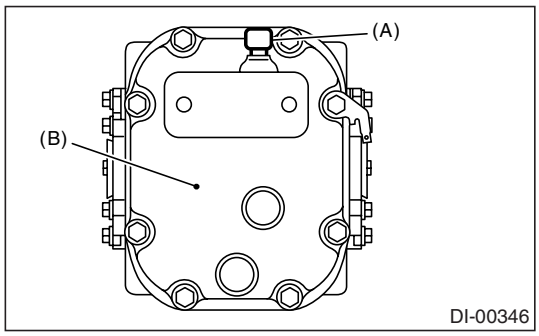


30) Install the new gasket and rear cover and tighten the bolts to specified torque.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

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31) Install new breather cap.



(A) Air breather cap
(B) Rear cover

32) Install the drain plug and filler plug or oil temperature sensor.

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, or other defects. Repair or replace 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 at assembly. 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) Bearing
Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal 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.

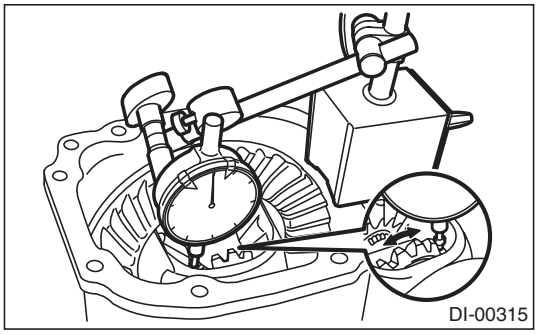
9) Rear differential oil temperature switch (mechanical LSD model)
If the results of the following inspections are not satisfactory, replace rear differential temperature sensor.
(1) At room temperature, check for continuity between the sensor terminal and body.
(2) Soak the sensor in oil, then raise the oil temperature. Check that the continuity is cut off when the oil temperature is between 144°C (291°F) and 156°C (313°F). Then, check that the continuity resumes by the time the oil temperature drops to 135°C (275°F).

1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear.

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

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

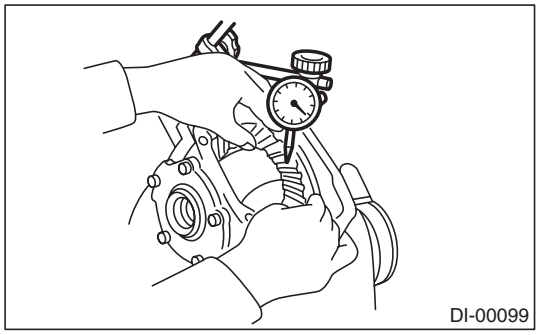


2. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of the 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.



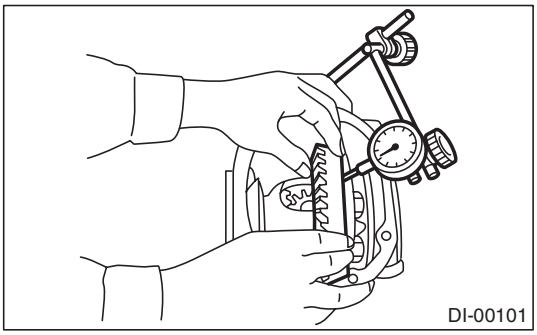
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3. HYPOID DRIVEN GEAR RUNOUT

Using a dial gauge, check the hypoid driven gear runout.

Hypoid driven gear runout:
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 driven pinion. <Ref. to DI-35, ASSEMBLY, Rear Differential (T-type).>

5. TOTAL PRELOAD

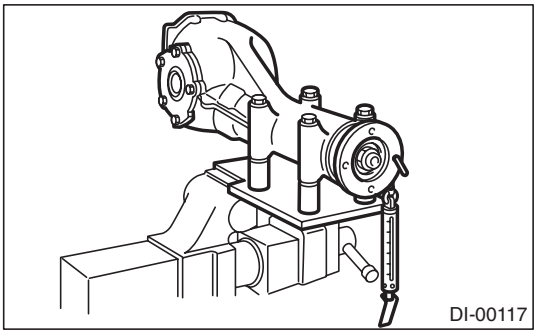
Using a gauge, check the turning resistance increase.

Total preload:

Except STi model:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)

STi model:
27.0 — 53.9 N (2.75 — 5.50 kgf, 6.07 — 12.12 lbf)

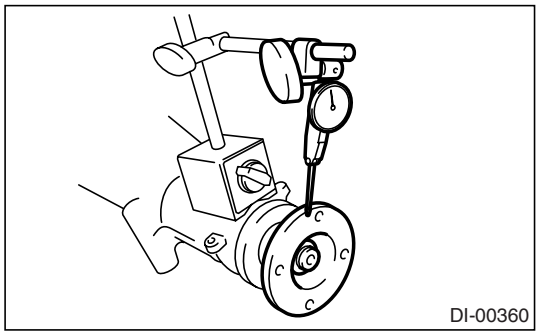
If the total preload is not within the specification, adjust the side bearing retainer shims.


DI-00117

6. COMPANION FLANGE

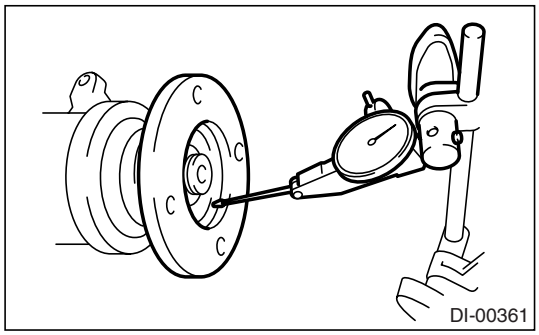
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.0031 in)


DI-00360

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

Limit of runout:
0.08 mm (0.0031 in)


DI-00361

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.

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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 the 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

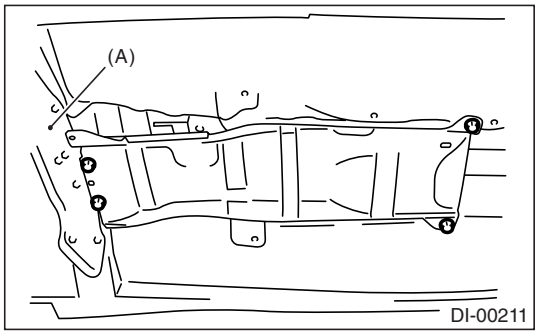
Adjust the side bearing shim. <Ref. to DI-35, ASSEMBLY, Rear Differential (T-type).>

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5. Rear Differential (VA-type)

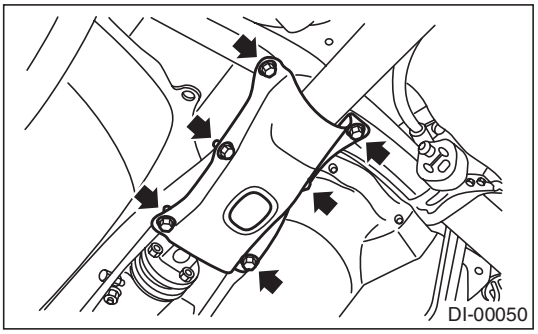
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Lift-up the vehicle.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler.
Non-turbo model without OBD
<Ref. to EX(H4SOw/oOBD)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-11, REMOVAL, Muffler.>
Non-turbo model with OBD
<Ref. to EX(H4SO)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-12, REMOVAL, Muffler.>
9) Remove the heat shield cover.



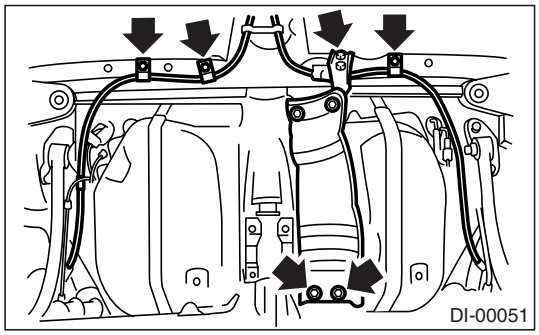
(A) Transmission mounting

10) Remove the front cover of rear differential mount.

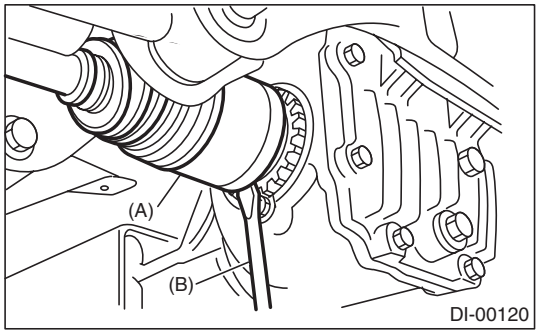


11) Remove the propeller shaft. <Ref. to DS-17, REMOVAL, Propeller Shaft.>

12) Remove the clamps and bracket of parking brake cable.

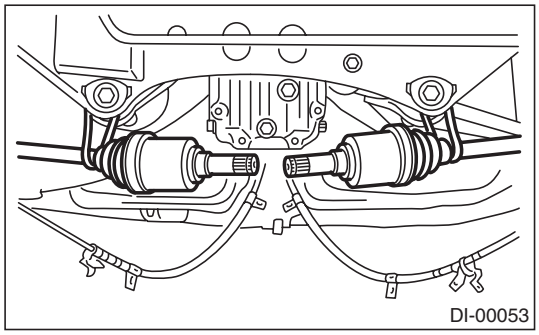


13) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DI-71, REPLACEMENT, Rear Differential Side Oil Seal.>



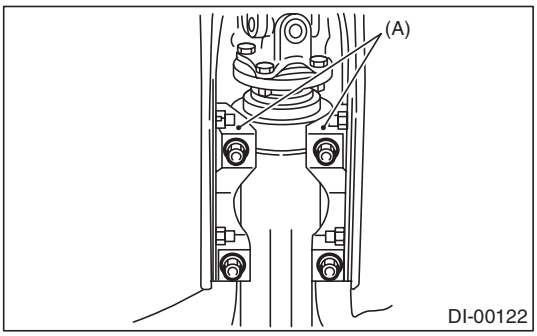
(A) DOJ
(B) Tire lever

14) Secure the rear drive shaft to rear crossmember using wire.



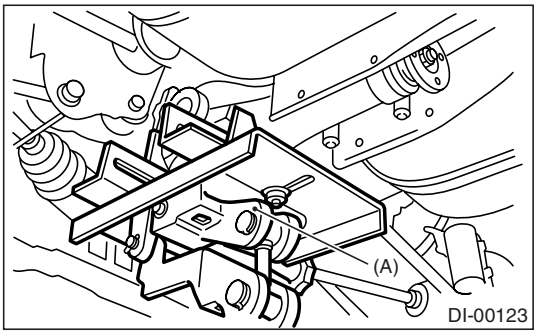
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15) Remove the lower bracket.



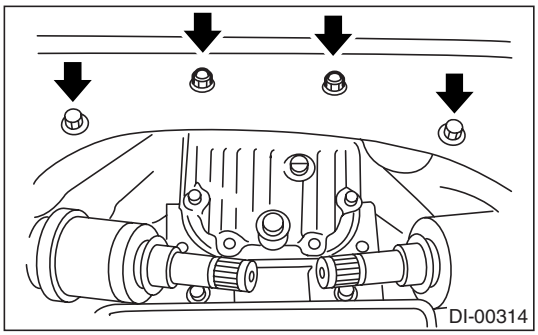
(A) Lower bracket

16) Support the rear differential with transmission jack.



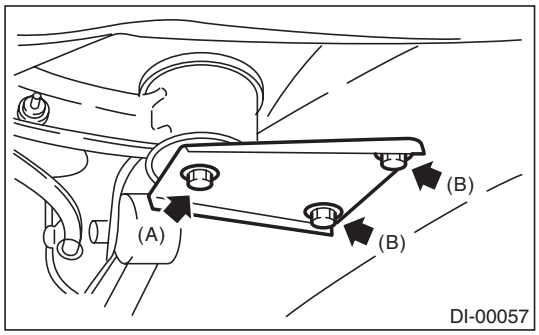
(A) Transmission jack

17) Remove the self-locking nuts and bolts.



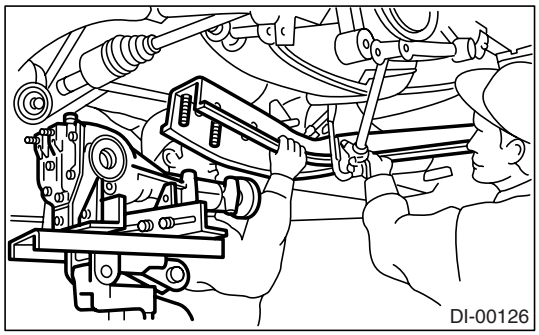
18) Remove the bolts which secure the rear differential front member to bolts B.

NOTE:
Support the front member with use of a helper to prevent it from dropping.

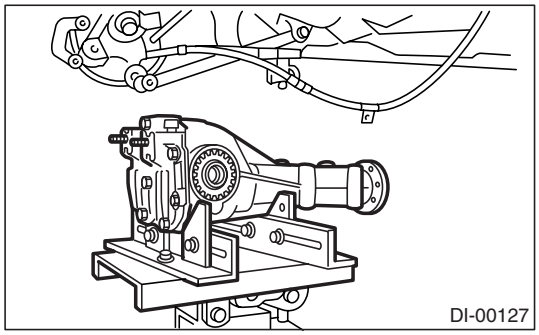


(A) Bolt A
(B) Bolt B

19) Remove the bolt A.
20) While slowly lowering the transmission jack, move the rear differential forward, and then remove the bolts from rear crossmember.
21) Remove the front member from vehicle.



22) Remove the rear differential from vehicle.



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B: INSTALLATION

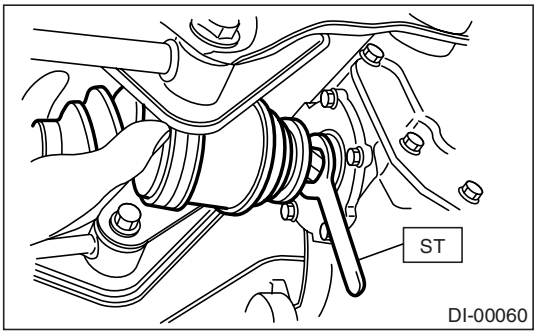
Install in the reverse order of removal.

1) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:
When installing the rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

2) Install the DOJ of rear drive shaft into rear differential. <Ref. to DI-71, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 OIL SEAL PROTECTOR



3) Install in the reverse order of removal.

4) After installation, fill the differential carrier with gear oil to the upper plug level. <Ref. to DI-26, Front Differential Assembly.>

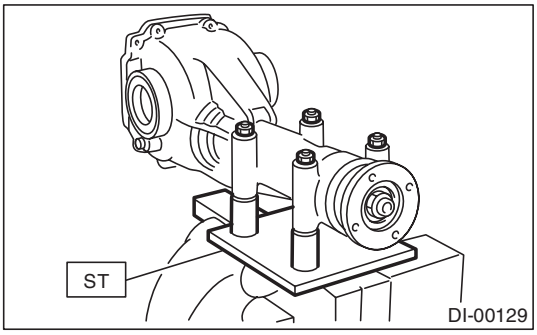
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact of hypoid driven gear and pinion, and backlash
- Runout of hypoid driven gear at its back surface
- Total preload of drive pinion

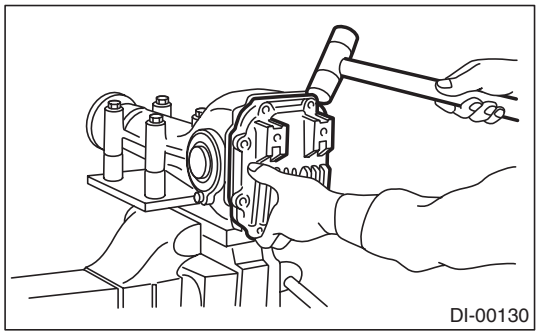
1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT SET



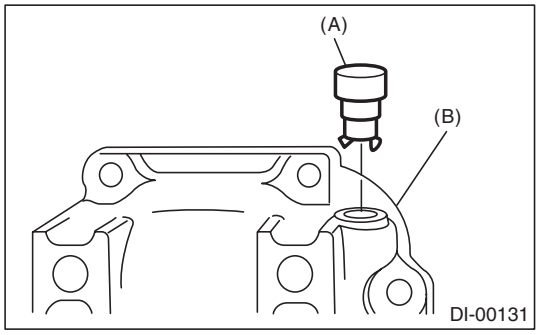
2) Drain the gear oil by removing the plug.

3) Remove the rear cover by loosening the retaining bolts.



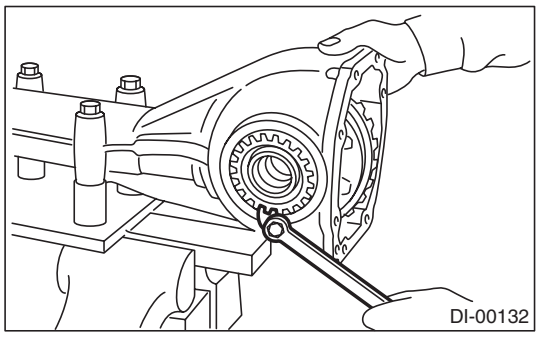
4) Replace the air breather cap.

NOTE:
Do not attempt to replace the air breather cap unless necessary.



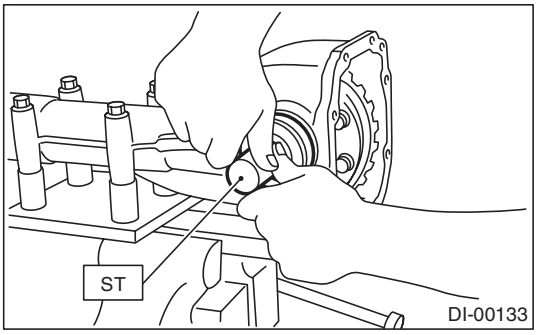
(A) Air breather cap
(B) Rear cover

5) Remove the right and left lock plates.



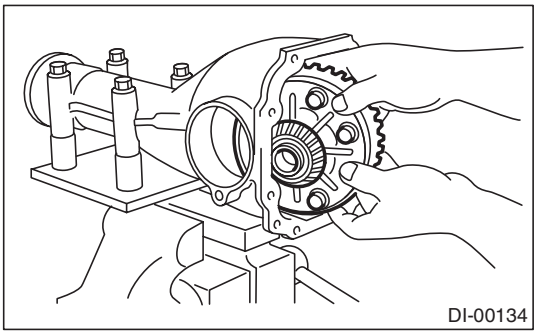
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6) Remove the right and left holders with ST.
ST 499785500 WRENCH ASSY

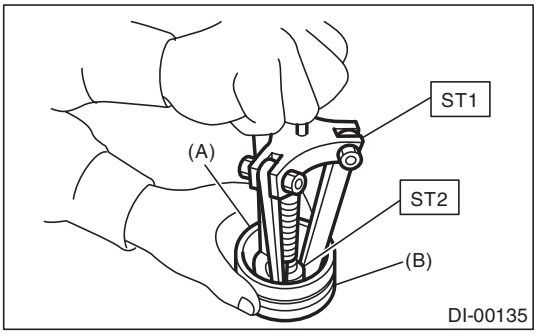


7) Pull out the differential assembly from differential case.

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



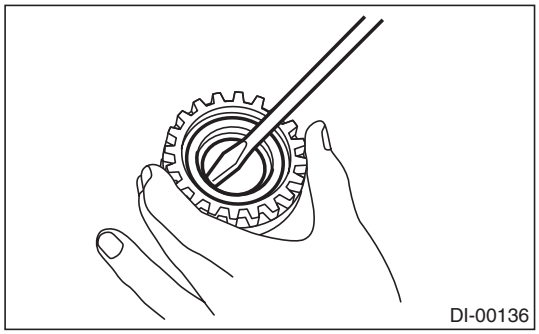
8) Remove the bearing race from right and left holders with ST1 and ST2.
ST1 499705401 PULLER ASSY
ST2 499705404 SEAT



(A) Bearing race
(B) Holder

9) Remove the oil seal from right and left holders using screwdriver.

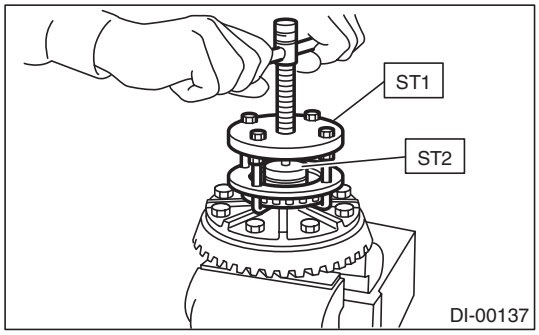
NOTE:
Perform this operation only when changing oil seal.



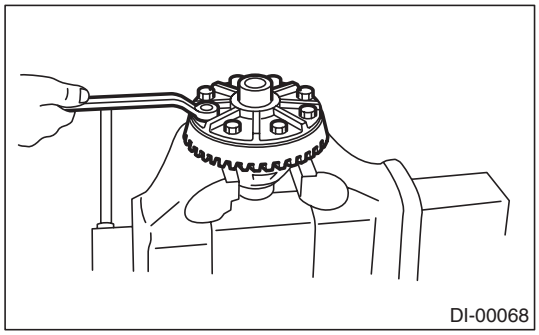
10) Extract the bearing cone with ST1 and ST2.

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

ST1 899524100 PULLER SET
ST2 399520105 SEAT



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

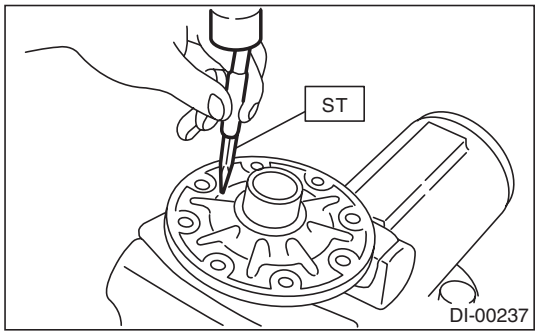


12) Drive out the pinion shaft lock pin from hypoid driven gear side.

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

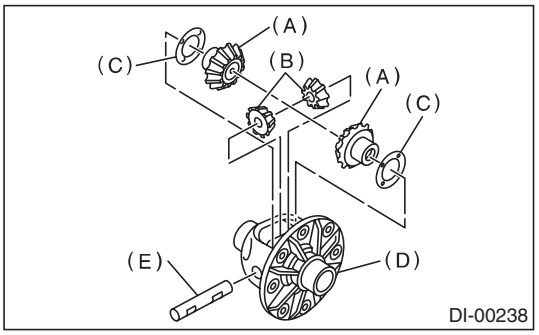
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ST 899904100 STRAIGHT PIN REMOVER



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

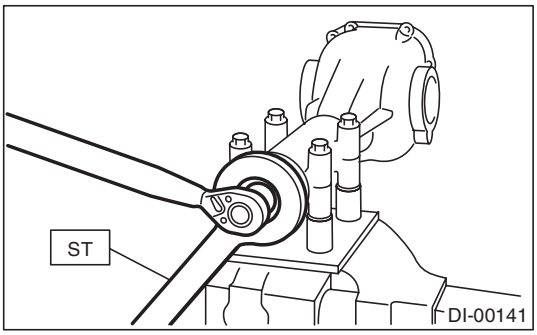
NOTE:
The gears as well as thrust washers should be marked or kept separated right and left, front and rear.



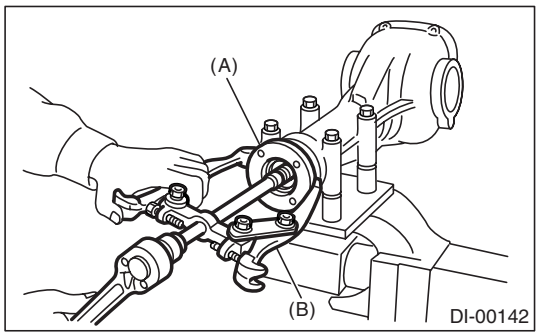
(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

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

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.

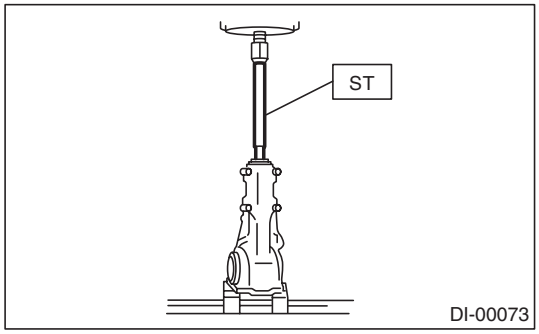


(A) Companion flange
(B) Puller

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

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

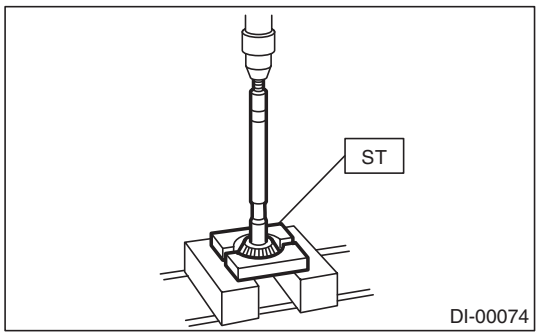
ST 398467700 DRIFT



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

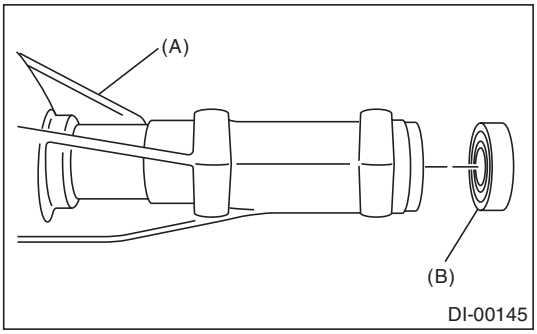
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER



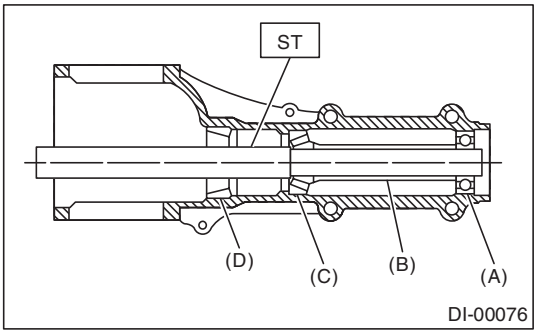
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18) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



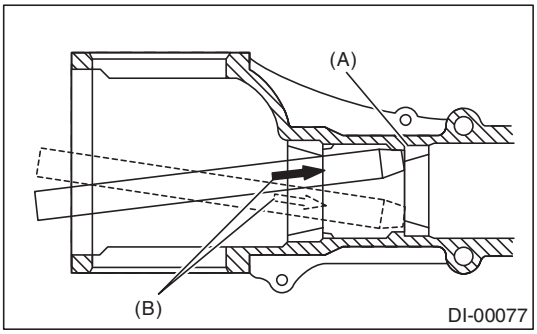
(A) Differential carrier
(B) Front oil seal

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



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

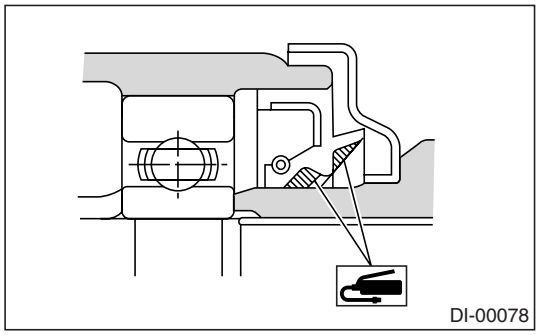
20) When replacing the bearings, tap the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



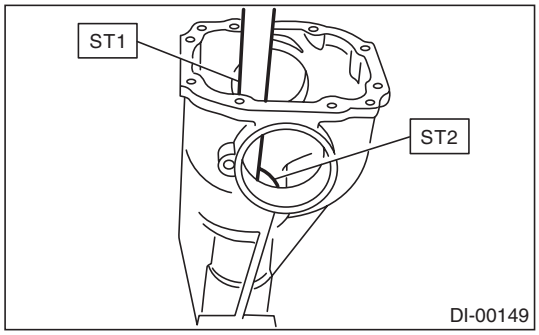
(A) 2 cutouts along diagonal lines
(B) Tap alternately with brass bar.

D: ASSEMBLY

NOTE:
• Assemble in the reverse order of disassembling.
• Check and adjust each part during assembly.
• Use a newgasket.
• 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 right and left hand races of the bearings.
• Replace the oil seal and O-ring with a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.
• Be careful not to mix up the differential oil seal RH and LH.



1) Adjust the preload for front and rear bearings.
Adjust the bearing preload with spacer 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 using ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477702 DRIFT
(2) Press the rear bearing race into differential carrier using ST1 and ST2.
ST1 398477701 HANDLE
ST2 498447110 DRIFT



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

ST1 398477701 HANDLE
ST2 398447110 DRIFT

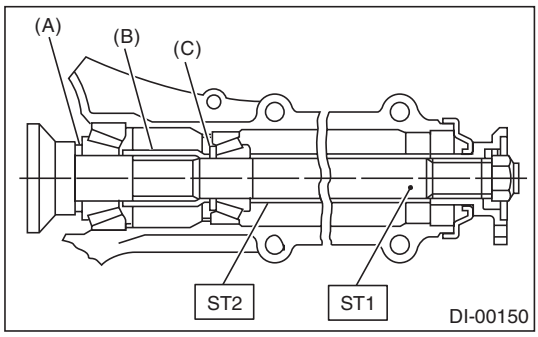
(4) Insert new front bearing cone.

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

NOTE:
Re-use the used washer if not deformed.

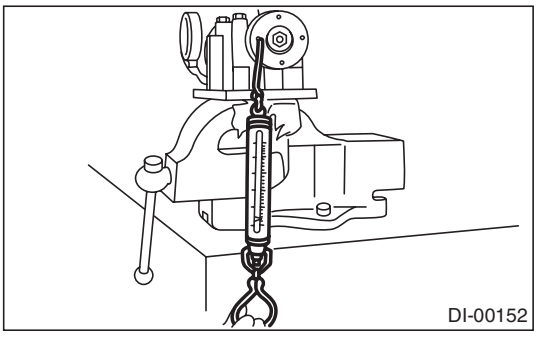
(6) Then install the preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and self-locking nut.

ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR



(A) Pinion height adjusting shim
(B) Preload adjusting spacer
(C) Preload adjusting washer

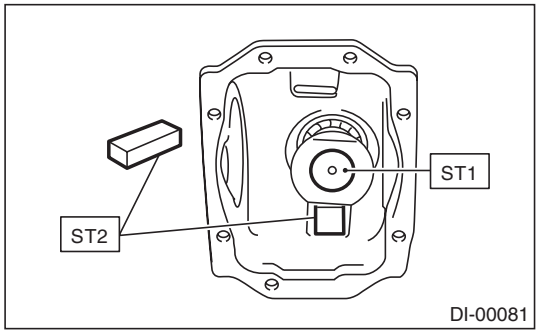
(7) Turn the ST1 with hand to make bearing fitted, and tighten the self locking nut while measuring the preload with spring balance. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.



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

ST1 498447150 DUMMY SHAFT
ST2 398507704 BLOCK

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



Front and rear bearing preload
For new bearing: 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	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 spacer	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)

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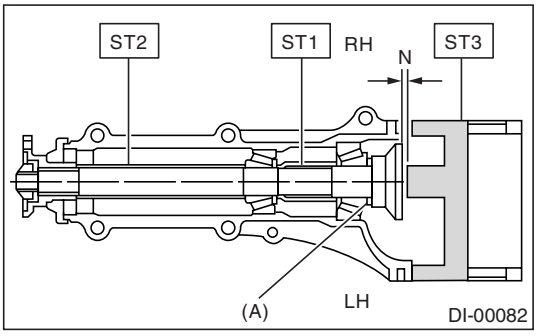
2) Adjusting drive pinion height
Adjust the drive pinion height with shim installed between the rear bearing cone and back of pinion gear.

(1) Install the ST3.

Front and rear bearing preload
For new bearing: 12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lbf) at companion flange bolt hole

NOTE:
At this time, install the pinion height adjusting shim which is temporarily selected or same as that used before.

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

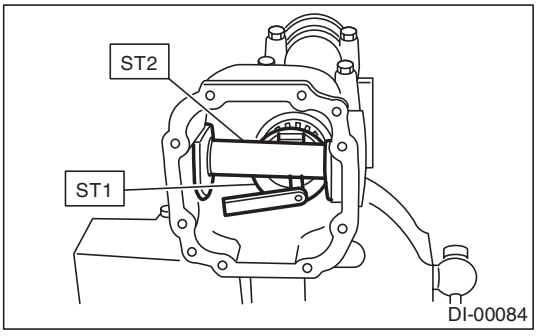


(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST3 and end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST3.

ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE



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

NOTE:
Use 1 to 3 shims as required for adjustment.

T = To + N − 0.05 mm (0.0020 in)

where

T = Thickness of pinion height adjusting shim mm (in)

To = Thickness of shim originally installed mm (in)

N = Reading of thickness gauge mm (in)

H = Figure marked on drive pinion head

(Example of calculation)

To = 0.15 mm (0.0059 in)

N = 0.1 mm (0.0039 in)

T = 0.15 mm (0.0059 in) + 0.1 mm (0.0039 in) − 0.05 mm (0.0020 in) = 0.2 mm (0.0079 in)

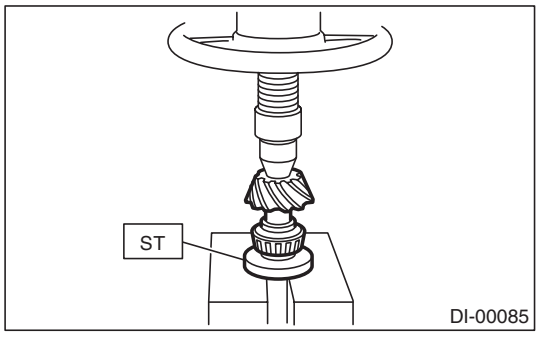
Result: Thickness = 0.2 mm (0.0079 in)

Therefore use the 32295AA220.

Pinion height adjusting shim	
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)

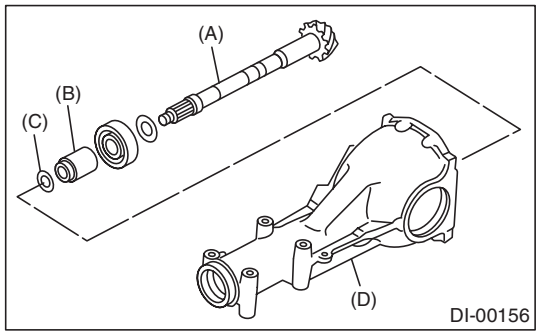
3) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 498175500 INSTALLER



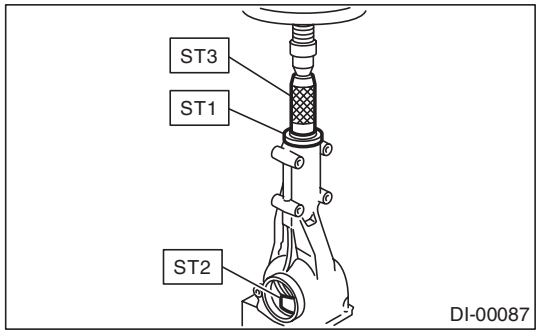
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4) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.

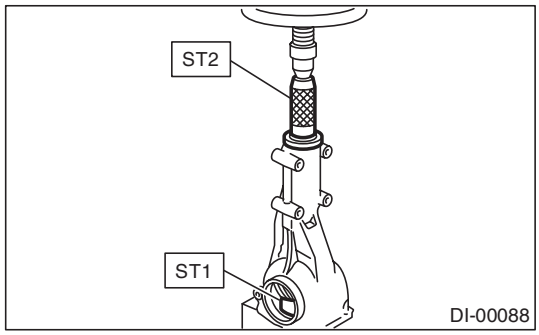


(A) Drive pinion
(B) Bearing preload adjusting spacer
(C) Bearing preload adjusting washer
(D) Differential carrier

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



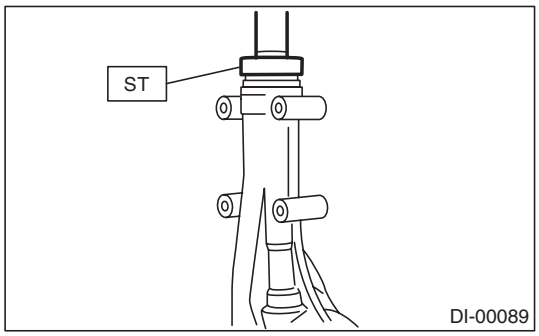
6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Fit a new oil seal with ST.

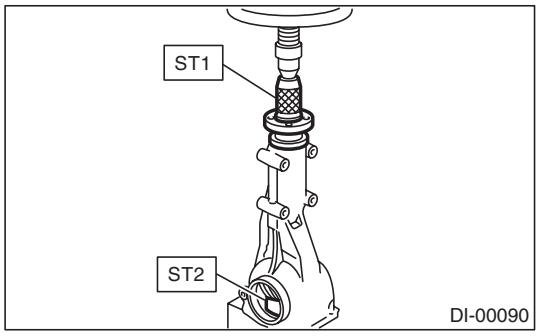
NOTE:
• Press-fit until the end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease between the oil seal lips.

ST 498447120 INSTALLER



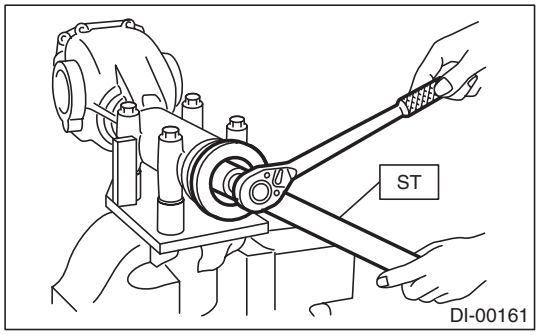
8) Press-fit the companion flange with ST1 and ST2.

NOTE:
Be careful not to damage the bearing.
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



9) Install the self-locking nut. Then tighten it with the ST.
ST 498427200 FLANGE WRENCH

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

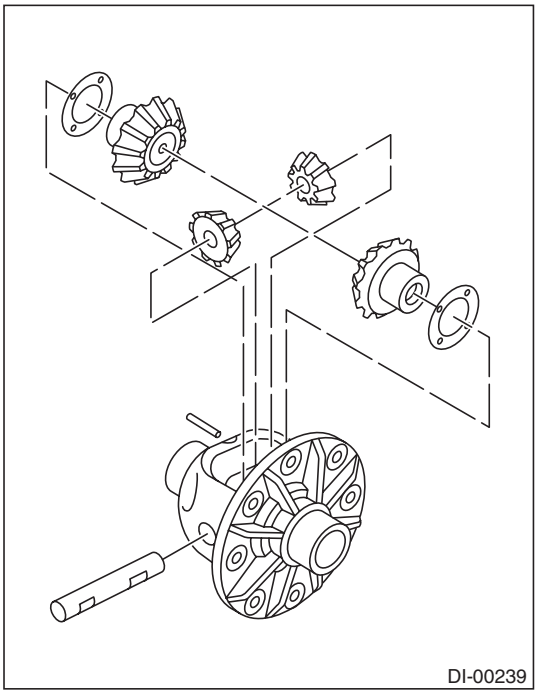


10) Assembling differential case
Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

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

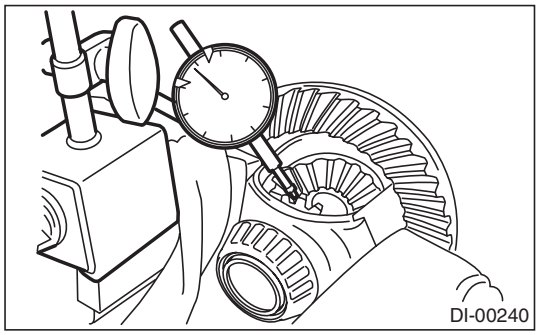
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• Insert the pinion mate shaft into the differential case by aligning the lock pin holes.


DI-00239

(1) Measure the side gear backlash.

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


DI-00240

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

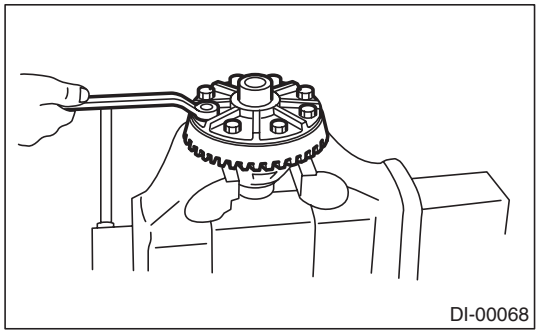
(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After driving in the pinion shaft lock pin, stake both sides of the hole to prevent pin from falling off.

11) Apply Lock Tite to bolt threads, and Install the hypoid driven gear on differential case.

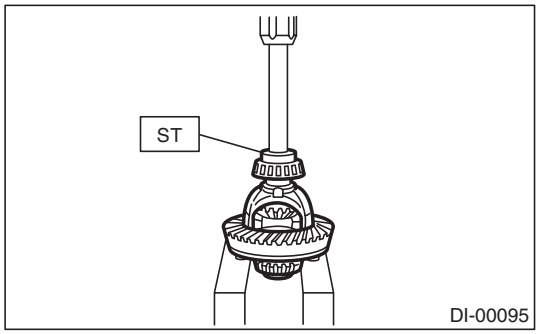
Lock Tite:
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:
Tighten diagonally while tapping the bolt heads.

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

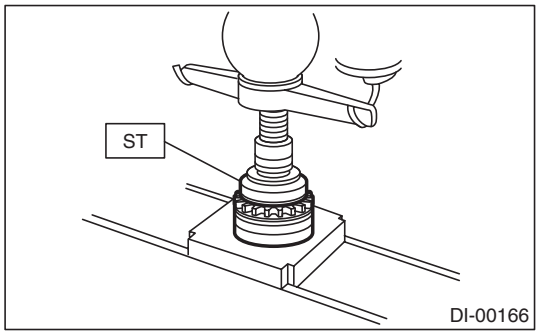

DI-00068

12) Press the side bearing cone onto differential case with ST.
ST 498485400 DRIFT



DI-00095

13) Assemble holders.
(1) Install the oil seal into right and left holders.
ST 498447100 INSTALLER

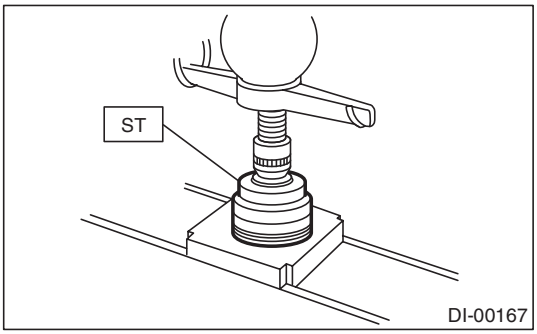


DI-00166

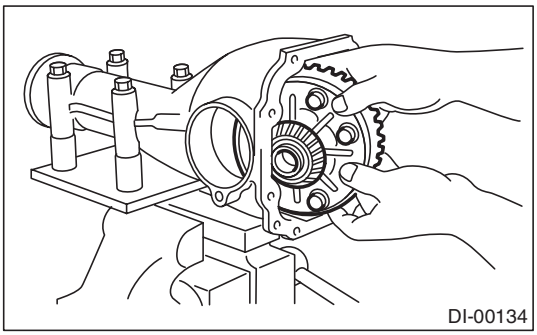
(2) Install the bearing race into right and left holders.
ST 398477702 DRIFT

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



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

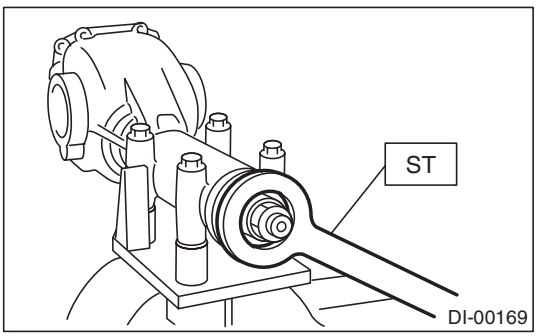


(4) Temporally tighten the side holder RH and LH in differential carrier, to install.

14) Perform the backlash adjustment of hypoid driven gear set and preload adjustment of differential side bearing.

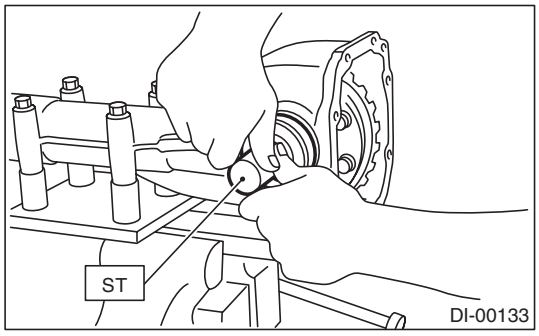
(1) Turn the drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



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

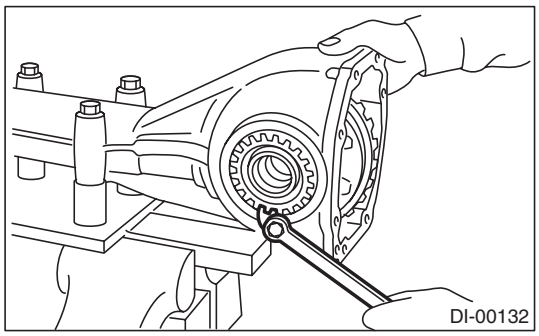
ST 499785500 WRENCH ASSY



(3) Back off the side (left-side) holder approx. 1 1/2 teeth of holder, and tighten the left-side holder by approx. 2 teeth (approx. 1 1/2 + 1/2 teeth). [Back off amount of side (left-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.

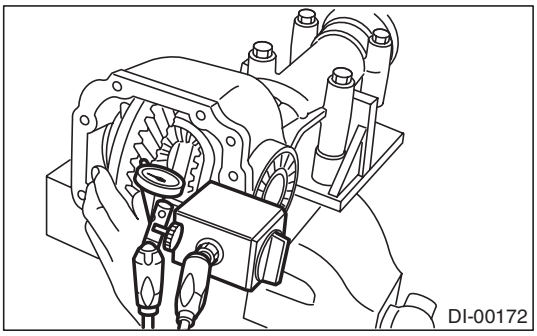


(5) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move the hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

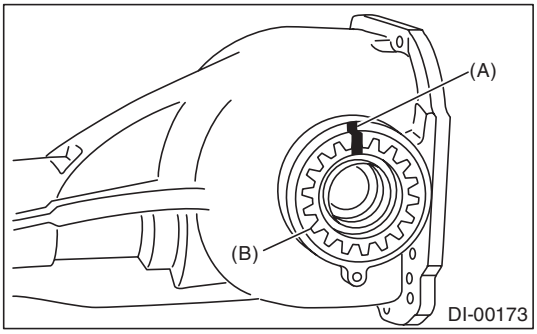
NOTE:
If measured backlash is not within specified range, repeat the procedures for hypoid driven gear set backlash adjustment and differential side bearing preload adjustment.

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



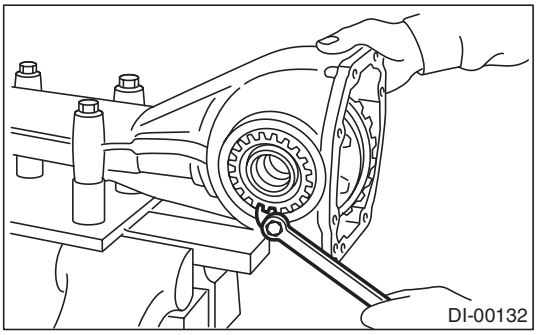
15) Draw a matching mark on both differential carrier and holder. Remove the holder one side at a time.
Replace in the original position after inserting an O-ring and applying grease to threaded portion.



(A) Matching mark
(B) Holder

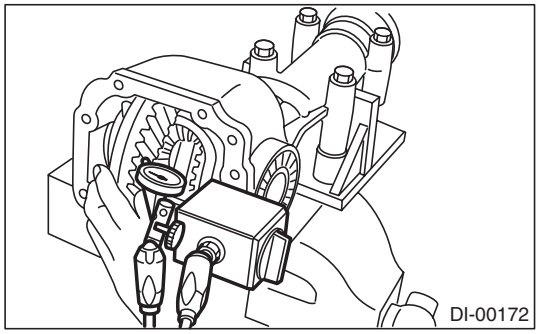
16) Tighten the bolt of lock plate to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



17) Re-check the hypoid driven gear-to-pinion backlash.

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

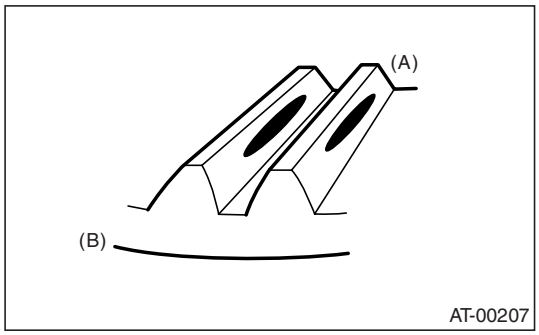


18) Checking and adjusting tooth contact of hypoid driven gear.
(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears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

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)

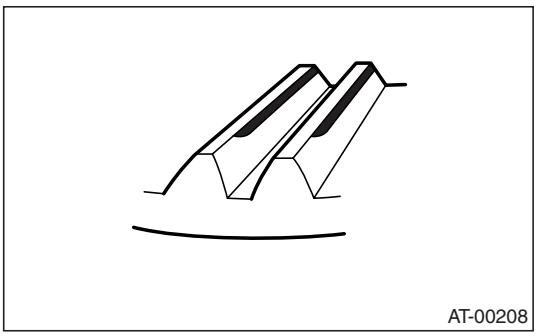


(A) Toe side
(B) Heel side

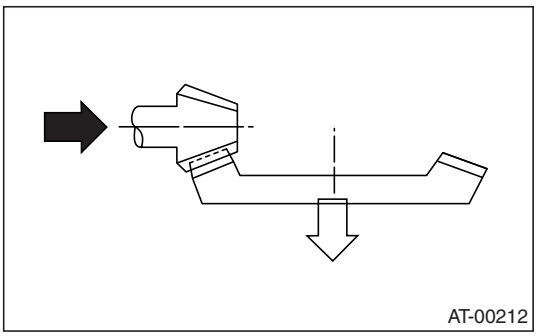
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- Face contact

Checking item: Backlash is too large.
Contact pattern

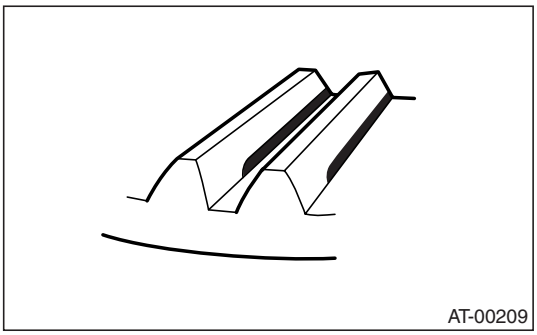


Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to hypoid driven gear.

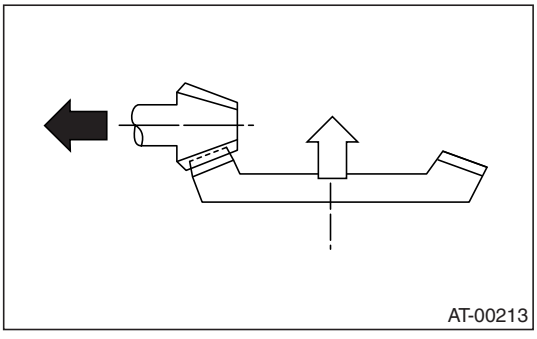


- Flank contact

Checking item: Backlash is too small.
Contact pattern

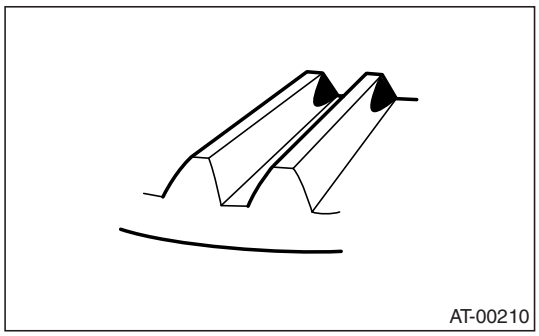


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from hypoid driven gear.

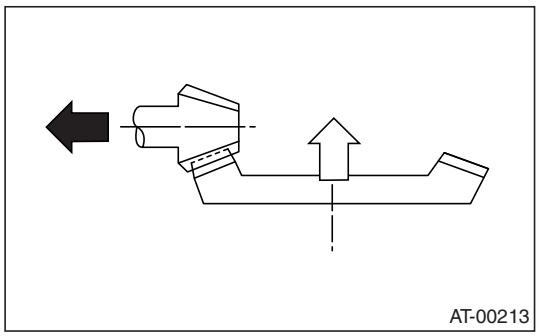


- Toe contact (Inside end contact)

Checking item: Contact area is small.
Contact pattern

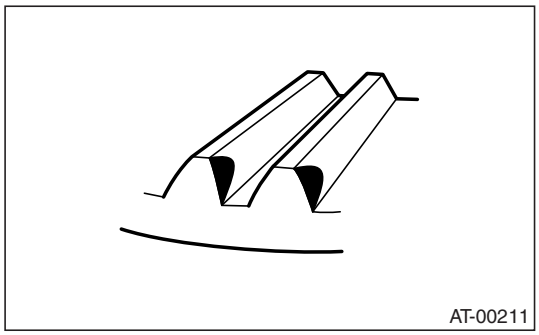


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from hypoid driven gear.

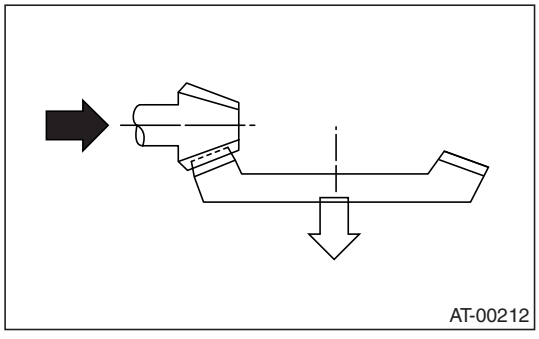


- Heel contact (Outside end contact)

Checking item: Contact area is small.
Contact pattern



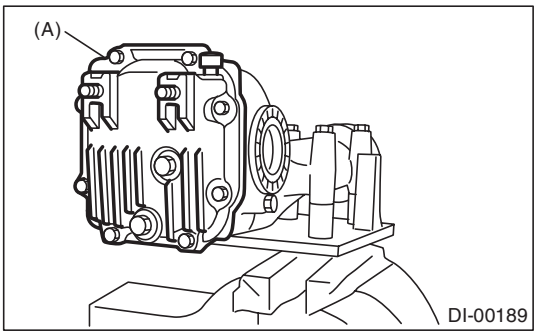
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to hypoid driven gear.



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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 rear cover and tighten the bolts to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Rear cover

E: INSPECTION

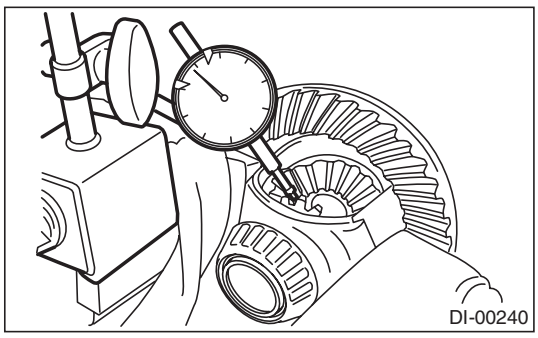
Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.
1) Hypoid driven gear and drive pinion
• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the 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) Bearing
Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal 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.

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

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

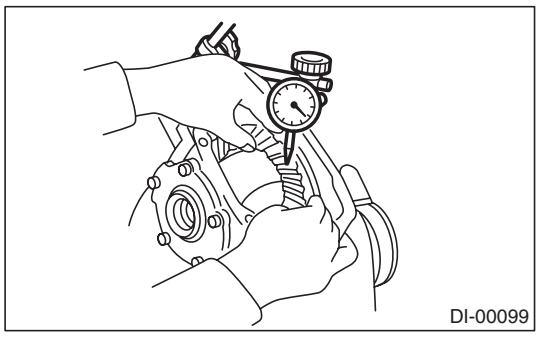


2. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of the 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.



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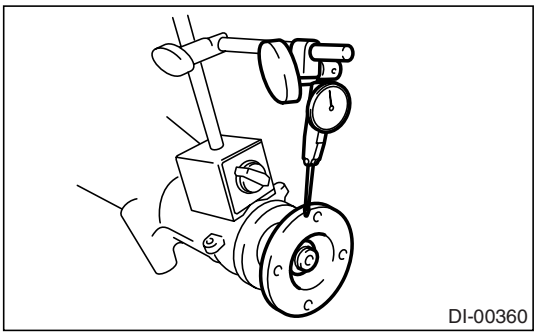
3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between hypoid driven gear and drive pinion.
<Ref. to DI-59, ASSEMBLY, Rear Differential (VA-type).>

4. COMPANION FLANGE

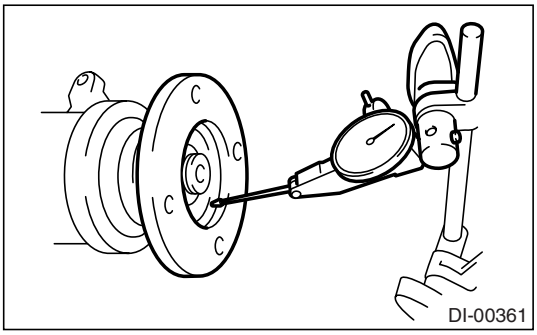
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

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.
<Ref. to DI-59, ASSEMBLY, Rear Differential (VA-type).>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust the hypoid driven gear backlash.
<Ref. to DI-59, ASSEMBLY, Rear Differential (VA-type).>

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

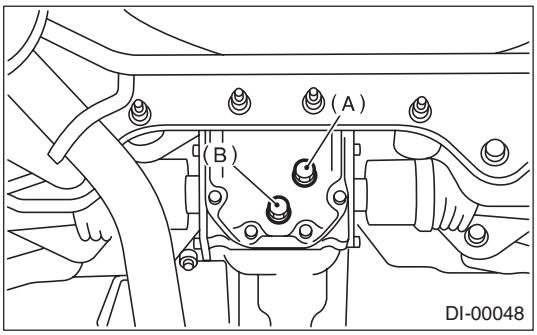
Adjust the tooth contact between hypoid driven gear and drive pinion gear.
<Ref. to DI-59, ASSEMBLY, Rear Differential (VA-type).>

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6. Rear Differential Front Oil Seal

A: REPLACEMENT

1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Remove the oil drain plug, and drain the gear oil. <Ref. to DI-24, Differential Gear Oil.>



(A) Filler plug
(B) Drain plug

5) Install the oil drain plug.

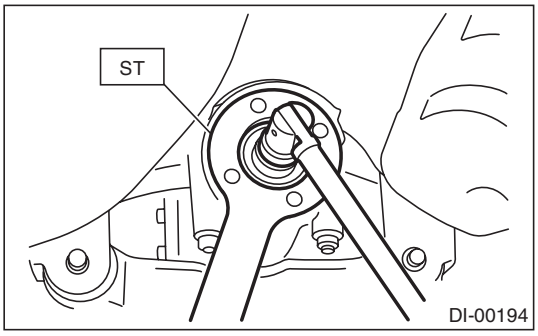
NOTE:
- Apply liquid gasket to the drain plug for T-type.

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

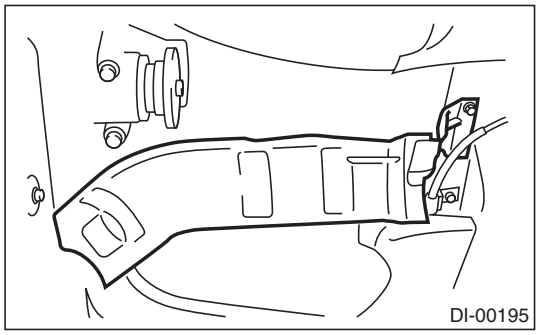
- Use a new aluminum gasket for VA-type.

Tightening torque:
T-type;
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type;
34 N·m (3.5 kgf-m, 25.3 ft-lb)

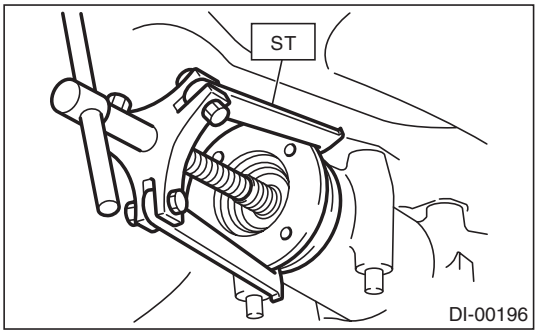
6) Jack-up the vehicle and support with sturdy racks.
7) Remove the rear exhaust pipe and muffler.
8) Remove the propeller shaft from body. <Ref. to DS-17, REMOVAL, Propeller Shaft.>
9) Remove the self-locking nut while holding the companion flange with ST.
ST (MODEL WITH MECHANICAL LSD)
18633AA000 WRENCH COMPL
ST (MODEL WITHOUT MECHANICAL LSD)
498427200 FLANGE WRENCH



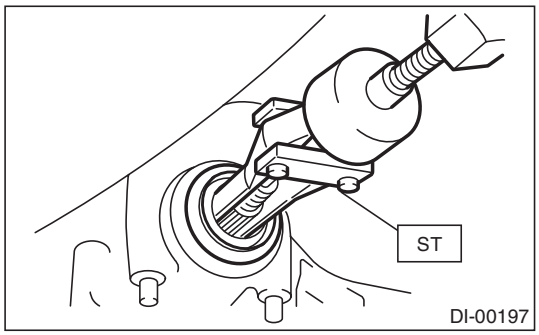
10) Remove the tank cover.



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

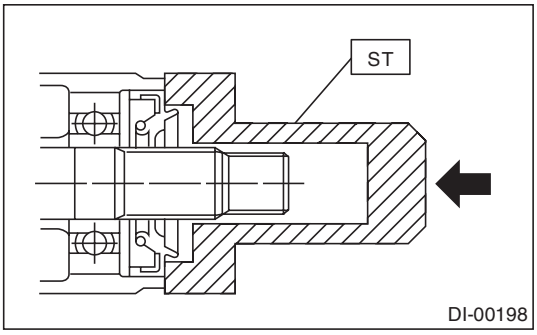


12) Remove the oil seal using ST.
ST 398527700 PULLER ASSY



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13) Fit a new oil seal using ST.
ST 498447120 INSTALLER



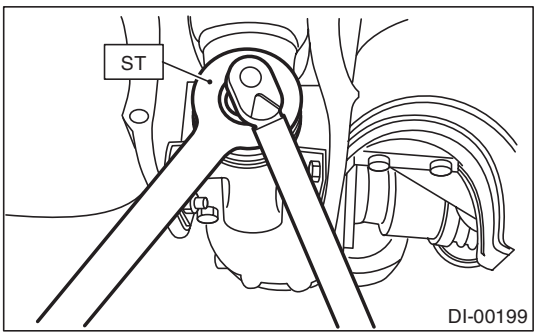
14) Install the companion flange.

NOTE:
Use a plastic hammer to install the companion flange.

15) Tighten the self-locking nut within the specified torque range so that the preload of companion flange becomes the same as that before replacing oil seal.
ST (MODEL WITH MECHANICAL LSD)
18633AA000 WRENCH COMPL
ST (MODEL WITHOUT MECHANICAL LSD)
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)



16) Hereafter, reassemble in the reverse order of disassembly.
17) After installing, refill the gear oil to the bottom of filler plug hole. <Ref. to DI-24, Differential Gear Oil.>

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7. Rear Differential Side Oil Seal

A: INSPECTION

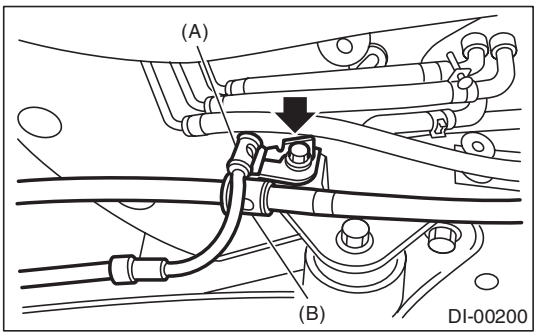
Make sure that there is no oil leakage from side oil seal.
If there is any oil leakage, replace the oil seal.

B: REPLACEMENT

1. T-TYPE

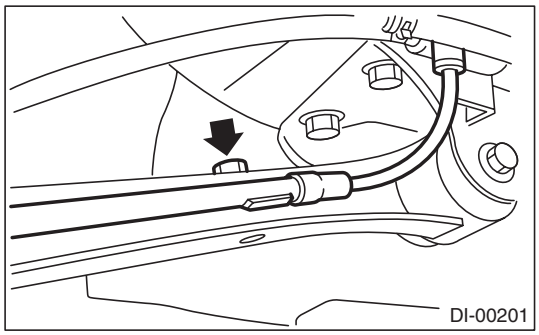
1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Loosen both wheel nuts.
4) Release the parking brake.
5) Jack-up the vehicle and support it with rigid racks.
6) Remove the wheels.
7) Remove the rear exhaust pipe and muffler.
Non-turbo model without OBD
<Ref. to EX(H4SOw/oOBD)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-11, REMOVAL, Muffler.>
Non-turbo model with OBD
<Ref. to EX(H4SO)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-12, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
8) Remove the DOJ of rear drive shaft from rear differential.

(1) Remove the ABS wheel speed sensor cable clamp and parking brake cable clamp from bracket.

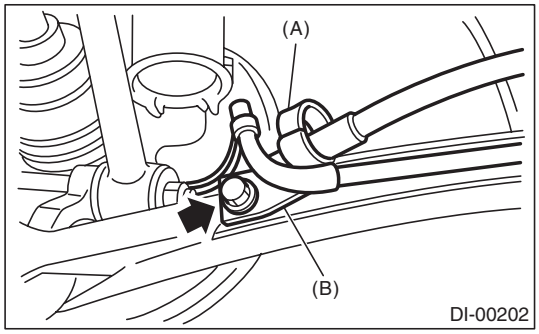


(A) ABS wheel speed sensor cable clamp
(B) Parking brake cable clamp

(2) Remove the ABS wheel speed sensor cable clamp from trailing link.

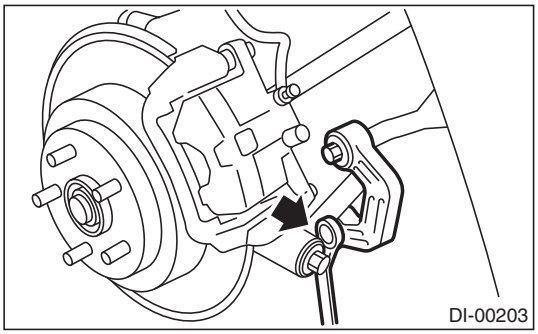


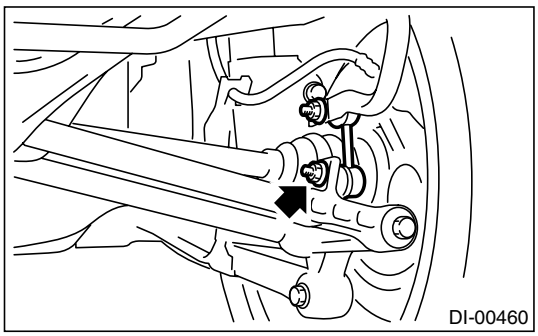
(3) Remove the ABS wheel speed sensor cable clamp and parking brake cable guide from trailing link.



(A) Parking brake cable guide
(B) ABS wheel speed sensor cable clamp

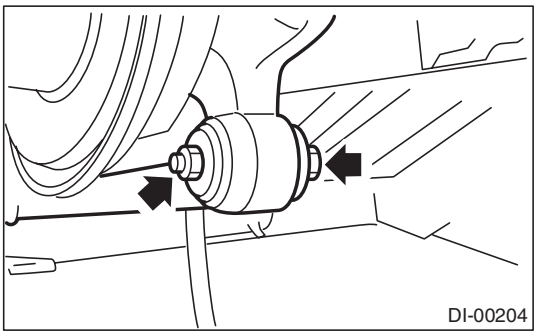
(4) Remove the rear stabilizer link.



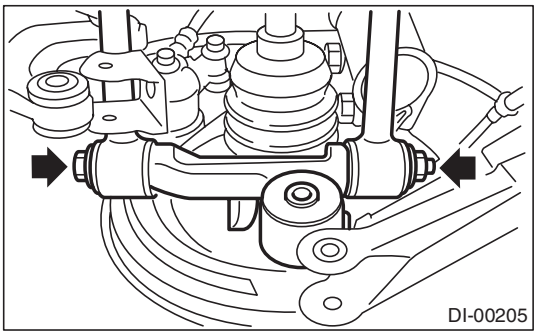


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(5) Remove the bolts which secure trailing link to housing.



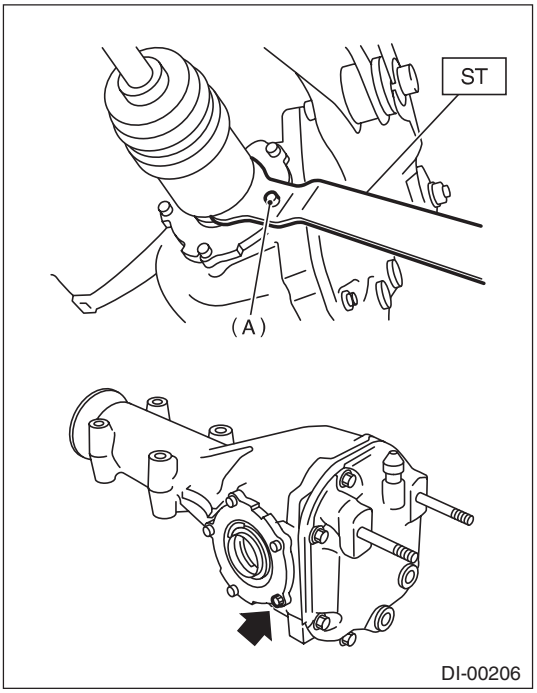
(6) Remove the bolts which secure the front and rear lateral link to rear housing.



(7) Remove the DOJ from the rear differential by using ST.

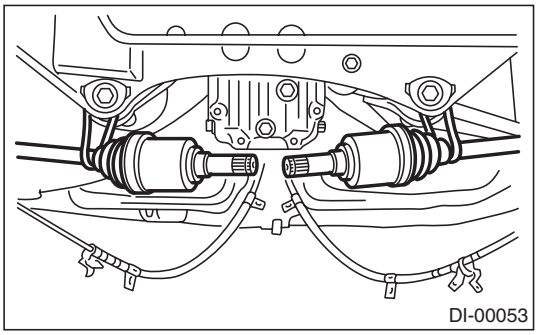
NOTE:
When removing the DOJ from rear differential, fit ST to the bolts as shown in the figure so as not to damage the side bearing retainer.

ST 208099PA100 DRIVE SHAFT REMOVER

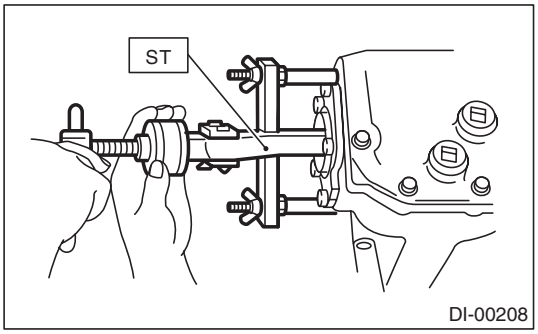


(A) Bolt

9) Suspend the rear drive shaft to the rear cross-member using wire.



10) Remove the oil seal using ST.
ST 398527700 PULLER ASSY

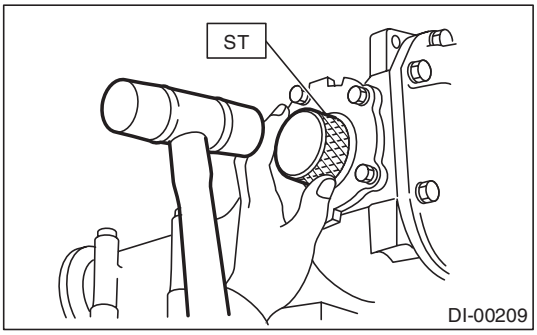


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11) Drive in a new side oil seal using ST.

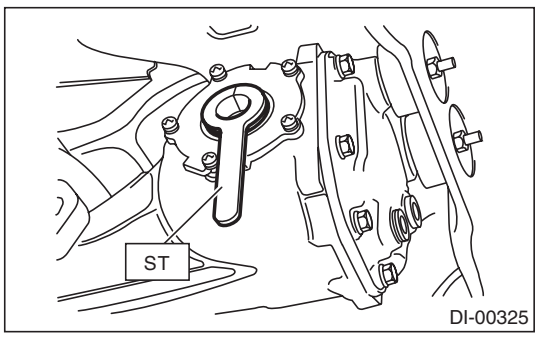
NOTE:
Apply chassis grease between the oil seal lips.

ST 398437700 DRIFT



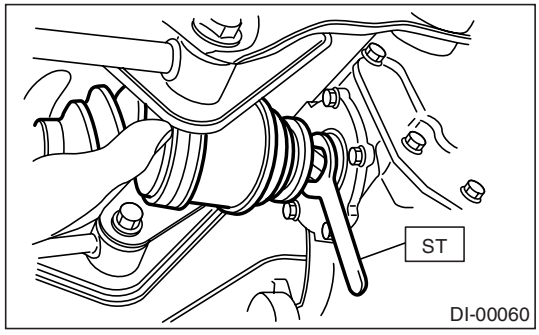
12) Insert the DOJ into rear differential.
(1) Install the ST to rear differential.

ST 28099PA090 OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal using ST.

ST 28099PA090 OIL SEAL PROTECTOR



(3) Remove the ST.

ST 28099PA090 OIL SEAL PROTECTOR

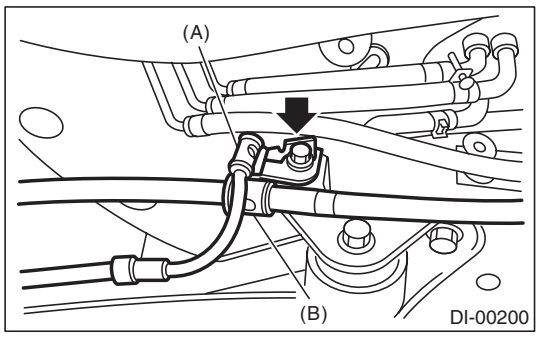
13) Hereafter, reassemble in the reverse order of disassembly.

2. VA-TYPE

1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Loosen both wheel nuts.
4) Release the parking brake.
5) Jack-up the vehicle and support it with rigid racks.
6) Remove the wheels.
7) Remove the rear exhaust pipe and muffler.

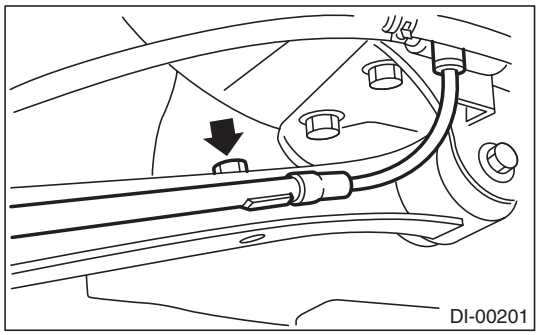
Non-turbo model without OBD
<Ref. to EX(H4SOw/oOBD)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-11, REMOVAL, Muffler.>
Non-turbo model with OBD
<Ref. to EX(H4SO)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-12, REMOVAL, Muffler.>

8) Remove the DOJ of rear drive shaft from rear differential.
(1) Remove the ABS wheel speed sensor cable clamp and parking brake cable clamp from bracket.



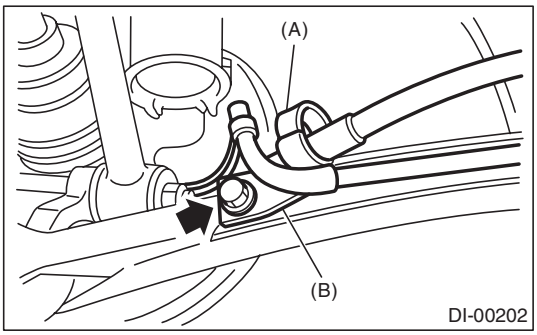
(A) ABS wheel speed sensor cable clamp
(B) Parking brake cable clamp

(2) Remove the ABS wheel speed sensor cable clamp from trailing link.



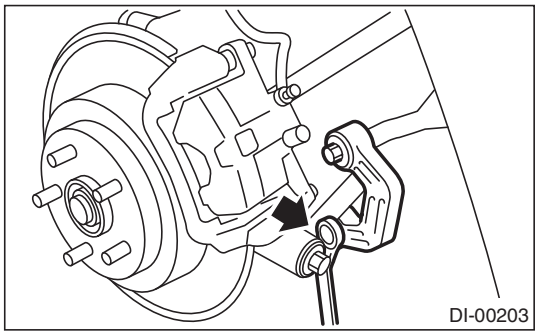
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(3) Remove the ABS wheel speed sensor cable clamp and parking brake cable guide from trailing link.

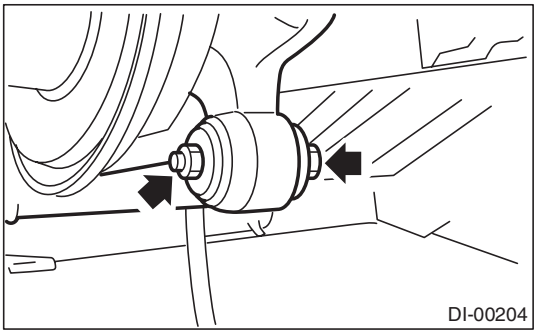


(A) Parking brake cable guide
(B) ABS wheel speed sensor cable clamp

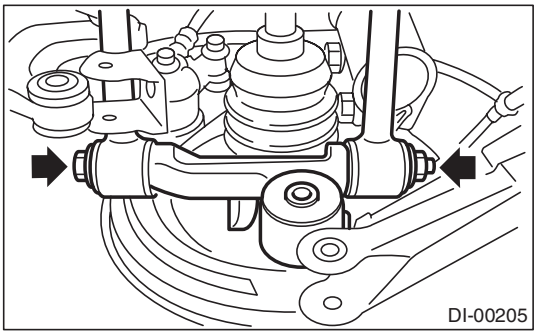
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure the trailing link to housing.

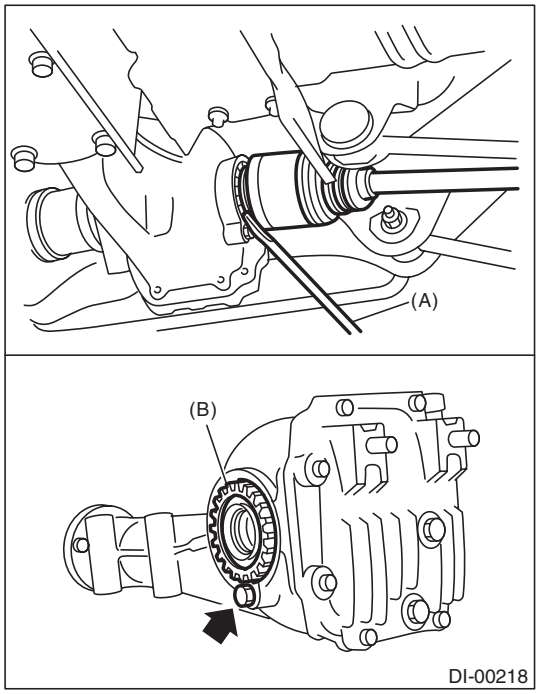


(6) Remove the bolts which secure the front and rear lateral link to rear housing.



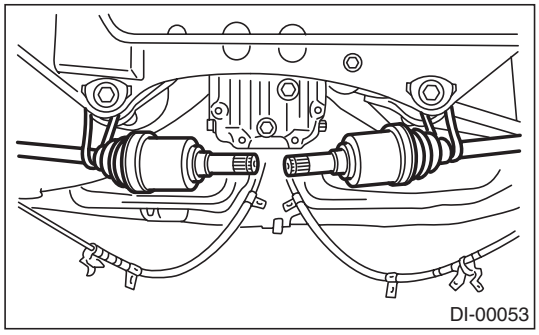
(7) Remove the DOJ from the rear differential using tire lever.

NOTE:
• When removing the DOJ from rear differential, fit tire lever to the bolt as shown in the figure so as not to damage the axle shaft holder.
• The side spline shaft circlip comes out together with the shaft.



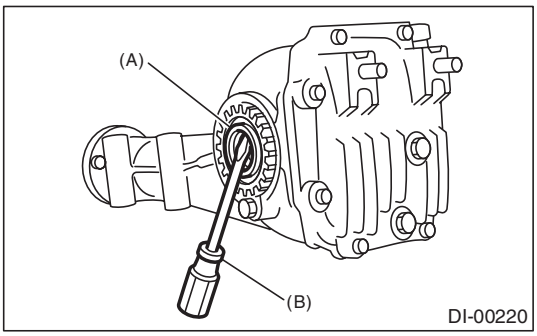
(A) Tire lever
(B) Axle shaft holder

9) Suspend the rear drive shaft to rear crossmember using wire.



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10) Remove the oil seal with screwdriver.

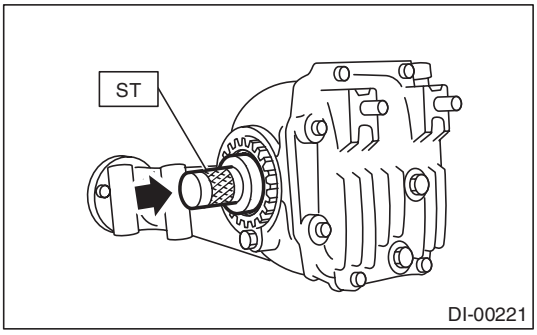


(A) Side oil seal
(B) Screwdriver

11) Drive in a new side oil seal using ST.

NOTE:
Apply chassis grease between the oil seal lips.

ST 498447100 INSTALLER

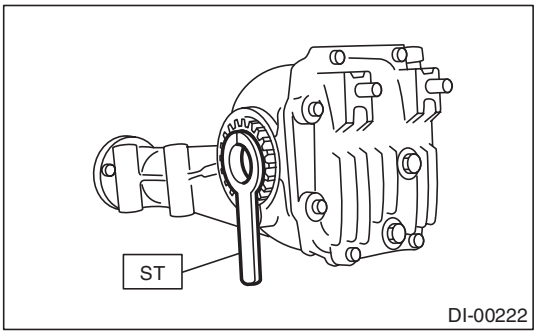


12) Insert the DOJ into rear differential.

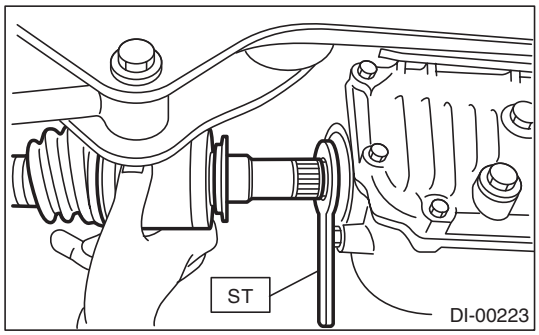
NOTE:
Before inserting, replace the circlip at the end of spline shaft with a new one.

(1) Install the ST to rear differential.

ST 28099PA090 OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal.

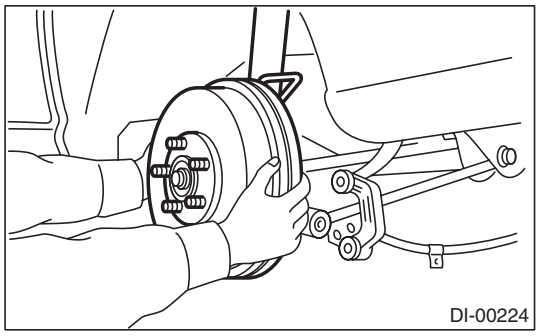


(3) Remove the ST.

ST 28099PA090 OIL SEAL PROTECTOR

(4) Completely insert the DOJ into rear differential by pressing rear housing.

NOTE:
Make sure that the oil seal lip is not folded over inward.



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

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8. Rear Differential Member

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the selector lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with study racks.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler.
Non-turbo model without OBD
<Ref. to EX(H4SOw/oOBD)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-11, REMOVAL, Muffler.> Non-turbo model with OBD<Ref. to EX(H4SO)-10, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-12, REMOVAL, Muffler.> Turbo model<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
9) Remove the rear differential front member.

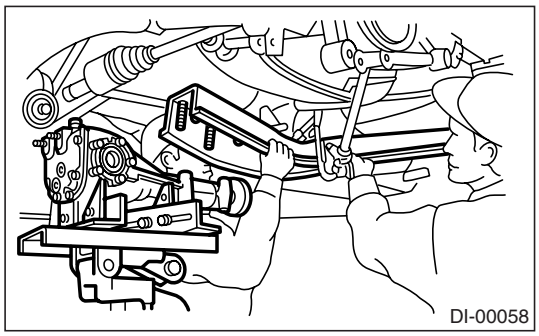
NOTE:
When removing the rear differential front member, work the removal procedure as rear differential. T-type<Ref. to DI-27, REMOVAL, Rear Differential (T-type).> VA-type<Ref. to DI-54, REMOVAL, Rear Differential (VA-type).>

10) Remove the differential rear member.

B: INSTALLATION

Install in the reverse order of removal.
1) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

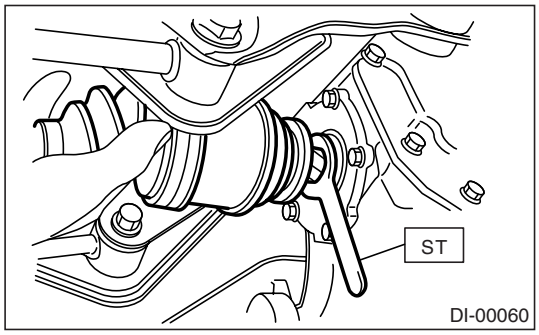
NOTE:
When installing the rear differential front member, do not confuse the installation sequence of the stopper.



2) Insert the DOJ of rear drive shaft into rear differential. <Ref. to DI-71, REPLACEMENT, Rear Differential Side Oil Seal.>

NOTE:
Before inserting, replace the differential side oil seal with a new one.

ST 28099PA090 OIL SEAL PROTEXTOR



3) Hereafter, install in the reverse order of removal.

C: INSPECTION

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

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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.	Repair 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 the gasket and apply liquid packing.
	(5) Loose oil filler or drain plug.	Retighten and apply liquid packing.
	(6) Wear, damage or incorrectly fitting for spindle, side retainer and oil seal.	Repair 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 the 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 the gear or thrust washer.
	(4) Loose bolts and nuts such as hypoid driven gear bolt.	Retighten.
	(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 disassembly.	(1) Excessive backlash for hypoid gear.	Readjust.
	(2) Excessive backlash for differential gear.	Replace the 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.

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Symptom or trouble	Possible cause	Remedy
6. Gear noises 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 the hypoid gear set.
	(2) Improper backlash for hypoid gear.	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace the hypoid gear set.
	(4) Seized hypoid gear.	Replace the 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.

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TRANSFER CASE

TC

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1. General Description

A: NOTE

For general description, refer to “4AT”, “5MT” or “6MT” section.
4AT model:
<Ref. to 4AT-2, General Description.>
5MT model:
<Ref. to 5MT-2, General Description.>
6MT model:
<Ref. to 6MT-2, General Description.>

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2. Transfer Case and Extension Case Assembly

A: NOTE

For removal, installation and inspection work, refer to “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-52, Transfer Case and Extension Case Assembly.>
6MT model:
<Ref. to 6MT-49, Extension Case.>

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3. Transfer Clutch

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-91, Transfer Clutch.>

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4. Extension Case

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-87, Extension Case.>

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5. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to “4AT”, “5MT” or “6MT” section.
4AT model:
<Ref. to 4AT-51, Extension Case Oil Seal.>
5MT model:
<Ref. to 5MT-45, Oil Seal.>
6MT model:
<Ref. to 6MT-31, Oil Seal.>

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6. Transfer Drive Gear

A: NOTE

For removal, installation and inspection work, refer to “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-57, Transfer Drive Gear.>
6MT model:
<Ref. to 6MT-58, Transfer Drive Gear.>

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7. Transfer Driven Gear

A: NOTE

For removal, installation and inspection work, refer to “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-59, Transfer Driven Gear.>
6MT model:
<Ref. to 6MT-60, Transfer Driven Gear.>

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8. Reduction Drive Gear

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-101, Reduction Drive Gear.>

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9. Reduction Driven Gear

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-99, Reduction Driven Gear.>

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10.Center Differential

A: NOTE

For removal, installation and inspection work, refer to “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-61, Center Differential.>
6MT model:
<Ref. to 6MT-62, Center Differential.>

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11.Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to “4AT” section. <Ref. to 4AT-40, Transfer Clutch Pressure Test.>

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12.Transfer Duty Solenoid and Valve Body

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-71, Transfer Duty Solenoid and Valve Body.>

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DRIVE SHAFT SYSTEM

DS

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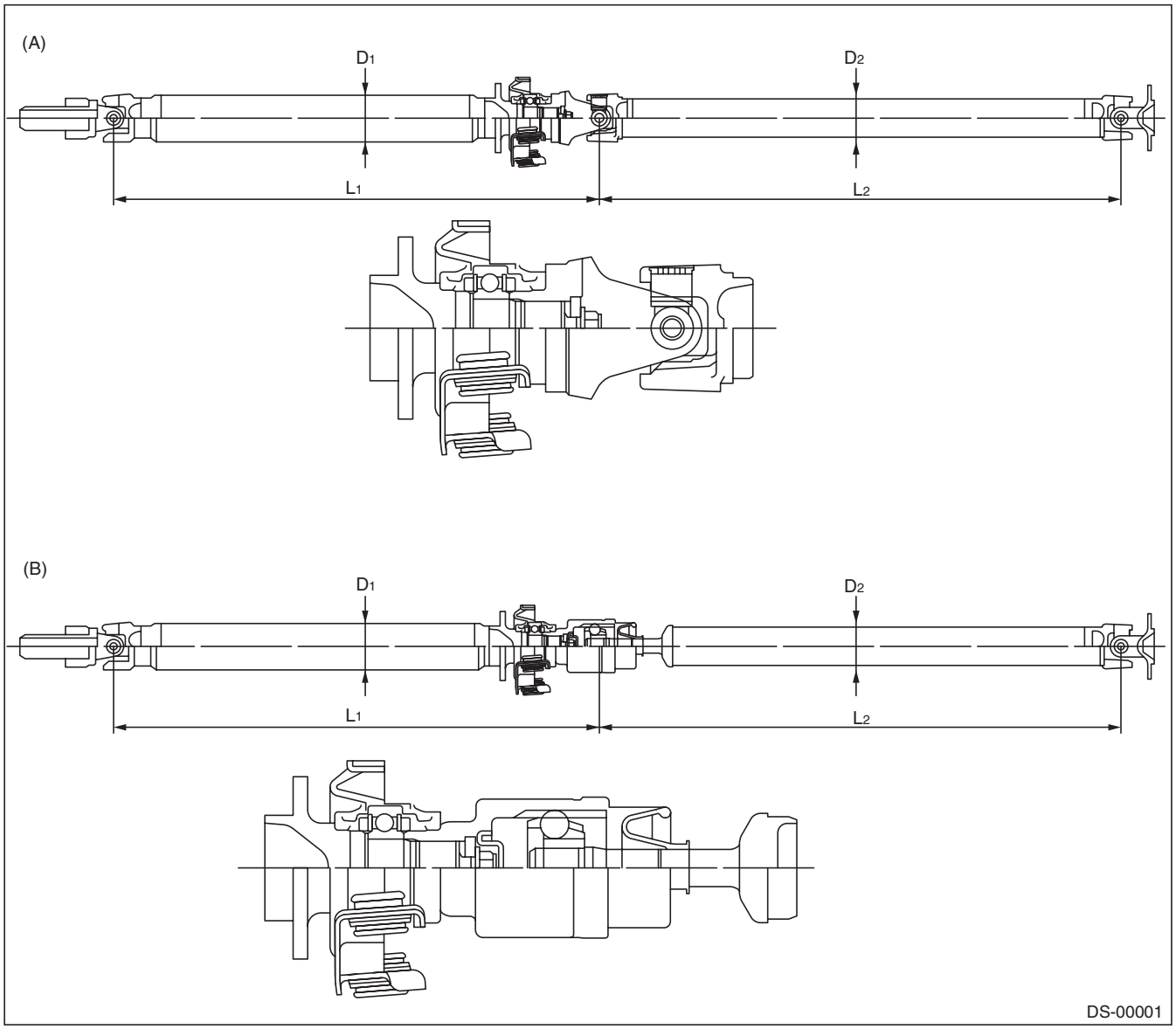
1. General Description

A: SPECIFICATION

1. PROPELLER SHAFT

Model		Non-turbo	Turbo (except STi)	STi	STi★
Propeller shaft type		UJ	DOJ	UJ	UJ
Front propeller shaft Joint-to-joint length: L_1 mm (in)	AT	584 (22.99)	579 (22.79)	—	
	MT	643 (25.32)	638 (25.12)	584 (22.99)	574 (22.60)
Rear propeller shaft Joint-to-joint length: L_2 mm (in)		708 (27.87)	713 (28.07)	708 (27.87)	706 (27.80)
Outer diameter of tube: mm (in)	D_1	63.5 (2.500)			70 (2.756)
	D_2	57.0 (2.244)			

★ : With driver's control center differential

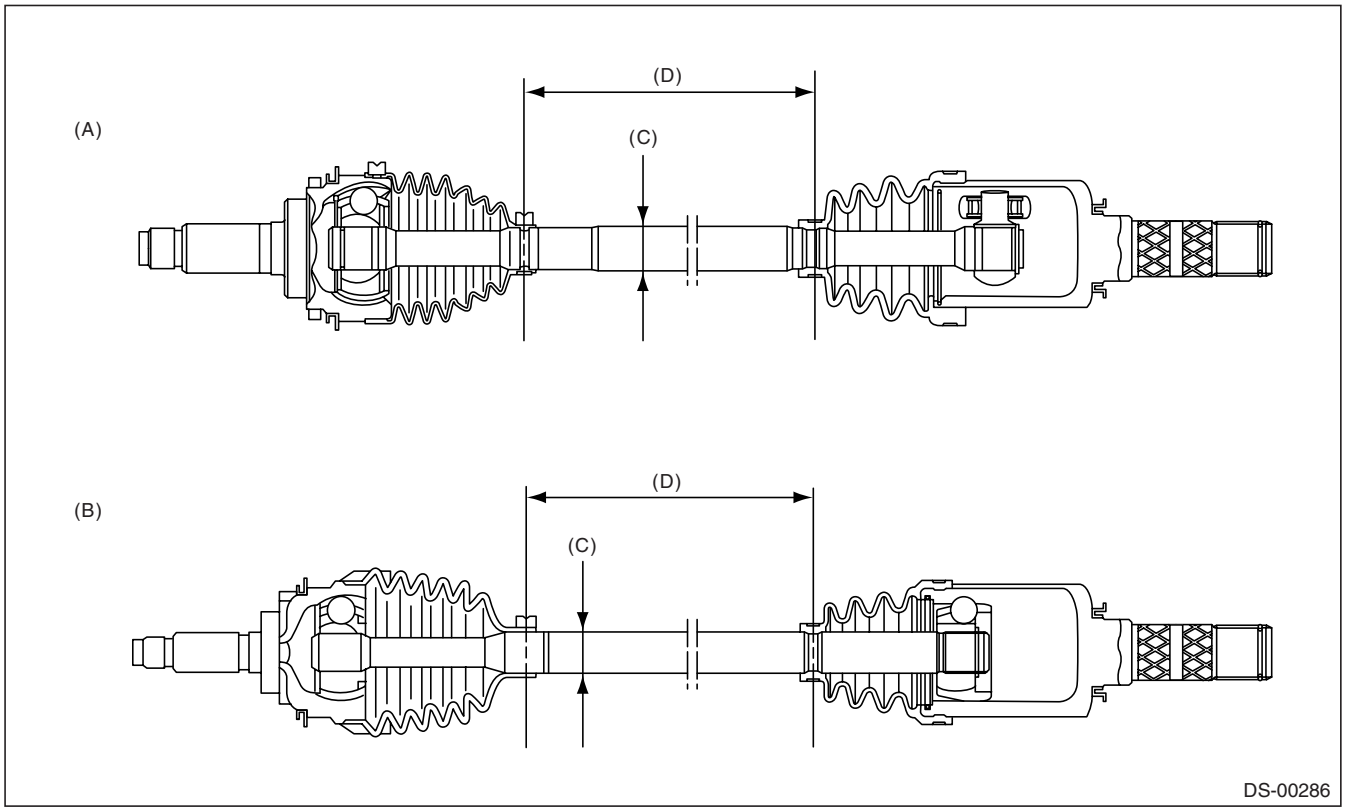


(A) UJ type (B) DOJ type

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2. FRONT DRIVE SHAFT ASSEMBLY

Model		Type of drive shaft	Axle diameter ϕ D mm (in)	Axle length L mm (in)	Identification color of inboard side boot band
Sedan	Non-turbo, Turbo AT	EBJ+PTJ	26 (1.02)	338.8 (13.34)	Large dia. white color
	Turbo MT (except STi)	EBJ+PTJ	28 (1.10)	338.8 (13.34)	Large dia. orange color
	Turbo MT (STi)	BJ+DOJ	28 (1.10)	295.6 (11.64)	Solid color
Wagon	Non-turbo, Turbo AT	EBJ+PTJ	26 (1.02)	329.6 (12.98)	Large dia. red color
	Turbo MT	EBJ+PTJ	28 (1.10)	329.6 (12.98)	Large dia. blue color

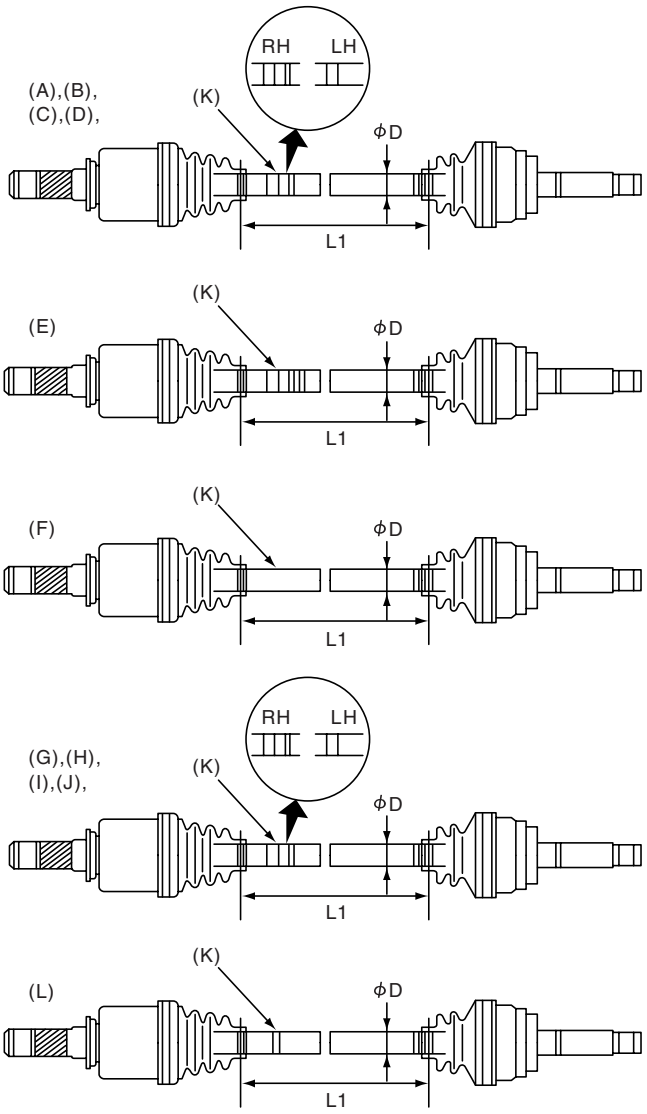


(A) EBJ+PTJ
(B) BJ+DOJ
(C) Axle diameter D
(D) Axle length L

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3. REAR DRIVE SHAFT ASSEMBLY

Model	Type of drive shaft		No. of identification protrusion on shaft	L1 mm (in)	ϕ D mm (in)	Identification color of inboard side boot band
Sedan turbo (except STi)	A	EBJ+DOJ	2	363 (14.29)	24 (0.94)	Large dia. red color
	B	EBJ+DOJ	1	353 (13.90)	24 (0.94)	
Sedan 2.0 L Non-turbo MT	C	BJ+DOJ	2	368 (14.49)	23 (0.91)	Large dia. white color
	D	BJ+DOJ	1	358 (14.09)	23 (0.91)	
Sedan 1.6 L, 2.0 L Non-turbo AT	E	BJ+DOJ	3	363 (14.29)	24 (0.94)	Large dia. pink color
Wagon 1.6 L, 2.0 L Non-turbo AT	F	BJ+DOJ	None	355 (13.98)	24 (0.94)	Large dia. orange color
Wagon turbo	G	EBJ+DOJ	2	353 (13.90)	24 (0.94)	Small dia. red color
	H	EBJ+DOJ	1	343 (13.50)	24 (0.94)	
Wagon 2.0 L Non-turbo MT	I	BJ+DOJ	2	358 (14.09)	23 (0.91)	Small dia. white color
	J	BJ+DOJ	1	348 (13.70)	23 (0.91)	
Sedan turbo (STi)	L	BJ+DOJ	None	316 (12.44)	25 (0.98)	Solid color



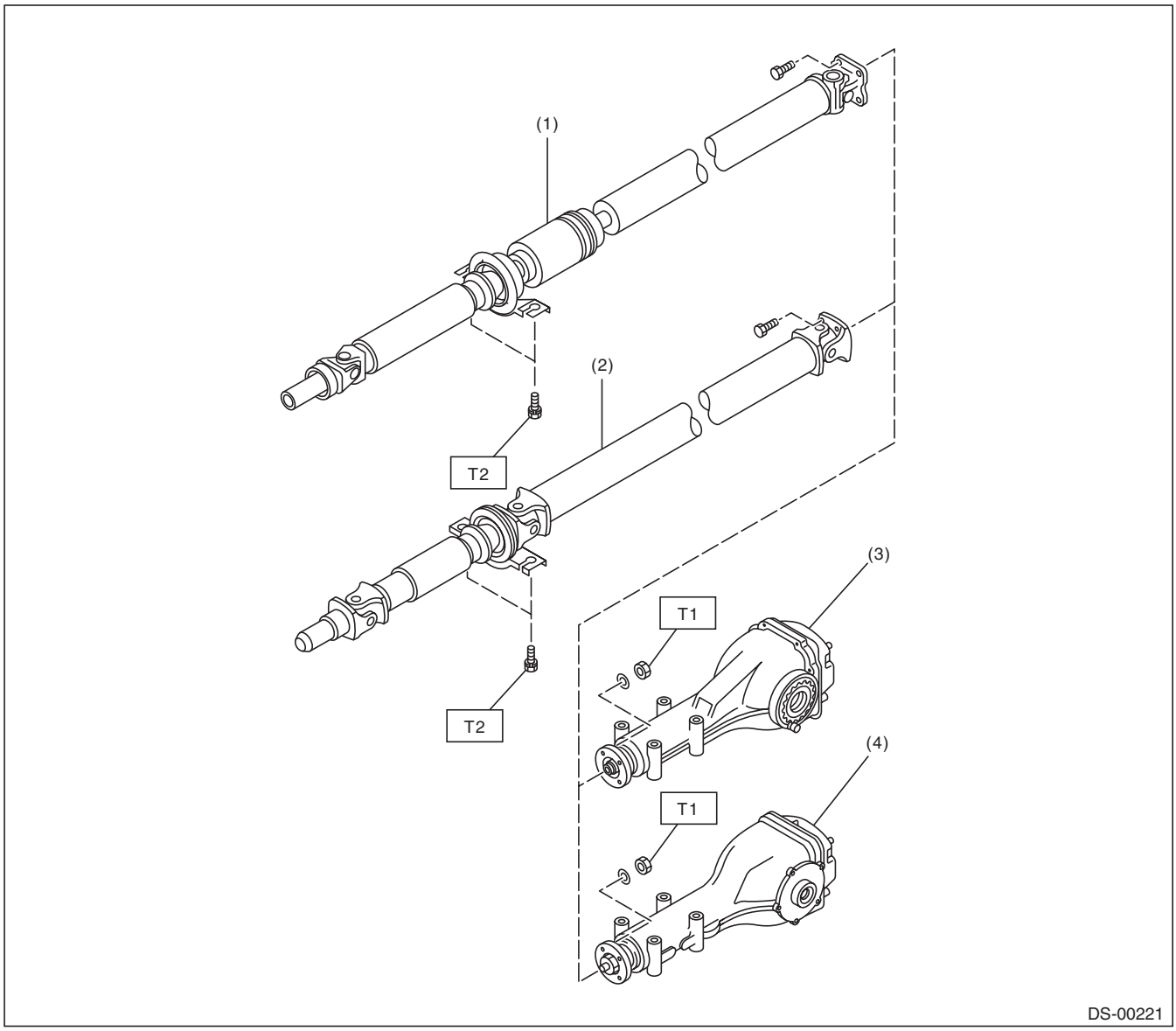
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(A) EBJ+DOJ sedan RH
(B) EBJ+DOJ sedan LH
(C) BJ+DOJ sedan R160RH
(D) BJ+DOJ sedan R160LH
(E) BJ+DOJ sedan R152R/L
(F) BJ+DOJ wagon R152R/L
(G) EBJ+DOJ wagon RH
(H) EBJ+DOJ wagon LH
(I) BJ+DOJ wagon R160RH
(J) BJ+DOJ wagon R160LH
(K) Identification protrusion
(L) EBJ+EDJ R180 RH/LH

B: COMPONENT

1. PROPELLER SHAFT



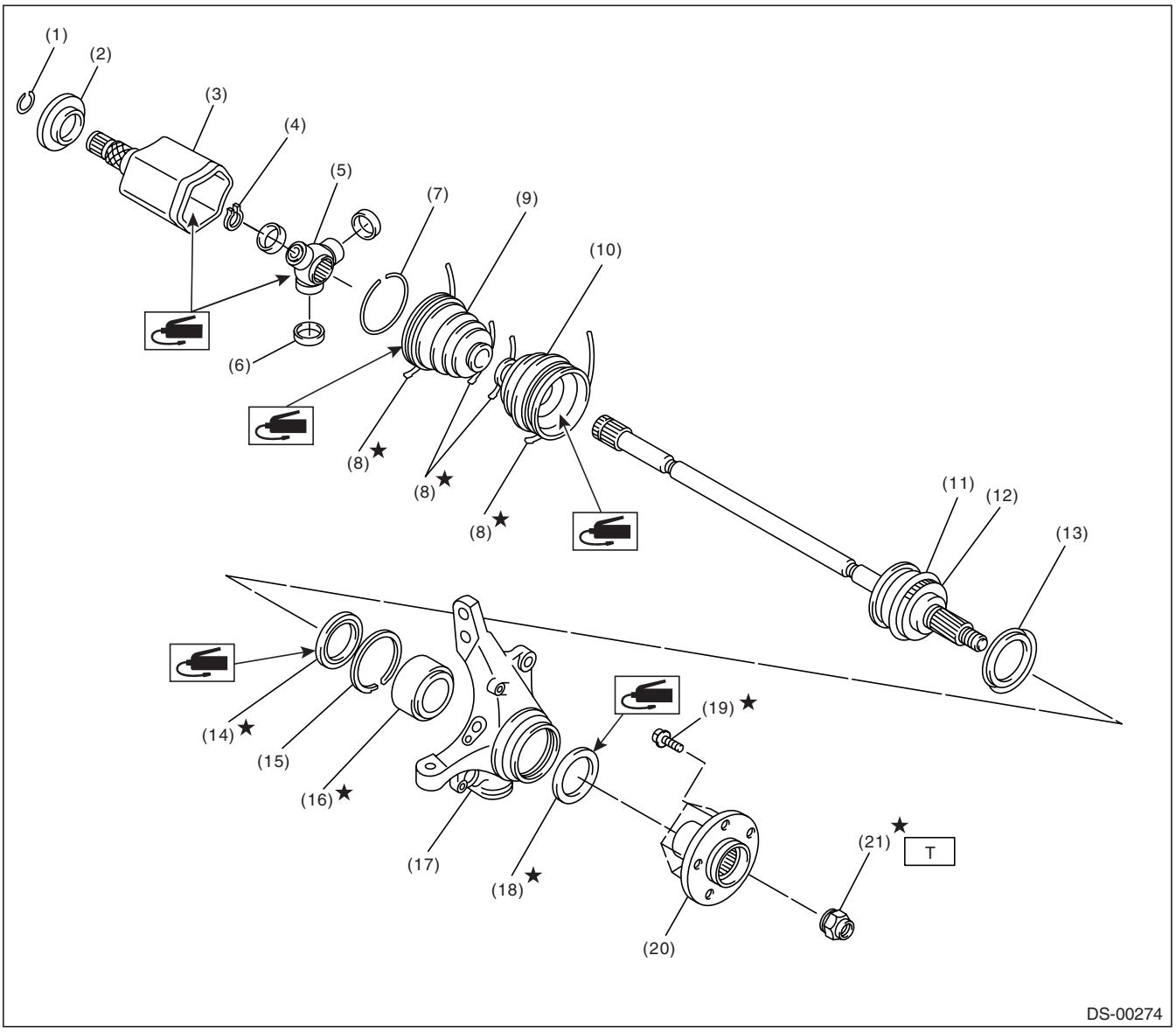
(1) Propeller shaft (DOJ type)
(2) Propeller shaft (UJ type)
(3) Rear differential (VA-type)
(4) Rear differential (T-type)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 31 (3.2, 22.9)
T2: 52 (5.3, 38.3)

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2. FRONT AXLE

- Except STi model

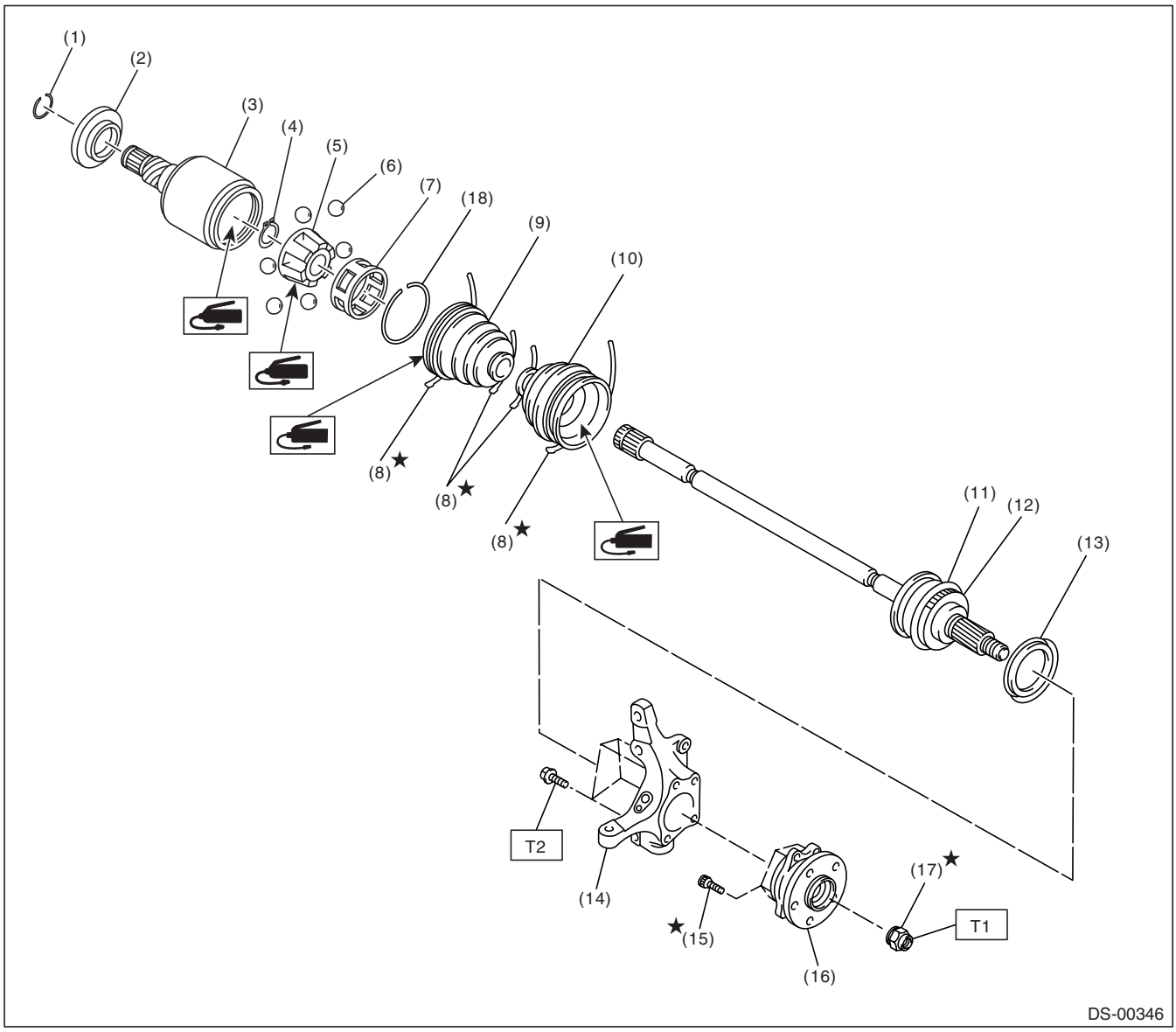


(1) Circlip
(2) Baffle plate (PTJ)
(3) Outer race (PTJ)
(4) Snap ring
(5) Trunnion
(6) Free ring
(7) Snap ring
(8) Boot band
(9) Boot (PTJ)
(10) Boot (EBJ)
(11) EBJ ASSY
(12) Tone wheel (with ABS)
(13) Baffle plate
(14) Oil seal (IN)
(15) Snap ring
(16) Bearing
(17) Housing
(18) Oil seal (OUT)
(19) Hub bolt
(20) Hub
(21) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 220 (22.4, 162)

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- STi model



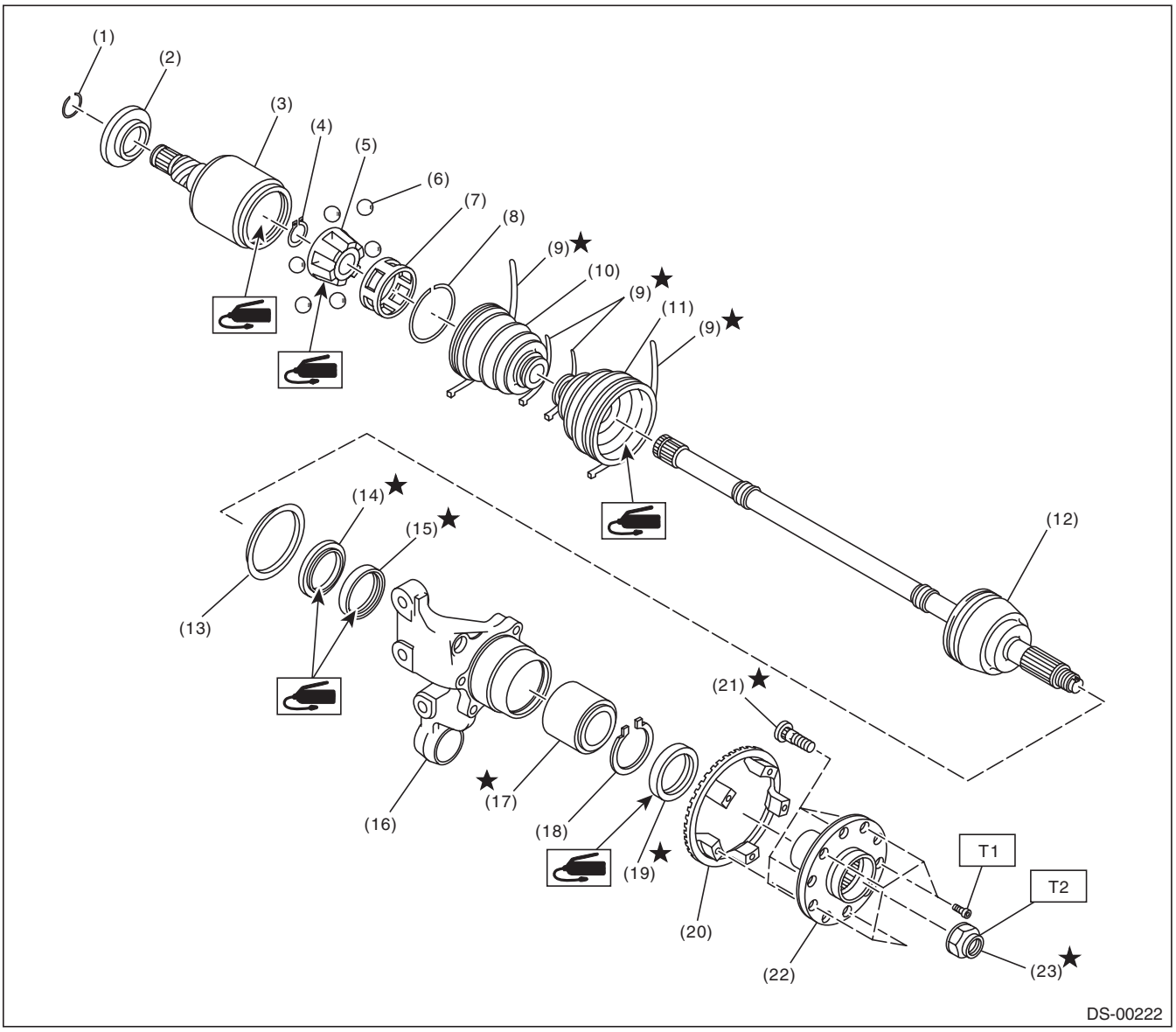
(1) Circlip
(2) Baffle plate
(3) Outer race (DOJ)
(4) Snap ring
(5) Inner race
(6) Ball
(7) Cage
(8) Boot band
(9) Boot (DOJ)
(10) Boot (BJ)
(11) BJ ASSY
(12) Tone wheel
(13) Baffle plate
(14) Housing
(15) Hub bolt
(16) Front unit bearing
(17) Axle nut
(18) Snap ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 220 (22.4, 162)
T2: 65 (6.6, 48.0)

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3. REAR AXLE

- AWD model

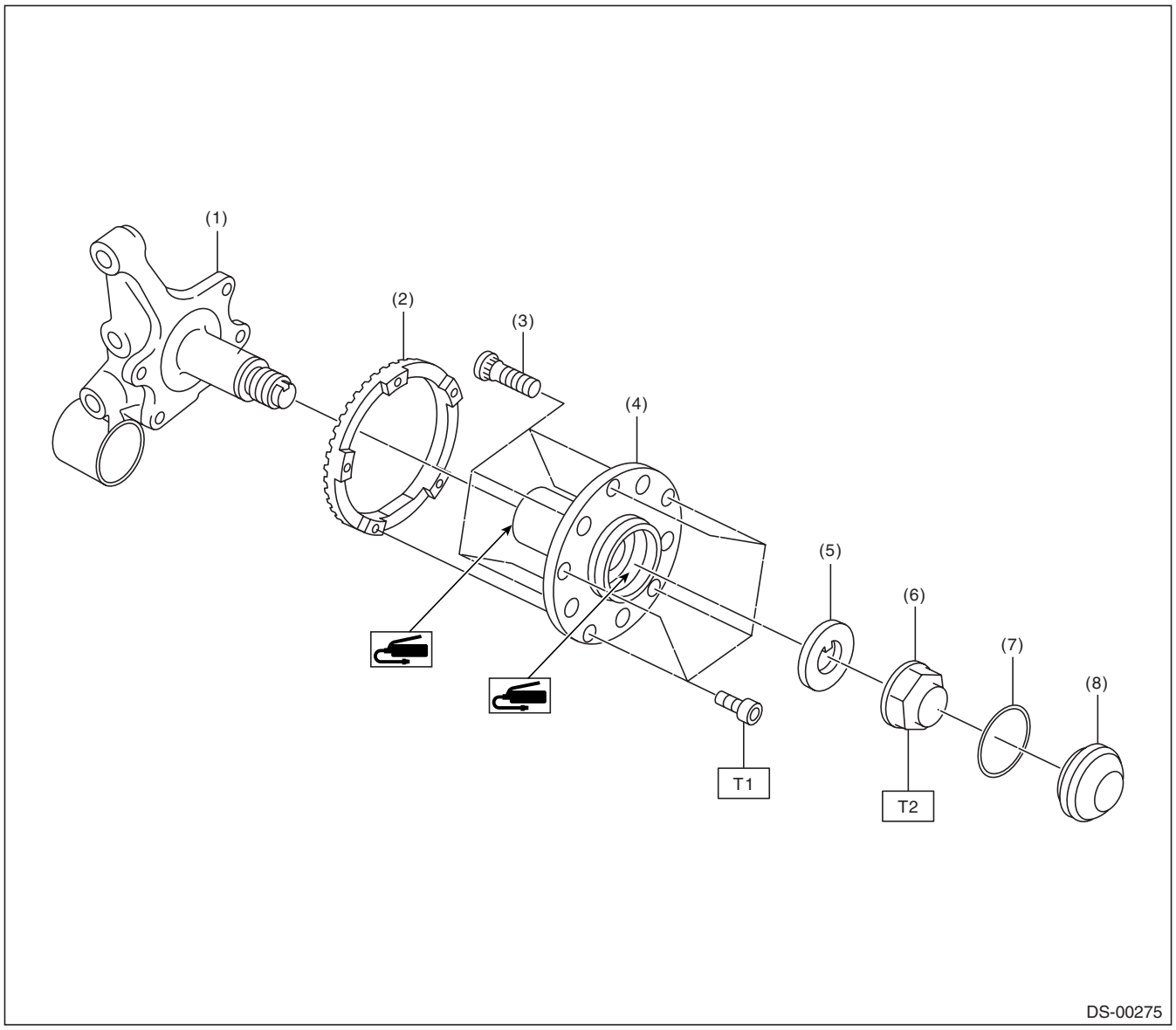


(1) Circlip
(2) Baffle plate (DOJ)
(3) Outer race (DOJ)
(4) Snap ring
(5) Inner race
(6) Ball
(7) Cage
(8) Snap ring
(9) Boot band
(10) Boot (DOJ)
(11) Boot (BJ or EBJ)
(12) Non-turbo: BJ ASSY
Turbo: EBJ ASSY
(13) Baffle plate
(14) Inner oil seal 2
(15) Inner oil seal
(16) Housing
(17) Bearing
(18) Snap ring
(19) Oil seal (OUT)
(20) Tone wheel
(21) Hub bolt
(22) Hub
(23) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 190 (19.4, 140)

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- FWD model



(1) Rear spindle
(2) Tone wheel
(3) Hub bolt
(4) Hub
(5) Washer
(6) Axle nut
(7) O-ring
(8) Hub cap

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 190 (19.4, 140)

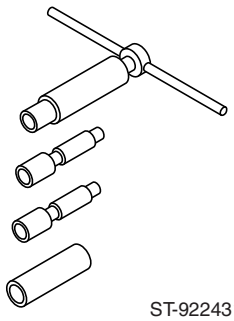
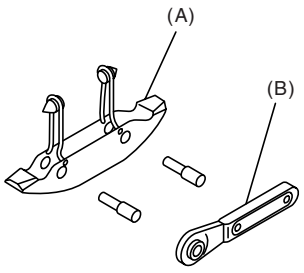
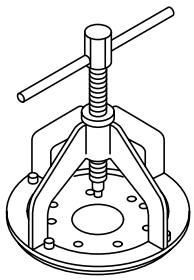
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C: CAUTION

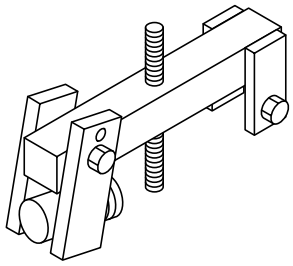
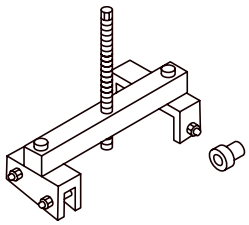
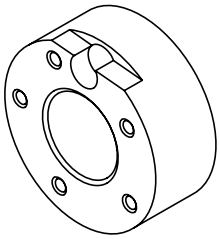
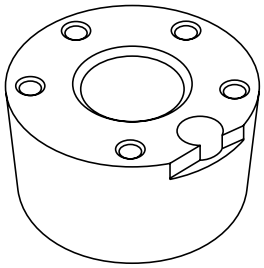
• Wear working clothing, including a cap, protective goggles and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Be careful not to burn, 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.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• 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

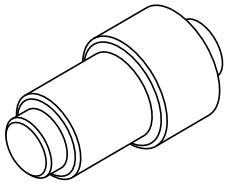
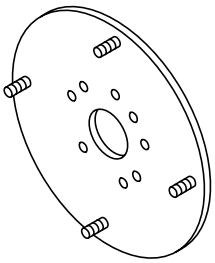
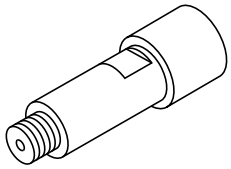
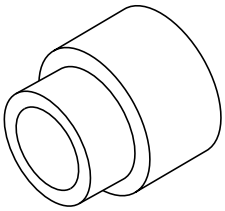
1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-922431000	922431000	AXLE SHAFT INSTALLER	• Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 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. • Used with AXLE SHAFT PULLER PLATE (28099PA110).

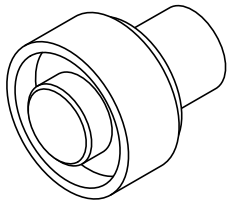
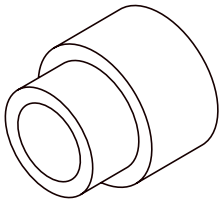
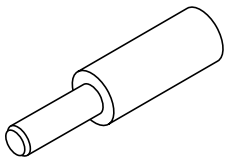
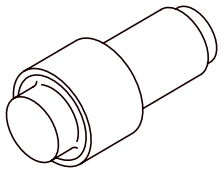
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927060000	927060000	HUB REMOVER	• Used for removing front hub (Except STi model). • Used with HUB STAND (927080000).
 ST-927420000	927420000	HUB REMOVER	• Used for removing rear hub. • Used with HUB STAND (927080000 or 28099PA080).
 ST-927080000	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub (Except STi model).
 ST28099PA080	28099PA080	HUB STAND	Used for disassembling and assembling hub bolt in hub (STi model).

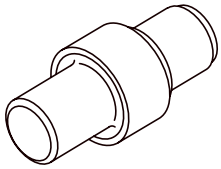
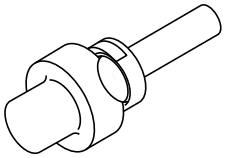
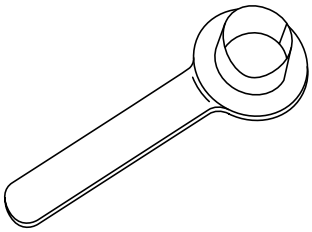
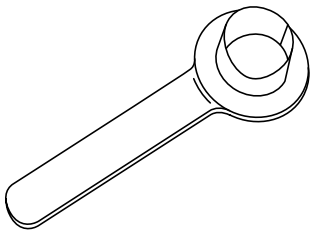
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927100000	927100000	BEARING PULLER	• Used for disassembling and assembling front housing bearing (Except STi model). • Used with HOUSING STAND (927400000).
 ST28099PA110	28099AP110	AXLE SHAFT PULLER PLATE	Used with AXLE SHAFT PULLER (926470000).
 ST-927390000	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).
 ST-927400000	927400000	HOUSING STAND	• Used for disassembling and assembling front housing bearing (Except STi model). • Used with BEARING PULLER (927100000).

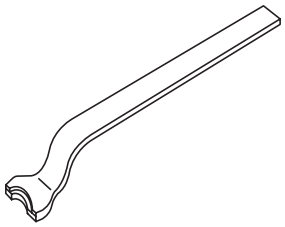
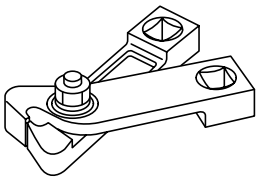
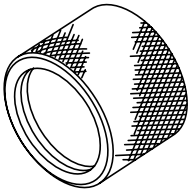
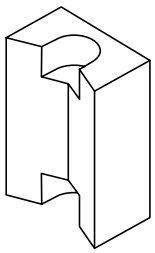
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927410000	927410000	OIL SEAL INSTALLER	• Used for installing oil seal into front housing (Except STi model). • Used with HOUSING STAND (927400000).
 ST-927430000	927430000	HOUSING STAND	Used for disassembling and assembling rear housing bearing (Except STi model).
 ST-927120000	927120000	HUB INSTALLER	Used for installing front hub (Except STi model).
 ST-927440000	927440000	BEARING REMOVER	• Used for disassembling and assembling rear wheel bearing (Except STi model). • Used with HOUSING STAND (927430000).

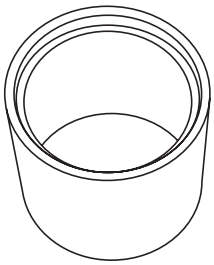
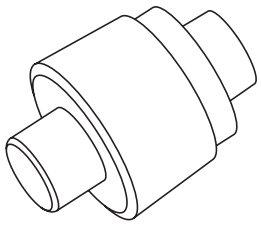
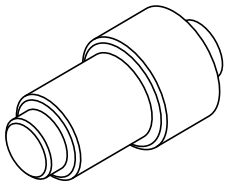
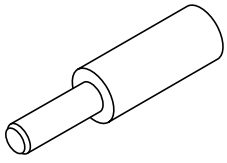
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927460000	927460000	OIL SEAL INSTALLER	• Used for installing outer oil seal (Except STi model). • Used with HOUSING STAND (927430000).
 ST-927450000	927450000	HUB INSTALLER	• Used for pressing hub bearing into hub (Except STi model). • Used with HUB STAND (927080000).
 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 to transmission. • For protecting oil seal.

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.
 ST28099AC000	28099AC000	BOOT BAND PLIERS	Used for tightening front BJ boot band.
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.
 ST28399AG000	28399AG000	HUB STAND	Used for extracting hub bolt. (STi model)

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA060	28099PA060	HOUSING STAND	Used for disassembling and assembling rear housing bearing. (STi model)
 ST28099PA070	28099PA070	OIL SEAL INSTALLER	• Used for press-fitting the rear housing oil seal. (STi model) • Used with HOUSING STAND (28099PA060).
 ST-927100000	927100000	BEARING INSTALLER	• Used for disassembling and assembling rear wheel bearing. (STi model) • Used with HOUSING STAND (28099PA060).
 ST-927120000	927120000	HUB INSTALLER	• Used for installing rear hub. (STi model) • Used with HUB STAND (28099PA060).

2. GENERAL PURPOSE TOOLS

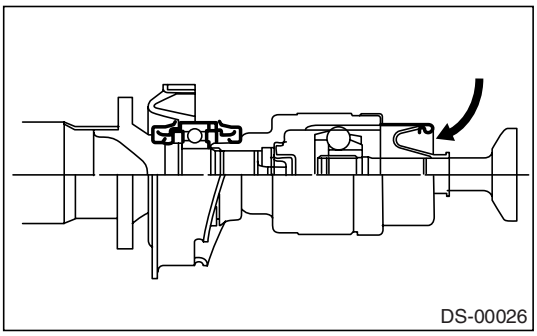
TOOL NAME	REMARKS
Puller	Used for removing ball joint from knuckle arm.
Dial gauge	Used for inspecting propeller shaft run-out.
Snap ring pliers	Used for installing and removing snap ring.
Pinch bar	Used for removing drive shaft.

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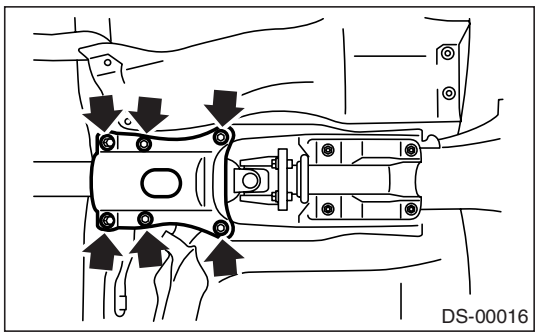
2. Propeller Shaft

A: REMOVAL

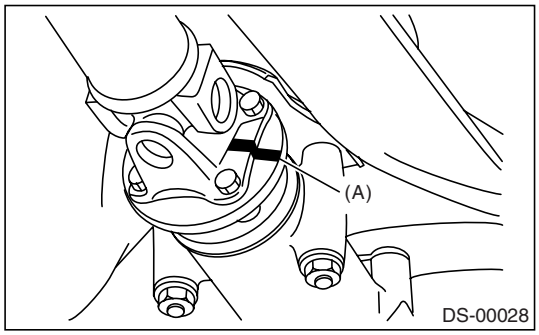
NOTE:
• Before removing the propeller shaft, wrap the metal parts with a cloth or rubber material.
• In case of DOJ type, before removing the propeller shaft, wrap the metal parts (installed at the rubber boot of center DOJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be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


DS-00026

1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Jack-up the vehicle and support it with sturdy racks.
5) Remove the center exhaust pipes.
6) Remove the rear exhaust pipe and muffler.
7) Remove the differential mount front cover.


DS-00016

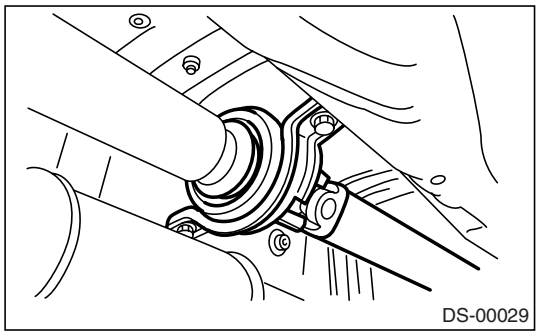
8) Make matching marks on affected parts before removal.



DS-00028

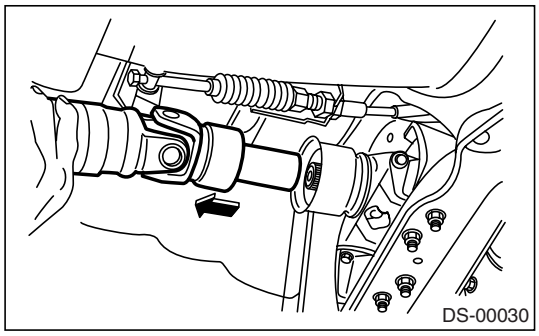
(A) Matching mark

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


DS-00029

12) Remove the propeller shaft from transmission.

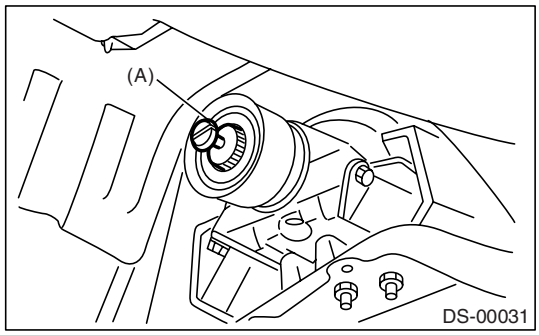
CAUTION:
• Be careful not to damage the oil seals and frictional surface of sleeve yoke.
• Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing the propeller shaft.


DS-00030

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13) Install the extension cap to transmission.

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

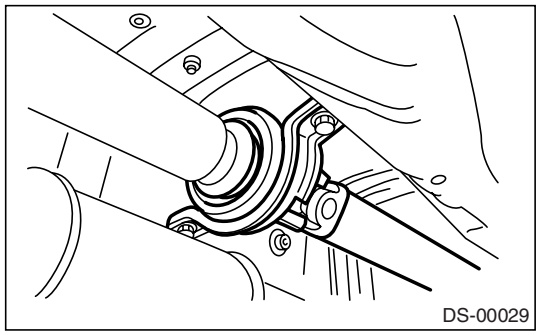


(A) Extension cap

B: INSTALLATION

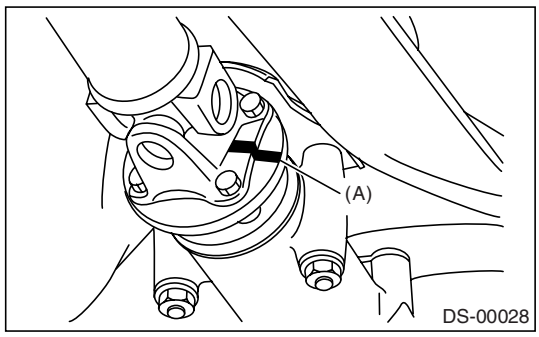
1) Insert the sleeve yoke into transmission, and then attach the center bearing to body.

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



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

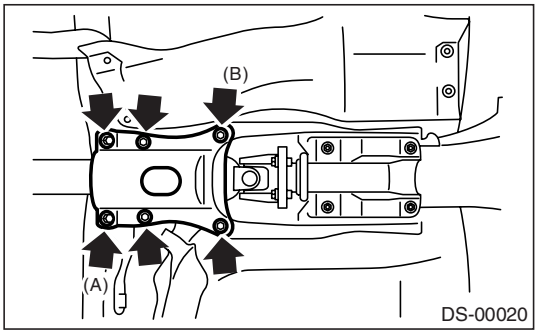
Tightening torque:
31 N·m (3.2 kgf-m, 22.9 ft-lb)



(A) Matching mark

3) Using new bolts, install the differential mount front cover.
(1) Temporarily tighten the bolt (A) while pushing cover forward.
(2) Tighten the bolt (B) to specified torque.
(3) Tighten the bolt (A) to specified torque.
(4) Tighten the remaining bolts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)



4) Install the center exhaust pipes.
5) Install the rear exhaust pipe and muffler.

C: INSPECTION

NOTE:
Do not disassemble the propeller shaft. Check the following and replace if necessary.
1) Tube surfaces for dents or cracks
2) Splines for deformation or abnormal wear
3) Joints for non-smooth operation or abnormal noise
4) Center bearing for free play, noise or non-smooth operation
5) Oil seals for abnormal wear or damage
6) Center bearing for breakage
Check the following points with propeller shaft installed in vehicle.

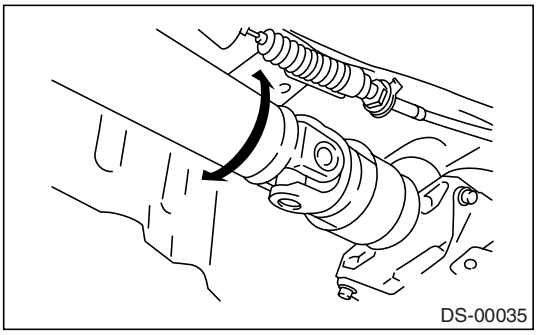
1. JOINTS AND CONNECTIONS

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

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2. SPLINES AND BEARING LOCATIONS

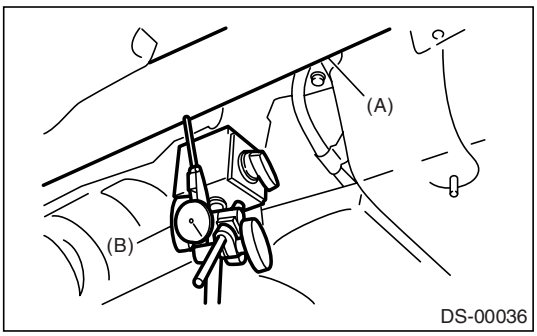
1) Remove the center exhaust pipes.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move the yokes to see if abnormal free play exists at spiders and bearings.



3. RUNOUT OF PROPELLER SHAFT

1) Remove the center exhaust pipes.
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.

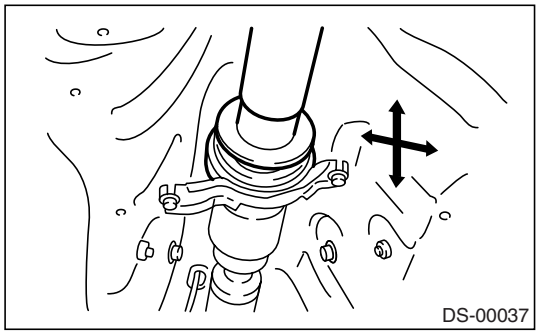
Runout:
Limit 0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

1) Remove the front and center exhaust pipes.
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.



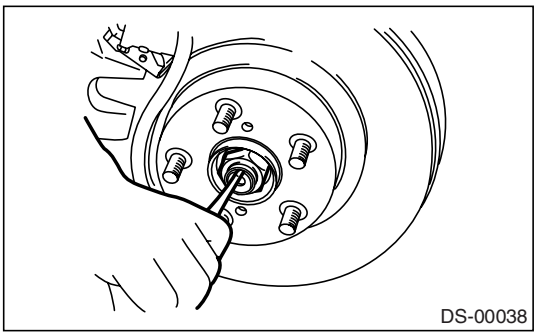
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3. Front Axle

A: REMOVAL

1. EXCEPT STi MODEL

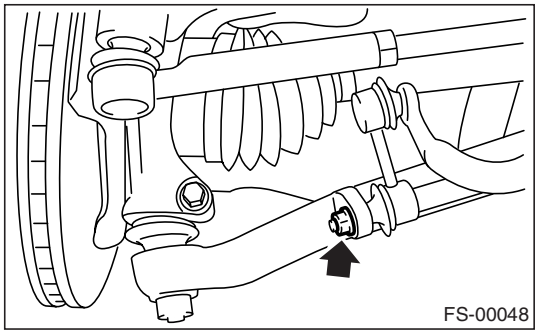
1) Lift-up the vehicle and remove the front wheels.
2) Unlock the axle nut.



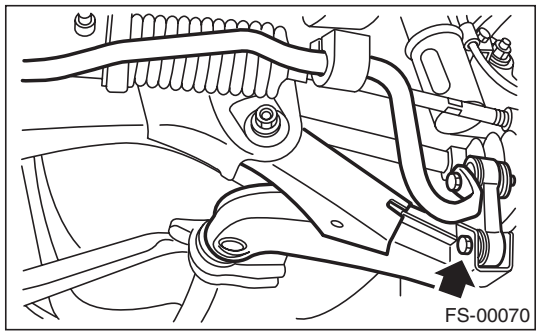
3) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

4) Remove the stabilizer link.
SEDAN:



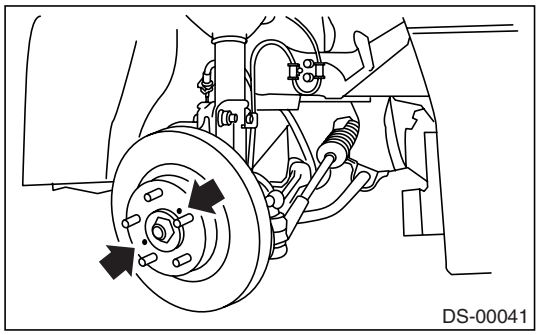
WAGON:



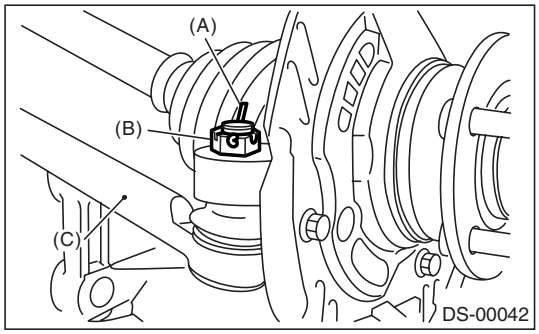
5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.

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.

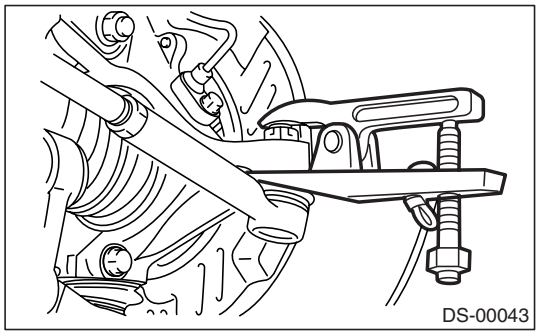


7) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.



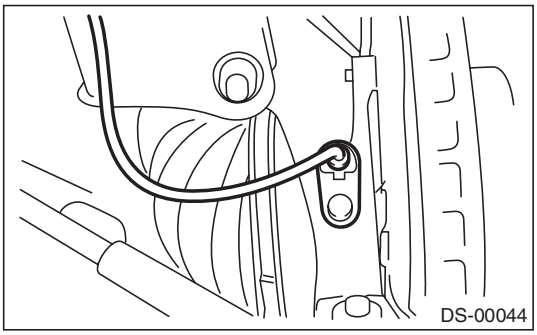
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

8) Using a puller, remove the tie-rod ball joint from knuckle arm.

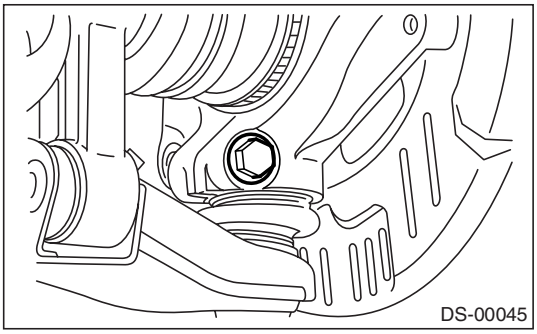


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9) Remove the ABS wheel speed sensor assembly and harness.



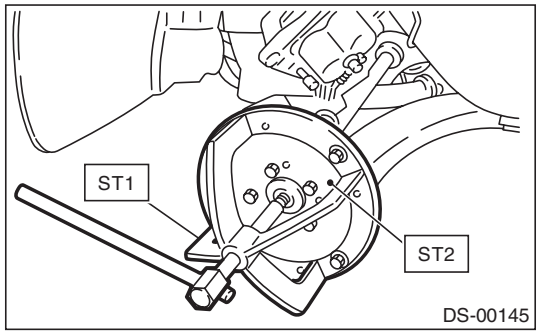
10) Remove the transverse link ball joint from housing.



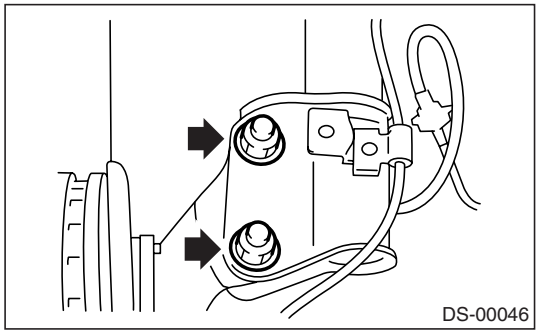
11) Remove the front drive shaft assembly from hub. If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	28099PA110	AXLE SHAFT PULLER PLATE

CAUTION:
• Be sure to replace the differential side retainer oil seal at transmission side with a new one when removing the front drive shaft.
• Suspend the front drive shaft to vehicle body using a wire.



12) After scribing an alignment mark on the camber adjusting bolt head, remove the bolts which connect the housing and strut, and disconnect the housing from strut.



2. STi MODEL

NOTE:
• When remove the housing, refer to Front Axle REMOVAL Except for STi model. <Ref. to DS-20, EXCEPT STi MODEL, REMOVAL, Front Axle.>
• When remove the hub bearing, refer to Hub Unit Bearing REMOVAL. <Ref. to DS-26, REMOVAL, Front Hub Unit Bearing.>

B: INSTALLATION

1) Temporarily tighten the front axle to front strut.
2) Insert the front drive shaft into front axle.
3) Temporarily tighten the axle nut.
4) Install the transverse link ball joint to housing.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

5) 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)

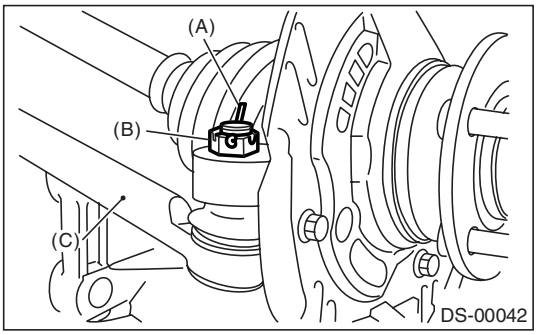
6) Connect the tie-rod end ball joint to the knuckle arm with a castle nut.

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 with hammer.

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7) 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

8) Install the disc rotor on hub.
9) Install the disc brake caliper on housing.

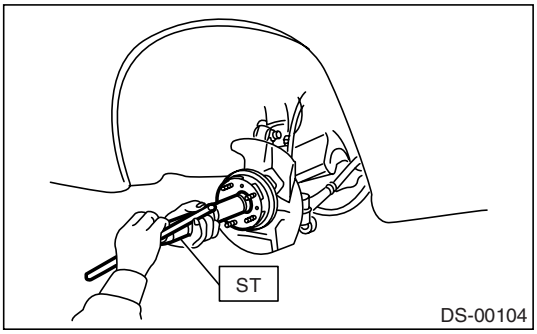
Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

10) Connect the stabilizer link.

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)

CAUTION:
Use a new self-locking nut.

11) Using the ST1 and ST2, pull the front drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

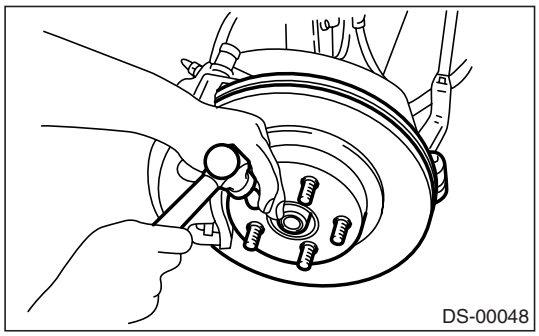


12) While depressing the brake pedal, tighten a new axle nut to specified torque and lock it securely.

Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

13) After tightening the axle nut, lock it securely.



14) Install the ABS wheel speed sensor on housing.

Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

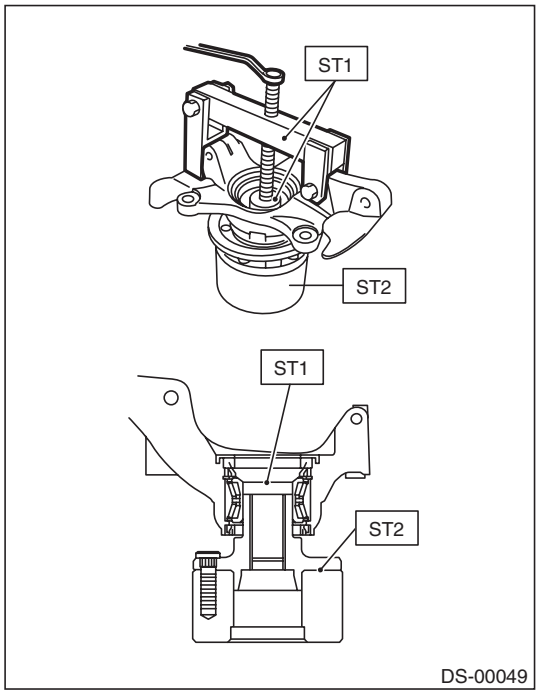
15) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

1. EXCEPT STi MODEL

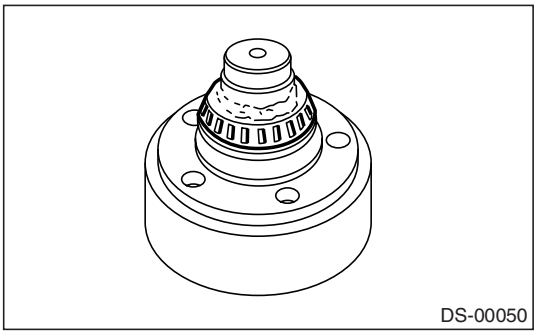
1) Using the ST1, support the housing and hub securely.
2) Attach the ST2 to housing and drive the hub out.
ST1 927060000 HUB REMOVER
ST2 927080000 HUB STAND



If the inner bearing race remains in hub, remove it with a suitable tool (commercially available).

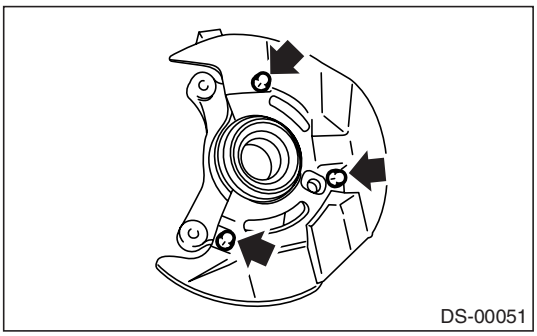
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NOTE:
Be careful not to scratch the polished area of hub.



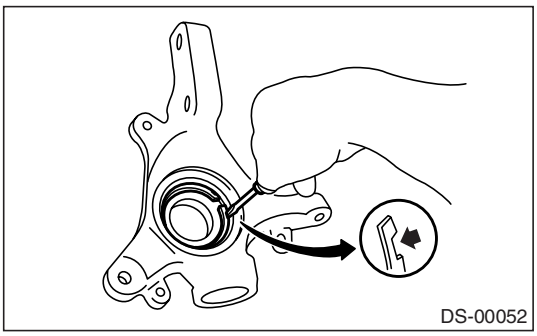
CAUTION:
Do not reuse the bearing if the hub was removed.

3) Remove the disc cover from housing.

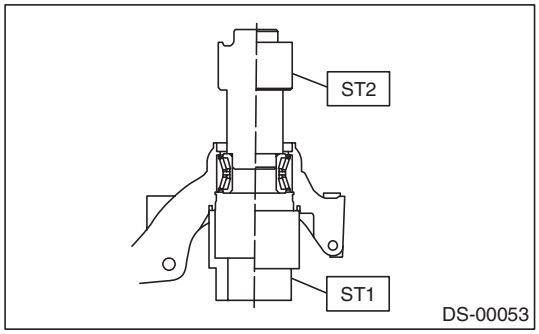


4) Using a standard screwdriver, remove the outer and inner oil seals.
5) Using a flat tip screwdriver, remove the snap ring.

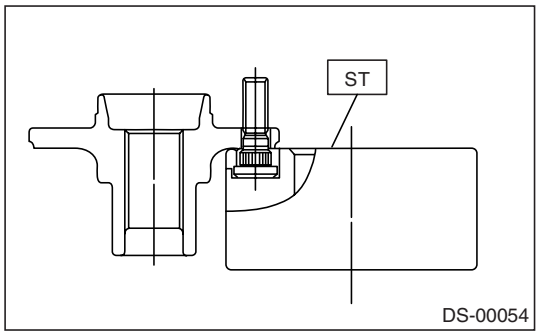
NOTE:
Be careful not to damage the housing at removal.



6) Using the ST1, support the housing securely.
7) Using the ST2, hold the inner race to drive out the outer race of bearing.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER



8) Using the ST and a hydraulic press, drive the hub bolts out.
ST 927080000 HUB STAND



2. STi MODEL

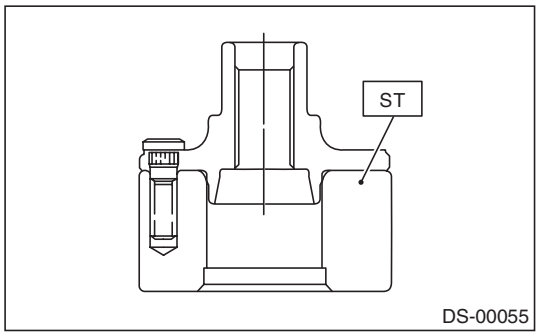
Disassemble the front hub unit bearing. <Ref. to DS-27, DISASSEMBLY, Front Hub Unit Bearing.>

D: ASSEMBLY

1. EXCEPT STi MODEL

NOTE:
When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Attach the hub to ST securely.
ST 927080000 HUB STAND



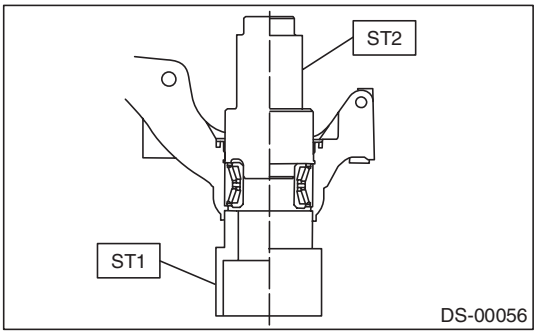
2) Using a hydraulic press, press new hub bolts until their seating surfaces contact the hub.

NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

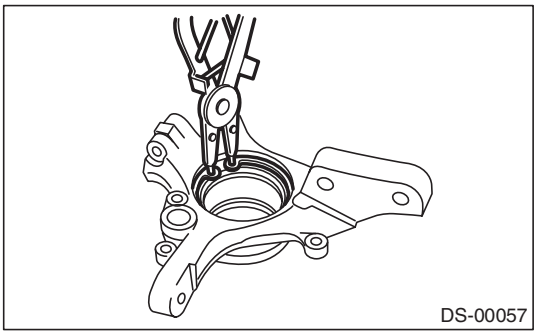
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3) Clean dust or foreign particles from inside of housing.
4) Using the ST1 and ST2, press a new bearing into place.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER

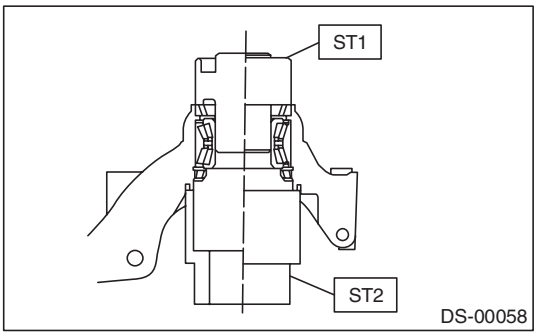
NOTE:
• Always press the outer race when installing the bearing.
• Be careful not to remove the plastic lock from inner race when installing the bearing.



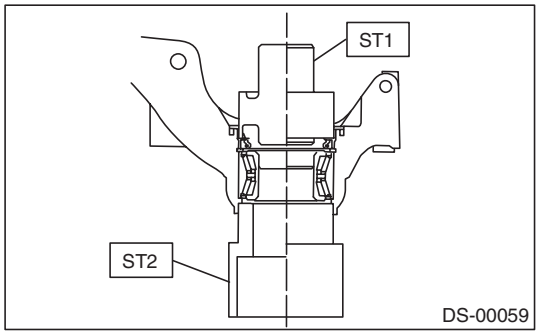
5) Using pliers, install the snap ring firmly.



6) Using the ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



7) Using the ST1 and ST2, press the inner oil seal until it contacts the circlip.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



8) Invert the ST and housing.
ST 927400000 HOUSING STAND
9) Apply sufficient grease to the oil seal lip.

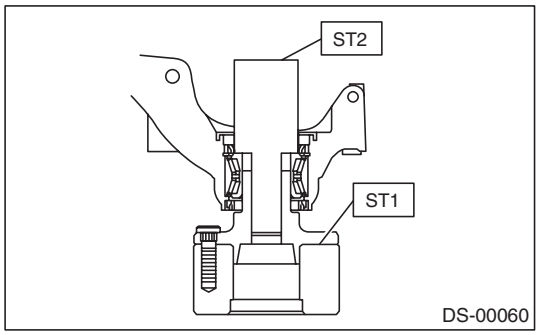
Specified grease:
SHELL 6459N

NOTE:
• If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
• Do not mix different types of grease.

10) Install the disc cover to housing with three bolts.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

11) Attach the hub to ST1 securely.
12) Clean dust or foreign particles from the polished surface of hub.
13) Using the ST2, press the bearing into hub by driving the inner race.
ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER



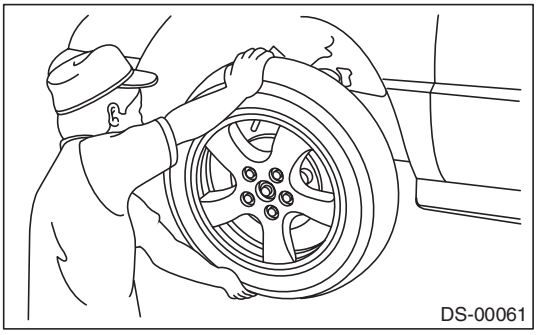
2. STi MODEL

Assembly the front hub unit bearing. <Ref. to DS-27, ASSEMBLY, Front Hub Unit Bearing.>

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E: INSPECTION

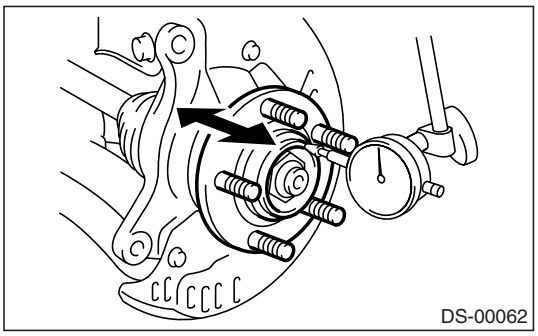
1) Moving the front tire up and down by hand, check there is no backlash in bearing, and check the wheel rotates smoothly.


DS-00061

2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceeds the limitation.

Limit:

Maximum: 0.05 mm (0.0020 in)

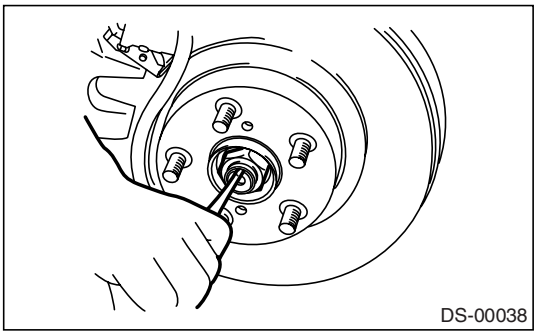

DS-00062

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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.

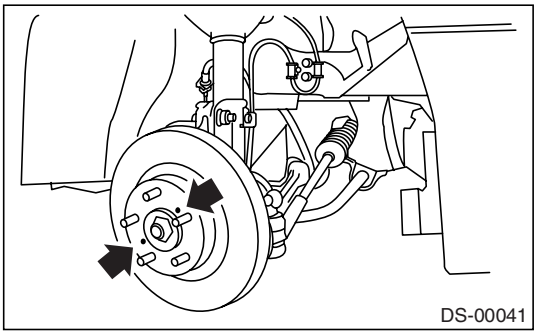


4) Remove the axle nut using a socket wrench while depressing the brake pedal.

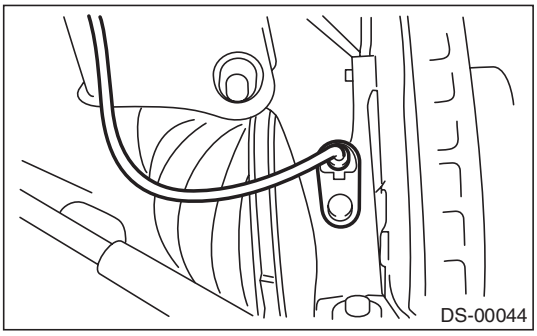
CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

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

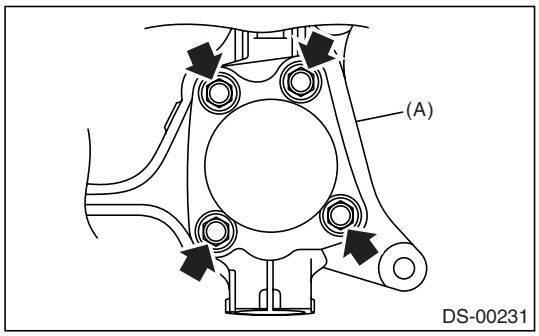
NOTE:
If the disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on rotor.



7) Remove the ABS wheel speed sensor assembly and harness.



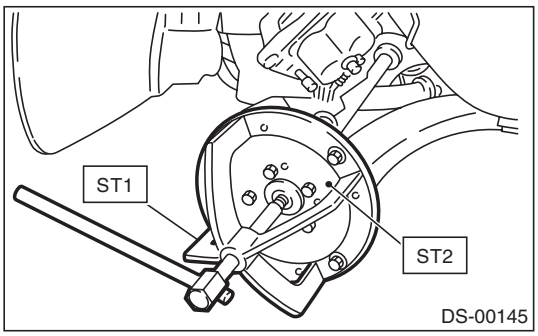
8) Remove four bolts from housing.



(A) Housing

9) Remove the front hub unit bearing. If it is hard to remove, use STs.

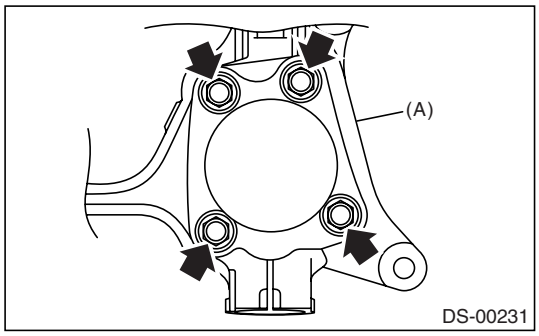
ST1	926470000	AXLE SHAFT PULLER
ST2	28099PA110	AXLE SHAFT PULLER PLATE



B: INSTALLATION

1) Tighten the front hub unit bearing to the housing with four bolts.

Tightening torque:
65 N·m (6.6 kgf-m, 48 ft-lb)



(A) Housing

2) Install the front drive shaft. <Ref. to DS-40, INSTALLATION, Front Drive Shaft.>
3) Tighten the axle nut temporarily.
4) Install the disc rotor on hub.

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5) Install the disc brake caliper on the housing.

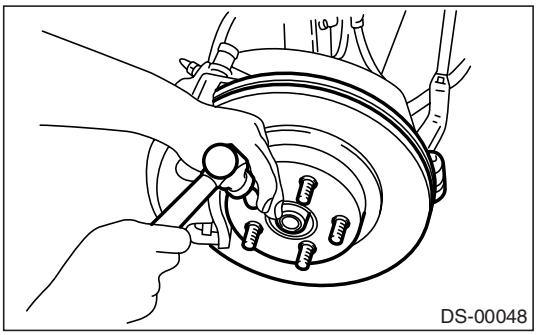
Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)

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 ABS wheel speed sensor on housing.

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

9) Install the wheel and tighten the wheel nuts to specified torque.

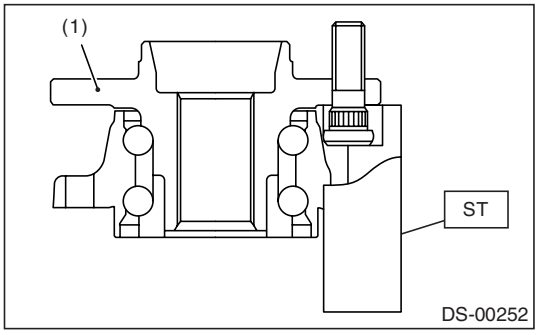
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

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.

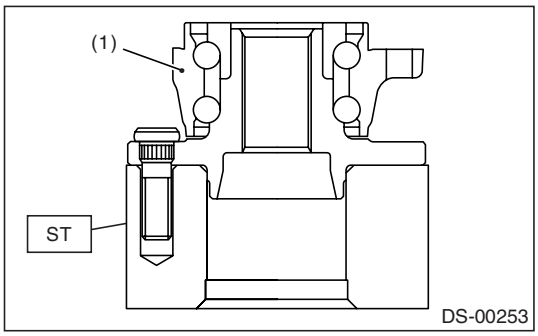
NOTE:
Since the hub unit bearing can not be disassembled, only hub bolts can be removed.



(1) Front hub unit bearing

D: ASSEMBLY

1) Attach the hub to ST securely.
ST 28099PA080 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-25, INSPECTION, Front Axle.>

CAUTION:
If there is any fault in the bearing, replace hub unit bearing.

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5. Rear Axle [AWD Model]

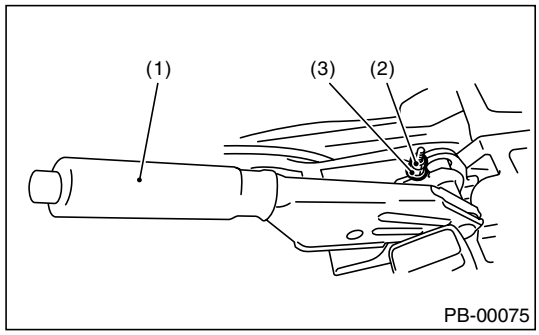
A: REMOVAL

1. DISC BRAKE

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove the rear wheel.
3) Unlock the axle nut.
4) Remove the axle nut using a socket wrench with parking brake applied.

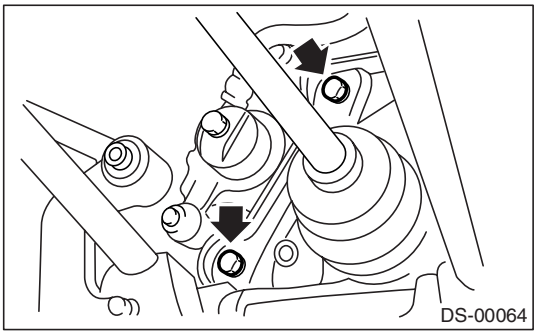
CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

5) Return the parking brake lever and loosen the adjusting nut.



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

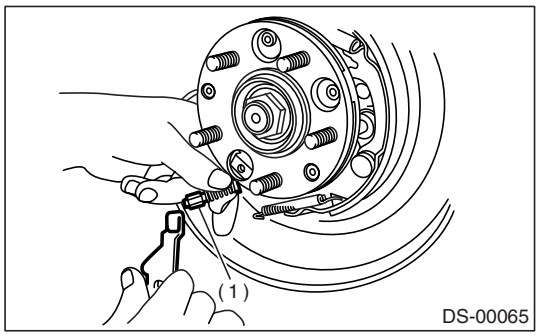
6) Remove the disc brake caliper from back plate, and suspend it from strut using a piece of wire.



7) Remove the disc rotor from hub.

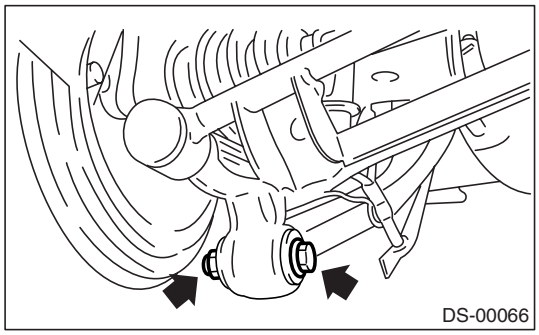
NOTE:
If the disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

8) Disconnect the parking brake cable end.

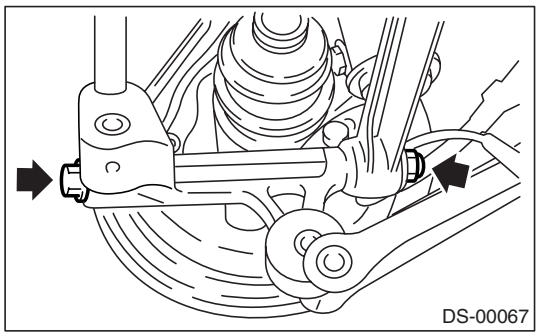


(1) Cable end

9) Disconnect the rear stabilizer from rear lateral link.
10) Remove the bolts which secure the trailing link assembly to rear housing.

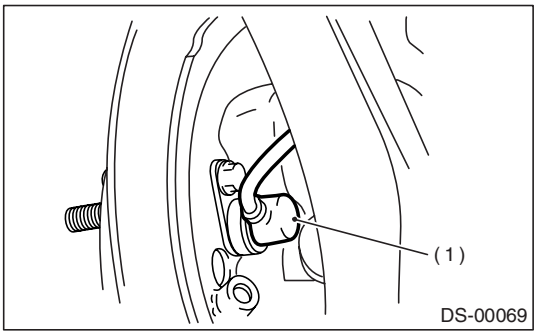


11) Remove the bolts which secure the lateral assembly to rear housing.



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12) Remove the rear ABS wheel speed sensor from back plate.

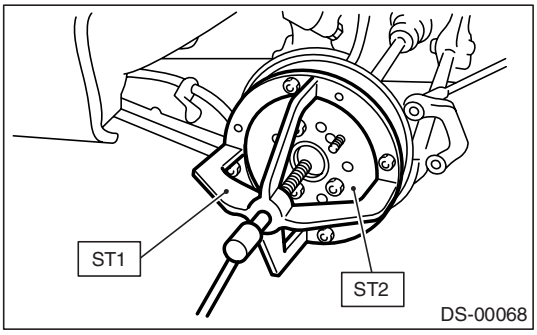


(1) ABS wheel speed sensor

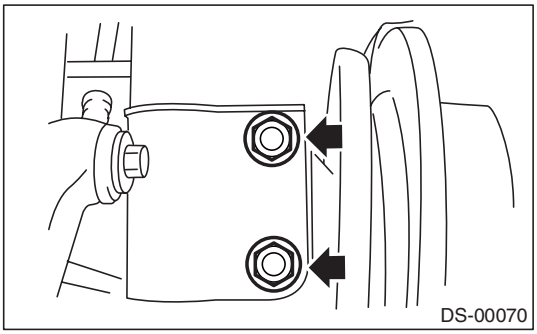
13) Disengage the BJ from housing splines, and then remove the rear drive shaft assembly.
If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	28099PA110	AXLE SHAFT PULLER PLATE

NOTE:
• Be careful not to damage the oil seal lip when removing the rear drive shaft.
• When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



14) Remove the bolts which secure the rear housing to strut, and separate the two.

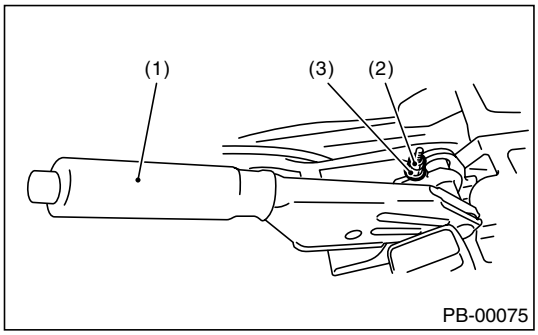


2. DRUM BRAKE

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove the rear wheel cap and wheels.
3) Unlock the axle nut.
4) Remove the axle nut using a socket wrench.

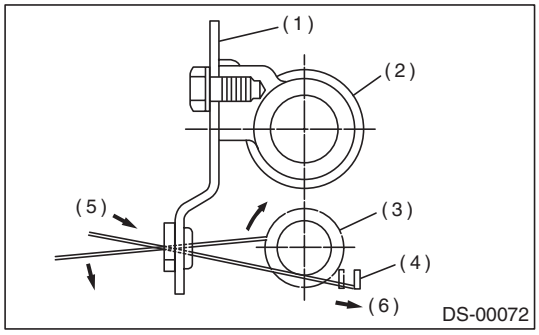
CAUTION:
Be sure to loosen and retighten the axle nut after removing the wheel from vehicle. Failure to follow this rule may damage the wheel bearings.

5) Return the parking brake lever and loosen the adjusting nut.



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

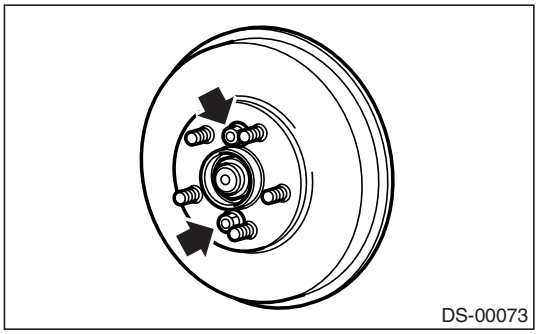
6) Remove the brake drum from hub.
7) If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn the adjusting screw using a flat tip screwdriver until the brake shoe separates from drum.



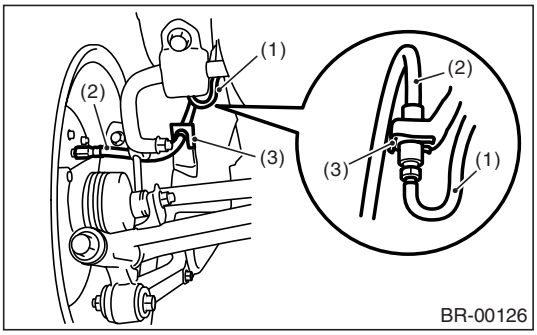
(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push

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NOTE:
If the brake drum is difficult to remove, drive it out by installing two 8-mm bolts into bolt hole in brake drum.

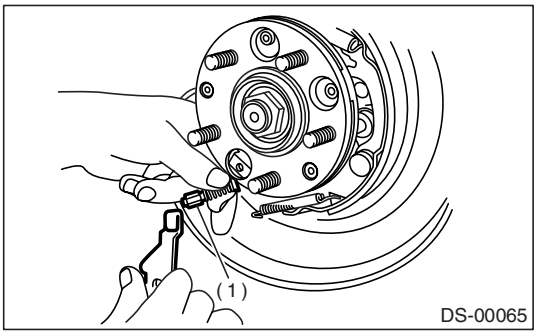


8) Remove the brake hose clamp from the rear strut portion, and separate the brake hose.



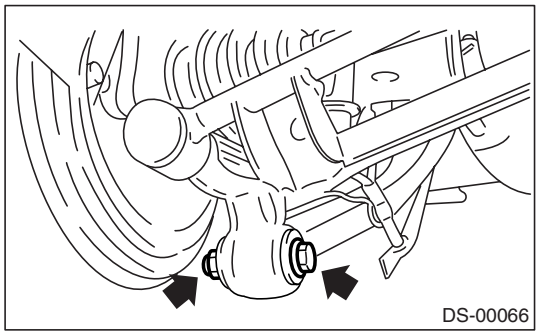
(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

9) Cover the open end of brake pipe with vinyl sheet or equivalent to prevent brake fluid from spilling.
10) Disconnect the parking brake cable end.

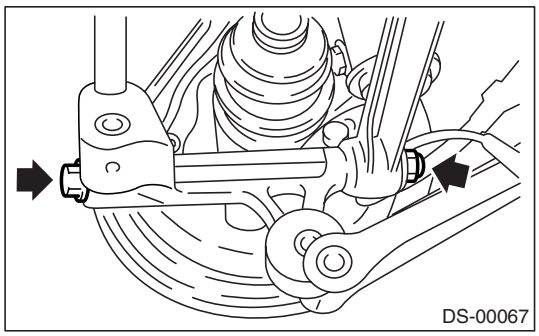


(1) Cable end

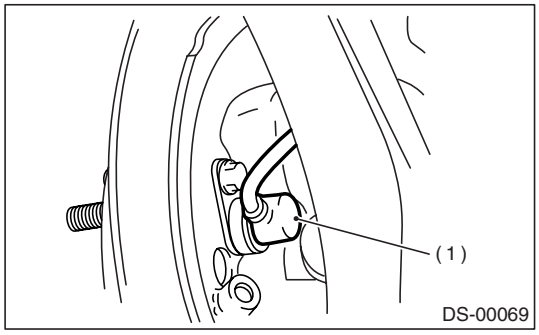
11) Disconnect the rear stabilizer from rear lateral link. Remove the bolts which secure the trailing link assembly to rear housing.



12) Remove the bolts which secure the lateral link assembly to rear housing.



13) Remove the rear ABS wheel speed sensor from back plate.



(1) ABS wheel speed sensor

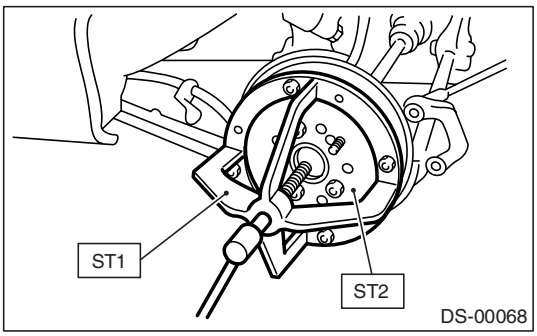
14) Disengage the BJ from housing splines, and remove the rear drive shaft assembly.
If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	28099PA110	AXLE SHAFT PULLER PLATE

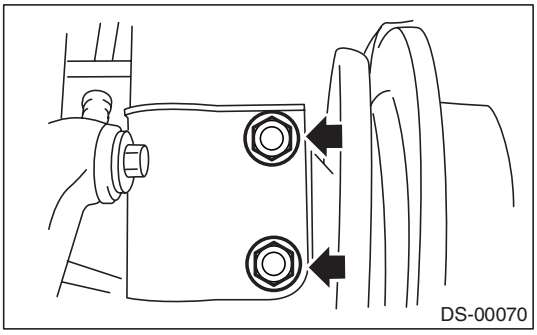
CAUTION:
• Be careful not to damage the oil seal lip when removing the rear drive shaft.

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• When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



15) Remove the bolts which secure the rear housing to strut, and separate the two.



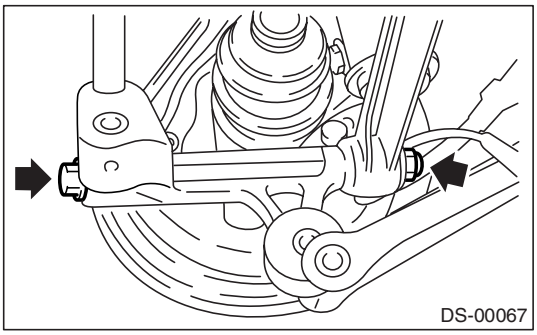
B: INSTALLATION

1. DISC BRAKE

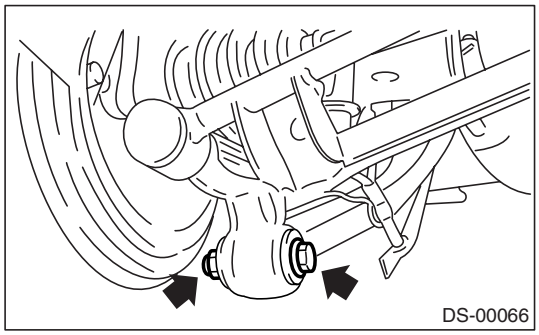
1) Temporarily tighten the rear axle to strut.
2) Insert the rear drive shaft into rear axle.

NOTE:
Be careful not to damage the inner oil seal lip.

3) Temporarily tighten the axle nut.
4) Using a new self-locking nut, temporarily tighten the rear housing assembly and lateral link assembly.



5) Using a new self-locking nut, temporarily tighten the rear housing assembly and trailing link assembly.



6) Tighten the rear housing assembly and strut assembly using a new self-locking nut.

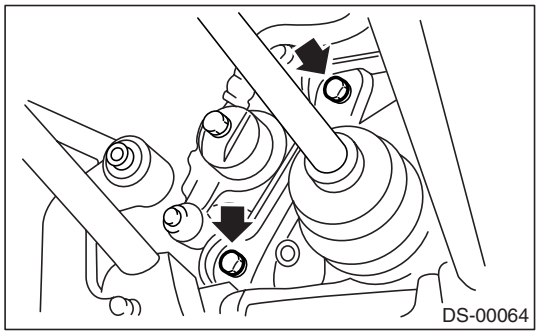
Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)

7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

8) Connect the parking brake cable to parking brake.
9) Install the disc rotor on rear housing assembly.
10) Install the disc brake caliper on back plate.

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



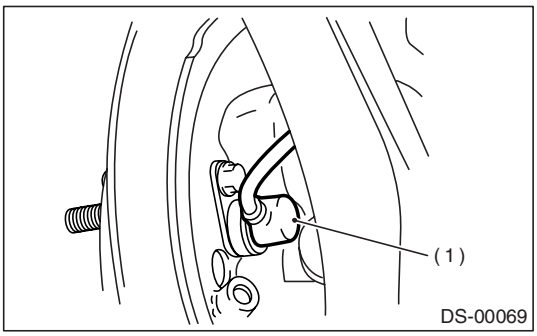
11) Adjust the parking brake lever stroke by turning the adjuster.
12) While applying the parking brake, tighten a new axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
Do not overtighten it as this may damage the wheel bearing.

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13) Install rear ABS wheel speed sensor.



(1) ABS wheel speed sensor

14) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

15) Make the tires contact the ground fully.

CAUTION:
Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

16) Tighten the installation bolt of rear housing assembly and lateral link assembly.

Tightening torque:
137 N·m (14 kgf-m, 101 ft-lb)

17) Tighten the installation bolt of rear housing assembly and trailing link assembly.

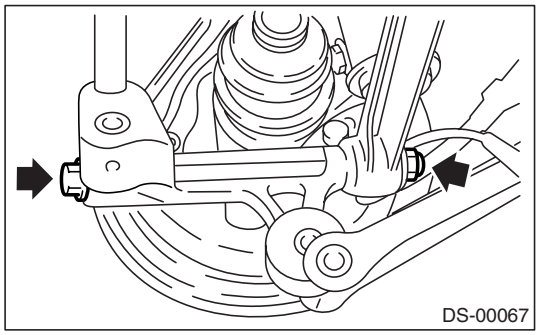
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

2. DRUM BRAKE

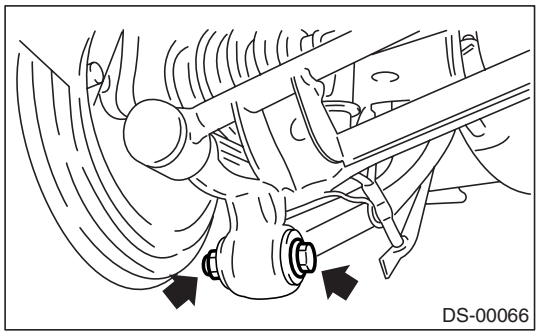
1) Using a new self-locking nut, temporarily tighten the rear axle to strut.
2) Insert the rear drive shaft to rear axle.

NOTE:
Be careful not to damage the inner oil seal lip.

3) Using a new axle nut, temporarily tighten the rear drive shaft.
4) Using a new self-locking nut, temporarily tighten the rear housing assembly and lateral link assembly.



5) Using a new self-locking nut, temporarily tighten the rear housing assembly and trailing link assembly.



6) Tighten the rear housing assembly and strut assembly using a new self-locking nut.

Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)

7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

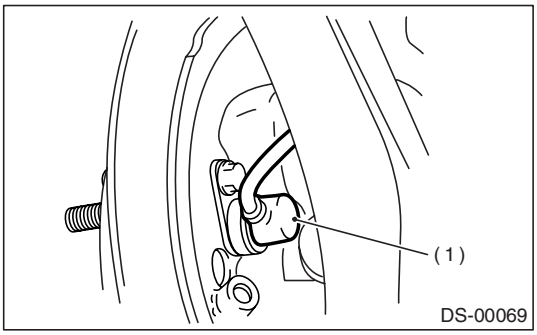
8) Connect the parking brake cable to parking brake.
9) Clean the brake pipe connection. Using a flare-nut wrench, connect the brake pipe to wheel cylinder.
10) Connect the parking brake cable to lever.
11) Install the brake drum on rear housing assembly.
12) Adjust the parking lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>
13) Apply parking brake, tighten the axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
Do not overtighten it as this may damage the wheel bearing.

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14) Connect the rear ABS wheel speed sensor to back plate.



(1) ABS wheel speed sensor

15) Bleed the air from brake system. <Ref. to BR-61, REPLACEMENT, Brake Fluid.>
16) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

17) Make the tires contact the ground fully.

CAUTION:
Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

18) Tighten the installation bolt of rear housing assembly and lateral link assembly.

Tightening torque:
137 N·m (14 kgf-m, 101 ft-lb)

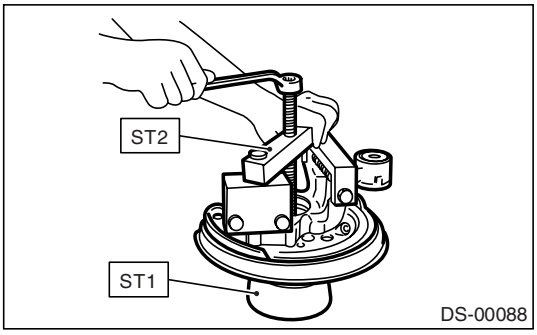
19) Tighten the installation bolt of rear housing assembly and trailing link assembly.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

1) Using the ST1 and ST2, remove the hub from rear housing.

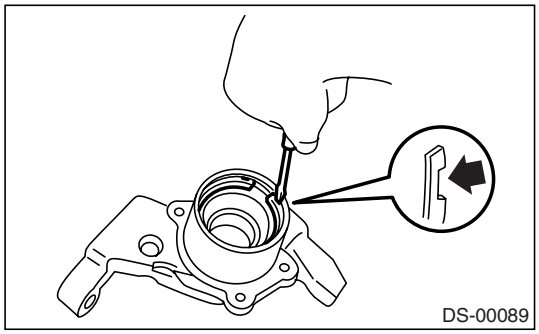
ST1	927080000	HUB STAND (Except STi model)
ST1	28099PA080	HUB STAND (STi model)
ST2	927420000	HUB REMOVER



2) Remove the back plate from rear housing.

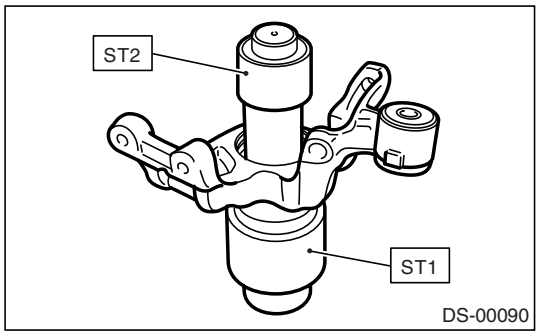
3) Using a standard screwdriver, remove the outer and inner oil seals.
4) Using a flat tip screwdriver, remove the snap ring.

NOTE:
Be careful not to damage the housing at removal.



5) Using the ST1 and ST2, remove the bearing by pressing the inner race.

ST1	927430000	HOUSING STAND (Except STi model)
ST1	28099PA060	HOUSING STAND (STi model)
ST2	927440000	BEARING REMOVER (Except STi model)
ST2	927100000	BEARING INSTALLER (STi model)

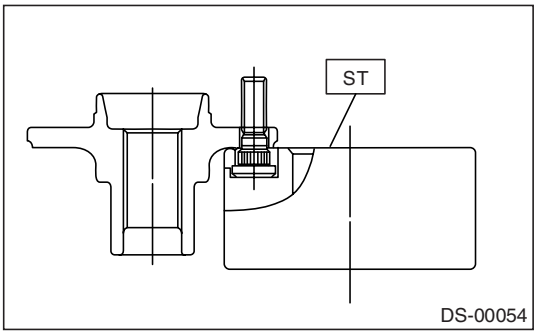


6) Remove the tone wheel bolts, and then remove the tone wheel from hub (Model with ABS).
7) Using the ST, press the hub bolt out.

ST	927080000	HUB STAND (Except STi model)
ST	28099PA080	HUB STAND (STi model)

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CAUTION:
Be careful not to hammer the hub bolts. This may deform the hub.



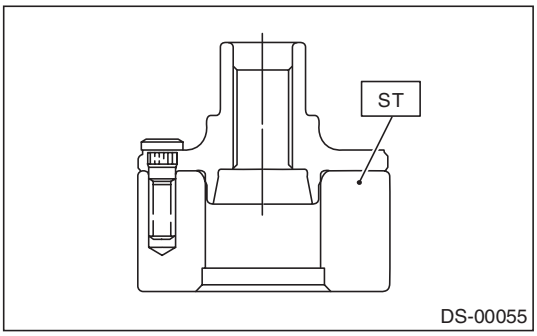
D: ASSEMBLY

NOTE:
When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Using the ST, press the new hub bolt into place.

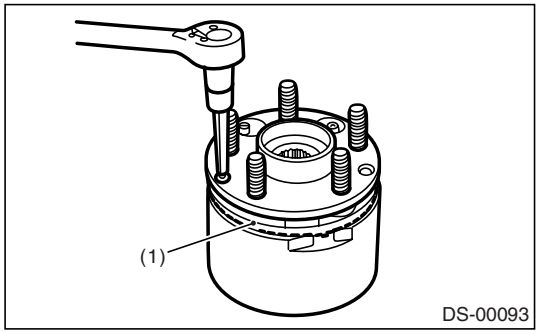
NOTE:
- Ensure the hub bolt closely contacts the hub.
- Use a 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

ST	927080000	HUB STAND (Except STi model)
ST	28099PA080	HUB STAND (STi model)



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of the hub tone wheel, and then install the tone wheel to hub (Model with ABS).

NOTE:
- Ensure the tone wheel closely contacts the hub.
- Be careful not to damage the tone wheel teeth.

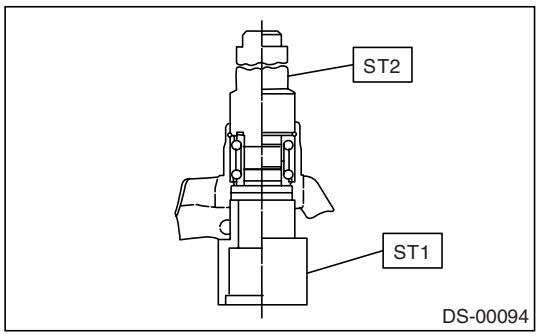


(1) Tone wheel

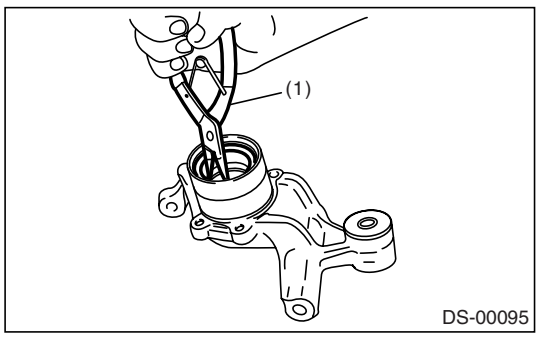
3) Clean the housing interior completely. Using the ST1 and ST2, press the bearing into housing.

ST1	927430000	HOUSING STAND (Except STi model)
ST1	28099PA060	HOUSING STAND (STi model)
ST2	927440000	BEARING REMOVER (Except STi model)
ST2	927100000	BEARING INSTALLER (STi model)

NOTE:
- Always press the outer race when installing the bearing.
- Be careful not to remove the plastic lock from inner race when installing the bearing.



4) Using pliers, install the snap ring firmly.

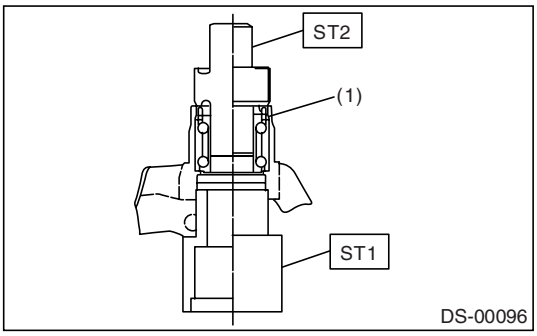


(1) Pliers

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5) Using the ST1 and ST2, press the outer oil seal until it comes in contact with snap ring.

ST1	927430000	HOUSING STAND (Except STi model)
ST1	28099PA060	HOUSING STAND (STi model)
ST2	927460000	OIL SEAL INSTALLER (Except STi model)
ST2	28099PA070	OIL SEAL INSTALLER (STi model)

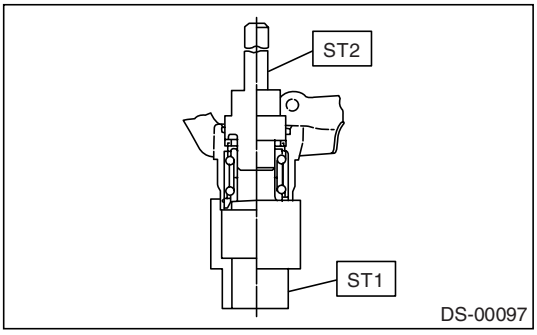


(1) Snap ring

6) Invert both ST1 and housing.

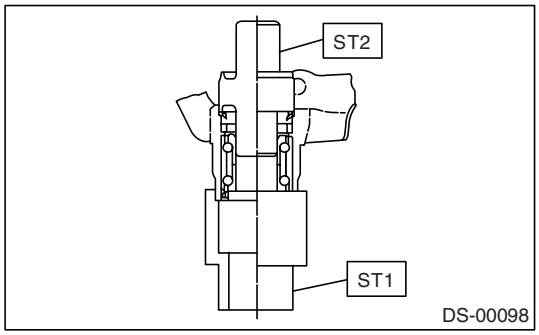
7) Using the ST2, press the inner oil seal into housing until it touches the bottom.

ST1	927430000	HOUSING STAND (Except STi model)
ST1	28099PA060	HOUSING STAND (STi model)
ST2	927460000	OIL SEAL INSTALLER (Except STi model)
ST2	28099PA070	OIL SEAL INSTALLER (STi model)



8) Using the ST1 and ST2, press the sub seal into place.

ST1	927430000	HOUSING STAND (Except STi model)
ST1	28099PA060	HOUSING STAND (STi model)
ST2	927460000	OIL SEAL INSTALLER (Except STi model)
ST2	28099PA070	OIL SEAL INSTALLER (STi model)



9) Apply sufficient grease to oil seal lip.

Specified grease:
SHELL 6459N

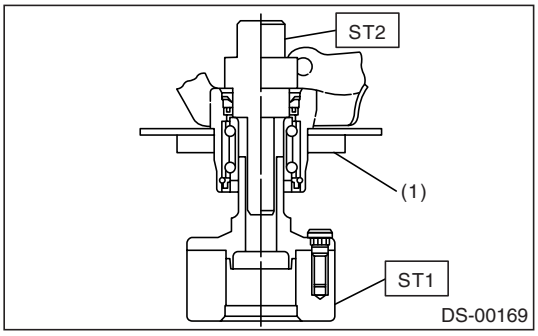
NOTE:
• If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
• Do not mix different types of grease.

10) Install the back plate to rear housing.

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

11) Using the ST1 and ST2, press the bearing into hub.

ST1	927080000	HUB STAND (Except STi model)
ST1	28099PA080	HUB STAND (STi model)
ST2	927450000	HUB INSTALLER (Except STi model)
ST2	927120000	HUB INSTALLER (STi model)

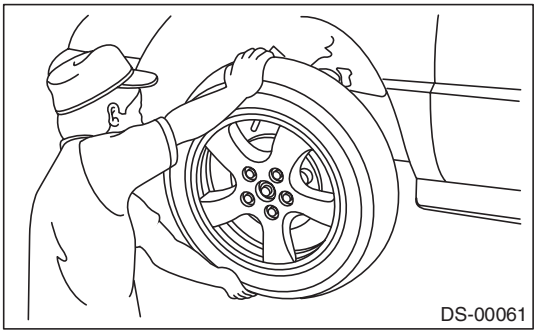


(1) Back plate

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E: INSPECTION

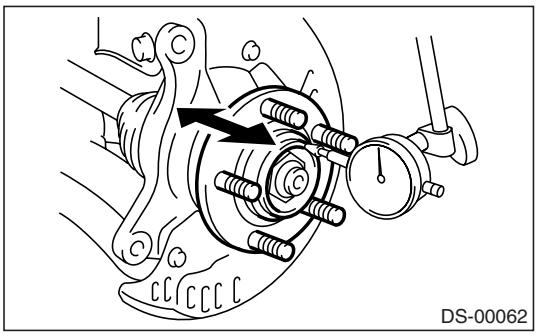
1) Moving the rear tire up and down by hand, check there is no backlash in bearing, and check the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceeds the limitation.

Limit:

Maximum: 0.05mm (0.0020 in)



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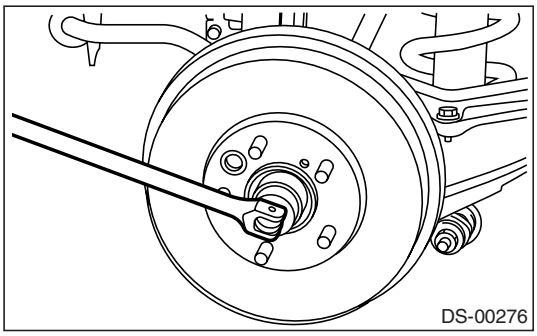
6. Rear Axle [FWD Model]

A: REMOVAL

CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

1) Apply the parking brake.
2) Lift-up the vehicle and remove the rear wheel.
3) Release the caulking of axle nut.
4) Remove the axle nut by socket wrench of 32 mm.

CAUTION:
Remove the axle nut with wheel removed.



5) Release the parking brake, loosen the adjuster.
6) Remove the drum brake from hub. <Ref. to BR-49, REMOVAL, Rear Drum Brake Drum.>
7) Using a flare nut wrench, disconnect the brake pipe from wheel cylinder.

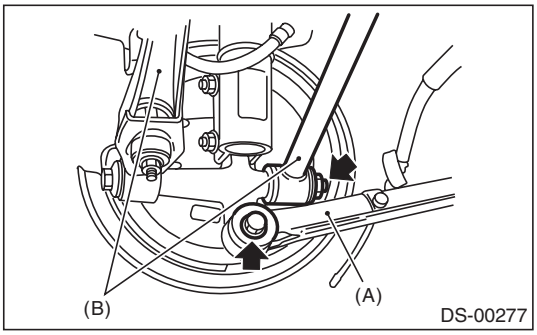
CAUTION:
Cover the brake pipe connection to protect it from dust.

8) Separate the rear spindle from lateral link assembly.

CAUTION:
Do not reuse the self-locking nut.

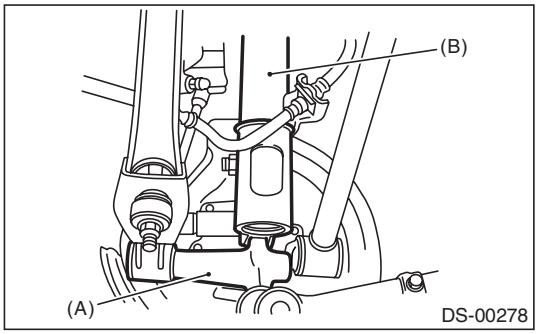
9) Separate the rear spindle from trailing link assembly.

CAUTION:
Do not reuse the self-locking nut.



(A) Trailing link
(B) Lateral link

10) Remove the bolt which combines the rear spindle and strut assembly, and then remove the rear spindle, back plate and hub unit as a unit.



(A) Rear spindle
(B) Strut ASSY

B: INSTALLATION

1) Combine the rear spindle assembly and strut assembly.

Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)

CAUTION:
Use a new self-locking nut.

2) Combine the rear spindle assembly and trailing link assembly.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

CAUTION:
Use a new self-locking nut.

3) Combine the rear spindle assembly and lateral link assembly.

Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)

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4) Clean the brake pipe connection, and then connect the brake pipe to wheel cylinder using a flare nut wrench.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

5) Connect the cable end of parking brake cable. <Ref. to PB-7, INSTALLATION, Parking Brake Cable.>
6) Install the drum brake to rear spindle.
7) Tighten the axle nut using a socket wrench of 32 mm, then caulk the axle nut.

Tightening torque:
200 N·m (20.0 kgf-m, 145 ft-lb)

8) Install the O-ring to cap flange portion, and then tap the hub cap by plastic hammer to install it.

CAUTION:
- **Do not tap directly by copper hammer.**
- **If O-ring has scratches, replace it with a new one.**
- **If hub cap has deformed flange, replace it.**

9) Install the wheel and wheel cap.

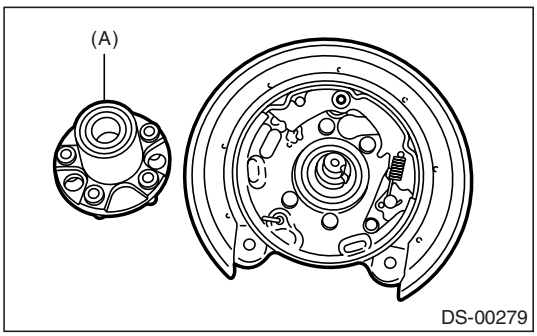
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

10) Connect the battery ground cable to battery.
11) Bleed air from brake system. <Ref. to BR-63, PROCEDURE, Air Bleeding.>
12) Adjust the stroke of parking brake lever. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

C: DISASSEMBLY

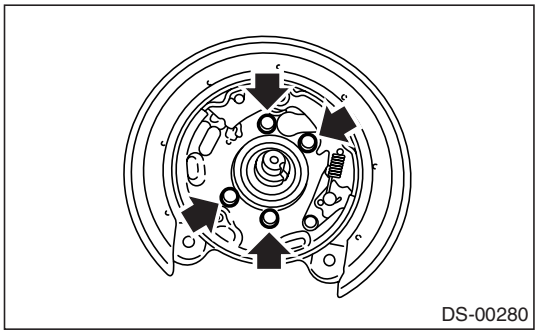
CAUTION:
Disassembly the rear axle only when rattling, dragging, noise or etc. are found on bearing.

1) Remove the hub unit from rear spindle.



(A) Hub unit

2) Remove the drum brake assembly or parking brake assembly from rear spindle.



D: ASSEMBLY

1) Completely remove away dust and foreign material on polished surface and mounting surface of rear spindle to drum brake assembly
2) Install the drum brake assembly or parking brake assembly to rear spindle.

Tightening torque:
53 N·m (5.3 kgf-m, 39.1 ft-lb)

3) Fill grease to oil seal at rear side of hub unit.

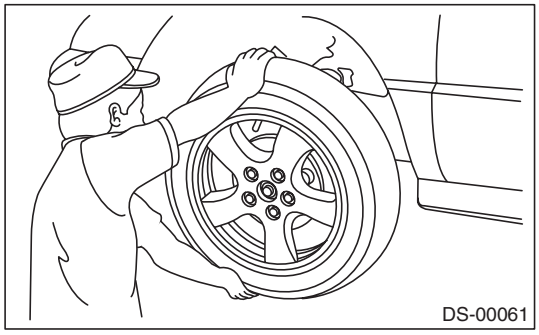
Grease:
Shell 6459N

4) Install the hub unit to rear spindle and hold them with washer and axle nut temporarily.

CAUTION:
Use a new axle nut.

E: INSPECTION

1) Moving the rear tire up and down by hand, check there is no backlash in bearing, and check the wheel rotates smoothly.

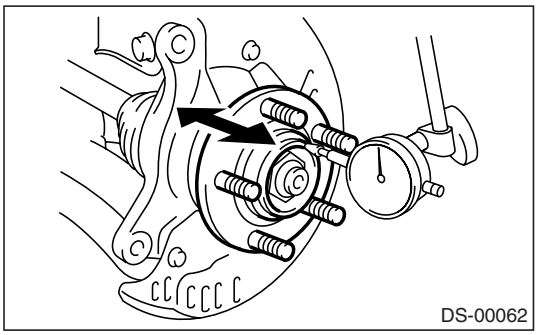


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2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceeds the limitation.

Limit:

Maximum: 0.05 mm (0.0020 in)



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7. Front Drive Shaft

A: REMOVAL

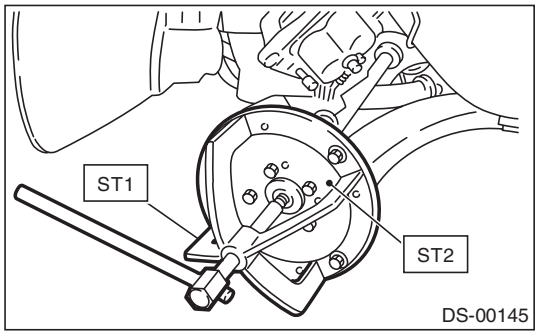
1) Jack-up the vehicle, support it with rigid racks, and then remove the wheels.
2) Raise the caulking portion of axle nut.
3) Depress the brake pedal and remove the axle nut using a socket wrench.

CAUTION:
Be sure to loosen the axle nut after removing the wheel from vehicle. Failure to follow this rule may damage the wheel bearings.

4) Remove the stabilizer link from transverse link.
5) Disconnect the transverse link from housing.
6) Remove the front drive shaft assembly. If it is hard to remove, use the ST1 and ST2.

ST1	926470000	AXLE SHAFT PULLER
ST2	28099PA110	AXLE SHAFT PULLER PLATE

CAUTION:
• Be careful not to damage the oil seal lip and tone wheel when removing the front drive shaft.
• When the front drive shaft is to be replaced, also replace the inner oil seal.



7) Remove the front drive shaft from transmission using bar.

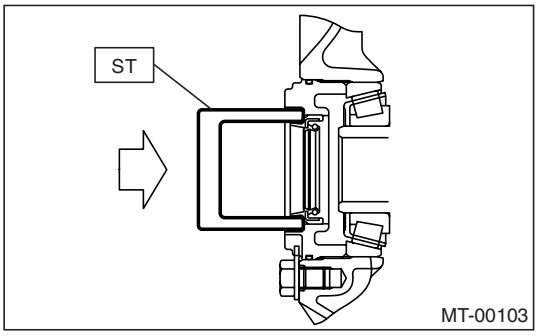
CAUTION:
Be careful not to damage the holder portion.

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.

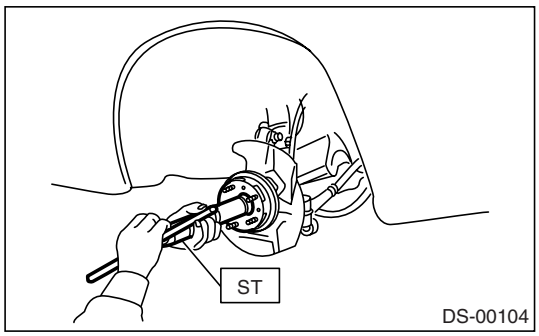


2) Insert the EBJ into hub splines.

CAUTION:
Be careful not to damage the inner oil seal lip and tone wheel.

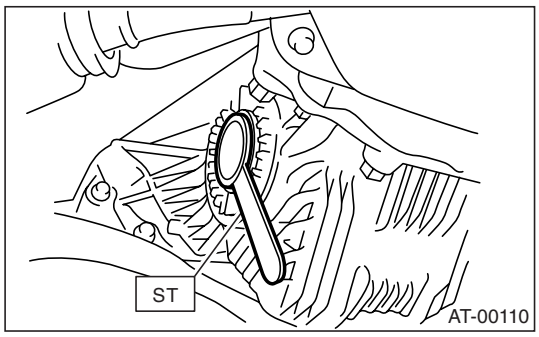
3) Using the ST1 and ST2, pull the drive shaft into place.

ST1	922431000	AXLE SHAFT INSTALLER
ST2	927390000	ADAPTER



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 transverse link to housing.

Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)

7) Install the stabilizer bracket.

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8) While depressing the brake pedal, tighten the axle nut to specified torque.

Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

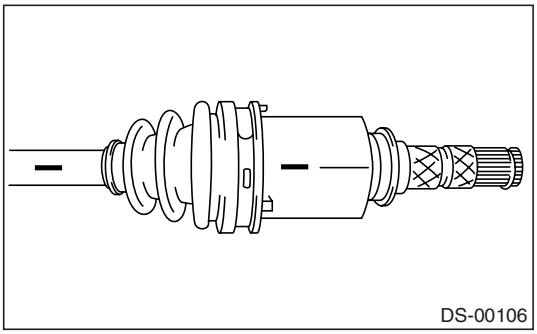
CAUTION:
• Always tighten the axle nut before installing wheel on vehicle. If the tire is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
• Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

9) After tightening the axle nut, caulk and lock it.

C: DISASSEMBLY

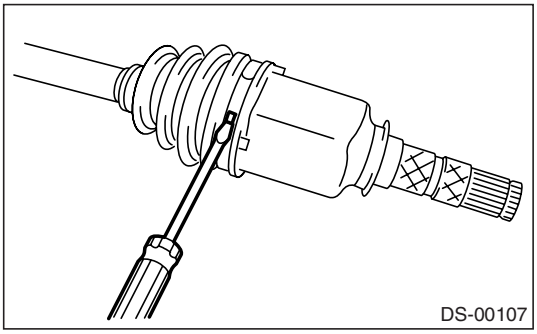
1. EBJ+PTJ TYPE

1) Place alignment marks on shaft and outer race.

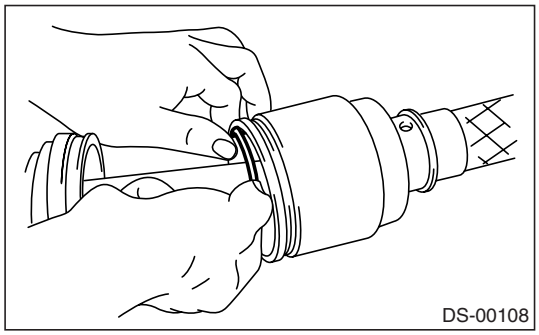

DS-00106

2) Remove the PTJ boot band and boot.

CAUTION:
Be careful not to damage the boot.


DS-00107

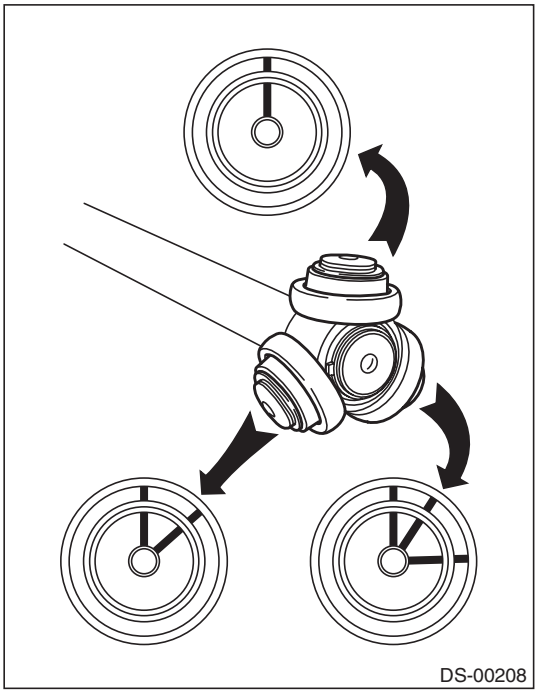
3) Remove the circlip from PTJ outer race using a screwdriver.


DS-00108

4) Remove the PTJ outer race from shaft assembly.
5) Wipe off the grease.

CAUTION:
The grease is a special grease. Do not confuse with other greases.

6) Place alignment marks on free ring and trunnion.

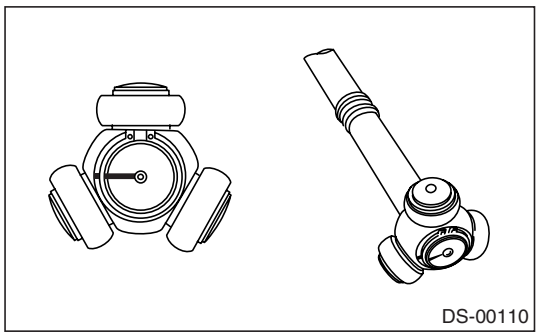

DS-00208

7) Remove the free ring from trunnion.

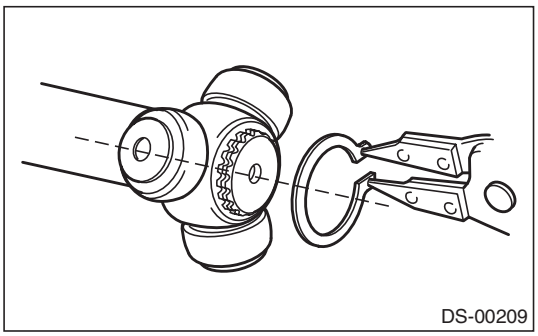
CAUTION:
Be careful with the free ring position.

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8) Place an alignment mark on trunnion and shaft.



9) Remove the snap ring and trunnion.

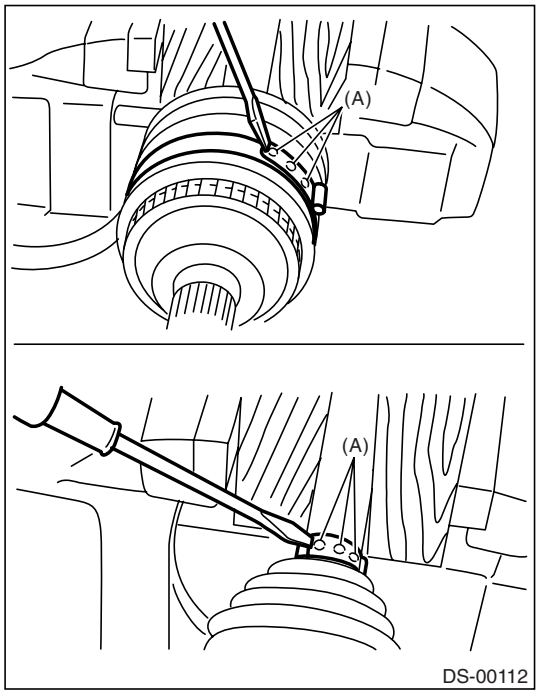


CAUTION:
Be sure to wrap the shaft splines with vinyl tape to prevent the boot from scratches.

10) Remove the PTJ boot.
11) Place the drive shaft in a vise between wooden blocks.

CAUTION:
Do not place the drive shaft directly in a vise; use wooden block.

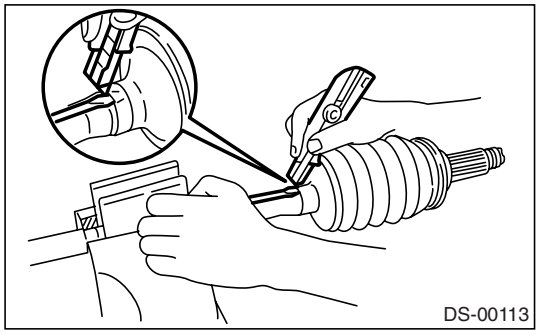
12) Raise the boot band claws by means of screwdriver and hammer.



(A) Boot band claws

13) Cut and remove the boot.

CAUTION:
The boot must be replaced with a new one whenever it is removed.



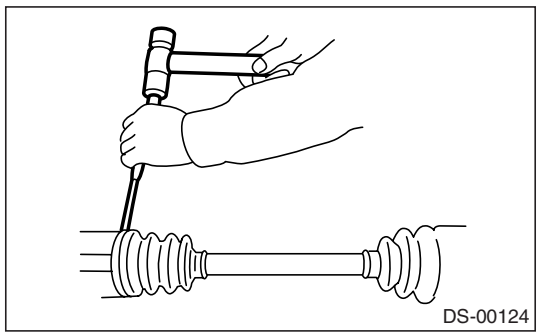
NOTE:
Further disassembly of axle is impossible because the EBJ cannot be disassembled.

2. BJ+DOJ TYPE

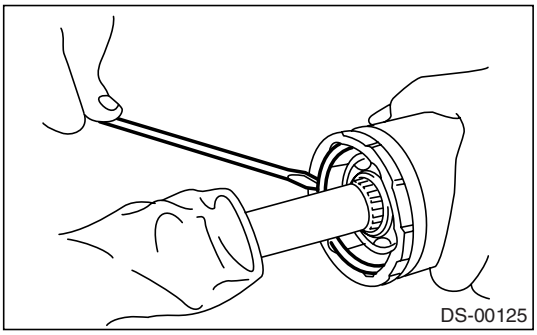
1) Straighten the bent claw of larger end of DOJ boot.

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2) Loosen the band by means of screwdriver or pliers with care of not damaging boot.

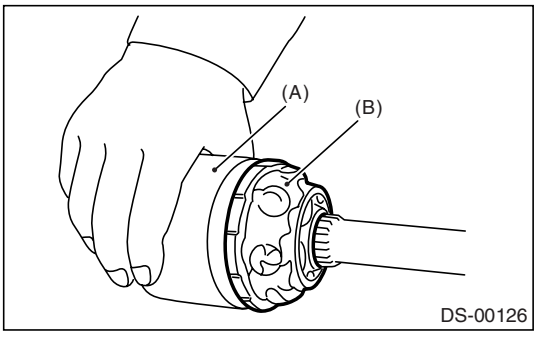

DS-00124

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 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 then take out the balls.

NOTE:
• The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.
• Disassemble with 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 the inner race to shaft, by using pliers.
10) Take out the DOJ inner race.
11) Take off the DOJ cage from shaft and remove the DOJ boot.
12) Wrap the shaft splines with vinyl tape.
13) Remove the BJ boot in the same procedure as DOJ boot.

NOTE:
Further disassembly of axle is impossible because the BJ cannot be disassembled.

D: ASSEMBLY

1. EBJ+PTJ TYPE

NOTE:
Use specified grease.

EBJ side:
NTG2218-M (Part No. 28395AG010)

PTJ side:
NSG301 (Part No. 28395AG020)

1) Place the EBJ boot and small boot band on EBJ side of shaft.

CAUTION:
Be sure to wrap the shaft splines with vinyl tape to prevent the boot from scratches.

2) Place the drive shaft in a vise.

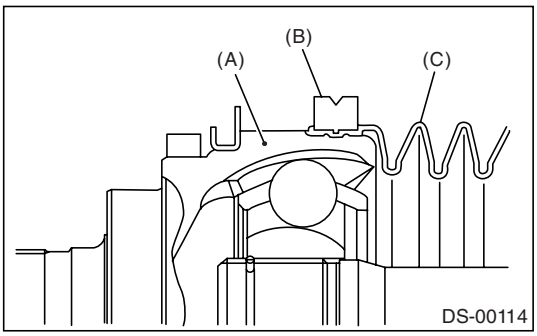
CAUTION:
Do not place the drive shaft directly in a vise; use wooden blocks.

3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to EBJ.
4) Apply an even coat of specified grease [20 to 30 g (0.71 to 1.06 oz)] to entire inner surface of boot. Also apply grease to shaft.

NOTE:
EBJ installation surface of EBJ boot shall be cleaned so as to be free from grease and other substances.

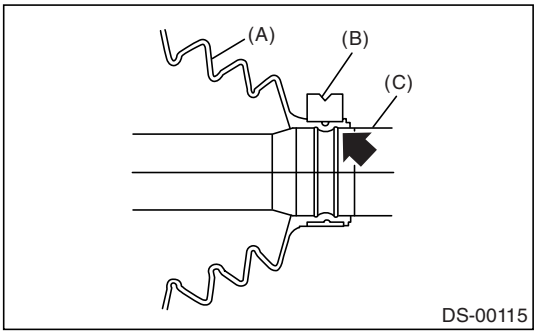
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5) Install the boot projecting portion to EBJ groove.



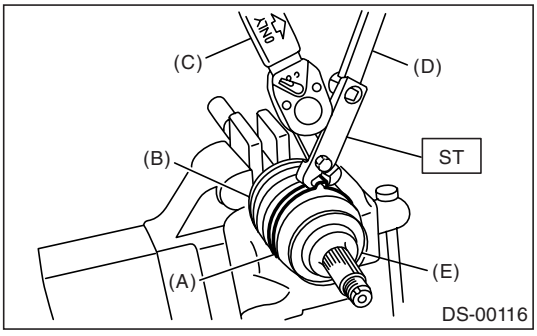
(A) EBJ
(B) Large boot band
(C) Boot

6) Set the large boot band in place.
7) Install the boot projecting portion to shaft groove.



(A) Boot
(B) Small boot band
(C) Shaft

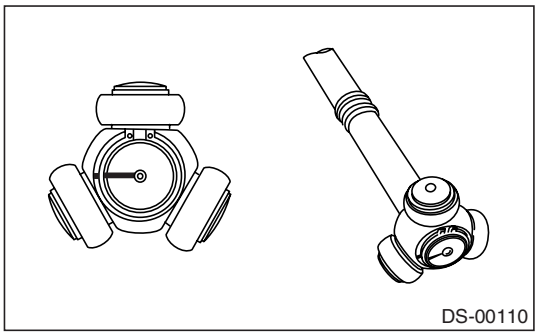
8) Tighten the boot bands using the ST, torque wrench and socket flex handle.
ST 28099AC000 BOOT BAND PLIER



(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) EBJ

Tightening torque:
Large boot band
157 N·m (16.0 kgf-m, 116 ft-lb) or more
Small boot band
133 N·m (13.6 kgf-m, 98 ft-lb) or more

9) Place the PTJ boot at the center of shaft.
10) Align the alignment marks, and then install the trunnion on shaft.

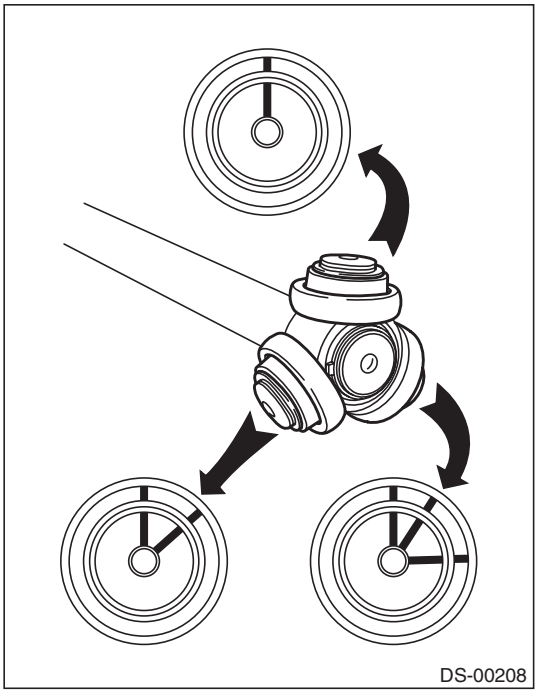


11) Install the snap ring to shaft.

CAUTION:
Confirm that the snap ring is completely fitted in shaft groove.

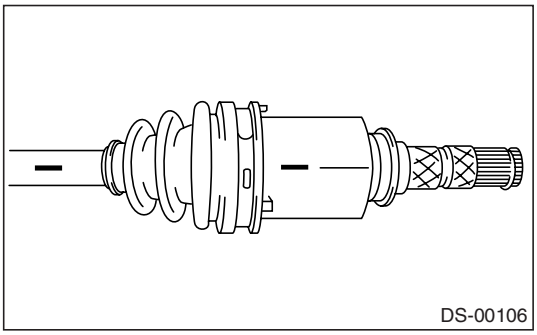
12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of PTJ outer race.
13) Apply a coat of specified grease to free ring and trunnion.
14) Align the alignment marks on free ring and trunnion, and then install the free ring.

CAUTION:
Be careful with the free ring position.



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15) Align the alignment marks on shaft and outer race, and then install the outer race.



16) Install the circlip in the groove on PTJ outer race.

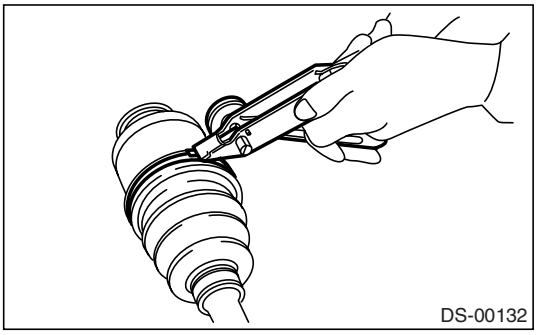
CAUTION:
Pull the shaft lightly and assure the circlip is completely fitted in groove.

17) 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.
18) Install the PTJ boot taking care not to twist it.

CAUTION:
• PTJ installation surface of PTJ boot shall be cleaned so as to be free from grease and other substances.
• When installing the PTJ boot, position the outer race of PTJ at center of its travel.

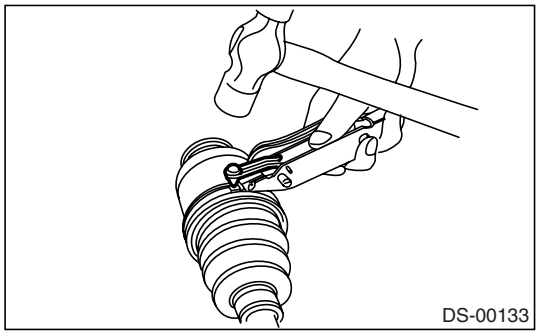
19) Put a new band through the clip and wind twice in alignment with band groove of boot.
20) Tighten the band by using the ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.



21) Tap on the clip with punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.



22) Cut off the band with an allowance of about 10 mm (0.39 in) left from clip, and bend this allowance over clip.

CAUTION:
Be careful so that the end of band is in close contact with clip.

23) Extend and retract the SFJ to provide equal grease coating.

2. BJ+DOJ TYPE

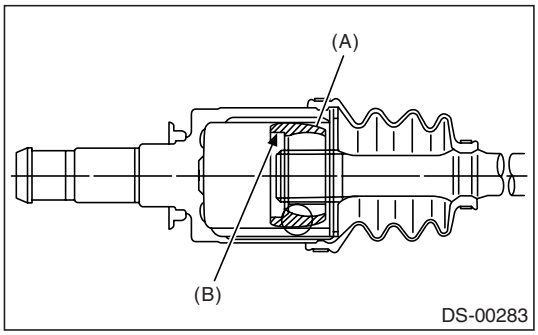
NOTE:
Use specified grease.

BJ side:
NTG2218-M (Part No. 28395AG030)

DOJ side:
NKG205 (Part No. 28495AG010)

1) Install the BJ 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.
3) Wrap the shaft splines with vinyl tape.
4) Insert the DOJ cage onto shaft.

NOTE:
Insert the cage with cut-out portion facing the shaft end, since the cage has an orientation.

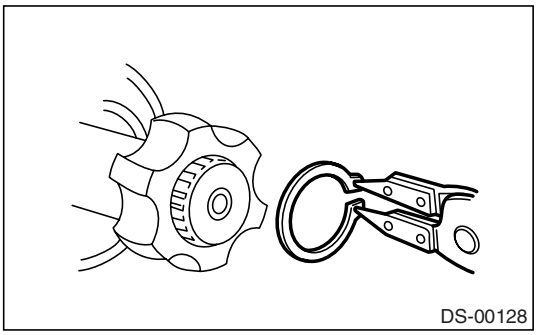


(A) Cage
(B) Cut-out portion

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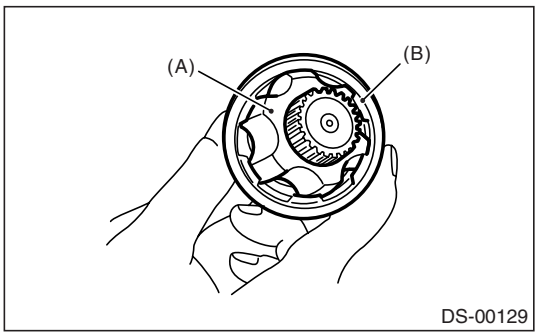
5) Install the DOJ inner race on shaft, and fit the snap ring with pliers.

NOTE:
Confirm the snap ring is completely fitted in shaft groove.


DS-00128

6) Install the cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:
Fit the cage with protruded part aligned with the track on inner race, and then turn by a half pitch.

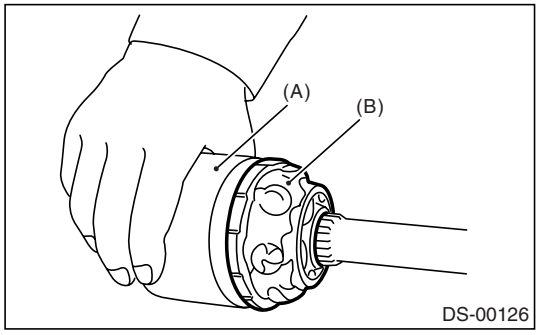


DS-00129

(A) Inner race
(B) Cage

7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.
8) Apply a coat of specified grease to cage pocket and six balls.
9) Insert six balls into cage pocket.

10) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit the outer race.

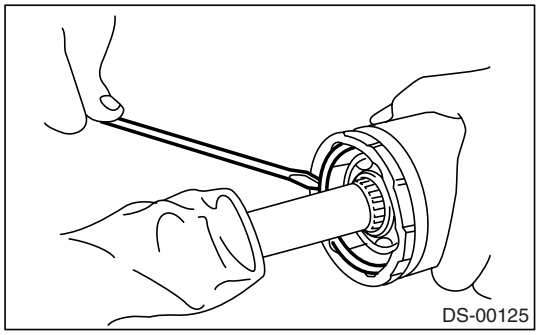


DS-00126

(A) Outer race
(B) Grease

11) Install the circlip in the groove on DOJ outer race.

NOTE:
• Assure the balls, cage and inner race are completely fitted in the outer race of DOJ.
• Exercise care not to place the matched position of circlip in ball groove of outer race.
• Pull the shaft lightly and assure that the circlip is completely fitted in groove.


DS-00125

12) 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.
13) Install the DOJ boot taking care not to twist it.

NOTE:
• Inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
• When installing the DOJ boot, position the outer race of DOJ at center of its travel.

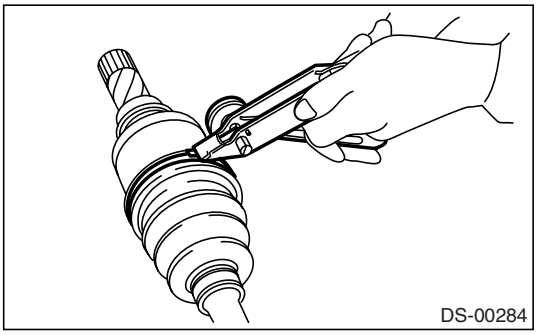
14) Put a new band through the clip and wind twice in alignment with band groove of boot.

NOTE:
When tightening the boot, exercise care so that air within boot is appropriate.

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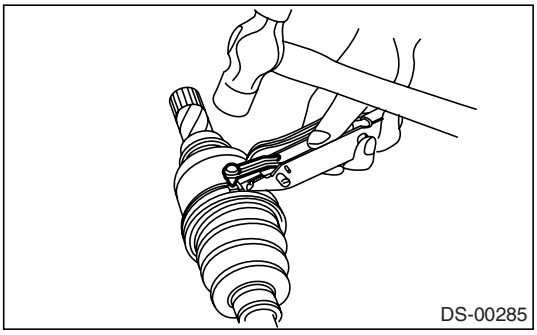
15) Tighten the band using the ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.



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.



17) Cut off the band with an allowance of about 10 mm (0.39 in) left from clip, and bend this allowance over the clip.

NOTE:
Be careful so that the end of band is in close contact with clip.

18) Fix up the boot on BJ in the same manner.
19) Extend and retract the DOJ to provide equal grease coating.

E: INSPECTION

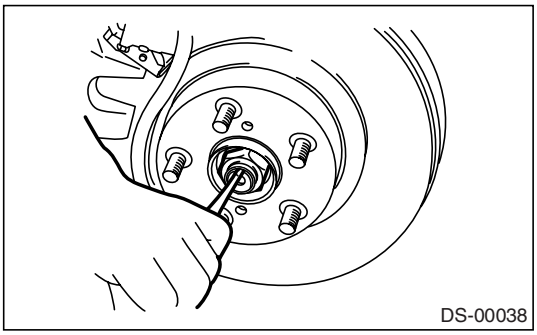
Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) DOJ (Double Offset Joint)
Check seizure, corrosion, damage, wear and excessive play.
2) PTJ (Pillow tripod Joint)
Check seizure, corrosion, damage and excessive play.
3) Shaft
Check excessive bending, twisting, damage and wear.
4) EBJ (High-efficiency compact ball fixed joint)
Check seizure, corrosion, damage and excessive play.
5) Boot
Check for wear, warping, breakage or scratches.
6) Grease
Check for discoloration or fluidity.

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8. Rear Drive Shaft

A: REMOVAL

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

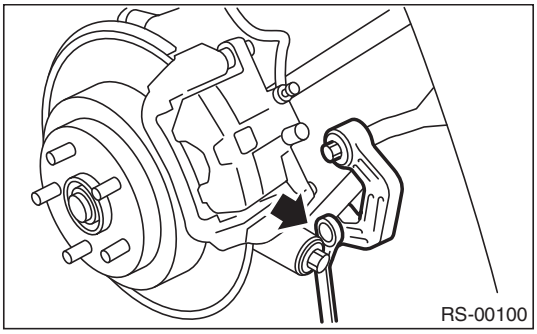


4) Remove the axle nut using a socket wrench with parking brake applied.

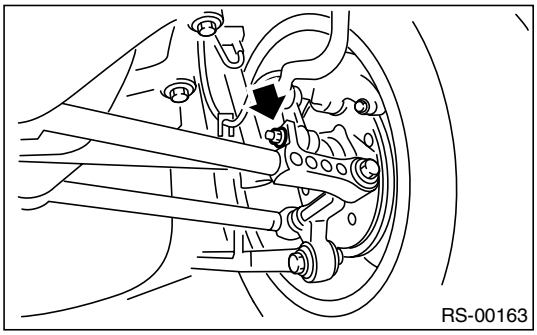
CAUTION:
Remove the axle nut with vehicle weight not applied on axle.

5) Disconnect the stabilizer link.

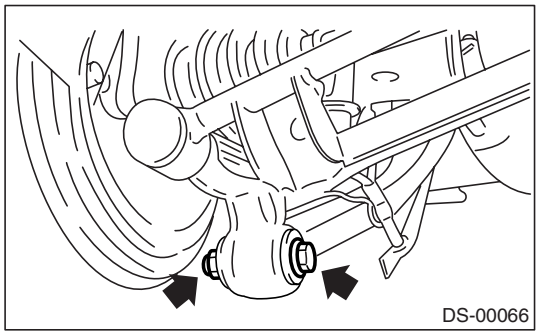
- Except STi model



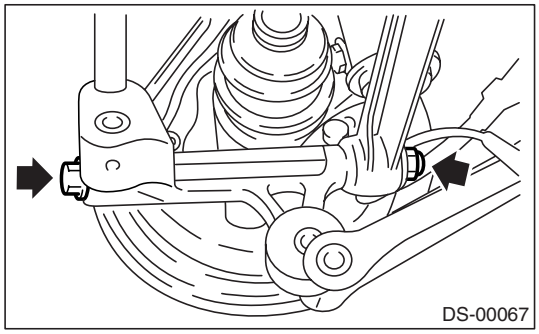
- STi model



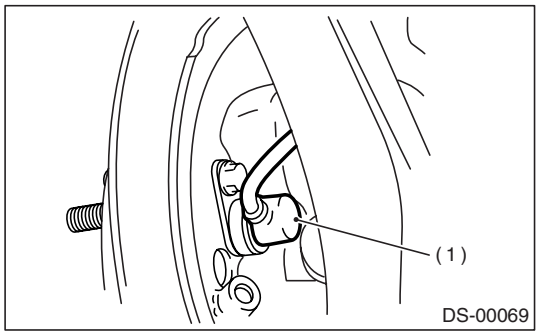
6) Remove the bolt which secures the trailing link to housing.



7) Remove the bolts which secure the front lateral link and rear lateral link to housing.



8) Remove the rear ABS wheel speed sensor from back plate.



(1) ABS wheel speed sensor

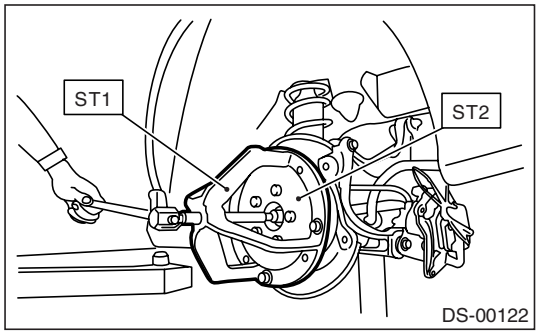
9) Remove the rear drive shaft from rear axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

ST1	926470000	AXLE SHAFT PULLER
ST2	28099PA110	AXLE SHAFT PULLER PLATE

CAUTION:
• Do not hammer the drive shaft when removing.

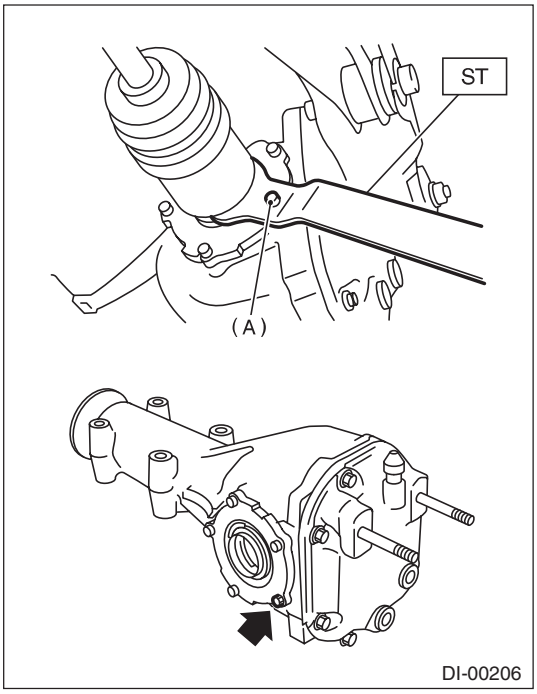
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- **Do not damage the oil seal and tone wheel.**



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

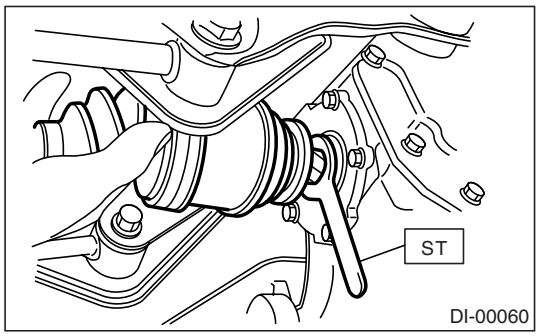
NOTE:
Fit the ST to the bolt (A) as shown in the figure to avoid damage on the side bearing retainer.



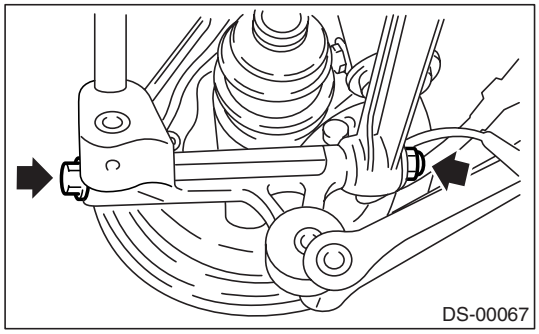
(A) Bolt

B: INSTALLATION

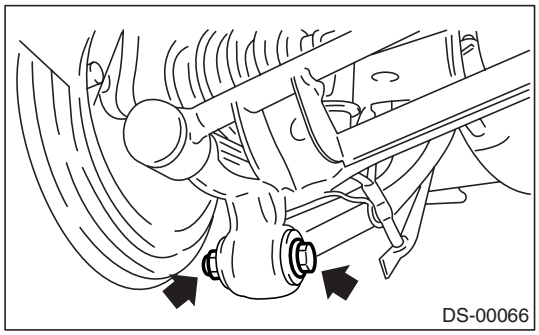
1) Insert the rear drive shaft into rear axle.
2) Temporarily tighten the axle nut.
3) Install the rear drive shaft to rear differential using the ST.
ST 28099PA090 OIL SEAL PROTECTOR



4) Temporarily tighten the front lateral link and rear lateral link to housing using a new self-locking nuts.



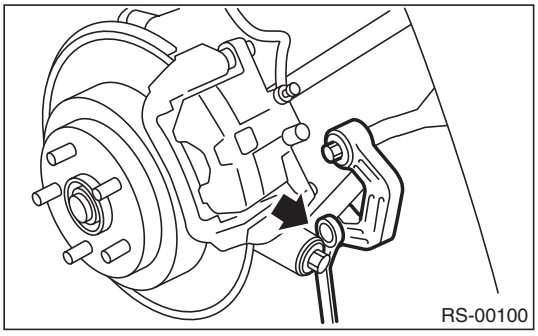
5) Temporarily tighten the trailing link to housing using a new self-locking nut.



6) Install the stabilizer link.

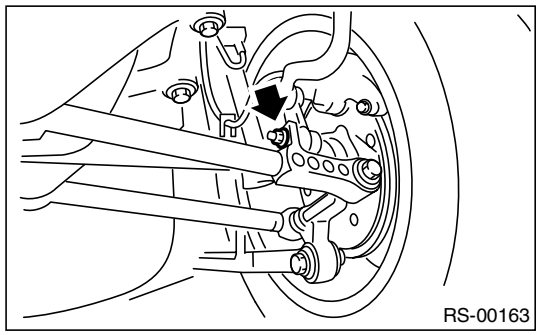
Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)

- Except STi model



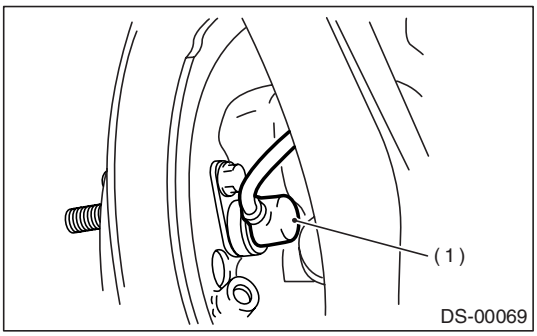
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- STi model



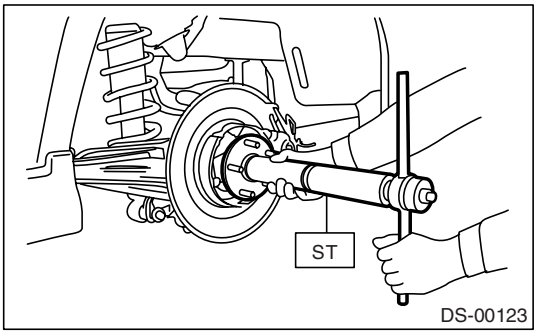
7) Install the ABS wheel speed sensor.

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



(1) ABS wheel speed sensor

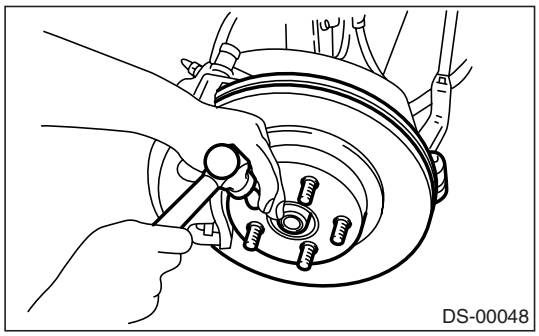
8) Using the ST1 and ST2, pull the rear drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER



9) Tighten a new axle nut to the specified torque with parking brake applied.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

10) Lock the axle nut.



11) Install the wheel.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

12) Make the tires contact the ground fully.

CAUTION:
Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

13) Tighten the installation bolt of rear housing assembly and lateral link assembly.

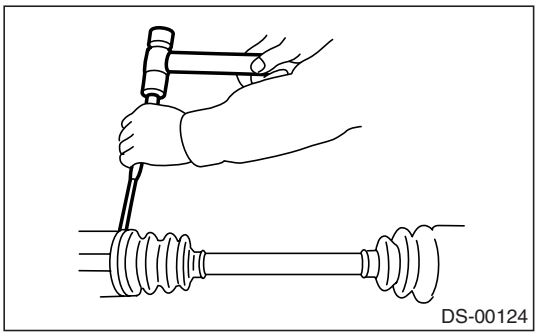
Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)

14) Tighten the installation bolt of rear housing assembly and trailing link assembly.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

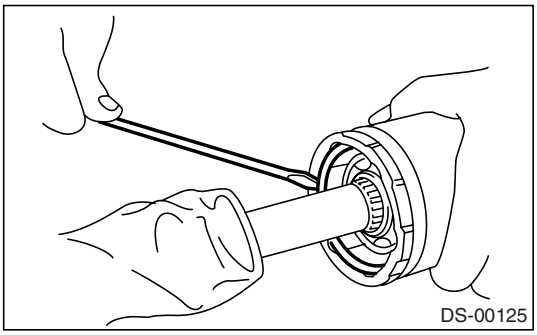
1) Straighten the bent claw of larger end of DOJ boot.
2) Loosen the band by means of screwdriver or pliers with care of not damaging boot.



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.

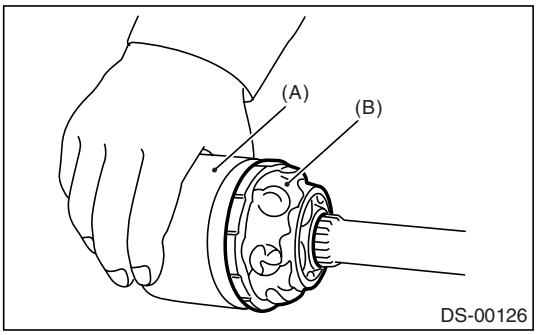
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5) Pry and remove the round circlip located at neck of DOJ outer race with a screwdriver.



6) Take out the DOJ outer race from shaft assembly.
7) Wipe off the grease, and then take out the balls.

NOTE:
• The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.
• Disassemble with exercising care not to lose balls (6 pcs).



(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 the inner race to shaft, by using pliers.
10) Take out the DOJ inner race.
11) Take off the DOJ cage from shaft and remove the DOJ boot.
12) Wrap the shaft splines with vinyl tape.
13) 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.

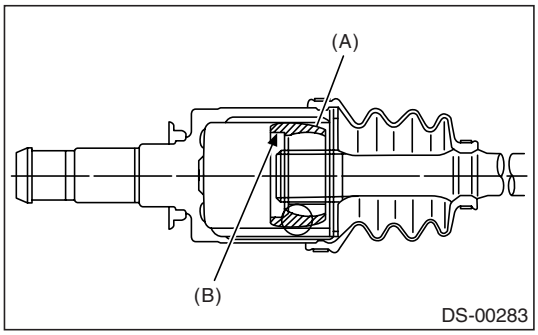
EBJ side:
NTG2218-M (Part No. 28395AG010)

BJ side:
NKG708 (Part No. 28495AE000)

DOJ side:
NKG205 (Part No. 28495AG010, 28495AG000)

1) Install the BJ boot 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.
3) Wrap the shaft splines with vinyl tape.
4) Insert the DOJ cage onto shaft.

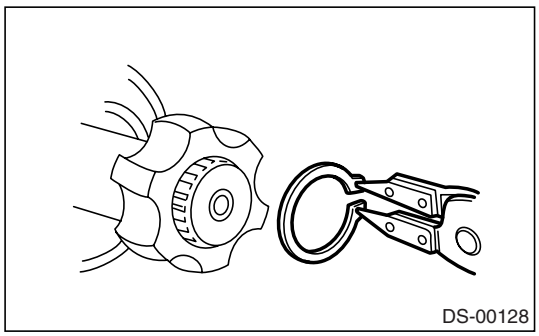
NOTE:
Insert the cage with cut-out portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cut-out portion

5) Install the DOJ inner race on shaft, and fit the snap ring with pliers.

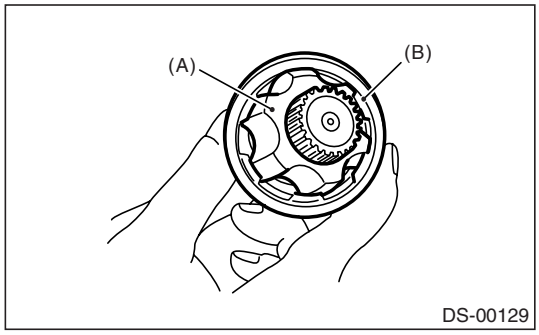
NOTE:
Confirm the snap ring is completely fitted in shaft groove.



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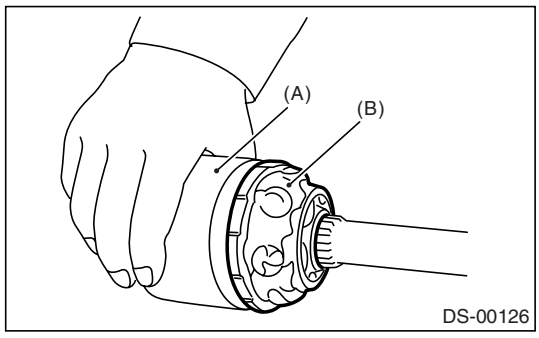
6) Install the cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:
Fit the cage with protruded part aligned with the track on inner race, and then turn by a half pitch.



(A) Inner race
(B) Cage

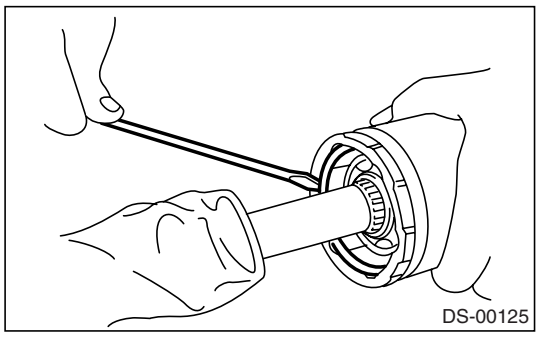
7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.
8) Apply a coat of specified grease to cage pocket and six balls.
9) Insert six balls into cage pocket.
10) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit the outer race.



(A) Outer race
(B) Grease

11) Install the circlip in the groove on DOJ outer race.

NOTE:
• Assure the balls, cage and inner race are completely fitted in the outer race of DOJ.
• Exercise care not to place the matched position of circlip in ball groove of outer race.
• Pull the shaft lightly and assure that the circlip is completely fitted in groove.



12) 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.
13) Install the DOJ boot taking care not to twist it.

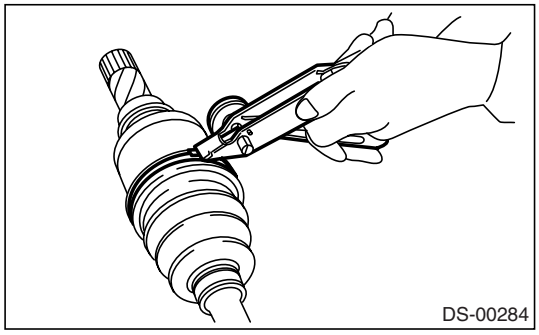
NOTE:
• Inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
• When installing the DOJ boot, position the outer race of DOJ at center of its travel.

14) Put a new band through the clip and wind twice in alignment with band groove of boot.

NOTE:
When tightening the boot, exercise care so that air within boot is appropriate.

15) Tighten the band using the ST.
ST 925091000 BAND TIGHTENING TOOL

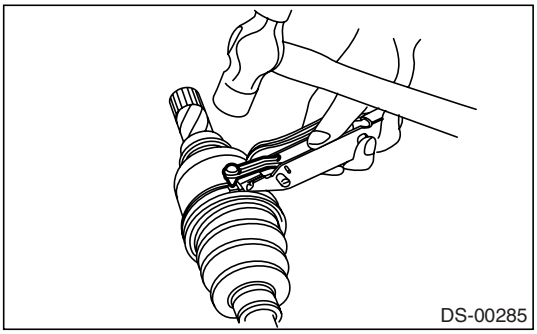
NOTE:
Tighten the band until it cannot be moved by hand.



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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.



17) Cut off the band with an allowance of about 10 mm (0.39 in) left from clip, and bend this allowance over the clip.

NOTE:
Be careful so that the end of band is in close contact with clip.

18) Fix up the boot on BJ in the same procedure.
19) Extend and retract the DOJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion, etc. If faulty, repair or replace.
1) DOJ (Double Offset Joint)
Check seizure, corrosion, damage, wear and excessive play.
2) Shaft
Check excessive bending, twisting, damage and wear.
3) BJ (Bell Joint)
Check seizure, corrosion, damage and excessive play.
4) EBJ (High-efficiency compact ball fixed joint)
Check seizure, corrosion, damage and excessive play.
5) Boot
Check for wear, warping, breakage or scratches.
6) Grease
Check for discoloration or fluidity.

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9. 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-19, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>
	Runout of propeller shaft	Check the vibration of propeller shaft. <Ref. to DS-19, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>
	Loose or free play of connection	Check joint and connector. <Ref. to DS-18, JOINTS AND CONNECTIONS, INSPECTION, Propeller Shaft.>
		Check splines and bearing. <Ref. to DS-19, SPLINES AND BEARING LOCATIONS, INSPECTION, Propeller Shaft.>
Abnormal wheel vibration	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-7, INSPECTION, 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-9, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-21, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-15, INSPECTION, Rear Strut.>
	Front drive shaft	Check the front drive shaft. <Ref. to DS-47, INSPECTION, Front Drive Shaft.>
	Rear drive shaft	Check the rear drive shaft. <Ref. to DS-53, INSPECTION, Rear Drive Shaft.>
	Front axle	Check the front axle. <Ref. to DS-25, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-25, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-36, INSPECTION, Rear Axle [AWD Model].> <Ref. to DS-38, INSPECTION, Rear Axle [FWD Model].>
Noise from the underbody	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-7, INSPECTION, 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-9, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-21, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-15, INSPECTION, Rear Strut.>

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ABS

		Page
1.	General Description	2
2.	ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)	7
3.	ABS Sequence Control	14
4.	Front ABS Wheel Speed Sensor	17
5.	Rear ABS Wheel Speed Sensor	20
6.	Front Tone Wheel	23
7.	Rear Tone Wheel	24
8.	G Sensor	25
9.	Lateral G Sensor	27
10.	Yaw Rate and Lateral G Sensor	29

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1. General Description

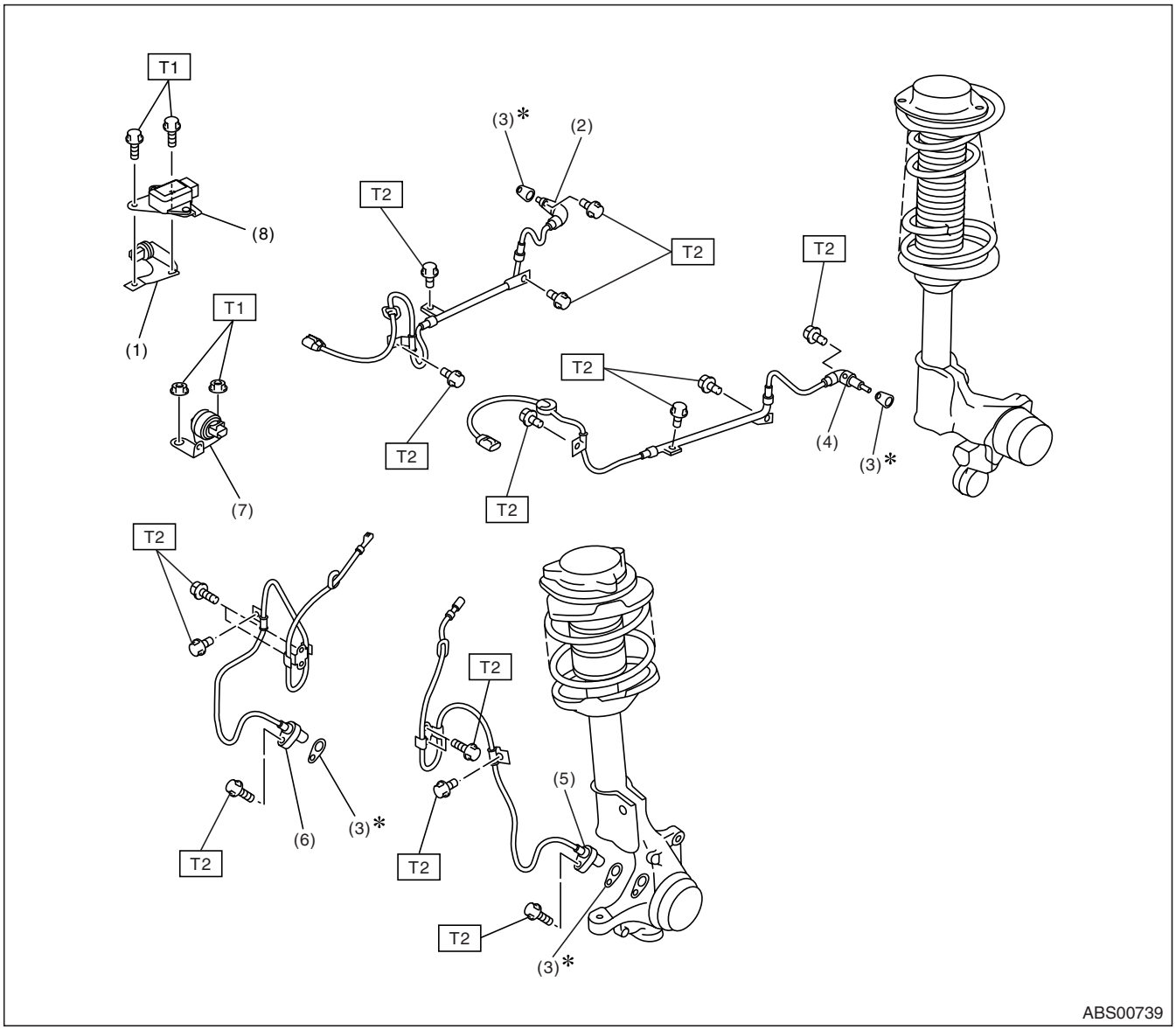
A: SPECIFICATION

Item				Specification or remarks
ABS wheel speed sensor	ABS wheel speed sensor gap		Front	0.3 — 0.8 mm (0.012 — 0.031 in)
			Rear	0.7 — 1.2 mm (0.028 — 0.047 in)
	ABS wheel speed sensor resistance		Front	1.25±0.25 kΩ
			Rear	1.15±0.115 kΩ
	Marks of harness	Front	RH	White
			LH	Yellow
		Rear	RH	Light blue
			LH	Brown
G sensor	G sensor voltage			2.3±0.2 V
Lateral G sensor (STi model)	Lateral G sensor voltage			2.5±0.2 V
ABSCM&H/U marks	FWD			MA
	AWD	AT model		MB
		MT model (Except Sedan STi model)		MC
		MT model (Sedan STi model without driver's control center differential auto)		CX
		MT model (Sedan STi model with driver's control center differential auto)		MD

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B: COMPONENT

1. SENSOR



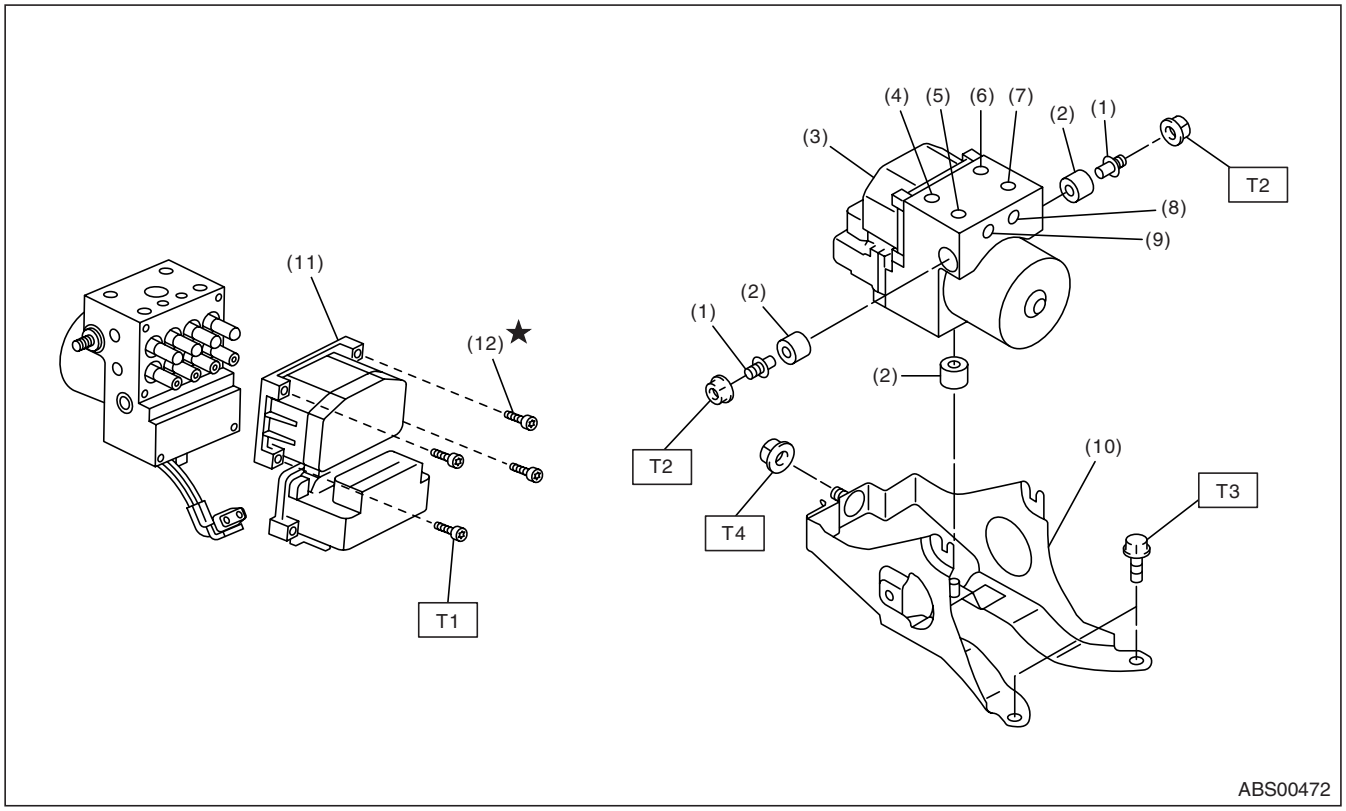
(1) G sensor
(2) Rear ABS wheel speed sensor RH
(3) Adjusting spacer
(4) Rear ABS wheel speed sensor LH
(5) Front ABS wheel speed sensor LH
(6) Front ABS wheel speed sensor RH
(7) Lateral G sensor (STi model without driver's control center differential auto)
(8) Yaw rate and leteral G sensor (STi model with driver's control center differential auto)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 33 (3.3, 24)

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2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

• STi MODEL WITHOUT DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO

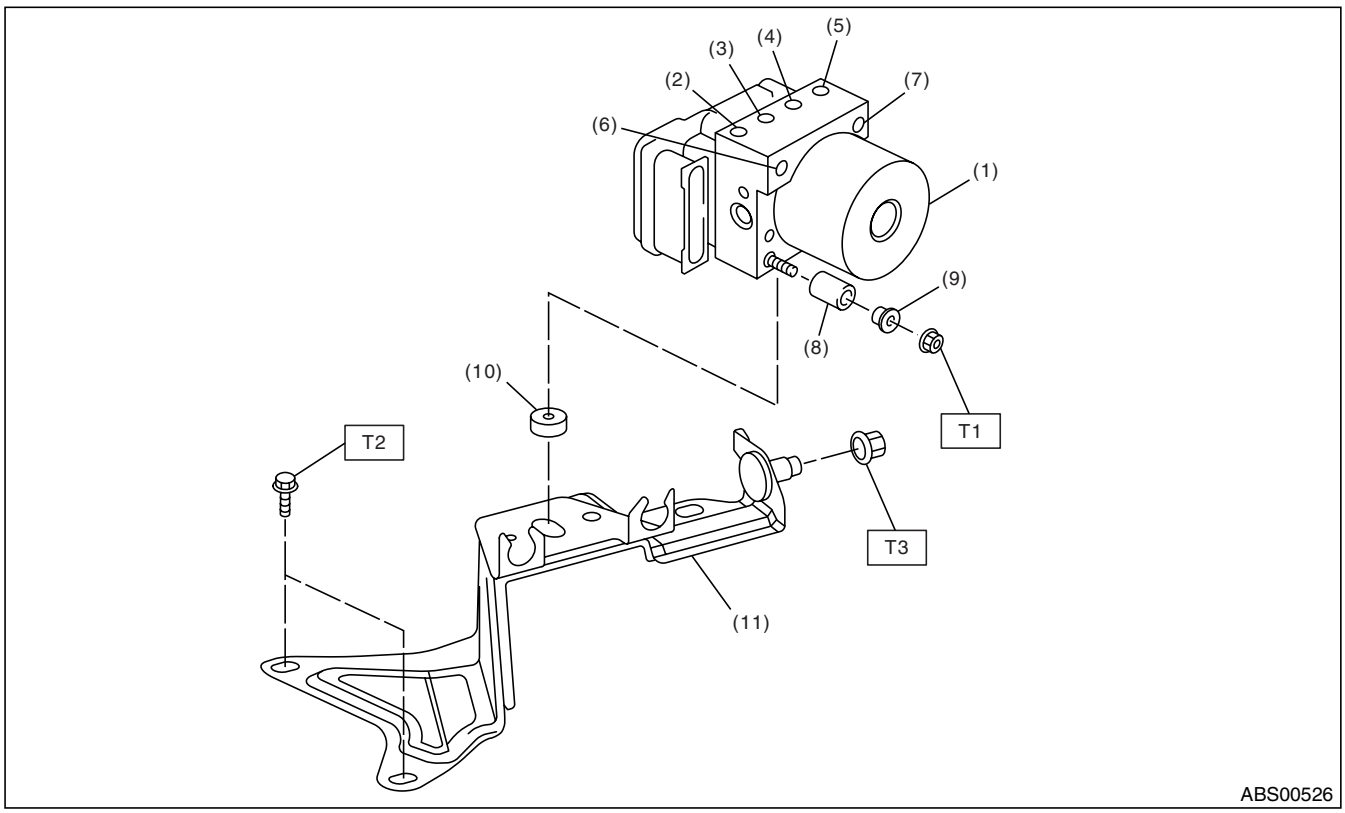


(1) Stud bolt
(2) Damper
(3) ABS control module and hydraulic control unit (ABSCM&H/U)
(4) Front-LH outlet
(5) Secondary inlet
(6) Front-RH outlet
(7) Primary inlet
(8) Rear-LH outlet
(9) Rear-RH outlet
(10) Bracket
(11) ABS control module (ABSCM)
(12) Screw

Tightening torque: N·m (kgf-m, ft-lb)
T1: 2.65 (0.27, 1.95)
T2: 18 (1.8, 13.0)
T3: 33 (3.3, 24)
T4: 38 (3.8, 27.5)

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• EXCEPT STi MODEL WITHOUT DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO



(1)	ABS control module and hydraulic control unit (ABSCM&H/U)	(6)	Primary inlet
(2)	Front outlet RH	(7)	Secondary inlet
(3)	Rear outlet LH	(8)	Damper
(4)	Rear outlet RH	(9)	Spacer
(5)	Front outlet LH	(10)	Damper
		(11)	Bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.3, 24)
T3: 38 (3.8, 27.5)

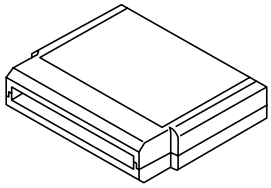
C: CAUTION

• 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, because each part in 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.

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D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

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 ABSCM removal. (Except STi model without driver's control center differential auto)
TORX® BIT T20	Used for ABSCM removal. (STi model without driver's control center differential auto)

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2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

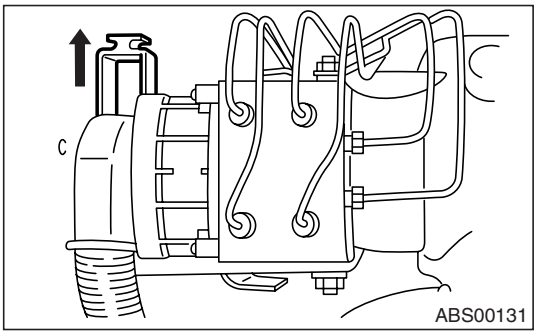
A: REMOVAL

1. STi MODEL WITHOUT DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO

1) Disconnect the ground cable from battery.
2) Remove the air intake duct from engine compartment to facilitate removal of ABSCM&H/U.
3) Use compressed air to get rid of water around the ABSCM&H/U.

NOTE:
Contact will be insufficient if the terminal gets wet.

4) Remove the ground cable from ABSCM&H/U.
5) Pull off the lock of ABSCM&H/U connector to remove it.



6) Disconnect the connector from ABSCM&H/U.

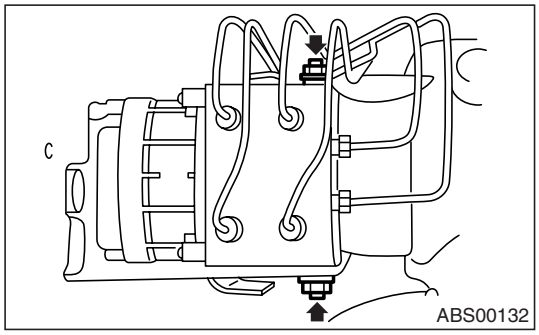
CAUTION:
Do not pull the harness when disconnecting the connector.

7) Unlock the harness clip.
8) Disconnect the brake pipes from ABSCM&H/U.
9) Wrap the brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

CAUTION:
Brake fluid spilt on the vehicle body will harm the painted surface; wash away quickly with water if spilt.

10) Remove the ABSCM&H/U from engine compartment.

CAUTION:
- **Do not drop or bump the ABSCM&H/U.**
- **Do not turn the ABSCM&H/U upside down or place it on its side.**
- **Be careful to prevent foreign particles from getting into ABSCM&H/U.**
- **Do not let water get into the connector.**



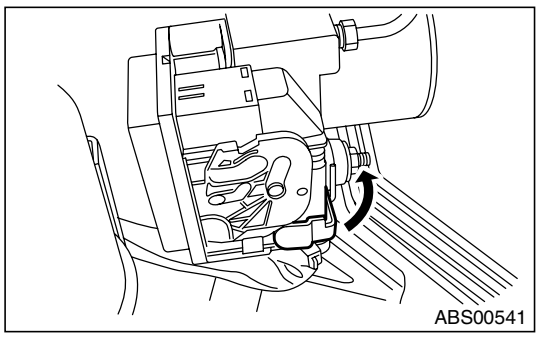
2. EXCEPT STi MODEL WITHOUT DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO

1) Disconnect the ground cable from battery.
2) Remove the air intake duct and air cleaner case from the engine compartment to facilitate removal of ABSCM&H/U. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> <Ref. to IN(H4DOTC)-9, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
3) Use compressed air to get rid of water around the ABSCM&H/U.

NOTE:
Contact will be insufficient if the terminal gets wet.

4) Disconnect the ABSCM&H/U connector pulling up the lock lever.

CAUTION:
Do not pull the harness when disconnecting connector.



5) Remove the harness clip.
6) Disconnect the brake pipes from ABSCM&H/U.
7) Wrap the brake pipe using a vinyl bag not to spill the brake fluid on the vehicle body.

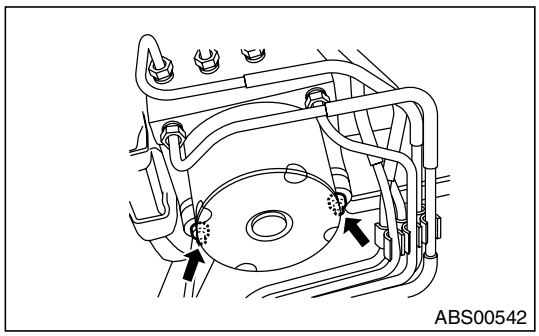
CAUTION:
When brake fluid is attached to the vehicle body, wash it off with water and wipe the water.

8) Remove the nuts and remove the ABSCM&H/U.

CAUTION:
- **Do not drop or bump the ABSCM&H/U.**

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• 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.


ABS00542

9) Remove the ABSCM&H/U bracket.

B: INSTALLATION

1. STi MODEL WITHOUT DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO

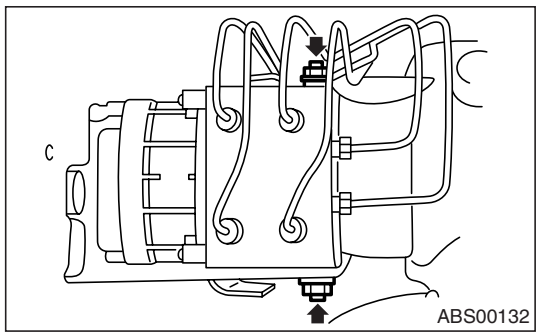
1) Install the ABSCM&H/U bracket.

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

2) Apply a coat of grease (Nippeco LT or GB) to the bracket attaching bolt.
3) Align the width across flat portion of ABSCM& H/U side stud bolt with the bolt hole groove on bracket, and then install the ABSCM&H/U.

NOTE:
Confirm the specification mark of ABSCM&H/U.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



ABS00132

4) Connect the brake pipes to their correct ABSCM&H/U connections.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

5) Using the cable clip, secure the ABSCM&H/U harness to bracket.
6) Connect the connector to ABSCM&H/U.

NOTE:
• Be sure to remove all foreign matter from inside of the connector before connecting.
• Ensure the ABSCM&H/U connector is securely locked.

7) Connect the ground cable to ABSCM&H/U, and then apply grease.
8) Install the air intake duct.
9) Bleed air from the brake system.

2. EXCEPT STi MODEL WITHOUT DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO

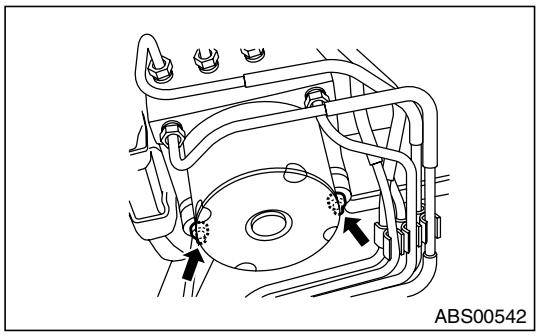
1) Install the ABSCM&H/U bracket.

Tightening torque:
33 N·m (3.3 kgf-m, 24 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)


ABS00542

3) Connect the brake pipes to their correct ABSCM&H/U connections.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

4) Using the cable clip, secure the ABSCM&H/U harness to bracket.
5) Connect the connector to ABSCM&H/U.

NOTE:
• Be sure to remove all foreign matter from inside of the connector before connecting.
• Ensure that the ABSCM&H/U connector is securely locked.

6) Connect the ground cable to ABSCM&H/U, and then apply anti-corrosive wax.

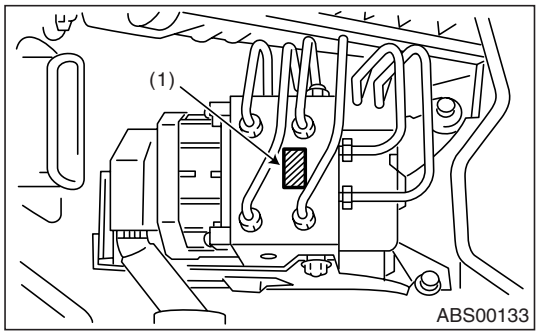
Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

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7) Install the air cleaner case and air intake duct. <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.> <Ref. to IN(H4DOTC)-9, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>
8) Bleed air from the brake system.

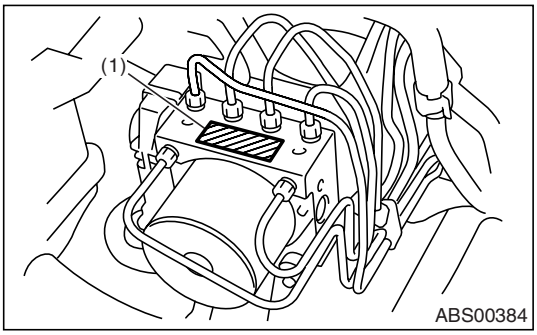
C: INSPECTION

1) Check the connected and fixed condition of connector.
2) Check specifications of the mark with ABSCM&H/U.
Refer to "SPECIFICATION" for identification mark. <Ref. to ABS-2, SPECIFICATION, General Description.>
• STi model without driver's control differential auto



(1) Mark

• Except STi model without driver's control differential auto



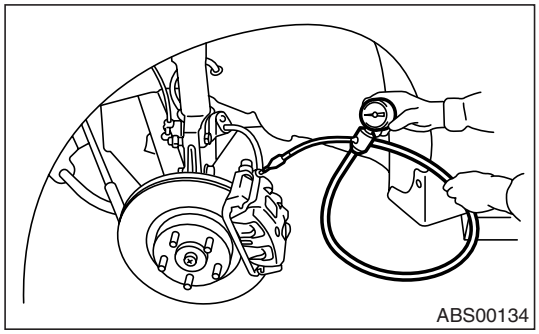
(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and 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 employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.



4) Bleed air from the pressure gauges.
5) Perform the ABS sequence control.
<Ref. to ABS-14, ABS Sequence Control.>
6) When the hydraulic unit begins to work, and 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 standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm^2, 511 psi)	3,500 kPa (36 kgf/cm^2, 511 psi)
Decompressed	500 kPa (5 kgf/cm^2, 73 psi) or less	500 kPa (5 kgf/cm^2, 73 psi) or less
Compressed	3,500 kPa (36 kgf/cm^2, 511 psi) or more	3,500 kPa (36 kgf/cm^2, 511 psi) or more

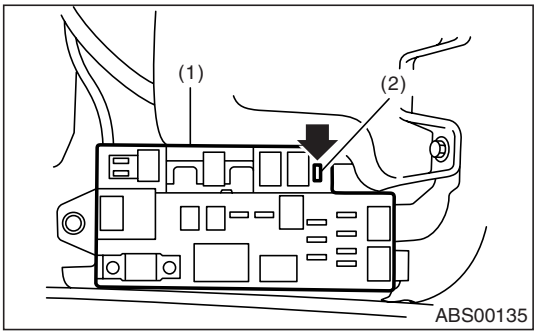
8) Remove the pressure gauges from the FL and FR caliper bodies.
9) Remove the air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform the ABS sequence control.
<Ref. to ABS-14, ABS Sequence Control.>

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14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from the brake line.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

1) In the case of AWD AT without VTD models, install a spare fuse with the FWD connector in the main fuse box to simulate FWD models.

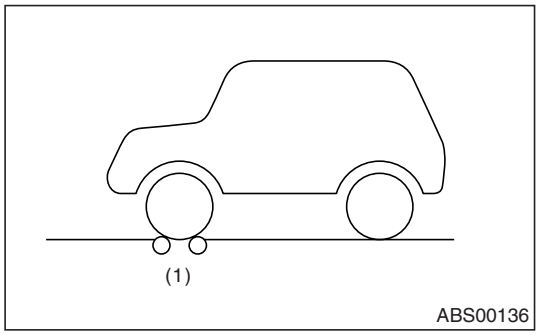


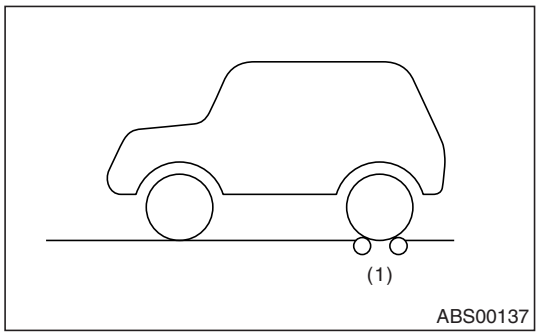
(1) Main fuse box
(2) FWD connector

NOTE:
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.

2) Prepare for operating the ABS sequence control.
<Ref. to ABS-14, ABS Sequence Control.>

3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "N" range.





(1) Brake tester

4) Operate the brake tester.
5) Perform the ABS sequence control.
<Ref. to ABS-14, ABS Sequence Control.>
6) Hydraulic unit begins to work; and 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.
7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meets the standard values.

	Front wheel	Rear wheel
Initial value	1,000 N (102 kgf, 225 lbf)	1,000 N (102 kgf, 225 lbf)
Decompressed	500 N (51 kgf, 112 lbf) or less	500 N (51 kgf, 112 lbf) or less
Compressed	1,000 N (102 kgf, 225 lbf) or more	1,000 N (102 kgf, 225 lbf) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

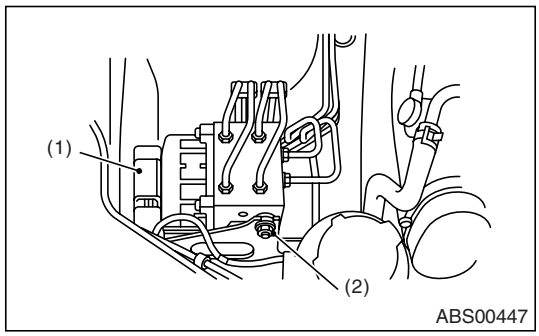
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D: REPLACEMENT

1. STi MODEL WITHOUT DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO

• ABSCM (ABS CONTROL MODULE)

1) Disconnect the ground cable from battery.
2) Disconnect the ABSCM harness connector.
3) Remove the bracket mounting nut of ABSCM&H/U.



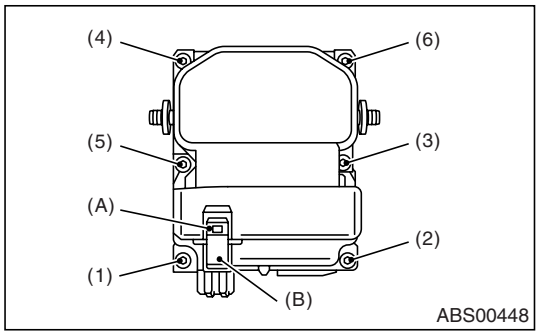
(1) ABSCM harness connector
(2) Bracket mounting nut

4) Leaving the brake pipe connected, raise the ABSCM&H/U for approx. 5 cm (2.0 in) from bracket.

CAUTION:
Do not deform the brake pipe.

5) Unlock the motor power supply connector lock, and disconnect the connector.
6) Using TORX® BIT T20, remove the screws (1), (2), (3), (4), (5), (6) in this order.

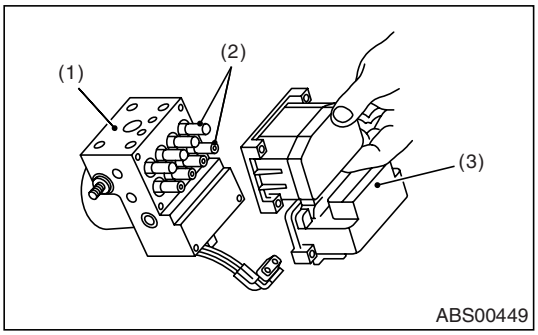
CAUTION:
Do not reuse the screw.



(A) Motor power supply connector lock
(B) Motor power supply connector

7) Remove the ABSCM from H/U.

CAUTION:
• Do not pry the ABSCM out, extract it straight out against H/U.
• Do not reuse the seal of ABSCM.



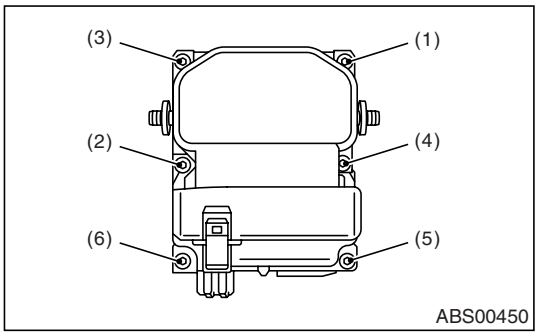
(1) H/U
(2) Valve
(3) ABSCU

8) Check that H/U seal surface is free from dust and damages.

CAUTION:
• If damage is found on seal surface, replace the H/U.
• Do not apply compressed air to ABSCM&H/U for cleaning.

9) Install ABSCM straight for ward on to H/U, being careful not to scratch the valve.
10) Temporarily tighten the six new screws by hand.
11) Using TORX® BIT T20, tighten the screws (1), (2), (3), (4), (5), (6) in this order.

Tightening torque:
2.65 N·m (0.27 kgf-m, 1.95 ft-lb)



12) Make sure no clearance exists at the mating surface of ABSCM and H/U.
13) Connect the motor power supply connector to ABSCM.

CAUTION:
Securely connect the connector until connector lock sound is heard.

14) Attach the ABSCM&H/U to bracket, and then tighten with nuts.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

15) Connect the ABSCM harness connector.

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16) Connect the battery ground cable to battery.
17) Turn the ignition key to ON. Check the ABS warning light turns on normally, then off.
18) Check that correct information (model year, drive system, transmission type) is displayed on the initial screen by connecting Subaru Select Monitor.
19) Start the engine and move the car to accelerate to more than 20 km/h (12.4 MPH). Check the ABS warning light dose not turn on.
20) If any abnormal is found during the work of step 17) to 19), repair according to the procedure of relevant failure in “ABS (DIAGNOSTICS)” section.

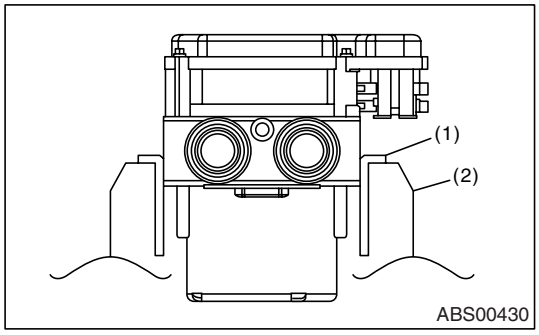
2. EXCEPT STi MODEL WITHOUT DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO

• ABSCM (ABS CONTROL MODULE)

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-7, 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.

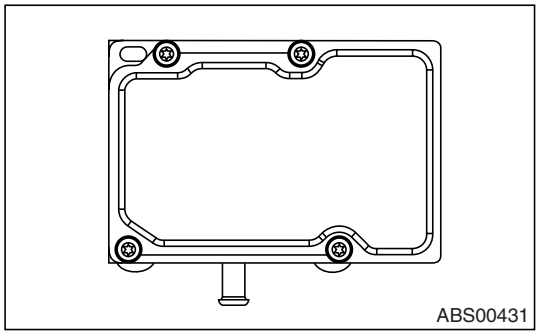
NOTE:
Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate or cloth between the part and vice.



(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.).

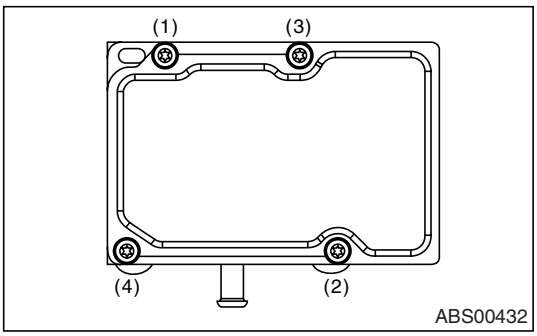
7) Position the coil of new ABSCM to align H/U valve.
8) To prevent deforming of ABSCM housing cover, hold the corner of ABSCM and install it to the H/U without tilting.

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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. <Ref. to ABS-8, INSTALLATION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

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3. ABS Sequence Control

A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
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 sequence control may not be operative. In such a case, perform the diagnosis. <Ref. to ABS(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

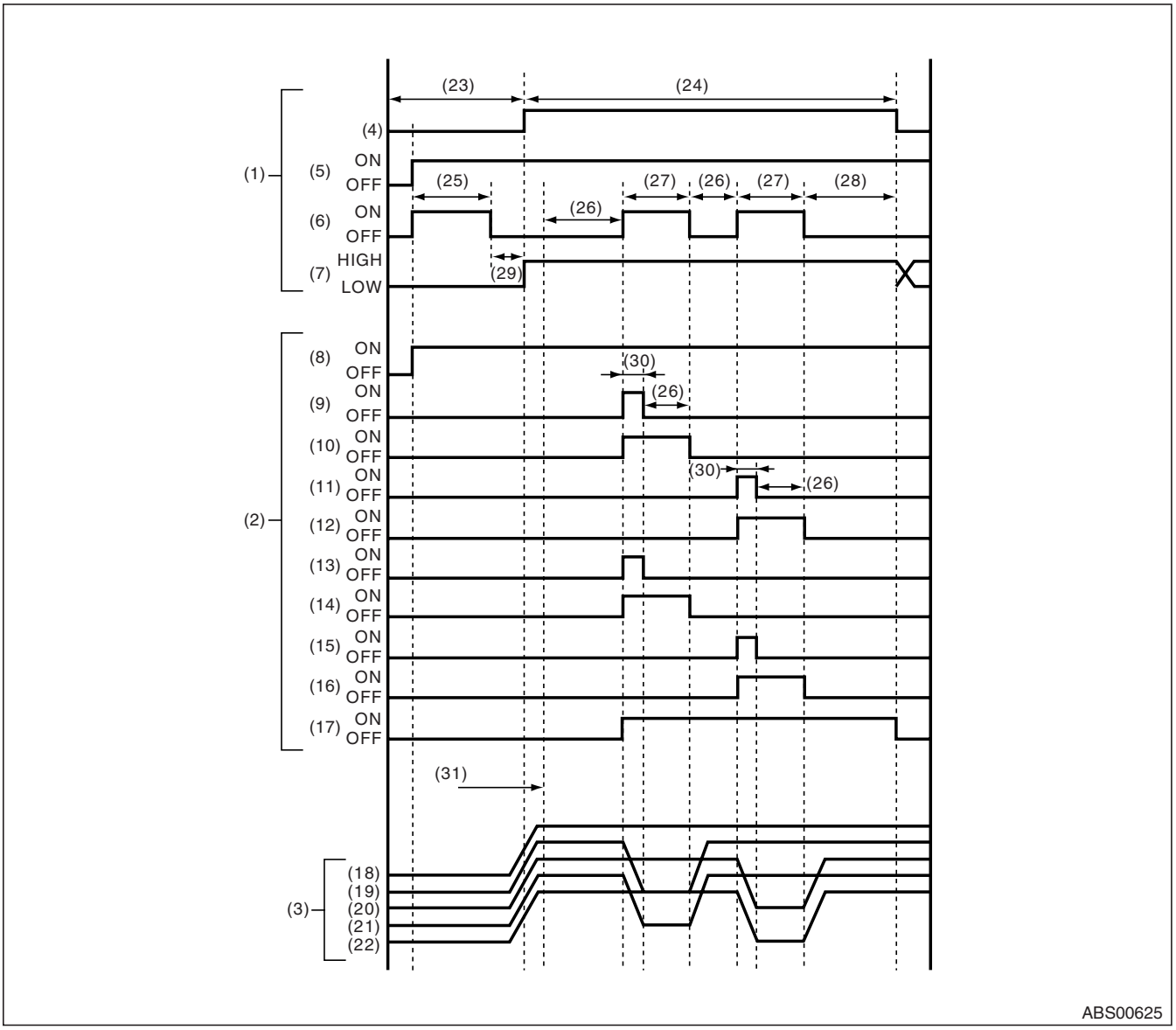
1) Connect the Subaru Select Monitor to data link connector under driver's seat instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Turn the Subaru Select Monitor power switch to ON.
4) Put the Subaru Select Monitor to "BRAKE CONTROL" mode.
5) When "Function check sequence" is selected, 'ABS sequence control' will start.
6) When the message "Press Brake Pedal with braking force of 100 to 150 kgf" is displayed, perform the followings.
   (1) When using the brake tester, depress the brake pedal with braking force of 981 N (100 kgf, 221 lbf).
   (2) When using the pressure gauge, depress the brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kgf/cm^2 , 498 psi).

CAUTION:
Do not depress the clutch pedal in case of vehicle with hill holder.

7) When the message "Press YES" is displayed, press the YES key.
8) The braking system in operation is displayed on Subaru Select Monitor.

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2. CONDITIONS FOR ABS SEQUENCE CONTROL



(1) Operational guide line of sequence control
(2) Operational pattern of sequence control
(3) Operational pressure of sequence control
(4) Speed of all wheels
(5) Ignition key switch
(6) ABS warning light
(7) Stop light switch
(8) Valve relay
(9) FL outlet valve
(10) FL inlet valve
(11) FR outlet valve
(12) FR inlet valve
(13) RR outlet valve
(14) RR inlet valve
(15) RL outlet valve
(16) RL inlet valve
(17) Pump motor
(18) Pressure of master cylinder
(19) Pressure of FL wheel cylinder
(20) Pressure of FR wheel cylinder
(21) Pressure of RR wheel cylinder
(22) Pressure of RL wheel cylinder
(23) 4 km/h (2 MPH) or less
(24) 10 km/h (6 MPH) or less
(25) 2.0 seconds
(26) 1.0 second
(27) 1.4 seconds
(28) 0.6 seconds
(29) Within 0.5 seconds
(30) 0.4 seconds
(31) Point A

NOTE:
When the Subaru Select Monitor is used, control operation starts at point A. (However, the brake light switch must be ON before point A.)

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- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

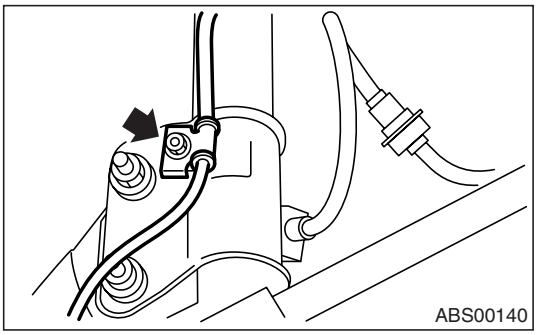
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
3) After completion of the sequence control.
4) When malfunction is detected.

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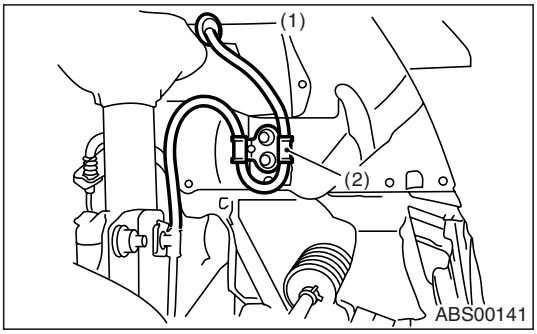
4. Front ABS Wheel Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the front ABS wheel speed sensor connector located next to the front strut mounting house in engine compartment. Pull the connector out from grommet hole to tire side.
3) Remove the bolts which secure the sensor harness to strut.



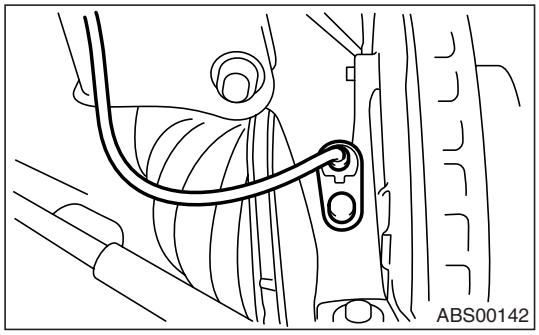
4) Remove the bolts which secure the sensor harness to body.



(1) To front ABS wheel speed sensor connector
(2) Bracket

5) Remove the bolts which secure the front ABS wheel speed sensor to housing, and remove the front ABS wheel speed sensor.

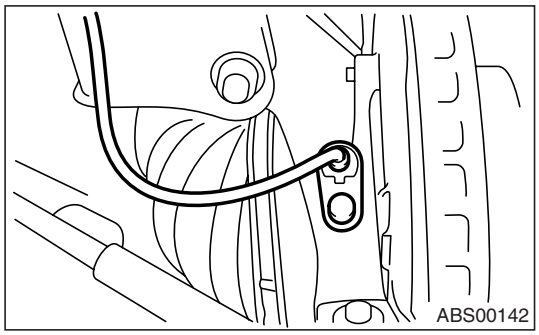
CAUTION:
• Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull the sensor harness during removal.



B: INSTALLATION

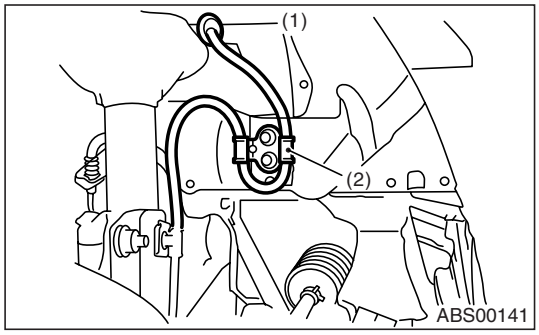
1) Temporarily install the front ABS wheel speed sensor on housing.

CAUTION:
Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.



2) Install the front ABS wheel speed sensor on strut and wheel apron bracket.

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



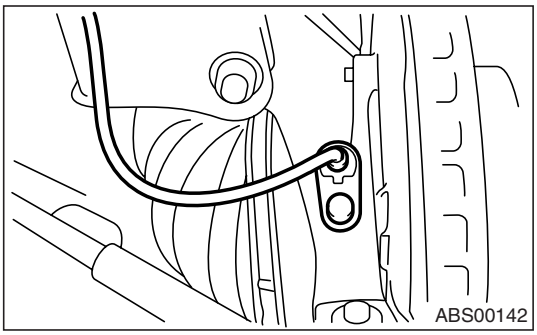
(1) To front ABS wheel speed sensor connector
(2) Bracket

3) Check the ABS wheel speed sensor gap. <Ref. to ABS-18, SENSOR GAP, INSPECTION, Front ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on housing to specified torque.
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

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ABS wheel speed sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

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



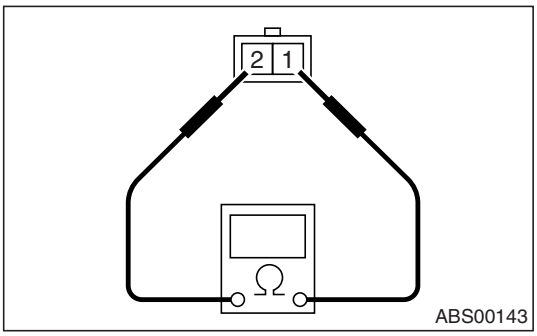
NOTE:
• Check the marks on the harness and make sure that no kink exists. (RH: White, LH: Yellow)
• Make sure the harness is not pulled and does not contact to suspension or body when steering wheel is turned.

4) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.
5) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.
2) Measure the ABS wheel speed sensor resistance.
If the resistance is outside standard value, replace the ABS wheel speed sensor with a new one.

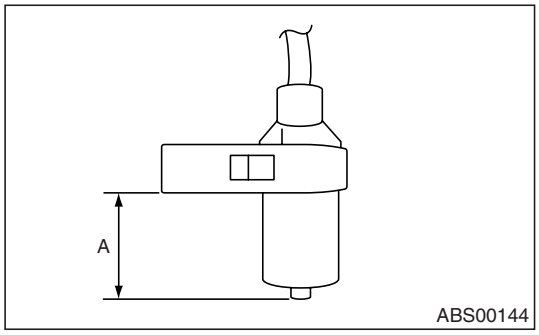


Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new one.

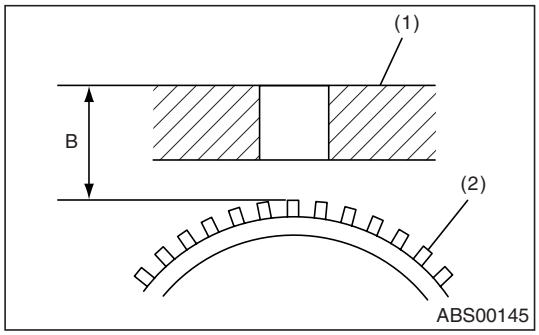
2. SENSOR GAP

1) Measure the distance “A” between ABS wheel speed sensor surface and sensor pole face.



2) Measure the distance “B” between surface where the front axle housing meets the ABS wheel speed sensor, and the tone wheel.

NOTE:
Measure so that the gauge touches the tone wheel teeth top.



(1) Axle housing
(2) Tone wheel

3) Find the gap between the ABS wheel speed sensor pole face and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.
ABS wheel speed sensor clearance = B − A

ABS wheel speed sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

NOTE:
If the clearance is out of specification, readjust using spacer (Part No. 26755AA000).

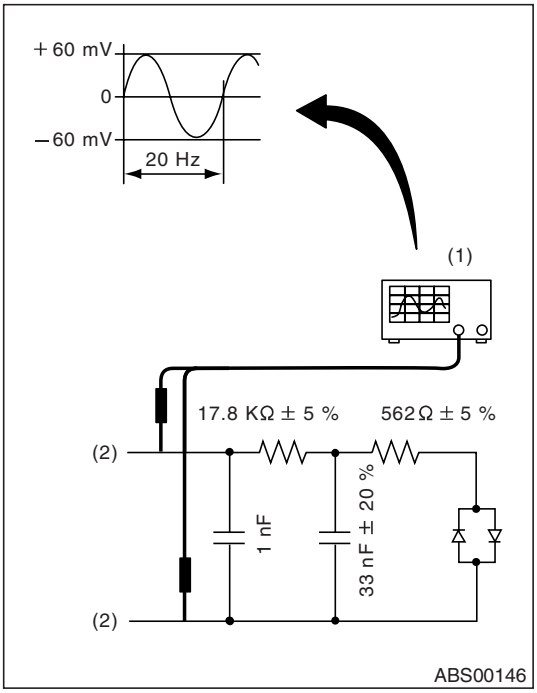
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3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Output voltage specification:
0.12 to 1 V (at 20 Hz)

NOTE:
Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-18, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>



(1) Oscilloscope
(2) Terminal

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755A000).

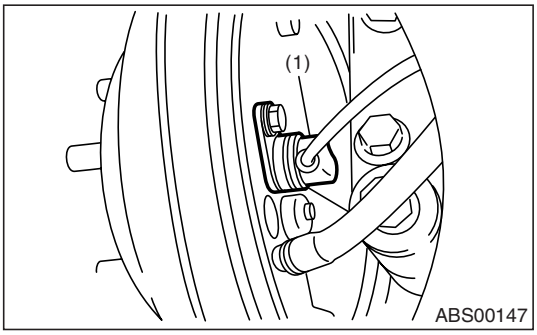
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5. Rear ABS Wheel Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle.
3) Remove the rear seat and disconnect the rear ABS wheel speed sensor connector. Pull the connector out from grommet hole to under floor.
4) Remove the rear sensor harness bracket from the rear trailing link and bracket.
5) Remove the rear ABS wheel speed sensor from back plate.

CAUTION:
• Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull the sensor harness during removal.



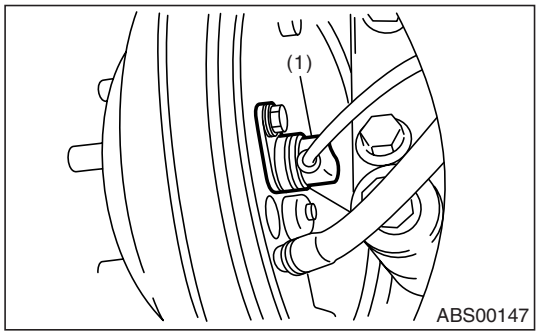
(1) Rear ABS wheel speed sensor

6) Remove the rear tone wheel while removing the hub from housing and hub assembly. <Ref. to DS-28, REMOVAL, Rear Axle [AWD Model].> <Ref. to DS-37, REMOVAL, Rear Axle [FWD Model].>

B: INSTALLATION

1) Install the rear tone wheel on hub, then rear housing on hub. <Ref. to DS-34, ASSEMBLY, Rear Axle [AWD Model].> <Ref. to DS-38, ASSEMBLY, Rear Axle [FWD Model].>
2) Temporarily install the rear ABS wheel speed sensor on back plate.

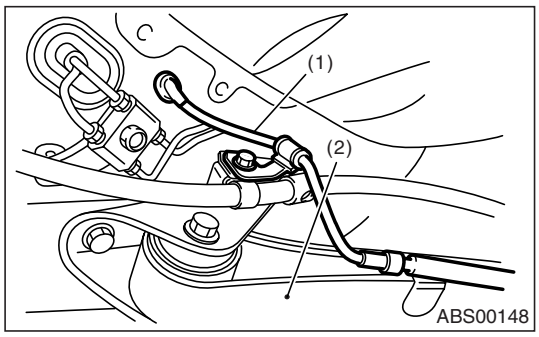
CAUTION:
Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.



(1) Rear ABS wheel speed sensor

3) Install the rear drive shaft to rear housing and rear differential spindle. <Ref. to DS-31, INSTALLATION, Rear Axle [AWD Model].> <Ref. to DS-37, INSTALLATION, Rear Axle [FWD Model].>
4) Install the rear sensor harness on rear trailing link.

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



(1) Rear sensor harness
(2) Trailing link

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5) Check the ABS wheel speed sensor gap. <Ref. to ABS-21, SENSOR GAP, INSPECTION, Rear ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on back plate to specified torque.
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

ABS wheel speed sensor standard clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)

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

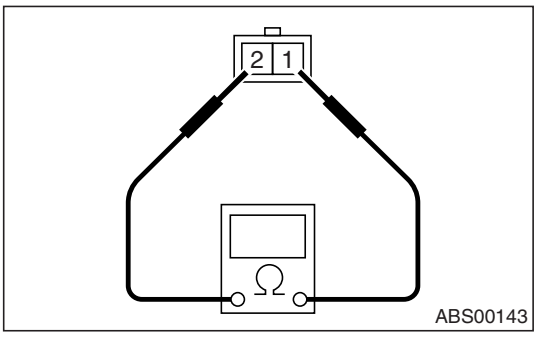
NOTE:
Check the marks on the harness and make sure no kink exists. (RH: Light blue, LH: Brown)

6) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.
7) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.
2) Measure the ABS wheel speed sensor resistance.
If resistance is out of standard value, replace the ABS wheel speed sensor with a new one.



Terminal No.	Standard
1 and 2	1.15±0.115 kΩ

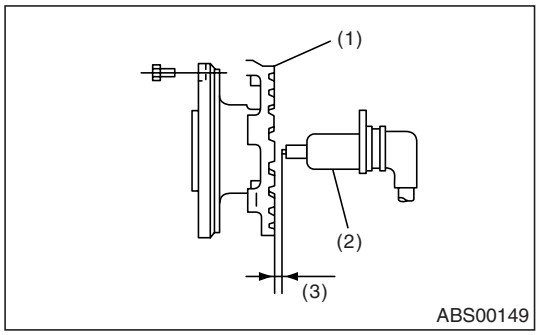
NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new one.

2. SENSOR GAP

1) Measure the clearance between tone wheel and ABS wheel speed sensor at whole periphery.

NOTE:
If clearance is narrow, adjust by using spacer (Part No. 26755AA000).
If clearance is wide, check the outputted voltage then replace the ABS wheel speed sensor or tone wheel if the outputted voltage is outside specification.

ABS wheel speed sensor clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)



(1) Tone wheel
(2) ABS wheel speed sensor
(3) Sensor gap

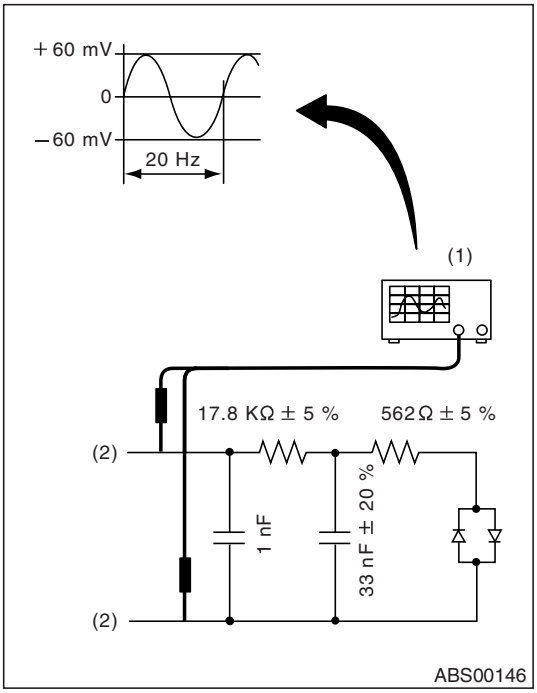
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3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Output voltage specification:
0.12 — 1 V (at 20 Hz)

NOTE:
Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-21, ABS WHEEL SPEED SENSOR, INSPECTION, Rear ABS Wheel Speed Sensor.>



(1) Oscilloscope
(2) Terminal

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

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6. Front Tone Wheel

A: REMOVAL

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-40, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-40, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

NOTE:
Replace the BJ assembly with a new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

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7. Rear Tone Wheel

A: REMOVAL

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.
<Ref. to DS-28, REMOVAL, Rear Axle [AWD Model].> <Ref. to DS-37, REMOVAL, Rear Axle [FWD Model].>

B: INSTALLATION

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.
<Ref. to DS-31, INSTALLATION, Rear Axle [AWD Model].> <Ref. to DS-37, INSTALLATION, Rear Axle [FWD Model].>

C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

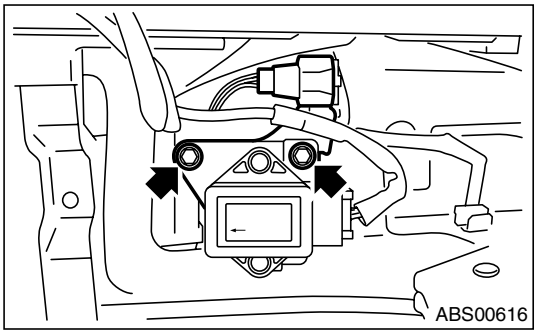
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8. G Sensor

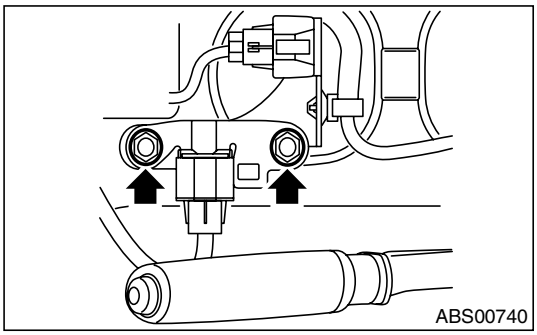
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console cover.
<Ref. to EI-45, REMOVAL, Console Box.>
3) Disconnect the connector from G sensor.
4) Remove the G sensor from body.

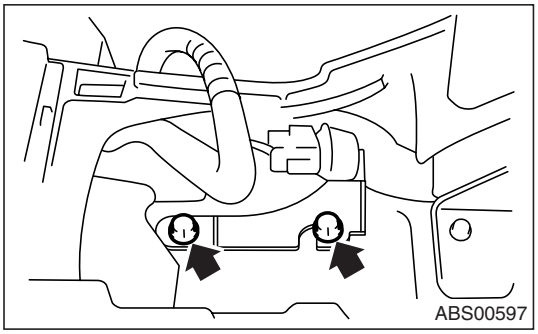
CAUTION:
- **Do not drop or bump the G sensor.**
- **G sensor and the bracket are integrated into one unit. Therefore, do not disassemble it.**
- STi model with driver's control center differential



- STi LHD model without driver's control center differential



- Other models



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not drop or bump the G sensor.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

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C: INSPECTION

Step		Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have a SUBARU SELECT MONITOR?	Go to step **5.**	Go to step **2.**
2	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 2.3±0.2 V when G sensor is horizontal?	Go to step **3.**	Replace the G sensor.
3	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace the G sensor.
4	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace the G sensor.
5	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the Subaru Select Monitor into {BRAKE CONTROL} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output value.	Is the indicated reading −1.2 — 1.2 m/s^2 when the vehicle is in horizontal position?	Go to step **6.**	Replace the G sensor.
6	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the G sensor from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display.	Is the indicated reading 8.1 — 11.2 m/s^2 when G sensor is inclined forwards to 90°?	Go to step **7.**	Replace the G sensor.
7	**CHECK G SENSOR.** Read the Subaru Select Monitor display.	Is the indicated reading −8.1 — −11.2 m/s^2 when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace the G sensor.

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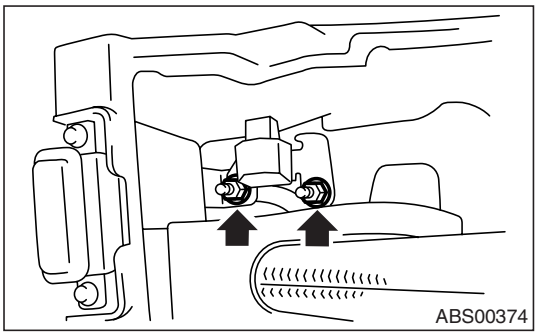
9. Lateral G Sensor

A: REMOVAL

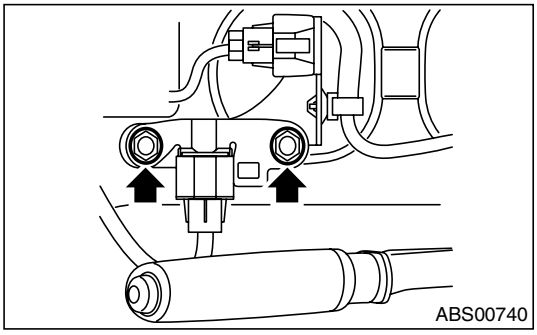
1) Disconnect the ground cable from battery.
2) Remove the console cover.
<Ref. to EI-45, REMOVAL, Console Box.>
3) Disconnect the connector from lateral G sensor.
4) Remove the lateral G sensor from vehicle.

CAUTION:
Do not drop or bump the lateral G sensor.

• STi RHD model without driver's control center differential auto



• STi LHD model without driver's control center differential auto



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not drop or bump the lateral G sensor.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

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C: INSPECTION

Step		Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have a SUBARU SELECT MONITOR?	Go to step **5.**	Go to step **2.**
2	**CHECK LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the lateral G sensor from vehicle. 3) Connect the connector to lateral G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 2.5±0.2 V when lateral G sensor is horizontal?	Go to step **3.**	Replace the lateral G sensor.
3	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 3.5±0.2 V when lateral G sensor is inclined forwards to 90°?	Go to step **4.**	Replace the lateral G sensor.
4	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 1.5±0.2 V when lateral G sensor is inclined backwards to 90°?	Lateral G sensor is normal.	Replace the lateral G sensor.
5	**CHECK LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the Subaru Select Monitor into {BRAKE CONTROL} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the lateral G sensor output value.	Is the indicated reading −2.0 — 2.0 m/s^2 when the vehicle is in horizontal position?	Go to step **6.**	Replace the lateral G sensor.
6	**CHECK LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the lateral G sensor from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display.	Is the indicated reading 7.8 — 11.8 m/s^2 when lateral G sensor is inclined forwards to 90°?	Go to step **7.**	Replace the lateral G sensor.
7	**CHECK LATERAL G SENSOR.** Read the Subaru Select Monitor display.	Is the indicated reading −7.8 — −11.8 m/s^2 when lateral G sensor is inclined backwards to 90°?	Lateral G sensor is normal.	Replace the lateral G sensor.

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10. Yaw Rate and Lateral G Sensor

A: REMOVAL

For removal procedure of the yaw rate & lateral G sensor, refer to “6MT” section. <Ref. to 6MT-129, REMOVAL, Yaw Rate and Lateral G Sensor.>

B: INSTALLATION

For installation procedure of the yaw rate & lateral G sensor, refer to “6MT” section. <Ref. to 6MT-129, INSTALLATION, Yaw Rate and Lateral G Sensor.>

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ABS (DIAGNOSTICS)

ABS(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:
This section is specified for non-turbo model, turbo model and STi driver's control center differential (with auto).

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)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 4) Read the DTC. <Ref. to ABS(diag)-25, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Record all DTCs and Freeze Frame Data.	Is DTC displayed?	Go to step **4.**	Go to step **3.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using "General Diagnostic Table". <Ref. to ABS(diag)-86, General Diagnostic Table.> 2) Perform clear memory mode. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the inspection mode. <Ref. to ABS(diag)-26, Inspection Mode.> 4) Read the DTC. <Ref. to ABS(diag)-16, 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)-21, NO TROUBLE CODE, INSPECTION, Subaru Select Monitor.>

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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)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the inspection mode. <Ref. to ABS(diag)-26, Inspection Mode.> 5) Read the DTC. <Ref. to ABS(diag)-16, 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.

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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:		

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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:		

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Check List for Interview

3. SYMPTOMS

<table>
<tr><td rowspan="11">ABS operating condition</td><td colspan="3">❑ Does not move.</td></tr>
<tr><td>❑ Operates only when applying an abrupt brake.</td><td rowspan="2">Vehicle speed:</td><td>km/h</td></tr>
<tr><td></td><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="13">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>

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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:	

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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 ABS ground (LHD: (B302), RHD: (F64)) bolt, tightening torque.

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-10, 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-9, 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-27, INSPECTION, Front Brake Pad.> <Ref. to BR-30, INSPECTION, Front Disc Rotor.>
• REAR <Ref. to BR-38, INSPECTION, Rear Brake Pad.> <Ref. to BR-40, INSPECTION, Rear Disc Rotor.>

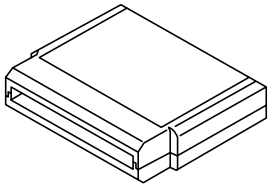
7. TIRE

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

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C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

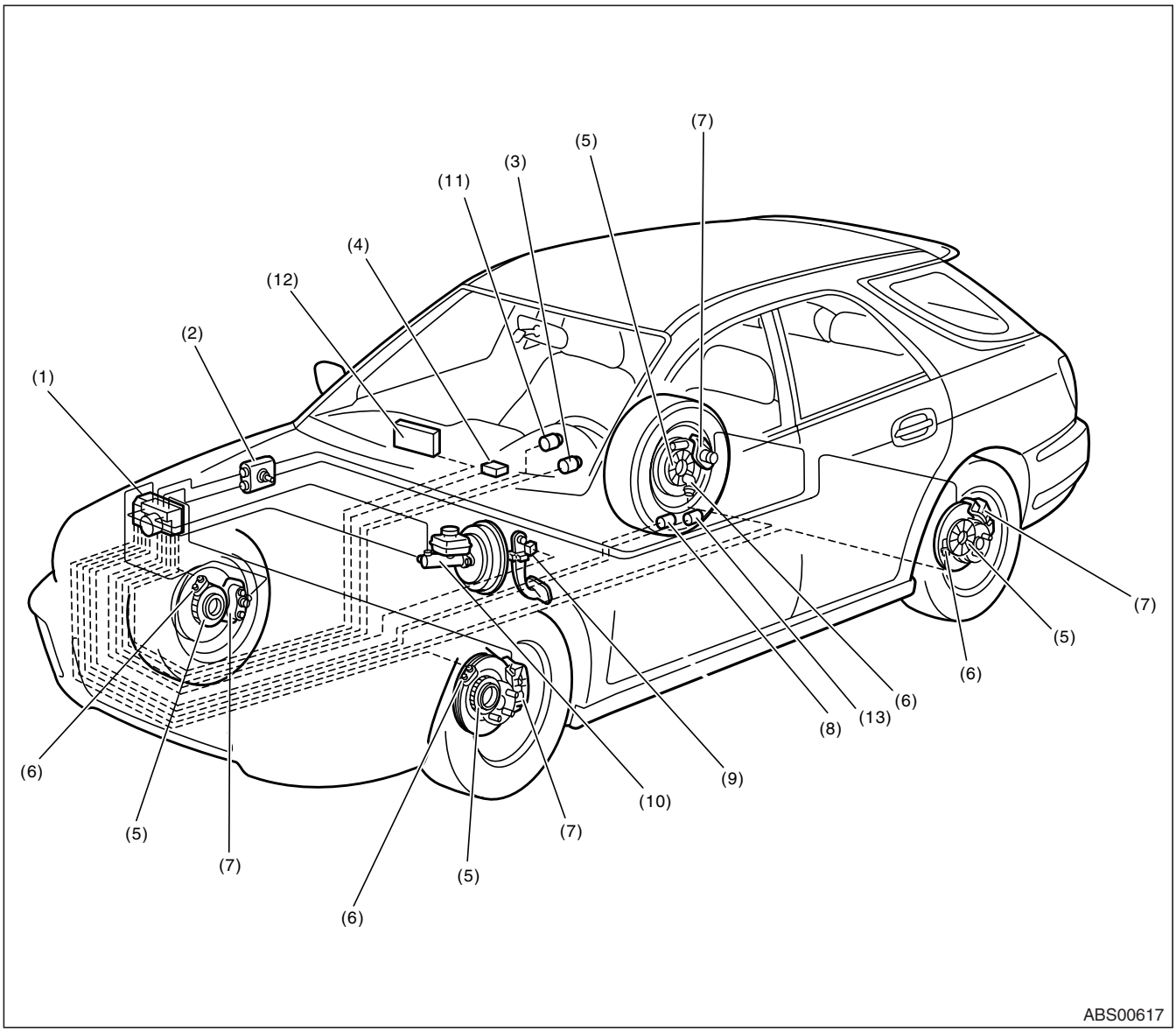
2. GENERAL PURPOSE TOOL

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

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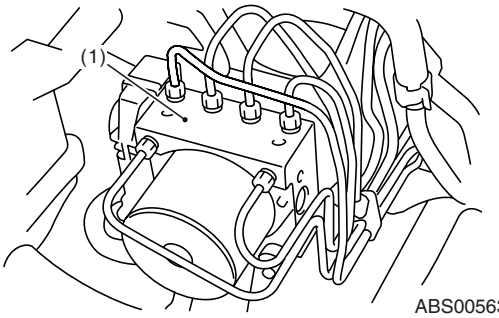
4. Electrical Component Location

A: LOCATION

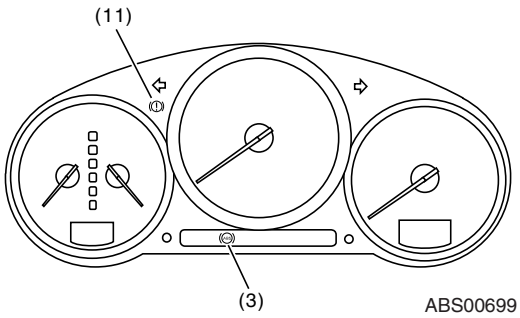


(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) Connector
(3) ABS warning light
(4) Data link connector (for Subaru Select Monitor)
(5) Tone wheel
(6) ABS wheel speed sensor
(7) Caliper body
(8) G sensor
(9) Stop light switch
(10) Master cylinder
(11) Brake and EBD warning light
(12) Driver's control center differential control module (STi model)
(13) Yaw rate & lateral G sensor (STi model)

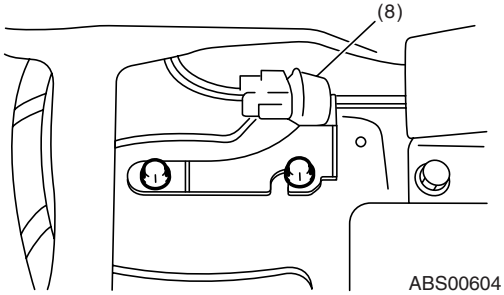
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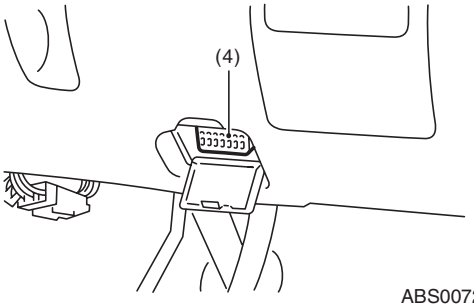
ABS00563



ABS00699

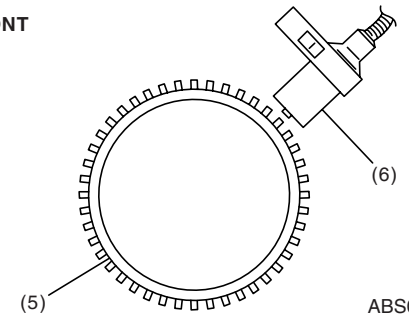


ABS00604



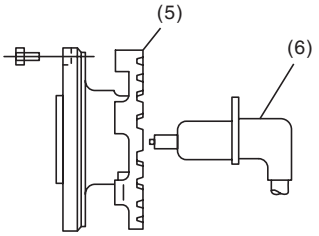
ABS00729

FRONT

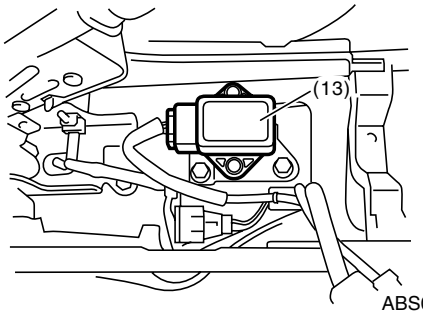


ABS00728

REAR



ABS00726

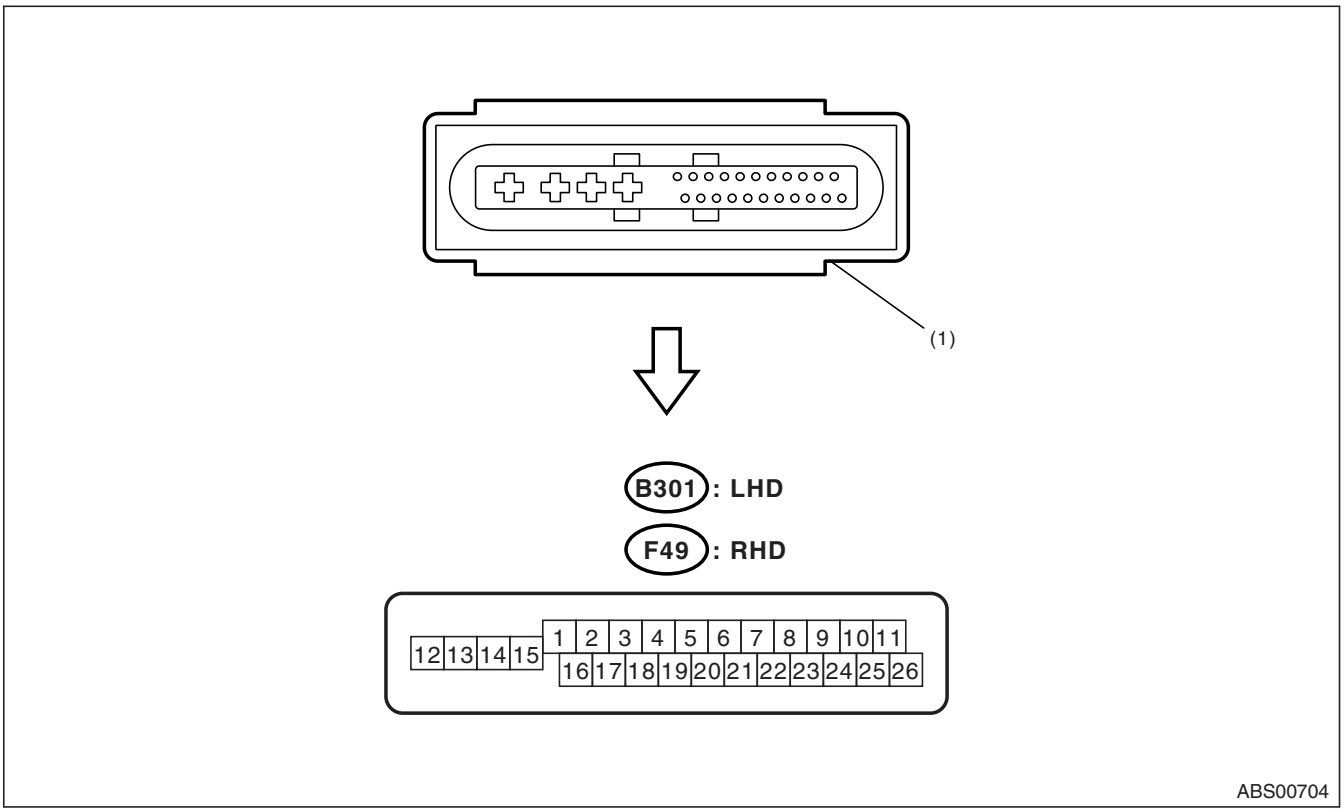


ABS00651

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5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



(1) ABS control module and hydraulic control unit (ABSCM&H/U) connector

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.

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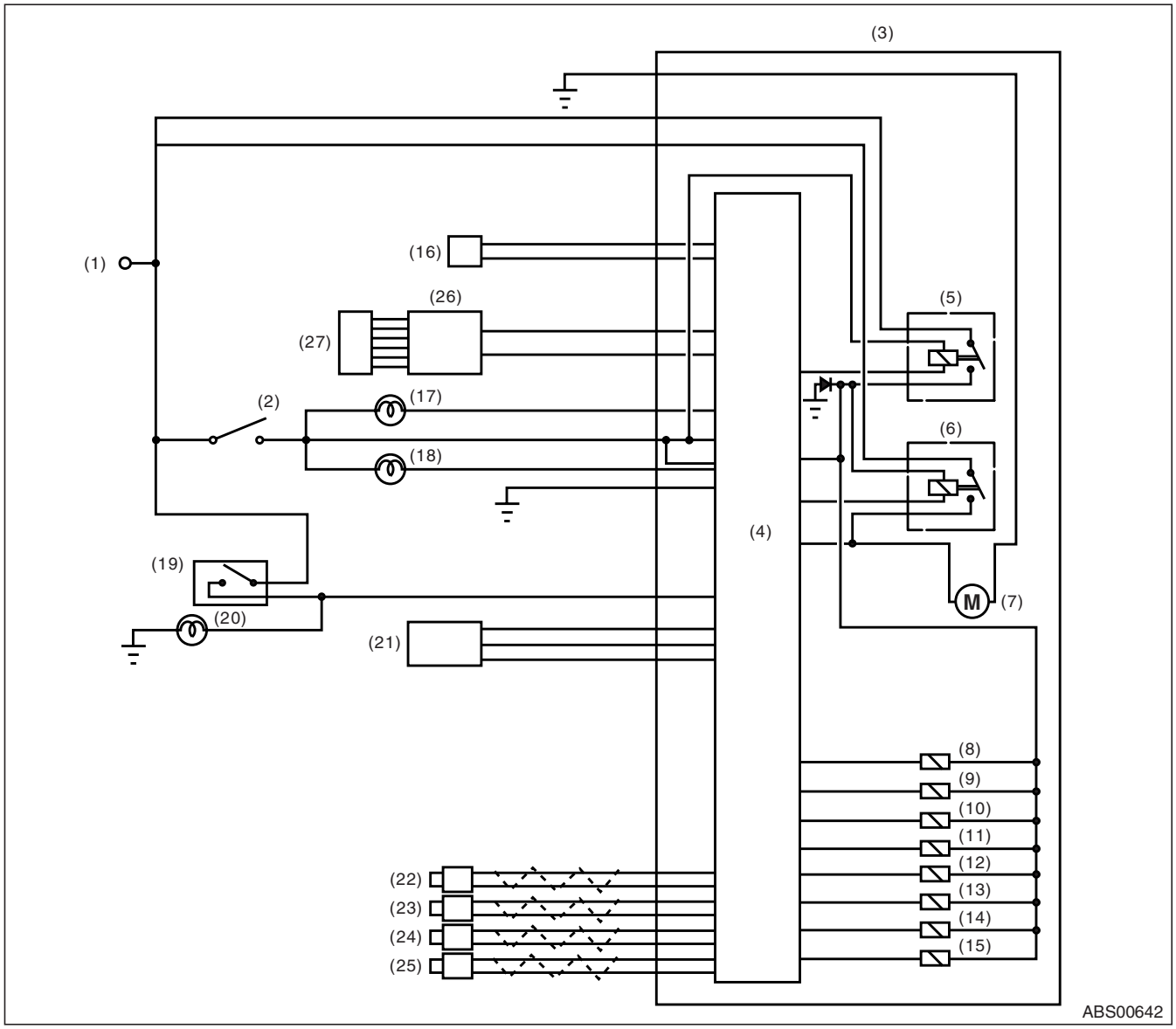
Control Module I/O Signal

Description			Terminal No. (+) — (–)	Input/Output signal Measured value and measuring conditions
ABS wheel speed sensor (Wheel speed sensor)	Front LH wheel	Ground	16	—
		Signal	1 — 16	When the 20 Hz. 0.12 — 1 V
	Front RH wheel	Ground	5	—
		Signal	6 — 5	When the 20 Hz. 0.12 — 1 V
	Rear LH wheel	Ground	2	—
		Signal	3 — 2	When the 20 Hz. 0.12 — 1 V
	Rear RH wheel	Ground	4	—
		Signal	19 — 4	When the 20 Hz. 0.12 — 1 V
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	—
Grounding line			12	—

*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.

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B: WIRING DIAGRAM

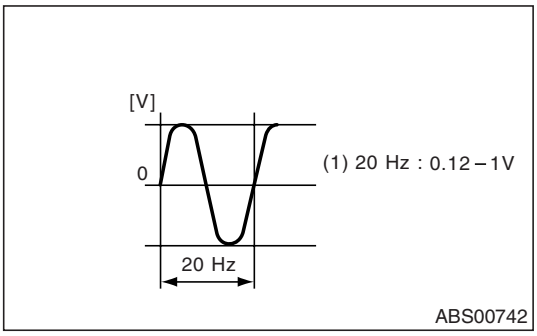


(1) Battery
(2) Ignition switch
(3) ABS control module and hydraulic control unit (ABSCM&H/U)
(4) ABS control module
(5) Valve relay
(6) Motor relay
(7) Motor
(8) Front inlet solenoid valve LH
(9) Front outlet solenoid valve LH
(10) Front inlet solenoid valve RH
(11) Front outlet solenoid valve RH
(12) Rear inlet solenoid valve LH
(13) Rear outlet solenoid valve LH
(14) Rear inlet solenoid valve RH
(15) Rear outlet solenoid valve RH
(16) Data link connector
(17) ABS warning light
(18) Brake warning light
(19) Stop light switch
(20) Stop light
(21) G sensor
(22) Front ABS wheel speed sensor LH
(23) Front ABS wheel speed sensor RH
(24) Rear ABS wheel speed sensor LH
(25) Rear ABS wheel speed sensor RH
(26) Driver's control center differential control module (STi model)
(27) Yaw rate & lateral G sensor (STi model)

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C: WAVEFORM

ABS wheel speed sensor wave form



(1) Standard output voltage

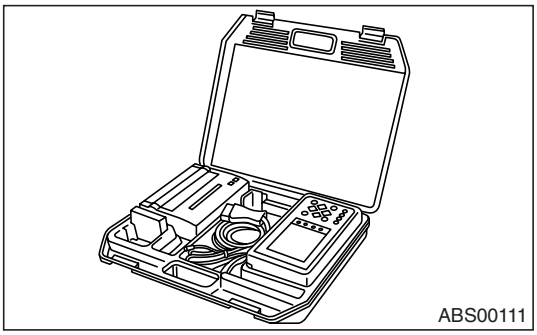
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6. Subaru Select Monitor

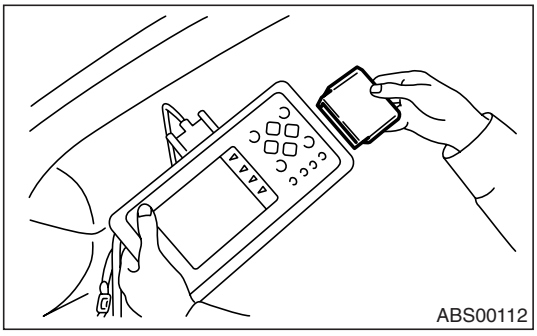
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

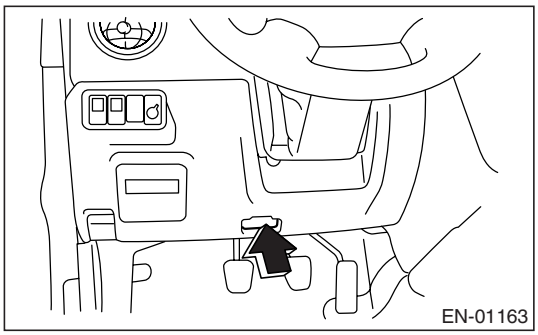
1) Prepare the Subaru Select Monitor kit.



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to ABS(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>



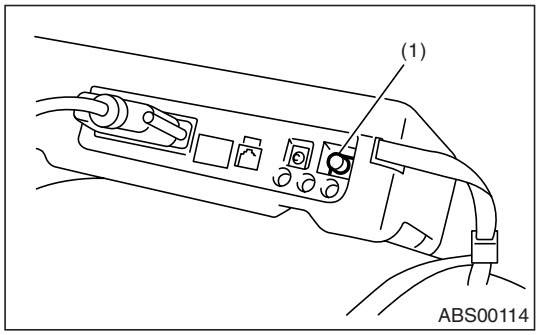
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control System} and press [YES] key.
8) Press the [YES] key after the information of engine type is displayed.
9) On the «ABS Diagnosis» display screen, select the {DTC Display} and press [YES] key.
10) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning the DTC, refer to the LIST OF DTC. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>
• A maximum of 3 DTCs are displayed in order of occurrence.
• If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark "?", appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
Latest	The most recent DTC appears on Subaru Select Monitor display.
Old	The second most recent DTC appears on Subaru Select Monitor display.
Older	The third most recent DTC appears on Subaru Select Monitor display.
Reference	DTC issued after elapse of a specified period of time.

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2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press «YES» key.
2) On the «System Selection Menu» display screen, select the {Brake Control System} and press «YES» key.
3) Press the «YES» key after the information of ABS type is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display & Save} and press «YES» key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press «YES» key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Display screen	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
Stop Light Switch	Stop light switch signal	ON or OFF
G Sensor Output Signal	Vehicle acceleration detected by analog G sensor is displayed.	m/s (m/s^2)
Lateral G Sensor Output Signal	Lateral G detected by Lateral G sensor is displayed in voltage. (STi model)	m/s (m/s^2)
Valve Relay Signal	Valve Relay Signal	ON or OFF
ABS Warning Lamp	ON operation of ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Monitor voltage of motor relay 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 detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

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3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press «YES» key.
2) On the «System Select Menu» display screen, select the {Brake System} and press «YES» key.
3) Press the «YES» key after the information of engine type is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press «YES» key.

Display screen	Contents to be monitored
Clear memory?	Function of clearing DTC.

5) When the “Done” and “turn ignition switch to OFF” are shown on display screen, turn the Subaru Select Monitor power switch and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

4. ABS SEQUENCE CONTROL

Display screen	Contents to be monitored	Index No.
ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to ABS-14, 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 maximum to three.
• If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a DTC, preceded by a question mark “?”, appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

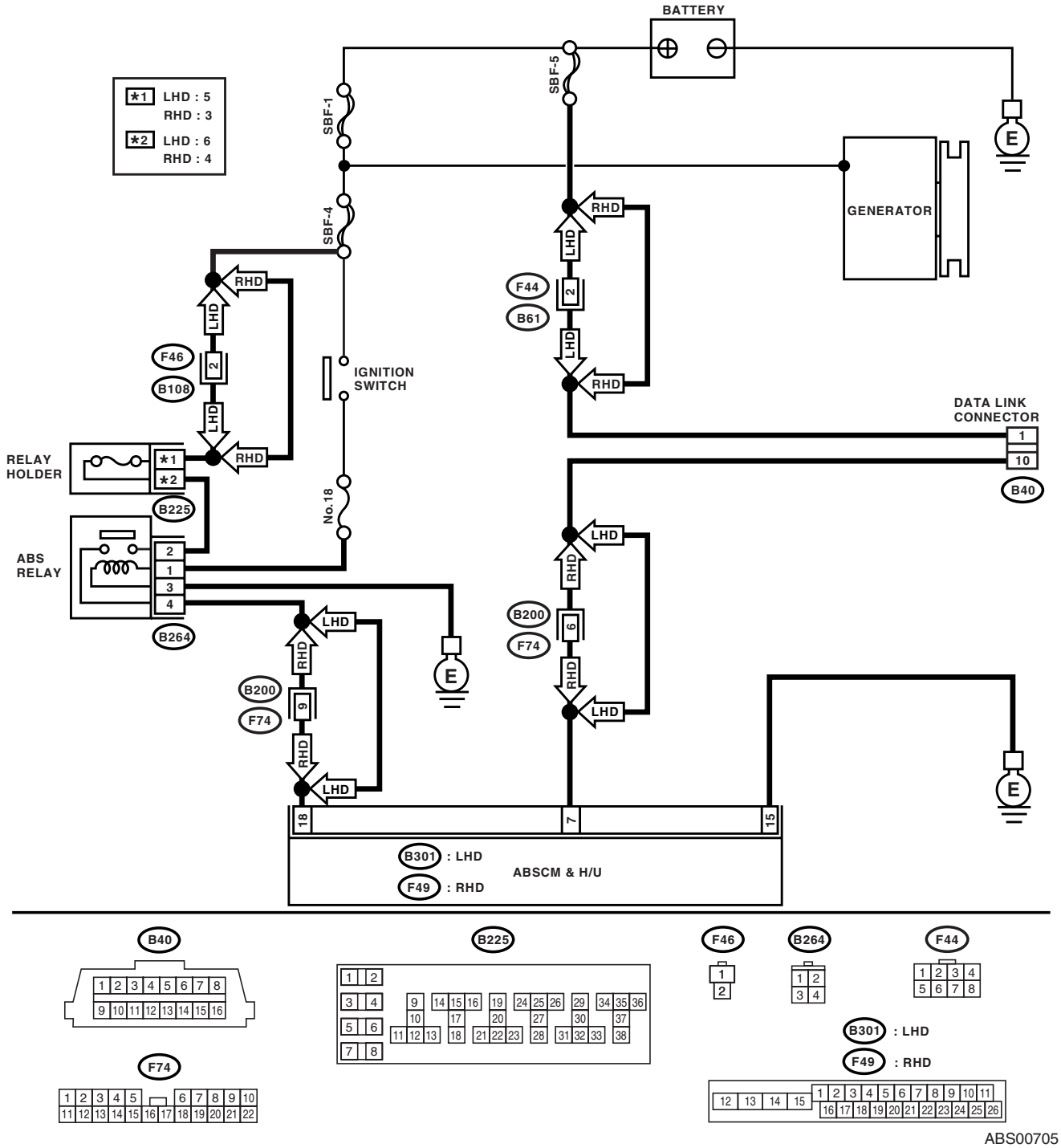
Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by Front ABS wheel speed sensor RH is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front ABS wheel speed sensor LH is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed in km/h or mile/h.
IG power voltage	Power (in volts) supplied to ABSCM& H/U appears on the Subaru Select Monitor display.
G sensor output voltage	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.
Lateral G sensor output voltage	Voltage equivalent to Lateral G detected by analog Lateral G sensor is displayed.
Motor relay monitor	Motor relay operation monitor signal
Stop light switch	Stop light switch signal
ABS operation signal	ABS operation signal
Power Supply Failure	Occurrence of abnormal voltage during malfunction is displayed.
Vehicle speed	Vehicle speed is displayed.

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B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Faulty harness connector
TROUBLE SYMPTOM:
Communication cannot be executed between ABS and Subaru select monitor.
WIRING DIAGRAM:



ABS00705

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	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch turned 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 COMMUNICATION OF SUBARU SELECT MONITOR.** 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 name and year of system displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 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.	Are the name and year of system displayed on Subaru Select Monitor?	Replace the ABSCM&H/U. <Ref. to ABS-7, 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 the ABSCM&H/U, ECM and TCM connectors. 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 ABSCM&H/U 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*** ***LHD :*** ***(B301) No. 7 — (B40) No. 10:*** ***RHD :*** ***(F49) 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 the clamp locks onto it?	Go to step **10.**	Insert the ABSCM&H/U connector into ABSCM&H/U.

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	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 ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD :*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***RHD :*** ***(F49) 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.
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 and transmission. 3) Measure the resistance of harness between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD :*** ***(B301) No. 15 — Chassis ground:*** ***RHD :*** ***(F49) 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 CONNECTORS.**	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2. NO TROUBLE CODE

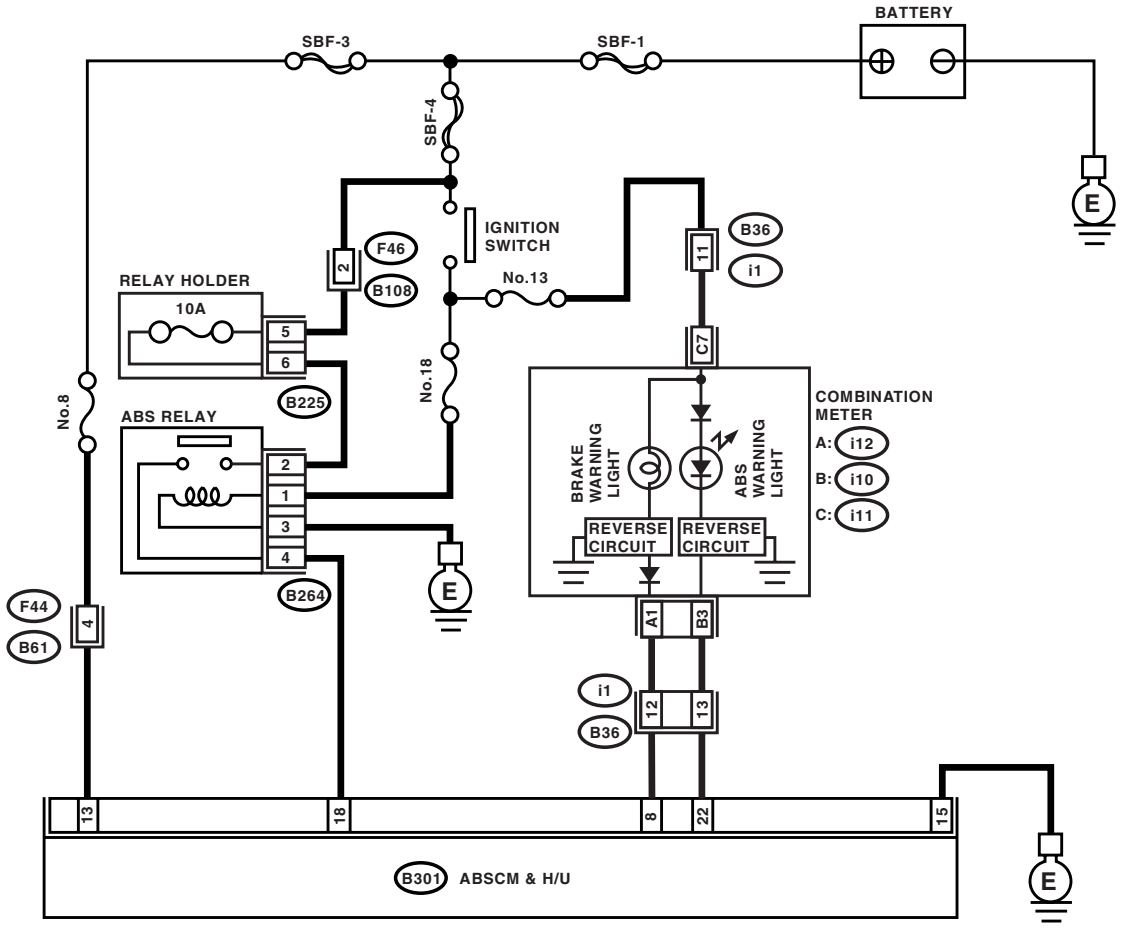
DETECTING CONDITION:
ABS warning light circuit is shorted.
TROUBLE SYMPTOM:
- ABS warning light remains on.
- “NO TROUBLE CODE” displayed on the Subaru Select Monitor.

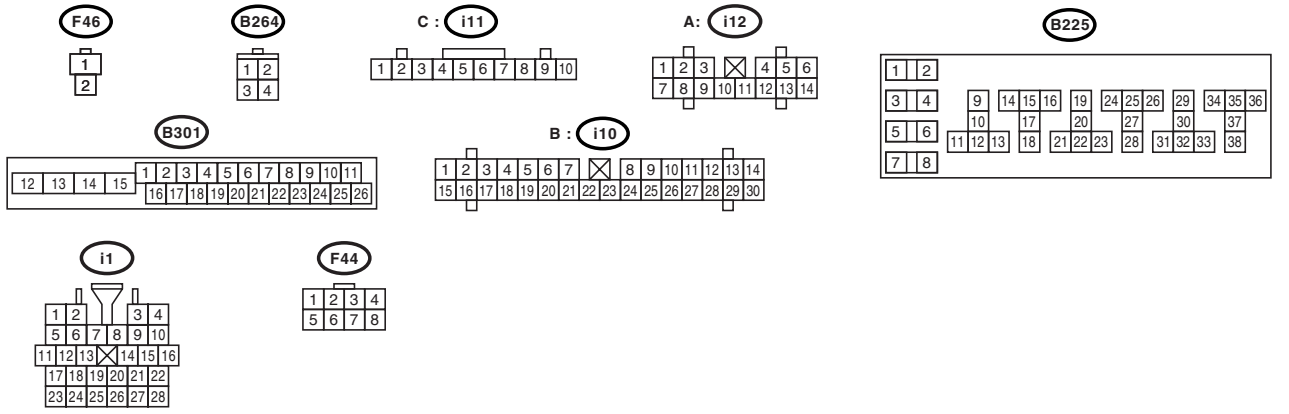
NOTE:
When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in normal condition.

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WIRING DIAGRAM:

- LHD model

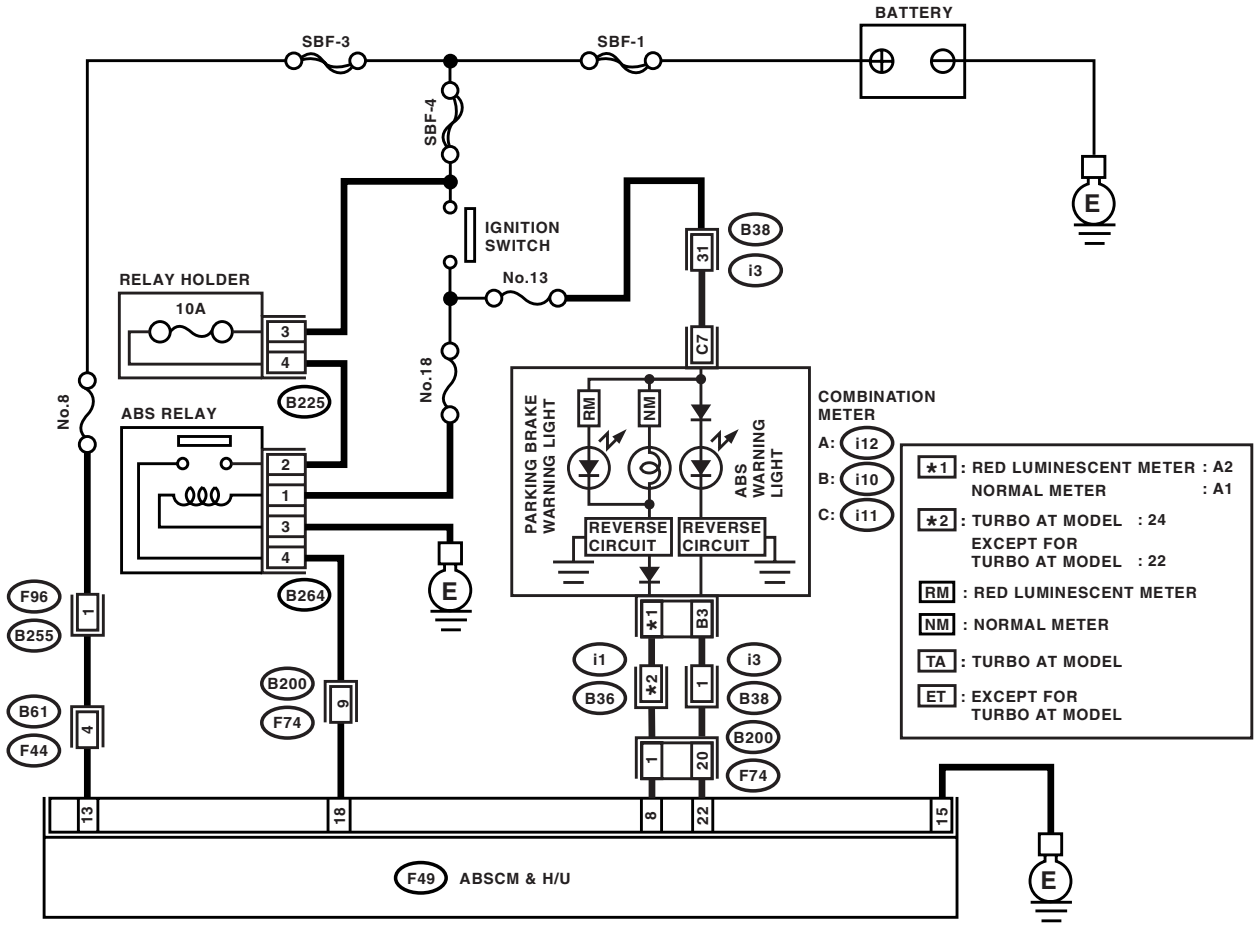


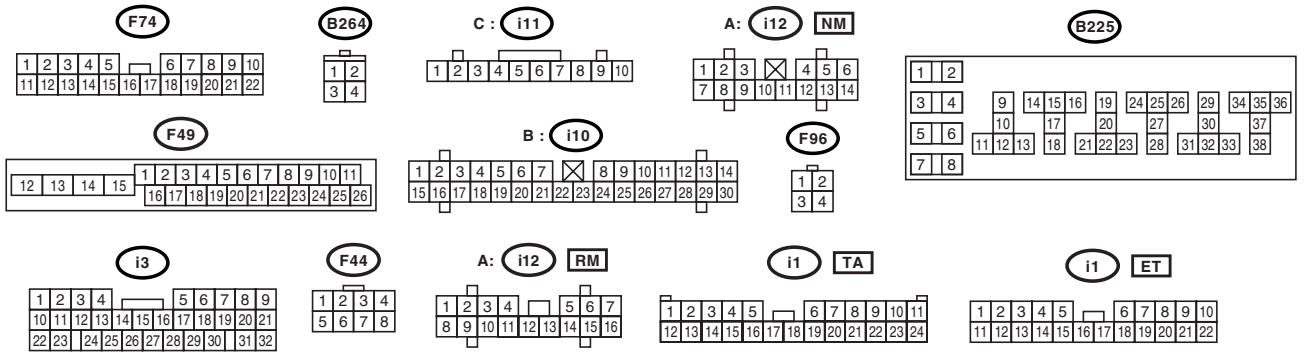


ABS00706

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- RHD model





ABS00707

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	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-11, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **2.**
2	**CHECK WIRING HARNESS.** Measure the resistance between ABSCM connector and combination meter connector. ***Connector & terminal*** ***LHD :*** ***(i10) No. 3 — (B301) No. 22:*** ***RHD :*** ***(i10) No. 3 — (F49) No. 22:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair harness and connector between ABSCM&H/U and combination meter connector.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in ABSCM connector and combination meter connector?	Repair the connector.	Check the combination meter.

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7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

Refer to “SUBARU SELECT MONITOR” for details about reading of DTCs. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

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8. Inspection Mode

A: PROCEDURE

WARNING:
Observe the road traffic law.

Reproduce the malfunction occurrence condition as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least 1 minute.

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9. Clear Memory Mode

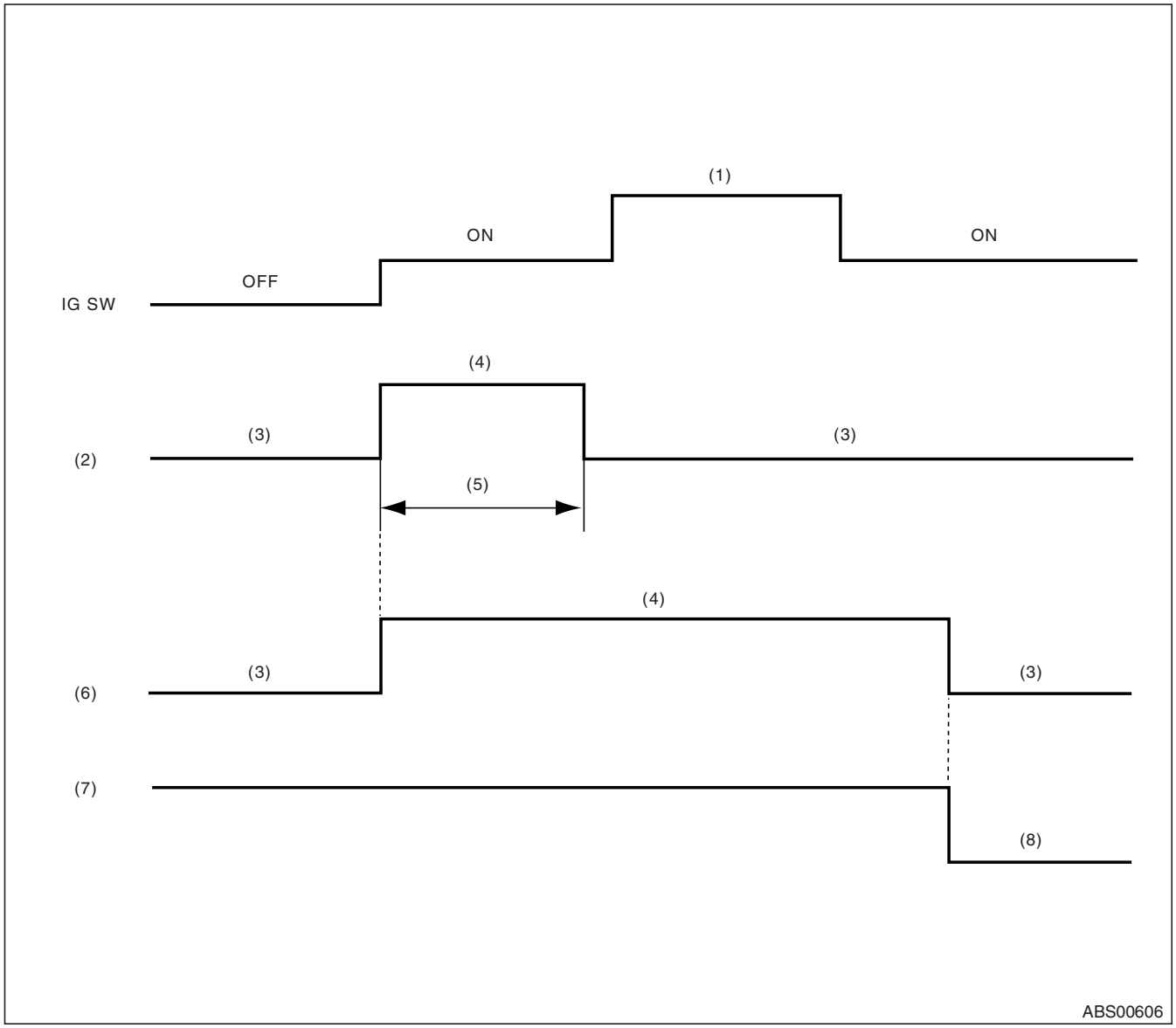
A: OPERATION

Refer to “SUBARU SELECT MONITOR” for details about how to clear DTC. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

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10.ABS Warning Light / Brake Warning Light Illumination Pattern

A: INSPECTION



(1)	Start	(4)	Illuminates	(7)	Parking brake
(2)	ABS warning light	(5)	About 2 sec.	(8)	Release
(3)	Go off	(6)	Brake warning light (EBD warning light)		

1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit.

NOTE:
Even though the ABS warning light does not go out about 2 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approx. 12 km/h (7 MPH). However, the ABS system do not work while ABS warning light is illuminated.

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B: ABS WARNING LIGHT DOES NOT COME ON

DETECTING CONDITION:

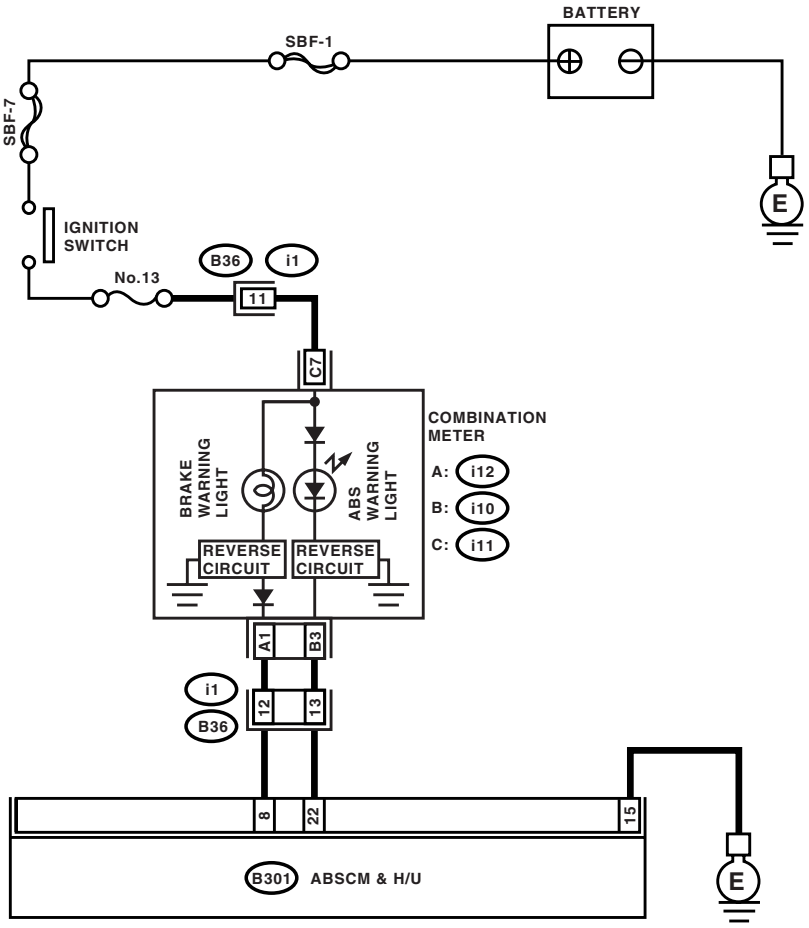
- Defective combination meter
- Defective harness

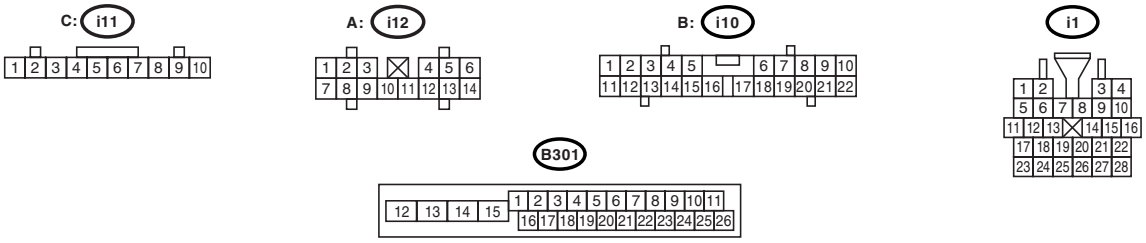
TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:

- LHD model



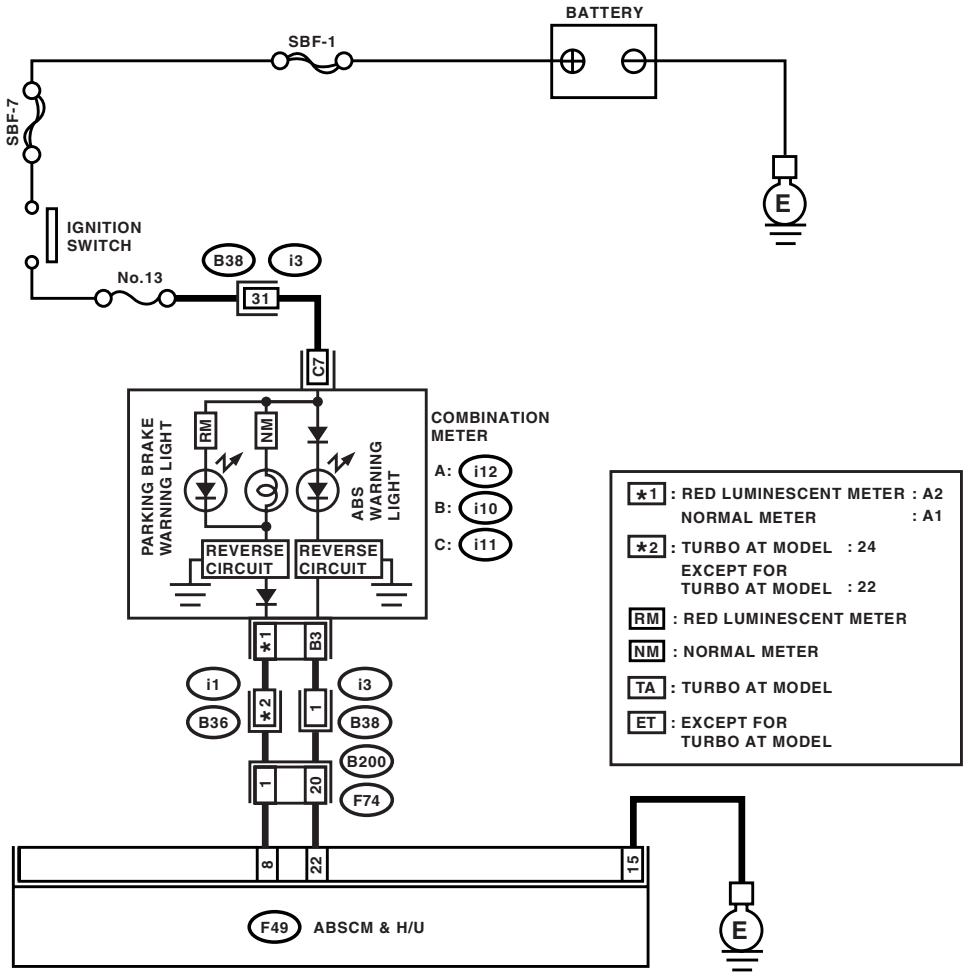


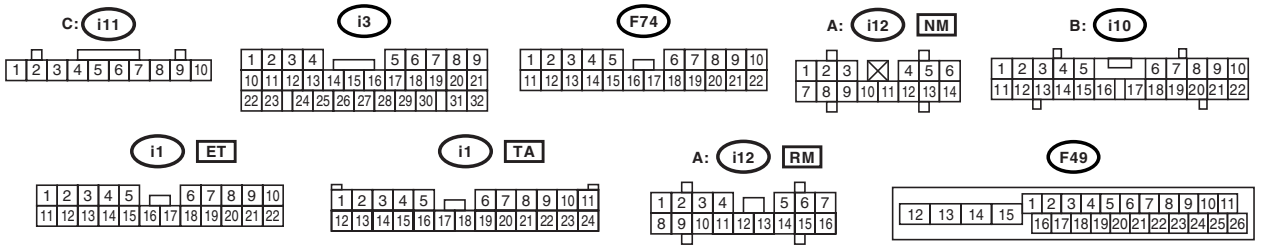
ABS00708

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ABS Warning Light / Brake Warning Light Illumination Pattern

- RHD model





ABS00709

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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)-25, 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 from ABSCM&H/U. 3) Disconnect the connector (i10) from the combination meter. 4) Measure the resistance between ABSCM connector and chassis ground. ***Connector & terminal*** ***LHD :*** ***(B301) No. 22 — Chassis ground:*** ***RHD :*** ***(F49) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair harness and connector between ABSCM&H/U and combination meter connector.
4	**CHECK ABSCM.** 1) Connect the connector 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 of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-11, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

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C: ABS WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

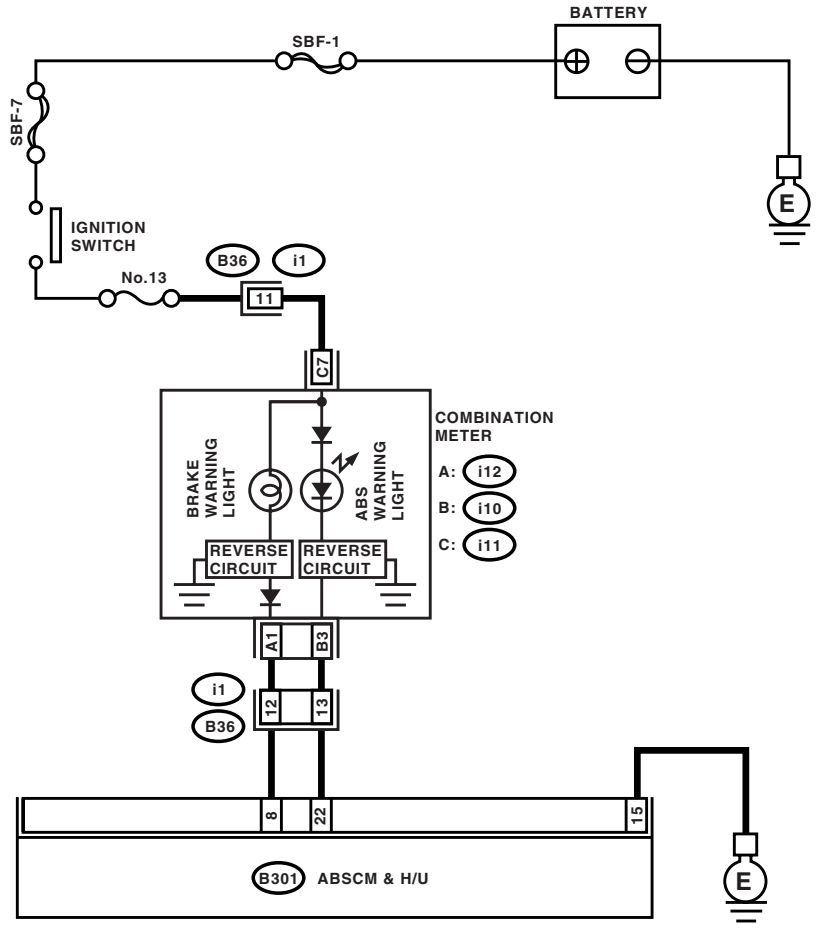
- Defective combination meter
- Open in harness

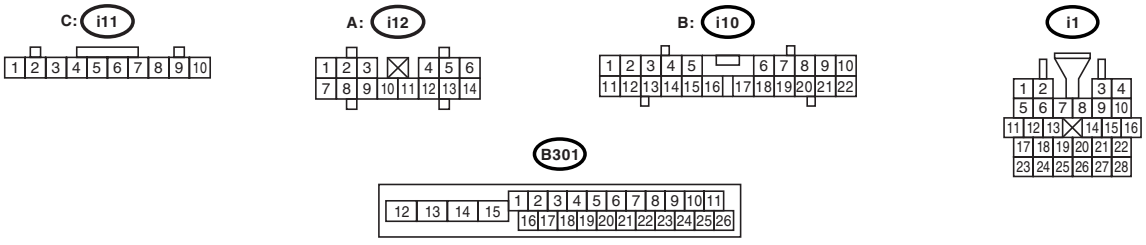
TROUBLE SYMPTOM:

When starting the engine, the ABS warning light is kept on.

WIRING DIAGRAM:

- LHD model

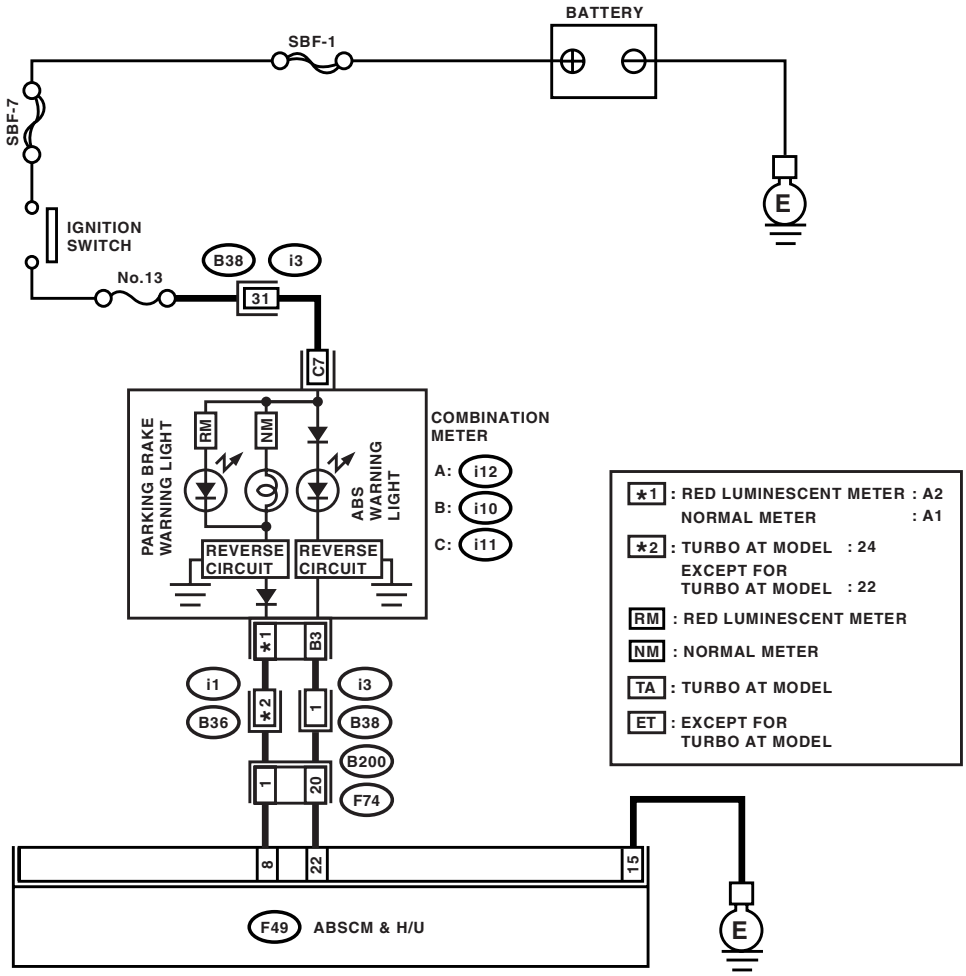


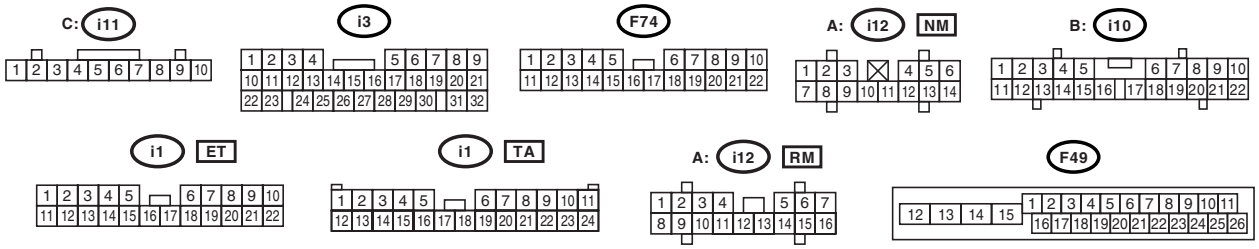


ABS00708

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- RHD model





ABS00709

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ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-25, 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 from ABSCM&H/U. 3) Disconnect the connector (i10) from the combination meter. 4) Measure the resistance between ABSCM connector and combination meter connector. ***Connector & terminal*** ***LHD :*** ***(B301) No. 22 — (i10) No. 3:*** ***RHD :*** ***(F49) No. 22 — (i10) No. 3:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair harness and connector between ABSCM&H/U and combination meter connector.
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 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. 3 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-11, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

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D: BRAKE WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

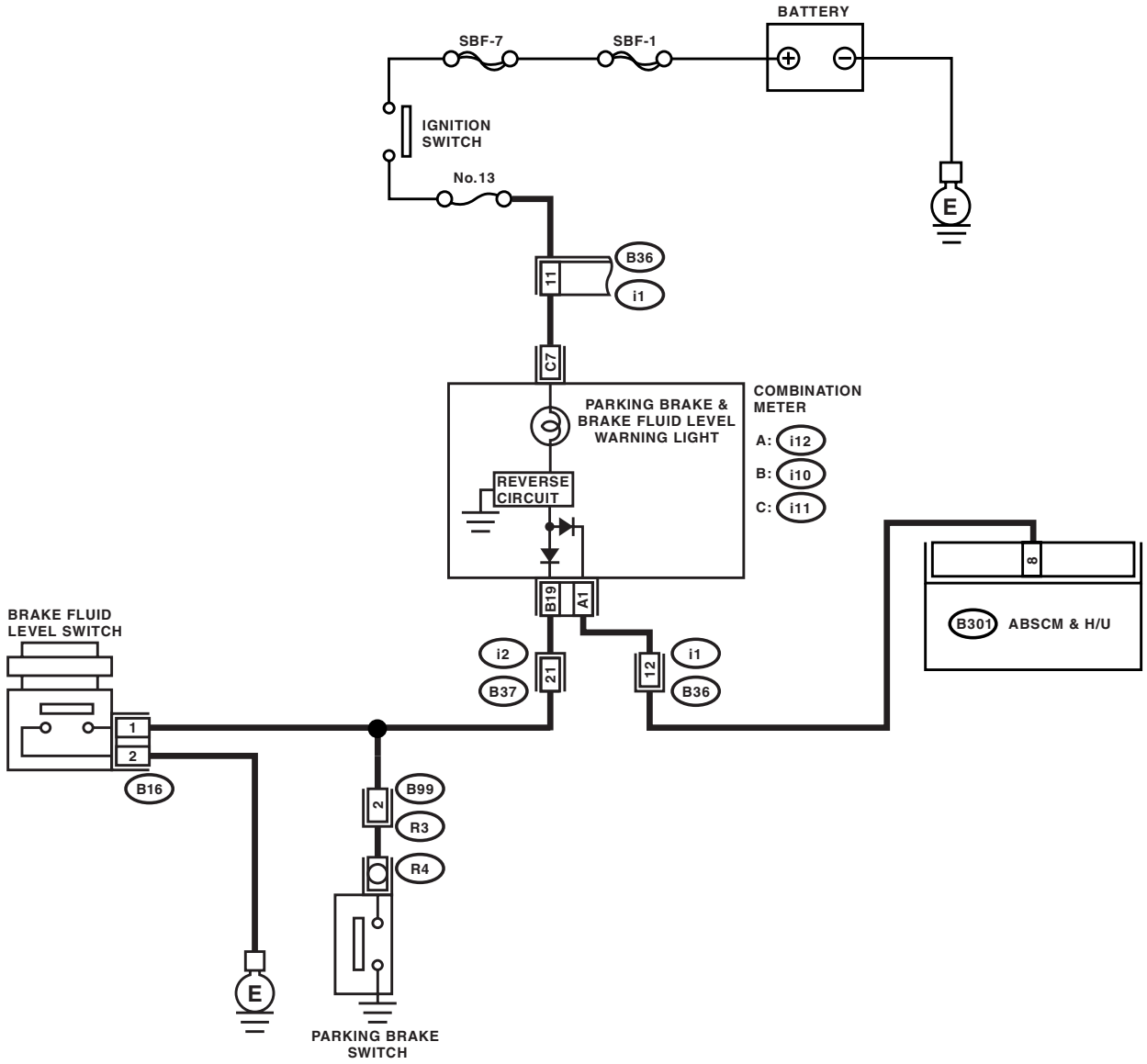
- Brake warning light circuit is shorted.
- Defective sensor/connector

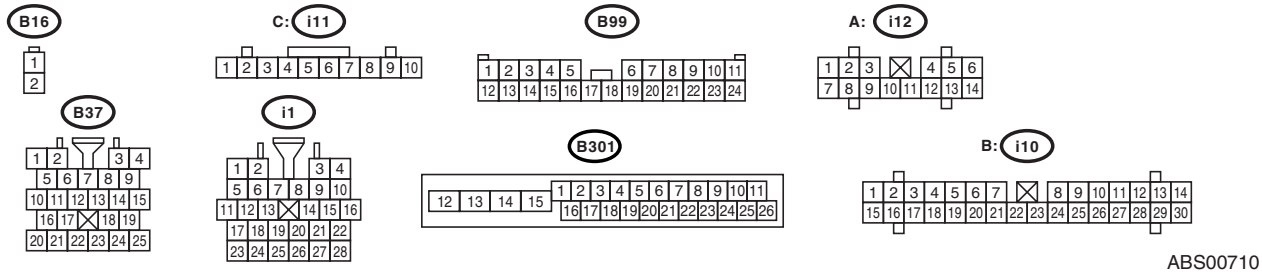
TROUBLE SYMPTOM:

After starting the engine, the brake warning light is kept on though the parking lever is released.

WIRING DIAGRAM:

- LHD model



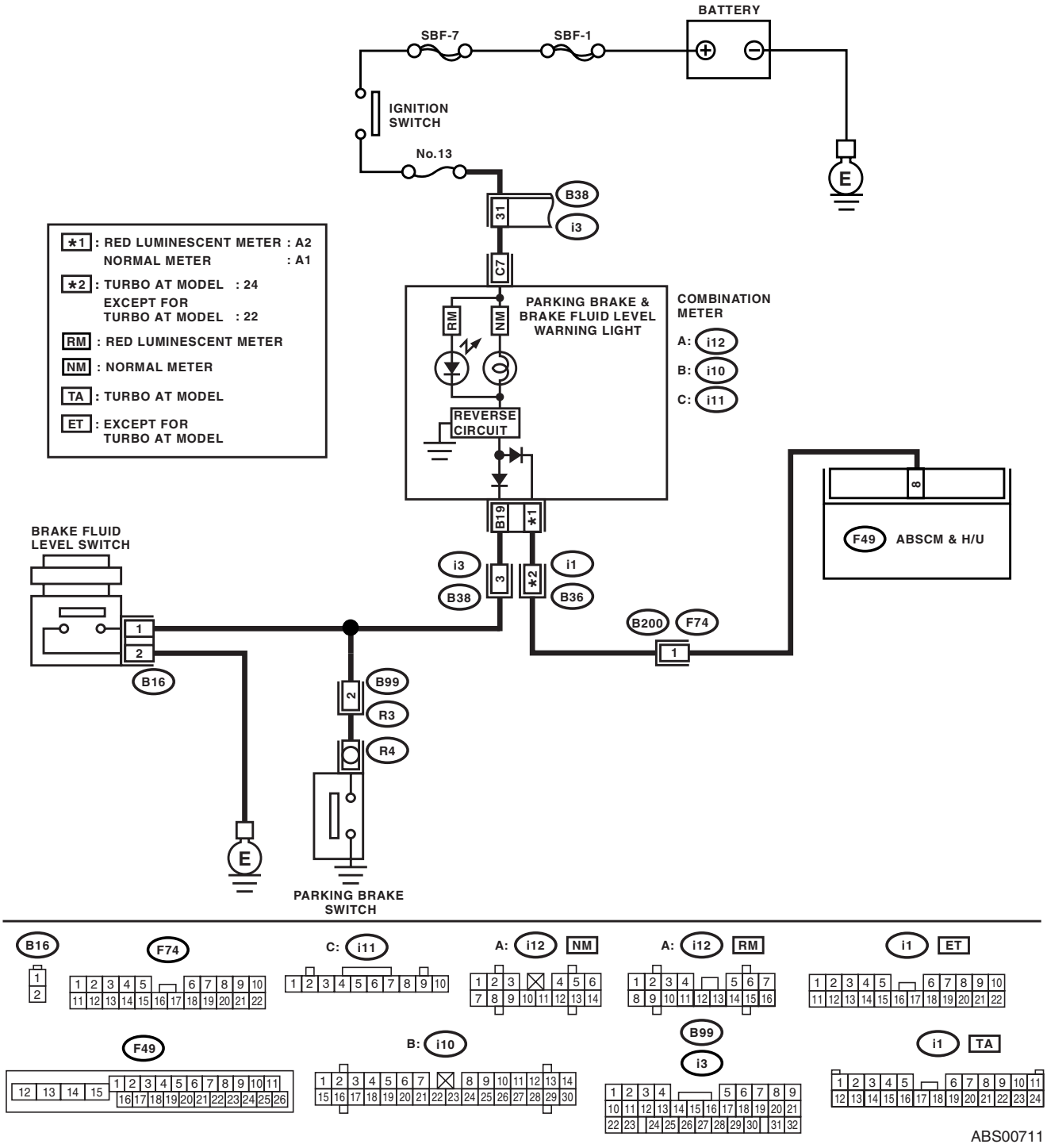


ABS00710

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ABS Warning Light / Brake Warning Light Illumination Pattern

- RHD model



ABS00711

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.

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	Step	Check	Yes	No
2	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-25, 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 brake fluid switch 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. 19 — 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 from ABSCM&H/U. 2) Disconnect the connector (i12) from the combination meter. 3) Measure the resistance between ABSCM&H/U connector and combination meter connector. ***Connector & terminal*** ***LHD :*** ***(B301) No. 8 — (i12) No. 1:*** ***RHD (red luminescent meter) :*** ***(F49) No. 8 — (i12) No. 2:*** ***RHD (normal meter) :*** ***(F49) No. 8 — (i12) No. 1:***	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*** ***LHD :*** ***(i12) No. 1 — Chassis ground:*** ***RHD (red luminescent meter) :*** ***(i12) No. 2 — Chassis ground:*** ***RHD (normal meter) :*** ***(i12) No. 1 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-11, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

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11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Subaru Select Monitor communication failure	<Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>
—	No DTC	Although no DTC appears on the Subaru Select Monitor display, the ABS warning light remains on.	<Ref. to ABS(diag)-21, NO TROUBLE CODE, INSPECTION, Subaru Select Monitor.>
21	Open or short circuit in Front ABS wheel speed sensor RH circuit	Open or short circuit in Front ABS wheel speed sensor RH circuit	<Ref. to ABS(diag)-40, DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Front ABS wheel speed sensor RH abnormal signal	Front ABS wheel speed sensor RH abnormal signal	<Ref. to ABS(diag)-47, DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Open or short circuit in Front ABS wheel speed sensor LH circuit	Open or short circuit in Front ABS wheel speed sensor LH circuit	<Ref. to ABS(diag)-40, DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Front ABS wheel speed sensor LH abnormal signal	Front ABS wheel speed sensor LH abnormal signal	<Ref. to ABS(diag)-47, DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	Open or short circuit in Rear ABS wheel speed sensor RH circuit	Open or short circuit in Rear ABS wheel speed sensor RH circuit	<Ref. to ABS(diag)-40, DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	Rear ABS wheel speed sensor RH abnormal signal	Rear ABS wheel speed sensor RH abnormal signal	<Ref. to ABS(diag)-47, DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	Open or short circuit in Rear ABS wheel speed sensor LH circuit	Open or short circuit in Rear ABS wheel speed sensor LH circuit	<Ref. to ABS(diag)-41, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	Rear ABS wheel speed sensor LH abnormal signal	Rear ABS wheel speed sensor LH abnormal signal	<Ref. to ABS(diag)-48, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
29	Abnormal ABS wheel speed sensor signal on any one of four sensor	Abnormal ABS wheel speed sensor signal on any one of four	<Ref. to ABS(diag)-54, DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Front inlet valve RH malfunction	Front inlet valve RH malfunction	<Ref. to ABS(diag)-59, DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Front outlet valve RH malfunction	Front outlet valve RH malfunction	<Ref. to ABS(diag)-61, DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Front inlet valve LH malfunction	Front inlet valve LH malfunction	<Ref. to ABS(diag)-59, DTC 33 FRONT LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	Front outlet valve LH malfunction	Front outlet valve LH malfunction	<Ref. to ABS(diag)-61, DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	Rear inlet valve RH malfunction	Rear inlet valve RH malfunction	<Ref. to ABS(diag)-59, DTC 35 REAR RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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List of Diagnostic Trouble Code (DTC)

DTC	Display screen	Contents of diagnosis	Index No.
36	Rear outlet valve RH malfunction	Rear outlet valve RH malfunction	<Ref. to ABS(diag)-61, DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	Rear inlet valve LH malfunction	Rear inlet valve LH malfunction	<Ref. to ABS(diag)-59, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Rear outlet valve LH malfunction	Rear outlet valve LH malfunction	<Ref. to ABS(diag)-62, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
41	ABS control module malfunction	ABSCM&H/U malfunction	<Ref. to ABS(diag)-65, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	Power supply voltage failure	Power voltage malfunction	<Ref. to ABS(diag)-66, DTC 42 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
47	Improper CAN Communication	CAN communication circuit failure	<Ref. to ABS(diag)-83, DTC 47 IMPROPER CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS(diag)-69, DTC 51 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	Motor and Motor Relay	Motor/motor relay on failure	<Ref. to ABS(diag)-71, DTC 52 MOTER/MOTER RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS(diag)-74, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
56	Longitudinal G Sensor malfunction	Faulty G sensor output voltage or output signal	<Ref. to ABS(diag)-76, DTC 56 G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	Lateral G Sensor malfunction	Faulty Lateral G sensor output voltage or output signal	<Ref. to ABS(diag)-80, DTC 73 LATERAL G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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12.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-41, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-41, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-41, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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D: DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT

DIAGNOSIS:

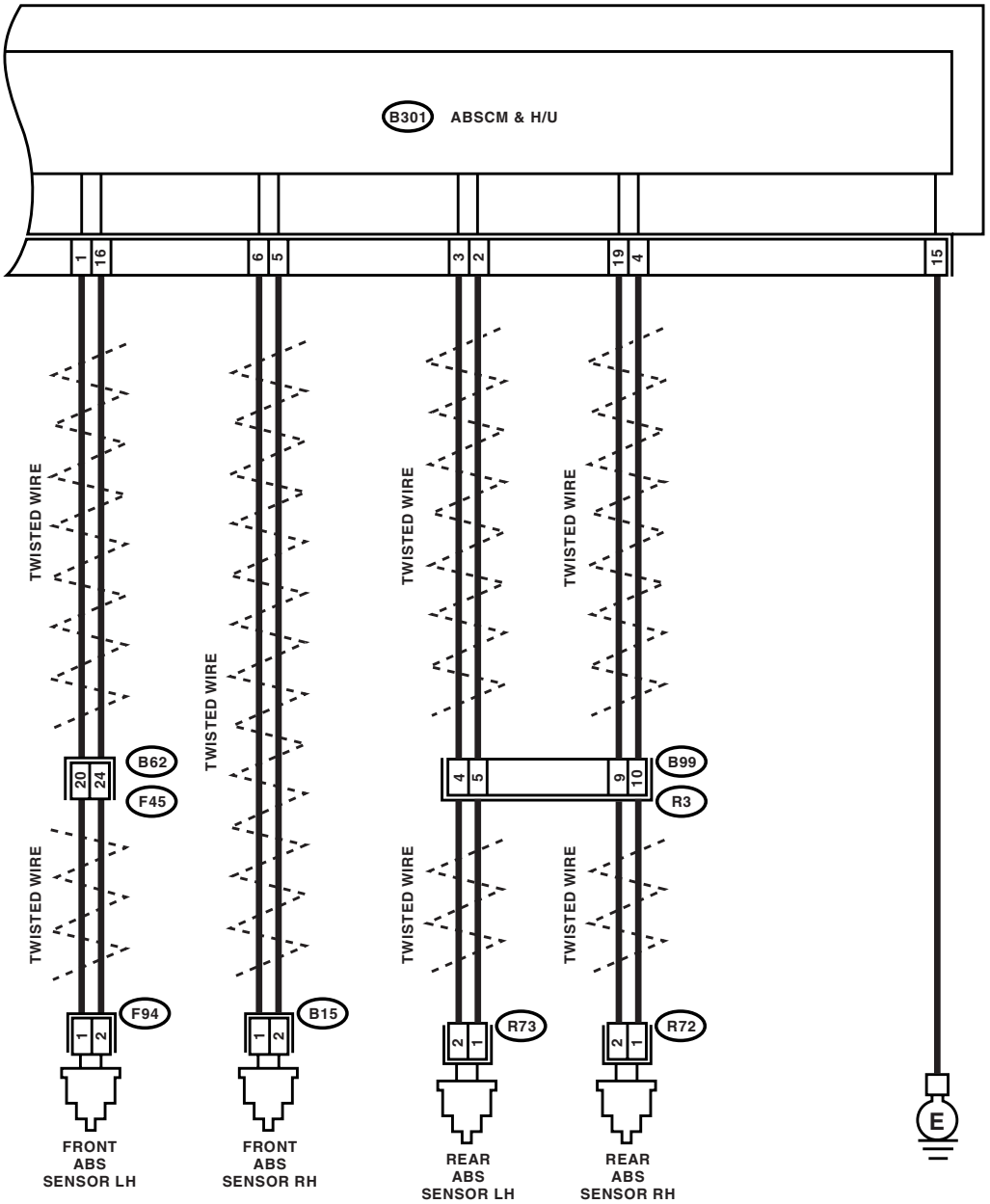
- Faulty ABS wheel speed sensor (Broken wire, input voltage too high)
- Faulty harness connector

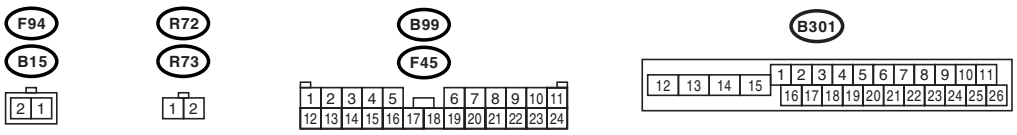
TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:

- LHD model

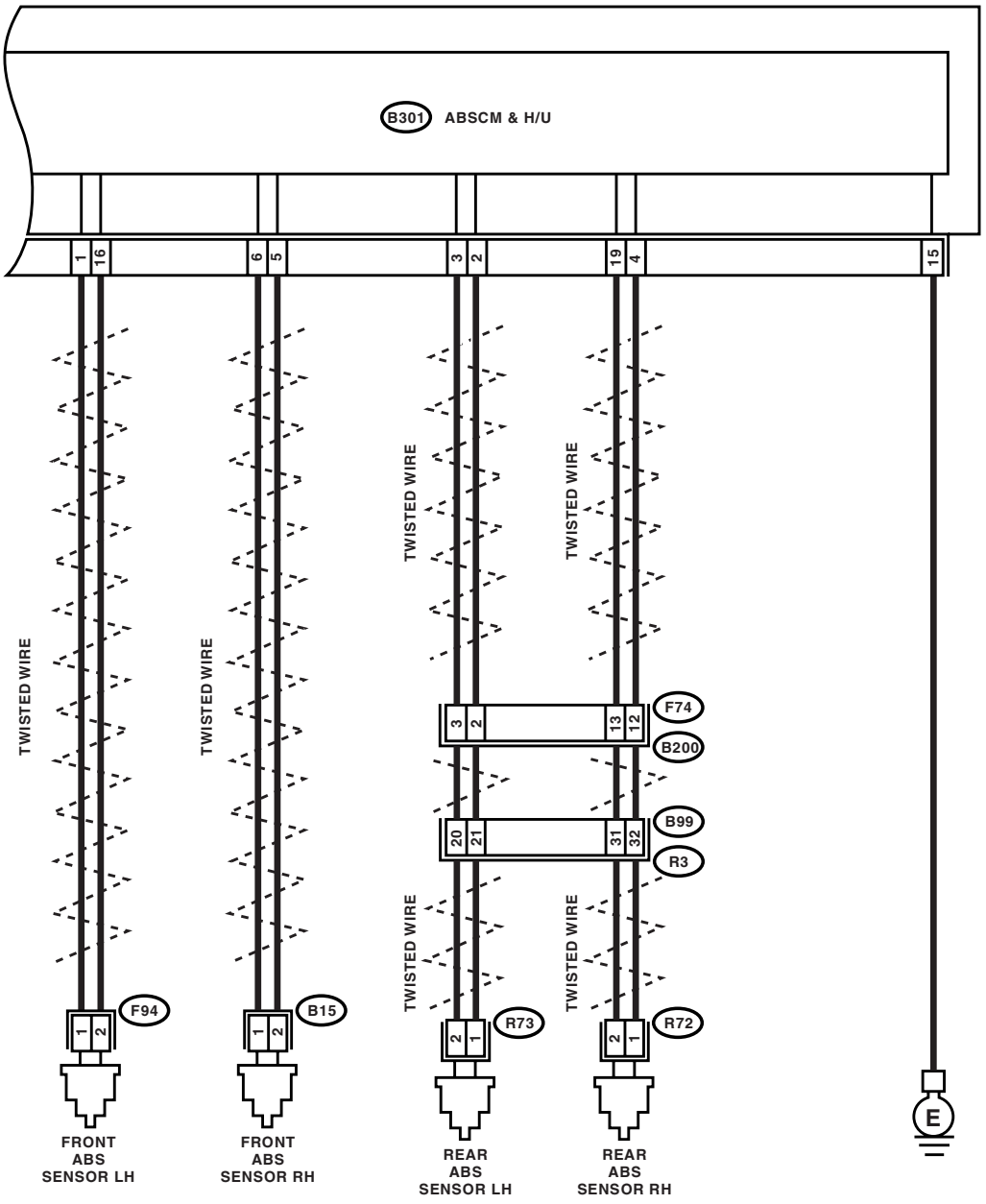


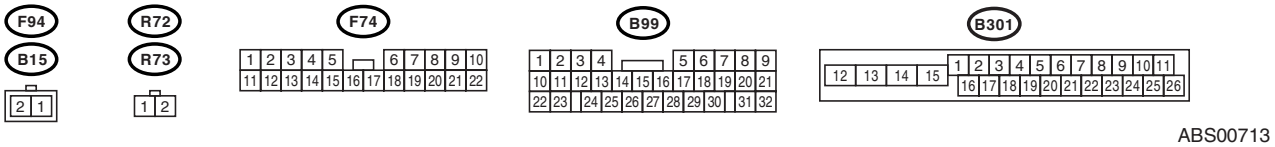


ABS00712

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- RHD model





ABS00713

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	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode.	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step **2.**	Go to step **8.**
2	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **3.**	Tighten the ABS wheel speed sensor installation bolts securely.
3	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in), Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **4.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **5.**	Replace the tone wheel. Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTORS.** 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 **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

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	Step	Check	Yes	No
8	**CHECK ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance of ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminals*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **9.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>
9	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector from ABSCM&H/U. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **10.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>
10	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>
11	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***LHD :*** ***DTC 21*** ***(B301) No. 6 — No. 5:*** ***DTC 23*** ***(B301) No. 1 — No. 16:*** ***DTC 25*** ***(B301) No. 19 — No. 4:*** ***DTC 27*** ***(B301) No. 3 — No. 2:*** ***RHD :*** ***DTC 21*** ***(F49) No. 6 — No. 5:*** ***DTC 23*** ***(F49) No. 1 — No. 16:*** ***DTC 25*** ***(F49) No. 19 — No. 4:*** ***DTC 27*** ***(F49) No. 3 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ , Rear: 1.025 — 1.265 kΩ	Go to step **12.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.

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	Step	Check	Yes	No
12	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD :*** ***DTC 21*** ***(B301) No. 6 (+) — Chassis ground (−):*** ***DTC 23*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***DTC 25*** ***(B301) No. 19 (+) — Chassis ground (−):*** ***DTC 27*** ***(B301) No. 3 (+) — Chassis ground (−):*** ***RHD :*** ***DTC 21*** ***(F49) No. 6 (+) — Chassis ground (−):*** ***DTC 23*** ***(F49) No. 1 (+) — Chassis ground (−):*** ***DTC 25*** ***(F49) No. 19 (+) — Chassis ground (−):*** ***DTC 27*** ***(F49) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **13.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD :*** ***DTC 21*** ***(B301) No. 6 (+) — Chassis ground (−):*** ***DTC 23*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***DTC 25*** ***(B301) No. 19 (+) — Chassis ground (−):*** ***DTC 27*** ***(B301) No. 3 (+) — Chassis ground (−):*** ***RHD :*** ***DTC 21*** ***(F49) No. 6 (+) — Chassis ground (−):*** ***DTC 23*** ***(F49) No. 1 (+) — Chassis ground (−):*** ***DTC 25*** ***(F49) No. 19 (+) — Chassis ground (−):*** ***DTC 27*** ***(F49) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **14.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
14	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **15.**	Tighten the ABS wheel speed sensor installation bolts securely.
15	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in), Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.

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	Step	Check	Yes	No
16	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **17.**	Replace the tone wheel. Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>
17	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **18.**	Replace the ABS wheel speed sensor and ABSCM&H/U. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.> and<Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***LHD :*** ***DTC 21*** ***(B301) No. 6 — Chassis ground:*** ***DTC 23*** ***(B301) No. 1 — Chassis ground:*** ***DTC 25*** ***(B301) No. 19 — Chassis ground:*** ***DTC 27*** ***(B301) No. 3 — Chassis ground:*** ***RHD :*** ***DTC 21*** ***(F49) No. 6 — Chassis ground:*** ***DTC 23*** ***(F49) No. 1 — Chassis ground:*** ***DTC 25*** ***(F49) No. 19 — Chassis ground:*** ***DTC 27*** ***(F49) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor. And replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
19	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **20.**
20	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U.	Go to step **21.**

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Step		Check	Yes	No
21	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

E: DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-48, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-48, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-48, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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H: DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

DIAGNOSIS:

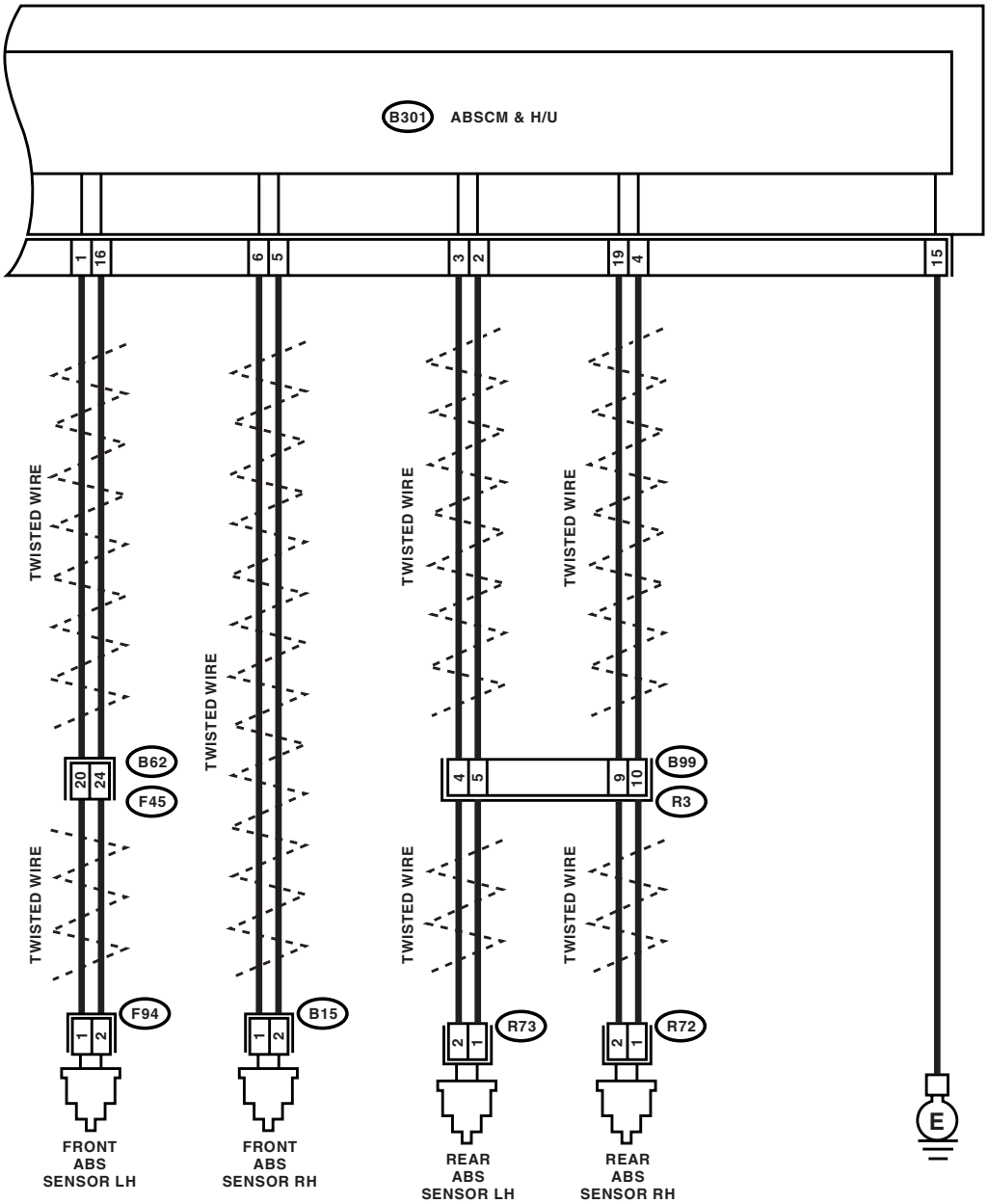
- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

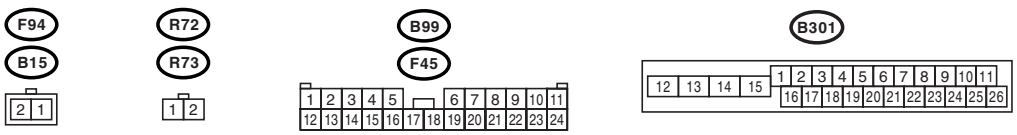
TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:

- LHD model

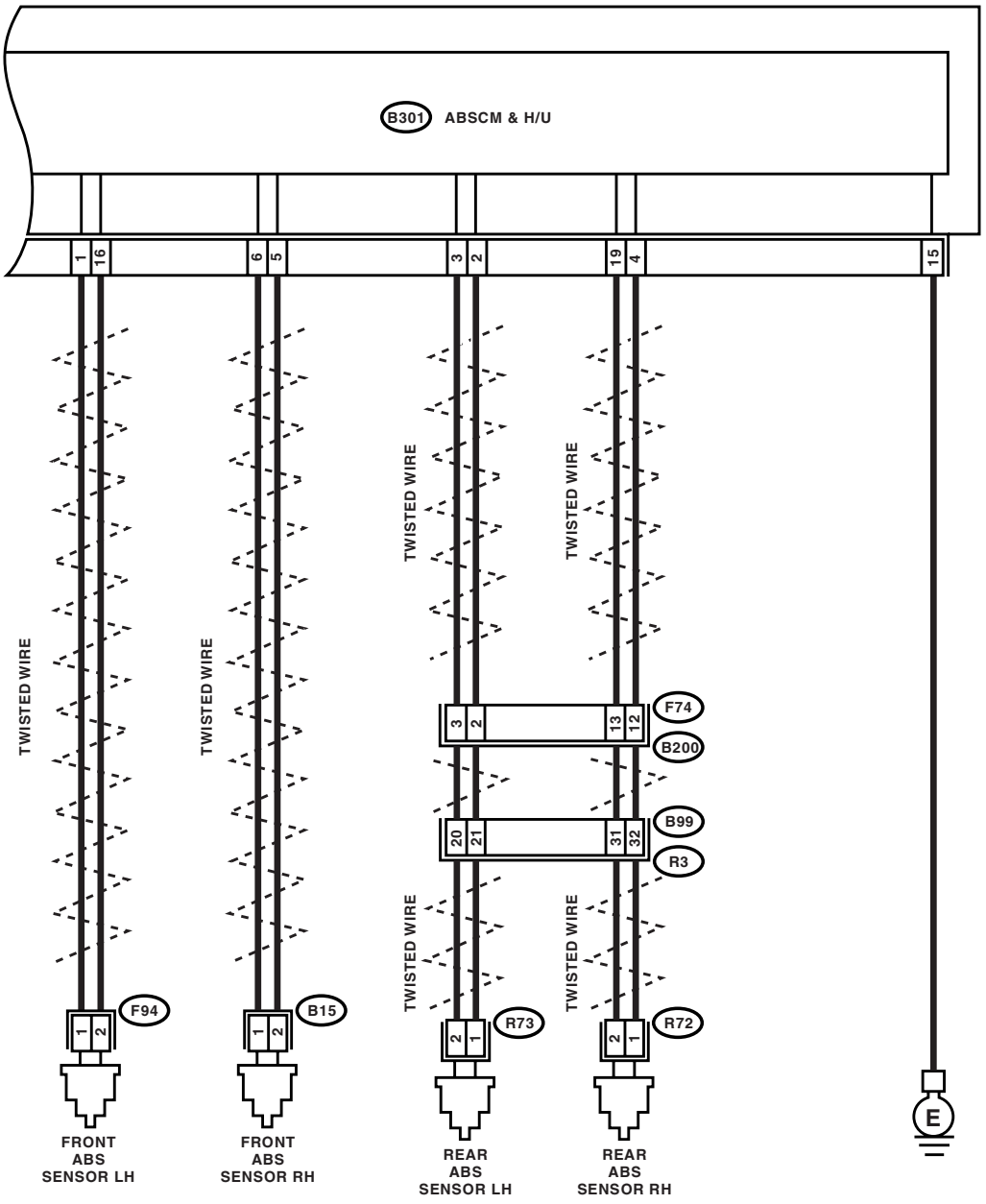


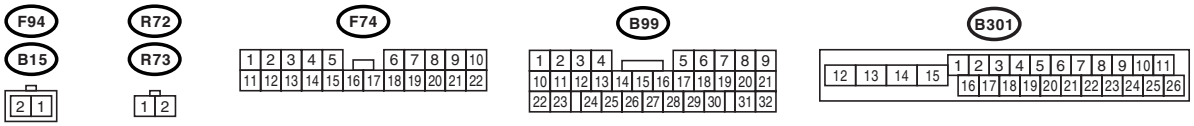


ABS00712

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- RHD model





ABS00713

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	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode.	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step **2.**	Go to step **7.**
2	**CHECK POOR CONTACT IN CONNECTORS.** 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.**	Is the car phone or wireless transmitter properly installed?	Go to step **4.**	Properly install the car phone or wireless transmitter.
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 ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference.
7	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **8.**	Tighten the ABS wheel speed sensor installation bolts securely.
8	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in), Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **9.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
9	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **10.**	Go to step **11.**

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	Step	Check	Yes	No
10	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores DTC 29 or DTC 56. ***Connector & terminal*** ***LHD :*** ***DTC 22*** ***(B15) No. 1 (+) — No. 2 (−):*** ***DTC 24*** ***(B62) No. 20 (+) — No. 24 (−):*** ***DTC 26*** ***(B99) No. 10 (+) — No. 9 (−):*** ***DTC 28*** ***(B99) No. 5 (+) — No. 4 (−):*** ***RHD :*** ***DTC 22*** ***(B15) No. 1 (+) — No. 2 (−):*** ***DTC 24*** ***(F94) No. 1 (+) — No. 2 (−):*** ***DTC 26*** ***(F74) No. 12 (+) — No. 13 (−):*** ***DTC 28*** ***(F74) No. 2 (+) — No. 3 (−):***	Is the waveform pattern on oscilloscope as shown in the figure?	Go to step **14.**	Go to step **11.**
11	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub in accordance with DTC.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **12.**
12	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS wheel speed sensor piece or tone wheel?	Go to step **13.**	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear:<Ref. to ABS-20, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>
13	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **14.**	Replace the tone wheel. Front:<Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>

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	Step	Check	Yes	No
14	**CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminals*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **15.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>
15	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **16.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>
16	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Connect the connector to ABS wheel speed sensor. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***LHD :*** ***DTC 22*** ***(B301) No. 6 — No. 5:*** ***DTC 24*** ***(B301) No. 1 — No. 16:*** ***DTC 26*** ***(B301) No. 19 — No. 4:*** ***DTC 28*** ***(B301) No. 3 — No. 2:*** ***RHD :*** ***DTC 22*** ***(F49) No. 6 — No. 5:*** ***DTC 24*** ***(F49) No. 1 — No. 16:*** ***DTC 26*** ***(F49) No. 19 — No. 4:*** ***DTC 28*** ***(F49) No. 3 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **17.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.

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	Step	Check	Yes	No
17	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD :*** ***DTC 22*** ***(B301) No. 6 — Chassis ground:*** ***DTC 24*** ***(B301) No. 1 — Chassis ground:*** ***DTC 26*** ***(B301) No. 19 — Chassis ground:*** ***DTC 28*** ***(B301) No. 3 — Chassis ground:*** ***RHD :*** ***DTC 22*** ***(F49) No. 6 — Chassis ground:*** ***DTC 24*** ***(F49) No. 1 — Chassis ground:*** ***DTC 26*** ***(F49) No. 19 — Chassis ground:*** ***DTC 28*** ***(F49) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **18.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
18	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **19.**	Repair the ABSCM&H/U ground harness.
19	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **20.**
20	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car phone or the wireless transmitter properly installed?	Go to step **21.**	Properly install the car phone or wireless transmitter.
21	**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 **22.**
22	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **23.**

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Step	Check	Yes	No
23 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

I: DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR

DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

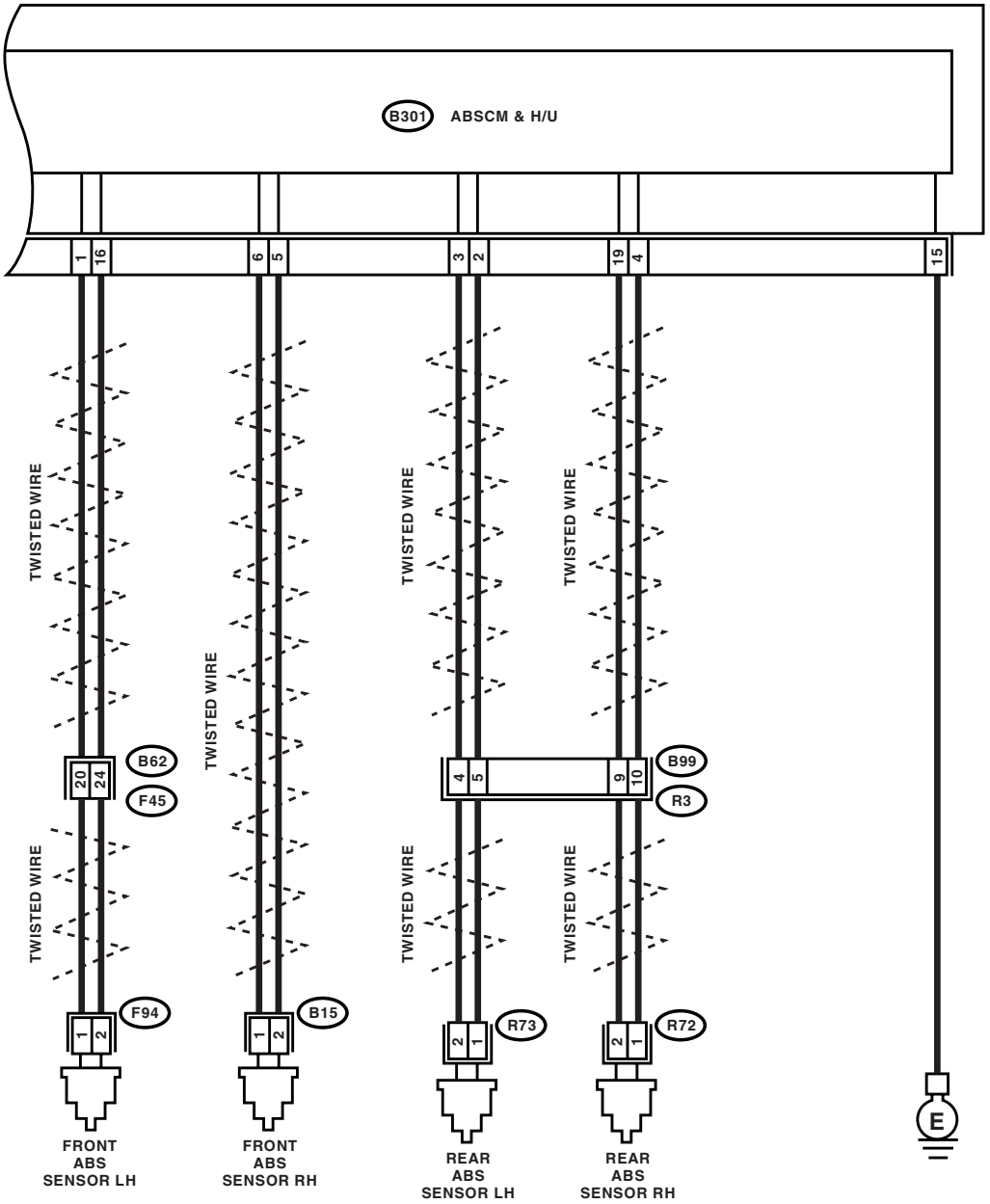
- ABS does not operate.
- EBD does not operate.

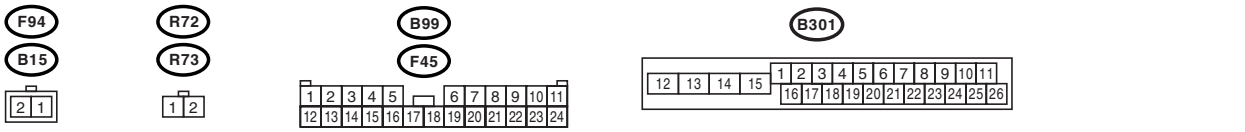
NOTE:
In addition to the ABS warning light, brake warning light illuminates.

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WIRING DIAGRAM:

- LHD model

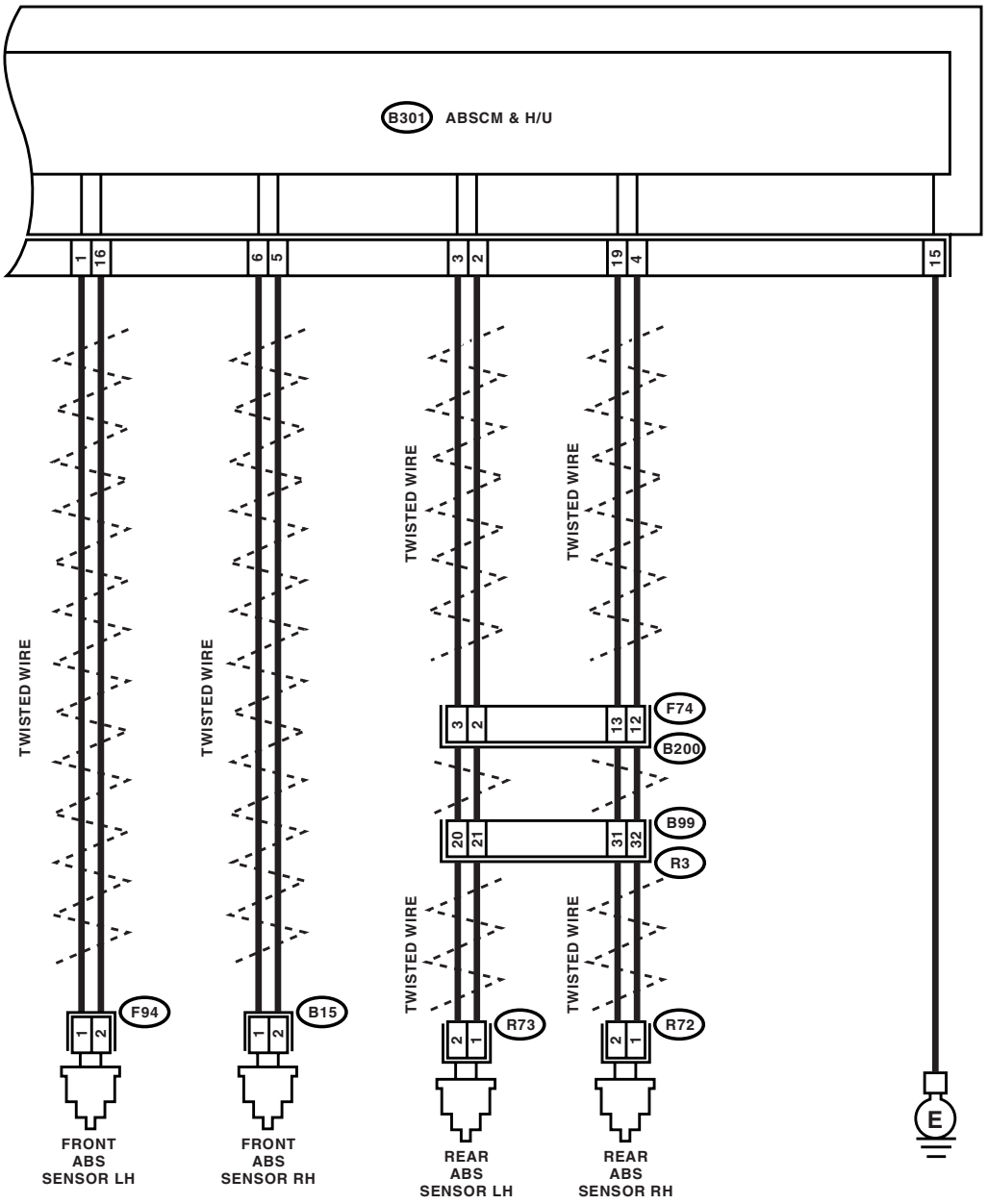


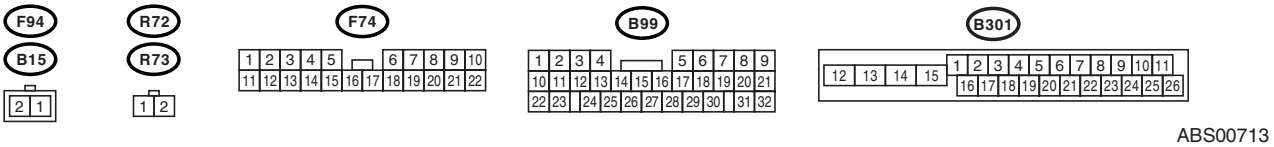


ABS00712

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- RHD model





ABS00713

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	Step	Check	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.**	Is the wheels have been turned freely for more than one minute, such as when vehicle is jacked-up, under full-lock cornering or the tires not in contact with road surface?	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when vehicle is towed or jacked-up, or when steering wheel is continuously turned all way, this DTC 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 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 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **6.**	Tighten the ABS wheel speed sensor installation bolts securely.
6	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in), Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**

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	Step	Check	Yes	No
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM& H/U sometimes stores the DTC 29. ***Connector & terminal*** ***LHD :*** ***Front RH*** ***(B15) No. 1 (+) — No. 2 (−):*** ***Front LH*** ***(B62) No. 20 (+) — No. 24 (−):*** ***Rear RH*** ***(B99) No. 10 (+) — No. 9 (−):*** ***Rear LH*** ***(B99) No. 5 (+) — No. 4 (−):*** ***RHD :*** ***Front RH*** ***(B15) No. 1 (+) — No. 2 (−):*** ***Front LH*** ***(F94) No. 1 (+) — No. 2 (−):*** ***Rear RH*** ***(F74) No. 12 (+) — No. 13 (−):*** ***Rear LH*** ***(F74) No. 2 (+) — No. 3 (−):***	Is the waveform pattern on oscilloscope as shown in the figure?	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**
10	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS wheel speed sensor piece or tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12.**	Replace the tone wheel. Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>

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	Step	Check	Yes	No
12	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

J: DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-59, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 33 FRONT LEFT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-59, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 35 REAR RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-59, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC 37 REAR LEFT INLET VALVE MALFUNCTION

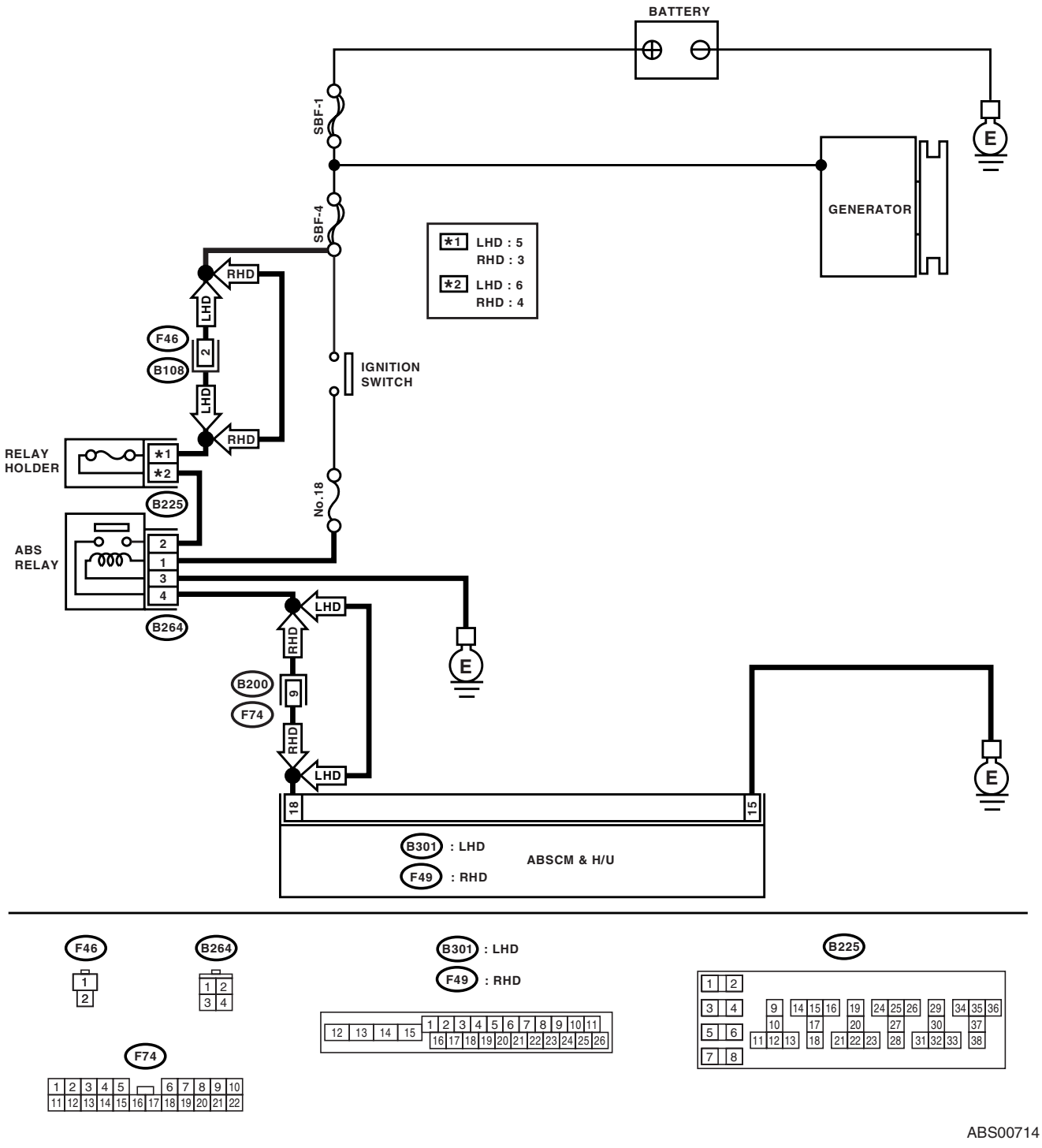
DIAGNOSIS:
- Faulty harness/connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

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WIRING DIAGRAM:



ABS00714

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	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*** ***LHD :*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***RHD :*** ***(F49) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery, ignition switch 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*** ***LHD :*** ***(B301) No. 15 — Chassis ground:*** ***RHD :*** ***(F49) 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 CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

N: DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-62, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-62, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-62, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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Q: DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION

DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve

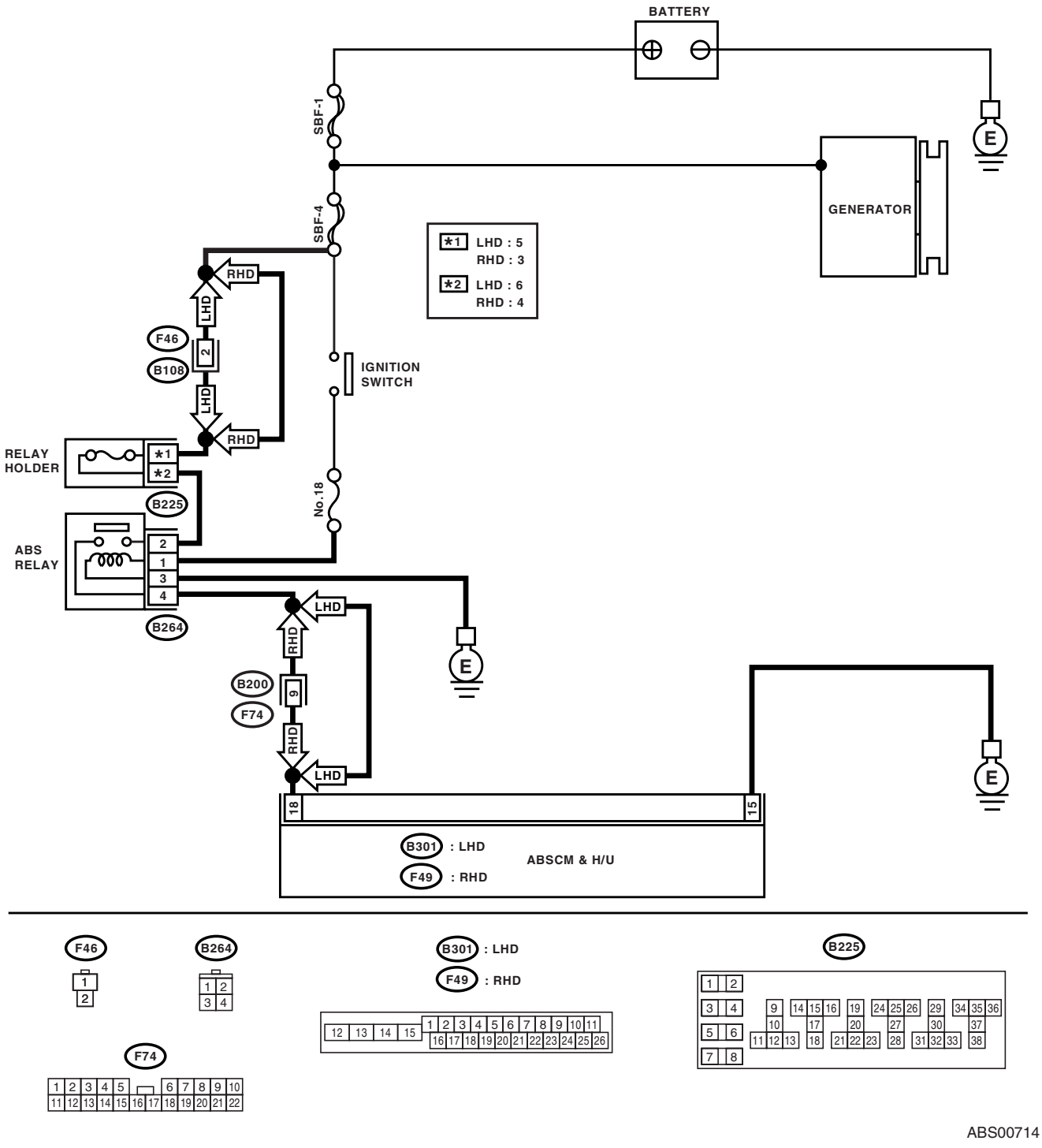
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

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WIRING DIAGRAM:



ABS00714

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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*** ***LHD :*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***RHD :*** ***(F49) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery, ignition switch 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*** ***LHD :*** ***(B301) No. 15 — Chassis ground:*** ***RHD :*** ***(F49) 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 CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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R: DTC 41 ABS CONTROL MODULE MALFUNCTION

DIAGNOSIS:

Faulty ABSCM&H/U

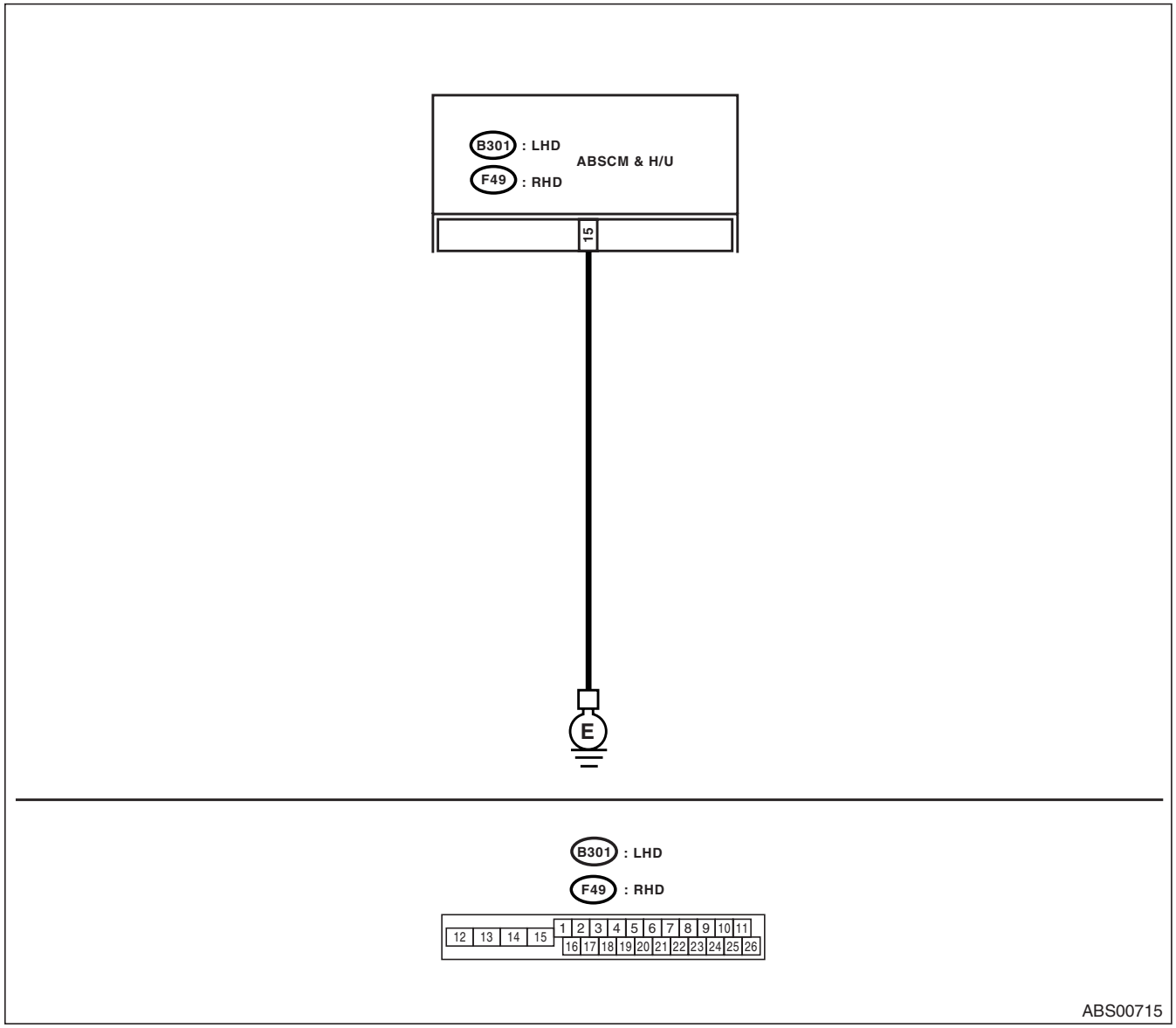
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



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	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 and chassis ground. ***Connector & terminal*** ***LHD :*** ***(B301) No. 15 — Chassis ground:*** ***RHD :*** ***(F49) 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 CONNECTORS.**	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.**	Is the car phone or wireless transmitter properly installed?	Go to step **4.**	Properly install the car phone or wireless transmitter.
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 ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

S: DTC 42 POWER VOLTAGE MALFUNCTION

DIAGNOSIS:

Power voltage of the ABSCM&H/U is too low or too high.

TROUBLE SYMPTOM:

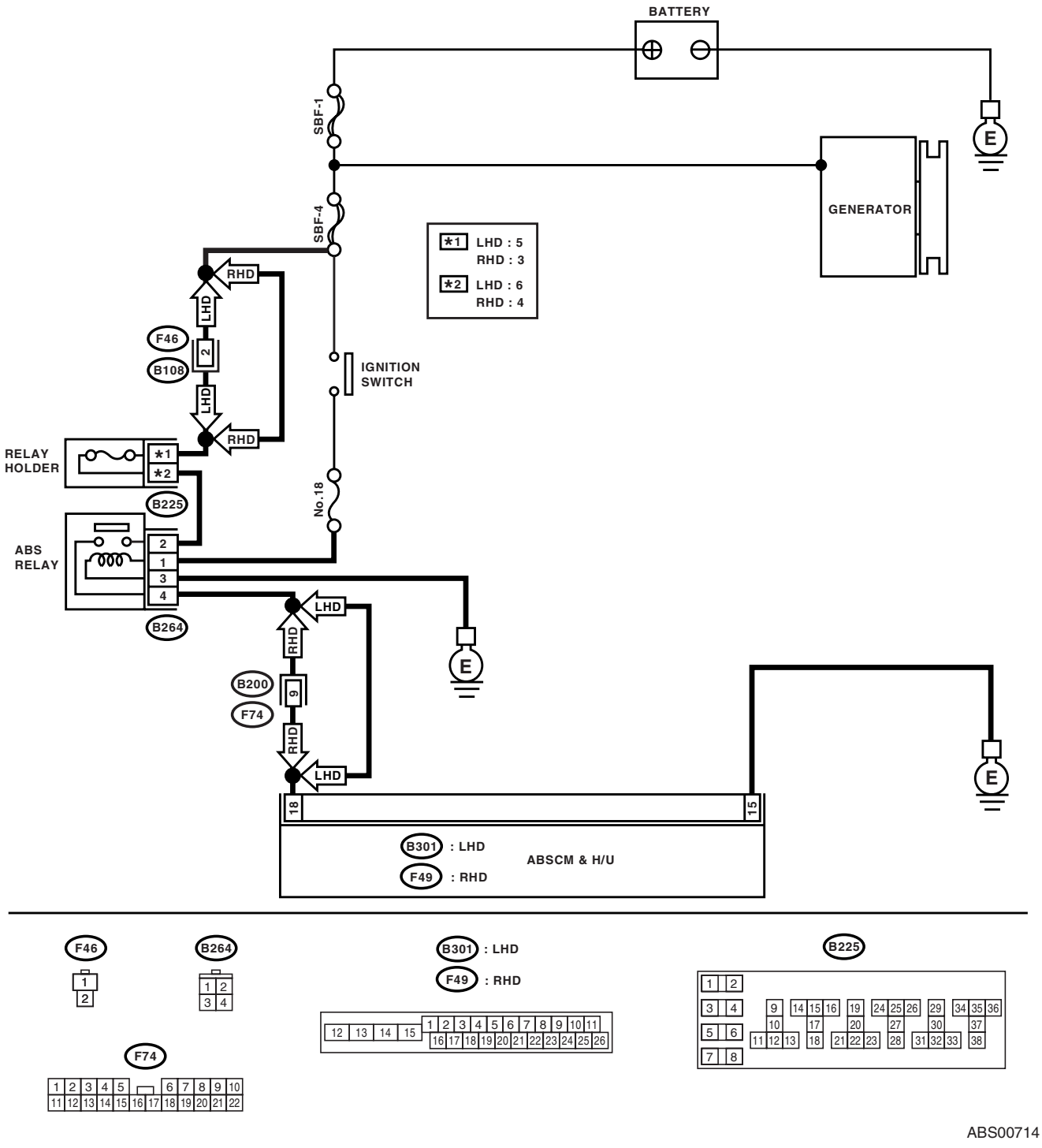
- ABS does not operate.
- EBD may not operate.

NOTE:

If EBD does not operate, brake warning light comes on as well as ABS warning light. Both warning lights go off on the recovery of voltage.

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WIRING DIAGRAM:



ABS00714

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Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idle after warm-up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 17 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of 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 electric load applying devices, such as the headlight, A/C, and defogger. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD :*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***RHD :*** ***(F49) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 17 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*** ***LHD :*** ***(B301) No. 15 — Chassis ground:*** ***RHD :*** ***(F49) 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 CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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T: DTC 51 VALVE RELAY MALFUNCTION

DIAGNOSIS:

Faulty valve relay

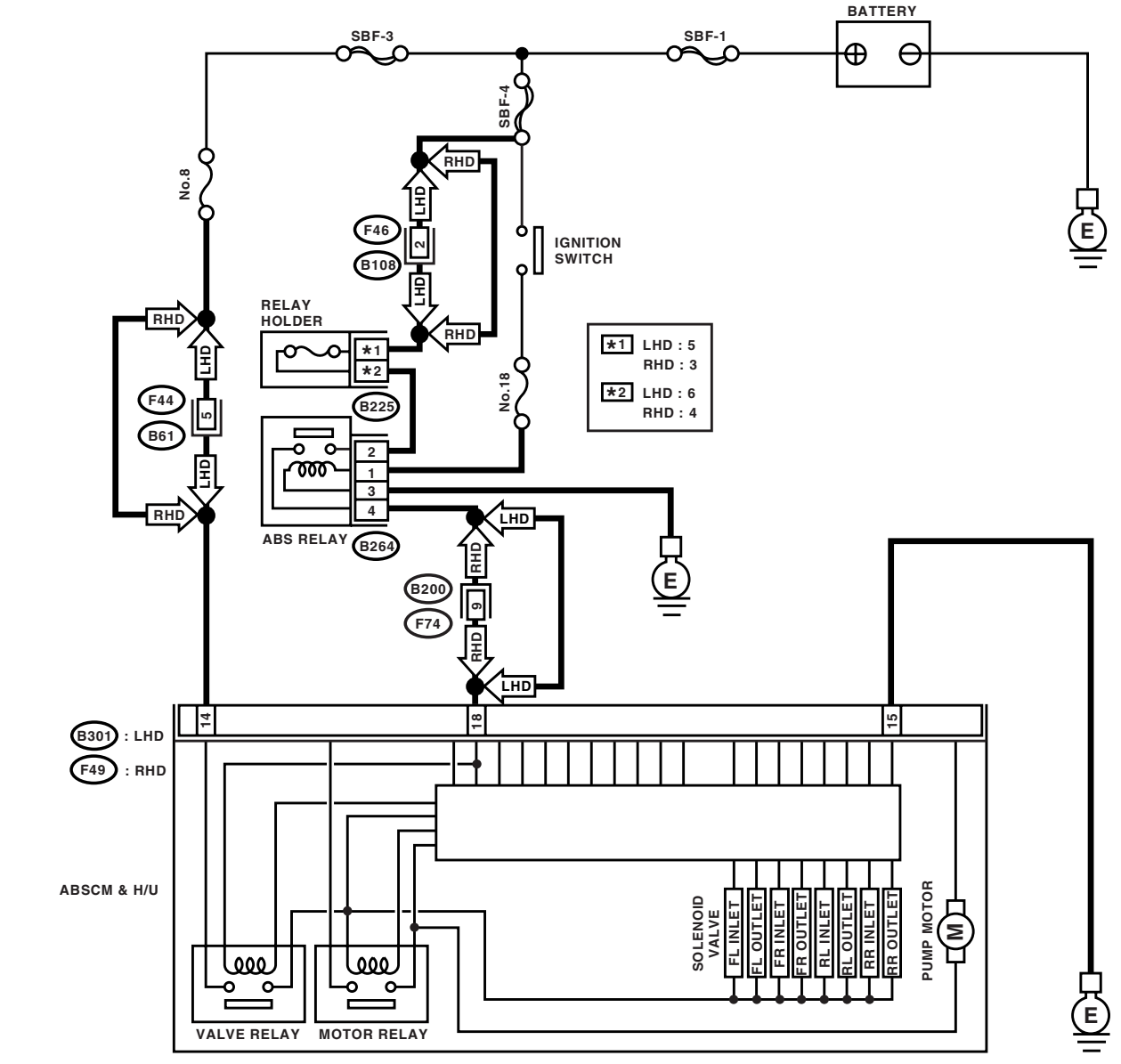
TROUBLE SYMPTOM:

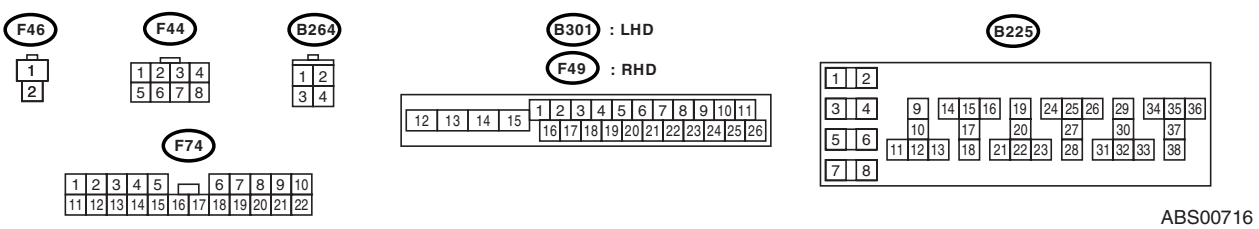
- ABS does not operate.
- EBD does not operate depending on the trouble contents.

NOTE:

In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:





ABS00716

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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*** ***LHD :*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***(B301) No. 14 (+) — Chassis ground (−):*** ***RHD :*** ***(F49) No. 18 (+) — Chassis ground (−):*** ***(F49) 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*** ***LHD :*** ***(B301) No. 15 — Chassis ground:*** ***RHD :*** ***(F49) 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-11, 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) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-11, 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.

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U: DTC 52 MOTER/MOTER RELAY MALFUNCTION

DIAGNOSIS:

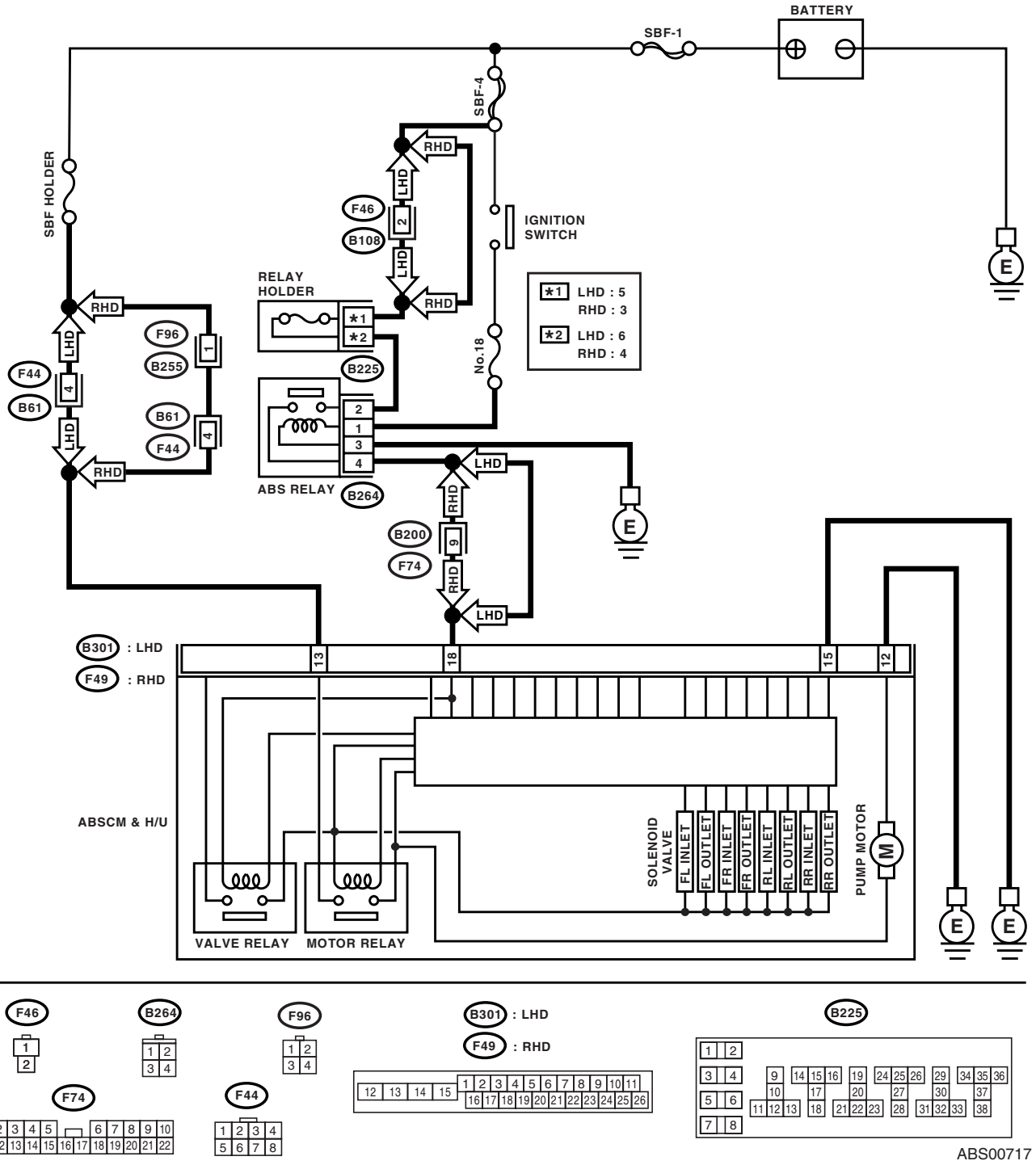
- Faulty motor
- Faulty motor relay
- Faulty harness connector
- Loose motor ground bolt

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

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WIRING DIAGRAM:



ABS00717

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	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*** ***LHD :*** ***(B301) No. 13 (+) — Chassis ground (−):*** ***RHD :*** ***(F49) No. 13 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF8.
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*** ***LHD :*** ***(B301) No. 12 — Chassis ground:*** ***RHD :*** ***(F49) 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*** ***LHD :*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***RHD :*** ***(F49) 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*** ***LHD :*** ***(B301) No. 15 — Chassis ground:*** ***RHD :*** ***(F49) 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 CONNECTORS.** 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 connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

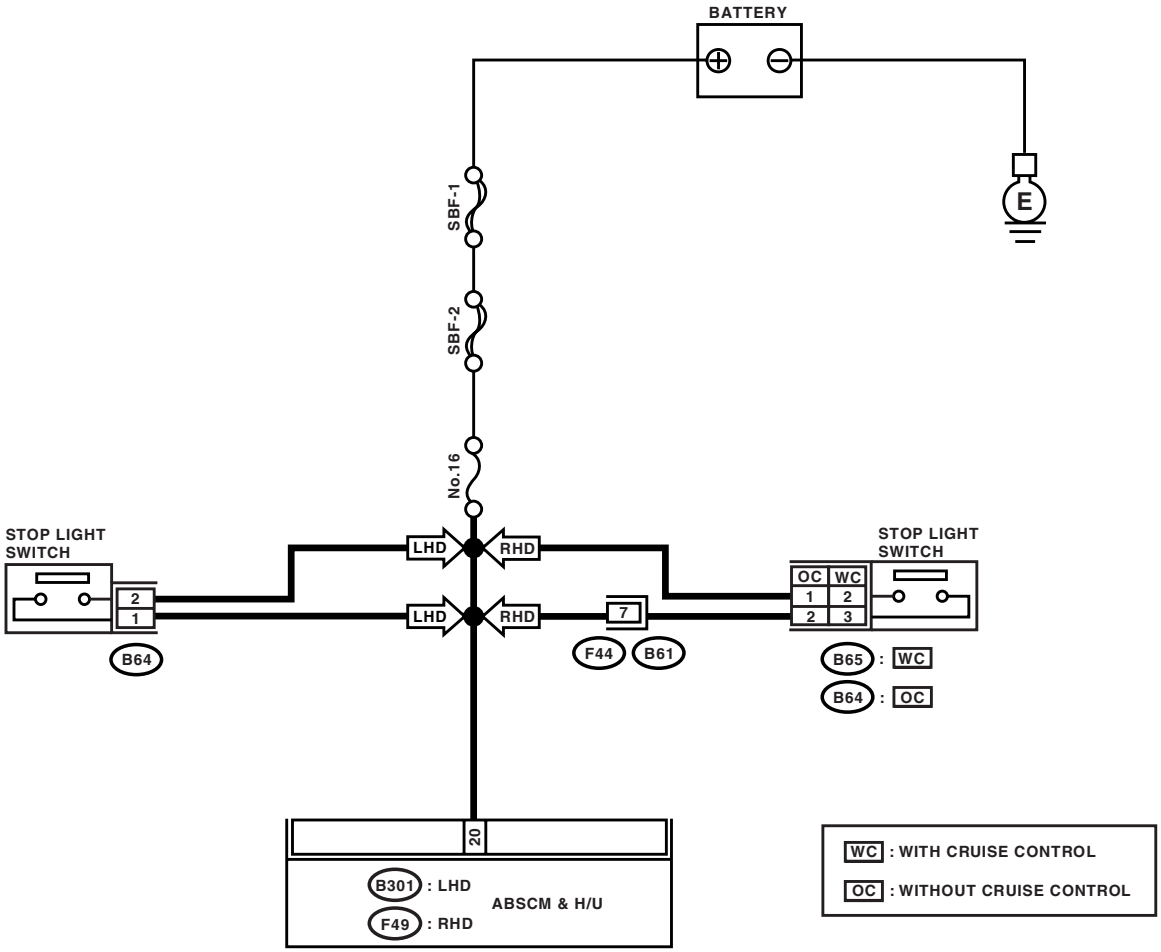
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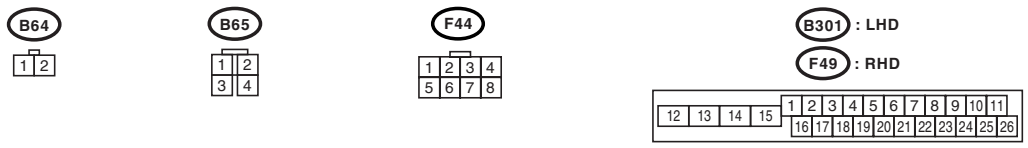
V: DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

DIAGNOSIS:

Faulty stop light switch

WIRING DIAGRAM:





ABS00718

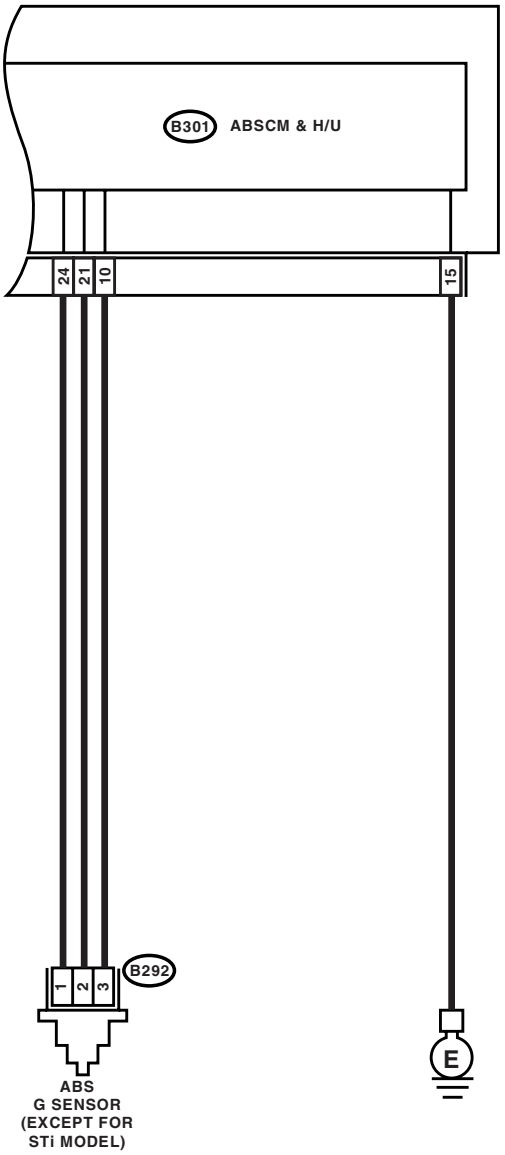
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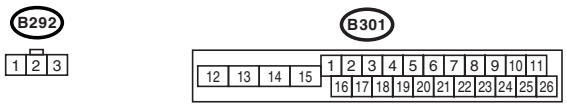
	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch signal in Subaru Select Monitor data display.	Is “OFF” indicated?	Go to step **2.**	Go 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 signal in Subaru Select Monitor data display.	Is “ON” indicated?	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal.	Do the stop lights turn on?	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*** ***LHD :*** ***(B301) No. 20 (+) — Chassis ground (−):*** ***RHD :*** ***(F49) No. 20 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Repair the harness between stop light switch and ABSCM&H/U connector.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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W: DTC 56 G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:
- LHD model

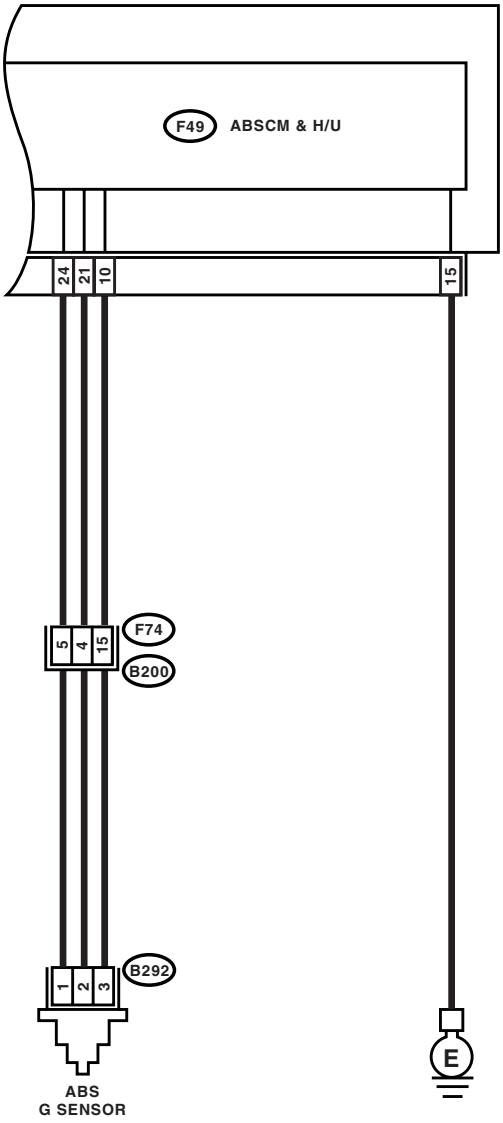


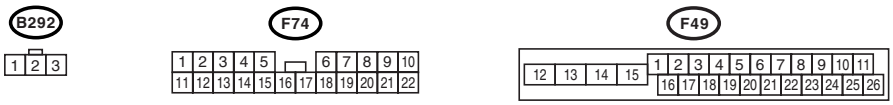


ABS00719

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- RHD model





ABS00720

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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 G sensor output on Subaru Select Monitor.	Is the reading indicated on display −1.2 — 1.2 m/s^2 when G sensor is horizontal?	Go to step **3.**	Go to step **6.**
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-11, REPLACEMENT, 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.
6	**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 **7.**	Repair the harness connector between G sensor and ABSCM&H/U.
7	**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*** ***LHD :*** ***(B301) No. 10 — No. 21:*** ***RHD :*** ***(F49) No. 10 — No. 21:***	Is the resistance 1.8 — 2.4 kΩ?	Go to step **8.**	Repair the harness connector between G sensor and ABSCM&H/U.
8	**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*** ***LHD :*** ***(B301) No. 21 — Chassis ground:*** ***RHD :*** ***(F49) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the harness between G sensor and ABSCM&H/U.

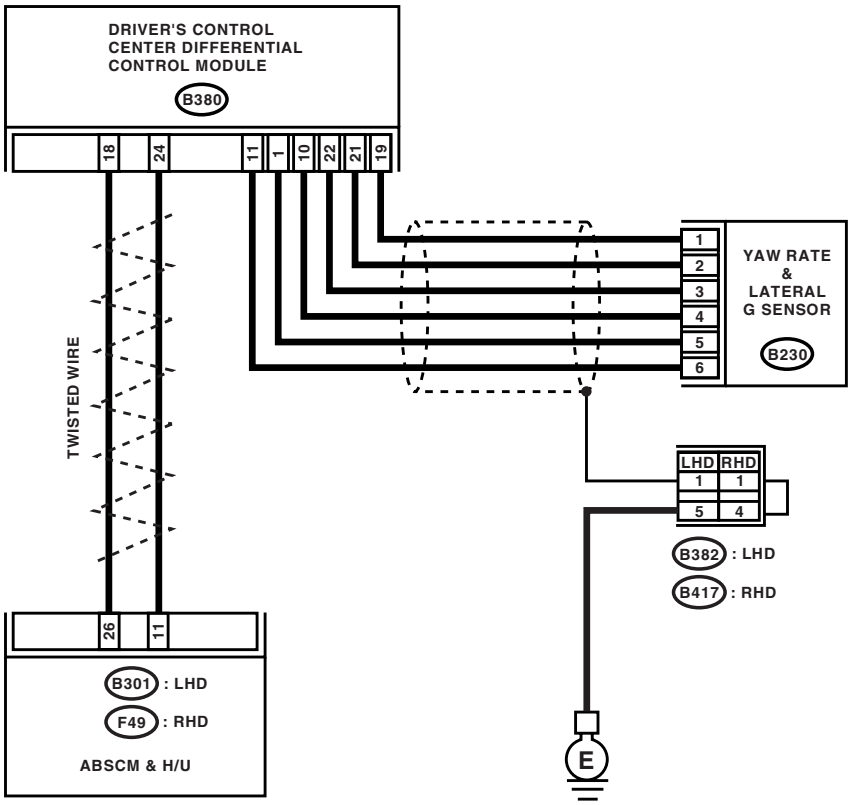
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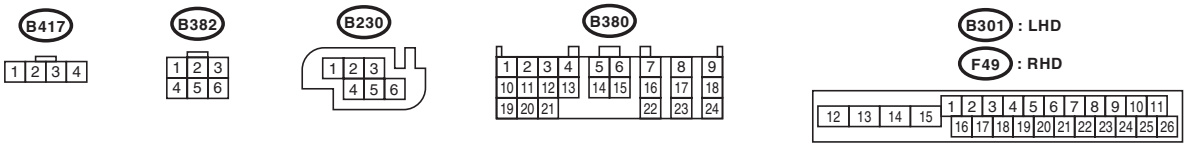
	Step	Check	Yes	No
9	**CHECK G SENSOR.** 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 2.1 — 2.5 V when G sensor is on a level?	Go to step **10.**	Replace G sensor. <Ref. to ABS-25, G Sensor.>
10	**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 **11.**	Replace G sensor. <Ref. to ABS-25, G Sensor.>
11	**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 **12.**	Replace G sensor. <Ref. to ABS-25, G Sensor.>
12	**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 **13.**
13	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-11, 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.

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X: DTC 73 LATERAL G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION

DIAGNOSIS:
Faulty Lateral G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





ABS00721

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	Step	Check	Yes	No
1	**CHECK ALL FOUR WHEELS FOR FREE TURNING.**	Have the wheels been turned freely such as when vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the DTC.	Go to step **2.**
2	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the Subaru Select Monitor display.	Is the lateral G sensor output on monitor display −1.5 — 1.5 m/s^2 when the vehicle is in horizontal position?	Go to step **3.**	Go to step **8.**
3	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the yaw rate & lateral G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Select "Current data display & Save" on the Subaru Select Monitor. 6) Read the Subaru Select Monitor display.	Is the voltage 6.8 — 12.8 m/s^2 when lateral G sensor is inclined right to 90°?	Go to step **4.**	Replace the yaw rate & lateral G sensor. <Ref. to 6MT-129, Yaw Rate and Lateral G Sensor.>
4	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR.** Read the Subaru Select Monitor display.	Is the voltage −6.8 — −12.8 m/s^2 when lateral G sensor is inclined left to 90°?	Go to step **5.**	Replace the yaw rate & lateral G sensor. <Ref. to 6MT-129, Yaw Rate and Lateral G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between driver's control center differential control module and yaw rate & lateral G sensor?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
8	**CHECK OPEN CIRCUIT IN YAW RATE & LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from driver's control center differential control module. 3) Measure the resistance between driver's control center differential control module connector terminals. ***Connector & terminal (B380) No. 1 — No. 11:***	Is the resistance 4.3 — 4.9 kΩ?	Go to step **9.**	Repair the harness/connector between yaw rate & lateral G sensor and ABSCM&H/U.

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	Step	Check	Yes	No
9	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between driver's control center differential control module connector and chassis ground. ***Connector & terminal*** ***(B380) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the harness between yaw rate & lateral G sensor and driver's control center differential control module. Replace the driver's control center differential control module. <Ref. to 6MT-130, Driver's Control Center Differential Control Module.>
10	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the yaw rate & lateral G sensor from vehicle. 3) Connect the connector to yaw rate & lateral G sensor. 4) Connect the connector to ABSCM&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 2.1 — 2.5 V when yaw rate & lateral G sensor is in horizontal position?	Go to step **11.**	Replace the yaw rate & lateral G sensor. <Ref. to 6MT-129, Yaw Rate and Lateral G Sensor.>
11	**CHECK YAW RATE & LATERAL G SENSOR.** Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B230) No. 5 (+) — No. 6 (−):***	Is the voltage 3.3 — 3.7 V when yaw rate & lateral G sensor is inclined right to 90°?	Go to step **12.**	Replace the lateral G sensor. <Ref. to 6MT-129, Yaw Rate and Lateral G Sensor.>
12	**CHECK YAW RATE & LATERAL G SENSOR.** Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B230) No. 5 (+) — No. 6 (−):***	Is the voltage 0.5 — 0.9 V when yaw rate & lateral G sensor is inclined left to 90°?	Go to step **13.**	Replace the lateral G sensor. <Ref. to 6MT-129, Yaw Rate and Lateral G Sensor.>
13	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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Y: DTC 47 IMPROPER CAN COMMUNICATION

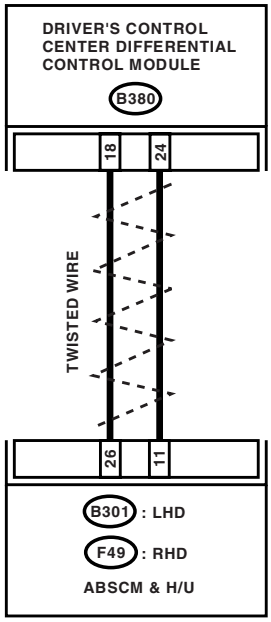
DIAGNOSIS:

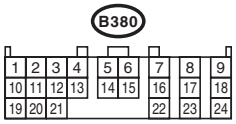
CAN communication circuit is damaged or shorted.

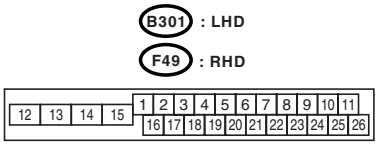
TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:







ABS00724

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	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN ABSCM AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from ABSCM and driver's control center differential control module. 3) Measure the resistance of harness connector between ABSCM and driver's control center differential control module. ***Connector & terminal*** ***LHD:*** ***(B301) No. 26 — (B380) No. 18:*** ***(B301) No. 11 — (B380) No. 24:*** ***RHD:*** ***(F49) No. 26 — (B380) No. 18:*** ***(F49) No. 11 — (B380) No. 24:***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Repair or replace the harness connector between ABSCM and driver's control center differential control module.
2	**CHECK GROUND SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** Measure the resistance between ABSCM connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 26 — Chassis ground:*** ***(B301) No. 11 — Chassis ground:*** ***RHD:*** ***(F49) No. 26 — Chassis ground:*** ***(F49) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair or replace the harness connector between ABSCM and driver's control center differential control module.
3	**CHECK BATTERY SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Turn the ignition switch to ON. 2) Measure the resistance between ABSCM connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 26 (+) — Chassis ground (−):*** ***(B301) No. 11 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 26 (+) — Chassis ground (−):*** ***(F49) No. 11 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **4.**	Repair or replace the harness connector between ABSCM and driver's control center differential control module.
4	**CHECK ABSCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABSCM. 3) Measure the resistance between driver's control center differential control module connector terminals. ***Connector & terminal*** ***(B380) No. 18 — (B380) No. 24:***	Is the resistance 120 ± 6 Ω?	Go to step **6.**	Go to step **5.**
5	**CHECK POOR CONTACT IN ABSCM CONNECTOR.**	Is there poor contact?	Repair poor contact in ABSCM connector.	Replace the ABSCM. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

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	Step	Check	Yes	No
6	**CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Connect the connector to driver's control differential control module. 2) Disconnect the connector from ABSCM. 3) Measure the resistance between ABSCM connector terminals. ***Connector & terminal*** ***LHD:*** ***(B301) No. 11 — No. 26:*** ***RHD:*** ***(F49) No. 11 — No. 26:***	Is the resistance 120 ± 6 Ω?	Go to step **8.**	Go to step **7.**
7	**CHECK POOR CONTACT IN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE CONNECTOR.**	Is there poor contact?	Repair poor contact in driver's control center differential control module connector.	Replace the driver's control center differential control module. <Ref. to 6MT-130, Driver's Control Center Differential Control Module.>
8	**CHECK DTC.**	Is DTC 47 detected?	Replace the ABSCM. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **9.**
9	**CHECK DTC P1720 INDICATION FOR DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO SYSTEM.**	Is DTC P1720 displayed?	Replace the driver's control center differential control module. <Ref. to 6MT-130, Driver's Control Center Differential Control Module.>	Replace the ABSCM. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

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13.General Diagnostic Table

A: INSPECTION

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either side.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper & piston, 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 braking	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 dragging	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Master cylinder • Brake (caliper & piston) • Parking brake • Axle & wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle 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, 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 piping
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Master cylinder • Brake (caliper & piston, pads, rotor) • Brake piping • Brake booster & check valve • Suspension play or fatigue
	Noise from rear of vehicle	• ABS wheel speed sensor • Brake (caliper & piston, pads, rotor) • Parking brake • Brake piping • Suspension play or fatigue

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ABS (5.3i)(DIAGNOSTICS)

ABS(5.3i)(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:
This section is specified for STi model with driver's control center differential (without auto).

CAUTION:
Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check the harness for broken wires or short circuits, shake it while holding it or the connector.
- Check list for interview <Ref. to ABS(5.3i)(diag)-4, Check List for Interview.>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how trouble occurred using interview checklist. <Ref. to ABS(5.3i)(diag)-4, Check List for Interview.> 2) Before performing diagnosis, inspect the unit which might influence the ABS problem. <Ref. to ABS(5.3i)(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 Subaru Select Monitor cannot be executed normally, check communication circuit. <Ref. to ABS(5.3i)(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 4) Read the DTC on Subaru Select Monitor. <Ref. to ABS(5.3i)(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5) Record all DTCs and freeze frame data.	Is DTC displayed on Subaru Select Monitor?	Go to step **4.**	Go to step **3.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using "General Diagnostics Table". <Ref. to ABS(5.3i)(diag)-121, General Diagnostic Table.> 2) Perform the clear memory mode. <Ref. to ABS(5.3i)(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the inspection mode. <Ref. to ABS(5.3i)(diag)-26, Inspection Mode.> 4) Read the DTC. <Ref. to ABS(5.3i)(diag)-16, 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.	Inspect using diagnostics procedure for no trouble code. <Ref. to ABS(5.3i)(diag)-21, NO TROUBLE CODE, INSPECTION, Subaru Select Monitor.>

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	Step	Check	Yes	No
4	**PERFORM THE DIAGNOSIS.** 1) For the DTC list, refer to “List of Diagnostics Trouble Code (DTC)”. <Ref. to ABS(5.3i)(diag)-39, LIST, List of Diagnostic Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to ABS(5.3i)(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the inspection mode. <Ref. to ABS(5.3i)(diag)-26, Inspection Mode.> 5) Read DTC on Subaru Select Monitor. <Ref. to ABS(5.3i)(diag)-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed on Subaru Select Monitor?	Inspect using diagnostics procedure with Subaru Select Monitor. <Ref. to ABS(5.3i)(diag)-42, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

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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 ❑ Does 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	to	km/h
		to	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	to	km/h
		to	MPH
	❑When turning to right	Steering angle:	deg
		Steering time:	sec
	❑ When turning to left	Steering angle:	deg
		Steering time:	sec
	❑ When operating other electrical parts		
	• Parts name: • Operating condition:		

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2. STATE OF BRAKE WARNING LIGHT

Brake warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does 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	to	km/h
		to	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	to	km/h
		to	MPH
	❑When turning to right	Steering angle:	deg
		Steering time:	sec
	❑ When turning to left	Steering angle:	deg
		Steering time:	sec
	❑ When operating other electrical parts		
	• Parts name: • Operating condition:		

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3. SYMPTOMS

ABS operating condition	❑ Performs no work.		
	❑ Operates only when abruptly applying brakes.	Vehicle speed:	km/h MPH
	• How to step on brake pedal:		
	a) Operating time:		sec
	b) Operating noise: ❑ Occurs / ❑ Does not occur		
	• What kind of noise?	❑ Knock ❑ Gong gong ❑ Bong ❑ Buzz ❑ Gong gong buzz ❑ Others:	
	c) Reaction force of brake pedal		
		❑ Stick ❑ Weak pedal resistance ❑ Strong pedal resistance ❑ Others:	
Behavior of vehicle	a) Directional stability cannot be obtained or steering refuses to work when applying brakes: ❑ Yes / ❑ No		
	• When:	❑ Vehicle turns to right ❑ Vehicle turns to left ❑ Spins ❑ Others:	
	b) Directional stability cannot be obtained or steering refuses to work when accelerating: ❑ Yes / ❑ No		
	• When:	❑ Vehicle turns to right ❑ Vehicle turns to left ❑ Spins ❑ Others:	
	c) Poor brake performance: ❑ Yes / ❑ No		
	• What kind:	❑ Braking distance is long ❑ Brakes lock or drag ❑ Pedal stroke is long ❑ Pedal sticks ❑ Others:	
	d) Poor acceleration: ❑ Yes / ❑ No		
	• What kind:	❑ Fails to accelerate ❑ Engine stalls ❑ Others:	
	e) Occurrence of vibration: ❑ Yes / ❑ No		
	• Where • What kind:		
	f) Occurrence of abnormal noise: ❑ Yes / ❑ No		
	• Where • What kind:		
	g) Occurrence of other phenomena: ❑ Yes / ❑ No		
	• What kind:		

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4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:
	b) Ambient temperature	°C (°F)
	c) Road	❑ Inner city ❑ Suburbs ❑ Highway ❑ General road ❑ Ascending slope ❑ Descending slope ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Others:
	d) Road surface	❑ Dry ❑ Wet ❑ New-fallen snow ❑ Compressed snow ❑ Frozen slope ❑ Others:
Condition	a) Brakes	Deceleration: G
		❑ Intermittent / ❑ Temporary
	b) Accelerator	Acceleration: G
		❑ Intermittent / ❑ Temporary
	c) Vehicle speed	km/h | MPH
		❑ Advancing ❑ Accelerating ❑ Reducing speed ❑ Low speed ❑ 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:	

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3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor, ABS control module and hydraulic control unit.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect ABS problems:

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V or more

Specific gravity: More than 1.260

2. GROUND

Check the ABS ground bolt, tightening torque.

Chassis ground:
RHD (F64)
LHD (B302)

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

3. BRAKE FLUID

1) Check the brake fluid level.
2) Check the brake fluid leakage.

4. HYDRAULIC UNIT

Check the hydraulic unit.
• With brake tester <Ref. to ABS-10, 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-9, 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-27, INSPECTION, Front Brake Pad.> and <Ref. to BR-30, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-38, INSPECTION, Rear Brake Pad.> and <Ref. to BR-40, INSPECTION, Rear Disc Rotor.> or <Ref. to BR-48, INSPECTION, Rear Drum Brake Shoe.> and <Ref. to BR-49, INSPECTION, Rear Drum Brake Drum.>

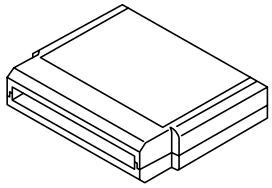
7. TIRE

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

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C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Used for troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Used for troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

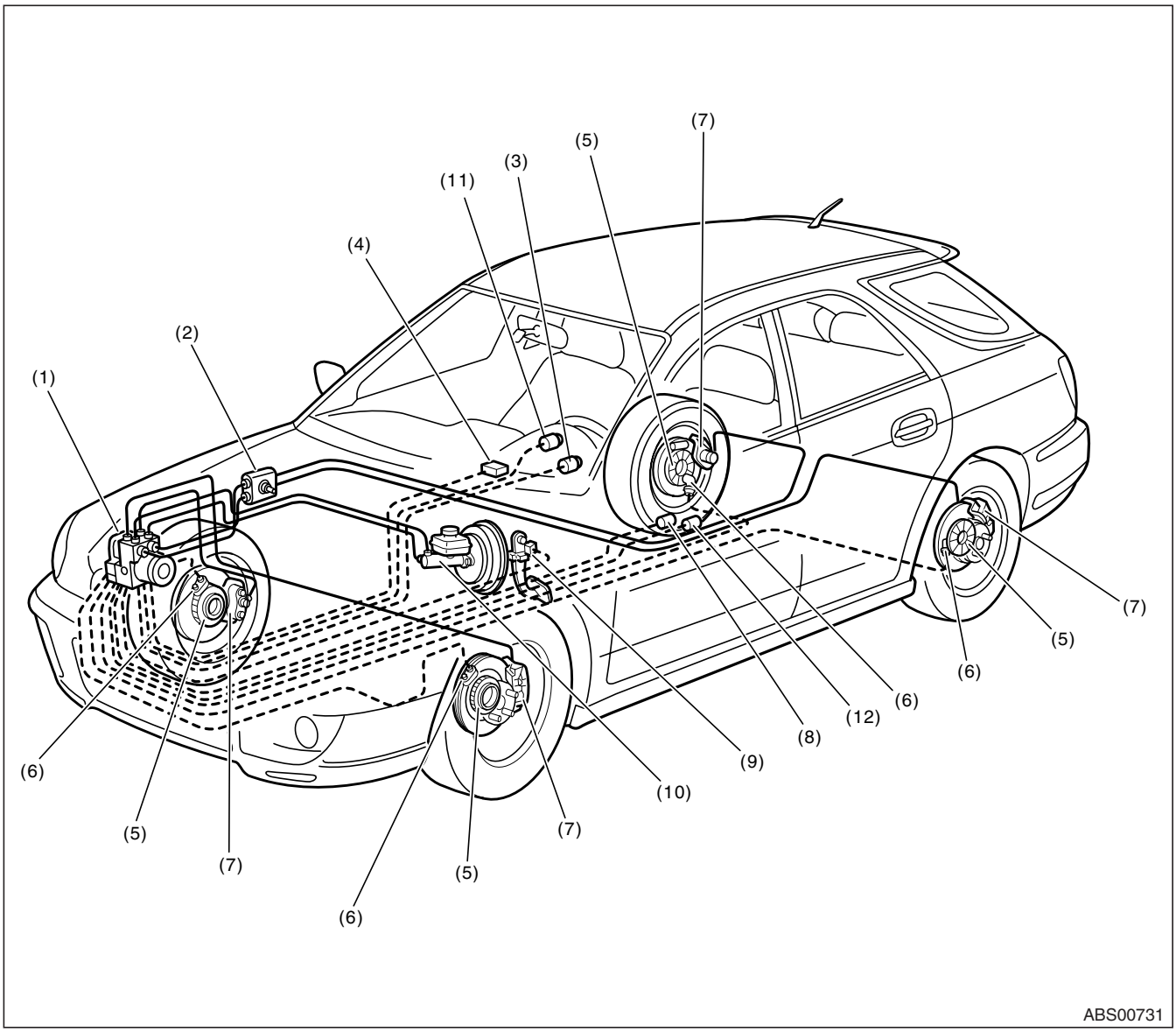
2. GENERAL PURPOSE TOOLS

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

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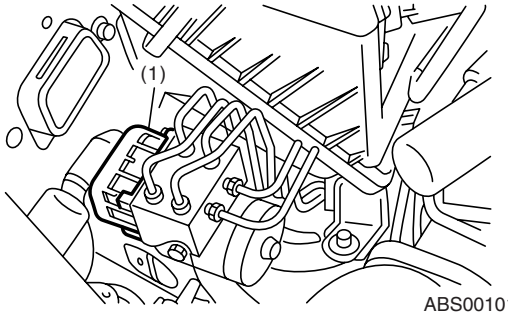
4. Electrical Component Location

A: LOCATION

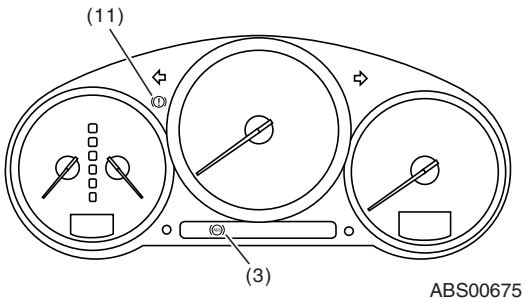


(1) ABS control unit and hydraulic control unit (ABSCM&H/U)
(2) Connector
(3) ABS warning light
(4) Data link connector (for Subaru Select Monitor)
(5) Tone wheel
(6) ABS wheel speed sensor
(7) Caliper body
(8) G sensor
(9) Stop light switch
(10) Master cylinder
(11) Brake and EBD warning light
(12) Lateral G sensor

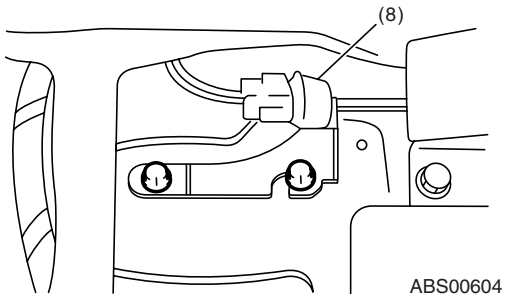
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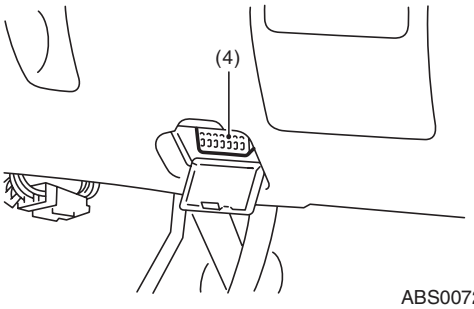
ABS00101



ABS00675

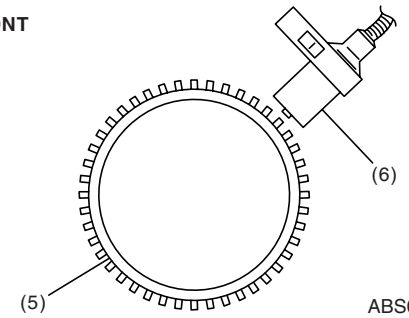


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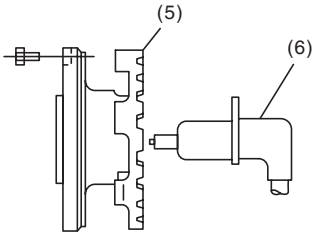
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FRONT

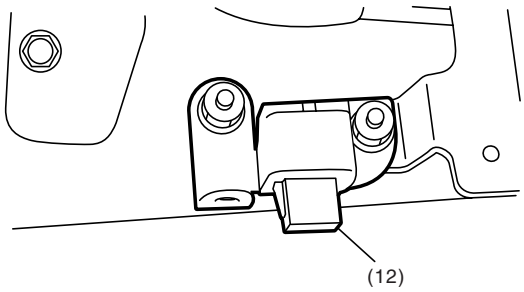


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REAR



ABS00726

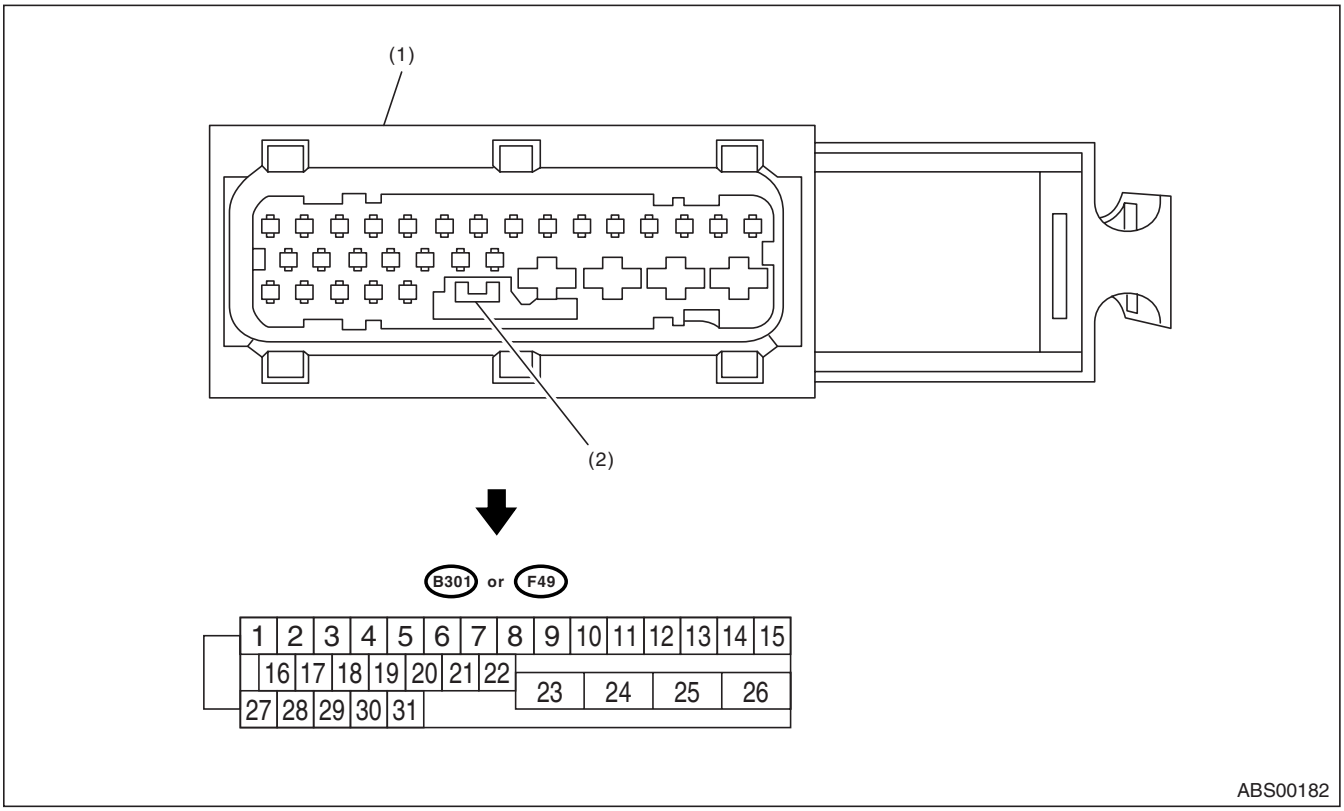


ABS00727

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5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



(1) ABS control module and hydraulic control unit (ABSCM&H/U) connector
(2) Connector switch

NOTE:
• The terminal numbers in ABS control module and hydraulic control unit connector are as shown in the figure.
• When the connector is removed from ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

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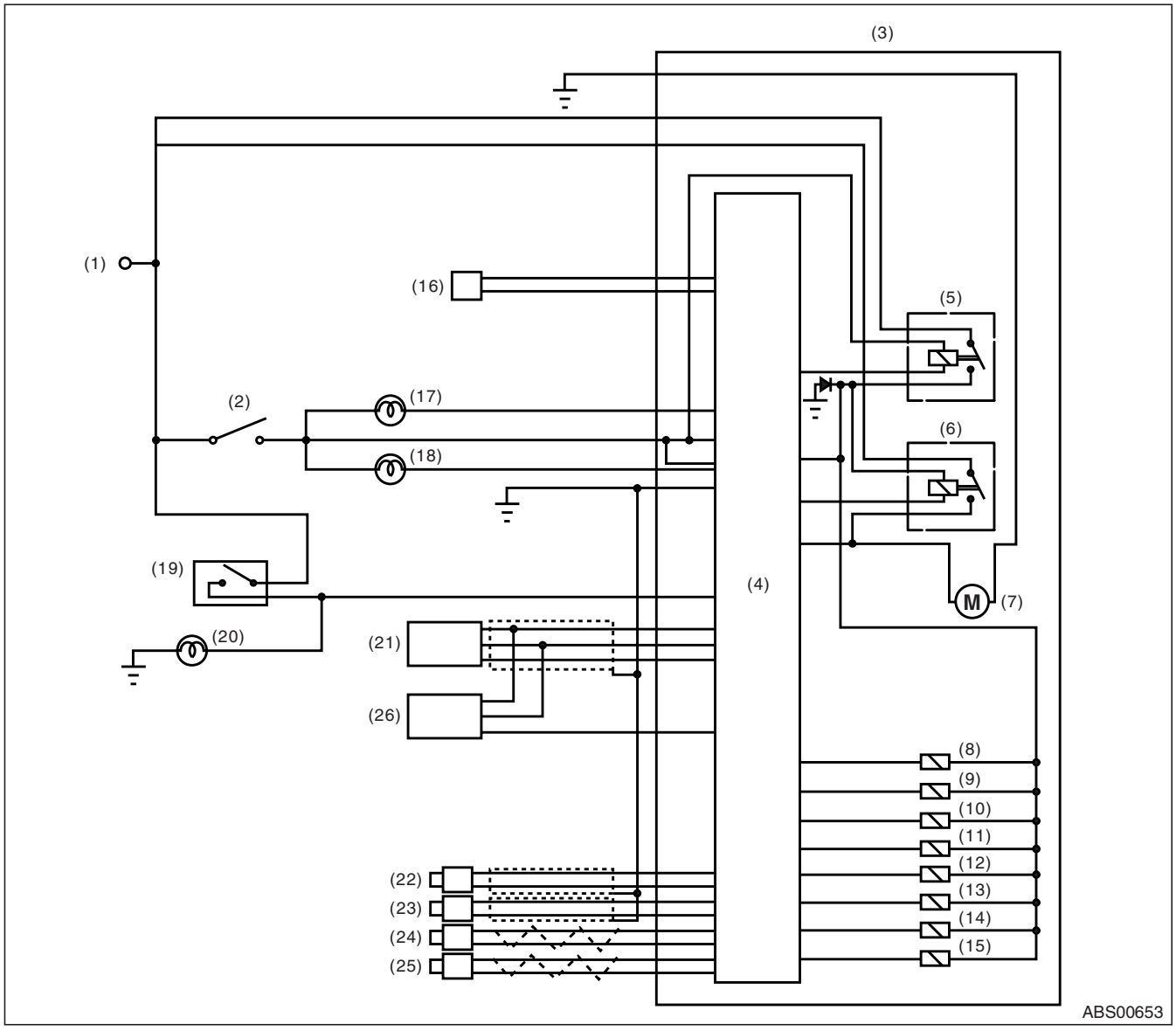
Control Module I/O Signal

Contents		Terminal No. (+) — (−)	Input/Output signal Measured value and measuring conditions
ABS wheel speed sensor*2 (Wheel speed sensor)	Front left wheel	9 — 10	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	11 — 12	
	Rear left wheel	7 — 8	
	Rear right wheel	14 — 15	
Valve relay power supply*1		24 — 23	10 — 15 V
Motor relay power supply*1		25 — 23	10 — 15 V
G sensor*2	Power supply	30 — 28	4.75 — 5.25 V
	Ground	28	—
	Output	6 — 28	2.1 — 2.5 V when vehicle is in horizontal position.
Lateral G sensor	Power supply	30 — 28	4.75 — 5.25 V
	Ground	28	—
	Output	29 — 28	2.3 — 2.7 V when vehicle is in horizontal position.
Stop light switch*1		2 — 23	Less than 1.5 V when the stop light is OFF and, 10 — 15 V when the stop light is ON.
ABS warning light*2		22 — 23	Less than 1.5 V within 1.5 seconds immediately after ignition switch has been turned to ON, and 10 — 15 V after 1.5 seconds has elapsed.
Brake warning light*2 (EBD warning light)		21 — 23	Less than 1.5 V within 1.5 seconds immediately after ignition switch has been turned to ON, and 10 — 15 V after 1.5 seconds has elapsed.
Subaru Select Monitor*2	Data is received.	20 — 23	Less than 1.5 V when no data is received.
	Data is sent.	5 — 23	4.75 — 5.25 V when no data is sent.
Power supply*1		1 — 23	10 — 15 V when ignition switch is ON.
Grounding line		23	—
Grounding line		26	—

*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.
*2: Measure the I/O signal voltage at connector (F2).

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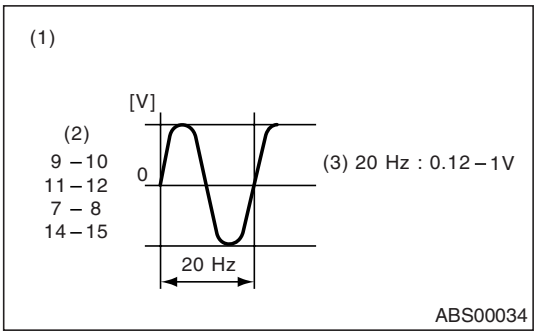
B: WIRING DIAGRAM



(1) Battery
(2) Ignition
(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) Data link connector
(17) Brake and EBD warning light
(18) ABS warning light
(19) Stop light switch
(20) Stop light
(21) G sensor
(22) Front ABS wheel speed sensor LH
(23) Front ABS wheel speed sensor RH
(24) Rear ABS wheel speed sensor LH
(25) Rear ABS wheel speed sensor RH
(26) Lateral G sensor

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C: WAVEFORM



(1) ABS wheel speed sensor
(2) Terminal No.
(3) Standard output voltage

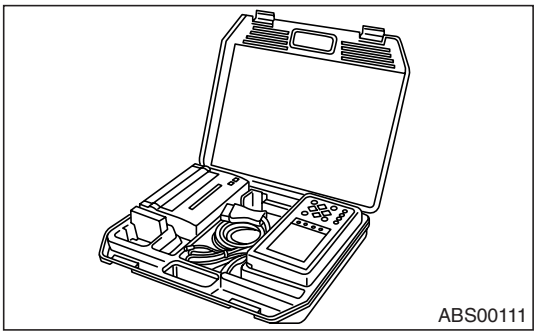
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6. Subaru Select Monitor

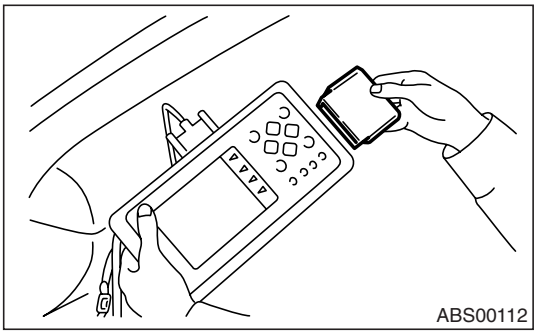
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

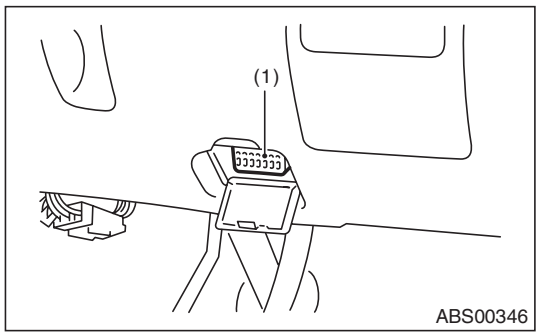
1) Prepare the Subaru Select Monitor kit.



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to ABS(5.3i)(diag)-9, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of instrument panel (on the driver's side).

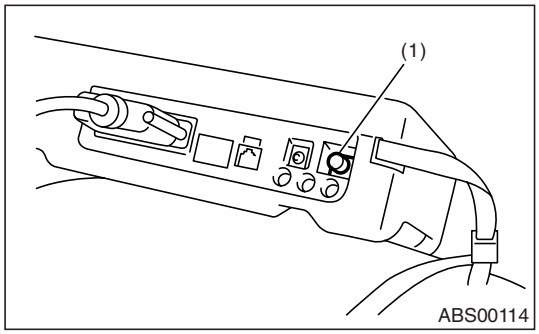


(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control System} and press [YES] key.
8) Press the [YES] key after the information of ABS type is displayed.
9) On the «ABS Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.
10) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning the DTC, refer to the LIST OF DIAGNOSTICS TROUBLE CODE (DTC). <Ref. to ABS(5.3i)(diag)-39, List of Diagnostic Trouble Code (DTC).>
• A maximum of 3 DTCs are displayed in order of occurrence.
• If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark "?", appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

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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 «YES» key.
2) On the «System Selection Menu» display screen, select the {Brake Control System} and press «YES» key.
3) Press the «YES» key after the information of ABS type is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display & Save} and press «YES» key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press «YES» key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Display screen	Contents to be monitored	Unit of measure
FR Wheel Speed Signal	Wheel speed detected by Front ABS wheel speed sensor RH is displayed	km/h or MPH
FL Wheel Speed Signal	Wheel speed detected by Front ABS wheel speed sensor LH is displayed	km/h or MPH
RR Wheel Speed Signal	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed	km/h or MPH
RL Wheel Speed Signal	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed	km/h or MPH
Stop Light Switch	Stop light switch signal	ON or OFF
Stop Light Switch	Stop light switch monitor voltage is displayed.	V
Longitudinal G Sensor	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.	V
Lateral G Sensor	Lateral G detected by Lateral G sensor is displayed in voltage.	V
Valve Relay Signal	Valve Relay Signal	ON or OFF
Motor Relay Signal	Motor Relay Signal	ON or OFF
ABS Warning Lamp	ON operation of ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Operating condition of motor relay is displayed.	ON or OFF
Valve Relay Monitor	Operating condition of the valve relay is displayed.	ON or OFF
CCM Signal	ABS operation signal from ABS control module to TCM	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

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3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press «YES» key.
2) On the «System Select Menu» display screen, select the {Brake System} and press «YES» key.
3) Press the «YES» key after the information of engine type is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press «YES» key.

Display screen	Contents to be monitored
Clear memory?	Function of clearing DTC.

5) When the “Done” and “Turn Ignition Switch OFF” are shown on display screen, turn the Subaru Select Monitor power switch and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. ABS SEQUENCE CONTROL

Display screen	Contents to be monitored	Index No.
ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to ABS-14, 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 maximum to three.
• If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a DTC, preceded by a question mark “?”, appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

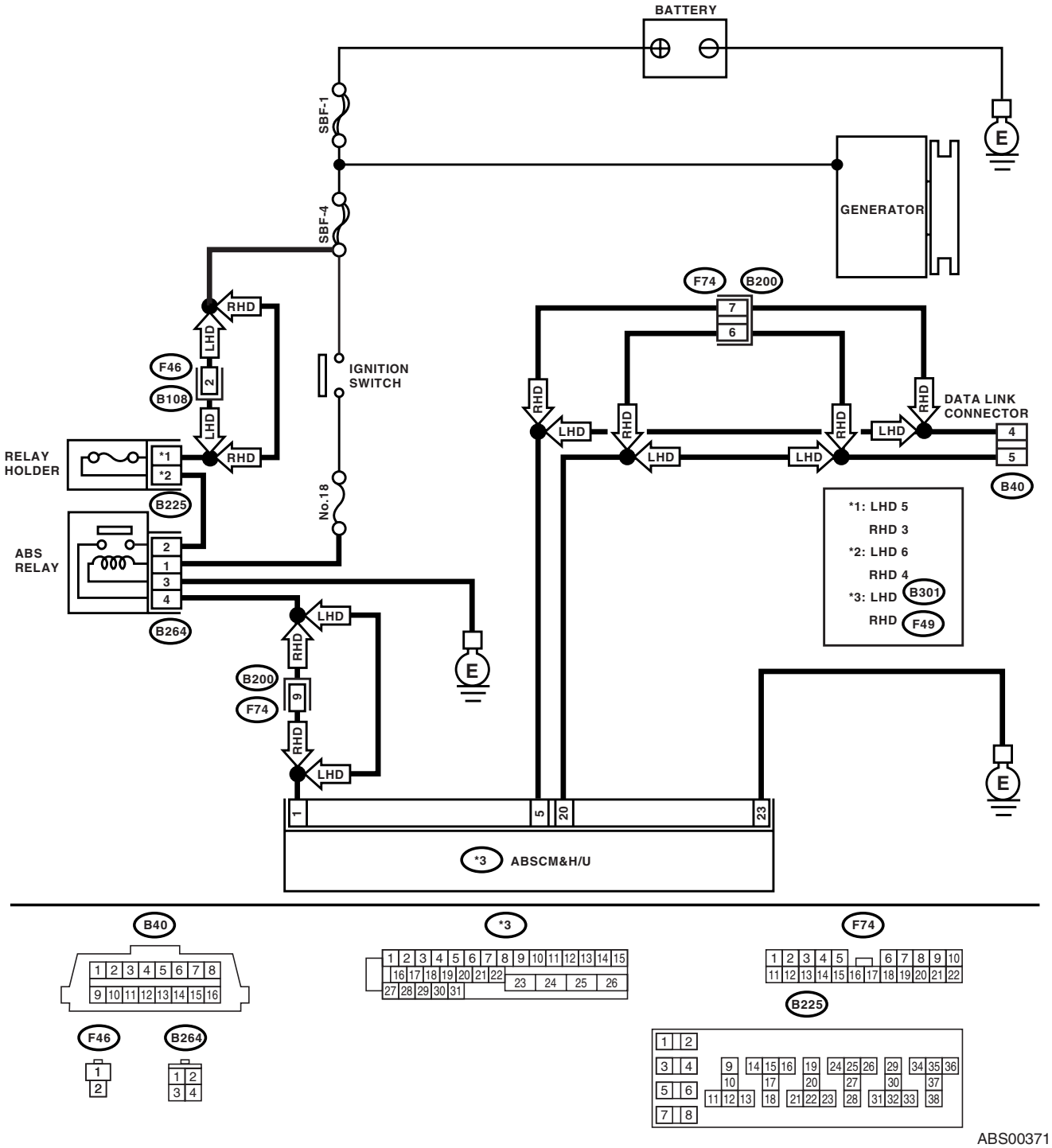
Display screen	Contents to be monitored
FR Wheel Speed	Wheel speed detected by Front ABS wheel speed sensor RH is displayed in km/h or mile/h.
FL Wheel Speed	Wheel speed detected by Front ABS wheel speed sensor LH is displayed in km/h or mile/h.
RR Wheel Speed	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed in km/h or mile/h.
RL Wheel Speed	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed in km/h or mile/h.
IG power supply voltage	Power (in volts) supplied to ABSCM& H/U appears on the Subaru Select Monitor display.
Longitudinal G Sensor	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.
Lateral G sensor	Voltage equivalent to lateral G detected by analog lateral G sensor is displayed.
Motor Relay Monitor	Motor relay operation monitor signal
Stop Light Switch	Stop light switch signal
ABS Operation Signal	ABS operation signal
Condition of Malfunction	Displays if the malfunction has occurred to ABS only, or to ABS and EBD.

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B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:
Faulty harness connector
TROUBLE SYMPTOM:
Communication can not be executed between ABS and Subaru Select Monitor.
WIRING DIAGRAM:



ABS00371

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	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch turned 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 COMMUNICATION OF SUBARU SELECT MONITOR.** 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 name and year of system displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 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.	Are the name and year of system displayed on Subaru Select Monitor?	Replace the ABSCM only. <Ref. to ABS-7, 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 the ABSCM&H/U, ECM and driver's control center differential control module connectors. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — 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. 5 (+) — Chassis ground (−):*** ***(B40) No. 4 (+) — 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*** ***LHD:*** ***(B301) No. 20 — (B40) No. 5:*** ***(B301) No. 5 — (B40) No. 4:*** ***RHD:*** ***(F49) No. 20 — (B40) No. 5:*** ***(F49) No. 5 — (B40) No. 4:***	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.

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	Step	Check	Yes	No
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 the clamp locks onto it?	Go to step **10.**	Insert the 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*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 to 15 V?	Go to step **11.**	Repair the open circuit in harness between ABSCM&H/U and battery.
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12.**	Repair open circuit in the ABSCM&H/U ground harness.
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2. NO TROUBLE CODE

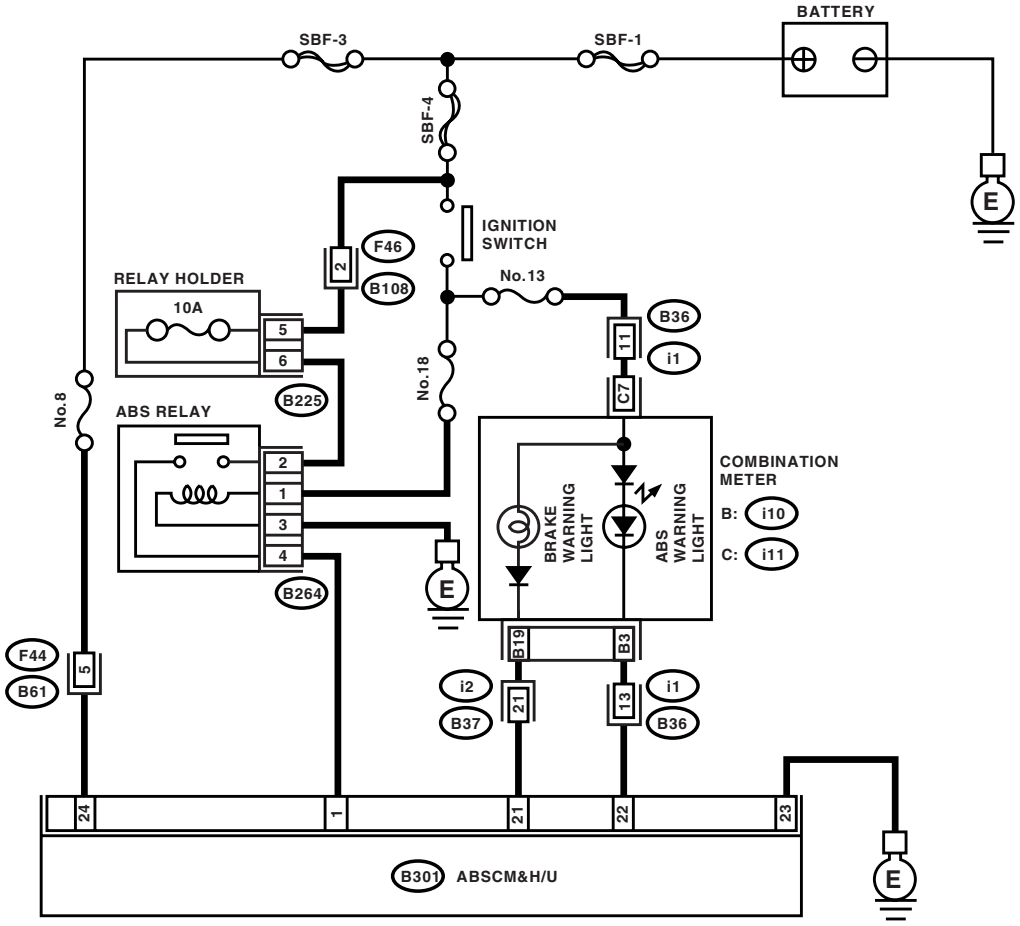
DIAGNOSIS:
ABS warning light circuit is shorted.
TROUBLE SYMPTOM:
- ABS warning light remains on.
- NO TROUBLE CODE displayed on the Subaru Select Monitor.

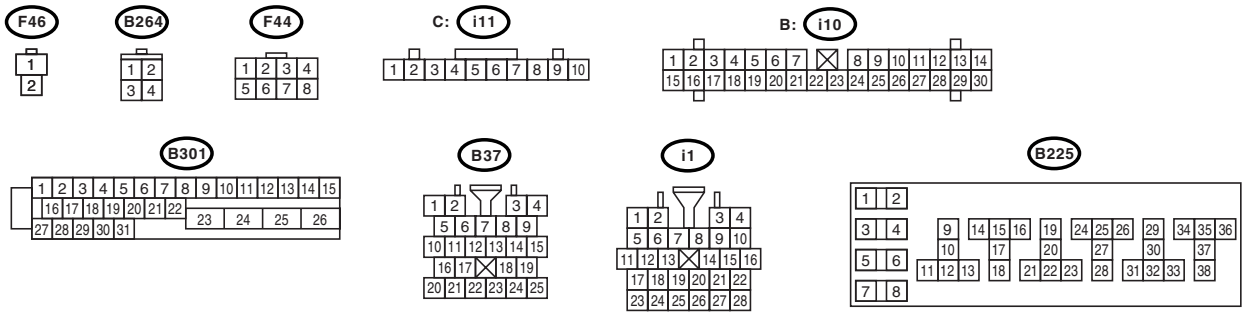
NOTE:
When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in normal condition.

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WIRING DIAGRAM:

- LHD model

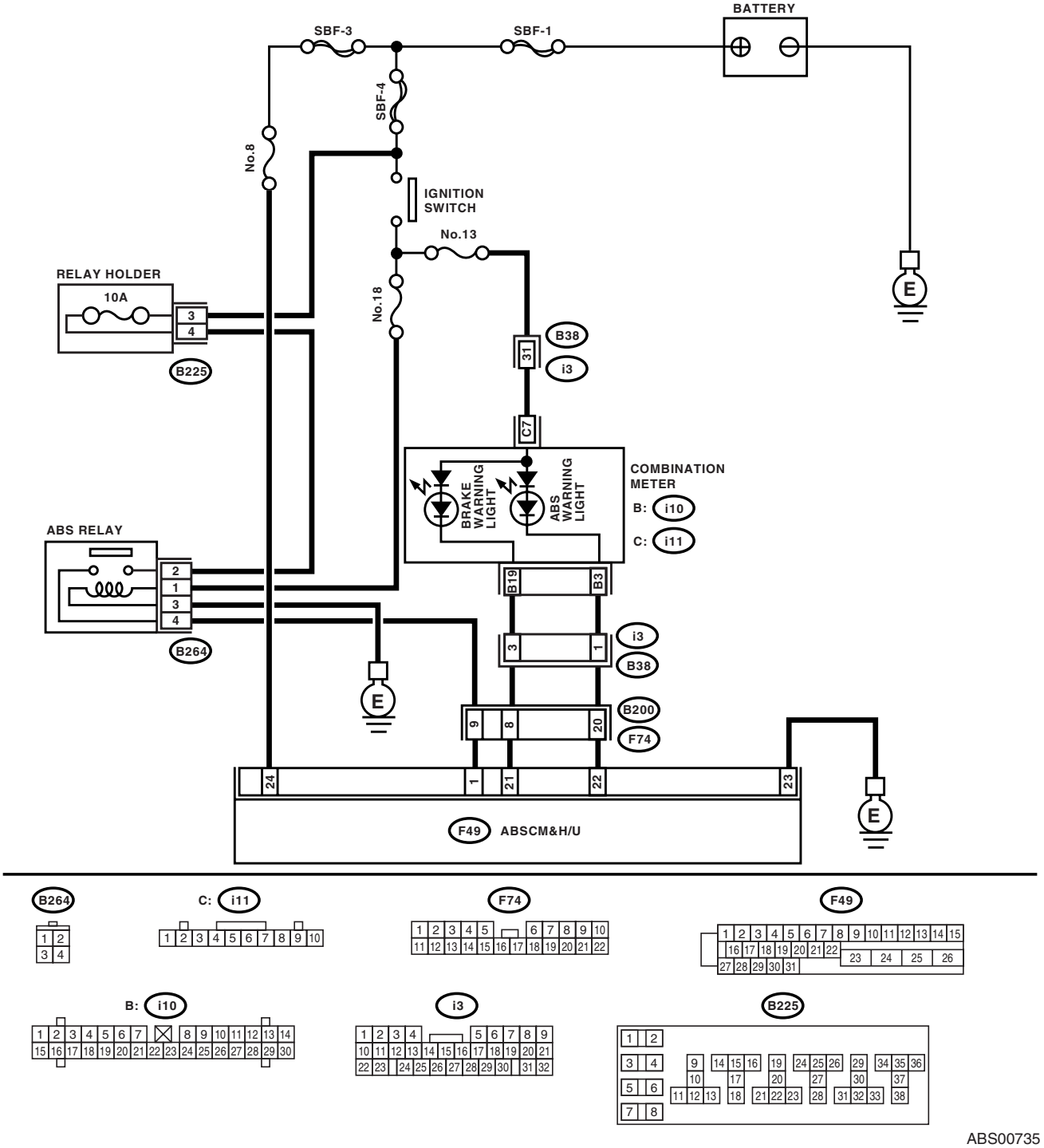




ABS00736

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- RHD model



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	Step	Check	Yes	No
1	**CHECK TERMINAL AT ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. NOTE: For detail of connector switch, refer to following. <Ref. to ABS(5.3i)(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Is there any damage on projection which switches connector switch?	Go to step **2.**	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 22 — No. 23:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK WIRING HARNESS.** Measure the resistance between connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 22 — Chassis ground:*** ***RHD:*** ***(F49) No. 22 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4.**	Repair open circuit in the ABSCM&H/U ground harness.
4	**CHECK WIRING HARNESS.** 1) Connect the connector to ABSCM&H/U. 2) Disconnect the connector (i10) from combination meter. 3) Measure the resistance between connector (i10) and chassis ground. ***Connector & terminal*** ***(i10) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the combination meter. <Ref. to IDI-12, Combination Meter.>	Repair the ground short circuit of harness between ABSCM&H/U connector and combination meter connector.

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7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand DTCs. <Ref. to ABS(5.3i)(diag)-16, Subaru Select Monitor.>

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8. Inspection Mode

A: OPERATION

WARNING:
Observe the road traffic law.

Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least 1 minute.

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9. Clear Memory Mode

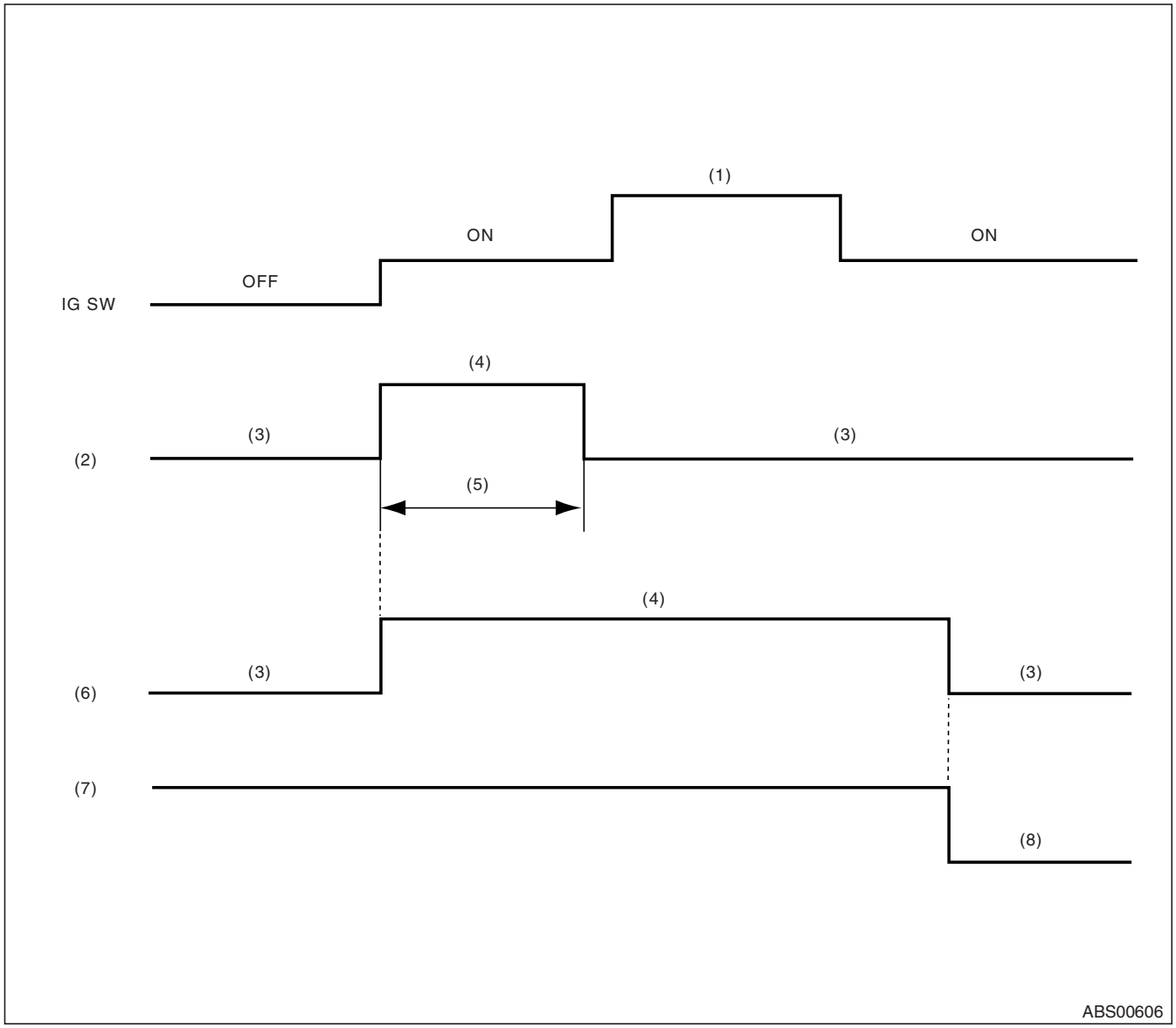
A: OPERATION

Refer to SUBARU SELECT MONITOR for information about how to clear DTC. <Ref. to ABS(5.3i)(diag)-16, Subaru Select Monitor.>

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10.ABS Warning Light / Brake Warning Light Illumination Pattern

A: INSPECTION



(1)	START	(4)	Illuminates	(7)	Parking brake
(2)	ABS warning light	(5)	Approx. 2 sec.	(8)	Release
(3)	Go off	(6)	Brake warning light (EBD warning light)		

1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit.

NOTE:
Even though the ABS warning light does not go out approx. 2 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approx. 12 km/h (7 MPH). However, the Anti-lock brakes do not work while ABS warning light is illuminated.

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B: ABS WARNING LIGHT DOES NOT COME ON

DIAGNOSIS:

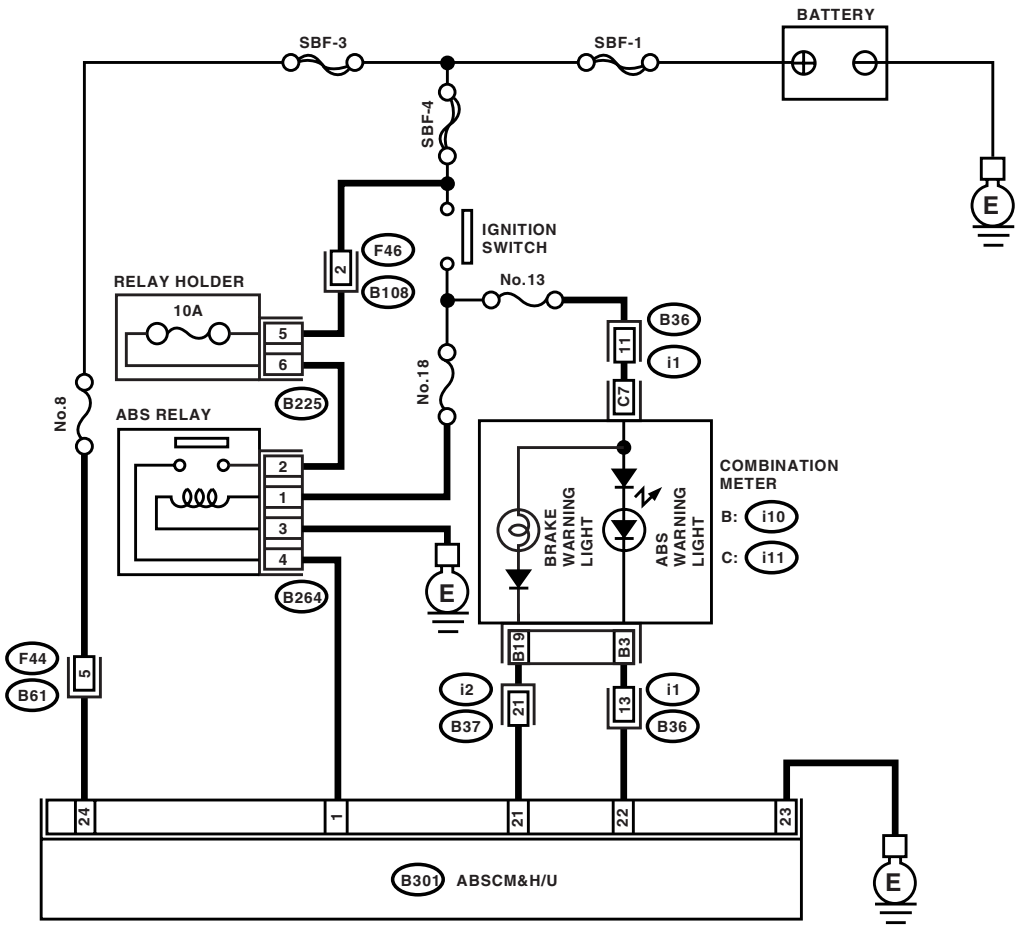
ABS warning light circuit is open or shorted.

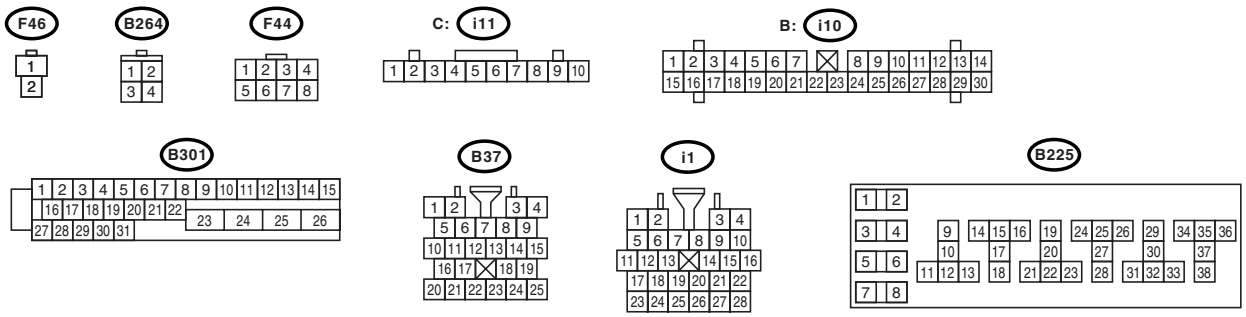
TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:

- LHD model



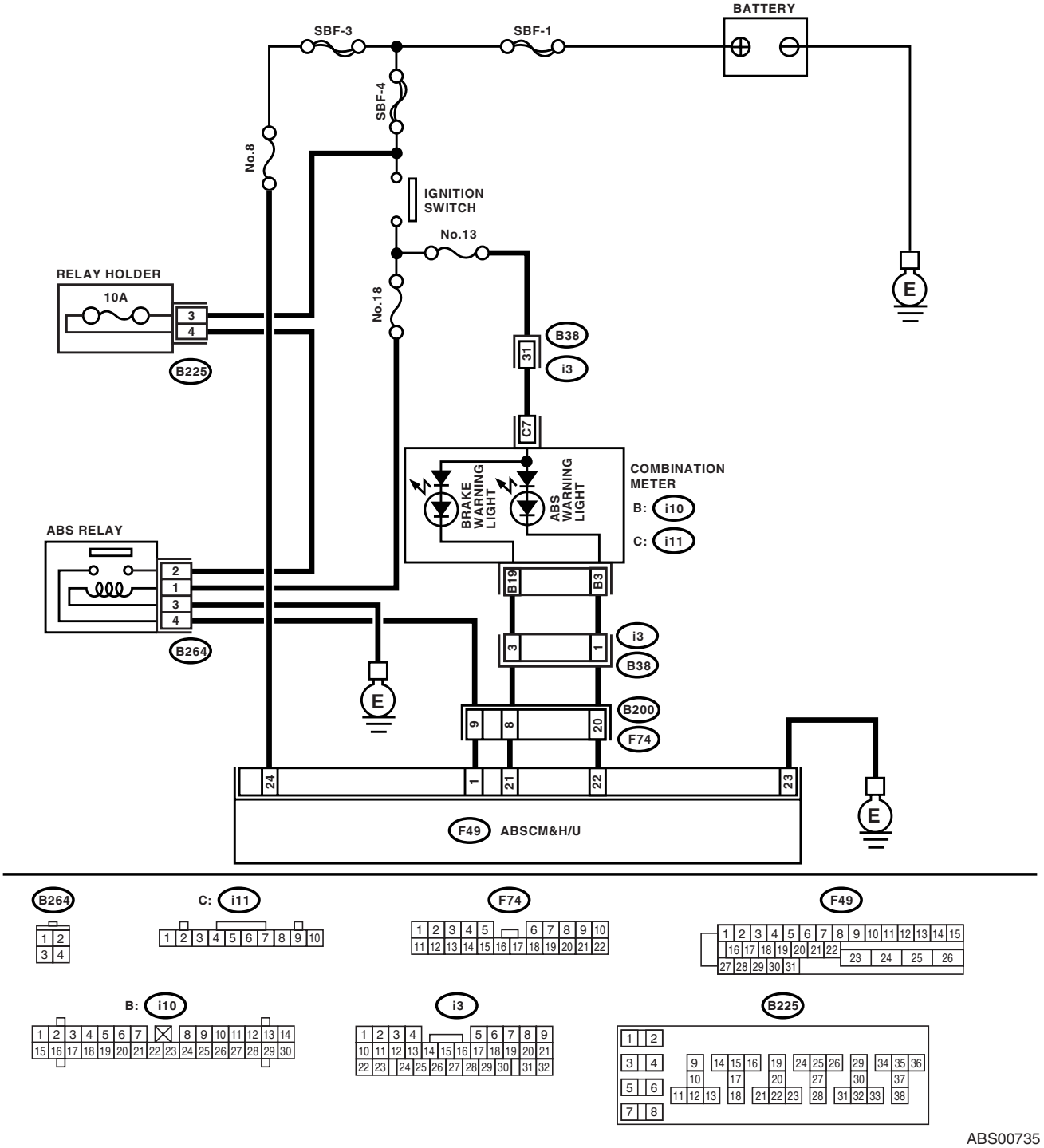


ABS00736

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ABS Warning Light / Brake Warning Light Illumination Pattern

- RHD model



ABS00735

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	Step	Check	Yes	No
1	**CHECK IF OTHER WARNING LIGHTS TURN ON.** Turn the ignition switch to ON (engine OFF).	Are other warning lights turned on?	Go to step **2.**	Repair the combination meter. <Ref. to IDI-12, Combination Meter.>
2	**READ DTC.** Read the DTC. <Ref. to ABS(5.3i)(diag)-25, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3.**
3	**CHECK ABSCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition to ON.	Does the ABS warning lights illuminate?	Go to step **4.**	Replace the ABSCM only. <Ref. to ABS-11, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the open circuit in the ABSCM&H/U ground harness.
5	**CHECK WIRING HARNESS.** 1) Disconnect the connector (i10) from combination meter. 2) Measure the resistance between ABSCM connector and combination meter connector. ***Connector & terminal*** ***LHD:*** ***(B301) No. 22 — (i10) No. 3:*** ***RHD:*** ***(F49) No. 22 — (i10) No. 3:***	Is the resistance less than 0.5 Ω?	Repair the combination meter. <Ref. to IDI-12, Combination Meter.>	Repair open circuit in the harness/connector, between ABSCM&H/U and combination meter.

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C: ABS WARNING LIGHT DOES NOT GO OFF

DIAGNOSIS:

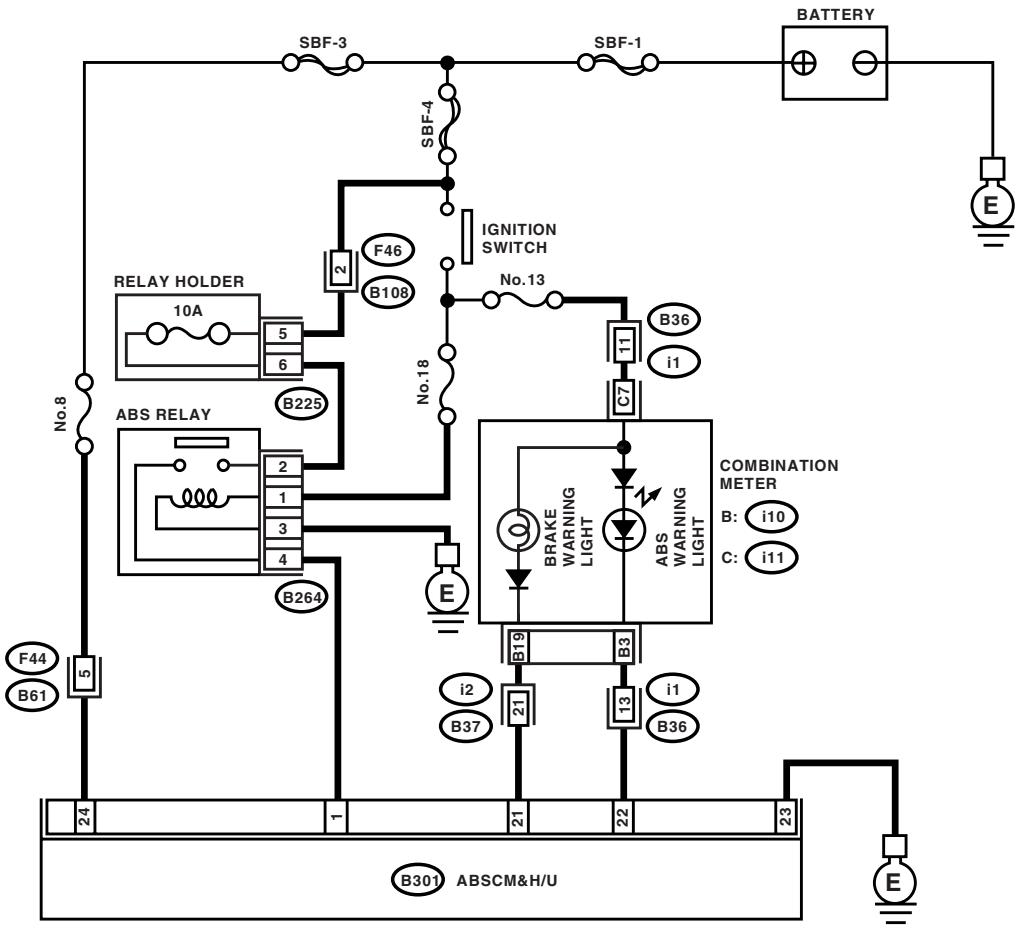
ABS warning light circuit is open or shorted.

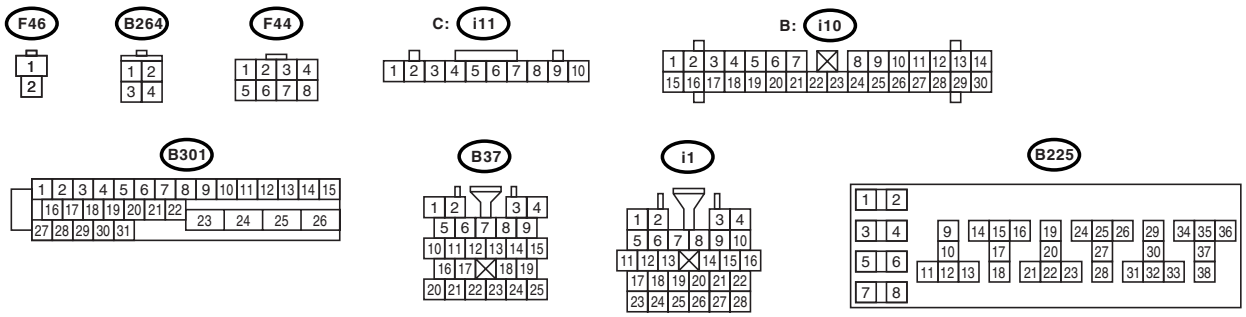
TROUBLE SYMPTOM:

When starting the engine ABS warning light is kept ON.

WIRING DIAGRAM:

- LHD model

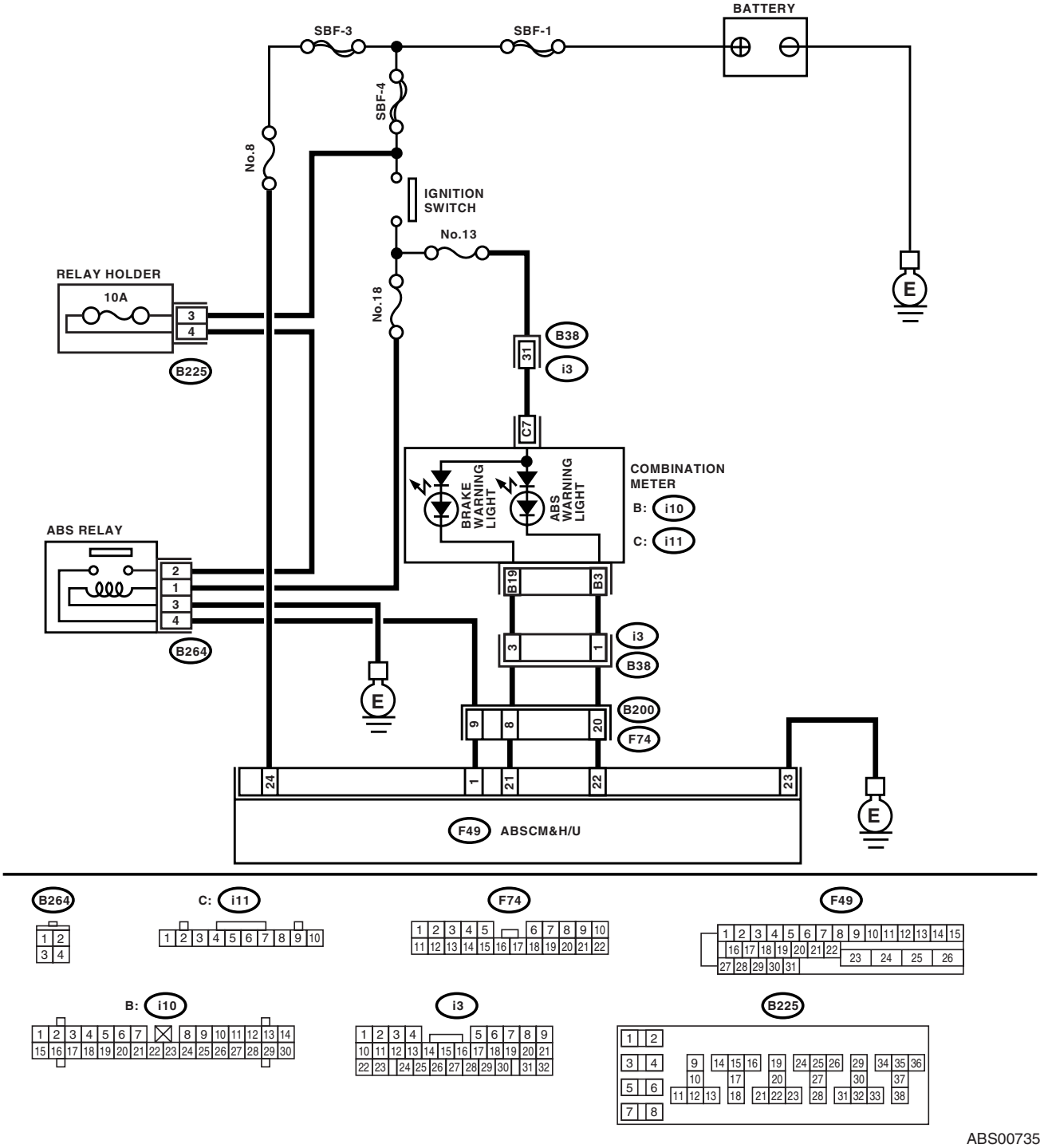




ABS00736

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- RHD model



ABS00735

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ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**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 the clamp locks onto it?	Go to step **2.**	Insert the ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.
2	**READ DTC.** Read the DTC. <Ref. to ABS(5.3i)(diag)-25, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3.**
3	**CHECK GENERATOR.** 1) Start the engine. 2) Idle the engine. 3) Measure the voltage between generator and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
4	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **5.**
5	**CHECK POWER SUPPLY OF ABSCM.** 1) Disconnect the connector from ABSCM&H/U. 2) Start the engine. 3) Idle the engine. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **6.**	Repair the ABSCM&H/U power supply unit.
6	**CHECK PROJECTION AT ABSCM&H/U.** Turn the ignition switch to OFF. NOTE: For detail of connector switch, refer to following. <Ref. to ABS(5.3i)(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Is there any damage on projection which switches connector switch?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminal*** ***No. 22 — No. 23:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
8	**CHECK WIRING HARNESS.** 1) On LHD model, disconnect the connector (i1) from connector (B36). On RHD model, disconnect the connector (i3) from connector (B38). 2) On LHD model, measure the resistance between connector (B36) and chassis ground. On RHD model, measure the resistance between connector (B38) and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B36) No. 13 — Chassis ground:*** ***RHD:*** ***(F38) No. 1 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness.

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	Step	Check	Yes	No
9	**CHECK WIRING HARNESS.** 1) Connect the connector to ABSCM&H/U. 2) Disconnect the connector (i10) from combination meter. 3) Measure the resistance between connector (i10) and chassis ground. ***Connector & terminal*** ***(i10) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the combination meter. <Ref. to IDI-12, Combination Meter.>	Repair the ground short of harness between ABSCM&H/U connector and combination meter connector.

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D: BRAKE WARNING LIGHT DOES NOT GO OFF

DIAGNOSIS:

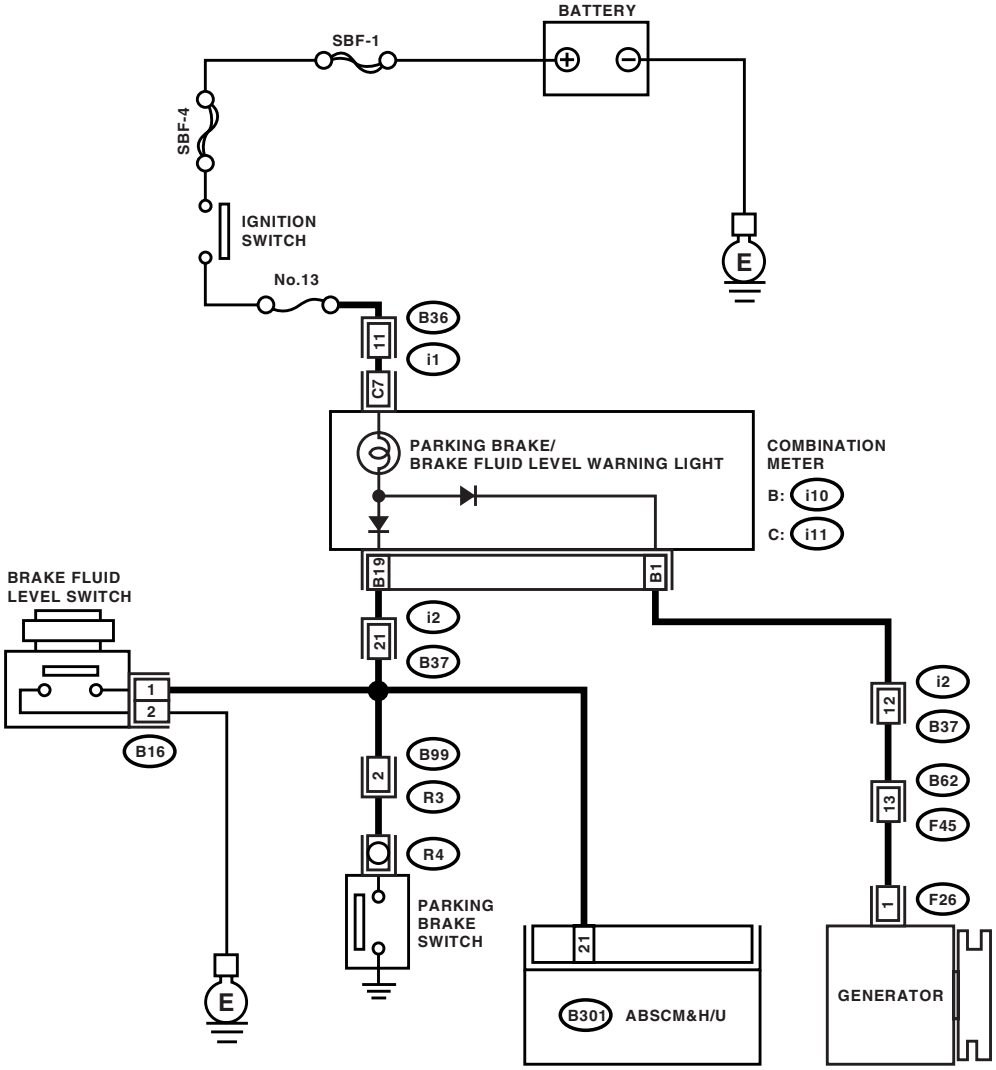
- Brake warning light circuit is shorted.
- Faulty sensor/connector

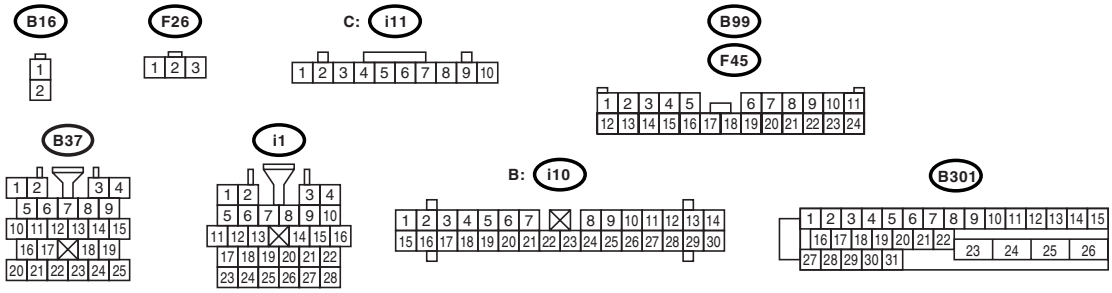
TROUBLE SYMPTOM:

After starting the engine, brake warning light is kept ON, even if the parking brake lever has been released.

WIRING DIAGRAM:

- LHD model

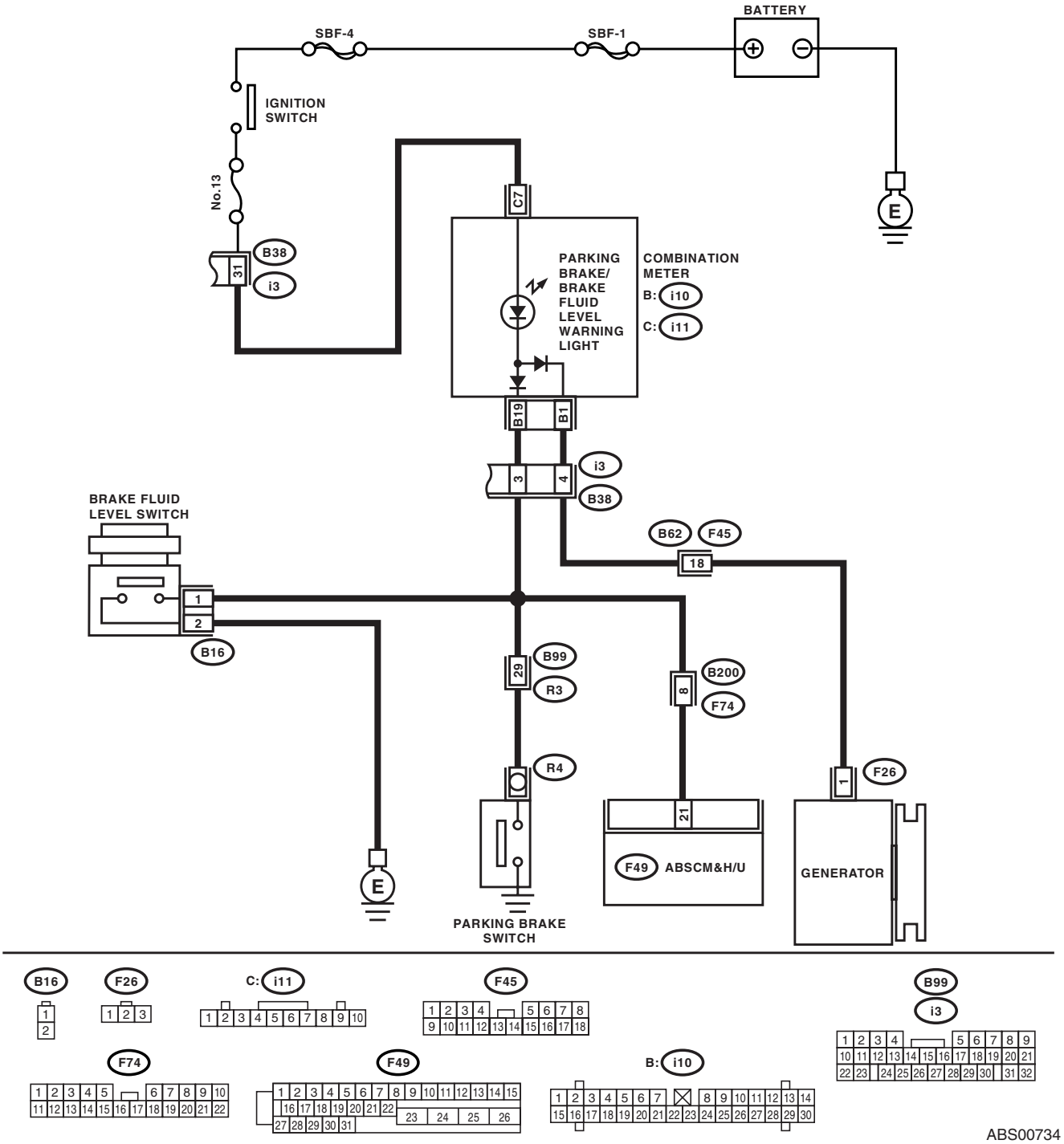




ABS00732

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- RHD model



ABS00734

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ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**CHECK BRAKE FLUID AMOUNT.** Check the amount of brake fluid in reservoir tank of master cylinder.	Is the brake fluid amount between “MAX” line and “MIN” line?	Go to step **2.**	Fill the brake fluid to specified amount.
2	**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 **3.**	Replace the master cylinder.
3	**CHECK PARKING BRAKE SWITCH.** 1) Disconnect the connector (R4) from parking brake switch. 2) Release the parking brake switch. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the parking brake switch.
4	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connector form ABSCM & H/U. 2) Disconnect the connector (F26) from generator. 3) Turn the ignition switch to ON.	Does the brake warning light go off?	Go to step **5.**	Repair the ground short of harness.
5	**CHECK POOR CONTACT IN ABSCM & H/U.**	Is there poor contact in ABSCM & H/U connector?	Repair the connector.	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

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11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
—	—	Communication for initializing impossible	Select monitor communication failure	<Ref. to ABS(5.3i)(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>
—	—	No trouble code	Although no trouble code appears on the Subaru Select Monitor display, the ABS warning light remains on.	<Ref. to ABS(5.3i)(diag)-21, NO TROUBLE CODE, INSPECTION, Subaru Select Monitor.>
21	4A02	Open or short circuit in Front ABS wheel speed sensor RH circuit	Open or short circuit in Front ABS wheel speed sensor RH circuit	<Ref. to ABS(5.3i)(diag)-42, DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	48C5, 4945 48E5, 4845 4905, 4885	Front ABS wheel speed sensor RH abnormal signal	Front ABS wheel speed sensor RH abnormal signal	<Ref. to ABS(5.3i)(diag)-50, DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	4202	Open or short circuit in Front ABS wheel speed sensor LH circuit	Open or short circuit in Front ABS wheel speed sensor LH circuit	<Ref. to ABS(5.3i)(diag)-42, DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	40C5, 4145 40E5, 4045 4105, 4085	Front ABS wheel speed sensor LH abnormal signal	Front ABS wheel speed sensor LH abnormal signal	<Ref. to ABS(5.3i)(diag)-50, DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	4602	Open or short circuit in Rear ABS wheel speed sensor RH circuit	Open or short circuit in Rear ABS wheel speed sensor RH circuit	<Ref. to ABS(5.3i)(diag)-42, DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	44C5, 4545 44E5, 4445 4505, 4485	Rear ABS wheel speed sensor RH abnormal signal	Rear ABS wheel speed sensor RH abnormal signal	<Ref. to ABS(5.3i)(diag)-50, DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	4E02	Open or short circuit in Rear ABS wheel speed sensor LH circuit	Open or short circuit in Rear ABS wheel speed sensor LH circuit	<Ref. to ABS(5.3i)(diag)-43, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	4CC5, 4D45 4CE5, 4C45 4D05, 4C85	Rear ABS wheel speed sensor LH abnormal signal	Rear ABS wheel speed sensor LH abnormal signal	<Ref. to ABS(5.3i)(diag)-51, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
29	5080 50C0	Abnormal ABS wheel speed sensor signal on any one of four sensor	Abnormal ABS wheel speed sensor signal on any one of four	<Ref. to ABS(5.3i)(diag)-58, DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	3200	Front inlet valve RH malfunction	Front inlet valve RH malfunction	<Ref. to ABS(5.3i)(diag)-63, DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	3600	Front outlet valve RH malfunction	Front outlet valve RH malfunction	<Ref. to ABS(5.3i)(diag)-65, DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	2200	Front inlet valve LH malfunction	Front inlet valve LH malfunction	<Ref. to ABS(5.3i)(diag)-63, DTC 33 FRONT LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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List of Diagnostic Trouble Code (DTC)

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
34	2600	Front outlet valve LH malfunction	Front outlet valve LH malfunction	<Ref. to ABS(5.3i)(diag)-65, DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	2A00	Rear inlet valve RH malfunction	Rear inlet valve RH malfunction	<Ref. to ABS(5.3i)(diag)-63, DTC 35 REAR RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	2E00	Rear outlet valve RH malfunction	Rear outlet valve RH malfunction	<Ref. to ABS(5.3i)(diag)-65, DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	3A00	Rear inlet valve LH malfunction	Rear inlet valve LH malfunction	<Ref. to ABS(5.3i)(diag)-63, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	3E00	Rear outlet valve LH malfunction	Rear outlet valve LH malfunction	<Ref. to ABS(5.3i)(diag)-66, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
41	02A0, 0040, 0020, 02C0, 00E0, 0340, 0140, 0160, 0280, 0080, 0300	ABS control module malfunction	ABS control module and hydraulic control unit malfunction	<Ref. to ABS(5.3i)(diag)-69, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	5A00	Power supply voltage too low	Power supply voltage too low	<Ref. to ABS(5.3i)(diag)-70, DTC 42 POWER SUPPLY VOLTAGE TOO LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5A80	Power supply voltage too high	Power supply voltage too high	<Ref. to ABS(5.3i)(diag)-72, DTC 42 POWER SUPPLY VOLTAGE TOO HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	0C80 0EA0	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS(5.3i)(diag)-75, DTC 51 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	0C40	Valve relay ON failure	Valve relay ON failure	<Ref. to ABS(5.3i)(diag)-77, DTC 51 VALVE RELAY ON FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	10A1	Open circuit in motor relay circuit	Open circuit in motor relay circuit	<Ref. to ABS(5.3i)(diag)-79, DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	10E1	Motor relay ON failure	Motor relay ON failure	<Ref. to ABS(5.3i)(diag)-81, DTC 52 MOTOR RELAY ON FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	10C1	Motor malfunction	Motor malfunction	<Ref. to ABS(5.3i)(diag)-83, DTC 52 MOTOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	5600	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS(5.3i)(diag)-85, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
56	7600	Open or short circuit in G sensor circuit	Open or short circuit in G sensor circuit	<Ref. to ABS(5.3i)(diag)-87, DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	7580	Battery short in G sensor circuit	Battery short in G sensor circuit	<Ref. to ABS(5.3i)(diag)-91, DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	7540	Abnormal G sensor high μ output	Abnormal G sensor high μ output	<Ref. to ABS(5.3i)(diag)-96, DTC 56 ABNORMAL G SENSOR HIGH μ OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	7500	Detection of G sensor stick	Detection of G sensor stick	<Ref. to ABS(5.3i)(diag)-100, DTC 56 DETECTION OF G SENSOR STICK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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List of Diagnostic Trouble Code (DTC)

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
73	7A00	Open or short circuit in lateral G sensor circuit	Open or short circuit in lateral G sensor circuit	<Ref. to ABS(5.3i)(diag)-104, DTC 73 OPEN OR SHORT CIRCUIT IN LATERAL G SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	7980	Battery short in lateral G sensor circuit	Battery short in lateral G sensor circuit	<Ref. to ABS(5.3i)(diag)-108, DTC 73 BATTERY SHORT IN LATERAL G SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	7940	Abnormal lateral G sensor high μ output	Abnormal lateral G sensor high μ output	<Ref. to ABS(5.3i)(diag)-113, DTC 73 ABNORMAL LATERAL G SENSOR HIGH μ OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	7900	Detection of lateral G sensor stick	Detection of lateral G sensor stick	<Ref. to ABS(5.3i)(diag)-117, DTC 73 DETECTION OF LATERAL G SENSOR STICK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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12.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(5.3i)(diag)-43, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(5.3i)(diag)-43, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(5.3i)(diag)-43, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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D: DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT

DIAGNOSIS:

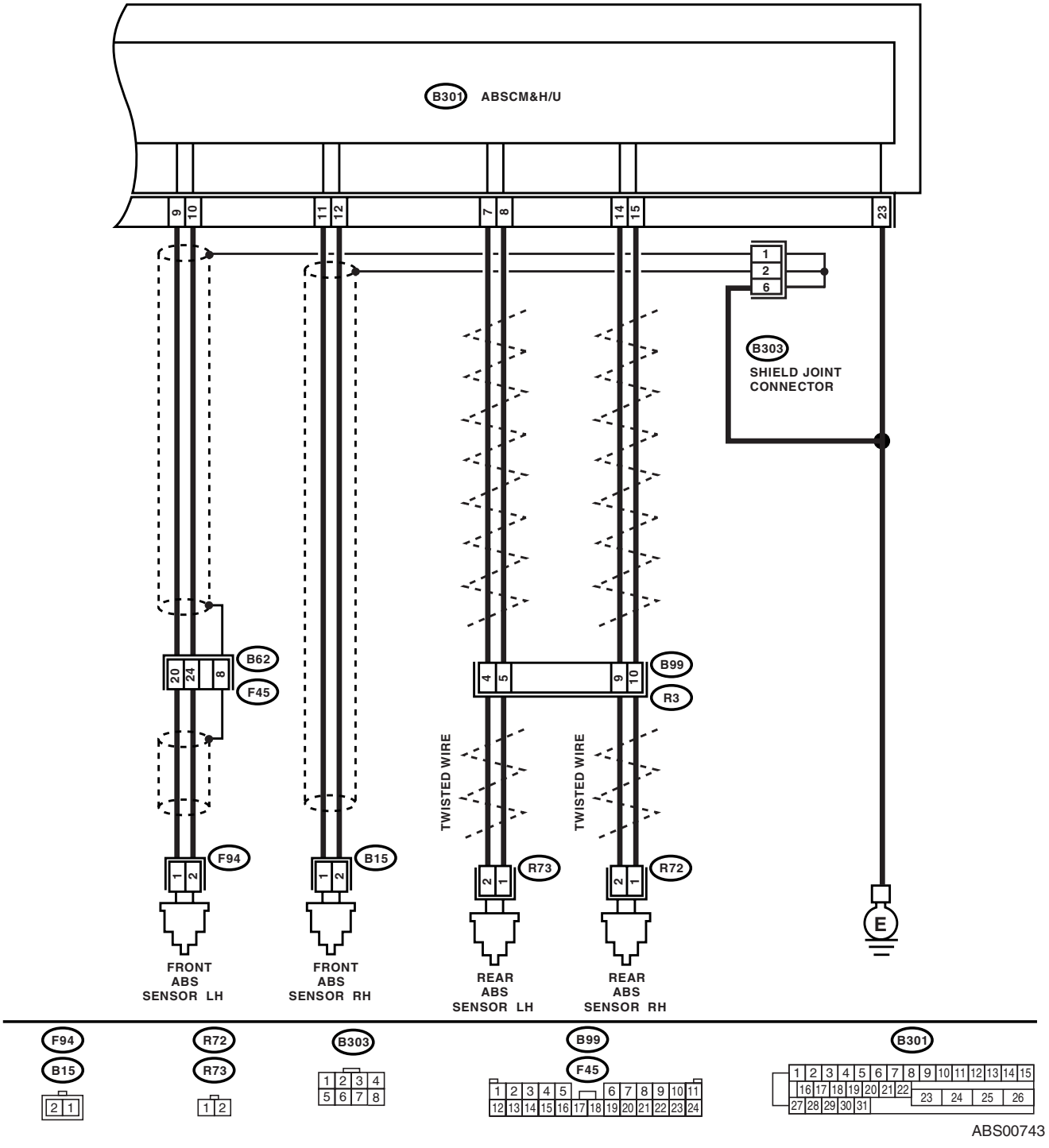
- Faulty ABS wheel speed sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:

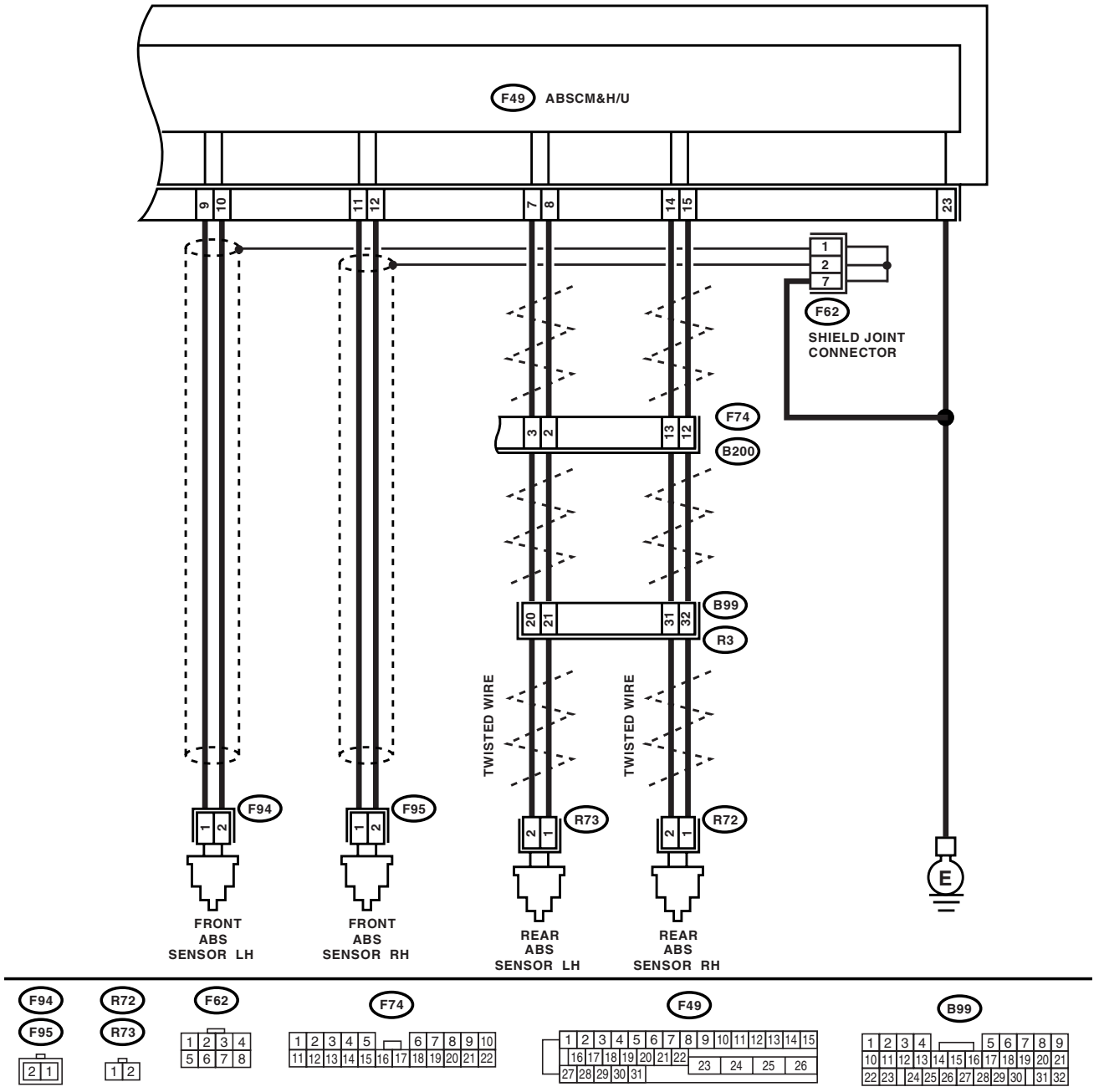
- LHD model



ABS00743

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- RHD model



ABS00354

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	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode.	Does the speed indicated on display change in response to speedometer reading during acceleration or deceleration when the steering wheel is in straight-ahead position?	Go to step **2.**	Go to step **8.**
2	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **3.**	Tighten the ABS wheel speed sensor installation bolts securely.
3	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) /Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **4.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **5.**	Replace the tone wheel. Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTORS.** 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 **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

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	Step	Check	Yes	No
8	**CHECK ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance of ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminals*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ / Rear: 1.025 — 1.265 kΩ	Go to step **9.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>
9	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector from ABSCM& H/U. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **10.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>
10	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>

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	Step	Check	Yes	No
11	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21*** ***LHD:*** ***(B301) No. 11 — No. 12:*** ***RHD:*** ***(F49) No. 11 — No. 12:*** ***DTC 23*** ***LHD:*** ***(B301) No. 9 — No. 10:*** ***RHD:*** ***(F49) No. 9 — No. 10:*** ***DTC 25*** ***LHD:*** ***(B301) No. 14 — No. 15:*** ***RHD:*** ***(F49) No. 14 — No. 15:*** ***DTC 27*** ***LHD:*** ***(B301) No. 7 — No. 8:*** ***RHD:*** ***(F49) No. 7 — No. 8:***	Is the resistance as following value? Front: 1 — 1.5 kΩ / Rear: 1.025 — 1.265 kΩ	Go to step **12.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD:*** ***(B301) No. 11 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 11 (+) — Chassis ground (−):*** ***DTC 23*** ***LHD:*** ***(B301) No. 9 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 9 (+) — Chassis ground (−):*** ***DTC 25*** ***LHD:*** ***(B301) No. 14 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 14 (+) — Chassis ground (−):*** ***DTC 27*** ***LHD:*** ***(B301) No. 7 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 7 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **13.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.

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	Step	Check	Yes	No
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD:*** ***(B301) No. 11 (+) — Chassis ground (–):*** ***RHD:*** ***(F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23*** ***LHD:*** ***(B301) No. 9 (+) — Chassis ground (–):*** ***RHD:*** ***(F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25*** ***LHD:*** ***(B301) No. 14 (+) — Chassis ground (–):*** ***RHD:*** ***(F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27*** ***LHD:*** ***(B301) No. 7 (+) — Chassis ground (–):*** ***RHD:*** ***(F49) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **14.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
14	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **15.**	Tighten the ABS wheel speed sensor installation bolts securely.
15	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) /Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
16	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **17.**	Replace the tone wheel. Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>

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	Step	Check	Yes	No
17	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **18.**	Replace the ABS wheel speed sensor and ABSCM&H/U. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.> and <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD:*** ***(B301) No. 11 — Chassis ground:*** ***RHD:*** ***(F49) No. 11 — Chassis ground:*** ***DTC 23*** ***LHD:*** ***(B301) No. 9 — Chassis ground:*** ***RHD:*** ***(F49) No. 9 — Chassis ground:*** ***DTC 25*** ***LHD:*** ***(B301) No. 14 — Chassis ground:*** ***RHD:*** ***(F49) No. 14 — Chassis ground:*** ***DTC 27*** ***LHD:*** ***(B301) No. 7 — Chassis ground:*** ***RHD:*** ***(F49) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor. And replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
19	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **20.**
20	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only.	Go to step **21.**

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Step		Check	Yes	No
21	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

E: DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(5.3i)(diag)-51, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(5.3i)(diag)-51, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(5.3i)(diag)-51, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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H: DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

DIAGNOSIS:

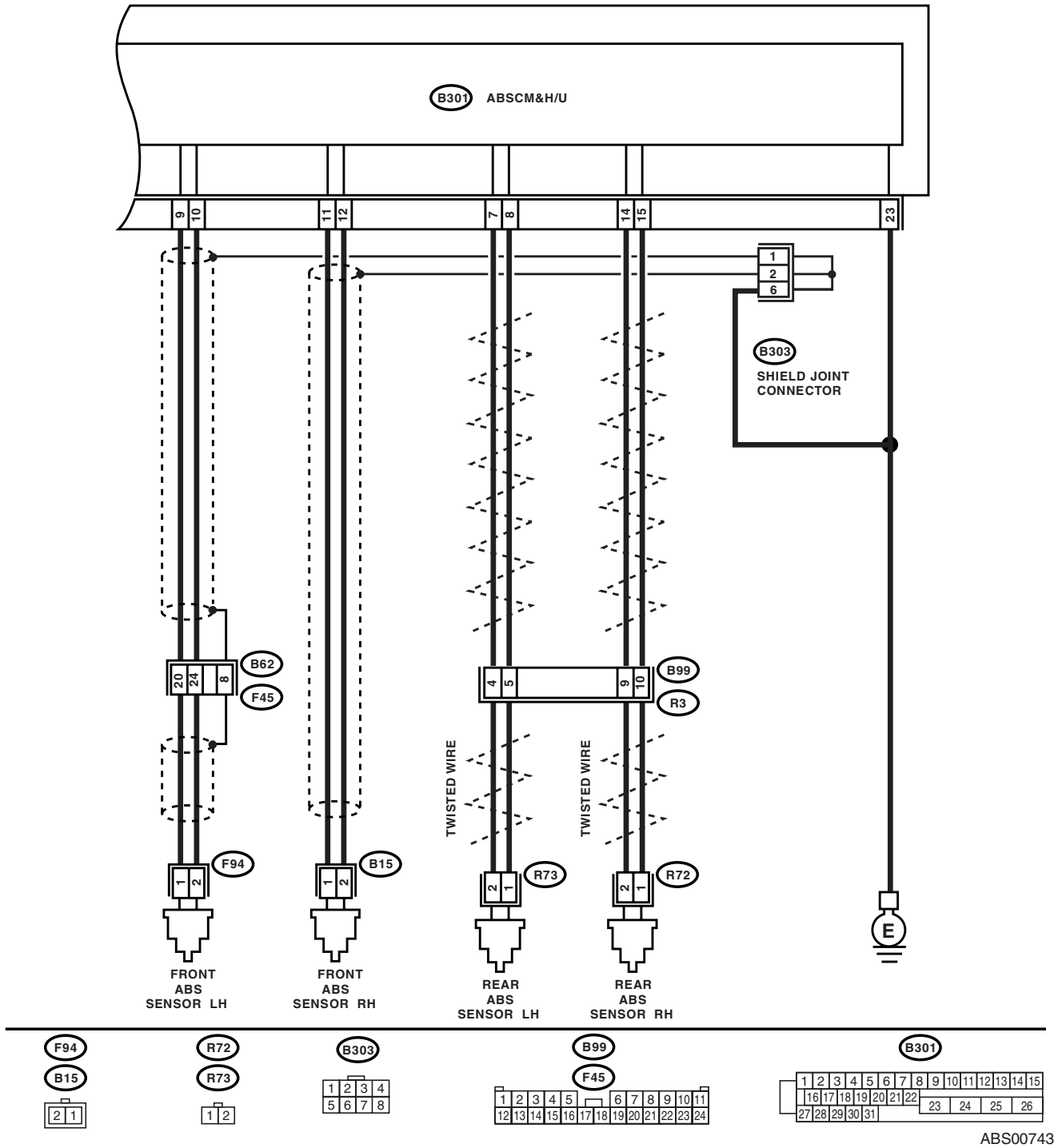
- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:

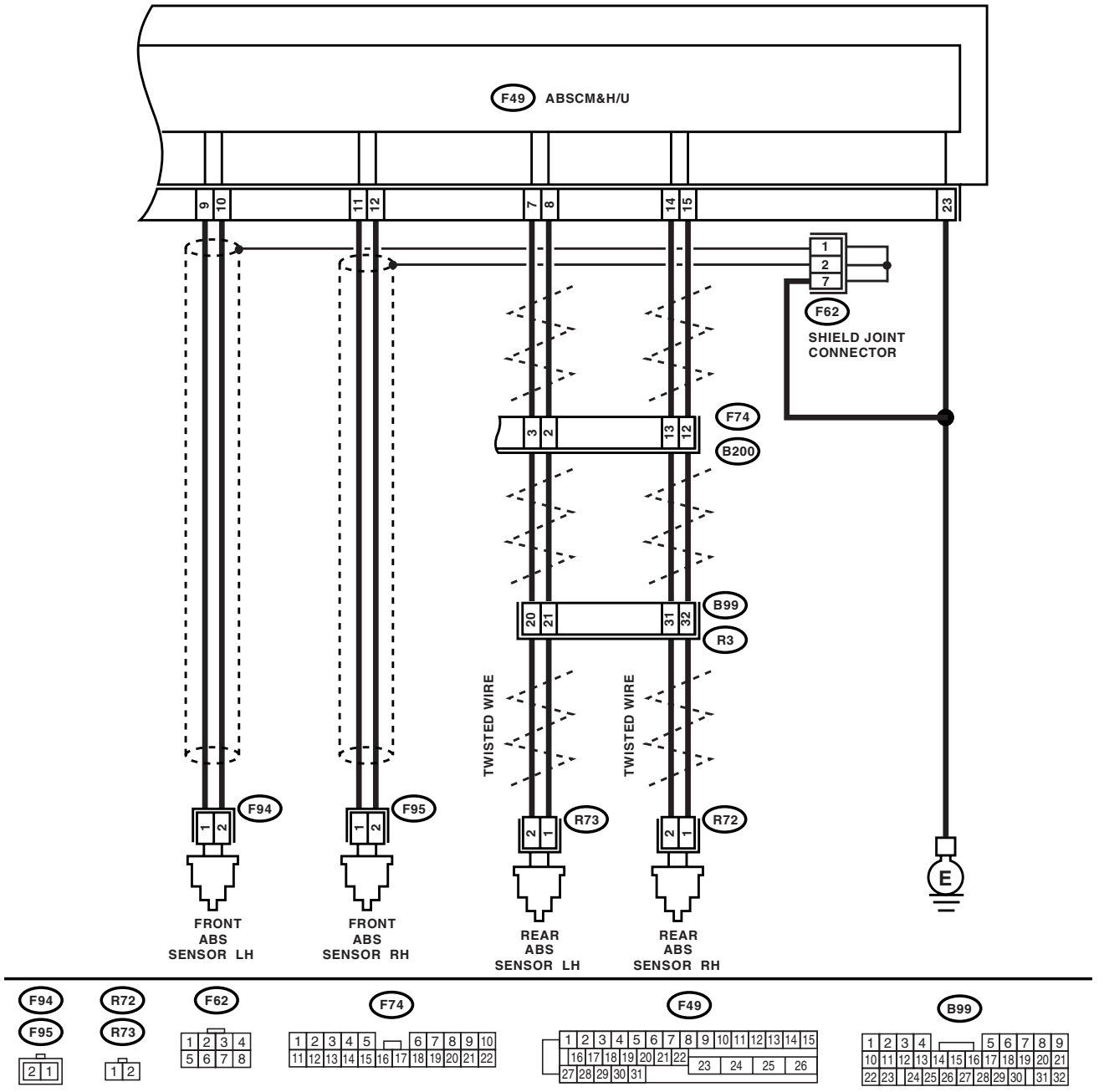
- LHD model



ABS00743

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- RHD model



ABS00354

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	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode.	Does the speed indicated on display change in response to speedometer reading during acceleration or deceleration when the steering wheel is in straight-ahead position?	Go to step **2.**	Go to step **8.**
2	**CHECK POOR CONTACT IN CONNECTORS.** 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 device and electric components are installed correctly.	Are the radio wave device 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 sensor harness.	Go to step **5.**
5	**CHECK SHIELD CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***LHD:*** ***(B303) No. 2 — Chassis ground:*** ***RHD:*** ***(F62) No. 2 — Chassis ground:*** ***DTC 24*** ***LHD:*** ***(B303) No. 1 — Chassis ground:*** ***RHD:*** ***(F62) No. 1 — Chassis ground:*** NOTE: If the DTC is 26, 28: Go to YES.	Is the resistance less than 0.5 Ω?	Go to step **6.**	Repair the shield harness.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference.
8	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **9.**	Tighten the ABS wheel speed sensor installation bolts securely.

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	Step	Check	Yes	No
9	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) /Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **10.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
10	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **11.**	Go to step **12.**
11	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(5.3i)(diag)-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores DTC 29 or DTC 56. ***Connector & terminal*** ***DTC 22*** ***LHD:*** ***(B15) No. 1 (+) — No. 2 (–):*** ***RHD:*** ***(F95) No. 1 (+) — No. 2 (–):*** ***DTC 24*** ***LHD:*** ***(B62) No. 20 (+) — No. 24 (–):*** ***RHD:*** ***(F94) No. 1 (+) — No. 2 (–):*** ***DTC 26*** ***LHD:*** ***(B99) No. 10 (+) — No. 9 (–):*** ***RHD:*** ***(B99) No. 32 (+) — No. 31 (–):*** ***DTC 28*** ***LHD:*** ***(B99) No. 5 (+) — No. 4 (–):*** ***RHD:*** ***(B99) No. 21 (+) — No. 20 (–):***	Is an oscilloscope pattern smooth, as shown in the figure?	Go to step **15.**	Go to step **12.**
12	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub in accordance with DTC.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **13.**

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	Step	Check	Yes	No
13	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS wheel speed sensor piece or tone wheel?	Go to step **14.**	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>
14	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **15.**	Replace the tone wheel. Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>
15	**CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ / Rear: 1.025 — 1.265 kΩ	Go to step **16.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>
16	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **17.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.>

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	Step	Check	Yes	No
17	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Connect the connector to ABS wheel speed sensor. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22*** ***LHD:*** ***(B301) No. 11 — No. 12:*** ***RHD:*** ***(F49) No. 11 — No. 12:*** ***DTC 24*** ***LHD:*** ***(B301) No. 9 — No. 10:*** ***RHD:*** ***(F49) No. 9 — No. 10:*** ***DTC 26*** ***LHD:*** ***(B301) No. 14 — No. 15:*** ***RHD:*** ***(F49) No. 14 — No. 15:*** ***DTC 28*** ***LHD:*** ***(B301) No. 7 — No. 8:*** ***RHD:*** ***(F49) No. 7 — No. 8:***	Is the resistance as following value? Front: 1 — 1.5 kΩ / Rear: 1.025 — 1.265 kΩ	Go to step **18.**	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
18	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***LHD:*** ***(B301) No. 11 — Chassis ground:*** ***RHD:*** ***(F49) No. 11 — Chassis ground:*** ***DTC 24*** ***LHD:*** ***(B301) No. 9 — Chassis ground:*** ***RHD:*** ***(F49) No. 9 — Chassis ground:*** ***DTC 26*** ***LHD:*** ***(B301) No. 14 — Chassis ground:*** ***RHD:*** ***(F49) No. 14 — Chassis ground:*** ***DTC 28*** ***LHD:*** ***(B301) No. 7 — Chassis ground:*** ***RHD:*** ***(F49) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.

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	Step	Check	Yes	No
19	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **20.**	Repair the ABSCM&H/U ground harness.
20	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **21.**
21	**CHECK SOURCES OF SIGNAL NOISE.** Make sure the radio wave device and electric components are installed correctly.	Are the radio wave device and electric components installed correctly?	Go to step **22.**	Install the radio wave device and electric components properly.
22	**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 **23.**
23	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***LHD:*** ***(B303) No. 2 — Chassis ground:*** ***RHD:*** ***(F62) No. 2 — Chassis ground:*** ***DTC 24*** ***LHD:*** ***(B303) No. 1 — Chassis ground:*** ***RHD:*** ***(F62) No. 1 — Chassis ground:*** NOTE: If the DTC is 26, 28: Go to YES.	Is the resistance less than 0.5 Ω?	Go to step **24.**	Repair the shield harness.
24	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **25.**
25	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

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I: DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR

DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

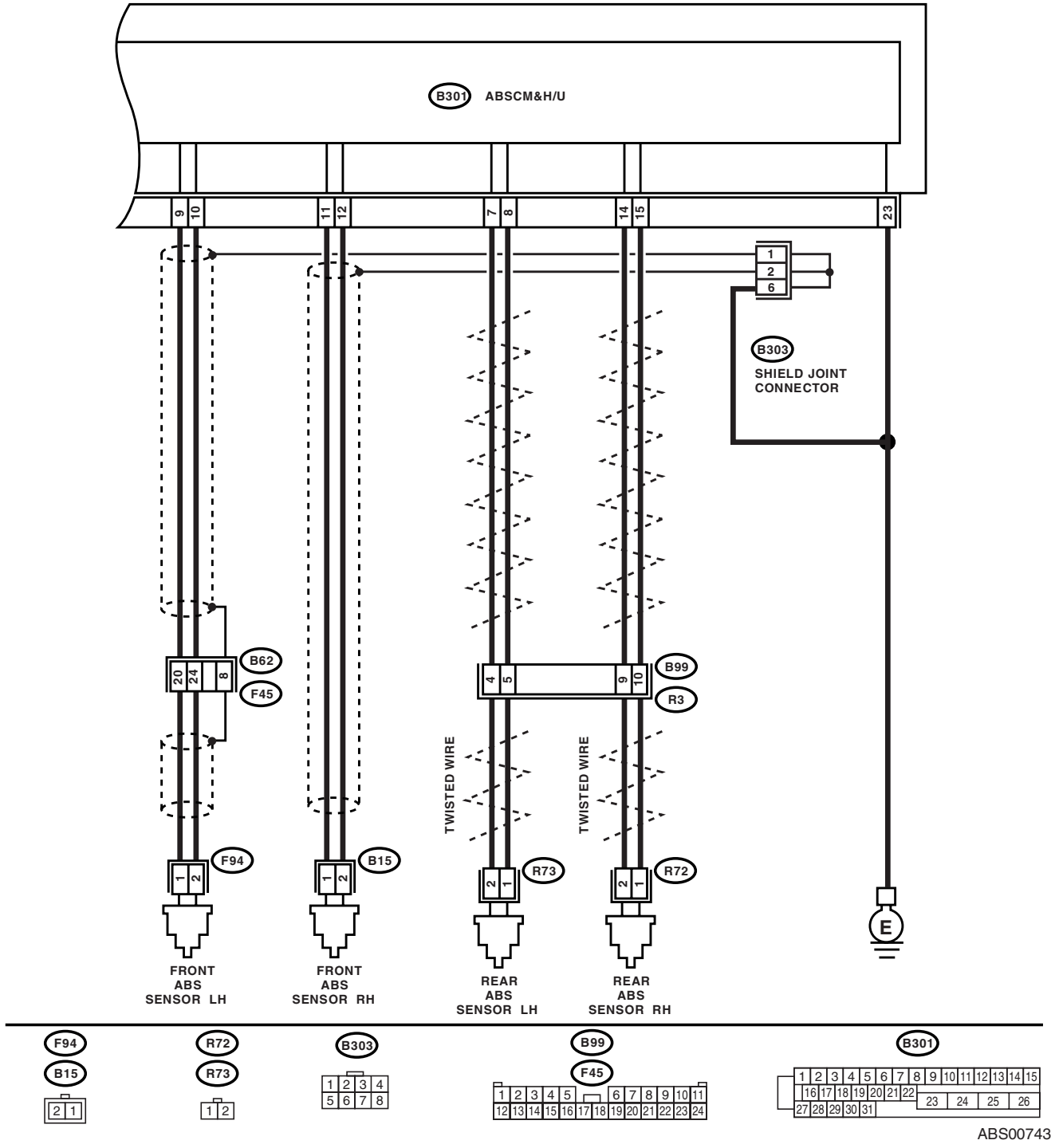
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

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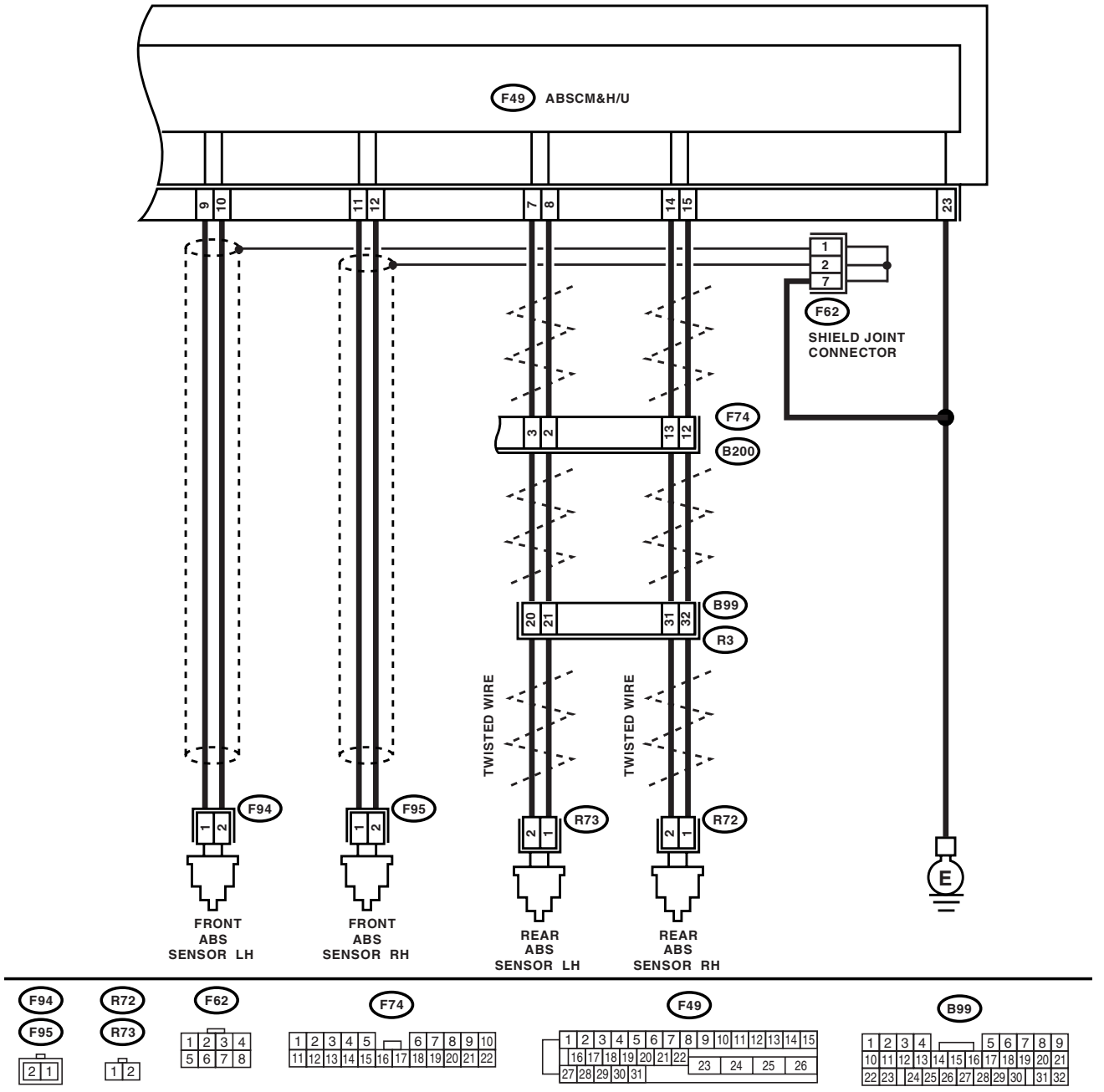
WIRING DIAGRAM:

- LHD model



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- RHD model



ABS00354

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	Step	Check	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.**	Check if the wheels have been turned freely for more than one minute, such as when vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when vehicle is towed or jacked-up, or when steering wheel is continuously turned all way, this trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.**	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 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 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **6.**	Tighten the ABS wheel speed sensor installation bolts securely.
6	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) /Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**

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	Step	Check	Yes	No
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(5.3i)(diag)-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM&H/U sometimes stores the DTC 29. ***Connector & terminal*** ***Front RH*** ***LHD:*** ***(B15) No. 1 (+) — No. 2 (−):*** ***RHD:*** ***(F95) No. 1 (+) — No. 2 (−):*** ***Front LH*** ***LHD:*** ***(B62) No. 20 (+) — No. 24 (−):*** ***RHD:*** ***(F94) No. 1 (+) — No. 2 (−):*** ***Rear RH*** ***LHD:*** ***(B99) No. 10 (+) — No. 9 (−):*** ***RHD:*** ***(B99) No. 32 (+) — No. 31 (−):*** ***Rear LH*** ***LHD:*** ***(B99) No. 5 (+) — No. 4 (−):*** ***RHD:*** ***(B99) No. 21 (+) — No. 22 (−):***	Is an oscilloscope pattern smooth, as shown in the figure? <Ref. to ABS(5.3i)(diag)-15, WAVEFORM, Control Module I/O Signal.>	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**
10	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS wheel speed sensor piece or tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-17, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-20, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12.**	Replace the tone wheel. Front: <Ref. to ABS-23, Front Tone Wheel.> Rear: <Ref. to ABS-24, Rear Tone Wheel.>

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	Step	Check	Yes	No
12	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

J: DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(5.3i)(diag)-63, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 33 FRONT LEFT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(5.3i)(diag)-63, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 35 REAR RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(5.3i)(diag)-63, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC 37 REAR LEFT INLET VALVE MALFUNCTION

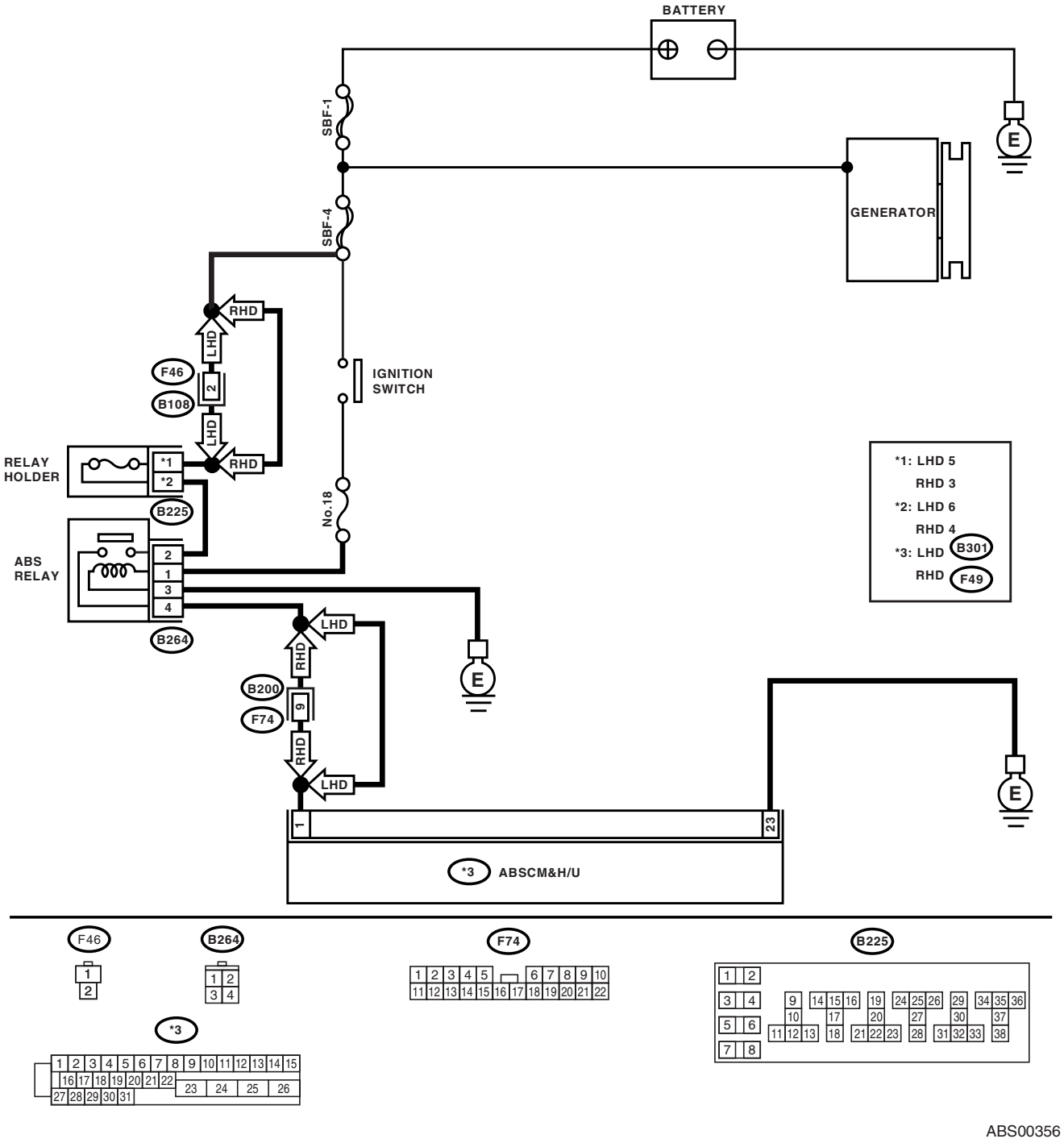
DIAGNOSIS:
- Faulty harness connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

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WIRING DIAGRAM:



ABS00356

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	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*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery, ignition switch 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*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — 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 CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

N: DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(5.3i)(diag)-66, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(5.3i)(diag)-66, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(5.3i)(diag)-66, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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Q: DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION

DIAGNOSIS:

- Faulty harness connector
- Faulty outlet solenoid valve

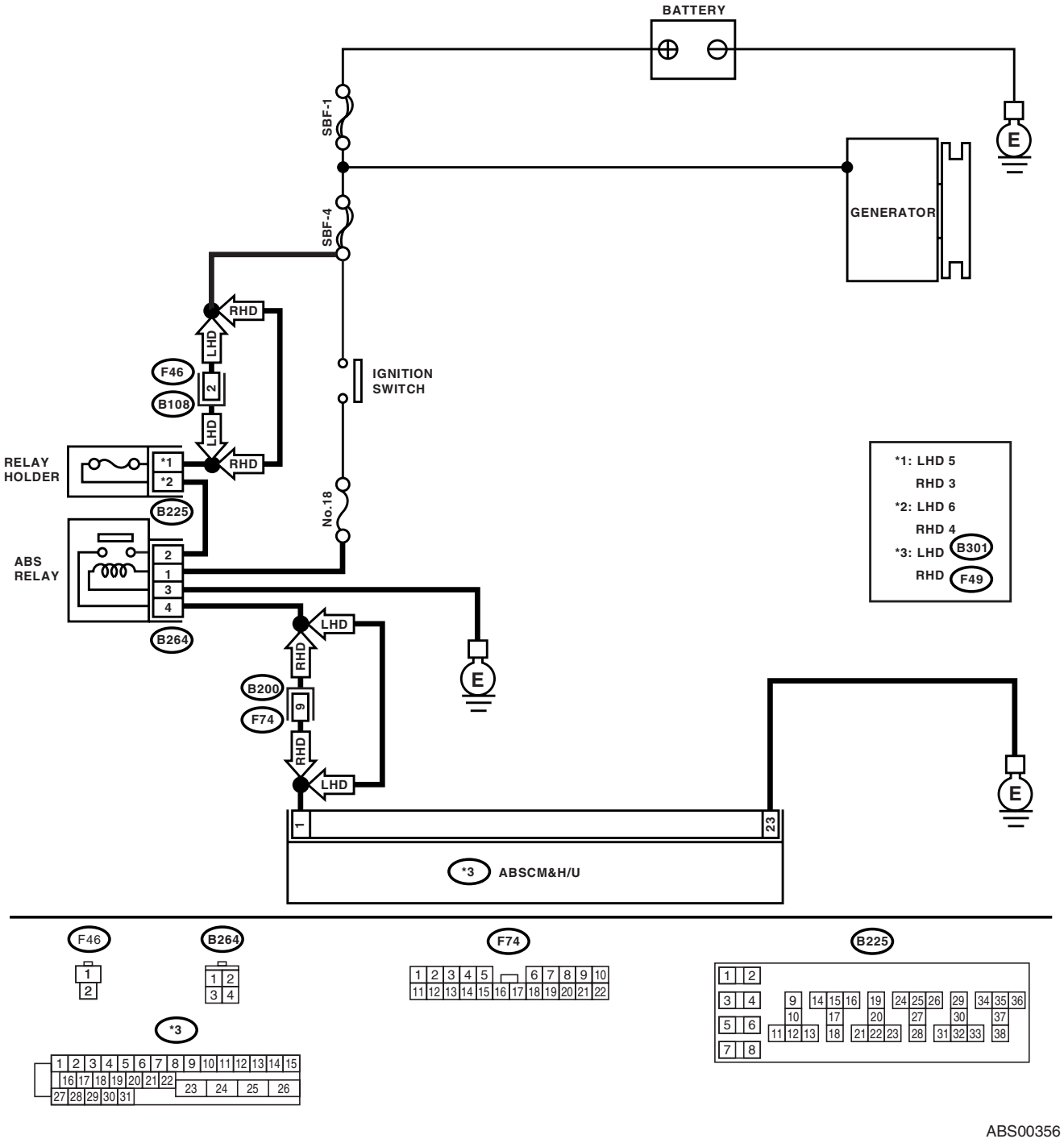
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

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WIRING DIAGRAM:



ABS00356

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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*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery, ignition switch 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*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — 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 CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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R: DTC 41 ABS CONTROL MODULE MALFUNCTION

DIAGNOSIS:

Faulty ABSCM&H/U

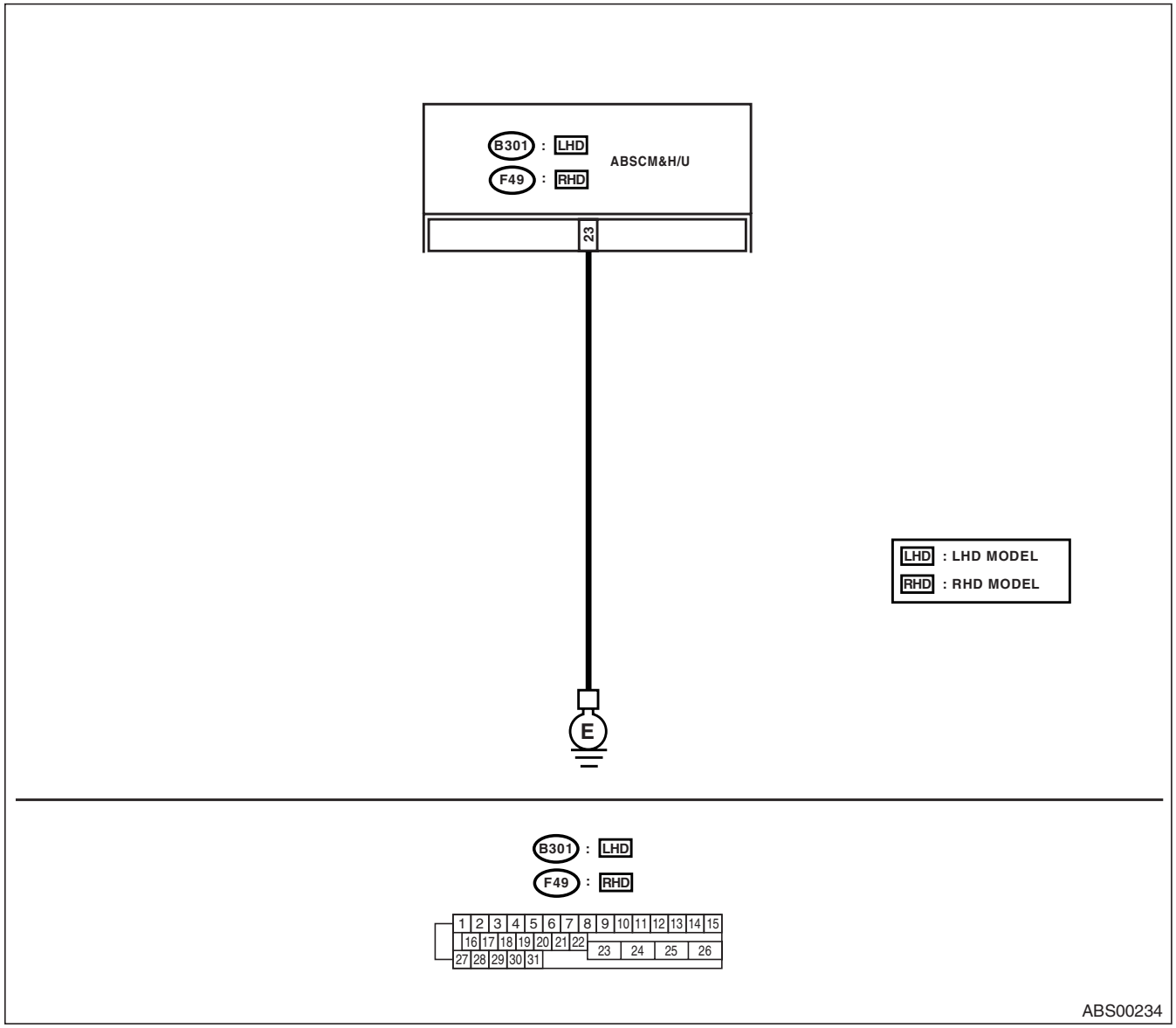
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



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	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 and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — 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 CONNECTORS.**	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.**	Is the car telephone or wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or wireless transmitter.
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 ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

S: DTC 42 POWER SUPPLY VOLTAGE TOO LOW

DIAGNOSIS:

Power source voltage of the ABSCM&H/U is low.

TROUBLE SYMPTOM:

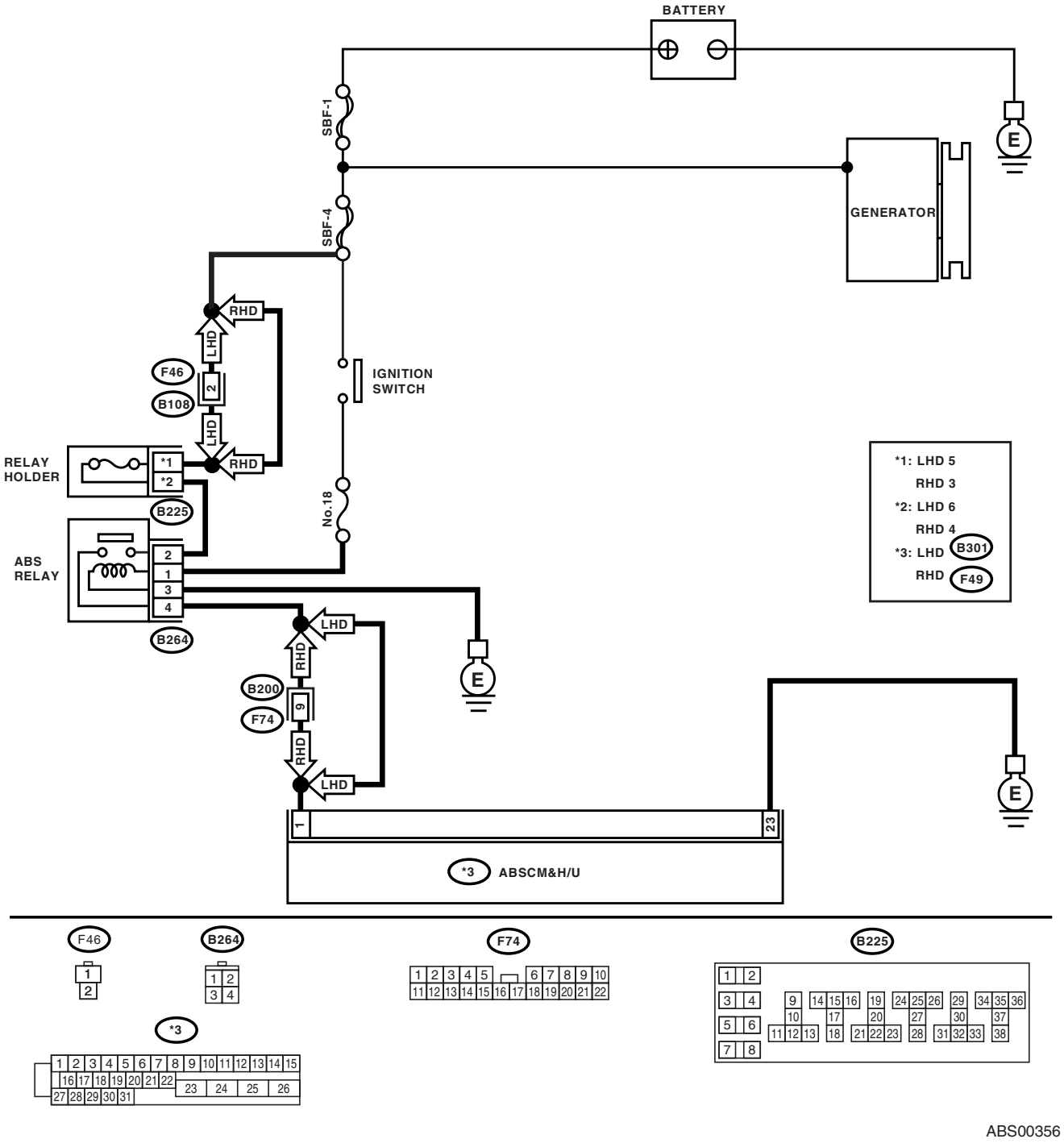
- ABS does not operate.
- EBD may not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates temporarily when the EBD does not operate. Both warning lights go off on the recovery of voltage.

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WIRING DIAGRAM:



ABS00356

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	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idle after warm-up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 17 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of 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 electric load applying devices, such as the headlight, A/C, and defogger. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 17 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*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — 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 CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

T: DTC 42 POWER SUPPLY VOLTAGE TOO HIGH

DIAGNOSIS:

Power source voltage of the ABSCM&H/U is high.

TROUBLE SYMPTOM:

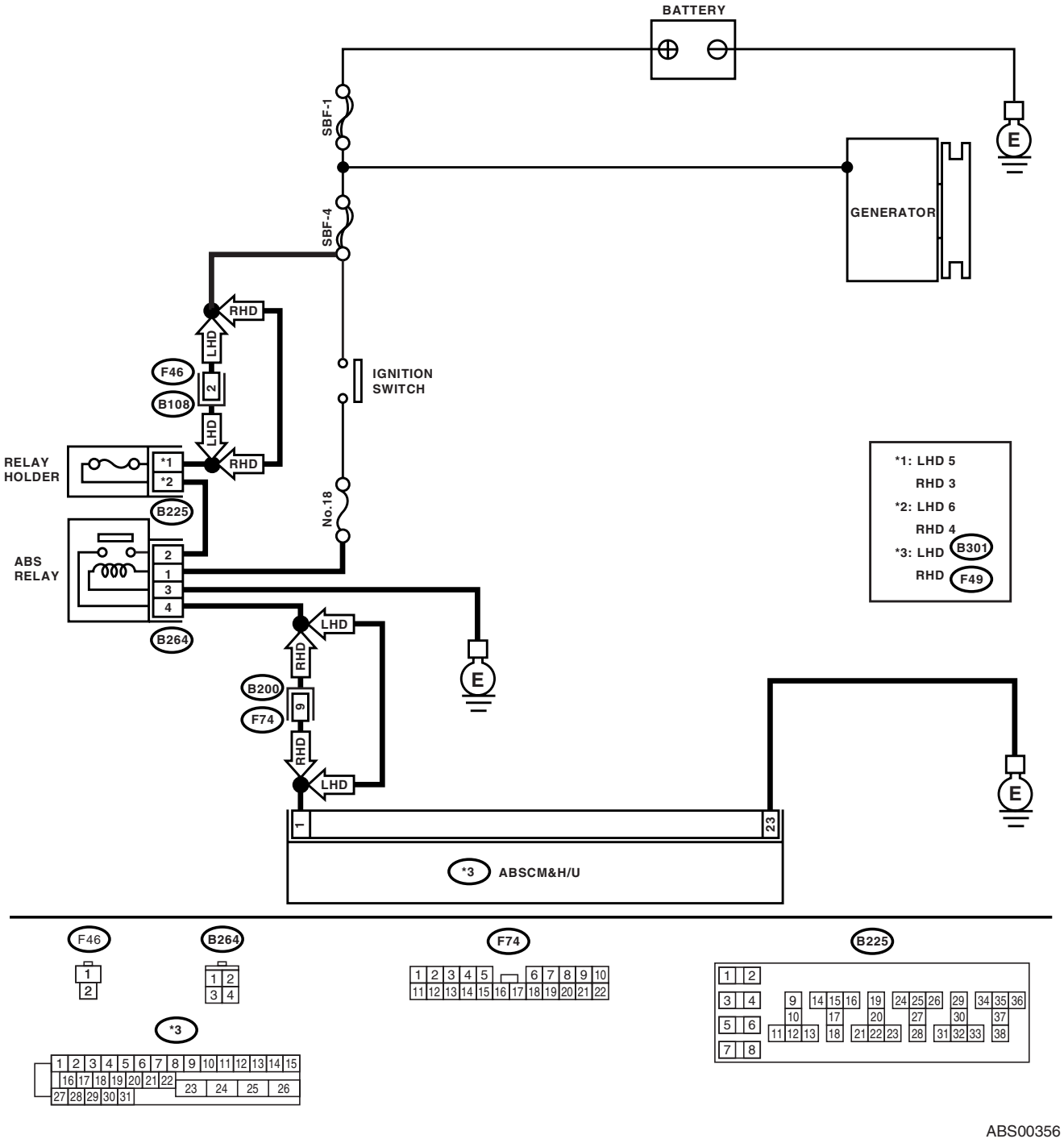
- ABS does not operate.
- EBD may not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates temporarily when the EBD does not operate. Both warning lights go off on the recovery of voltage.

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WIRING DIAGRAM:



ABS00356

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Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idle after warm-up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 17 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of 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 electric load applying devices, such as the headlight, A/C, and defogger. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 17 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*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — 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 CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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U: DTC 51 VALVE RELAY MALFUNCTION

DIAGNOSIS:

Faulty valve relay

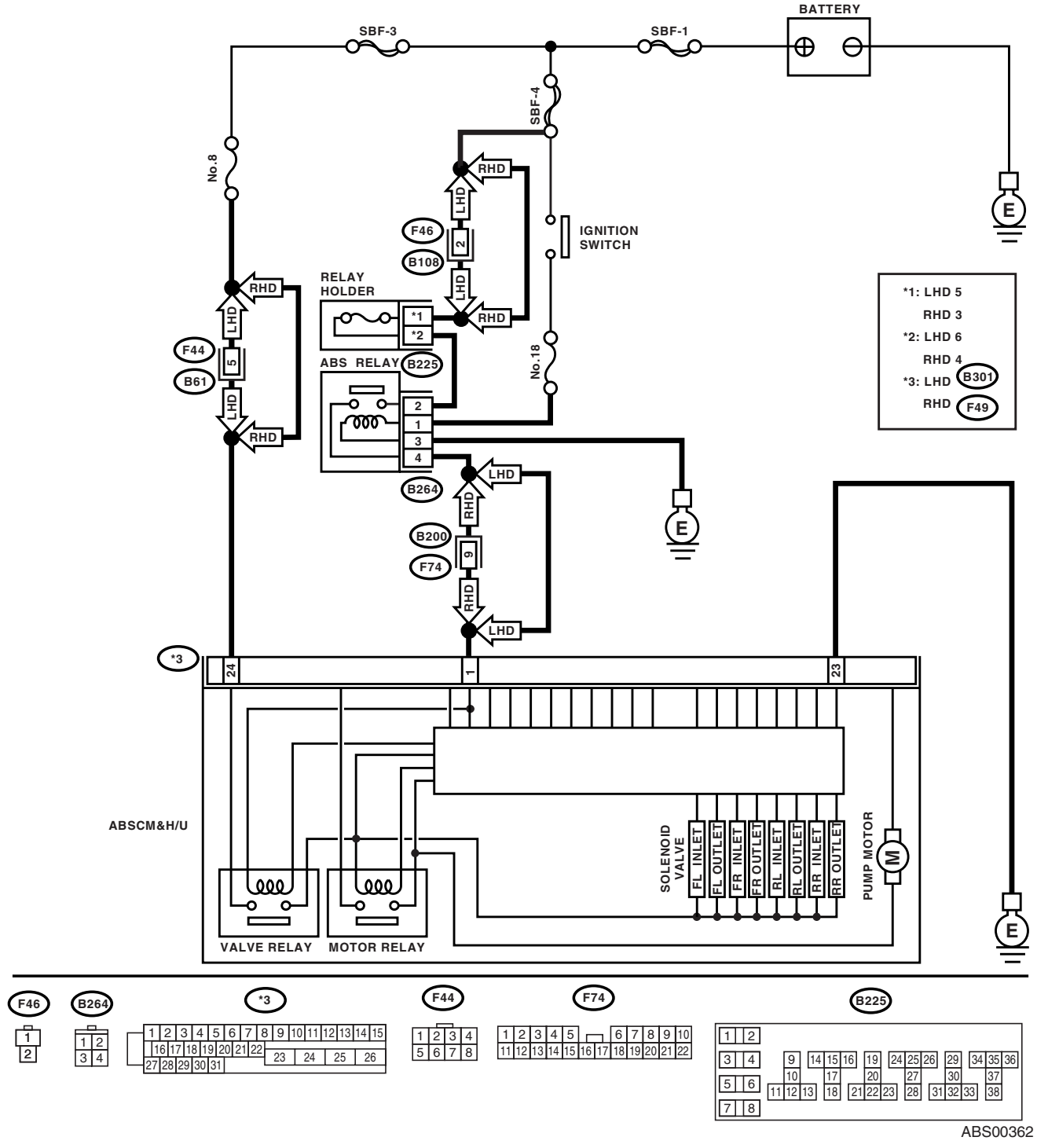
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD may not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates when the EBD does not operate.

WIRING DIAGRAM:



ABS00362

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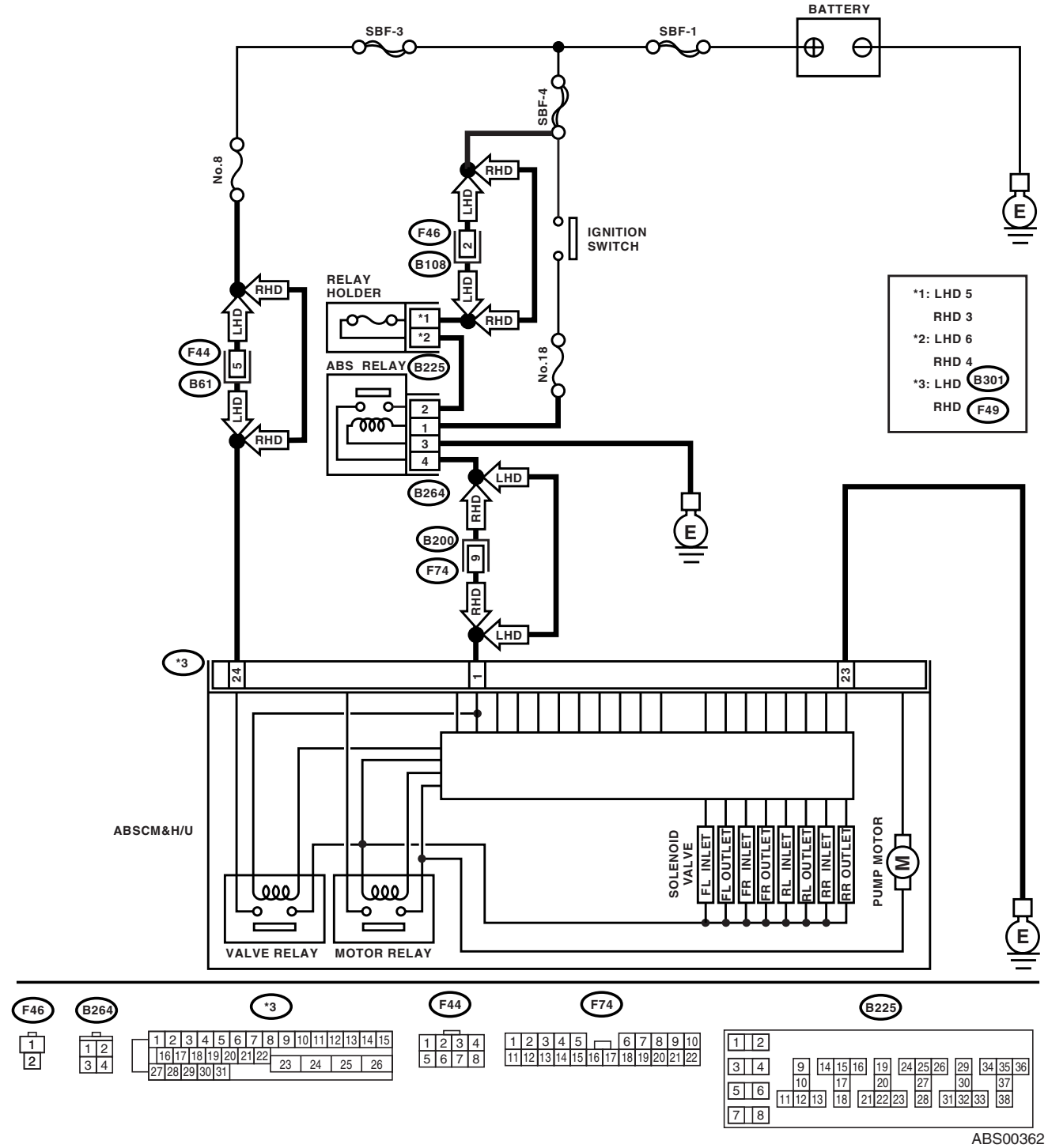
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	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*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***(B301) No. 24 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 1 (+) — Chassis ground (−):*** ***(F49) No. 24 (+) — 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*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — 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 CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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V: DTC 51 VALVE RELAY ON FAILURE

DIAGNOSIS:
Faulty valve relay
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:



ABS00362

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	Step	Check	Yes	No
1	**CHECK VALVE RELAY IN ABSCM&H/U.** 1) Disconnect the connector from ABSCM&H/U. 2) Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 23 — No. 24:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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W: DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT

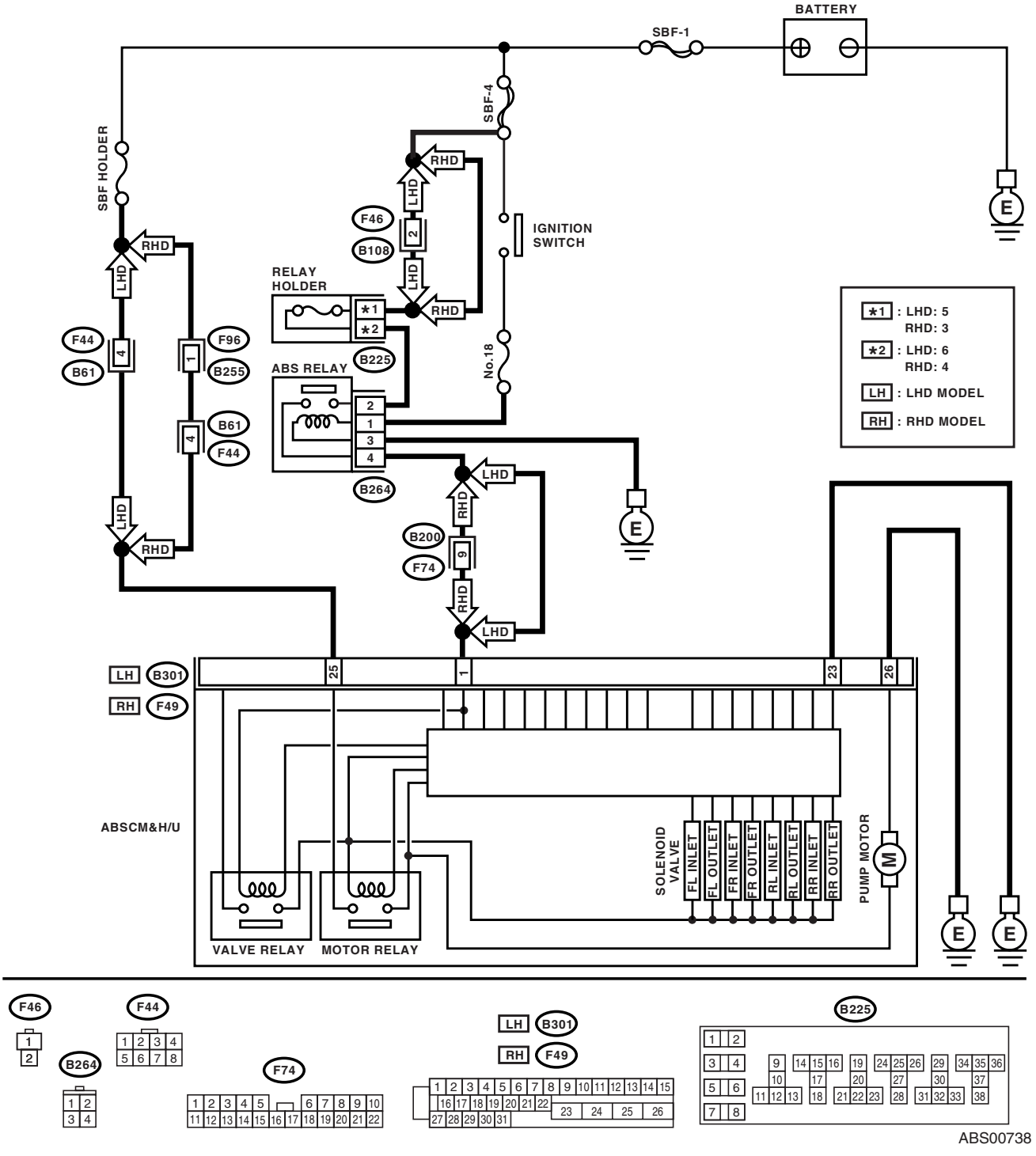
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00738

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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) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 25 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 25 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery and ABSCM&H/U and check fuse SBF8.
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*** ***LHD:*** ***(B301) No. 26 — Chassis ground:*** ***RHD:*** ***(F49) No. 26 — 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 CONNECTORS.** 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 **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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X: DTC 52 MOTOR RELAY ON FAILURE

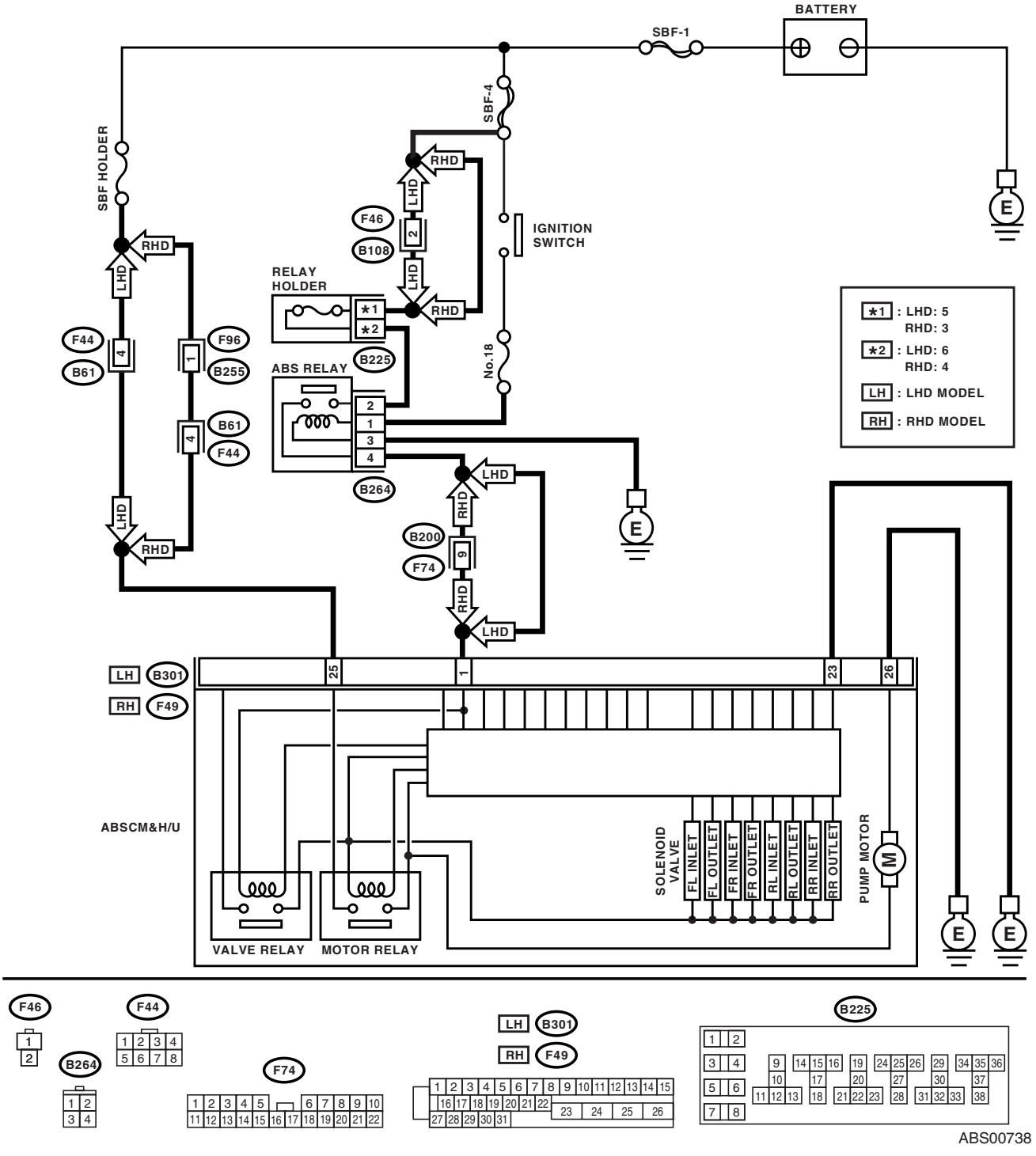
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00738

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	Step	Check	Yes	No
1	**CHECK MOTOR RELAY IN ABSCM&H/U.** 1) Disconnect the connector from ABSCM&H/U. 2) Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 25 — No. 26:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK POOR CONTACT IN CONNECTORS.** 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 **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

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Y: DTC 52 MOTOR MALFUNCTION

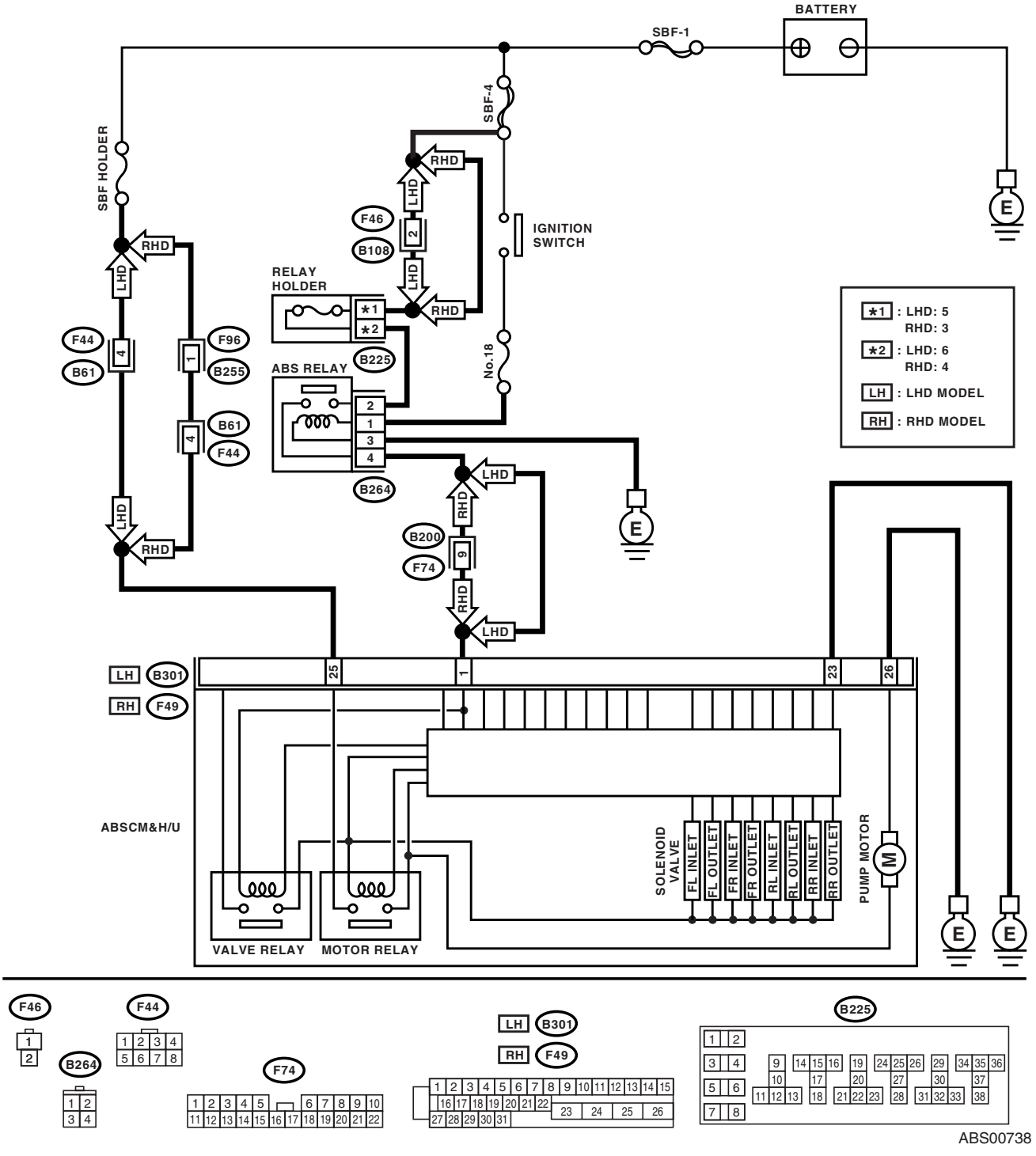
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00738

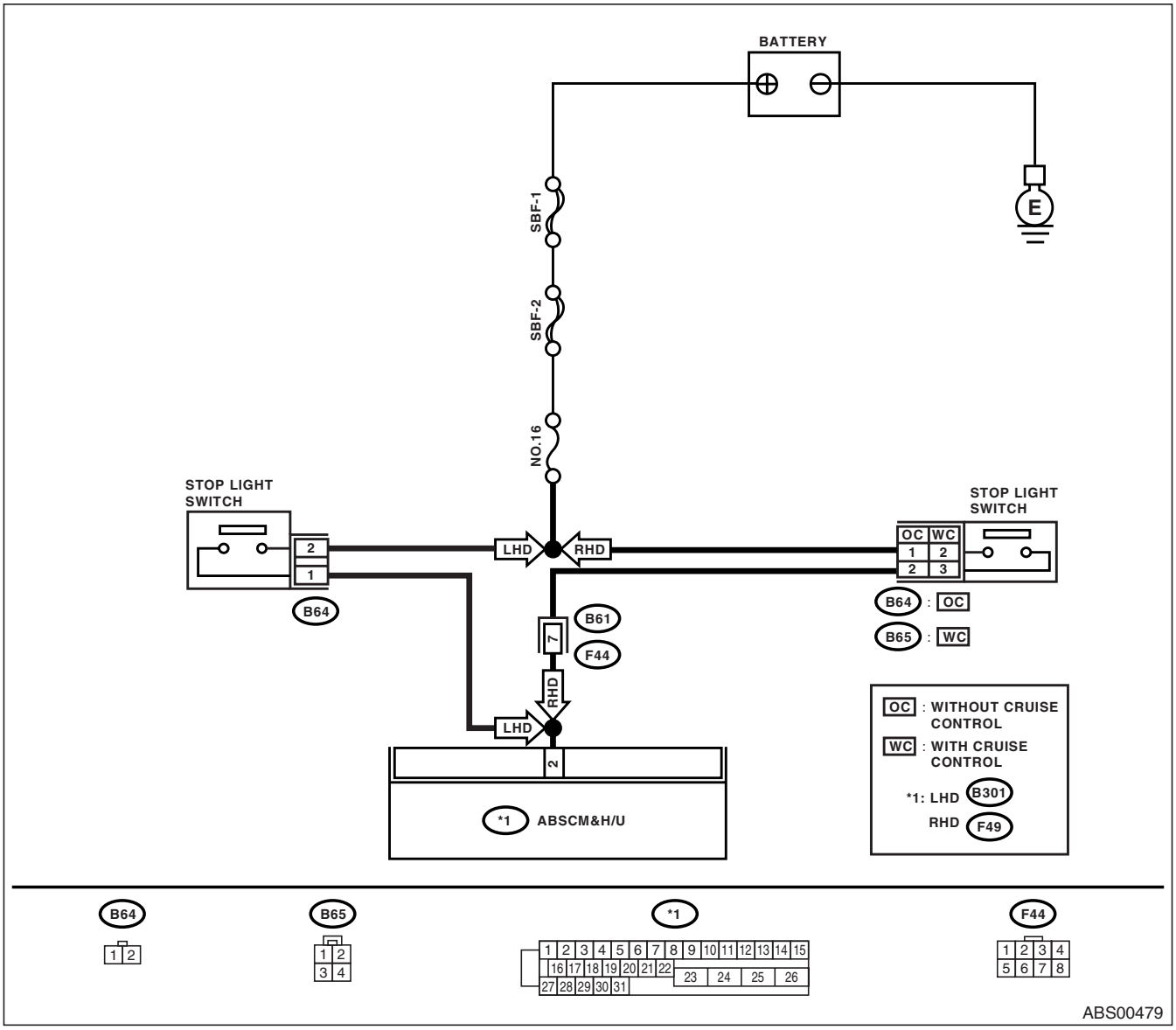
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	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 25 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 25 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery and ABSCM&H/U and check fuse SBF8.
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*** ***LHD:*** ***(B301) No. 26 — Chassis ground:*** ***RHD:*** ***(F49) No. 26 — 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*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 1 (+) — 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*** ***LHD:*** ***(B301) No. 23 — Chassis ground:*** ***RHD:*** ***(F49) No. 23 — 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 CONNECTORS.** 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 connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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Z: DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

DIAGNOSIS:
Faulty stop light switch
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:



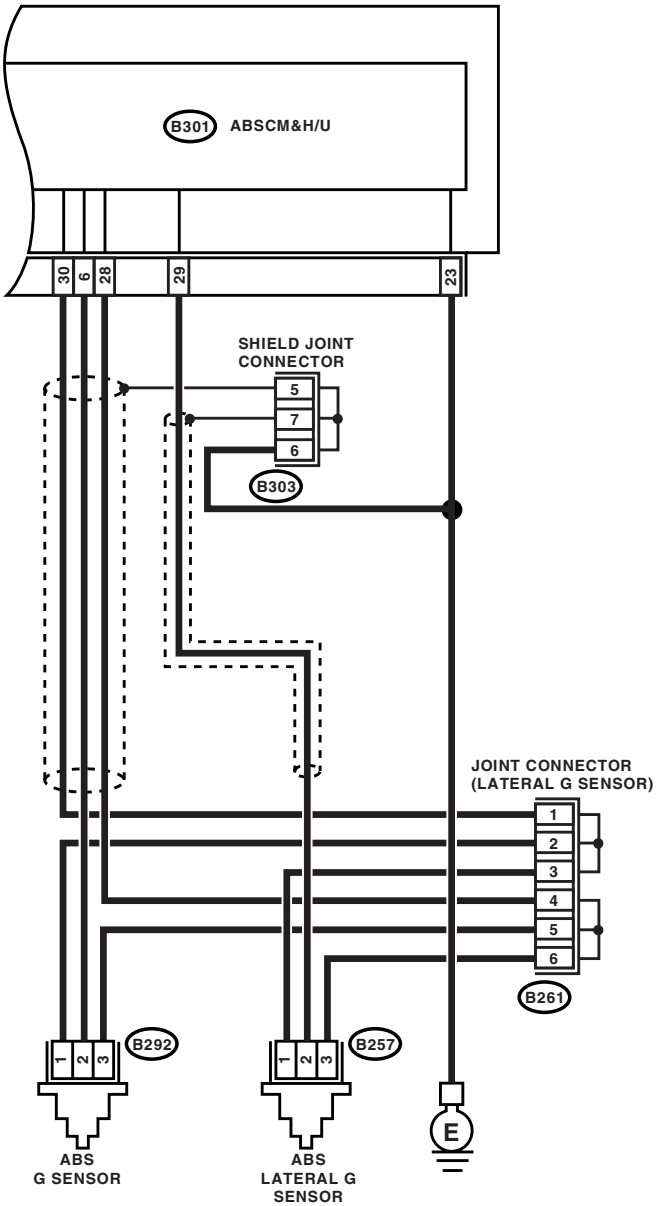
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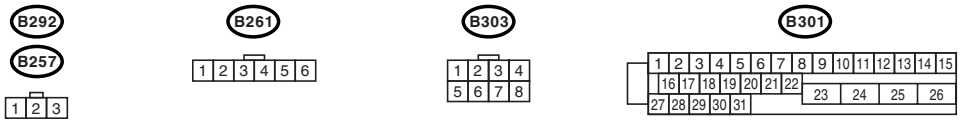
	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch output in Subaru Select Monitor data display.	Is the reading indicated on monitor display less than 1.5 V?	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 data display.	Is the reading indicated on monitor display 10 — 15 V?	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal.	Do the stop lights turn on?	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*** ***LHD:*** ***(B301) No. 2 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 2 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Repair the harness between stop light switch and ABSCM&H/U connector.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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AA:DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:
- LHD model

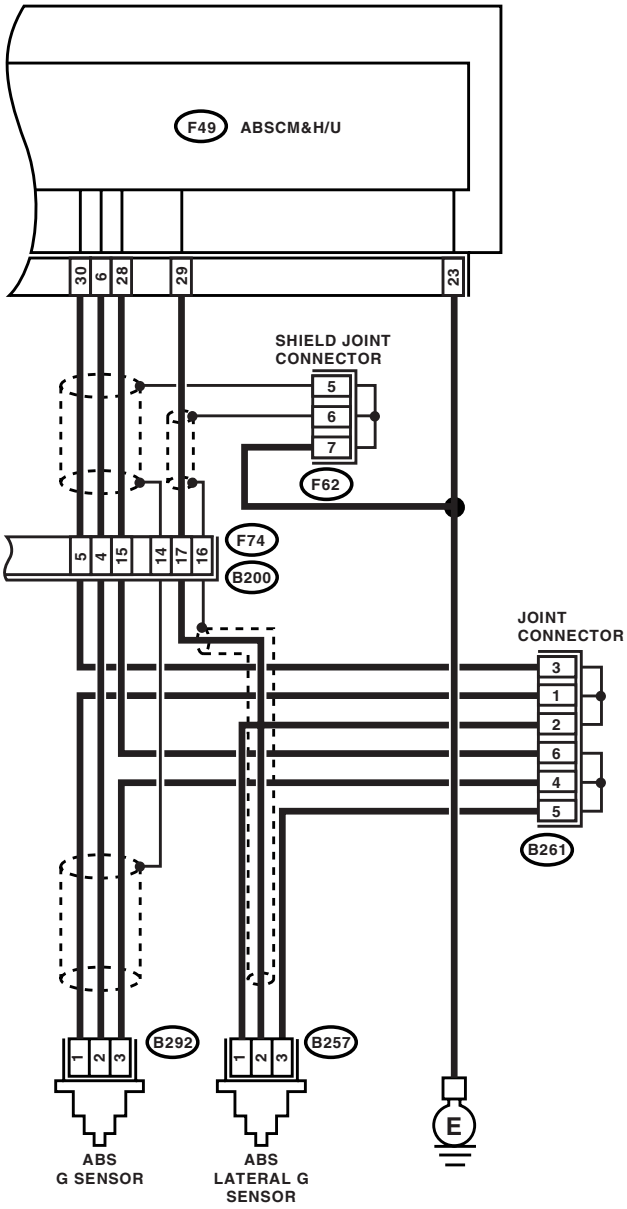


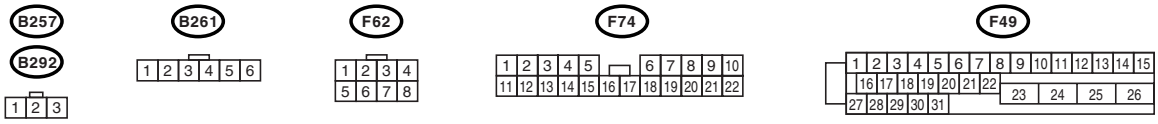


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- RHD model





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	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the G sensor output in Subaru Select Monitor data display.	Is the G sensor output on monitor display 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** 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 **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
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*** ***LHD:*** ***(B301) No. 6 — No. 28:*** ***RHD:*** ***(F49) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 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*** ***LHD:*** ***(B301) No. 6 — Chassis ground:*** ***RHD:*** ***(F49) No. 6 — 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 in horizontal position?	Go to step **9.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>

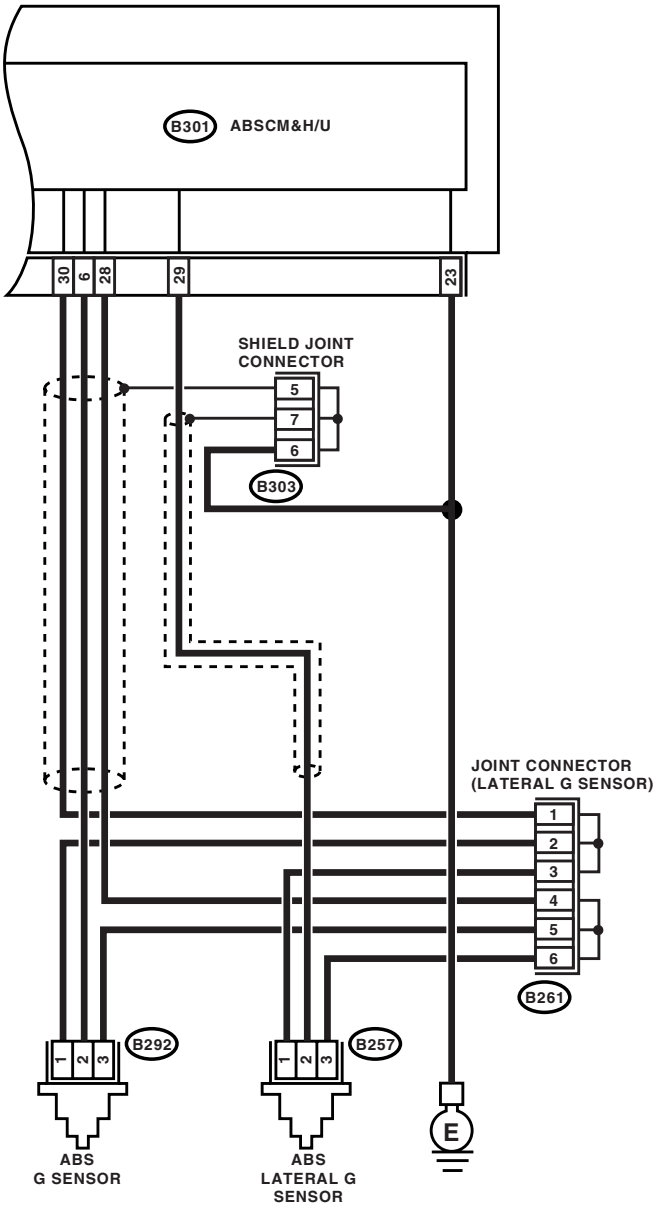
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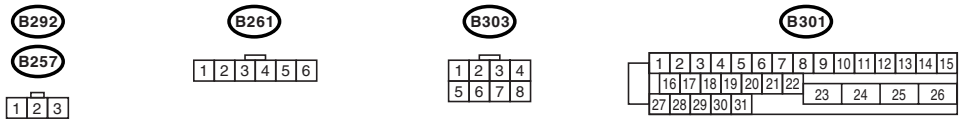
	Step	Check	Yes	No
9	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **11.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
11	**CHECK POOR CONTACT IN CONNECTORS.** 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 connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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AB:DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:
- LHD model

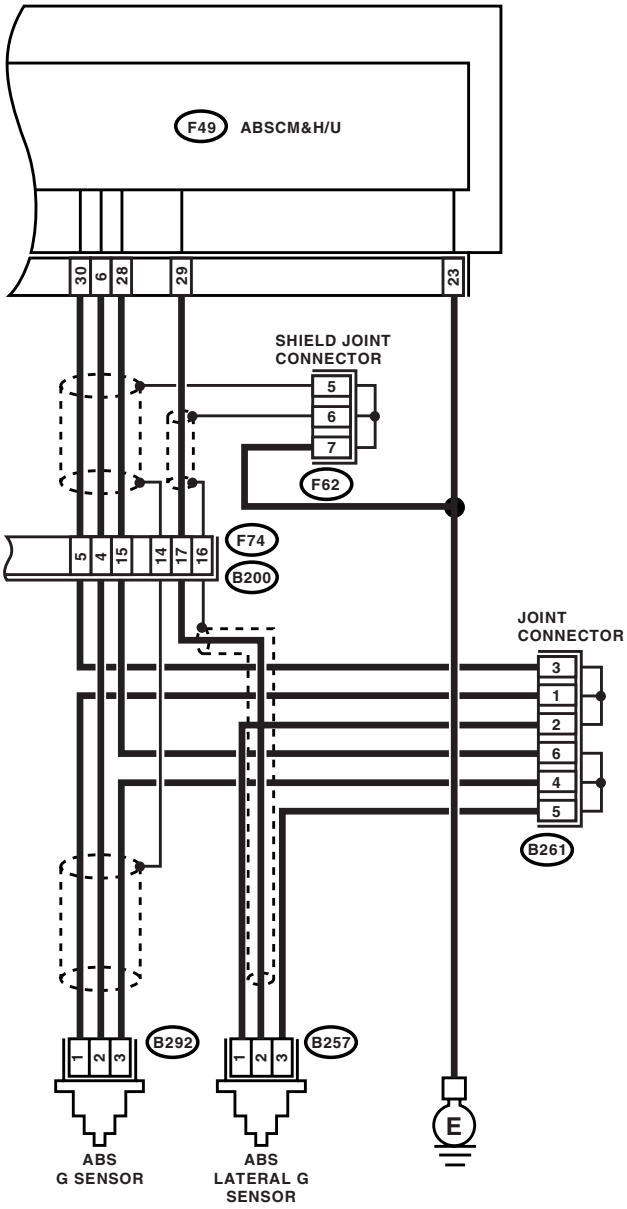


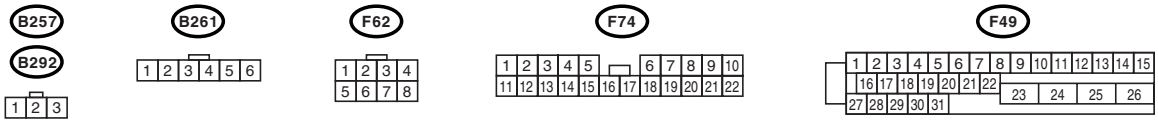


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- RHD model





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	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the G sensor output in Subaru Select Monitor data display.	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** 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 **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK FREEZE FRAME DATA.** 1) Select “Freeze frame data” on the Subaru Select Monitor. 2) Read front right wheel speed on the Subaru Select Monitor display.	Is the front right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **6.**	Go to step **16.**
6	**CHECK FREEZE FRAME DATA.** Read front left wheel speed on the Subaru Select Monitor display.	Is the front left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **7.**	Go to step **16.**
7	**CHECK FREEZE FRAME DATA.** Read rear right wheel speed on the Subaru Select Monitor display.	Is the rear right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **8.**	Go to step **16.**
8	**CHECK FREEZE FRAME DATA.** Read rear left wheel speed on the Subaru Select Monitor display.	Is the rear left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **9.**	Go to step **16.**
9	**CHECK FREEZE FRAME DATA.** Read G sensor output on the Subaru Select Monitor display.	Is the G sensor output on monitor display more than 3.65 V?	Go to step **10.**	Go to step **16.**
10	**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*** ***LHD:*** ***(B301) No. 6 — No. 28:*** ***RHD:*** ***(F49) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **11.**	Repair the harness/connector between G sensor and ABSCM&H/U.

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	Step	Check	Yes	No
11	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Disconnect the connector from G sensor. 4) Disconnect the connector from ABSCM&H/U. 5) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 6 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **12.**	Repair the harness between G sensor and ABSCM&H/U.
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 6 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **13.**	Repair the harness between G sensor and ABSCM&H/U.
13	**CHECK POOR CONTACT IN CONNECTORS.** 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 **14.**
14	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **15.**
15	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
16	**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 **17.**	Repair the harness connector between G sensor and ABSCM&H/U.
17	**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*** ***LHD:*** ***(B301) No. 6 — No. 28:*** ***RHD:*** ***(F49) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **18.**	Repair the harness connector between G sensor and ABSCM&H/U.

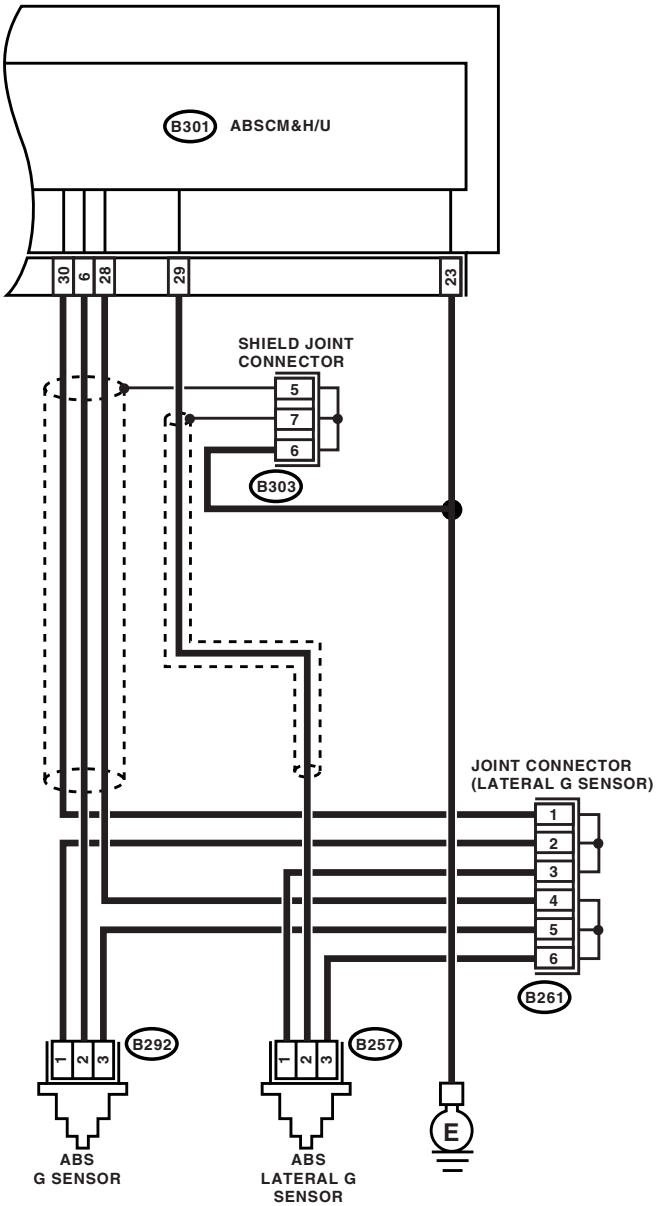
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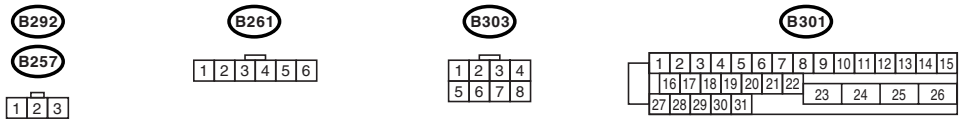
	Step	Check	Yes	No
18	**CHECK G SENSOR.** 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **19.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
19	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **20.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
20	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **21.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
21	**CHECK POOR CONTACT IN CONNECTORS.** 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 **22.**
22	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **23.**
23	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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AC:DTC 56 ABNORMAL G SENSOR HIGH μ OUTPUT

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:
- LHD model

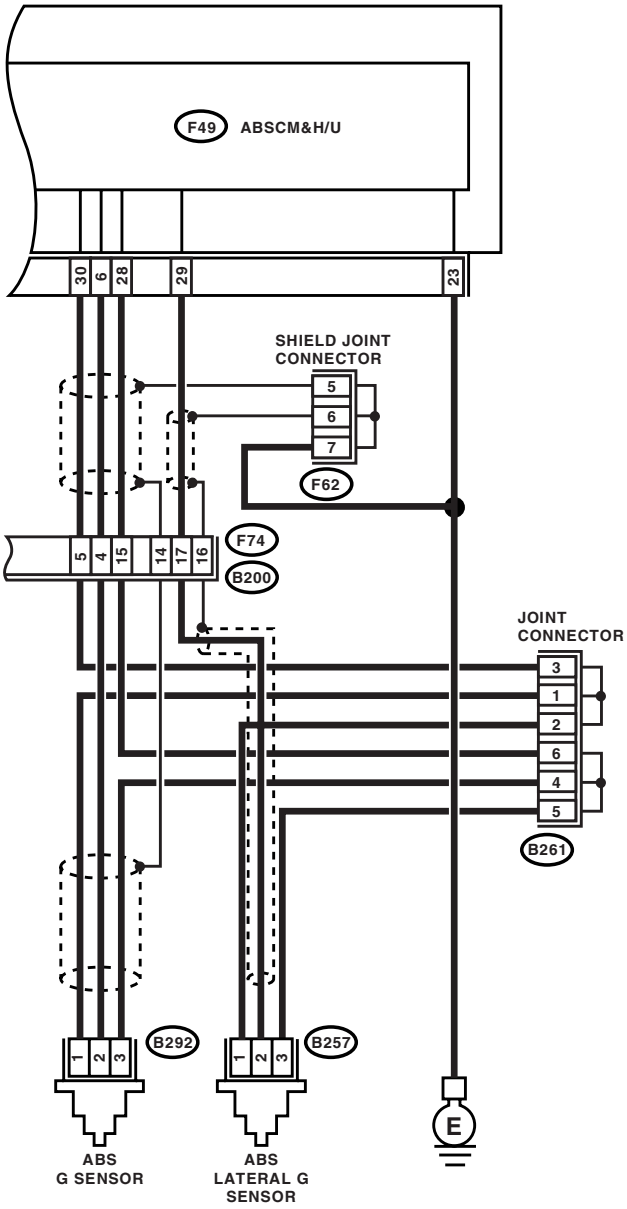


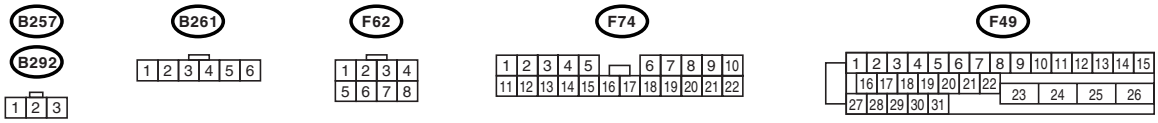


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- RHD model





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	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read G sensor output on the Subaru Select Monitor display.	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** 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 **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**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*** ***LHD:*** ***(B301) No. 6 — No. 28:*** ***RHD:*** ***(F49) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **6.**	Repair the harness connector between G sensor and ABSCM&H/U.
6	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 28 — Chassis ground:*** ***RHD:*** ***(F49) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness between G sensor and ABSCM&H/U. Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**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 in horizontal position?	Go to step **8.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
8	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **9.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>

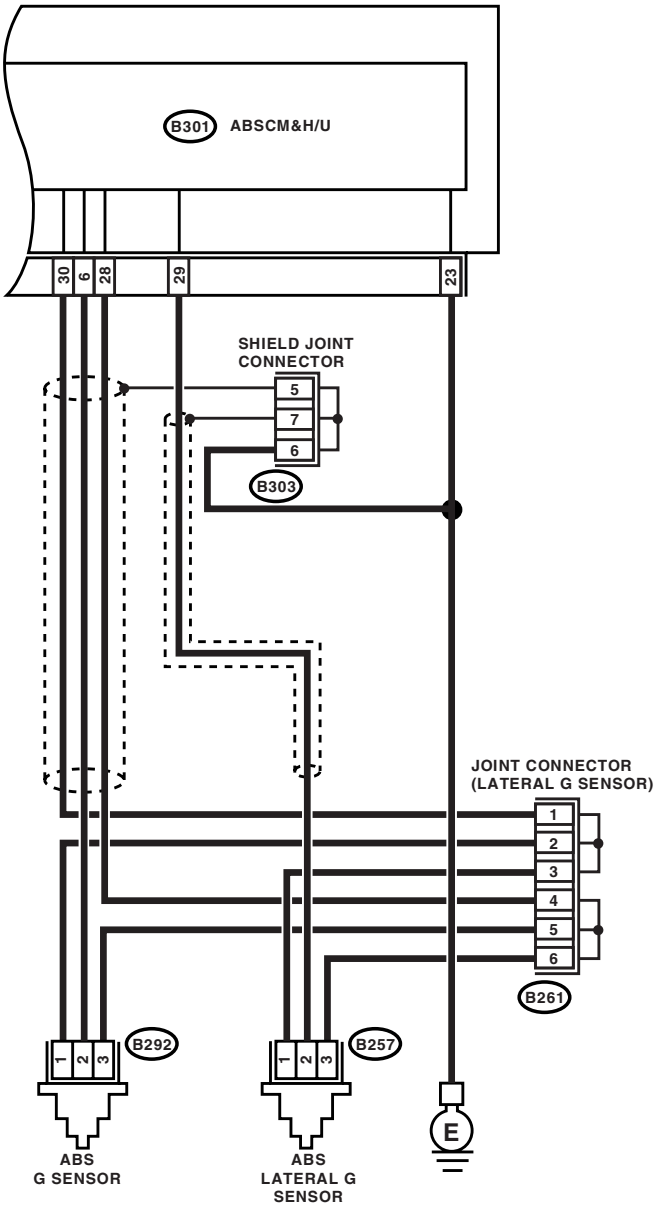
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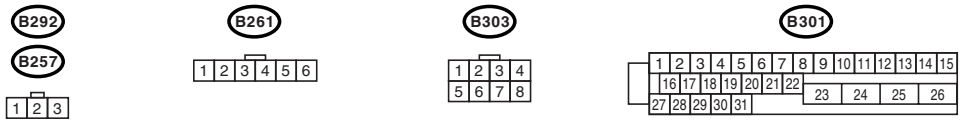
	Step	Check	Yes	No
9	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
10	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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AD:DTC 56 DETECTION OF G SENSOR STICK

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:
- LHD model

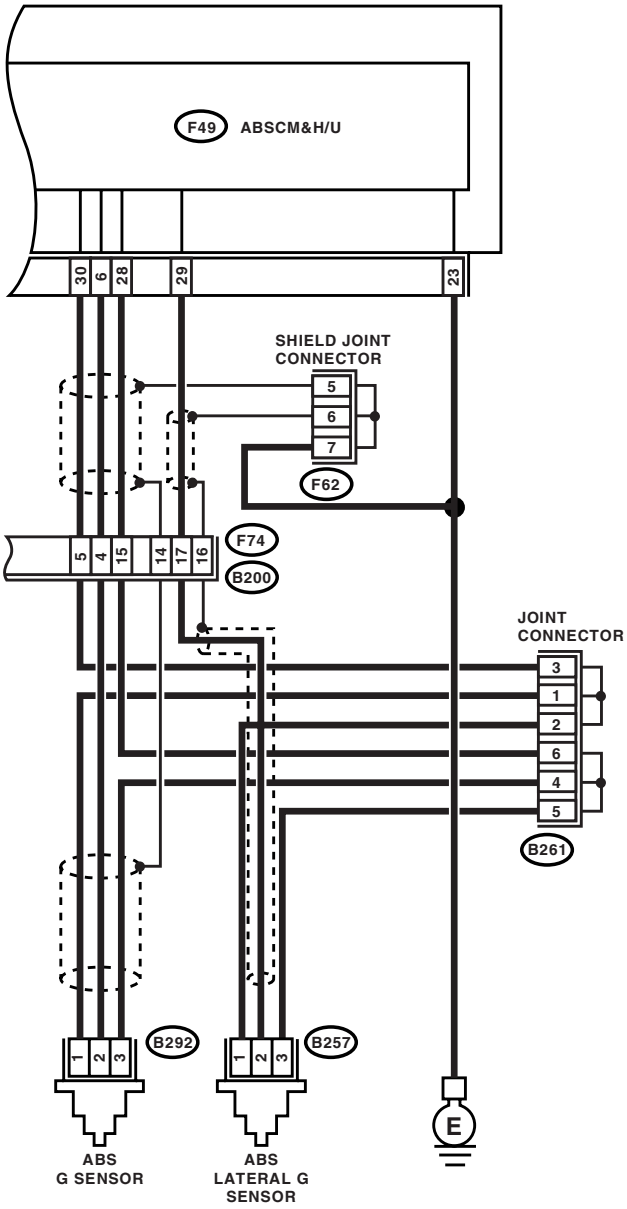


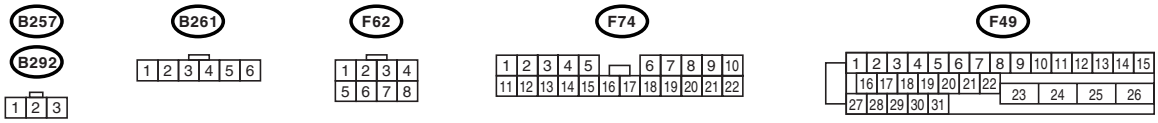


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- RHD model





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Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK ALL FOUR WHEELS FOR FREE TURNING.**	Have the wheels been turned freely such as when vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the DTC.	Go to step **2.**
2	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the Subaru Select Monitor display.	Is the G sensor output on monitor display 2.1 — 2.5 V when the vehicle is in horizontal position?	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 the connector.) 4) Turn the ignition switch to ON. 5) Select “Current data display & Save” on the Subaru Select Monitor. 6) Read the Subaru Select Monitor display.	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
4	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** Read the Subaru Select Monitor display.	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **5.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTORS.** 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 connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
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*** ***LHD:*** ***(B301) No. 6 — No. 28:*** ***RHD:*** ***(F49) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **9.**	Repair the harness connector between G sensor and ABSCM&H/U.
9	**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 in horizontal position?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>

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	Step	Check	Yes	No
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **11.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **12.**	Replace the G sensor. <Ref. to ABS-25, G Sensor.>
12	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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AE:DTC 73 OPEN OR SHORT CIRCUIT IN LATERAL G SENSOR CIRCUIT

DIAGNOSIS:

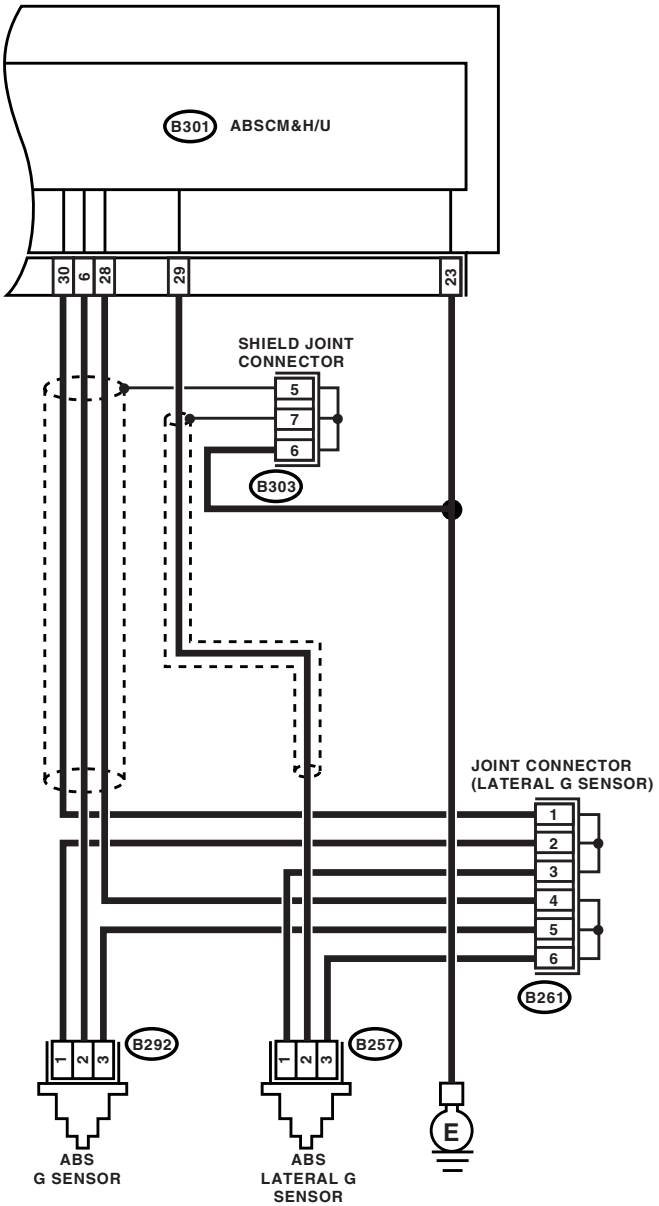
Faulty lateral G sensor output voltage

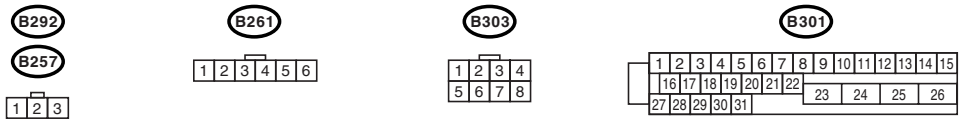
TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:

- LHD model

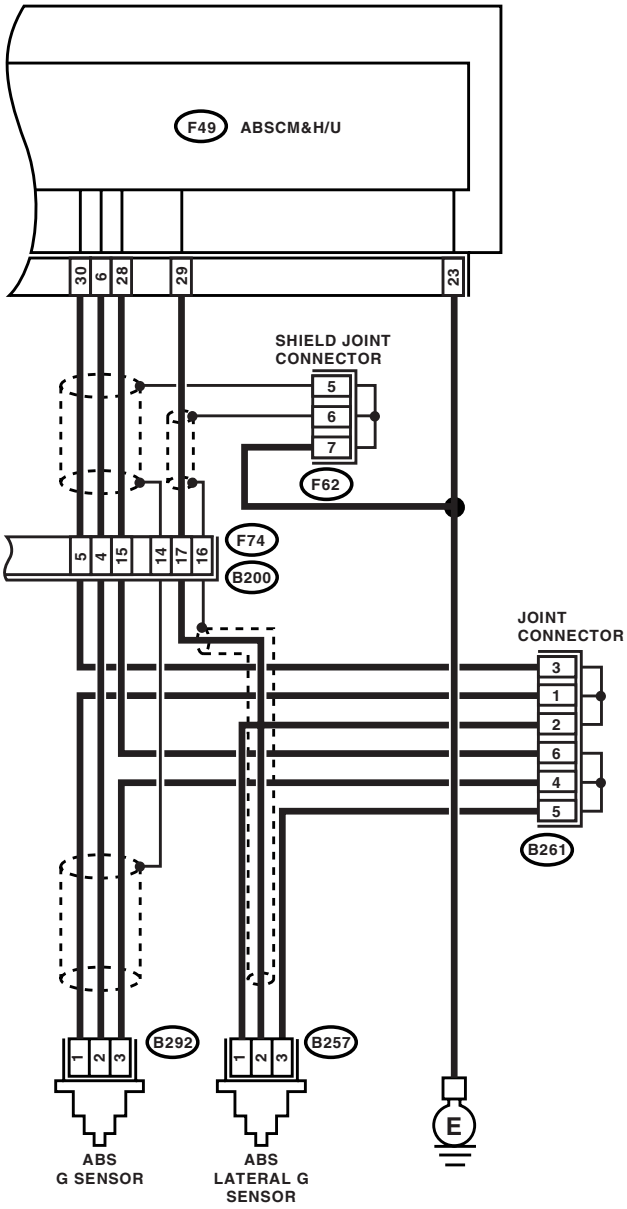


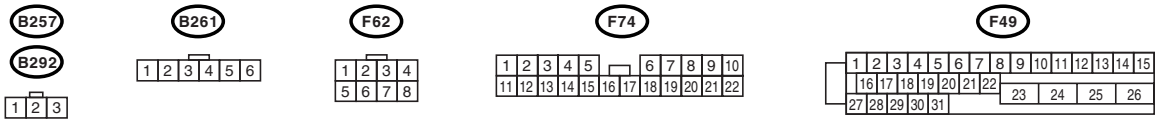


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- RHD model





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Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the lateral G sensor output in Subaru Select Monitor data display.	Is the lateral G sensor output on monitor display 2.3 — 2.7 V when lateral G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK INPUT VOLTAGE OF LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 1 (+) — No. 3 (−):***	Is the voltage 4.75 — 5.25 V?	Go to step **6.**	Repair the harness connector between lateral G sensor and ABSCM&H/U.
6	**CHECK OPEN CIRCUIT IN LATERAL 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*** ***LHD:*** ***(B301) No. 28 — No. 30:*** ***RHD:*** ***(F49) No. 29 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **7.**	Repair the harness connector between lateral G sensor and ABSCM&H/U.
7	**CHECK GROUND SHORT IN LATERAL G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from lateral G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 29 — Chassis ground:*** ***RHD:*** ***(F49) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between lateral G sensor and ABSCM&H/U.

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	Step	Check	Yes	No
8	**CHECK LATERAL G SENSOR.** 1) Connect the connector to lateral G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step **9.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
9	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step **10.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
10	**CHECK LATERAL G SENSOR.** Measure the voltage between Lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 0.9 V when Lateral G sensor is inclined left to 90°?	Go to step **11.**	Replace the Lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
11	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **12.**
12	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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AF:DTC 73 BATTERY SHORT IN LATERAL G SENSOR CIRCUIT

DIAGNOSIS:

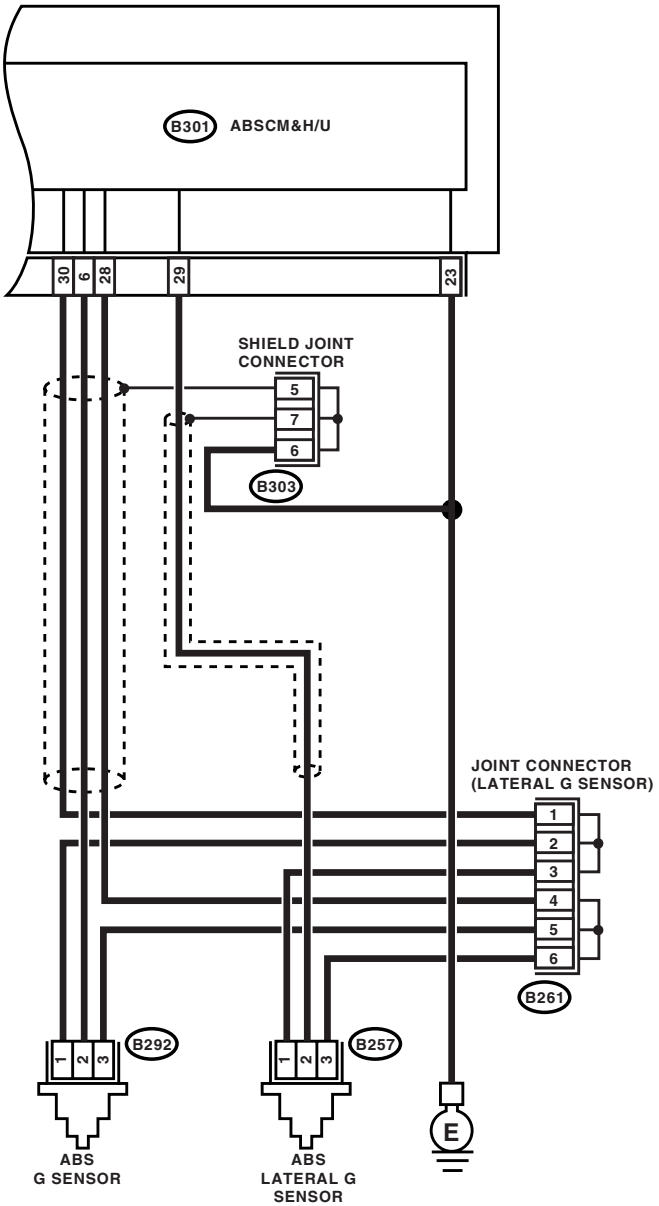
Faulty lateral G sensor output voltage

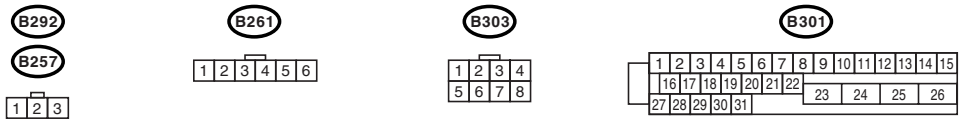
TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:

- LHD model

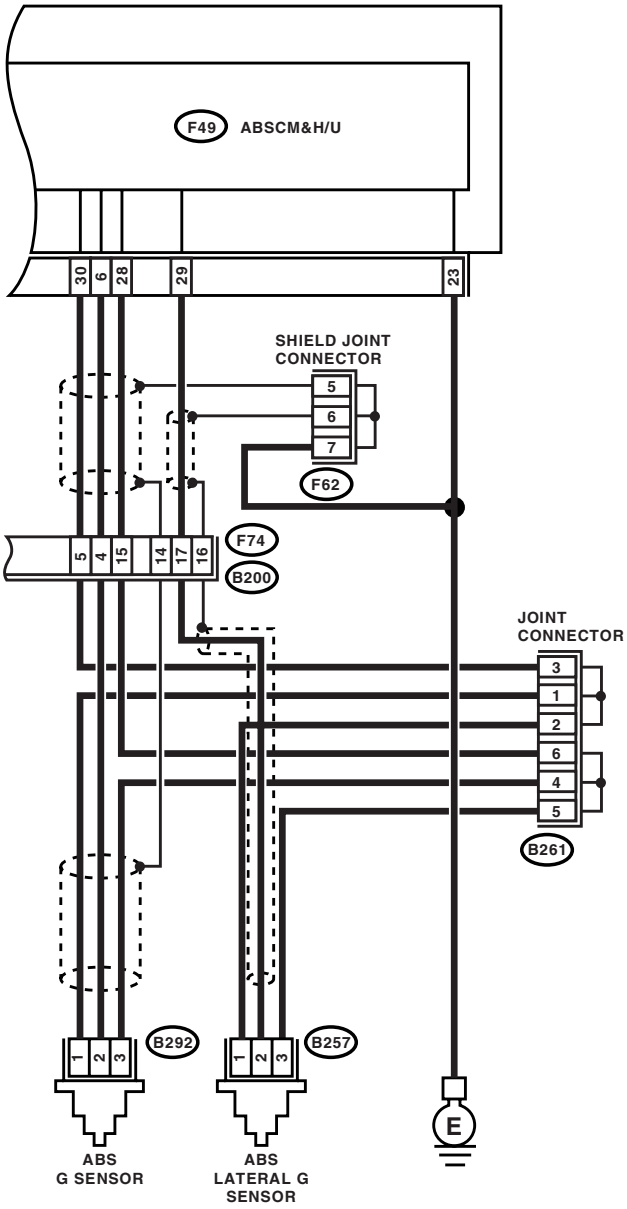


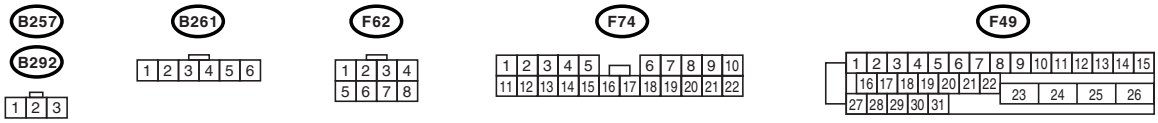


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- RHD model





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	Step	Check	Yes	No
1	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the lateral G sensor output in Subaru Select Monitor data display.	Is the voltage 2.3 — 2.7 V when lateral G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK FREEZE FRAME DATA.** 1) Select “Freeze frame data” on the Subaru Select Monitor. 2) Read front right wheel speed on the Subaru Select Monitor display.	Is the front right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **6.**	Go to step **16.**
6	**CHECK FREEZE FRAME DATA.** Read front left wheel speed on the Subaru Select Monitor display.	Is the front left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **7.**	Go to step **16.**
7	**CHECK FREEZE FRAME DATA.** Read rear right wheel speed on the Subaru Select Monitor display.	Is the rear right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **8.**	Go to step **16.**
8	**CHECK FREEZE FRAME DATA.** Read rear left wheel speed on the Subaru Select Monitor display.	Is the rear left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **9.**	Go to step **16.**
9	**CHECK FREEZE FRAME DATA.** Read lateral G sensor output on the Subaru Select Monitor display.	Is the lateral G sensor output on monitor display more than 3.65 V?	Go to step **10.**	Go to step **16.**
10	**CHECK OPEN CIRCUIT IN LATERAL 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*** ***LHD:*** ***(B301) No. 29 — No. 28:*** ***RHD:*** ***(F49) No. 29 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **11.**	Repair the harness connector between lateral G sensor and ABSCM&H/U.

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	Step	Check	Yes	No
11	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Disconnect the connector from lateral G sensor. 4) Disconnect the connector from ABSCM&H/U. 5) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 29 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 29 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **12.**	Repair the harness between lateral G sensor and ABSCM&H/U.
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 29 (+) — Chassis ground (−):*** ***RHD:*** ***(F49) No. 29 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **13.**	Repair the harness between lateral G sensor and ABSCM&H/U.
13	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **14.**
14	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **15.**
15	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
16	**CHECK INPUT VOLTAGE OF LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 1 (+) — No. 3 (−):***	Is the voltage 4.75 — 5.25 V?	Go to step **17.**	Repair the harness connector between lateral G sensor and ABSCM&H/U.
17	**CHECK OPEN CIRCUIT IN LATERAL 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*** ***LHD:*** ***(B301) No. 29 — No. 28:*** ***RHD:*** ***(F49) No. 29 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **18.**	Repair the harness connector between lateral G sensor and ABSCM&H/U.

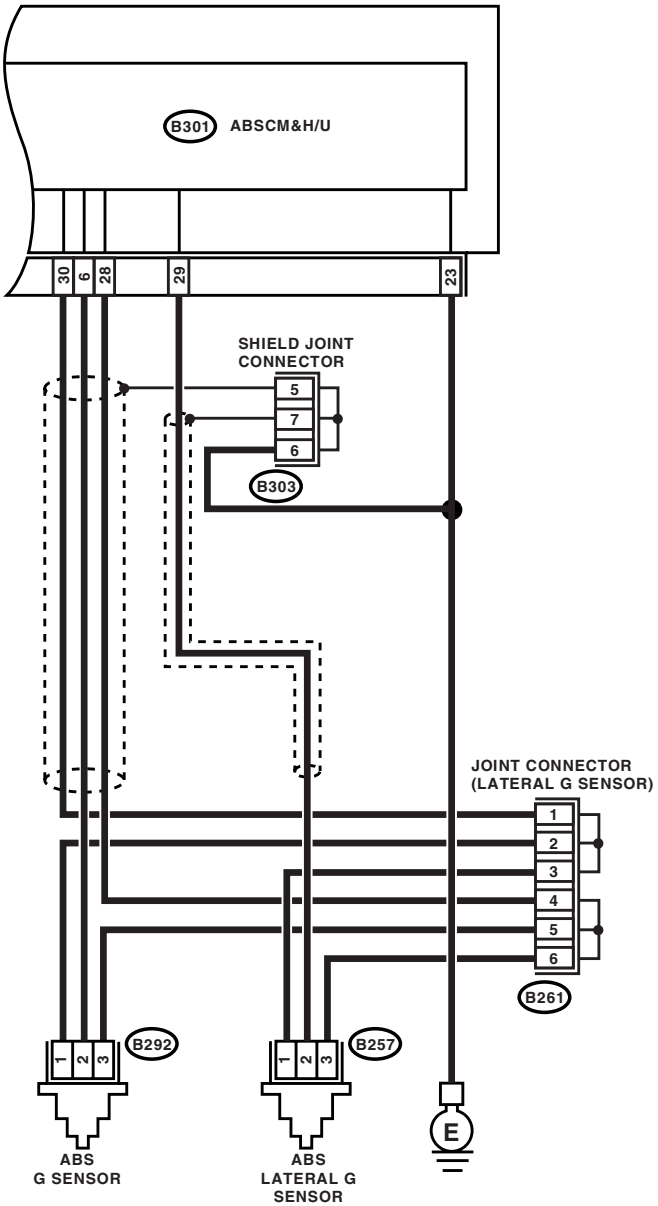
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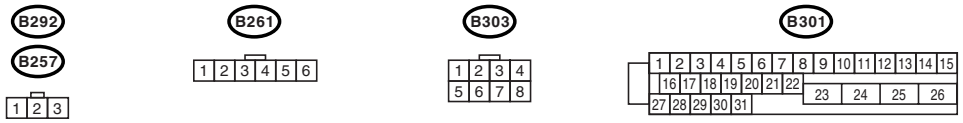
	Step	Check	Yes	No
18	**CHECK LATERAL G SENSOR.** 1) Connect the connector to lateral G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step **19.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
19	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step **20.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
20	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **21.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
21	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **22.**
22	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **23.**
23	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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AG:DTC 73 ABNORMAL LATERAL G SENSOR HIGH μ OUTPUT

DIAGNOSIS:
Faulty lateral G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:
- LHD model

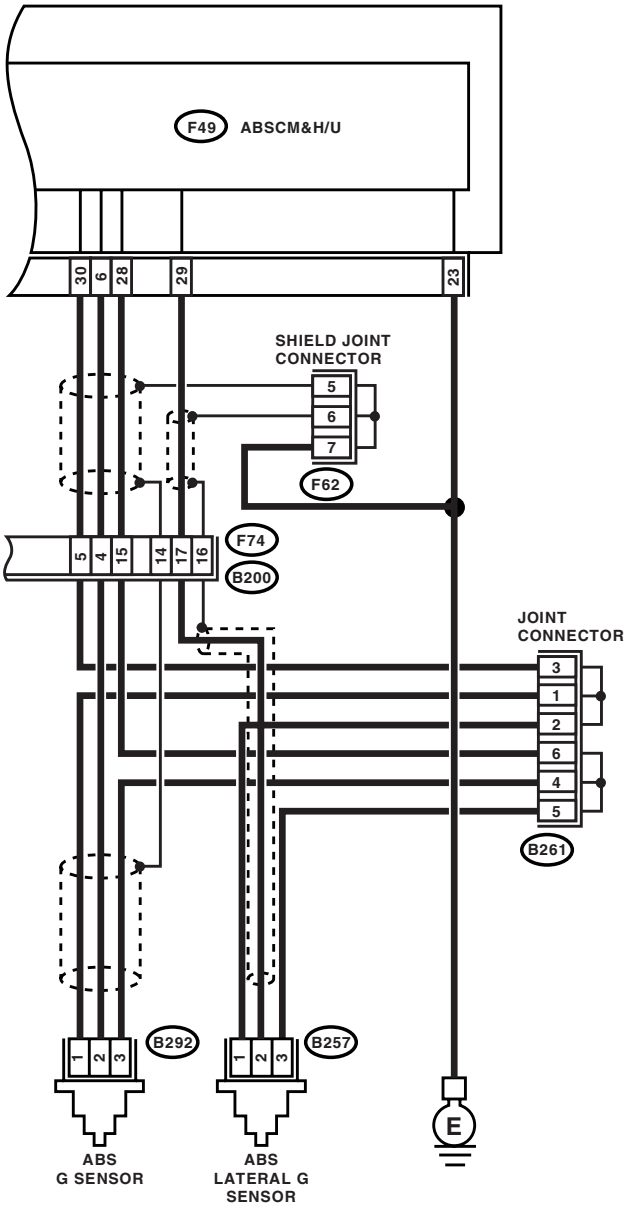


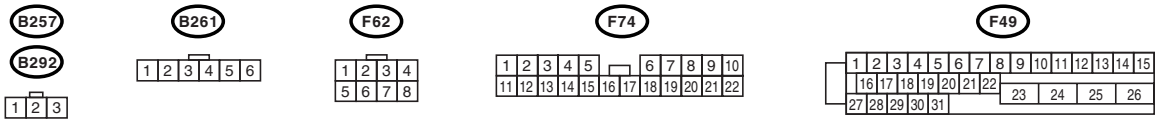


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- RHD model





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	Step	Check	Yes	No
1	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read lateral G sensor output on the Subaru Select Monitor display.	Is the voltage 2.3 — 2.7 V when lateral G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK OPEN CIRCUIT IN LATERAL 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*** ***LHD:*** ***(B301) No. 29 — No. 28:*** ***RHD:*** ***(F49) No. 29 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **6.**	Repair the harness connector between lateral G sensor and ABSCM&H/U.
6	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 28 — Chassis ground:*** ***RHD:*** ***(F49) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness between lateral G sensor and ABSCM&H/U. Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the lateral G sensor from vehicle. 3) Connect the connector to lateral G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step **8.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
8	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step **9.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>

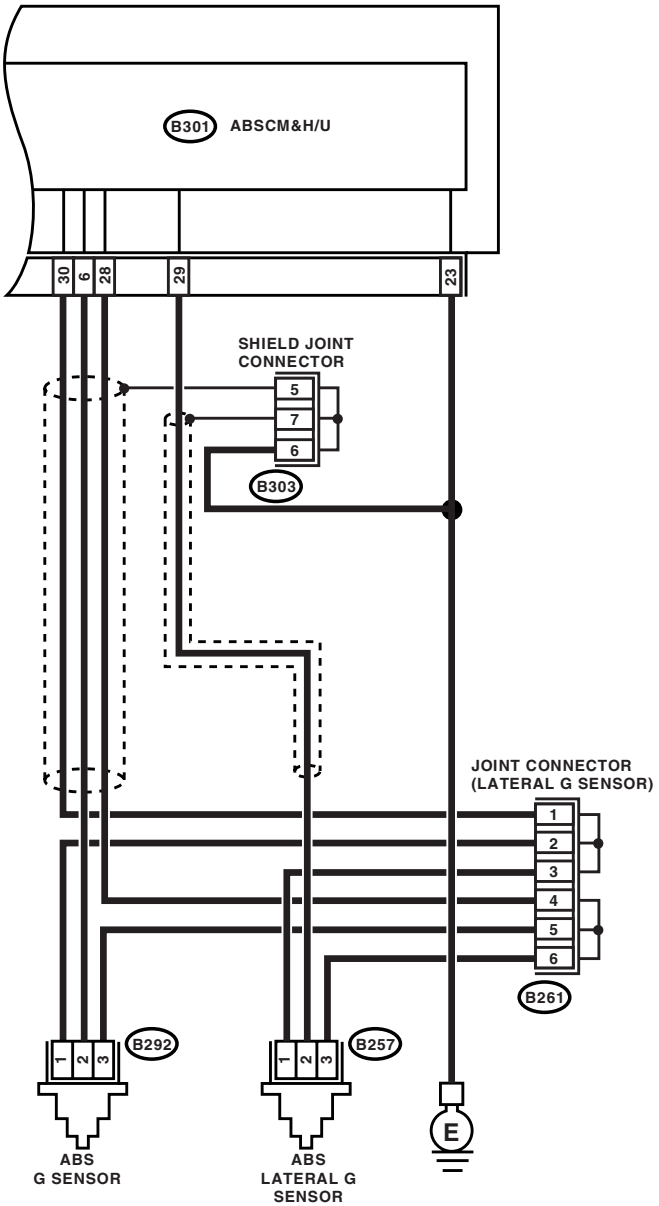
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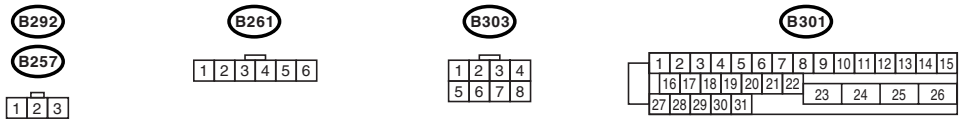
	Step	Check	Yes	No
9	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal (B257) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **10.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
10	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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AH:DTC 73 DETECTION OF LATERAL G SENSOR STICK

DIAGNOSIS:
Faulty lateral G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:
- LHD model

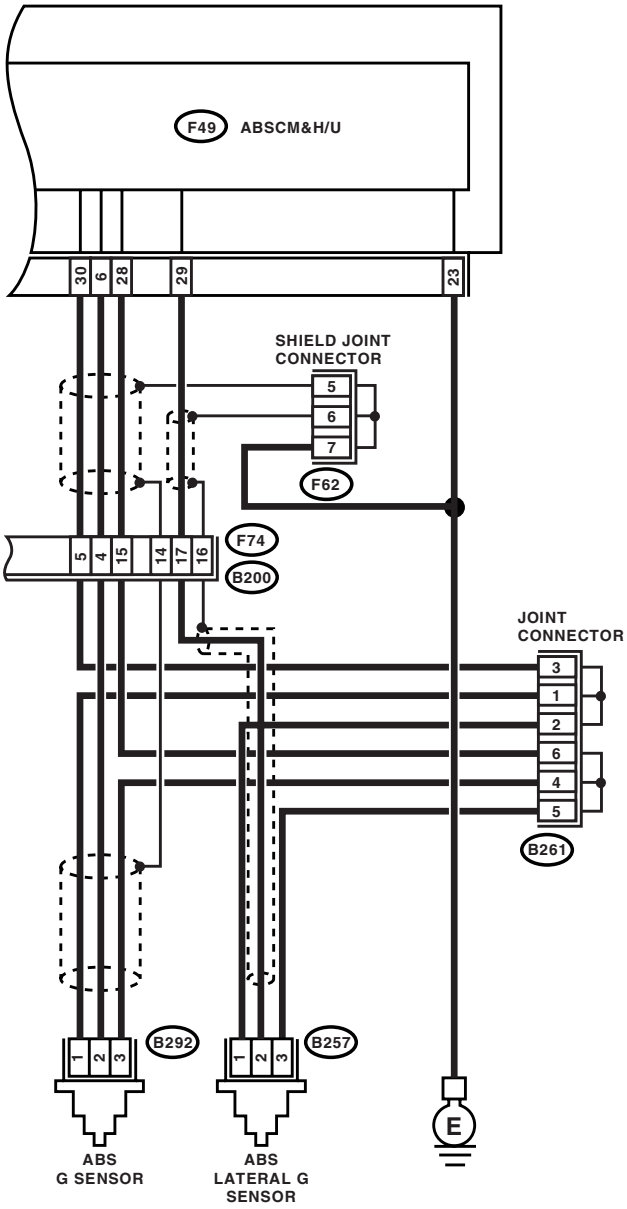


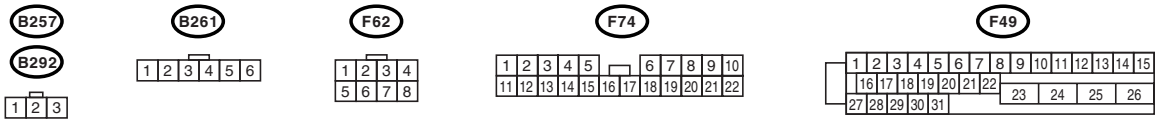


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- RHD model





ABS00733

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	Step	Check	Yes	No
1	**CHECK ALL FOUR WHEELS FOR FREE TURNING.**	Have the wheels been turned freely such as when vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the DTC.	Go to step **2.**
2	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the Subaru Select Monitor display.	Is the lateral G sensor output on monitor display 2.3 — 2.7 V when the vehicle is in horizontal position?	Go to step **3.**	Go to step **8.**
3	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Select “Current data display & Save” on the Subaru Select Monitor. 6) Read the Subaru Select Monitor display.	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step **4.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
4	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** Read the Subaru Select Monitor display.	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **5.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
8	**CHECK OPEN CIRCUIT IN LATERAL 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*** ***LHD:*** ***(B301) No. 29 — No. 28:*** ***RHD:*** ***(F49) No. 29 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **9.**	Repair the harness connector between lateral G sensor and ABSCM&H/U.
9	**CHECK LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the lateral G sensor from vehicle. 3) Connect the connector to lateral G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step **10.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>

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	Step	Check	Yes	No
10	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step **11.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
11	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **12.**	Replace the lateral G sensor. <Ref. to ABS-27, Lateral G Sensor.>
12	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

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13.General Diagnostic Table

A: INSPECTION

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either 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 braking	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 dragging	• 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 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 piping
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Master cylinder • Brake (caliper, piston, pads and rotor) • Brake piping • 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 piping • Suspension play or fatigue

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BRAKE

BR

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1. General Description

A: SPECIFICATION

Model		BASE, TS	GX, RS, OBK	WRX	STi
Front disc brake	Size	14 inch type	15 inch type	16 inch type	17 inch type
	Type	Disc (Floating type, ventilated)		Disc (Fixed type, ventilated)	
	Effective disc diameter	210 mm (8.27 in)	228 mm (8.98 in)	255 mm (10.04 in)	268 mm (10.55 in)
	Disc thickness × Outer diameter	24 × 260 mm (0.94 × 10.24 in)	24 × 277 mm (0.94 × 10.91 in)	24 × 294 mm (0.94 × 11.57 in)	30 × 326 mm (1.18 × 12.83 in)
	Effective cylinder diameter	57.2 mm (2.252 in)	42.8 mm (1.685 in) × 2	40.4 mm (1.591 in) × 4	40.0 mm × 2, 46.0 mm × 2 (1.575 in × 2, 1.811 in × 2)
	Pad dimensions (length × width × thickness)	115.0 × 44.3 × 11.0 mm (4.528 × 1.744 × 0.433 in)	117.8 × 50.5 × 11.0 mm (4.638 × 1.988 × 0.433 in)	116.0 × 47.7 × 10.0 mm (4.567 × 1.878 × 0.394 in)	129.8 × 60.5 × 9.2 mm (5.110 × 2.382 × 0.362 in)
	Clearance adjustment	Automatic adjustment			
Rear disc brake	Size	—	14 inch type	15 inch type	17 inch type
	Type	—	Disc (Floating type)	Disc (Fixed type, ventilated)	
	Effective disc diameter	—	230 mm (9.06 in)	261 mm (10.28 in)	268 mm (10.55 in)
	Disc thickness × Outer diameter	—	10 × 266 mm (0.39 × 10.47 in)	18 × 290 mm (0.71 × 11.42 in)	20 × 316 mm (0.79 × 12.44 in)
	Effective cylinder diameter	—	38.1 mm (1.500 in)		36.0 mm (1.417 in)
	Pad dimensions (length × width × thickness)	—	89.4 × 33.7 × 9.0 mm (3.520 × 1.327 × 0.354 in)	71.8 × 35.0 × 11.5 mm (2.827 × 1.378 × 0.453 in)	74.8 × 45.0 × 9.0 mm (2.945 × 1.772 × 0.354 in)
	Clearance adjustment	—	Automatic adjustment		
Rear drum brake	Type	Drum (Leading-Trailing type)	—	—	—
	Effective drum diameter	228.6 mm (9 in)	—	—	—
	Effective cylinder diameter	17.5 mm (0.689 in)	—	—	—
	Lining dimensions (length × width × thickness)	218.8 × 35.0 × 4.1 mm (8.61 × 1.378 × 0.161 in)	—	—	—
	Clearance adjustment	Automatic adjustment	—	—	—
Master cylinder	Type	Tandem			
	Effective diameter	23.81 mm (0.9374 in) [25.4 mm (1 in)]	26.99 mm (1-1/16 in)		
	Reservoir type	Sealed type			
	Brake fluid reservoir capacity	205 cm^3 (12.51 cu in)			
Brake booster	Type	Vacuum suspended			
	Effective diameter	230 mm (9.06 in) [180 + 205 mm (7.09 + 8.07 in)]	205 + 230 mm (8.07 + 9.06 in)		

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Model		BASE, TS	GX, RS, OBK	WRX	STi
* Proportioning valve	Split point	1,961 kPa (20 kgf/cm^2, 285 psi)	—		
	Reduce ratio	0.4	—		
Brake line		Dual circuit system			
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading.** **• When brake fluid is supplemented, be careful not to allow any dust into the reservoir.** **• Use fresh DOT3 brake fluid when replacing or refilling the fluid.**		FMVSS No. 116, DOT3			

[ ]: Model with ABS.
*: Model without ABS.

NOTE:
Refer to “PB section” for parking brake SPECIFICATIONS. <Ref. to PB-2, SPECIFICATION, General Description.>

ITEM			STANDARD	SERVICE LIMIT
Front brake	Pad thickness	14″, 15″	11 mm (0.43 in)	1.5 mm (0.059 in)
		16″	10 mm (0.39 in)	1.5 mm (0.059 in)
		17″	9.2 mm (0.362 in)	1.2 mm (0.047 in)
	Disc thickness	Except 17″	24 mm (0.94 in)	22 mm (0.87 in)
		17″	30 mm (1.18 in)	28 mm (1.10 in)
	Disc runout		—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness	14″	9.0 mm (0.354 in)	1.5 mm (0.059 in)
		15″	11.5 mm (0.452 in)	1.5 mm (0.059 in)
		17″	9.0 mm (0.354 in)	1.2 mm (0.047 in)
	Disc thickness	14″	10 mm (0.39 in)	8.5 mm (0.335 in)
		15″	18 mm (0.71 in)	16 mm (0.63 in)
		17″	20 mm (0.79 in)	18 mm (0.71 in)
	Disc runout		—	0.07 mm (0.0028 in)
Rear brake (Drum type)	Inside diameter		228.6 mm (9 in)	230.6 mm (9.08 in)
	Lining thickness		4.1 mm (0.161 in)	1.5 mm (0.059 in)
Rear brake (Disc type parking) (Except STi model)	Inside diameter		170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness		3.2 mm (0.126 in)	1.5 mm (0.059 in)
Rear brake (Disc type parking) (STi model)	Inside diameter		190 mm (7.48 in)	191 mm (7.52 in)
	Lining thickness		3.2 mm (0.126 in)	1.5 mm (0.059 in)
Parking brake	Lever stroke		7 to 8 notches/196 N (20 kgf, 44 lbf)	

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		Brake pedal force	Fluid pressure				
			BASE, TS		GX, RS, OBK	WRX	STi
			Without ABS	With ABS			
Brake booster	Brake fluid pressure without engine running	147 N (15 kgf, 33 lbf)	686 kPa (7 kgf/cm^2, 100 psi)	588 kPa (6 kgf/cm^2, 85 psi)	588 kPa (6 kgf/cm^2, 85 psi)		
		294 N (30 kgf, 66 lbf)	1,961 kPa (20 kgf/cm^2, 284 psi)	1,667 kPa (17 kgf/cm^2, 242 psi)	1,471 kPa (15 kgf/cm^2, 213 psi)		
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lbf)	5,786 kPa (59 kgf/cm^2, 839 psi)	5,982 kPa (61 kgf/cm^2, 868 psi)	5,296 kPa (54 kgf/cm^2, 768 psi)	4,707 kPa (48 kgf/cm^2, 683 psi)	4,021 kPa (41 kgf/cm^2, 583 psi)
		294 N (30 kgf, 66 lbf)	7,649 kPa (78 kgf/cm^2, 1,109 psi)	8,434 kPa (86 kgf/cm^2, 1,223 psi)	9,120 kPa (93 kgf/cm^2, 1,323 psi)		8,336 kPa (85 kgf/cm^2, 1,209 psi)

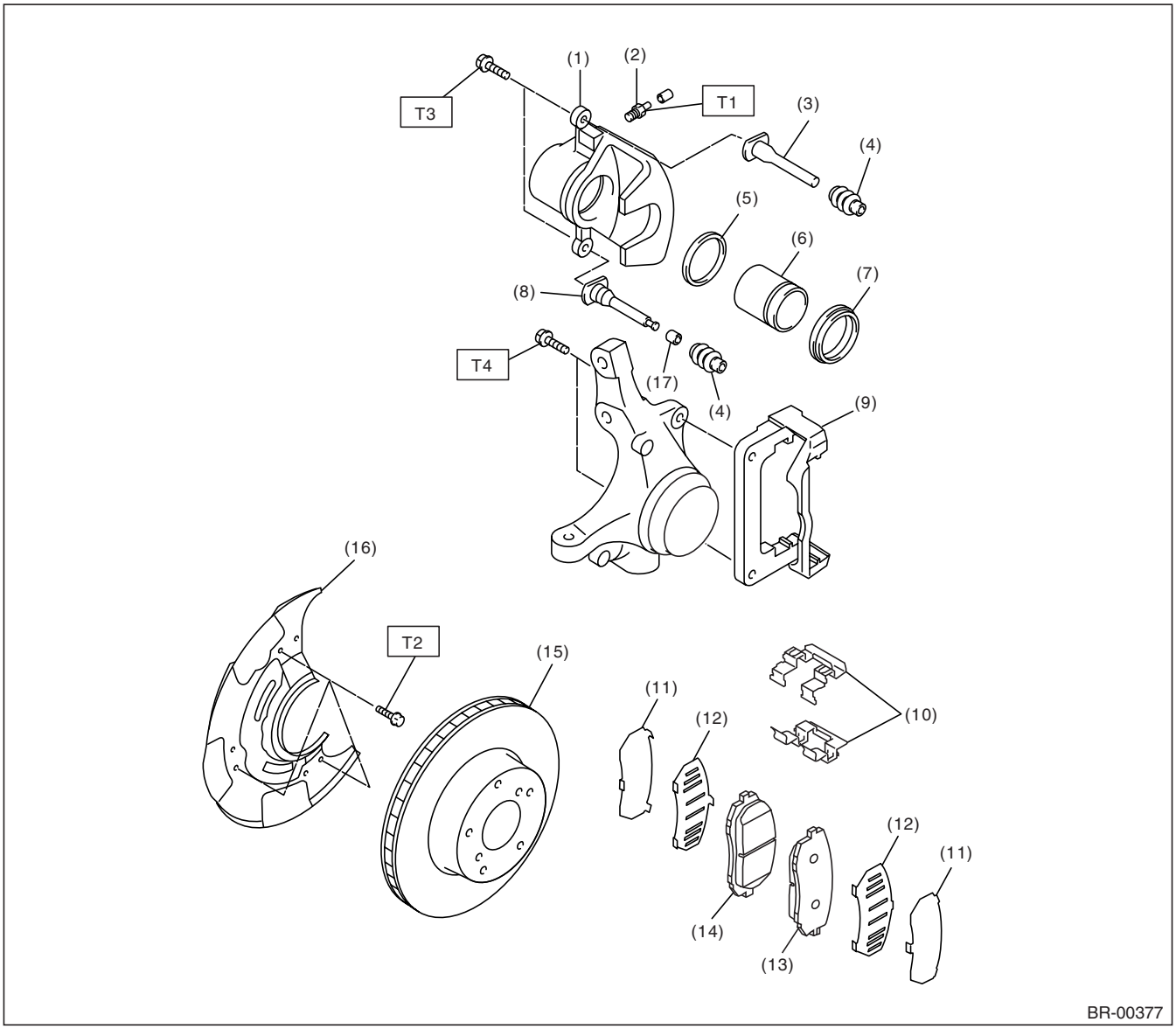
Brake pedal	Free play	1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lbf).]

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B: COMPONENT

1. FRONT DISC BRAKE

• 14 INCH TYPE

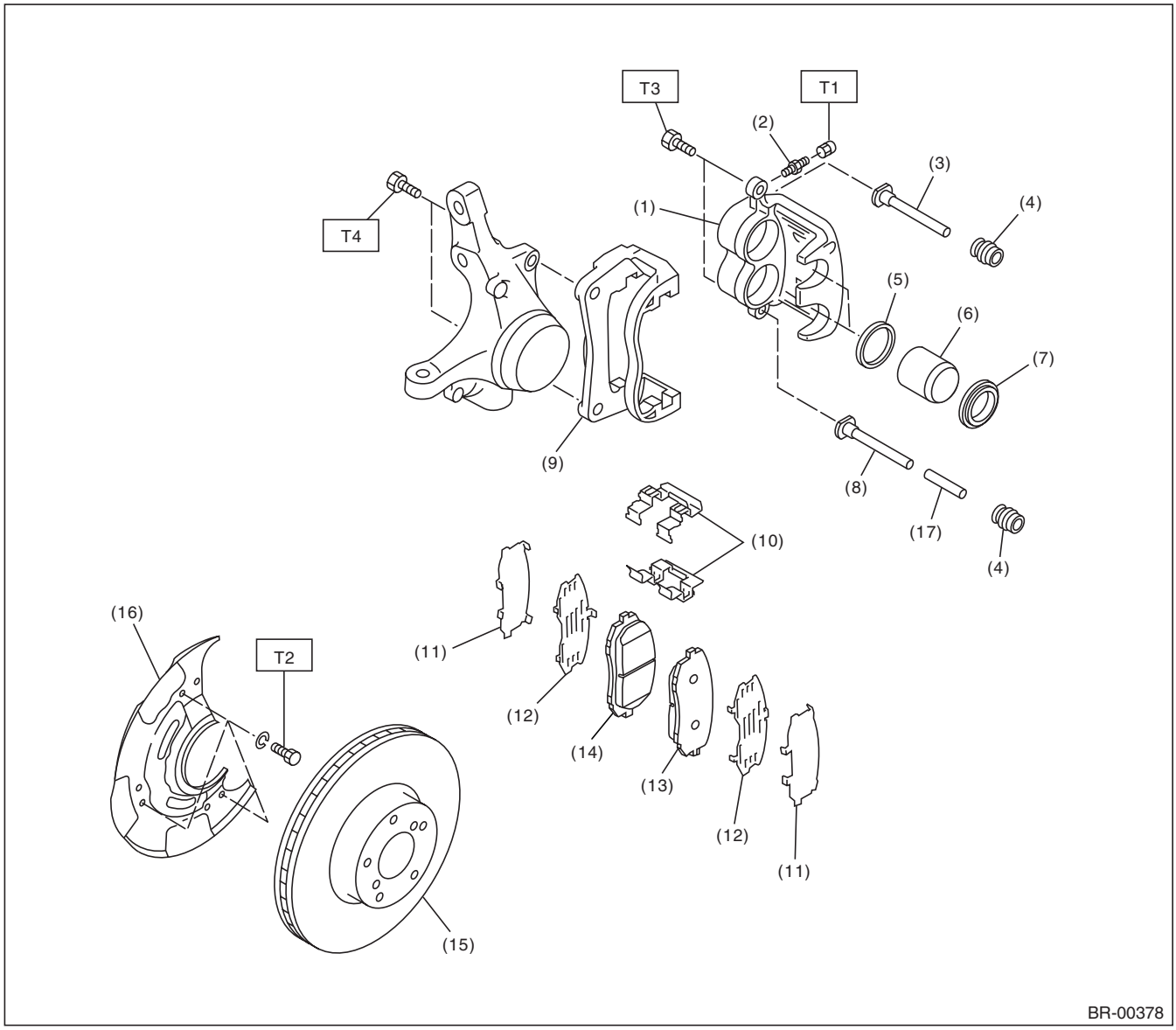


(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Support
(10) Pad clip
(11) Outer shim
(12) Inner shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Disc rotor
(16) Disc cover
(17) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.3)
T3: 37 (3.8, 27.5)
T4: 80 (8.2, 59)

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• 15 INCH TYPE

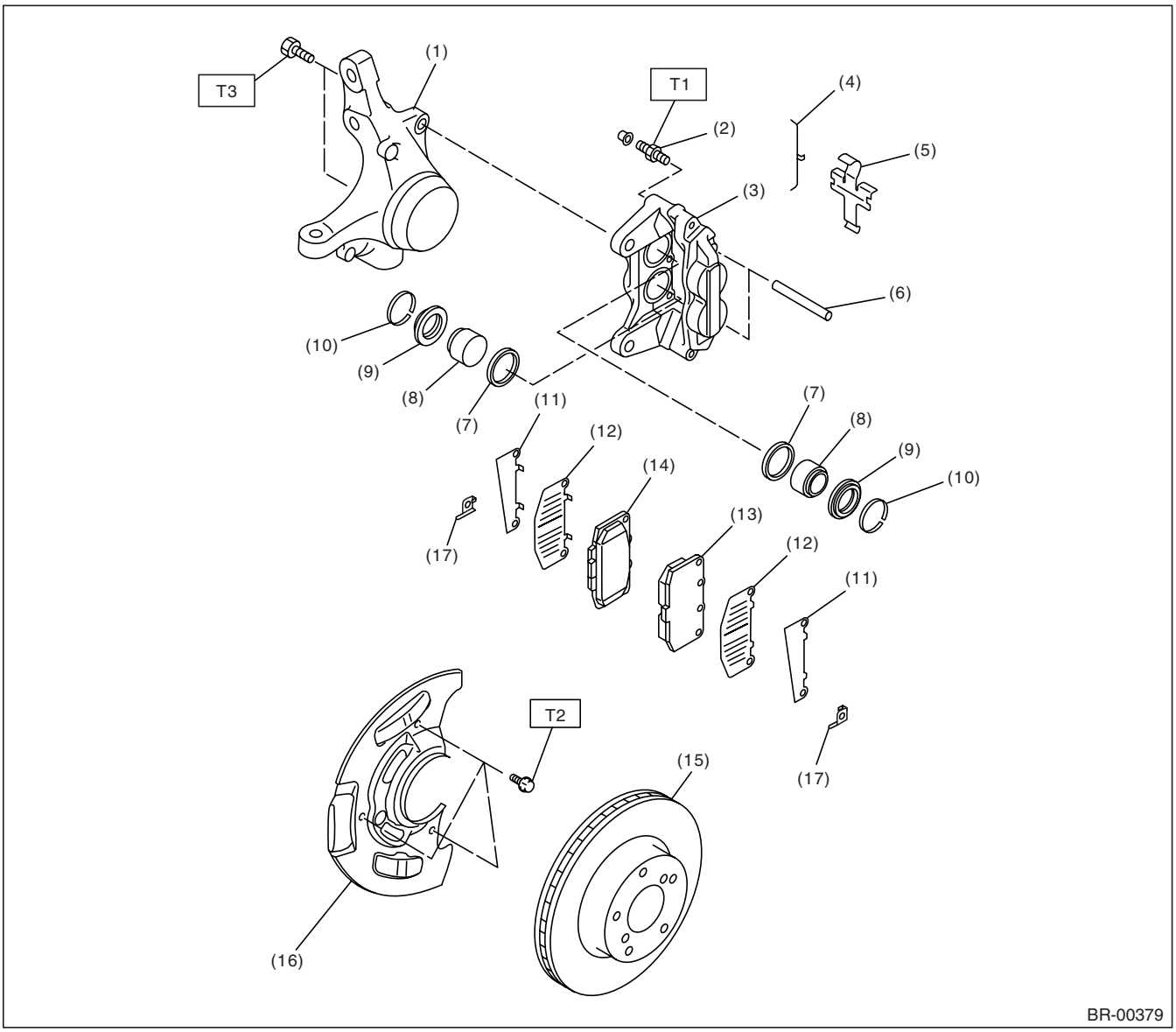


(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Support
(10) Pad clip
(11) Outer shim
(12) Inner shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Disc rotor
(16) Disc cover
(17) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.3)
T3: 26.5 (2.7, 19.6)
T4: 80 (8.2, 59)

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• 16 INCH TYPE

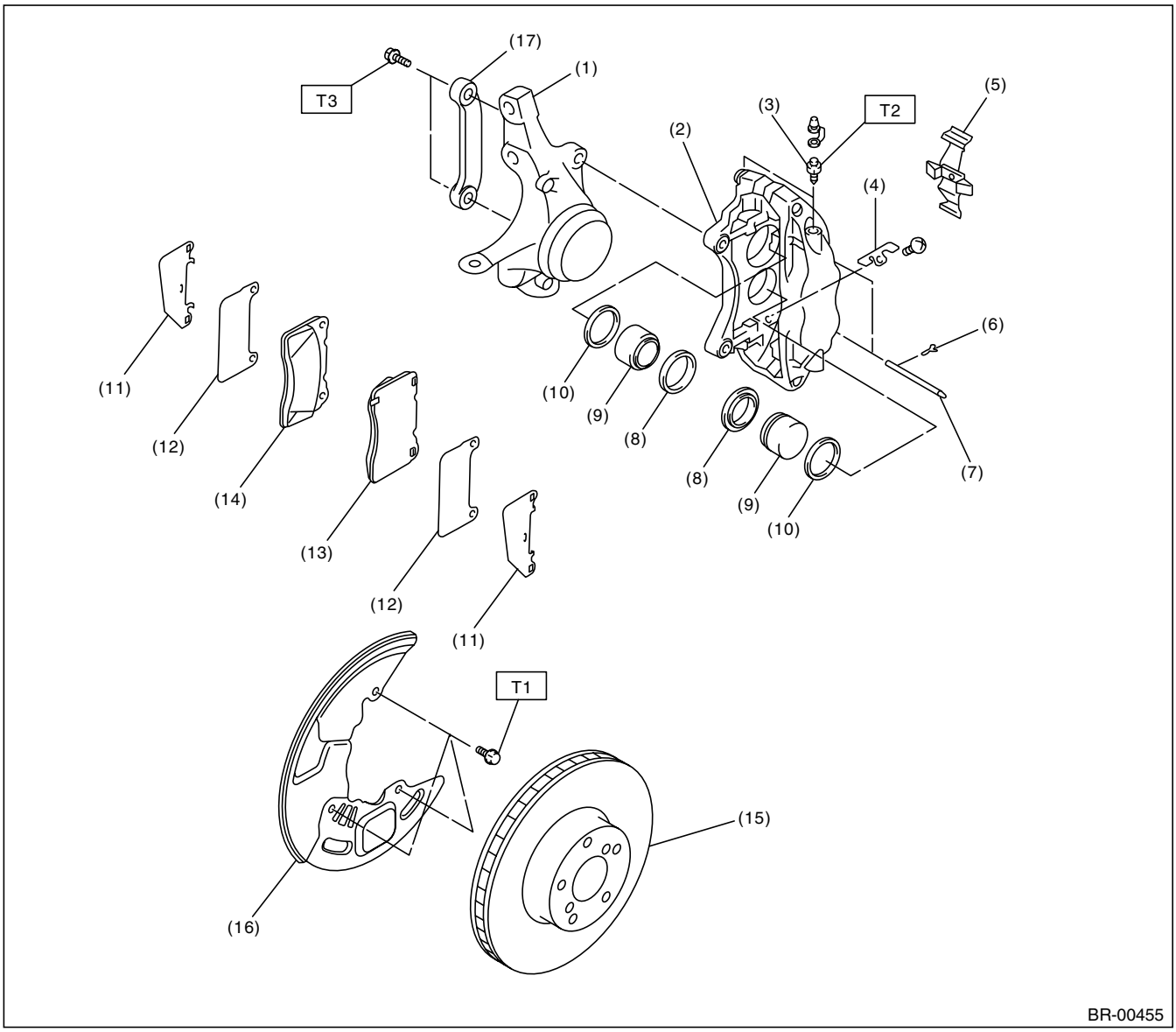


(1) Housing
(2) Air bleeder screw
(3) Caliper body
(4) M clip
(5) Cross spring
(6) Pad pin
(7) Piston seal
(8) Piston
(9) Piston boot
(10) Boot ring
(11) Outer shim
(12) Inner shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Disc rotor
(16) Disc cover
(17) Spacer

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.3)
T3: 80 (8.2, 59)

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• 17 INCH TYPE



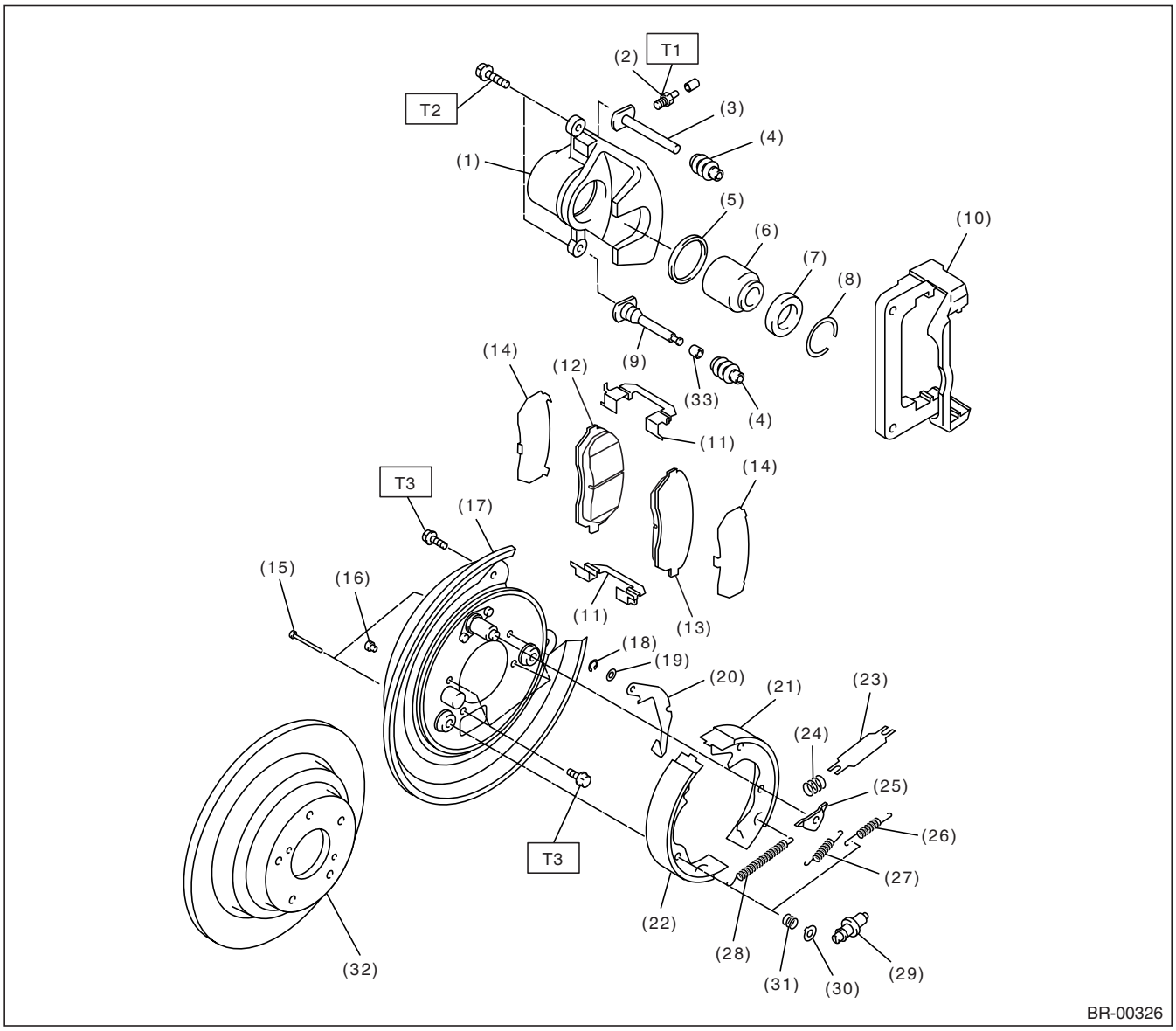
(1) Housing
(2) Caliper body
(3) Air bleeder screw
(4) Guide plate
(5) Cross spring
(6) Clip
(7) Pad pin
(8) Piston boot
(9) Piston
(10) Piston seal
(11) Outer shim
(12) Inner shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Disc rotor
(16) Disc cover
(17) Tie bar

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.3)
T2: 20 (2.0, 14.5)
T3: 155 (15.8, 114.3)

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2. REAR DISC BRAKE

• 14 INCH TYPE

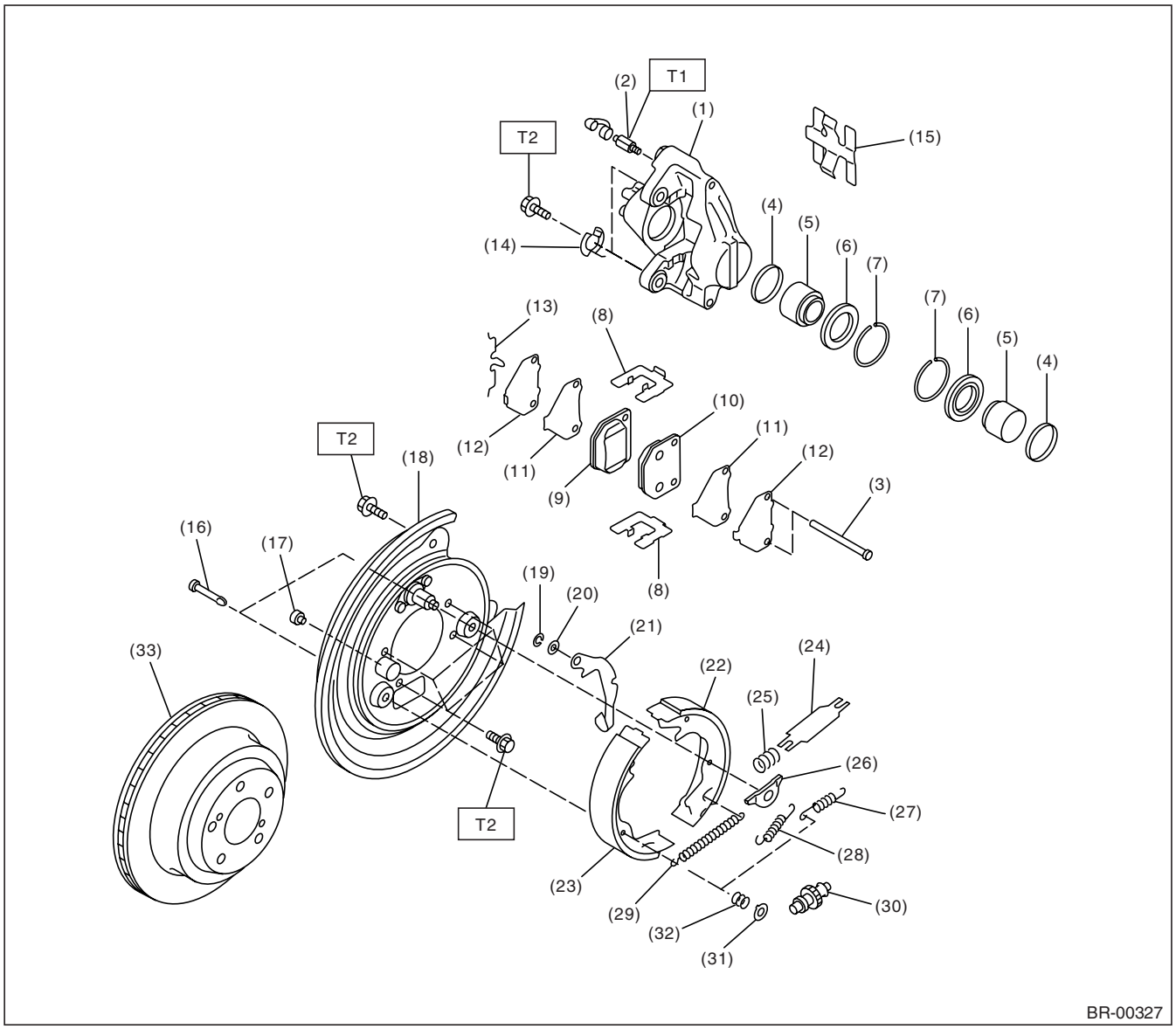


(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Boot ring
(9) Lock pin (Yellow)
(10) Support
(11) Pad clip
(12) Pad (Inside)
(13) Pad (Outside)
(14) Shim
(15) Shoe hold-down pin
(16) Cover
(17) Back plate
(18) Retainer
(19) Spring 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
(33) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 37 (3.8, 27.5)
T3: 53 (5.4, 39.1)

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• 15 INCH TYPE

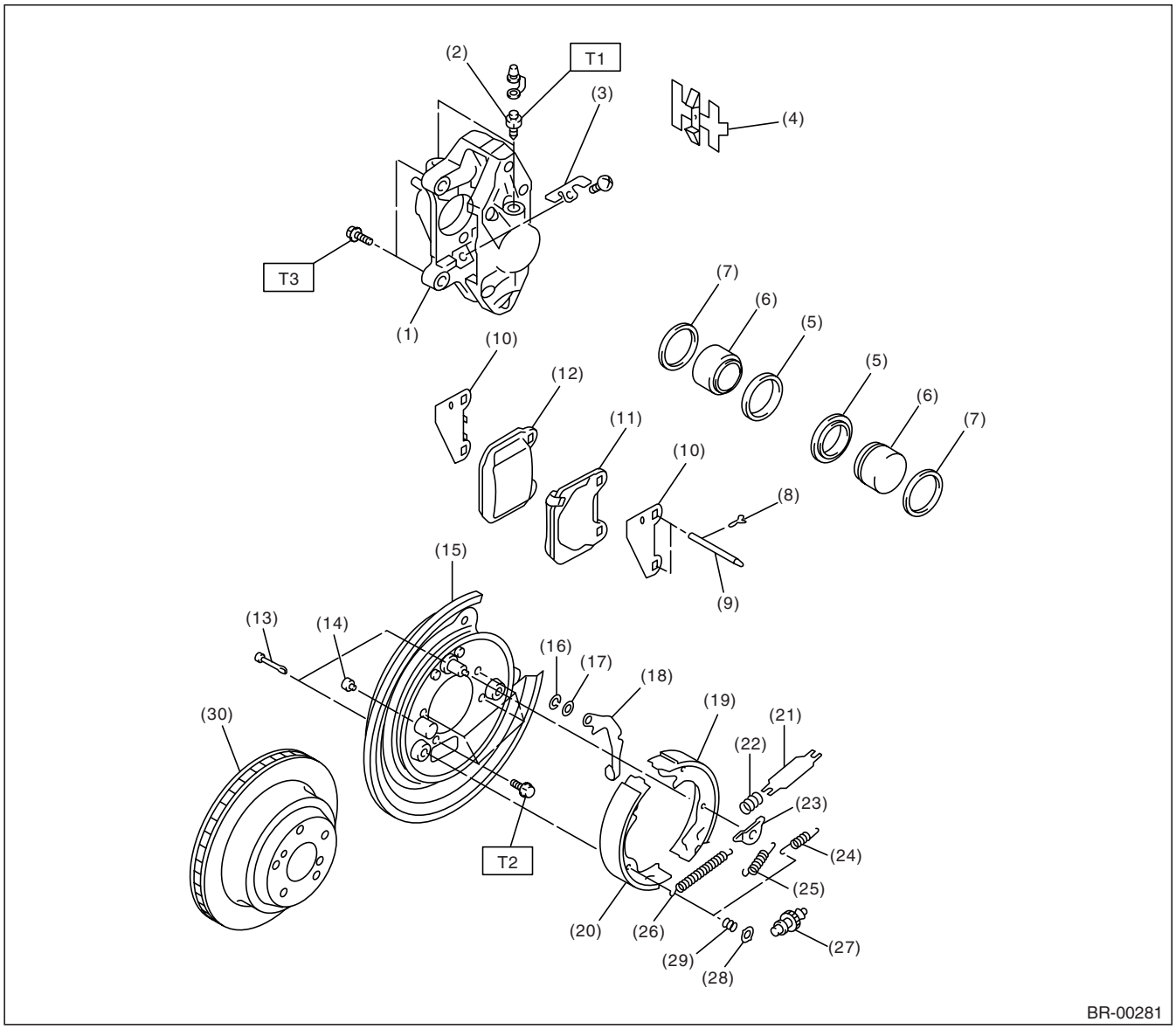


(1) Caliper body
(2) Air bleeder screw
(3) Pad pin
(4) Piston seal
(5) Piston
(6) Piston boot
(7) Boot ring
(8) Pad clip
(9) Pad (Inside)
(10) Pad (Outside)
(11) Inner shim
(12) Outer shim
(13) M clip
(14) Washer
(15) Cross spring
(16) Shoe hold-down pin
(17) Cover
(18) Back plate
(19) Retainer
(20) Spring washer
(21) Parking brake lever
(22) Parking brake shoe (Secondary)
(23) Parking brake shoe (Primary)
(24) Strut
(25) Strut shoe spring
(26) Shoe guide plate
(27) Secondary shoe return spring
(28) Primary shoe return spring
(29) Adjusting spring
(30) Adjuster
(31) Shoe hold-down cup
(32) Shoe hold-down spring
(33) Disc rotor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 53 (5.4, 39.1)

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• 17 INCH TYPE

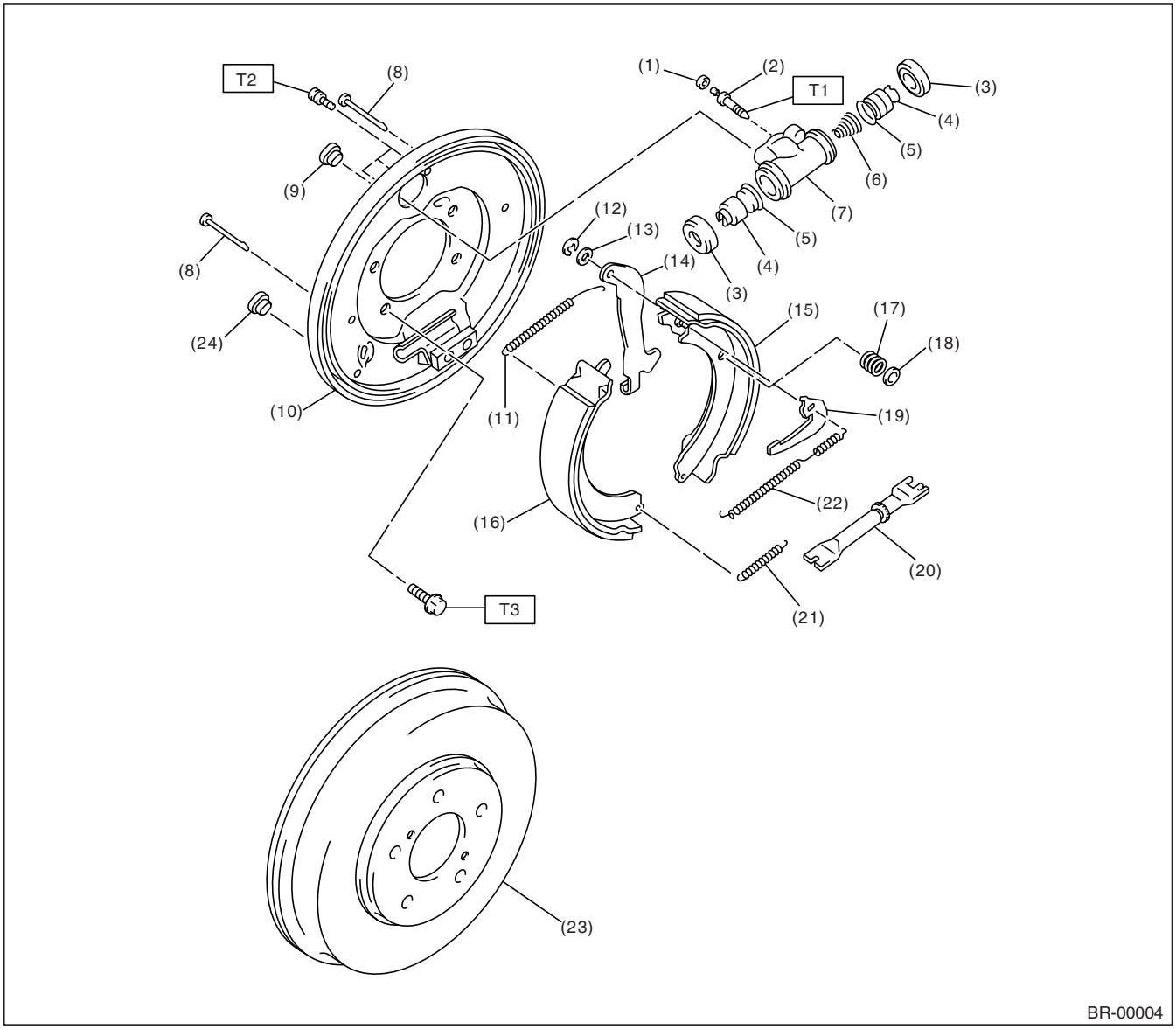


(1) Caliper body
(2) Air bleeder screw
(3) Guide plate
(4) Cross spring
(5) Piston boot
(6) Piston
(7) Piston seal
(8) Clip
(9) Pad pin
(10) Pad shim
(11) Pad (Outside)
(12) Pad (Inside)
(13) Shoe hold-down pin
(14) Cover
(15) Back plate
(16) Retainer
(17) Spring washer
(18) Parking brake lever
(19) Parking brake shoe (Secondary)
(20) Parking brake shoe (Primary)
(21) Strut
(22) Strut shoe spring
(23) Shoe guide plate
(24) Secondary shoe return spring
(25) Primary shoe return spring
(26) Adjusting spring
(27) Adjuster
(28) Shoe hold-down cup
(29) Shoe hold-down spring
(30) Disc rotor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 53 (5.4, 39.1)
T3: 65 (6.6, 47.9)

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3. REAR DRUM BRAKE



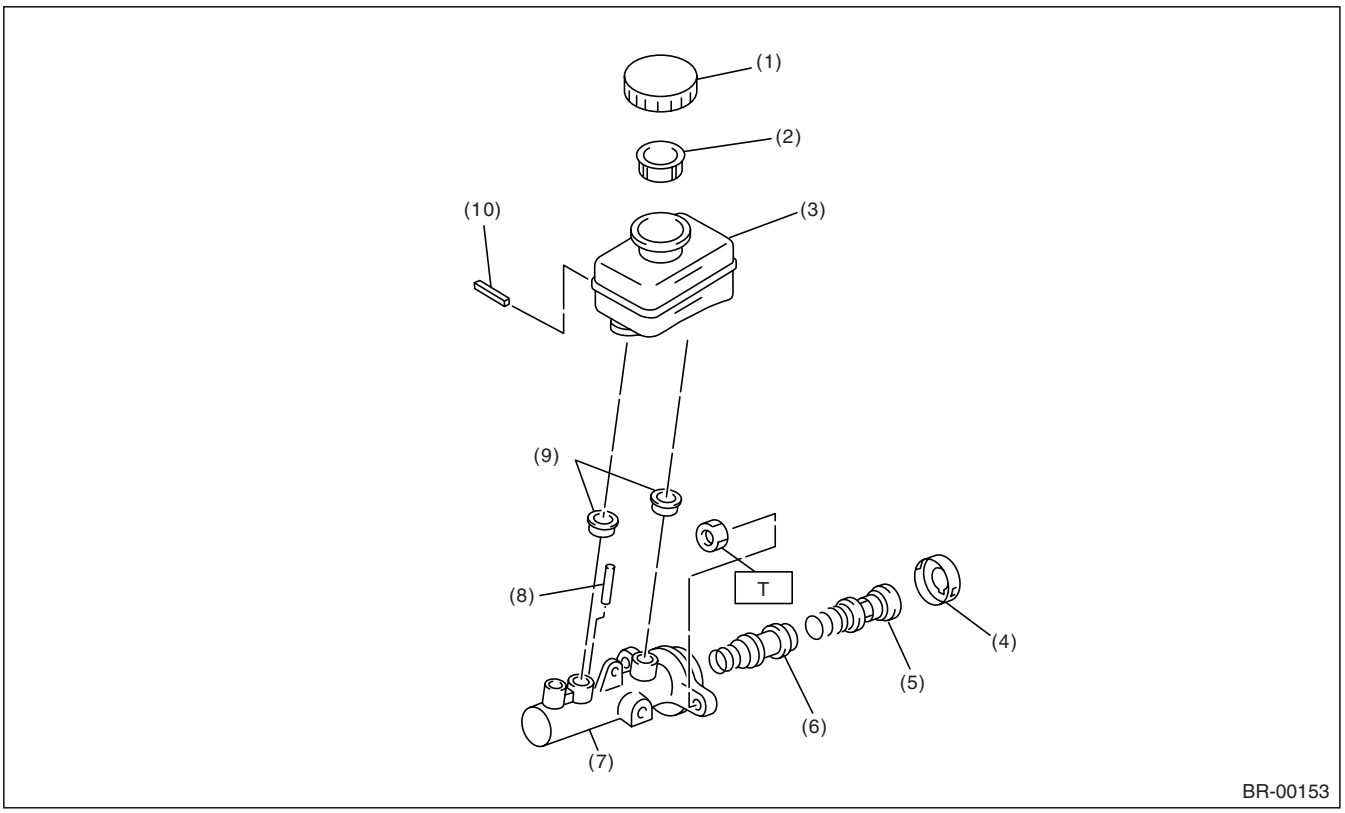
(1) Air bleeder cap
(2) Air bleeder screw
(3) Boot
(4) Piston
(5) Cup
(6) Spring
(7) Wheel cylinder body
(8) Pin
(9) Plug
(10) Back plate
(11) Upper shoe return spring
(12) Retainer
(13) Washer
(14) Parking brake lever
(15) Brake shoe (Trailing)
(16) Brake shoe (Leading)
(17) Shoe hold-down spring
(18) Cup
(19) Adjusting lever
(20) Adjuster
(21) Lower shoe return spring
(22) Adjusting spring
(23) Drum
(24) Plug

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 10 (1.0, 7.2)
T3: 53 (5.4, 39.1)

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4. MASTER CYLINDER

• LHD MODEL

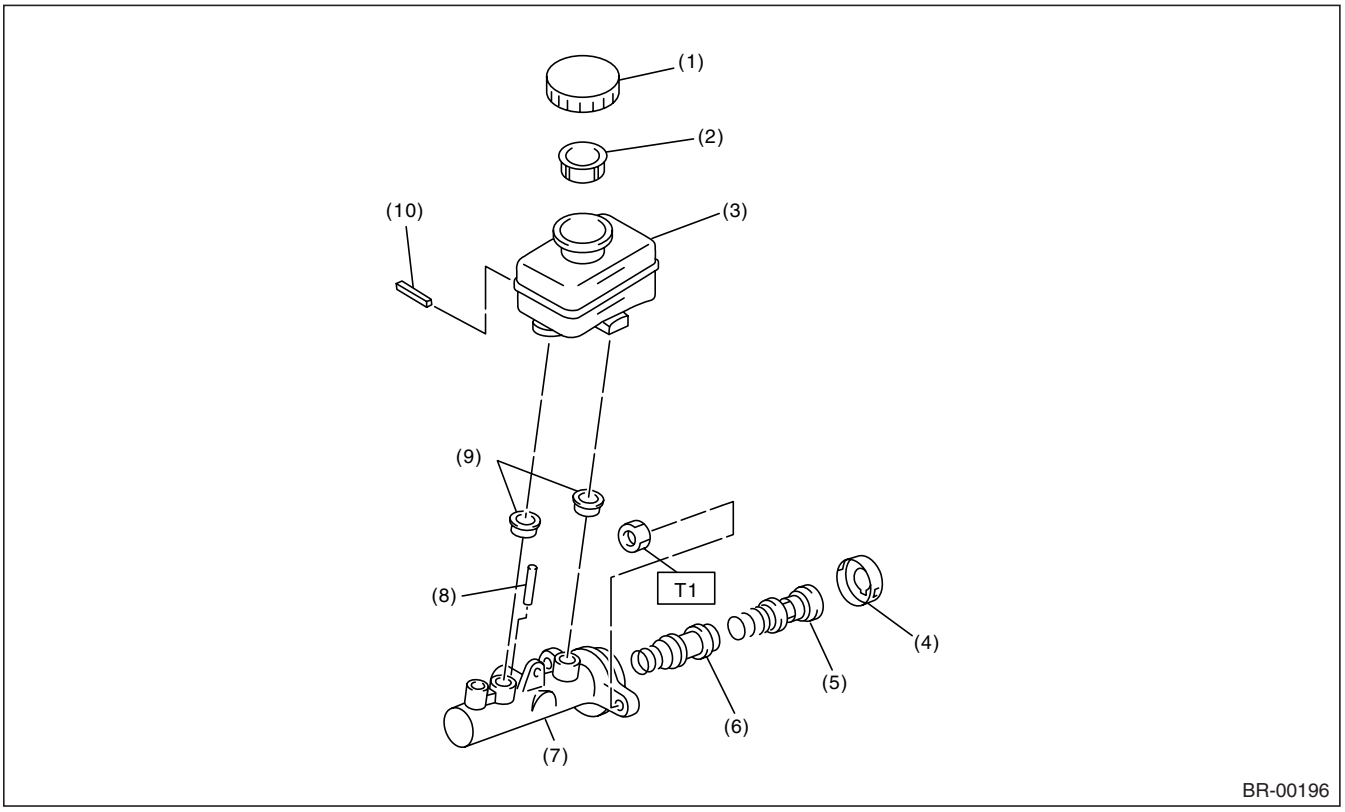


(1) Cap
(2) Filter
(3) Reservoir tank
(4) Piston retainer
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin (With ABS)
(9) Seal
(10) Pin

Tightening torque: N·m (kgf-m, ft-lb)
T1: 14 (1.4, 10.3)

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• RHD MODEL



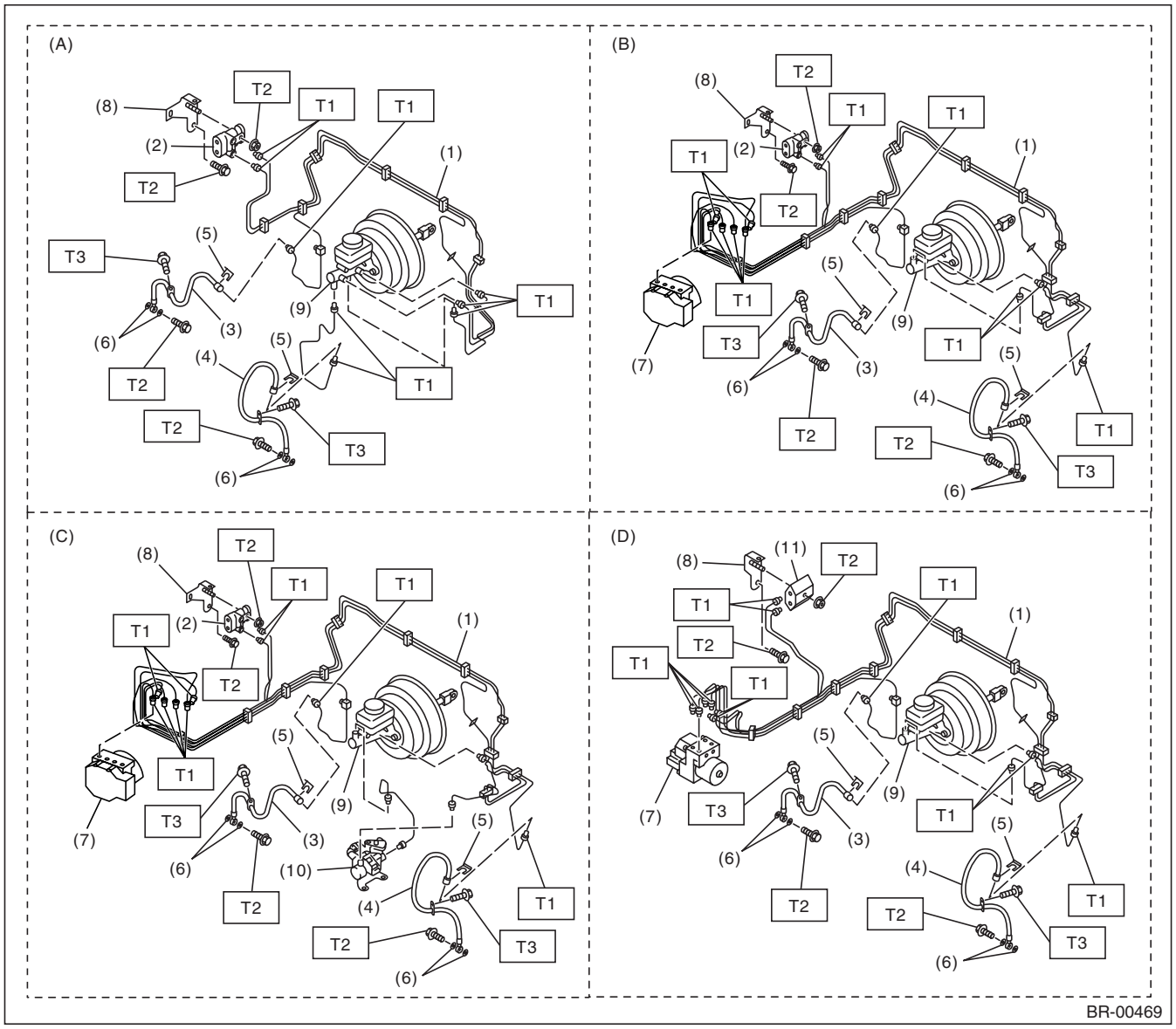
(1) Cap
(2) Filter
(3) Reservoir tank
(4) Piston retainer
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin (With ABS)
(9) Seal
(10) Pin

Tightening torque: N·m (kgf-m, ft-lb)
T1: 14 (1.4, 10.3)

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5. FRONT BRAKE PIPES AND HOSE

• LHD MODEL



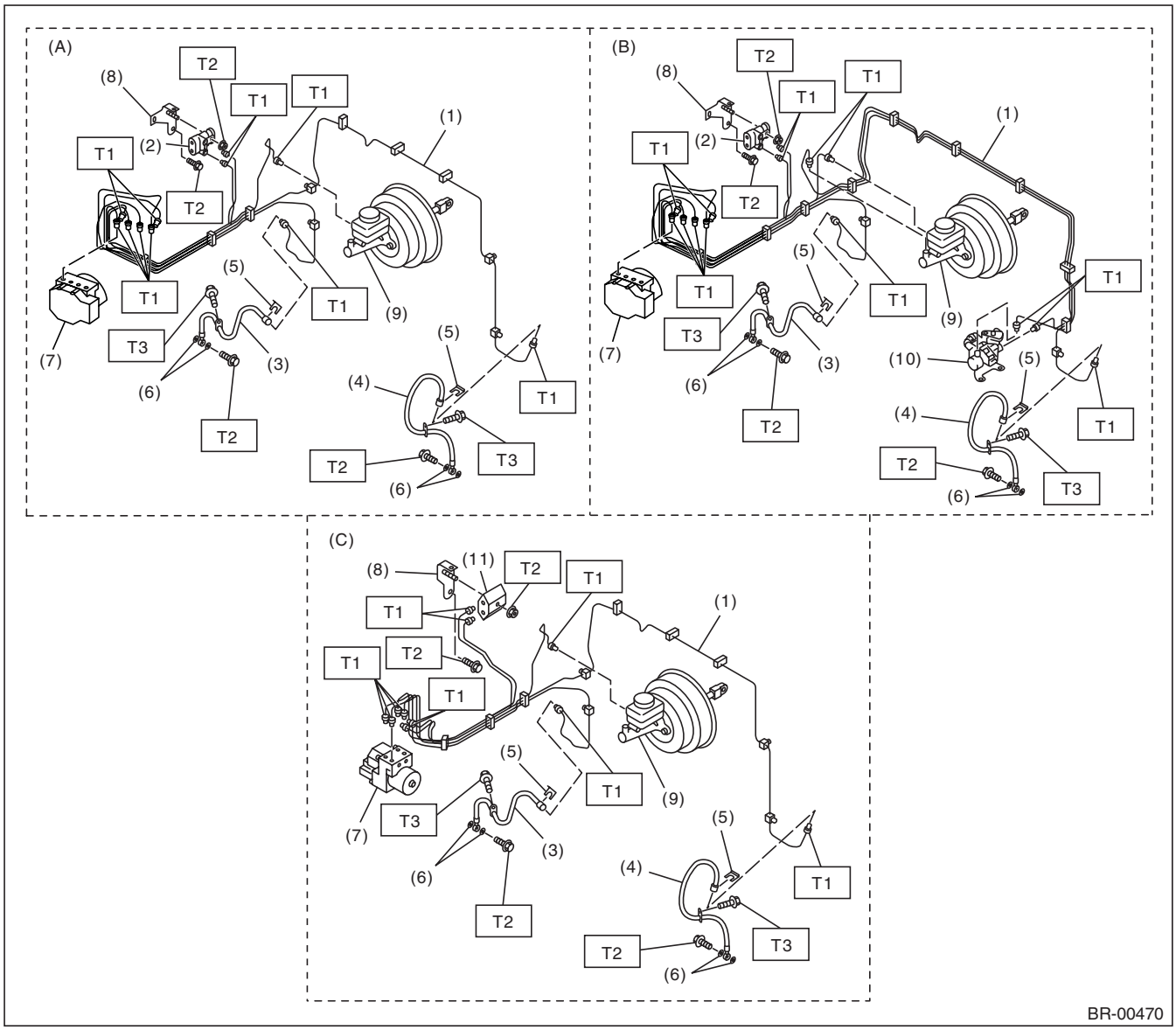
(A) Model without ABS
(B) Model with ABS
(C) Model with ABS (with hill holder)
(D) STi model without driver's control center differential auto

(1) Front brake pipe assembly
(2) Proportioning valve (Without ABS) Proportioning valve type connector (With ABS)
(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) Hill holder
(11) Two-way connector

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 11.1)
T2: 18 (1.8, 13.3)
T3: 32 (3.3, 23.6)

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• RHD MODEL



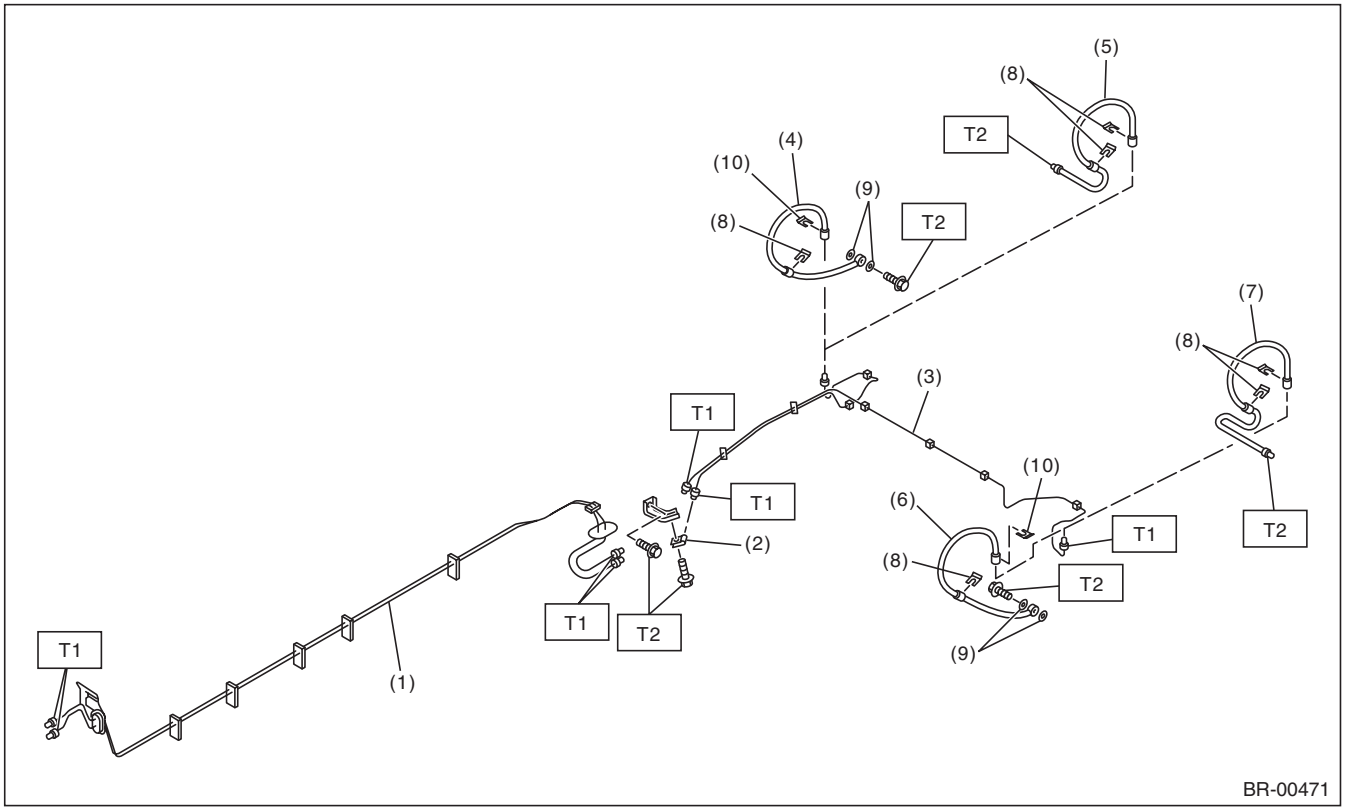
(A) Model without hill holder
(B) Model with hill holder
(C) STi model without driver's control center differential auto

(1) Front brake pipe assembly
(2) Proportioning type 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) Hill holder
(11) Two-way connector

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 11.1)
T2: 18 (1.8, 13.3)
T3: 32 (3.3, 23.6)

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6. CENTER AND REAR BRAKE PIPES AND HOSES



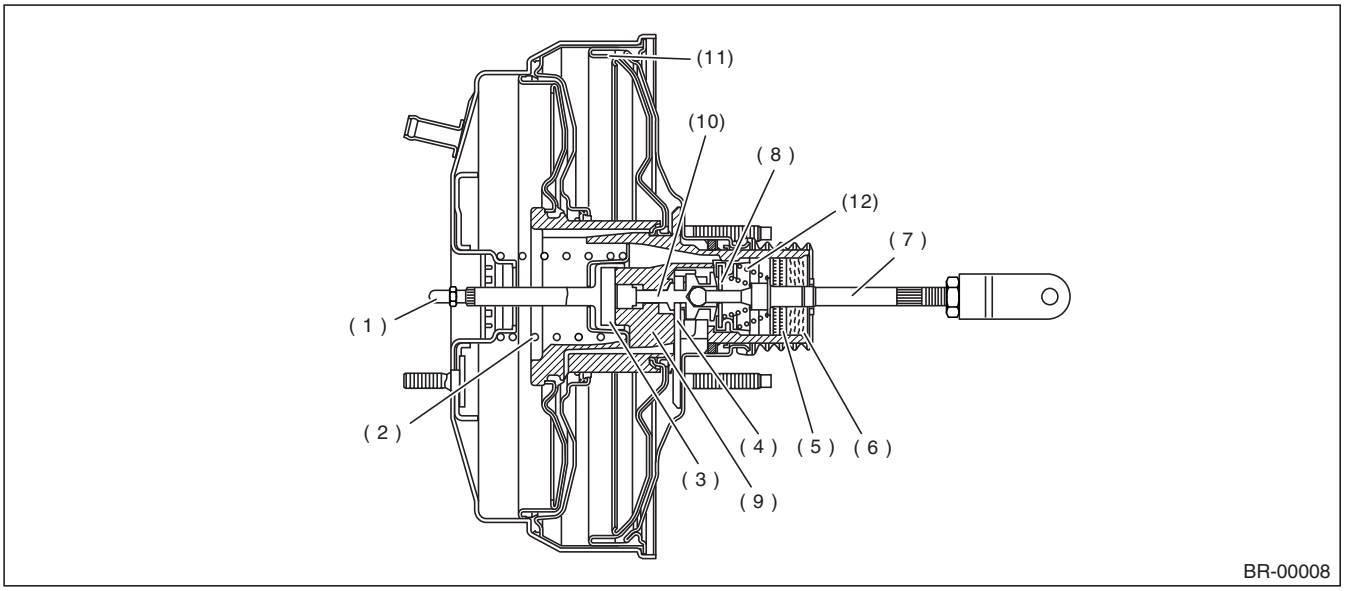
(1) Center brake pipe assembly
(2) Two-way connector
(3) Rear brake pipe assembly
(4) Rear brake hose RH (Disc brake model)
(5) Rear brake hose RH (Drum brake model)
(6) Rear brake hose LH (Disc brake model)
(7) Rear brake hose LH (Drum brake model)
(8) Clamp
(9) Gasket
(10) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 11.1)
T2: 18 (1.8, 13.3)

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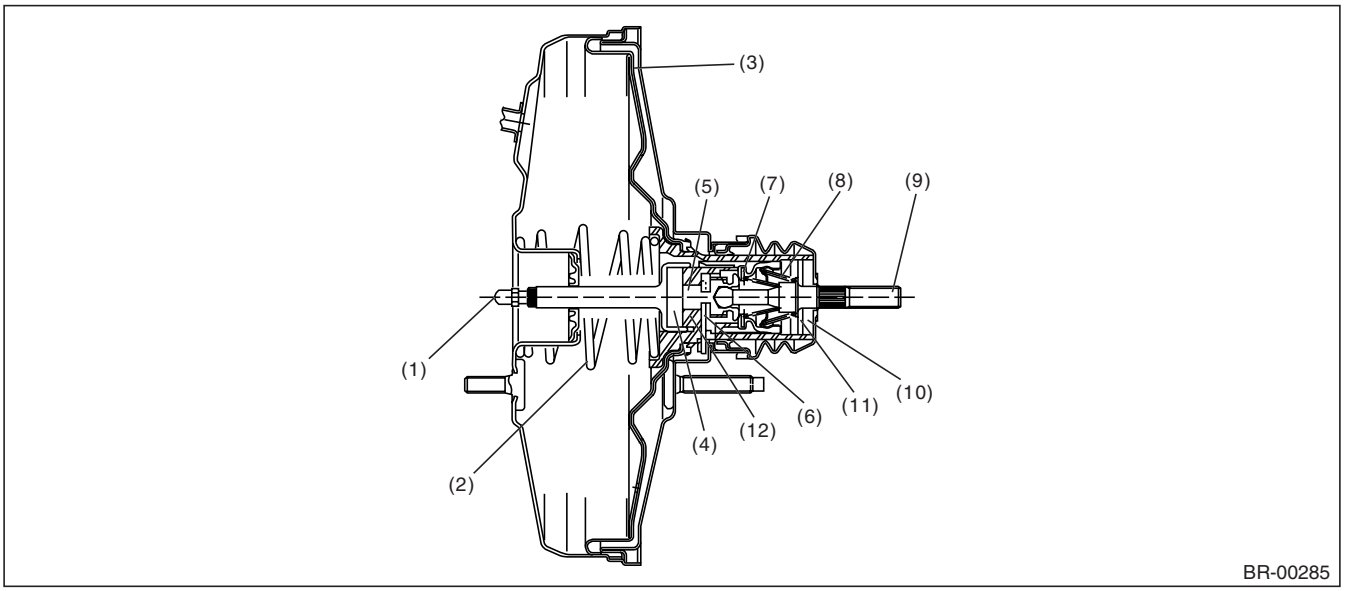
7. BRAKE BOOSTER

• MODEL With ABS



(1) Push rod
(2) Return spring
(3) Reaction disc
(4) Key
(5) Filter
(6) Silencer
(7) Operating rod
(8) Poppet valve
(9) Valve body
(10) Plunger valve
(11) Diaphragm plate
(12) Valve return spring

• MODEL Without ABS

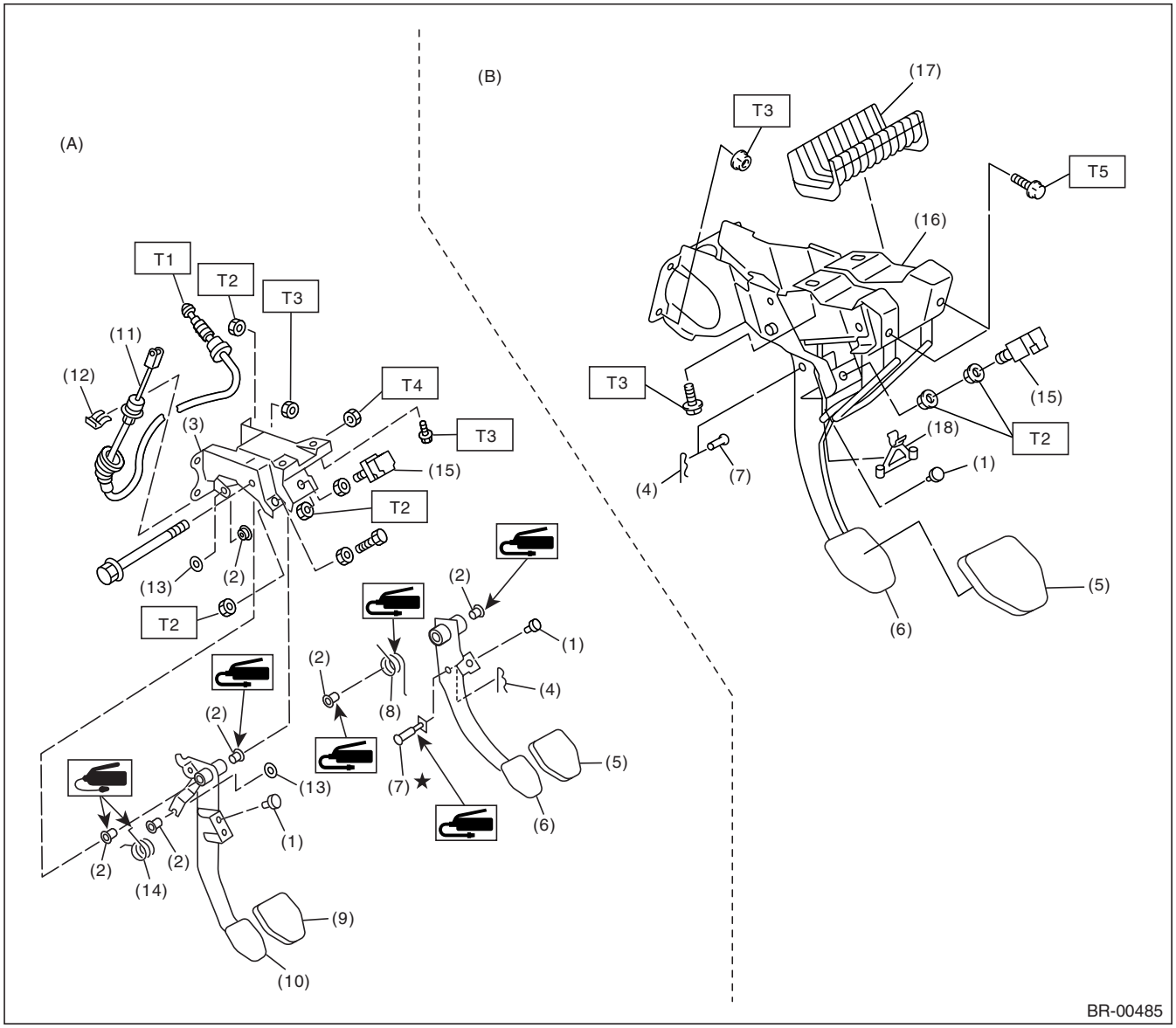


(1) Push rod
(2) Return spring
(3) Diaphragm plate
(4) Reaction disc
(5) Plunger valve
(6) Key
(7) Poppet valve
(8) Valve return spring
(9) Operating rod
(10) Silencer
(11) Filter
(12) Valve body

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8. BRAKE PEDAL

• 1.6 L MT MODEL



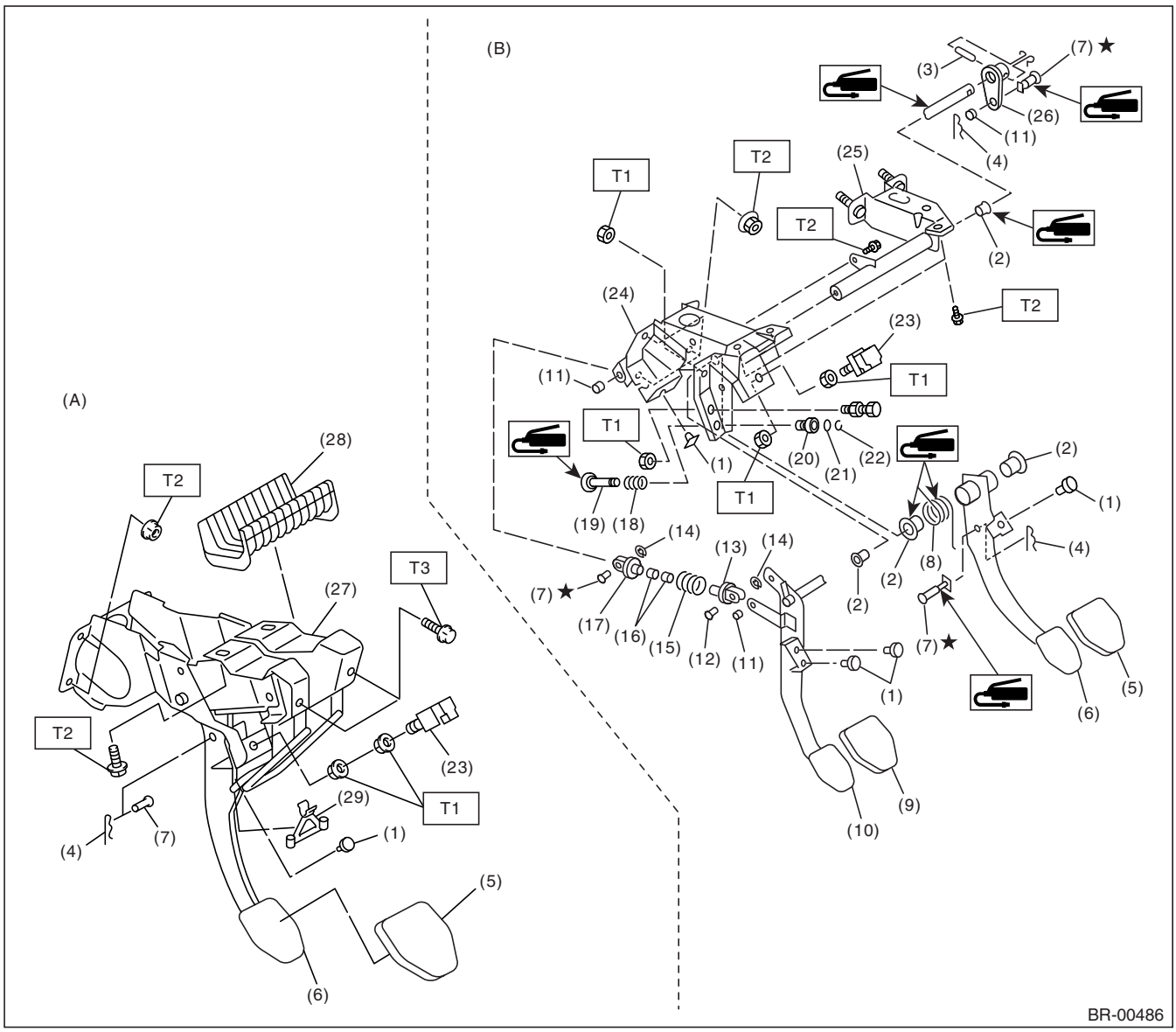
(A) LHD
(B) RHD

(1) Stopper
(2) Bushing
(3) Pedal bracket
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Clutch cable
(12) Clutch cable clamp
(13) Clip
(14) Assist spring
(15) Stop light switch
(16) Brake pedal bracket ASSY
(17) Cover
(18) Protector

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6 (0.6, 4.5)
T2: 8 (0.8, 5.8)
T3: 18 (1.8, 13.3)
T4: 30 (3.1, 22.4)
T5: 33 (3.3, 24.3)

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• 2.0 L AND 2.5 L MT MODEL



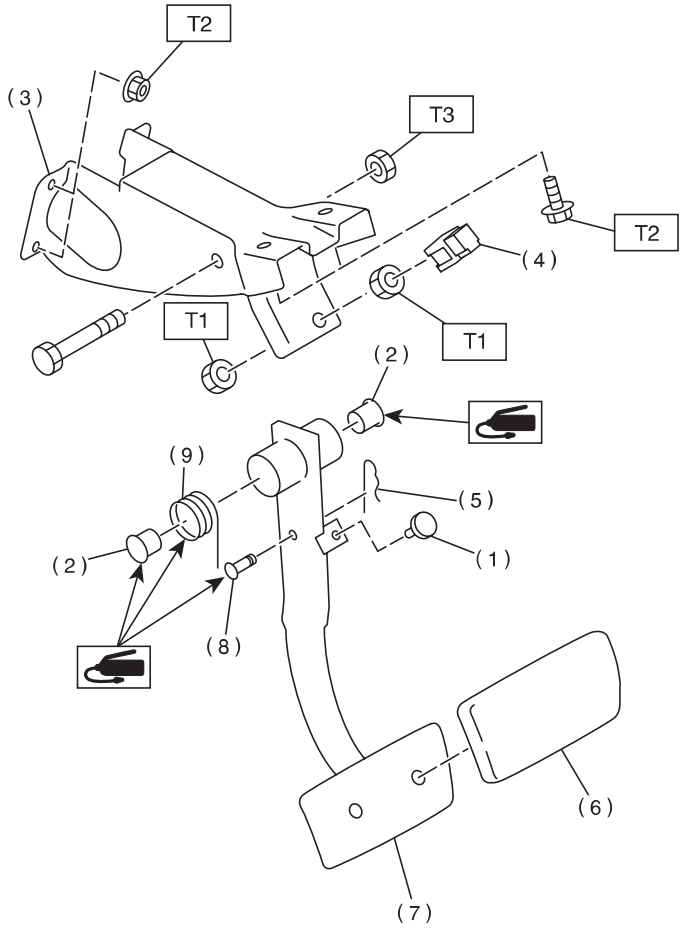
(A) RHD
(B) LHD

(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring S
(19) Rod S
(20) Bushing S
(21) O-ring
(22) Clip
(23) Stop light switch
(24) Pedal bracket
(25) Clutch master cylinder bracket
(26) Lever
(27) Brake pedal bracket ASSY
(28) Cover
(29) Protector

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.3)
T3: 33 (3.3, 24.3)

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• LHD AT MODEL



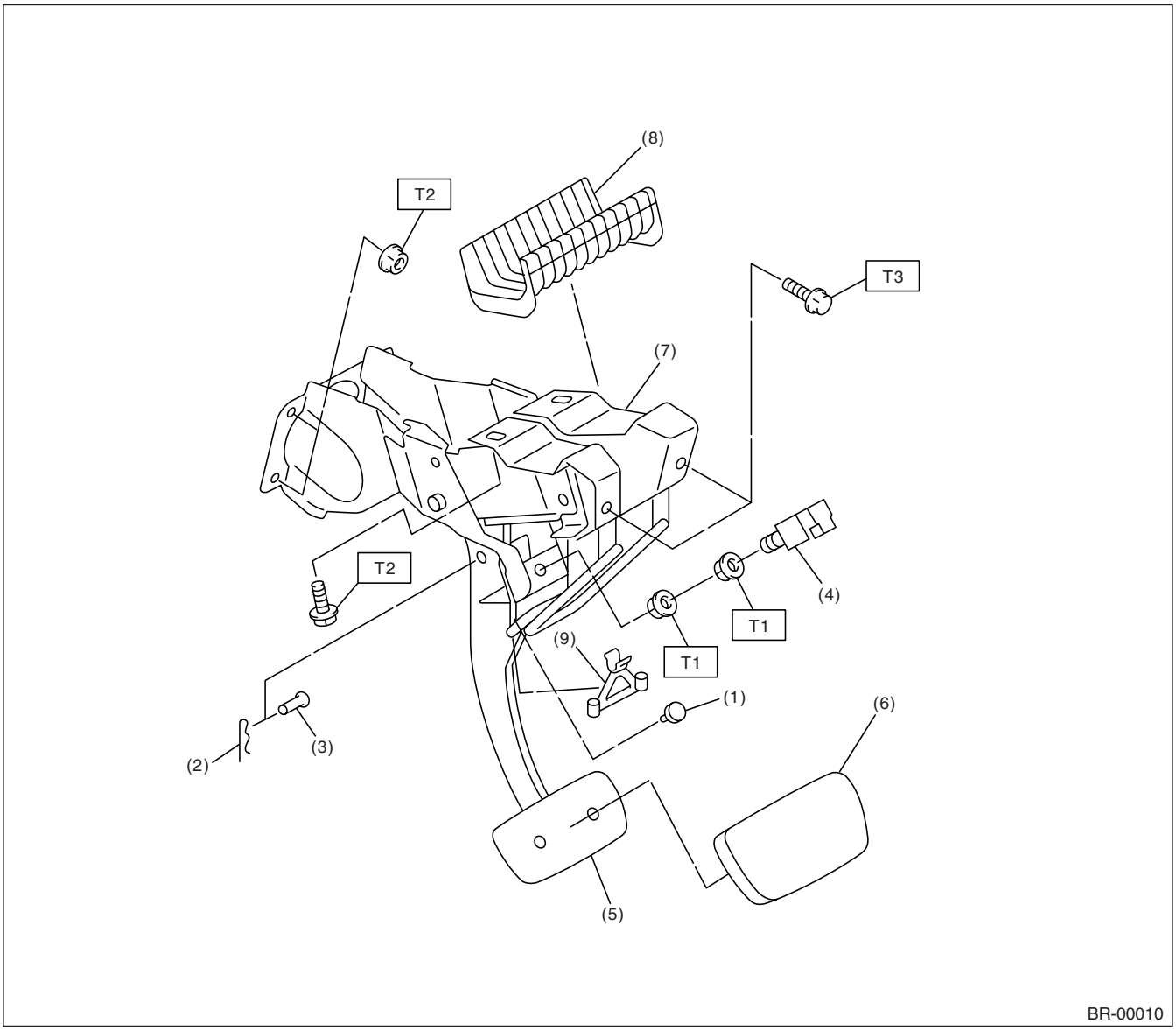
BR-00139

(1) Stopper
(2) Bushing
(3) Pedal bracket
(4) Stop light switch
(5) Snap pin
(6) Brake pedal pad
(7) Brake pedal
(8) Clevis pin
(9) Brake pedal spring

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*8 (0.8, 5.8)*
T2:	*18 (1.8, 13.3)*
T3:	*30 (3.1, 22.4)*

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• RHD AT MODEL

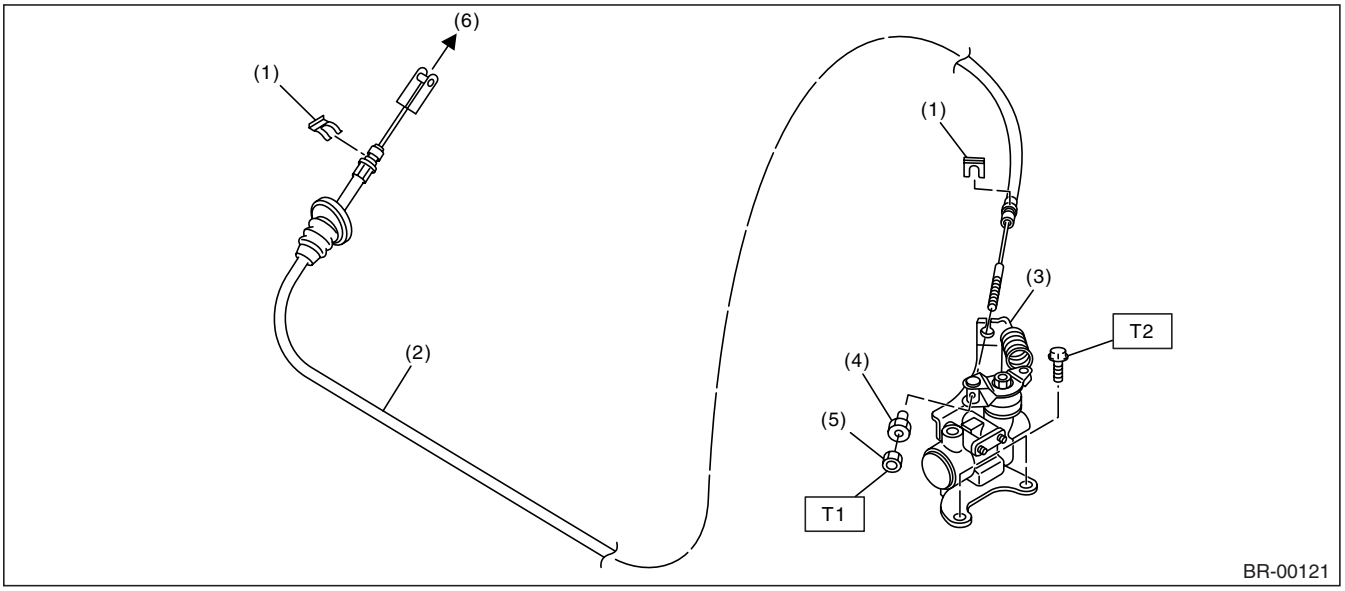


(1)	Stopper	(6)	Brake pedal pad
(2)	Snap pin	(7)	Brake pedal bracket ASSY
(3)	Clevis pin	(8)	Cover
(4)	Stop light switch	(9)	Protector
(5)	Brake pedal		

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*8 (0.8, 5.8)*
T2:	*18 (1.8, 13.3)*
T3:	*33 (3.3, 24.3)*

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9. HILL HOLDER



(1) Clamp
(2) PHV cable
(3) PHV (Pressure hold valve)
(4) Adjusting nut
(5) Lock nut
(6) To clutch pedal

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3.5 (0.35, 2.5)
T2: 18 (1.8, 13.3)

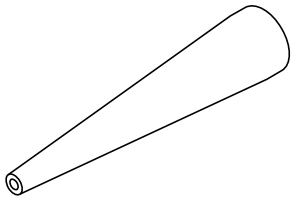
C: CAUTION

• Wear working 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 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 vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

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D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925460000	925460000	WHEEL CYLINDER 11/16″ ADAPTER	Used for installing cup onto wheel cylinder piston (Size 11/16″).

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
SNAP RING PLIERS	Used for removing and installing snap ring.

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2. Front Brake Pad

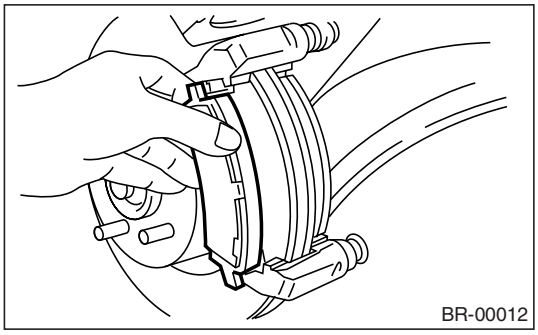
A: REMOVAL

1. 14 INCH AND 15 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the lower caliper bolt.
5) Raise the caliper body upward and support it.

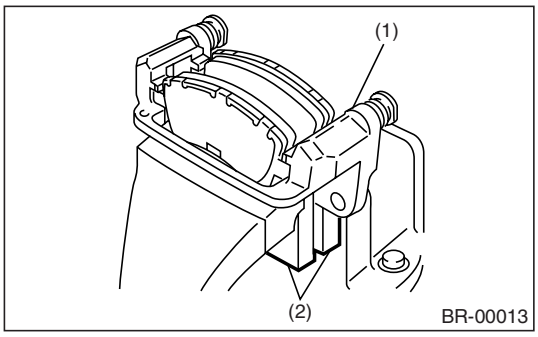
NOTE:
Do not disconnect the brake hose from caliper body.

6) Remove the pad.



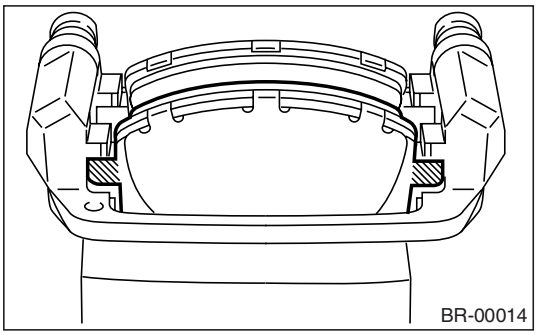
NOTE:
If the brake pad is difficult to remove, proceed as follows:

(1) Remove the caliper body from support.
(2) Remove the support.
(3) Place a support in a vise between wooden blocks.



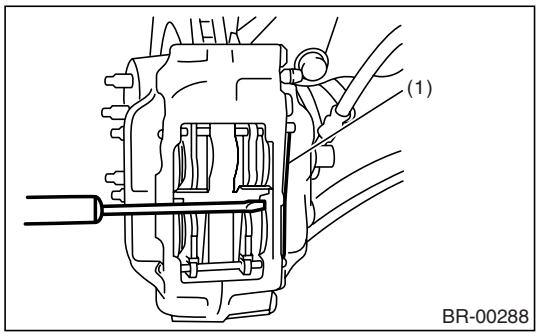
(1) Support
(2) Wooden blocks

(4) Use a rod of less than 12 mm (0.47 in) dia. to the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.



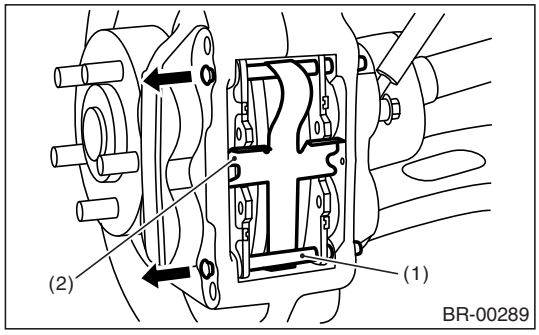
2. 16 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the M clip.



(1) M clip

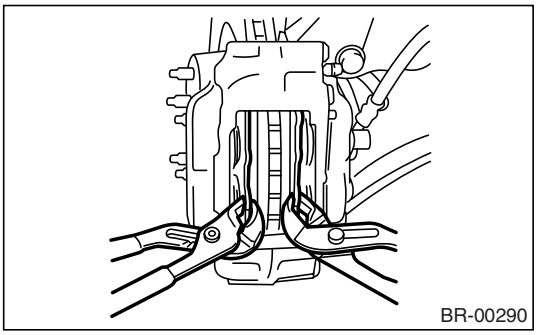
5) Remove the pad pins, then remove the cross spring.



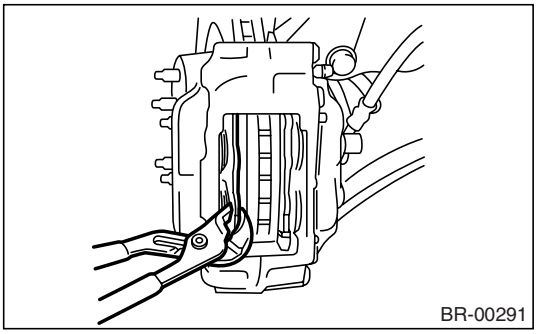
(1) Pad pin
(2) Cross spring

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6) Use a wrench to expand the pads, and then push the piston back.

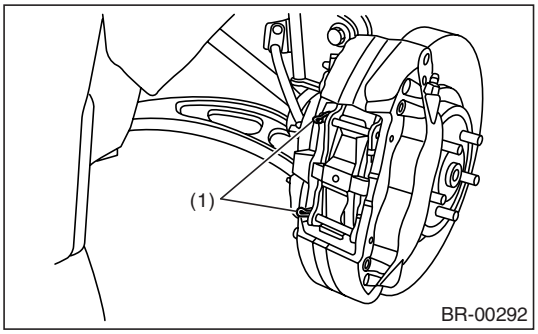


7) Remove the pad.



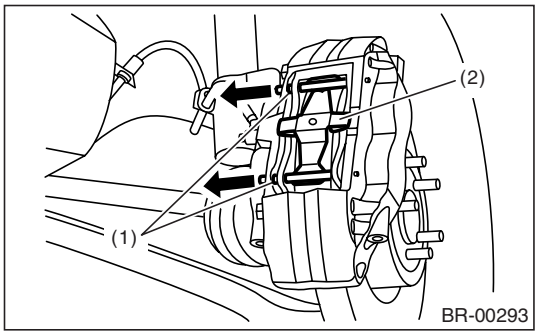
3. 17 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the clip.



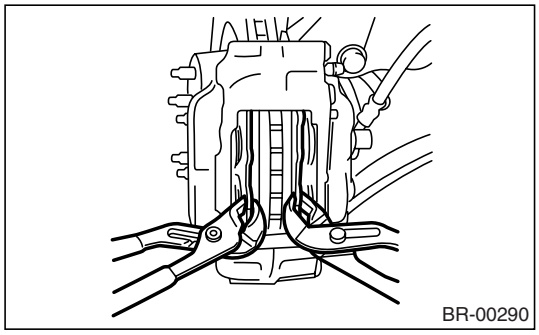
(1) Clip

5) Remove the pad pins and cross spring.

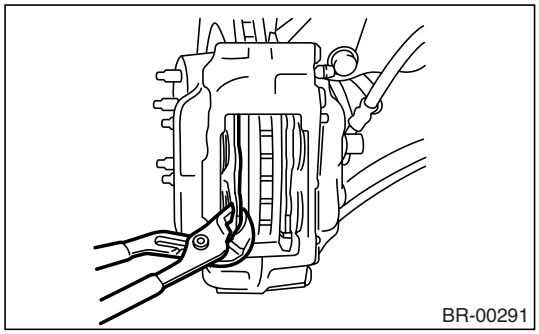


(1) Pad pin
(2) Cross spring

6) Use a wrench to expand the pads, and then push the piston back.



7) Remove the pad.

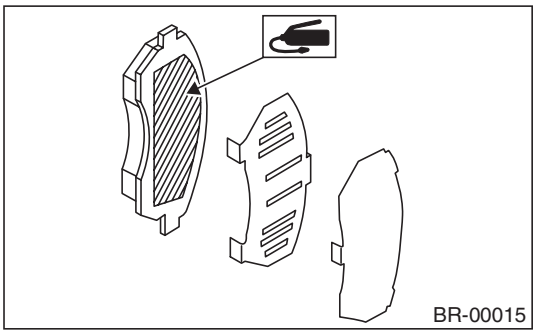


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B: INSTALLATION

1. 14 INCH AND 15 INCH TYPE

1) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



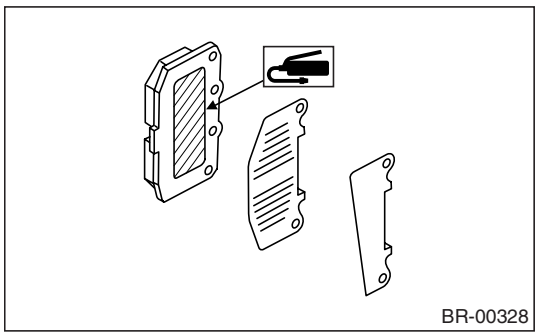
3) Install the pads on support.
4) Install the caliper body on support.

Tightening torque:
14 INCH TYPE
37 N·m (3.8 kgf-m, 27.5 ft-lb)
15 INCH TYPE
26.5 N·m (2.7 kgf-m, 19.6 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen the air bleeder to facilitate work.

2. 16 INCH TYPE

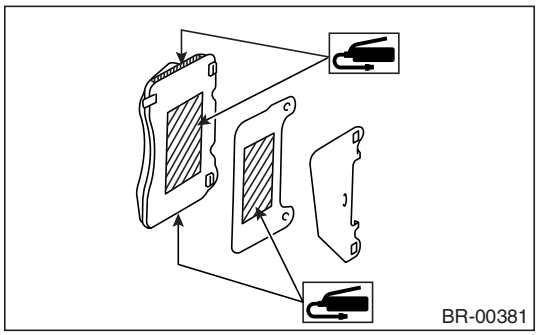
1) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



2) Install the pads on caliper body.
3) Install the pad pins on caliper body.
4) Install the M clip.
5) Install the cross spring.

3. 17 INCH TYPE

1) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad shim.

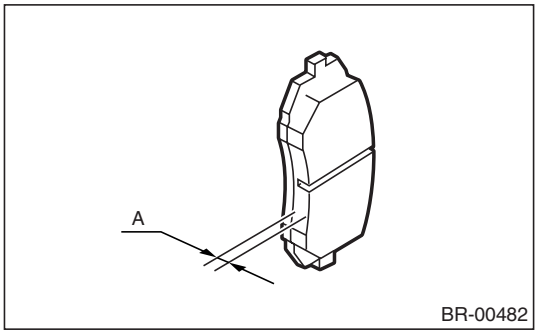


2) Install the pads on caliper body.
3) Install the cross spring.
4) Install the pad pins.
5) Install the clip.

C: INSPECTION

1. 14 INCH AND 15 INCH TYPE

Check the pad thickness A.



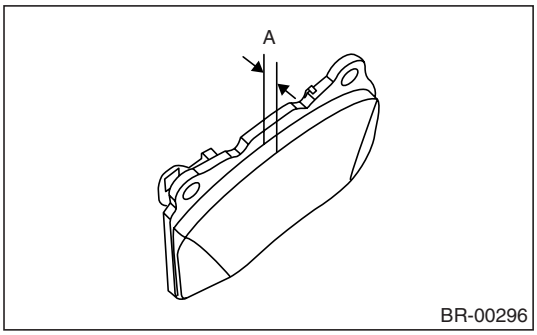
Pad thickness	Standard value	11 mm (0.43 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the 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.

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2. 16 INCH TYPE

Check the pad thickness A.

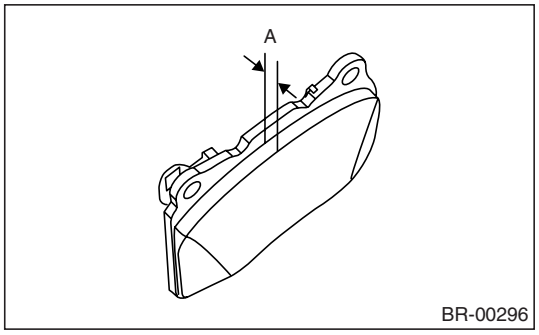


Pad thickness	Standard value	10 mm (0.393 in)
	Wear limit	1.5 mm (0.59 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the 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.

3. 17 INCH TYPE

Check the pad thickness A.



Pad thickness	Standard value	9.2 mm (0.362 in)
	Wear limit	1.2 mm (0.047 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the 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.

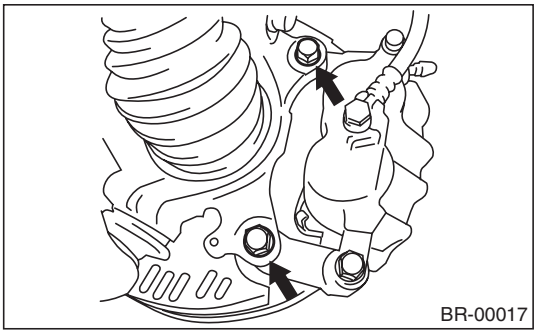
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3. Front Disc Rotor

A: REMOVAL

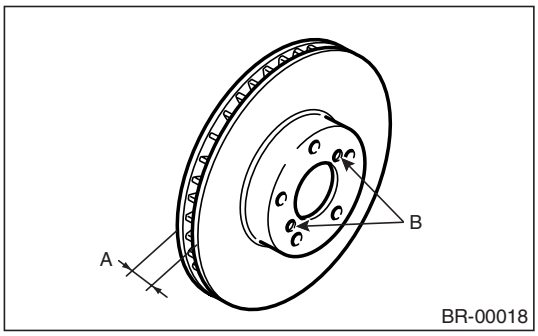
1. 14 INCH AND 15 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the caliper body and support from housing, and suspend it from strut using a wire.



5) Remove the disc rotor.

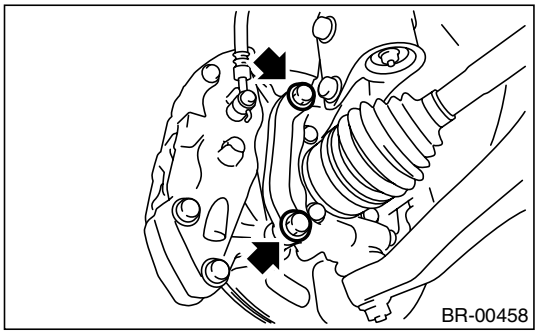
NOTE:
If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes (B) on rotor.



6) Clean mud and foreign particles from the caliper body assembly and support.

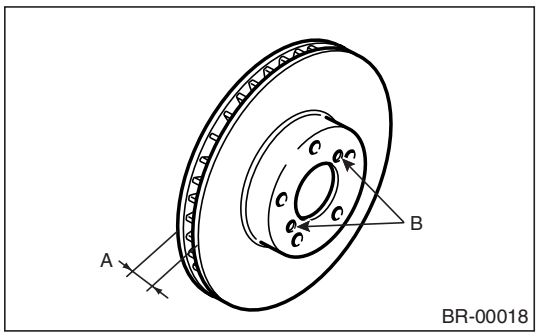
2. 16 INCH AND 17 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nut.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the caliper body assy and tie bar (17 inch type) from housing and suspend from strut using a wire.



5) Remove the disc rotor from hub.

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



6) Clean mud and foreign particles from the caliper body assembly and support.

B: INSTALLATION

1) Install the disc rotor.
2) Install the caliper body assy and tie bar (17 inch type) to housing.

CAUTION:
• When installing the caliper body and tie bar, temporarily tighten two bolts until the bolts cannot be tighten by hand, and then tighten them to specified torque with tool.
• Keep away oil such as grease or etc, from bolt.

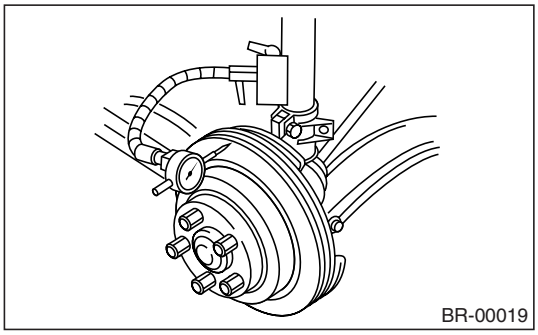
Tightening torque:
Except 17 inch type:
80 N·m (8.2 kgf-m, 59 ft-lb)
17 inch type:
155 N·m (15.8 kgf-m, 114.3 ft-lb)

3) Install the wheel.

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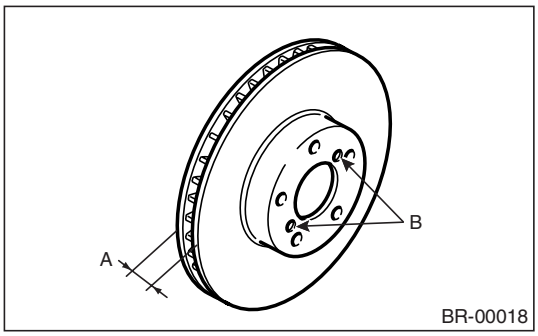
C: INSPECTION

1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-25, 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 rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout is above specified value, replace the disc rotor.


BR-00019

Disc rotor runout limit:
0.075 mm (0.0030 in)

4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor is outside the service limit, replace the disc rotor.



BR-00018

		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	14″	24 mm (0.94 in)	22 mm (0.87 in)	260 mm (10.24 in)
	15″	24 mm (0.94 in)	22 mm (0.87 in)	277 mm (10.91 in)
	16″	24 mm (0.94 in)	22 mm (0.87 in)	294 mm (11.57 in)
	17″	30 mm (1.18 in)	28 mm (1.10 in)	326 mm (12.83 in)

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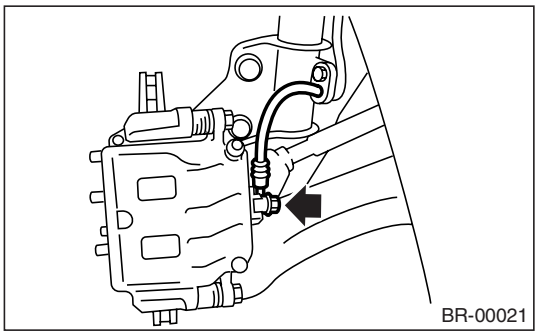
4. Front Disc Brake Assembly

A: REMOVAL

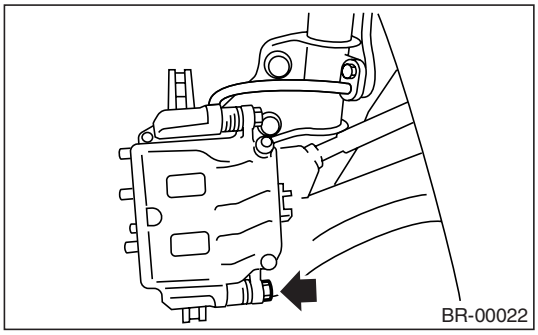
1. 14 INCH AND 15 INCH TYPE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the union bolt, and then disconnect the brake hose from caliper body assembly.

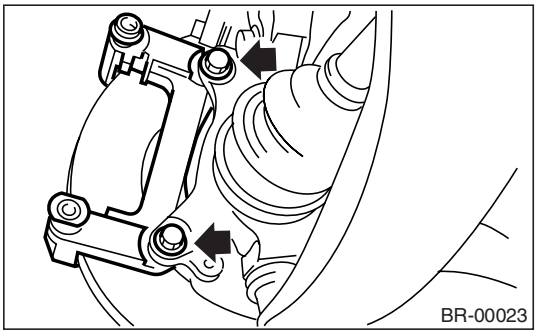


5) Remove the bolt securing lock pin to caliper body.



6) Raise the caliper body, and then move it toward vehicle center to separate it from support.
7) Remove the support from housing.

NOTE:
Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.

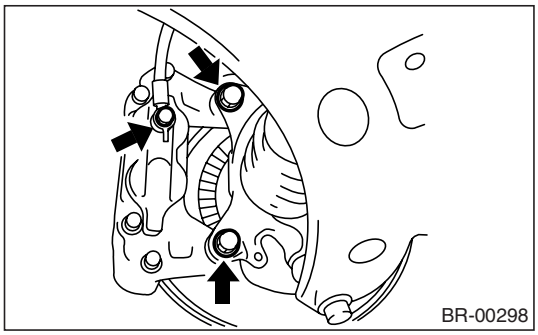


8) Clean mud and foreign particles from the caliper body assembly and support.

2. 16 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) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the union bolt, and then disconnect the brake hose from caliper body assembly.
5) Remove the caliper body from housing.



6) Clean mud and foreign particles from the caliper body assembly and support.

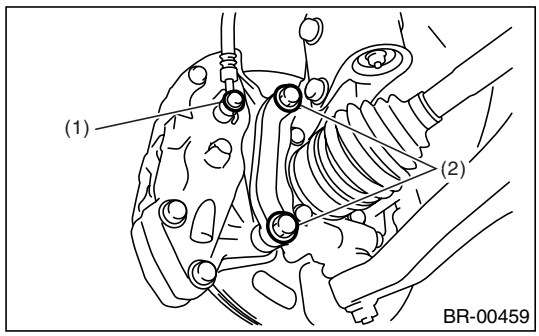
3. 17 INCH TYPE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.

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4) Remove the brake pads from caliper body. <Ref. to BR-26, 17 INCH TYPE, REMOVAL, Front Brake Pad.>.
5) Remove the union bolt (1) and brake hose from caliper body assembly.
6) Remove bolt (2) and tie bar from housing.



(1) Union bolt
(2) Installation bolt

7) Clean mud and foreign particles from the caliper body assembly.

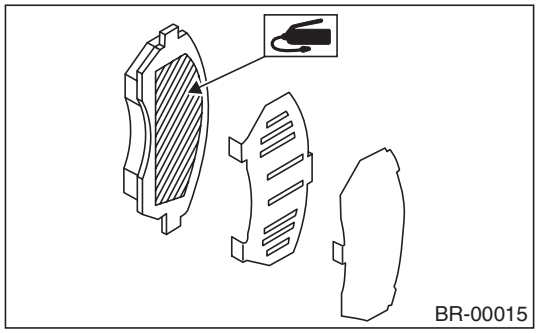
B: INSTALLATION

1. 14 INCH AND 15 INCH TYPE

1) Install the support on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
3) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and inner shim.



4) Install the pads on support.
5) Install the caliper body on support.

Tightening torque:
14 INCH TYPE
37 N·m (3.8 kgf-m, 27.5 ft-lb)
15 INCH TYPE
26.5 N·m (2.7 kgf-m, 1.96 ft-lb)

6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

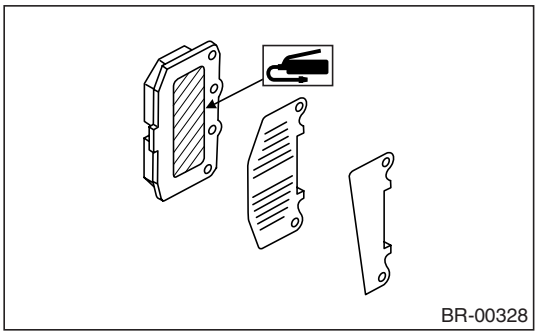
7) Bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>

2. 16 INCH TYPE

1) Install the caliper body on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



3) Install the pads on caliper body.
4) Install the pad pins and cross spring on caliper body.
5) Install the M clip.
6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

7) Bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>

3. 17 INCH TYPE

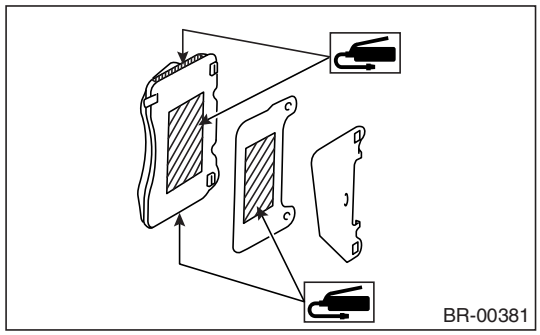
1) Install the caliper body assembly and tie bar on housing.

CAUTION:
• When installing the caliper body and tie bar, temporarily tighten two bolts until the bolts cannot be tighten by hand, and then tighten them to specified torque with tool.
• Keep away oil such as grease or etc, from bolt.

Tightening torque:
155 N·m (15.8 kgf-m, 114.3 ft-lb)

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2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad shim.



3) Install the pads on caliper body.
4) Install the cross spring.
5) Install the pad pins.
6) Install the clip.
7) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

8) Bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>

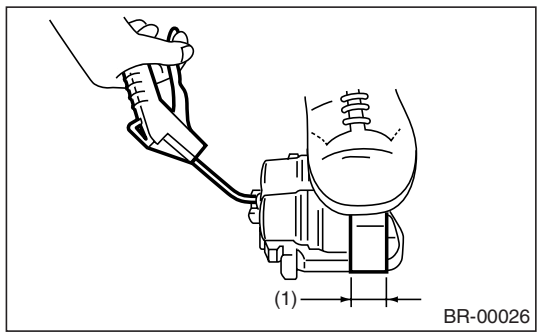
C: DISASSEMBLY

1. 14 INCH AND 15 INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly and 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 the installation hole of brake hose to force the piston out.

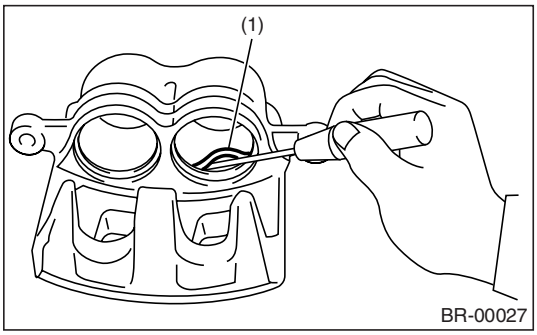


(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove the piston boot.

5) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



(1) Piston seal

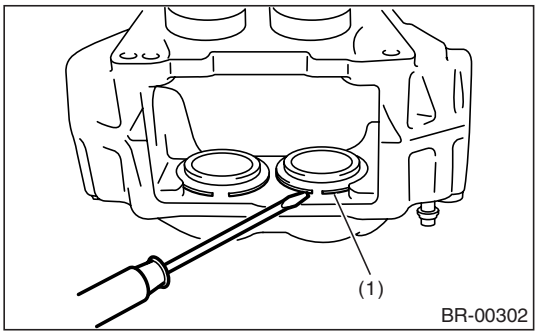
6) Remove the guide pin and boot from caliper body.

2. 16 INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly.

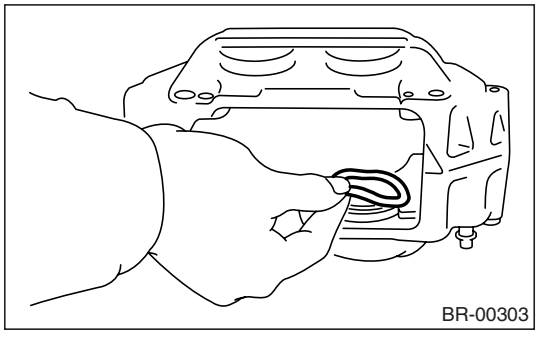
CAUTION:
Be careful not to allow foreign particles to enter the brake hose connector.

2) Using a standard screwdriver, remove the boot ring from piston.



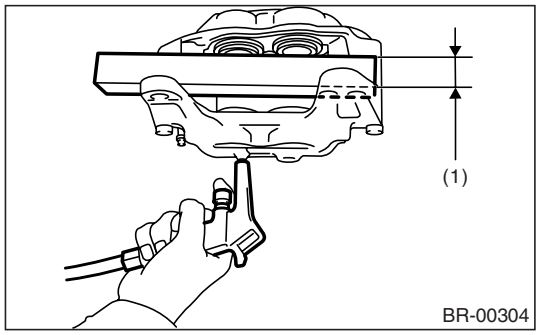
(1) Boot ring

3) Remove the boot from piston end.



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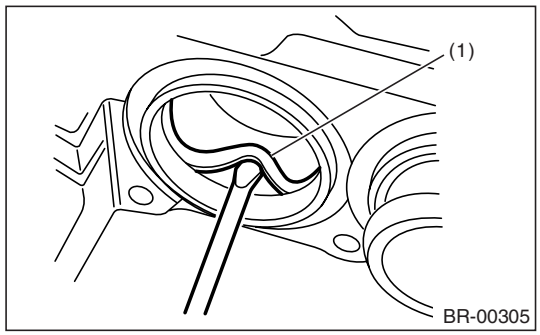
4) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
5) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

6) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



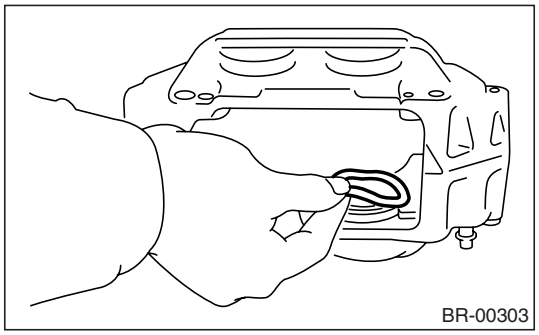
(1) Piston seal

3. 17 INCH TYPE

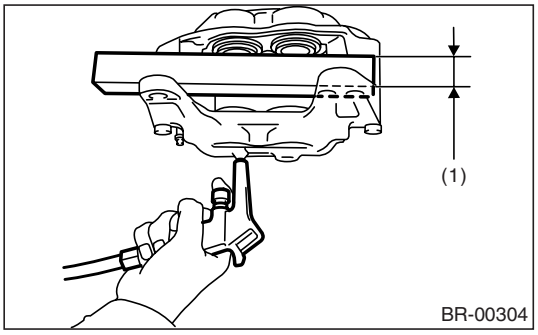
1) Clean mud and foreign particles from the caliper body assembly.

CAUTION:
Be careful not to allow foreign particles to enter the brake hose connector.

2) Remove the piston boots from each piston end.



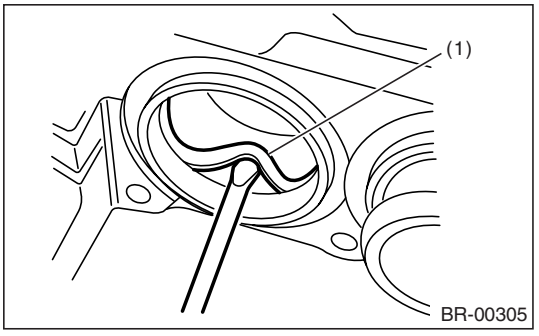
3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

5) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



(1) Piston seal

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D: ASSEMBLY

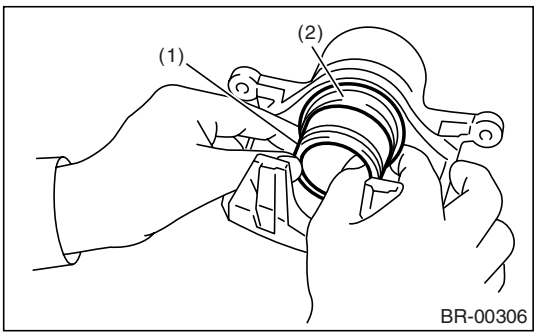
1. 14 INCH AND 15 INCH TYPE

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 install the piston boot to the groove on ends of cylinder.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

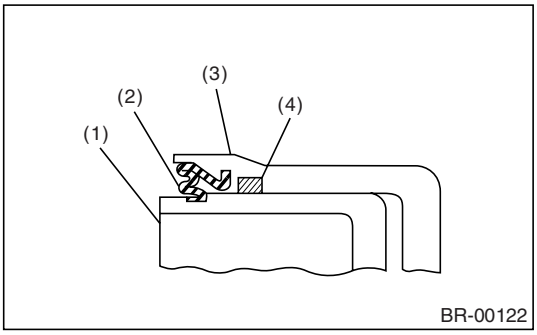
5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



(1) Piston
(2) Piston boot

6) Position the boot in grooves on cylinder and piston.

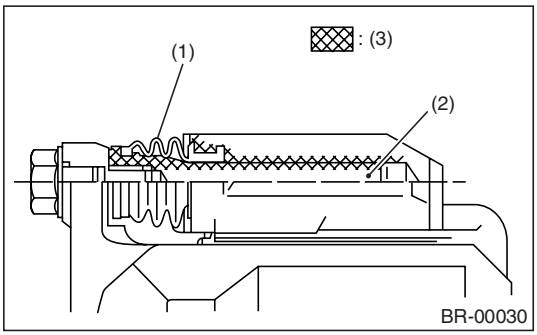


(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply a coat of specified grease to the lock pin and guide pin outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

8) Install the lock and guide pin boot on support.



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

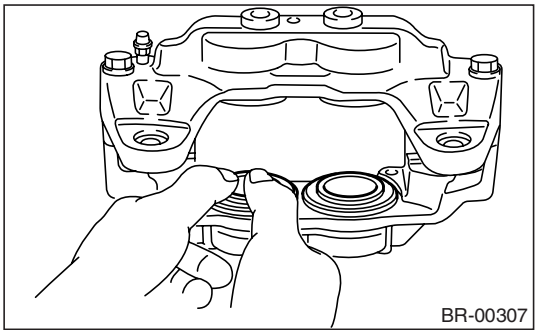
2. 16 INCH TYPE

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 groove on ends of cylinder and piston.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

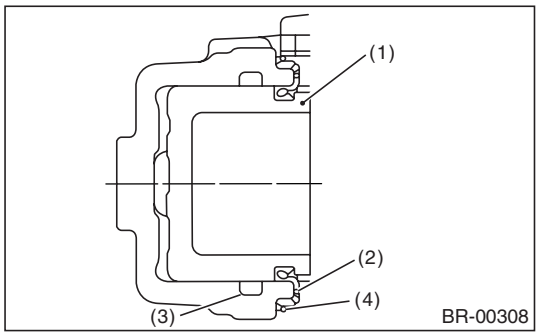
5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



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6) Position the boot in grooves on cylinder and piston.



(1) Piston
(2) Piston boot
(3) Piston seal
(4) Boot ring

7) Install the boot ring. Be careful not scratch the boot.

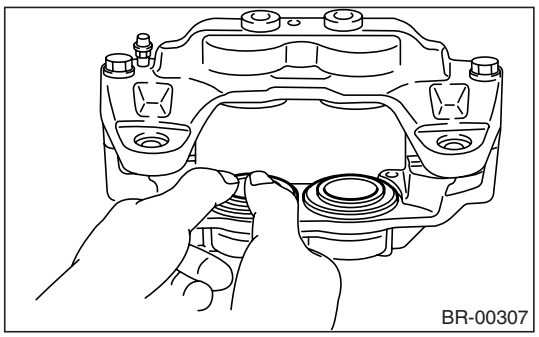
3. 17 INCH TYPE

1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal, and then install the 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 install it in the groove on piston.

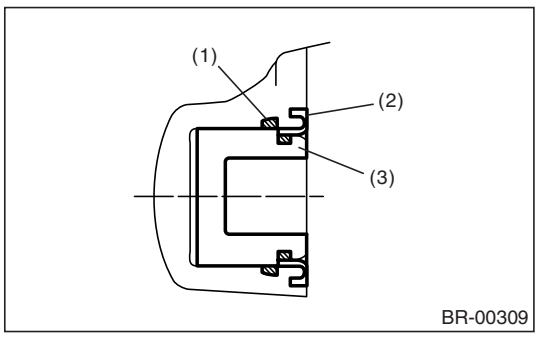
Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



6) Position the boot in grooves on cylinder and piston.



(1) Piston seal
(2) Piston boot
(3) Piston

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.

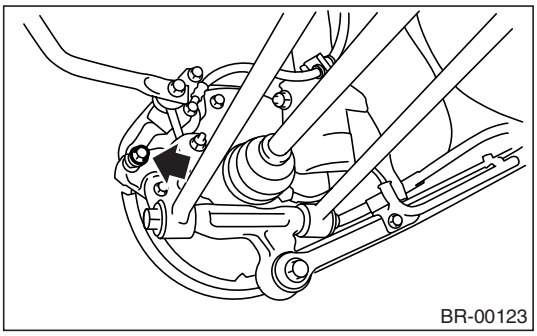
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5. Rear Brake Pad

A: REMOVAL

1. 14 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the rear wheel.
4) Remove the lower caliper bolt.

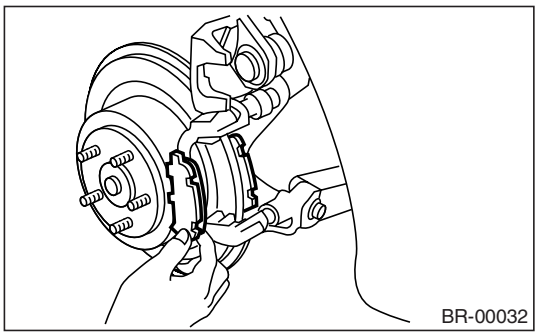


5) Raise the caliper body upward and support it.

NOTE:
Do not disconnect the brake hose from caliper body.

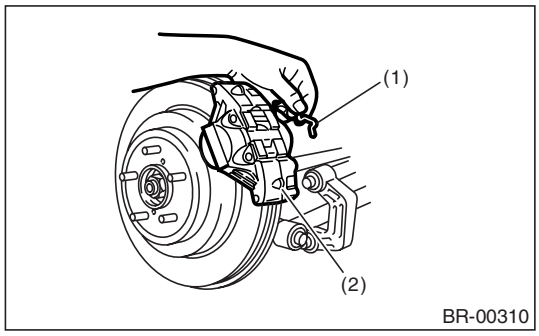
6) Remove the pad.

NOTE:
If the brake pad is difficult to remove, use the same procedure as for front disc brake pad.
<Ref. to BR-25, REMOVAL, Front Brake Pad.>



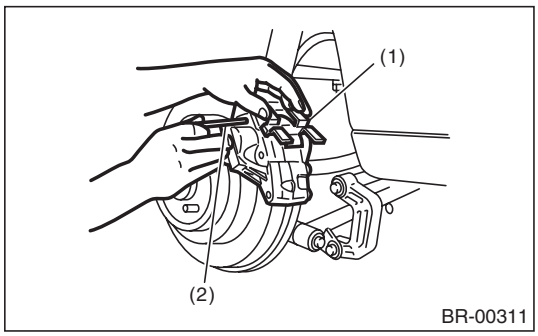
2. 15 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the rear wheel.
4) Remove the M clip.



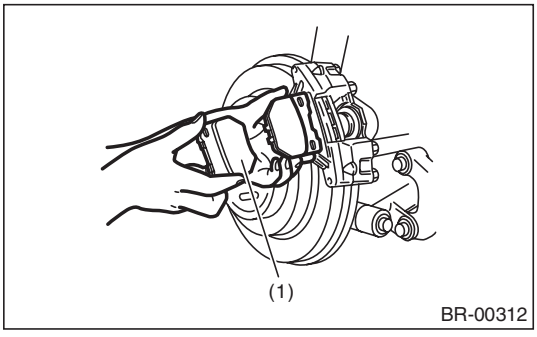
(1) M clip
(2) Caliper

5) Remove the two pad pins.
6) Remove the cross spring.



(1) Cross spring
(2) Pad pin

7) Expand the pads and push piston back.
8) Remove the pad and shim.

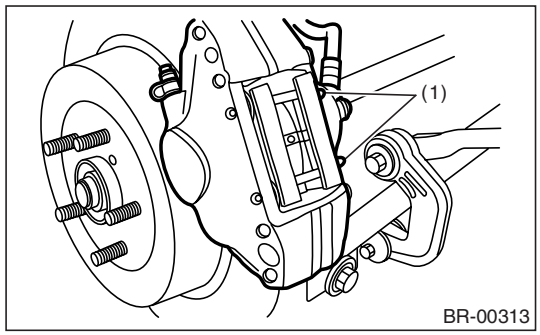


(1) Brake pad

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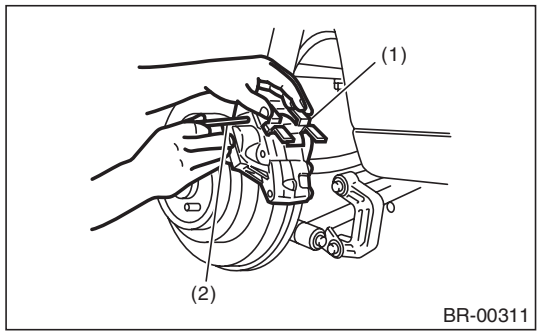
3. 17 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the rear wheel.
4) Remove the clip.



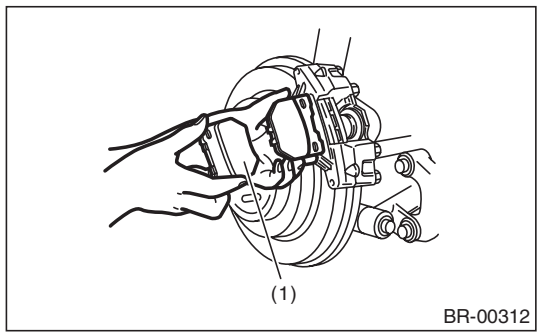
(1) Clip

5) Remove the pad pins and cross spring.



(1) Cross spring
(2) Pad pin

6) Expand the pads and push piston back.
7) Remove the pad.



(1) Rear brake pad

B: INSTALLATION

1. 14 INCH TYPE

1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
2) Install the pad on support.
3) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen air bleeder to facilitate work.

2. 15 INCH TYPE

1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to frictional portion between pad and pad inner shim.
2) Install the pads on caliper body.
3) Install the cross spring.
4) Install the pad pins on caliper body.
5) Install the M clip.

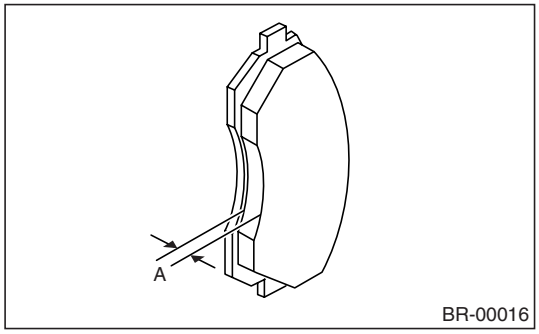
3. 17 INCH TYPE

1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to frictional portion between pad and pad inner shim.
2) Install the pads on caliper body.
3) Install the cross spring and pad pins.
4) Install the Clip.

C: INSPECTION

1. 14 INCH TYPE

Check pad thickness A.



Pad thickness	Standard value	9.0 mm (0.354 in)
	Wear limit	1.5 mm (0.059 in)

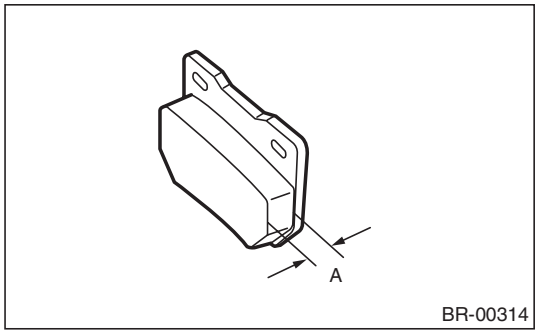
NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the pad clips if they are twisted or worn.

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• 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.

2. 15 INCH TYPE

Check the pad thickness A.

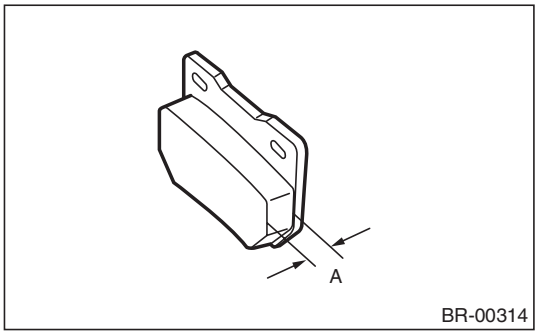


Pad thickness	Standard value	11.5 mm (0.452 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the 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.

3. 17 INCH TYPE

Check the pad thickness A.



Pad thickness	Standard value	9.0 mm (0.354 in)
	Wear limit	1.2 mm (0.047 in)

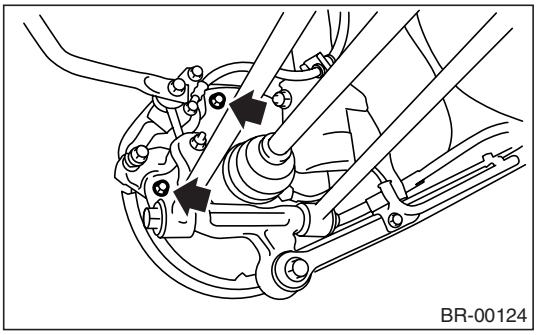
NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking 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.

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6. Rear Disc Rotor

A: REMOVAL

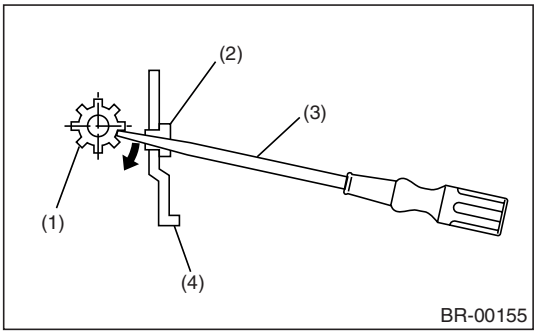
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Pull down and release the parking brake.
5) Remove the two mounting bolts, and then remove the disc brake assembly.



6) Suspend the disc brake assembly so that hose is not stretched.
7) Remove the disc rotor.

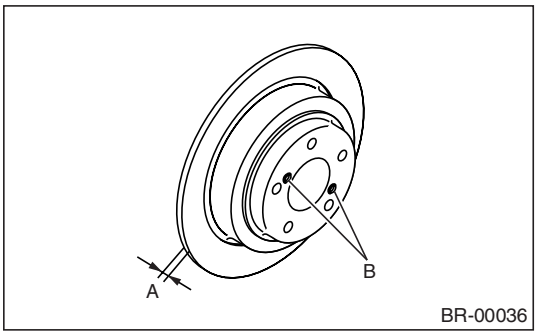
NOTE:
If the disc rotor is difficult to remove try following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until 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 installing an 8-mm bolt in holes B on rotor.

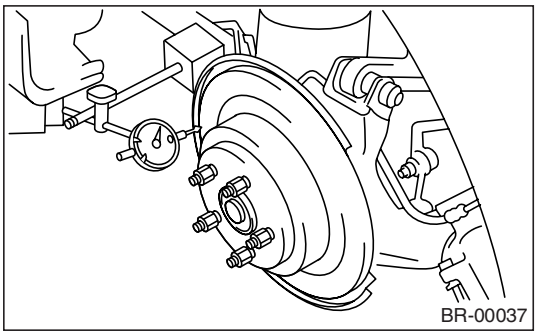


B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the parking brake. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

C: INSPECTION

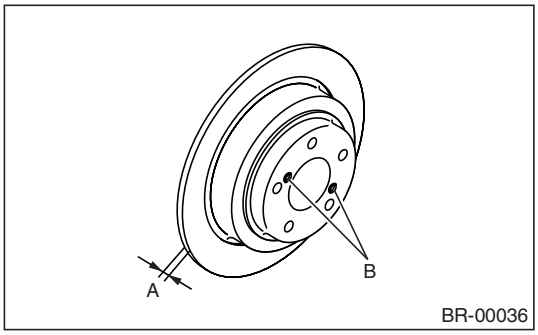
1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-36, INSPECTION, Rear Axle [AWD Model].> <Ref. to DS-38, INSPECTION, Rear Axle [FWD Model].>
2) Secure the disc rotor by tightening five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout is above specified value, replace the disc rotor.



Disc rotor runout limit:
0.070 mm (0.0027 in)

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4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor is outside the service limit, replace the disc rotor.



		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	14″	10 mm (0.39 in)	8.5 mm (0.335 in)	266 mm (10.47 in)
	15″	18 mm (0.71 in)	16 mm (0.63 in)	290 mm (11.42 in)
	17″	20 mm (0.79 in)	18 mm (0.71 in)	316 mm (12.44 in)

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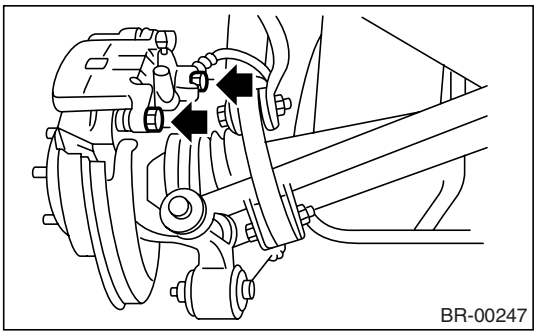
7. Rear Disc Brake Assembly

A: REMOVAL

1. 14 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) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Disconnect the brake hose from caliper body assembly.
5) Remove the bolt securing lock pin to caliper body.



6) Raise the caliper body and move it toward vehicle center to separate it from support.
7) Remove the support from housing.

NOTE:
Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.

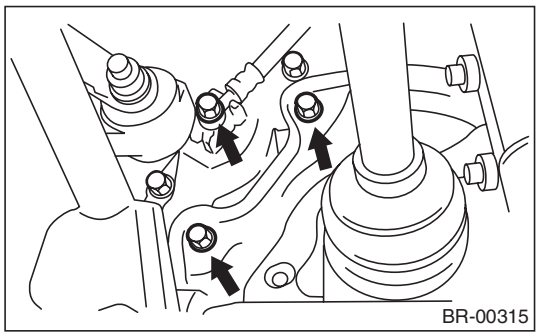
8) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter brake hose connector.

2. 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) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Remove the pads from caliper body. <Ref. to BR-37, REMOVAL, Rear Brake Pad.>
5) Disconnect the brake hose from caliper body assembly.
6) Remove the caliper body from housing.



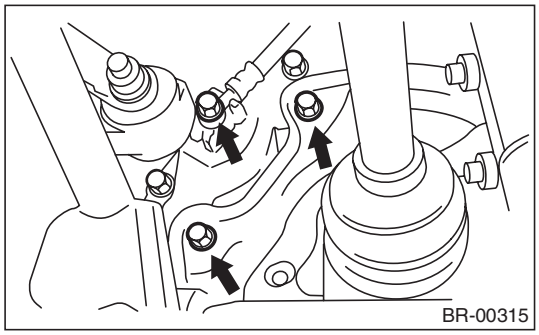
7) Clean mud and foreign particles from the caliper body assembly.

CAUTION:
Be careful not to allow foreign particles to enter brake hose connector.

3. 17 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) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Remove the brake pads from caliper body. <Ref. to BR-38, 17 INCH TYPE, REMOVAL, Rear Brake Pad.>
5) Disconnect the brake hose from caliper body.
6) Remove the caliper body from housing.



7) Clean mud and foreign particles from the caliper body.

CAUTION:
Be careful not to allow foreign particles to enter brake hose connector.

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B: INSTALLATION

1. 14 INCH TYPE

1) Install the support on housing.

Tightening torque:
53 N·m (5.4 kgf-m, 39.1 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
3) Install the pads on support.
4) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

5) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

6) Bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>

2. 15 INCH TYPE

1) Install the caliper body on housing.

Tightening torque:
53 N·m (5.4 kgf-m, 39.1 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
3) Install the pads on caliper body.
4) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

5) Bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>

3. 17 INCH TYPE

1) Install the caliper body on housing.

Tightening torque:
65 N·m (6.6 kgf-m, 47.9 ft-lb)

2) Install the pads on caliper body.
3) Replace the brake hose gaskets with new ones, and then connect the brake hose.

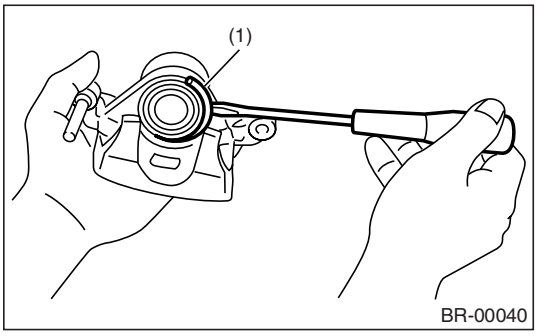
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

4) Bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>

C: DISASSEMBLY

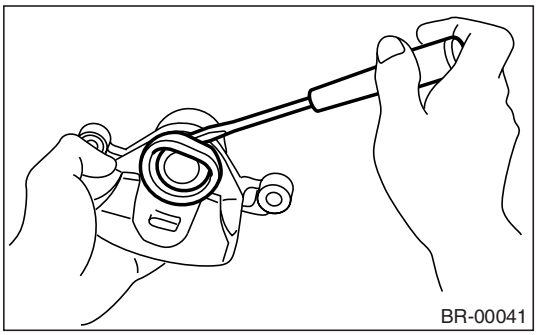
1. 14 INCH TYPE

1) Remove the boot ring.

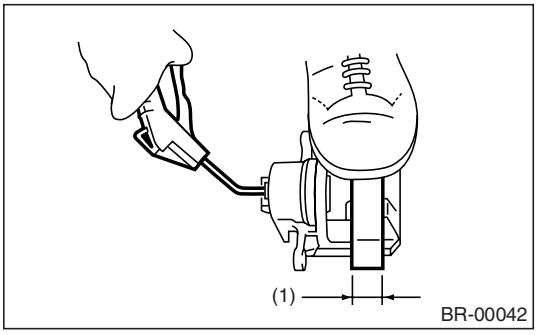


(1) Boot ring

2) Remove the piston boot.



3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.

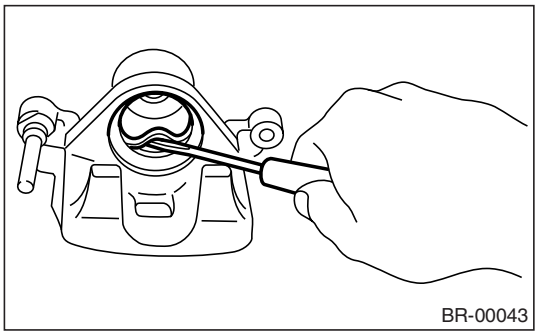


(1) Place a 30 mm (1.18 in) wide wooden block here.

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5) Remove the piston seal from caliper body cylinder.

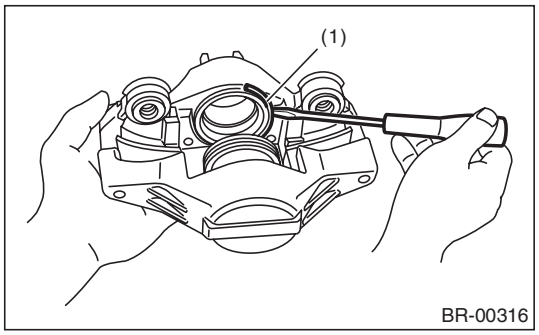
CAUTION:
Do not damage the cylinder and piston seal groove.



6) Remove the lock pin sleeve and boot from caliper body.

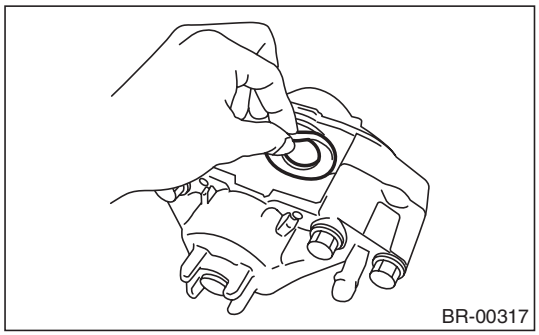
2. 15 INCH TYPE

1) Remove the boot ring.



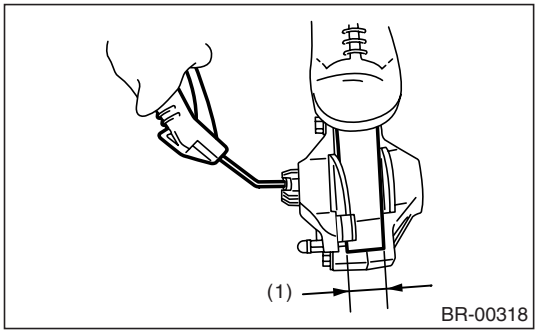
(1) Boot ring

2) Remove the piston boot.



3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

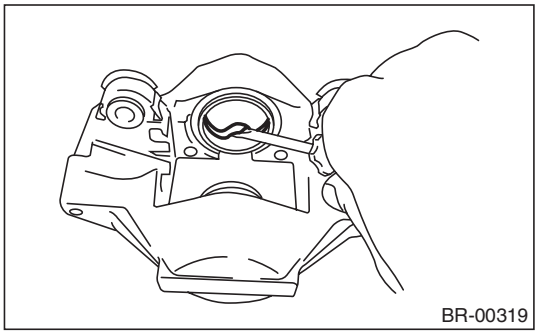
4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

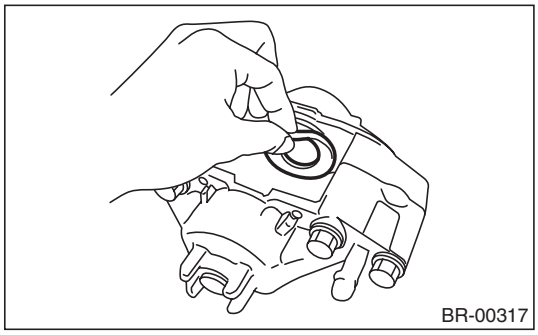
5) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



3. 17 INCH TYPE

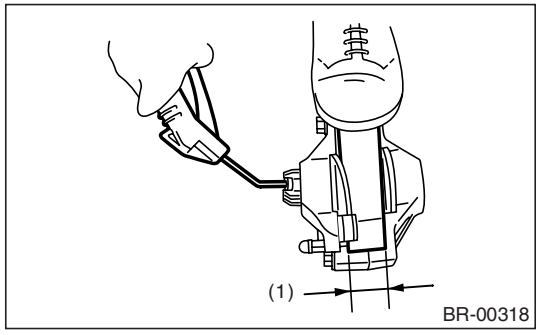
1) Remove the piston boot from piston end.



2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

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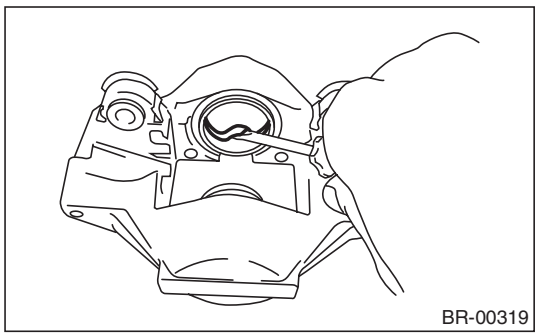
3) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 20 mm (0.79 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



D: ASSEMBLY

1. 14 INCH TYPE

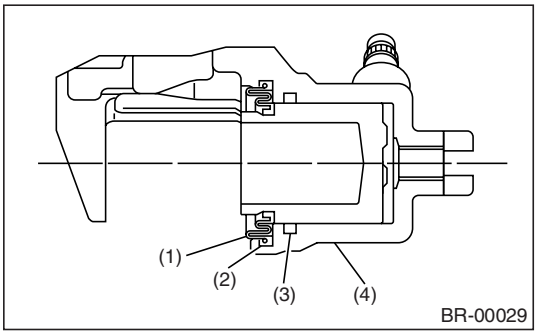
1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Insert the piston into cylinder.

CAUTION:
Do not force piston into cylinder.

5) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

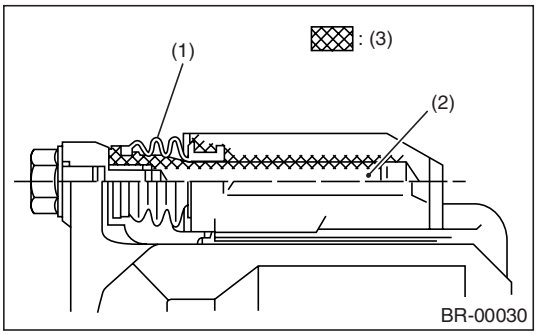
6) Install the piston boot to caliper body, and then attach boot ring.



(1) Piston boot
(2) Boot ring
(3) Piston seal
(4) Caliper body

7) Apply a coat of specified grease to the guide pin, outer surface, sleeve outer surface, cylinder inner surface, 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 place.

2. 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 install it in the groove on piston.

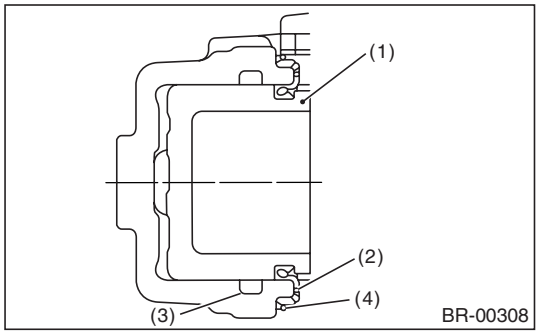
Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

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5) Insert the piston into cylinder.

CAUTION:
Do not force piston into cylinder.

6) Install the piston boot to the caliper body, and then attach boot ring.



(1) Piston
(2) Piston boot
(3) Piston seal
(4) Boot ring

3. 17 INCH TYPE

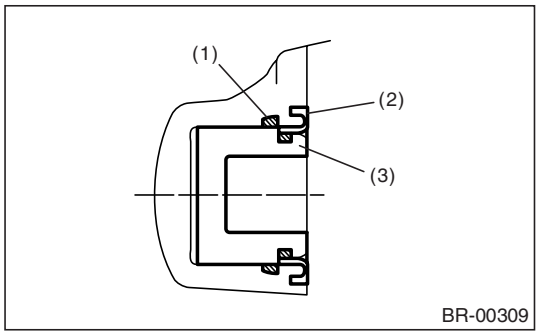
1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and install the piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and install it in the groove on piston.

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 grooves on cylinder and piston.



(1) Piston seal
(2) Piston boot
(3) Piston

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.

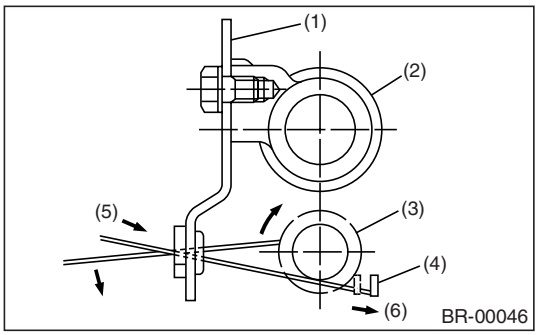
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8. Rear Drum Brake Shoe

A: REMOVAL

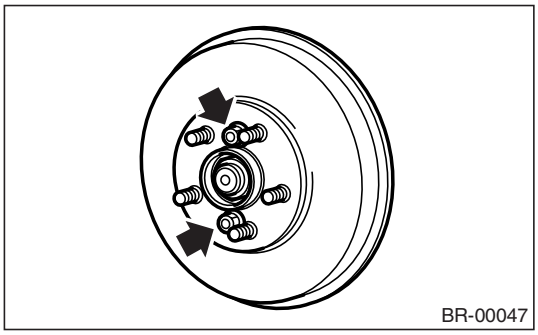
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly.

NOTE:
• If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn adjuster assembly pawls using a flat tip screwdriver until brake shoe separates from the drum.

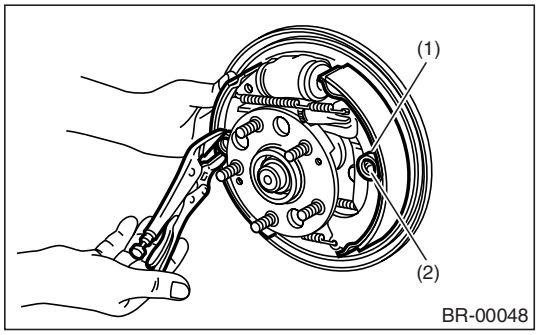


(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push.

• If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.

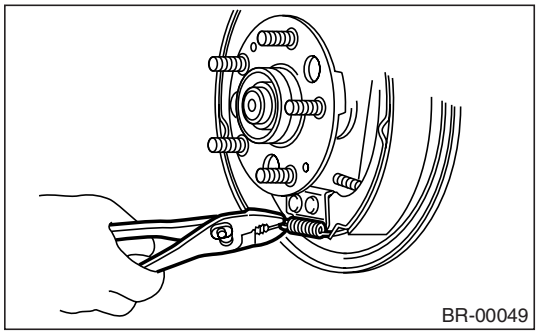


6) Hold the hold-down pin by securing rear of back plate with your hand.



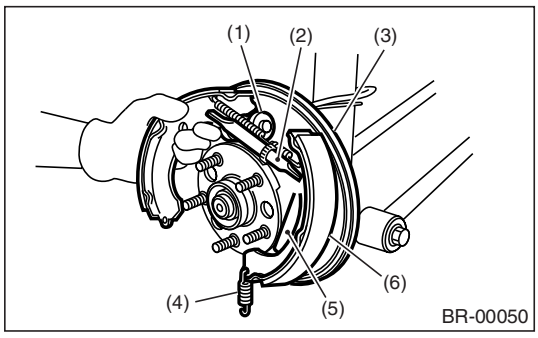
(1) Hold-down cup
(2) Hold-down pin

7) Disconnect the hold-down cup from hold-down pin by rotating hold-down cup.
8) Disconnect the lower shoe return spring from shoes.



9) Remove the shoes one by one from back plate with adjuster.

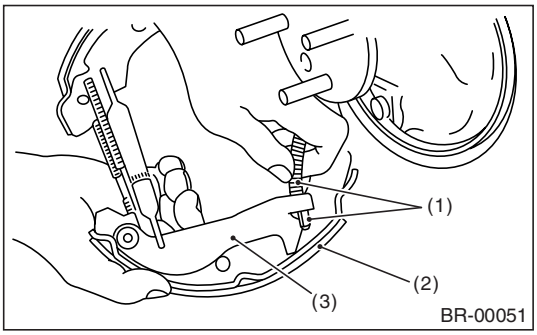
CAUTION:
Be careful not to bend the parking brake cable excessively when removing brake shoes.



(1) Wheel cylinder
(2) Adjuster
(3) Back plate
(4) Lower shoe return spring
(5) Parking lever
(6) Trailing shoe

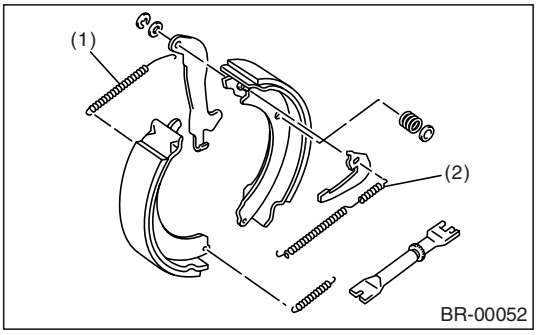
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10) Disconnect the parking brake cable from parking lever.



(1) Parking brake cable
(2) Trailing shoe
(3) Parking brake lever

11) Remove the upper shoe return spring and adjusting spring from brake shoe.

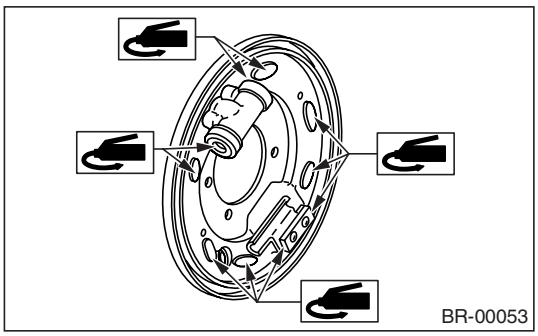


(1) Upper shoe return spring
(2) Adjusting spring

B: INSTALLATION

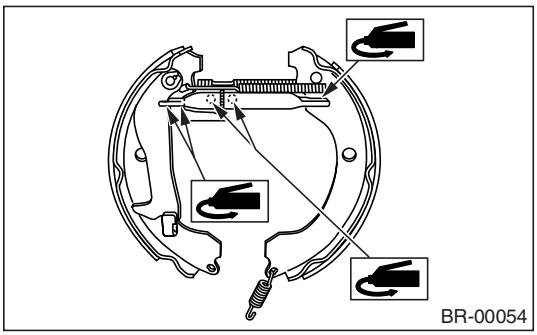
1) Clean the back plate and wheel cylinder.
2) Apply grease to portions indicated by arrows in the figure.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)

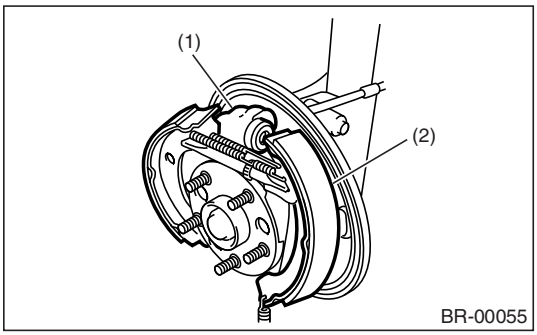


3) Apply grease to the adjusting screw and both ends of adjuster.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)



4) Connect the upper shoe return spring to shoes.
5) Connect the parking brake cable to parking lever.
6) While positioning the shoes (one at a time) in groove on wheel cylinder, secure the shoes.



(1) Wheel cylinder
(2) Shoe (Trailing)

7) Fix the shoes by connecting hold-down cup to hold-down pin.
8) Connect the lower shoe return spring.
9) Set the outside diameter of brake shoes less than 0.5 to 0.8 mm (0.020 to 0.031 in) in comparison with inside diameter of brake drum.

C: INSPECTION

1) Measure the lining thickness. If the thickness of lining is outside the service limit, replace the shoes.

Lining thickness:
Standard 4.1 mm (0.161 in)
Service limit 1.5 mm (0.059 in)

2) If the deformation or wear of back plate, shoe, etc. are notable, replace them.
3) When the shoe return spring tension is excessively weakened, replace it, taking care to identify the upper and lower springs.

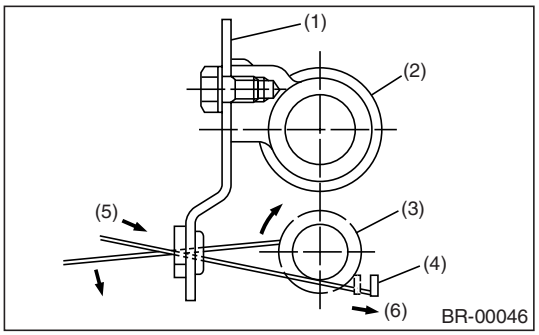
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9. Rear Drum Brake Drum

A: REMOVAL

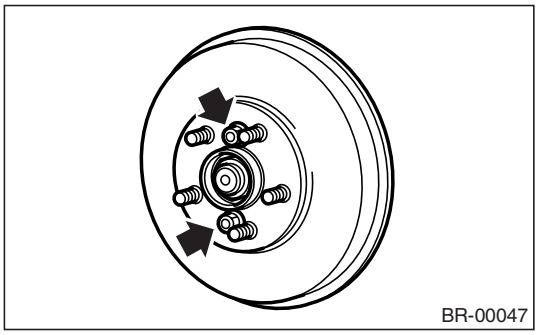
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly.

NOTE:
• If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn the adjuster assembly pawls using a flat tip screwdriver until brake shoe separates from drum.



(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push.

• If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in the brake drum.



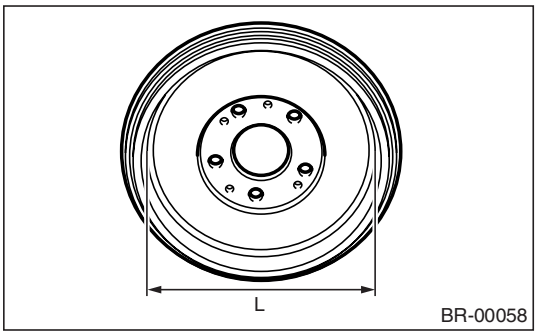
B: INSTALLATION

Set the outside diameter of brake shoes less than 0.5 to 0.8 mm (0.020 to 0.031 in) in comparison with inside diameter of brake drum.

C: INSPECTION

1) If the inside surface of brake drum is streaked, correct the surface. And, if it is unevenly worn, taperingly streaked, or the outside surface of brake drum is damaged, correct or replace it.
2) Measure the drum inner diameter. If the inner diameter of drum is outside the service limit, replace the drum.

Drum inner diameter L:
Standard 228.6 mm (9 in)
Service limit 230.6 mm (9.08 in)



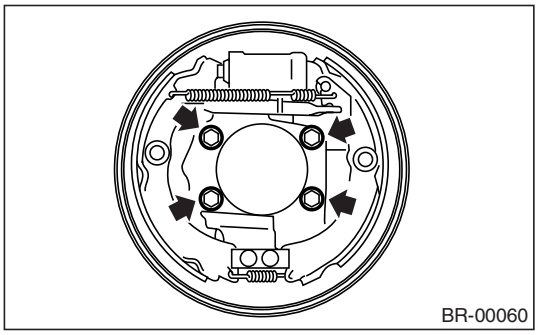
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10.Rear Drum Brake Assembly

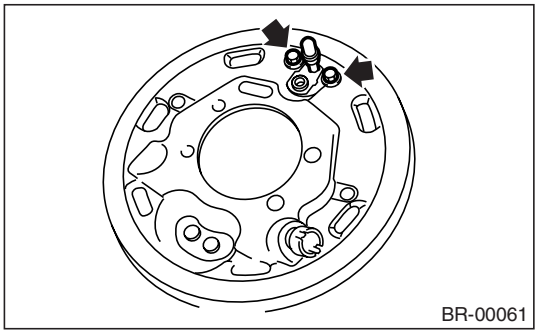
A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly. <Ref. to BR-49, REMOVAL, Rear Drum Brake Drum.>
6) Remove the brake shoe. <Ref. to BR-47, REMOVAL, Rear Drum Brake Shoe.>
7) Disconnect the brake hose. <Ref. to BR-65, REAR BRAKE HOSE (DRUM BRAKE), REMOVAL, Brake Hose.>
8) Remove the hub. <Ref. to DS-28, REMOVAL, Rear Axle [AWD Model].> <Ref. to DS-37, REMOVAL, Rear Axle [FWD Model].>
9) Disconnect the ABS wheel speed sensor from back plate.
10) Remove the brake assembly.


BR-00060

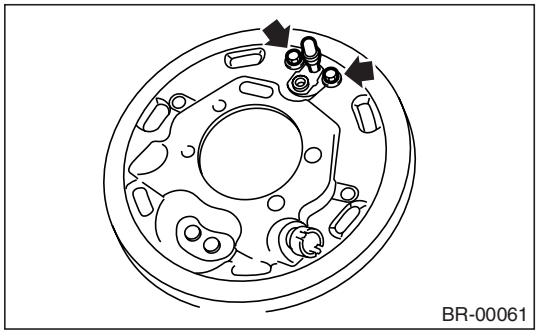
11) Remove the bolts installing wheel cylinder on back plate, and remove it.


BR-00061

B: INSTALLATION

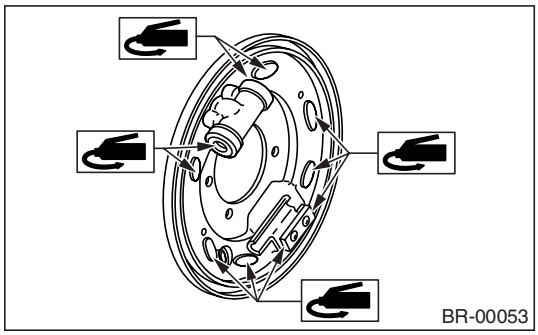
1) Clean the back plate and wheel cylinder.
2) Install the wheel cylinder on back plate, and tighten bolts.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


BR-00061

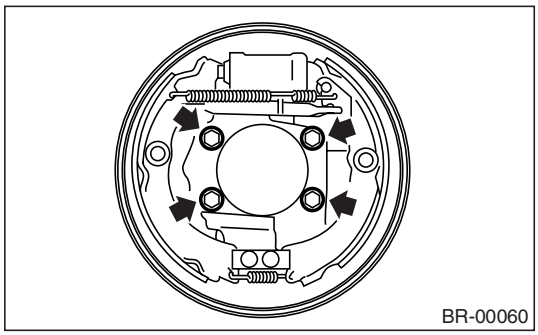
3) Apply grease to the portions indicated by arrows in the figure.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)


BR-00053

4) Install the brake assembly on housing, and tighten the bolts to install back plate.

Tightening torque:
53 N·m (5.4 kgf-m, 39.1 ft-lb)


BR-00060

5) Install the hub. <Ref. to DS-31, INSTALLATION, Rear Axle [AWD Model].> <Ref. to DS-37, INSTALLATION, Rear Axle [FWD Model].>

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6) Connect the brake hose, and tighten the brake hose flange nut.

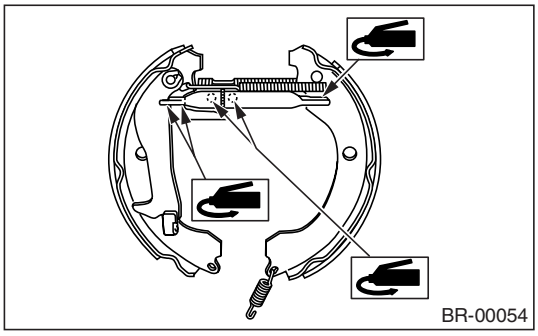
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

7) Connect the ABS wheel speed sensor to back plate.

Tightening torque:
32 N·m (3.3 kgf-m, 23.6 ft-lb)

8) Apply grease to the adjusting screw and both ends of adjuster.

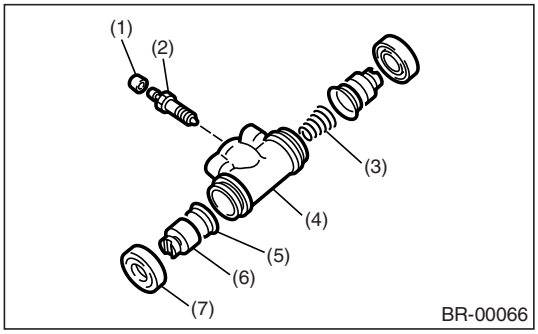
Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)



9) Install the brake shoe. <Ref. to BR-48, INSTALLATION, Rear Drum Brake Shoe.>
10) Install the brake drum. <Ref. to BR-49, INSTALLATION, Rear Drum Brake Drum.>
11) After installing the brake assembly, bleed air from the brake line. <Ref. to BR-63, Air Bleeding.>

C: DISASSEMBLY

1) Remove the right and left dust boots from wheel cylinder.



(1) Bleeder cap
(2) Bleeder screw
(3) Spring
(4) Cylinder
(5) Cup
(6) Piston
(7) Boot

2) Remove the piston, cup, spring and air bleeder screw and cap.

D: ASSEMBLY

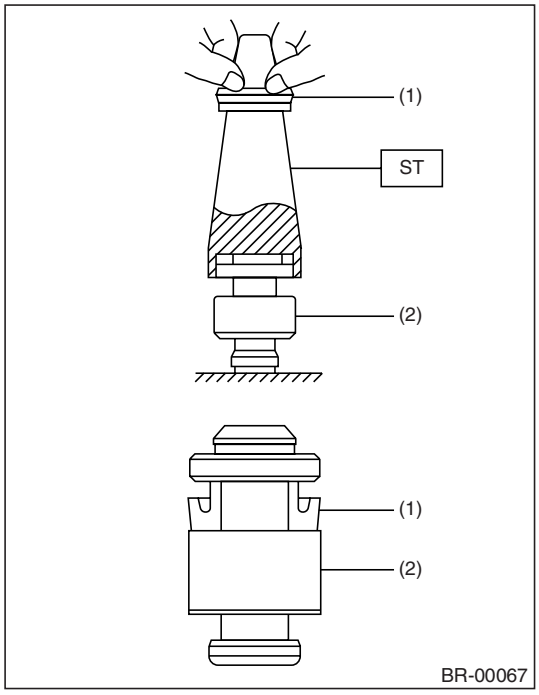
1) Clean all parts in brake fluid. Check and replace the faulty parts.
- Cup and boot for damage or fatigue
- Cylinder, piston and spring or damage or rust formation

2) Assemble in the reverse order of disassembly.
(1) When installing the cup, use ST, apply brake fluid to the frictional surface for smooth installation and pay attention to cup direction.
(2) STs are available in different sizes.

CAUTION:
When replacing the repair kit, make sure that the sizes of cylinder and cup are same as those which were replaced.

ST: ADAPTER	
Applicable size	Part No.
11/16″	925460000

CAUTION:
While assembling, be careful to prevent any metal chip, dust or dirt from entering the wheel cylinder.



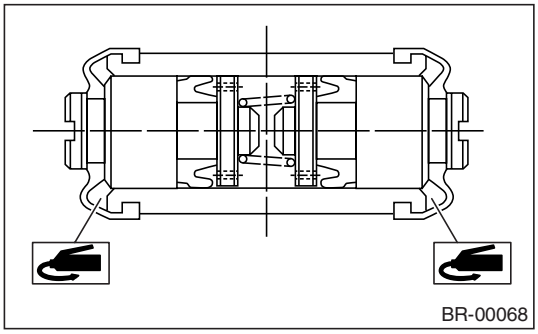
(1) Cup
(2) Piston

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3) Apply rubber grease to the boot inside as shown in the figure.

CAUTION:
Never use brake grease.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



E: INSPECTION

If the deformation or wear of back plate, shoe, etc. are notable, replace them.

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11.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 brake fluid from reservoir tank.
2) Disconnect the fluid level indicator harness connector.
3) Remove the brake pipes from master cylinder.
4) Remove the master cylinder mounting nuts, and take out master cylinder from brake booster.

B: INSTALLATION

1) To install the master cylinder to body, reverse the sequence of removal procedure.

Tightening torque:
Master cylinder mounting nut
14 N·m (1.4 kgf-m, 10.3 ft-lb)
Piping flare nut
15 N·m (1.5 kgf-m, 11.1 ft-lb)

CAUTION:
Be sure to use recommended brake fluid.

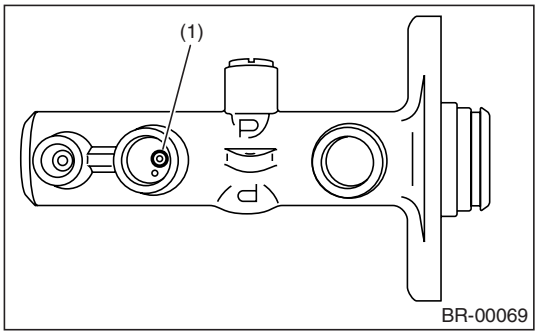
2) Bleed air from the brake system. <Ref. to BR-63, PROCEDURE, Air Bleeding.>

C: DISASSEMBLY

1) Remove mud and dirt from the surface of brake master cylinder.
2) Secure the master cylinder on a vise.

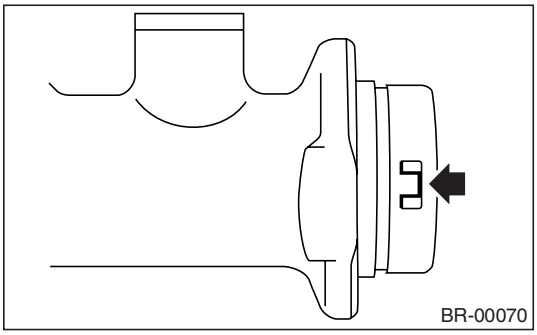
NOTE:
To avoid damaging master cylinder use aluminum plate while holding with vise.

3) Remove the pin which secures reservoir tank to master cylinder, and then remove the reservoir tank and seal.
4) Remove the cylinder pin with magnetic pick-up tool while pushing in primary piston by screwdriver which wrapped with tape. (Model with ABS)



(1) Cylinder pin (straight pin)

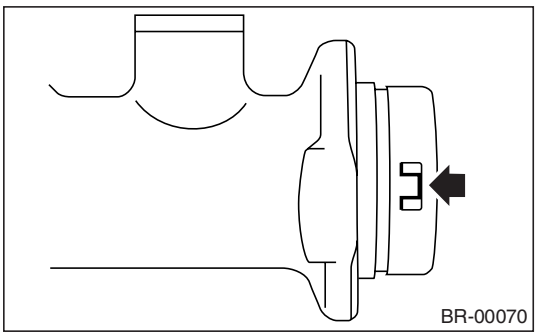
5) Pry up the pawl, and then remove the piston retainer. Hold piston retainer tight, because the piston may jump out from master cylinder.



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 and wear. Replace the master cylinder as assembly if faulty.

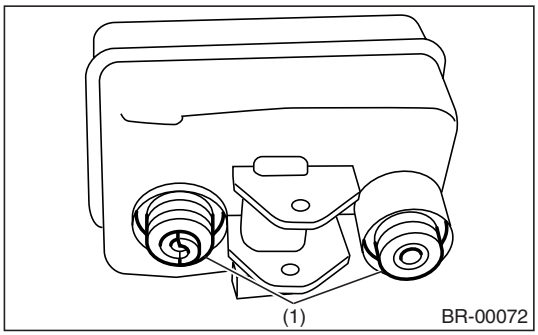
D: ASSEMBLY

1) Apply recommended brake fluid to the inside wall of cylinder, and to outer surface of the piston assembly.
2) Ensure that the inside wall of cylinder, and piston assembly are free from dirt when assembling. Install the primary piston assembly and secondary piston assembly, while taking care not to damage, scratch, or dent the cylinder inside wall, and piston assembly.
3) Install the cylinder pin while pushing in primary piston by screwdriver which wrapped with tape. (Model with ABS)
4) Install the piston retainer, and then secure it by pressing the pawl.



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5) Install the seal to reservoir tank.



(1) Seal

6) Install the reservoir tank to master cylinder and secure with pin.

E: INSPECTION

Inspect for oil leakage from the master cylinder.

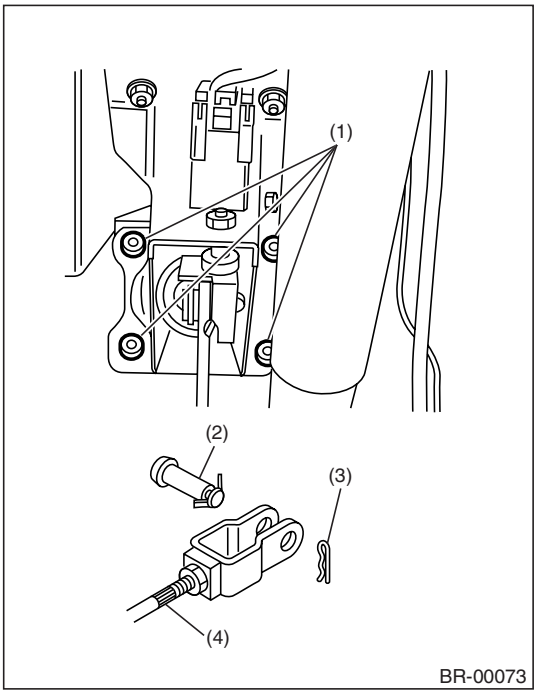
NOTE:
After replacing piston kit; when the oil leakage is found without damaging or scratching the inside of cylinder wear of master cylinder inner wall may be the cause. In this case, replace the master cylinder as assembly.

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12.Brake Booster

A: REMOVAL

1) Remove or disconnect the following parts at engine compartment.
   (1) Disconnect the connector for brake fluid level indicator.
   (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



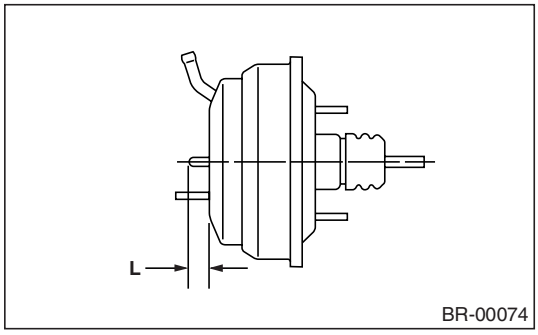
(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

CAUTION:
The clevis pin must be replaced with a new one whenever it is removed.

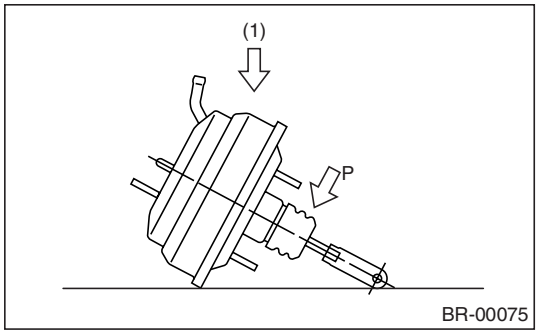
3) Remove the brake booster while shunning brake pipes.

NOTE:
• Be careful not to drop the brake booster. The brake booster should be discarded if it has been dropped.
• Use special care when handling the operating rod.
If excessive force is applied to the 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 floor.
• Do not change the push rod length. If it has been changed, reset the projected length “L” to standard length.

Standard L:
Europe model BASE and TS model:
10.4 mm (0.409 in)
Except Europe model BASE and TS model:
10.05 mm (0.396 in)



CAUTION:
If external force is applied from above when the brake booster is placed in this position, the resin portion as indicated by “P”, may be damaged.



(1) Force

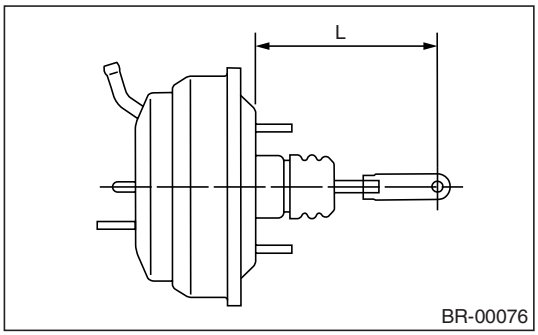
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B: INSTALLATION

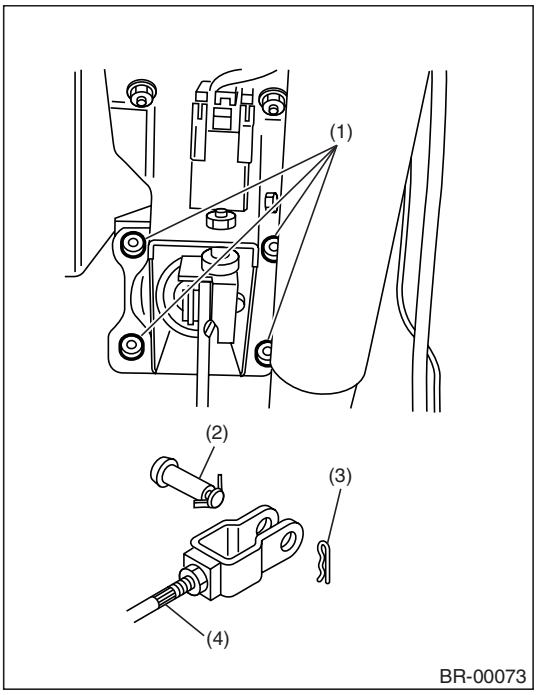
1) Adjust the operating rod of brake booster.

Standard L:
LHD model: 144.6 mm (5.69 in)
RHD model: 173.2 mm (6.82 in)

If it is not within specified value, adjust it by adjusting the brake booster operating rod.

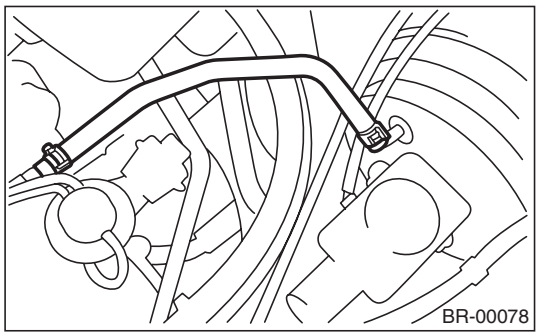


2) Mount the brake booster in position.
3) Connect the operating rod to brake pedal with new clevis pin and snap pin.



(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

4) Connect the vacuum hose to brake booster.



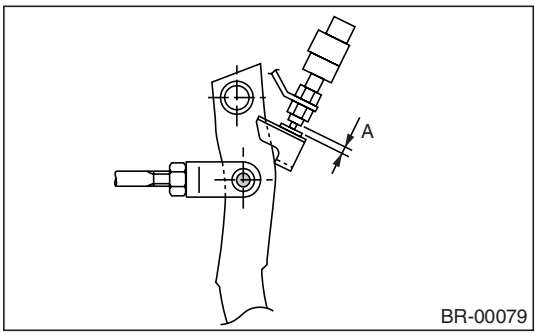
5) Mount the master cylinder onto brake booster.
6) Connect the brake pipes to master cylinder.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

7) Connect the electric connector for brake fluid level indicator.
8) Measure the clearance between threaded end of stop light switch and stopper. If it is not within specified value, adjust it by adjusting the position of stop light switch. <Ref. to BR-74, ADJUSTMENT, Stop Light Switch.>
If it is not within specified value, adjust it by adjusting the position of 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 operating rod connecting pin to prevent it from wearing.
10) Bleed air from the brake system.

Tightening torque (Air bleeder screw):
Except 17 inch type:
8 N·m (0.8 kgf-m, 5.8 ft-lb)
17 inch type:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

11) Conduct road tests to ensure brakes do not drag.

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C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

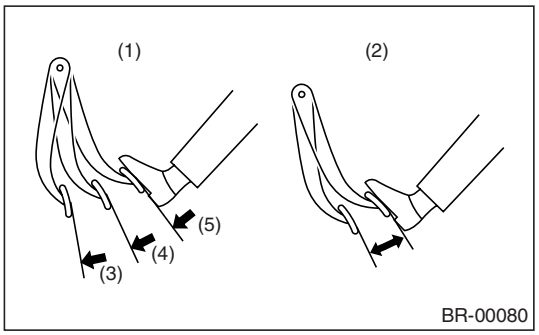
CAUTION:
When checking operation, be sure to securely apply the parking brake.

• 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 run it for 1 to 2 minutes, then turn it off. Depress the brake pedal several times applying same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on 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.

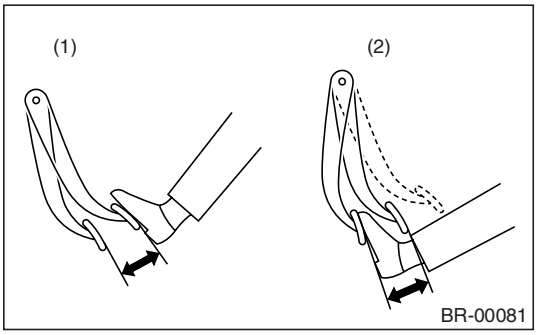


(1) OK
(2) NOT OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In the event of defective operation, inspect the condition of 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 same pedal force and make sure that pedal height does not vary with each depression of pedal.



(1) When engine is stopped
(2) When engine is started

2) With the brake pedal depressed, start the engine.
3) As the engine starts, the brake pedal should move slightly 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 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.

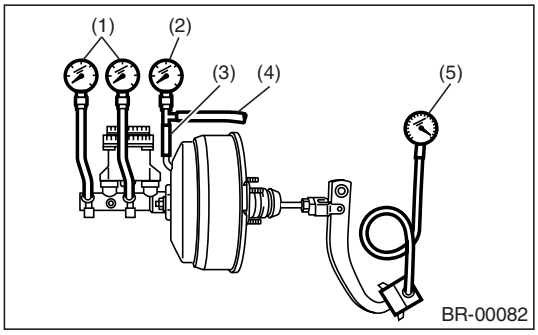
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2. OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to securely apply the parking brake.

• Checking with gauges

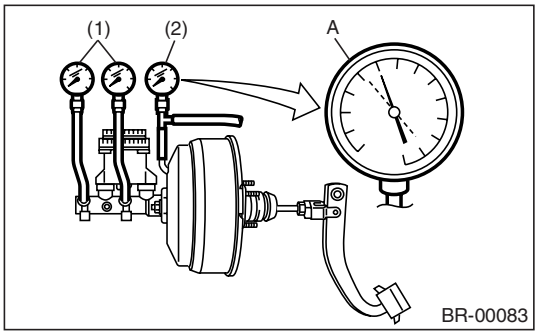
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



(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.

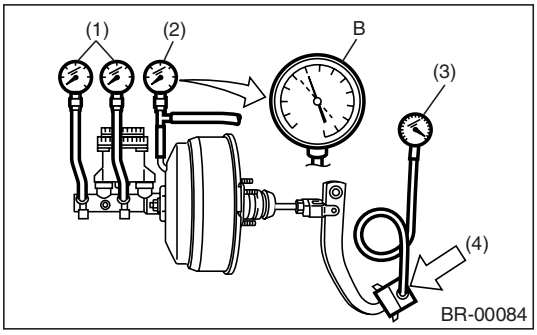


(1) Pressure gauge
(2) Vacuum gauge

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 engine, the 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 the 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 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) Depress

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 engine, the brake booster is functioning properly.
If defective, refer to “AIR TIGHTNESS CHECK”.
<Ref. to BR-57, 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 standard value listed.

Brake pedal force		147 N (15 kgf, 33 lbf)	294 N (30 kgf, 66 lbf)
Fluid pressure	14″	686 kPa (7 kgf/cm^2, 100 psi) [588 kPa (6 kgf/cm^2, 85 psi)]	1,961 kPa (20 kgf/cm^2, 284 psi) [1,667 kPa (17 kgf/cm^2, 242 psi)]
	15″	588 kPa (6 kgf/cm^2, 85 psi)	1,471 kPa (15 kgf/cm^2, 213 psi)
	16″		
	17″		

[ ] : Model with ABS

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• 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 standard value listed.

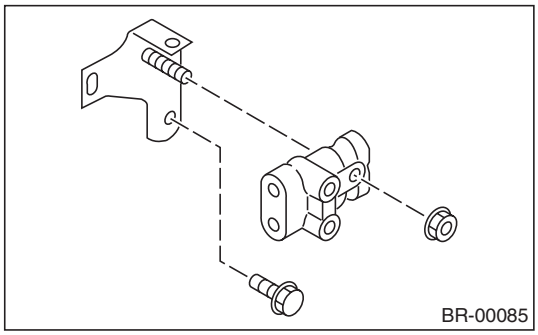
Brake pedal force		147 N (15 kgf, 33 lbf)	294 N (30 kgf, 66 lbf)
Fluid pressure	14″	5,786 kPa (59 kgf/cm^2, 839 psi)	7,649 kPa (78 kgf/cm^2, 1,109 psi) [8,434 kPa (86 kgf/cm^2, 1,223 psi)]
	15″	5,296 kPa (54 kgf/cm^2, 768 psi)	9,120 kPa (93 kgf/cm^2, 1,323 psi)
	16″	4,707 kPa (48 kgf/cm^2, 683 psi)	
	17″	4,021 kPa (41 kgf/cm^2, 583 psi)	8,336 kPa (85 kgf/cm^2, 1,209 psi)

[ ] : Model with ABS

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13.Proportioning Valve

A: REMOVAL



1) Remove the brake pipe from proportioning valve at four places.
2) Remove the proportioning valve from its bracket.

NOTE:
Do not disassemble or adjust the proportioning valve. (The proportioning valve must be replaced as an assembly.)

B: INSTALLATION

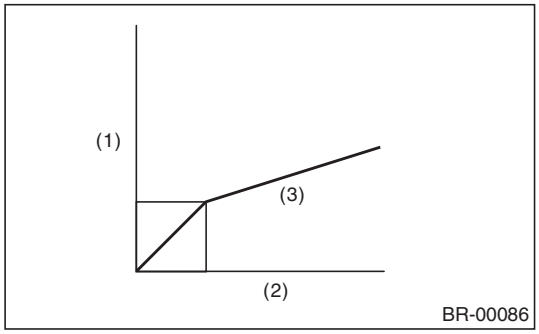
1) Install the proportioning valve to bracket.
2) Connect the brake pipes correctly to proportioning valve.

Tightening torque:
Proportioning valve to brake pipe flare nut:
15 N·m (1.5 kgf-m, 11.1 ft-lb)
Proportioning valve to bracket
18 N·m (1.8 kgf-m, 13.3 ft-lb)

3) Bleed air, and then check each joint of the brake pipe for oil leaks. <Ref. to BR-63, Air Bleeding.>

C: INSPECTION

1) Install the oil pressure gauges to measure the master cylinder fluid pressure (front wheel brake fluid pressure) and rear wheel cylinder fluid pressure.
2) Bleed air from the oil pressure gauges.
3) Check the master cylinder fluid pressure and rear wheel cylinder fluid pressure.
The standard values are shown in the figure.



(1) Rear wheel cylinder fluid pressure: P_3
(2) Master cylinder fluid pressure: P_2
(3) When both circuits are normal

4) For the oil pressure in case of split point, refer to “SPECIFICATIONS”.
<Ref. to BR-2, SPECIFICATION, General Description.>

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14.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”, refill the fluid.
2) Check the fluid for discoloration. If the fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

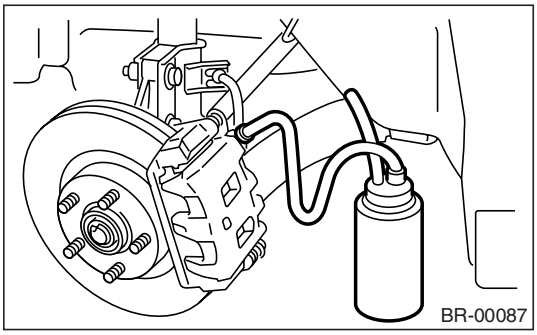
CAUTION:
• To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
• The FMVSS No. 116, fresh DOT3 brake fluid must be used.
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely 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.
• When bleeding air of 16 and 17 inch model, flush with brake cleaner or water after air bleeding as soon as possible because brake fluid leaks through the threads of air bleeder screw, and then painted area of caliper body may be washed away. Also wipe out brake fluid in air bleeder screw with cloth.

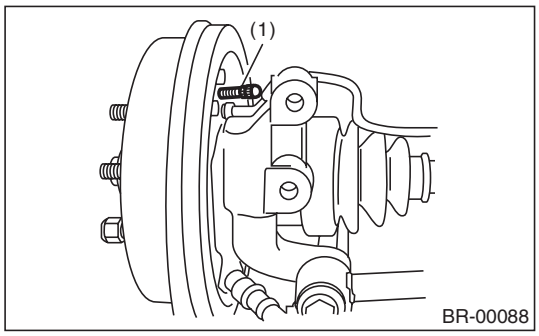
NOTE:
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approx. 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

1) Either lift-up the vehicle and place a rigid rack under it, or lift-up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 brake fluid

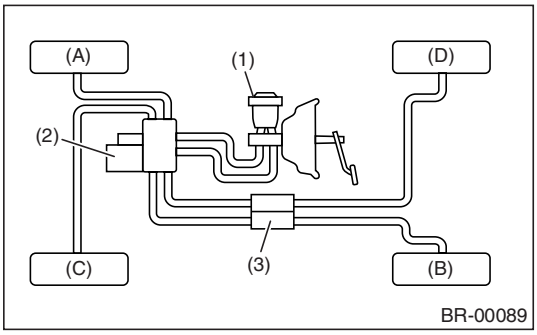
5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.





(1) Air bleeder screw

NOTE:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



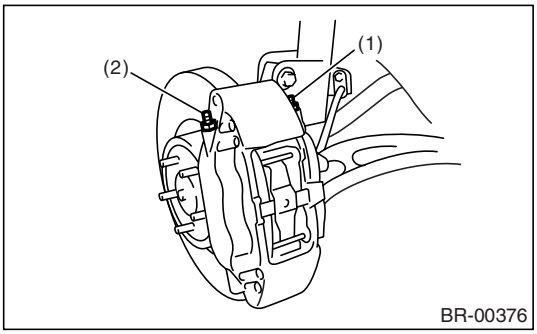
(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen the bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.

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8) Release the brake pedal slowly. Repeat steps 6) through 8) until there are no air bubbles in the drained brake fluid and new fluid flows through vinyl tube.

NOTE:
• Add brake fluid as necessary while performing air bleed operation, in order to prevent the tank from running short of brake fluid.
• If caliper has two air bleeder screws, bleed air from inner first, then outer.



(1) Inner air bleeder screw
(2) Outer air bleeder screw

9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque (Bleeder screw):
Except 17 inch type:
8 N·m (0.8 kgf-m, 5.8 ft-lb)
17 inch type:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 8) above.
11) Depress the brake pedal with a force of approx. 294 N (30 kgf, 66 lbf) and hold it there for approx. 20 seconds. At this time check for mix in air and pedal height change. Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

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15.Air Bleeding

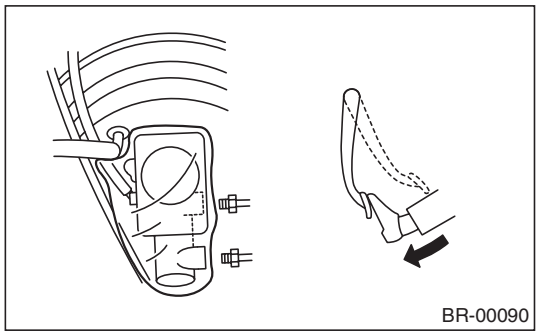
A: PROCEDURE

CAUTION:
• The FMVSS No. 116, fresh DOT3 brake fluid must be used.
• Cover the bleeder with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
• Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.
• When bleeding air of 16 and 17 inch model, flush with brake cleaner or water after air bleeding as soon as possible because brake fluid leaks through the threads of air bleeder screw, and then painted area of caliper body may be washed away. Also wipe out brake fluid in air bleeder screw with cloth.

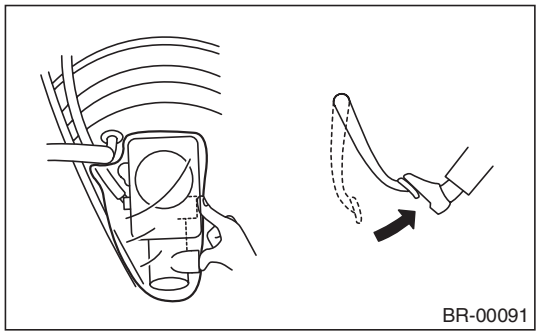
1. MASTER CYLINDER

NOTE:
• If the master cylinder is disassembled or reservoir tank is empty, bleed the master cylinder.
• During the bleeding 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.

1) Loosen the wheel nuts, jack-up the vehicle, support it with rigid racks, and remove the wheel.
2) Disconnect the brake line at primary and secondary sides.
3) Put a plastic bag cover on master cylinder.
4) Carefully depress and hold the brake pedal.


BR-00090

5) Close the outlet plug with your finger, and then release the brake pedal.


BR-00091

6) Repeat step4) and 5) until the brake fluid is completely bled from outlet plug.
7) Remove the plastic bag.
8) Install the brake pipes to master cylinder.

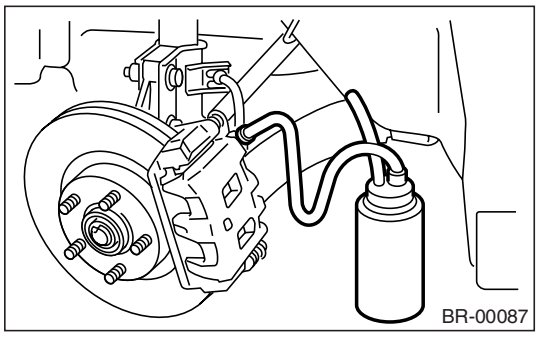
Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

9) Bleed air from the brake line. <Ref. to BR-63, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

NOTE:
• During the bleeding 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.

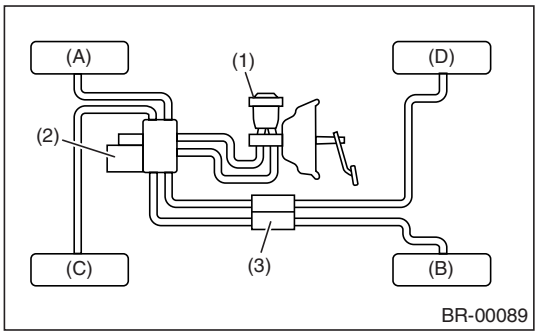
1) Make sure that there is no leak from the joints and connections of brake system.
2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.


BR-00087

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Air Bleeding

NOTE:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right

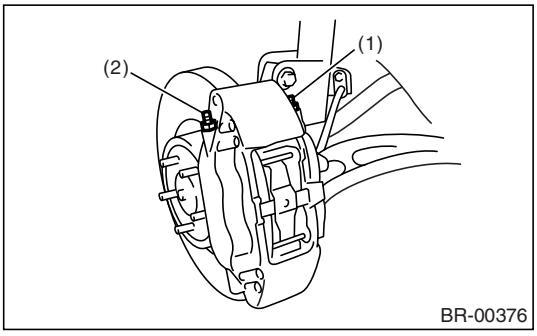


(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 to 2 seconds.
Next, with the bleeder closed, slowly release the brake pedal.
Repeat these steps until there are no more air bubbles in the vinyl tube.
Allow 3 to 4 seconds between two brake pedal operations.

CAUTION:
Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

NOTE:
If caliper has two air bleeder screws, bleed air from inner first, then outer.

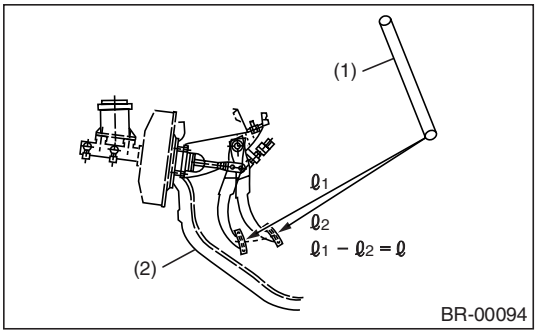


(1) Inner air bleeder screw
(2) Outer air bleeder screw

4) Tighten the air bleeder securely when no air bubbles are visible.

Air bleeder tightening torque:
Except 17 inch type:
8 N·m (0.8 kgf-m, 5.8 ft-lb)
17 inch type:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

5) Fully depress the brake pedal and keep it in that position for approx. 20 seconds to make sure that there is no leak evident in the entire system.
6) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lbf) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must not be more than specified.



(1) Steering wheel
(2) Toe board

Specified pedal stroke
90 mm (3.54 in)
When depressing brake pedal with a 490 N (50 kgf, 110 lbf) load.

7) If the distance is more than the specifications, there is a possibility that air is in the brake line. Bleed the brake line until pedal stroke meets the specification.
8) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-14, ABS Sequence Control.>
9) Recheck the pedal stroke.
10) If the distance is more than specifications, there is a possibility air is in the inside of hydraulic unit. Repeat above steps 2) to 9) above until pedal stroke meets the specification.
11) Add brake fluid to the required level (MAX. level) of reservoir tank.
12) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

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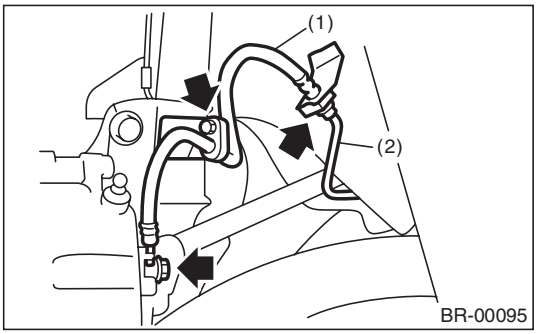
16.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Separate the brake pipe from brake hose.
(Always use the flare nut wrench and be careful not to deform the flare nut.)
2) Pull out the clamp to remove brake hose.
3) Remove the bolt at strut and union bolt.



(1) Brake hose
(2) Brake pipe

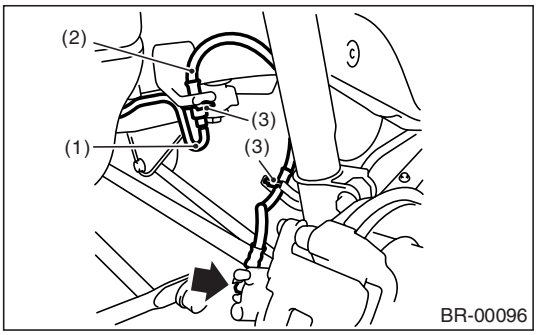
2. REAR BRAKE HOSE (DISC BRAKE)

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Separate the brake pipe from brake hose.

NOTE:
Always use the flare nut wrench and be careful not to deform the flare nut.

2) Remove the clamp and union bolt.

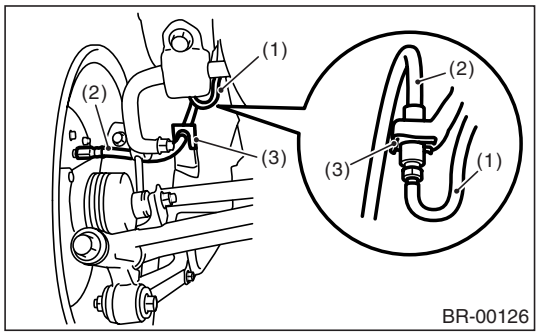


(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

3. REAR BRAKE HOSE (DRUM BRAKE)

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Separate the brake pipe from brake hose using a flare nut wrench.
2) Remove two clamps.
3) Separate the brake hose from wheel cylinder.



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

B: INSTALLATION

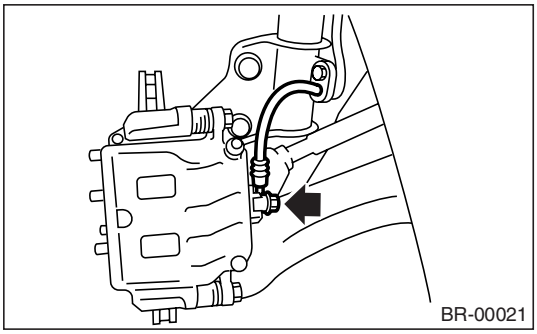
1. FRONT BRAKE HOSE

1) Secure the brake hose to strut.

Tightening torque:
32 N·m (3.3 kgf-m, 23.6 ft-lb)

2) Install the brake hose to caliper using a new gasket.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.3 ft-lb)



3) Position the disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

CAUTION:
Be sure brake hose is not twisted.

4) Temporarily tighten the flare nut to connect brake pipe and hose.

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5) Fix the brake hose with clamp at wheel apron bracket.
6) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 11.1 ft-lb)

7) Bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>

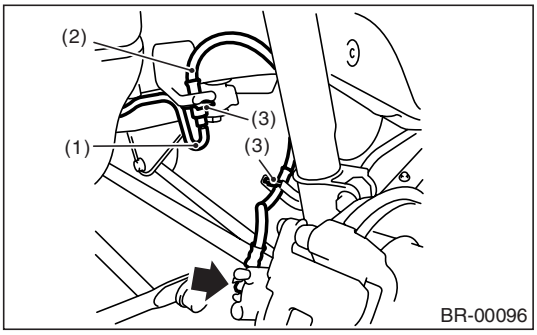
2. REAR BRAKE HOSE (DISC BRAKE)

1) Pass the brake hose through hole of bracket, and then lightly tighten the flare nut to connect brake pipe.
2) Insert the clamp upward to fix brake hose.
3) Install the brake hose to caliper using a new gasket.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.3 ft-lb)

4) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 11.1 ft-lb)



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

5) Bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>

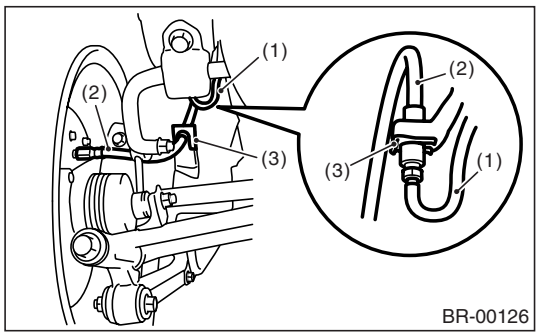
3. REAR BRAKE HOSE (DRUM BRAKE)

1) Install the brake hose to wheel cylinder.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

2) Secure the brake hose to bracket on strut using a clamp.
3) Connect the brake hose through hole in bracket on body.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

4) Bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>

C: INSPECTION

Ensure there are no cracks, breakage, or damage on the hoses. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the hose.

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17.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 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 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 the air.
• After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

Brake pipe tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the pipe.

NOTE:
Use a mirror when inspecting low-visible part or back side.

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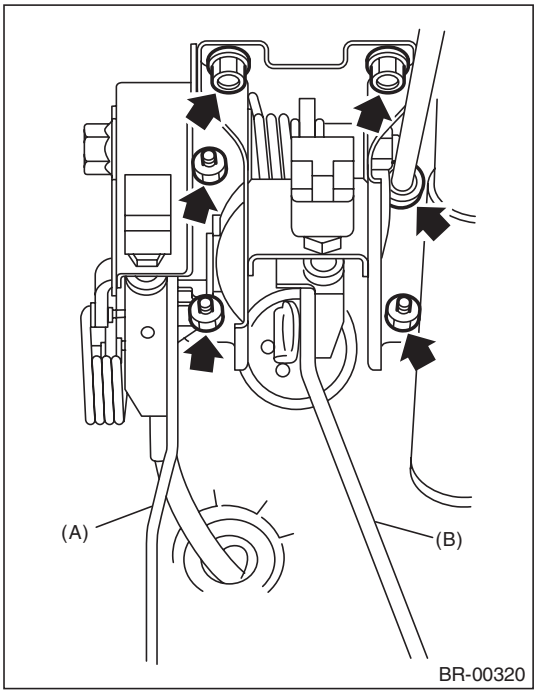
18.Brake Pedal

A: REMOVAL

1. LHD 1.6 L MT MODEL

1) Disconnect the ground cable from battery.
2) Disconnect the clutch cable from release lever.
3) Remove the instrument panel lower cover from instrument panel.
4) Disconnect the connectors (for stop light switch, etc.) from pedal bracket.
5) Remove the clevis pin which secures the pedal to push rod.
6) Remove the bolts and nuts which secure the brake and clutch pedals, and then remove the pedal bracket and clutch cable as a unit.

CAUTION:
Before removing the clutch cable from toe board, remove the grommet. Slowly remove the clutch cable, being careful not to scratch it.

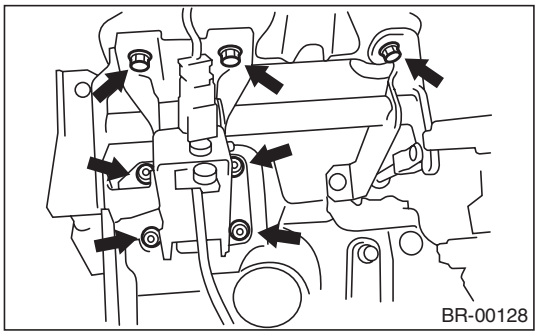


(A) Clutch pedal
(B) Brake pedal

7) Depress the clutch pedal, and then disconnect the clutch cable from clutch pedal.

2. LHD 2.0 L MT MODEL

1) Remove the steering shaft.
2) Disconnect the connectors (for stop light switch, etc.) from pedal bracket.
3) Remove the clevis pin which secures the lever to push rod.
4) Remove the nut which secures the clutch master cylinder.
5) Remove the accelerator pedal.
6) Remove the bolts and nuts which the secure pedal bracket.



3. LHD 2.5 L MT MODEL

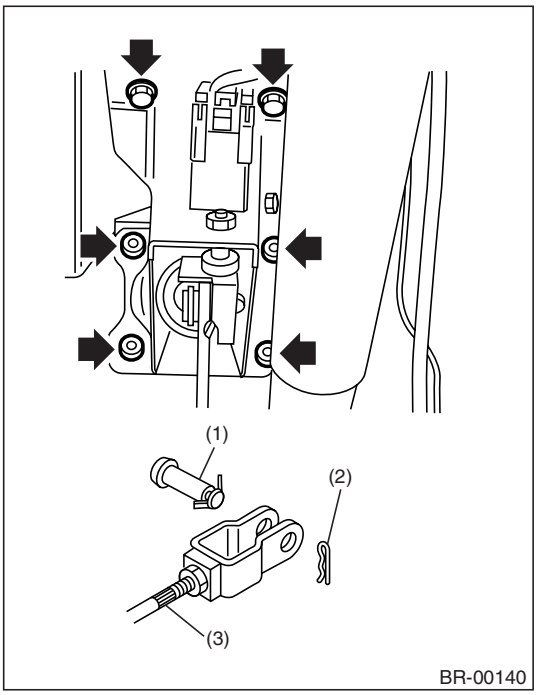
Refer to LHD 2.0 L MT MODEL for removal. <Ref. to BR-68, LHD 2.0 L MT MODEL, REMOVAL, Brake Pedal.>

4. LHD AT MODEL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover from instrument panel.
3) Remove the clevis pin which secures the brake pedal to brake booster operating rod. Also disconnect the stop light switch connector.

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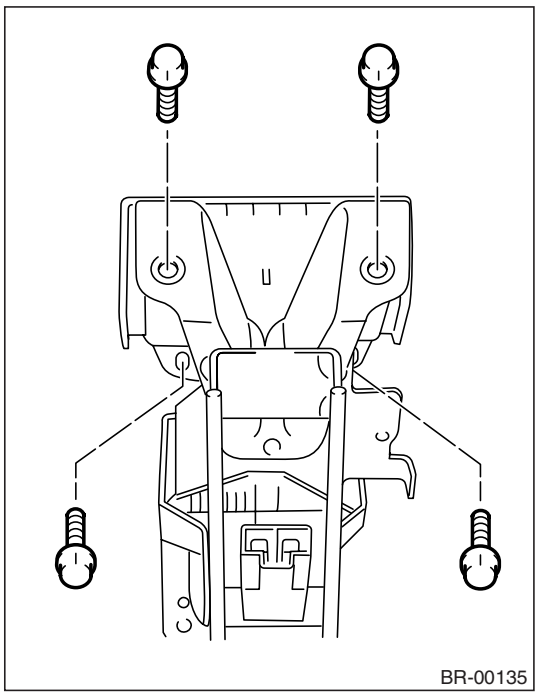
4) Remove the four bolts and four nuts which secure the brake pedal to pedal.



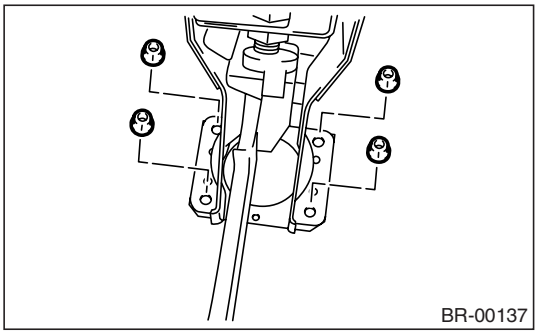
(1) Clevis pin
(2) Snap pin
(3) Operating rod

5. RHD AT MODEL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover from instrument panel.
3) Disconnect the connectors (for stop light switch, etc.) from pedal bracket.
4) Remove the snap pin and clevis pin.
5) Remove the four bolts which secure the brake pedal bracket (rear side).



6) Remove the nuts which secure the brake pedal bracket (front side).



7) Remove the brake pedal without prying the bracket.

6. RHD MT MODEL

Refer to RHD AT MODEL. <Ref. to BR-69, RHD AT MODEL, REMOVAL, Brake Pedal.>

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
- **If the cable clamp is damaged, replace it with a new one.**
- **Never fail to cover the outer cable end with boot.**
- **Be careful not to kink the accelerator cable.**
- **Always use new clevis pins.**

2) Adjust the clutch pedal. <Ref. to CL-44, ADJUSTMENT, Clutch Pedal.>

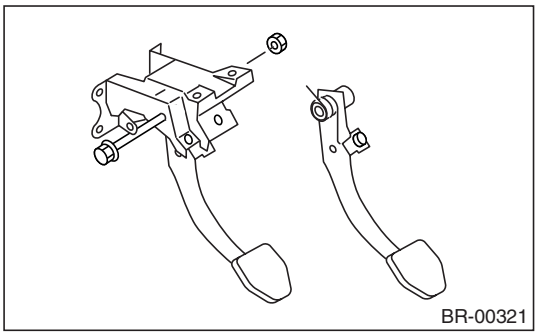
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3) Inspect the brake pedal after installation <Ref. to BR-71, INSPECTION, Brake Pedal.>

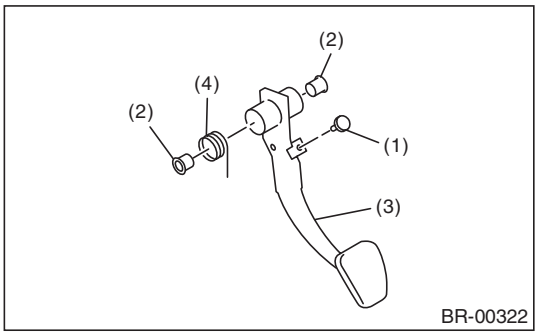
C: DISASSEMBLY

1. LHD 1.6 L MT MODEL

1) Remove the stop light switch.
<Ref. to BR-73, REMOVAL, Stop Light Switch.>
2) Remove the nut and pull out the bolt until brake pedal is able to remove, then remove brake pedal.


BR-00321

3) Remove the bushing, spring and stopper.



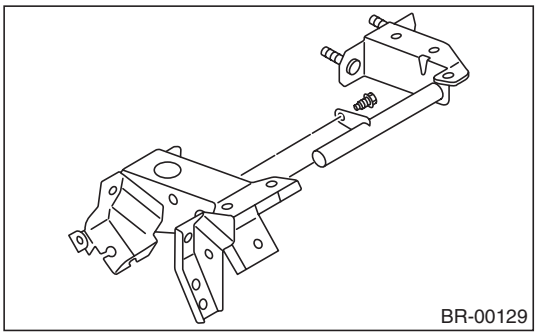
BR-00322

(1) Stopper
(2) Bushing
(3) Brake pedal
(4) Brake pedal spring

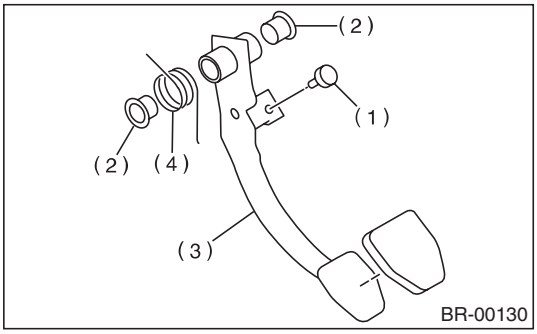
4) Remove the brake pad.

2. LHD 2.0 L MT MODEL

1) Remove the brake switch.
<Ref. to BR-73, REMOVAL, Stop Light Switch.>
2) Remove the clutch pedal. <Ref. to CL-41, DISASSEMBLY, Clutch Pedal.>
3) Remove the clutch master cylinder bracket.


BR-00129

4) Remove the bushing, spring and stopper.



BR-00130

(1) Stopper
(2) Bushing
(3) Brake pedal
(4) Brake pedal spring

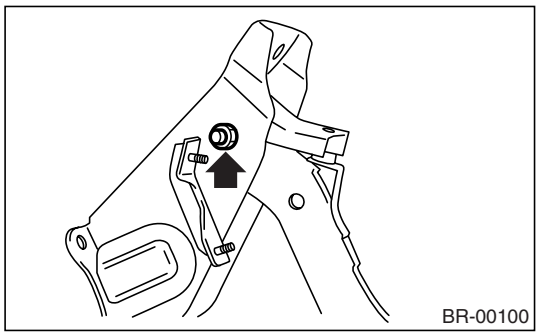
5) Remove the brake pedal pad.

3. LHD 2.5 L MT MODEL

Refer to LHD 2.0 L MT MODEL for disassembly.
<Ref. to BR-70, LHD 2.0 L MT MODEL, DISASSEMBLY, Brake Pedal.>

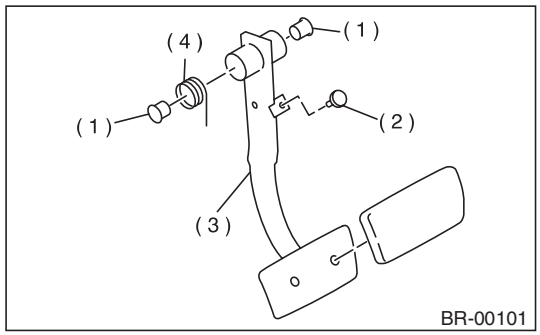
4. LHD AT MODEL

1) Remove the brake switch.
2) Unbolt, and then remove the brake pedal.


BR-00100

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3) Remove the bushing, spacer and spring.



(1) Plug
(2) Stopper
(3) Brake pedal
(4) Brake pedal spring

4) Remove the brake pedal pad.

5. RHD AT MODEL

Do not disassemble the brake pedal because it has non-disassemble structure.

6. RHD MT MODEL

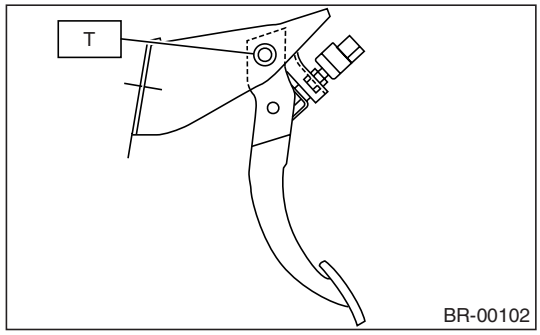
Do not disassemble the brake pedal because it has non-disassemble structure.

D: ASSEMBLY

1) Attach the stop light switch, etc. to pedal bracket temporarily.
2) Clean the inside of bores of clutch pedal and brake pedal, apply grease, and set the bushings into bores.
3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring and clutch pedal effort reducing spring (model with hill holder), and then install the pedal bolt.

NOTE:
Clean up the inside of bushings and apply grease before installing spacer.

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



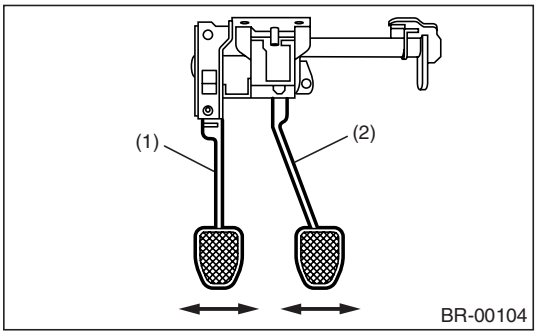
4) Adjust the stop light switch position after installing the brake pedal to vehicle.

E: INSPECTION

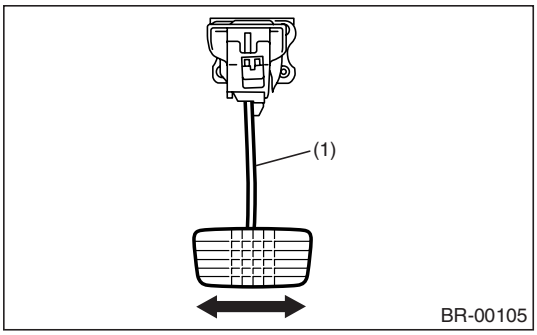
1) Move the brake and clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lbf) to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushings with new ones.

Deflection of brake and clutch pedal:
Service limit
5.0 mm (0.197 in) or less



(1) Clutch pedal
(2) Brake pedal



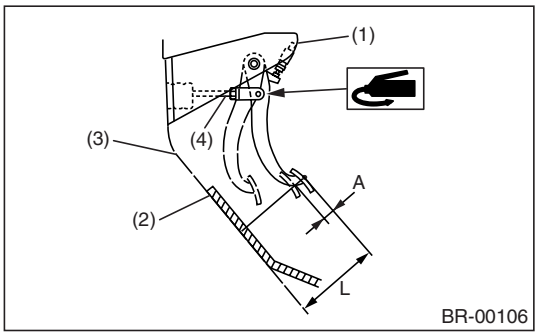
(1) Brake pedal

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2) Check the position of pedal pad.

Pedal height L:
148 mm (5.83 in)

Brake pedal free play A:
1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad 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

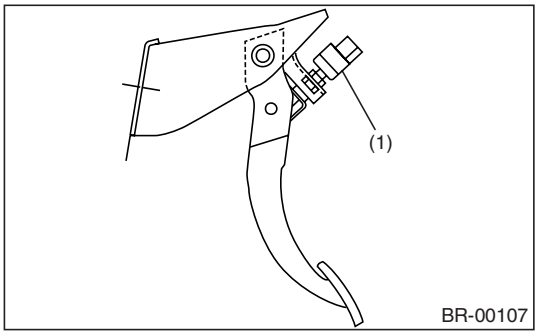
3) If it is not within specified value, adjust it by adjusting the brake booster operating rod length.

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19.Stop Light Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the stop light switch connector.
3) Loosen nuts, and unscrew stop light switch to remove.

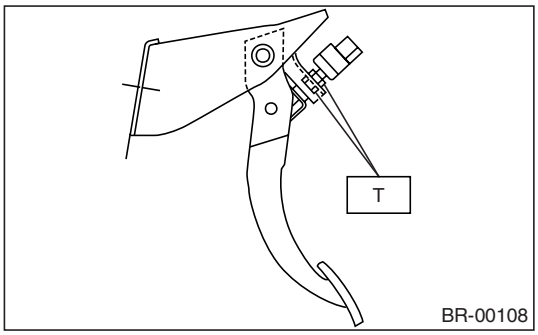


(1) Stop light switch

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-74, ADJUSTMENT, Stop Light Switch.>

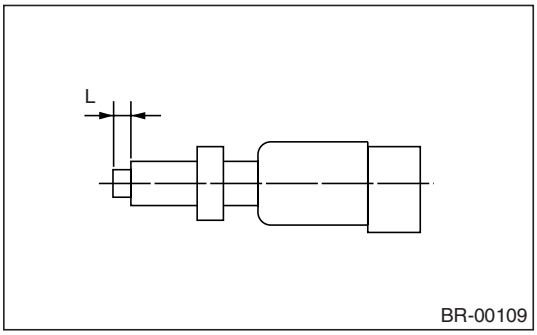
Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



C: INSPECTION

1) If the stop light switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

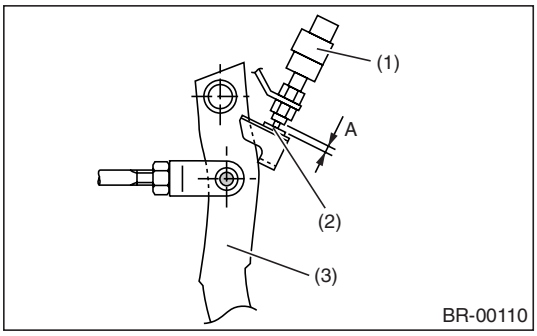
Specified position L:
2 mm (0.079 in)



2) Measure the clearance between threaded end of stop light switch and stopper.

CAUTION:
Be careful not to rotate 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 specified value, adjust it by adjusting position of stop light switch.

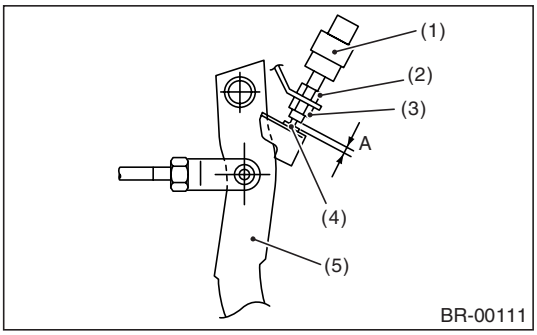
CAUTION:
Be careful not to rotate the stop light switch.

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D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance between threaded end of 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 threaded end of stop light switch and stopper becomes 0 mm (0 in). Hold the stop light switch to prevent turning, and then loosen the lock nut B approx. 60°. The clearance (A) will become 0.3 mm (0.012 in).

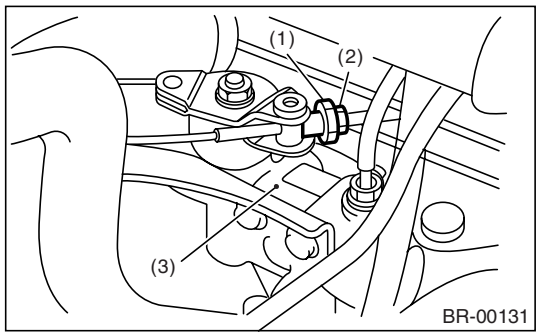
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20.Hill Holder

A: REMOVAL

1. PHV (PRESSURE HOLD VALVE)

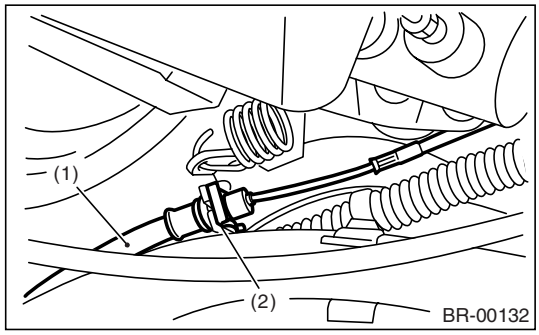
1) Drain the brake fluid from reservoir of master cylinder.
2) Remove the adjusting nut and lock nut.



(1) Adjusting nut
(2) Lock nut
(3) PHV

3) Remove the cable clamp, and disconnect the PHV cable from PHV.

CAUTION:
Carefully protect the boots and inner cable from damage when disconnecting PHV cable.



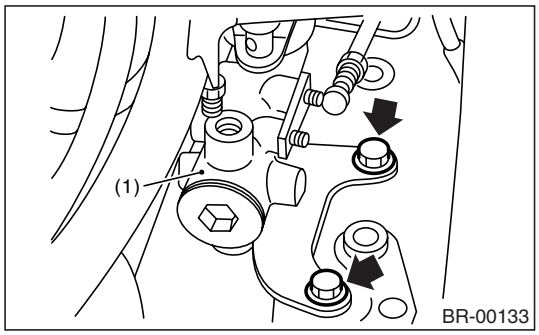
(1) PHV cable
(2) Clamp

4) Disconnect the brake pipes from PHV.

CAUTION:
• Pay attention not to drop the brake fluid onto body painting since it may dissolve paint.
• Pay attention not to damage hexagonal head of the flare nut by using pipe wrench without fail.

5) Detach the PHV along with support from side frame.

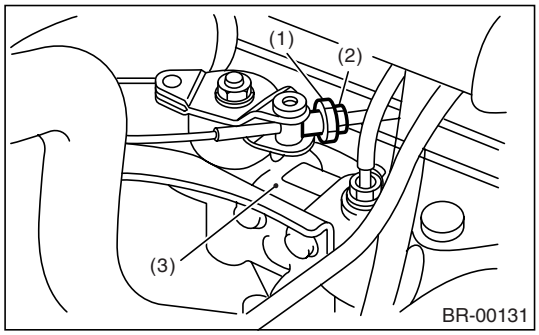
CAUTION:
Exercise utmost care to prevent foreign matter from entering into the PHV when removing it.



(1) PHV

2. PHV CABLE

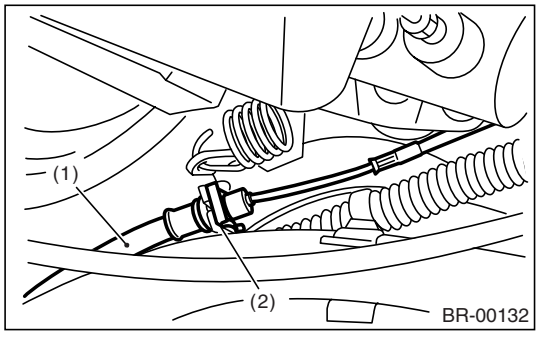
1) Remove the adjusting nut and lock nut.



(1) Adjusting nut
(2) Lock nut
(3) PHV

2) Remove the cable clamp, and disconnect PHV cable from PHV.

CAUTION:
Carefully protect the boot and inner cable from damage when disconnecting PHV cable.

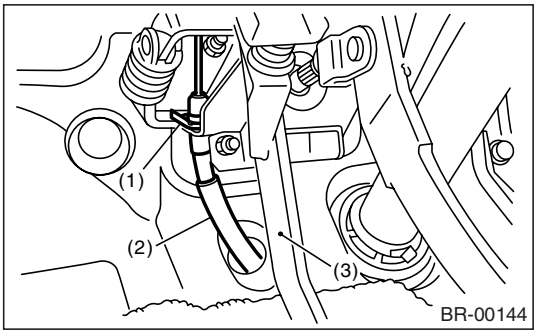


(1) PHV cable
(2) Clamp

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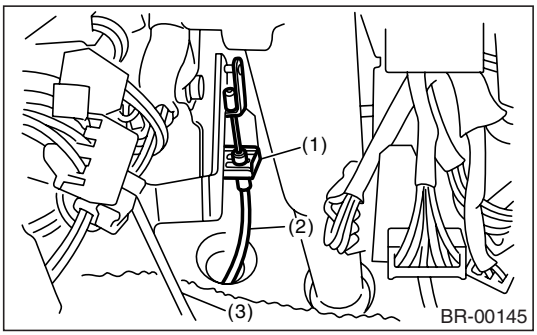
3) Remove the cable clamp from clutch pedal bracket.

- LHD MODEL



(1) Clamp
(2) PHV cable
(3) Clutch pedal

- RHD MODEL



(1) Clamp
(2) PHV cable
(3) Clutch pedal

4) Remove the PHV cable.

B: INSPECTION

Check up removed parts as follows, and replace defective ones.
1) Check if the boots of PHV cable are damaged or degraded, the inner cable is damaged or corroded.
2) Check if the return spring is worn out, damaged or corroded.
3) Confirm that rolling sound of the ball is heard with PHV inclined and lever rotates smoothly.

CAUTION:
Never disassemble the PHV. Replace entire PHV assembly if necessary.

C: INSTALLATION

1. PHV (PRESSURE HOLD VALVE)

1) Install the PHV onto side frame.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

2) Connect the brake pipes to PHV.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

CAUTION:
Confirm that the brake pipes are not deformed and/or damaged. Replace them with new ones if necessary.

3) Install the PHV cable to PHV.

CAUTION:
• If the cable clamp and clips are damaged, replace it with a new one.
• Avoid sharp bending of PHV cable as it may cause breakage.

4) Connect the PHV cable with clips.
5) Apply grease to the following points.
- Hook portion of return spring
- Cable end portion of lever

Grease:
SUNLIGHT 2 (Part No. 003602010)

6) Be sure to bleed air from the brake system. <Ref. to BR-63, Air Bleeding.>
7) Adjust the PHV cable. <Ref. to BR-77, ADJUSTMENT, Hill Holder.>

CAUTION:
After replacing with new one, operate the clutch pedal about 30 times as a running-in operation prior to adjustment.

2. PHV CABLE

1) Install in the reverse order of removal.

CAUTION:
• If the cable clamp is damaged, replace it with a new one.
• Avoid sharp bending of PHV cable as it may cause breakage.

2) Apply grease to the following points.
- Hook portion of return spring
- Cable end portion of lever

Grease:
SUNLIGHT 2 (Part No. 003602010)

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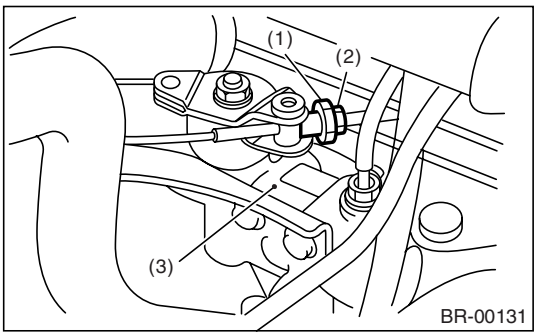
3) Adjust the PHV cable. <Ref. to BR-77, ADJUSTMENT, Hill Holder.>

CAUTION:
After replacing with new one, operate the clutch pedal about 30 times as a running-in operation prior to adjustment.

D: ADJUSTMENT

Confirm stopping and starting performances by activating the hill holder on an uphill road of 3° or higher inclination.
1) If the vehicle does not stop;
Tighten the adjusting nut of PHV cable.
2) If the vehicle does not start properly;
• Case A — When the hill holder is released later than engagement of clutch pedal (Engine tends to stall.):
Loosen adjusting nut gradually until smooth starting is enabled.
• Case B — When the hill holder is released earlier than engagement of clutch pedal (Vehicle slips down slightly.):
Tighten the adjusting nut so that hill holder is released later than engagement of clutch pedal (status in Case A). Then make adjustment the same as in Case A.

CAUTION:
Whenever turning the adjusting nut, prevent the PHV cable from revolving.



(1) Adjusting nut
(2) Lock nut
(3) PHV

3) Tighten the lock nut.

Tightening torque:
3.5 N·m (0.35 kgf-m, 2.5 ft-lb)

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21.General Diagnostic Table

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(2) Entry of air into the hydraulic mechanism	Bleed the air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(5) 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, drum or rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Drum or rotor eccentricity	Correct or replace the drum or rotor.
	(3) Worn brake drum, or damage to the drum caused by sand	Correct by grinding, or replace.
	(4) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(5) Deformed back plate	Correct or replace.
	(6) Improper tire inflation	Inflate to correct pressure.
	(7) Disordered wheel alignment	Adjust alignment.
	(8) Loosened back plate or the support installing bolts	Retighten.
	(9) Loosened wheel bearing	Retighten to normal tightening torque or replace.
	(10) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
	(11) 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 the air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(4) Improperly adjusted shoe clearance	Adjust.
	(5) 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) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Wheel bearing faulty	Replace the wheel bearing.
5. Brake noise (1) (creak sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loosened back plate or the support installing bolts	Retighten.
	(4) Loose wheel bearing	Retighten to normal tightening torque.
	(5) Dirty drum or rotor	Clean the drum or rotor, or clean and replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improper installed shoe or pad	Correct or replace the shoe assembly or pad.
	(3) Loose or bent drum or rotor	Retighten or replace.

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	Trouble and possible cause	Corrective action
7. Brake noise (3) (click sound)	In the case of the disc brake:	
	(1) Excessively worn pad or the support	Replace the pad or the support.
	In the case of the drum brake:	
	(1) Excessively worn shoe ridge	Replace the back plate.
	(2) Lack of oil on the shoe ridge surface and anchor	Add more grease.

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General Diagnostic Table

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PARKING BRAKE

PB

		Page
1.	General Description	2
2.	Parking Brake Lever	5
3.	Parking Brake Cable	7
4.	Parking Brake Assembly (Rear Disc Brake)	9
5.	General Diagnostic Table	12

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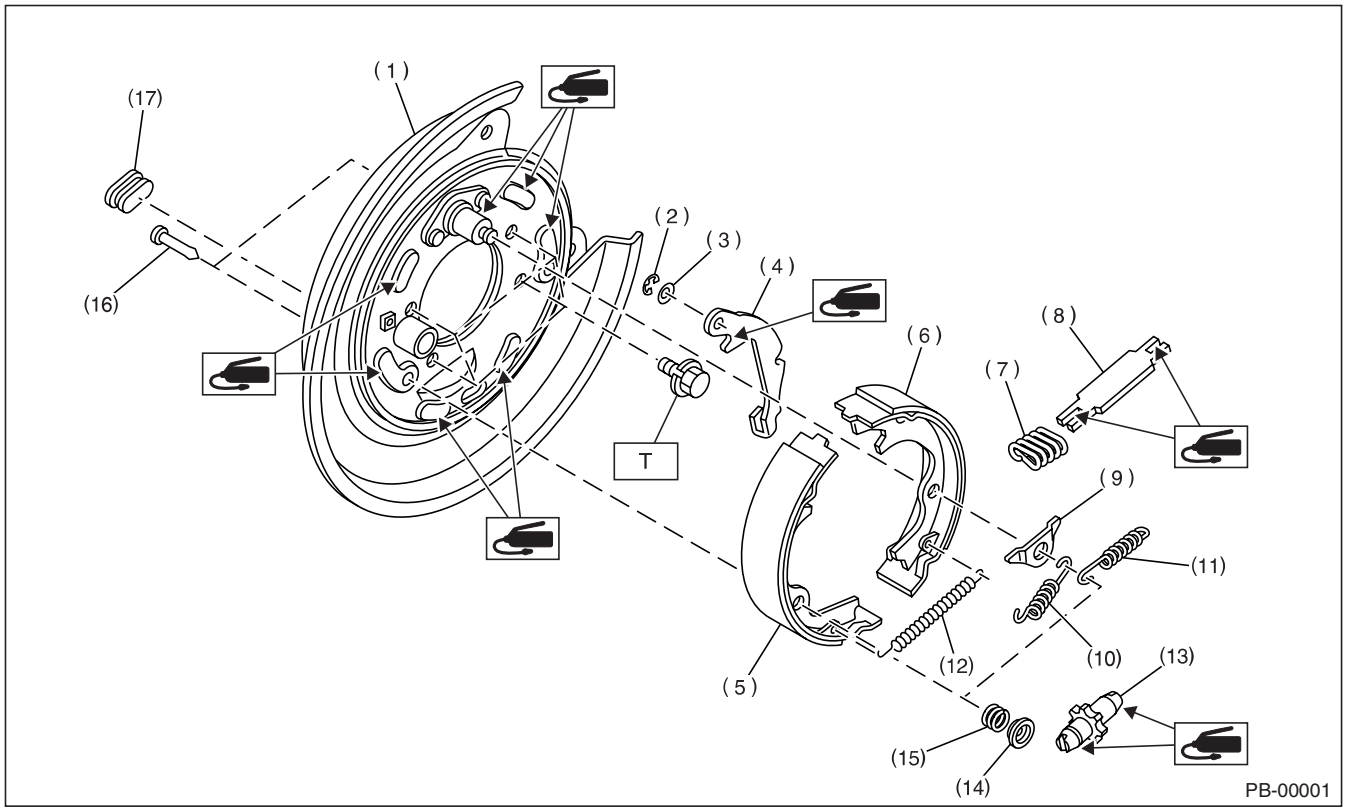
1. General Description

A: SPECIFICATION

Model		Rear drum brake	Rear disc brake	Rear disc brake (STi model)
Type		Mechanical on rear brakes	Mechanical on rear brakes, drum in disc	
Effective drum diameter	mm (in)	228.6 (9)	170 (6.69)	190 (7.48)
Lining dimensions (length × width × thickness)	mm (in)	218.8 × 35.0 × 4.1 (8.61 × 1.378 × 0.161)	162.6 × 30.0 × 3.2 (6.40 × 1.181 × 0.126)	182.3 × 30.0 × 3.2 (7.18 × 1.181 × 0.126)
Clearance adjustment		Automatic adjustment	Manual adjustment	
Lever stroke	notches/N (kgf, lbf)	7 to 8/196 (20, 44)		

B: COMPONENT

1. PARKING BRAKE (REAR DISC BRAKE)



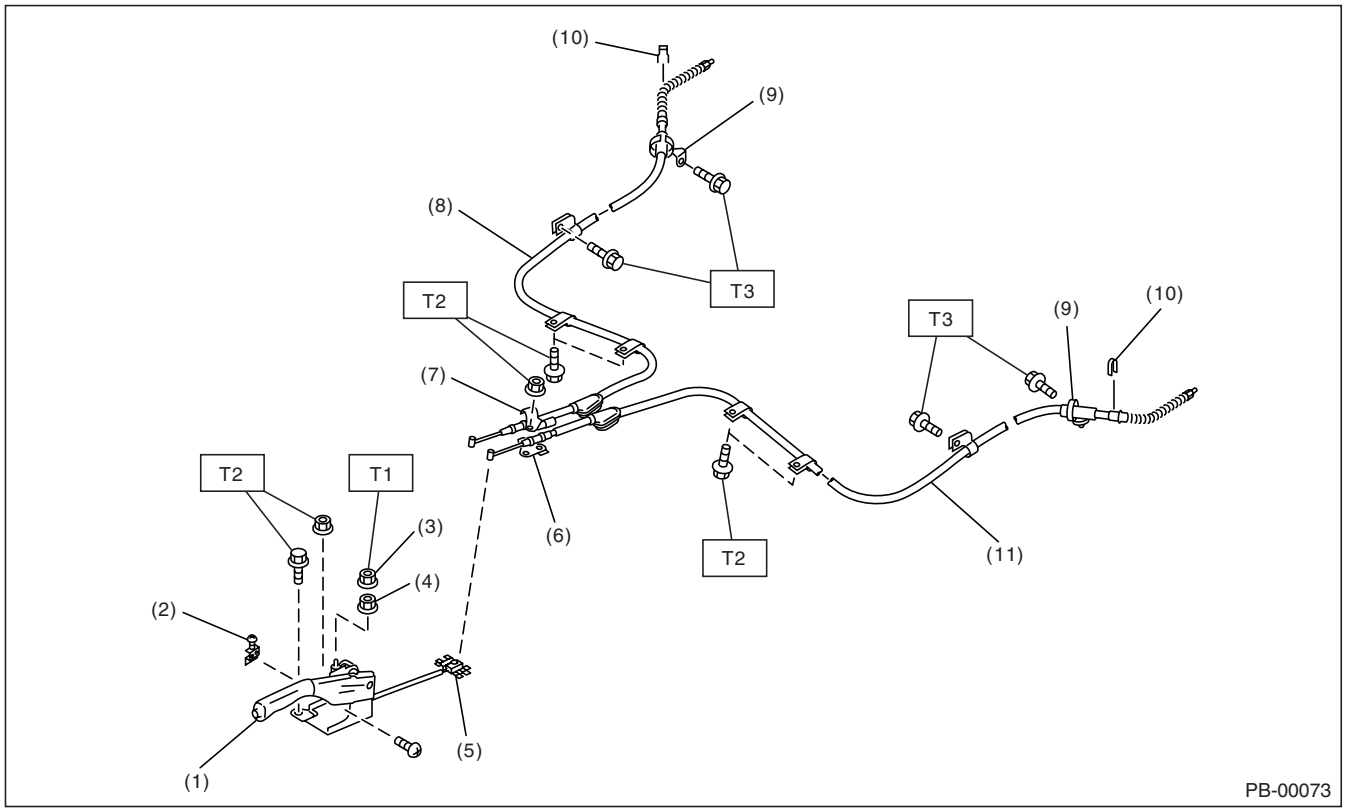
(1) Back plate
(2) Retainer
(3) Spring washer
(4) Lever
(5) Parking brake shoe (Primary)
(6) Parking brake shoe (Secondary)
(7) Strut spring
(8) Strut
(9) Shoe guide plate
(10) Primary return spring
(11) Secondary return spring
(12) Adjusting spring
(13) Adjuster
(14) Shoe hold-down cup
(15) Shoe hold-down spring
(16) Shoe hold-down pin
(17) Adjusting hole cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 53 (5.4, 39.1)

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2. PARKING BRAKE CABLE

- LHD MODEL

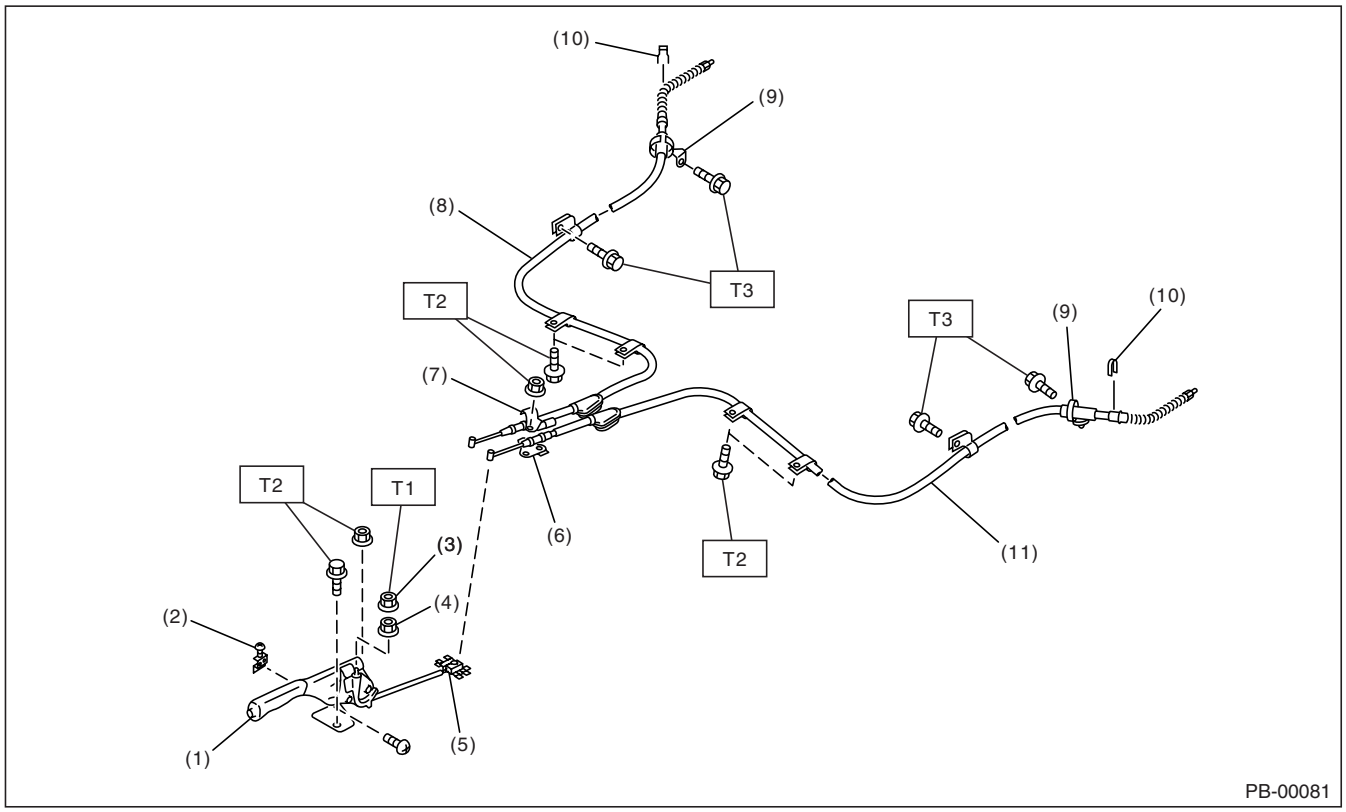


(1)	Parking brake lever	(7)	Clamp	
(2)	Parking brake switch	(8)	Parking brake cable RH	
(3)	Lock nut	(9)	Cable guide	
(4)	Adjusting nut	(10)	Clamp (Rear disc brake model)	
(5)	Equalizer	(11)	Parking brake cable LH	
(6)	Bracket			

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6 (0.6, 4.4)
T2: 18 (1.8, 13.0)
T3: 32 (3.3, 23.6)

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• RHD MODEL



(1) Parking brake lever
(2) Parking brake switch
(3) Lock nut
(4) Adjusting nut
(5) Equalizer
(6) Bracket
(7) Clamp
(8) Parking brake cable RH
(9) Cable guide
(10) Clamp (Rear disc brake model)
(11) Parking brake cable LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6 (0.6, 4.4)
T2: 18 (1.8, 13.0)
T3: 32 (3.3, 23.6)

C: CAUTION

• Wear working 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, 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 vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Keep grease etc. away from parking brake shoes.

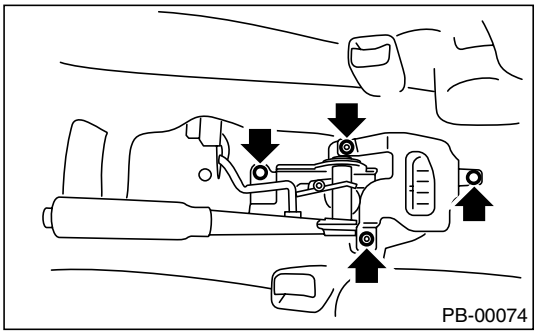
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2. Parking Brake Lever

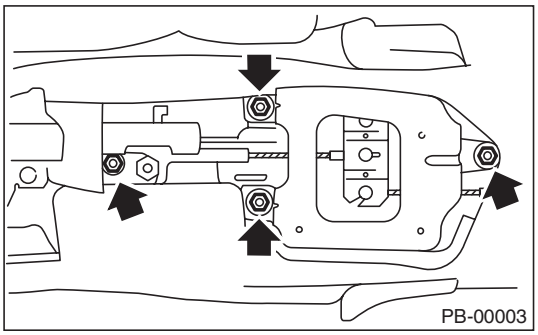
A: REMOVAL

1) Set the wheel stoppers to tires.
2) Remove the console box.
3) Loosen the parking cable adjusting nut and console bracket.
4) Disconnect the connector of parking brake switch.
5) Remove the parking brake lever.

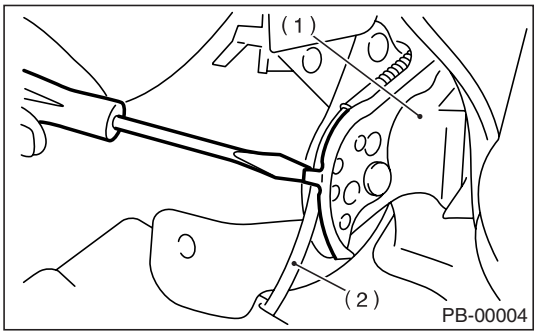
- LHD MODEL



- RHD MODEL



6) Unbend the parking brake lever pawls and remove cable.



(1) Parking brake lever
(2) Cable

B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
Parking brake lever;
18 N·m (1.8 kgf-m, 13.0 ft-lb)
Adjusting nut;
6 N·m (0.6 kgf-m, 4.4 ft-lb)

2) Be sure to adjust the lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

While pulling the parking brake lever upward, count the notches.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)

If not as specified, adjust the parking brake. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

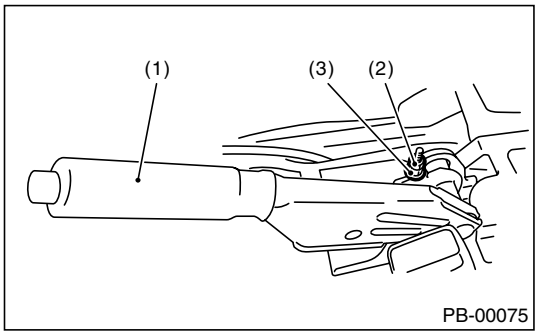
D: ADJUSTMENT

1) Remove the console cover.
2) Forcibly pull the parking brake lever 3 to 5 times.
3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lbf).
4) Tighten the lock nut.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)

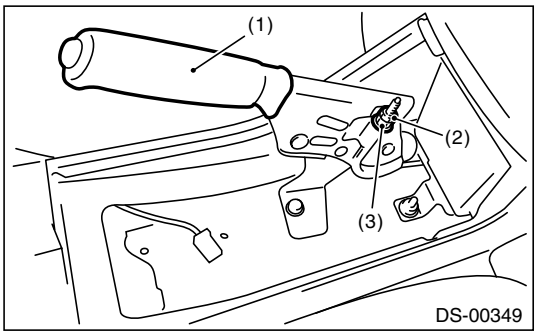
Tightening torque (Lock nut):
6 N·m (0.6 kgf-m, 4.4 ft-lb)

- LHD MODEL



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- RHD MODEL



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

5) Install the console cover.

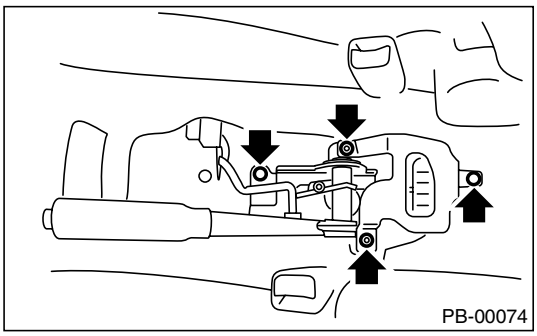
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3. Parking Brake Cable

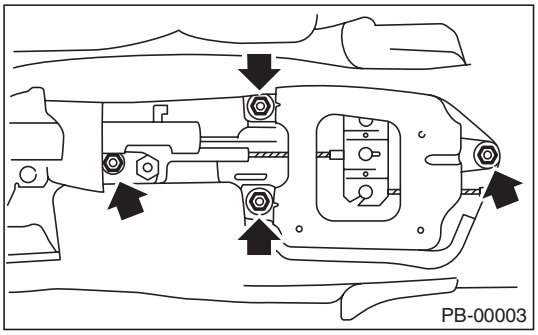
A: REMOVAL

1) Lift up the vehicle.
2) Remove the rear wheels.
3) Remove the rear seat cushion.
4) Remove the console box.
5) Loosen the parking cable adjusting nut and console bracket.
6) Remove the parking brake lever.

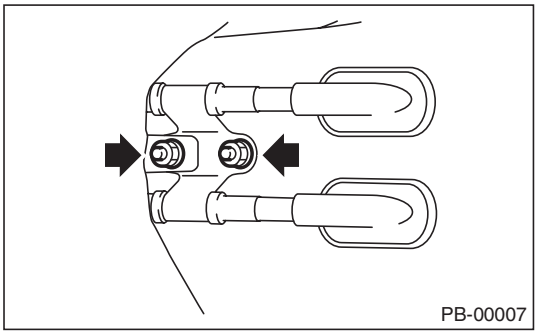
- LHD MODEL



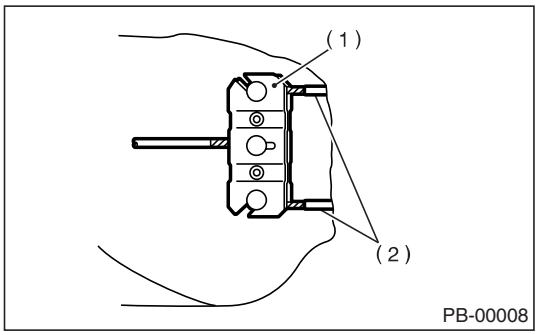
- RHD MODEL



7) Roll up the floor mat and remove clamps.

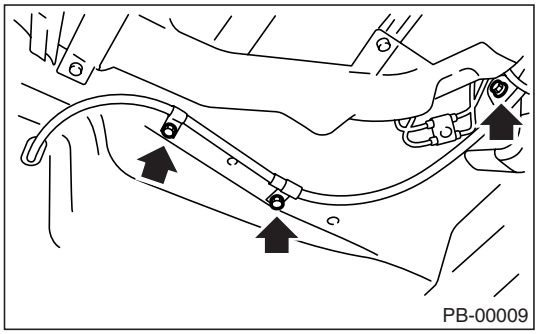


8) Remove the equalizer cover.
9) Remove the inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

10) Remove the parking brake cable from rear brake.
Disc brake
<Ref. to PB-9, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
Drum brake
<Ref. to BR-50, REMOVAL, Rear Drum Brake Assembly.>
11) Remove the clamp from rear brake.
12) Remove the bolt and bracket from trailing link bracket.
13) Remove the bolt and clamp from rear floor.



14) Detach the grommet from rear floor.
15) Remove the cable assembly from cabin by forcibly pulling it backward.
16) Detach the parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

1) Install the (new) parking brake assembly in the reverse order of removal.

NOTE:
Be sure to pass the cable through cable guide inside the tunnel.

2) Be sure to adjust the lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

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C: INSPECTION

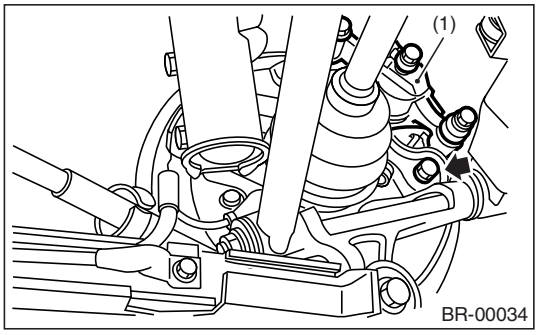
Check the removed cable and replace it if damaged, rusty or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends and cracks.
4) Check the boot for damage, cracks and deterioration.

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4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

1) Lift up the vehicle.
2) Remove the rear wheels.
3) Pull down and release the parking brake.
4) Remove the two mounting bolts and remove the brake caliper assembly.

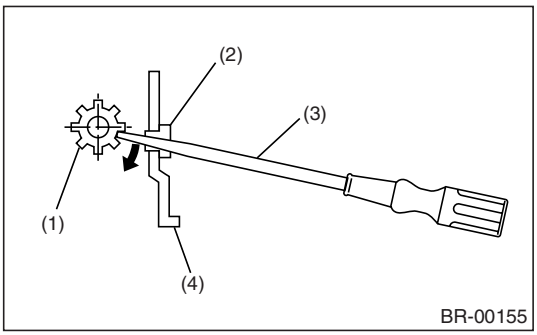


(1) Brake caliper assembly

5) Suspend the brake caliper assembly so that the hose is not stretched.
6) Remove the disc rotor.

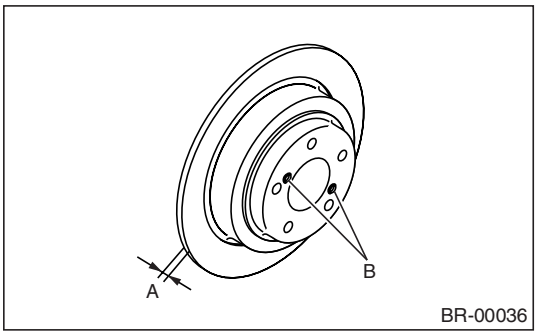
NOTE:
If the disc rotor is difficult to remove, try the two following methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.

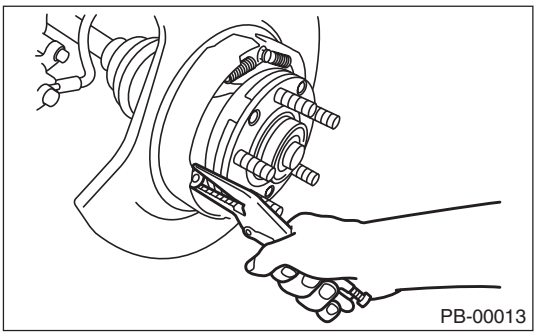


(1) Adjusting screw
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

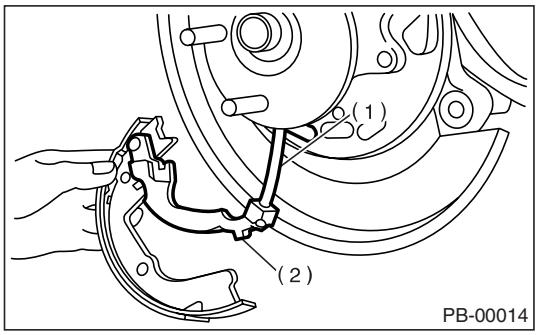
(2) If the disc rotor seizes up within hub, drive the disc rotor out by installing two 8-mm bolts in holes B on rotor.



7) Remove the shoe return spring from parking brake assembly.
8) Remove the front shoe hold-down spring and pin with pliers.



9) Remove the strut and strut spring.
10) Remove the adjuster assembly from parking brake assembly.
11) Remove the brake shoe.
12) Remove the rear shoe hold-down spring and pin with pliers.
13) Remove the parking brake cable from parking brake lever.



(1) Parking brake cable
(2) Parking brake lever

14) Using a standard screwdriver, raise the retainer. Remove the parking brake lever and washer from brake shoe.

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B: INSTALLATION

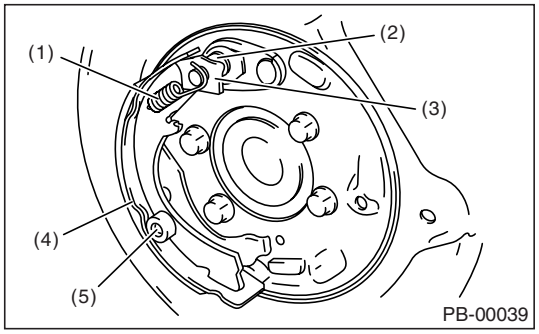
CAUTION:
Be sure the lining surface is free from oil and grease contamination.

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

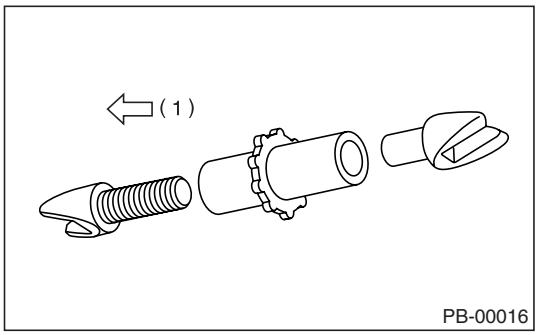
2) Insert the primary side brake shoe into anchor pin groove.
3) Secure the brake shoe with shoe hold-down pin and cup.
4) Install the plate to anchor pin, and then assemble the primary return spring to anchor pin.



(1) Primary return spring
(2) Anchor pin
(3) Plate
(4) Primary shoe
(5) Shoe hold-down pin & cup

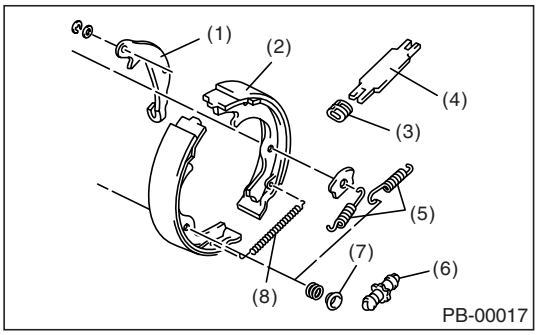
5) Install the parking brake cable to parking brake lever.
6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with shoe hold-down pin & cup.

NOTE:
- Install the strut spring of both right and left wheels facing vehicle front.
- Install the adjuster assembly with screw on left side.



(1) Left

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 brakes. <Ref. to PB-11, 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 meter (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
(5) After breaking-in, re-adjust the parking brakes.

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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:

Standard
Except STi model 170 mm (6.69 in)
STi model 190 mm (7.48 in)

Service limit
Except STi model 171 mm (6.73 in)
STi model 191 mm (7.52 in)

2) Measure the lining thickness. If it exceeds the limit, replace the shoe assembly.

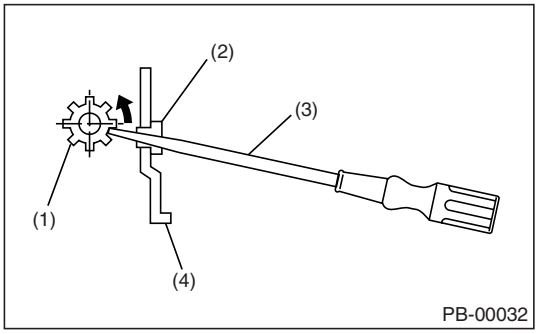
Lining thickness:
Standard
3.2 mm (0.126 in)
Service limit
1.5 mm (0.059 in)

NOTE:
Replace the right and left brake shoes at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Return the parking brake lever completely.
2) Remove the adjusting hole cover from back plate.
3) Turn the adjusting screw using a flat tip screwdriver until 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 or 4 notches.

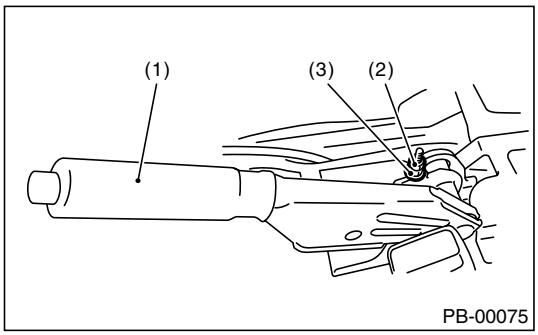
CAUTION:
Be sure that the brake is not dragging.

5) Install the adjusting hole cover to back plate.
6) Adjust the parking brake lever stroke. <Ref. to PB-11, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

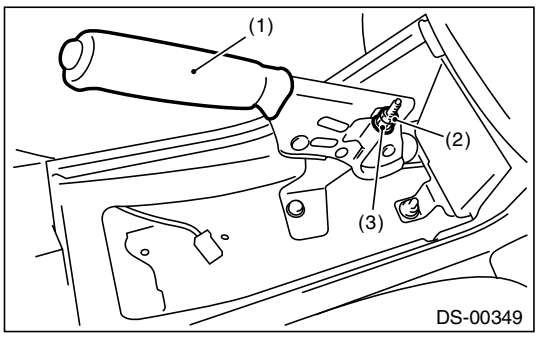
2. LEVER STROKE

1) Before adjusting the lever stroke, adjust the shoe clearance. <Ref. to PB-11, SHOE CLEARANCE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
2) Remove the console box lid.
3) Forcibly pulling the parking brake lever 3 to 5 times.
4) Adjust the parking brake lever stroke by turning adjusting nut to set the lever stroke to 7 to 8 notches when pulled the lever with a force of 196 N (20 kgf, 44 lbf).

- LHD MODEL



- RHD MODEL



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

5) Tighten the lock nut.
6) Install the console box lid.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)

Tightening torque (Lock nut):
6 N·m (0.6 kgf-m, 4.4 ft-lb)

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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.

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POWER ASSISTED SYSTEM (POWER STEERING)

PS

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2.	Steering Wheel	28
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1. General Description

A: SPECIFICATION

Model			1.6 L	2.0 L	OUTBACK	2.5 L	TURBO	STi
Whole system	Minimum turning radius m (ft)		5.2 (17.1)		5.5 (18.0)			5.7 (18.7)
	Steering angle (Inside-Outside)		37.3° — 32.4°		34.5° — 30.3°			32.9° — 28.5°
	Steering wheel diameter mm (in)		375 (14.76)					
	Overall gear ratio (Turns, lock to lock Gear box)		3.22		3.02	2.69		2.66
Gearbox	Type		Rack abd pinion, Integral					
	Backlash		0 (Automatically adjustable)					
	Valve (Power steering system)		Rotary valve					
Pump (Power steering system)	Type		Vane pump					
	Oil tank		Installed on body					
	Output cm^3 (cu in)/rev.		7.2 (0.439)	7.8 (0.476)			7.2 (0.439)	
	Relief pressure kPa (kgf/cm^2, psi)		6,174 — 6,860 (63 — 70, 896 — 994)	6,767 — 7,453 (69 — 76, 981 — 1,081)			7,350 — 8,036 (75 — 82, 1,067 — 1,165)	
	Hydraulic fluid control		Dropping in response to increased engine revolutions					
	Hydraulic fluid ℓ (US qt, Imp qt)/min		1,000 rpm: 6.7 (7.1, 5.9) 3,000 rpm: 6.2 (6.6, 5.4)	1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)			7.5 (7.9, 6.6)*1 7 (7.4, 6.2)*2	
	Range of revolution rpm		700 — 9,000					
	Revolving direction		Clockwise					
Working fluid (Power steering system)	Name		ATF DEXRON III or equivalent					
	Capacity ℓ (US qt, Imp qt)	Oil tank	0.3 (0.3, 0.3)					
		Total	0.7 (0.7, 0.6)					

*1: With maximum load.
*2: With no load.

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Model				LHD	RHD
Steering wheel	Free play		mm (in)	17 (0.67)	
Turning angle	Inner tire & wheel	TURBO, OUTBACK, RS		34.5°±1.5°	
		STi		32.9°±1.5°	
		Except TURBO, OUTBACK, RS, STi		37.3°±1.5°	
	Outer tire & wheel	TURBO, OUTBACK, RS		30.3°±1.5°	
		STi		28.5°±1.5°	
		Except TURBO, OUTBACK, RS, STi		32.4°±1.5°	
Steering shaft	Clearance between steering wheel and column cover		mm (in)	4.0 (0.16)	
Steering gear-box (Power steering system)	Sliding resistance		N (kgf, lbf)	400 (41, 90) or less	
	Rack shaft play in radial direction	Right-turn steering	mm (in)	0.19 (0.0075) or less	Horizontal movement: 0.19 (0.0075) or less Vertical movement: 0.3 (0.012) or less
		Left-turn steering	mm (in)	Horizontal movement: 0.15 (0.0059) or less Vertical movement: 0.3 (0.012) or less	0.19 (0.0075) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less	
		In axial direction	mm (in)	0.5 (0.020) or less	
	Turning resistance		N (kgf, lbf)	Maximum allowable value: Less than 10.5 N (1.1 kgf, 2.4 lbf) Difference between right and left sliding 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)	31.4 (3.2, 7.1) or less	
	At standstill with engine stalled on a concrete road		N (kgf, lbf)	294.2 (30, 66.2) or less	

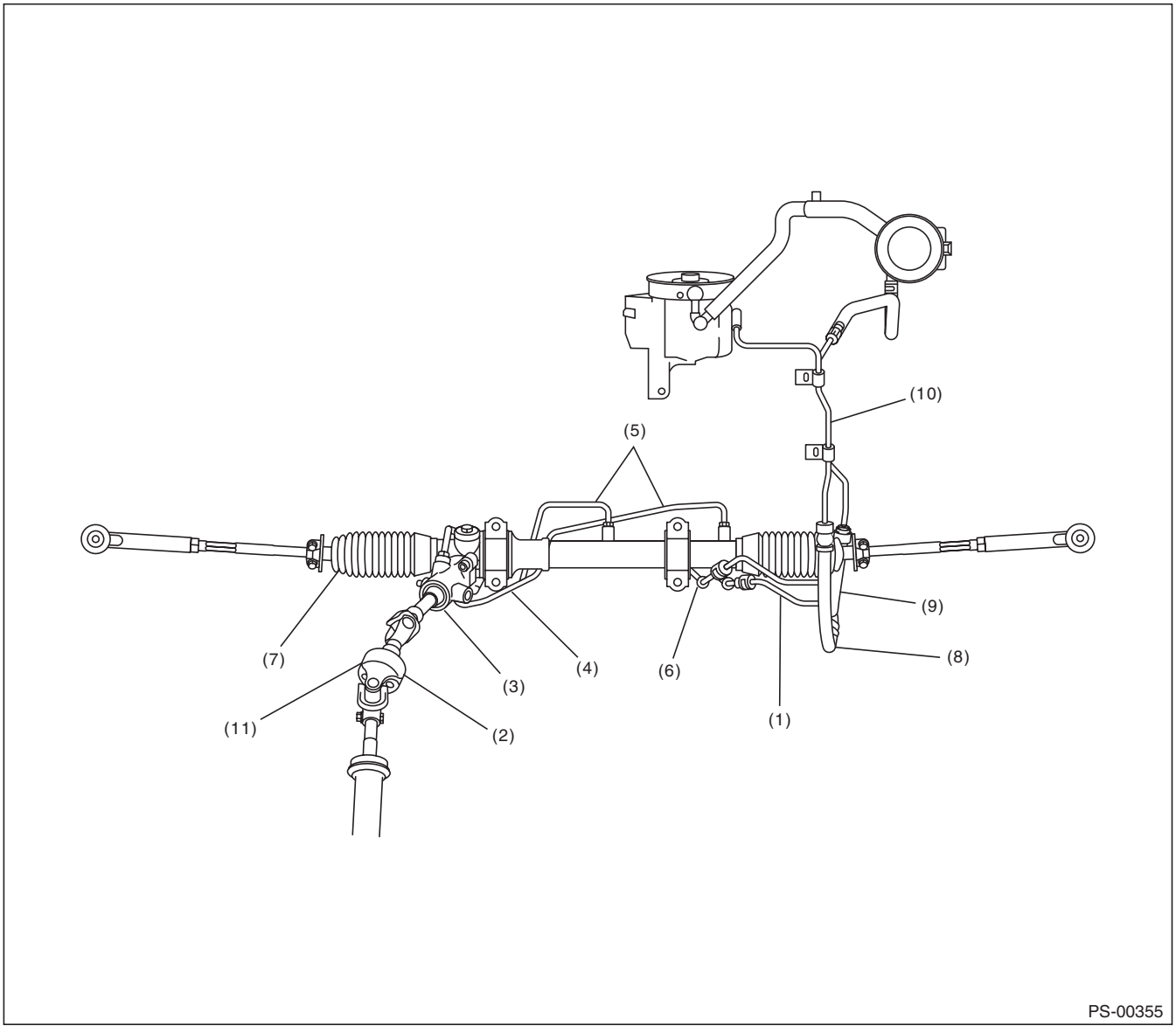
Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

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

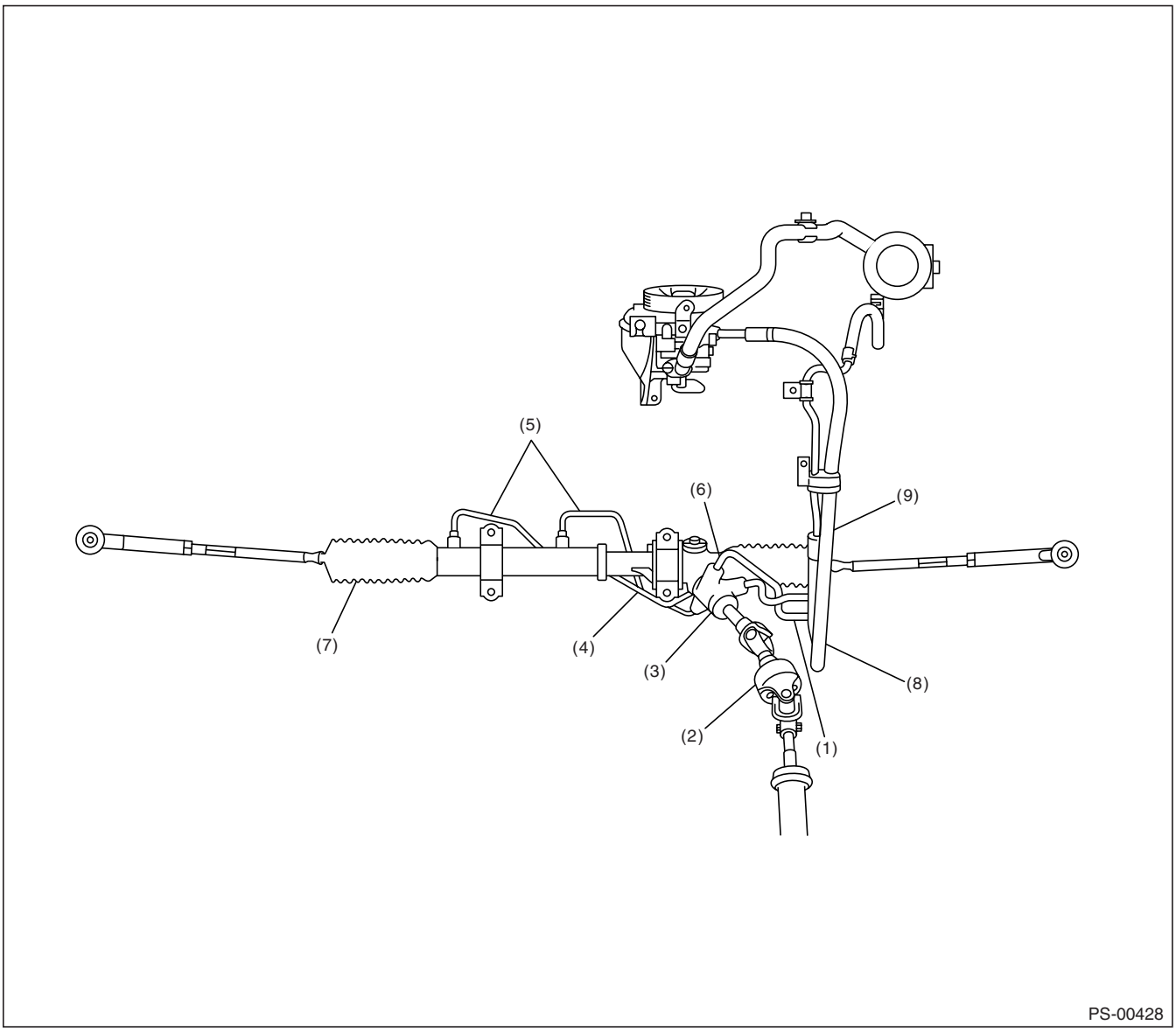
Location	Minimum allowance
(1) Crossmember — Pipe	5 mm (0.20 in)
(2) DOJ — Shaft or joint	14 mm (0.55 in)
(3) DOJ — Valve housing	11 mm (0.43 in)
(4) Pipe — Pipe	2 mm (0.08 in)
(5) Stabilizer — Pipe	5 mm (0.20 in)
(6) Exhaust pipe — Pipe	11 mm (0.43 in)
(7) Exhaust pipe — Gearbox bolt	15 mm (0.59 in)
(8) Side frame — Hose A and B	10 mm (0.39 in)
(9) Cruise control pump — Hose A and B	15 mm (0.59 in)
(10) Pipe portion of hose A — Pipe portion of hose B	1.5 mm (0.059 in)
(11) AT cooling hose — Joint (LHD model)	20 mm (0.79 in)

- LHD MODEL



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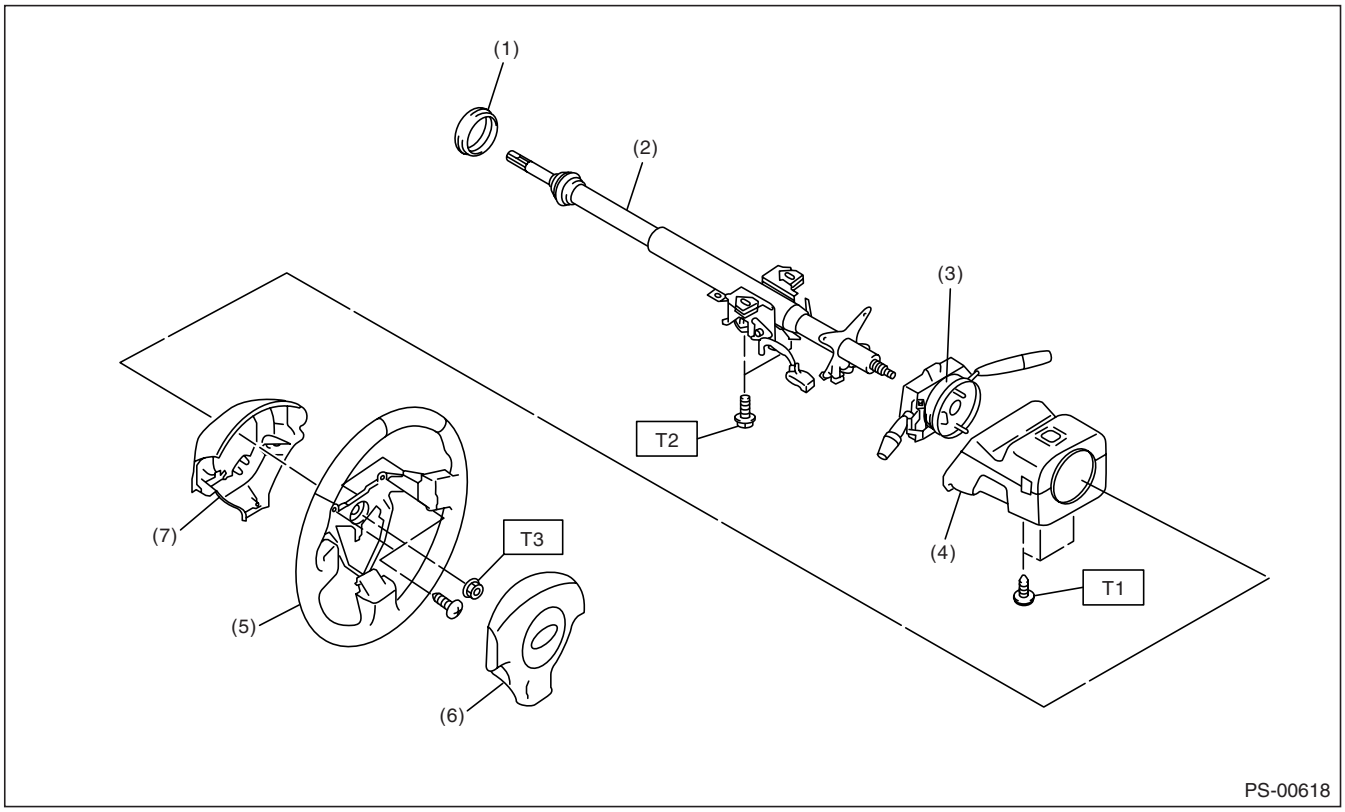
- RHD MODEL



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B: COMPONENT

1. STEERING WHEEL AND COLUMN



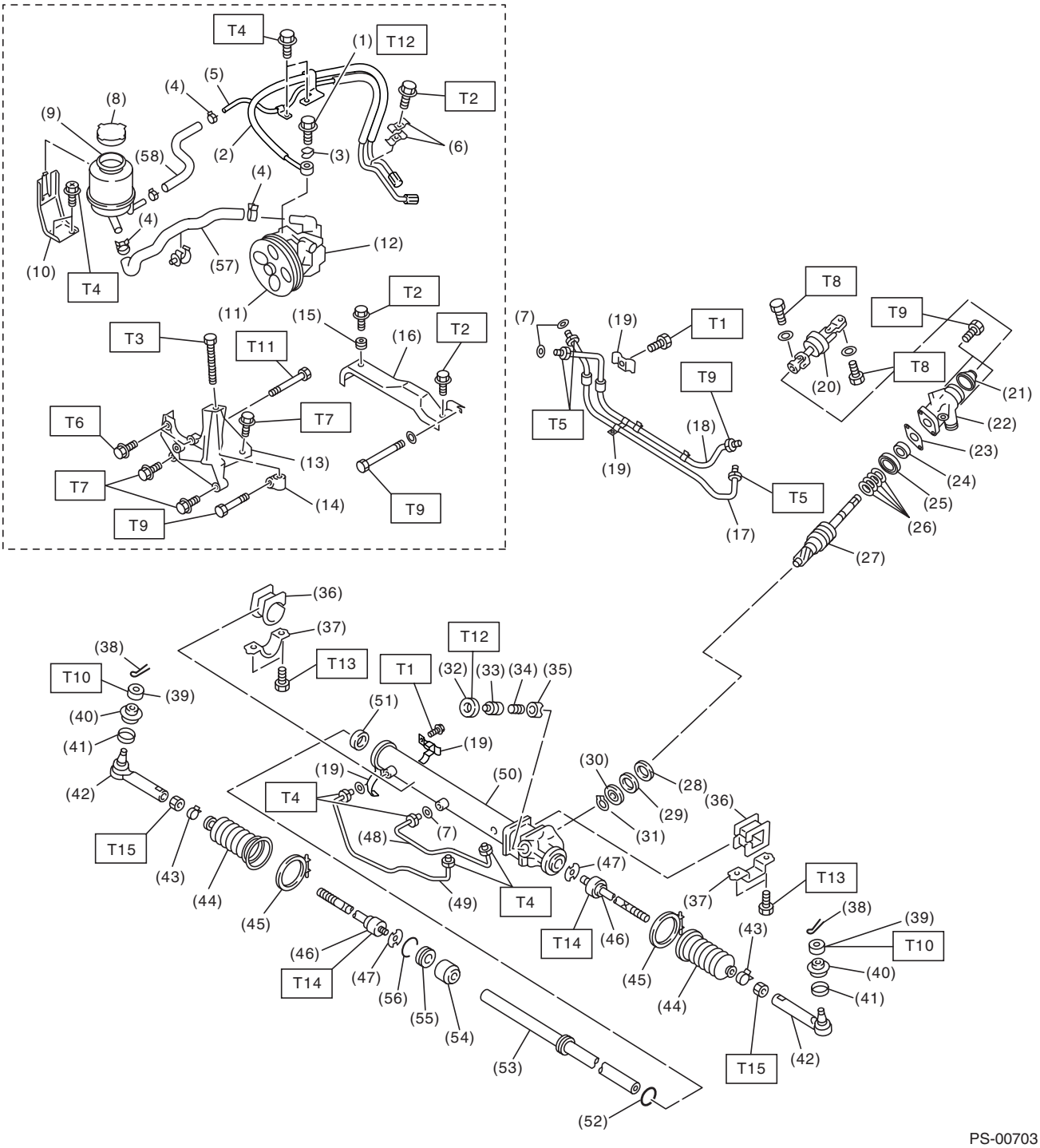
(1) Bushing
(2) Steering shaft
(3) Steering roll connector
(4) Column cover
(5) Steering wheel
(6) Airbag module
(7) Steering wheel lower cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.2 (0.12, 0.9)
T2: 25 (2.5, 18.1)
T3: 45 (4.6, 33.2)

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2. POWER ASSISTED SYSTEM

• LHD NON-TURBO MODEL



PS-00703

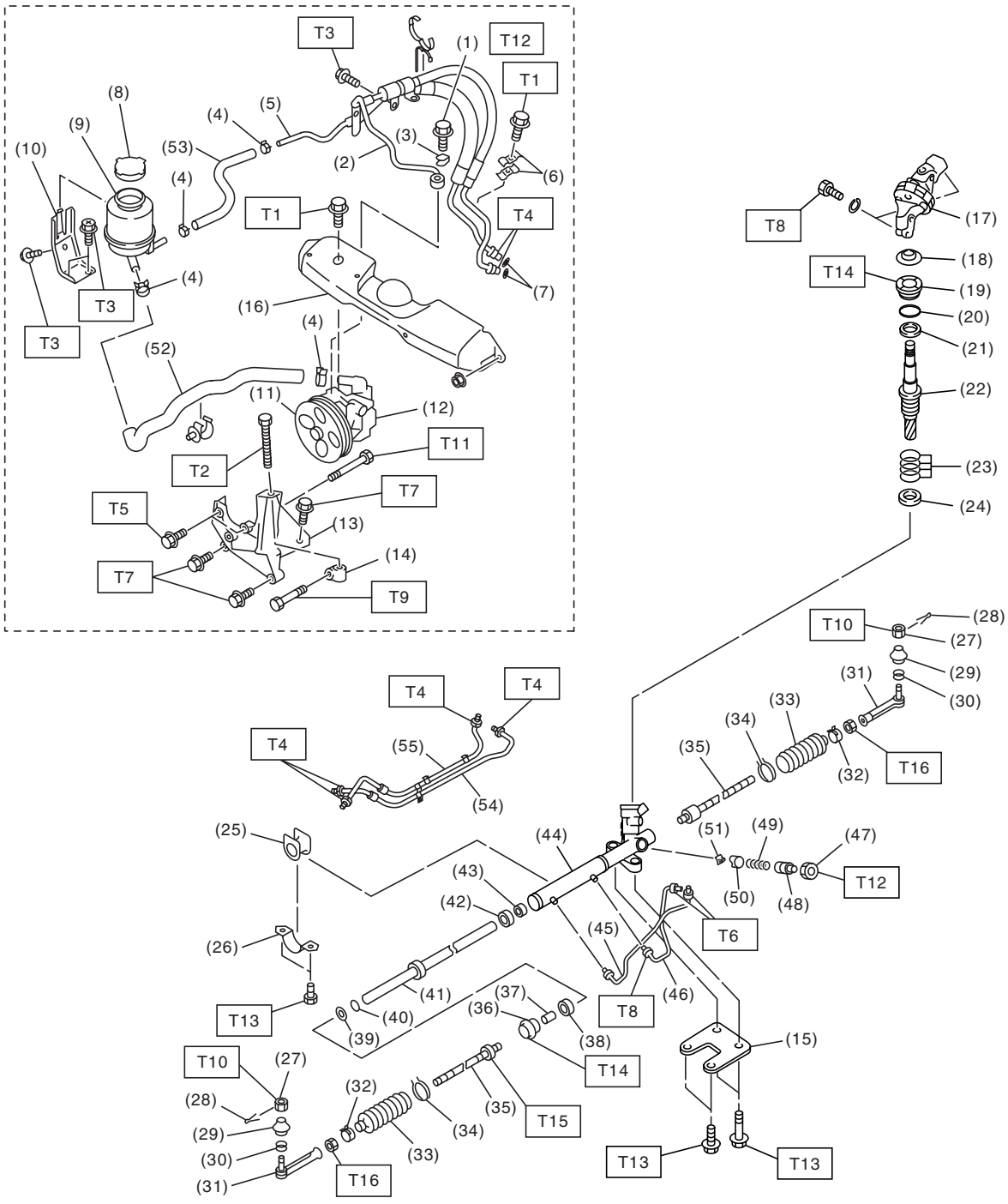
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(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bush
(16) Belt cover
(17) Pipe E
(18) Pipe F
(19) Clamp plate
(20) Universal joint
(21) Dust seal
(22) Valve housing
(23) Gasket
(24) Oil seal
(25) Ball bearing
(26) Seal ring
(27) Pinion and valve ASSY
(28) Oil seal
(29) Back-up washer
(30) Ball bearing
(31) Snap ring
(32) Lock nut
(33) Adjusting screw
(34) Spring
(35) Sleeve
(36) Adapter
(37) Clamp
(38) Cotter pin
(39) Castle nut
(40) Dust cover
(41) Clip
(42) Tie-rod end
(43) Clip
(44) Boot
(45) Band
(46) Tie-rod
(47) Lock washer
(48) Pipe B
(49) Pipe A
(50) Steering body
(51) Oil seal
(52) Piston ring
(53) Rack
(54) Rack bushing
(55) Rack stopper
(56) Snap ring
(57) Suction hose
(58) Hose

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***6 (0.6, 4.3)***
T2:	***7.4 (0.75, 5.4)***
T3:	***8 (0.8, 5.8)***
T4:	***13 (1.3, 9.4)***
T5:	***15 (1.5, 10.8)***
T6:	***15.7 (1.6, 11.6)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.4)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***39 (4.0, 28.9)***
T13:	***59 (6.0, 43.4)***
T14:	***78 (8.0, 57.9)***
T15:	***83 (8.5, 61.5)***

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• LHD TURBO MODEL AND STi MODEL



PS-00704

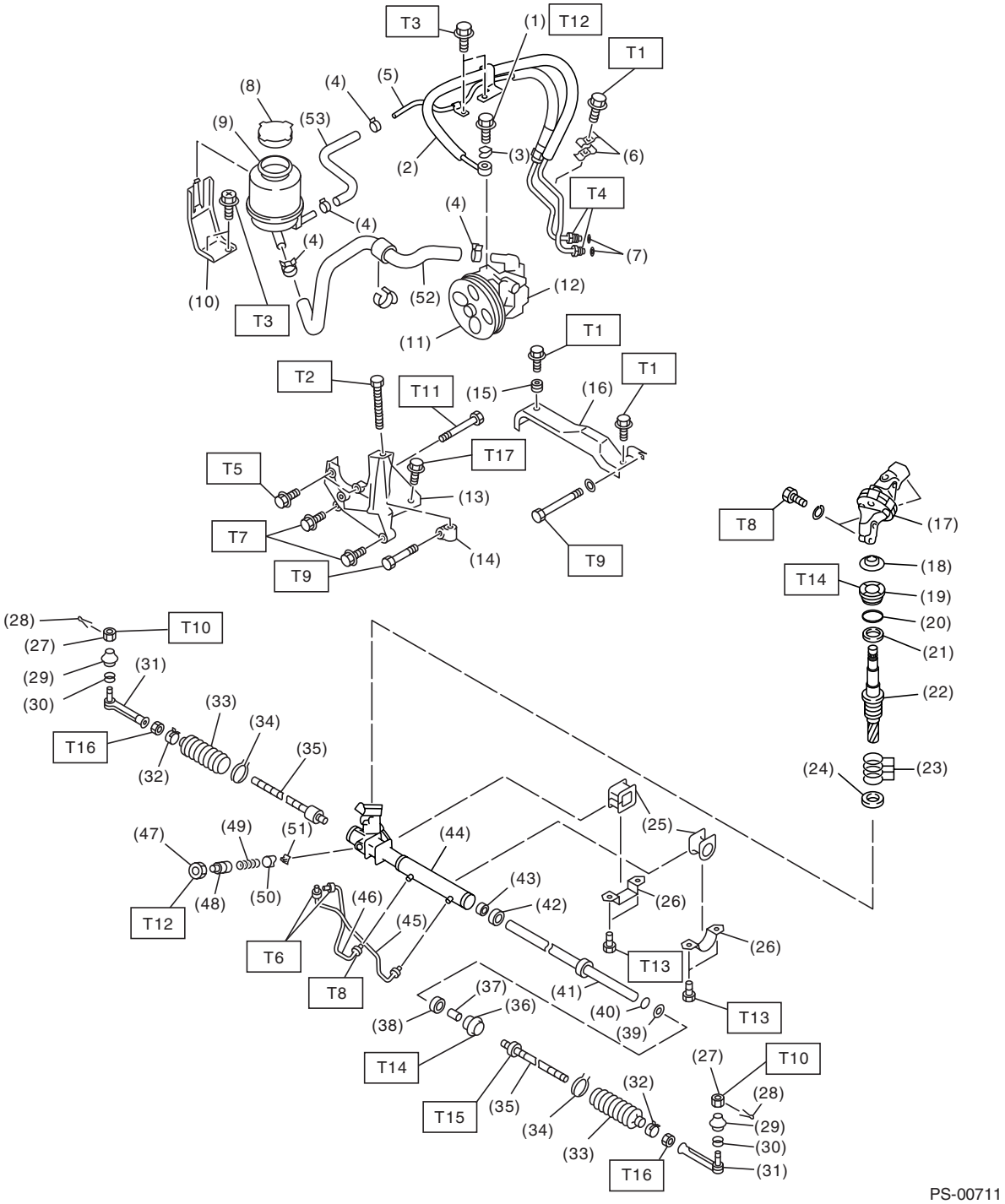
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(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Stiffener
(16) Belt cover
(17) Universal joint
(18) Dust cover
(19) Plug
(20) O-ring
(21) Oil seal
(22) Pinion
(23) Seal ring
(24) Oil seal
(25) Adapter
(26) Clamp
(27) Castle nut
(28) Cotter pin
(29) Dust seal
(30) Clip
(31) Tie-rod end
(32) Clip
(33) Boot
(34) Wire
(35) Tie-rod
(36) Holder
(37) Bushing
(38) Oil seal
(39) Oil seal
(40) O-ring
(41) Rack
(42) Oil seal
(43) Back-up washer
(44) Steering body
(45) Pipe A
(46) Pipe B
(47) Lock nut
(48) Adjusting screw
(49) Spring
(50) Sleeve
(51) Seat pad
(52) Suction hose
(53) Return hose
(54) Pipe G
(55) Pipe H

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***7.4 (0.75, 5.4)***
T2:	***8 (0.8, 5.8)***
T3:	***13 (1.3, 9.4)***
T4:	***15 (1.5, 10.8)***
T5:	***15.7 (1.6, 11.6)***
T6:	***20 (2.0, 14.5)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.4)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***39 (4.0, 28.9)***
T13:	***60 (6.1, 44.1)***
T14:	***64 (6.5, 47.0)***
T15:	***90 (9.0, 65.1)***
T16:	***85 (8.7, 62.7)***

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• RHD NON-TURBO MODEL



PS-00711

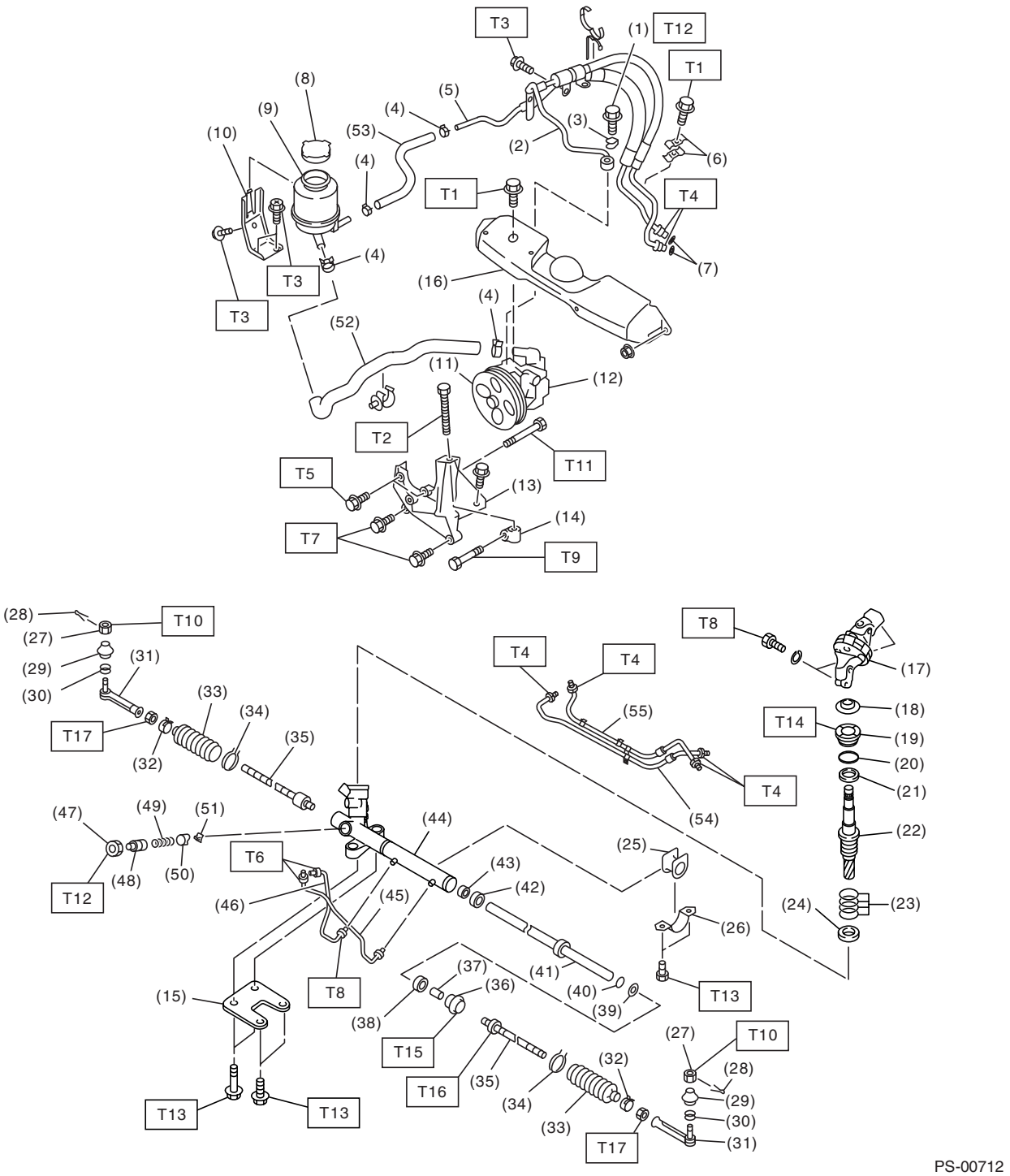
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(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bush
(16) Belt cover
(17) Universal joint
(18) Dust cover
(19) Plug
(20) O-ring
(21) Oil seal
(22) Pinion
(23) Seal ring
(24) Oil seal
(25) Adapter
(26) Clamp
(27) Castle nut
(28) Cotter pin
(29) Dust seal
(30) Clip
(31) Tie-rod end
(32) Clip
(33) Boot
(34) Wire
(35) Tie-rod
(36) Holder
(37) Bush
(38) Oil seal
(39) Oil seal
(40) O-ring
(41) Rack
(42) Oil seal
(43) Back-up washer
(44) Steering body
(45) Pipe A
(46) Pipe B
(47) Lock nut
(48) Adjusting screw
(49) Spring
(50) Sleeve
(51) Seat pad
(52) Suction hose
(53) Return hose

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***7.4 (0.75, 5.4)***
T2:	***8 (0.8, 5.8)***
T3:	***13 (1.3, 9.4)***
T4:	***15 (1.5, 10.8)***
T5:	***15.7 (1.6, 11.6)***
T6:	***20 (2.0, 14.5)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.4)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***39 (4.0, 28.9)***
T13:	***60 (6.1, 44.1)***
T14:	***64 (6.5, 47.0)***
T15:	***90 (9.0, 65.1)***
T16:	***85 (8.7, 62.7)***

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• RHD TURBO MODEL



PS-00712

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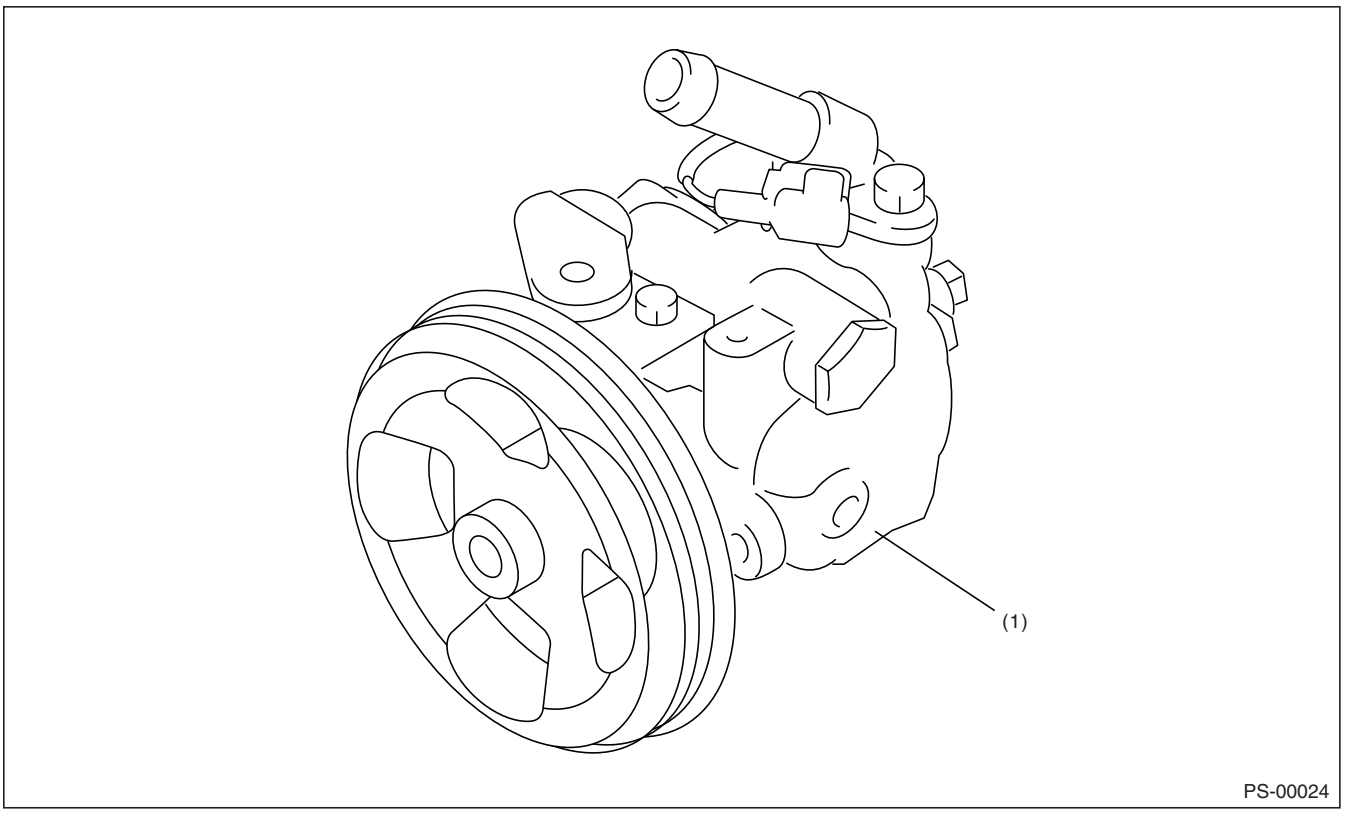
(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Stiffener
(16) Belt cover
(17) Universal joint
(18) Dust cover
(19) Plug
(20) O-ring
(21) Oil seal
(22) Pinion
(23) Seal ring
(24) Oil seal
(25) Adapter
(26) Clamp
(27) Castle nut
(28) Cotter pin
(29) Dust seal
(30) Clip
(31) Tie-rod end
(32) Clip
(33) Boot
(34) Wire
(35) Tie-rod
(36) Holder
(37) Bush
(38) Oil seal
(39) Oil seal
(40) O-ring
(41) Rack
(42) Oil seal
(43) Back-up washer
(44) Steering body
(45) Pipe A
(46) Pipe B
(47) Lock nut
(48) Adjusting screw
(49) Spring
(50) Sleeve
(51) Seat pad
(52) Suction hose
(53) Return hose
(54) Pipe G
(55) Pipe H

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***7.4 (0.75, 5.4)***
T2:	***8 (0.8, 5.8)***
T3:	***13 (1.3, 9.4)***
T4:	***15 (1.5, 10.8)***
T5:	***15.7 (1.6, 11.6)***
T6:	***20 (2.0, 14.5)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.4)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***39 (4.0, 28.9)***
T13:	***60 (6.1, 44.1)***
T14:	***64 (6.5, 47.0)***
T15:	***75 (7.6, 58.7)***
T16:	***90 (9.0, 65.1)***
T17:	***85 (8.7, 62.7)***

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3. OIL PUMP

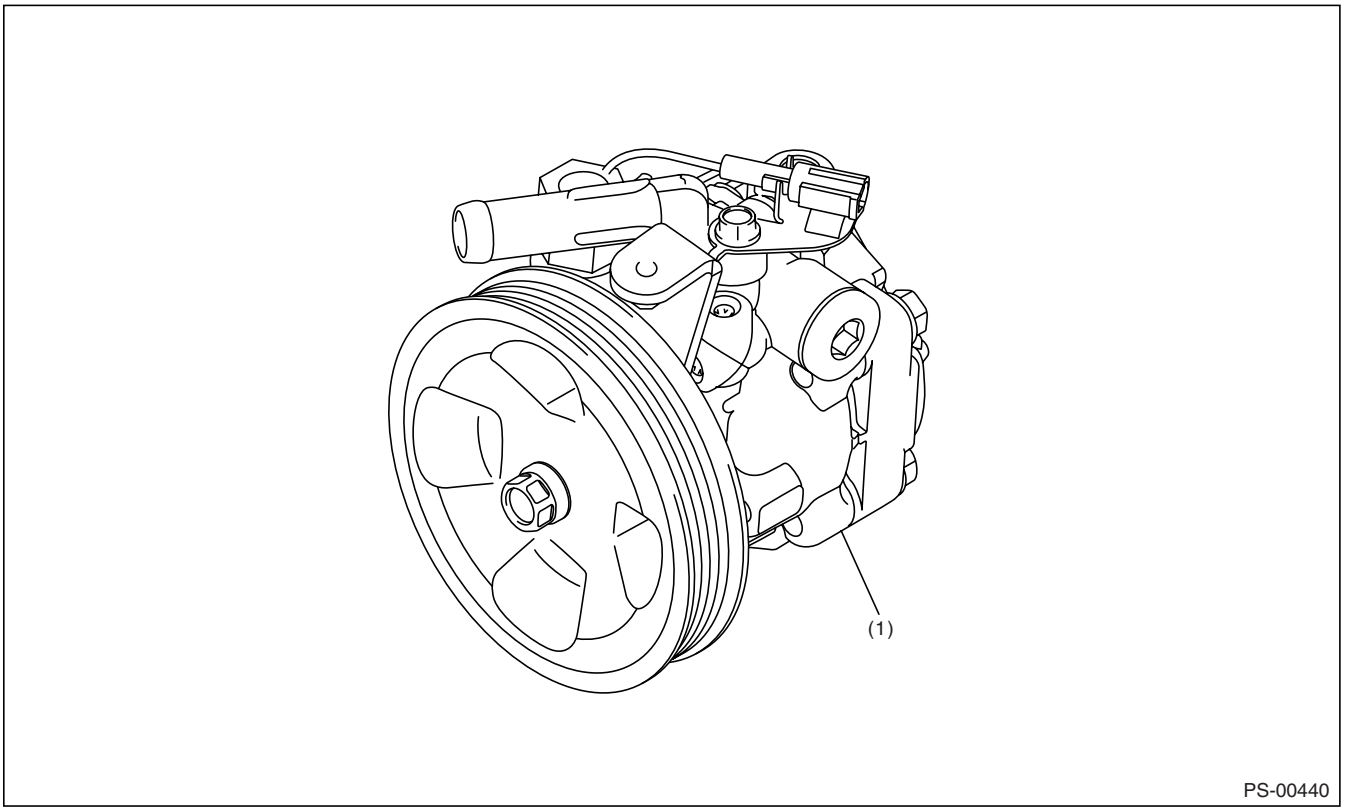
• NON-TURBO MODEL



(1) Power steering oil pump ASSY

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• TURBO MODEL



(1) Power steering oil pump ASSY

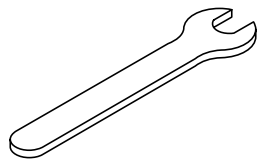
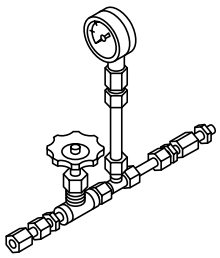
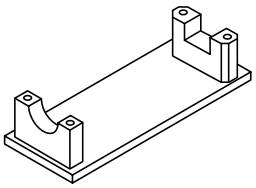
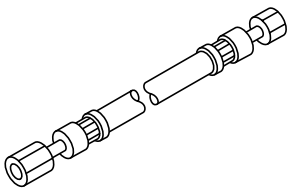
C: CAUTION

• Wear working 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, because each part on the vehicle is hot after running.
• Use SUBARU genuine power steering fluid, grease etc. or the equivalent. Do not mix steering 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 wood blocks, aluminum plate, or shop cloth between the part and the vise.

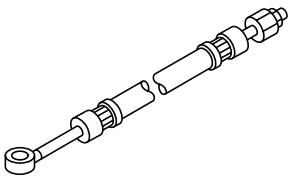
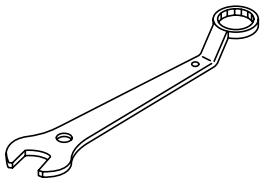
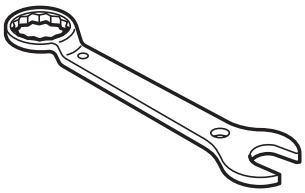
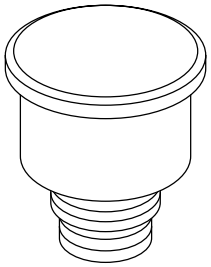
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D: PREPARATION TOOL

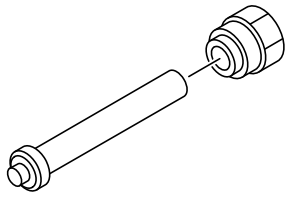
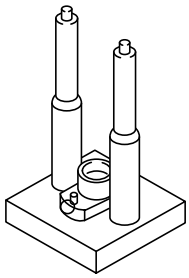
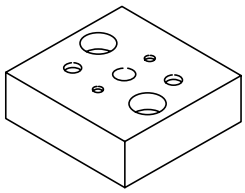
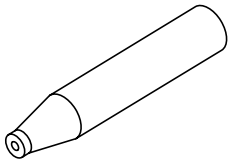
1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925700000	925700000	WRENCH	• Used for removing and installing tie-rod. • Apply this tool to rack.
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

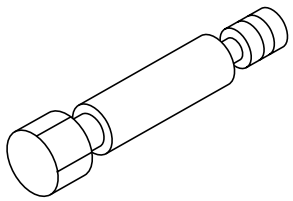
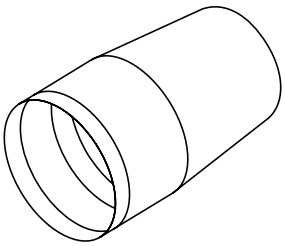
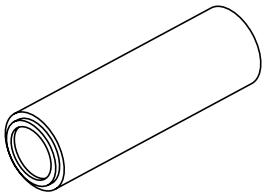
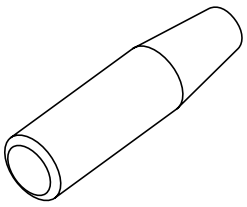
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gear-box.
 ST34099PA100	34099PA100	SPANNER	Used for measuring the rotating resistance of gear-box assembly.
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering fluid.

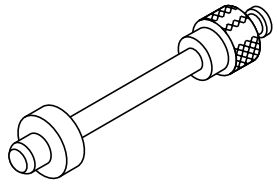
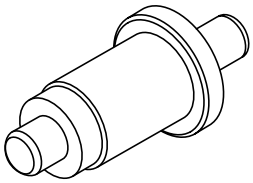
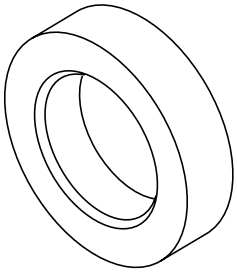
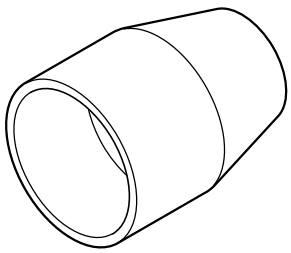
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926420000	926420000	PLUG	When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.
 ST-926370000	926370000	INSTALLER A	• Used for installing valve assembly into valve housing assembly. • Used with STAND BASE (34099FA100). • For LHD Non-turbo model.
 ST34099FA100	34099FA100	STAND BASE	• Used for assembling power steering gearbox. • For LHD Non-turbo model.
 ST-926390001	926390001	COVER & REMOVER ASSY	• Used for assembling rack assembly. • For LHD Non-turbo model.

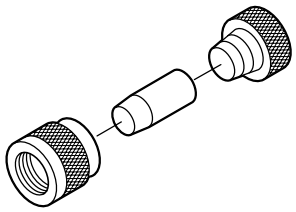
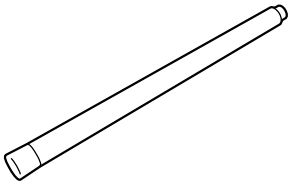
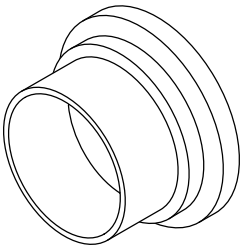
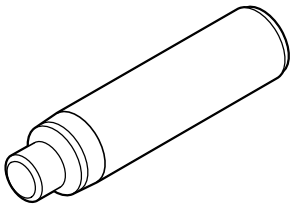
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926400000	926400000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (927660000). • For LHD Non-turbo model.
 ST-927660000	927660000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (926400000). • For LHD Non-turbo model.
 ST-927620000	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000). • For LHD Non-turbo model.
 ST-926360000	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000). • For LHD Non-turbo model.

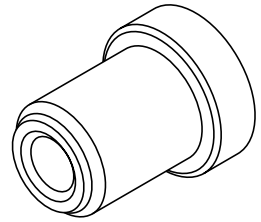
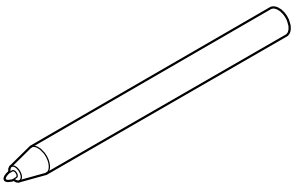
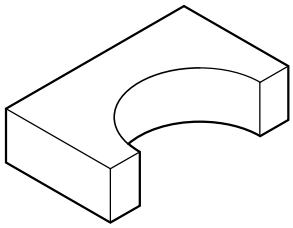
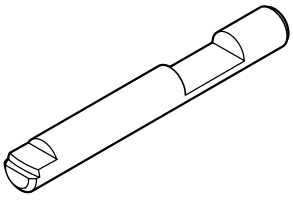
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA110	34099FA110	INSTALLER	Used for installing oil seal. • For LHD Non-turbo model.
 ST34099FA120	34099FA120	INSTALLER AND REMOVER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER SEAL. (34099FA130) • Used for installing valve housing ball bearing. • Used for removing oil seal and ball bearing from valve housing. • For LHD Non-turbo model.
 ST34099FA130	34099FA130	INSTALLER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER AND REMOVER SEAL (34099FA120). • For LHD Non-turbo model.
 ST-926250000	926250000	GUIDE	• Used for installing holder ASSY into rack housing. • For RHD Non-turbo model.

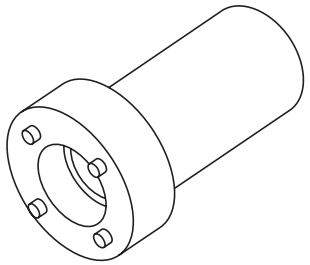
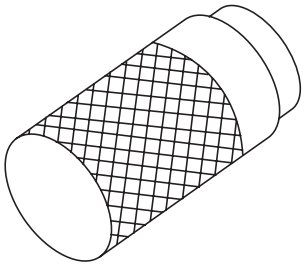
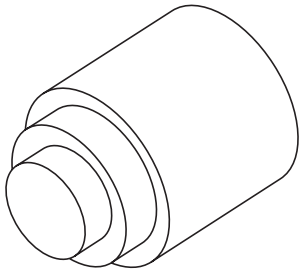
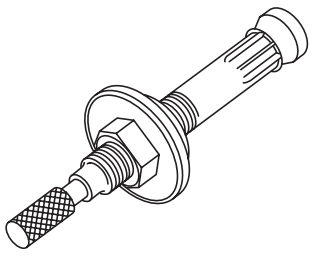
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927490000	927490000	INSTALLER A, B, C	• Used for installing oil seal into rack assembly. • For RHD Non-turbo model.
 ST-927580000	927580000	REMOVER	• Used for removing back-up ring and oil seal. • For RHD Non-turbo model.
 ST34199AE000	34199AE000	GUIDE	• Used for installing rack and seal into housing assembly. • For RHD Non-turbo model.
 ST34099FA030	34099FA030	INSTALLER & REMOVER	• Used for removing and installing rack oil seal (outer & inner). • For RHD Non-turbo model.

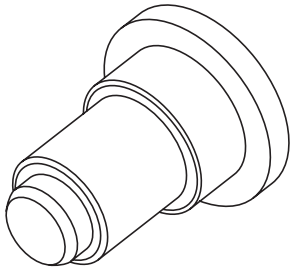
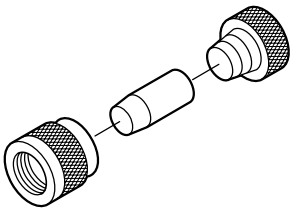
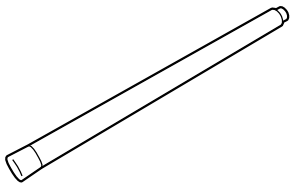
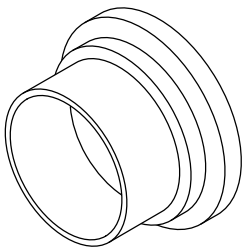
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE010	34199AE010	INSTALLER	• Used for installing rack oil seal (outer). • For RHD Non-turbo model.
 ST34099FA060	34099FA060	PUNCH HOLDER	• Used for caulking. • For RHD Non-turbo and Turbo model • For LHD Turbo model
 ST34099FA070	34099FA070	BASE	• Used for supporting housing assembly. • For RHD Non-turbo model.
 ST34099FA080	34099FA080	PUNCH	• Used for removing caulking. • For RHD Non-turbo and Turbo model • For LHD Turbo model

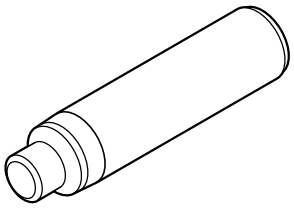
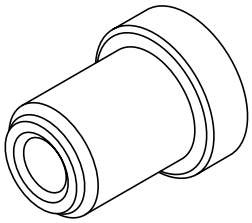
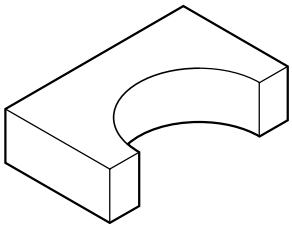
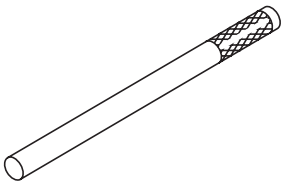
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE090	34199AE090	PLUG WRENCH	• Used for removing plug. • For RHD Non-turbo and Turbo model • For LHD Turbo model
 ST34199AE100	34199AE100	PLUG OIL SEAL REMOVER	• Used for removing plug oil seal. • For RHD Non-turbo and Turbo model • For LHD Turbo model
 ST34199AE110	34199AE110	PLUG OIL SEAL INSTALLER	• Used for installing plug oil seal. • For RHD Non-turbo and Turbo model • For LHD Turbo model
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	• Used for removing gearbox oil seal. • For RHD Non-turbo and Turbo model • For LHD Turbo model

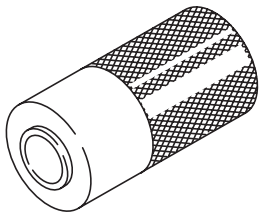
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	• Used for installing gearbox oil seal. • For RHD Non-turbo and Turbo model • For LHD Turbo model
 ST34199FE040	34199FE040	INSTALLER A, B, C	• Used for installing oil seal into rack assembly. • For RHD Turbo model. • For LHD Turbo model.
 ST34199FE010	34199FE010	REMOVER	• Used for removing back-up ring and oil seal. • For RHD Turbo model. • For LHD Turbo model.
 ST34199FE050	34199FE050	GUIDE	• Used for installing rack and seal into housing assembly. • For RHD Turbo model. • For LHD Turbo model.

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199FE000	34199FE000	INSTALLER & REMOVER	• Used for removing and installing rack oil seal (outer & inner). • For RHD Turbo model. • For LHD Turbo model.
 ST34199FE060	34199FE060	INSTALLER	• Used for installing rack oil seal (outer). • For RHD Turbo model. • For LHD Turbo model.
 ST34199FE020	34199FE020	BASE	• Used for supporting housing assembly. • For RHD Turbo model. • For LHD Turbo model.
 ST34199AE050	34199AE050	OIL SEAL REMOVER	• Used for removing oil seal. • For LHD Non-turbo model.

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927640000	927640000	INSTALLER B	• Used for ball bearing into housing. • For LHD Non-turbo model.

2. GENERAL TOOL

TOOL NAME	REMARKS
Spring scale	Used for measuring tightening torque.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring steering gearbox.

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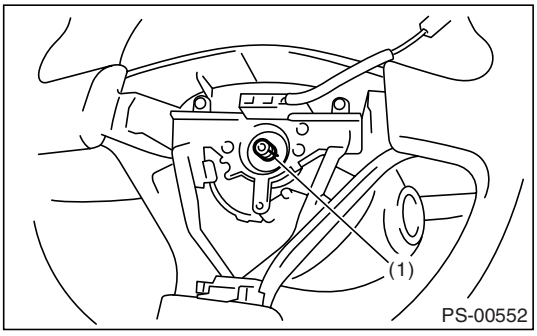
2. Steering Wheel

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tires to straight-ahead position.
3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

4) Make matching marks on the steering wheel and steering shaft.



(1) Matching 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-3, CAUTION, General Description.>

1) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align matching 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 the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

C: INSPECTION

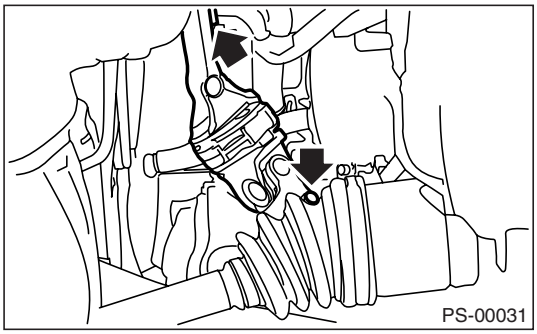
1) Check the steering wheel for deformation. If the deformation is excessive, replace steering wheel.
2) Check the splines on steering wheel for damage. If the damage is excessive, replace steering wheel.

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3. Universal Joint

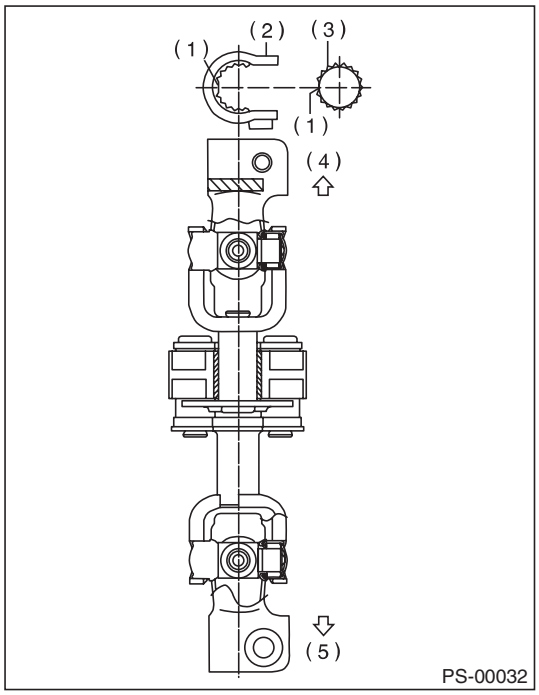
A: REMOVAL

1) Remove the steering wheel. <Ref. to PS-28, REMOVAL, Steering Wheel.>
2) Make matching mark on the 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, and then insert the universal joint into column shaft.



(1) Cutout
(2) Yoke
(3) Column shaft
(4) Column shaft side
(5) Gearbox side

2) Align the matching marks, and then insert the universal joint to serrated section of gear box assembly.
3) Tighten the bolt.

Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
Excessively large tightening torque of the universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 14 mm (0.55 in)

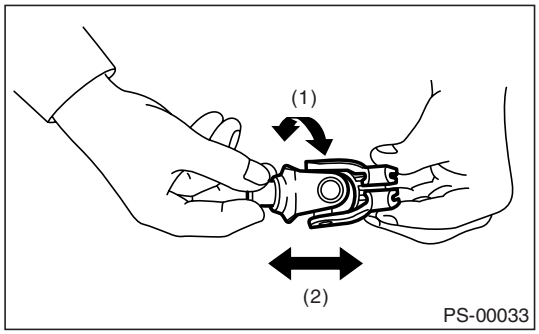
4) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
5) Install the steering wheel and airbag module. <Ref. to PS-28, INSTALLATION, Steering Wheel.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

C: INSPECTION

Check for wear, damage, or any other faults. If necessary, replace.

Service limit:
Universal joint play; 0 mm (0 in)
Maximum swing torque; 0.3 N (0.03 kgf, 0.07 lbf)

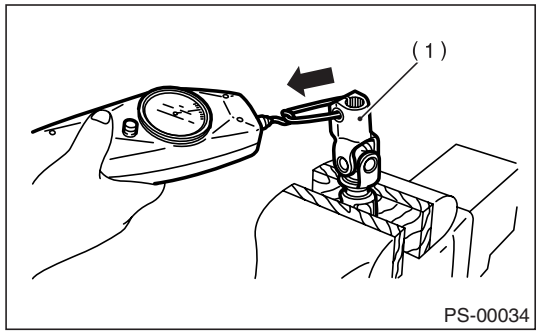


(1) Swing torque
(2) Play

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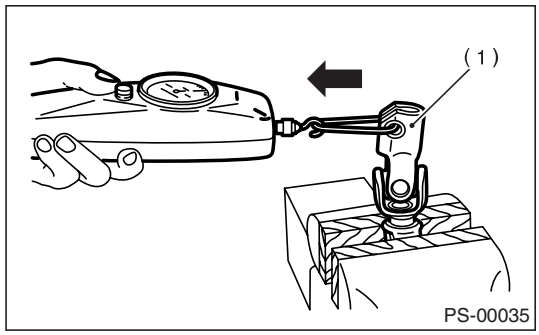
Measurement of swing torque of universal joint is as shown in the figures.

Service limit:
Maximum load; 3.8 N (0.39 kgf, 0.86 lbf) or less



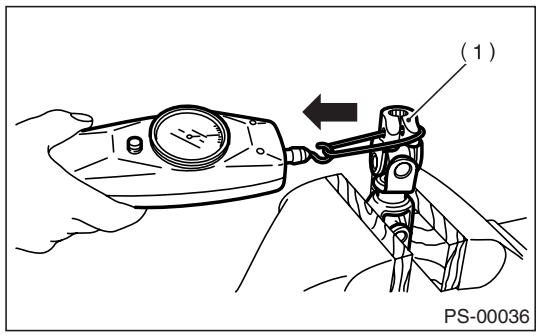
(1) Yoke (gearbox side)

Service limit:
Maximum load; 3.8 N (0.39 kgf, 0.86 lbf) or less



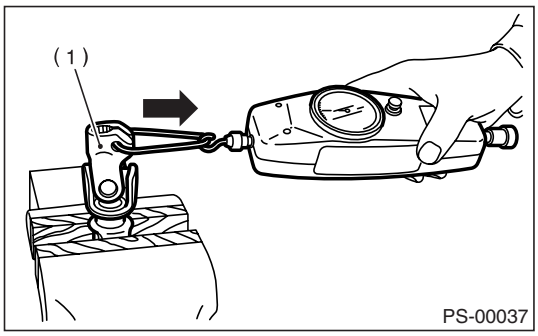
(1) Yoke (gearbox side)

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

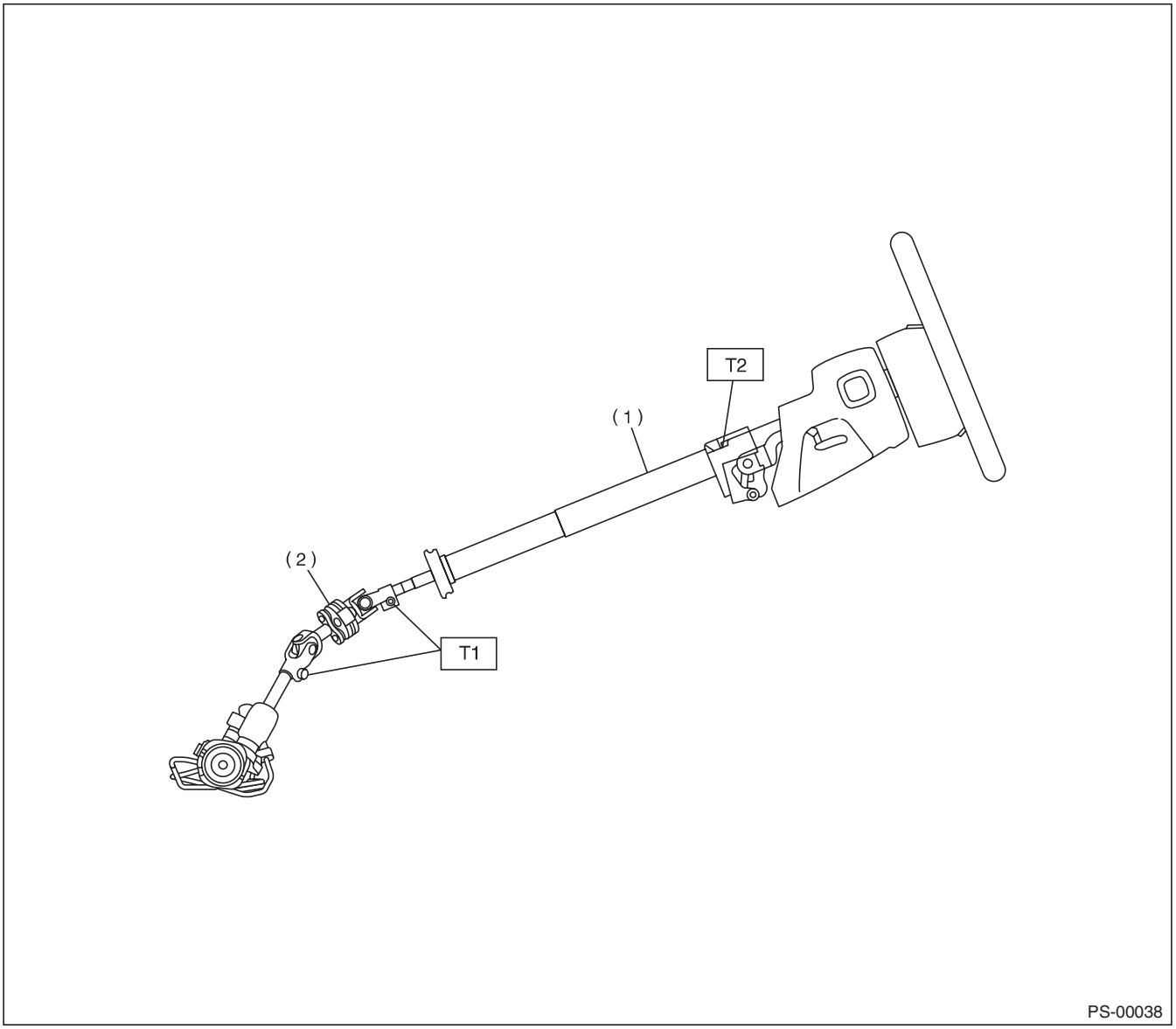


(1) Yoke (Steering column side)

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4. Tilt Steering Column

A: REMOVAL



(1) Tilt steering column
(2) Universal joint

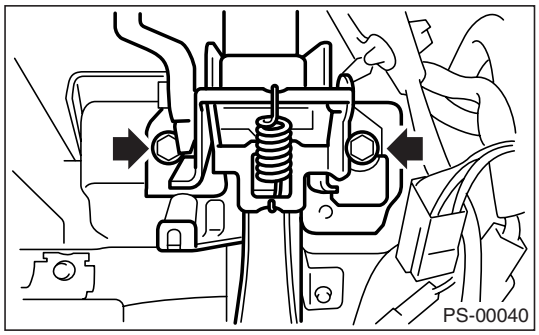
Tightening torque: N·m (kgf-m, ft-lb)
T1: 24 (2.4, 17.4)
T2: 25 (2.5, 18.1)

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1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

4) Remove the steering wheel. <Ref. to PS-28, REMOVAL, Steering Wheel.>
5) Remove the universal joint. <Ref. to PS-29, REMOVAL, Universal Joint.>
6) Remove the trim panel under instrument panel.
7) Remove the steering column lower cover.
8) Remove all connectors from steering column.
9) Remove the two bolts under instrument panel securing steering column.

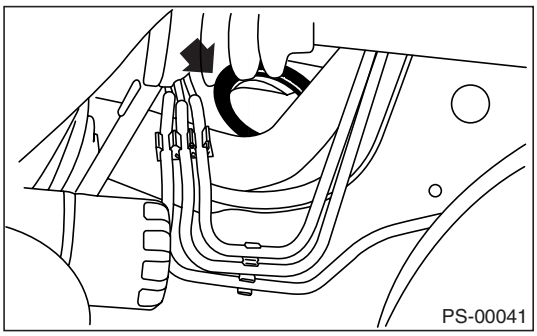

PS-00040

10) Pull out the steering shaft assembly from hole on toe board.

CAUTION:
• Be sure to remove the universal joint before removing the steering shaft assembly installing bolts when removing the 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) Set the grommet to toe board.


PS-00041

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, 18.1 ft-lb)

4) Connect all connectors under instrument panel.
5) Connect the airbag system connector at harness spool.

NOTE:
Make sure to apply double lock.

6) Install the lower column cover with tilt lever held in the lowered position.
7) Install the universal joint. <Ref. to PS-29, INSTALLATION, Universal Joint.>
8) Align center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
9) Install the steering wheel. <Ref. to PS-28, INSTALLATION, Steering Wheel.>

CAUTION:
Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

10) Install the airbag module to steering wheel.

WARNING:
Always refer to "Airbag System" before performing the service operation. <Ref. to AB-3, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and two screws securing combination switch, and then remove the related parts.

D: ASSEMBLY

Insert the combination switch to upper column shaft, and then install the upper column cover. Then route the ignition key harness and combination switch harness between column cover mounting bosses.

Tightening torque:
Column cover
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

CAUTION:
Do not overtorque the screw.

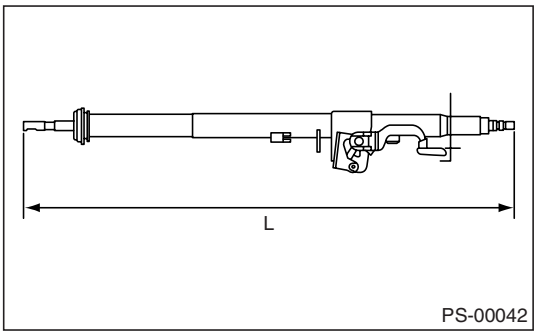
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E: INSPECTION

1. BASIC INSPECTION

Measure overall length of the steering column. If not as specified, replace.

Standard value:
Overall length L
818.7±1.5 mm (32.23±0.059 in)



2. AIRBAG MODEL INSPECTION

WARNING:
For airbag inspection procedures, refer to "Air-bag System". <Ref. to AB-3, CAUTION, General Description.>

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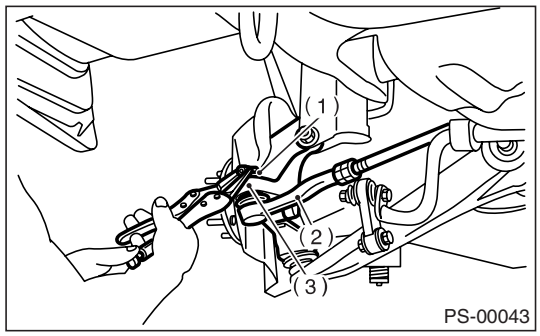
5. Steering Gearbox [LHD Model]

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nut.
4) Lift-up the vehicle, and then remove the front wheels.
5) Remove the under cover.
6) Remove the sub frame. <Ref. to FS-25, REMOVAL, Sub Frame.>
7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(H4SO)-6, REMOVAL, Front Exhaust Pipe.>

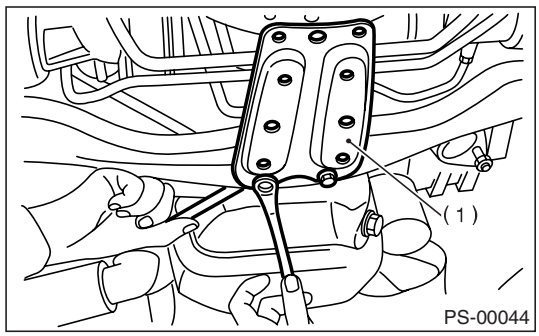
WARNING:
Be careful, the exhaust pipe is hot.

8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



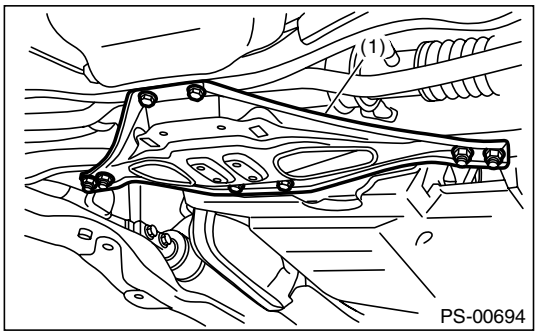
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

9) Remove the jack-up plate and front stabilizer.
- NON-TURBO MODEL



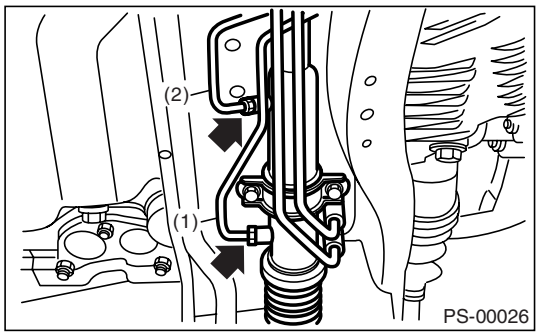
(1) Jack-up plate

- TURBO MODEL



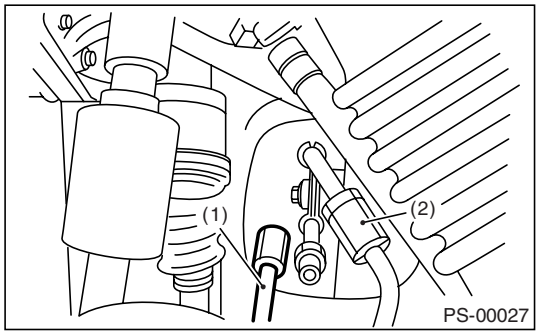
(1) Jack-up plate

10) Remove the one pipe joint at center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



(1) Pipe A
(2) Pipe B

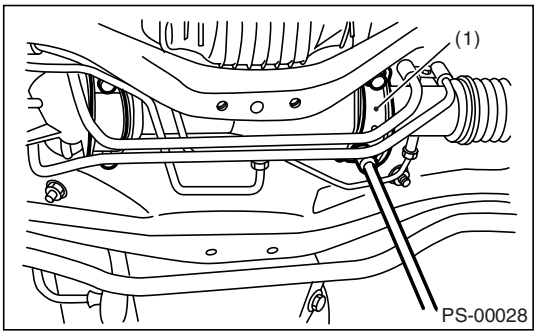
11) Remove the universal joint. <Ref. to PS-29, REMOVAL, Universal Joint.>
12) Disconnect the lower pipe C from gear box first, and upper pipe D second.



(1) Pipe C
(2) Pipe D

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13) Remove the clamp bolts securing the gearbox to crossmember, and then remove the gearbox.

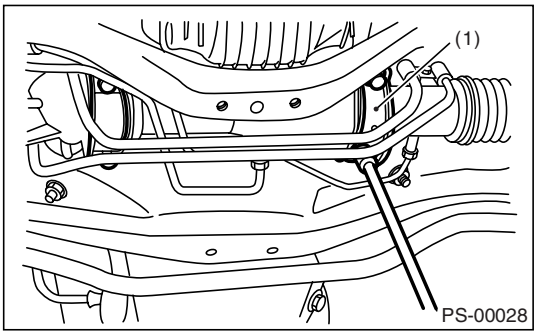


(1) Clamp

B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.
2) Tighten the gearbox to crossmember bracket via clamp with bolts to specified torque.

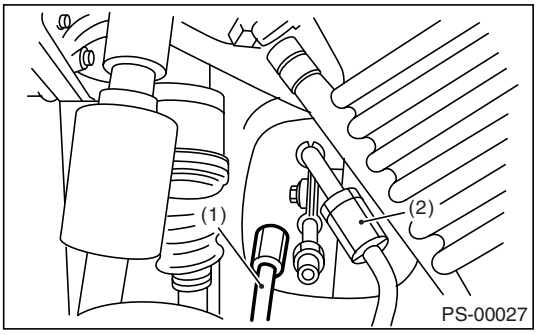
Tightening torque:
59 N·m (6.0 kgf-m, 43.4 ft-lb)



(1) Clamp

3) Connect the pipe D first to gear box, and pipe C second.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



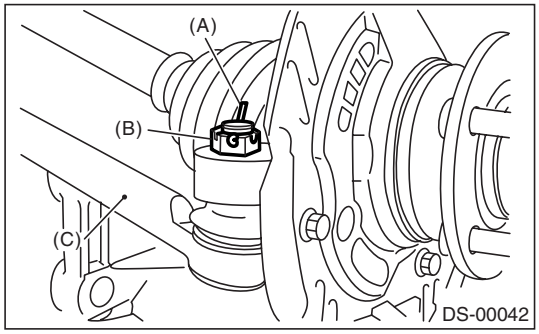
(1) Pipe C
(2) Pipe D

4) Install the universal joint. <Ref. to PS-29, INSTALLATION, Universal Joint.>
5) 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 the cap at bottom of tie-rod end with hammer.

6) After tightening the castle nut to specified torque, tighten it further within 60° until cotter pin hole is aligned with the slot in nut, and then bend the cotter pin to lock.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

7) Install the front stabilizer to vehicle. <Ref. to FS-23, INSTALLATION, Front Stabilizer.>
8) Install the front exhaust pipe assembly.
9) Install the sub frame. <Ref. to FS-25, INSTALLATION, Sub Frame.>
10) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
11) Install the steering wheel. <Ref. to PS-28, INSTALLATION, Steering Wheel.>
12) Install the front wheels.
13) Tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66.4 ft-lb)

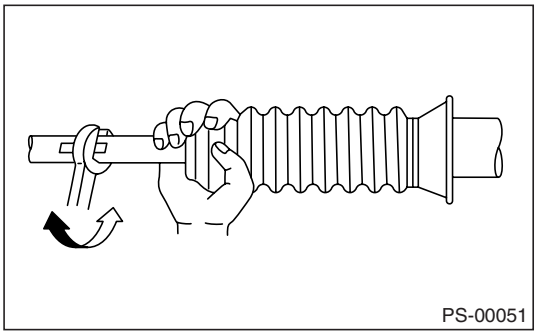
14) Connect the battery ground cable to battery.
15) Pour fluid into the oil tank, and bleed air.
<Ref. to PS-100, Power Steering Fluid.>
16) Check for fluid leaks.
17) Install the jack-up plate.
18) Install the under cover. <Ref. to EI-22, INSTALLATION, Front Under Cover.>
19) Lower the vehicle.
20) Check the fluid level in oil tank.

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

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

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



C: DISASSEMBLY

1. NON-TURBO MODEL

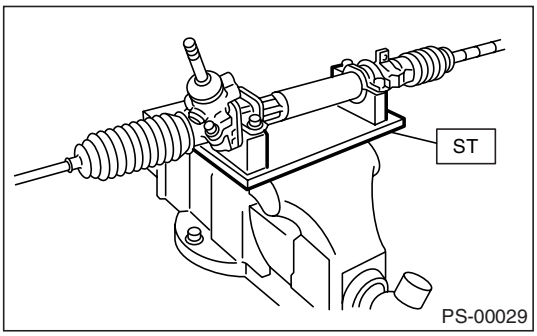
• RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes E and F as a single unit being fixed at clamp plate.

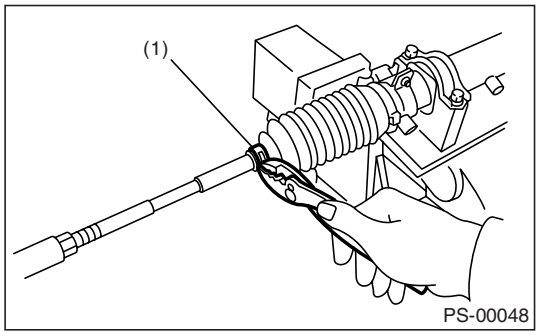
2) Secure the gearbox removed from vehicle in vice using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.



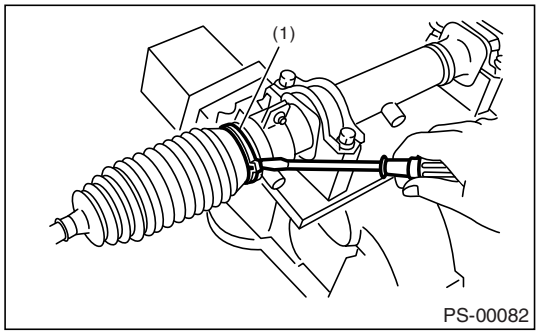
3) Remove the tie-rod end and lock nut from gearbox.

4) Remove the small clip from boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

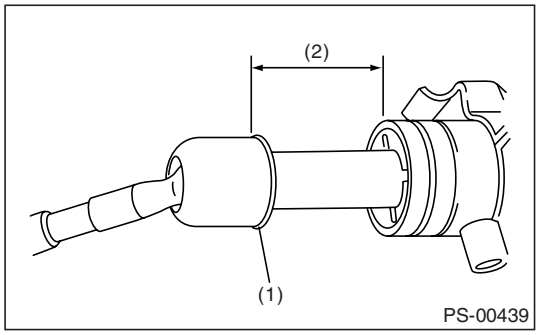
5) Using a flat tip screwdriver, remove the band from boot.



(1) Band

6) Extend the rack approx. 40 mm (1.57 in) out. Unlock the lock washer on both side of tie-rod end using a flat tip screwdriver.

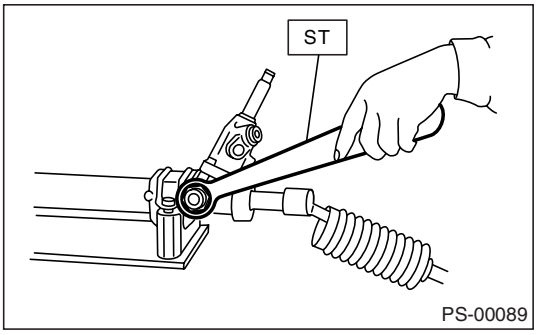
CAUTION:
Be careful not to scratch the rack surface as oil leaks may result.



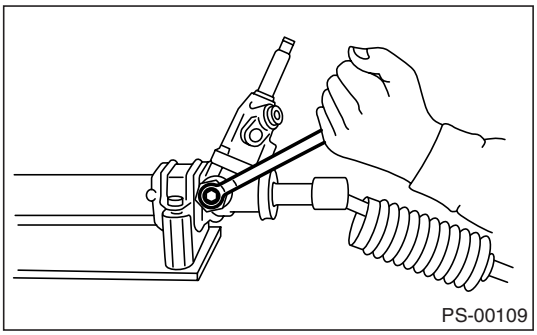
(1) Lock washer
(2) Approx. 40 mm (1.57 in)

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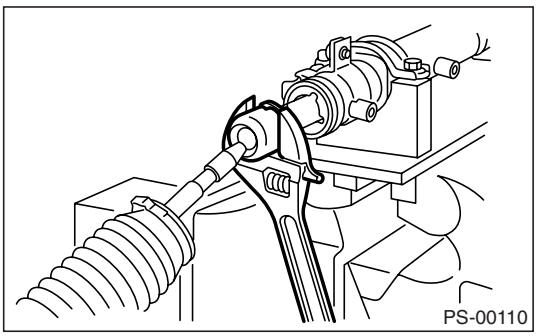
7) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



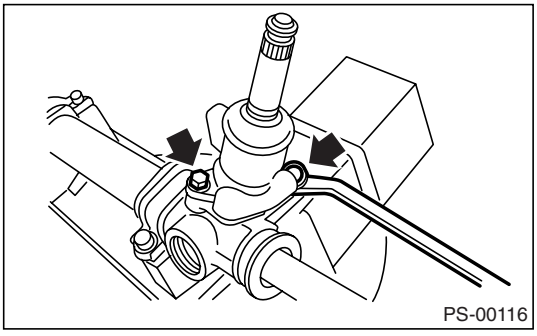
8) Tighten the adjusting screw until it no longer tightens.



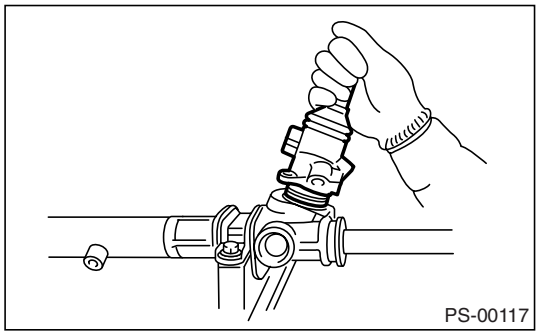
9) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove the tie-rod.



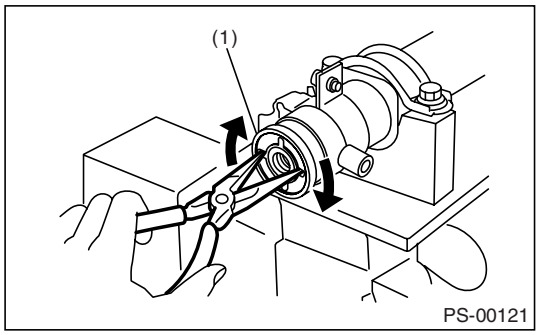
10) Loosen the adjusting screw, and then remove the spring and sleeve.
11) Remove the two bolts securing valve assembly.



12) Carefully draw out the input shaft, and then remove the valve assembly.



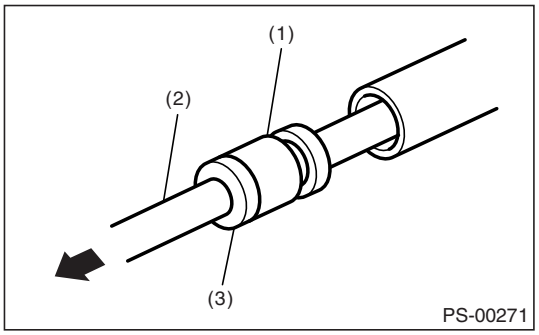
13) Using a sharp pointed pliers, rotate the rack stopper in direction of the arrow until end of the circlip comes out of stopper. Rotate the circlip in opposite direction and pull it out.



(1) Rack stopper

14) Pull the rack assembly from cylinder side, and draw out the rack bushing and rack stopper together with the rack assembly.

CAUTION:
Be careful not to contact the rack to inner wall of cylinder when drawing out. Any scratch on the cylinder inner wall will cause oil leakage.

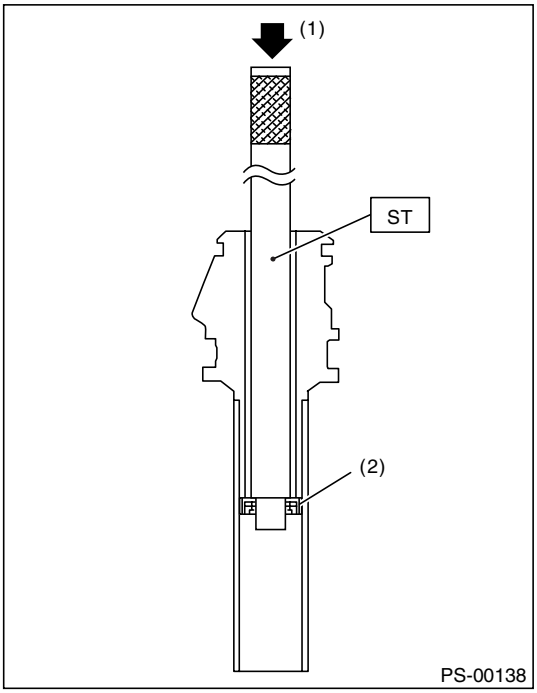


(1) Rack bushing
(2) Rack assembly
(3) Rack stopper

15) Remove the rack bushing and rack stopper from rack assembly.
16) Remove the oil seal from rack.

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17) Insert the ST from pinion housing side, and then remove the oil seal using a press.
ST 34199AE050 REMOVER



(1) Press
(2) Oil seal

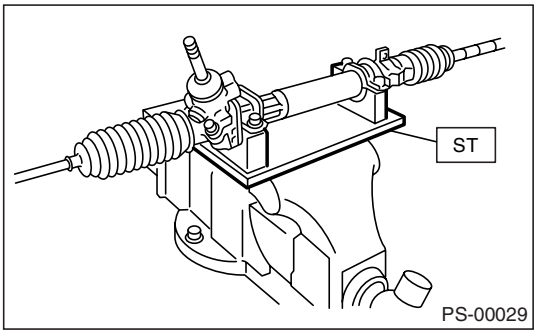
• CONTROL VALVE ASSEMBLY

1) Disconnect the four pipes from gearbox.

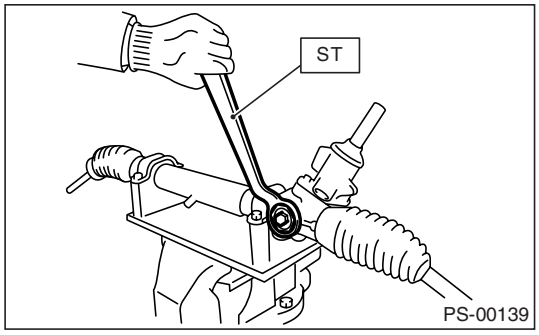
NOTE:
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from the vehicle in vise using ST.
ST 926200000 STAND

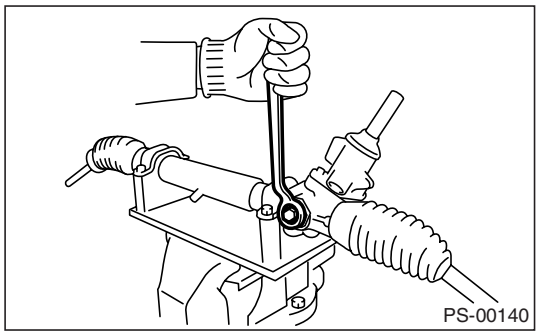
CAUTION:
Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.



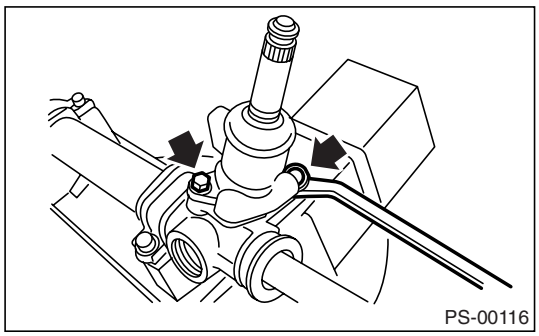
3) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



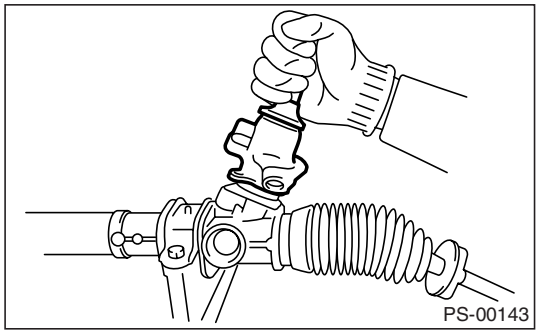
4) Loosen the adjusting screw, and then remove the spring and sleeve.



5) Remove the two bolts securing valve assembly.

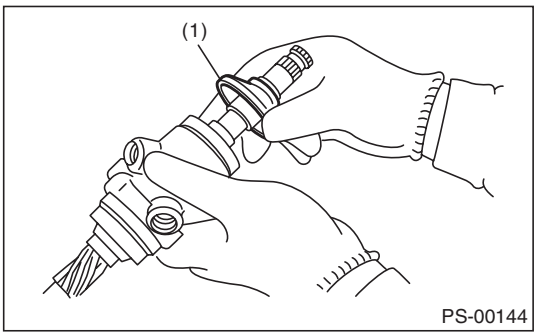


6) Carefully draw out the input shaft, and then remove the valve assembly.



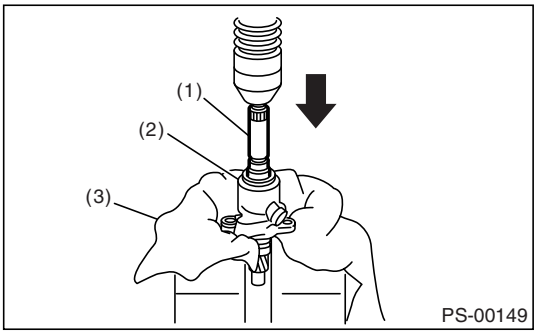
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7) Slide the dust cover out.



(1) Dust cover

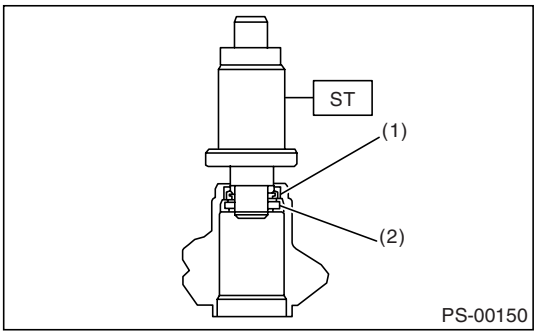
8) Using a press remove the pinion and valve assembly from valve housing.



(1) Valve assembly
(2) Valve housing
(3) Cloth

9) Using the ST and press, remove the dust seal, oil seal and special bearing from valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL

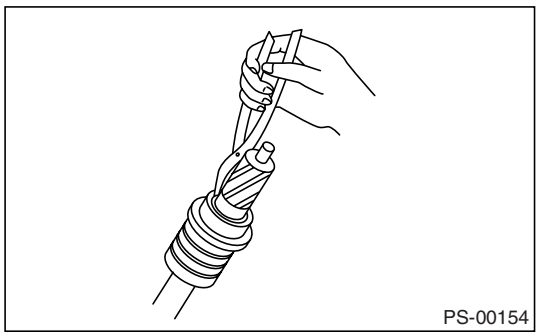
CAUTION:
• Do not apply force to the end surface of valve housing.
• Do not reuse the oil seal after removal.



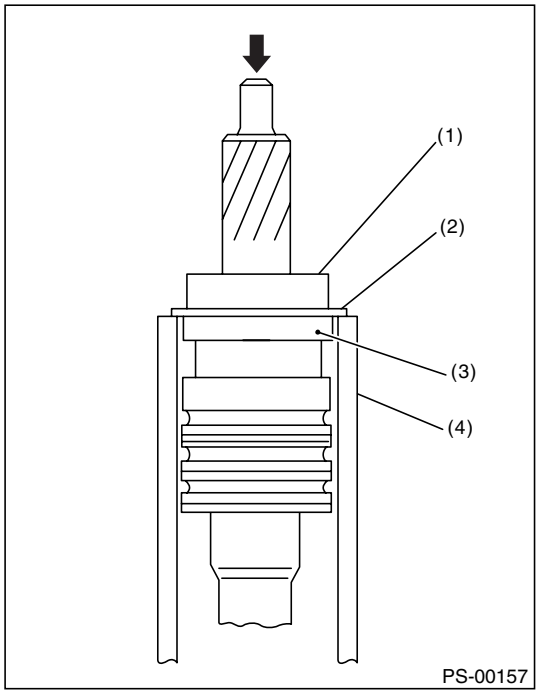
(1) Oil seal
(2) Special bearing

10) Remove the snap ring using snap ring pliers.

CAUTION:
Be careful not to scratch the pinion and valve assembly.



11) Press out the bearing together with the back up washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.



(1) Bearing
(2) Back-up washer
(3) Oil seal
(4) Pipe

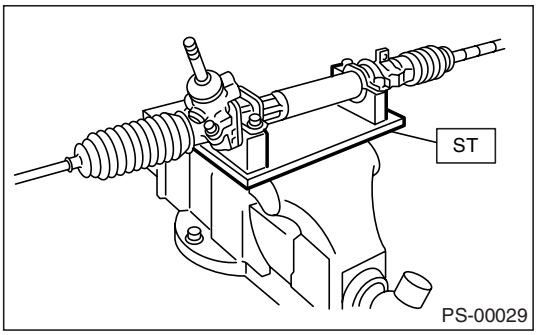
12) Remove the oil seal.

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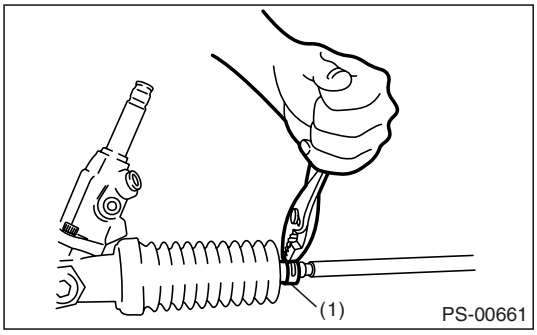
2. TURBO MODEL

1) Secure the gearbox removed from vehicle in vise using the ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox assembly in a vise using the ST as shown. Do not attempt to secure it without this ST.



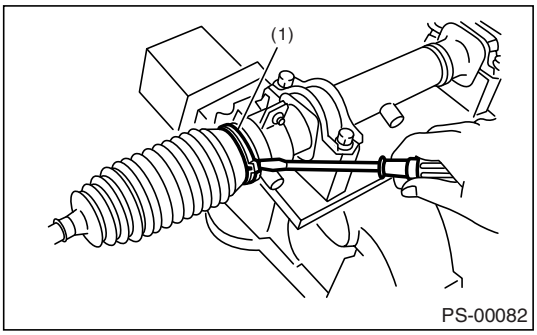
2) Remove the tie-rod end and lock nut from gearbox.
3) Remove the clip on outside of boot using pliers, and then slide the boot to tie-rod end side.



(1) Clip

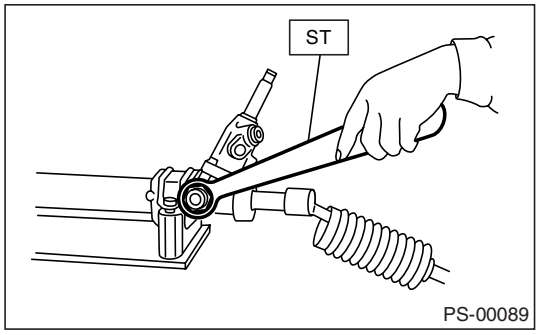
4) Using flat tip screwdriver, remove the band from boot.

NOTE:
Check the boot for crack, damage or deterioration. Replace the boot with a new one if necessary.



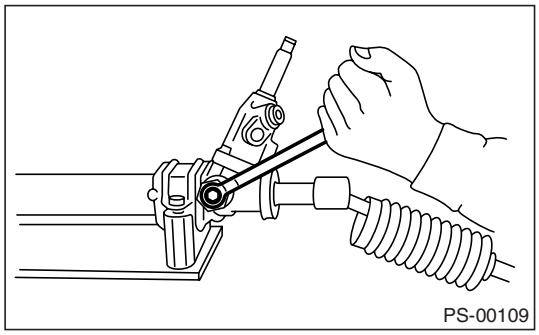
(1) Band

5) Using the ST, loosen lock nut.
ST 926230000 SPANNER

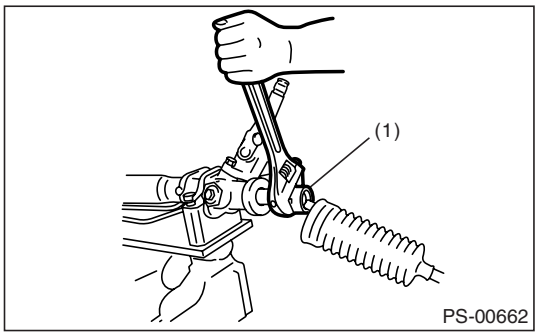


(1) Lock nut

6) Tighten the adjusting screw until it no longer tightens.



7) Using a wrench (32 mm (1.26 in) width across flats) or adjustable wrench with cinching boot, remove the tie-rod.

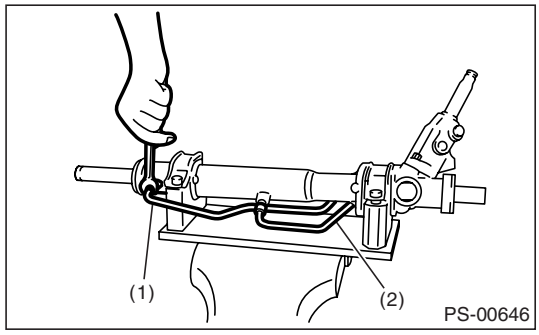


(1) Tie-rod

8) Loosen the adjusting screw, and then remove the spring and sleeve.

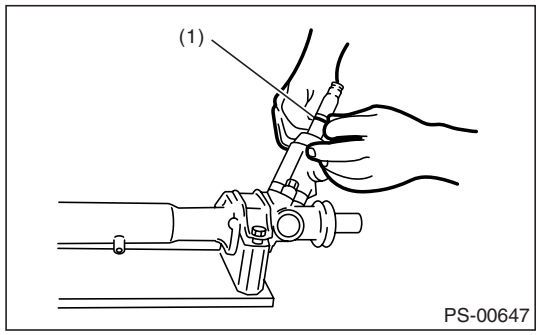
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9) Disconnect the pipes A and B from steering body and control valve housing.



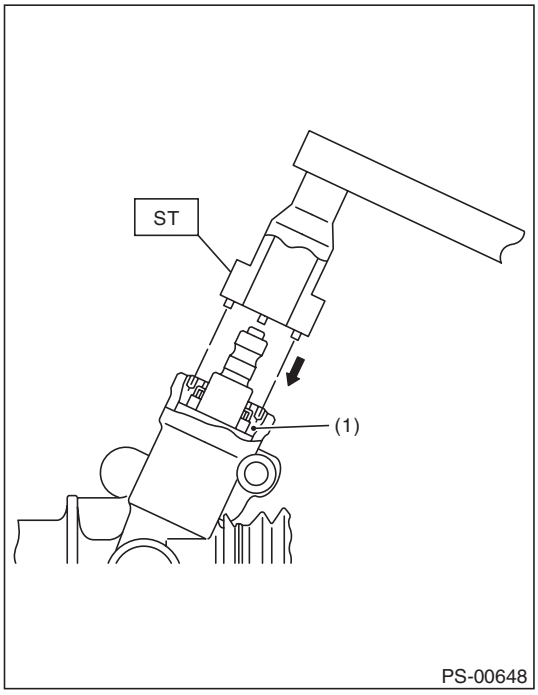
(1) Pipe A
(2) Pipe B

10) Clean the dirt of input shaft. Remove the dust cover taking care not to scratch the housing or input shaft and allow foreign matter to enter gear box interior.



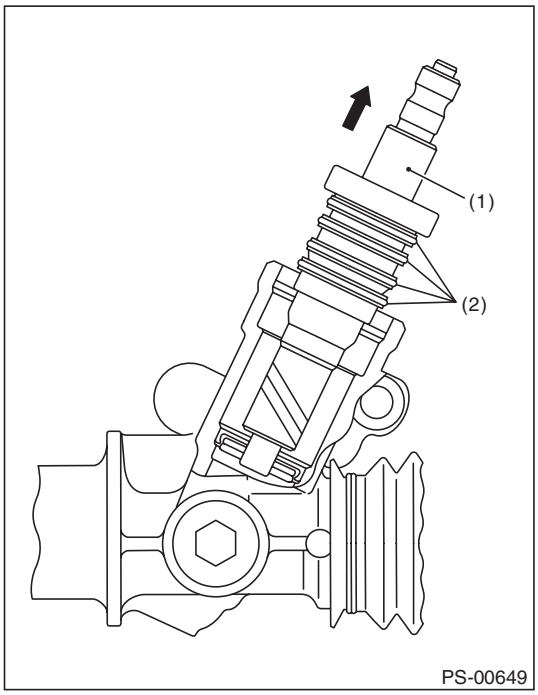
(1) Dust cover

11) Align the ST pin to plug hole to install. Rotate the ST counterclockwise to remove plug.
ST 34199AE090 PLUG WRENCH



(1) Plug

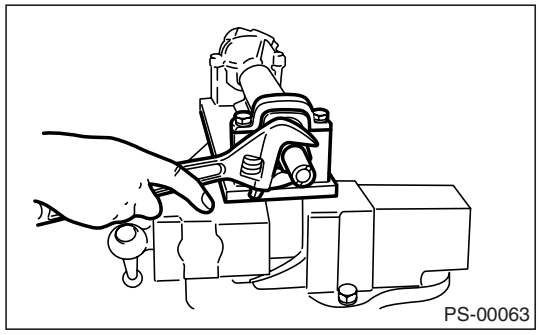
12) Remove the valve assembly taking care not to scratch seal ring and valve housing inner surface.



(1) Valve ASSY
(2) Seal ring

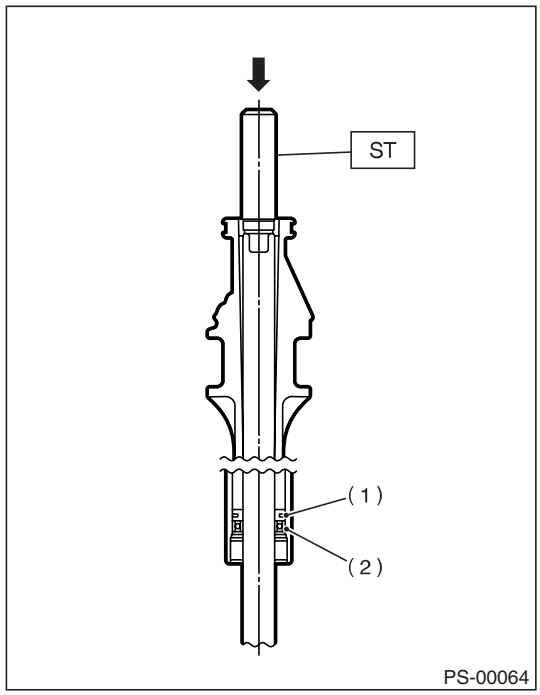
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13) Remove the holder using a wrench (36 mm (1.42 in) width across flats) or adjustable wrench.



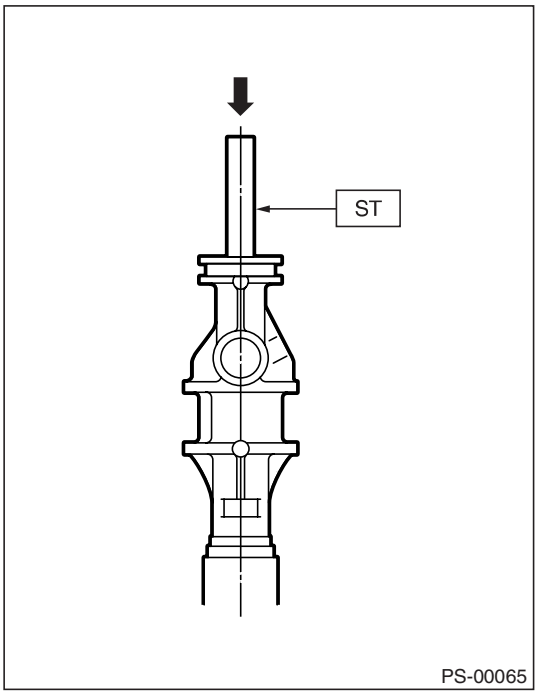
14) Install the ST on valve side of rack and press outer side oil seal out taking care not to contact rack with steering body inner surface.
ST 34199FE000 INSTALLER & REMOVER

NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.

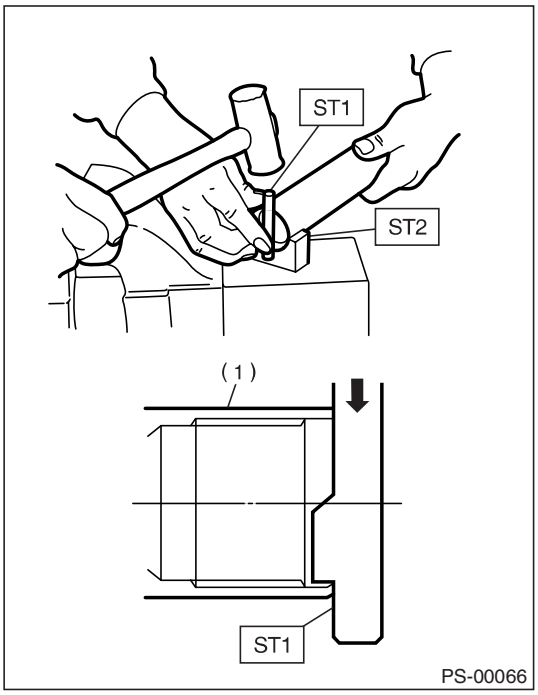


(1) Rack piston
(2) Outer side oil seal

15) Insert the ST from valve side and press back-up ring and oil seal out.
ST 34199FE010 REMOVER



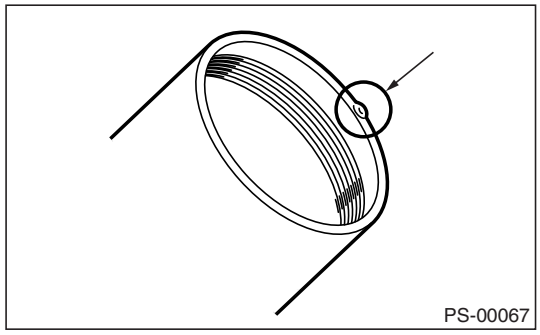
16) Using the ST1 and ST2, repair the cylinder's clinched sections.
ST1 34099FA080 PUNCH
ST2 34199FE020 BASE



(1) Cylinder

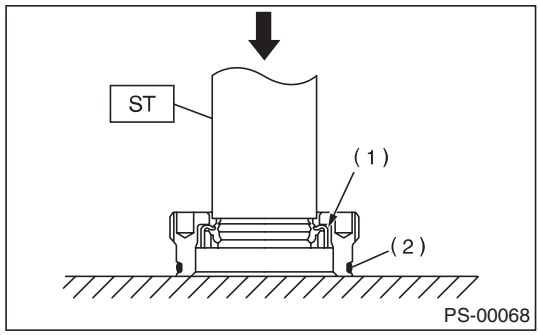
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17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



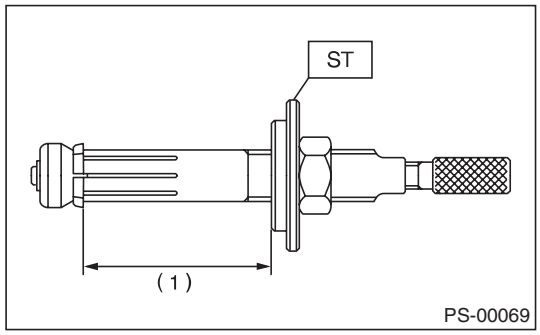
18) Remove the oil seal using ST and press from plug.
ST 34199AE100 PLUG OIL SEAL REMOVER

NOTE:
Do not apply force on the plug edge surface.



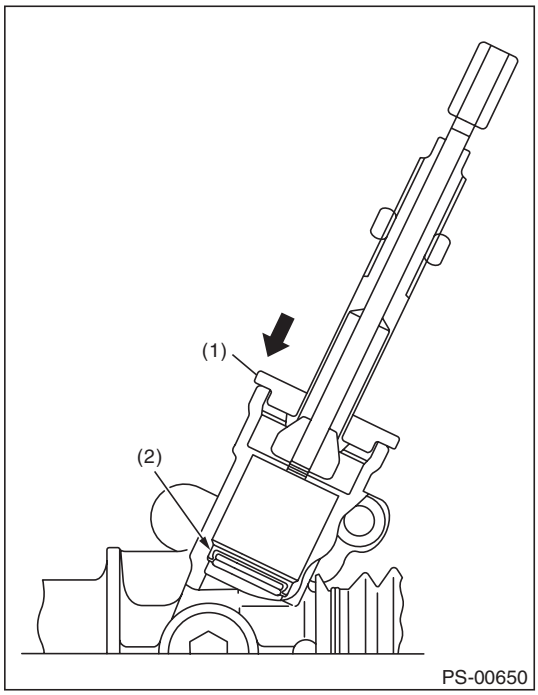
(1) Oil seal
(2) O-ring

19) Set the ST on drawing dimension.
ST 34199AE120 GEARBOX OIL SEAL REMOVER



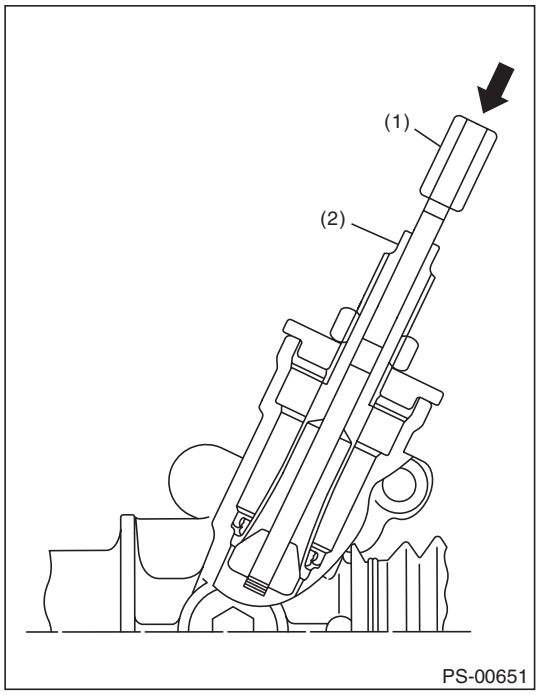
(1) 70 mm (2.76 in)

20) Set the stopper to gear box, and then insert the tip of ST to gear box.



(1) Stopper
(2) Oil seal

21) By fixing the 2-surface width, press in by rotating the rod and attach to oil seal.

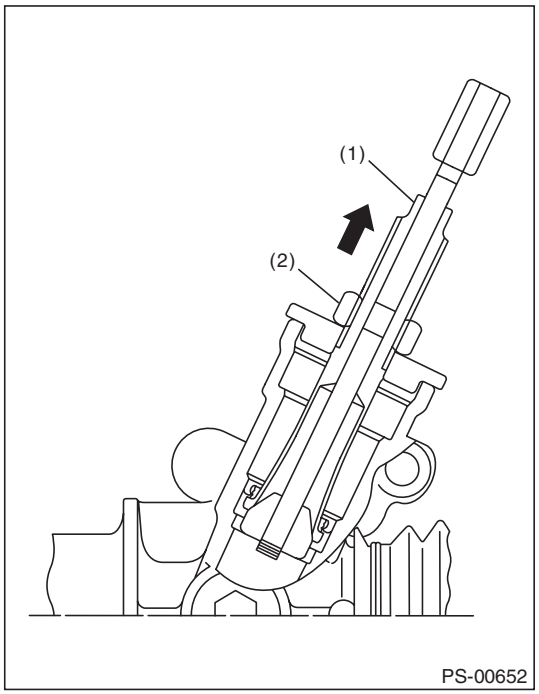


(1) Rod
(2) 2-surface width

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22) While fixing the 2-surface width, pull out the oil seal by rotating nut.

CAUTION:
Take care not to scratch the gear box inner surface.



(1) 2-surface width
(2) Nut

D: ASSEMBLY

1. NON-TURBO MODEL

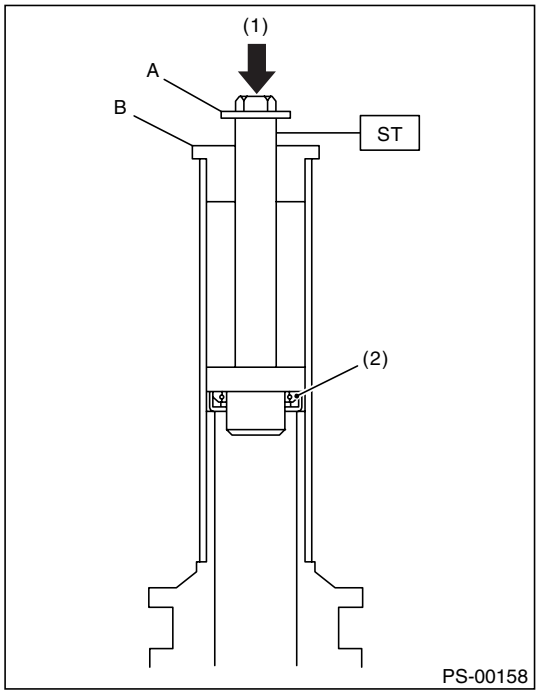
• RACK HOUSING ASSEMBLY

CAUTION:
Use only SUBARU genuine grease for the gearbox.

Specified grease for gearbox:
VALIANT GREASE M2 (Part No. 003608001)

1) Apply power steering fluid to a new oil seal.
2) Install the oil seal in correct position as shown in the figure. Push the oil seal using a press until portion A of ST contacts face of B.
ST 34099FA110 INSTALLER

CAUTION:
Be careful not to damage or scratch the cylinder inner wall.

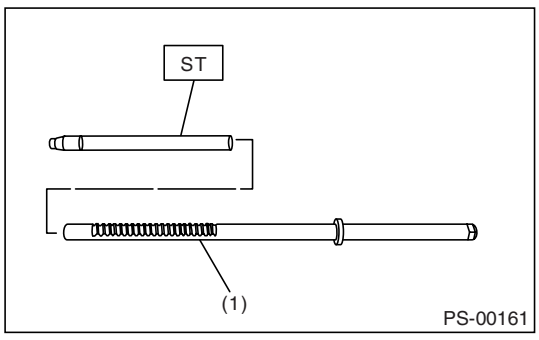


(1) Press
(2) Oil seal

3) Fix the rack housing in vise using ST.
ST 926200000 STAND

NOTE:
• When fixing the rack housing in vise, be sure to use this special tool. Do not fix rack housing in vise using pad such as aluminum plates, etc.
• When using the old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

4) Fit the ST over toothed portion of rack assembly, and check for binding or unsmooth insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.
ST 926390001 COVER & REMOVER



(1) Rack assembly

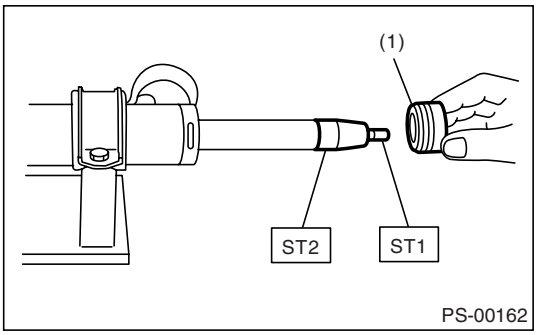
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5) Apply genuine grease to the teeth of thoroughly washed rack assembly, and then fit the ST over the toothed portion.

CAUTION:
• Be careful not to block the air passage with grease. Remove excessive grease.
• After fitting cover, check the air passage hole for clogging. If clogged, open by removing grease from the hole.

6) Before inserting the rack assembly, apply a coat of specified power steering fluid to the surfaces of ST and rack piston.
7) Insert the rack assembly into rack housing from cylinder side, and then remove the ST after it has passed completely through oil seal.
8) Fit the ST1 and ST2 over the end of rack, and then install a new rack bushing.
ST1 926400000 GUIDE
ST2 927660000 GUIDE

CAUTION:
• If burrs or nicks are found on this guide and rack shaft portion, remove by filing.
• Dip the rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.

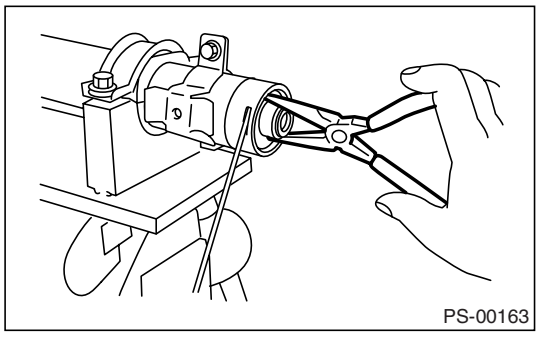


(1) Rack bushing assembly

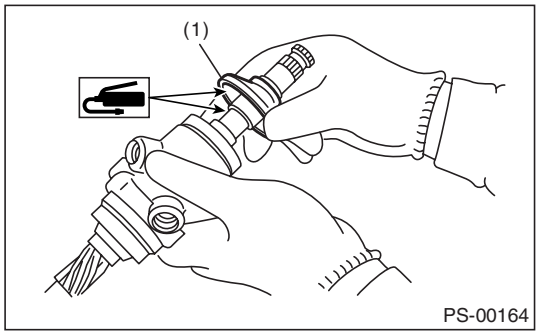
9) Insert the rack stopper into the cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn the rack stopper with ST so that the rack stopper hole is seen through cylinder slits.
10) Insert the rack stopper into the rack housing, and then wrap a new circlip using a sharp pointed pliers to secure the rack stopper in position.

CAUTION:
Be careful not to scratch the rack while winding circlip.

NOTE:
Rotate the wrench another 90 to 180° after end of circlip has been wrapped in.

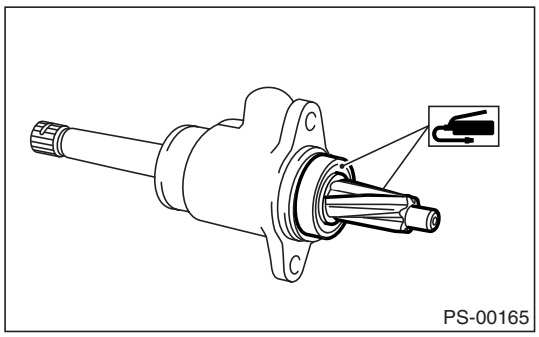


11) Apply genuine grease to dust cover, and then install the dust cover to valve assembly.

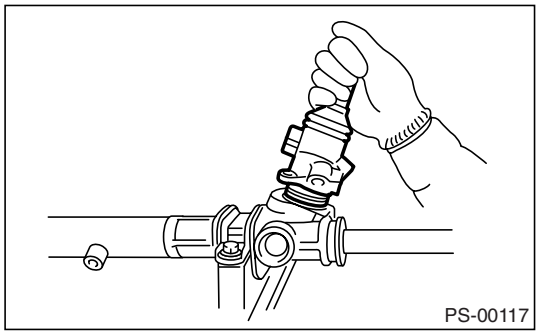


(1) Dust cover

12) Apply genuine grease to the pinion gear and bearing of valve assembly.



13) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.



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14) Tighten the bolts alternately to secure valve assembly.

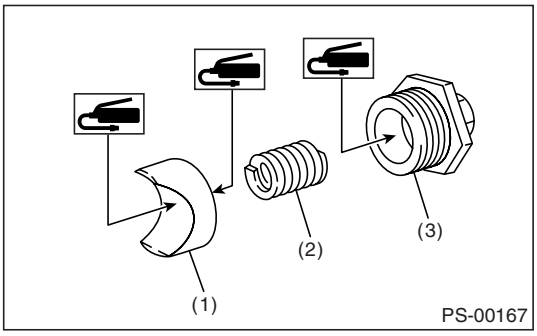
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.

15) Temporarily install 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.

16) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert 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

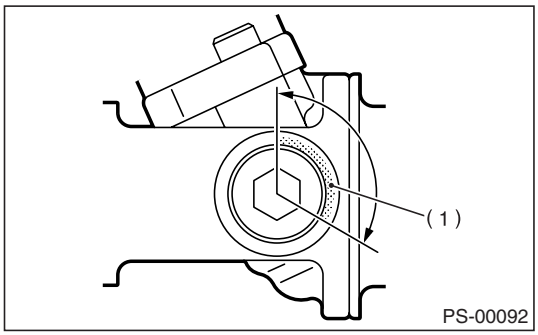
17) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

18) After tightening to the specified tightening torque, loosen it by 25°.
19) Remove the tie-rod.
20) Verify that play is within specified value. <Ref. to PS-58, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].>

21) Loosen the adjusting screw, and then 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.

22) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

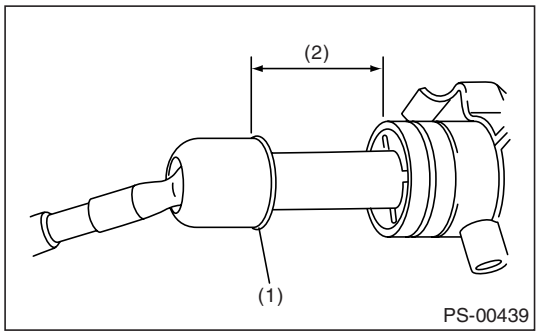
23) After tightening to the specified tightening torque, loosen it by 25°.
24) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

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) Extend the rack approx. 40 mm (1.57 in) beyond side of steering body.
26) Install the tie-rod and a new lock washer into rack.

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)

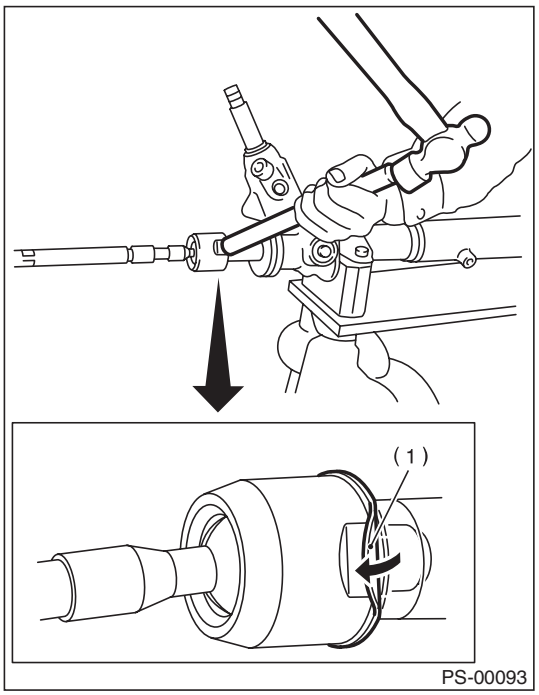


(1) Lock washer
(2) Approx. 40 mm (1.57 in)

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27) Bend the lock washer.

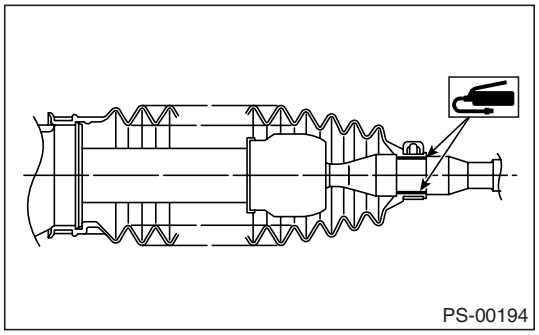
CAUTION:
Be careful not to scratch the rack when bending lock washer.



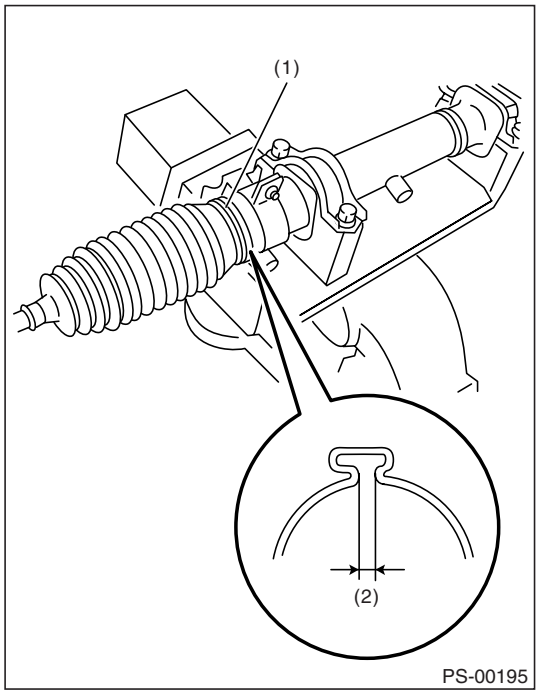
(1) Lock washer

28) 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.

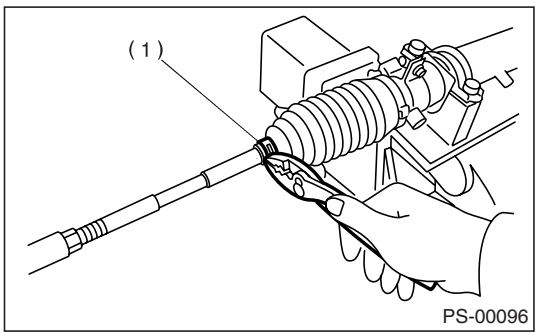


29) Install a new boot band. Using band clamp pliers, caulk the boot band until caulking part clearance is 2 mm (0.079 in) or less.



(1) Boot band
(2) 2 mm (0.079 in) or less

30) Fix the boot end with clip (small).



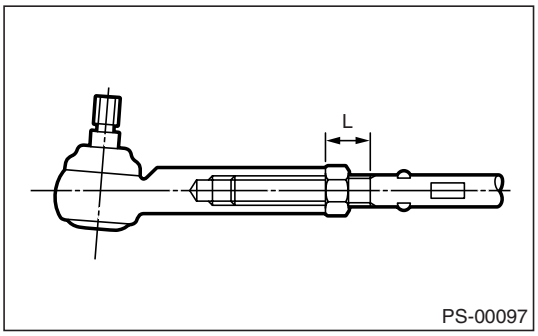
(1) Clip

31) After installing, check the boot end is positioned into groove on tie-rod.

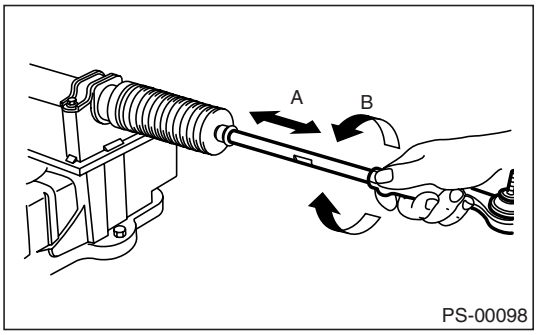
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32) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:
Sedan:
25 mm (0.98 in)
Wagon:
15 mm (0.59 in)



33) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding the 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 specified position without deflation.



34) Remove the gearbox from ST.
ST 926200000 STAND
35) Install the four pipes on gearbox.
(1) Connect the pipe A and B to four pipe joints of gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

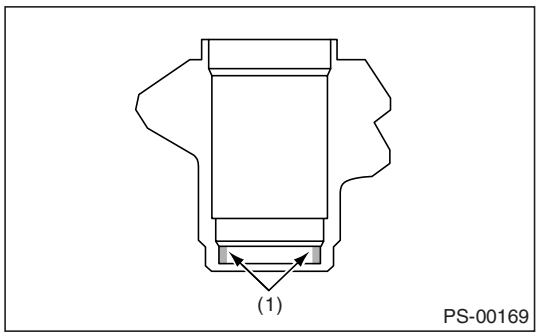
(2) Connect the pipe E and F to gearbox.

Tightening torque:
Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

• CONTROL VALVE ASSEMBLY

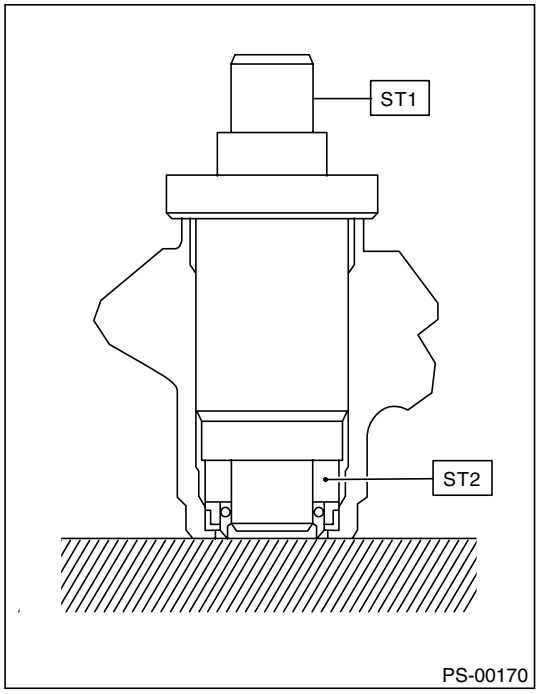
Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

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.

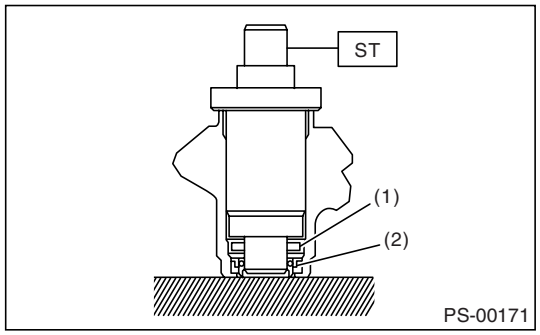
3) Attach the ST2 to ST1.
ST1 34099FA120 INSTALLER & REMOVER SEAL
ST2 34099FA130 INSTALLER SEAL
4) To avoid scratching the oil seal, apply a coat of grease to the contact surface of installer and oil seal.
5) Verify the oil seal direction.
Attach the oil seal to installer and position in valve housing before pressing into place.
6) Press the oil seal into place using a press.



7) Attach the bearing to ST, and then position in value housing. Using the ST and press, install the special bearing in valve housing.

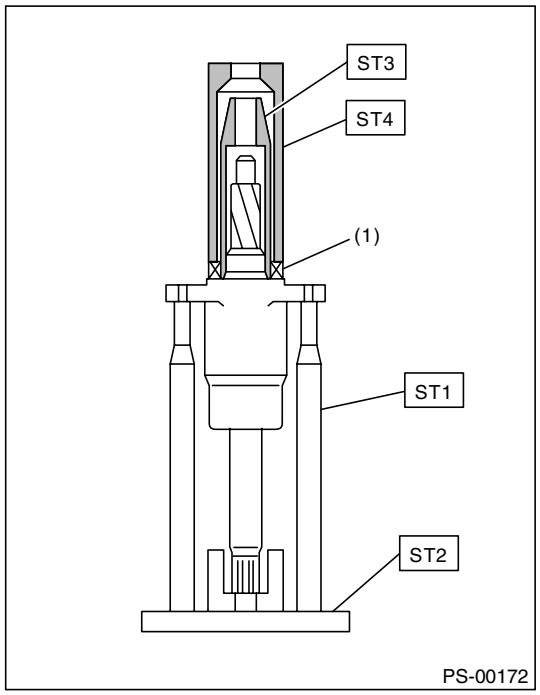
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ST 34099FA120 INSTALLER & REMOVER SEAL



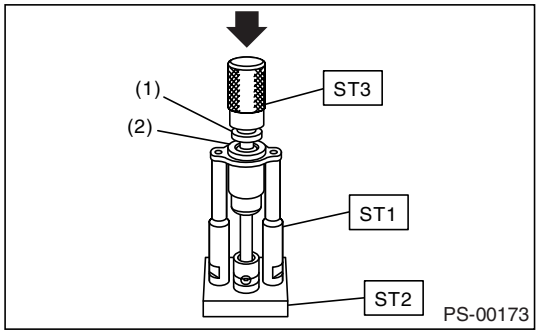
(1) Special bearing
(2) Oil seal

8) Put vinyl tape around the pinion shaft splines to protect oil seal from damage.
9) Fit the pinion and valve assembly into valve housing.
10) Secure the valve assembly to ST1 and ST2.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
11) Apply specified power steering fluid to oil seal and ST3.
12) Install the ST3 to pinion, and then insert the oil seal. Press the oil seal using a press until ST4 contacts face end of valve housing.
ST3 926360000 INSTALLER A
ST4 927620000 INSTALLER B



(1) Oil seal

13) Remove the ST used install oil seal, and then fit the back-up washer.
14) Force-fit the ball bearing using ST3.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 927640000 INSTALLER B



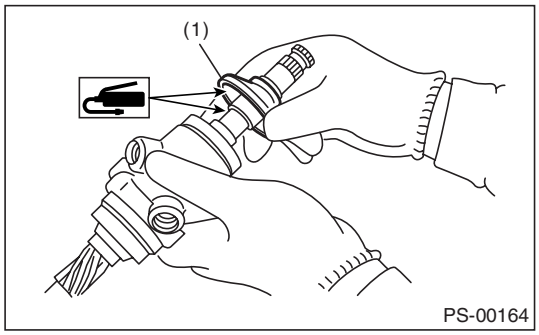
(1) Ball bearing
(2) Back-up washer

NOTE:
Be careful not to tilt the ball bearing during installation.

15) Install the snap ring using snap ring pliers.

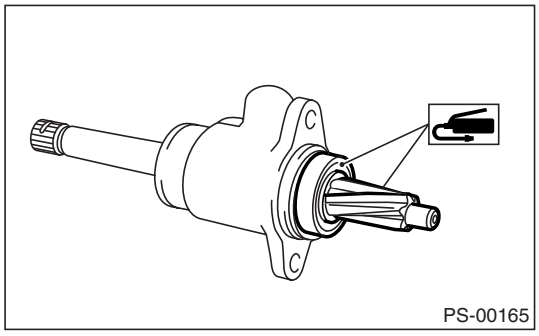
NOTE:
Rotate the snap ring to check for proper installation.

16) Apply the specified grease to dust cover.
17) Install the dust cover on valve assembly.



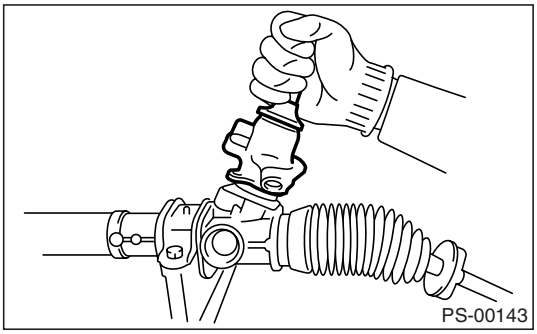
(1) Dust cover

18) Apply genuine grease to the pinion gear and bearing of valve assembly.



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19) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.

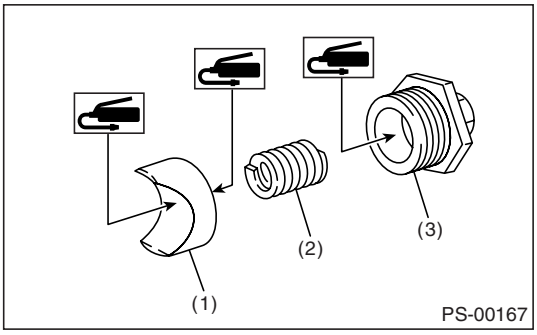


20) Tighten the bolts alternately to secure valve assembly.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.

21) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert 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

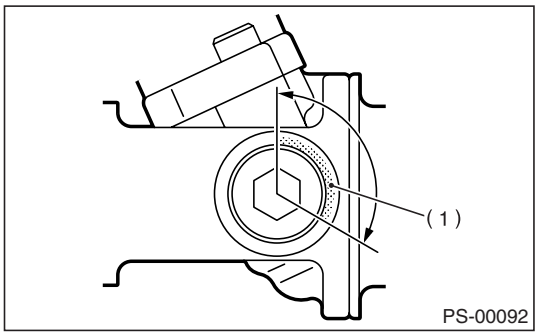
22) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

23) After tightening to the specified tightening torque, loosen it by 25°.
24) Verify that play is within specified value. <Ref. to PS-58, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].>

25) Loosen the adjusting screw, and then 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.

26) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

27) After tightening to the specified tightening torque, loosen it by 25°.
28) Install the lock nut. While holding the adjusting screw with a wrench, tighten 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.

29) Remove the gearbox from ST.
30) Install the four pipes on gearbox.
(1) Connect the pipe A and B to the gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect the pipe E and F to gearbox.

Tightening torque:
Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

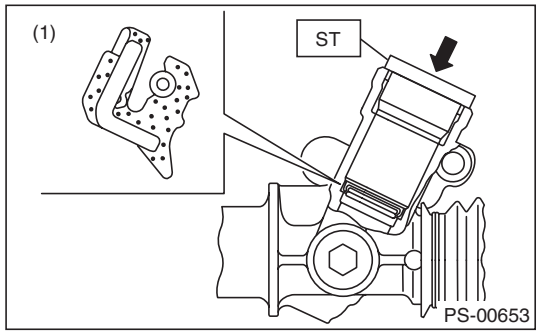
2. TURBO MODEL

1) Apply a coat of grease to inside and outside of new oil seal.

Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

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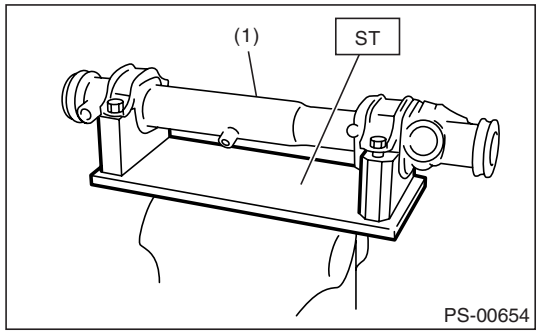
2) Verify the oil seal direction and installation position. Using the ST and press, press fit the oil seal to gear box.
ST 34199AE130 GEARBOX OIL SEAL INSTALLER



(1) Oil seal

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.
ST 926200000 STAND

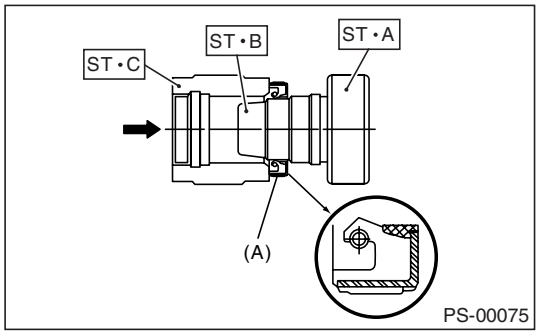
CAUTION:
Ensure the needle bearing is free from defects. If it is faulty, replace the steering body with a new one.



(1) Steering body

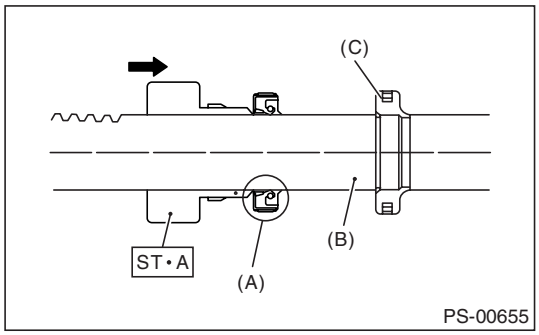
4) Using the ST·B and ST·C, attach the oil seal to ST·A.
ST 34199FE040 INSTALLER A, B, C

NOTE:
Face the oil seal in direction shown in the figure.



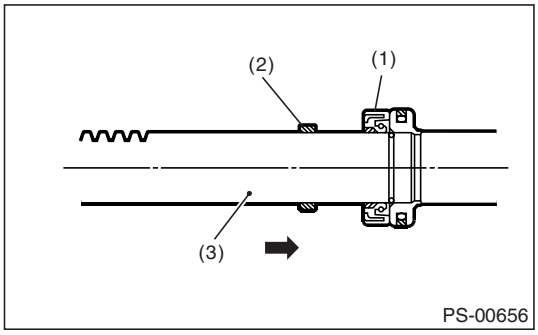
(A) Oil seal

5) Insert the ST·A with oil seal assembled, through 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 gear side of rack.

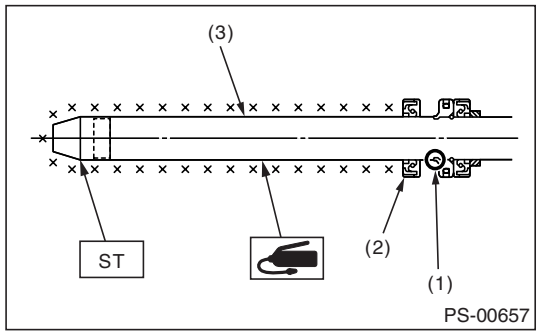


(1) Oil seal
(2) Back-up washer
(3) Rack

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7) Equally apply a thin coat of grease to the rack, then install the oil seal.

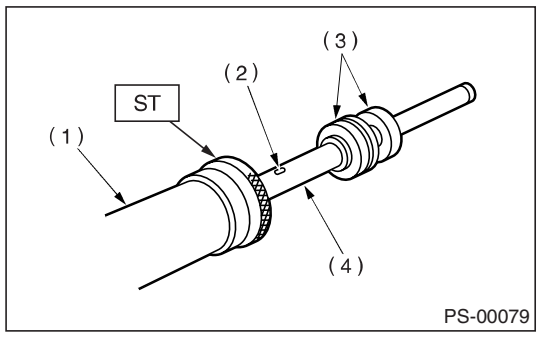
CAUTION:
Be careful not to scratch the oil seal lips with piston's inner ring section.



(1) Rack piston inner ring
(2) Outer side oil seal
(3) Rack

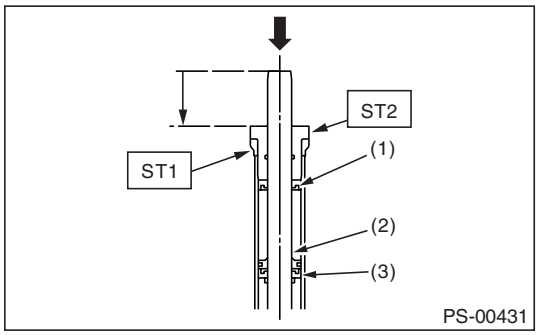
8) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Install the ST on end of steering body cylinder. Then insert the rack into steering body from cylinder side.
ST 34199FE050 GUIDE

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

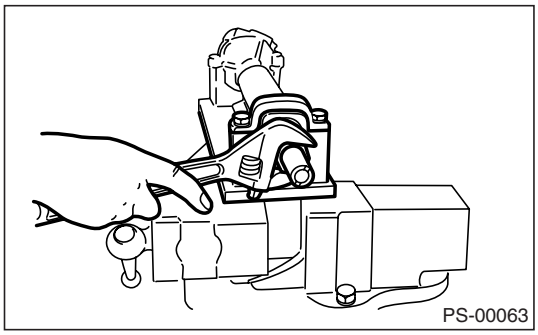
9) Make the ST2 pass through rack, and then push in the rack and ST2 using a press until ST1 comes in contact with ST2 and the end of rack is aligned with end of ST2.
ST1 34199FE050 GUIDE
ST2 34199FE060 INSTALLER



(1) Outer side oil seal
(2) Rack piston
(3) Inner side oil seal

10) Install a new holder to cylinder side of steering body.

Tightening torque:
90 N·m (9.18 kgf-m, 66.4 ft-lb)

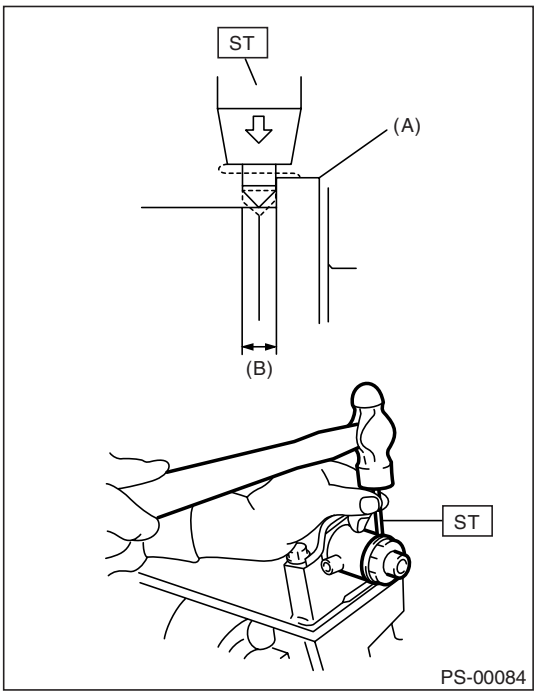


11) Using the ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

CAUTION:
Be careful not to deform the holder.

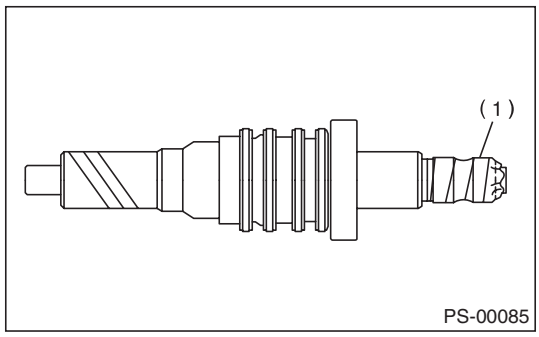
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ST 34099FA060 PUNCH HOLDER



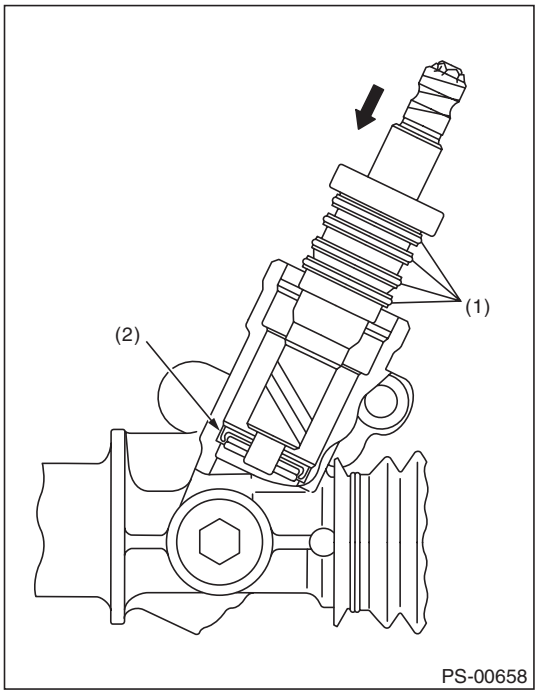
(A) Holder
(B) 3 mm (0.12 in)

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.

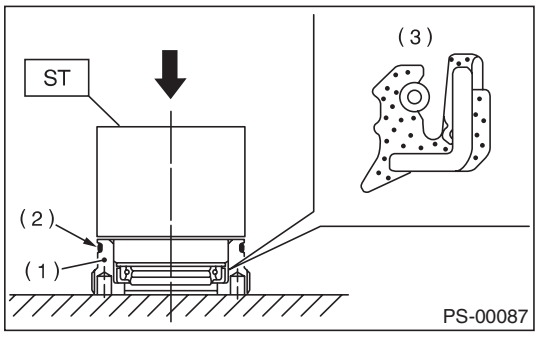


(1) Seal ring
(2) Oil seal

14) Apply grease on the oil seal circumference, and then press into the plug using ST and a press. Replace the plug circumference O-rings with new ones.

ST 34199AE110 PLUG OIL SEAL INSTALLER

CAUTION:
Pay attention to the oil seal direction, and attaching position.

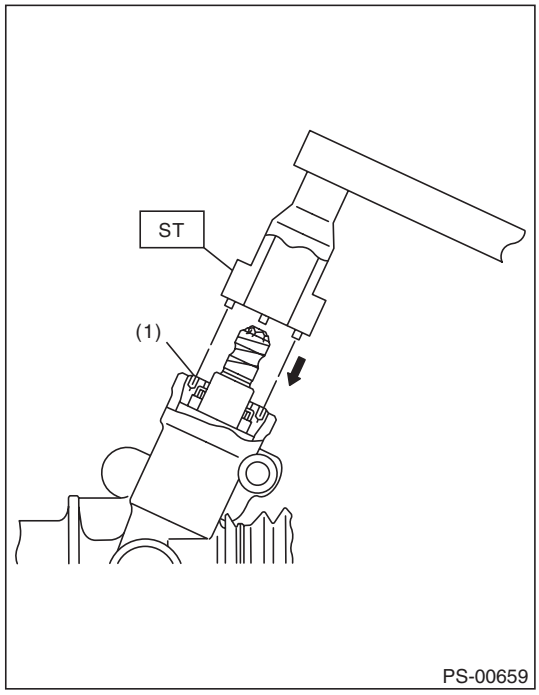


(1) Plug
(2) O-ring
(3) Oil seal

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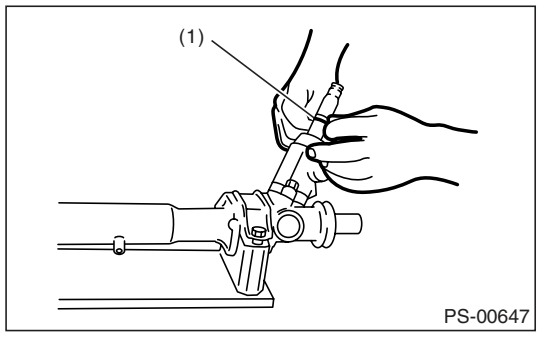
15) Using the ST, install the plug.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf-m, 47.0 ft-lb)



(1) Plug

16) Install the dust cover. Remove the vinyl tape.



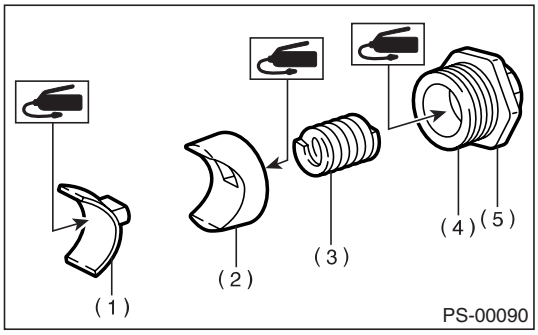
(1) Dust cover

17) Temporarily install 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 a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body.

Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



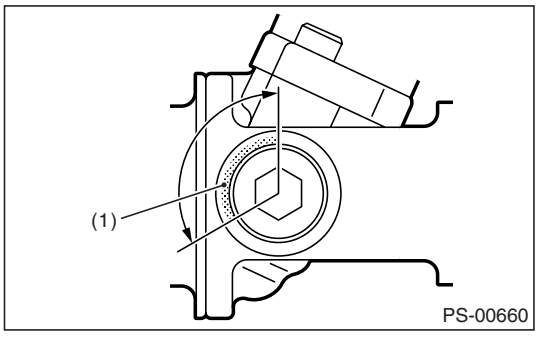
(1) Seat pad
(2) Sleeve
(3) Spring
(4) Adjusting screw
(5) Lock nut

19) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

20) After tightening to the specified tightening torque, loosen it by 37°.
21) Remove the tie-rod.
22) Verify that play is within specified value. <Ref. to PS-58, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].>
23) Loosen the adjusting screw, and then 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.

24) Tighten the adjusting screw.

Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)

25) After tightening to the specified tightening torque, loosen it.

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26) Tighten the adjusting screw.

Tightening torque:
4.8 N·m (0.49 kgf-m, 3.5 ft-lb)

27) After tightening to the specified tightening torque, loosen it.
28) Tighten the adjusting screw.

Tightening torque:
4.8 N·m (0.49 kgf-m, 3.5 ft-lb)

29) After tightening to the specified tightening torque, loosen it by 37°.
30) Install the lock nut. While holding the adjusting screw with a wrench, tighten 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.

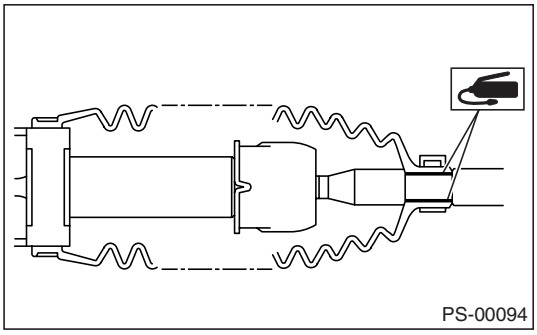
31) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.0 kgf-m, 65.1 ft-lb)

NOTE:
Check the mating face of rack and tie-rod for foreign material, dirt, dust and etc.
If required, clean the mating face.

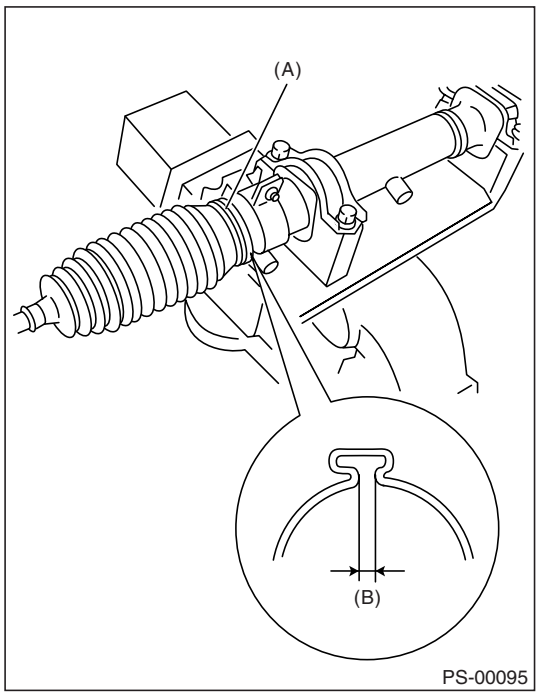
32) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.


PS-00094

33) Caulk the boot so the space inside boot band caulking portion becomes 2 mm (0.08 in) or less.

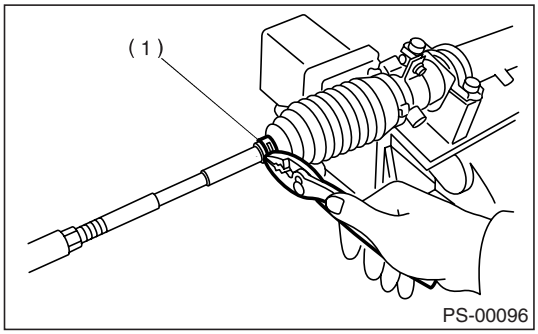
NOTE:
Use a new boot band.



PS-00095

(A) Boot band
(B) Less than 2mm (0.08 in)

34) Fix the boot end with clip (small).



PS-00096

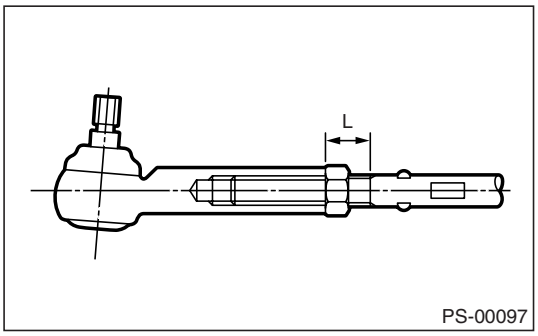
(1) Clip

35) After installing, check the boot end is positioned into groove on tie-rod.

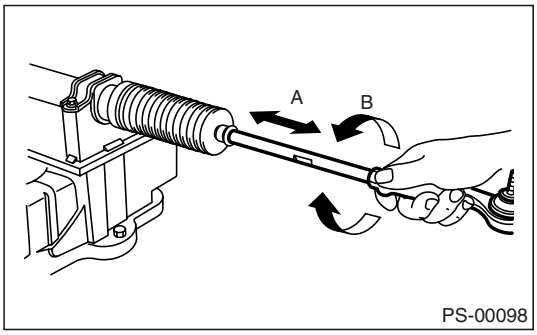
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36) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:
Sedan:
25 mm (0.98 in)
Wagon:
15 mm (0.59 in)



37) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding the 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 specified position without deflation.



38) Remove the gearbox from ST.
ST 926200000 STAND
39) Install the four pipes on gearbox.
(1) Connect the pipe A and B to 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)

(2) Connect the pipe G and H to gearbox.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

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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 assembly.
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 and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping the 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 assembly.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox assembly 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 assembly with a new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox assembly 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	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

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2. SERVICE LIMIT

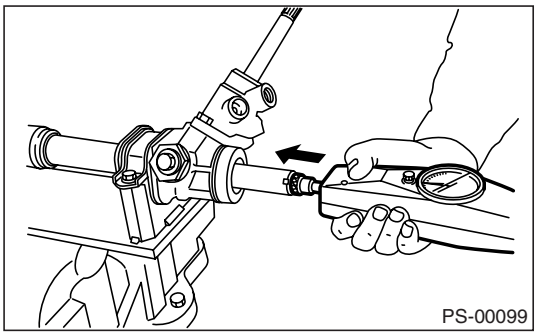
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

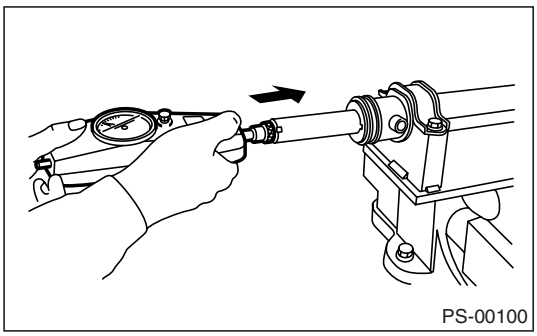
NOTE:
When making a measurement, vise the gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
400 N (41 kgf, 90 lbf) or less


PS-00099

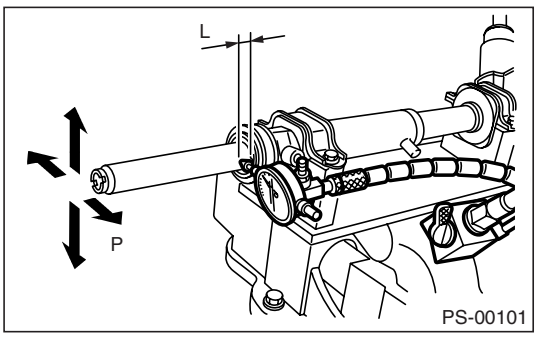

PS-00100

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)

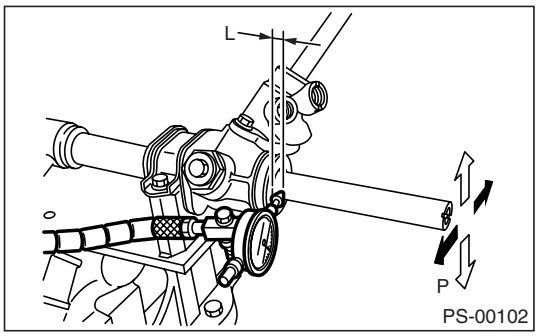


PS-00101

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)



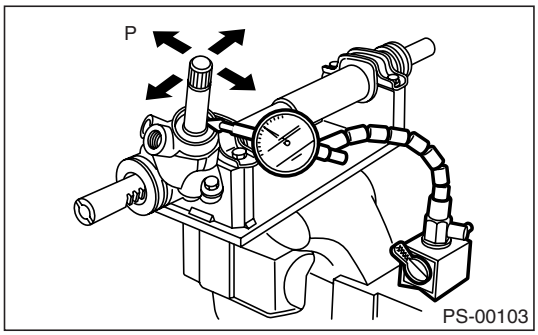
PS-00102

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)



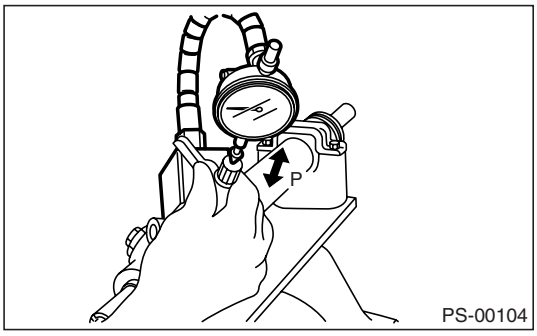
PS-00103

In axial direction:

Service limit
0.5 mm (0.020 in) or less

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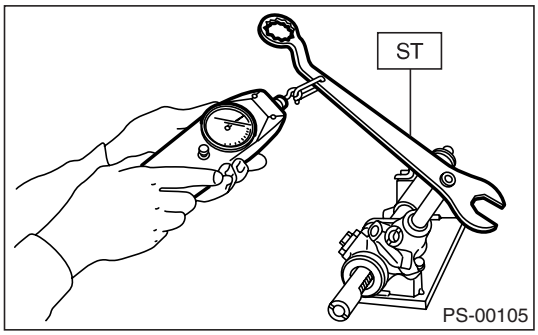
On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)



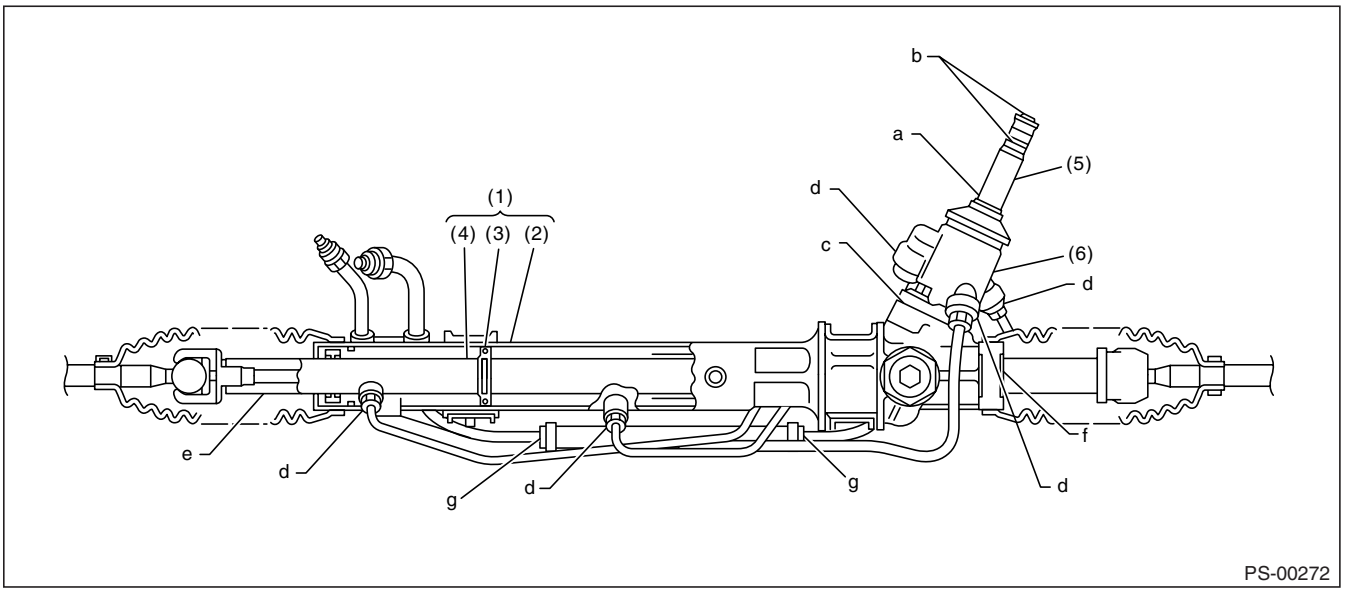
5. TURNING RESISTANCE OF GEARBOX

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: Less than 20%



6. OIL LEAKING



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack
(5) Input shaft
(6) Valve housing

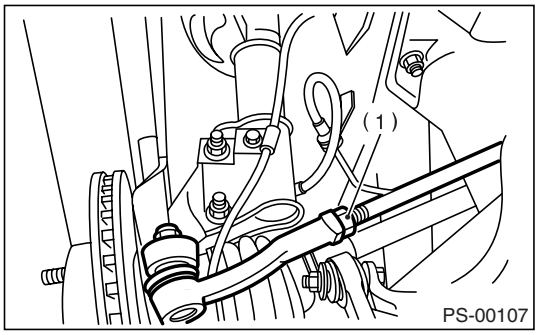
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1) Lift up the vehicle.
2) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the fluid from the suspected portion and turn the steering wheel from lock to lock about thirty to forty times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.
3) Inspect leakage from “a”.
The oil seal is damaged. Replace the valve assembly with a new one.
4) Inspect leakage from “b”.
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
5) Inspect leakage from “c”.
The oil seal is damaged. Replace the valve assembly or oil seal with a new one.
6) Inspect leakage from “d”.
The pipe is damaged. Replace the faulty pipe or O-ring.
7) Inspect 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, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from the surrounding portions. Then, turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of 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. Take the following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.
ST 926420000 PLUG
Turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion between 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 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 the 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)



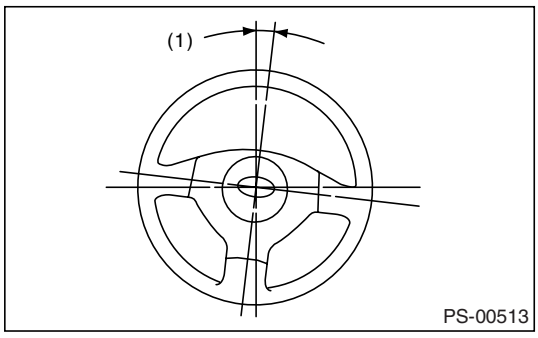
(1) Lock nut

2) Adjust the steering angle of wheels.

Standard of steering angle:

Model	TURBO, 2.5 L and OUT-BACK	1.6 L and 2.0 L	STi
Inner wheel	34.5°±1.5°	37.3°±1.5°	32.9°±1.5°
Outer wheel	30.3°±1.5°	32.4°±1.5°	28.5°±1.5°

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and 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 opposite direction by same angle.

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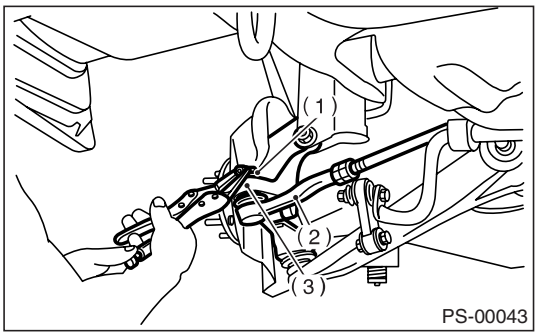
6. Steering Gearbox [RHD Model]

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nut.
4) Lift-up the vehicle, and then remove the front wheels.
5) Remove the under cover.
6) Remove the sub frame. <Ref. to FS-25, REMOVAL, Sub Frame.>
7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(H4SO)-6, REMOVAL, Front Exhaust Pipe.>

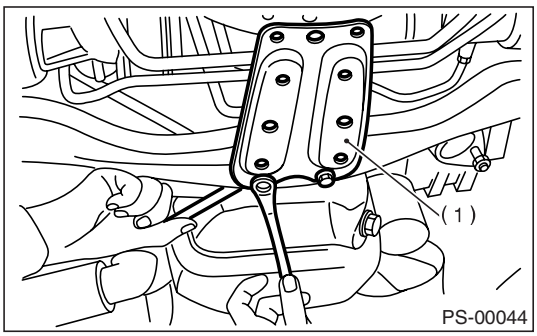
WARNING:
Be careful, the exhaust pipe is hot.

8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



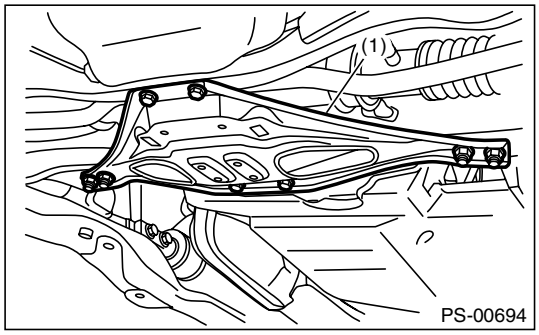
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

9) Remove the jack-up plate and front stabilizer.
• NON-TURBO MODEL



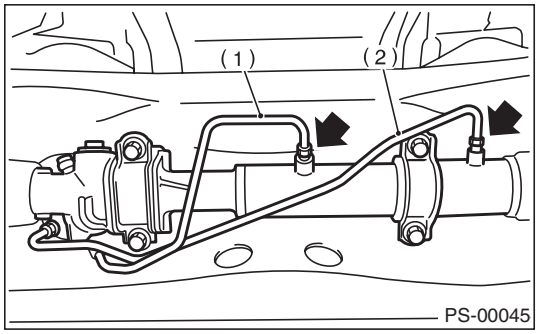
(1) Jack-up plate

• TURBO MODEL



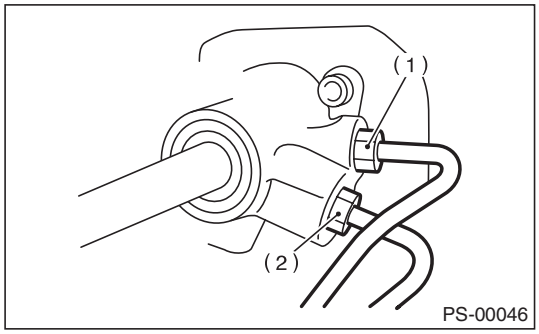
(1) Jack-up plate

10) Remove the one pipe joint at center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



(1) Pipe A
(2) Pipe B

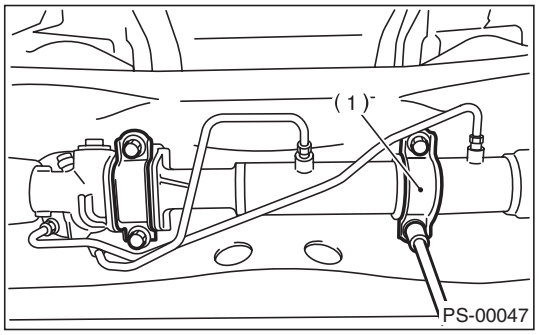
11) Remove the universal joint. <Ref. to PS-29, REMOVAL, Universal Joint.>
12) Disconnect the lower pipe C from gear box first, and upper pipe D second.



(1) Pipe C
(2) Pipe D

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13) Remove the clamp bolts securing the gearbox to crossmember, and then remove the gearbox.

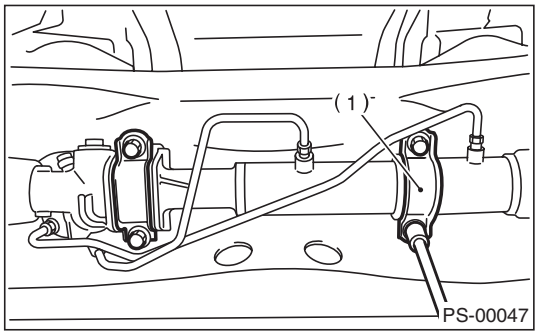


(1) Clamp

B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.
2) Tighten the gearbox to crossmember bracket via clamp with bolts to specified torque.

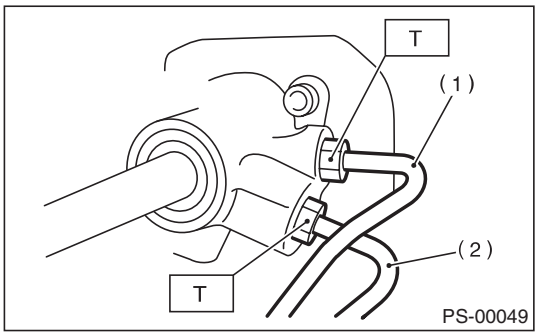
Tightening torque:
60 N·m (6.1 kgf-m, 44.1 ft-lb)



(1) Clamp

3) Connect the pipe D first to gear box, and pipe C second.

Tightening torque:
T: 15 N·m (1.5 kgf-m, 10.8 ft-lb)



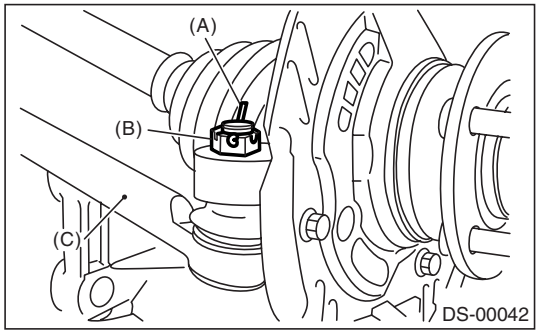
(1) Pipe C
(2) Pipe D

4) Install the universal joint. <Ref. to PS-29, INSTALLATION, Universal Joint.>
5) 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 the cap at bottom of tie-rod end with hammer.

6) 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

7) Install the front stabilizer to vehicle.
8) Install the front exhaust pipe assembly.
9) Install the sub frame.
10) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
11) Install the steering wheel. <Ref. to PS-28, INSTALLATION, Steering Wheel.>
12) Install the front wheels.
13) Tighten the wheel nuts to specified torque.

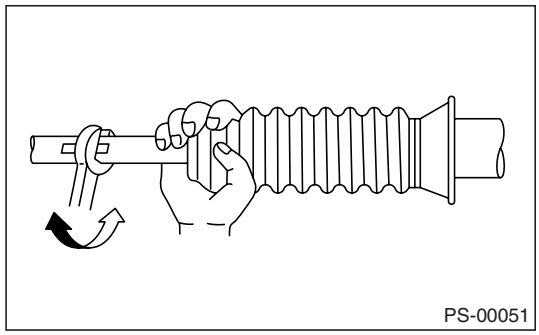
Tightening torque:
90 N·m (9.2 kgf-m, 66.4 ft-lb)

14) Connect the battery ground cable to battery.
15) Pour fluid into the oil tank, and bleed air.
<Ref. to PS-100, Power Steering Fluid.>
16) Check for fluid leaks.
17) Install the jack-up plate.
18) Install the under cover.
19) Lower the vehicle.
20) Check the fluid level in oil tank.
21) After adjusting the 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)

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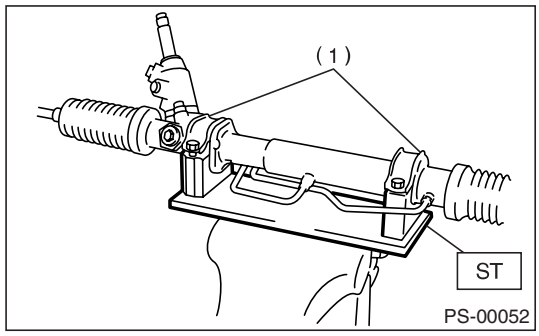
NOTE:
When adjusting the toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

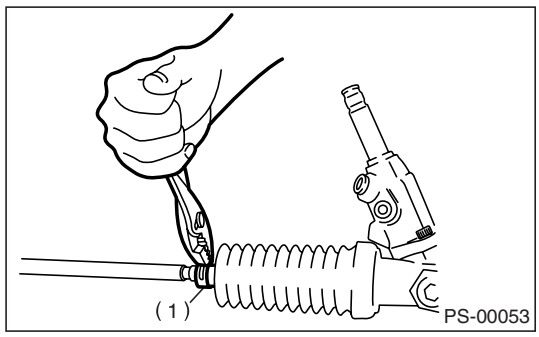
1) Secure the gearbox removed from vehicle in vise using the ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox assembly in a vise using the ST as shown. Do not attempt to secure it without this ST.



(1) Clamp

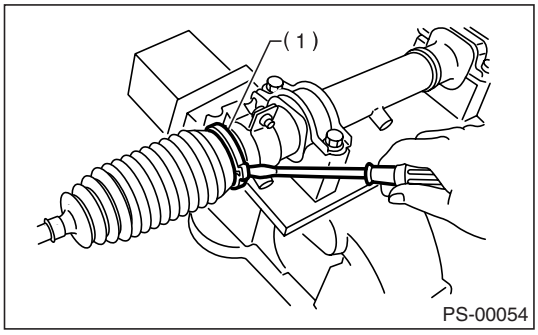
2) Remove the tie-rod end and lock nut from gearbox.
3) Remove the clip on outside of boot using pliers, and then slide the boot to tie-rod end side.



(1) Clip

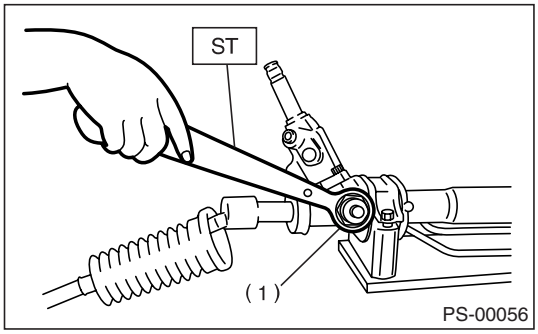
4) Using flat tip screwdriver, remove the band from boot.

NOTE:
Check the boot for crack, damage or deterioration. Replace the boot with a new one if necessary.



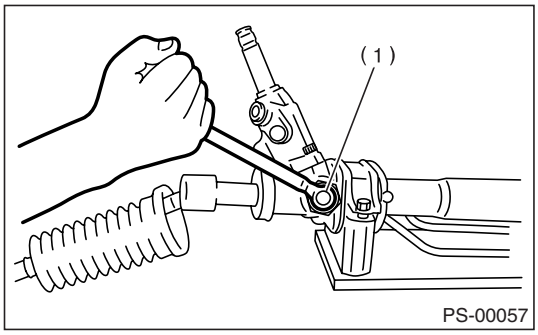
(1) Band

5) Using the ST, loosen lock nut.
ST 926230000 SPANNER



(1) Lock nut

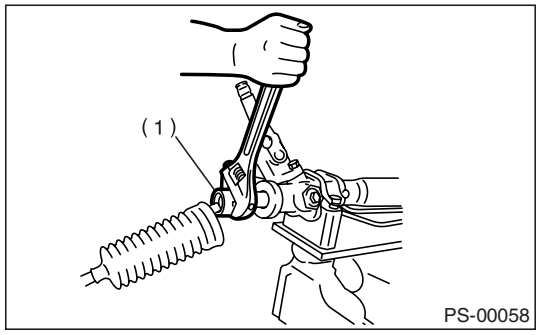
6) Tighten the adjusting screw until it no longer tightens.



(1) Adjusting screw

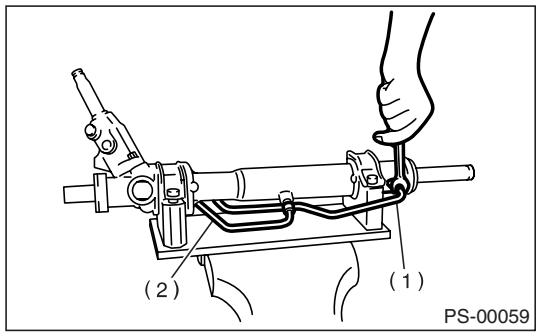
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7) Using a wrench (32 mm (1.26 in) width across flats) or adjustable wrench with cinching boot, remove the tie-rod.



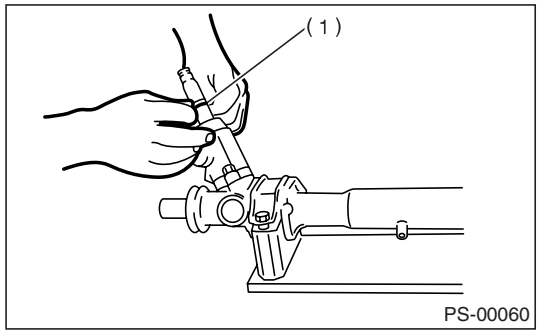
(1) Tie-rod

8) Loosen the adjusting screw, and then remove the spring and sleeve.
9) Disconnect the pipes A and B from steering body and control valve housing.



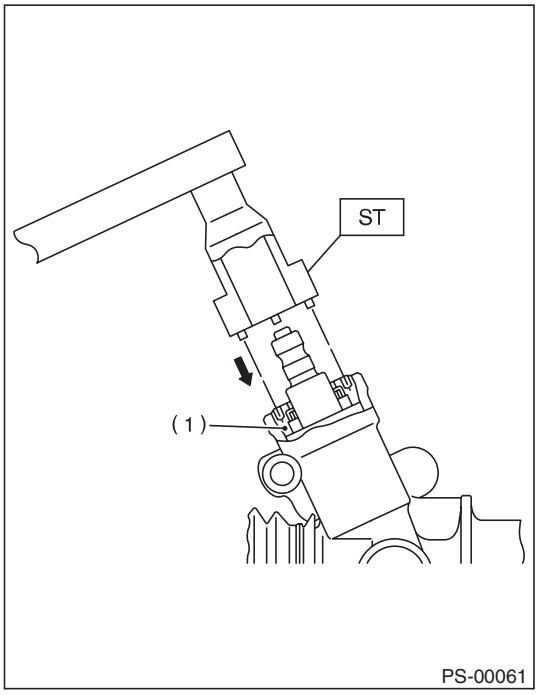
(1) Pipe A
(2) Pipe B

10) Clean the dirt of input shaft. Remove the dust cover taking care not to scratch the housing or input shaft and allow foreign matter to enter gear box interior.



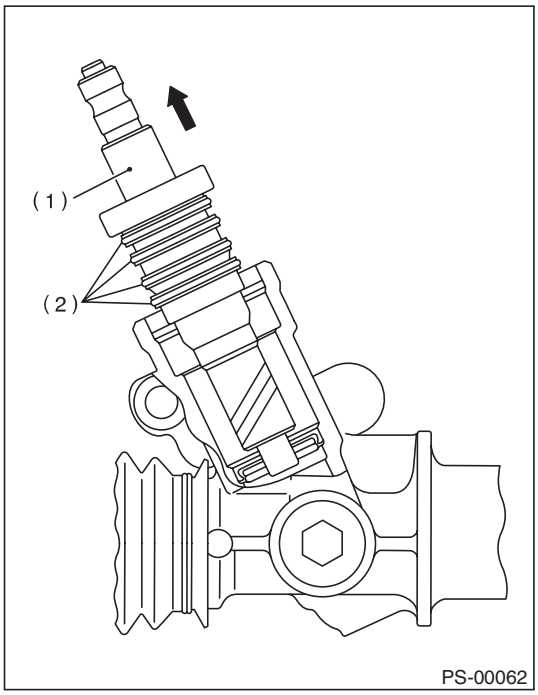
(1) Dust cover

11) Align the ST pin to plug hole to install. Rotate the ST counterclockwise to remove plug.
ST 34199AE090 PLUG WRENCH



(1) Plug

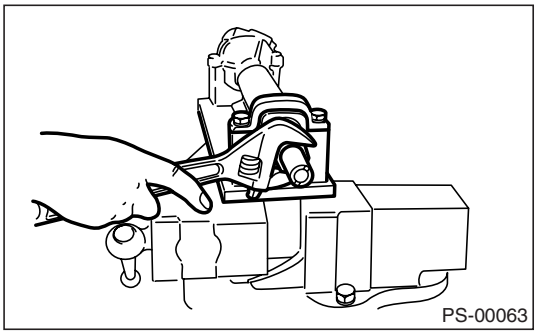
12) Remove the valve assembly taking care not to scratch seal ring and valve housing inner surface.



(1) Valve ASSY
(2) Seal ring

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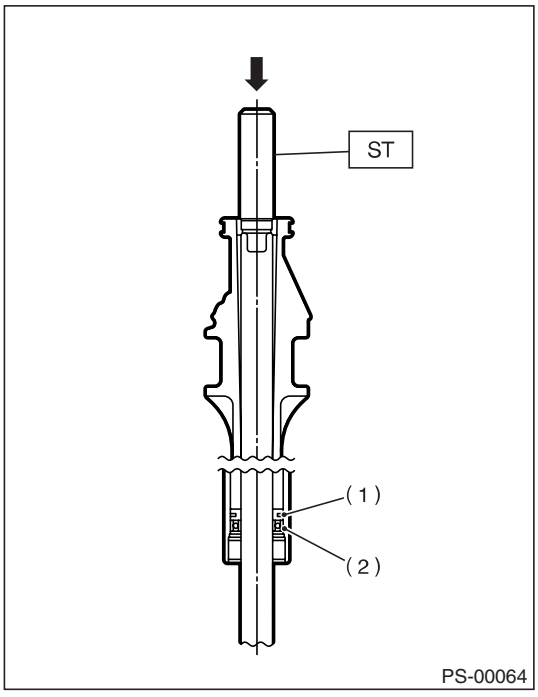
13) Remove the holder using a wrench (32 mm (1.26 in) width across flats for non-turbo model, 36 mm (1.42 in) width across flats for turbo model) or adjustable wrench.



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 34099FA030 INSTALLER & REMOVER (Non-turbo model)
ST 34199FE000 INSTALLER & REMOVER (Turbo model)

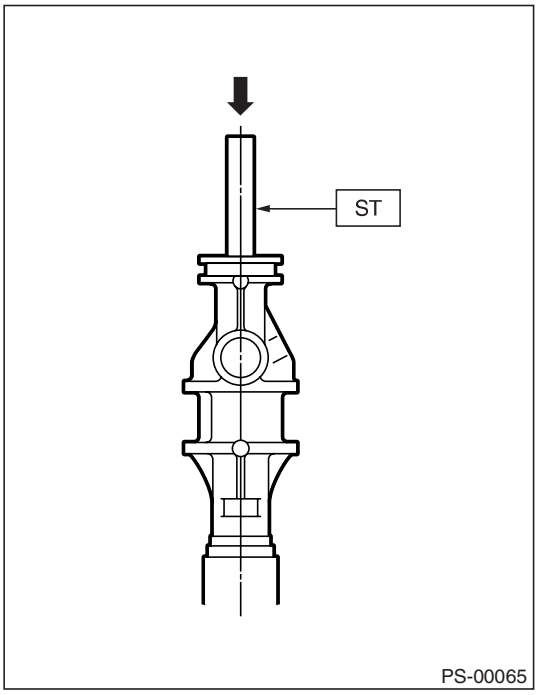
NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.



(1) Rack piston
(2) Outer side oil seal

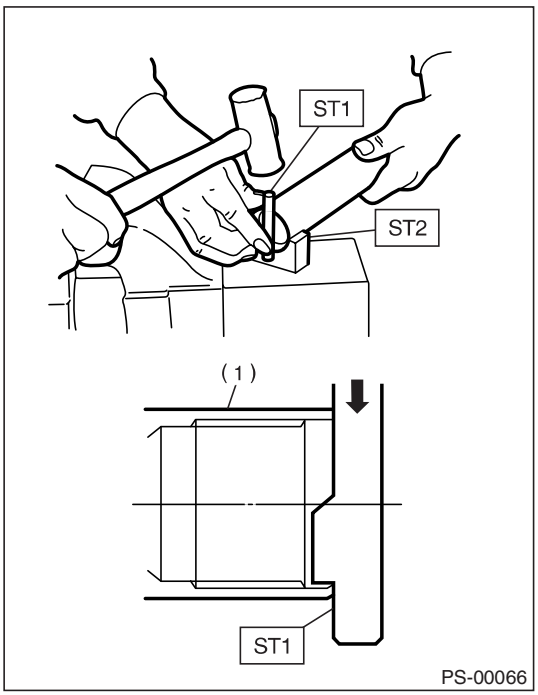
15) Insert the ST from valve side and press back-up ring and oil seal out.

ST 927580000 REMOVER (Non-turbo model)
ST 34199FE010 REMOVER (Turbo model)



16) Using the ST1 and ST2, repair the cylinder's clinched sections.

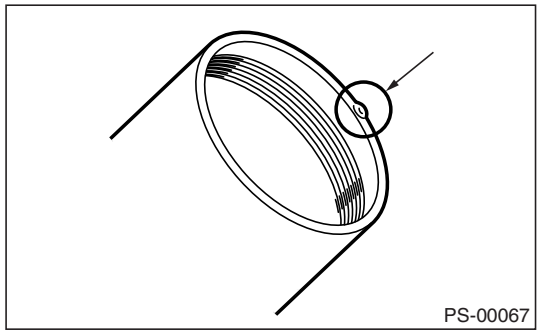
ST1 34099FA080 PUNCH
ST2 34099FA070 BASE (Non-turbo model)
ST2 34199FE020 BASE (Turbo model)



(1) Cylinder

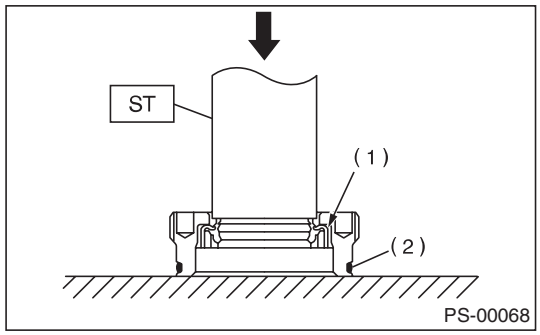
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17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



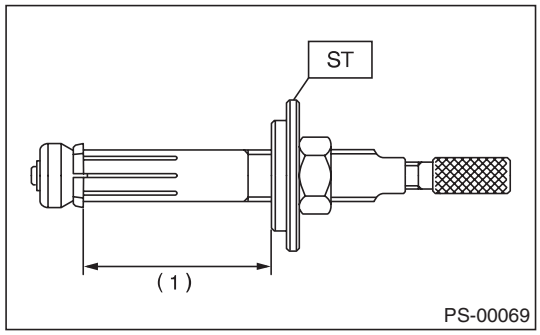
18) Remove the oil seal using ST and press from plug.
ST 34199AE100 PLUG OIL SEAL REMOVER

NOTE:
Do not apply force on the plug edge surface.



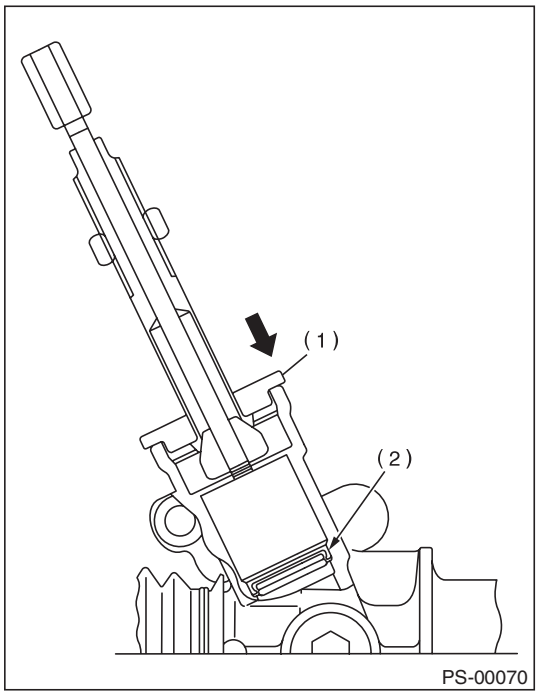
(1) Oil seal
(2) O-ring

19) Set the ST on drawing dimension.
ST 34199AE120 GEARBOX OIL SEAL REMOVER



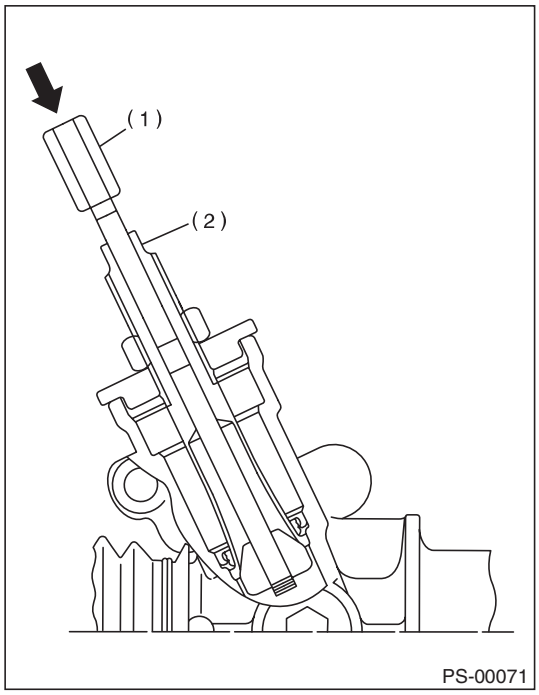
(1) 70 mm (2.76 in)

20) Set the stopper to gear box, and then insert the tip of ST to gear box.



(1) Stopper
(2) Oil seal

21) By fixing the 2-surface width, press in by rotating the rod and attach to oil seal.

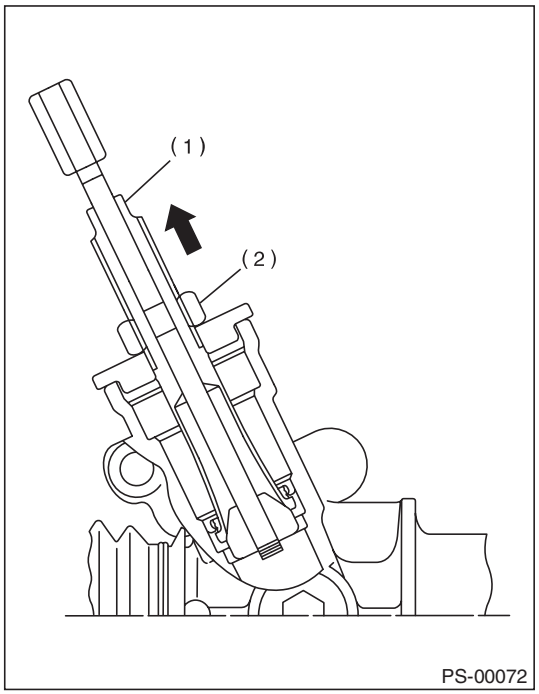


(1) Rod
(2) 2-surface width

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22) While fixing the 2-surface width, pull out the oil seal by rotating nut.

CAUTION:
Take care not to scratch the gear box inner surface.



(1) 2-surface width
(2) Nut

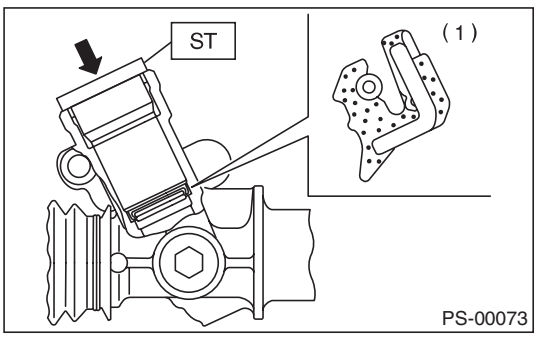
D: ASSEMBLY

1) Apply a coat of grease to inside and outside of new oil seal.

Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

2) Verify the oil seal direction and installation position. Using the ST and press, press fit the oil seal to gear box.

ST 34199AE130 GEARBOX OIL SEAL INSTALLER

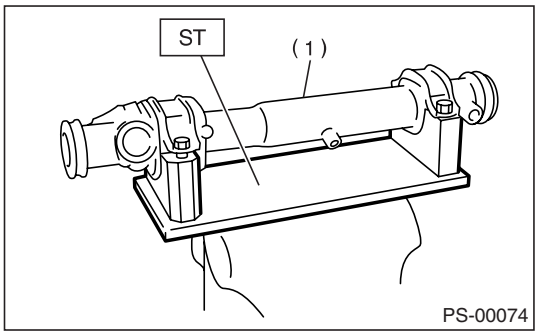


(1) Oil seal

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.

ST 926200000 STAND

CAUTION:
Ensure the needle bearing is free from defects. If it is faulty, replace the steering body with a new one.

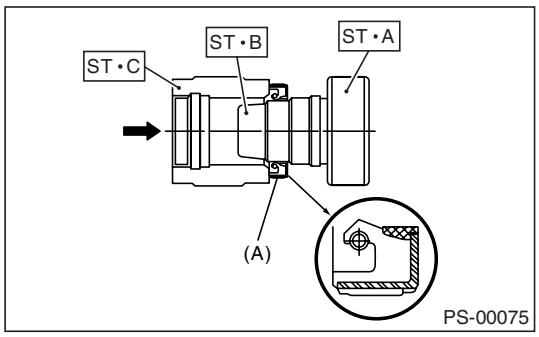


(1) Steering body

4) Using the ST·B and ST·C, attach the oil seal to ST·A.

ST 927490000 INSTALLER A, B, C (Non-turbo model)
ST 34199FE040 INSTALLER A, B, C (Turbo model)

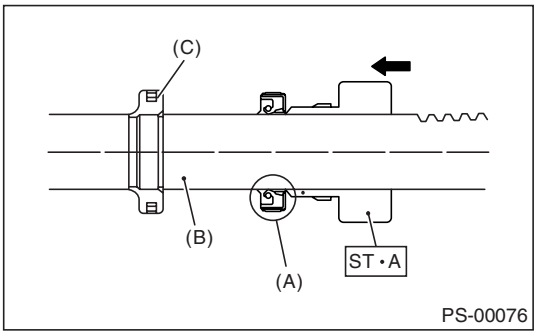
NOTE:
Face the oil seal in direction shown in the figure.



(A) Oil seal

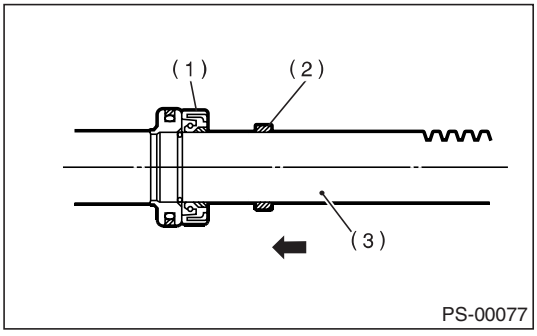
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5) Insert the ST·A with oil seal assembled, through gear side of rack. Remove the oil seal from ST·A near piston, and then remove the ST·A from rack.



(A) Oil seal
(B) Rack
(C) Piston

6) Install the back-up washer from gear side of rack.

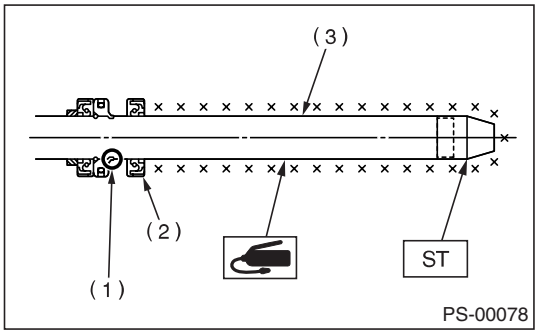


(1) Oil seal
(2) Back-up washer
(3) Rack

7) Install the ST on rack and equally apply a thin coat of grease to the rack and ST, then install the oil seal.
ST 926250000 GUIDE

CAUTION:
Be careful not to scratch the oil seal lips with piston's inner ring section.

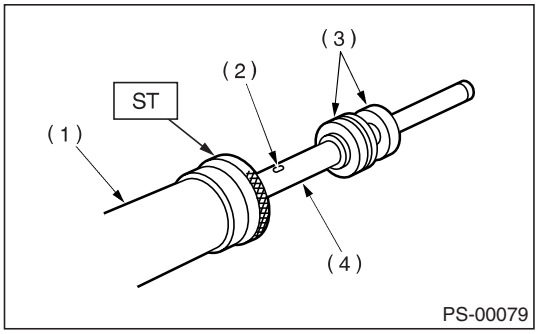
NOTE:
For turbo model, do not use this ST.



(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 the ST on end of steering body cylinder. Then insert the rack into steering body from cylinder side.
ST 34199AE000 GUIDE (Oil seal) (Non-turbo model)
ST 34199FE050 GUIDE (Oil seal) (Turbo model)

CAUTION:
Do not allow grease to block the air vent hole on rack.

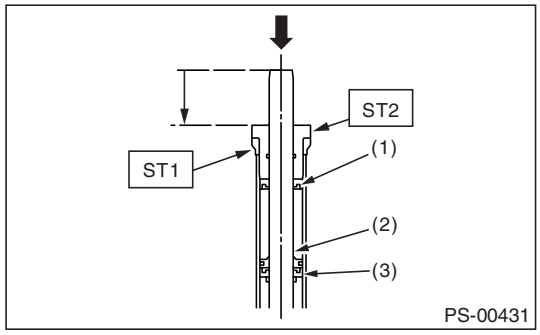


(1) Cylinder side of steering body
(2) Air vent hole
(3) Oil seal
(4) Rack

9) Make the ST2 pass through rack, and then push in the rack and ST2 using a press until ST1 comes in contact with ST2 and the end of rack is aligned with end of ST2.
ST1 34199AE000 GUIDE (Oil seal) (Non-turbo model)
ST1 34199FE050 GUIDE (Oil seal) (Turbo model)
ST2 34199AE010 INSTALLER (Oil seal) (Non-turbo model)

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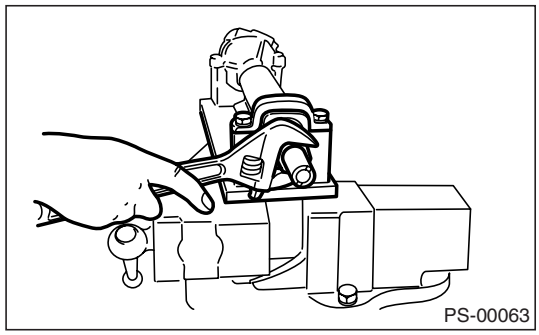
ST2 34199FE060 INSTALLER (Oil seal) (Turbo model)



(1) Outer side oil seal
(2) Rack piston
(3) Inner side oil seal

10) Install a new holder to cylinder side of steering body.

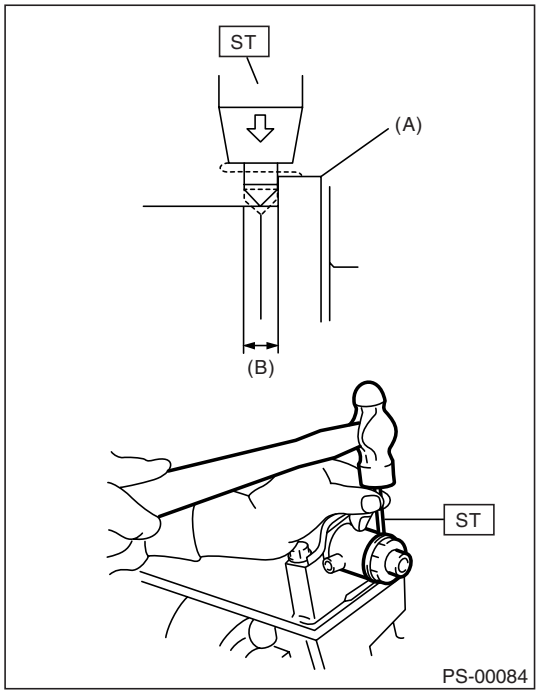
Tightening torque:
Non-turbo model:
64 N·m (6.5 kgf-m, 47.0 ft-lb)
Turbo model:
75 N·m (7.6 kgf-m, 58.7 ft-lb)



11) Using the ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

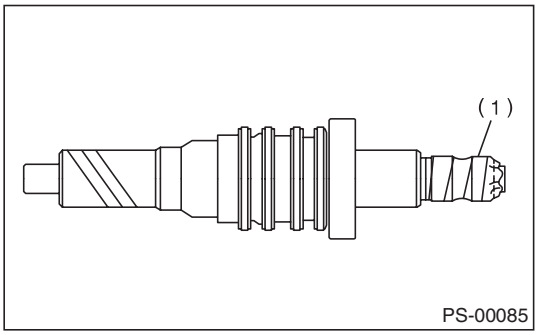
CAUTION:
Be careful not to deform the holder.

ST 34099FA060 PUNCH HOLDER



(A) Holder
(B) 3 mm (0.12 in)

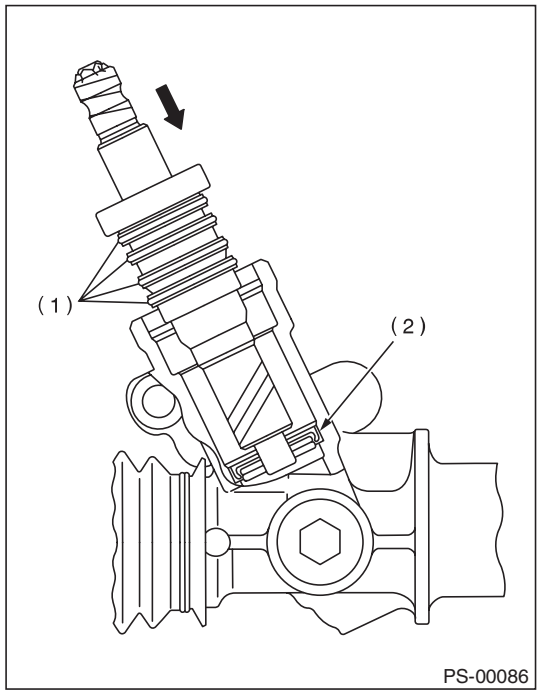
12) Roll the vinyl tape on serration part of valve assembly, and then apply grease on the tape surface.



(1) Vinyl tape

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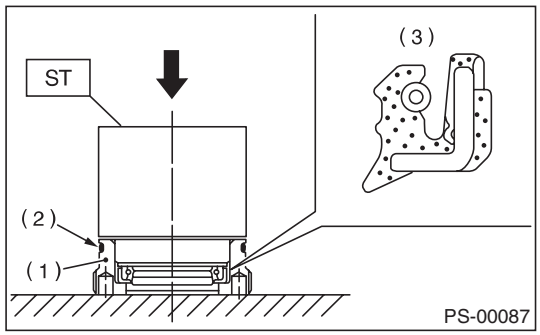
13) Apply a coat of grease on the gear teeth of valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.



(1) Seal ring
(2) Oil seal

14) Apply grease on the oil seal circumference, and then press into the plug using ST and a press. Replace the plug circumference O-rings with new ones.
ST 34199AE110 PLUG OIL SEAL INSTALLER

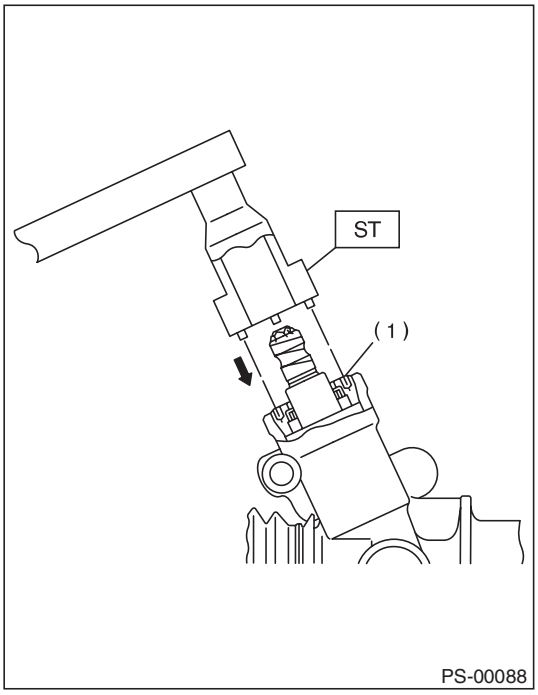
CAUTION:
Pay attention to the oil seal direction, and attaching position.



(1) Plug
(2) O-ring
(3) Oil seal

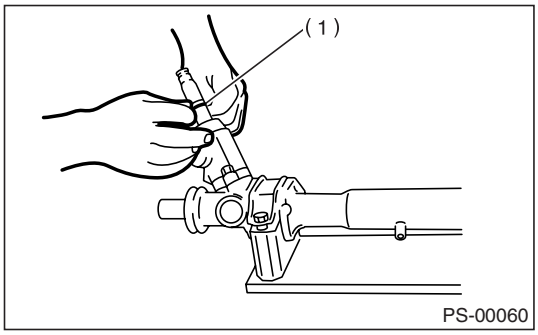
15) Using the ST, install plug.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf-m, 47.0 ft-lb)



(1) Plug

16) Install the dust cover. Remove the vinyl tape.



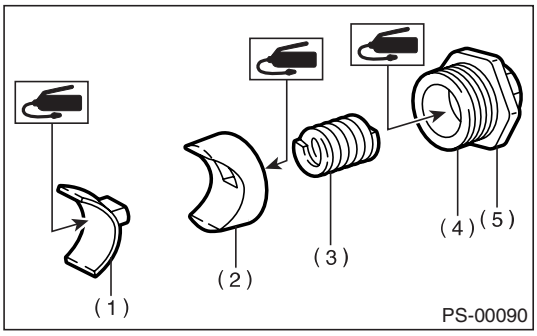
(1) Dust cover

17) Temporarily install 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.

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18) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



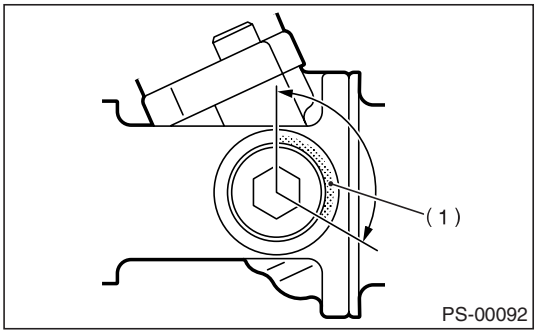
(1) Seat pad
(2) Sleeve
(3) Spring
(4) Adjusting screw
(5) Lock nut

19) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

20) After tightening to the specified tightening torque, loosen it by 25°. (Non-turbo model)
21) After tightening to the specified tightening torque, loosen it by 37°. (Turbo model)
22) Remove the tie-rod.
23) Verify that play is within specified value. <Ref. to PS-74, SERVICE LIMIT, INSPECTION, Steering Gearbox [RHD Model].>
24) Loosen the adjusting screw, and then 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.

25) Tighten the adjusting screw.

Tightening torque:
9.8 N·m (10.0 kgf-m, 7.2 ft-lb)

26) After tightening to the specified tightening torque, loosen it.
27) Tighten the adjusting screw.

Tightening torque:
4.8 N·m (0.49 kgf-m, 3.5 ft-lb)

28) After tightening to the specified tightening torque, loosen it.
29) Tighten the adjusting screw.

Tightening torque:
4.8 N·m (0.49 kgf-m, 3.5 ft-lb)

30) After tightening to the specified tightening torque, loosen it by 25°. (Non-turbo model)
31) After tightening to the specified tightening torque, loosen it by 37°. (Turbo model)
32) Install the lock nut. While holding the adjusting screw with a wrench, tighten 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.

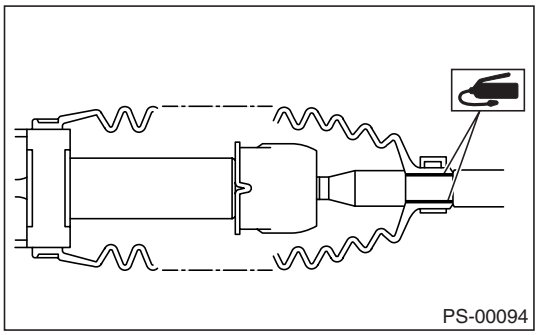
33) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.0 kgf-m, 65.1 ft-lb)

NOTE:
Check the mating face of rack and tie-rod for foreign material, dirt, dust and etc.
If required, clean the mating face.

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

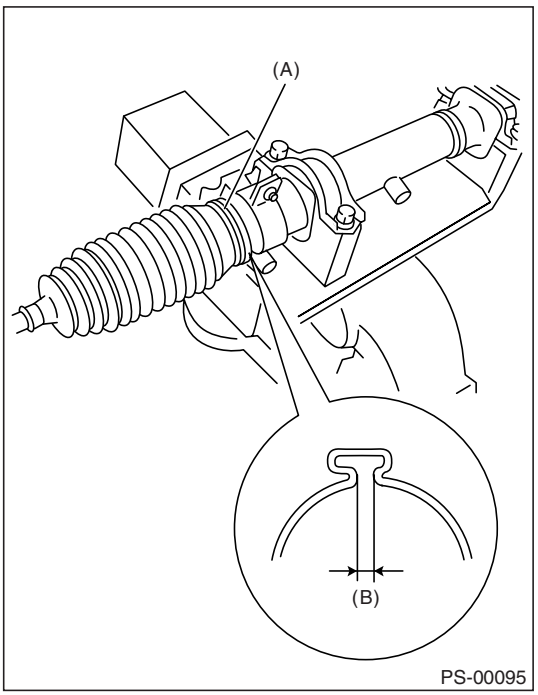
NOTE:
Make sure that the boot is installed without unusual inflation or deflation.



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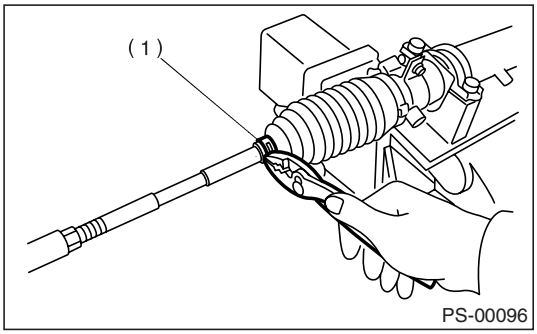
35) Caulk the boot so the space inside boot band caulking portion becomes 2 mm (0.08 in) or less.

NOTE:
Use a new boot band.



(A) Boot band
(B) Less than 2mm (0.08 in)

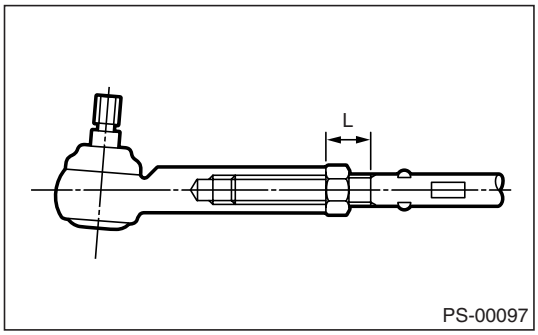
36) Fix the boot end with clip (small).



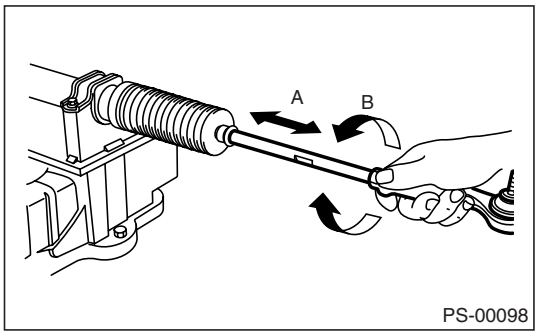
(1) Clip

37) After installing, check the boot end is positioned into groove on tie-rod.
38) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:
Sedan:
25 mm (0.98 in)
Wagon:
15 mm (0.59 in)



39) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding the 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 specified position without deflation.



40) Remove the gearbox from ST.
ST 926200000 STAND

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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 assembly.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, 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 and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping the 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 assembly.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox assembly 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 assembly with a new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox assembly with a new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace with a new one.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace with a new one.
7	Tie-rod end	Damage or deterioration on dust seal	Replace with a new one.
8	Adjusting screw spring	Deterioration	Replace with a new one.
9	Boot clip	Deterioration	Replace with a new one.
10	Sleeve	Damage	Replace with a new one.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace with a new one.

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2. SERVICE LIMIT

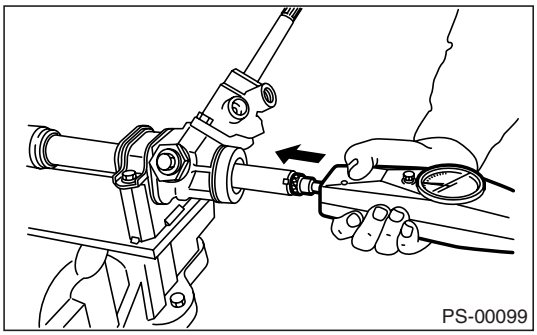
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

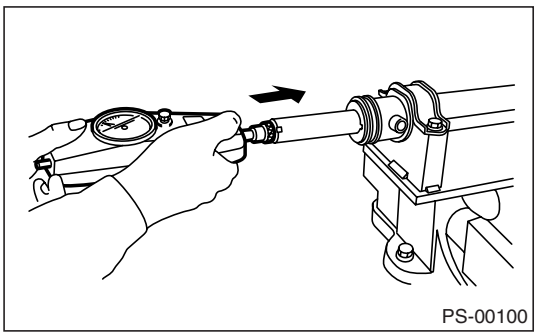
NOTE:
When making a measurement, vise gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
400 N (41 kgf, 90 lbf) or less



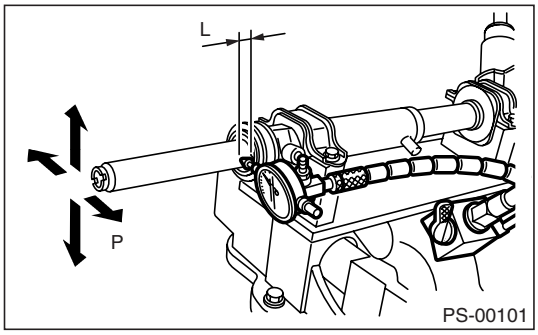


3. RACK SHAFT PLAY IN RADIAL DIRECTION

Left-turn steering:

Service limit
0.19 mm (0.0075 in) or less

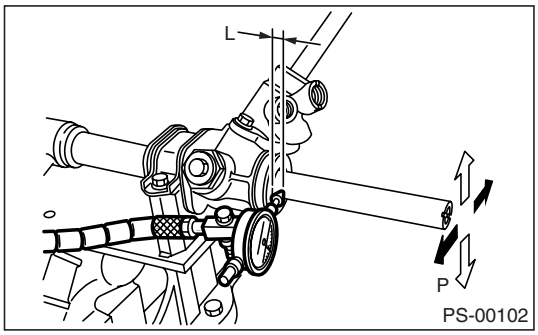
On condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lbf)



Right-turn steering:

Service limit
Direction ⇦ ⇨
0.3 mm (0.012 in) or less
Direction ⬅ ➡
0.19 mm (0.0075 in) or less

On condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lbf)



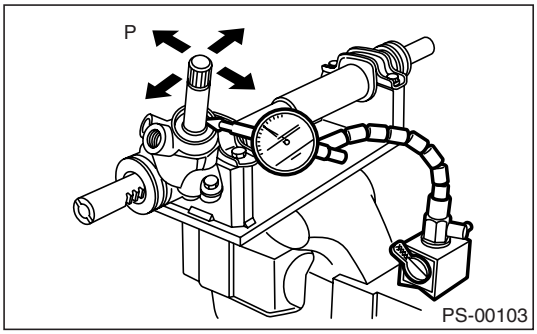
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4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

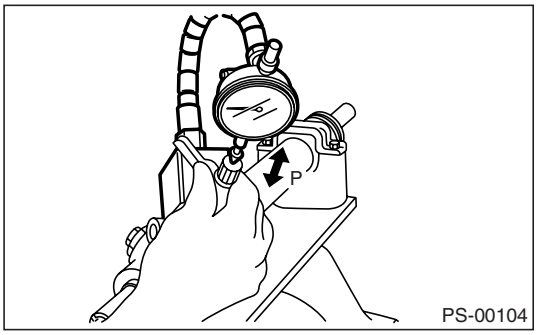
On condition
P: 98 N (10 kgf, 22 lbf)



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)

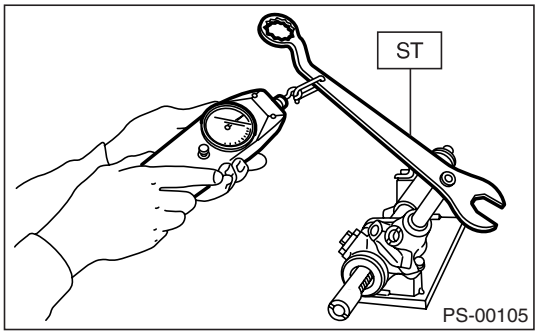


5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure gearbox turning resistance.
ST 34099PA100 SPANNER

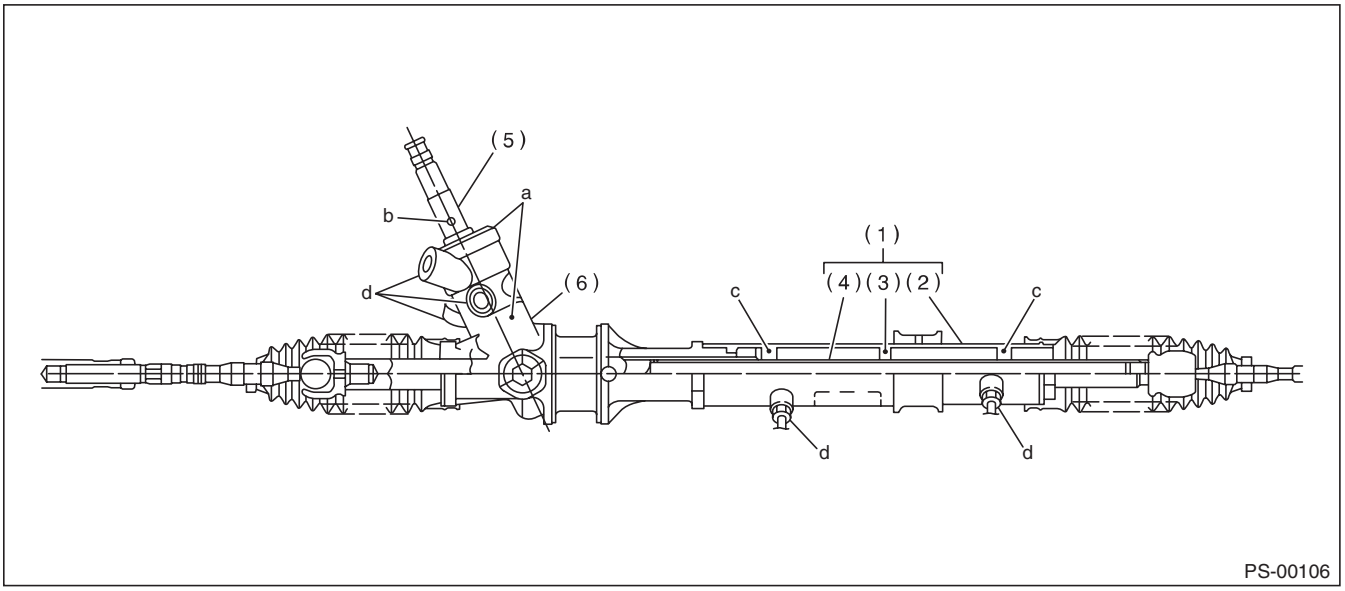
Service limit
Maximum allowable resistance
10.5 N (1.1 kgf, 2.4 lbf) or less

Difference between right and left turning resistance:
Less than 20%



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6. OIL LEAKING



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack
(5) Input shaft
(6) Valve housing

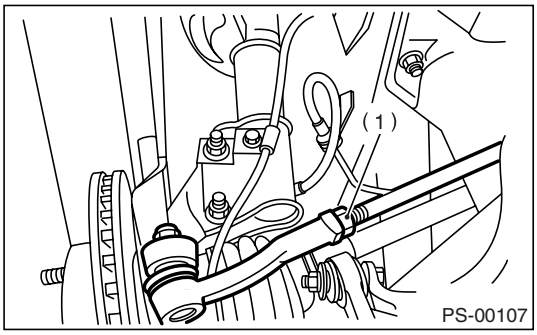
1) Lift up the vehicle.
2) Even if the location of leak can be easily found by observing leaking condition, it is necessary to thoroughly remove the oil from suspected portion and turn steering wheel from lock to lock about thirty to forty times with engine running, then reinspect the suspected portion between immediately after and several hours after this operation.
3) Inspect leakage from “a”.
The oil seal is damaged. Replace the valve assembly with a new one.
4) Inspect leakage from “b”.
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
5) Inspect leakage from “c”.
The oil seal is damaged. Replace the oil seal with a new one.
6) Inspect leakage from “d”.
The pipe is damaged. Replace the faulty pipe or O-ring with a new one.

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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)



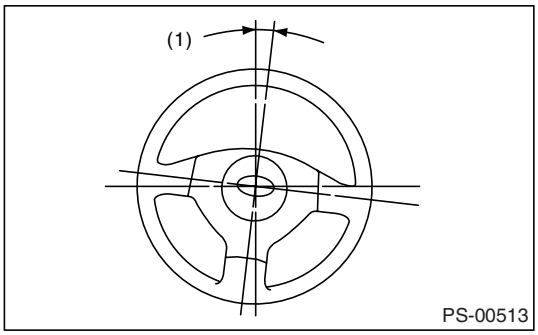
(1) Lock nut

2) Adjust the steering angle of wheels. <Ref. to FS-10, STEERING ANGLE, INSPECTION, Wheel Alignment.>

Standard of steering angle:

Model	TURBO, 2.5 L and OUTBACK	1.6 L and 2.0 L	STi
Inner wheel	34.5°±1.5°	37.3°±1.5°	32.9°±1.5°
Outer wheel	30.3°±1.5°	32.4°±1.5°	28.5°±1.5°

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and 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.

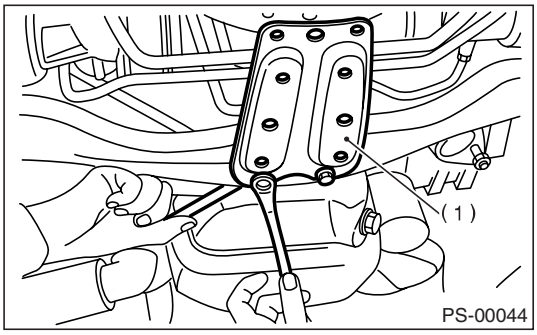
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7. Pipe Assembly [LHD Model]

A: REMOVAL

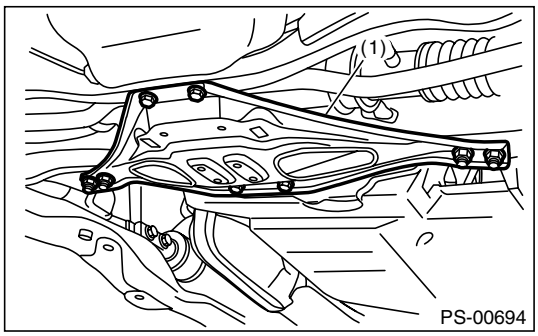
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the jack-up plate.

• NON-TURBO MODEL



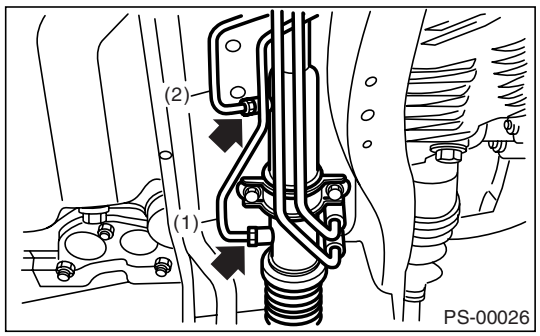
(1) Jack-up plate

• TURBO MODEL



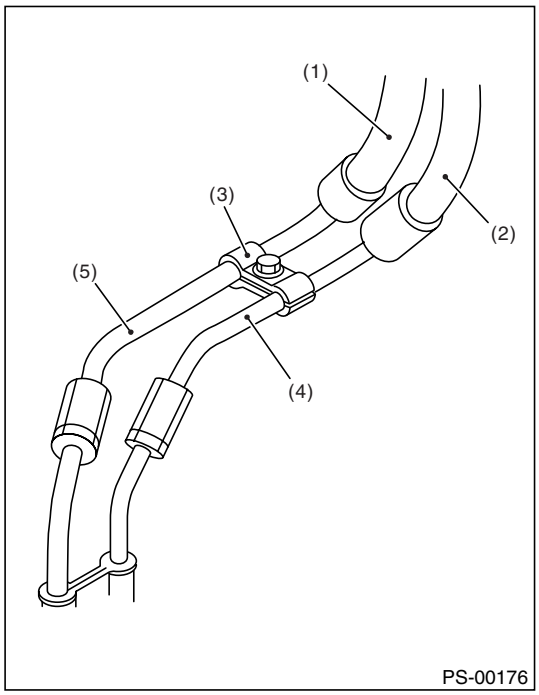
(1) Jack-up plate

3) Remove the one pipe joint at the center of gear-box, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



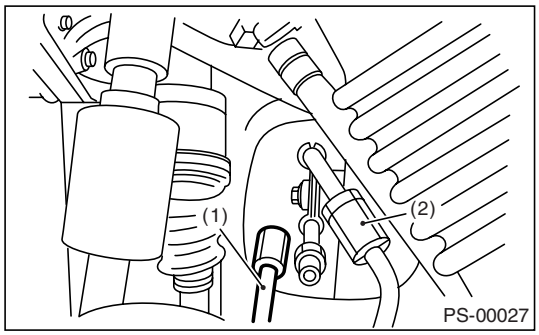
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

5) Disconnect the pipe C and D from gear box.



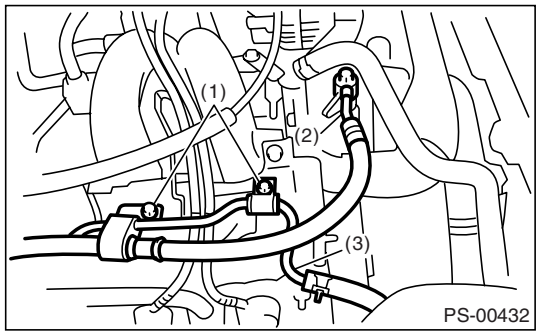
(1) Pipe C
(2) Pipe D

6) NON-TURBO MODEL
(1) Remove the air intake duct. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
(2) Remove the bolt A.
(3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.

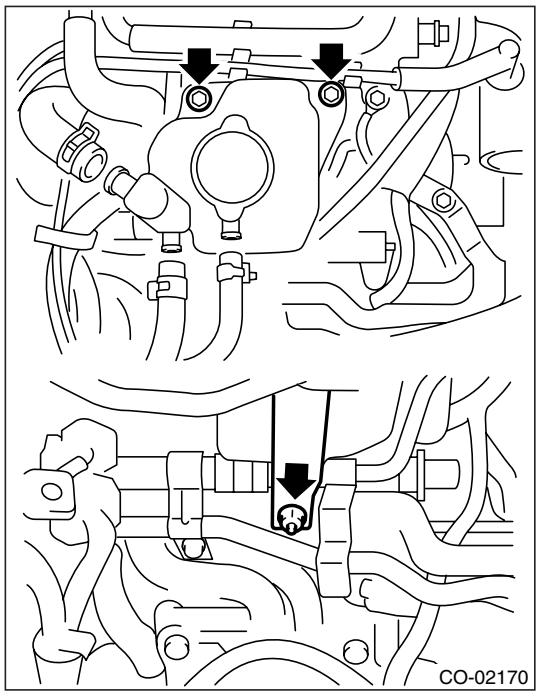
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• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



(1) Bolt A
(2) Pipe C
(3) Pipe D

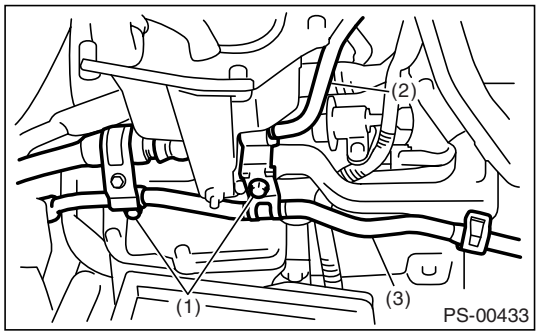
7) TURBO MODEL
(1) Remove the air cleaner case.
<Ref. to IN(H4DOTC)-9, REMOVAL, Air Cleaner Case.>
(2) Remove the coolant filler tank.



(3) Remove the two bolts fixing pipe C and D.
(4) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.

• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



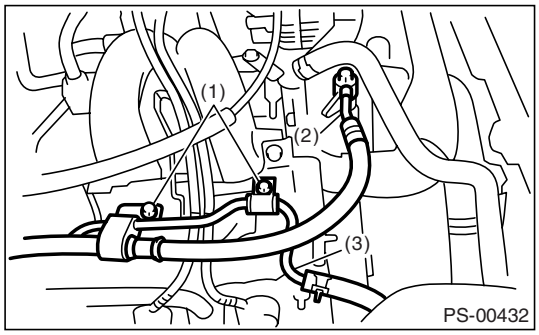
(1) Bolt
(2) Pipe C
(3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A)

NOTE:
Visually check that the hose between tank and pipe D is free from bending or twisting.

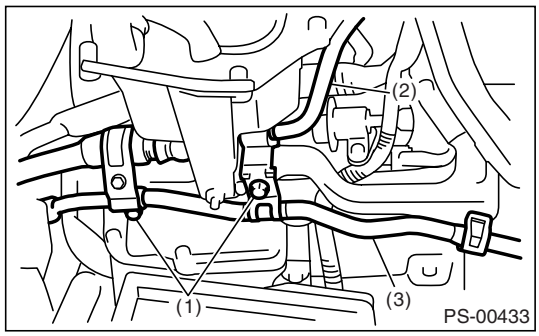
• NON-TURBO MODEL



(1) Bolt A
(2) Pipe C
(3) Pipe D

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• TURBO MODEL



(1) Bolt
(2) Pipe C
(3) Pipe D

(1) Connect the pipe D to oil tank.
(2) Using a new gasket, connect the pipe C to oil pump.

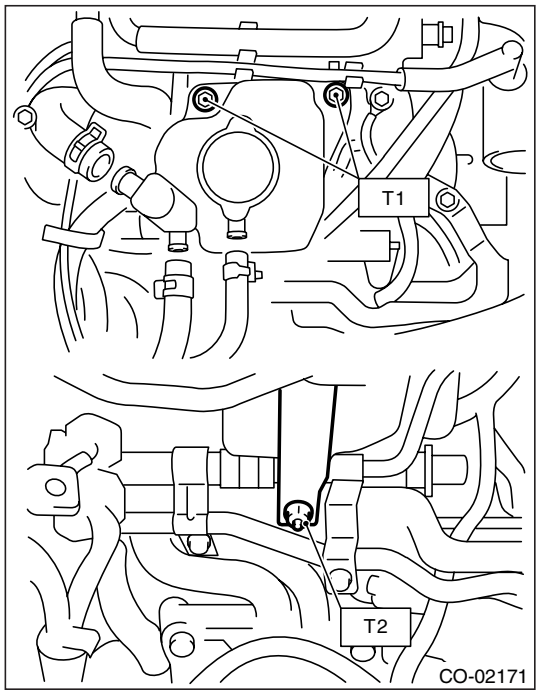
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten the two bolts fixing pipe C and D. (bolt A)

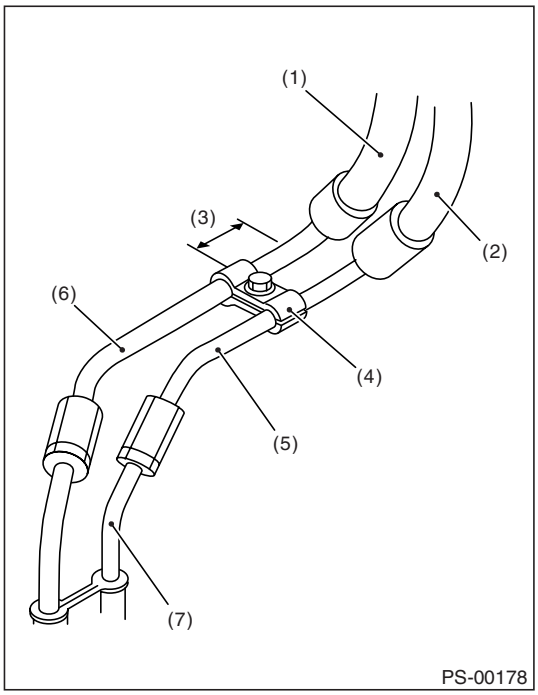
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 13 N·m (1.3 kgf-m, 9.6 ft-lb)



3) Temporarily connect the pipe C and D to gear box.

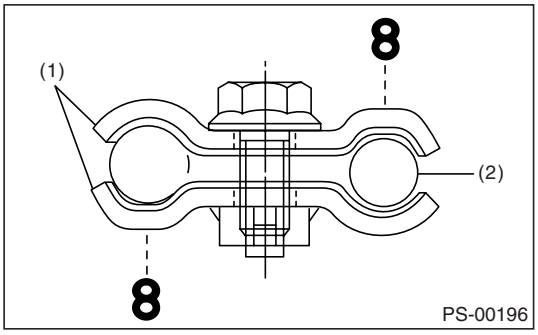


(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E
(5) Pipe C
(6) Pipe D
(7) Pipe (Gear box side)

4) Temporarily install the clamp E on pipes C and D.

NOTE:
Ensure the letter “8” on each clamp are diagonally opposite each other as shown in the figure.

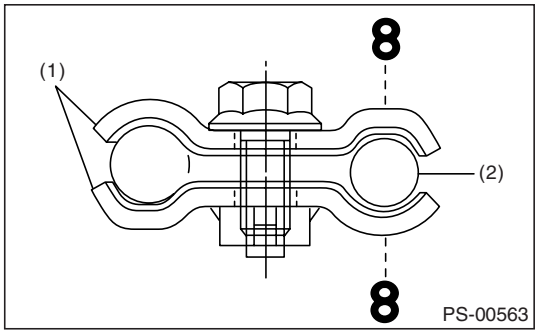
• NON-TURBO MODEL



(1) Clamp E
(2) Pipe C

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- TURBO MODEL



(1) Clamp E
(2) Pipe C

5) Tighten the clamp E firmly.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten the joint nut.

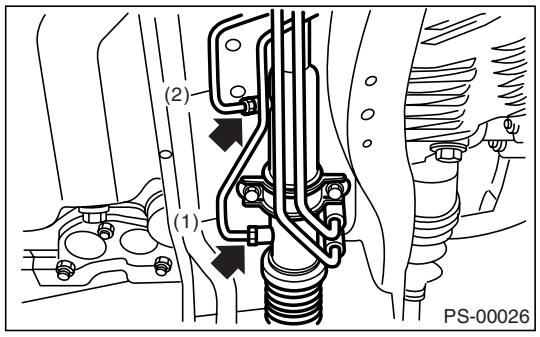
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A second.

Tightening torque:

Non-turbo model
13 N·m (1.3 kgf-m, 9.4 ft-lb)

Turbo model
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)



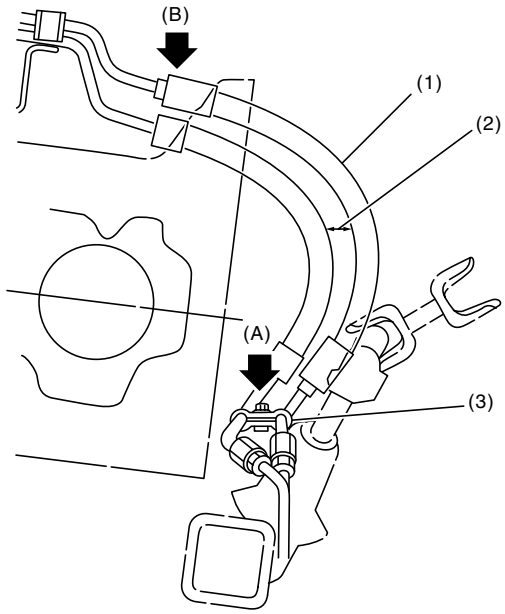
(1) Pipe A
(2) Pipe B

8) Install the jack-up plate.
9) Install the air intake duct. <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
10) Install the air intake duct, air cleaner upper cover and air intake boot.
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
11) Connect the battery ground cable to battery.
12) Feed the specified fluid.

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

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13) Finally check clearance between pipes and/or hoses, as shown above.
If cruise control actuator-to-power steering hose clearance is less than 10 mm (0.39 in), move the portion (A) secured by clamp to other portion, or bend portion (B) to adjust.



PS-00179

(1) High pressure hose
(2) No interference is allowed between hoses.
(3) Clearance between crossmember and pipe: 3 — 8 mm (0.12 — 0.31 in)

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C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
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	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with a new one.

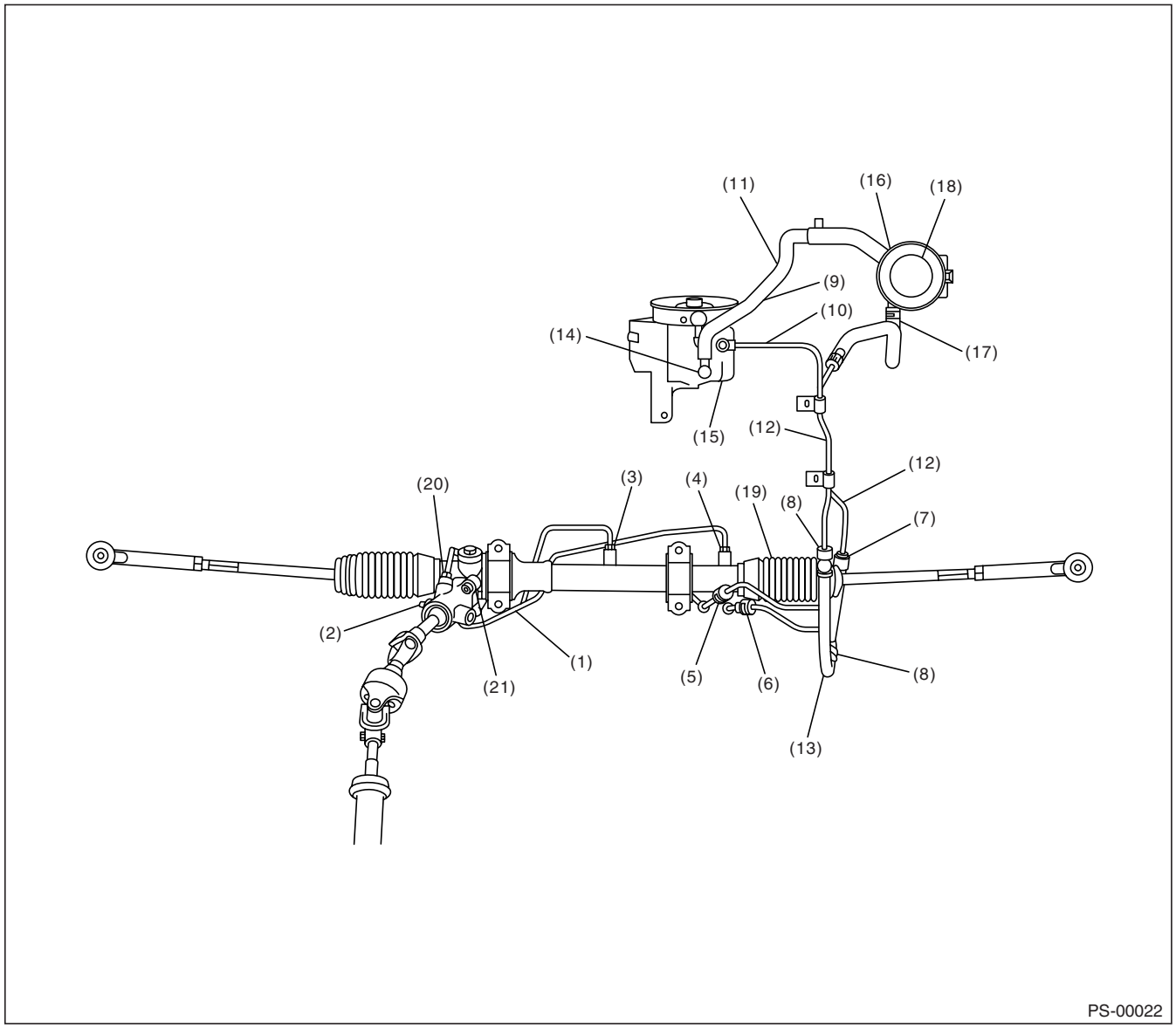
CAUTION:
Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since the 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 the careful inspection frequently when the vehicle is used in hot weather areas, cold weather area 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 the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the 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 defective parts.
	Improper stop position of pitching stopper	Replace the defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake 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 the customers.

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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.



Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose (11), (12) and (13) in 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 figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.

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Fluid leaking area	Possible cause	Corrective action
Leakage from oil tank (16) and (17) in 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 figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gear-box (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

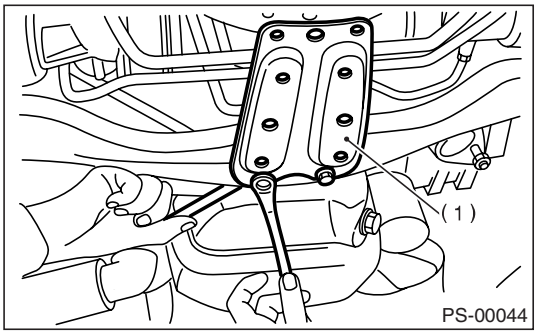
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8. Pipe Assembly [RHD Model]

A: REMOVAL

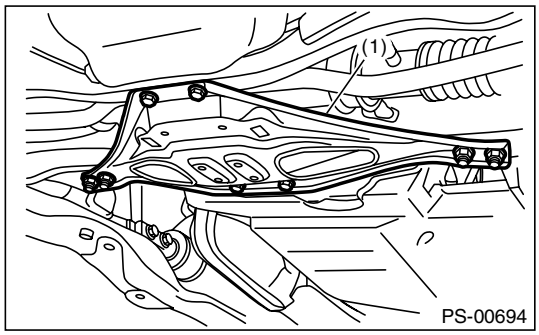
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the jack-up plate.

- NON-TURBO MODEL



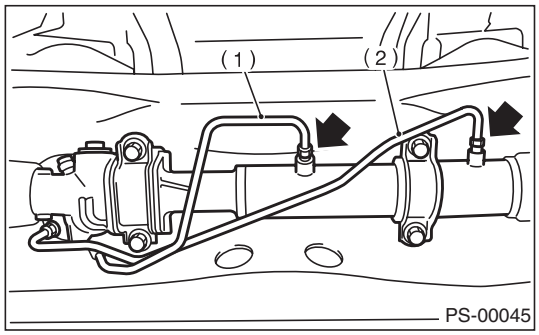
(1) Jack-up plate

- TURBO MODEL



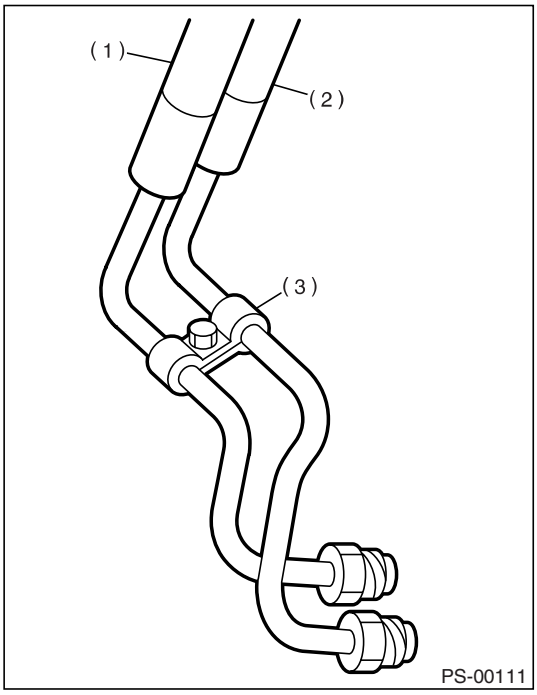
(1) Jack-up plate

3) Remove the one pipe joint at the center of gear-box, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



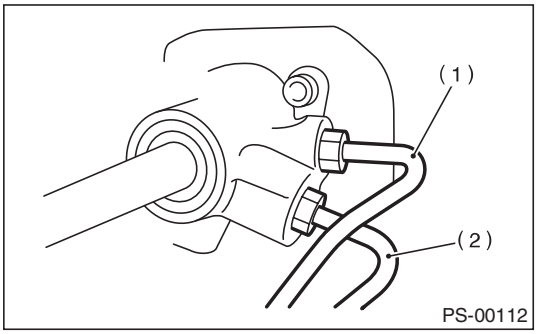
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E

5) Disconnect the pipe C and D from gear box.

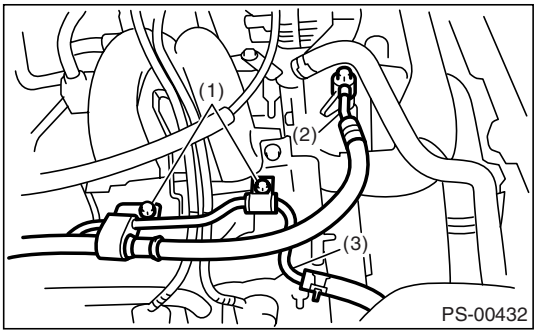


(1) Pipe C
(2) Pipe D

6) Non-turbo model
(1) Remove the air cleaner case. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
(2) Remove the bolt A.
(3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

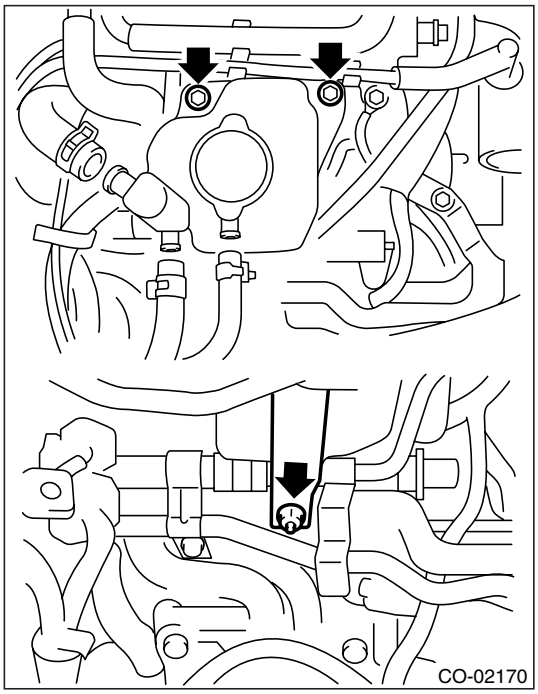
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CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



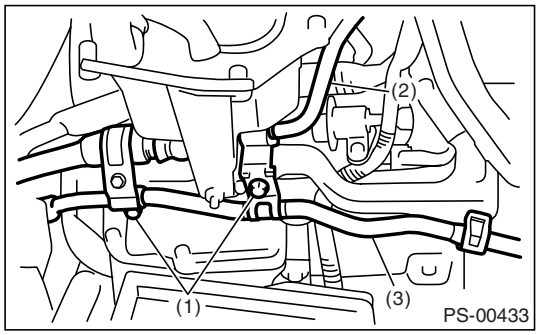
(1) Bolt A
(2) Pipe C
(3) Pipe D

7) Turbo model
(1) Remove the air cleaner case.
<Ref. to IN(H4DOTC)-9, REMOVAL, Air Cleaner Case.>
(2) Remove the coolant filler tank.



(3) Remove the two bolts fixing pipe C and D.
(4) Disconnect the pipe C from oil pump. Disconnect pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



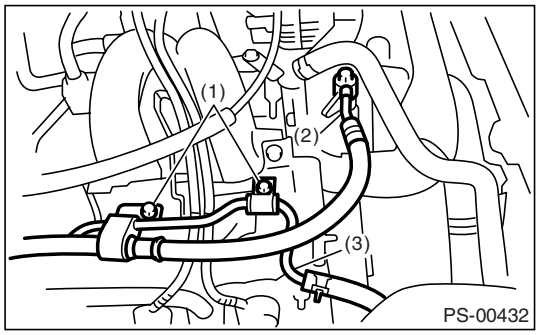
(1) Bolt
(2) Pipe C
(3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A for Non-turbo model.)

NOTE:
Visually check that the hose between tank and pipe D is free from bending or twisting.

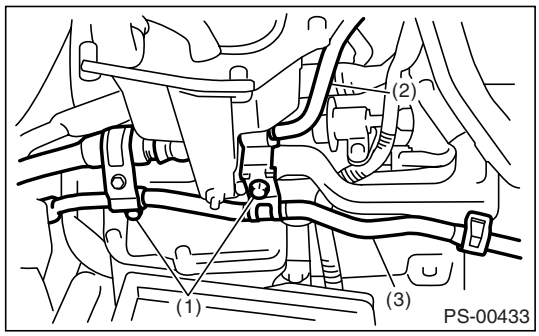
• NON-TURBO MODEL



(1) Bolt A
(2) Pipe C
(3) Pipe D

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• TURBO MODEL



(1) Bolt
(2) Pipe C
(3) Pipe D

(1) Connect the pipe D to oil tank.
(2) Using a new gasket, connect the pipe C to oil pump.

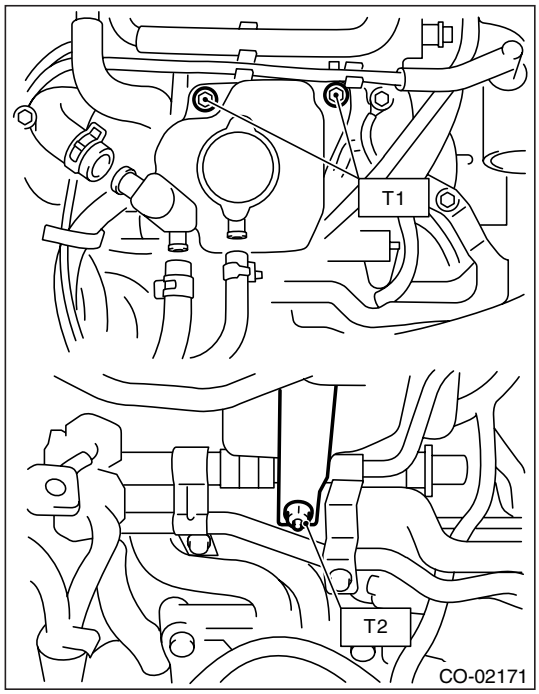
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten the two bolts fixing pipe C and D. (bolt A for Non-turbo model.)

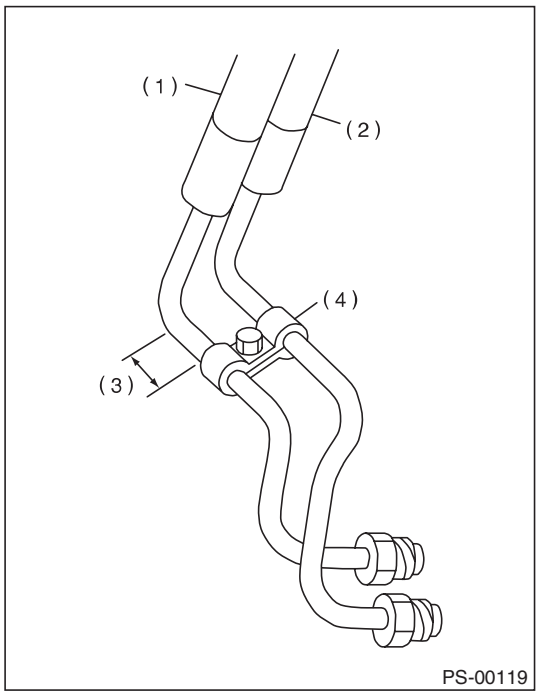
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 13 N·m (1.3 kgf-m, 9.6 ft-lb)



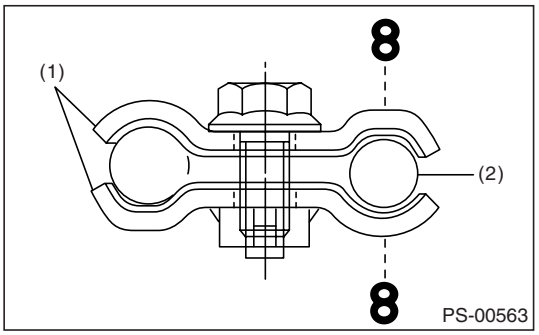
3) Temporarily connect the pipe C and D to gear box.



(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E

4) Temporarily install the clamp E on pipes C and D.

NOTE:
Ensure the letter “8” on each clamp are opposite each other as shown in the figure.



(1) Clamp E
(2) Pipe C

5) Tighten the clamp E firmly.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

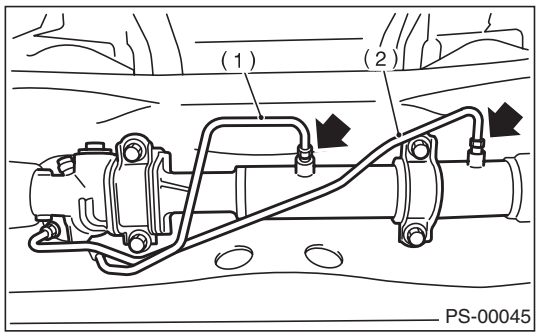
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6) Tighten the joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A second.

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)



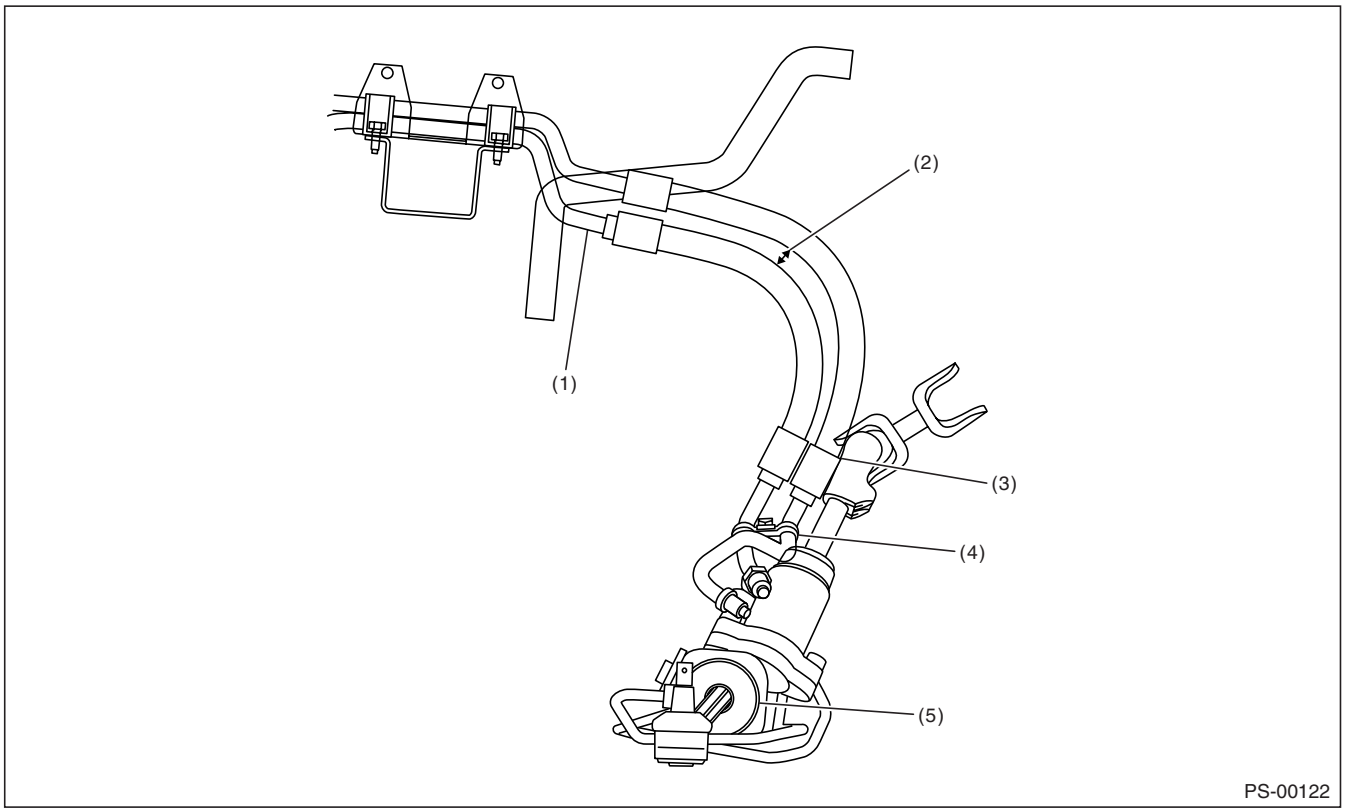
(1) Pipe A
(2) Pipe B

8) Install the jack-up plate.
9) Install the air intake duct, air cleaner upper cover and air intake boot.
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
10) Connect the battery ground cable to battery.
11) Feed the specified fluid.

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

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12) Finally check clearance between pipes and/or hoses, as shown in the figure.



(1) Clearance between blow-by hose and pipe: 3 — 5 mm (0.12 — 0.20 in)
(2) No interference is allowed between hoses.
(3) Clearance between side frame and hose: 15 mm (0.59 in) or more
(4) Clearance between crossmember and pipe: 5 — 13 mm (0.20 — 0.51 in)
(5) Steering gearbox

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C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
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	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with a new one.

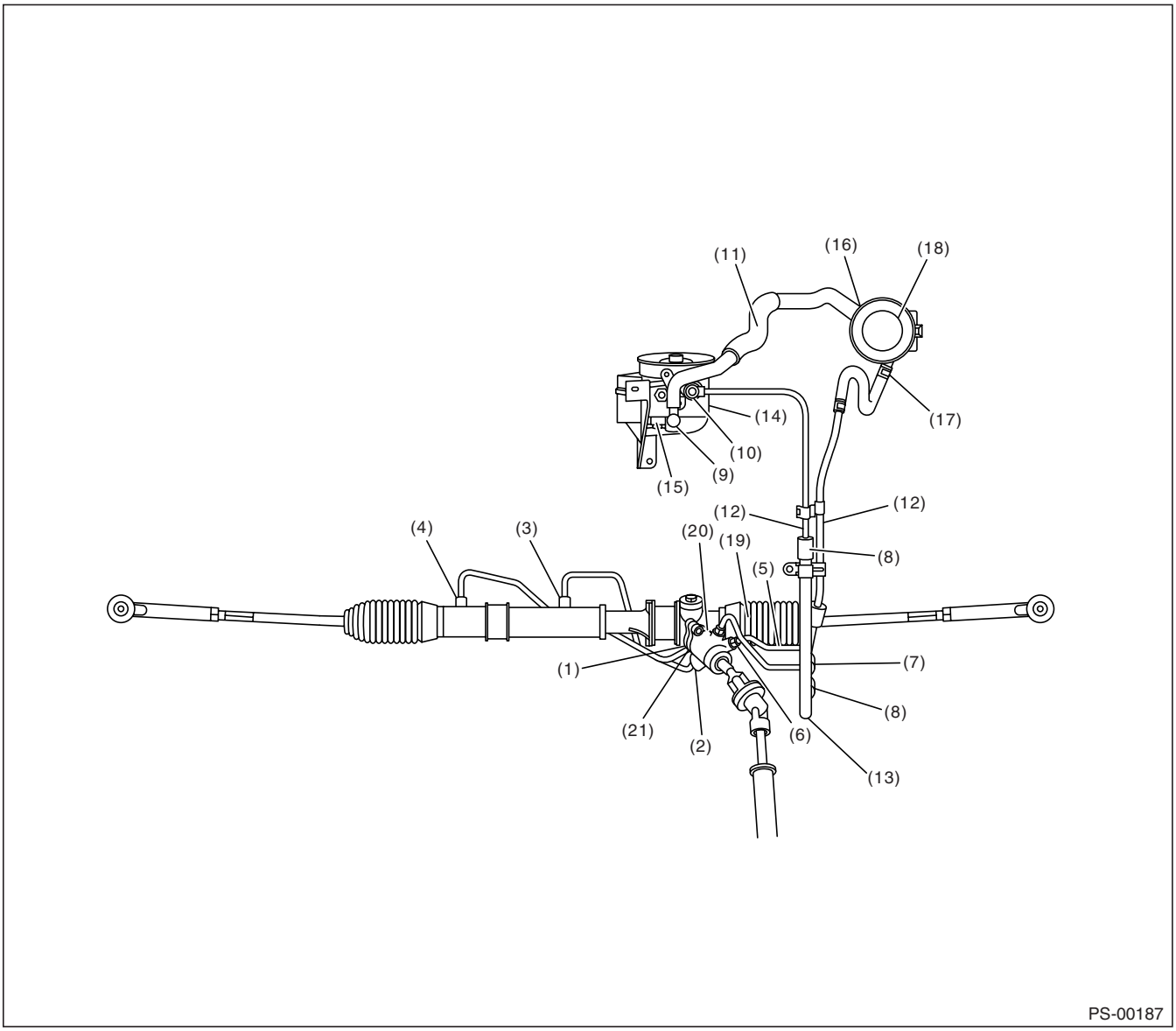
CAUTION:
Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since the 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 the careful inspection frequently when the vehicle is used in hot weather areas, cold weather area 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 the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the 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 defective parts.
	Improper stop position of pitching stopper	Replace the defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake 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 the customers.

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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.



Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose (11), (12) and (13) and oil cooler (22) in 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 figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.

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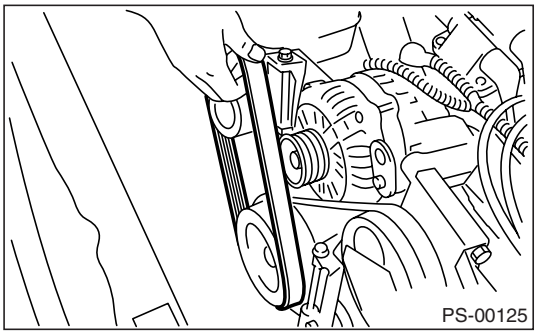
Fluid leaking area	Possible cause	Corrective action
Leakage from oil tank (16) and (17) in figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gear-box (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

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9. Oil Pump

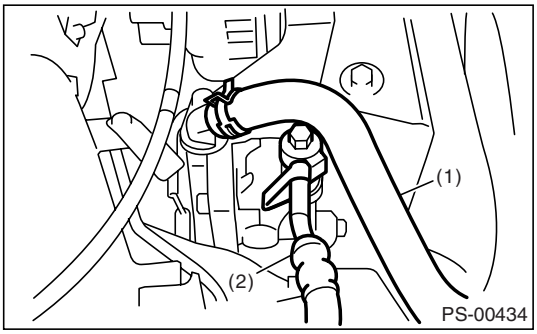
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the pulley belt cover.
3) Loosen the belt tension adjusting bolt and generator securing bolt, and then remove the power steering pump V-belt.



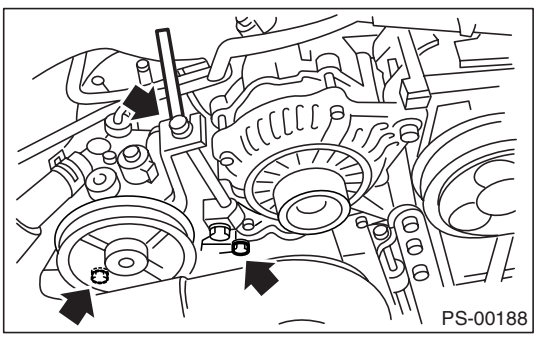
4) Disconnect the connector from power steering pump switch.
5) Disconnect the pipe C and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



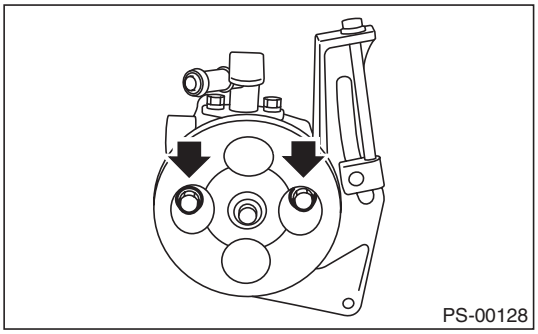
(1) Suction hose
(2) Pipe C

6) Remove the bolts which install the power steering pump bracket.

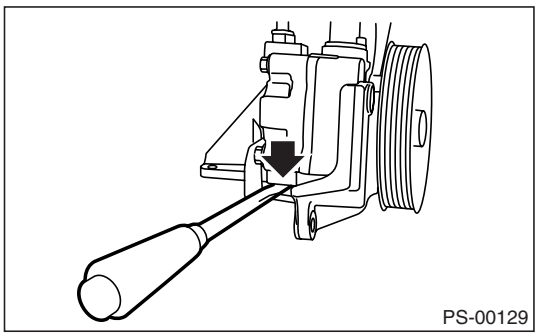


7) Place the oil pump bracket in a vise, remove the two bolts from front side of oil pump.

CAUTION:
Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



8) Remove the bolt from the rear side of oil pump.
9) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.

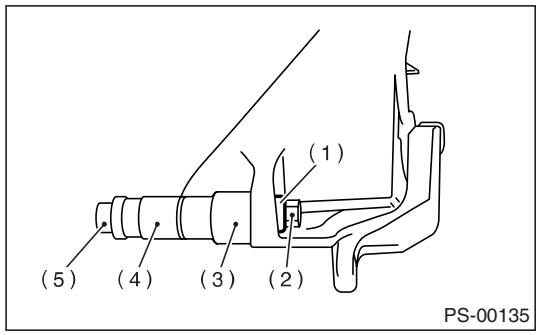


B: INSTALLATION

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 mm and 21 mm box wrench until it is in contact with the oil pump mounting surface.

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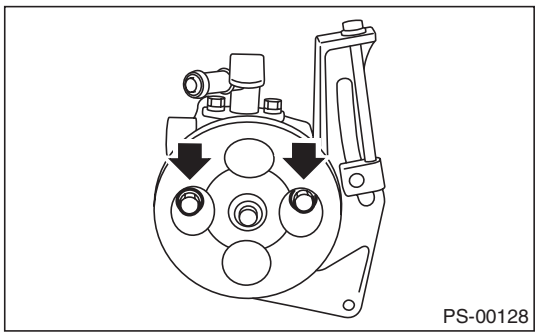
CAUTION:
Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



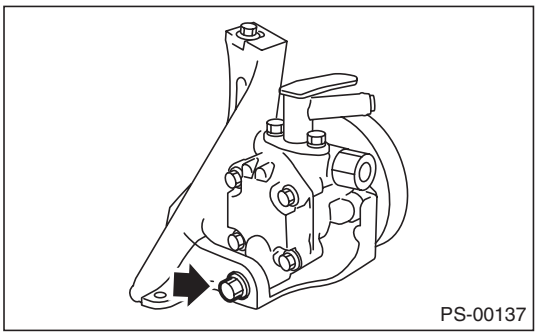
(1) Bush
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten the bolts which install the oil pump to bracket.

Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

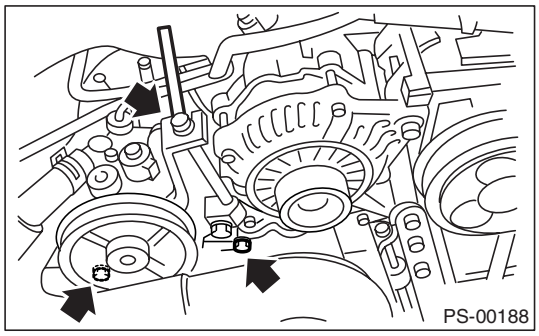


Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten the bolts which install the power steering pump bracket.

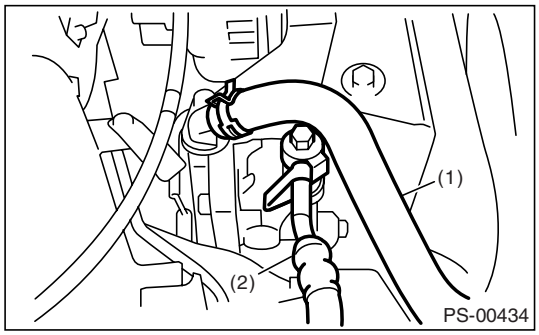
Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



3) Interconnect the pipe C 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, the hose may come into contact with some other parts.



(1) Suction hose
(2) Pipe C

4) Connect the connector to power steering pump switch.
5) Install the pulley belt to oil pump.
6) Check the pulley belt tension.
<Ref. to ME(H4SO)-42, INSPECTION, V-belt.>
7) Tighten the lock bolt of belt tension nut.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

8) Tighten the tension bolt.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

9) Install the pulley belt cover.
10) Connect the battery ground cable to battery.
11) Feed the specified power steering fluid. <Ref. to PS-100, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

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C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or 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 it 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 rotation of pulley. If it is past 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 with a string put around its pulley, replace the oil pump with a new one.
4	O-ring	Crack or deterioration	Replace it with a new one.
5	Bracket	Crack	Replace it with a new one.

2. SERVICE LIMIT

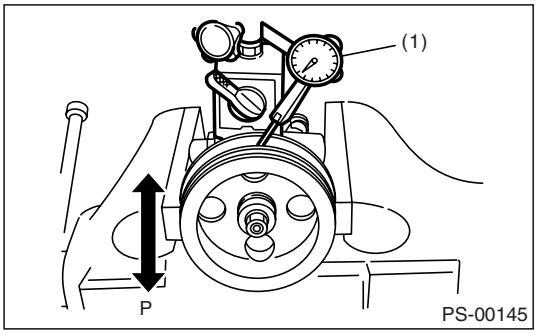
Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:
• Fix the oil pump on a vise to make a measurement. At this time, hold the oil pump with least possible force between two wood blocks.
• Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood blocks.

1) Play of the pulley shaft

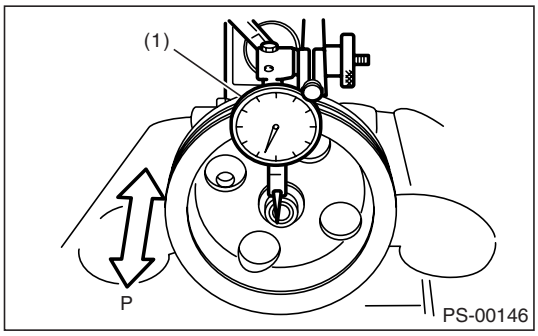
Condition:
P: When applying the force of 9.8 N (1.0 kgf, 2.2 lbf)

Service limit:
Radial play (Direction ⇦ ⇨)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction ⇦ ⇨)
0.9 mm (0.035 in) or less



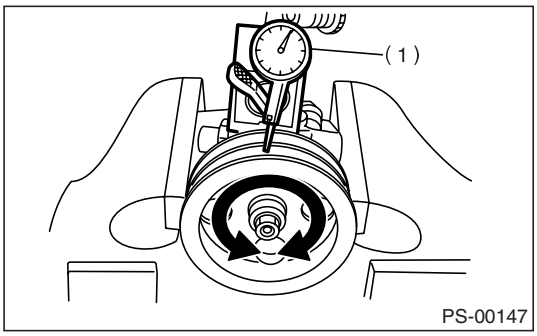
(1) Dial indicator

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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.

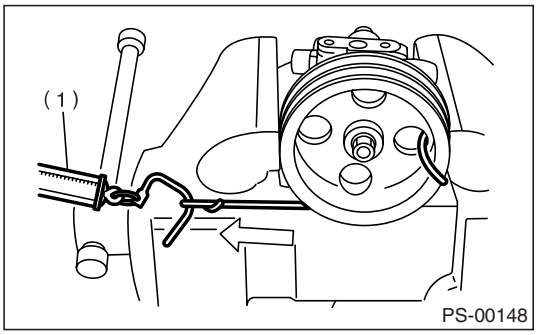


(1) Dial indicator

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 and make a judgment.



(1) Spring balance

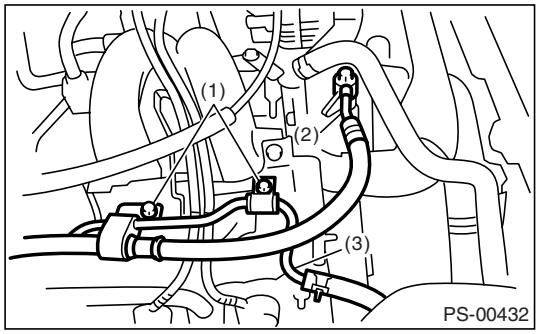
3. HYDRAULIC PRESSURE

NOTE:
• Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-101, 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 a cotton cloth waste at a place where fluid drops before the pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

1) REGULAR PRESSURE MEASUREMENT
(1) Connect the ST1, ST2 and ST3.

ST1 92511000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

(2) Remove the air intake duct.
(3) Disconnect the pipe C from the pump.
(4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to the pump instead of pipe C.



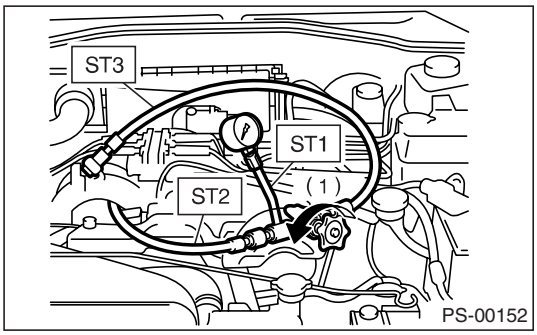
(1) Bolt A
(2) Pipe C
(3) Pipe D

(5) Install the ST3 to end of pipe C removed from pump.
(6) Replenish power steering fluid up to the specified level.
(7) Open the valve, and start the engine.
(8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B

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ST3 34099AC010 ADAPTER HOSE A



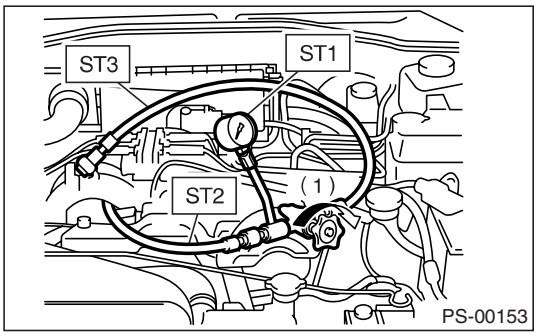
(1) Open the valve

Service limit:
981 kPa (10 kgf/cm^2, 142 psi) or less

(9) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

2) Measure the relief pressure.
(1) Using the STs, measure the relief pressure.
(2) Close the valve.
(3) Measure the relief pressure.

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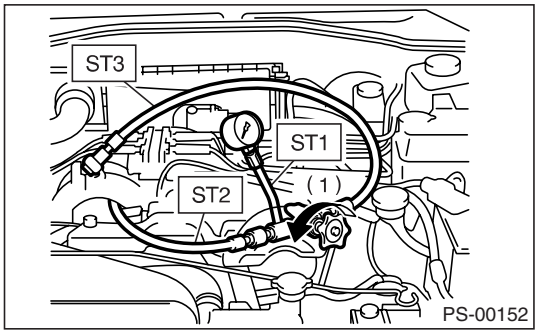
(1) Close the valve

Service limit:
1.6 L model:
6,174 — 6,860 kPa (63 — 70 kgf/cm^2, 896 — 994 psi)
2.0 L Non-turbo model, 2.5 L model:
6,767 — 7,453 kPa (69 — 76 kgf/cm^2, 981 — 1,081 psi)
2.0 L Turbo model (WRX model):
7,350 — 8,036 kPa (75 — 82 kgf/cm^2, 1,067 — 1,165 psi)
2.0 L Turbo model (STi model):
8,100 — 8,800 kPa (82.6 — 89.8 kgf/cm^2, 1,176 — 1,277 psi)

(4) If it is not within the specified value, replace the oil pump.

3) Measure the working pressure.
(1) Using the STs, measure the working pressure.
(2) Open the valve.
(3) Measure the working pressure of control valve by turning wheel from stop to stop.

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(1) Open the valve

Service limit:
1.6 L model:
6,174 — 6,860 kPa (63 — 70 kgf/cm^2, 896 — 994 psi)
2.0 L Non-turbo model, 2.5 L model:
6,767 — 7,453 kPa (69 — 76 kgf/cm^2, 981 — 1,081 psi)
2.0 L Turbo model:
7,350 — 8,036 kPa (75 — 82 kgf/cm^2, 1,067 — 1,165 psi)

(4) If it is within the specified value, measure the steering effort. <Ref. to PS-103, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace the control valve itself or control valve and pinion as a single unit with new ones.

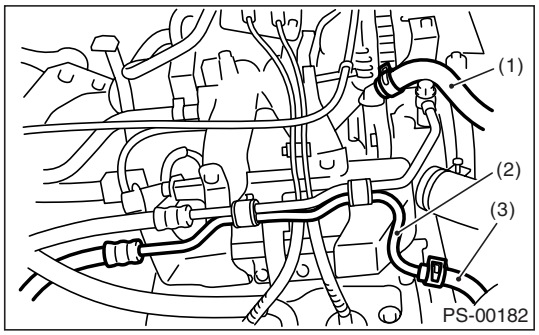
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10.Reservoir Tank

A: REMOVAL

1) Remove the air intake duct. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Drain fluid from the reservoir tank.
3) Disconnect the pipe D from return hose and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

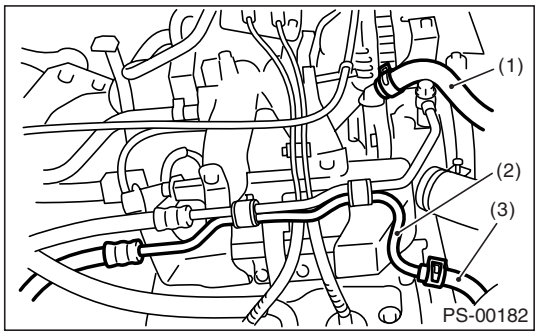


(1) Suction hose
(2) Pipe D
(3) Return hose

4) Remove the reservoir tank from bracket by pulling it upwards.

B: INSTALLATION

1) Install the reservoir tank to bracket.
2) Connect the pipes D to return hose and suction hose to oil pump.



(1) Suction hose
(2) Pipe D
(3) Return hose

3) Feed the power steering fluid to the specified level. <Ref. to PS-100, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace the reservoir tank.

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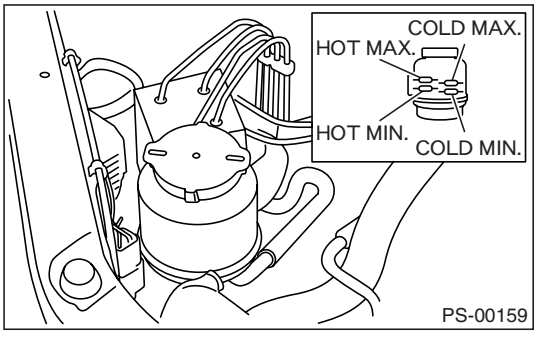
11.Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid	Manufacturer
DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

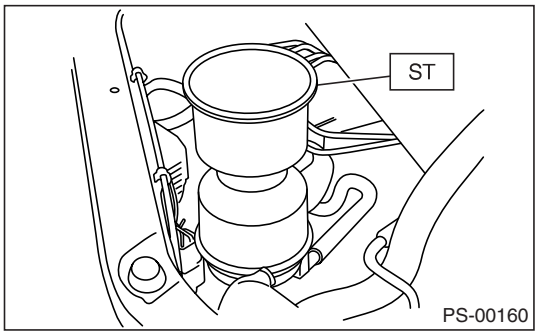
B: INSPECTION

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 jack up plate.
3) Remove the pipe joint in center of gear box, and then install the vinyl hose to pipe and joint. Drain the fluid while turning steering wheel.
4) Set the ST on top of reservoir tank and fill it about half way with the specified fluid.
ST 34199AE040 OIL CHARGE GUIDE



5) Continue to turn the steering wheel slowly from lock to lock until bubbles stop appearing on oil surface while keeping the fluid at that level.
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) Lift up the vehicle, start the engine and let it idle.
8) Continue to turn the steering wheel slowly from lock to lock again until bubbles stop appearing on oil surface while keeping the fluid at that level.
It is normal that bubbles stop appearing after three times turning of steering wheel from lock to lock.
9) In case the 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 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.

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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 • Improper wheels out of specification • Tires not properly inflated *1	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 the customer.
	4. Idle speed • Lower idle speed • Excessive drop of idle speed at start or at turning steering wheel *3	Adjust or instruct the customer.
	5. Measure hydraulic pressure. <Ref. to PS-96, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure steering effort. <Ref. to PS-101, 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	Reform 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 • One-sided weight	Replace, adjust or instruct the customer.
	5. Measure steering effort. <Ref. to PS-101, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or wheels are wider, the load to power steering system is the more. 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 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 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.

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1. NOISE AND VIBRATION

CAUTION:
Don't keep the relief valve operated over 5 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 disk 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 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.
This phenomena does not indicate there is some abnormal function in the system.
The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in "D" range for automatic transmission vehicle.

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. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	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-83, 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 gearbox or oil pump.
Knocking When turning steering wheel in both direction 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, or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten the fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Pulley bearing seizing of oil pump	Replace the oil pump.
	Folded hose, flat pipe	Replace.
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.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.

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Trouble	Possible cause	Corrective action
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 Flat hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install the cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace the faulty parts of gearbox or hose.
Whine or growl (continuous or intermittent) 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, 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.
Creaking noise (intermittent) While engine is running with 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) Idle the engine. 4) Install the spring scale on the steering wheel. 5) Pull the spring scale at an right angle to steering wheel, and measure both right and left steering wheel effort. 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 a problem.	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 an right angle to the steering wheel, and measure both right and left steering wheel effort.	Is the steering effort less than 400 N (41 kgf, 90 lbf)?	Go to step **3.**	Perform adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is the maximum steering effort less than 2.26 N (0.23 kgf, 0.51 lbf)?	Go to step **4.**	Check, adjust and replace if necessary.

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	Step	Check	Yes	No
4	**CHECK STEERING WHEEL EFFORT.** Measure the 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-29, INSPECTION, Universal Joint.>	Is the swing torque less than 7.3 N (0.74 kgf, 1.64 lbf)?	Go to step **6.**	Replace with new one.
6	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-29, INSPECTION, Universal Joint.>	Is the swing torque less than 3.8 N (0.39 kgf, 0.86 lbf)?	Go to step **7.**	Replace with new one.
7	**CHECK FRONT WHEEL.** Check the front wheel.	Are the front wheels for 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.	Are the tie-rod ends of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **9.**
9	**CHECK BALL JOINT.** Remove the ball joint.	Are the ball joints of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **10.**
10	**CHECK GEARBOX.** Measure the rotating of gearbox. <Ref. to PS-59, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [LHD Model].> or <Ref. to PS-75, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [RHD Model].>	Is the rotating resistance of gear box less than 10.5 N (1.1 kgf, 2.4 lbf)? Is the difference between clockwise and counterclockwise 20%?	Go to step **11.**	Readjust the backlash, and if ineffective, replace the faulty parts.
11	**CHECK GEARBOX.** Measure the sliding of gearbox. <Ref. to PS-58, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].> or <Ref. to PS-74, SERVICE LIMIT, INSPECTION, Steering Gearbox [RHD Model].>	Is the sliding resistance of gear box less than 400 N (41 kgf, 90 lbf)? Is the difference between right and left 20%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

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