1. General Description

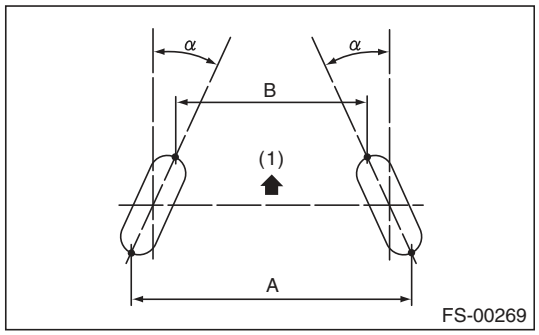
A: SPECIFICATION

	Model		Sedan			Wagon		
			2.5 i	2.5 GT spec.B, 3.0 R	2.5 GT spec.B, 3.0 R-LTD	2.5 i	2.5 GT	OUTBACK
Front	Wheel arch height (Tolerance: $^{+12\ mm}_{-24\ mm}$ ($^{+0.47\ in}_{-0.94\ in}$))	mm (in)	381 (15.0)					439 (17.3)
	Camber (Tolerance: ±0°45′ Differences between RH and LH: 45′ or less)		–0°15′					0°40′
	Caster (Referential Value)		5°55′			5°40′		4°55′
	Steering angle (Tolerance: ±1.5°)	Inner wheel	37.6°		33.8°	37.6°		
		Outer wheel	33.0°		30.2°	33.0°		
	Toe-in	mm (in)	0±3 (0±0.12) Toe angle (sum of both wheels): 0°±0°15′					
	Kingpin angle (Referential Value)		13°45′					12°05′
Rear	Wheel arch height (Tolerance: $^{+12\ mm}_{-24\ mm}$ ($^{+0.47\ in}_{-0.94\ in}$))	mm (in)	365 (14.4)			375 (14.8)		438 (17.2)
	Camber (Tolerance: ±0°45′ Differences between RH and LH: 45′ or less)		–0°40′			–0°30′		–0°10′
	Toe-in	mm (in)	*2					*1
	Thrust angle (Tolerance: ±0°30′)		0°					

*1: OUTBACK model
–3 — 0 mm (–0.12 — 0 in) Toe angle (sum of both wheels): –0°15′ — 0°

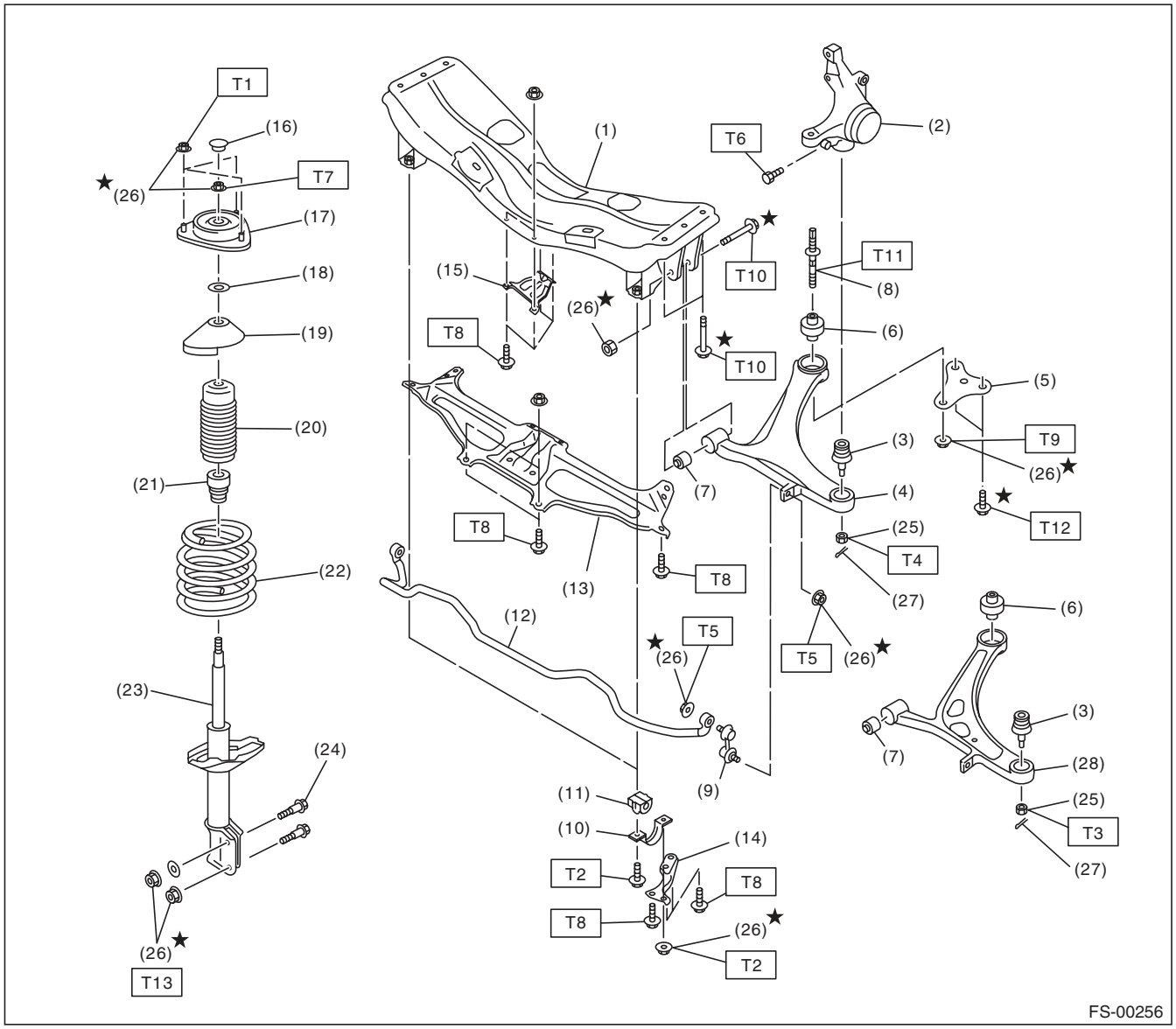
*2: Except for OUTBACK model
0±3 mm (0±0.12 in) Toe angle (sum of both wheels): 0°±0°15′

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



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

B: COMPONENT



(1)	Front crossmember	(15)	Jack-up plate	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Housing	(16)	Dust seal	***T1: 20 (2.0, 14.5)***
(3)	Ball joint	(17)	Strut mount	***T2: 25 (2.5, 18.1)***
(4)	Front arm (steel type)	(18)	Spacer	***T3: 30 (3.1, 22)***
(5)	Support plate	(19)	Upper spring seat	***T4: 39 (4.0, 28.8)***
(6)	Rear bushing	(20)	Dust cover	***T5: 45 (4.6, 33.2)***
(7)	Front bushing	(21)	Helper	***T6: 50 (5.1, 36.9)***
(8)	Stud bolt	(22)	Coil spring	***T7: 55 (5.6, 41)***
(9)	Stabilizer link	(23)	Damper strut	***T8: 60 (6.1, 44.3)***
(10)	Bracket	(24)	Adjusting bolt	***T9: 88 (9.0, 64.9)***
(11)	Bushing	(25)	Castle nut	***T10: 95 (9.7, 70.1)***
(12)	Stabilizer	(26)	Self-locking nut	***T11: 110 (11.2, 81.1)***
(13)	Crossmember support plate (Large type)	(27)	Cotter pin	***T12: 150 (15.3, 110.6)***
(14)	Crossmember support plate (Small type)	(28)	Front arm (aluminium type)	***T13: 155 (15.8, 114.3)***

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOL

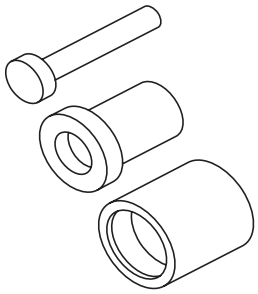
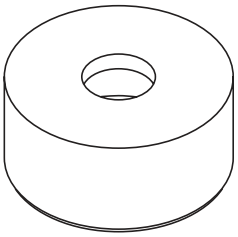
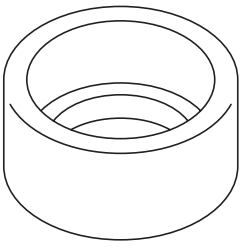
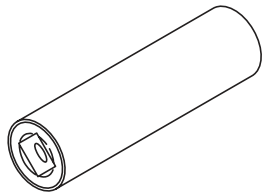
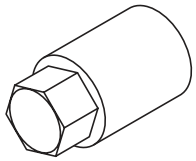
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing front arm front bushing.
 ST20299AG000	20299AG000	REMOVER	Used for replacing front arm rear bushing. Used together with BASE (20999AG010).
 ST20299AG010	20299AG010	BASE	Used for replacing front arm rear bushing. Used together with REMOVER (20999AG000).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20299AG020	20299AG020	STUD BOLT SOCKET	Used for removing and installing the stud bolt for front arm installing portion.
 ST20399AG000	20399AG000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut mount.

2. GENERAL TOOL

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

2. Wheel Alignment

A: INSPECTION

Check the following items before performing the wheel alignment measurement.
Check items before measuring wheel alignment:

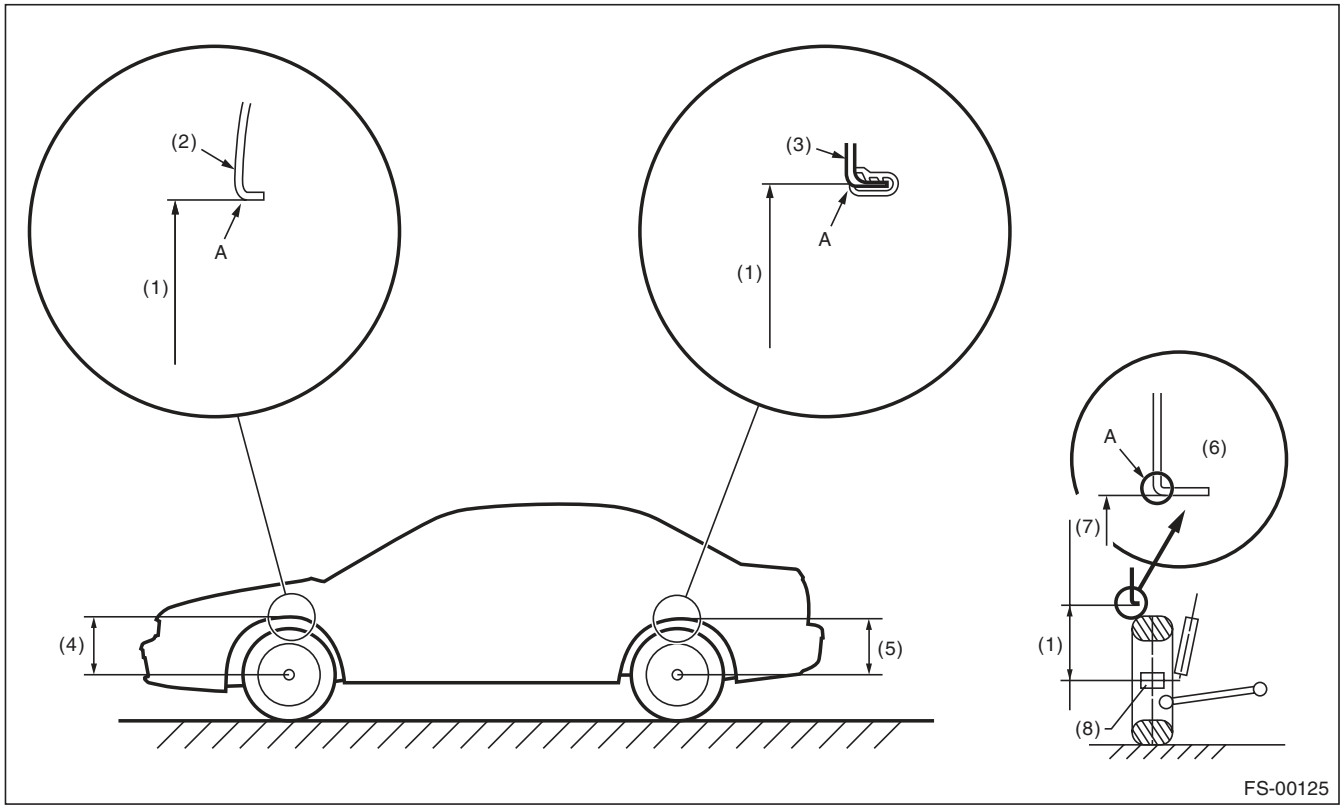
- Tire inflation pressure
- Uneven wear of RH and LH tires, or difference of sizes
- Tire runout
- Excessive play and wear of ball joint
- Excessive play and wear of tie-rod end
- Excessive play of wheel bearing
- Right and left wheel base imbalance
- Deformation and excessive play of steering link
- Deformation and excessive play of suspension parts

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

Wheel arch height (front and rear wheels) <Ref. to FS-7, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (front and rear wheels) <Ref. to FS-8, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (front wheel) <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-10, 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.>

1. WHEEL ARCH HEIGHT

1) Park the vehicle on a level surface.
2) Empty the vehicle so that it is at “curb weight”. (Empty the luggage compartment, load the spare tire, jack and service tools, and fill up the fuel tank.)
3) Set the steering wheel in a straight-ahead position, and stabilize the suspensions by moving the vehicle in a straight line for 5 m (16 ft) or more.
4) Suspend a thread from the wheel arch (point “A” in the figure below) and affix at a position directly above the center of wheel.
5) Measure the distance between the point “A” and the center of wheel.



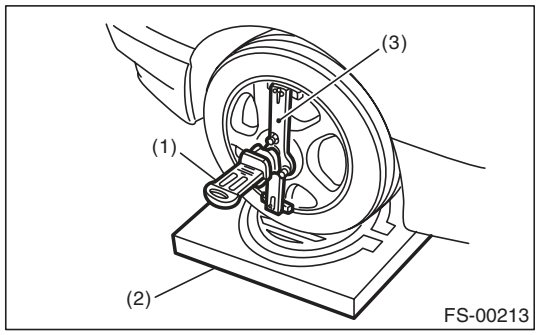
(1) Wheel arch height
(2) Front fender
(3) Rear quarter
(4) Front wheel arch height
(5) Rear wheel arch height
(6) Flange bend line
(7) Point of measurement
(8) End of spindle

Wheel arch height specification mm (in) (Tolerance: $^{+12\ mm}_{-24\ mm}$ ($^{+0.47\ in}_{-0.94\ in}$))			
Model	Sedan	Wagon	
	All models	Except for OUTBACK	OUTBACK
Front	381 (15.0)	381 (15.0)	439 (17.3)
Rear	365 (14.4)	375 (14.8)	438 (17.2)

2. CAMBER

• INSPECTION

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



(1) Alignment gauge
(2) Turning radius gauge
(3) Adapter

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

Model	Camber (Difference between RH and LH 45′ or less)
Except for OUTBACK	–0°15′±0°45′
OUTBACK	0°40′±0°45′

• FRONT CAMBER ADJUSTMENT

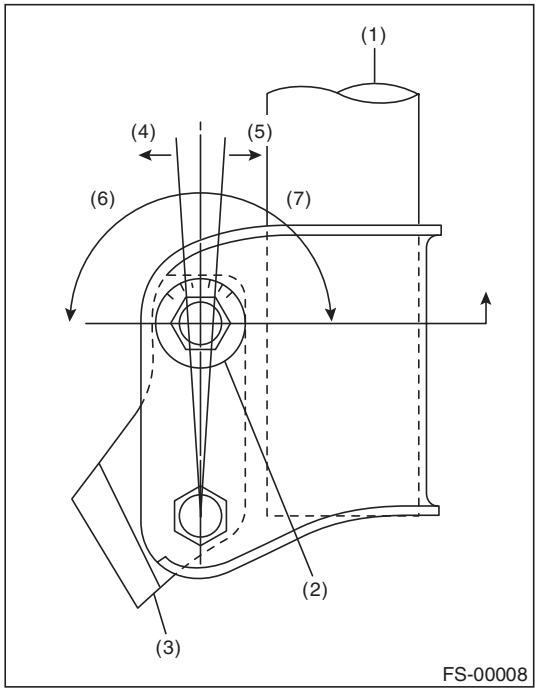
1) When adjusting the camber, adjust it to the following value.

Model	Camber (Difference between RH and LH 45′ or less)
Except for OUTBACK	–0°15′±0°30′
OUTBACK	0°40′±0°30′

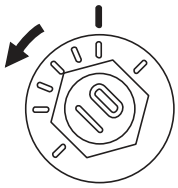
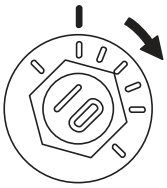
2) Loosen the two self-locking nuts located at the front lower section of the strut.

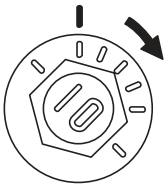
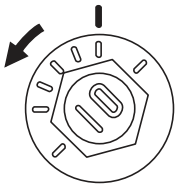
NOTE:
When the adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn the self-locking nut.
3) Turn the camber adjusting bolt so that the camber is set at specification.

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



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

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

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

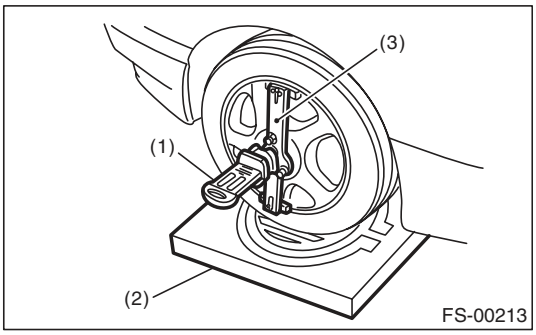
4) Tighten two new self-locking nuts.

Tightening torque:
155 N·m (15.8 kgf-m, 114.3 ft-lb)

3. CASTER

INSPECTION

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



(1) Alignment gauge
(2) Turning radius gauge
(3) Adapter

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

Model	Caster (Reference)
Sedan	5°55′
Wagon	5°40′
OUTBACK	4°55′

4. STEERING ANGLE

• INSPECTION

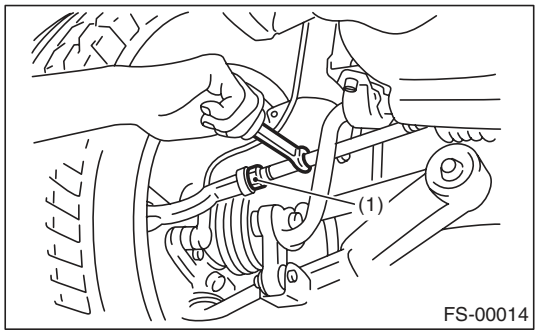
1) Place the vehicle on turning radius gauge.
2) While depressing the brake pedal, turn the steering wheel fully to the left and right. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angles.

Model	Inner wheel	Outer wheel
Other than below	37.6°±1.5°	33.0°±1.5°
2.5 GT spec.B, 3.0 R-LTD	33.8°±1.5°	30.2°±1.5°

• ADJUSTMENT

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

NOTE:
Correct the boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• INSPECTION

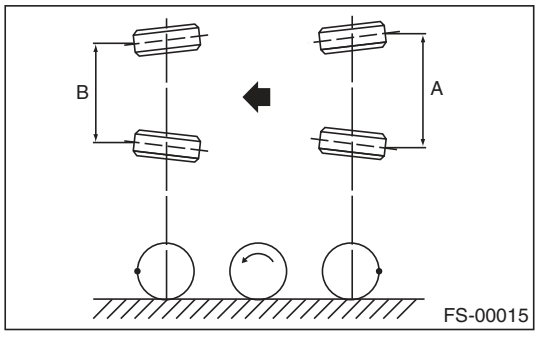
Toe-in:
0±3 mm (0±0.12 in)

1) Set the toe-in gauge in the position at wheel axis center height behind the right and left front tires.
2) Place a mark at the center of both left and right tires, and measure distance “A” between the marks.
3) Move the vehicle forward to rotate the tires 180°.

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

4) Measure the distance “B” between the left and right marks. Find toe-in using the following equation:

A – B = Toe-in

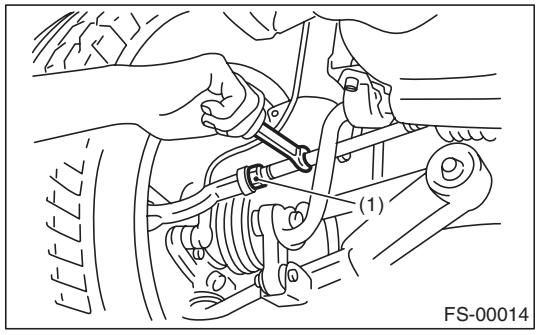


• **ADJUSTMENT**

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

Toe-in:
0±2 mm (0±0.08 in)

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



(1) Lock nut

4) Tighten the tie-rod lock nut.

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

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

6. REAR WHEEL TOE-IN

• **INSPECTION**

Toe-in:
OUTBACK model
–3 — 0 mm (–0.12 — 0 in)
Except for OUTBACK model
0±3 mm (0±0.12 in)

Refer to FRONT WHEEL TOE-IN for rear toe-in inspection procedures.
<Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

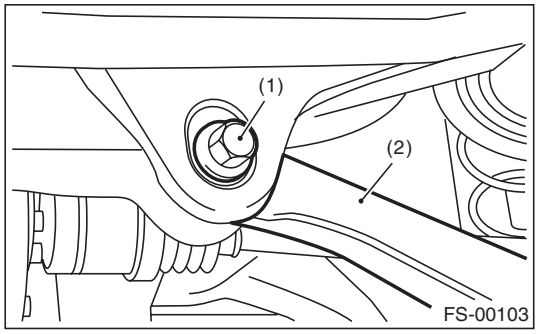
• **ADJUSTMENT**

When adjusting, adjust it to the following value.

Toe-in:
OUTBACK model
–3 — 0 mm (–0.12 — 0 in)
Except for OUTBACK model
0±2 mm (0±0.08 in)

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

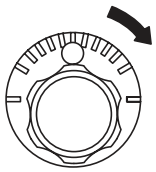
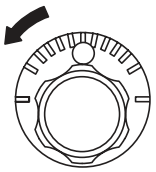
NOTE:
When loosening or tightening the adjusting bolt, hold the bolt head and turn the self-locking nut.

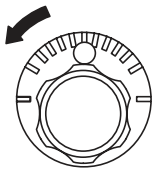
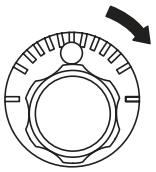


(1) Adjusting bolt
(2) Rear link

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

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

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

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

3) Attach and tighten a new self-locking nut.

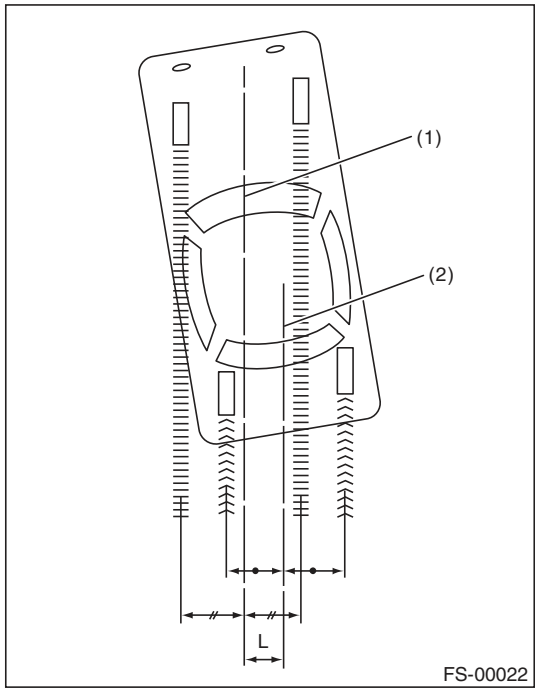
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

7. THRUST ANGLE

• INSPECTION

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

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



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

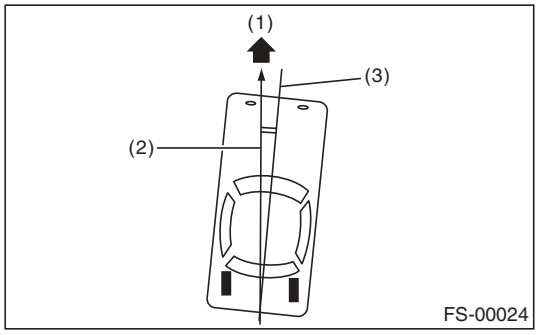
• ADJUSTMENT

When adjusting, adjust it to the following value.

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

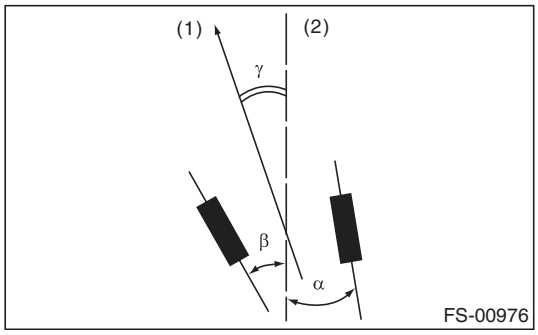
1) Make thrust angle adjustments by turning the toe-in adjusting bolts of the rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make the thrust angle adjustment.
3) When the left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

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



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

Thrust angle: r = (α – β)/2
α: Rear RH wheel toe-in angle
β: Rear LH wheel toe-in angle
Substitute only the positive toe-in values from each wheel into α and β in the equation.



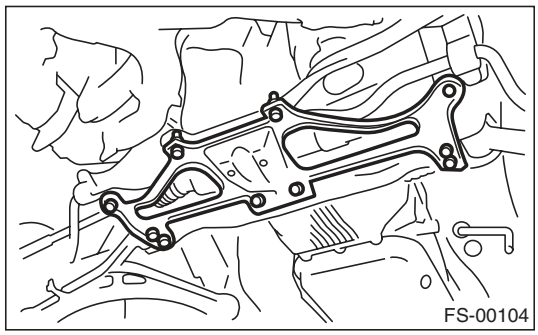
(1) Front
(2) Body center line

3. Front Crossmember Support Plate

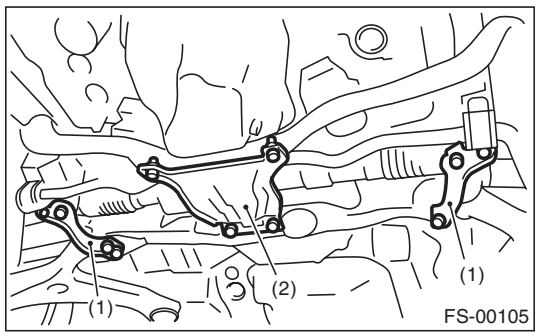
A: REMOVAL

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

- Large type



- Small type



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

B: INSTALLATION

Install in the reverse order of removal.

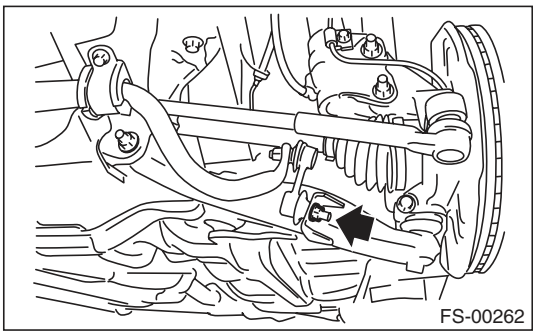
NOTE:
Tighten the small type crossmember support plate together with stabilizer bracket.
After installing the stabilizer bracket to the crossmember, tighten the crossmember support plate together.

Tightening torque:
Crossmember support plate:
60 N·m (6.1 kgf-m, 44.3 ft-lb)
Crossmember support plate (Tightened together with the stabilizer bracket):
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Jack-up plate:
60 N·m (6.1 kgf-m, 44.3 ft-lb)

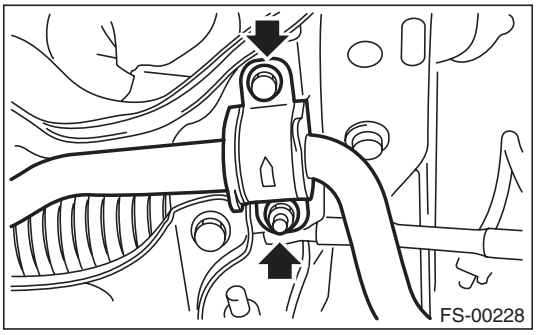
4. Front Stabilizer

A: REMOVAL

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



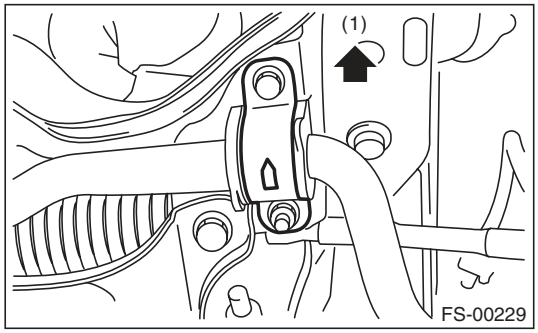
5) Remove the stabilizer bracket.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
• Be sure to use a new self-locking nut.
• Ensure the stabilizer bushing and stabilizer have the same identification colors.
• Install the stabilizer bushing (front crossmember side) while aligning it with the paint mark on stabilizer.
• The stabilizer bracket has a set orientation. Install it with the arrow mark facing the upper side of the vehicle.



(1) Front side of vehicle

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

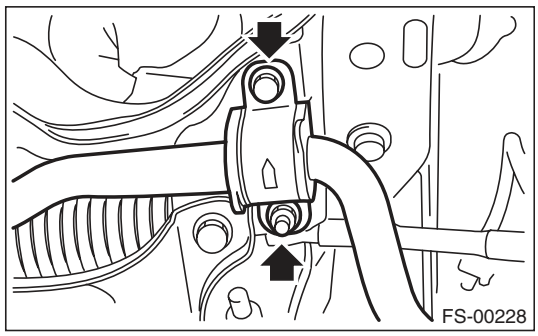
C: INSPECTION

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

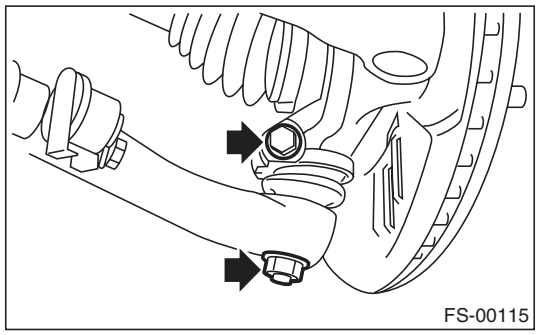
5. Front Ball Joint

A: REMOVAL

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



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



5) Extract the ball joint from housing.

B: INSTALLATION

1) Insert the ball joint into housing.

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

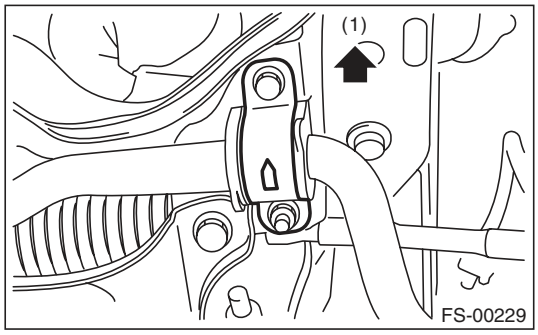
CAUTION:
Do not apply grease to the tapered portion of ball stud.

2) Install the ball joint into front arm.

Tightening torque (castle nut):
Front arm (aluminium type):
30 N·m (3.1 kgf-m, 22 ft-lb)
Front arm (steel type):
39 N·m (4.0 kgf-m, 28.8 ft-lb)

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

NOTE:
The stabilizer bracket has a set orientation. Install it with the arrow mark facing the upper side of the vehicle.



(1) Front side of vehicle

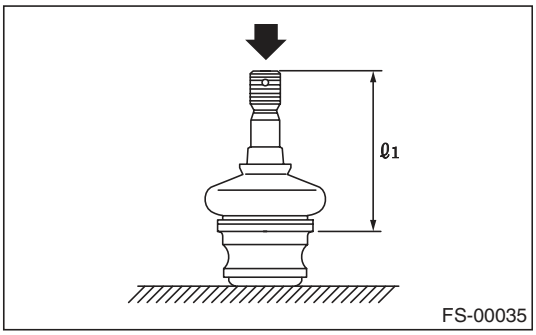
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

5) Install the front wheels.

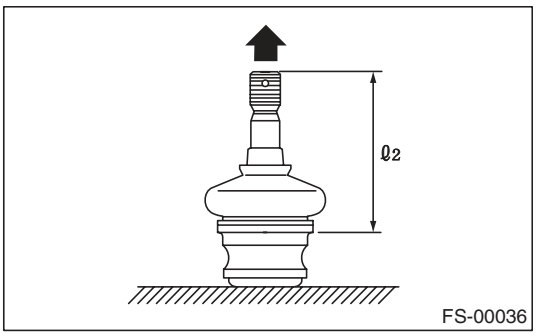
C: INSPECTION

1) Measure the play of the ball joint using the following procedures. Replace with a new part if the play exceeds specification.

(1) With 686 N (70 kgf, 154 lb) loaded in direction shown in the figure, measure the length ℓ_1.



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



(3) Determine free play using the following formula.

$S = \ell_2 - \ell_1$

(4) Replace with a new part if the play exceeds specification.

Front ball joint

Specification for replacement S:

Less than 0.3 mm (0.012 in)

2) If the play is within specification, visually check the dust cover.

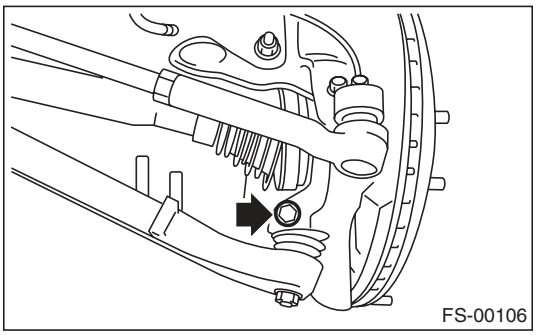
3) Remove the ball joint and cover, and check for wear, damage or cracks. If any damage is found, replace the corresponding part.

4) If the dust cover is damaged, replace with a new ball joint.

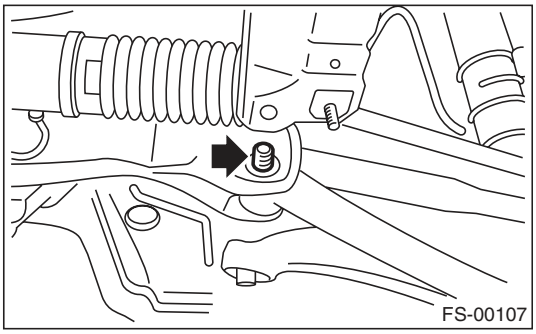
6. Front Arm

A: REMOVAL

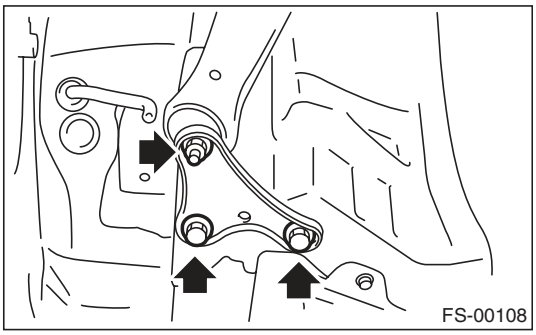
1) Lift up the vehicle, and then remove the front wheels.
2) Remove the front crossmember support plate. <Ref. to FS-14, REMOVAL, Front Crossmember Support Plate.>
3) Remove the front stabilizer. <Ref. to FS-15, REMOVAL, Front Stabilizer.>
4) Remove the ball joint of front arm.


FS-00106

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

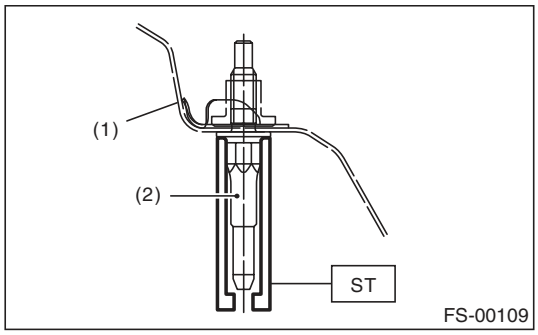

FS-00107

6) Remove the front arm support plate.


FS-00108

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

CAUTION:
Do not remove the stud bolt unnecessarily. Always replace the parts with new parts when removed.



(1) Vehicle body
(2) Stud bolt

B: INSTALLATION

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

Tightening torque:
110 N·m (11.2 kgf-m, 81.1 ft-lb)
2) Using new bolts and self-locking nuts, temporarily tighten the front arm to crossmember.
3) Secure the front arm to body, and then install the support plate with new bolts and self-locking nuts.

Tightening torque:
Support plate to Front arm:
88 N·m (9.0 kgf-m, 64.9 ft-lb)
Support plate to Body:
150 N·m (15.3 kgf-m, 110.6 ft-lb)
4) Install the ball joint into housing.

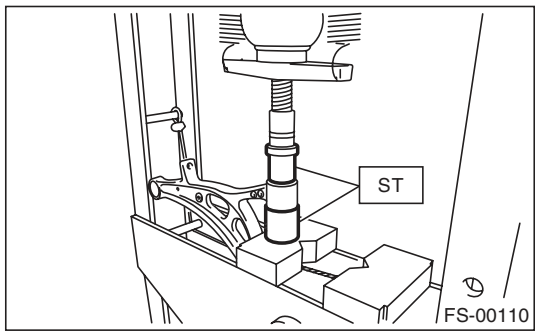
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)
5) Install the stabilizer. <Ref. to FS-15, INSTALLATION, Front Stabilizer.>
6) Lower the vehicle from lift, and tighten the bolt which secures the front arm to crossmember with wheels in full contact with the ground and the vehicle at curb weight.

Tightening torque:
95 N·m (9.7 kgf-m, 70.1 ft-lb)
7) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

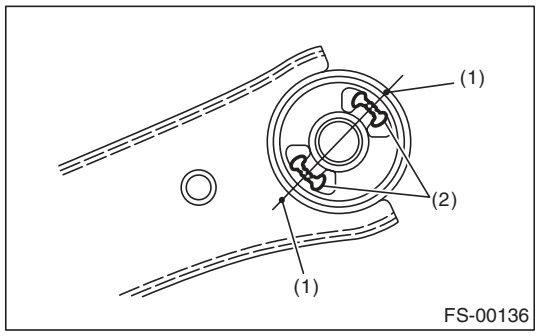
Using the ST and a press, remove the front bushing.
ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

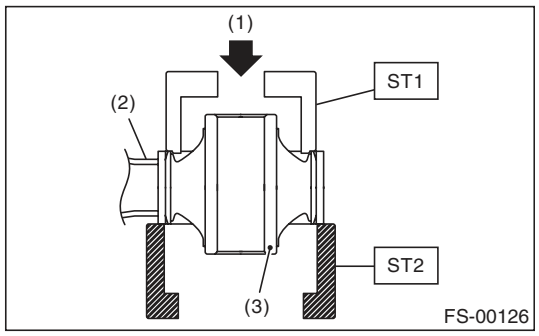
1) Put an alignment mark on the front arm based on the center of rear bushing recess portion.

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



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

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



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

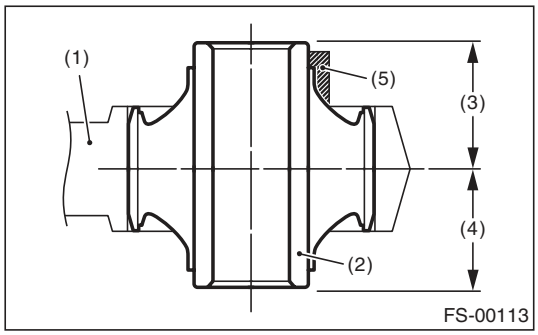
D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

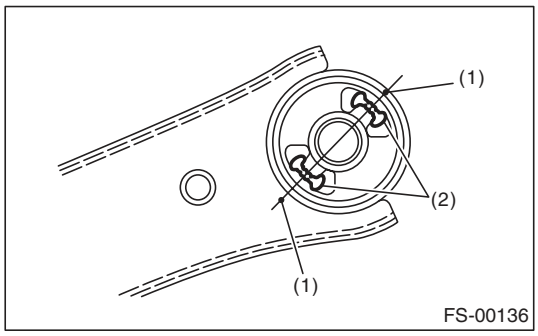
2. REAR BUSHING

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



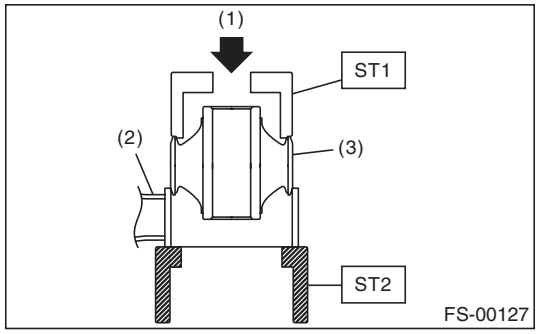
(1) Front arm
(2) Bushing inner cylinder
(3) Longer
(4) Shorter
(5) Protrusion portion

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



(1) Alignment mark
(2) Recess section

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



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

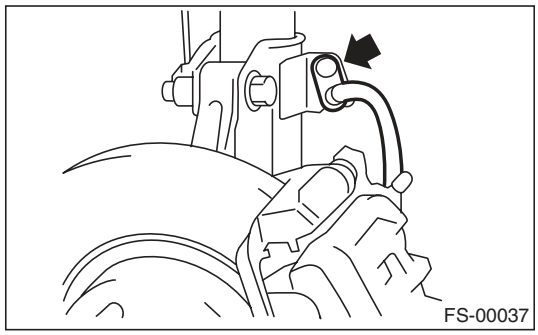
E: INSPECTION

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

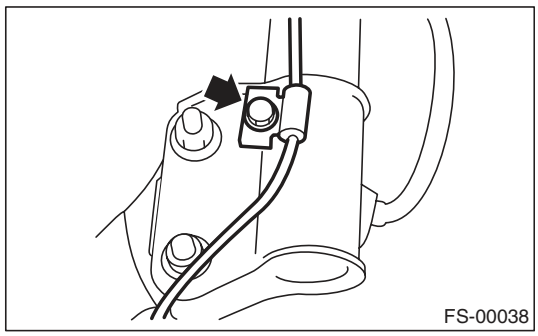
7. Front Strut

A: REMOVAL

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



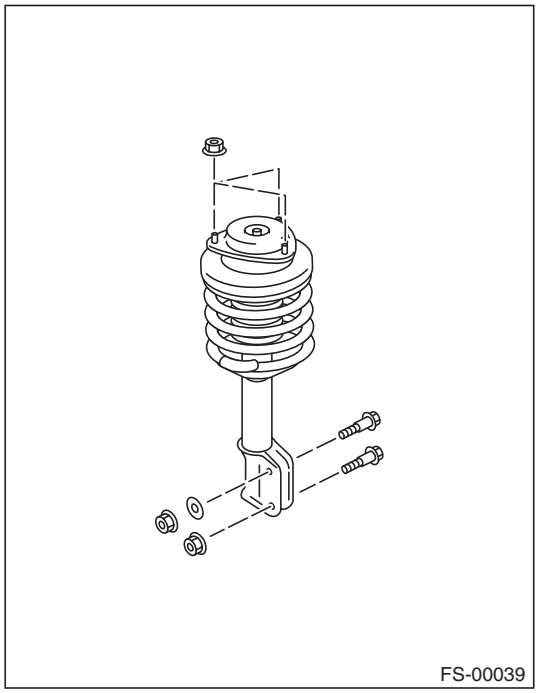
4) Remove the bolt securing the ABS wheel speed sensor harness.



5) Remove the two bolts securing the housing to the strut.

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

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



B: INSTALLATION

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

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

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

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

Tightening torque:
155 N·m (15.8 kgf-m, 114.3 ft-lb)

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

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

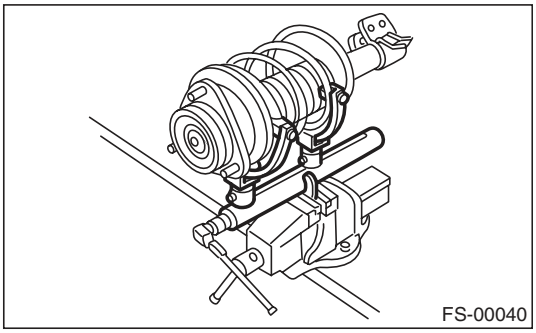
4) Install the bolts which secure the brake hose to the strut.

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

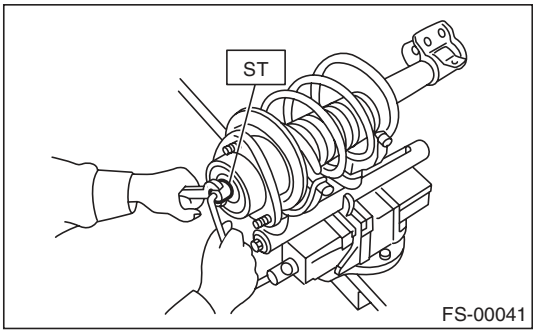
5) Install the front wheels.
6) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

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



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



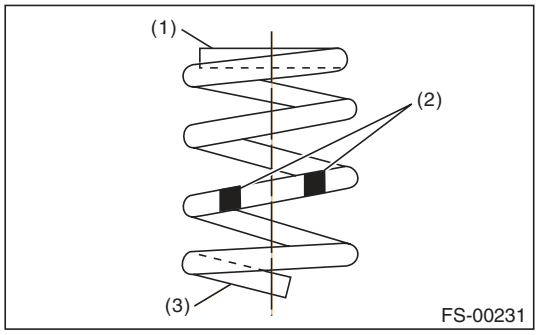
3) Remove the strut mount, spacer and upper spring seat from strut.
4) Gradually decrease the compression force of compressor, and remove the coil spring.
5) Remove the dust cover and helper spring.

D: ASSEMBLY

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

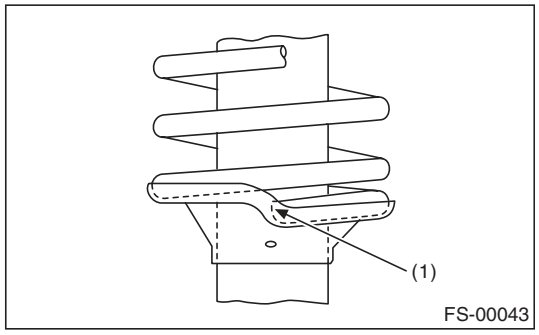
NOTE:
After purging air from the strut, be sure to place the strut with the piston rod facing up. If the strut is laid down for any reason, check for the entry of air in accordance with “Checking for presence of air”
4) Using a coil spring compressor, compress the coil spring.

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



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

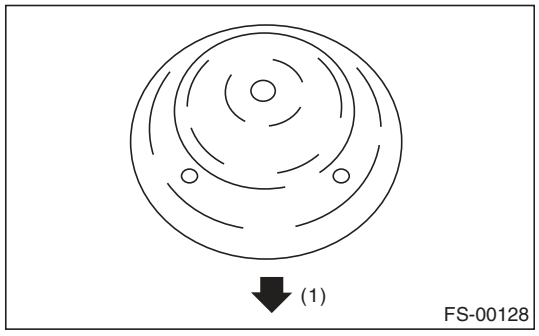
5) Set the coil spring correctly so that its end face seats well in the spring seat as shown in the figure.



(1) Coil spring end face

6) Install the helper and dust cover to the piston rod.
7) Pull the piston rod fully upward, and install the spring seat.

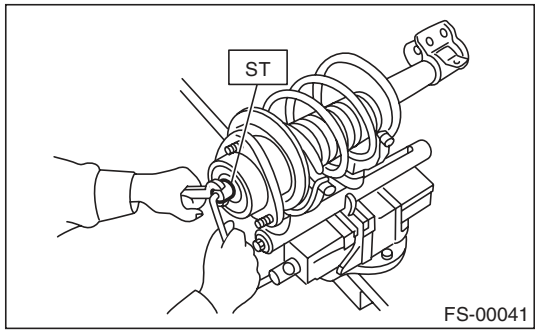
NOTE:
Position the upper spring seat as shown in the figure.



(1) Outside of body

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

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



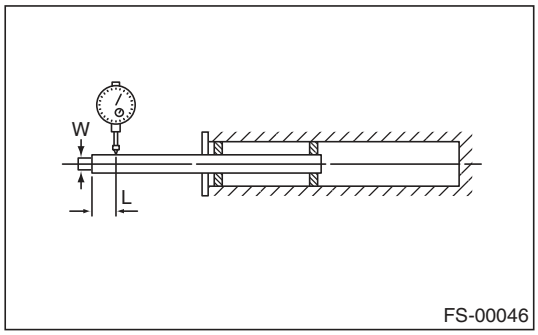
10) Loosen the coil spring compressor carefully.

E: INSPECTION

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

1. STRUT

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



Play limit ($P_1 + P_2$):
0.8 mm (0.031 in)
If the play exceeds limit, replace the strut.

2. STRUT MOUNT

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

3. DUST COVER

If major cracks or damage are found, replace it with a new part.

4. COIL SPRING

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

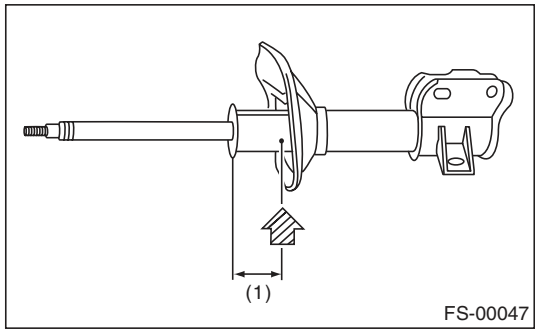
5. HELPER

If major cracks or damage are found, replace it with a new part.

F: DISPOSAL

1. EXCEPT FOR BILSTEIN STRUT

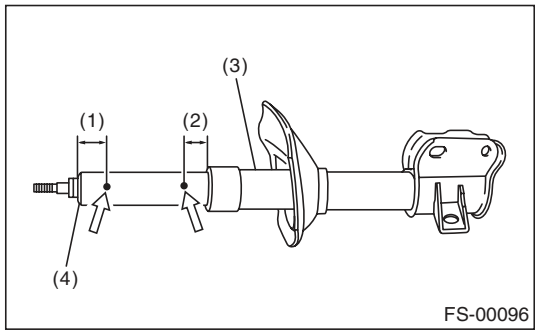
CAUTION:
• Before handling struts, be sure to wear goggles to protect eyes from gas, oil and cutting powder.
• Do not disassemble the strut damper or throw into flames.
• When discarding gas filled struts, drill holes in them to purge the gas.
1) Place the strut on a level surface with the piston rod fully expanded.
2) Using a 2 — 3 mm (0.08 — 0.12 in) dia. drill, make holes in areas shown in the figure.



(1) 40 mm (1.57 in)

2. BILSTEIN STRUT

CAUTION:
• Before handling struts filled with gas, be sure to wear goggles to protect eyes from gas, oil and metal shavings.
• Do not disassemble the strut damper or throw into flames.
• When discarding gas filled struts, drill holes in them to purge the gas.
1) Place the gas-filled strut on a level surface with the damping tube fully extended.
2) Using a 2 — 3 mm (0.08 — 0.12 in) dia. drill, make the holes at (1) first, and then (2).

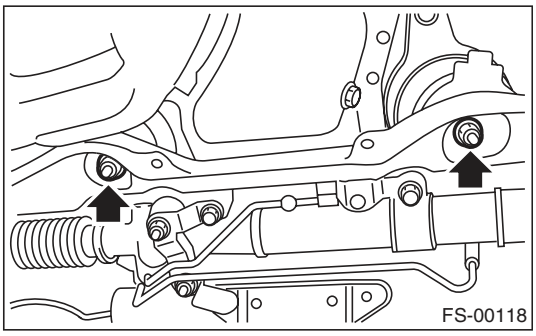


(1) 20 mm (0.78 in)
(2) 10 mm (0.39 in)
(3) Strut
(4) Damping tube

8. Front Crossmember

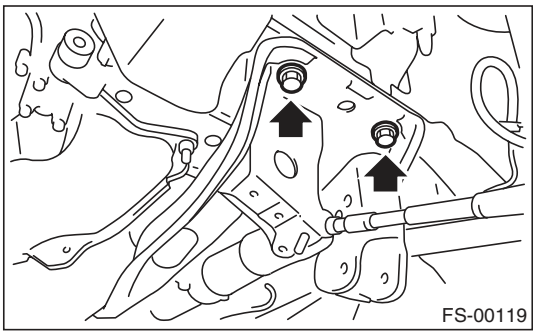
A: REMOVAL

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


FS-00118

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

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


FS-00119

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
• Use a new bolt and self-locking nut. For parts which are not reusable, refer to COMPONENT. <Ref. to FS-3, COMPONENT, General Description.>
• Always tighten the stabilizer bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.

Tightening torque:
Crossmember to body:
95 N·m (9.7 kgf-m, 70.1 ft-lb)
Engine mounting to Crossmember:
75 N·m (7.6 kgf-m, 55.3 ft-lb)
Front arm to Crossmember:
95 N·m (9.7 kgf-m, 70.1 ft-lb)
Front arm to Support plate:
88 N·m (9.0 kgf-m, 64.9 ft-lb)
Support plate to Body:
150 N·m (15.3 kgf-m, 110.6 ft-lb)
Tie-rod end to Housing:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

After tightening to the specified torque, tighten the castle nut further but within 60° until the hole in the ball stud is aligned with a slot in castle nut
Universal joint:
24 N·m (2.4 kgf-m, 17.7 ft-lb)
Stabilizer bracket:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Stabilizer link:
45 N·m (4.6 kgf-m, 33.2 ft-lb)
Power steering hose to Steering gearbox:
15 N·m (1.5 kgf-m, 11 ft-lb)

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

C: INSPECTION

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

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible cause	Corrective action
(1) Permanent distortion or damage of the coil spring	Replace.
(2) Rough operation of strut or shock absorber	Replace.
(3) Improper installation of strut or shock absorber	Replace with appropriate parts.
(4) Installation of the wrong coil spring	Replace with appropriate parts.

2. POOR RIDE COMFORT

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

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

3. NOISE

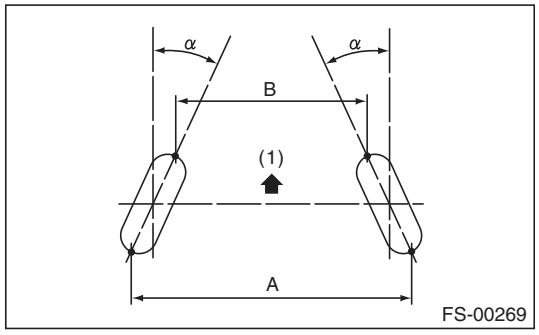
Possible cause	Corrective action
(1) Wear or damage of strut or shock absorber component parts	Replace.
(2) Loosening of the suspension link installing bolt	Tighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitable length (maximum or minimum) of strut or shock absorber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

1. General Description

A: SPECIFICATION

Refer to “FS” section for rear suspension specifications. <Ref. to FS-2, SPECIFICATION, General Description.>

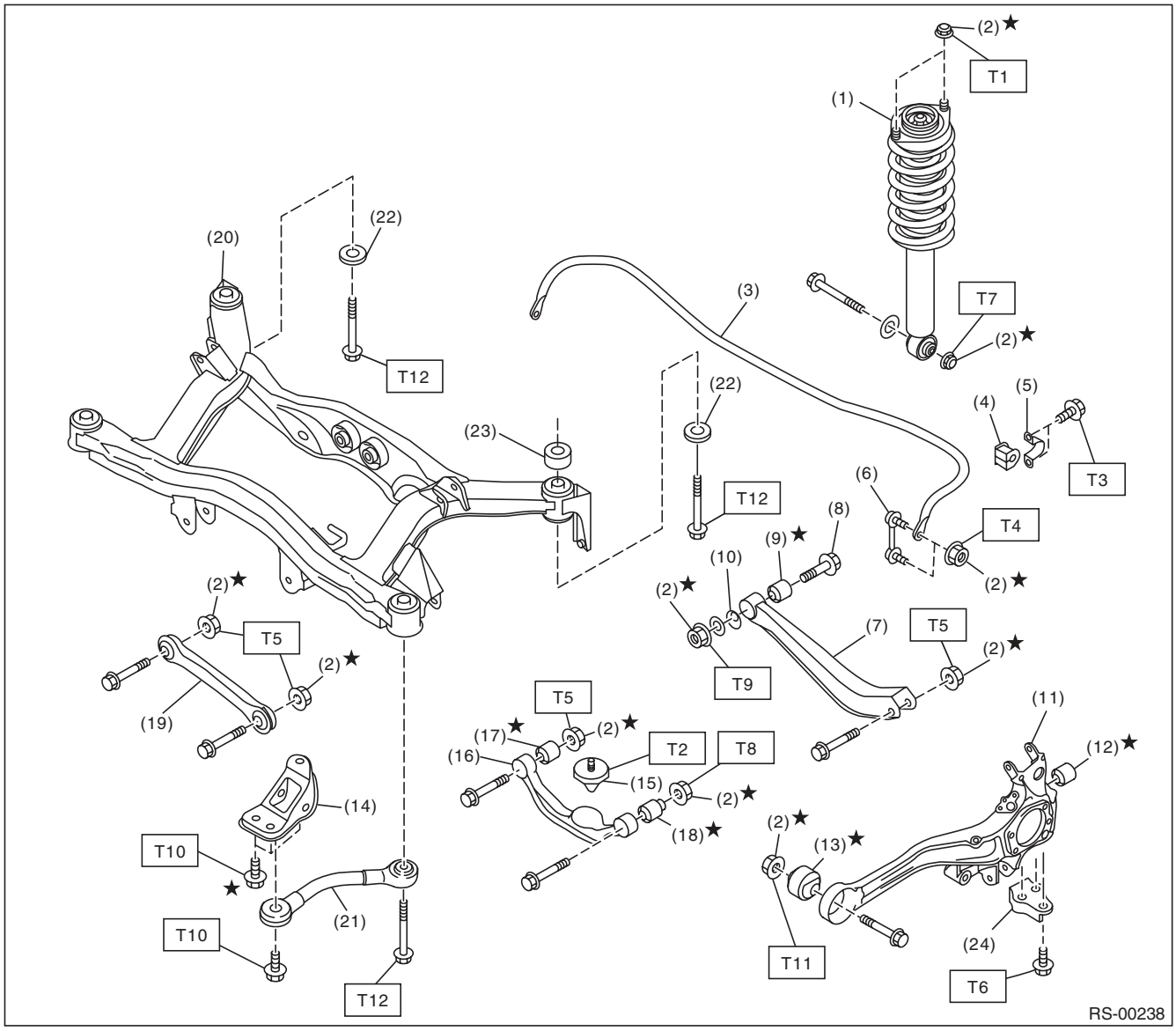
NOTE:
• Front and rear toe-in and front camber can be adjusted. Adjust if the toe-in or camber tolerance exceeds specifications.
• Other items indicated in the specifications table cannot be adjusted. If other items exceed specifications, check the suspension parts and connections for deformation, and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



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

B: COMPONENT

1. REAR SUSPENSION

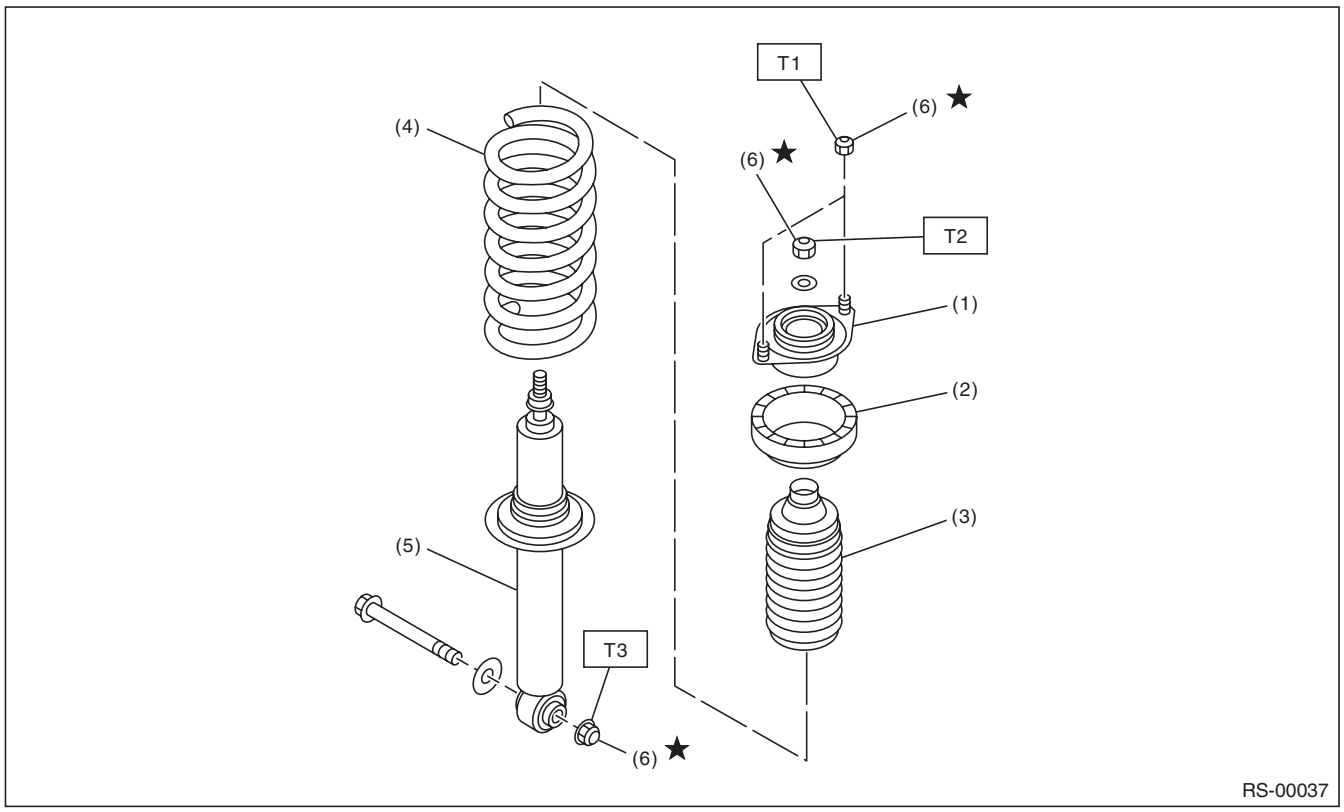


(1)	Shock absorber	(14)	Rear arm bracket
(2)	Self-locking nut	(15)	Helper
(3)	Stabilizer	(16)	Upper link
(4)	Stabilizer bushing	(17)	Upper link bushing (inner side)
(5)	Bracket	(18)	Upper link bushing (outer side)
(6)	Stabilizer link	(19)	Front link
(7)	Rear link	(20)	Rear sub frame
(8)	Adjusting bolt	(21)	Sub frame support arm
(9)	Rear link bushing	(22)	Sub frame lower stopper
(10)	Adjusting washer	(23)	Spacer
(11)	Rear arm	(24)	Stabilizer link bracket (model with aluminum rear arm)
(12)	Rear arm rear bushing		
(13)	Rear arm front bushing		

Tightening torque:N·m (kgf-m, ft-lb)

T1:	***30 (3.1, 22.4)***
T2:	***32 (3.3, 24)***
T3:	***38 (3.9, 28)***
T4:	***44 (4.5, 32.5)***
T5:	***57 (5.8, 42)***
T6:	***60 (6.1, 44)***
T7:	***62 (6.3, 46)***
T8:	***65 (6.6, 48)***
T9:	***120 (12.2, 89)***
T10:	***125 (12.7, 92)***
T11:	***150 (15.3, 111)***
T12:	***175 (17.8, 129)***

2. SHOCK ABSORBER



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

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

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before disposing of shock absorbers, be sure to bleed the gas out completely. Also, do not expose to flames or fire.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. of different grades or manufacturers.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or cloth between the part and the vise.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

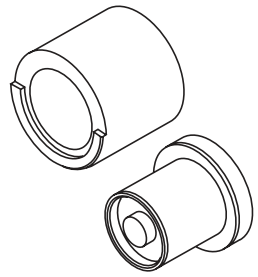
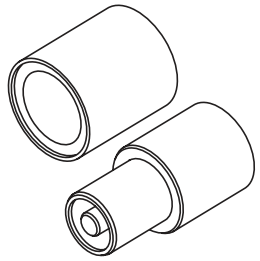
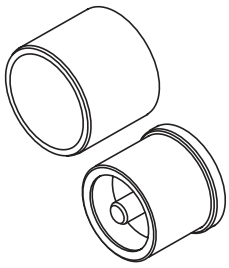
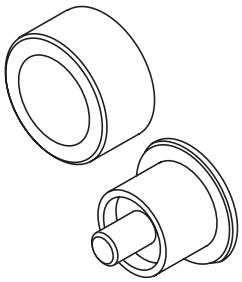
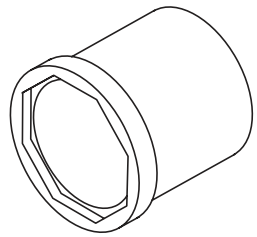
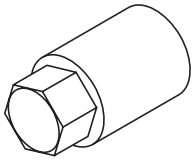
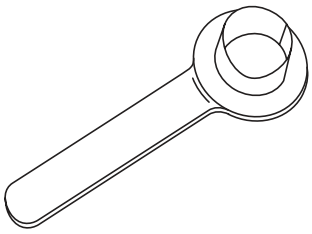
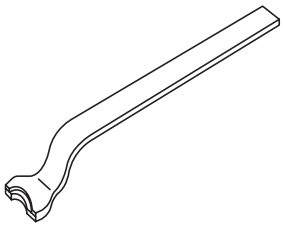
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099AE000	20099AE000	INSTALLER & REMOVER	Used for replacing the rear link bushing.
 ST20099AE010	20099AE010	INSTALLER & REMOVER	Used for replacing the upper link bushing.
 ST20099AE020	20099AE020	INSTALLER & REMOVER SET	Used for replacing the rear arm front bushing.
 ST20099AE040	20099AE040	INSTALLER & REMOVER SET	Used for replacing the rear arm rear bushing.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099AE030	20099AE030	HELPER SOCKET WRENCH	Used for replacing helper.
 ST20399AG000	20399AG000	STRUT MOUNT SOCKET	Used for removing and installing shock mount.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to the rear differential. • For oil seal protection
 ST28099PA100	28099PA100	REMOVER	Used for removal of DOJ.

2. GENERAL TOOL

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

2. Wheel Alignment

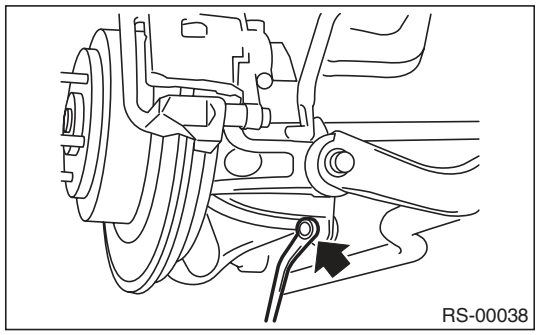
A: INSPECTION

NOTE:
Measure and adjust the front and rear wheel alignment at a time. Refer to FS section for measurement and adjustment of wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

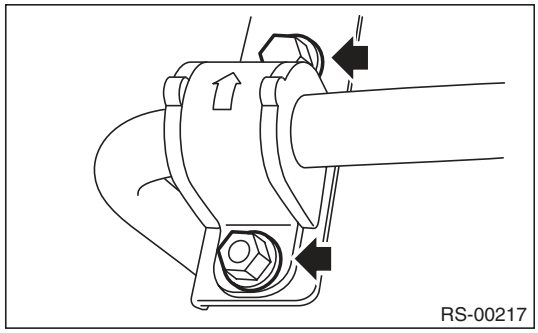
3. Rear Stabilizer

A: REMOVAL

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



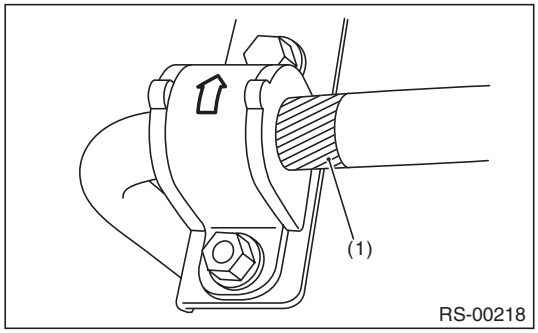
3) Remove the stabilizer bracket.



B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
• Be sure to use a new self-locking nut.
• Ensure the stabilizer bushing and stabilizer have the same identification colors.
• To install the stabilizer bushing, align the paint mark end of stabilizer to the end of stabilizer bushing.
• The stabilizer bracket has a set orientation. Install it with the arrow mark facing the upper side of the vehicle.



(1) Paint mark

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

Tightening torque:
Stabilizer link
44 N·m (4.5 kgf-m, 32.5 ft-lb)
Stabilizer bracket
38 N·m (3.9 kgf-m, 28 ft-lb)

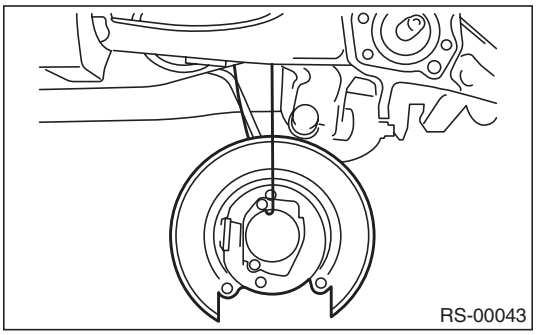
C: INSPECTION

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

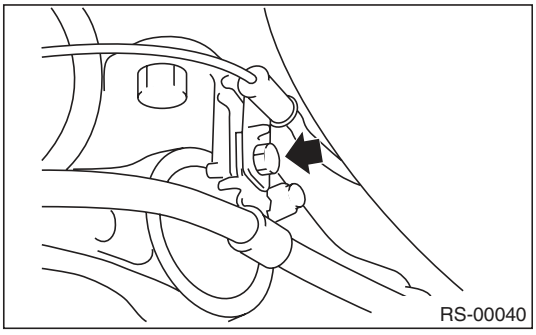
4. Rear Arm

A: REMOVAL

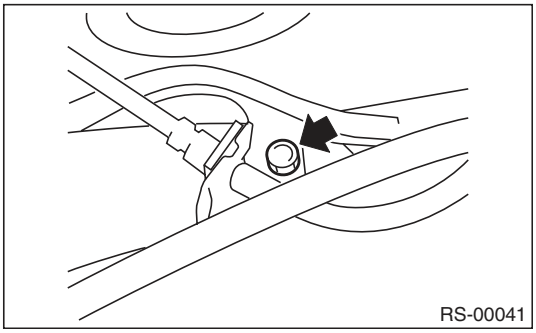
1) Lift up the vehicle, and then remove the rear wheels.
2) Remove the sub frame support arm.
<Ref. to RS-20, REMOVAL, Sub Frame Support Arm.>
3) Remove the bearing unit.
<Ref. to DS-19, REMOVAL, Rear Hub Unit Bearing.>
4) Hang the back plate from sub frame.


RS-00043

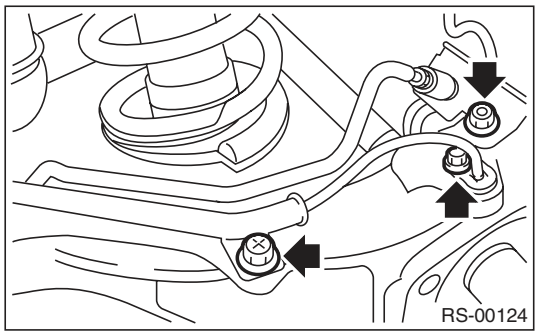
5) Remove the bolt which secures the parking brake cable clamp to the rear arm bracket.


RS-00040

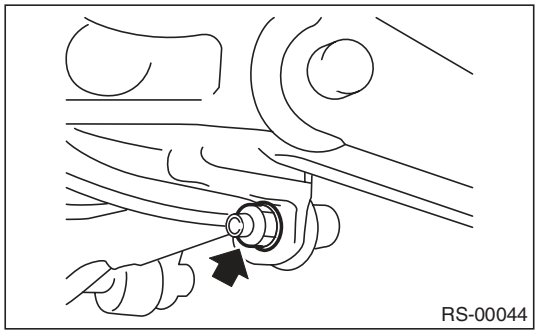
6) Remove the bolt which holds the brake hose bracket and ABS wheel speed sensor bracket to the rear arm.


RS-00041

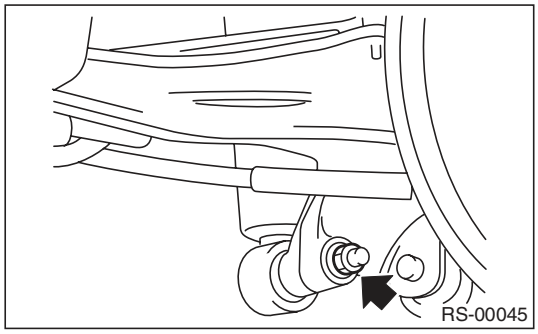
7) Remove the bolts which secure the brake hose bracket to the rear arm. Remove the bolts which secure the ABS wheel speed sensor to the rear arm.


RS-00124

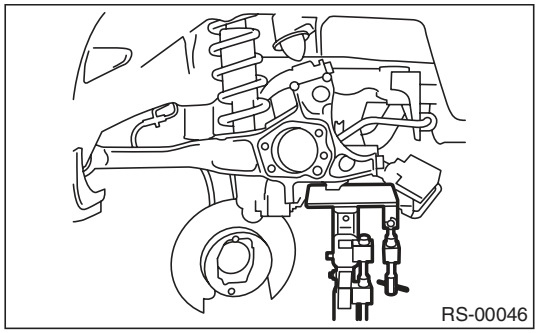
8) Remove the stabilizer link from the rear arm.


RS-00044

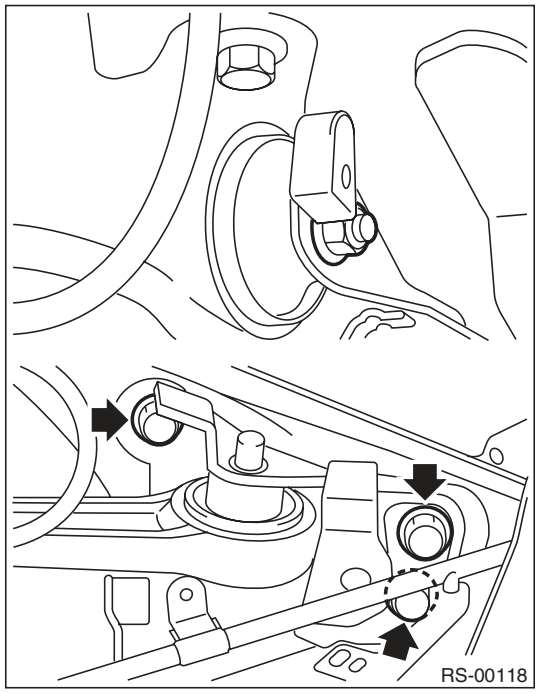
9) Remove the shock absorber from the rear arm.


RS-00045

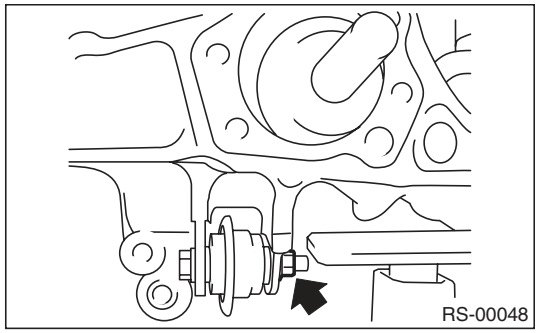
10) Support the rear arm horizontally using a transmission jack.


RS-00046

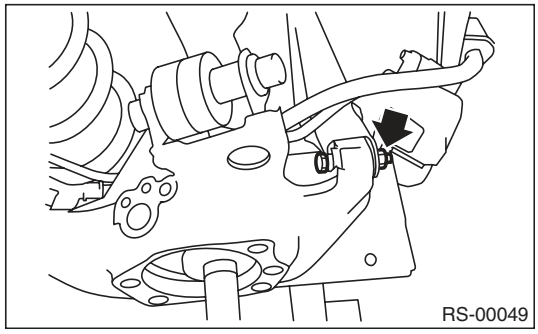
11) Remove the nuts which hold the rear arm to bracket. Remove the bolts and then remove the rear frame bracket.



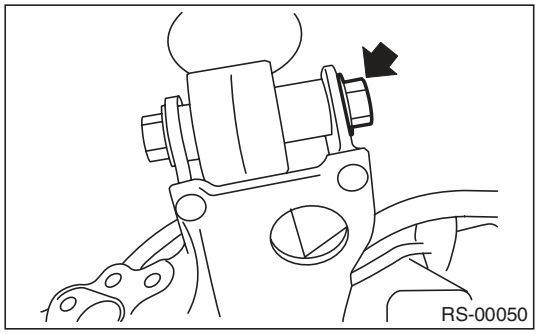
12) Loosen the nut which holds the front link to the rear arm.



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



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



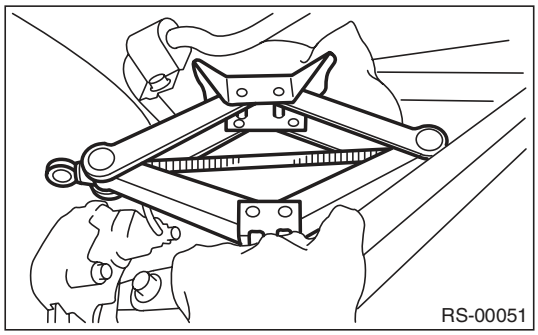
15) Remove the bolt which secures the rear arm to the link, and then remove the rear arm.

B: INSTALLATION

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

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

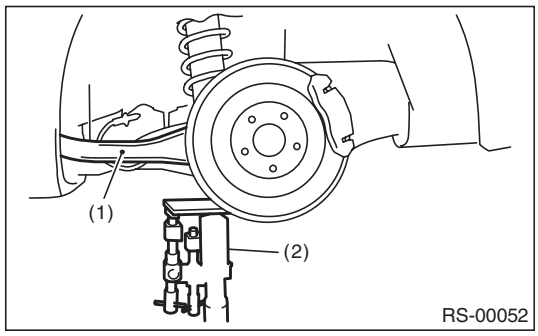
CAUTION:
Protect the rear link and sub frame from being damaged by putting a waste cloth between the contact surface with the jack.



8) Support the rear arm horizontally using a transmission jack.

9) Tighten the nuts and bolts which hold the rear arm, front link, rear link, upper link and shock absorber.

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



(1) Rear arm
(2) Transmission jack

10) Install the sub frame support arm.

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

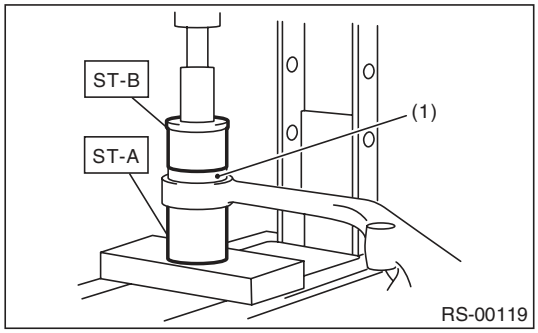
11) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

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

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

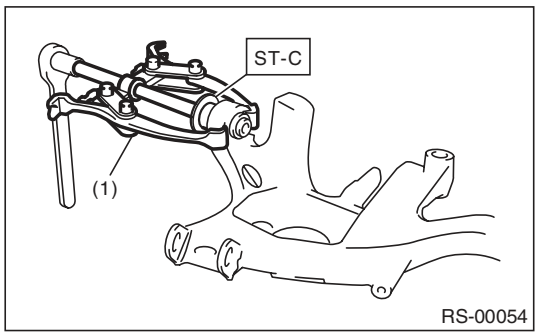


(1) Bushing

2. REAR BUSHING

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

ST C 20099AE040 INSTALLER & REMOVER SET



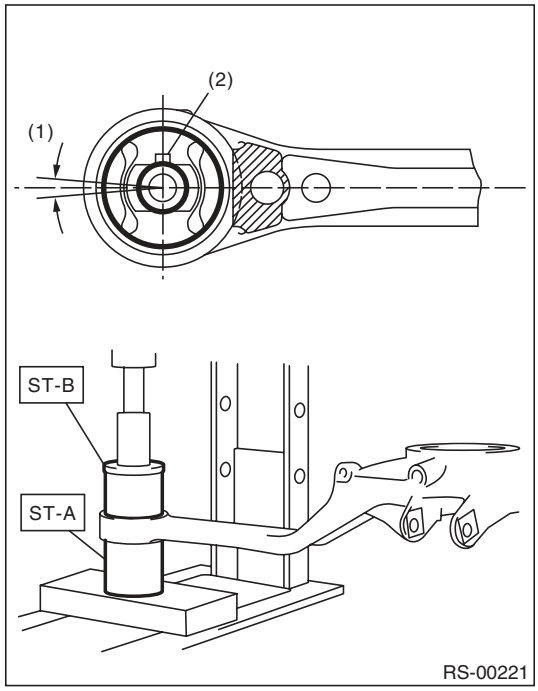
(1) Bearing puller

D: ASSEMBLY

1. FRONT BUSHING

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

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

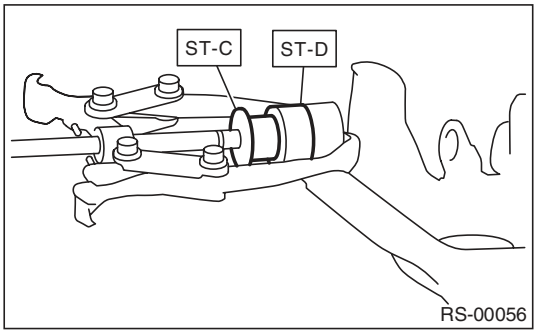


(1) 0±5°
(2) Rubber protrusion: Assemble with the rubber protrusion side facing the arm inner side.

2. REAR BUSHING

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

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



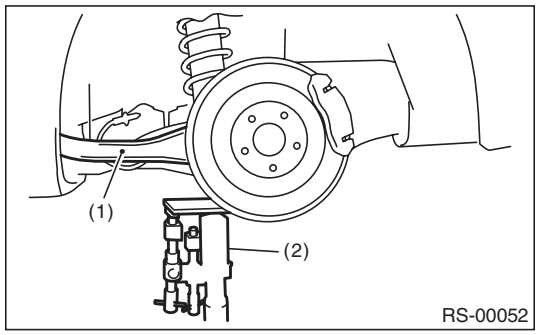
E: INSPECTION

Check the rear arm for bending, corrosion or damage.

5. Upper Link

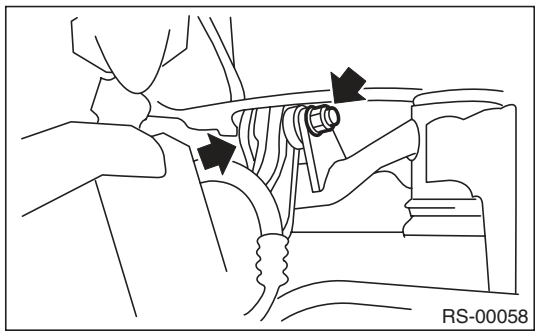
A: REMOVAL

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

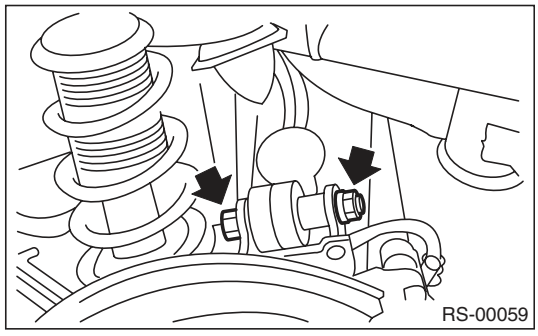


(1) Rear arm
(2) Transmission jack

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

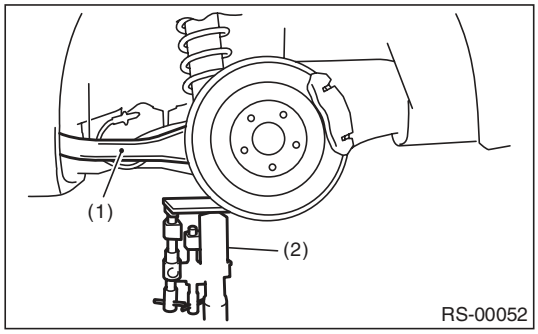


4) Remove the bolts which secure the upper link to the rear arm, and then remove the upper link.



B: INSTALLATION

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



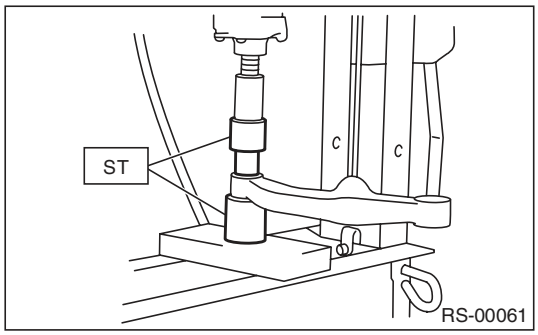
(1) Rear arm
(2) Transmission jack

NOTE:
Inspect the wheel alignment and adjust if necessary.

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

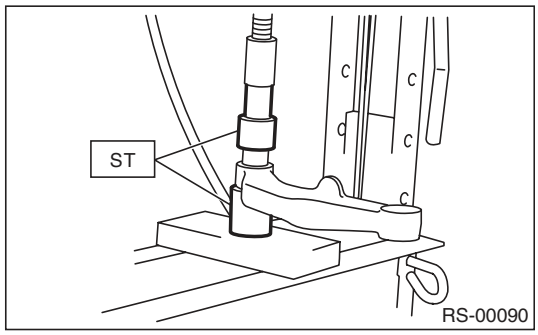
C: DISASSEMBLY

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

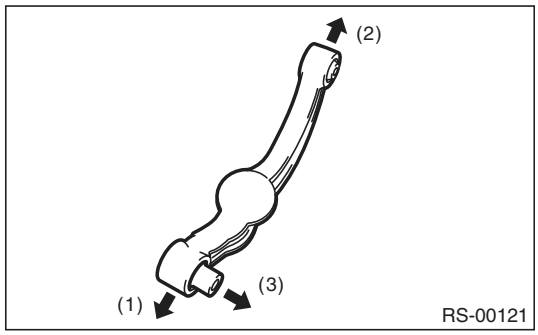


D: ASSEMBLY

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



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



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

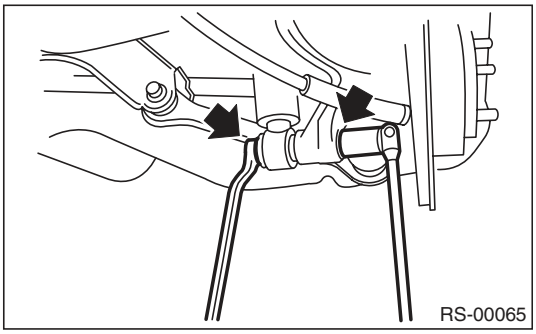
E: INSPECTION

1) Visually check the upper link for abnormal fatigue or damage.
2) Visually check the bushing for abnormal fatigue or damage.

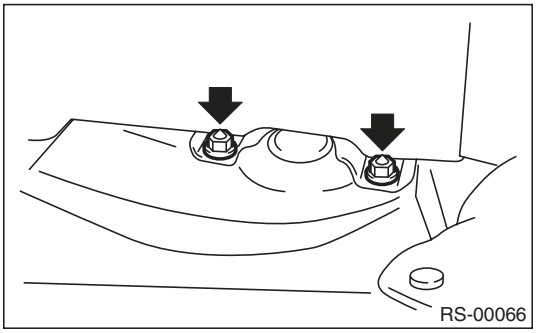
6. Rear Shock Absorber

A: REMOVAL

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



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



7) Remove the shock absorber.

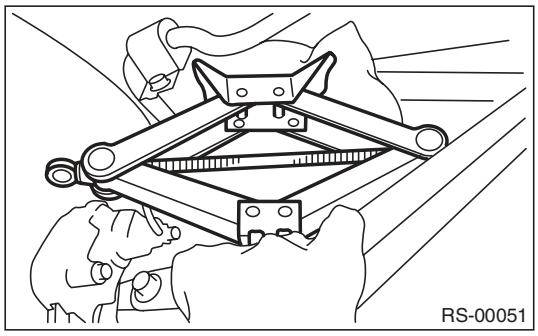
B: INSTALLATION

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

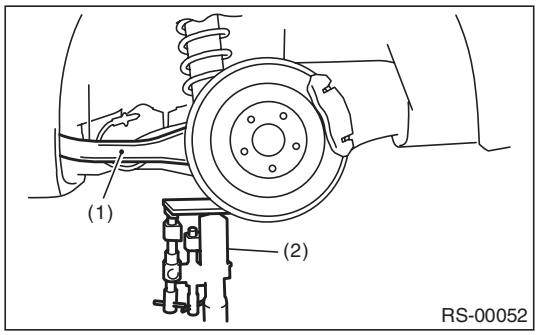
Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

3) Set the vehicle equipped jack upside down, between the rear link and sub frame. Adjust the position of the jack, and align the attachment position of the rear shock absorber and rear arm. Using new self-locking nuts, temporary tighten the bolt.

CAUTION:
Protect the rear link and sub frame from being damaged by putting a waste cloth between the contact surface with the jack.



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



(1) Rear arm
(2) Transmission jack

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

6) Install the luggage floor mat. (Wagon model)
7) Set the trunk side trim. (Sedan model)
8) Check the wheel alignment and adjust it if necessary.

C: DISASSEMBLY

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

D: ASSEMBLY

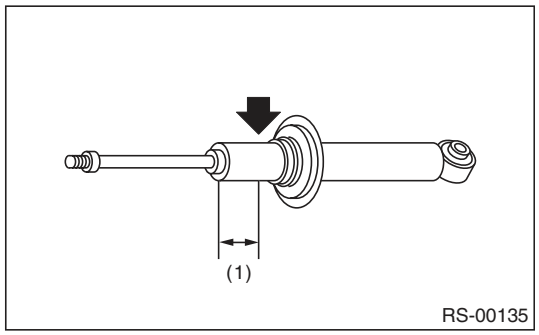
Refer to “Front Strut” for installation procedures.
<Ref. to FS-22, ASSEMBLY, Front Strut.>

E: INSPECTION

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

F: DISPOSAL

CAUTION:
• Before handling the shock absorber, be sure to wear goggles to protect eyes from gas, oil and cutting powder.
• Do not disassemble the shock absorber or place it into a fire.
• Drill a hole into shock absorbers in case of discarding shock absorbers filled with gas.
1) Place the shock absorber on a level surface with the piston rod fully expanded.
2) Make a hole into the specified position 30 mm (1.18 in) deep using a drill with 2 — 3 mm (0.08 — 0.12 in) diameter.

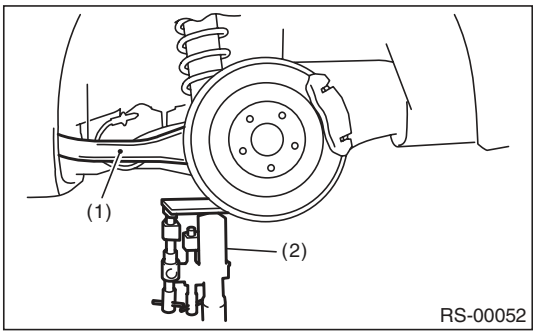


(1) 40 mm (1.57 in)

7. Front Link

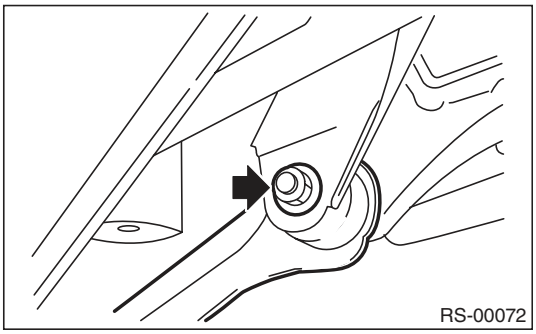
A: REMOVAL

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

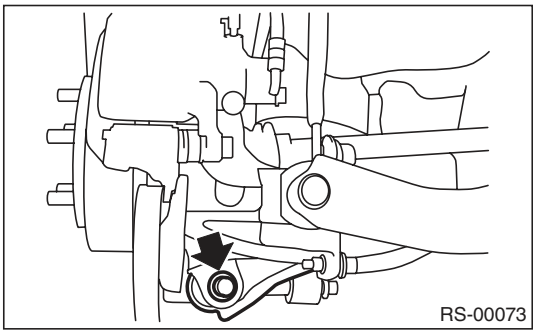


(1) Rear arm
(2) Transmission jack

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

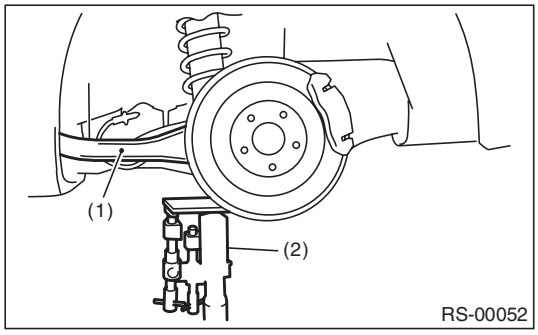


4) Remove the bolt which secures the front link to rear arm, then remove the front link.



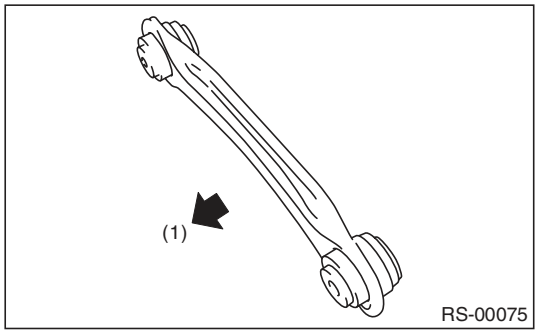
B: INSTALLATION

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



(1) Rear arm
(2) Transmission jack

CAUTION:
Install the front link with the protruding side facing the front side of the vehicle.



(1) Front

NOTE:
Inspect the wheel alignment and adjust if necessary.

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

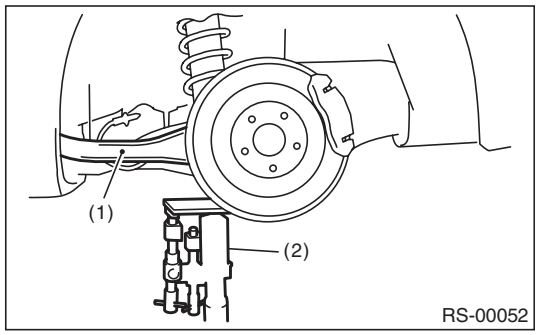
C: INSPECTION

Visually check the front link for damage and deformation.

8. Rear Link

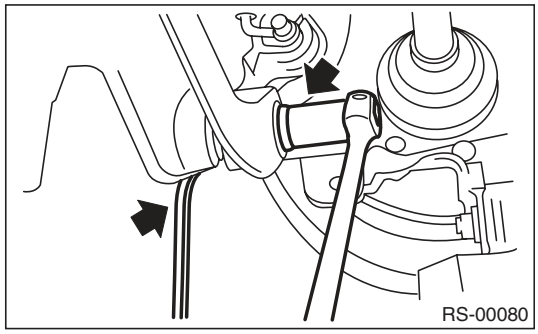
A: REMOVAL

1) Lift up the vehicle, and then remove the rear wheels.
2) Remove the rear stabilizer. <Ref. to RS-8, REMOVAL, Rear Stabilizer.>
3) Support the rear arm horizontally using a transmission jack.



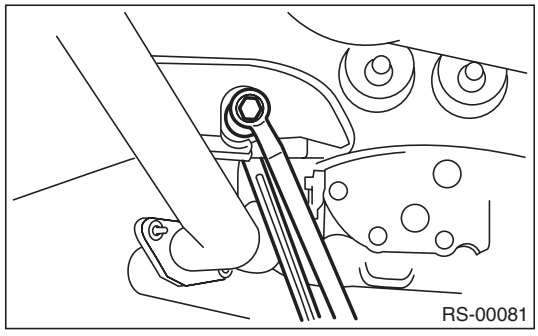
(1) Rear arm
(2) Transmission jack

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



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

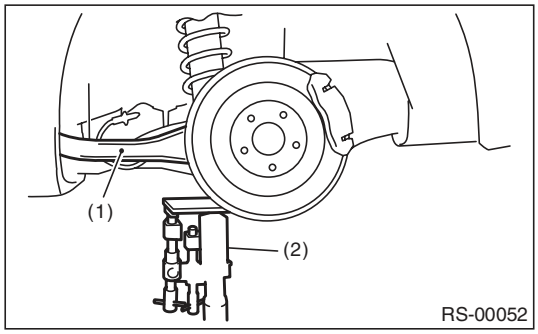
CAUTION:
When loosening the adjusting bolt, make sure to fix the bolt head in place when loosening the nut.



B: INSTALLATION

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

NOTE:
Tighten the self-locking nut with the bolt head fixed in place when installing the adjusting bolt.



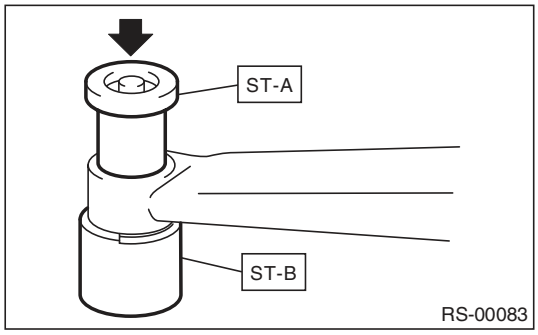
(1) Rear arm
(2) Transmission jack

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

3) Inspect the wheel alignment and adjust if necessary.

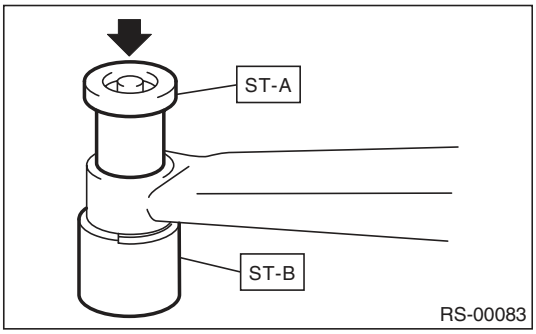
C: DISASSEMBLY

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



D: ASSEMBLY

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



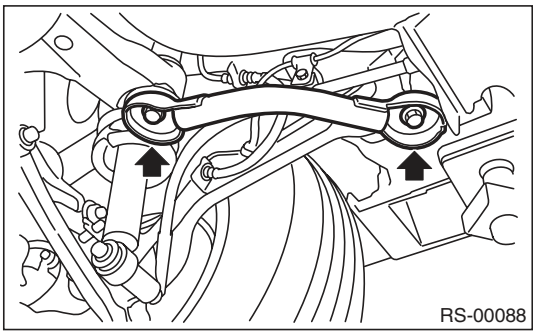
E: INSPECTION

1) Visually check the rear link for abnormal fatigue or damage.
2) Visually check the bushing for abnormal fatigue or damage.

9. Sub Frame Support Arm

A: REMOVAL

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



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Sub frame support arm-to-Rear arm bracket
125 N·m (12.7 kgf-m, 92 ft-lb)
Sub frame support arm-to-Rear sub frame
175 N·m (17.8 kgf-m, 129 ft-lb)

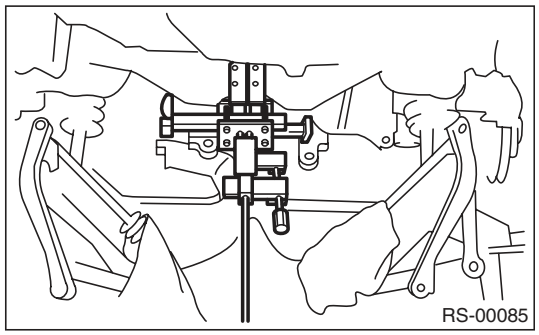
C: INSPECTION

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

10. Rear Sub Frame

A: REMOVAL

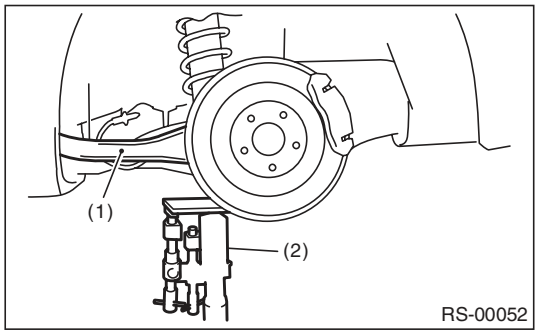
1) Separate the front exhaust pipe and rear exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the rear differential.
T-type
<Ref. to DI-30, REMOVAL, Rear Differential (T-type).>
VA-type
<Ref. to DI-56, REMOVAL, Rear Differential (VA-type).>
4) Remove the rear stabilizer. <Ref. to RS-8, REMOVAL, Rear Stabilizer.>
5) Remove the bolts which secure the rear shock absorber to the rear arm.
6) Support the sub frame using a transmission jack.



7) Remove the front link from sub frame.
<Ref. to RS-17, REMOVAL, Front Link.>
8) Remove the rear link from the sub frame.
<Ref. to RS-18, REMOVAL, Rear Link.>
9) Remove the upper link from the sub frame.
<Ref. to RS-13, REMOVAL, Upper Link.>
10) Remove the sub frame support arm.
11) Remove the sub frame.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Follow the procedure below for the rear differential installation and tightening torque.
T-type
<Ref. to DI-32, INSTALLATION, Rear Differential (T-type).>
VA-type
<Ref. to DI-58, INSTALLATION, Rear Differential (VA-type).>
3) Support the rear arm horizontally using a transmission jack. Tighten the nuts and bolts which hold the rear arm, front link, rear link, upper link and shock absorber.



(1) Rear arm
(2) Transmission jack

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

4) Check the wheel alignment and adjust it if necessary.

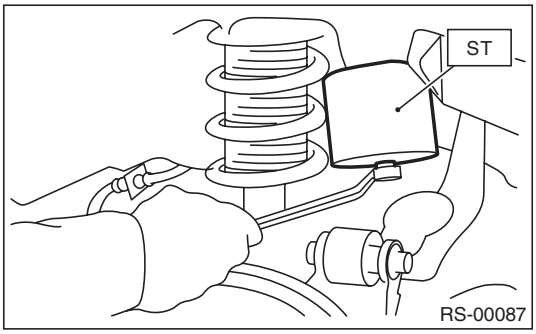
C: INSPECTION

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

11.Helper

A: REMOVAL

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



B: INSTALLATION

Install in the reverse order of removal.

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

C: INSPECTION

Check the helper for major cracks or damages.

12. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible cause	Corrective action
(1) Permanent distortion or damaged coil spring	Replace.
(2) Rough operation of strut or shock absorber	Replace.
(3) Installation of the wrong strut or shock absorber	Replace with proper parts.
(4) Installation of the 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 hump.
3) Excessive shock in bumping

Possible cause	Corrective action
(1) Damaged coil spring	Replace.
(2) Overinflation of tires	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new parts.
(4) Fault in operation of strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Unsuitable length (maximum or minimum) of 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 from the strut or shock absorber	Replace.

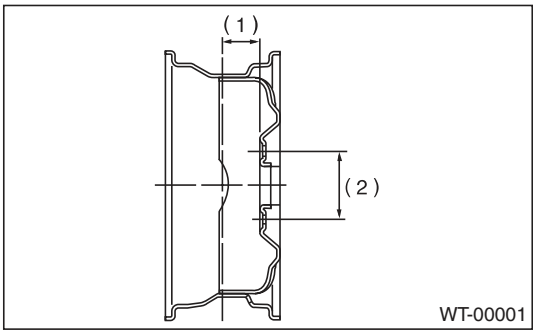
3. NOISE

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

1. General Description

A: SPECIFICATION

1. WHEEL AND TIRE SIZE



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

Specification		Tire size	Wheel size	Offset mm (in)	P.C.D. mm (in)	Tire inflation pressure kPa (kgf/cm^2, psi)	
						Front wheel	Rear wheel
Sedan	2.5 i, - LTD	P205/50 R17 88V	17 × 7JJ	55 (2.17)	100 (3.94)	230 (2.3, 33)	220 (2.2, 32)
	2.5 i	P205/50 R17 88V	17 × 7JJ				
		P205/55 R16 89V	16 × 6 $^1/_2$JJ			220 (2.2, 32)	210 (2.1, 30)
	2.5 GT LTD, 3.0 R	215/45 R17 91W	17 × 7JJ			240 (2.4, 35)	230 (2.3, 33)
	2.5 GT spec. B	215/45 R18 89Y	18 × 7JJ			230 (2.3, 33)	220 (2.2, 32)
	3.0 R LTD	P215/45 R18 89W	18 × 7JJ				
Wagon	2.5 i	P205/55 R16 89V	16 × 6 $^1/_2$JJ			220 (2.2, 32)	210 (2.1, 30)
		P205/50 R17 88V	17 × 7JJ				
	OUTBACK 2.5 i Base	P225/60 R16 97H	16 × 6 $^1/_2$JJ	48 (1.89)			
	OUTBACK 2.5 i, -LTD, - LLB OUTBACK 2.5 XT OUTBACK 3.0 R LTD	P225/55 R17 95V	17 × 7JJ				
Spare tire		T135/80R16 101M	16 × 4T	50 (1.97)		–	420 (4.2, 60)
		T135/70D17 102M	17 × 4T	40 (1.57)			
		T155/70D17 110M					

2. SERVICE DATA

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

3. ADJUSTING PARTS

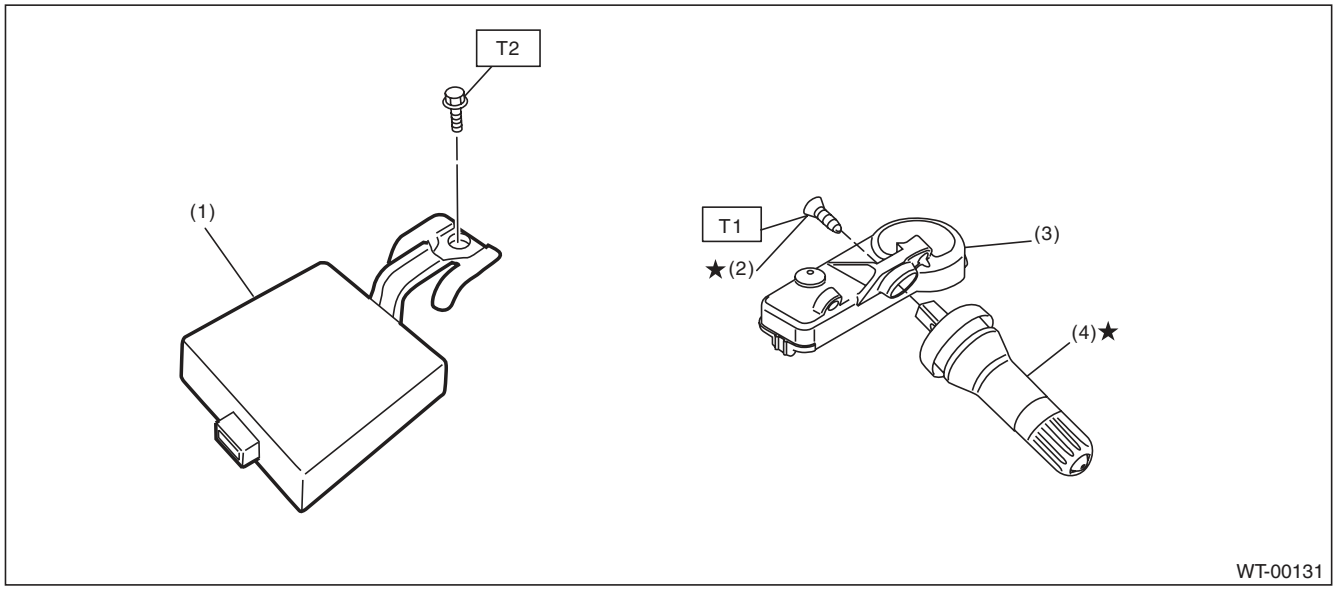
Wheel balancing	Standard:	Service limit
Dynamic unbalance	10 g (0.35 oz) or less	

Balance weight part number (Knock-on type weight for steel wheels)	Weight
28101AA001	5 g (0.18 oz)
28101AA011	10 g (0.35 oz)
28101AA021	15 g (0.53 oz)
28101AA031	20 g (0.71 oz)
28101AA041	25 g (0.88 oz)
28101AA051	30 g (1.06 oz)
28101AA061	35 g (1.23 oz)
28101AA071	40 g (1.41 oz)
28101AA081	45 g (1.59 oz)
28101AA091	50 g (1.76 oz)
28101AA101	55 g (1.94 oz)
28101AA111	60 g (2.12 oz)

Balance weight part number (Knock-on type weight for aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
28101SA100	30 g (1.06 oz)
28101SA110	35 g (1.23 oz)
28101SA120	40 g (1.41 oz)
28101SA130	45 g (1.59 oz)
28101SA140	50 g (1.76 oz)
28101XA000	55 g (1.94 oz)
28101SA150	60 g (2.12 oz)

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AE00B	5 g (0.18 oz)
28101AE01B	7.5 g (0.26 oz)
28101AE02B	10 g (0.35 oz)
28101AE03B	12.5 g (0.44 oz)
28101AE04B	15 g (0.53 oz)
28101AE05B	17.5 g (0.62 oz)
28101AE06B	20 g (0.71 oz)
28101AE07B	22.5 g (0.79 oz)
28101AE08B	25 g (0.88 oz)
28101AE09B	27.5 g (0.97 oz)
28101AE10B	30 g (1.06 oz)
28101AE11B	32.5 g (1.15 oz)
28101AE12B	35 g (1.23 oz)
28101AE13B	37.5 g (1.32 oz)
28101AE14B	40 g (1.41 oz)
28101AE15B	42.5 g (1.50 oz)
28101AE16B	45 g (1.59 oz)
28101AE17B	47.5 g (1.68 oz)
28101AE18B	50 g (1.76 oz)
28101AE19B	52.5 g (1.85 oz)
28101AE20B	55 g (1.94 oz)
28101AE21B	57.5 g (2.03 oz)
28101AE22B	60 g (2.12 oz)
28101AE23B	62.5 g (2.20 oz)
28101AE24B	65 g (2.29 oz)
28101AE25B	67.5 g (2.38 oz)
28101AE26B	70 g (2.47 oz)
28101AE27B	72.5 g (2.56 oz)
28101AE28B	75 g (2.65 oz)
28101AE29B	77.5 g (2.73 oz)
28101AE30B	80 g (2.82 oz)
28101AE31B	82.5 g (2.91 oz)
28101AE32B	85 g (3.00 oz)
28101AE33B	87.5 g (3.09 oz)
28101AE34B	90 g (3.17 oz)
28101AE35B	92.5 g (3.26 oz)
28101AE36B	95 g (3.35 oz)
28101AE37B	97.5 g (3.44 oz)
28101AE38B	100 g (3.53 oz)
28101AG50B	102.5 g (3.62 oz)
28101AG51B	105 g (3.70 oz)
28101AG52B	107.5 g (3.79 oz)
28101AG53B	110 g (3.88 oz)
28101AG54B	112.5 g (3.97 oz)
28101AG55B	115 g (4.06 oz)
28101AG56B	117.5 g (4.14 oz)
28101AG57B	120 g (4.23 oz)

B: COMPONENT



(1) Tire pressure monitoring control module
(2) Screw
(3) Transmitter (Snap in type)
(4) Valve

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.4 (0.14, 1)
T2: 7.5 (0.76, 5.5)

C: PREPARATION TOOL

1. GENERAL TOOL

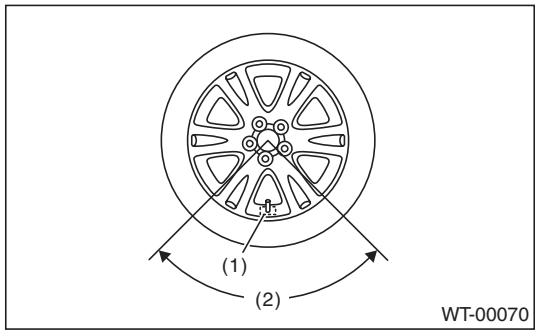
TOOL NAME	REMARKS
Air pressure gauge	Used for measuring tire air pressure.
Dial gauge with magnet stand	Used for measuring wheel runout.
Wheel balancer	Used for adjusting wheel balance.

2. Tire

A: INSPECTION

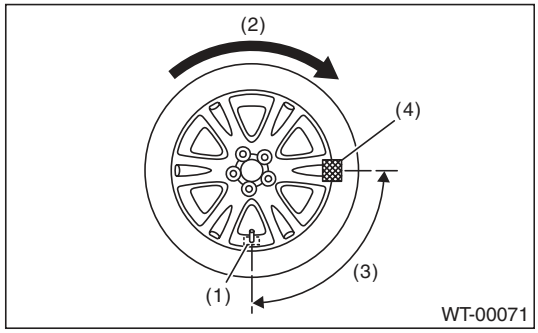
1) Take stones, glass, nails etc. out of the tread groove.
2) Replace tires in the following cases.

CAUTION:
• When replacing a tire, make sure to use only tires of the same size, construction and load range as originally installed.
• Use a tire changer when removing the tire from the wheel.
• On models equipped with tire pressure monitoring systems, do not use the bead breaker in a 90° area centered on the transmitter to prevent damaging the transmitter.



(1) Transmitter
(2) 90°
(use of a bead breaker is prohibited in this area.)

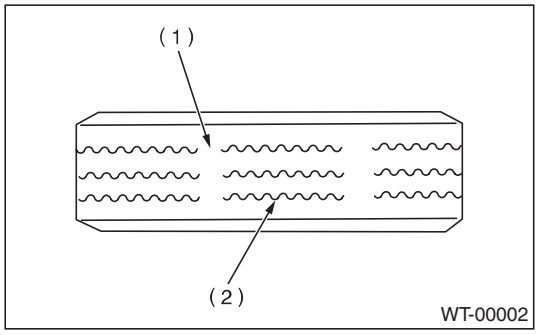
• To prevent damaging the transmitter, set the tire changer boom in the position as shown in the figure.



(1) Transmitter
(2) Direction of turn table rotation
(3) 90°
(4) Tire changer boom

(1) If large cracks on side wall, damage or cracks on the tread is found.

(2) When the “tread wear indicator” appears as a solid band across the tread.



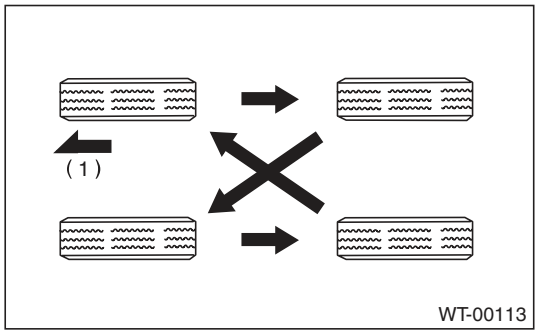
(1) Tread wear indicator
(2) Tire tread

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

1. TIRE ROTATION

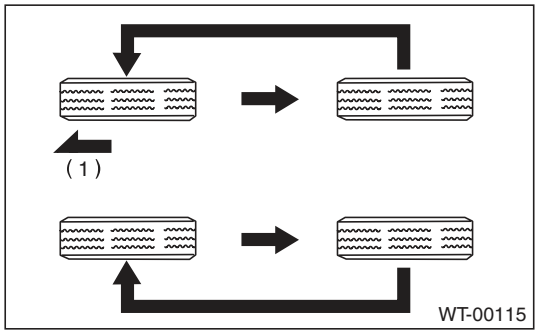
Rotate tires periodically (12,500 km/7,500 miles) as shown in the figure, in order to prevent them from uneven wear and to prolong their life.

• Without instruction for the direction of tire rotation



(1) Front

• When the direction of tire rotation is specified



(1) Front

NOTE:
Vehicles equipped with tire pressure monitoring systems will require re-registration of transmitter ID. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.>

3. Steel Wheel

A: REMOVAL

1) Apply the parking brake, and position select lever or shift lever to “P” range (AT model) or “1st gear” (MT model).
2) Set the shop jacks or a lift to the specified points, and support the vehicle with its wheels slightly contacting the floor.
3) Loosen the wheel nuts.
4) Raise the vehicle until its wheels are off the ground using the jack or a lift.
5) Remove the wheel nuts and wheels.

NOTE:
• When removing the wheels, be careful not to damage the hub bolts.
• Place the wheels with their outer sides facing upward to prevent wheels from being damaged.

B: INSTALLATION

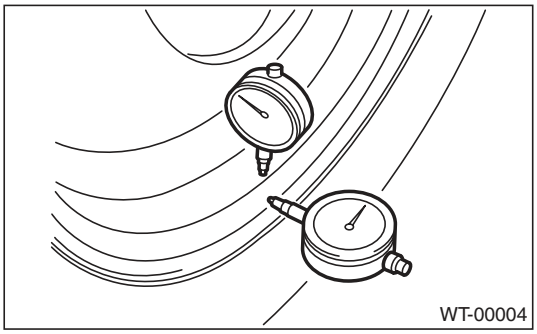
1) Remove dirt from the mating surface of the wheel and brake rotor.
2) Attach the wheel to the hub by aligning the wheel bolt holes with the hub bolts.
3) Temporarily attach the wheel nuts to the hub bolts. (In the case of aluminum wheels, use SUBARU genuine wheel nuts for aluminum wheels.)
4) Tighten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

Wheel nut tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

CAUTION:
• Tighten the wheel nuts in two or three steps by gradually increasing the torque on opposing nuts, until they reach the specified torque.
• Do not push the wrench by foot. Always use both hands when tightening the nuts.
• Make sure the bolt, nut and the nut seating surface of the wheel are free from oil.
6) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after driving 1,000 km (600 miles).

C: INSPECTION

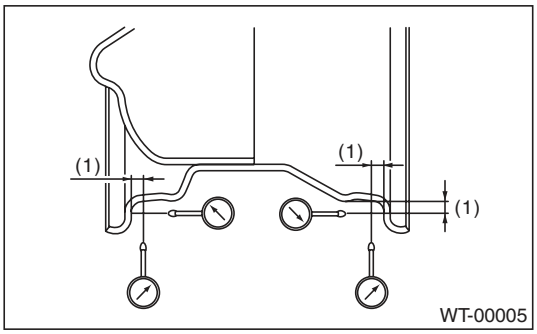
1) Deformation or damage to the rim may cause air leakage. Check the rim flange for deformation, cracks or damage, and repair or replace as necessary.
2) Jack-up the vehicle until wheels clear the floor.
3) Slowly rotate the wheel to check rim “runout” using a dial gauge.



Rim runout:

Axial runout limit	Vertical run-out limit
1.5 mm (0.059 in)	

4) If the rim runout exceeds specifications, remove the tire from the wheel and check runout with the dial gauge attached to positions shown in the figure.



(1) Approx. 7 mm (0.28 in)

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

4. Aluminum Wheel

A: REMOVAL

Refer to “Steel Wheels” for removal procedure of aluminum wheels. <Ref. to WT-6, REMOVAL, Steel Wheel.>

B: INSTALLATION

Refer to “Steel Wheels” for installation procedure of aluminum wheels. <Ref. to WT-6, INSTALLATION, Steel Wheel.>

C: INSPECTION

Refer to “Steel Wheels” for inspection procedure of aluminum wheels. <Ref. to WT-6, INSPECTION, Steel Wheel.>

Rim runout:

Axial runout limit	Vertical run-out limit
1.0 mm (0.039 in)	

D: CAUTION

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

5. Wheel Balancing

A: ADJUSTMENT

NOTE:
Because an adhesive type weight is adopted for the outside balance weight of 17-inch and 18-inch wheels, change the setting of the wheel balancer to adhesive type weight.
1) Remove the balance weights.

CAUTION:
- **Be careful not to damage the wheel.**
- **Completely remove the double-sided tape of the adhesive weight from the wheel.**

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

CAUTION:
Use SUBARU genuine balance weights.

Balance weight part number (Knock-on type weight for steel wheels)	Weight
28101AA001	5 g (0.18 oz)
28101AA011	10 g (0.35 oz)
28101AA021	15 g (0.53 oz)
28101AA031	20 g (0.71 oz)
28101AA041	25 g (0.88 oz)
28101AA051	30 g (1.06 oz)
28101AA061	35 g (1.23 oz)
28101AA071	40 g (1.41 oz)
28101AA081	45 g (1.59 oz)
28101AA091	50 g (1.76 oz)
28101AA101	55 g (1.94 oz)
28101AA111	60 g (2.12 oz)

Balance weight part number (Knock-on type weight for aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
28101SA100	30 g (1.06 oz)
28101SA110	35 g (1.23 oz)
28101SA120	40 g (1.41 oz)
28101SA130	45 g (1.59 oz)
28101SA140	50 g (1.76 oz)
28101XA000	55 g (1.94 oz)
28101SA150	60 g (2.12 oz)

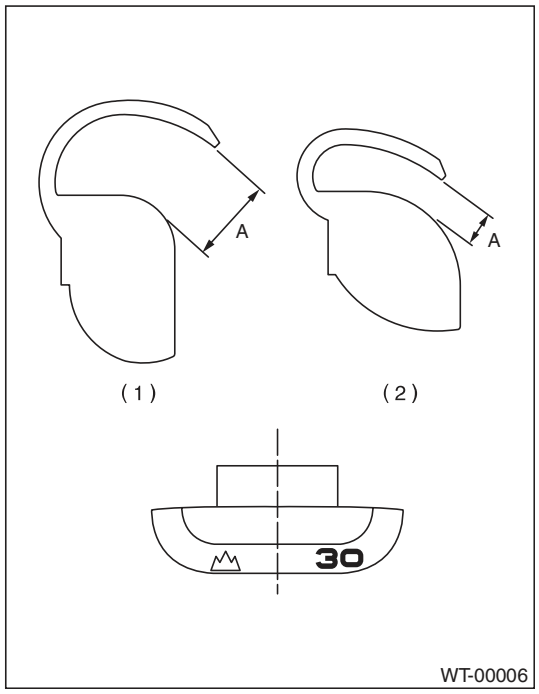
Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AE00B	5 g (0.18 oz)
28101AE01B	7.5 g (0.26 oz)
28101AE02B	10 g (0.35 oz)
28101AE03B	12.5 g (0.44 oz)
28101AE04B	15 g (0.53 oz)
28101AE05B	17.5 g (0.62 oz)
28101AE06B	20 g (0.71 oz)
28101AE07B	22.5 g (0.79 oz)
28101AE08B	25 g (0.88 oz)
28101AE09B	27.5 g (0.97 oz)
28101AE10B	30 g (1.06 oz)
28101AE11B	32.5 g (1.15 oz)
28101AE12B	35 g (1.23 oz)
28101AE13B	37.5 g (1.32 oz)
28101AE14B	40 g (1.41 oz)
28101AE15B	42.5 g (1.50 oz)
28101AE16B	45 g (1.59 oz)
28101AE17B	47.5 g (1.68 oz)
28101AE18B	50 g (1.76 oz)
28101AE19B	52.5 g (1.85 oz)
28101AE20B	55 g (1.94 oz)
28101AE21B	57.5 g (2.03 oz)
28101AE22B	60 g (2.12 oz)
28101AE23B	62.5 g (2.20 oz)
28101AE24B	65 g (2.29 oz)
28101AE25B	67.5 g (2.38 oz)
28101AE26B	70 g (2.47 oz)
28101AE27B	72.5 g (2.56 oz)
28101AE28B	75 g (2.65 oz)
28101AE29B	77.5 g (2.73 oz)
28101AE30B	80 g (2.82 oz)
28101AE31B	82.5 g (2.91 oz)
28101AE32B	85 g (3.00 oz)
28101AE33B	87.5 g (3.09 oz)
28101AE34B	90 g (3.17 oz)
28101AE35B	92.5 g (3.26 oz)
28101AE36B	95 g (3.35 oz)
28101AE37B	97.5 g (3.44 oz)
28101AE38B	100 g (3.53 oz)
28101AG50B	102.5 g (3.62 oz)
28101AG51B	105 g (3.70 oz)
28101AG52B	107.5 g (3.79 oz)
28101AG53B	110 g (3.88 oz)
28101AG54B	112.5 g (3.97 oz)
28101AG51B	115 g (4.06 oz)
28101AG56B	117.5 g (4.14 oz)
28101AG57B	120 g (4.23 oz)

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

CAUTION:
• Degrease the wheel surface where the adhesive type weight will be applied.
• Press the adhesive type weight by 25 N (2.5 kgf, 5.6 lb) or more per 5 g (0.18 oz) for 2 seconds or more and attain full adhesion.
• Total application of the adhesive type weight should be 100 g (3.53 oz) or less.
• The total weight of all adhesive weight on models with transmitters (tire pressure sensor) is to be 120 g (4.23 oz) or less.

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

NOTE:
Knock-on type balance weights for aluminum wheels can be used on any 15 to 18 inch aluminum wheels.



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

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

6. "T-type" Tire

A: NOTE

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

CAUTION:
• Do not drive at a speed greater than 80 km/h (50 MPH).
• For the model with tire pressure monitoring system, the indicator light may blink when running with the "T-type" tire.

B: REPLACEMENT

Refer to "Steel Wheels" for removal and installation procedures of the "T-type" tire. <Ref. to WT-6, REMOVAL, Steel Wheel.>

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

C: INSPECTION

1) Check the tire air pressure.

Specifications:
420 kPa (4.2 kg/cm^2, 60 psi)
2) Take stones, glass, nails, etc. out of the tread groove.
3) Check the tires for deformation, cracks, partial wear, or wear.

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

7. Tire Pressure Monitoring System

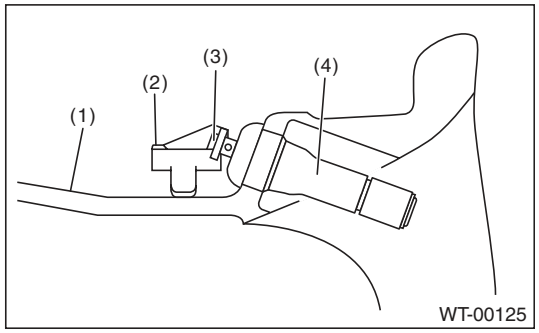
A: REMOVAL

1. TRANSMITTER (SNAP IN TYPE)

1) Remove the wheels from the vehicle. <Ref. to WT-6, REMOVAL, Steel Wheel.>
2) Remove the tires from wheels.

CAUTION:
Use a tire changer when removing the tire from the wheel.
3) Loosen the screw to remove the transmitter from the valve.

NOTE:
Replace the valve and screw with a new part when reusing transmitter.

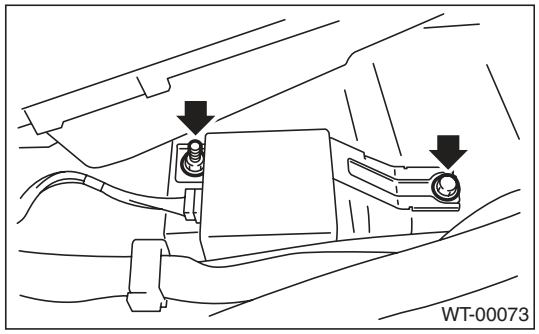


(1) Wheel
(2) Transmitter
(3) Screw
(4) Valve

4) Remove the valve stems from the wheel.

2. TIRE PRESSURE MONITORING CONTROL MODULE

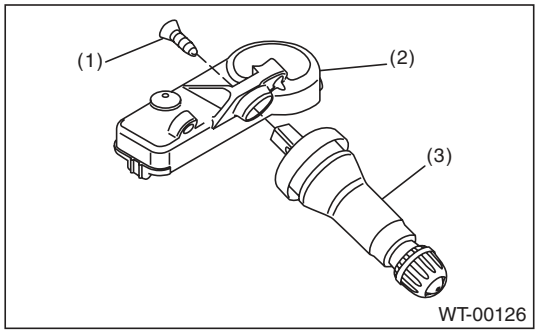
1) Remove the driver's seat. <Ref. to SE-9, REMOVAL, Front Seat.>
2) Turn up the floor mat in the driver's seat area.
3) Remove the connector to remove tire pressure monitoring control module.



B: INSTALLATION

1. TRANSMITTER (SNAP IN TYPE)

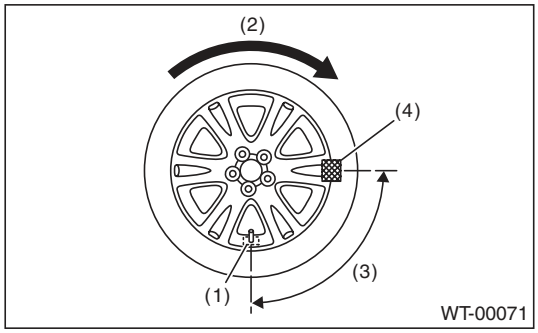
CAUTION:
Use the new transmitter assembly or replace the new valve and screw, when installing.
1) Replace the valve and screw with a new part when reusing transmitter.



(1) Screw
(2) Transmitter
(3) Valve

Tightening torque:
1.4 N·m (0.1 kgf-m, 1 ft-lb)
2) Install the transmitter to the wheel by aligning it with valve hole.
3) Install the tires to wheels.

CAUTION:
• Use a tire changer when installing tire to wheel.
• To prevent damaging the transmitter, set the tire changer boom in the position as shown in the figure.



(1) Transmitter
(2) Direction of turn table rotation
(3) 90°
(4) Tire changer boom

4) Install the wheels to vehicle. <Ref. to WT-6, INSTALLATION, Steel Wheel.>

5) Register the transmitter ID to the tire pressure monitoring control module. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.>

2. TIRE PRESSURE MONITORING CONTROL MODULE

Install in the reverse order of removal.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

C: ADJUSTMENT

Re-register the transmitter ID when transmitter has been replaced or tires have been rotated. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.>

8. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Corrective action
Wheel is 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 wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-7, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-23, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-16, INSPECTION, Rear Shock Absorber.>
	Front axle	Check the front axle. <Ref. to DS-16, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-21, INSPECTION, Rear Hub Unit Bearing.>
Vehicle is abnormally out of balance.	Improperly inflated tire	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure and replace the tire.
	Front stabilizer	Inspect the front stabilizer. <Ref. to FS-15, INSPECTION, Front Stabilizer.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-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-8, ADJUSTMENT, Wheel Balancing.>
	Front axle	Check the front axle. <Ref. to DS-16, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-21, INSPECTION, Rear Hub Unit Bearing.>
Abnormal tire wear	Improperly inflated tire	Adjust the tire pressure.
	Improper wheel balancing	Check the wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-7, INSPECTION, Wheel Alignment.>

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
Remove foreign matter (dust, water, oil etc.) from the tire pressure monitoring control module connector when removing or installing.

NOTE:
To check harness for open or short circuits, shake the suspected trouble spot or connector.

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Check with the user regarding when the warning light lit or started blinking. 2) Before performing diagnostics, check all components which may adversely affect the tire pressure monitor system. <Ref. to TPM(diag)-3, INSPECTION, General Description.>	Is the component that might affect the tire pressure monitor system normal?	Go to step **2**.	Repair or replace each component.
2	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to TPM(diag)-11, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 4) Read the DTC. <Ref. to TPM(diag)-16, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Go to step **4**.	Go to step **3**.
3	**PERFORM GENERAL DIAGNOSTICS.** 1) Perform the inspection by referring to “General Diagnostic Table”. <Ref. to TPM(diag)-38, General Diagnostic Table.> 2) Perform the Clear Memory Mode. <Ref. to TPM(diag)-9, CLEAR MEMORY, OPERATION, Subaru Select Monitor.> 3) Perform the Inspection Mode. <Ref. to TPM(diag)-17, Inspection Mode.> 4) Read the DTC. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Check the DTC is not displayed.	Does the tire pressure warning light illuminates for about 2 seconds and then foes off after turning on the ignition switch, and then go out?	Finish the diagnosis.	Check by referring to “Diagnostic Procedure for TPM”. <Ref. to TPM(diag)-14, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>
4	**PERFORM DIAGNOSIS.** 1) Refer to “List of Diagnostic Trouble Code (DTC)”. 2) Correct the cause of trouble. 3) Perform the Clear Memory Mode. <Ref. to TPM(diag)-9, CLEAR MEMORY, OPERATION, Subaru Select Monitor.> 4) Perform the drive test. Drive the vehicle at 40 km/h (25 MPH) or faster for at least 10 minutes. 5) Read the DTC. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Repeat steps 1 to 4 until DTC is not shown.	Finish the diagnosis.

2. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the TPM control module.

CAUTION:
• All airbag system wiring harnesses are yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the tire pressure monitoring control module.

2. TIRE PRESSURE MONITORING CONTROL MODULE

• If the transmitter is replaced, ID registration for the transmitter is required. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.>
• When adjusting tire pressure indoors in winter, there is a big temperature difference between the indoor facilities and outside. Once the car is outside where the temperature is lower, the air pressure in the tires will drop, causing the tire pressure warning light to illuminate, even if the pressure in the tires was adjusted to standard values indoors. To avoid this, it is necessary to adjust the tire pressure to the high side in consideration of the difference in temperature between inside and outside according to the following table.

a. 215/45ZR17

Temperature °C (°F)	Indoor temperature	15.5 (60)		
	Ambient temperature	–1 (30)	–12 (10)	–23 (–10)
Air pressure kPa (psi)	Front	265 (38)	280 (40)	295 (42)
	Rear	250 (36)	265 (38)	280 (40)

b. 215/45R18 and P215/45R18, P205/50R17

Temperature °C (°F)	Indoor temperature	15.5 (60)		
	Ambient temperature	–1 (30)	–12 (10)	–23 (–10)
Air pressure kPa (psi)	Front	250 (36)	265 (38)	280 (40)
	Rear	240 (35)	255 (37)	270 (39)

c. P225/60R16 and P225/55R17

Temperature °C (°F)	Indoor temperature	15.5 (60)		
	Ambient temperature	–1 (30)	–12 (10)	–23 (–10)
Air pressure kPa (psi)	Front	240 (35)	255 (37)	270 (39)
	Rear	230 (33)	245 (35)	260 (37)

B: INSPECTION

Before performing diagnosis, check the following item which might affect the quality of the tire pressure monitoring system.

1. TIRE

• Inspect that the tire pressure is within the specification while the tire is cool. (Refer to Tire Caution Label.)
• Check the tires for damage or the insertion of foreign matters.

2. BATTERY

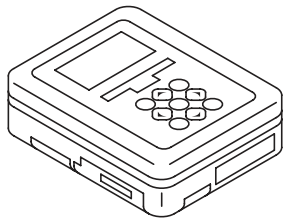
Check that amount of battery fluid, gravity and voltage are within the specifications.

Standard voltage: 12 V or more

Specific gravity: 1.260 or more

C: PREPARATION TOOL

1. SPECIAL TOOL

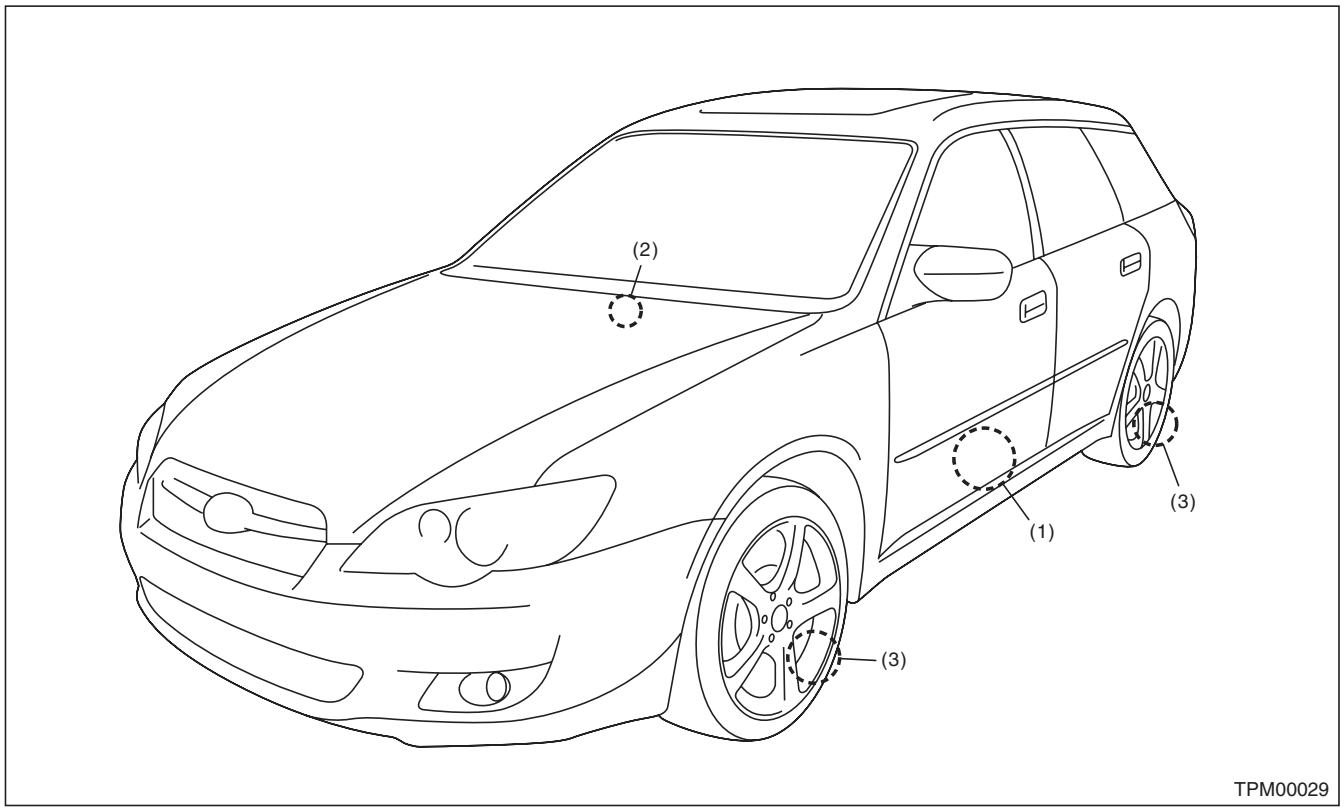
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

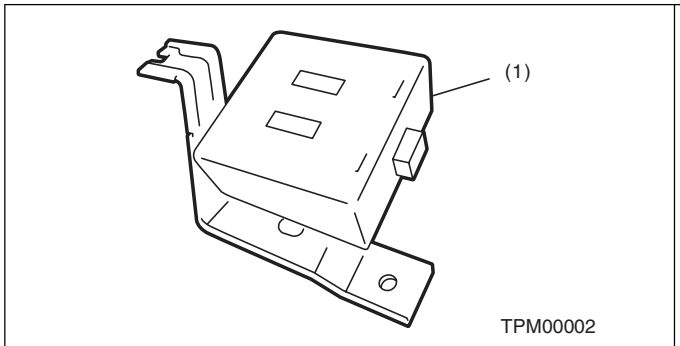
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Transmitter registration tool	Used to register the transmitter ID. Manufacturer: Kent-Moore Item number: J45295

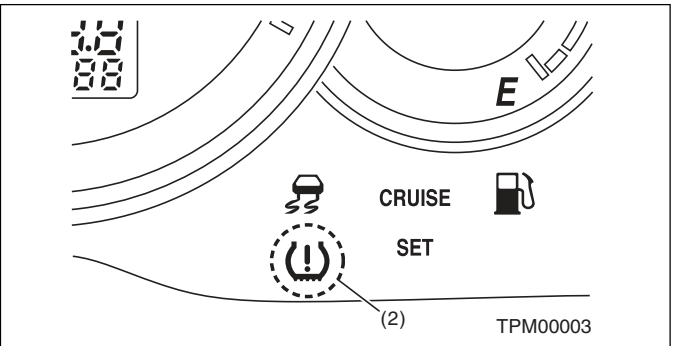
3. Electrical Component Location

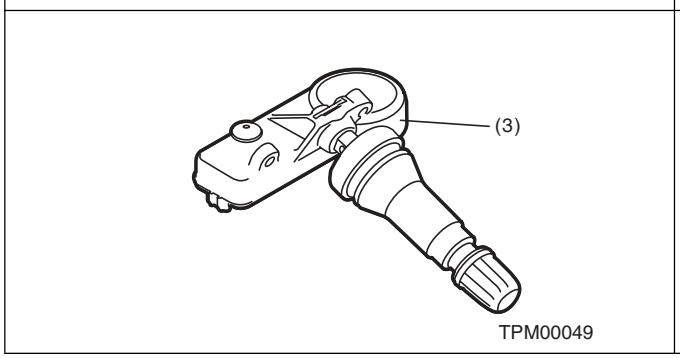
A: LOCATION



(1) Tire pressure monitoring control module
(2) Tire pressure warning light
(3) Snap-in type transmitter





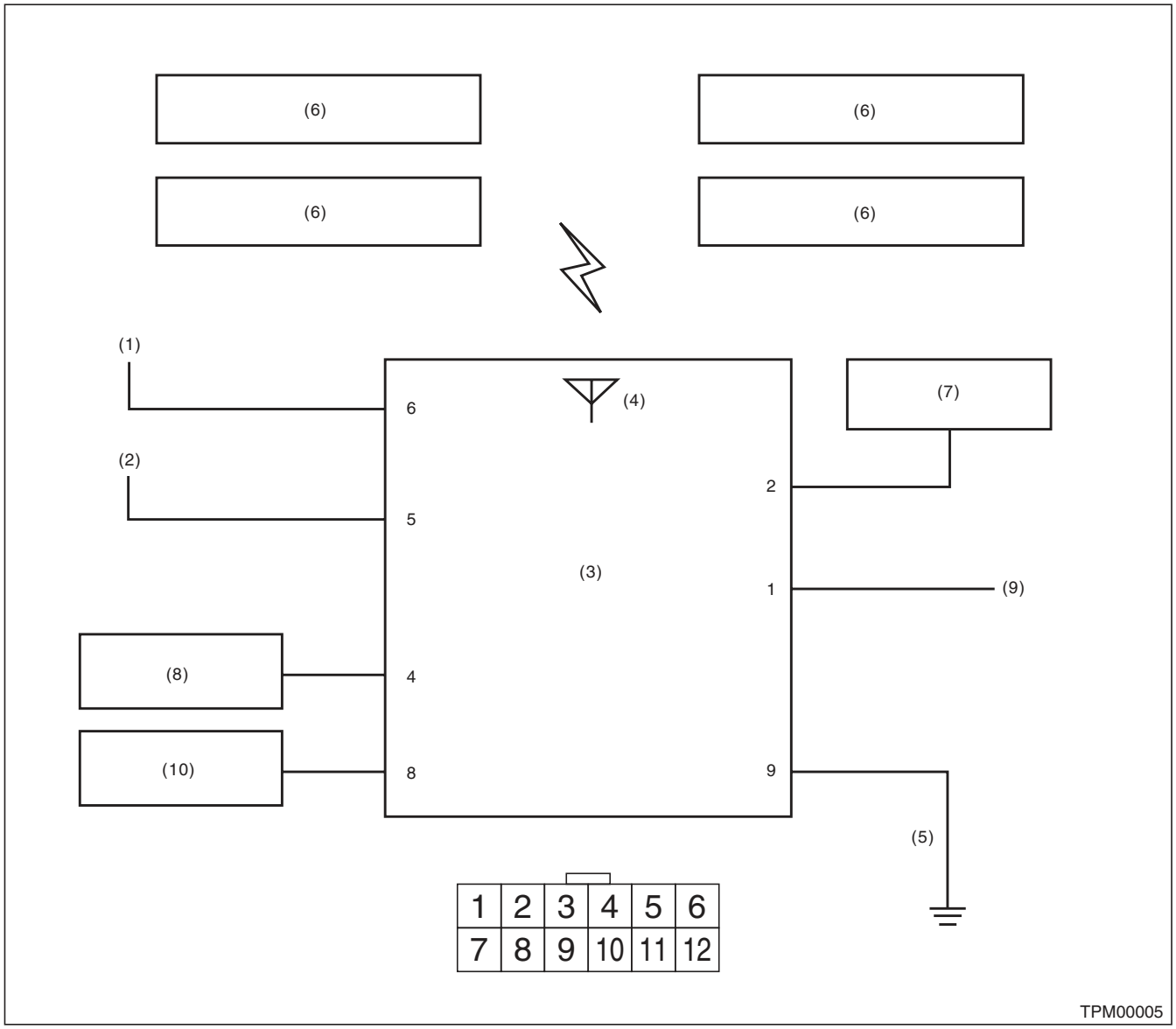


4. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

Terminal No.	Measured value	Measuring condition	Remarks
1	Select monitor communication	Serial communication	—
2	Tire pressure warning light output	Illuminate when malfunction occurs, or tire pressure decreases	System failure: blinks 25 times → illuminates Tire pressure decreases: turns on
4	Speed sensor signal	While driving (Pulse signal)	Change according to vehicle speed
5	Ignition power supply	IG switch ON (Battery voltage)	—
6	Battery power supply	Battery voltage	Always
8	Body integrated unit (Hazard output signal)	—	When hazard turns on.
9	GND	0 V (Always)	Always

B: WIRING DIAGRAM



(1) Battery power supply
(2) Ignition power supply
(3) Tire pressure monitoring control module
(4) Antenna
(5) GND
(6) Transmitter
(7) Combination meter
(8) Vehicle speed signal
(9) Subaru Select Monitor
(10) Body integrated unit

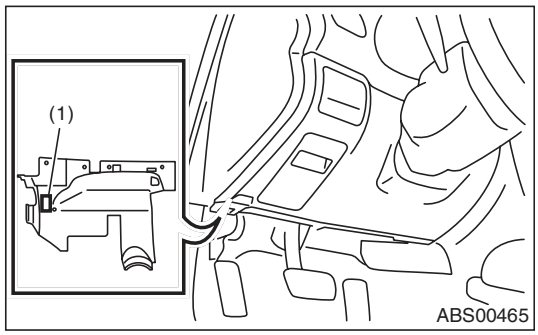
5. Subaru Select Monitor

A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit. <Ref. to TPM(diag)-4, SPECIAL TOOL, PREPARATION TOOL, General Description.>
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.

4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
5) On the «Main Menu» display, select the {Each System Check}.
6) On the «System Selection Menu» display, select the {Tire pressure monitor}.
7) After {Model Year} is displayed, select [OK].
8) On the «Tire pressure monitor diagnosis» display, select the {Diagnostic Code(s) Display}.

NOTE:
• For detailed operation procedures, refer to the "PC application help for Subaru Select Monitor".
• For details concerning DTCs, refer to List of Diagnostic Trouble Code (DTC). <Ref. to TPM(diag)-26, List of Diagnostic Trouble Code (DTC).>
• Display all the DTCs detected.
• If a particular DTC is not properly stored in memory (due to a voltage drop of the tire air pressure monitor control module power supply, etc.) when a problem occurs, a DTC suffixed with a question mark will appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

9) If communication is not possible between the tire pressure monitoring control module and the Subaru Select Monitor, check the communication circuit. <Ref. to TPM(diag)-11, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>
10) When DTC is not displayed, check the indicator circuit and communication circuit. <Ref. to TPM(diag)-14, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

2. DATA DISPLAY

1) On the «Main Menu» display, select the {Each System Check}.
2) On the «System Selection Menu» display, select the {Tire pressure monitor}.
3) After the {Tire pressure monitor} is displayed, select [OK].
4) On the «Tire pressure monitor diagnosis» display, select the {Data Display}, and then necessary data will be displayed.

- A list of the support data is shown in the following table.

1. Data monitor (Analog)

Display	Contents to be displayed	Unit of measure
Tire 1 FN code	LEARN, LOW BAT, OFF, WAKE, RE ME, NORMAL	LEARN: Transmitted transmitter ID using the transmitter registration tool LOW BAT: Transmitter battery voltage running low OFF: Transmitter function stops (no data transmission) RE ME: Tire air changes ±8.4 kPa WAKE: When data transmission is started from a stopped state. NORMAL: Conditions other than above
Tire 2 FN code		
Tire 3 FN code		
Tire 4 FN code		
Tire 1 air pressure	Value converted to tire pressure from data delivered from transmitter is displayed. (The figure may differ from the actual measured values.)	kPa, psig, mmHg, inHg
Tire 2 air pressure		kPa, psig, mmHg, inHg
Tire 3 air pressure		kPa, psig, mmHg, inHg
Tire 4 air pressure		kPa, psig, mmHg, inHg
Vehicle Speed	Vehicle speed signal which is input in control module.	km/h, MPH
Pressure warning	Threshold where tire pressure warning light illuminates	kPa, psig, mmHg, inHg
Return pressure	Threshold where tire pressure warning light goes out	kPa, psig, mmHg, inHg

3. CLEAR MEMORY

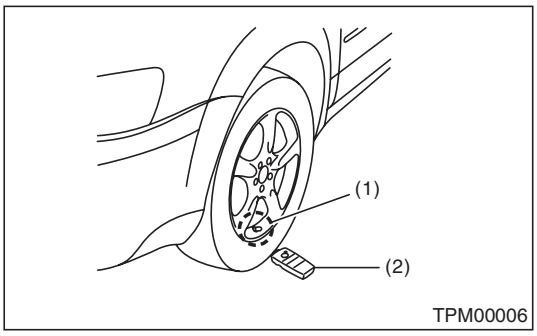
1) On the «Main Menu» display, select the {2. Each System Check}.
2) On the «System Selection Menu» display, select the {Tire pressure monitor}.
3) After the {Tire pressure monitor} is displayed, select [OK].
4) On the «Tire pressure monitor diagnosis» display, select the {Clearing Memory}.
5) When “Done” and “Turn off the ignition switch.” are shown on the display screen, end the Subaru Select Monitor and turn the ignition switch to OFF.

NOTE:
For detailed operation procedures, refer to the “PC application help for Subaru Select Monitor”.

4. REGISTER TRANSMITTER ID

Perform the procedures below to register the transmitter.
• Transmitter replaced.
• Replaced the tire pressure monitoring control module.

NOTE:
• If registration of the transmitter ID is not possible after 2 attempts, replace the tire pressure monitoring control module. <Ref. to WT-11, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.> <Ref. to WT-12, TIRE PRESSURE MONITORING CONTROL MODULE, INSTALLATION, Tire Pressure Monitoring System.>
• During the registration, turn the ignition switch to OFF and end the Subaru Select Monitor. Or if the registration is not performed for 5 minutes or more, the registration mode is cancelled.
• When rotating tires, there is no affect on the performance or functions of the tire pressure monitoring control module even if the transmitter (ID) is not registered, however, the tire position displayed on the Subaru Select Monitor will be incorrect.
1) Adjust all tire pressures to the specifications.
2) Connect Subaru Select Monitor and select the {2. Each System Check} on the «Main Menu».
3) On the «System Selection Menu» display, select the {Tire pressure monitor}.
4) After the {Tire pressure monitor} is displayed, select [OK].
5) On the «Tire pressure monitor diagnosis» display, select the {Transmitter ID regist confirm}.
6) {ID registration mode When execute Registered ID is deleted. Continue?} is displayed, select [OK].
7) Touch the transmitter registration tool to the side wall area near the air valve on the front left tire, and press the switch. The transmitter ID is sent to the tire pressure monitoring control module. (At that time, the tire pressure warning light blinks to confirm that the registration has started.)



(1) Air valve (transmitter)
(2) Transmitter registration tool

NOTE:
• The registration order of transmitter ID is not specified.
• The transmitter registration tool is used by touching the side wall area near the transmitter.
• When registration of each tire is completed, the hazard light will blink and {ID registration completed} is displayed on the Select Monitor screen.
• If registration procedure stop in the halfway (turning ignition switch to OFF, wrong registration order, etc), proceed from step 5)
8) When ID registration is completed, the tire pressure warning light remains lit for approximately 2 seconds, to end the registration. Switch to the screen displaying the transmitter ID on the Subaru Select Monitor display. <Ref. to TPM(diag)-10, DISPLAY TRANSMITTER (ID)., OPERATION, Subaru Select Monitor.>
9) Check the transmitter ID that was registered, then perform a driving test. <Ref. to TPM(diag)-17, PROCEDURE, Inspection Mode.>

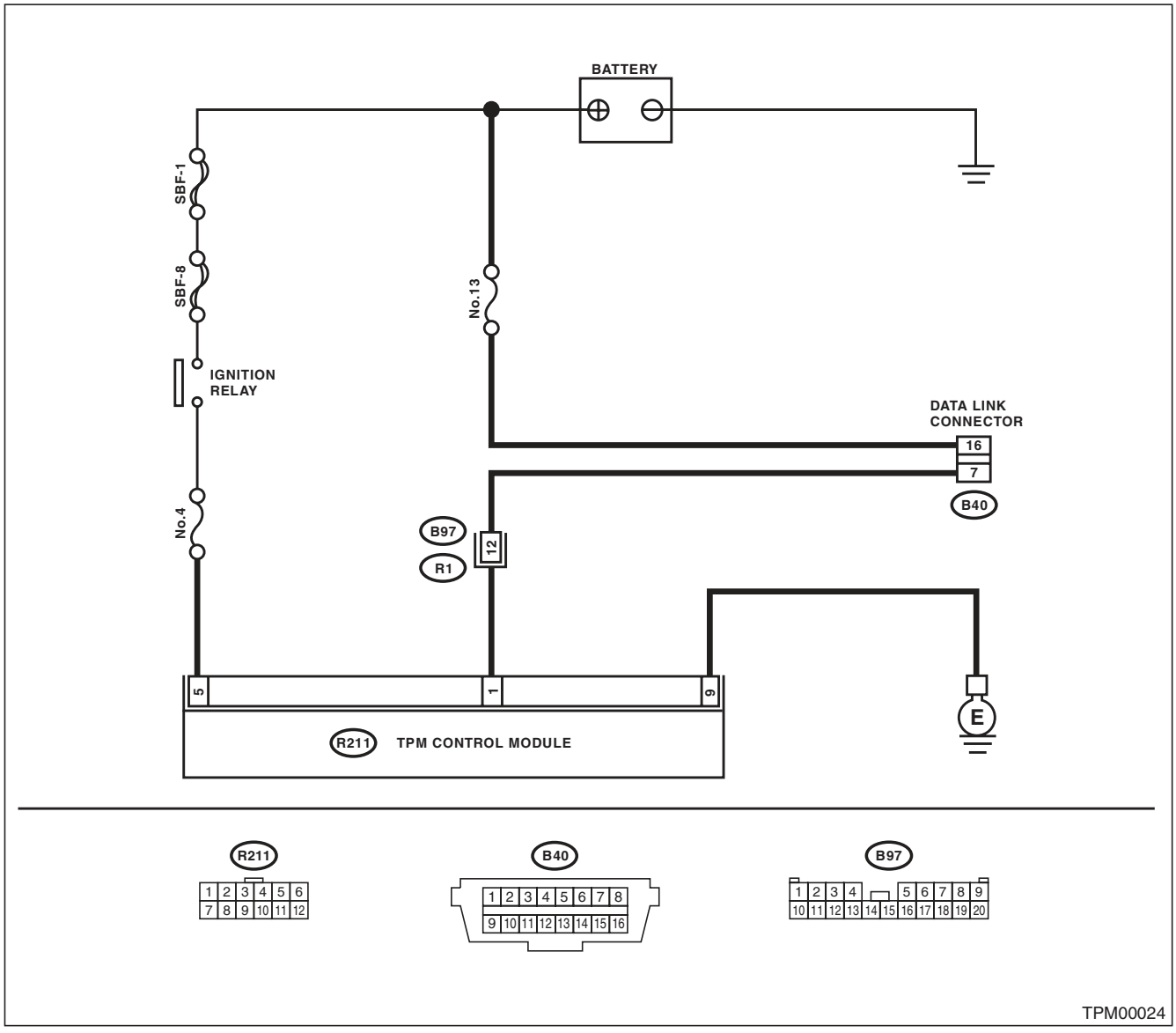
5. DISPLAY TRANSMITTER (ID)

1) On the «Main Menu» display, select the {Each System Check}.
2) On the «System Selection Menu» display, select the {Tire pressure monitor}.
3) After the {Tire pressure monitor} is displayed, select [OK].
4) On the «Tire pressure monitor diagnosis» display, select the {Transmitter ID regist confirm}.
5) Select the {Transmitter ID data monitor} and then select [OK] to display the transmitter ID.

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Communication is impossible between the tire pressure monitoring control module and the Subaru Select Monitor.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch ON?	Go to step **2**.	Turn the ignition switch to ON, and select TPM mode using Subaru Select Monitor.
2	**CHECK BATTERY.**	Is the voltage 11 V or more?	Go to step **3**.	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **4**.
4	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Is the system name displayed on the Subaru Select Monitor?	Go to step **8**.	Go to step **5**.
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the tire pressure monitoring control module connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name displayed on the Subaru Select Monitor?	Replace the tire pressure monitoring control module. <Ref. to WT-11, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	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 tire pressure monitoring control module. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the harness and connector between each control module and data link connector.
7	**CHECK TIRE PRESSURE MONITORING CONTROL MODULE OUTPUT SIGNAL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tire pressure monitoring control module and chassis ground. ***Connector & terminal*** ***(B40) No. 7 (+) — 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 TIRE PRESSURE MONITORING CONTROL MODULE AND DATA LINK CONNECTOR.** Measure the resistance between tire pressure monitoring control module and data link connector. ***Connector & terminal*** ***(R211) No. 1 — (B40) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **9**.	Repair the harness and connector between tire pressure monitoring control module and data link connector.
9	**CHECK TIRE PRESSURE MONITORING CONTROL MODULE CONNECTOR.** Turn the ignition switch to OFF.	Is the tire pressure monitoring control module connector inserted in the tire pressure monitoring control module until it locks?	Go to step **10**.	Insert the tire pressure monitoring control module connector into the tire pressure monitoring control module.

	Step	Check	Yes	No
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power voltage between tire pressure monitoring control module connector and chassis ground. ***Connector & terminal*** ***(R211) No. 5 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **11**.	Repair open circuit of the harness between the tire pressure monitoring control module and battery.
11	**CHECK HARNESS CONNECTOR BETWEEN TIRE PRESSURE MONITORING CONTROL MODULE AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the tire pressure monitoring control module. 3) Measure the resistance of harness between tire pressure monitoring control module and chassis ground. ***Connector & terminal*** ***(R211) No. 9 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12**.	Repair open circuit of the harness of the tire pressure monitoring control module.
12	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in tire pressure monitoring control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the tire pressure monitoring control module. <Ref. to WT-11, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>

2. WITHOUT DTC

DETECTING CONDITION:

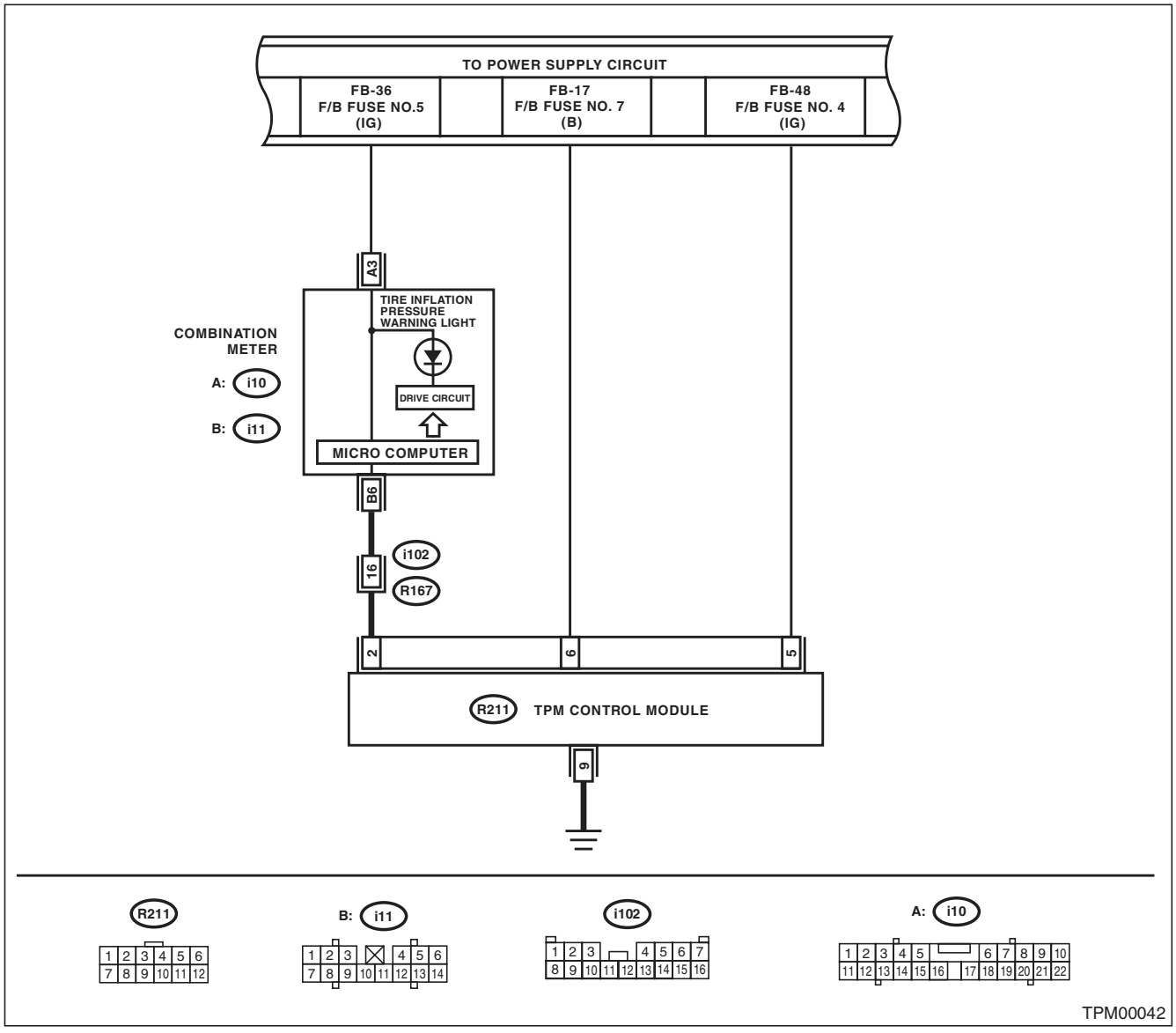
- Defective combination meter
- Defective harness

TROUBLE SYMPTOM:

- Tire pressure warning light does not go off.
- “No diagnostic Code Present” will be displayed on the Subaru Select Monitor.

NOTE:
When the tire pressure warning light is OFF and “No diagnostic Code Present” will be displayed on the Subaru Select Monitor, the system is in a normal condition.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR DATA.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the data of the “Tire pressure warning light”.	Is “ON” indicated?	Replace the tire pressure monitoring control module. <Ref. to WT-11, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	Go to step **2**.
2	**CHECK WIRING HARNESS.** Measure the resistance between tire pressure monitoring control module and combination meter connector. ***Connector & terminal*** ***(i11) No. 6 — (R211) No. 2:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the harness and connector between tire pressure monitoring control module and combination meter.
3	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the tire pressure monitoring control module connector and combination meter connector?	Repair the connector.	Check the combination meter.

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details concerning DTC reading procedure, refer to “Subaru Select Monitor”. <Ref. to TPM(diag)-8, Subaru Select Monitor.>

7. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as much as possible. Drive the vehicle at 40 km/h (25 MPH) or faster for at least ten minutes.

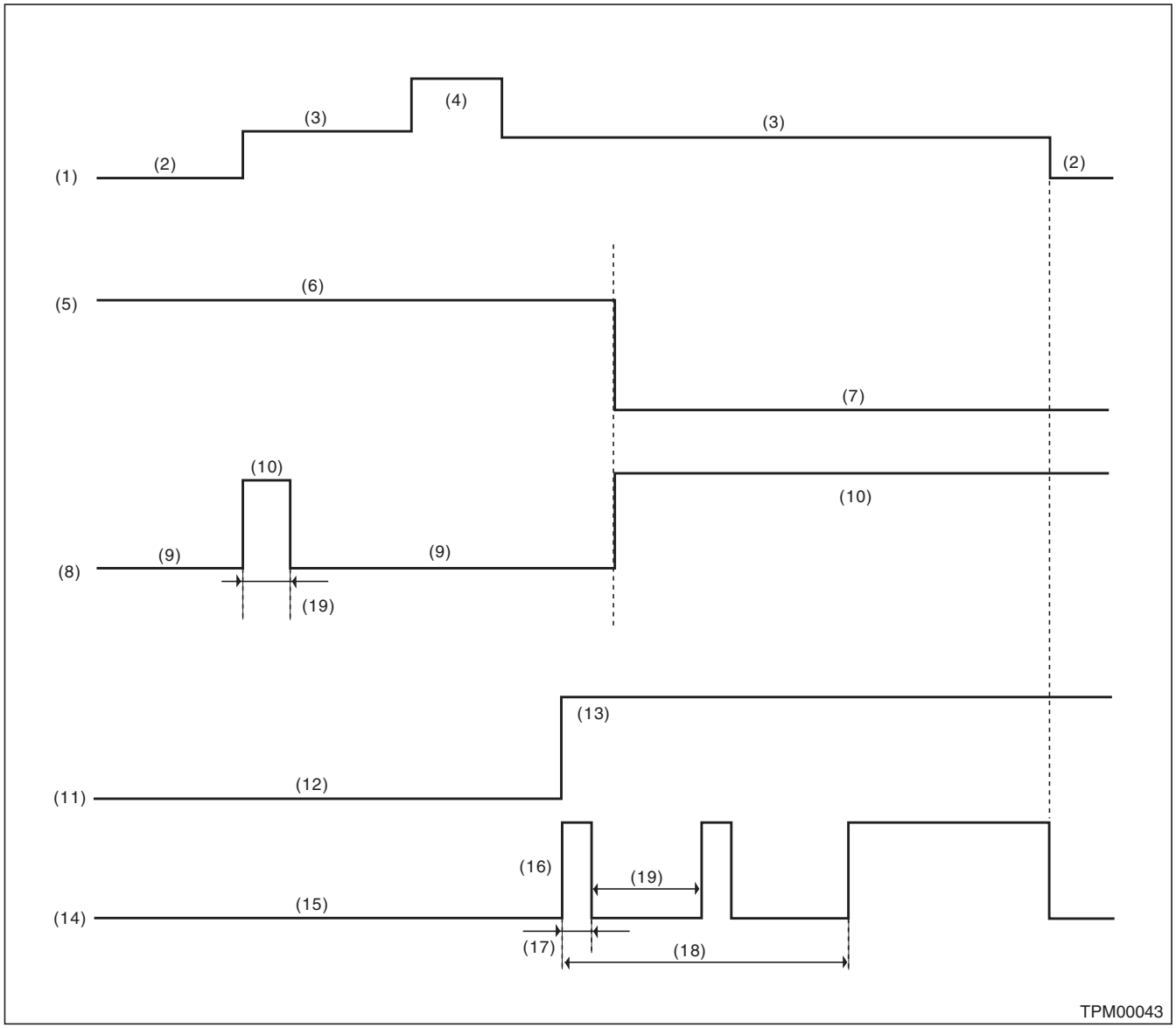
8. Clear Memory Mode

A: OPERATION

For details concerning DTC clear operation, refer to “Subaru Select Monitor”. <Ref. to TPM(diag)-8, Subaru Select Monitor.>

9. Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Start
(5) Tire pressure
(6) Meet the specification
(7) Under the specification (refer to the following table.)
(8) Tire pressure warning light
(9) Light OFF
(10) Light ON
(11) System status
(12) Normal operation
(13) Malfunction
(14) Tire pressure warning light
(15) Light OFF
(16) Blink
(17) 1 second
(18) Blinks 25 times
(19) 2 seconds

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

Tire size	Air pressure
P225/60 R16 97H	180 kPa (1.8 kgf/cm^2, 26 psi), or less
P225/55 R17 95V	
P205/55 R16 89H	186 kPa (1.86 kgf/cm^2, 27 psi) or less
P205/50 R17 88V	
215/45 R18 89Y	
P215/45 R18 89W	
215/45 R17 91W	196 kPa (1.96 kgf/cm^2, 28 psi) or less

1) When the tire pressure warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When tire pressure warning light does not go off, check the tire pressure monitoring control module/warning light circuit and the combination meter circuit. <Ref. to TPM(diag)-22, TIRE PRESSURE WARNING LIGHT DOES NOT COME OFF, Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern.>

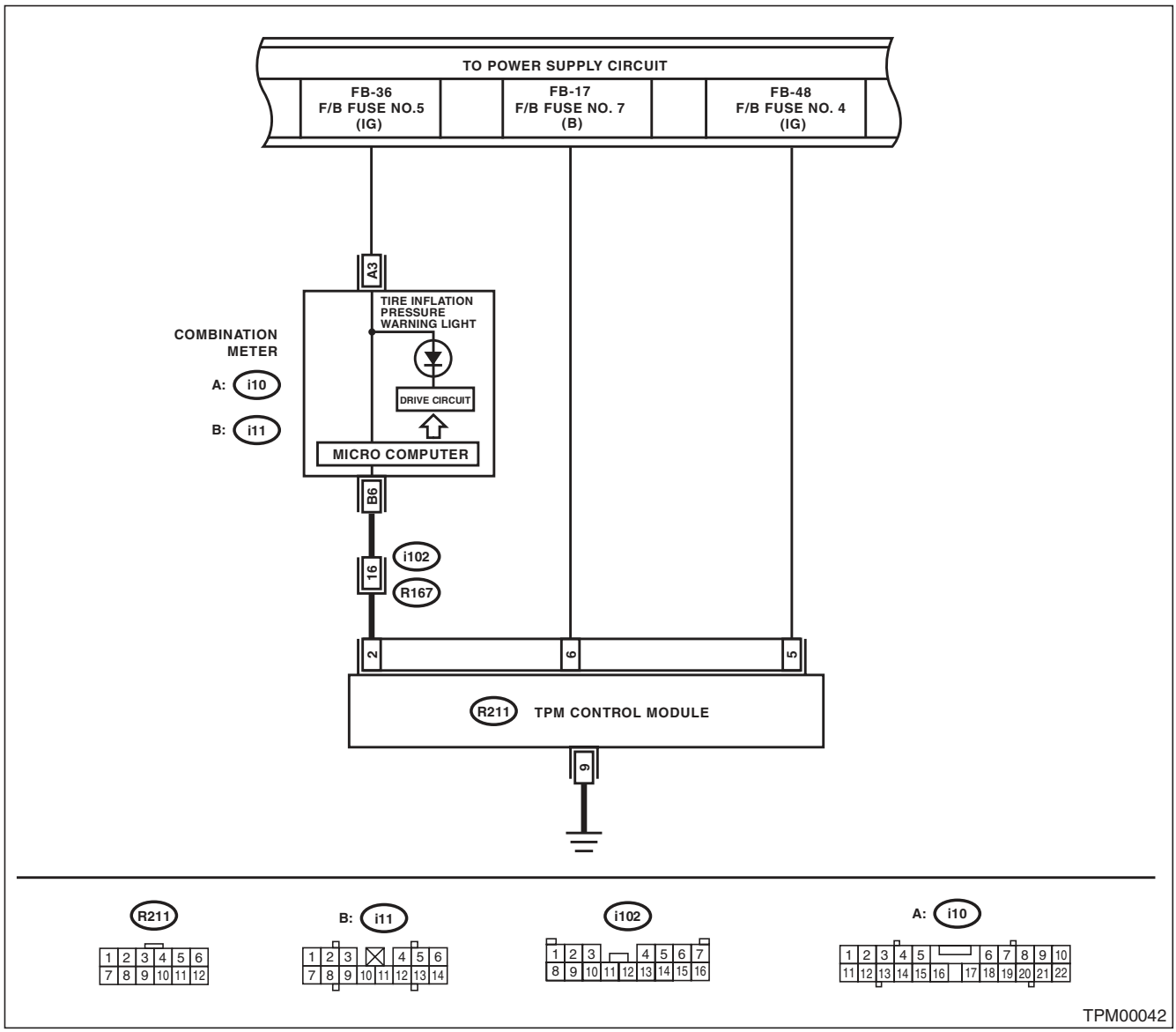
NOTE:
If the problem is fixed while driving at approximately 40 km/h (25 MPH) after the tire pressure warning light blinks/lights, the warning light goes out and the tire pressure monitor system operates normally. (If there is a decrease in tire pressure, or a malfunction of the system, the malfunction history is displayed.)

B: TIRE PRESSURE WARNING LIGHT DOES NOT COME ON

DETECTING CONDITION:
Defective combination meter

TROUBLE SYMPTOM:
When the ignition switch is turned to ON (engine OFF), the tire pressure warning light does not come on (for approximately 2 seconds).

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** Connect the Subaru Select Monitor, and read the Diagnostic Trouble Code. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is diagnostics code (DTC) displayed?	Perform the diagnosis according to DTC. <Ref. to TPM(diag)-26, List of Diagnostic Trouble Code (DTC).>	Replace the combination meter. <Ref. to IDI-22, REMOVAL, Combination Meter.>

C: TIRE PRESSURE WARNING LIGHT DOES NOT COME OFF

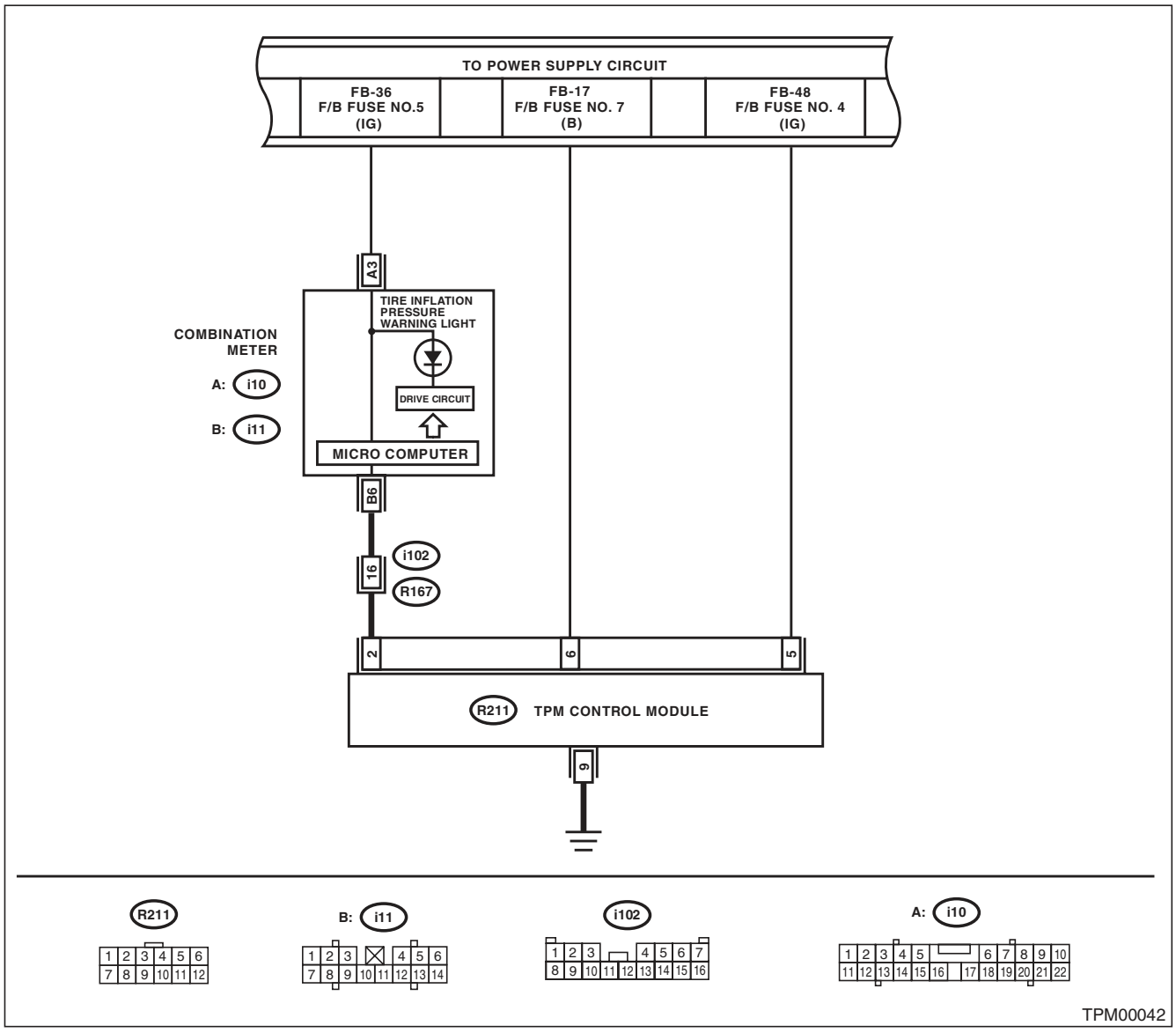
DETECTING CONDITION:

- Defective combination meter
- Tires pressure drop
- Transmitter ID not registered

TROUBLE SYMPTOM:

Tire pressure warning light remains illuminating after engine starts.

WIRING DIAGRAM:



Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

	Step	Check	Yes	No
1	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** Connect the Subaru Select Monitor, and read the Diagnostic Trouble Code. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to TPM(diag)-26, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TRANSMITTER (ID).** Display the transmitter ID of the tire pressure monitor system.	Is the transmitter ID registered?	Go to step **3**.	Register the transmitter ID. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.>
3	**CHECK TRANSMITTER DATA OUTPUT.** 1) Select data display of the tire pressure monitoring. 2) Start the engine and check the tire pressure warning light output.	Is the warning light output ON?	Replace the tire pressure monitoring control module. <Ref. to WT-11, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	Replace the combination meter. <Ref. to IDI-22, REMOVAL, Combination Meter.>

D: TIRE PRESSURE WARNING LIGHT IS 25 TIMES BLINKING AND TURN ON

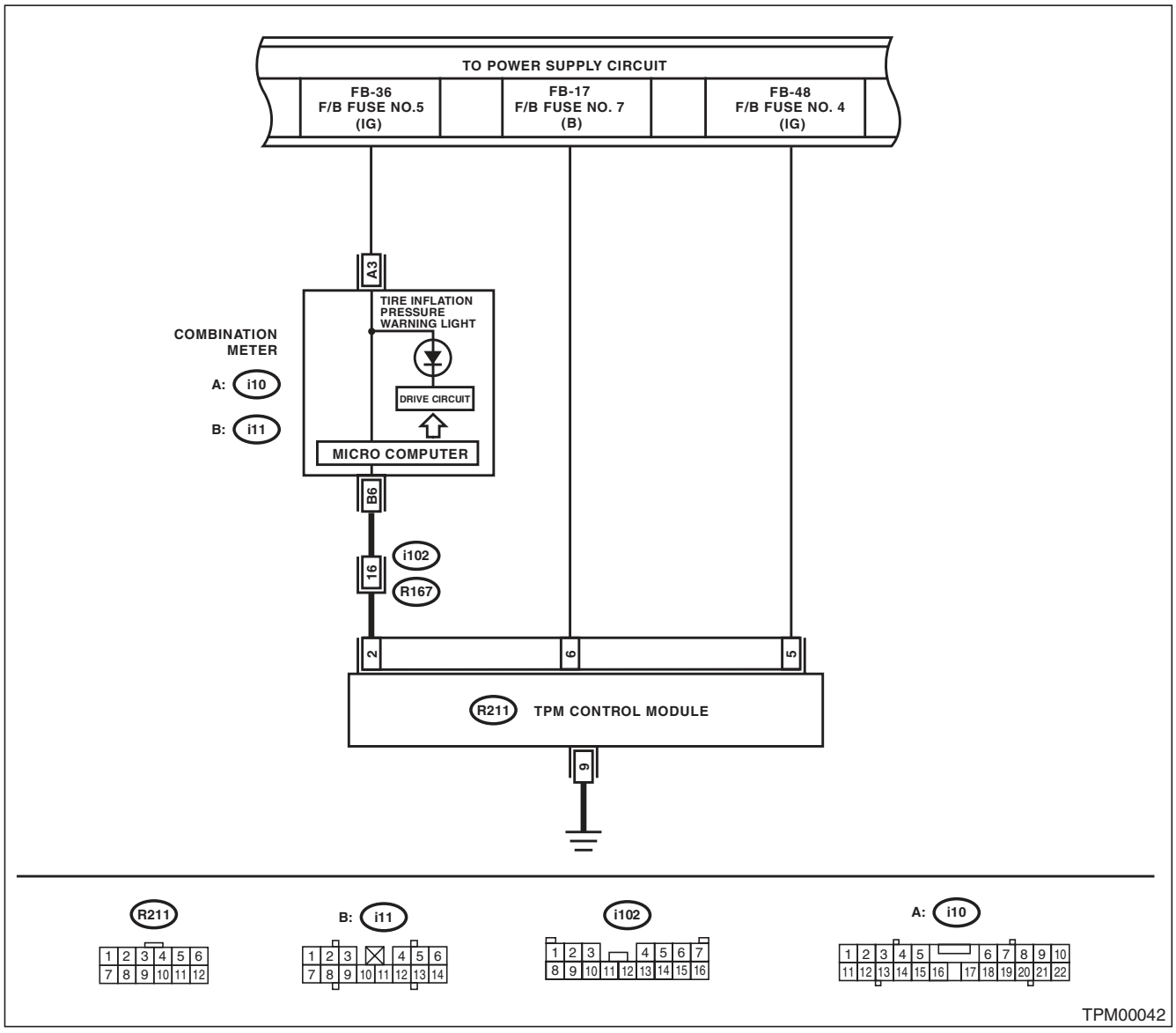
DETECTING CONDITION:

- Tire pressure monitoring control module is faulty.
- Defective harness
- Transmitter is faulty.

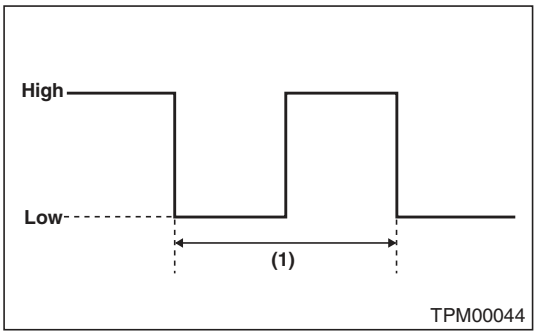
TROUBLE SYMPTOM:

Every time the engine starts, tire pressure warning light blinks 25 times and then illuminates.

WIRING DIAGRAM:



Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

	Step	Check	Yes	No
1	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** Connect the Subaru Select Monitor, and read the Diagnostic Trouble Code. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is diagnostics code (DTC) displayed?	Perform the diagnosis according to DTC. <Ref. to TPM(diag)-26, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS.** 1) Connect the Subaru Select Monitor to the terminal No. 2 of the tire pressure monitoring control module connector (R211). ***Connector & terminal*** ***(R211) No. 2 (+) — Chassis ground (–):*** 2) Turn the ignition switch to ON, and select "Oscilloscope" from the Main Menu of Subaru Select Monitor. 3) Check the voltage displayed.	Is the voltage 10 V or more?	Go to step **3**.	Go to step **4**.
3	**CHECK HARNESS.** 1) Check the output waveform displayed in the oscilloscope of Subaru Select Monitor. 	Is the pattern the same output waveform as shown in the figure? (1) 400±20 ms Duty 50 % High: Battery voltage Low:1.5 V or less	Check the combination meter.	Replace the tire pressure monitoring control module. <Ref. to WT-11, REMOVAL, Tire Pressure Monitoring System.>
4	**CHECK HARNESS.** 1) Disconnect the tire pressure monitoring control module connector. 2) Connect the Subaru Select Monitor to the terminal No. 2 of the tire pressure monitoring control module connector (R211). ***Connector & terminal*** ***(R211) No. 2 (+) — Chassis ground (–):*** 3) Turn the ignition switch to ON, and select "Oscilloscope" from the Main Menu of Subaru Select Monitor. 4) Check the voltage displayed.	Is the voltage 10 V or more?	Replace the tire pressure monitoring control module. <Ref. to WT-11, REMOVAL, Tire Pressure Monitoring System.>	The harness between the combination meter connector and the tire pressure monitoring control module connector is shorted or open. Repair or replace the harness.

10. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnosis	Remarks
11	Tire 1 air pressure decrease	Tire pressure of tire 1 is reduced.	<Ref. to TPM(diag)-28, DTC 11 TIRE 1 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Tire 2 air pressure decrease	Tire pressure of tire 2 is reduced.	<Ref. to TPM(diag)-28, DTC 12 TIRE 2 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
13	Tire 3 air pressure decrease	Tire pressure of tire 3 is reduced.	<Ref. to TPM(diag)-28, DTC 13 TIRE 3 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
14	Tire 4 air pressure decrease	Tire pressure of tire 4 is reduced.	<Ref. to TPM(diag)-29, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	Transmitter 1 no data	Data cannot be received from transmitter 1.	<Ref. to TPM(diag)-29, DTC 21 TRANSMITTER 1 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Transmitter 2 no data	Data cannot be received from transmitter 2.	<Ref. to TPM(diag)-29, DTC 22 TRANSMITTER 2 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Transmitter 3 no data	Data cannot be received from transmitter 3.	<Ref. to TPM(diag)-29, DTC 23 TRANSMITTER 3 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Transmitter 4 no data	Data cannot be received from transmitter 4.	<Ref. to TPM(diag)-30, DTC 24 TRANSMITTER 4 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Transmitter 1 pressure data abnormal	Transmitter 1 data contents are abnormal.	<Ref. to TPM(diag)-31, DTC 31 TRANSMITTER 1 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Transmitter 2 pressure data abnormal	Transmitter 2 data contents are abnormal.	<Ref. to TPM(diag)-31, DTC 32 TRANSMITTER 2 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Transmitter 3 pressure data abnormal	Transmitter 3 data contents are abnormal.	<Ref. to TPM(diag)-31, DTC 33 TRANSMITTER 3 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	Transmitter 4 pressure data abnormal	Transmitter 4 data contents are abnormal.	<Ref. to TPM(diag)-32, DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
41	Transmitter 1 function code abnormal	Function code has error.	<Ref. to TPM(diag)-33, DTC 41 TRANSMITTER 1 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	Transmitter 2 function code abnormal	Function code has error.	<Ref. to TPM(diag)-33, DTC 42 TRANSMITTER 2 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
43	Transmitter 3 function code abnormal	Function code has error.	<Ref. to TPM(diag)-33, DTC 43 TRANSMITTER 3 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Contents of diagnosis	Remarks
44	Transmitter 4 function code abnormal	Function code has error.	<Ref. to TPM(diag)-34, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Transmitter 1 battery voltage decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 51 TRANSMITTER 1 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	Transmitter 2 battery voltage decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 52 TRANSMITTER 2 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
53	Transmitter 3 battery voltage decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 53 TRANSMITTER 3 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	Transmitter 4 battery voltage decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
61	Vehicle speed is abnormal	Vehicle speed signal is not input to the control module when the vehicle speed is 6 km/h (3.7 MPH) or more.	<Ref. to TPM(diag)-36, DTC 61 VEHICLE SPEED IS ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

11.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 TIRE 1 AIR PRESSURE DECREASE

NOTE:
Refer to DTC 14 for diagnostic procedure. <Ref. to TPM(diag)-29, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC 12 TIRE 2 AIR PRESSURE DECREASE

NOTE:
Refer to DTC 14 for diagnostic procedure. <Ref. to TPM(diag)-29, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC 13 TIRE 3 AIR PRESSURE DECREASE

NOTE:
Refer to DTC 14 for diagnostic procedure. <Ref. to TPM(diag)-29, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC 14 TIRE 4 AIR PRESSURE DECREASE

DTC DETECTING CONDITION:
Inflation pressure of tires dropped under specifications

NOTE:
For specification, refer to “Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern”. <Ref. to TPM(diag)-19, INSPECTION, Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern.>
TROUBLE SYMPTOM:
Tire pressure warning light illuminates.

	Step	Check	Yes	No
1	**CHECK TIRES.** Lift up the vehicle and check for damage in the tires.	Are there cracks or damage?	Replace the tire. <Ref. to WT-5, Tire.>	Go to step **2**.
2	**CHECK TIRES.** Check the tire air pressure.	Is the tire pressure in the specifications?	Go to step **3**.	Adjust the air pressure.
3	**CHECK TRANSMITTER.** Drive the vehicle at 40 km/h (25 MPH) or faster and compare the data from the transmitter on the four wheels.	Is there a transmitter with different data?	Replace the transmitter (tire pressure sensor). <Ref. to WT-11, Tire Pressure Monitoring System.>	Go to step **4**.
4	**PERFORM DRIVING TEST.** 1) Perform the Clear Memory Mode. <Ref. to TPM(diag)-9, CLEAR MEMORY, OPERATION, Subaru Select Monitor.> 2) Perform the driving test. <Ref. to TPM(diag)-17, PROCEDURE, Inspection Mode.> 3) Read the DTC. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Inspect using the “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to TPM(diag)-28, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

CAUTION:
When driving vehicle to perform driving test, there should be always 2 persons (driver and checker) to check.

E: DTC 21 TRANSMITTER 1 NO DATA

NOTE:
Refer to DTC 24 for diagnostic procedure. <Ref. to TPM(diag)-30, DTC 24 TRANSMITTER 4 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 22 TRANSMITTER 2 NO DATA

NOTE:
Refer to DTC 24 for diagnostic procedure. <Ref. to TPM(diag)-30, DTC 24 TRANSMITTER 4 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 23 TRANSMITTER 3 NO DATA

NOTE:
Refer to DTC 24 for diagnostic procedure. <Ref. to TPM(diag)-30, DTC 24 TRANSMITTER 4 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC 24 TRANSMITTER 4 NO DATA

DTC DETECTING CONDITION:
Data from each transmitter is not received for 8 minutes.
TROUBLE SYMPTOM:
Tire pressure warning light blinks 25 times and then illuminates.

	Step	Check	Yes	No
1	**START FL TRANSMITTER.** 1) Connect the Subaru Select Monitor and then turn the ignition switch to ON. 2) Select “Transmit ID data monitor”. <Ref. to TPM(diag)-10, DISPLAY TRANSMITTER (ID)., OPERATION, Subaru Select Monitor.> 3) Use the transmitter registration tool and transmit the ID from the FL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **2**.	Replace front left transmitter.
2	**CHECK FL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 1 registered ID.	Are the two IDs same?	Go to step **3**.	Record the received ID update as the FL transmitter. Go to step **3**.
3	**START FR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the FR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **4**.	Replace the front right transmitter.
4	**CHECK FR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 2 registered ID.	Are the two IDs same?	Go to step **5**.	Record the received ID update as the FR transmitter. Go to step **5**.
5	**START RR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **6**.	Replace the RR transmitter.
6	**CHECK RR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 3 registered ID.	Are the two IDs same?	Go to step **7**.	Record the received ID update as the RR transmitter. Go to step **7**.
7	**START RL TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **8**.	Replace the RL transmitter.
8	**CHECK RL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 4 registered ID.	Are the two IDs same?	Go to step **9**.	Record the received ID update as the RL transmitter. Go to step **9**.
9	**CHECK MALFUNCTION TRANSMITTER.**	Is ID recorded by this procedure?	Go to step **10**.	Go to step **1**.
10	**CHECK MALFUNCTION TRANSMITTER.** Check the registered ID of the transmitter indicated by DTC.	Is there checked ID in the record?	Replace the transmitter of the recorded position.	Replace the transmitter showing the latest ID that is not included in the registered IDs.

CAUTION:
When driving vehicle to perform driving test, there should be always 2 persons (driver and checker) to check.

I: DTC 31 TRANSMITTER 1 PRESSURE DATA ABNORMAL

NOTE:
Refer to DTC 34 for diagnostic procedure. <Ref. to TPM(diag)-32, DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC 32 TRANSMITTER 2 PRESSURE DATA ABNORMAL

NOTE:
Refer to DTC 34 for diagnostic procedure. <Ref. to TPM(diag)-32, DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 33 TRANSMITTER 3 PRESSURE DATA ABNORMAL

NOTE:
Refer to DTC 34 for diagnostic procedure. <Ref. to TPM(diag)-32, DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL

DTC DETECTING CONDITION:

- When comparing the data from each transmitter to the previous data, the change is large.
- The pressure exceeds what the transmitter can measure. (Excessive pressure)

TROUBLE SYMPTOM:

Tire pressure warning light blinks 25 times and then illuminates.

	Step	Check	Yes	No
1	**START FL TRANSMITTER.** 1) Connect the Subaru Select Monitor and then turn the ignition switch to ON. 2) Select “Transmit ID data monitor”. <Ref. to TPM(diag)-10, DISPLAY TRANSMITTER (ID)., OPERATION, Subaru Select Monitor.> 3) Use the transmitter registration tool and transmit the ID from the FL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **2**.	Replace front left transmitter.
2	**CHECK FL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 1 registered ID.	Are the two IDs same?	Go to step **3**.	Record the received ID update as the FL transmitter. Go to step **3**.
3	**START FR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the FR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **4**.	Replace the front right transmitter.
4	**CHECK FR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 2 registered ID.	Are the two IDs same?	Go to step **5**.	Record the received ID update as the FR transmitter. Go to step **5**.
5	**START RR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **6**.	Replace the RR transmitter.
6	**CHECK RR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 3 registered ID.	Are the two IDs same?	Go to step **7**.	Record the received ID update as the RR transmitter. Go to step **7**.
7	**START RL TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **8**.	Replace the RL transmitter.
8	**CHECK RL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 4 registered ID.	Are the two IDs same?	Go to step **9**.	Record the received ID update as the RL transmitter. Go to step **9**.
9	**CHECK MALFUNCTION TRANSMITTER.**	Is ID recorded by this procedure?	Go to step **10**.	Go to step **1**.
10	**CHECK MALFUNCTION TRANSMITTER.** Check the registered ID of the transmitter indicated by DTC.	Is there checked ID in the record?	Replace the transmitter of the recorded position.	Replace the transmitter showing the latest ID that is not included in the registered IDs.

M: DTC 41 TRANSMITTER 1 FUNCTION CODE ABNORMAL

NOTE:
Refer to DTC 44 for diagnostic procedure. <Ref. to TPM(diag)-34, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC 42 TRANSMITTER 2 FUNCTION CODE ABNORMAL

NOTE:
Refer to DTC 44 for diagnostic procedure. <Ref. to TPM(diag)-34, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 43 TRANSMITTER 3 FUNCTION CODE ABNORMAL

NOTE:
Refer to DTC 44 for diagnostic procedure. <Ref. to TPM(diag)-34, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL

DTC DETECTING CONDITION:
Unexpected function codes received from each transmitter.
TROUBLE SYMPTOM:
Tire pressure warning light blinks 25 times and then illuminates.

	Step	Check	Yes	No
1	**START FL TRANSMITTER.** 1) Connect the Subaru Select Monitor and then turn the ignition switch to ON. 2) Select “Transmit ID Monitor”. <Ref. to TPM(diag)-10, DISPLAY TRANSMITTER (ID)., OPERATION, Subaru Select Monitor.> 3) Use the transmitter registration tool and transmit the ID from the FL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **2**.	Replace front left transmitter.
2	**CHECK FL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 1 registered ID.	Are the two IDs same?	Go to step **3**.	Record the received ID update as the FL transmitter. Go to step **3**.
3	**START FR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the FR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **4**.	Replace the front right transmitter.
4	**CHECK FR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 2 registered ID.	Are the two IDs same?	Go to step **5**.	Record the received ID update as the FR transmitter. Go to step **5**.
5	**START RR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **6**.	Replace the RR transmitter.
6	**CHECK RR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 3 registered ID.	Are the two IDs same?	Go to step **7**.	Record the received ID update as the RR transmitter. Go to step **7**.
7	**START RL TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **8**.	Replace the RL transmitter.
8	**CHECK RL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 4 registered ID.	Are the two IDs same?	Go to step **9**.	Record the received ID update as the RL transmitter. Go to step **9**.
9	**CHECK MALFUNCTION TRANSMITTER.**	Is ID recorded by this procedure?	Go to step **10**.	Replace the transmitter indicated by DTC.
10	**CHECK MALFUNCTION TRANSMITTER.** Check the registered ID of the transmitter indicated by DTC.	Is there checked ID in the record?	Replace the transmitter of the recorded position.	Replace the transmitter indicated by DTC.

Q: DTC 51 TRANSMITTER 1 BATTERY VOLTAGE DECREASE

NOTE:
Refer to DTC 54 for diagnostic procedure. <Ref. to TPM(diag)-35, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC 52 TRANSMITTER 2 BATTERY VOLTAGE DECREASE

NOTE:
Refer to DTC 54 for diagnostic procedure. <Ref. to TPM(diag)-35, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

S: DTC 53 TRANSMITTER 3 BATTERY VOLTAGE DECREASE

NOTE:
Refer to DTC 54 for diagnostic procedure. <Ref. to TPM(diag)-35, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

T: DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE

DTC DETECTING CONDITION:
Low battery signals received 20 times from each transmitter.
TROUBLE SYMPTOM:
Tire pressure warning light blinks 25 times and then illuminates.

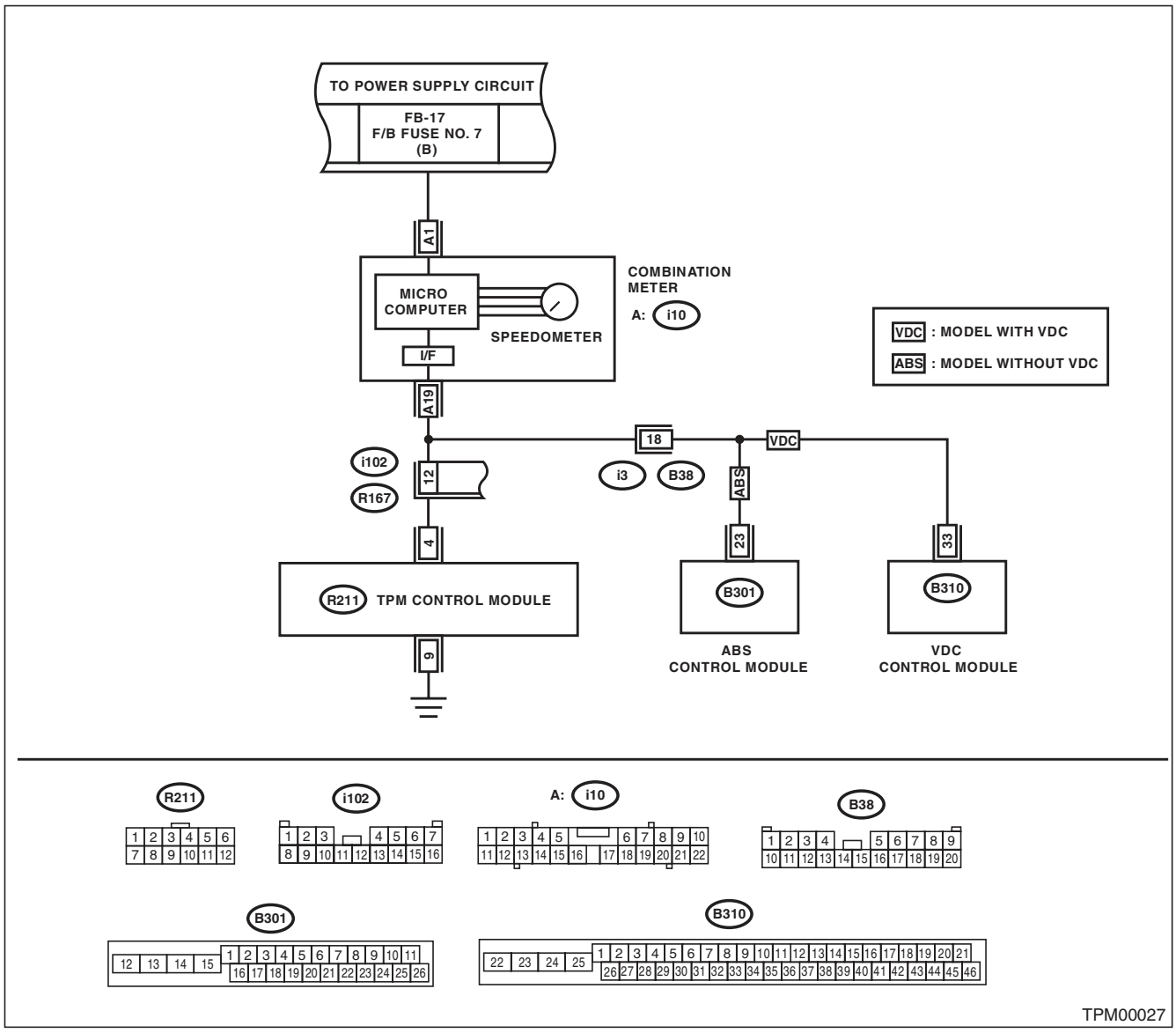
	Step	Check	Yes	No
1	**CHECK TRANSMITTER.** 1) Replace all transmitters with new parts and register their IDs. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.> 2) Perform the Clear Memory Mode, and perform driving test.	Is the fault eliminated?	Internal battery of the transmitter had worn out.	Replace the tire pressure monitoring control module. <Ref. to WT-11, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>

U: DTC 61 VEHICLE SPEED IS ABNORMAL

DTC DETECTING CONDITION:
Vehicle speed function codes were received from the transmitter, but the vehicle speed signal was not input to the module.

TROUBLE SYMPTOM:
Tire pressure warning light blinks 25 times and then illuminates.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TIRE PRESSURE MONITORING CONTROL MODULE.** 1) Connect an oscilloscope to the terminal No. 4 of the tire pressure monitoring control module connector (R211). 2) Drive the vehicle at 40 km/h (25 MPH) and check the vehicle speed signal at that time.	Is the vehicle speed being input?	Replace the tire pressure monitoring control module. <Ref. to WT-11, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	Go to step **2**.
2	**CHECK HARNESS.** 1) Disconnect the combination meter connector (i10). 2) Connect the tire pressure monitoring control module connector (R211) and combination meter connector (i10) and measure the resistance.	Is the resistance less than 0.5 Ω?	Check the combination meter. <Ref. to IDI-22, REMOVAL, Combination Meter.>	Repair or replace the open circuit of the harness.

12.General Diagnostic Table

A: INSPECTION

Symptoms		Problem parts
Tire pressure warning light illuminates.	Tire pressure is reduced.	• Improper tire pressure adjustment. • Punctured tire
Tire pressure warning light blinks 25 times and then illuminates.	Tire pressure monitoring system has malfunction.	• Air pressure sensor malfunction • Air pressure sensor is out of battery. • Tire pressure monitoring control module is faulty. • Defective vehicle harness • Defective combination meter
Tire pressure is dropping but the warning light does not illuminate.	Tire pressure warning light does not illuminate.	• Air pressure sensor is faulty. • Tire pressure monitoring control module is faulty. • Defective combination meter

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 a different rear differential assembly will cause the drive train and tires to drag or emit abnormal noise.
• For option codes, refer to the “ID” section. <Ref. to ID-2, IDENTIFICATION, Identification.>

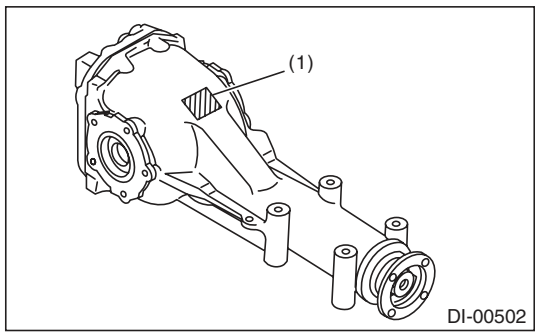
Model	Sedan, Wagon						
	2.5 L Non-turbo		2.5 L Turbo			3.0 L	
	5MT	4AT	6MT	5MT	5AT		
Rear differential type	T-type	VA1-type	T-type		VA2-type		
Identification	T1	XJ	HY	EW	XZ	XT	XU
LSD type	—		Torsen	Viscous coupling			
Type of gear	Hypoid gear						
Gear ratio (Number of gear teeth)	3.900 (39/10)	4.111 (37/9)	3.545 (39/11)	3.900 (39/10)	3.083 (37/12)		3.272 (36/11)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)		1.0 ℓ (1.1 US qt, 0.9 Imp qt)	0.8 ℓ (0.8 US qt, 0.7 Imp qt)			
Rear differential gear oil	GL-5						

Model	OUTBACK						
	2.5 L Non-turbo				2.5 L Turbo		3.0 L
	5MT		4AT		5MT	5AT	
Rear differential type	T-type					VA2-type	
Identification	JE	T2	CD	TP	CF	XU	
LSD type	Viscous coupling	—	Viscous coupling	—	Viscous coupling		
Type of gear	Hypoid gear						
Gear ratio (Number of gear teeth)	4.111 (37/9)		4.444 (40/9)			3.272 (36/11)	
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)						
Rear differential gear oil	GL-5						

2. IDENTIFICATION

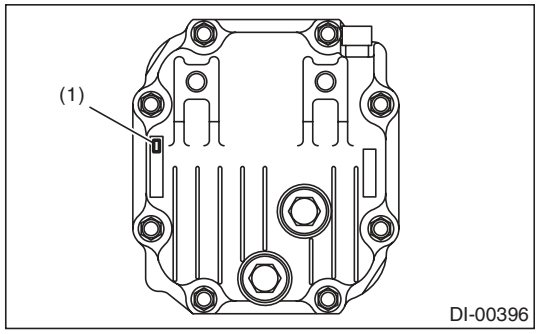
Identification label positions are shown in the following figures. For details concerning identification, refer to the “ID” section.

- T-type



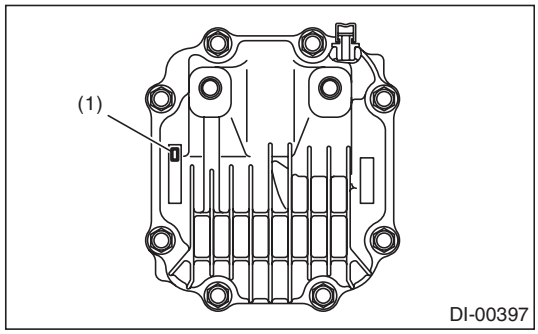
(1) Identification

- VA1-type



(1) Identification

- VA2-type

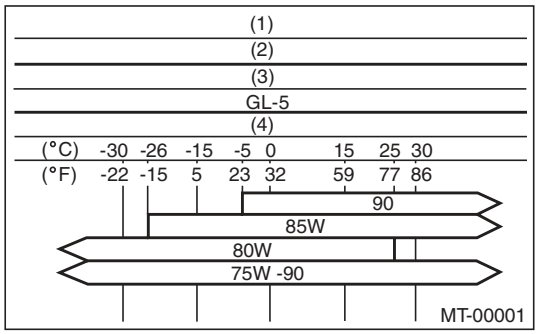


(1) Identification

3. REAR DIFFERENTIAL GEAR OIL

Recommended gear oil:
GL–5 (75W–90)

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



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

4. SERVICE DATA

Drive pinion bearing preload (For new bearing)	Measure with spring measurement. (Measured from the companion flange bolt) N (kgf, lbf)	T-type (Except for GT spec. B 6MT model)	17.7 — 38.8 (1.8 — 4.0, 4.0 — 8.7)
		T-type (GT spec. B 6MT model)	24.1 — 38.6 (2.5 — 3.9, 5.4 — 8.7)
		VA-type	12.7 — 32.2 (1.3 — 3.3, 2.9 — 7.2)
	Measure with torque wrench N·m (kgf-m, ft-lb)	T-type (Except for GT spec. B 6MT model)	0.67 — 1.47 (0.07 — 0.15, 0.49 — 1.08)
		T-type (GT spec. B 6MT model)	0.91 — 1.46 (0.09 — 0.15, 0.67 — 1.08)
		VA-type	0.48 — 1.22 (0.05 — 0.12, 0.35 — 0.90)
Side gear backlash mm (in)		T-type	0.10 — 0.20 (0.004 — 0.008)
		VA-type	0.05 — 0.15 (0.002 — 0.006)
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 (0.004 — 0.008)
		VA-type	0.10 — 0.15 (0.004 — 0.006)
Hypoid driven gear runout on its back surface mm (in)			0.05 (0.002)

5. ADJUSTING PARTS

- T-type (except for GT spec. B 6MT model)

	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)

	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)

Pinion height adjusting washer	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 thrust washer (Model without LSD)	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 retainer shim	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)

Drive pinion bearing preload	Measure with spring measurement. (Measured from the companion flange bolt hole)	N (kgf, lb)	17.7 — 38.8 (1.8 — 4.0, 4.0 — 8.7)
	Measure with torque wrench	N·m (kgf-m, ft-lb)	0.67 — 1.47 (0.07 — 0.15, 0.49 — 1.08)
Side gear backlash		mm (in)	0.10 — 0.20 (0.004 — 0.008)
Hypoid driven gear to drive pinion backlash limit		mm (in)	0.10 — 0.20 (0.004 — 0.008)
Hypoid driven gear runout limit on its back surface		mm (in)	0.05 (0.002)

- T-type (GT spec. B 6MT model)

Drive pinion bearing preload (For new bearing)	Measure with spring measurement. (Measured from the companion flange bolt hole) N (kgf, lbf)	24.1 — 38.6 (2.5 — 3.9, 5.4 — 8.7)
	Measured with torque wrench N·m (kgf-m, ft-lb)	0.91 — 1.46 (0.09 — 0.15, 0.67 — 1.08)
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)

Preload adjusting washer	Part No.	Thickness mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
Pinion height adjusting washer	Part No.	Thickness mm (in)
	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 retainer shim	Part No.	Thickness mm (in)
	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)
Hypoid driven gear to drive pinion backlash	Limit mm (in)	0.10 — 0.20 (0.004 — 0.008)
Driven gear rear face runout limit		0.05 (0.002)

DIFFERENTIALS

- VA1-type

	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)

	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)
Pinion height adjusting washer	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 thrust washer	803135011	0.925 — 0.950 (0.0364 — 0.0374)
	803135012	0.950 — 0.975 (0.0374 — 0.0384)
	803135013	0.975 — 1.000 (0.0384 — 0.0394)
	803135014	1.000 — 1.025 (0.0394 — 0.0404)
	803135015	1.025 — 1.050 (0.0404 — 0.0413)

Drive pinion bearing preload	Measure with spring measurement. (Measured from the companion flange bolt hole)	N (kgf, lb)	12.7 — 32.2 (1.3 — 3.3, 2.9 — 7.2)
	Measure with torque wrench	N·m (kgf-m, ft-lb)	0.48 — 1.22 (0.05 — 0.12, 0.35 — 0.90)
Side gear backlash		mm (in)	0.05 — 0.15 (0.002 — 0.006)
Hypoid driven gear to drive pinion backlash limit		mm (in)	0.10 — 0.15 (0.004 — 0.006)

- VA2-type

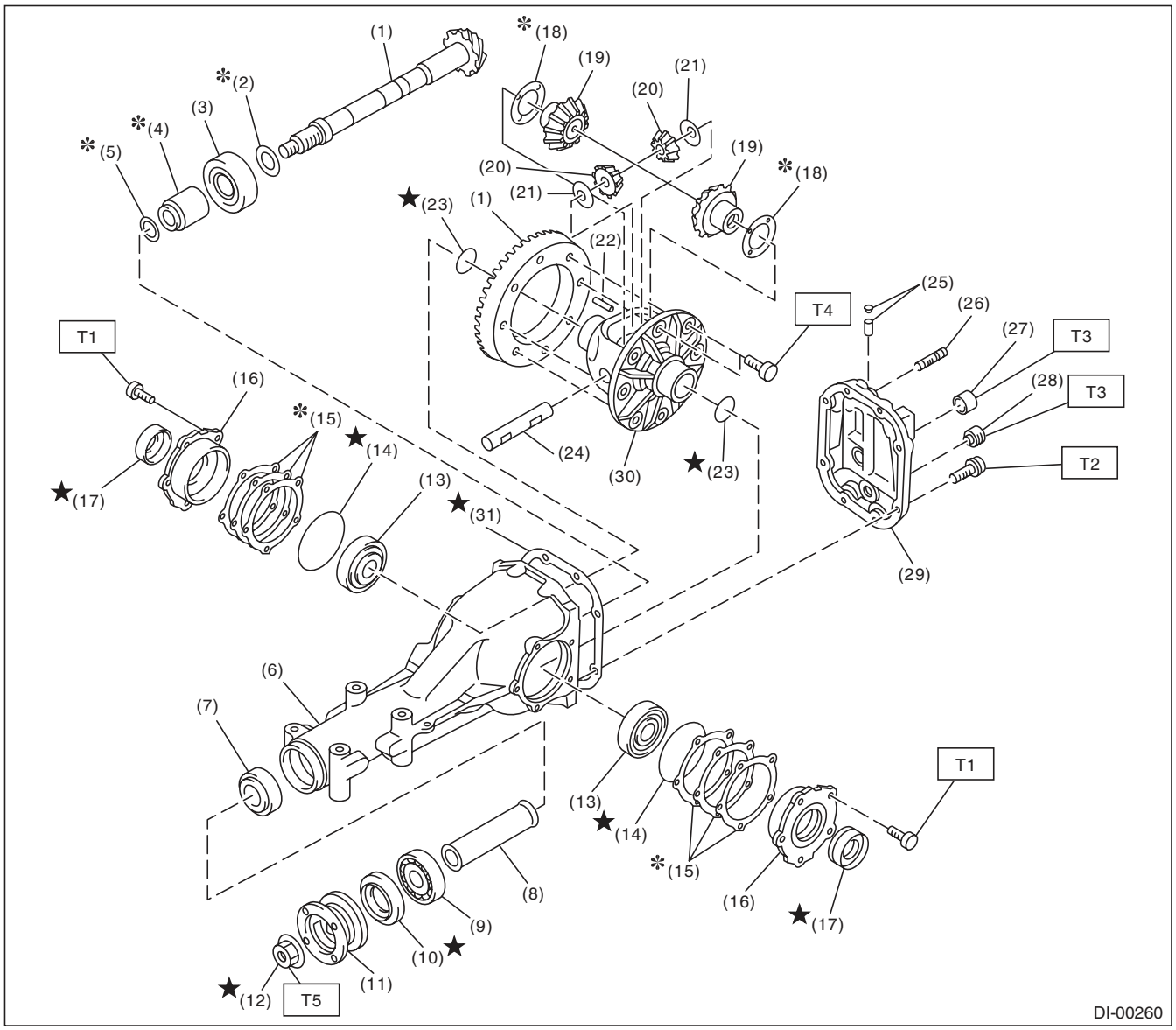
	Part No.	Length mm (in)
Preload adjusting spacer	31454AA250	51.05 (2.010)
	31454AA260	51.25 (2.018)
	31454AA270	51.35 (2.022)
	31454AA280	51.45 (2.026)
	31454AA290	51.55 (2.030)
	31454AA300	51.65 (2.033)
	31454AA310	51.75 (2.037)
	31454AA320	51.85 (2.041)
	31454AA330	52.05 (2.049)

	Part No.	Thickness mm (in)
Preload adjusting washer	38336AA430	1.500 (0.0591)
	38336AA440	1.513 (0.0596)
	38336AA450	1.525 (0.0600)
	38336AA460	1.538 (0.0606)
	38336AA470	1.550 (0.0610)
	38336AA480	1.563 (0.0615)
	38336AA490	1.575 (0.0620)
	38336AA500	1.588 (0.0625)
	38336AA510	1.600 (0.0630)
	38336AA520	1.613 (0.0635)
	38336AA530	1.625 (0.0640)
	38336AA540	1.638 (0.0645)
	38336AA550	1.650 (0.0650)
	38336AA560	1.663 (0.0655)
	38336AA570	1.675 (0.0659)
	38336AA580	1.688 (0.0665)
	38336AA590	1.700 (0.0669)
	38336AA600	1.713 (0.0674)
	38336AA610	1.725 (0.0679)
	38336AA620	1.738 (0.0684)
	38336AA630	1.750 (0.0689)
	38336AA640	1.763 (0.0694)
	38336AA650	1.775 (0.0699)
Pinion height adjusting washer	32295AA350	0.150 (0.0059)
	32295AA360	0.175 (0.0069)
	32295AA370	0.200 (0.0079)
	32295AA380	0.225 (0.0089)
	32295AA390	0.250 (0.0098)
	32295AA400	0.275 (0.0108)

Drive pinion bearing preload	Measure with spring measurement. (Measured from the companion flange bolt hole)	N (kgf, lb)	12.7 — 32.2 (1.3 — 3.3, 2.9 — 7.2)
	Measure with torque wrench	N·m (kgf-m, ft-lb)	0.48 — 1.22 (0.05 — 0.12, 0.35 — 0.90)
Hypoid driven gear to drive pinion backlash limit		mm (in)	0.10 — 0.15 (0.004 — 0.006)

B: COMPONENT

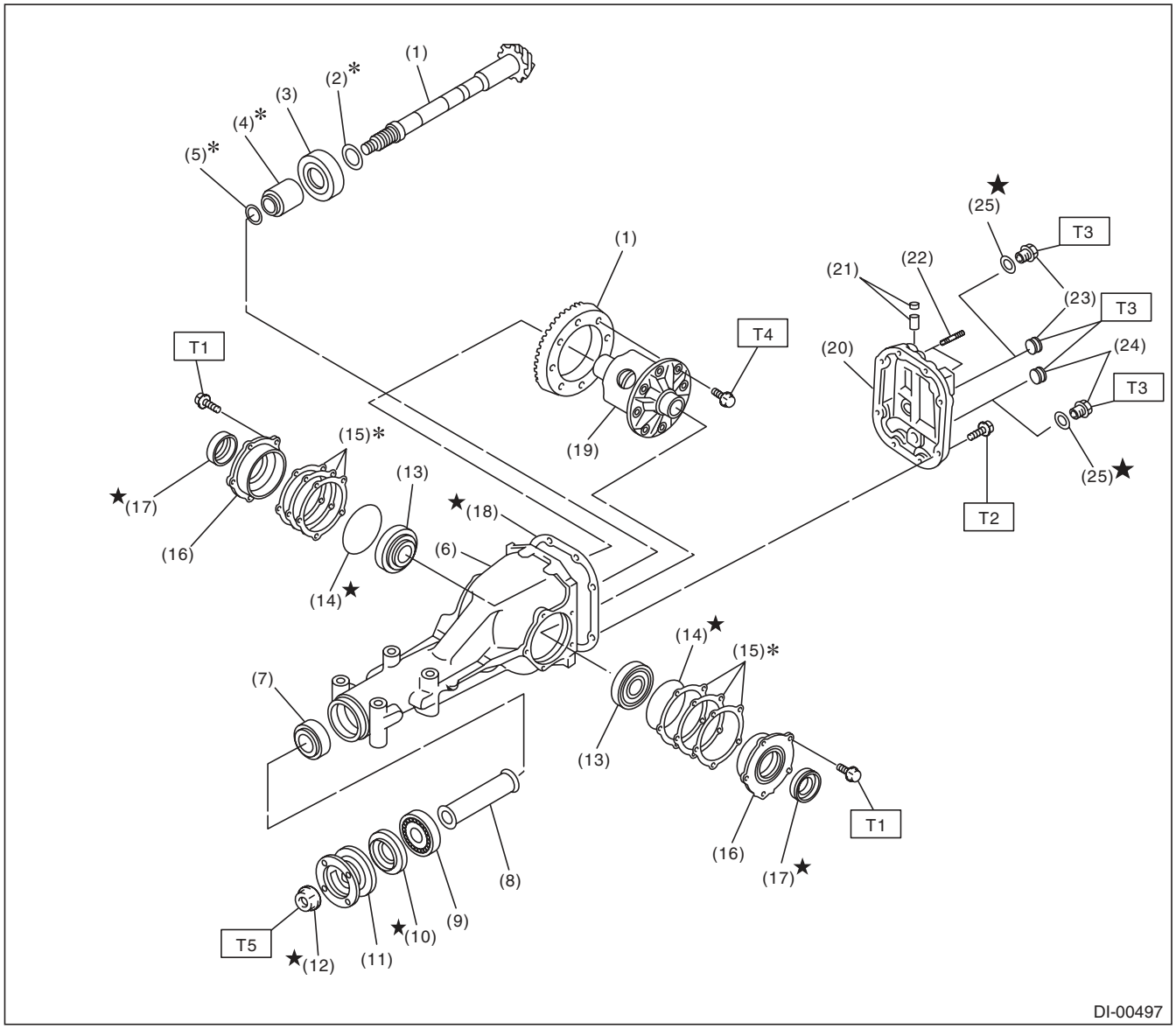
1. REAR DIFFERENTIAL WITHOUT LSD (T-TYPE)



(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting 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 retainer shim
(16) Side retainer
(17) Side oil seal
(18) Side gear thrust washer
(19) Side gear
(20) Pinion mate gear
(21) Pinion mate gear washer
(22) Pinion shaft lock pin
(23) Snap ring
(24) Pinion mate shaft
(25) Air breather cap
(26) Stud bolt
(27) Oil filler plug
(28) Oil drain plug
(29) Rear cover
(30) Differential case
(31) Gasket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 10.5 (1.1, 7.7)
T2: 29.5 (3.0, 21.8)
T3: 49 (5.0, 36.1)
T4: 103 (10.5, 76.0)
T5: 181.5 (18.5, 133.9)

2. REAR DIFFERENTIAL WITH LSD (T-TYPE)



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

Tightening torque:N·m (kgf-m, ft-lb)

T1: 10.5 (1.1, 7.7)

T2: 29.5 (3.0, 21.8) (Except for GT spec. B 6MT model)

44 (4.5, 32.5) (GT spec. B 6MT model)

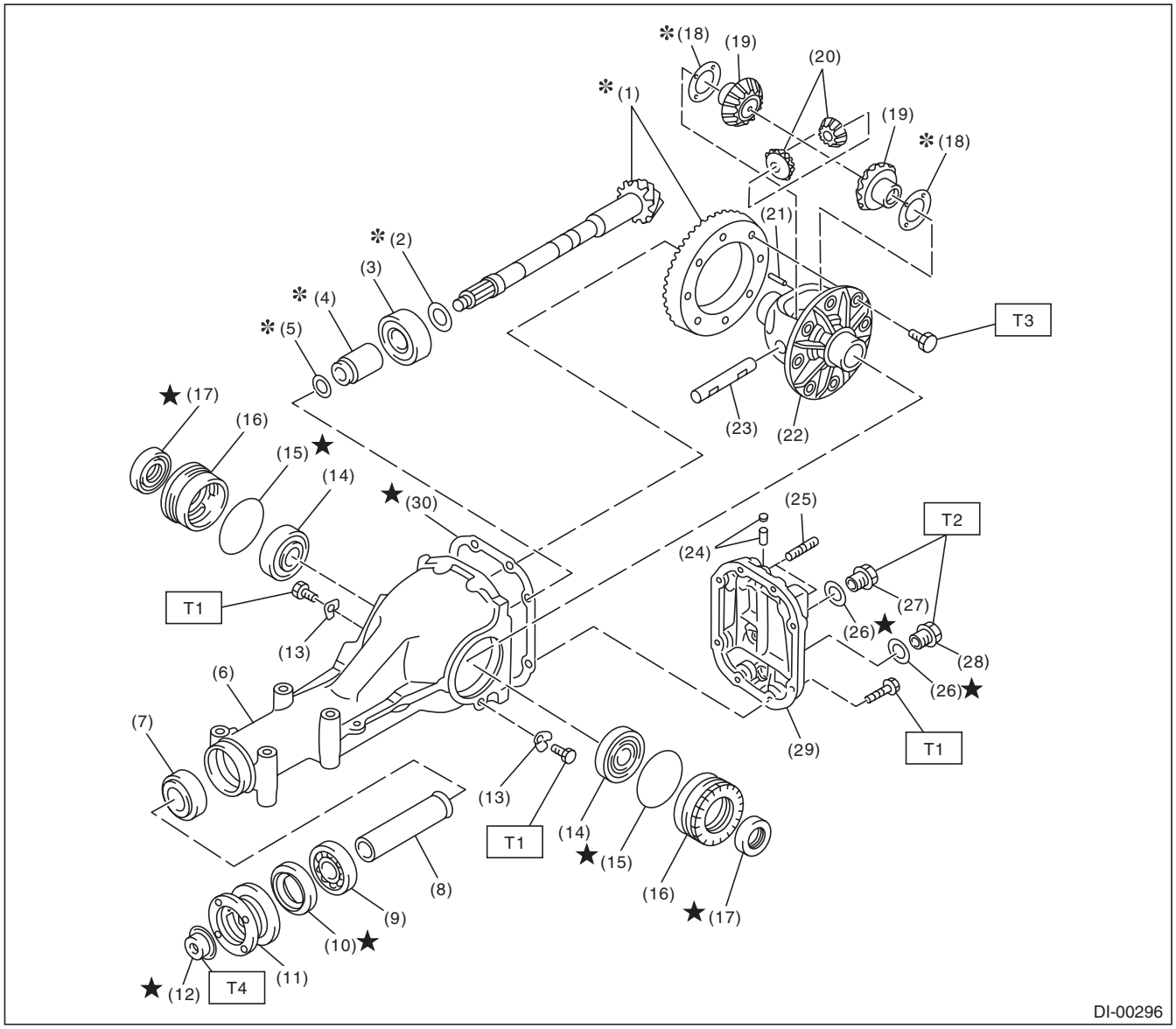
T3: 49 (5.0, 36.1) (Except for GT spec. B 6MT model)

60 (6.1, 44.3) (GT spec. B 6MT model)

T4: 103 (10.5, 76.0)

T5: 181.5 (18.5, 133.9)

3. REAR DIFFERENTIAL (VA1-TYPE)

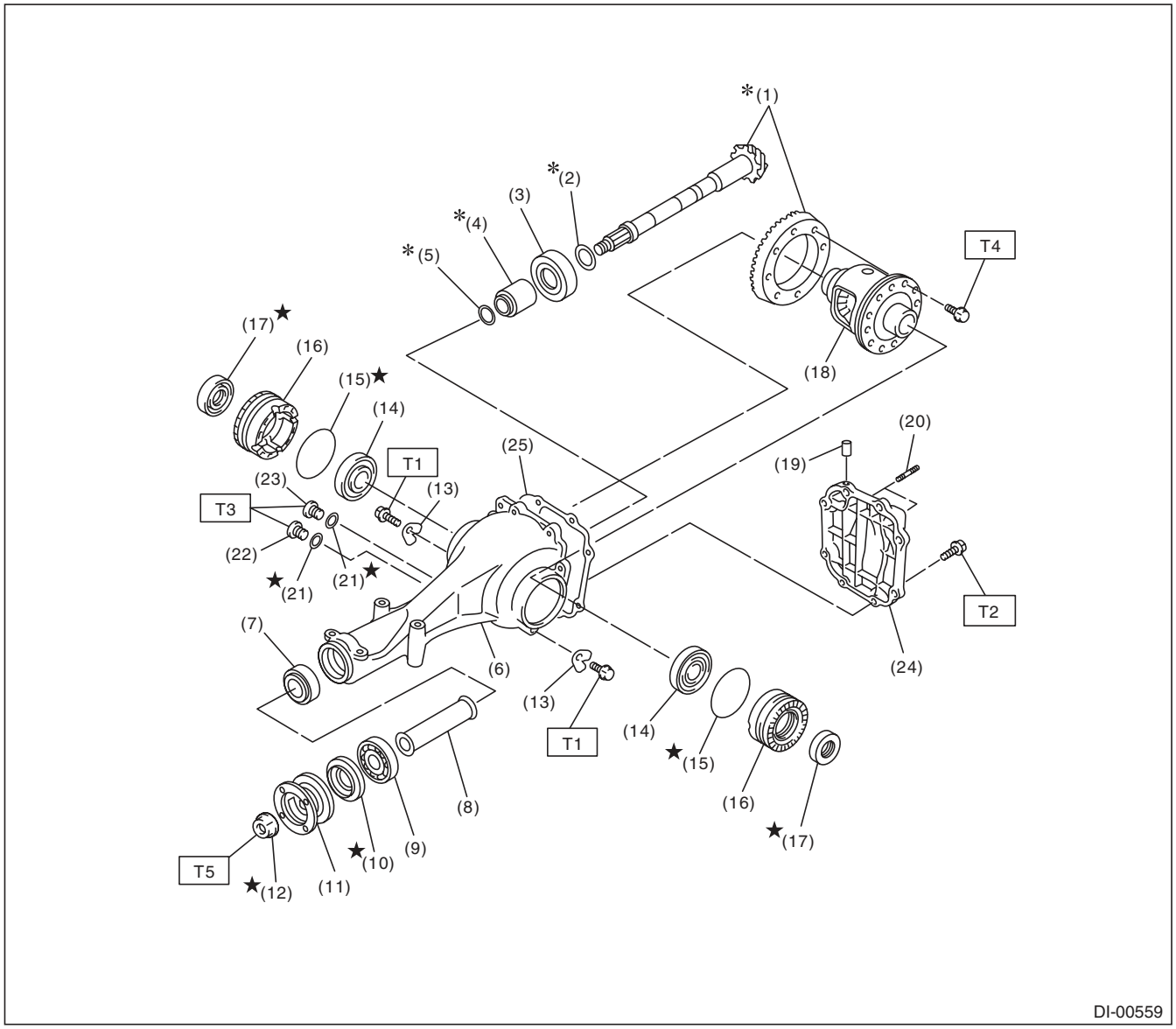


(1)	Hypoid driven gear and drive pinion set	(13)	Lock plate	(25)	Stud bolt
(2)	Pinion height adjusting washer	(14)	Side bearing	(26)	Gasket
(3)	Rear bearing	(15)	O-ring	(27)	Oil filler plug
(4)	Bearing preload adjusting spacer	(16)	Side retainer	(28)	Oil drain plug
(5)	Bearing preload adjusting washer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

Tightening torque:N·m (kgf-m, ft-lb)

T1: 25 (2.5, 18.4)
T2: 34 (3.5, 25.1)
T3: 62 (6.3, 45.7)
T4: 191 (19.5, 140.9)

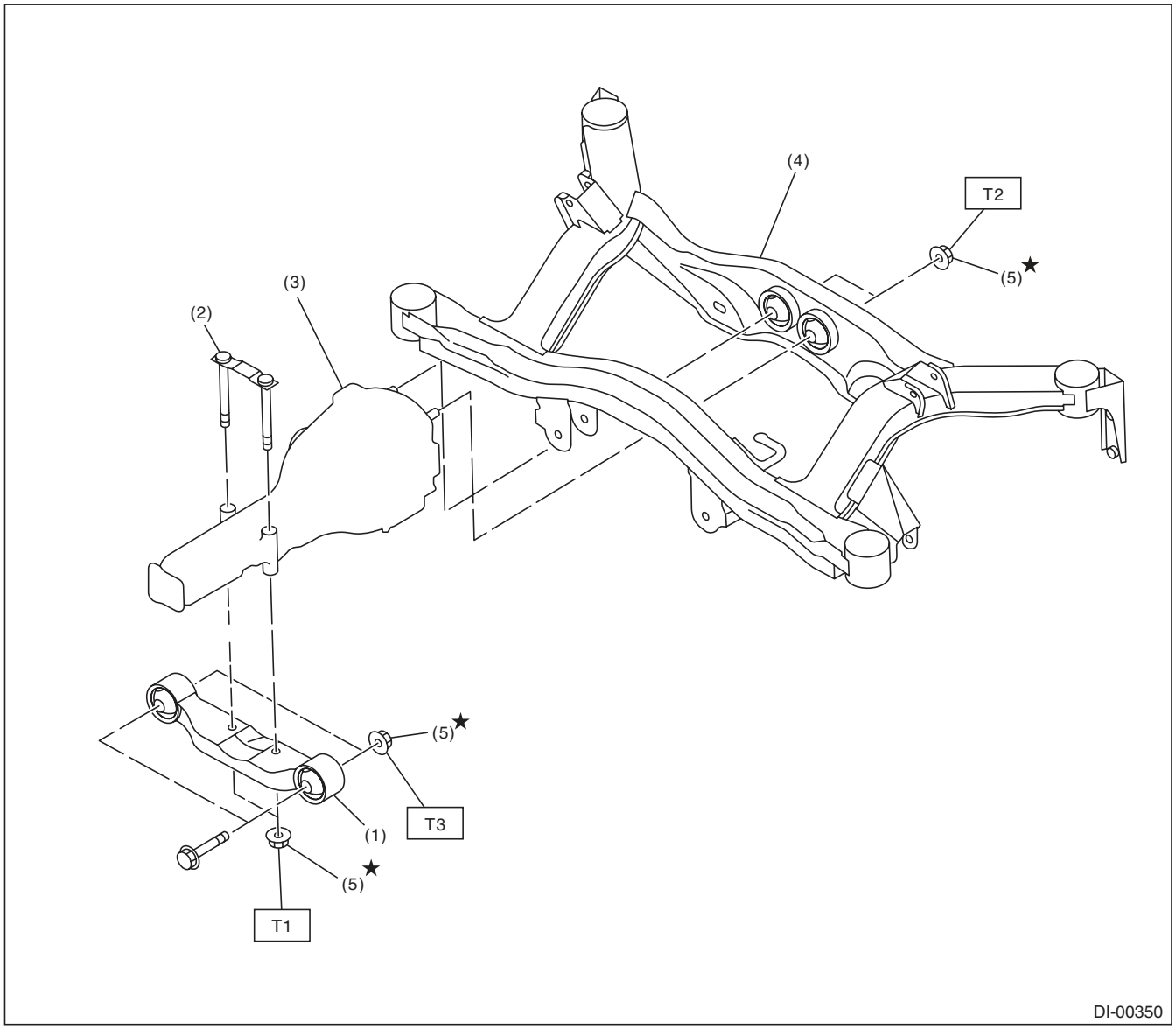
4. REAR DIFFERENTIAL (VA2-TYPE)



(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(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) Lock plate
(14) Side bearing
(15) O-ring
(16) Side retainer
(17) Side oil seal
(18) Differential case ASSY
(19) Air breather cap
(20) Stud bolt
(21) Gasket
(22) Oil filler plug
(23) Oil drain plug
(24) Rear cover
(25) Gasket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.4)
T2: 34 (3.5, 25.1)
T3: 50 (5.1, 36.9)
T4: 62 (6.3, 45.7)
T5: 191 (19.5, 140.9)

5. REAR DIFFERENTIAL MOUNTING SYSTEM



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

Tightening torque:N·m (kgf-m, ft-lb)
T1: 50 (5.1, 36.9)
T2: 70 (7.1, 51.6)
T3: 110 (11.2, 81.1)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine gear oil, grease or the equivalent. Do not mix gear oil, grease, etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply gear oil onto sliding or revolving surfaces before installation.
- Before installing the O-ring or snap ring, apply a 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 cloth between the part and the vise.
- Avoid damaging the mating surface of the case.

D: PREPARATION TOOL

1. SPECIAL TOOL

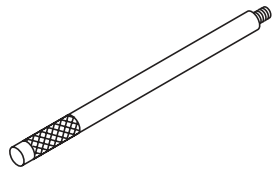
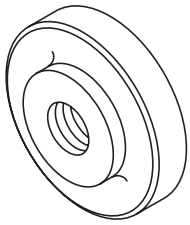
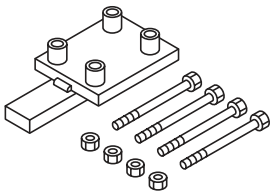
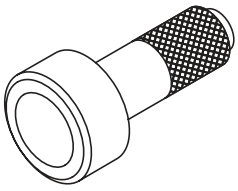
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing the front and rear bearing cones.
 ST-398477702	398477702	DRIFT	• Used for press-fitting the bearing cone of differential carrier (front). • For T-type
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear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

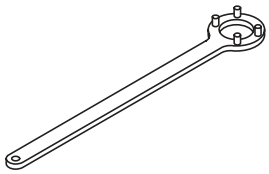
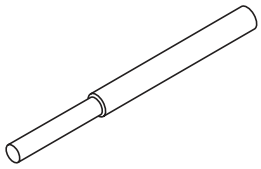
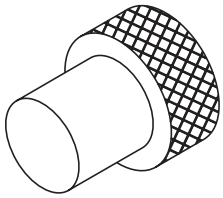
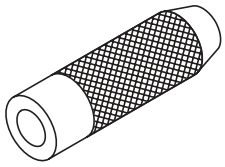
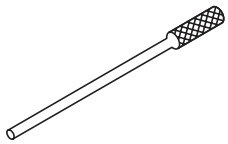
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498427200	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when removing and tightening self-lock nut.
 ST-398467700	398467700	DRIFT	• Used for removing pinion, pilot bearing and front bearing cone. • For T-type and VA1-type
 ST-399780104	399780104	WEIGHT	Used for installing the front bearing cone and the pilot bearing companion flange.
 ST-899580100	899580100	INSTALLER	Used for press-fitting the front bearing cone and pilot bearing.
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.

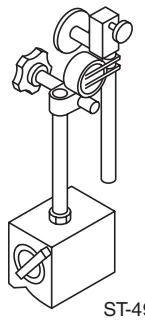
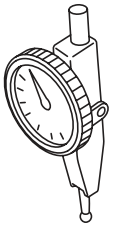
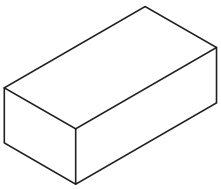
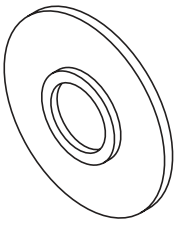
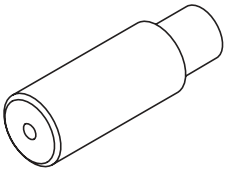
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used together with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used together with the MAGNET BASE (498247001).
 ST-398507704	398507704	BLOCK	• Used for adjusting pinion height and preload. • For T-type and VA1-type
 ST-398177700	398177700	INSTALLER	• Used for installing the rear bearing cone. • For T-type and VA2-type
 ST-398457700	398457700	ATTACHMENT	• Used for removing the side retainer. • For T-type

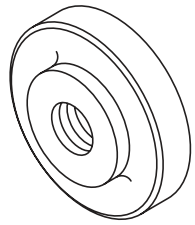
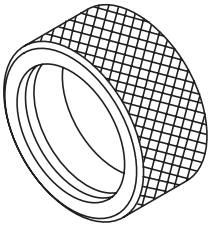
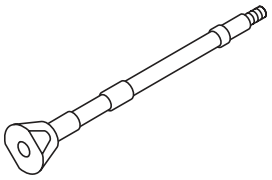
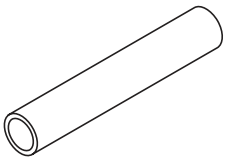
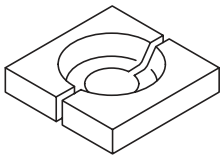
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477703	398477703	DRIFT 2	• Used for press-fitting bearing race (rear) of differential carrier. • For T-type and VA2-type
 ST-398437700	398437700	DRIFT	• Used for installing the side oil seal. • For T-type and VA2-type
 ST-398507702	398507702	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For T-type
 ST-398507703	398507703	DUMMY COLLAR	• Used for adjusting pinion height and preload. • For T-type
 ST-398517700	398517700	REPLACER	• Used for removing rear bearing cone. • For T-type and VA2-type

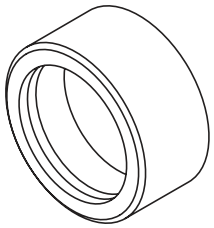
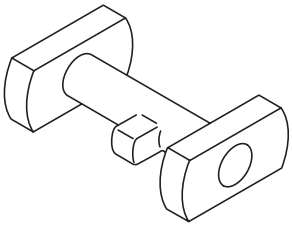
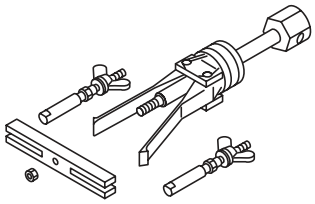
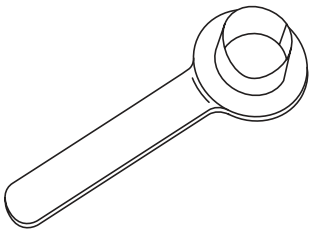
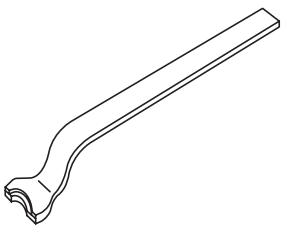
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398487700	398487700	DRIFT	• Used for press-fitting side bearing cone. • For T-type and VA2-type
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For T-type
 ST-398527700	398527700	PULLER ASSY	• Used for removing front oil seal. • Used for removing side bearing cup. (T-type and VA1-type)
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to the rear differential. • For oil seal protection
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	• Used for removing the rear drive shaft from rear differential. • For T-type

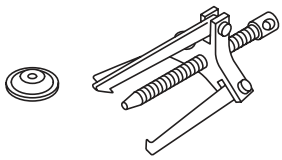
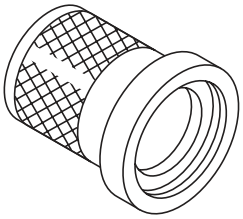
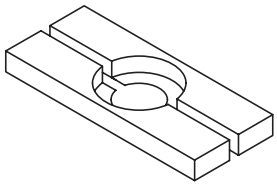
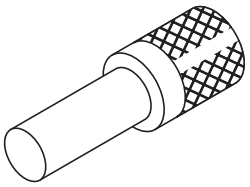
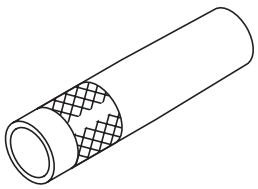
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-899874100	899874100	INSTALLER	Used for installing the companion flange.
 ST-498077000	498077000	REMOVER	• Used for removing the differential side bearing cone. • For VA2-type
 ST-899864100	899864100	REMOVER	Used for removing the differential side bearing.
 ST-499277200	499277200	INSTALLER	• Used for installing the front bearing cone. • For VA2-type

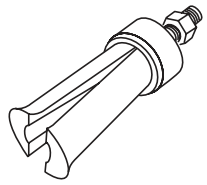
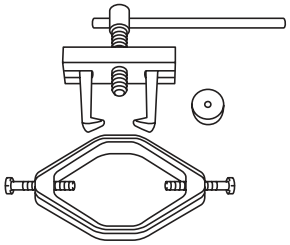
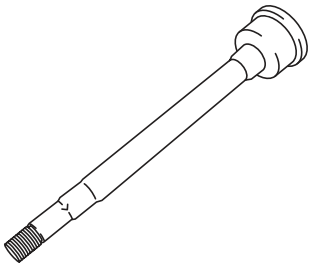
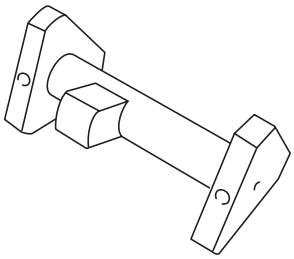
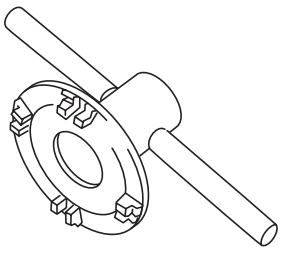
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18758AA000	18758AA000	PULLER	• Used for removing side bearing cup. • For VA2-type
 ST18759AA000	18759AA000	PULLER ASSY	• Used for removing the differential side bearing cone. • For T-type
 ST18678AA000	18678AA000	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For VA2-type
 ST18831AA010	18831AA010	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For VA2-type
 ST18630AA010	18630AA010	WRENCH COMPL RETAINER	• Used for removing and installing the side oil seal holder. • For VA-type • WRENCH ASSY (499787000) can also be used.

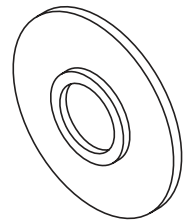
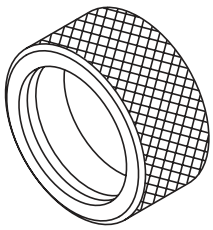
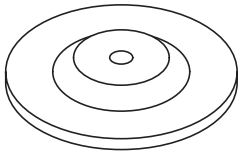
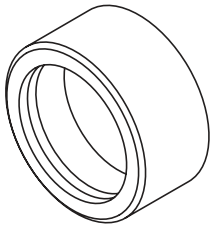
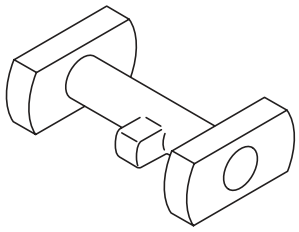
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498175500	498175500	INSTALLER	• Used for installing the rear bearing cone. • For VA1-type
 ST-498447100	498447100	INSTALLER	• Used for installing the oil seal. • For VA1-type and T-type
 ST-399520105	399520105	SEAT	• Used for removing the side bearing cone. • Used together with the PULLER SET (899524100). • For VA-type
 ST-498485400	498485400	DRIFT	• Used for installing side bearing cone. • For VA1-type
 ST-498505501	498505501	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For VA1-type

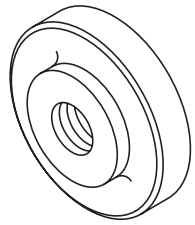
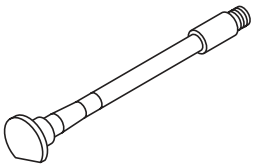
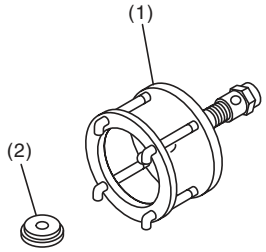
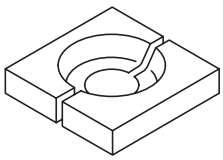
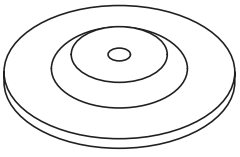
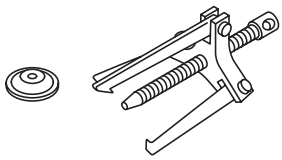
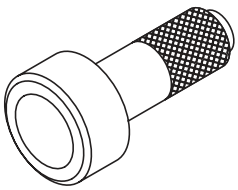
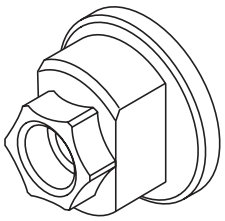
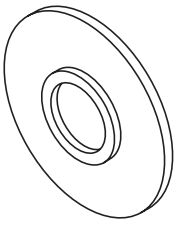
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498447110	498447110	DRIFT	• Used for press-fitting the bearing race (front) of the differential carrier. • For VA1-type
 ST-498447150	498447150	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For VA1-type
 ST-899524100	899524100	PULLER SET	Used for removing the differential side bearing cone. (1) Puller (2) Cap
 ST-498515500	498515500	REPLACER	• Used for removing rear bearing cone. • For VA1-type
 ST-499705404	499705404	SEAT	• Used for removing the side bearing race. • Used together with PULLER ASSY (499705401). • For VA1-type

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499705401	499705401	PULLER ASSY	• Used for removing the side bearing race. • Used together with SEAT (499705404). • For VA-type
 ST-398417700	398417700	DRIFT	• Used for installing side bearing race. • For T-type and VA2-type
 ST-498937110	498937110	HOLDER DRIVE PINION	• Used for installing the pilot bearing. • For T-type
 ST18674AA000	18674AA000	INSTALLER	• Used for installing the rear bearing cone. • For T-type

2. GENERAL TOOL

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

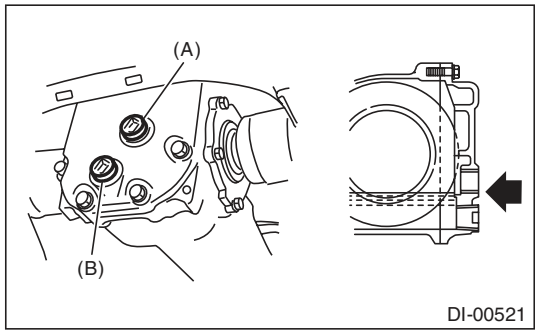
2. Differential Gear Oil

A: INSPECTION

1) Remove the filler plug, and then check the gear oil. Replace the gear oil if it is contaminated or deteriorated. <Ref. to DI-26, REPLACEMENT, Differential Gear Oil.>
2) Check that the gear oil level is within –5 mm (–0.2 in) from the bottom of the filler plug hole. If the level is low, confirm that there is no oil leakage and refill up to the bottom of filler plug.

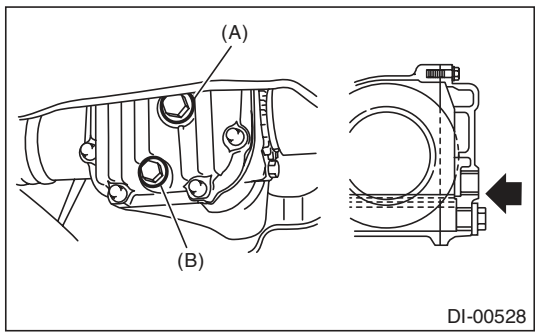
NOTE:
On VA1-types at factory settings, the oil level may be within –14 mm (–0.6 in) from the bottom of the filler plug. This is at normal level, requiring no oil refill.

- T-type



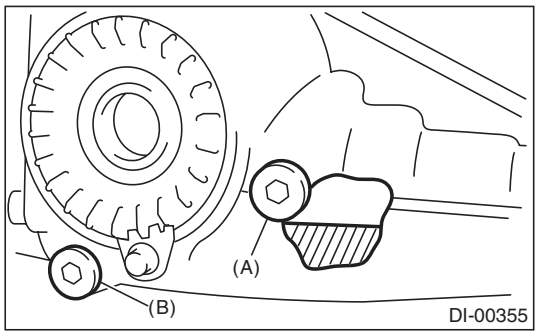
(A) Filler plug
(B) Oil drain plug

- VA1-type



(A) Filler plug
(B) Oil drain plug

- VA2-type



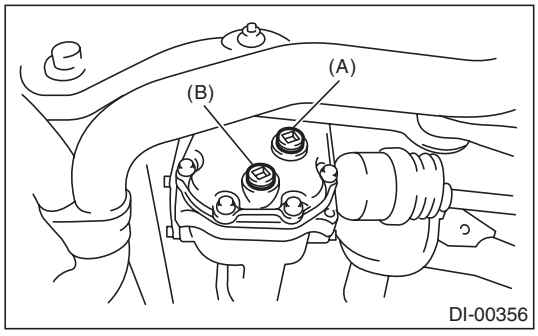
(A) Filler plug
(B) Oil drain plug

B: REPLACEMENT

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

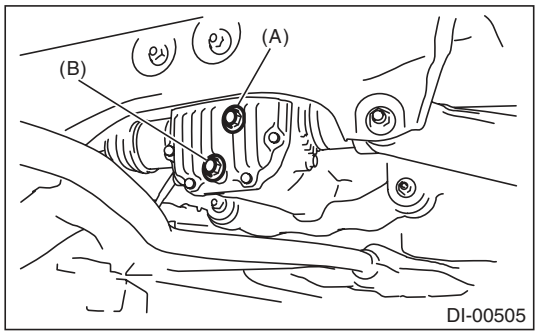
CAUTION:
Be careful not to burn your hands, because gear oil becomes extremely hot after running.

- T-type



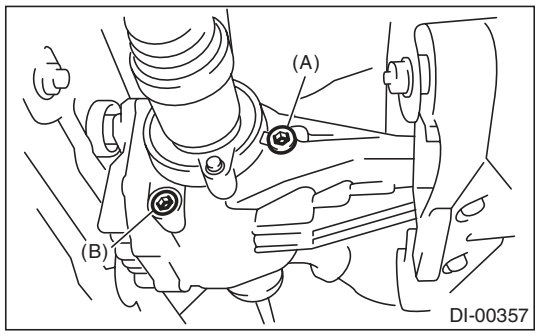
(A) Filler plug
(B) Oil drain plug

- VA1-type



(A) Filler plug
(B) Oil drain plug

• VA2-type



(A) Filler plug
(B) Oil drain plug

3) Tighten the oil drain plug.

NOTE:
• Apply liquid gasket to the drain plug for the T-type (except for GT spec. B 6MT model).

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

• Use a new gasket for the VA-type and T-type (GT spec. B 6MT model).

Tightening torque:
T-type (except for GT spec.B 6MT model):
49 N·m (5.0 kgf-m, 36.1 ft-lb)
T-type (GT spec. B 6MT model):
60 N·m (6.1 kgf-m, 44.3 ft-lb)
VA1-type:
34 N·m (3.5 kgf-m, 25.1 ft-lb)
VA2-type:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

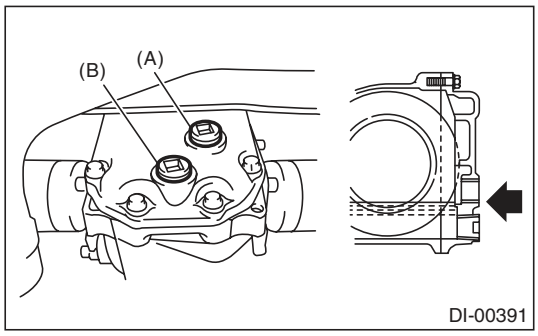
4) Fill the differential carrier with gear oil to the bottom of filler plug.

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

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

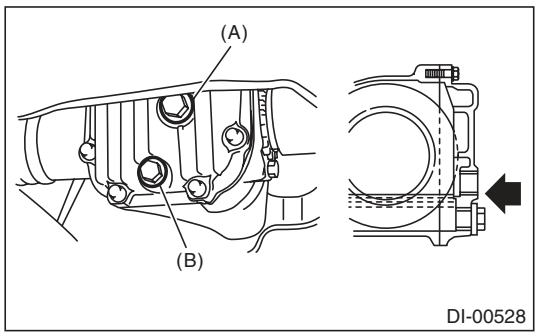
Oil capacity:
Except for GT spec. B 6MT model:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)
GT spec. B 6MT model:
1.0 ℓ (1.1 US qt, 0.9 Imp qt)

• T-type



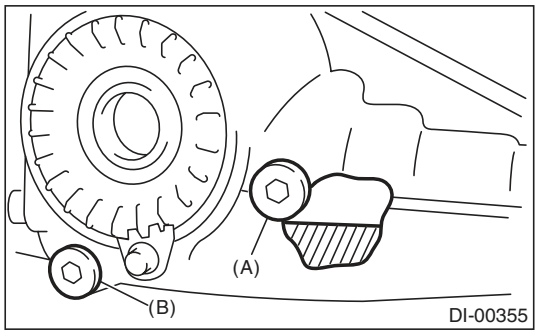
(A) Filler plug
(B) Oil drain plug

• VA1-type



(A) Filler plug
(B) Oil drain plug

• VA2-type



(A) Filler plug
(B) Oil drain plug

5) Install the filler plug.

NOTE:
• Apply liquid gasket to the filler plug for the T-type (except for GT spec. B 6MT model).

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent
• Use a new gasket for the VA-type and T-type (GT spec. B 6MT model).

Tightening torque:
T-type (except for GT spec.B 6MT model):
49 N·m (5.0 kgf-m, 36.1 ft-lb)
T-type (GT spec. B 6MT model):
60 N·m (6.1 kgf-m, 44.3 ft-lb)
VA1-type:
34 N·m (3.5 kgf-m, 25.1 ft-lb)
VA2-type:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

3. Front Differential Assembly

A: NOTE

1. AT MODEL

• 4AT

For front differential of 4AT model, refer to “4AT” section. <Ref. to 4AT-95, Front Differential Assembly.>

• 5AT

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

2. MT MODEL

• 5MT

For front differential for the 5MT model, refer to the “5MT” section. <Ref. to 5MT-69, Front Differential Assembly.>

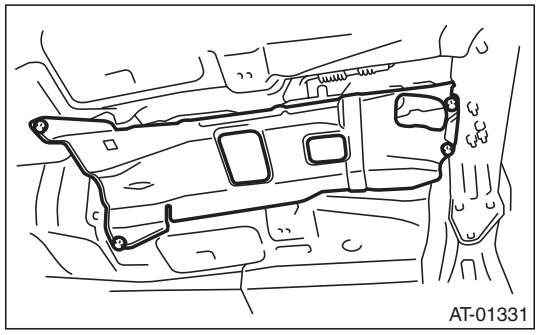
• 6MT

For front differential for the 6MT model, refer to the “6MT” section. <Ref. to 6MT-100, Front Differential Assembly.>

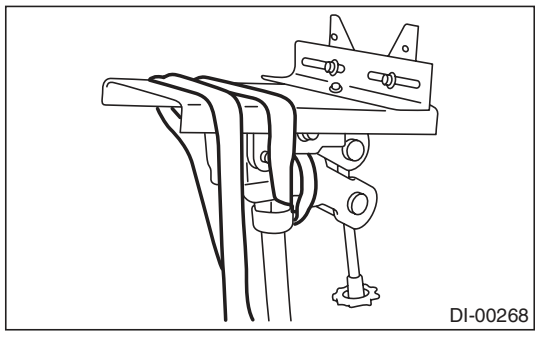
4. Rear Differential (T-type)

A: REMOVAL

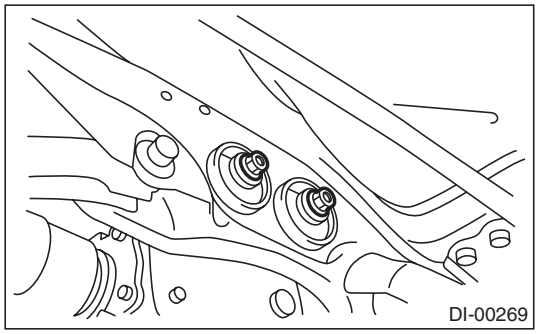
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Shift the select lever or gear shift lever to neutral.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Lift up the vehicle.
7) Remove the wheels.
8) Drain the differential gear oil. <Ref. to DI-26, REPLACEMENT, Differential Gear Oil.>
9) Remove the rear exhaust pipe and muffler.
• 2.5 L SOHC non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
• 2.5 L DOHC turbo model
<Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
10) Remove the heat shield cover.


AT-01331

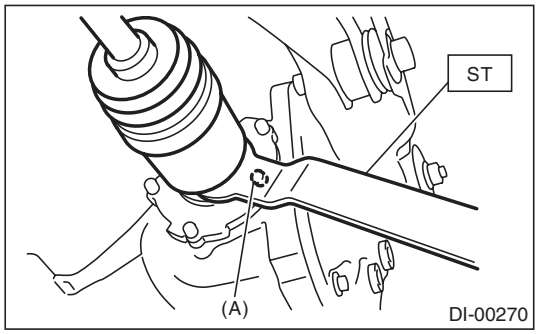
11) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
12) Prepare the transmission jack and band.


DI-00268

13) Loosen the self-lock nuts which hold the rear differential to rear crossmember.


DI-00269

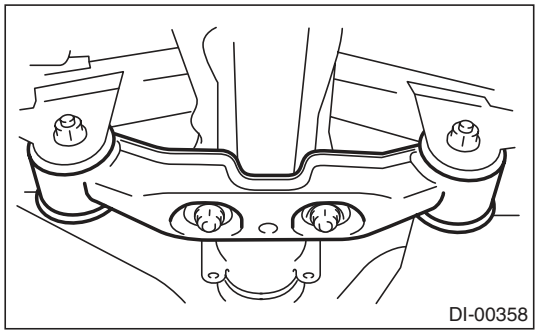
14) Remove the DOJ of rear drive shaft from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER



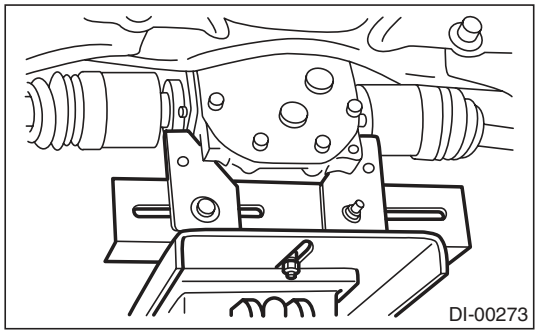
DI-00270

(A) Bolt

15) Remove the rear differential front member.


DI-00358

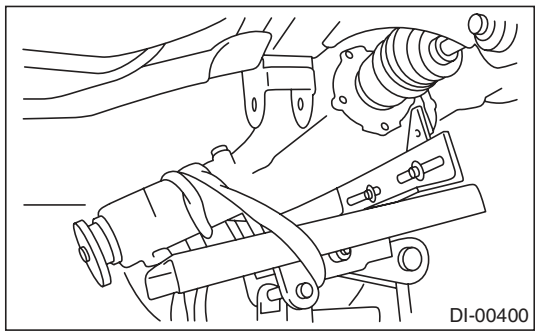
16) Support the rear differential with the transmission jack.


DI-00273

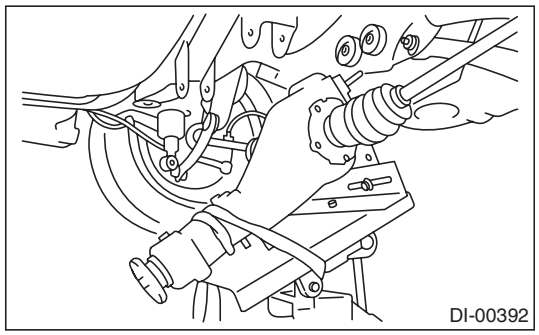
17) Secure the rear differential using band.
18) Remove the self-lock nuts which hold the rear differential to the crossmember.

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

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

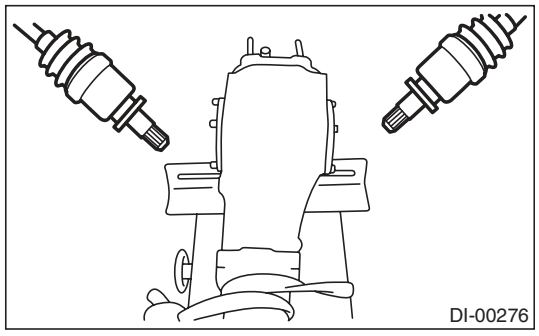


20) Lower the transmission jack stand after removing the rear differential stud bolt from the rear crossmember. Rear drive shaft should not come into contact with the lateral link bolt.



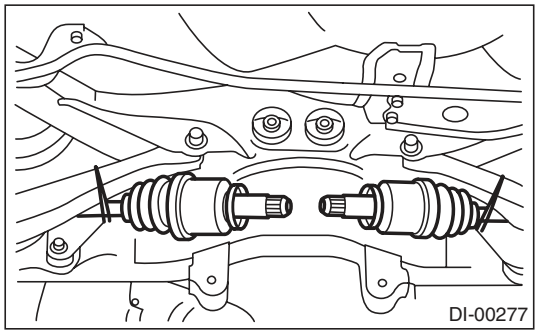
21) Pull out the axle shaft from rear differential.

NOTE:
If it is difficult to remove the axle shaft from the rear differential, remove it using a ST.
ST 28099PA100 DRIVE SHAFT REMOVER

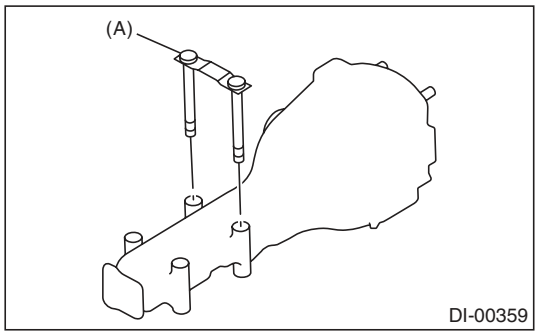


22) Lower the transmission jack.

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



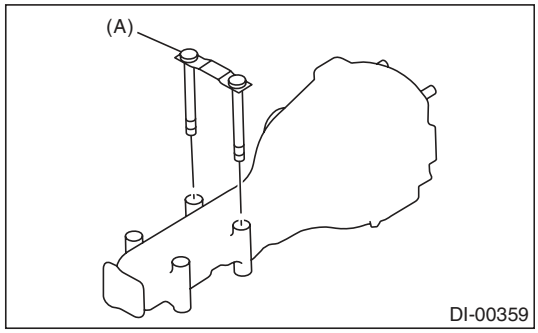
24) Remove the rear differential member plate from rear differential.



(A) Rear differential member plate

B: INSTALLATION

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

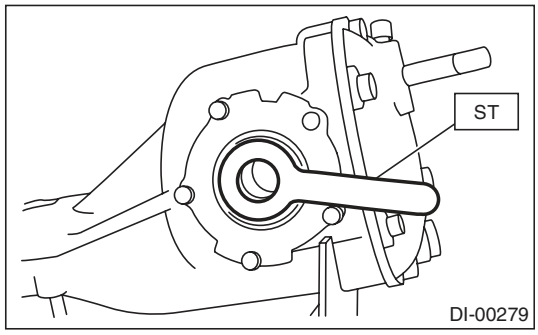


(A) Rear differential member plate

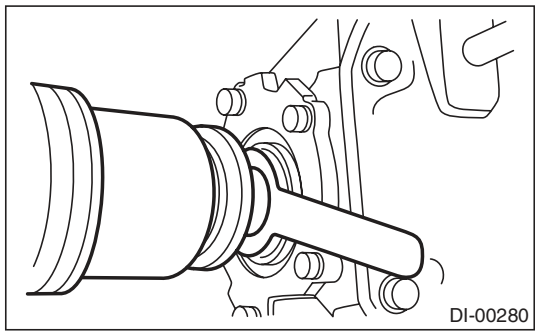
2) Set the rear differential to transmission jack.

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

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

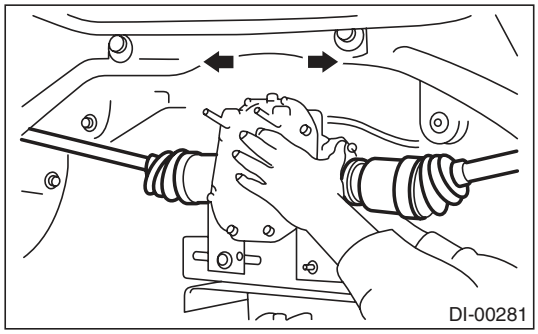


4) Insert the spline shaft until the spline portion comes inside the side oil seal.

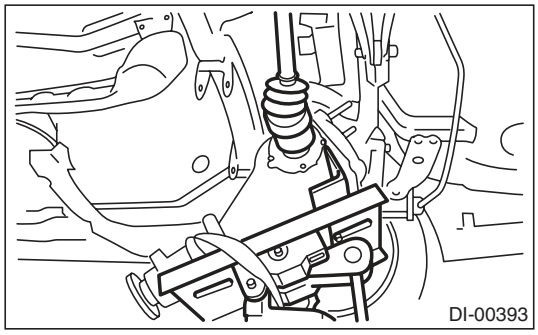


5) Remove ST from rear differential.

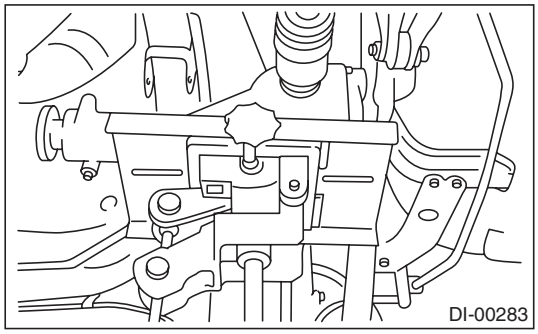
6) Push the rear differential to insert the axle shaft into rear differential.



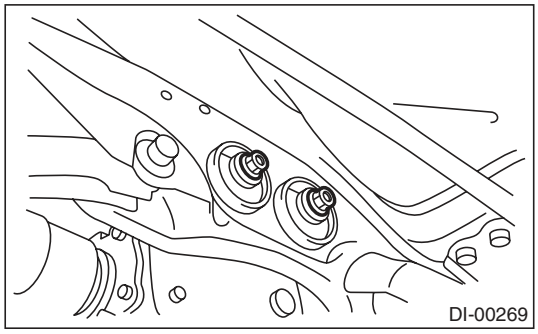
7) Adjust the transmission jack, if necessary, and insert the rear differential stud bolt into rear crossmember bushing properly.



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

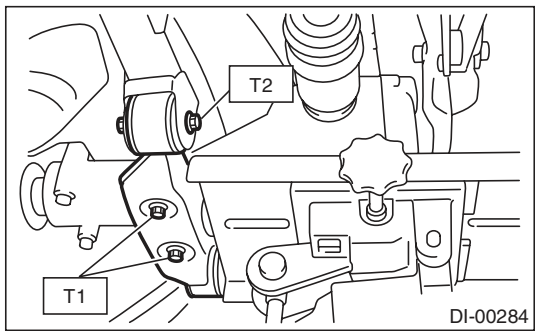


9) Tighten a new self-locking nut temporarily to rear crossmember.



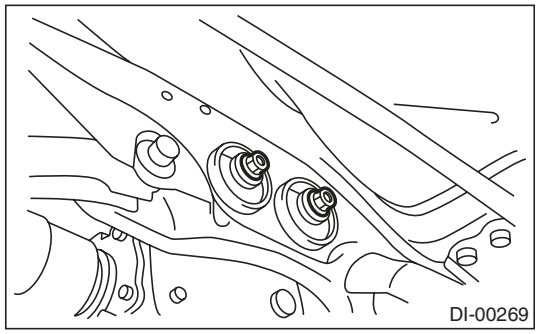
10) Remove the band from rear differential. Lift up the rear differential until the rear differential is separated from the transmission jack.
11) Install the rear differential front member with a new self-locking nut.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)

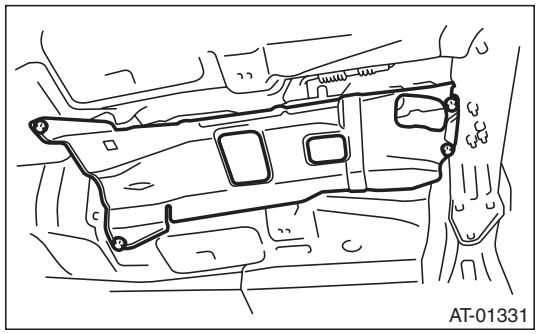


12) Tighten the self-locking nut.

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

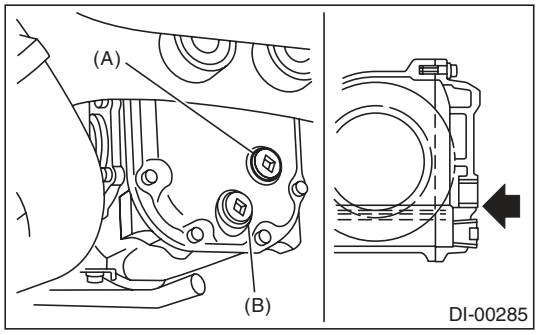


13) Lower the transmission jack.
14) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
15) Install the heat shield cover.



16) Install the rear exhaust pipe and muffler.
• 2.5 L SOHC non-turbo model
<Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
• 2.5 L DOHC turbo model
<Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
17) After installing the rear differential carrier to the vehicle, remove the filler plug, and refill with gear oil up to the lower lip of the plug hole.

Oil capacity:
Except for GT spec. B 6MT model:
0.8 ℓ (0.8 US qt, 0.7 lmp qt)
GT spec. B 6MT model:
1.0 ℓ (1.1 US qt, 0.9 lmp qt)



(A) Filler plug
(B) Oil drain plug

18) Tighten the filler plug.

NOTE:
• Apply liquid gasket to the filler plug. (Except for GT spec. B 6MT model)

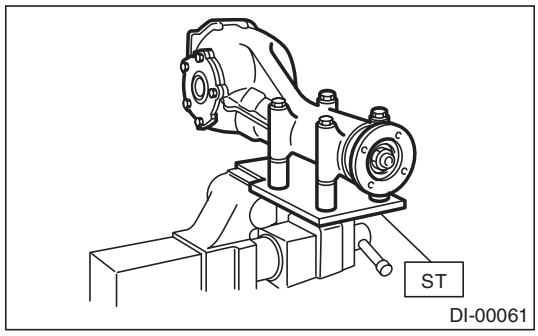
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent
• Use a new gasket. (GT spec. B 6MT model)

Tightening torque:
Except for GT spec. B 6MT model:
49 N·m (5.0 kgf-m, 36.1 ft-lb)
GT spec. B 6MT model:
60 N·m (6.1 kgf-m, 44.3 ft-lb)
19) Hereafter, install in the reverse order of removal.

C: DISASSEMBLY

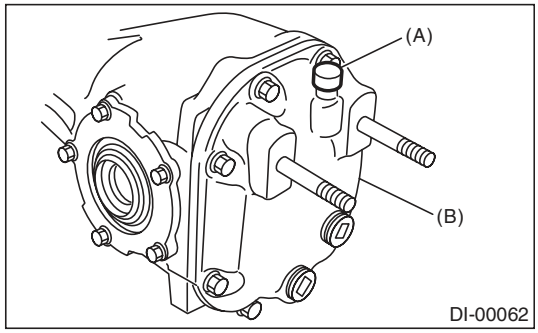
To detect the real cause of trouble, inspect the following items before disassembling.
- Tooth contact and backlash of hypoid driven gear and drive pinion.
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

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



2) Remove the oil drain plug and filler plug, and drain the gear oil.
3) Remove the air breather cap.

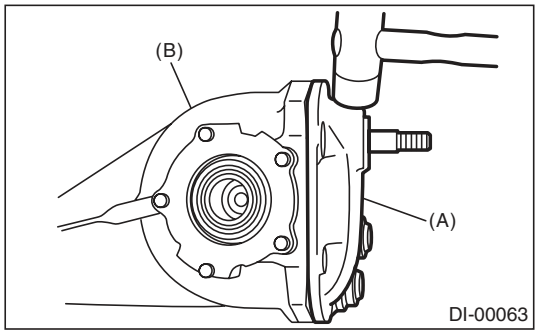
NOTE:
- Do not attempt to replace the air breather cap unless necessary.
- Whenever the air breather cap is removed, replace it with a new part.



(A) Air breather cap
(B) Rear cover

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

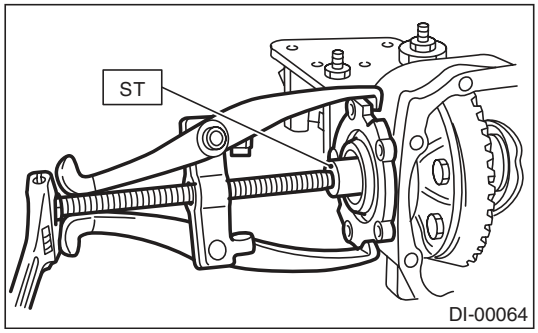
NOTE:
Remove by tapping with a plastic hammer.



(A) Rear cover
(B) Differential carrier

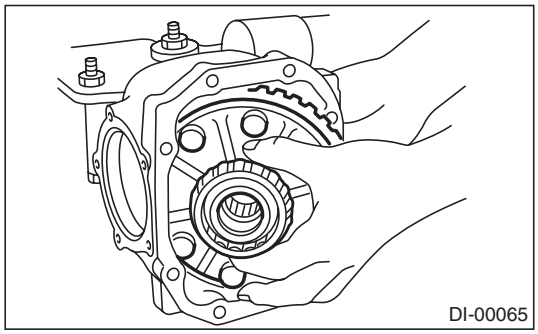
5) Keep the side retainers separate in order to easily identify RH and LH sides. Remove the side retainer mounting bolts, set the ST to differential case, and extract the side retainers RH and LH with a puller.

NOTE:
Side retainer shim of each side should be kept together with its mating retainer.
ST 398457700 ATTACHMENT

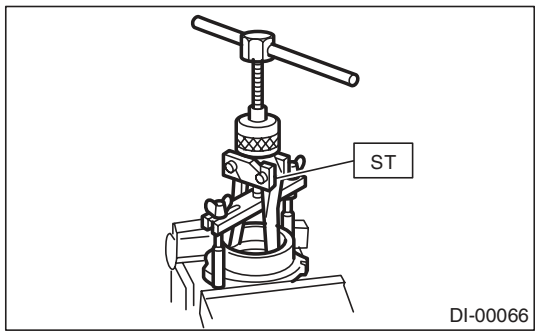


6) Pull out the differential case assembly from differential carrier.

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

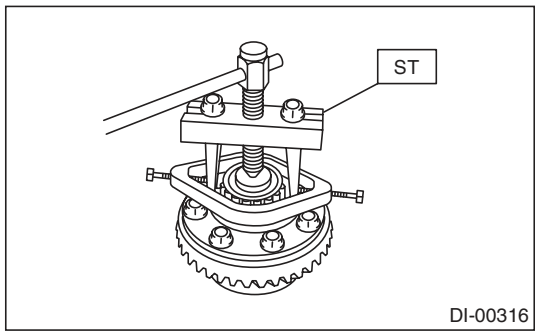


7) When replacing the side bearing, remove the bearing cup from the side retainer using ST.
ST 398527700 PULLER ASSY

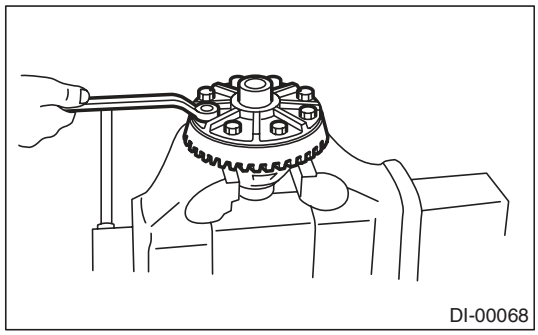


8) Remove the bearing cone with ST.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of the bearing cone.
• Store so that the right and left side bearing races and cones are not mixed together.
ST 18759AA000 PULLER ASSY

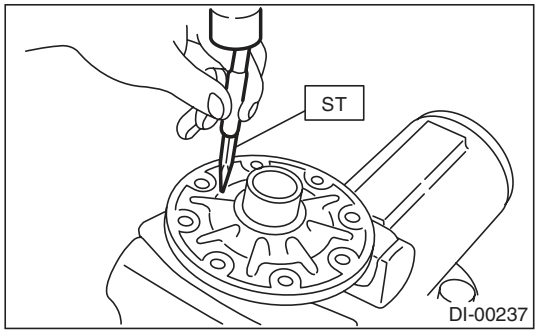


9) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



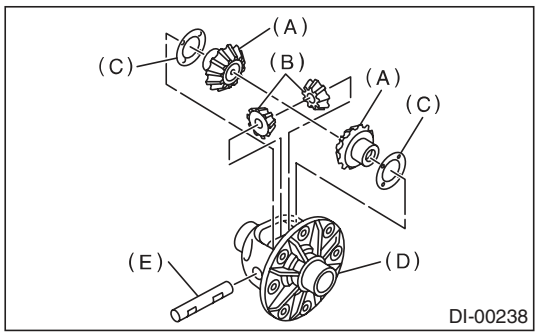
10) Drive out the pinion shaft lock pin from the hypoid driven gear side. (Model without LSD)

NOTE:
The lock pin is staked at the pin hole end on the differential carrier. Do not drive it out forcibly before removing the stake.
ST 899904100 STRAIGHT PIN REMOVER



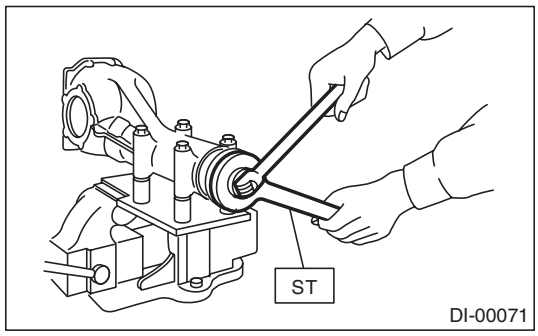
11) Draw out the pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Model without LSD)

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

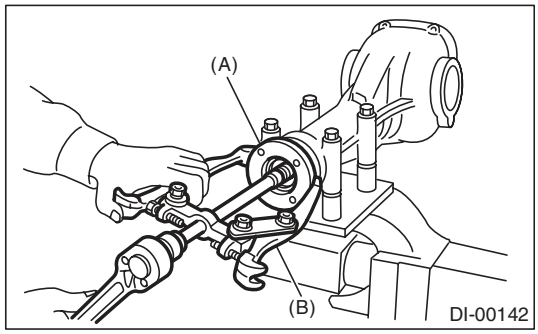


(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

12) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



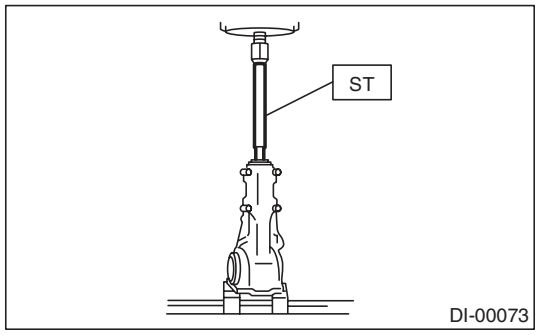
13) Extract the companion flange with a puller.



(A) Companion flange
(B) PULLER

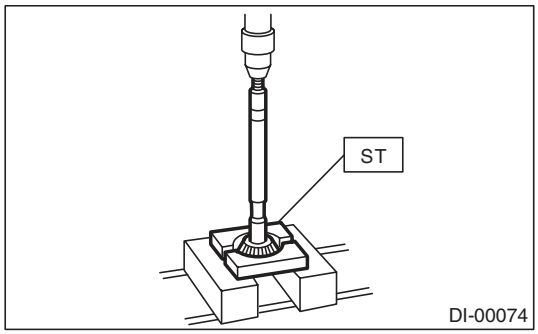
14) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjusting washer and washer.

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

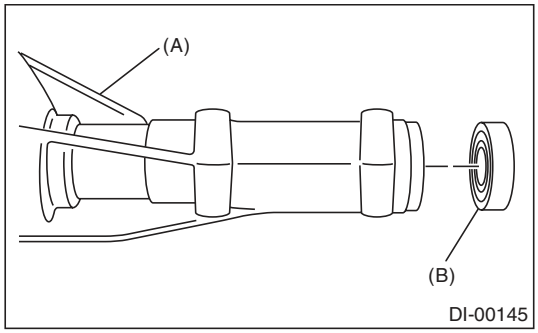


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

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

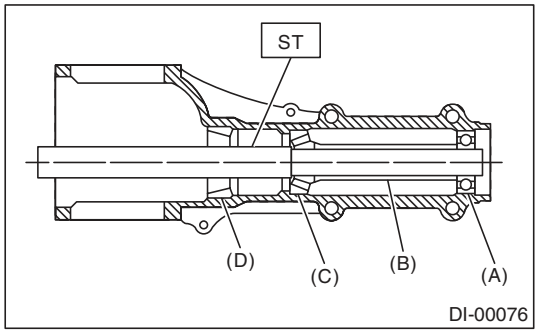


16) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



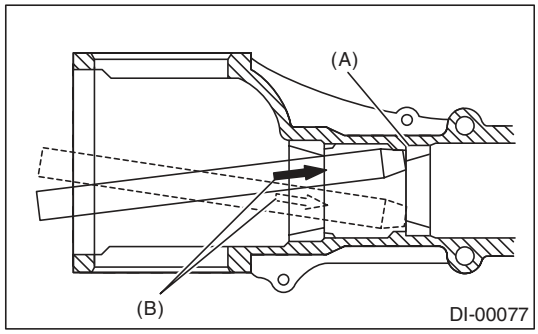
(A) Differential carrier
(B) Front oil seal

17) Remove the pilot bearing together with the front bearing cone and spacer using the 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 using a brass bar.

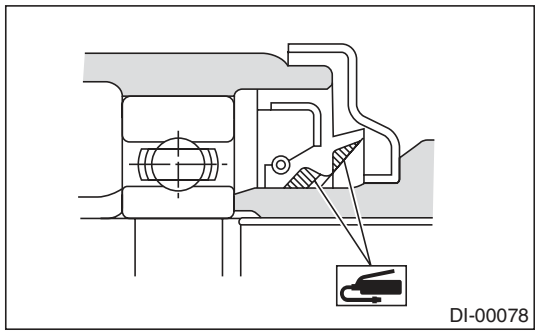


(A) 2 cutout portions along diagonal lines
(B) Tap alternately with a brass bar.

D: ASSEMBLY

1. EXCEPT FOR GT SPEC. B 6MT MODEL

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

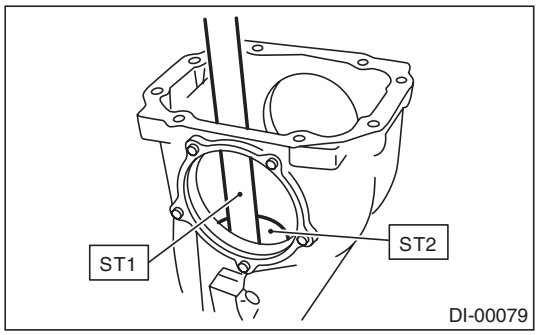


1) Adjusting preload for front and rear bearings

NOTE:
Adjust the bearing preload between front and rear bearings with spacer and washer. Pinion height adjusting washer is not affected by this adjustment. The adjustment must not be carried out with oil seal inserted.

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

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



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

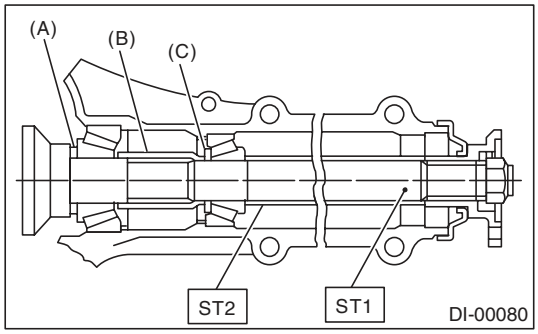
ST1 398477701 HANDLE
ST2 398477702 DRIFT

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

NOTE:
• If tooth contact is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.
• Use new rear bearing cone.

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

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



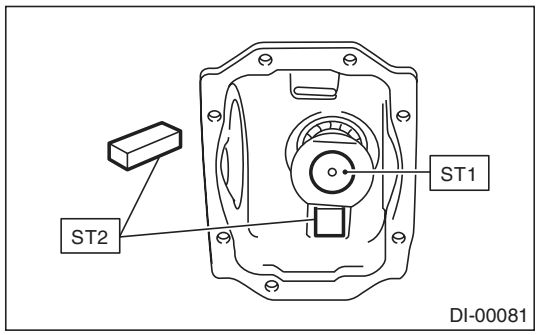
(A) Pinion height adjusting washer
(B) Preload adjusting spacer
(C) Preload adjusting washer

(5) Turn the ST1 by hand to smooth the bearing, and tighten the self-locking nut while measuring the initial load or initial torque with a spring scale or torque wrench. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

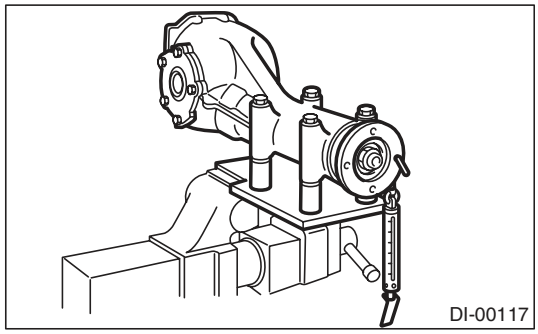
NOTE:
- Use a new self-locking nut.
- Measure the preload in direction of tangent to the flange.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.

ST1 398507702 DUMMY SHAFT
ST2 398507704 BLOCK

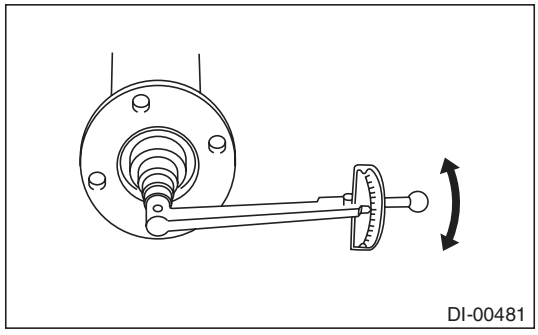
Tightening torque:
181.5 N·m (18.5 kgf-m, 133.9 ft-lb)



Initial load:
17.7 — 38.8 N (1.8 — 4.0 kgf, 4.0 — 8.7 lb)



Initial torque:
0.67 — 1.47 N·m
(0.07 — 0.15 kgf-m, 0.49 — 1.08 ft-lb)



Preload adjusting washer	
Part No.	Thickness 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)

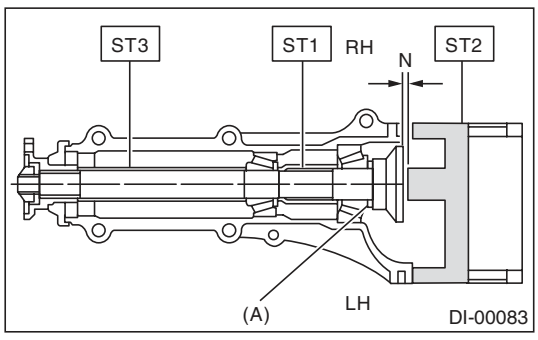
Preload adjusting spacer	
Part No.	Length mm (in)
383695201	56.2 (2.213)
383695202	56.4 (2.220)
383695203	56.6 (2.228)
383695204	56.8 (2.236)
383695205	57.0 (2.244)
383695206	57.2 (2.252)

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

(1) Attach ST2.

NOTE:
At this time, install a provisionally selected or previously used pinion height adjusting washer. Measure and record the thickness.

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

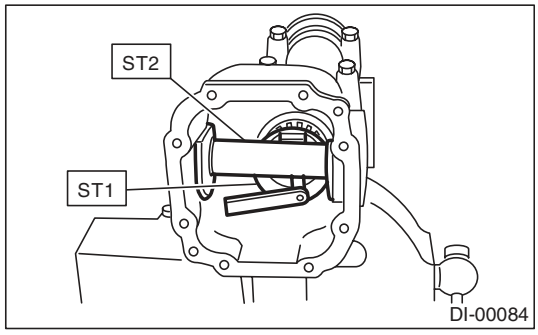


N Measured value

(A) Pinion height adjusting washer

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

NOTE:
Make sure there is no clearance between the case and ST2.
ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.
T = To + N – (H × 0.01) – 0.20 mm (0.008 in)

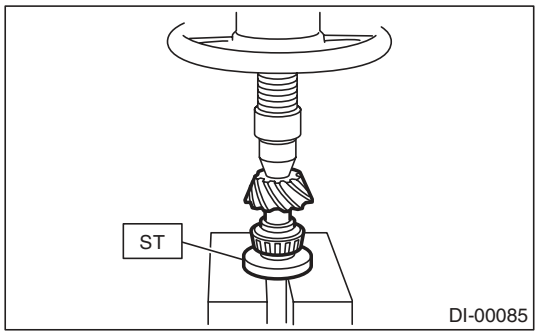
NOTE:
Use copies of this page.

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

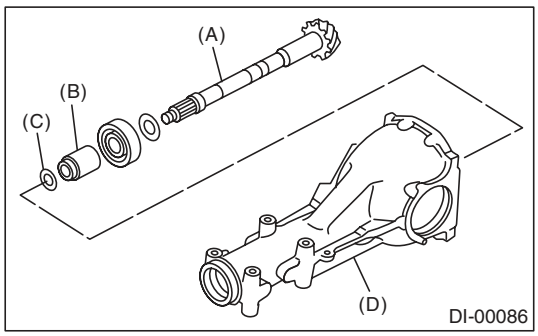
(Example of calculation)
To = 2.20 mm (0.0866 in) + 1.20 mm (0.0472 in) = 3.40 mm (0.1339 in)
N = 0.23 mm (0.0091 in)
H = + 1
T = 3.40 mm (0.1339 in) + 0.23 mm (0.0091 in) – 0.01 mm (0.0004 in) – 0.20 mm (0.0079 in) = 3.42 mm (0.1346 in)
Result: Thickness = 3.42 mm (0.1346 in)
Therefore use washer 383605200.

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

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

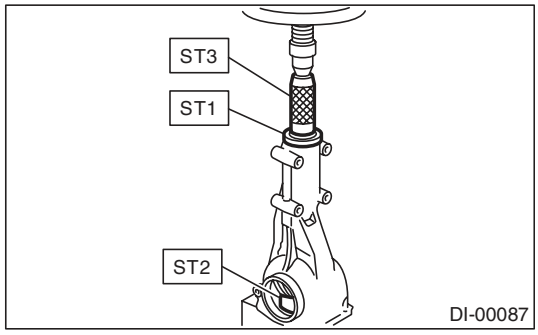


4) Insert the drive pinion into the differential carrier, and install the preselected bearing preload adjusting spacer and washer.

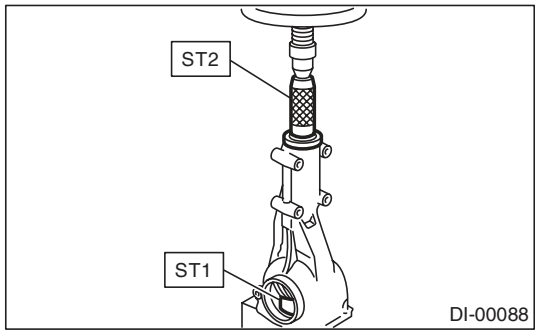


(A) Drive pinion
(B) Bearing preload adjusting spacer
(C) Bearing preload adjusting washer
(D) Differential carrier

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

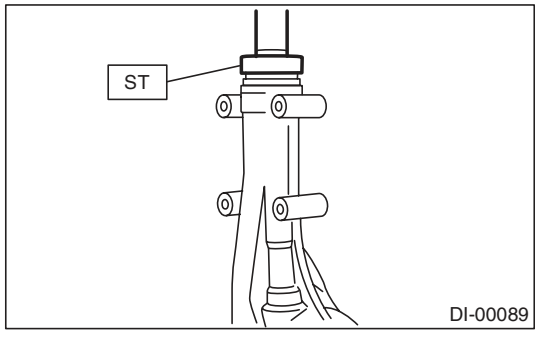


6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



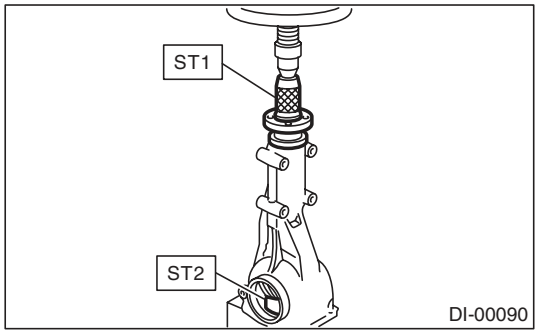
7) Fit a new oil seal with ST.

NOTE:
• Press-fit until the oil seal end comes 1 mm (0.04 in) inward from end of carrier.
• Apply the differential gear oil to the oil seal lips.
ST 498447120 INSTALLER



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

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

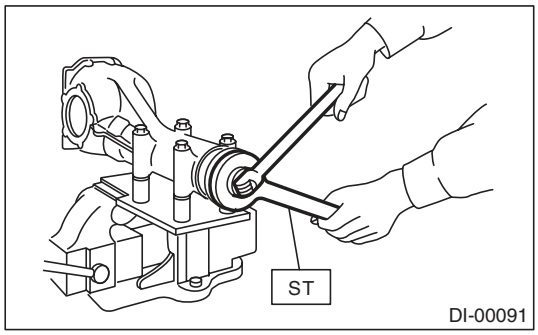


9) Apply seal material on the drive pinion shaft thread and new self-locking nut seat.

Seal material:
THREE BOND 1324 (Part No. 004403042) or equivalent

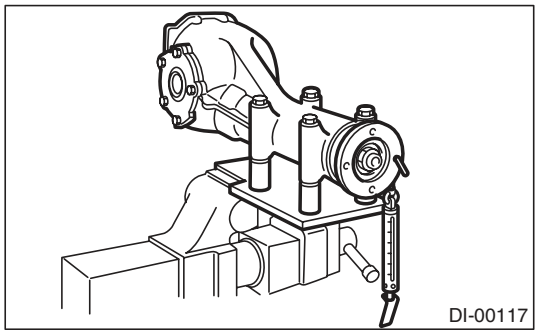
10) Attach a new self-locking nut and tighten using the ST.
ST 498427200 FLANGE WRENCH

Tightening torque:
181.5 N·m (18.5 kgf-m, 133.9 ft-lb)

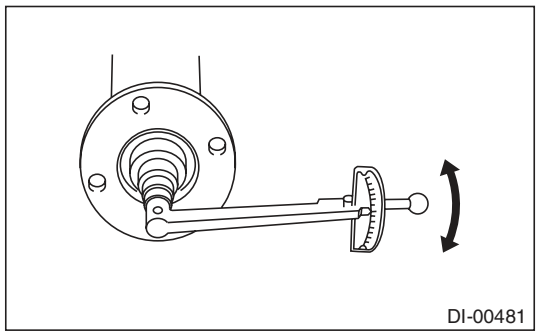


11) Check the initial torque and initial load.

Initial load:
17.7 — 38.8 N (1.8 — 4.0 kgf, 4.0 — 8.7 lb)

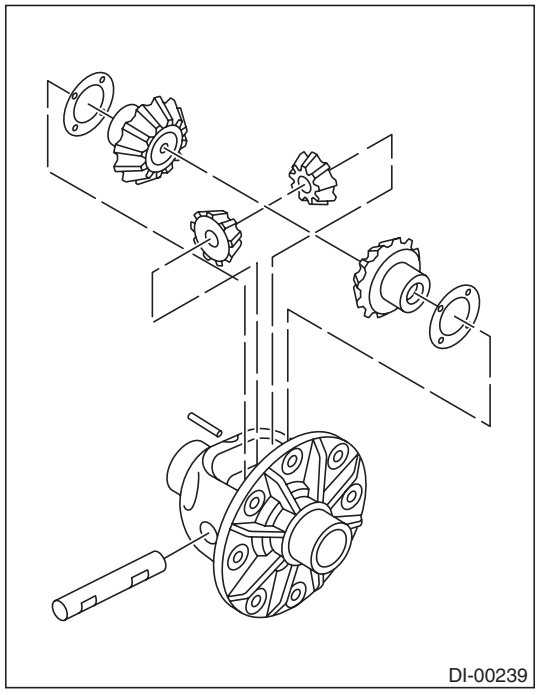


Initial torque:
0.67 — 1.47 N·m
(0.07 — 0.15 kgf-m, 0.49 — 1.08 ft-lb)



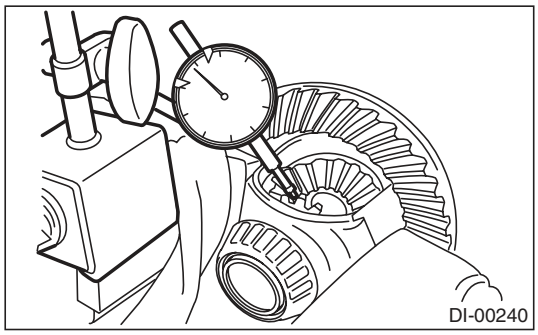
12) Assembling differential case
Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into the differential case. (Model without LSD)

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 (0.004 — 0.008 in)



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

Side gear thrust washer	
Part No.	Thickness mm (in)
383445201	075 — 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 the both sides of the hole to prevent pin from falling off.

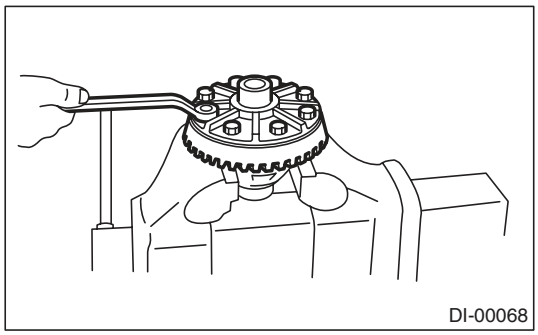
13) Install the driven gear to the differential case.

NOTE:
Before installing bolts, apply seal material to bolt threads.

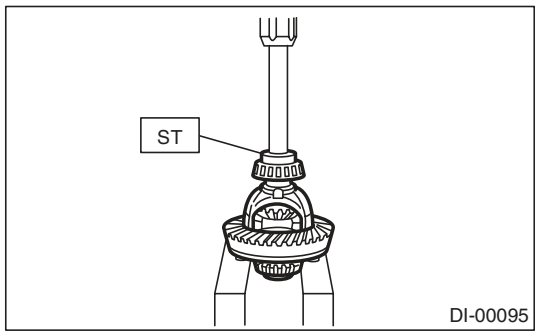
SEAL MATERIAL:
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:
• Make sure there is no clearance between the differential case and driven gear.
• Tighten diagonally.

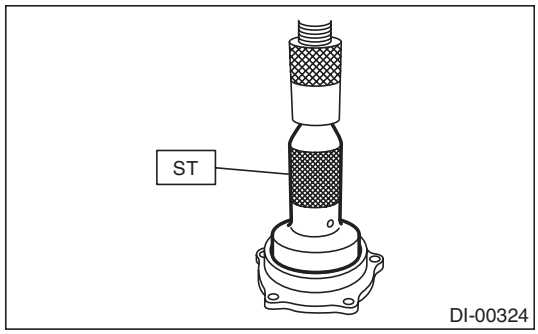
Tightening torque:
103 N·m (10.5 kgf-m, 76.0 ft-lb)



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

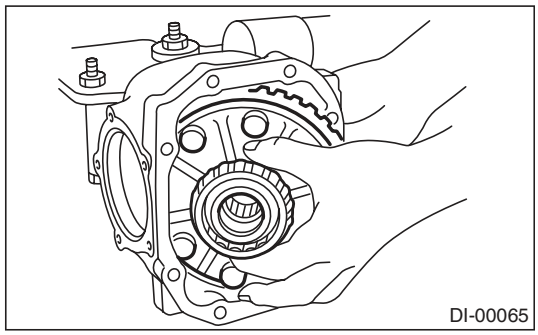


15) Press-fit the side bearing race into side retainer using ST.
ST 398417700 DRIFT



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

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



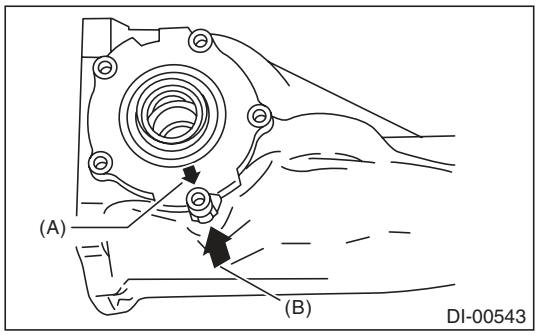
(3) Install the side retainer shims and O-ring to retainers RH and LH on which they were installed.

NOTE:
- Replace the O-ring with a new part.
- Replace broken or corroded side retainer shims with a new part of the same thickness.

Side 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) When installing, align the arrow mark on the differential carrier with the mark on the side retainer.

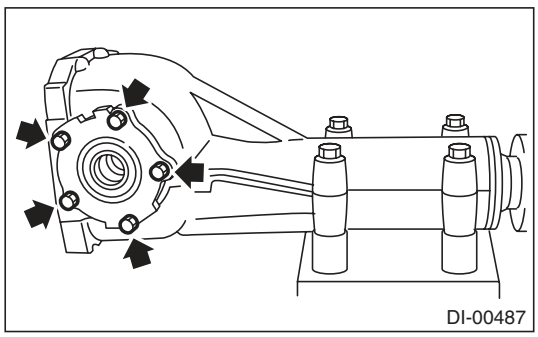
NOTE:
Be careful that the bearing roller does not damage the side bearing race.



(A) Arrow mark (Side retainer side)
(B) Arrow mark (Differential carrier side)

(5) Tighten the side retainer bolts.

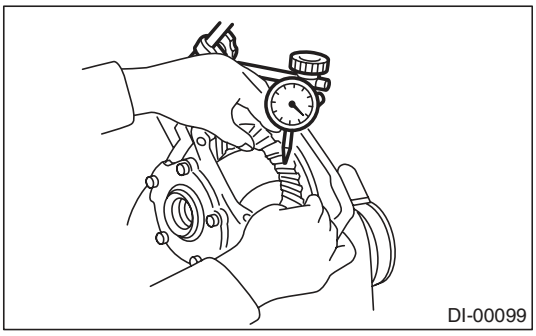
Tightening torque:
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



(6) Measure the backlash between the hypoid driven gear and drive pinion. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge. If the backlash is outside the standard range, adjust the side retainer shim by the following method.

- **When backlash is less than 0.1 mm (0.004 in):** Reduce the hypoid driven gear rear face shim thickness and increase the hypoid driven gear tooth surface side shim thickness.
- **When backlash exceeds 0.2 mm (0.008 in):** Increase the thickness of shim on the back side of the hypoid driven gear and reduce the thickness of shims on the teeth side of the hypoid driven gear.

Backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)

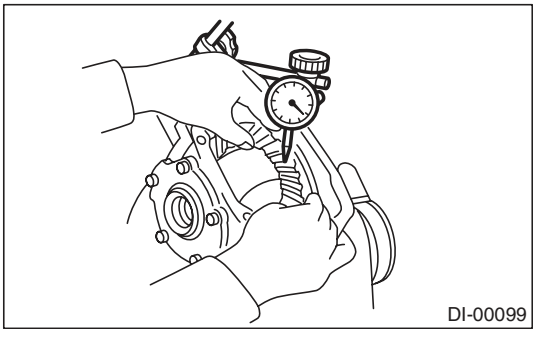


(7) At the same time, measure the total preload of the drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side retainer shims, increasing/reducing both shims by an even amount at a time.

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

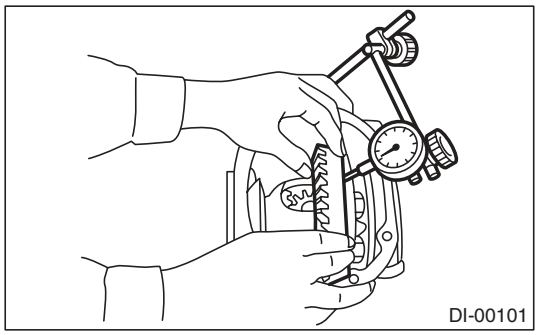
17) Recheck the hypoid driven gear to pinion backlash.

Backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)



18) Check the hypoid driven gear runout on its back surface, and make sure that the pinion and hypoid driven gear rotates smoothly.
If the hypoid driven gear runout on its back surface exceeds the specification, check for any foreign objects between the hypoid driven gear and differential case, and for any deformation of the case or gear.

Hypoid driven gear runout on its back surface:
0.05 mm (0.002 in)



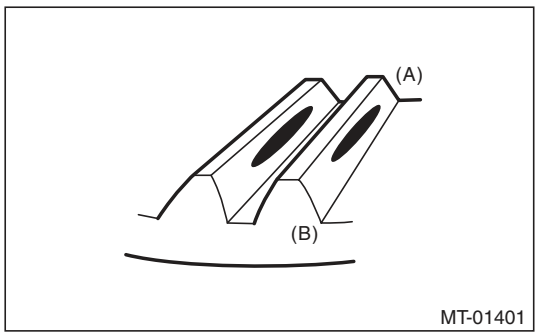
19) Checking and adjusting the tooth contact of hypoid driven gear

(1) Apply lead-free red dye evenly on the both sides of three to four teeth of 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 not correct, readjust.

NOTE:
Be sure to wipe off the lead-free red lead after the adjustment is completed.

- Correct tooth contact

Check item: Tooth contact pattern is slightly shifted towards the toe side under no-load rotation. (When driving, it moves towards the heel side.)

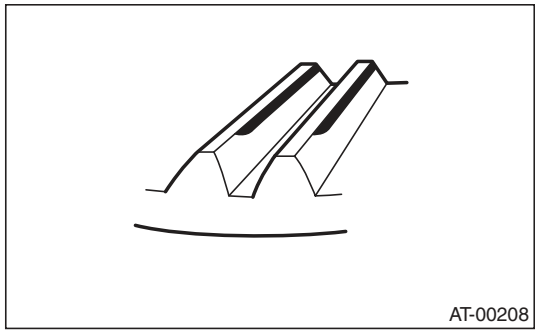


(A) Toe side
(B) Heel side

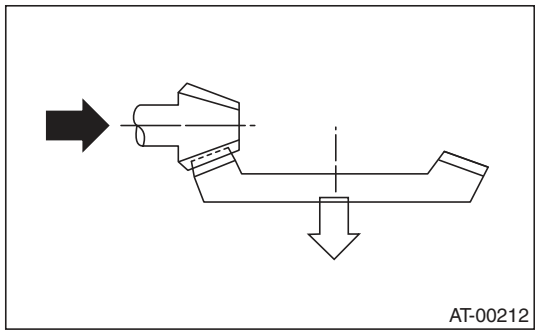
• Face contact

Check item: Backlash is too large.

Contact pattern



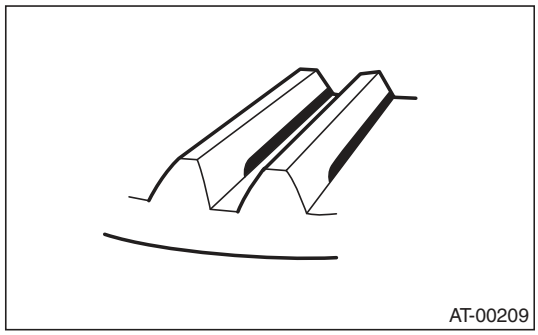
Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



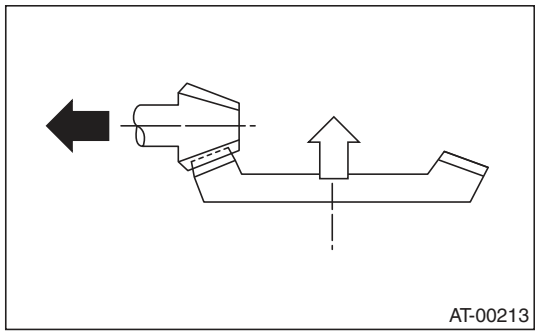
• Flank contact

Check item: Backlash is too small.

Contact pattern



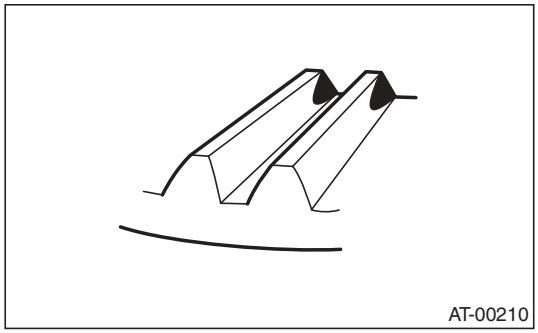
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



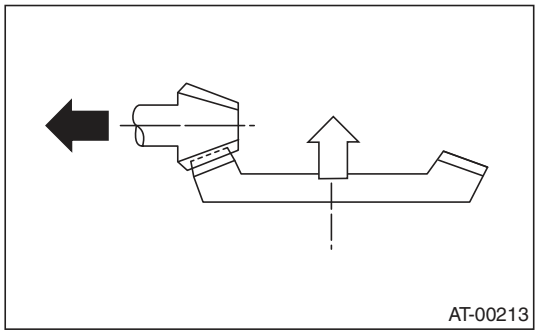
• Toe contact (inside contact)

Check item: Contact area is too small.

Contact pattern



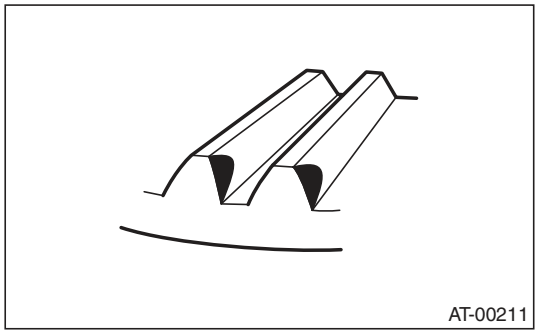
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



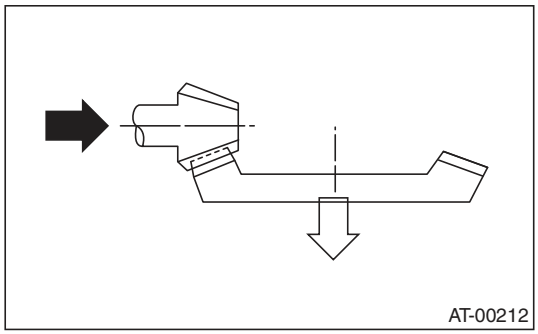
• Heel contact (outside end contact)

Check item: Contact area is too small.

Contact pattern

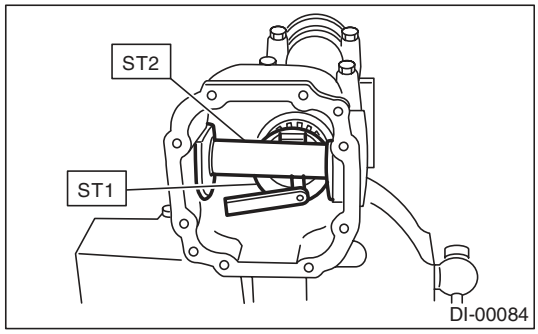


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



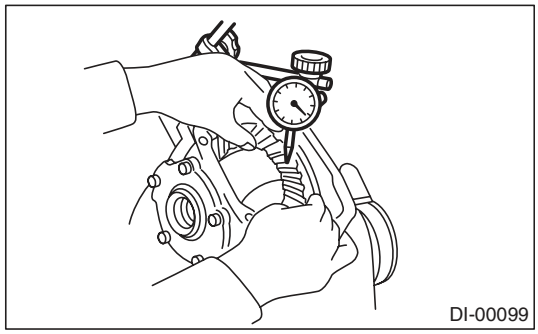
20) If proper tooth contact is not obtained, readjust the drive pinion height by changing the RH and LH side retainer shims and the hypoid gear backlash.
(1) Drive pinion height

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



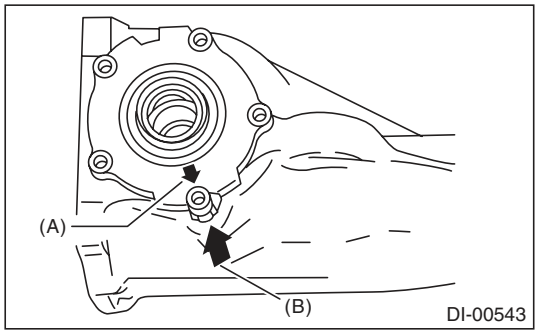
T = To + N – (H × 0.01) – 0.20 mm (0.008 in)
Place:
T = Thickness of pinion height adjusting washer mm (in)
To = Thickness of washer temporarily inserted mm (in)
N = Clearance of thickness gauge mm (in)
H = Figure marked on drive pinion head
(2) Hypoid gear backlash

Backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)



21) Remove the RH and LH side retainers.
22) Install new O-rings to side retainers of both sides.
23) Install oil seals to the side retainers on both sides. <Ref. to DI-88, REPLACEMENT, Rear Differential Side Oil Seal.>

24) When installing, align the arrow mark on the differential carrier with the mark on the side retainer.

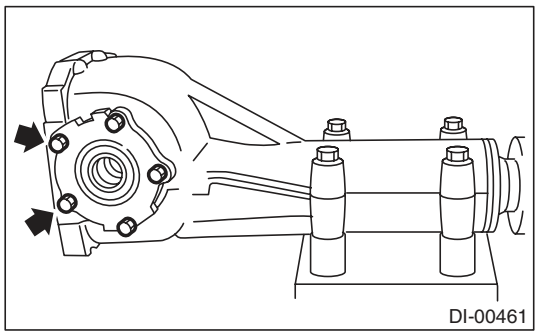


(A) Arrow mark (Side retainer side)
(B) Arrow mark (Differential carrier side)

25) Apply liquid gasket to the bolt with arrow marks and install the side retainer bolt.

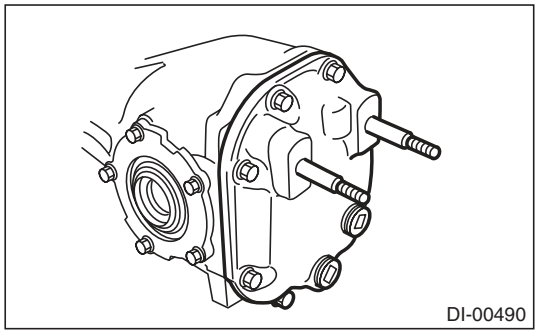
Liquid gasket:
THREE BOND 1110B (Part No. K0879Y0020) or equivalent

Tightening torque:
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)

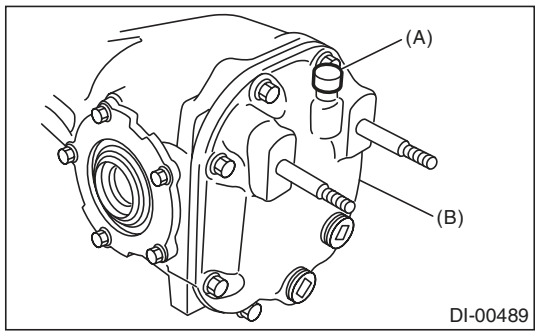


26) Install the new gasket and rear cover, and tighten the bolts to the specified torque.

Tightening torque:
29.5 N·m (3.0 kgf-m, 21.8 ft-lb)



27) Install the air breather cap.



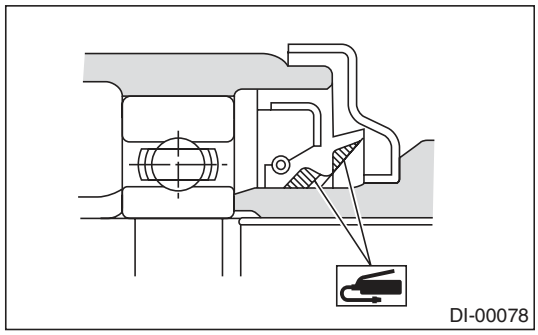
(A) Air breather cap
(B) Rear cover

28) Install the oil drain plug and filler plug.

Tightening torque:
49 N·m (5.0 kgf-m, 36.1 ft-lb)

2. GT SPEC. B 6MT MODEL

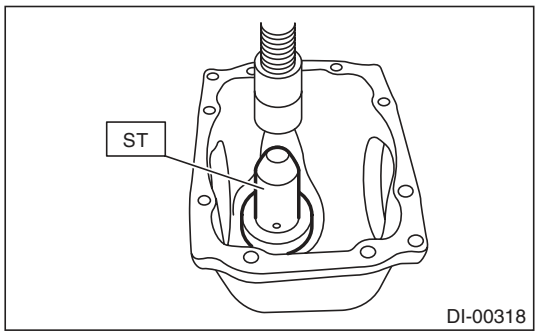
NOTE:
- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply differential gear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



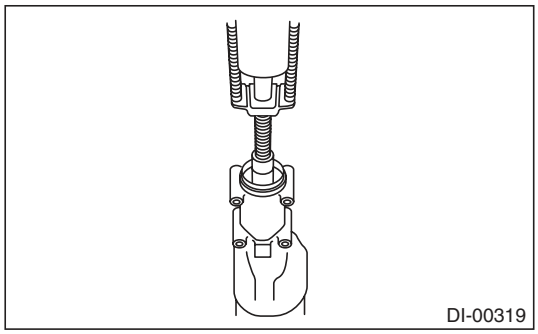
1) Adjusting preload for front and rear bearings

NOTE:
Adjust the bearing preload between front and rear bearings with spacer and washer. Pinion height adjusting washer is not affected by this adjustment. The adjustment must not be carried out with oil seal inserted.

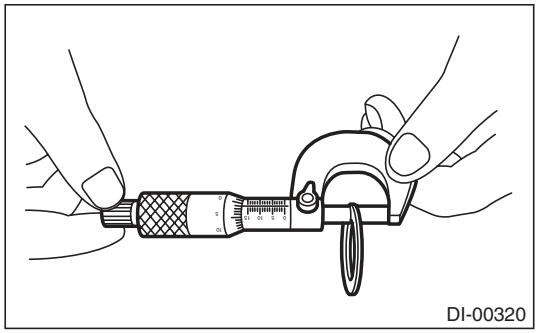
2) Using the ST, press-fit the rear bearing race to the differential carrier.
ST 398417700 DRIFT



3) Using the ST, press-fit the front bearing race to the differential carrier.
ST 398477702 DRIFT

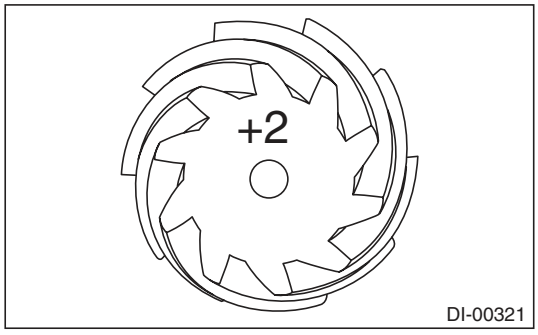


4) Selection of pinion height adjusting washer
(1) Measure the thickness of the inserted pinion height adjusting washer.



(2) Read the stamps of the attached drive pinion gear and a new part.

NOTE:
When there is no stamp, it indicates 0 (zero).



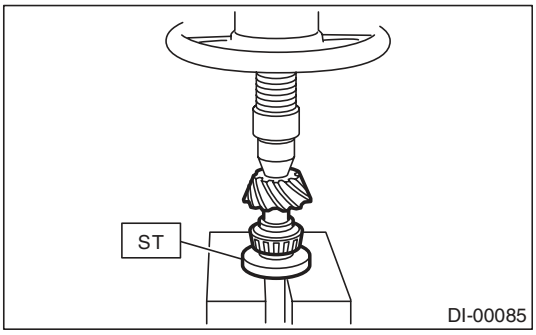
(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the installed washer with this one.
T = T1 + (T2 × 0.01 – T3 × 0.01)

T mm (in)	Thickness of the selected pinion height adjusting washer
T1 mm (in)	Thickness of the inserted pinion height adjusting washer
T2 mm (in)	Numbers stamped on the attached drive pinion gear
T3 mm (in)	Numbers stamped on a new drive pinion gear

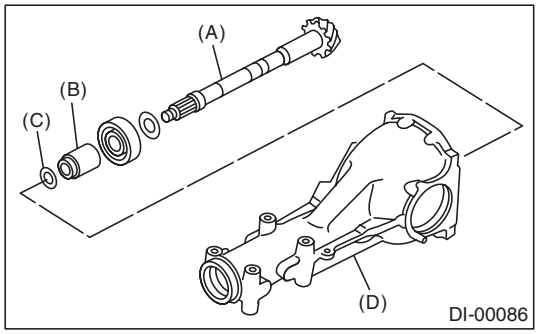
(Example of calculation)
T1 = 3.30 mm (0.1299 in), T2 = +2, T3 = –1
T = 3.30 mm (0.1299 in) + {(2 × 0.01) – (–1 × 0.01)} = 3.33 mm (0.1311 in)
Result: Thickness = 3.33 mm (0.1311 in)
A washer to be used is 38336AA310.

Pinion height adjusting washer	
Part No.	Thickness 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)

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

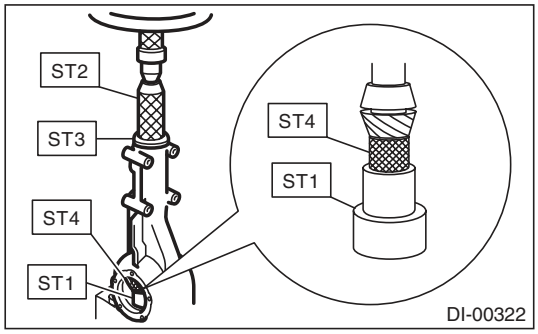


6) Insert the drive pinion into the differential carrier, and install the originally attached bearing preload adjusting spacer and washer.



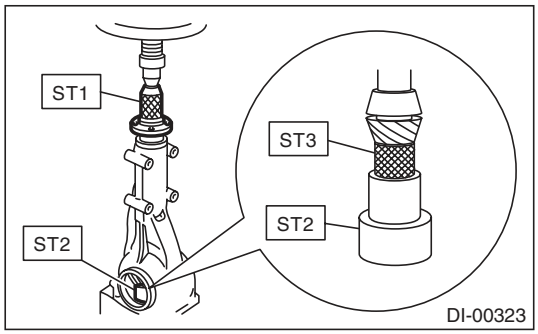
(A) Drive pinion
(B) Bearing preload adjusting spacer
(C) Bearing preload adjusting washer
(D) Differential carrier

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



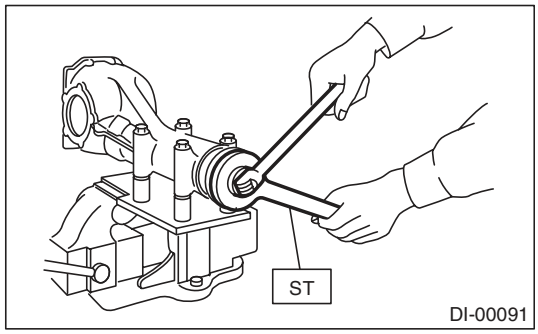
8) Press-fit the companion flange with ST1, ST2 and ST3.

NOTE:
Be careful not to damage the bearing.
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT
ST3 498937110 HOLDER DRIVE PINION



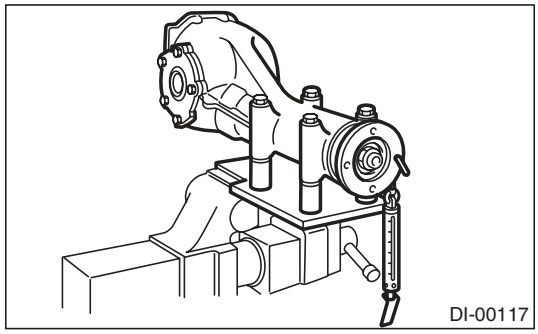
9) Install the self-locking nut. Tighten using the ST.
ST 498427200 FLANGE WRENCH

Tightening torque:
181.5 N·m (18.5 kgf-m, 133.9 ft-lb)

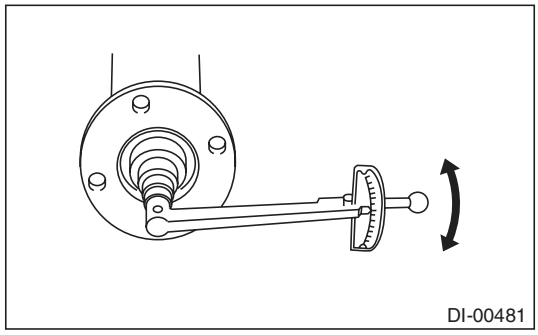


10) Turn the drive pinion shaft 10 or more times to make it fit in each taper roller bearing, and measure the initial load or initial torque.

Initial load:
24.1 — 38.6 N (2.5 — 3.9 kgf, 5.4 — 8.7 lb)



Initial torque:
0.91 — 1.46 N·m
(0.09 — 0.15 kgf-m, 0.67 — 1.08 ft-lb)

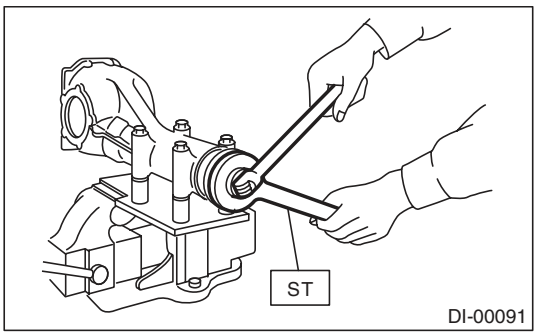


11) If the bearing preload is outside the specification range, select a preload adjusting washer and spacer from the table below to fit within the specification range.

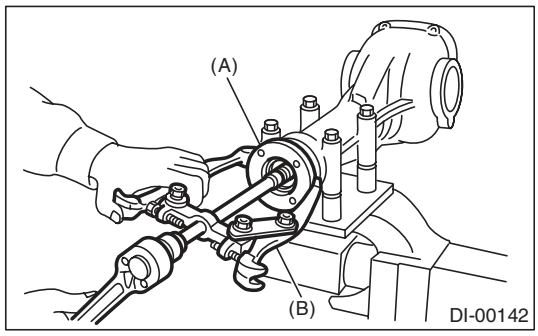
Preload adjusting washer	
Part No.	Thickness mm (in)
383705200	2.59 (0.1020)
383715200	2.57 (0.1012)
383725200	2.55 (0.1004)
383735200	2.53 (0.0996)
383745200	2.51 (0.0988)
383755200	2.49 (0.0980)
383765200	2.47 (0.0972)
383775200	2.45 (0.0965)
383785200	2.43 (0.0957)
383795200	2.41 (0.0949)
383805200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

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)

12) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



13) Draw out the companion flange with a puller.

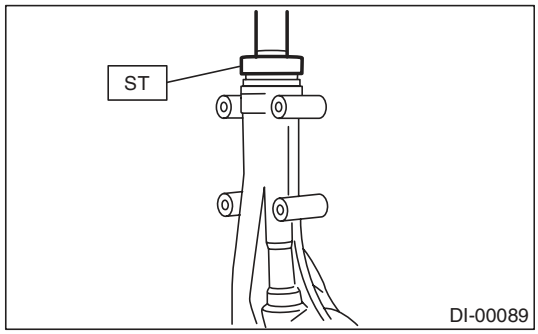


(A) Companion flange
(B) Puller

14) Install a new oil seal using ST.

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

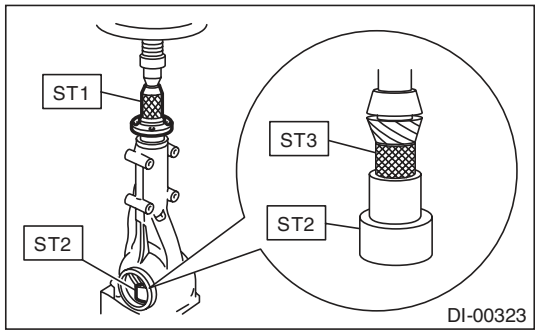
ST 498447120 INSTALLER



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

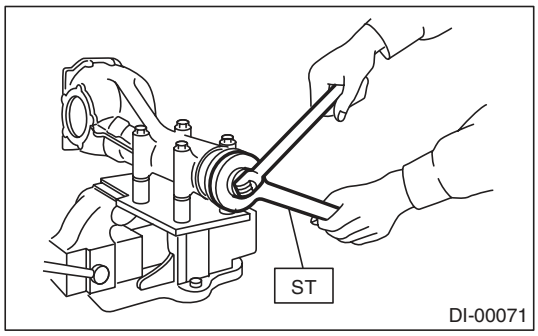
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT
ST3 498937110 HOLDER DRIVE PINION

NOTE:
Be careful not to damage the bearing.



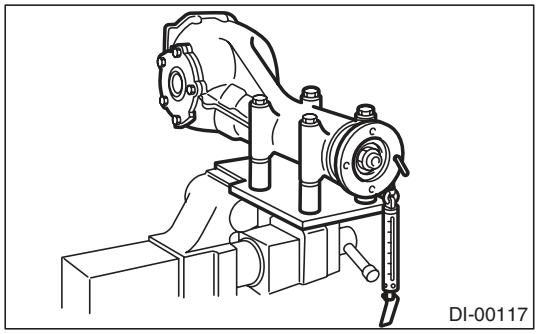
16) Install the self-locking nut. Tighten using the ST.

ST 498427200 FLANGE WRENCH

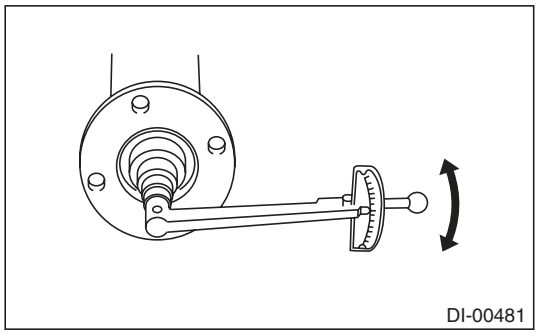


17) Check the initial torque and initial load.

Initial load:
24.1 — 38.6 N (2.5 — 3.9 kgf, 5.4 — 8.7 lb)



Initial torque:
0.91 — 1.46 N·m
(0.09 — 0.15 kgf-m, 0.67 — 1.08 ft-lb)

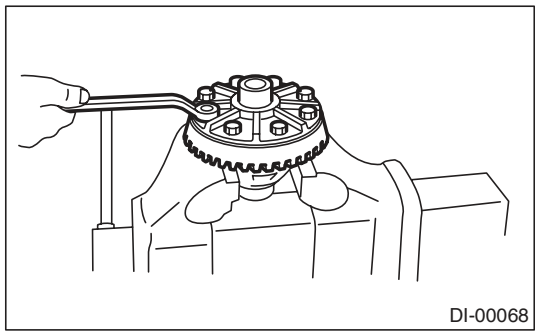


18) Install the driven gear to the differential case.

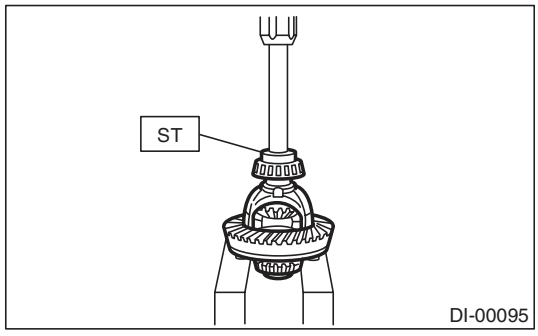
NOTE:
• Before installing bolts, apply seal material to bolt threads.
• Tighten diagonally.

SEAL MATERIAL:
THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:
103 N·m (10.5 kgf-m, 76.0 ft-lb)

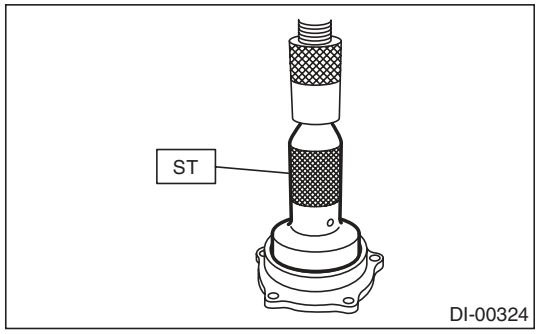

DI-00068

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



DI-00095

20) Assembling the side retainer
(1) Using the ST and a press, press-fit the side bearing outer race.
ST 398417700 DRIFT

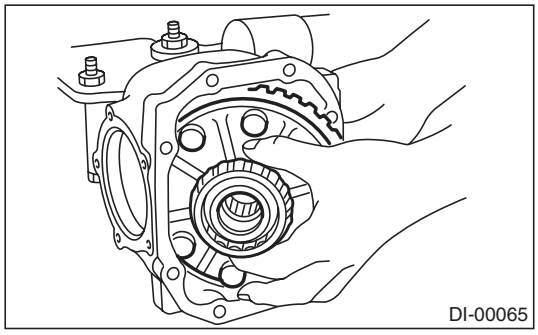


DI-00324

(2) Install the oil seal. <Ref. to DI-88, REPLACEMENT, Rear Differential Side Oil Seal.>

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

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


DI-00065

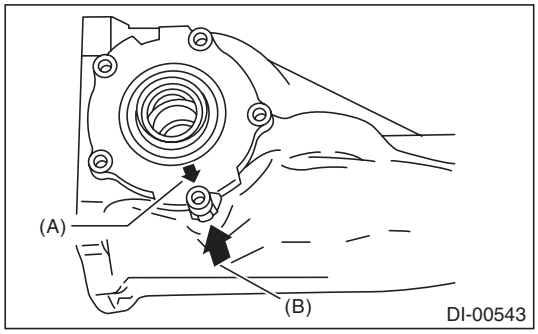
(3) Install the side retainer shims and O-rings to retainers RH and LH from which they were removed.

NOTE:
• Replace the O-ring with a new part.
• Replace broken or corroded side retainer shims with a new part of the same thickness.

Side 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) When installing, align the arrow mark on the differential carrier with the mark on the side retainer.

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

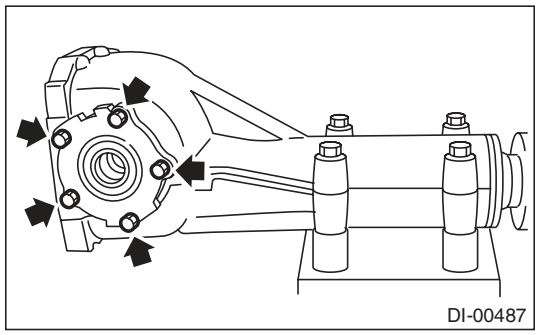


DI-00543

(A) Arrow mark (Side retainer side)
(B) Arrow mark (Differential carrier side)

(5) Tighten the side retainer bolts.

Tightening torque:
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



(6) Measure the backlash between the hypoid driven gear and drive pinion. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge. If the backlash is outside the standard range, adjust the side retainer shim by the following method.

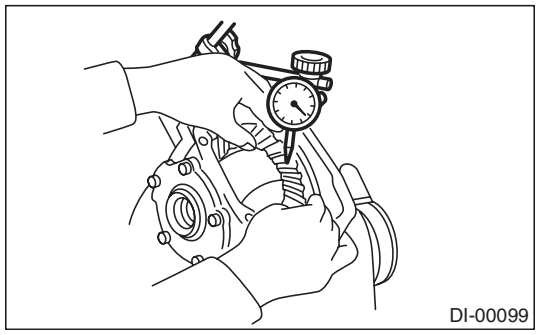
- **When backlash is less than 0.1 mm (0.004 in):**

Reduce the hypoid driven gear back surface shim thickness and increase the hypoid driven gear tooth surface side shim thickness.

- **When backlash exceeds 0.2 mm (0.008 in):**

Increase the thickness of shim on the back side of the hypoid driven gear and reduce the thickness of shims on the teeth side of the hypoid driven gear.

Backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)

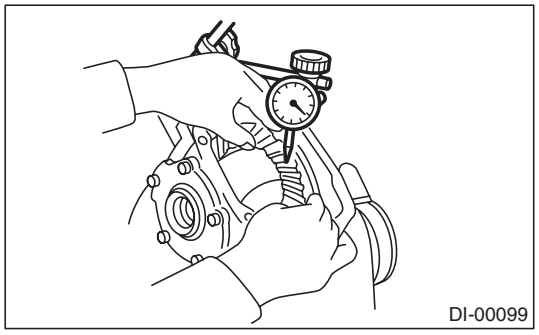


(7) At the same time, measure the total preload of the drive pinion. Compared with when differential case is not installed, if the total preload is not within specification, adjust the thickness of side retainer shims, by increasing/reducing both shims by an even amount at a time.

Total preload:
27.0 — 54.0 N (2.8 — 5.5 kgf, 6.1 — 12.1 lb)

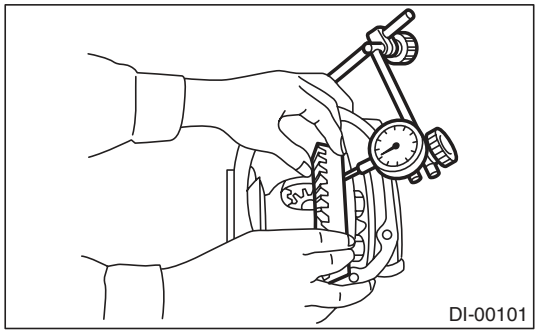
22) Measure the backlash between the hypoid driven gear and drive pinion again.

Backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)



23) Check the hypoid driven gear runout on its back surface, and make sure that the pinion and hypoid driven gear rotates smoothly.
If the hypoid driven gear runout on its rear face exceeds the limit, check for any foreign objects between hypoid driven gear and differential case, and for any deformation of the case or gear.

Driven gear rear face runout limit:
0.05 mm (0.002 in)



24) Checking and adjusting the tooth contact of hypoid driven gear

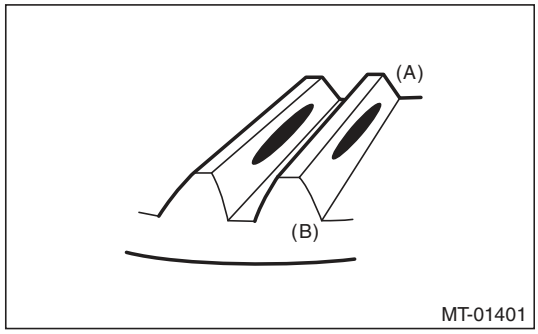
(1) Apply lead-free red dye evenly on the both sides of three to four teeth of the hypoid driven gear. Rotate the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear, and check the contact pattern.

(2) When the contact pattern is not correct, re-adjust.

NOTE:
Be sure to wipe off the lead-free red dye after the adjustment is completed.

- Correct tooth contact

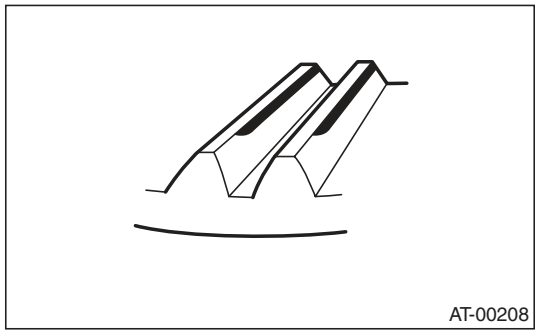
Check item: Tooth contact pattern is slightly shifted towards the toe side under no-load rotation. (When driving, it moves towards the heel side.)



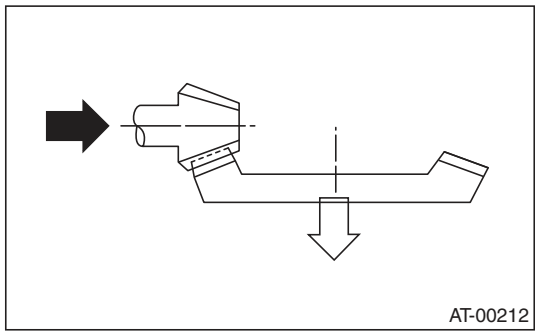
(A) Toe side
(B) Heel side

- Face contact

Check item: Backlash is too large.
Contact pattern

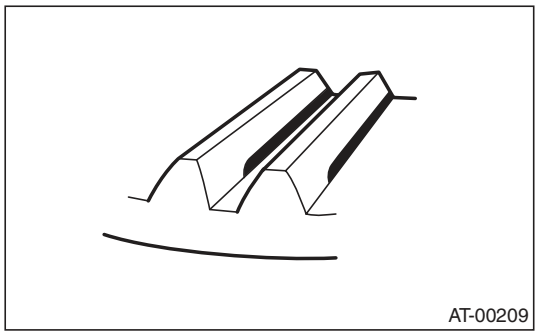


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

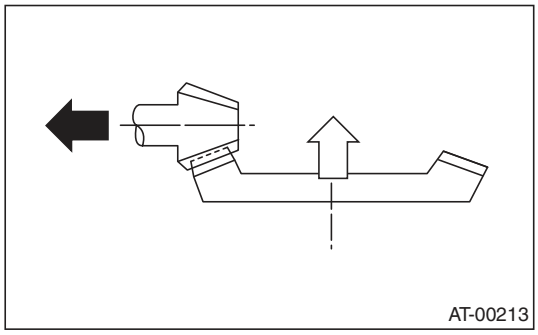


- Flank contact

Check item: Backlash is too small.
Contact pattern

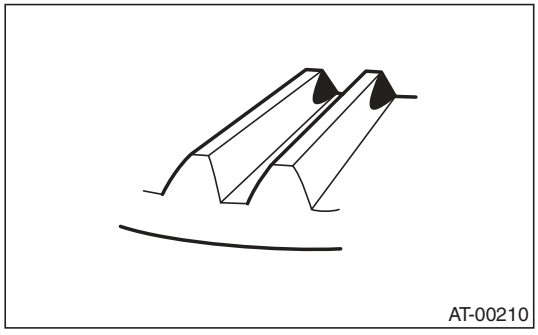


Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.

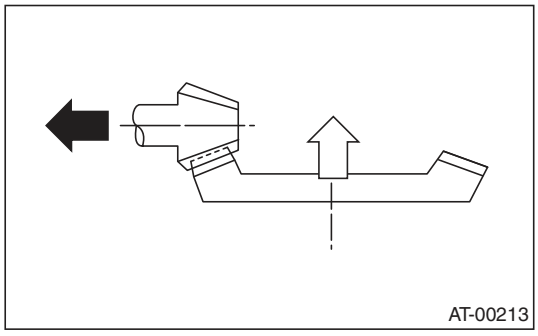


- Toe contact (inside contact)

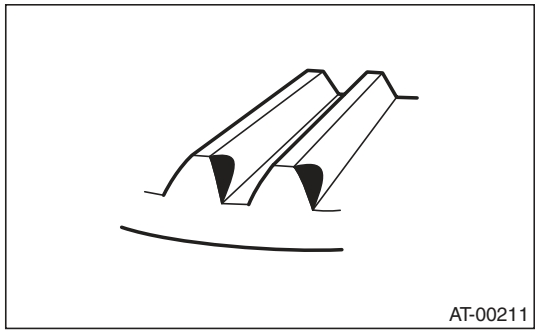
Check item: Contact area is too small.
Contact pattern



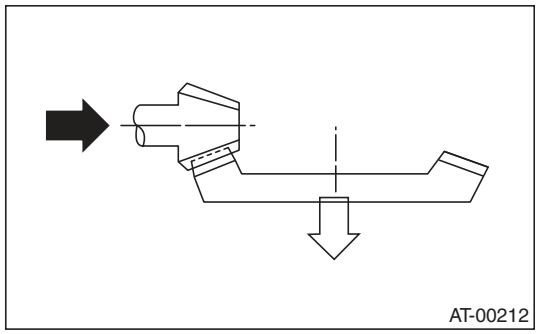
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



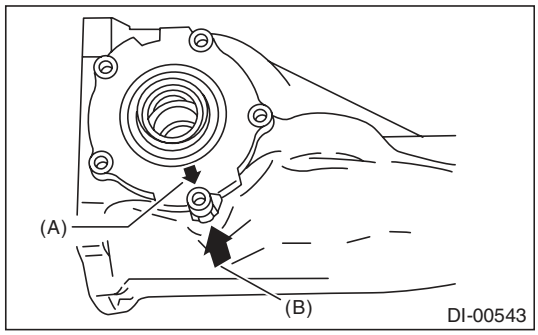
• Heel contact (outside end contact)
Check item: Contact area is too small.
Contact pattern



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



25) If proper tooth contact is not obtained, readjust the drive pinion height by changing the RH and LH side retainer shims and the hypoid gear backlash.
26) Install oil seals to the side retainers on both sides. <Ref. to DI-88, REPLACEMENT, Rear Differential Side Oil Seal.>
27) When installing, align the arrow mark on the differential carrier with the mark on the side retainer.

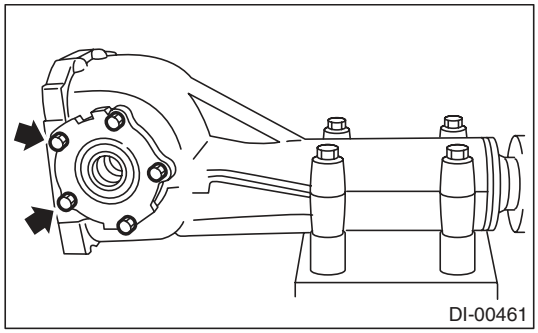


(A) Arrow mark (Side retainer side)
(B) Arrow mark (Differential carrier side)

28) Apply liquid gasket to the bolts indicated by arrows, and tighten the side retainer bolt.

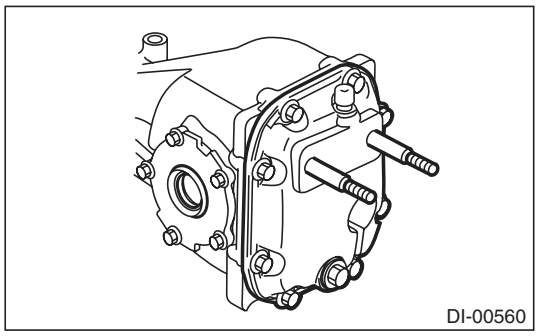
Liquid gasket:
THREE BOND 1110B (Part No. K0879Y0020) or equivalent

Tightening torque:
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



29) 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)



30) Install the breather cap.
31) Install the oil drain plug and filler plug.

Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)

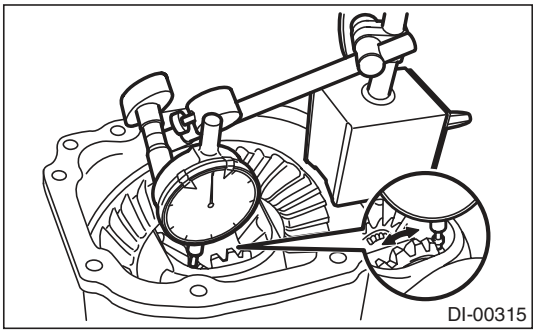
E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage and other defects. Repair or replace the defective parts as necessary.
1) Hypoid driven gear and drive pinion
• If there is evidently an abnormal tooth contact, find out the cause and adjust until the teeth contact correctly. Replace the gear if there is an excessive worn or an incapable adjustment.
• If crack, cutout or seizure is found, replace the parts as a set. Slight damage of some teeth can be corrected by oil stone or the like.
2) Side gear and pinion mate gear
• Replace if cracks, scoring or other defects are evident on the tooth surface.
• Replace if thrust washer contact surface is worn or seized. Slight damages of the surface can be corrected by oil stones or equivalent.
3) Bearing
Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.
4) Thrust washer of the side gear and pinion mate gear
Replace if seized, flawed, abnormally worn or having other defects.
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 abnormally worn, burned, or cracked.
8) Companion flange
Replace if the oil seal lip contact surface shows cracking.

1. SIDE GEAR BACKLASH

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

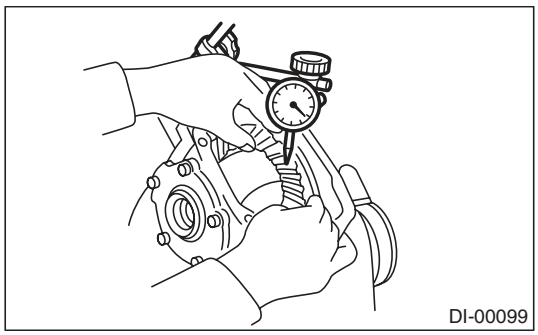
Side gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)
If the side gear backlash is not within the specification, select the side gear thrust washer and adjust the side gear backlash as specified.


DI-00315

2. HYPOID DRIVEN GEAR BACKLASH

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

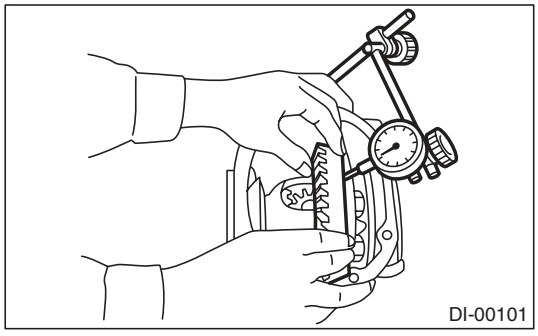
Hypoid driven gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)
If the hypoid driven gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.


DI-00099

3. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

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

Hypoid driven gear back surface runout:
0.05 mm (0.002 in)
If the hypoid driven gear runout exceeds 0.05 mm (0.002 in), replace the hypoid driven gear.


DI-00101

4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

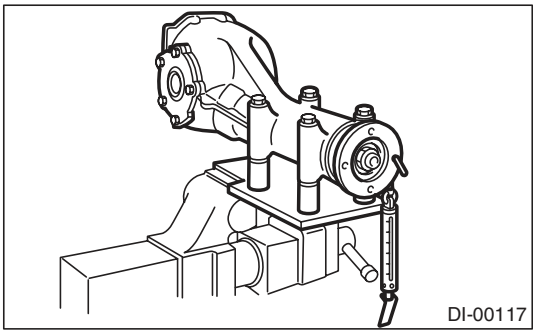
Inspect the tooth contact between the hypoid driven gear and drive pinion. <Ref. to DI-37, ASSEMBLY, Rear Differential (T-type).>

5. TOTAL PRELOAD

Using a spring scale, check the total preload.

Total preload:
Except for GT spec. B 6MT model:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lb)
GT spec. B 6MT model
27.0 — 54.0 N (2.8 — 5.5 kgf, 6.1 — 12.1 lb)

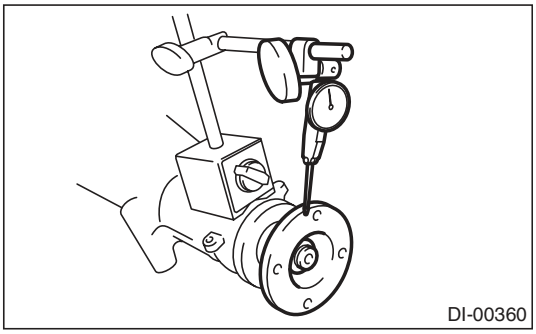
If the total preload is not within the specifications, adjust the side retainer shims.


DI-00117

6. COMPANION FLANGE

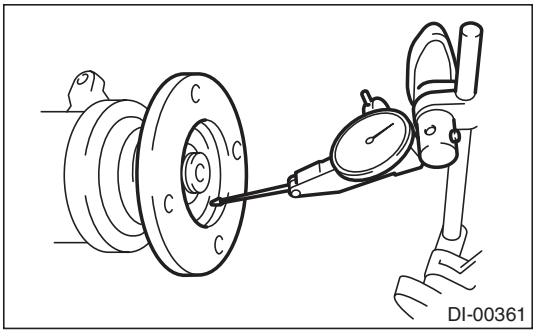
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.003 in)


DI-00360

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

Limit of runout:
0.08 mm (0.003 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 even 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-37, ASSEMBLY, Rear Differential (T-type).>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash. <Ref. to DI-37, 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-37, ASSEMBLY, Rear Differential (T-type).>

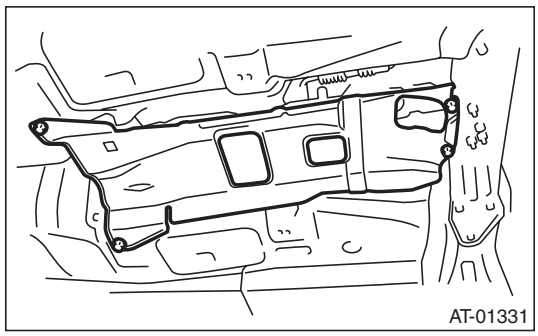
4. TOTAL PRELOAD

Adjust the side retainer shim. <Ref. to DI-37, ASSEMBLY, Rear Differential (T-type).>

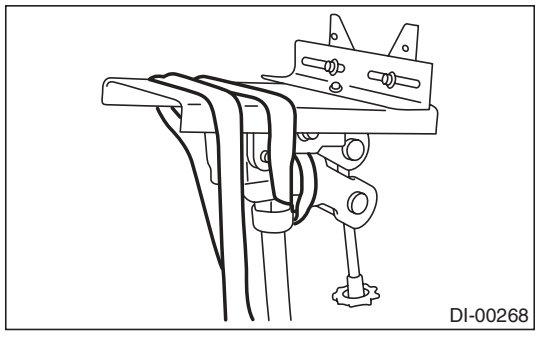
5. Rear Differential (VA-type)

A: REMOVAL

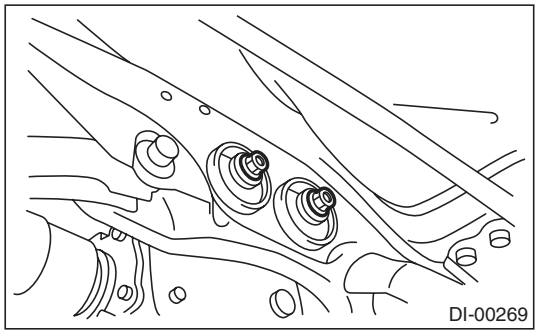
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Shift the select lever or gear shift lever to neutral.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Lift up the vehicle.
7) Remove the wheels.
8) Drain the differential gear oil. <Ref. to DI-26, REPLACEMENT, Differential Gear Oil.>
9) Remove the rear exhaust pipe and muffler.
• 2.5 L SOHC non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
• 2.5 L DOHC turbo model
<Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
• 3.0 L DOHC non-turbo model
<Ref. to EX(H6DO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
10) Remove the heat shield cover.



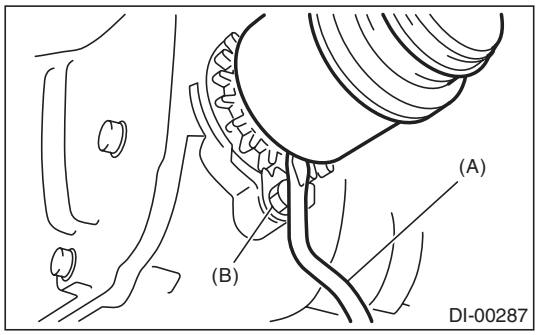
11) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
12) Prepare the transmission jack and band.



13) Loosen the self-lock nuts which hold the rear differential to rear crossmember.

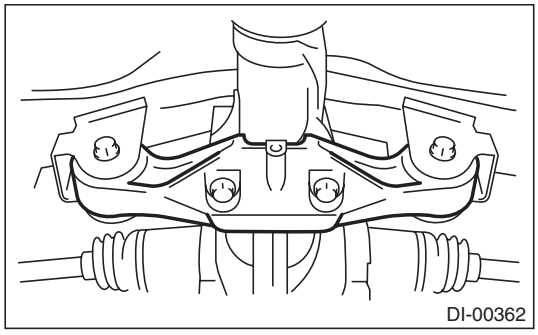


14) Remove the DOJ of rear drive shaft from rear differential.

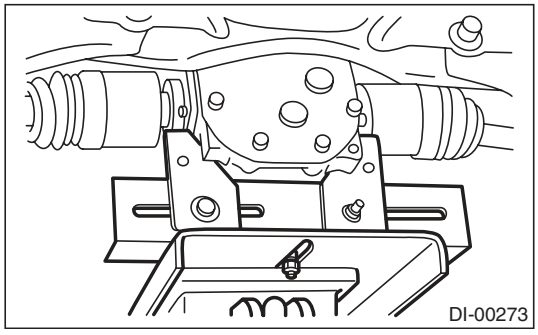


(A) Tire lever
(B) Bolt

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



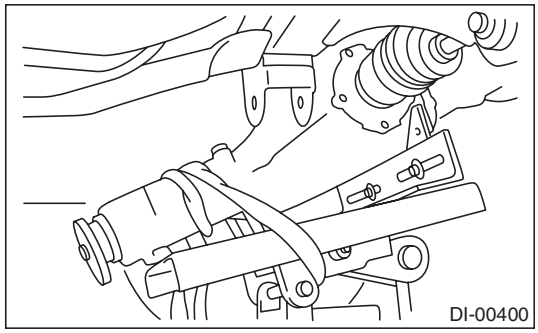
16) Support the rear differential with the transmission jack.



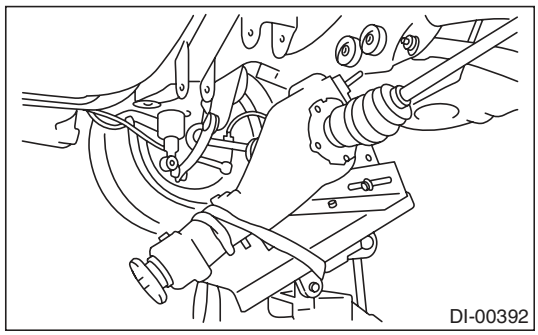
17) Remove the rear differential front member.
18) Secure the rear differential using band.

19) Remove the self-lock nuts which hold the rear differential to rear crossmember.
20) Remove the rear differential stud bolt from rear crossmember bushing.

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

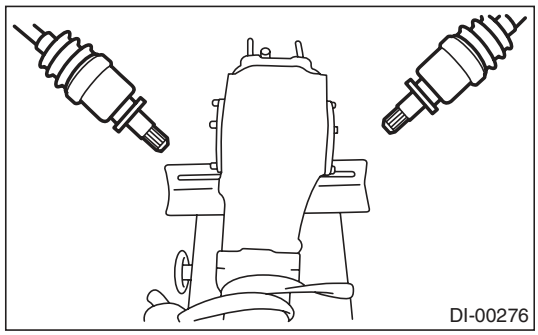


21) Lower the transmission jack stand after removing the rear differential stud bolt from the rear crossmember. Rear drive shaft should not come into contact with the lateral link bolt.



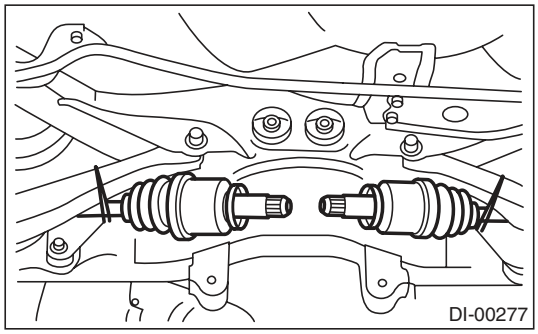
22) Pull out the axle shaft from rear differential.

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

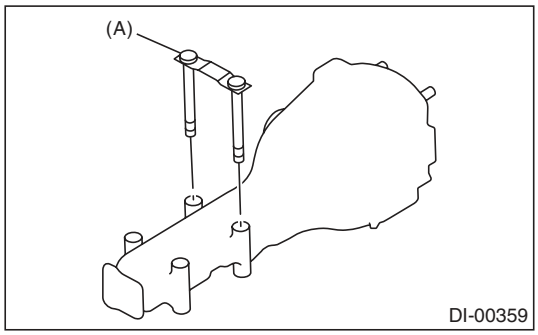


23) Lower the transmission jack.

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



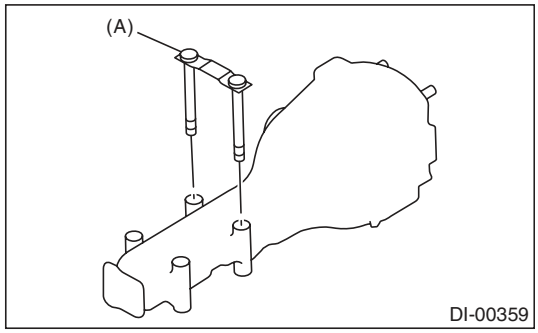
25) Remove the rear differential member plate from rear differential.



(A) Rear differential member plate

B: INSTALLATION

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

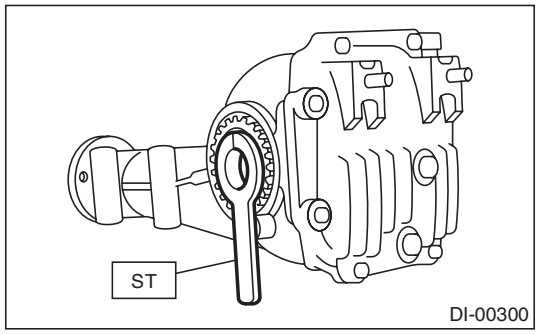


(A) Rear differential member plate

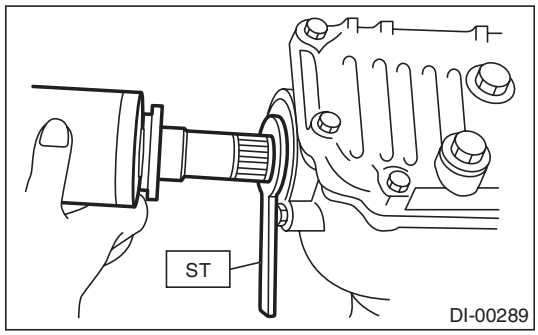
2) Set the rear differential to transmission jack.

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

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

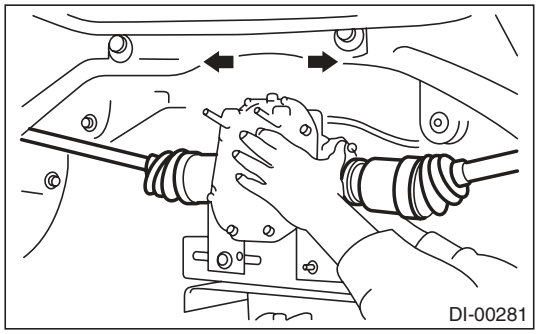


4) Insert the spline shaft until the spline portion comes inside the side oil seal.

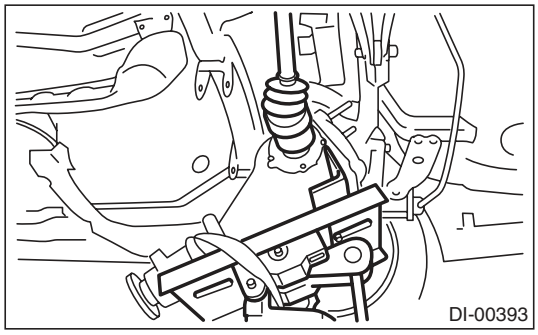


5) Remove ST from rear differential.

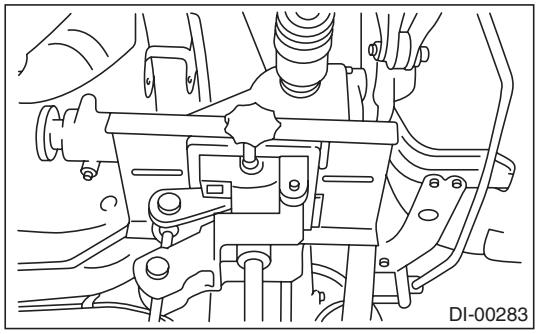
6) Push the rear differential to insert the axle shaft into rear differential.



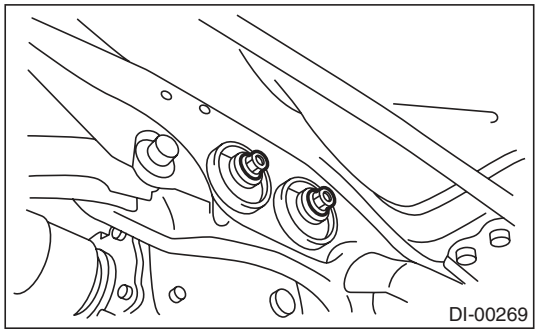
7) Adjust the transmission jack, if necessary, and insert the rear differential stud bolt into rear crossmember bushing properly.



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

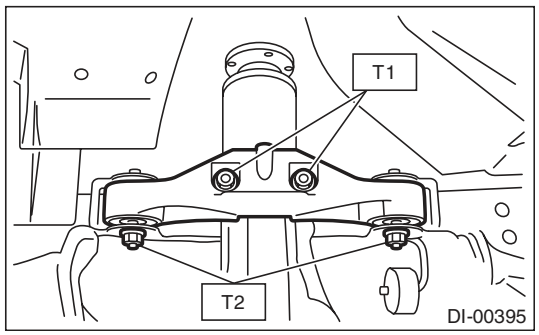


9) Tighten a new self-locking nut temporarily to rear crossmember.



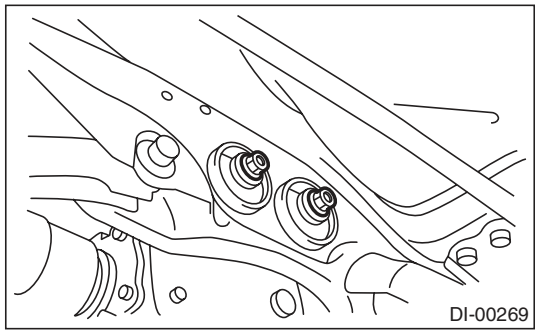
10) Remove the band from rear differential. Lift up the rear differential until the rear differential is separated from the transmission jack.
11) Install the rear differential front member with a new self-locking nut.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)

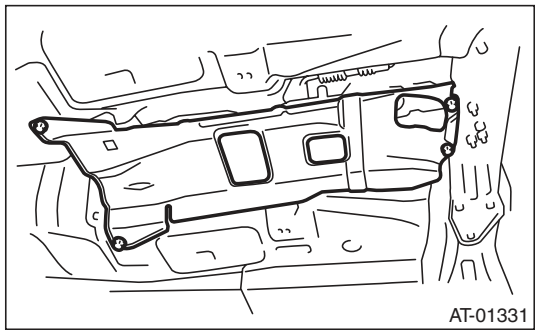


12) Tighten the self-locking nut.

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



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



16) Install the rear exhaust pipe and muffler.
- 2.5 L SOHC non-turbo model

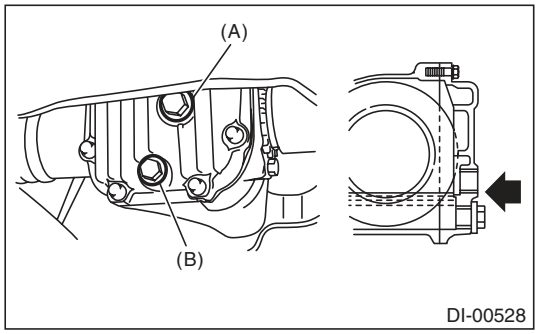
<Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
- 2.5 L DOHC turbo model

<Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
- 3.0 L DOHC non-turbo model

<Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>

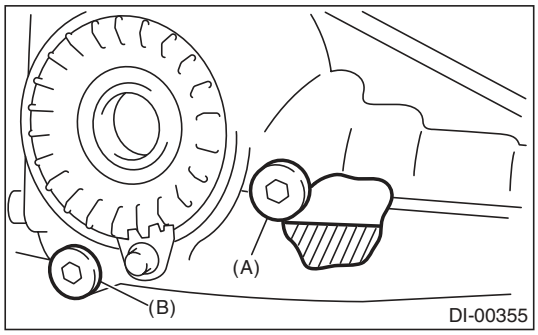
17) After installing the rear differential carrier to the vehicle, remove the filler plug, and refill with gear oil up to the lower lip of the plug hole.

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)
- VA1-type



(A) Filler plug
(B) Oil drain plug

- VA2-type



(A) Filler plug
(B) Oil drain plug

18) Tighten the filler plug.

NOTE:
For VA-type, use a new gasket.

Tightening torque:
VA1-type:
34 N·m (3.5 kgf-m, 25.1 ft-lb)
VA2-type:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

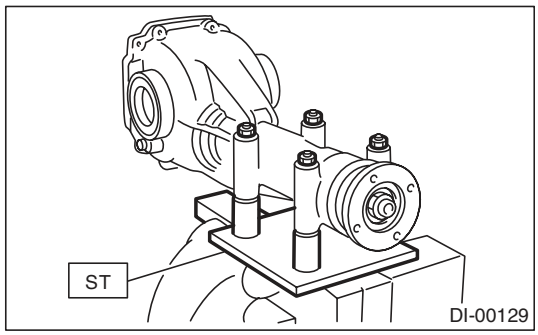
19) Hereafter, install in the reverse order of removal.

C: DISASSEMBLY

1. VA1-TYPE

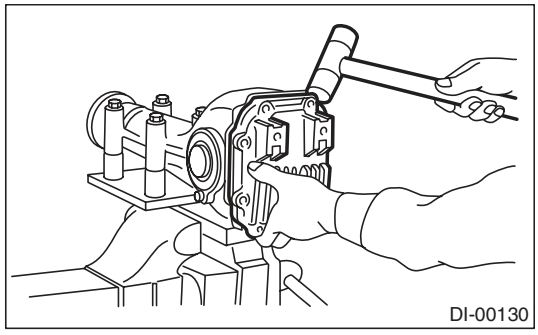
To detect the real cause of trouble, inspect the following items before disassembling.
- Tooth contact and backlash between hypoid driven gear and drive pinion
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

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



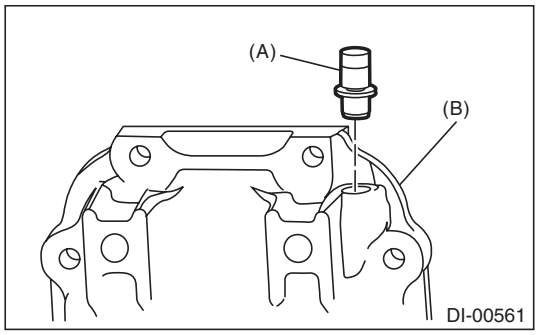
2) Remove the oil drain plug and filler plug, and drain the gear oil.
3) Remove the mounting bolts, and remove the rear cover.

NOTE:
Remove by tapping with a plastic hammer.



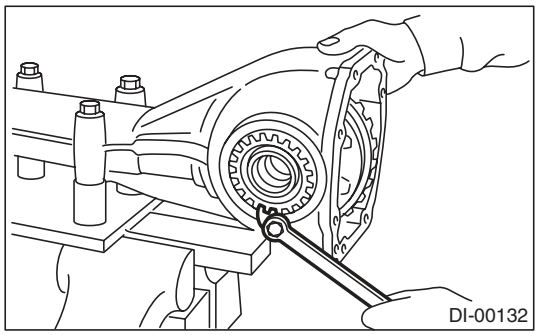
4) Remove the air breather cap.

NOTE:
- Do not attempt to replace the air breather cap unless necessary.
- Whenever the air breather cap is removed, replace it with a new part.

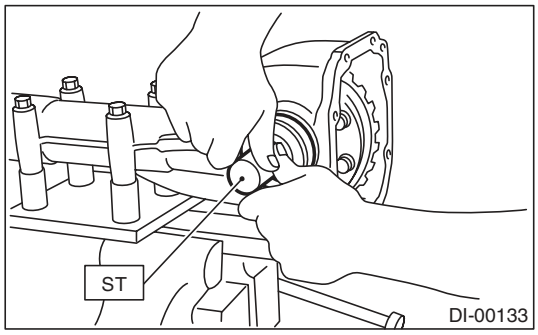


(A) Air breather cap
(B) Rear cover

5) Remove the lock plate RH and LH.

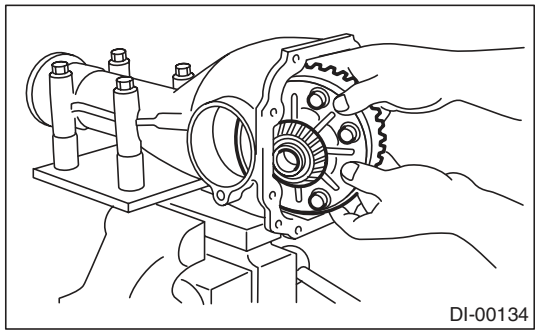


6) Remove the side retainer RH and LH with the ST.
ST 18630AA010 WRENCH COMPL RETAINER

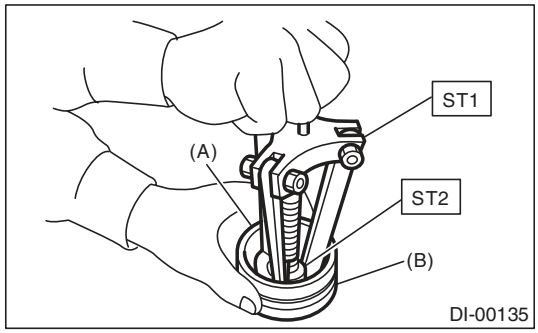


7) Pull out the differential case assembly from differential carrier.

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



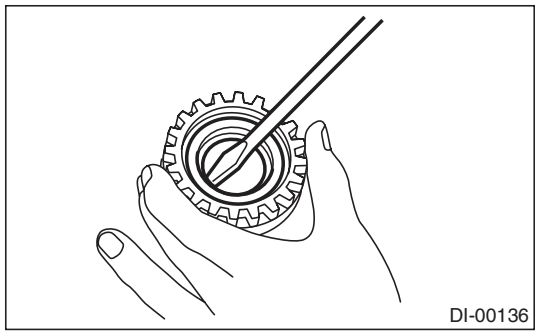
8) Remove the bearing race from side retainer RH and LH with ST1 and ST2.
ST1 499705401 PULLER ASSY
ST2 499705404 SEAT



(A) Bearing race
(B) Side retainer

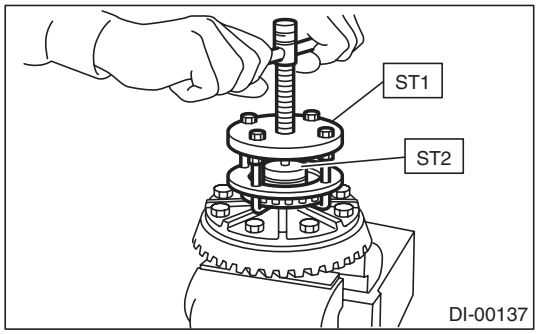
9) Remove the oil seal from the side retainer RH and LH using a screwdriver.

NOTE:
Perform this operation only when changing oil seal.

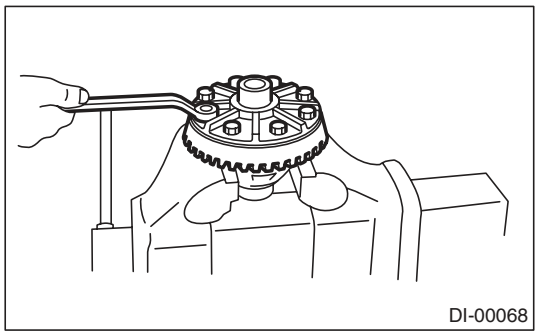


10) Extract the bearing cone with ST1 and ST2.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of the bearing cone.
• Store so that the right and left side bearing races and cones are not mixed together.
ST1 899524100 PULLER SET
ST2 399520105 SEAT

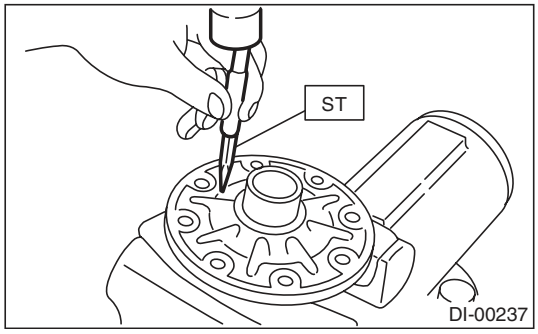


11) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



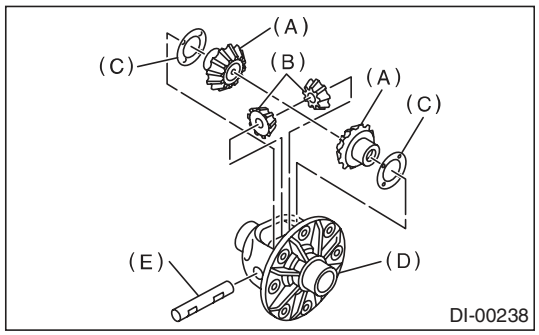
12) Drive out the pinion shaft lock pin from the hypoid driven gear side.

NOTE:
The lock pin is staked at the pin hole end on the differential case. Do not drive it out forcibly before removing the stake.
ST 899904100 STRAIGHT PIN REMOVER



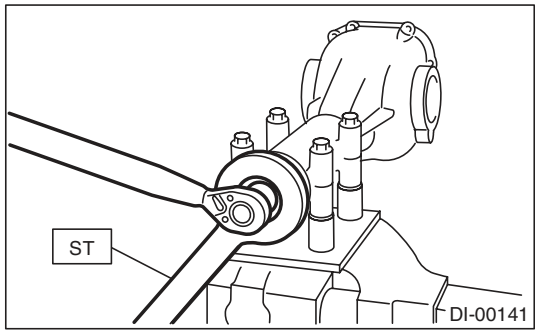
13) Draw out the pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

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

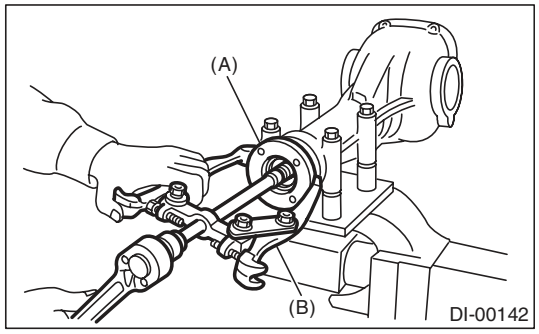


(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

14) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



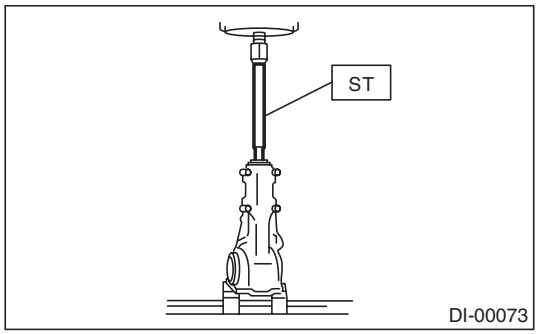
15) Extract the companion flange with a puller.



(A) Companion flange
(B) Puller

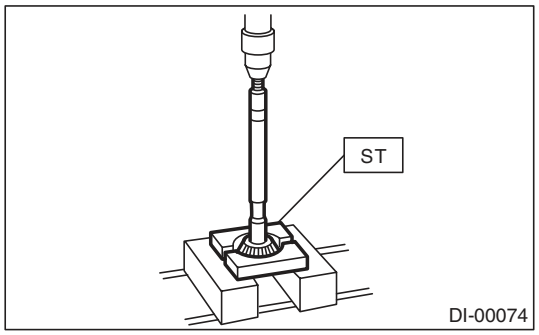
16) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjusting washer and washer.

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

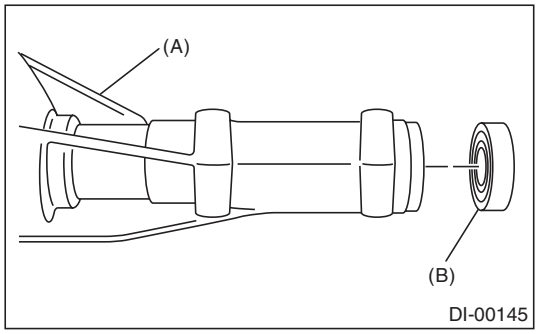


17) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 498515500 REPLACER

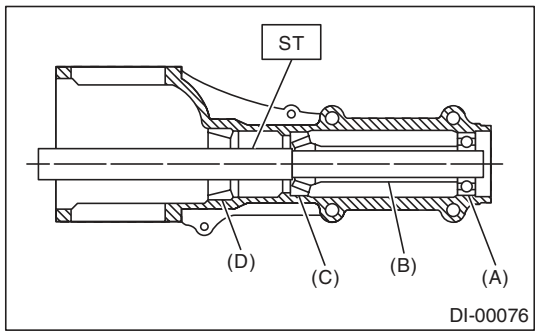


18) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



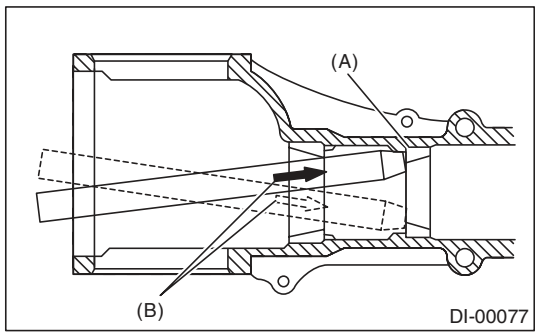
(A) Differential carrier
(B) Front oil seal

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



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

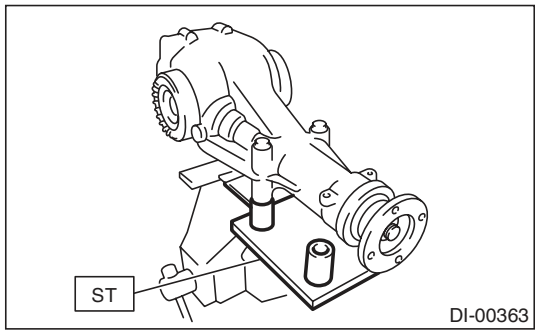
20) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order using a brass bar.



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

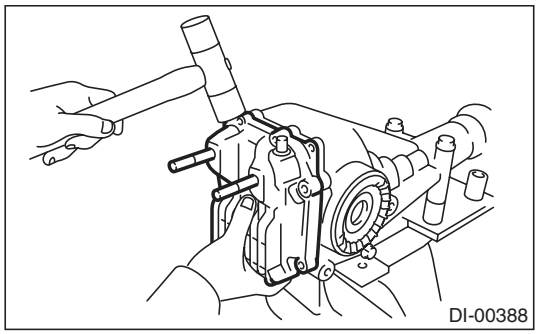
2. VA2-TYPE

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



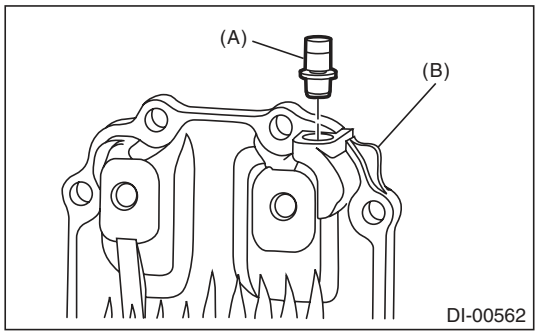
2) Remove the oil drain plug and filler plug, and drain the gear oil.
3) Remove the mounting bolts, and remove the rear cover.

NOTE:
Remove by tapping with a plastic hammer.



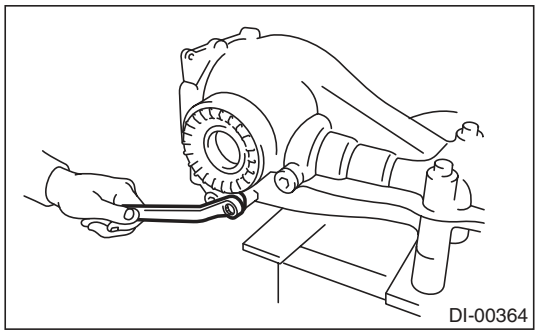
4) Remove the air breather cap.

NOTE:
• Do not attempt to replace the air breather cap unless necessary.
• Whenever the air breather cap is removed, replace it with a new part.

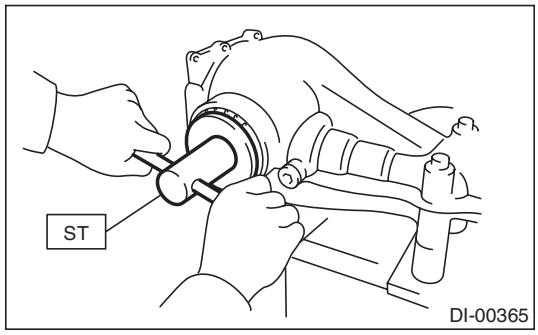


(A) Air breather cap
(B) Rear cover

5) Remove the lock plate RH and LH.

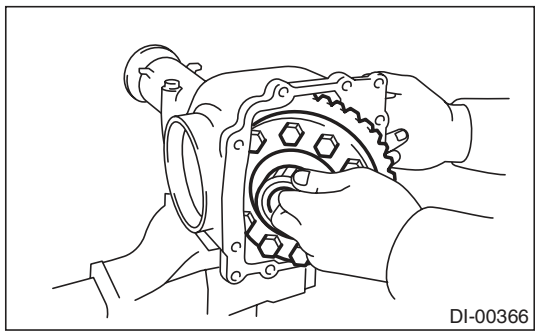


6) Remove the side retainer RH and LH with the ST.
ST 18630AA010 WRENCH COMPL RETAINER



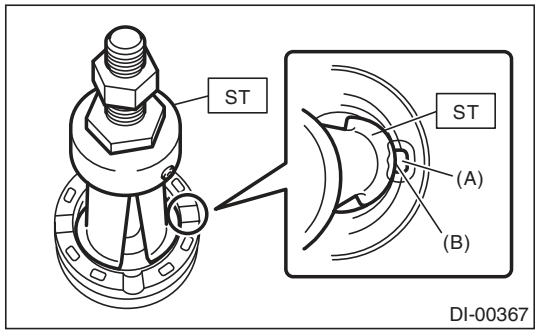
7) Pull out the differential case assembly from differential carrier.

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

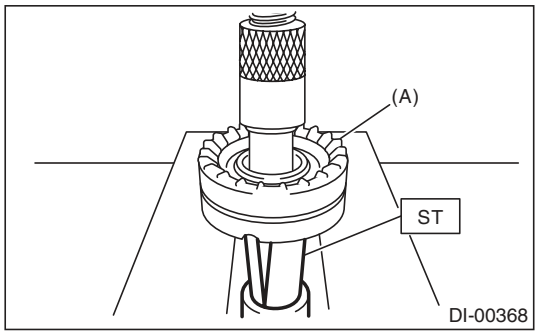


8) Remove the bearing race from side retainer RH and LH with ST and a press.
ST 18758AA000 PULLER

NOTE:
• Be sure to turn the bolt of puller manually.
• Set the puller so that its claws catch the groove of side retainer.



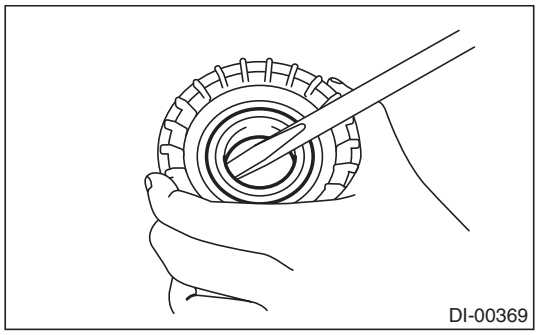
(A) Groove
(B) Claw



(A) Side retainer

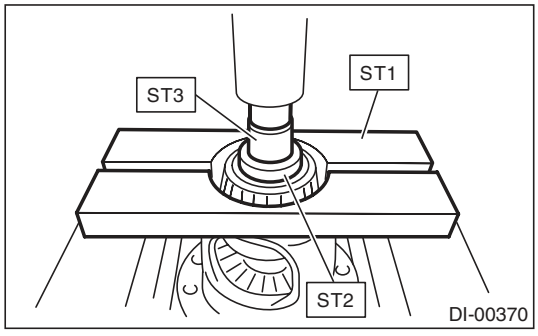
9) Remove the oil seal from the side retainer RH and LH using a screwdriver.

NOTE:
Perform this operation only when changing oil seal.

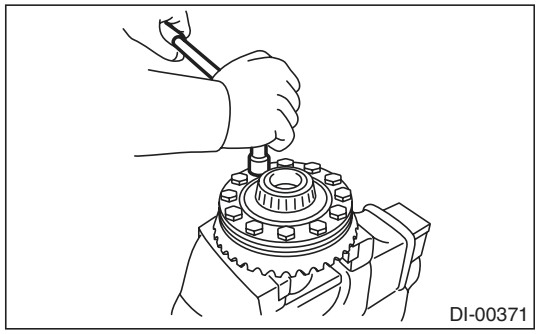


10) Extract the bearing cone with ST1, ST2 and ST3.

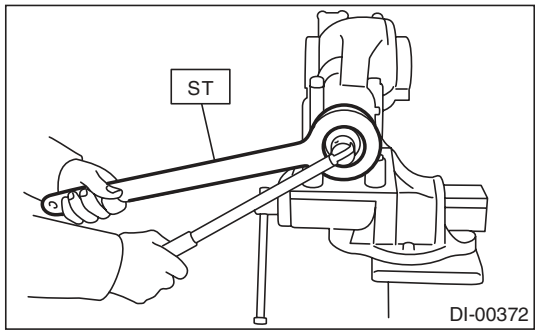
NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Never mix up the RH and LH bearing races and cones.
ST1 498077000 REMOVER
ST2 399520105 SEAT
ST3 899864100 REMOVER



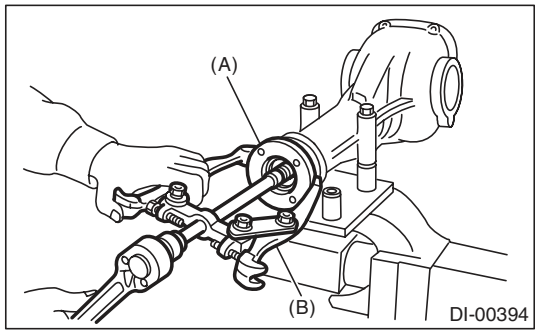
11) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



12) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



13) Extract the companion flange with a puller.

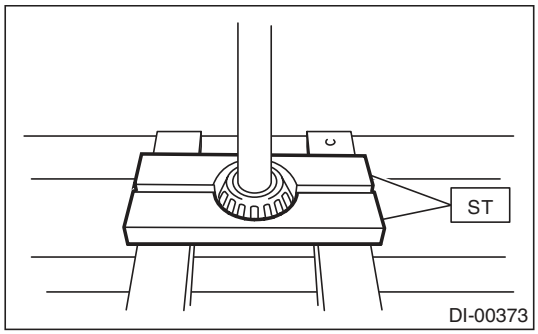


(A) Companion flange
(B) Puller

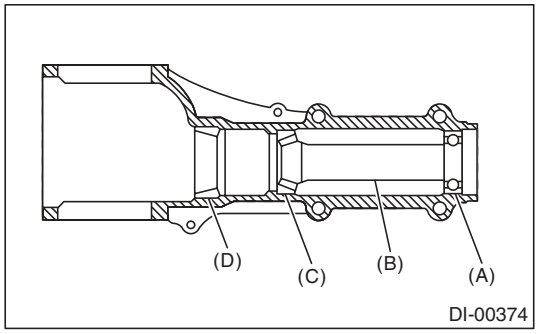
14) Removes the drive pinion shaft.

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

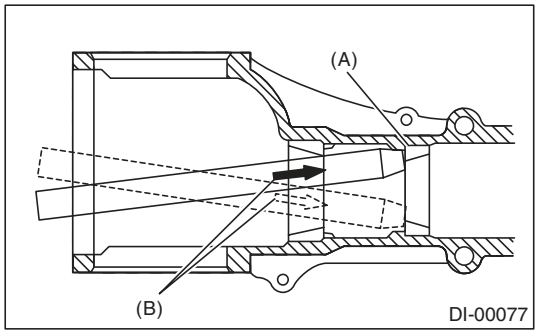


16) Remove the front oil seal from differential carrier using screwdriver.
17) Remove the pilot bearing, front bearing cone and spacer.



(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 using a brass bar.

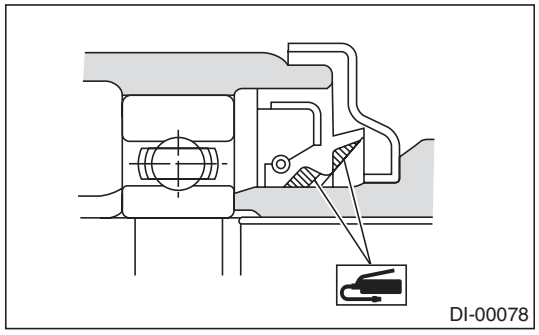


(A) 2 cutout portions along diagonal lines
(B) Tap alternately with brass bar.

D: ASSEMBLY

1. VA1-TYPE

NOTE:
- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Use new gaskets and O-rings.
- 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 RH and LH bearing races.
- Replace the oil seals and O-rings with new parts at every disassembly.
- Apply differential gear oil to the lips when installing the oil seal.
- Be careful not to mix up the differential oil seal RH and LH.

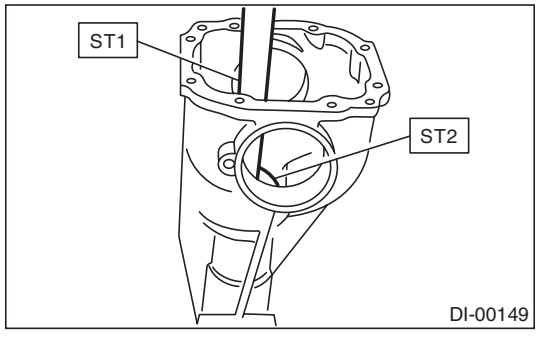

DI-00078

1) Adjusting preload for front and rear bearings

NOTE:
Adjust the bearing preload between front and rear bearings with spacer and washer. Pinion height adjusting washer is not affected by this adjustment. The adjustment must not be carried out with oil seal inserted.

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

ST1 398477701 HANDLE
ST2 398477702 DRIFT



DI-00149

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

ST1 398477701 HANDLE
ST2 498447110 DRIFT

(3) Insert the front bearing cone.

NOTE:
Use new front bearing cone.

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

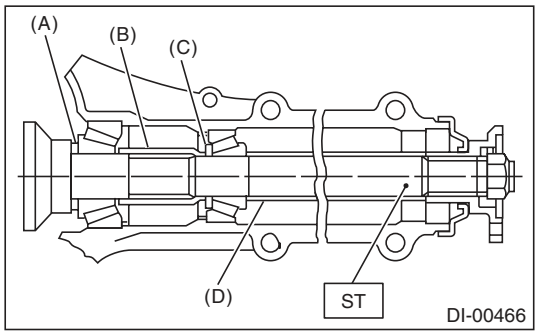
NOTE:
If tooth contact (drive pinion and hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then reuse the used washer.

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

NOTE:
Use new rear bearing cone.

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

ST 498447150 DUMMY SHAFT
Part No. 32285AA000 Spacer



DI-00466

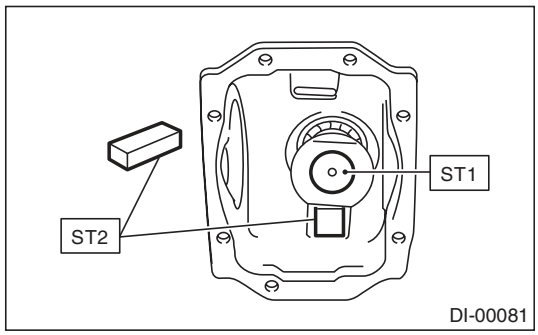
(A) Pinion height adjusting washer
(B) Preload adjusting spacer
(C) Preload adjusting washer
(D) Spacer (SUBARU genuine part)

(7) Turn the ST1 by hand to smooth the bearing, and tighten the self-locking nut while measuring the initial load or initial torque with a spring scale or torque wrench. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

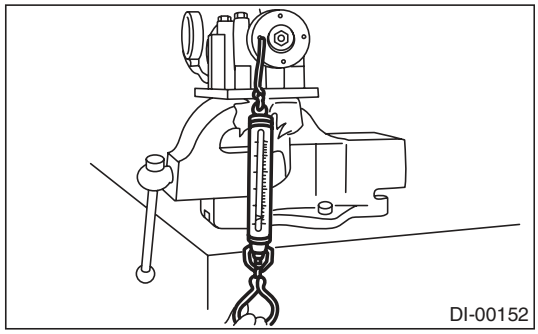
NOTE:
- Use a new self-locking nut.
- Measure the preload in direction of tangent to the flange.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.

ST1 498447150 DUMMY SHAFT
ST2 398507704 BLOCK

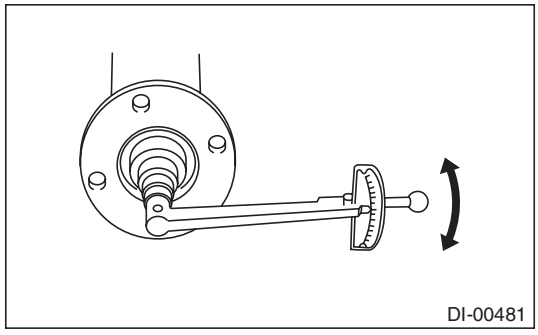
Tightening torque:
191 N·m (19.5 kgf-m, 140.9 ft-lb)



Initial load:
12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lb)



Initial torque:
0.48 — 1.22 N·m
(0.05 — 0.12 kgf-m, 0.35 — 0.9 ft-lb)

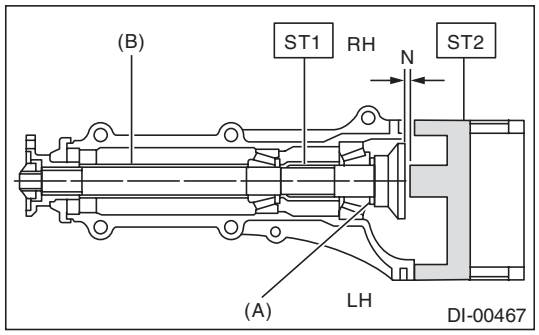


Preload adjusting washer	
Part No.	Thickness mm (in)
38336AA000	1.500 (0.0591)
38336AA120	1.513 (0.0596)
38336AA010	1.525 (0.0600)
38336AA130	1.538 (0.0606)
38336AA020	1.550 (0.0610)
38336AA140	1.563 (0.0615)
38336AA030	1.575 (0.0620)
38336AA150	1.588 (0.0625)
38336AA040	1.600 (0.0630)
38336AA160	1.613 (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)

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)

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

NOTE:
At this time, install a provisionally selected or previously used pinion height adjusting washer.
ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE
Part No. 32285AA000 Spacer

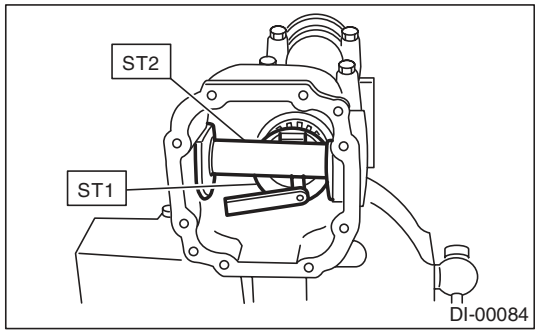


N Measured value

(A) Pinion height adjusting washer
(B) Spacer (SUBARU genuine part)

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

NOTE:
Make sure there is no clearance between the case and ST2.
ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE



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

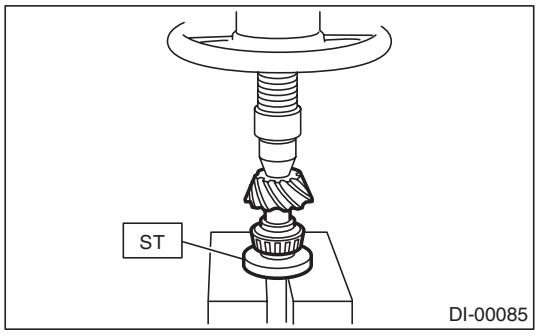
NOTE:
Adjust it using 1 — 3 washers.
T = To + N – 0.05 mm (0.0020 in)

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

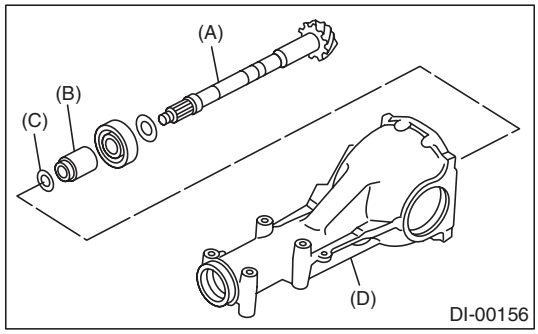
(Example of calculation)
To = 0.15 mm (0.0059 in)
N = 0.1 mm (0.0039 in)
T = 0.15 mm (0.0059 in) + 0.1 mm (0.0039 in) – 0.05 mm (0.0020 in) = 0.2 mm (0.0079 in)
Result: Thickness = 0.2 mm (0.0079 in)
Therefore use part number 32295AA220.

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

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

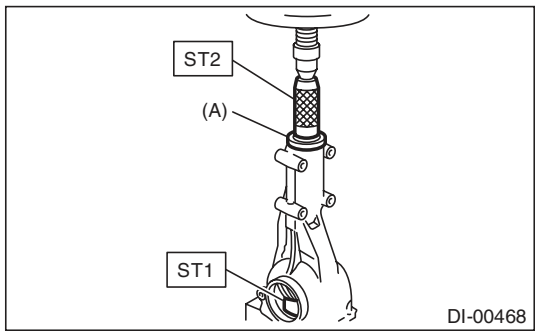


4) Insert the drive pinion into the differential carrier, and install the preselected bearing preload adjusting spacer and washer.



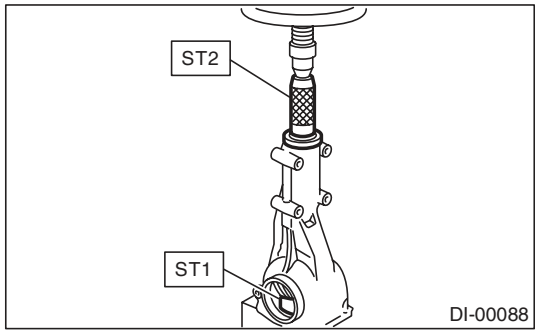
(A) Drive pinion
(B) Bearing preload adjusting spacer
(C) Bearing preload adjusting washer
(D) Differential carrier

5) Press-fit the front bearing cone into the carrier with ST1, ST2 and the spacer.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER
Part No. 32285AA000 Spacer



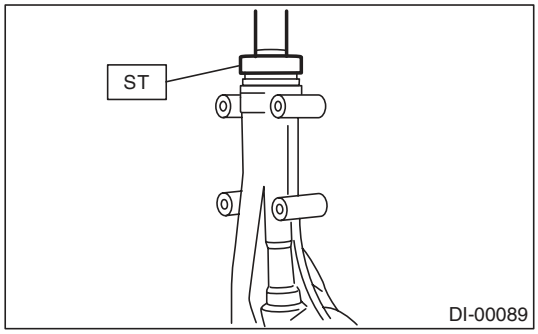
(A) Spacer (SUBARU genuine part)

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



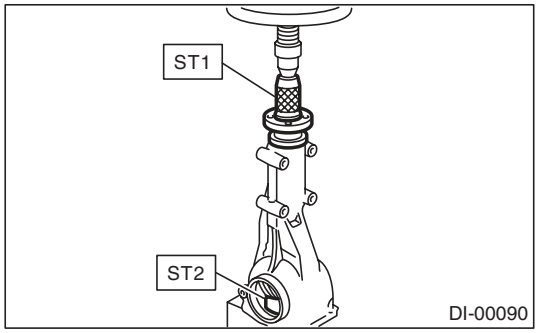
7) Fit a new oil seal with ST.

NOTE:
• Press-fit until the oil seal end comes 1 mm (0.04 in) inward from end of carrier.
• Apply the differential gear oil to the oil seal lips.
ST 498447120 INSTALLER



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

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

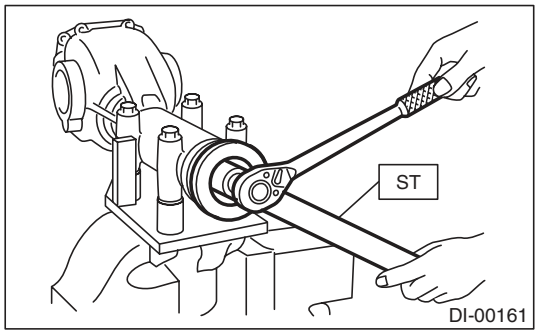


9) Attach a new self-locking nut and secure the companion flange using ST, then tighten the nut.

NOTE:
Before installing lock nuts, apply seal material to lock nut threads.

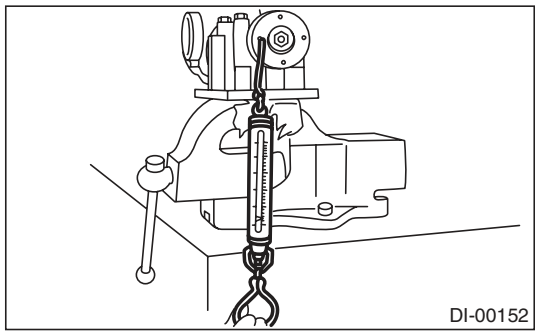
SEAL MATERIAL:
THREE BOND 1324 (Part No. 004403042) or equivalent
ST 498427200 FLANGE WRENCH

Tightening torque:
191 N·m (19.5 kgf-m, 140.9 ft-lb)

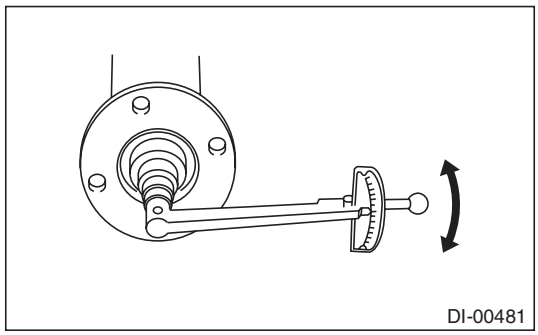


10) Check the initial torque and initial load.

Initial load:
12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lb)

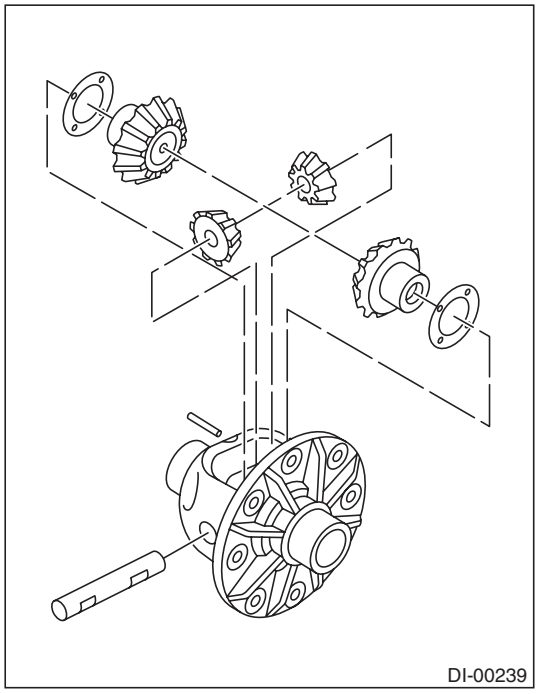


Initial torque:
0.48 — 1.22 N·m
(0.05 — 0.12 kgf-m, 0.35 — 0.90 ft-lb)



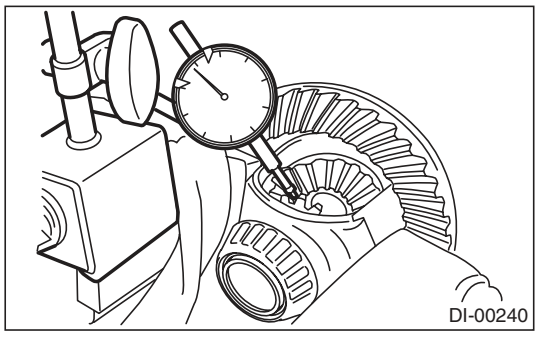
11) Assembling differential case
Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into the differential case.

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:
0.05 — 0.15 mm (0.002 — 0.006 in)



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

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

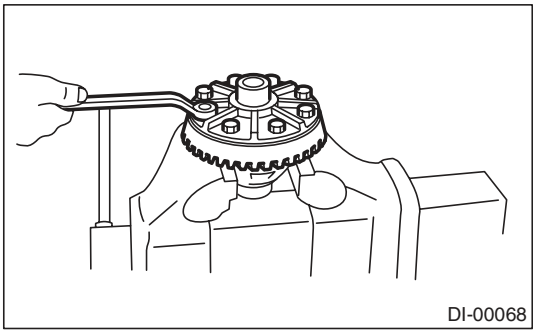
(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After inserting the pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

12) Install the hypoid driven gear to differential case.

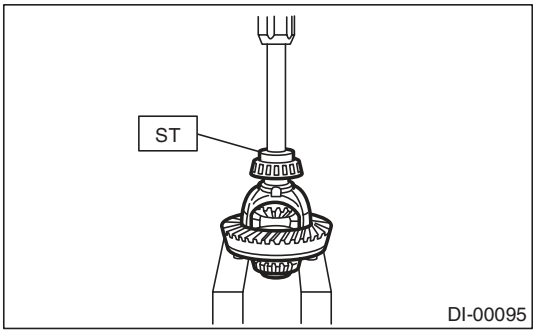
NOTE:
• Before installing bolts, apply seal material to bolt threads.

SEAL MATERIAL:
THREE BOND 1324 (Part No. 004403042) or equivalent
• Tighten diagonally.

Tightening torque:
62 N·m (6.3 kgf-m, 45.7 ft-lb)

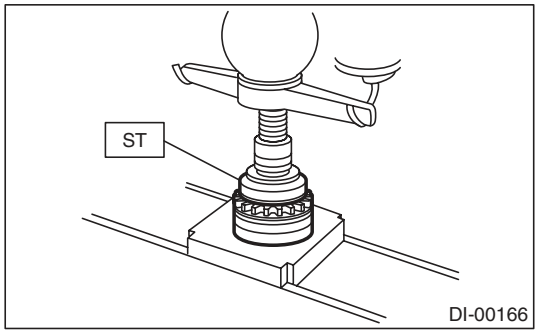

DI-00068

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



DI-00095

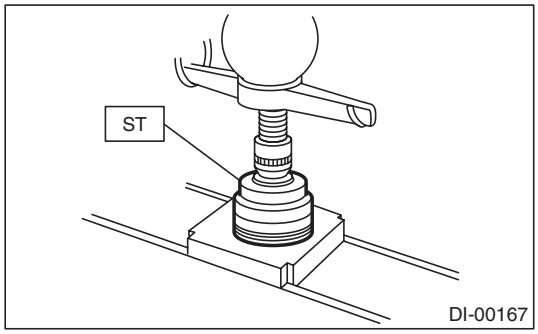
14) Assemble the side retainer.
(1) Attach the oil seal to the side retainer RH and LH.
ST 498447100 INSTALLER



DI-00166

(2) Attach the bearing race to side retainer RH and LH.
ST 398477702 DRIFT

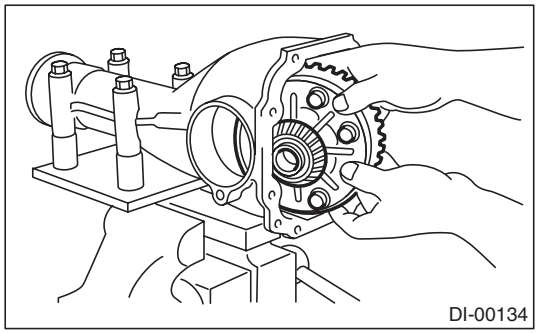
CAUTION:
Be careful to properly match the RH and LH oil seals, bearing outer races and cones during assembly.



DI-00167

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

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

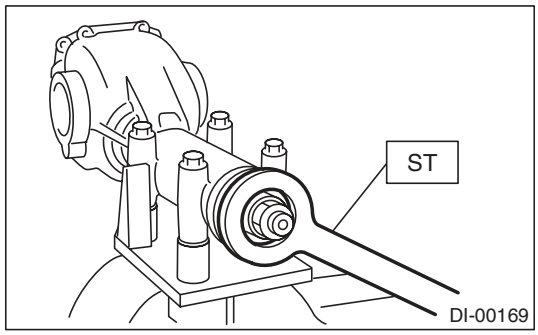

DI-00134

(4) Push the side retainer RH and LH lightly into the differential carrier to install.

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

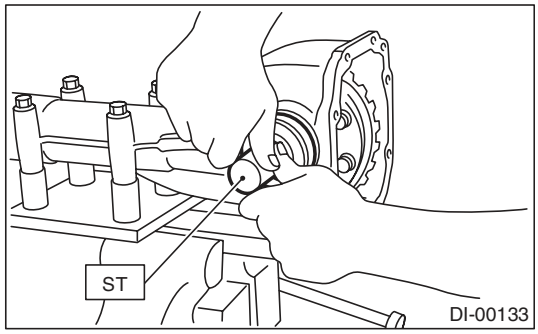
(1) Turn the drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



(2) Using the ST, tighten side retainer RH, and then tighten side retainer LH until there is no backlash.

ST 18630AA010 WRENCH COMPL RETAINER

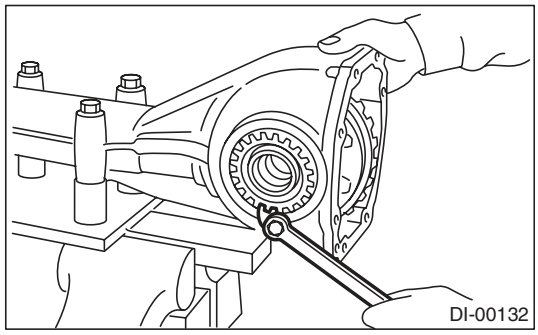


(3) Back off the side retainer LH by approx. 1.5 teeth, and tighten the side retainer RH by approx. 2 teeth (amount that the side retainer LH is turned back (1.5) + 1/2 teeth).

Difference between [amount that the side retainer LH is turned back (approx. 1 and 1/2 teeth)] and [amount that the side retainer RH is tightened (approx. 2 teeth)] gives preload.

(4) Temporarily tighten the lock plate.

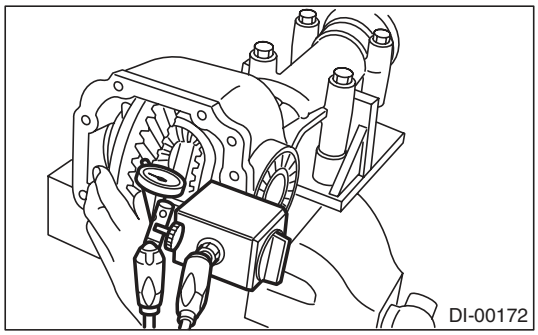
NOTE:
Turn over the lock plate to shift the holder by 1/2 tooth.



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

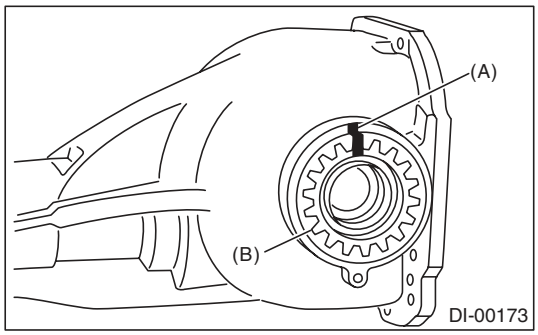
NOTE:
If measured value of backlash is not within the specified range, repeat the procedures for pinion driven gear set backlash adjustment and the differential side bearing preload adjustment.

Backlash:
0.10 — 0.15 mm (0.004 — 0.006 in)



16) Mark both the differential carrier and side retainer with alignment marks. Remove the side retainer one side at a time.

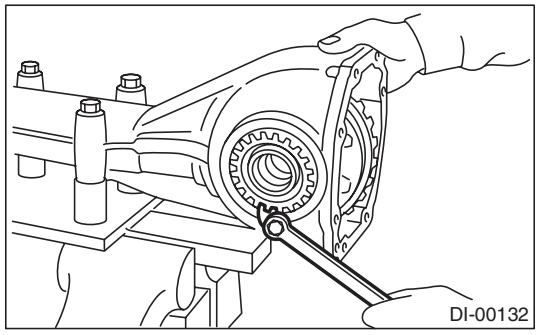
Replace them in the original position after inserting an O-ring and applying gear oil to the threaded portion.



(A) Alignment mark
(B) Side retainer

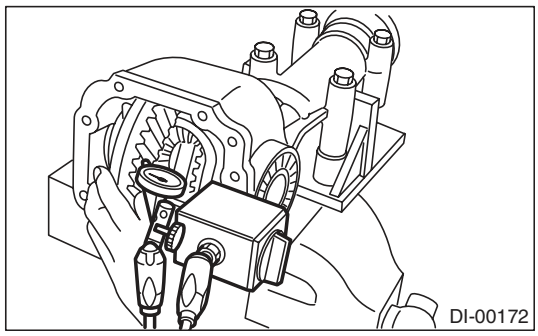
17) Tighten the bolt of lock plate to specified torque.

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



18) Recheck the hypoid driven gear to pinion backlash.

Backlash:
0.10 — 0.15 mm (0.004 — 0.006 in)



19) Checking and adjusting the tooth contact of hypoid driven gear

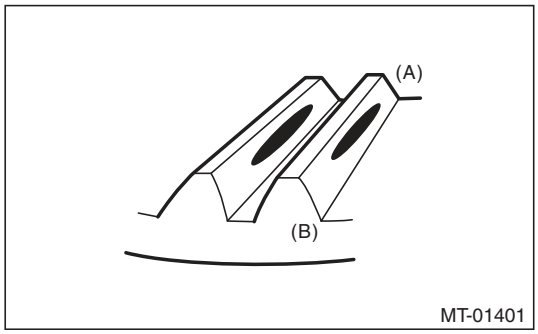
(1) Apply lead-free red dye evenly on the both sides of three to four teeth of the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.

(2) When the contact pattern is not correct, readjust.

NOTE:
Be sure to wipe off the lead-free red dye after the adjustment is completed.

• Correct tooth contact

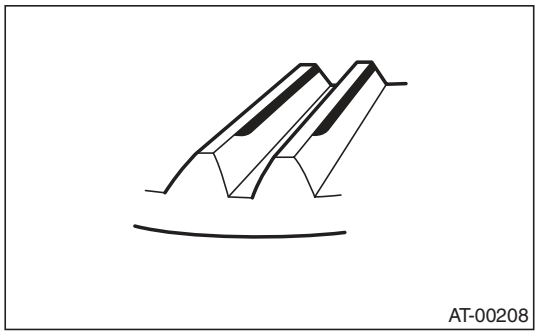
Check item: Tooth contact pattern is slightly shifted towards the toe side under no-load rotation. (When driving, it moves towards the heel side.)



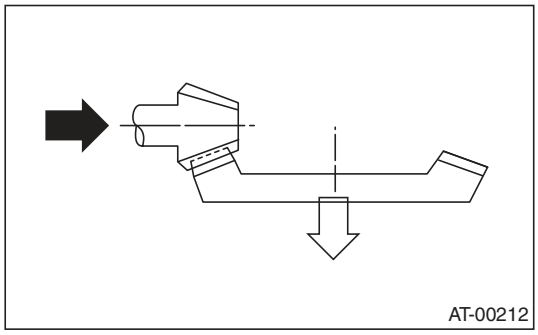
(A) Toe side
(B) Heel side

• Face contact

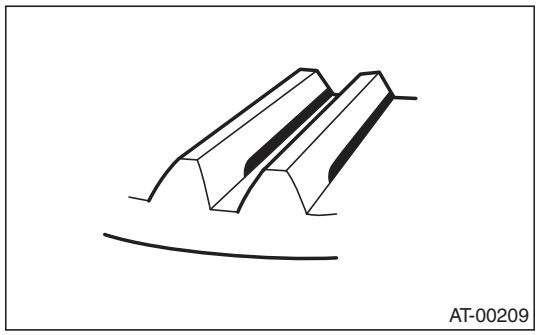
Check item: Backlash is too large.
Contact pattern



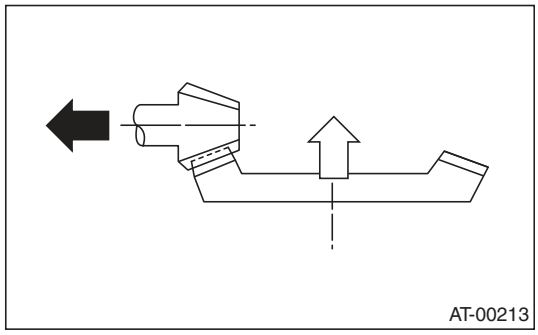
Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



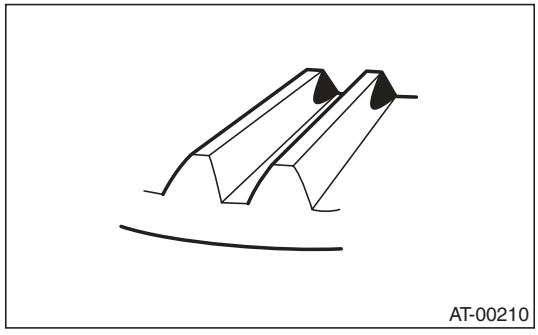
• Flank contact
Check item: Backlash is too small.
Contact pattern



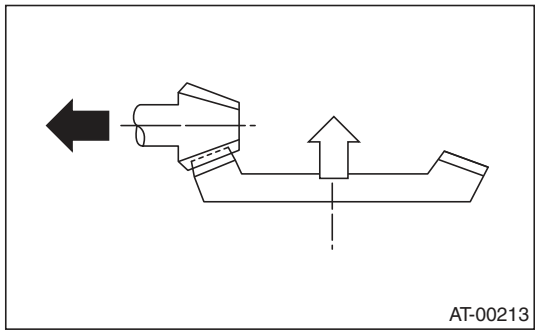
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



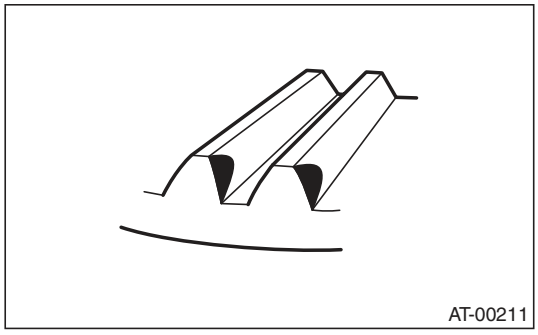
• Toe contact (inside contact)
Check item: Contact area is too small.
Contact pattern



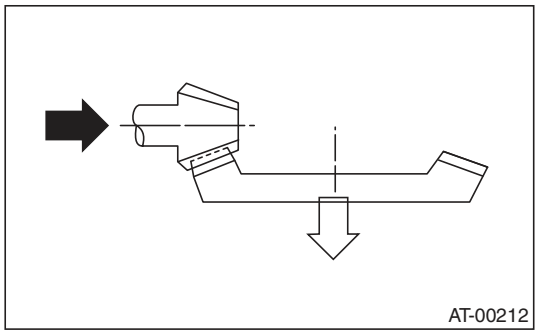
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



• Heel contact (outside end contact)
Check item: Contact area is too small.
Contact pattern

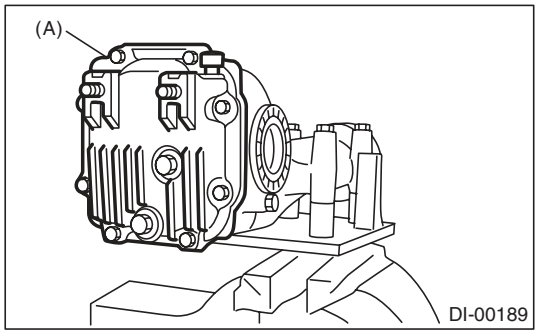


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



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

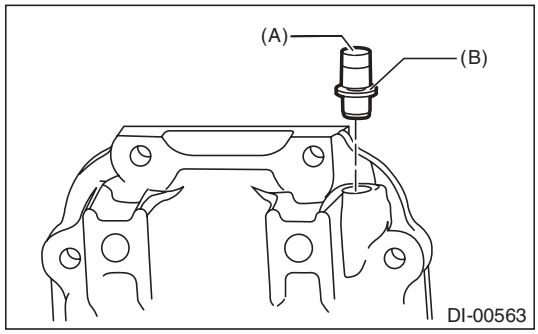
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



(A) Rear cover

22) Install the air breather cap.

NOTE:
When installing the air breather cap, hit on section (A). Be sure to hit on section (B) to install.

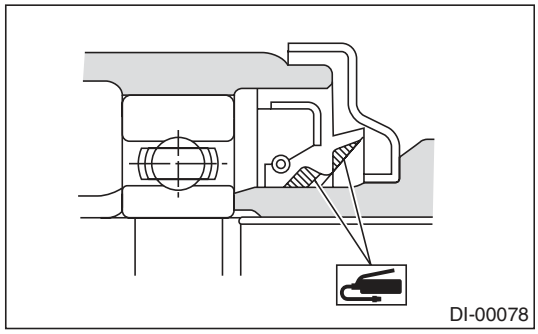


23) Install the oil drain plug and filler plug.

Tightening torque:
34 N·m (3.5 kgf-m, 25.1 ft-lb)

2. VA2-TYPE

NOTE:
- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Use new gaskets and O-rings.
- 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 RH and LH bearing races.
- Replace the oil seal with a new part at every disassembly.
- Apply differential gear oil to the lips when installing the oil seal.
- Be careful not to mix up the differential oil seal RH and LH.

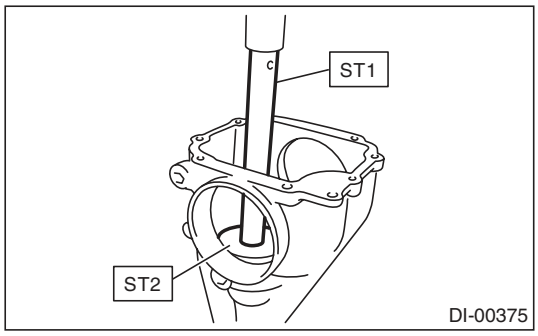


1) Adjusting preload for front and rear bearings

NOTE:
Adjust the bearing preload between front and rear bearings with spacer and washer. Pinion height adjusting washer is not affected by this adjustment. The adjustment must not be carried out with oil seal inserted.

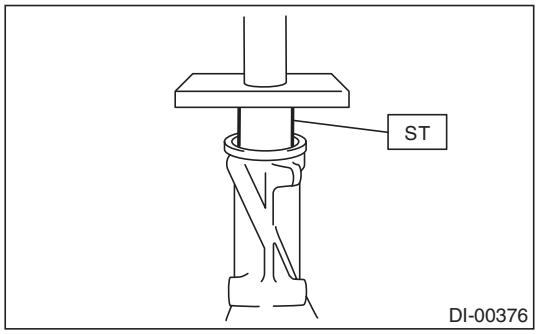
(1) Install the rear bearing race into the differential carrier using ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



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

ST 499277200 INSTALLER



(3) Insert the front bearing cone.

NOTE:
Use new front bearing cone.

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

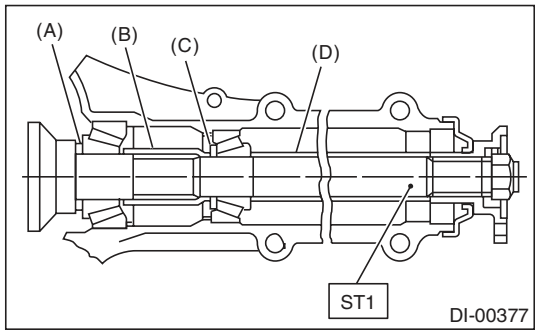
NOTE:
If tooth contact (drive pinion, hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.

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

NOTE:
Use new rear bearing cone.

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

ST1 18678AA000 DUMMY SHAFT



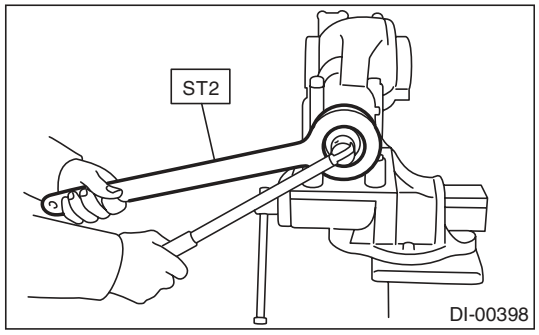
(A) Pinion height adjusting washer
(B) Preload adjusting spacer
(C) Preload adjusting washer
(D) Spacer

(7) Turn ST1 by hand to seat the bearing, and measure the initial load and initial torque with a spring scale or a torque wrench while tightening the self-locking nut. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

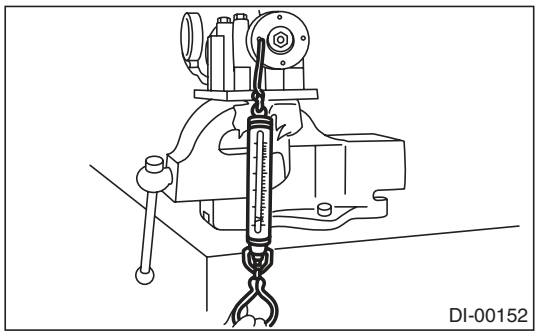
NOTE:
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock companion flange with ST2 as shown in the figure.
- Measure the preload in direction of tangent to the flange.

ST1 18678AA000 DUMMY SHAFT
ST2 498427200 FLANGE WRENCH

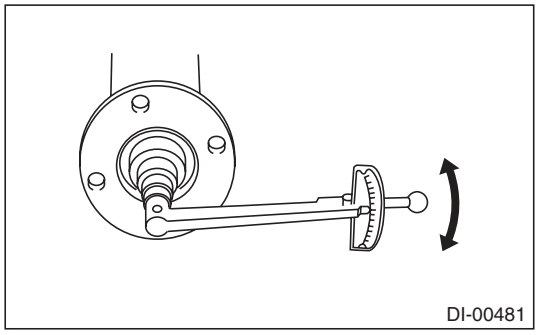
Tightening torque:
191 N·m (19.5 kgf-m, 140.9 ft-lb)



Initial load:
12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lb)



Initial torque:
0.48 — 1.22 N·m
(0.05 — 0.12 kgf-m, 0.35 — 0.90 ft-lb)



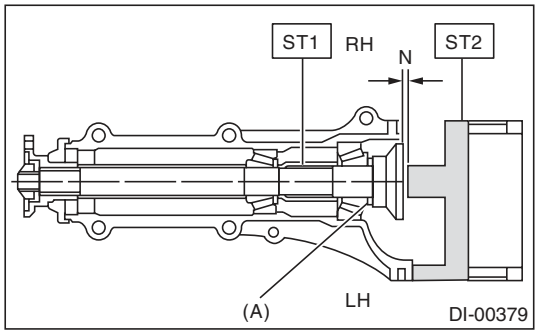
Preload adjusting washer	
Part No.	Thickness mm (in)
38336AA430	1.500 (0.0591)
38336AA440	1.513 (0.0596)
38336AA450	1.525 (0.0600)
38336AA460	1.538 (0.0606)
38336AA470	1.550 (0.0610)
38336AA480	1.563 (0.0615)
38336AA490	1.575 (0.0620)
38336AA500	1.588 (0.0625)
38336AA510	1.600 (0.0630)
38336AA520	1.613 (0.0635)
38336AA530	1.625 (0.0640)
38336AA540	1.638 (0.0645)
38336AA550	1.650 (0.0650)
38336AA560	1.663 (0.0655)
38336AA570	1.675 (0.0659)
38336AA580	1.688 (0.0665)
38336AA590	1.700 (0.0669)
38336AA600	1.713 (0.0674)
38336AA610	1.725 (0.0679)
38336AA620	1.738 (0.0684)
38336AA630	1.750 (0.0689)
38336AA640	1.763 (0.0694)
38336AA650	1.775 (0.0699)

Preload adjusting spacer	
Part No.	Length mm (in)
31454AA250	51.05 (2.010)
31454AA260	51.25 (2.018)
31454AA270	51.35 (2.022)
31454AA280	51.45 (2.026)
31454AA290	51.55 (2.030)
31454AA300	51.65 (2.033)
31454AA310	51.75 (2.037)
31454AA320	51.85 (2.041)
31454AA330	52.05 (2.049)

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

(1) Attach ST2.

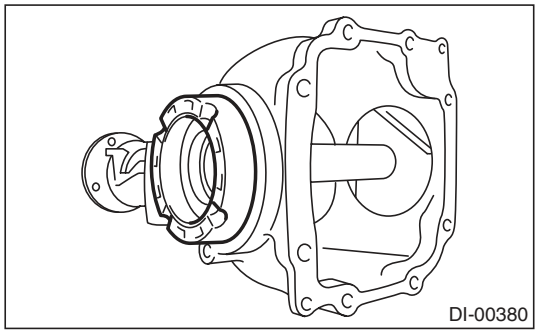
ST1 18678AA000 DUMMY SHAFT
ST2 18831AA010 DIFFERENTIAL CARRIER GAUGE



N Measured value

(A) Pinion height adjusting washer

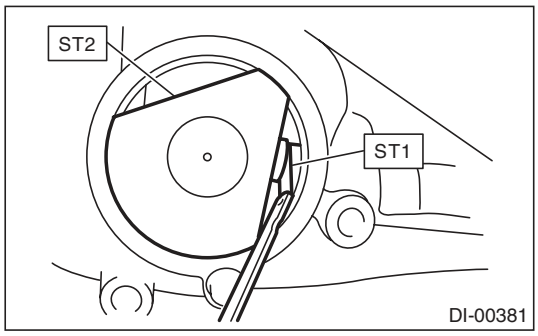
(2) Install the side retainer LH to the left side of the differential carrier in the reverse direction.



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

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

ST1 18678AA000 DUMMY SHAFT
ST2 18831AA010 DIFFERENTIAL CARRIER GAUGE



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

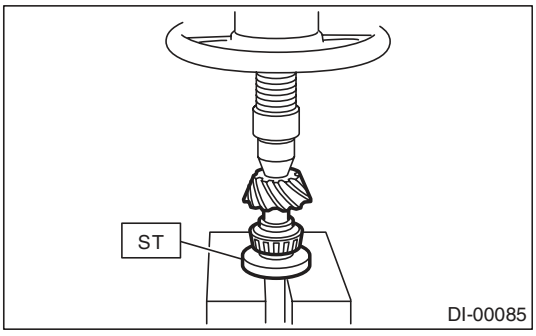
NOTE:
Adjust it using 1 — 3 washers.
T = To + N – 0.05 mm (0.002 in)

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

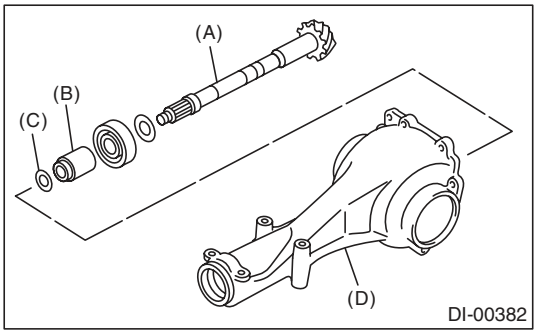
(Example of calculation)
To = 0.15 mm (0.0059 in)
N = 0.1 mm (0.0039 in)
T = 0.15 mm (0.0059 in) + 0.1 mm (0.0039 in) – 0.05 mm (0.0020 in) = 0.2 mm (0.0079 in)
Result: Thickness = 0.2 mm (0.0079 in)
Therefore use part number 32295AA370.

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

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

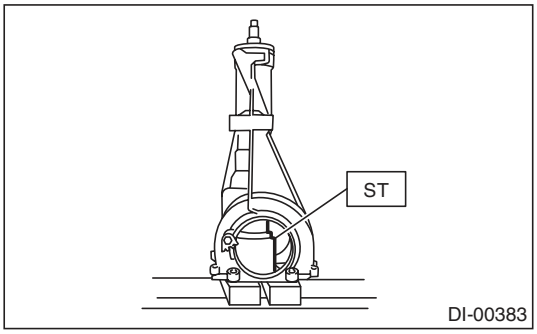


4) Insert the drive pinion into the differential carrier, and install the preselected bearing preload adjusting spacer and washer.

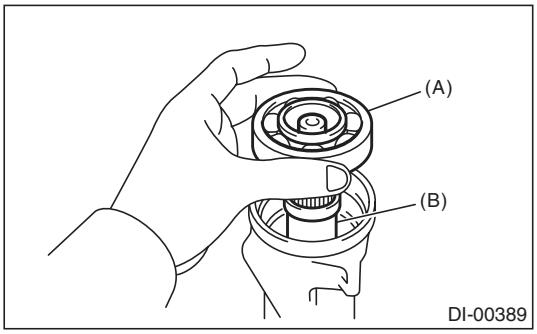


(A) Drive pinion
(B) Bearing preload adjusting spacer
(C) Bearing preload adjusting washer
(D) Differential carrier

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



NOTE:
Set the carrier to the press until the companion flange is installed.
6) Insert the spacer, then install the pilot bearing.

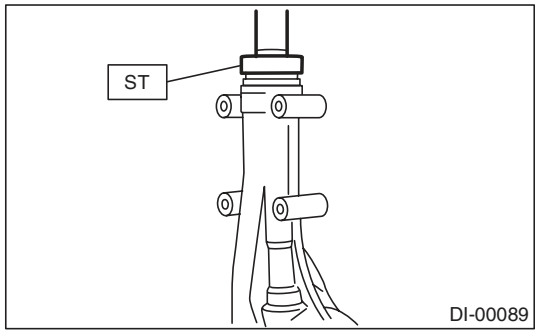


(A) Pilot bearing
(B) Spacer

7) Fit a new oil seal with ST.

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

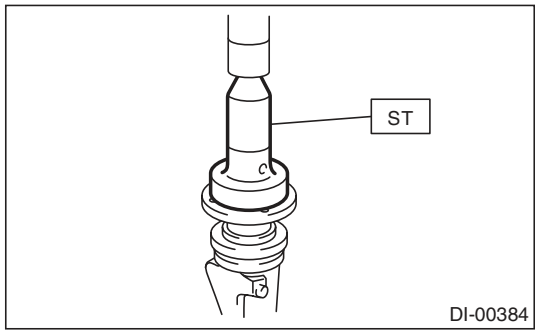
ST 499277200 INSTALLER



8) Press-fit the companion flange with ST.

NOTE:
Be careful not to damage the bearing.

ST 899874100 INSTALLER



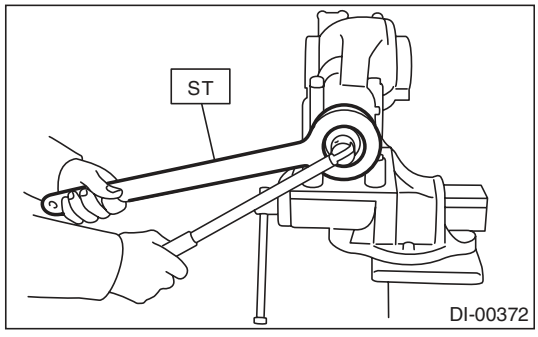
9) Apply seal material on the drive pinion shaft thread and new self-locking nut seat.

SEAL MATERIAL:
THREE BOND 1324 (Part No. 004403042) or equivalent

10) Tighten the nut and use the ST to fix the companion flange in place, then tighten.

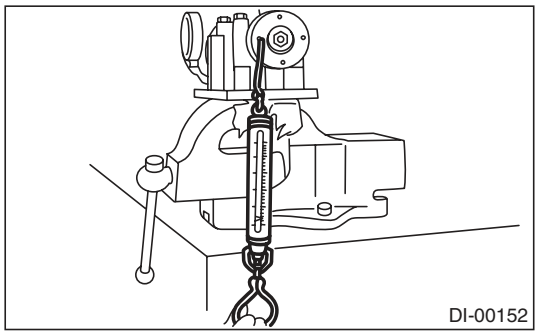
ST 498427200 FLANGE WRENCH

Tightening torque:
191 N·m (19.5 kgf-m, 140.9 ft-lb)

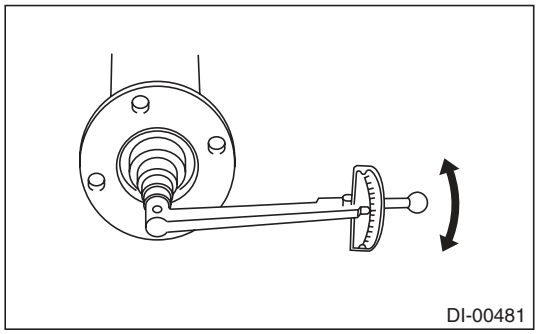


11) Measure the initial torque and initial load.

Initial load:
12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lb)



Initial torque:
0.48 — 1.22 N·m
(0.05 — 0.12 kgf-m, 0.35 — 0.90 ft-lb)



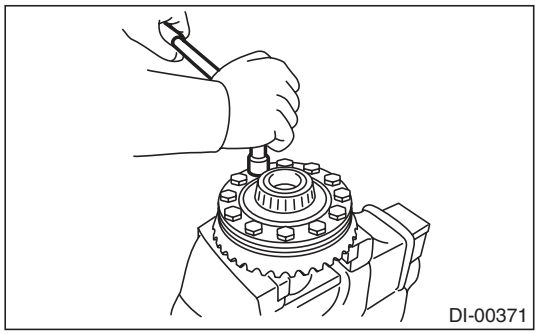
12) Install the hypoid driven gear to differential case.

NOTE:
• Set a cushioning such as wooden block, aluminum plate or shop cloth between vise and differential case if the side gear comes into contact with vise.
• Before installing bolts, apply seal material to bolt threads.

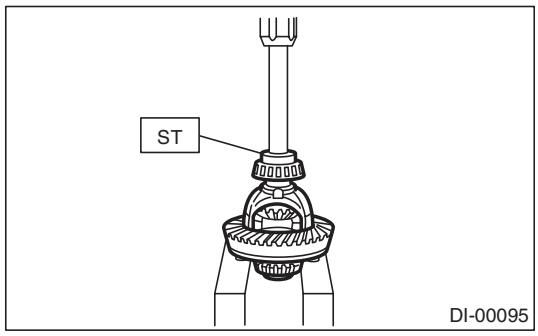
SEAL MATERIAL:
THREE BOND 1324 (Part No. 004403042)

• Tighten diagonally.

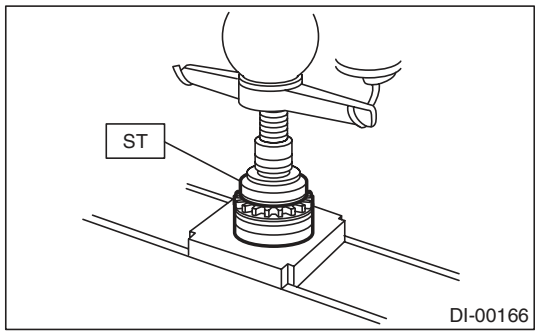
Tightening torque:
62 N·m (6.3 kgf-m, 45.7 ft-lb)



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



14) Assemble the side retainer.
(1) Attach the new oil seal to the side retainer RH and LH.
ST 498447100 INSTALLER

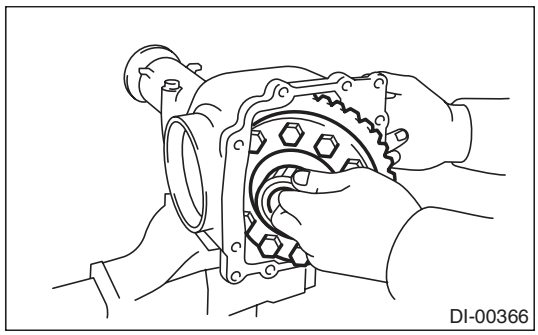


(2) Attach the bearing race to side retainer RH and LH.
ST 398417700 DRIFT

CAUTION:
Be careful to properly match the RH and LH oil seals, bearing outer races and cones during assembly.

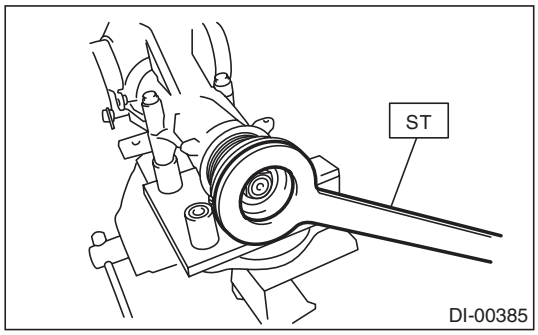
(3) Install the differential assembly into differential carrier in the reverse order of disassembly.

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

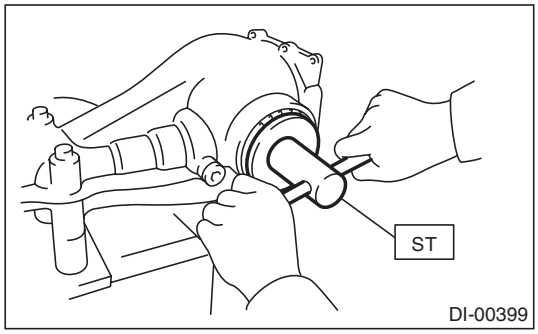


(4) Push the side retainer RH and LH lightly into the differential carrier to install.

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

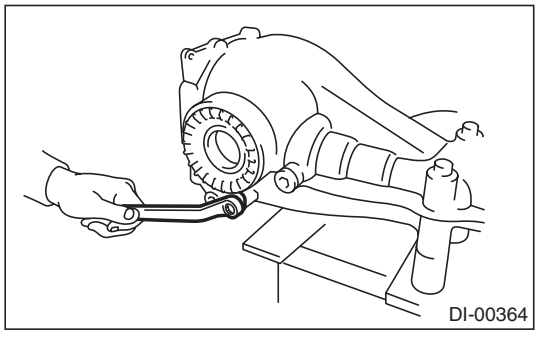


(2) Using the ST, tighten the side retainer LH, and then tighten the side retainer RH until there is no backlash.
ST 18630AA010 WRENCH COMPL RETAINER



(3) Back off the side retainer LH by approx. 1.5 teeth, and tighten the side retainer RH by approx. 2 teeth (amount that the side retainer LH is turned back (1.5) + 1/2 teeth).
Difference between [amount that the side retainer LH is turned back (approx. 1 and 1/2 teeth)] and [amount that the side retainer RH is tightened (approx. 2 teeth)] gives preload.
(4) Temporarily tighten the lock plate.

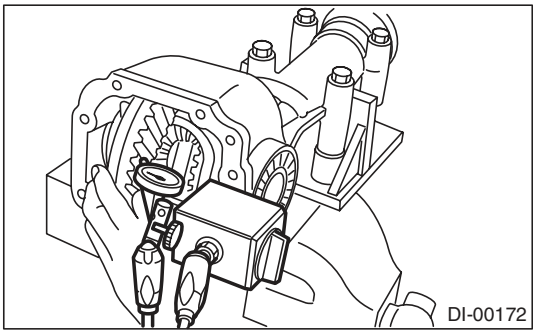
NOTE:
Turn over the lock plate to shift the holder by 0.5 teeth.



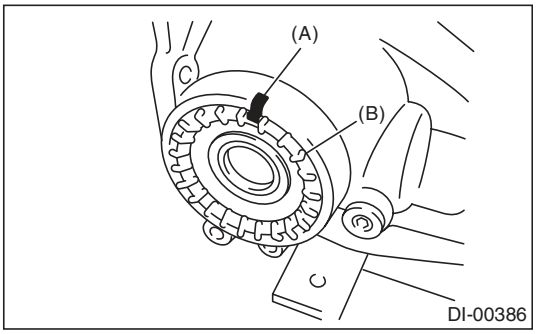
(5) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

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

Backlash:
0.10 — 0.15 mm (0.004 — 0.006 in)



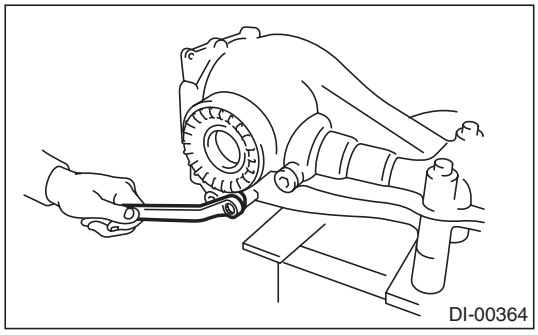
16) Mark both the differential carrier and side retainer with alignment marks. Remove the side retainer one side at a time.
Replace them in the original position after inserting an O-ring and applying differential gear oil to the threaded portion.



(A) Alignment mark
(B) Side retainer

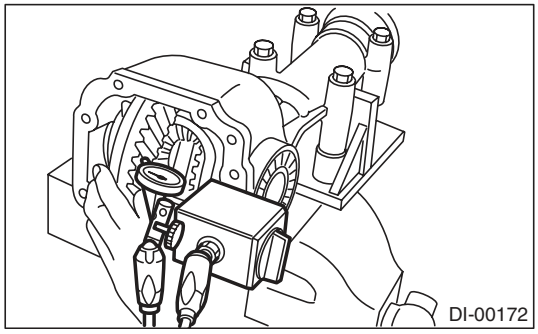
17) Tighten the bolt of lock plate to specified torque.

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



18) Recheck the hypoid driven gear to pinion backlash.

Backlash:
0.10 — 0.15 mm (0.004 — 0.006 in)

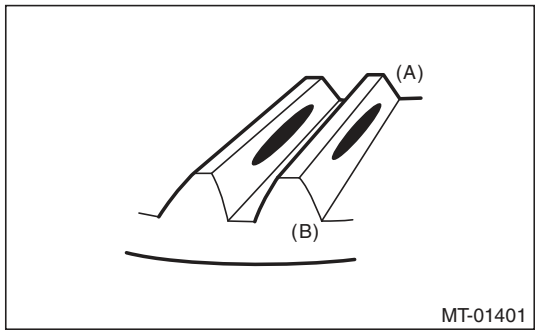


19) Checking and adjusting the tooth contact of hypoid driven gear
(1) Apply lead-free red dye evenly on the both sides of three to four teeth of the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.
(2) When the contact pattern is not correct, readjust.

NOTE:
Be sure to wipe off the lead-free red dye completely after the adjustment is completed.

• Correct tooth contact

Check item: Tooth contact pattern is slightly shifted towards the toe side under no-load rotation. (When driving, it moves towards the heel side.)

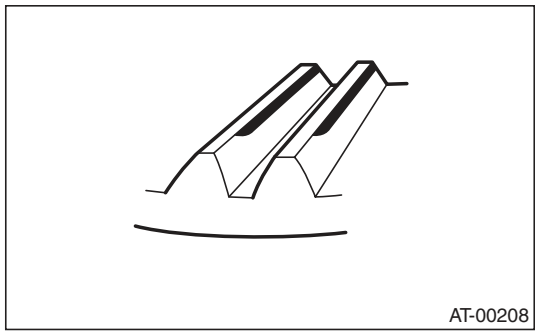


(A) Toe side
(B) Heel side

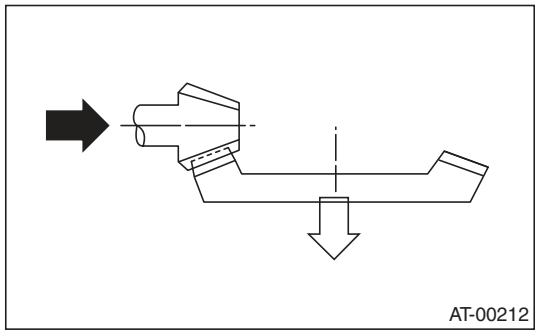
• Face contact

Check item: Backlash is too large.

Contact pattern



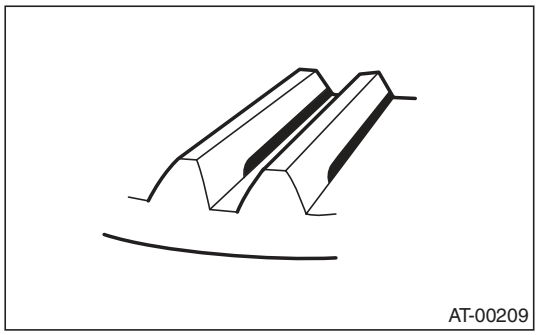
Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



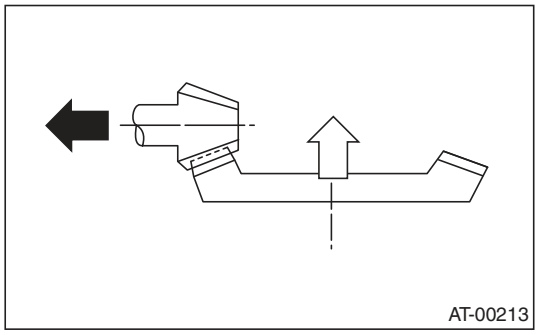
• Flank contact

Check item: Backlash is too small.

Contact pattern



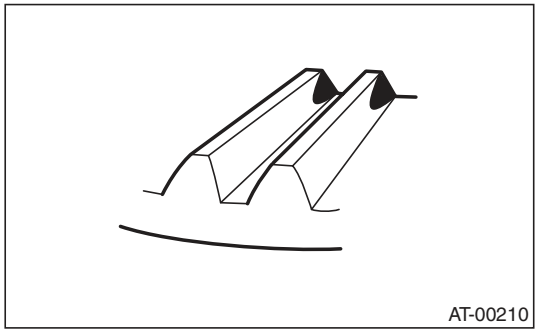
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



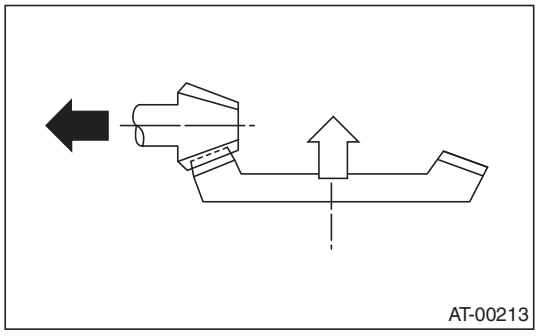
• Toe contact (inside contact)

Check item: Contact area is too small.

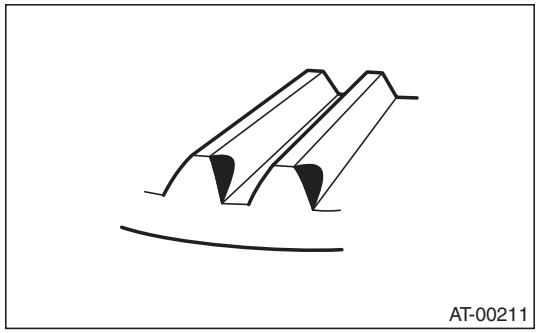
Contact pattern



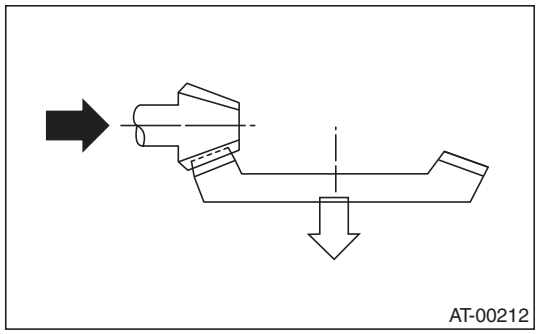
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



• Heel contact (outside end contact)
Check item: Contact area is too small.
Contact pattern

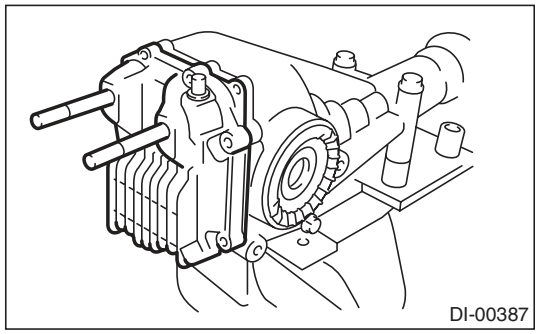


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



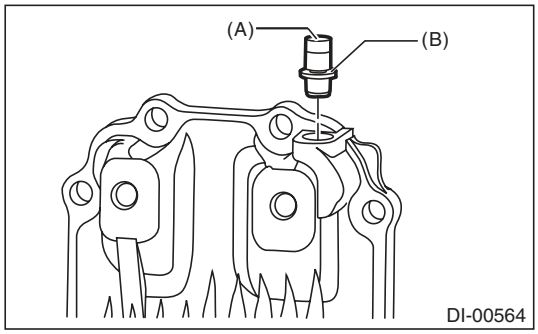
20) If correct tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.
21) Install the new gasket and rear cover to the differential carrier, and tighten the bolts to specified torque.

Tightening torque:
34 N·m (3.5 kgf-m, 25.1 ft-lb)



22) Install the air breather cap.

NOTE:
When installing the air breather cap, hit on section (A). Be sure to hit on section (B) to install.



23) Tighten the oil drain plug and filler plug.

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

E: INSPECTION

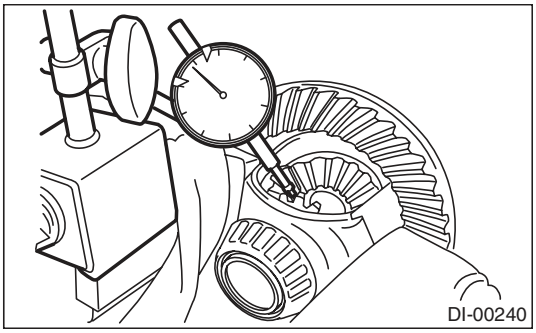
Wash all the disassembled parts clean, and examine them for wear, damage or other defects. Repair or replace the defective parts as necessary.
1) Hypoid driven gear and drive pinion
• If there is evidently an abnormal tooth contact, find out the cause and adjust until the teeth contact correctly. Replace the gear if there is an excessive worn or an incapable adjustment.
• If crack, cutout or seizure is found, replace the parts as a set. Slight damage of some teeth can be corrected by oil stone or the like.
2) Side gear and pinion mate gear
• Replace if cracks, scoring or other defects are evident on the tooth surface.
• Replace if thrust washer contact surface is worn or seized. Slight damages of the surface can be corrected by oil stones or equivalent.
3) Bearing
Replace if seizure, peeling, wear, rust, dragging during rotation, noise or other defect is evident.
4) Thrust washer of the side gear and pinion mate gear
Replace if seized, flawed, abnormally worn or having other defects.
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 abnormally worn, burned, or cracked.
8) Companion flange
Replace if the oil seal lip contact surface shows cracking.

1. SIDE GEAR BACKLASH

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

Side gear backlash:
0.05 — 0.15 mm (0.002 — 0.006 in)

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

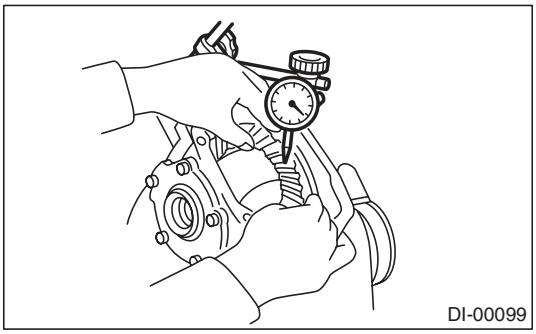

DI-00240

2. HYPOID DRIVEN GEAR BACKLASH

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

Hypoid driven gear backlash:
0.10 — 0.15 mm (0.004 — 0.006 in)

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


DI-00099

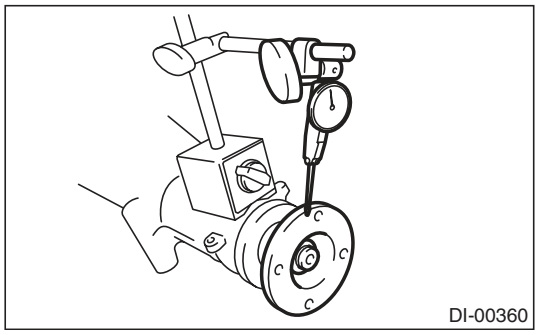
3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between the hypoid driven gear and drive pinion. <Ref. to DI-66, ASSEMBLY, Rear Differential (VA-type).>

4. COMPANION FLANGE

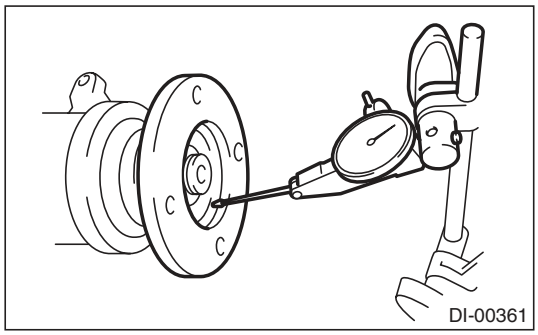
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.003 in)


DI-00360

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

Limit of runout:
0.08 mm (0.003 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 even after changing the phase, replace the companion flange and recheck the runout.
6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash. (VA1-type) <Ref. to DI-66, ASSEMBLY, Rear Differential (VA-type).>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash. <Ref. to DI-66, 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-66, ASSEMBLY, Rear Differential (VA-type).>

6. Rear Differential Front Oil Seal

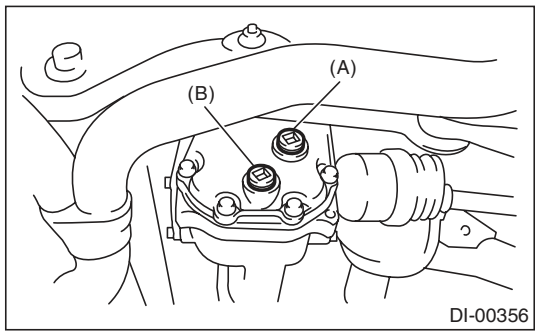
A: INSPECTION

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

B: REPLACEMENT

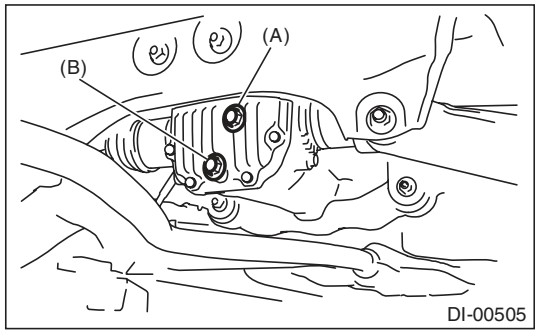
1) Disconnect the ground cable from battery.
2) Shift the select lever or gear shift lever to neutral.
3) Release the parking brake.
4) Lift up the vehicle.
5) Remove the oil drain plug, and drain gear oil.

• T-type



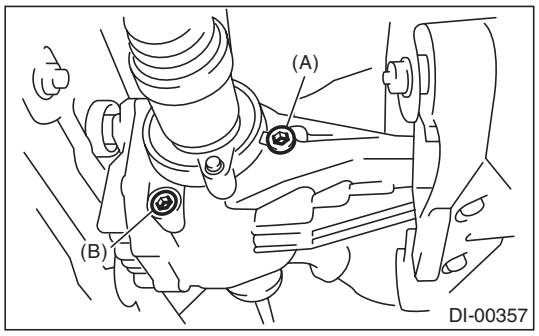
(A) Filler plug
(B) Oil drain plug

• VA1-type



(A) Filler plug
(B) Oil drain plug

• VA2-type



(A) Filler plug
(B) Oil drain plug

6) Install the oil drain plug.

NOTE:
• Apply liquid gasket to the drain plug for the T-type (except for GT spec. B 6MT model).

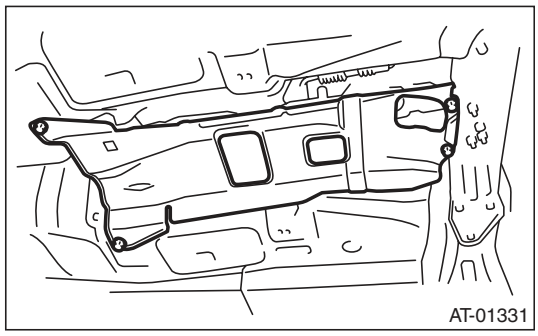
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

• Use a new gasket for the VA-type and T-type (GT spec. B 6MT model).

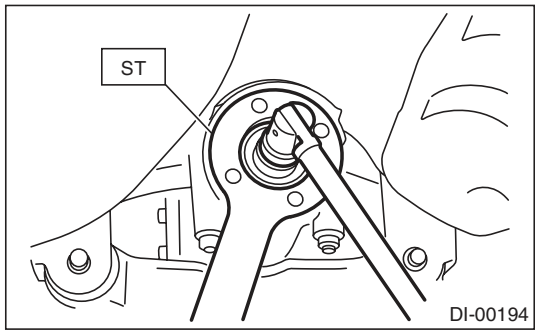
Tightening torque:
T-type (except for GT spec.B 6MT model):
49 N·m (5.0 kgf-m, 36.1 ft-lb)
T-type (GT spec. B 6MT model):
60 N·m (6.1 kgf-m, 44.3 ft-lb)
VA1-type:
34 N·m (3.5 kgf-m, 25.1 ft-lb)
VA2-type:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

7) Remove the rear exhaust pipe and muffler.
• 2.5 L SOHC non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
• 2.5 L DOHC turbo model
<Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
• 3.0 L DOHC non-turbo model
<Ref. to EX(H6DO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>

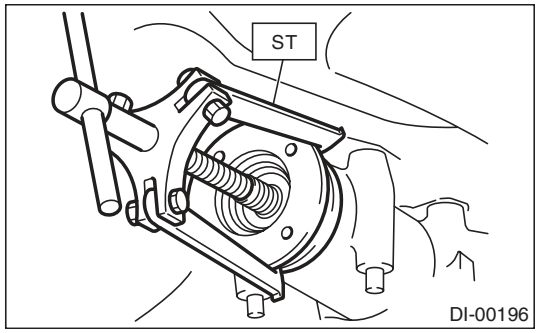
8) Remove the heat shield cover.



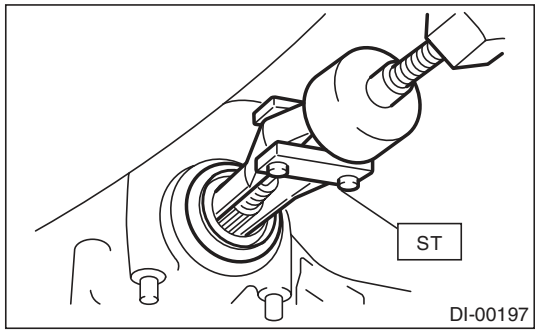
9) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
10) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



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

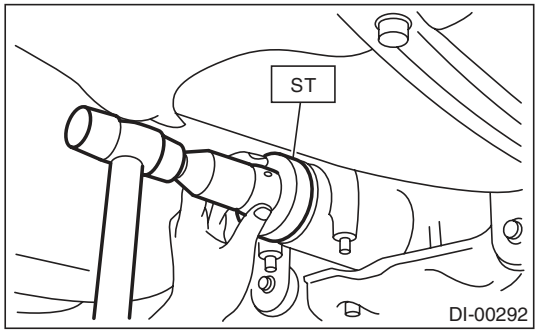


12) Remove the oil seal using ST or screwdriver.
ST 398527700 PULLER ASSY



13) Install a new oil seal using ST.

NOTE:
Apply the differential gear oil to the oil seal lips.
ST 498447120 INSTALLER



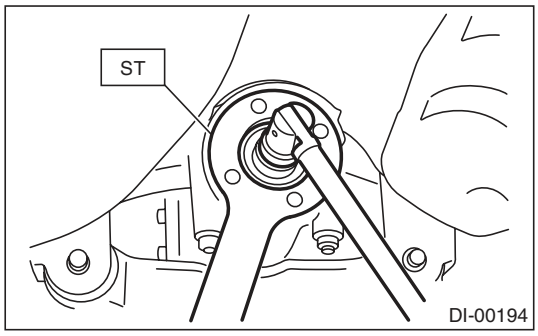
14) Install the companion flange.

NOTE:
Use a plastic hammer to install companion flange.
15) Tighten the self-locking nut within the specified torque range so that the rotating resistance of companion flange becomes the same as that of before oil seal replacement.
ST 498427200 FLANGE WRENCH

NOTE:
- Use a new self-locking nut.
- Before installing the self-locking nut, apply seal material to self-locking nut threads.

SEAL MATERIAL:
THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:
T-type:
181.5 N·m (18.5 kgf-m, 133.9 ft-lb)
VA-type:
191 N·m (19.5 kgf-m, 140.9 ft-lb)



16) Hereafter, reassemble in the reverse order of disassembly.
17) After installing, fill with differential gear oil up to the bottom of the filler plug hole. <Ref. to DI-26, Differential Gear Oil.>

7. Rear Differential Side Oil Seal

A: INSPECTION

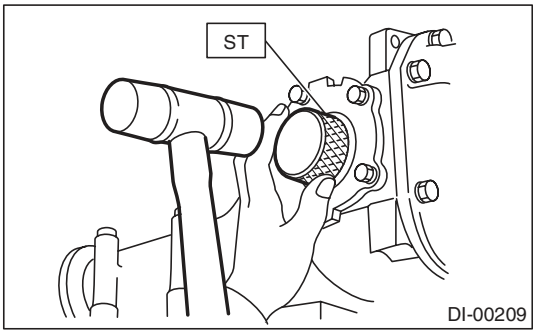
Make sure that there is no leakage from side oil seal. If there is any leakage, replace the oil seal.

B: REPLACEMENT

1) Remove the rear differential. <Ref. to DI-30, REMOVAL, Rear Differential (T-type).> <Ref. to DI-56, REMOVAL, Rear Differential (VA-type).>
2) Remove the rear differential side oil seal using a screwdriver or ST wrapped with vinyl tape to prevent the side retainer from scratches.
3) Using the ST, install the oil seal to the side retainer.

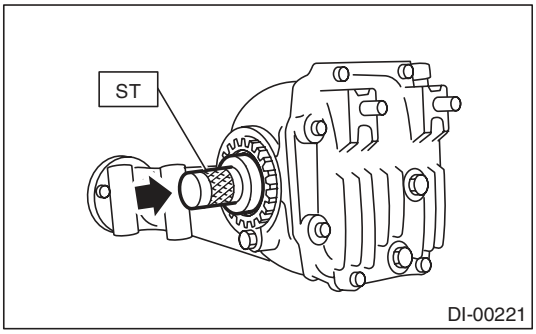
- T-type and VA2-type

ST 398437700 DRIFT



- VA1-type

ST 498447100 INSTALLER

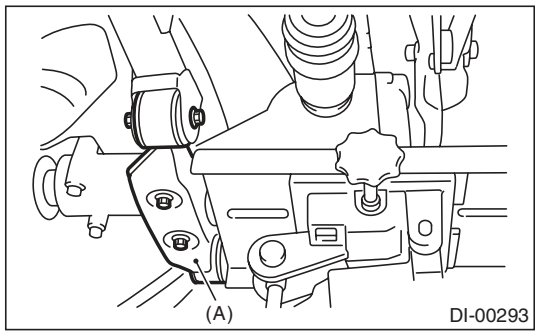


4) Install the rear differential. <Ref. to DI-32, INSTALLATION, Rear Differential (T-type).> <Ref. to DI-58, INSTALLATION, Rear Differential (VA-type).>

8. Rear Differential Front Member

A: REMOVAL

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

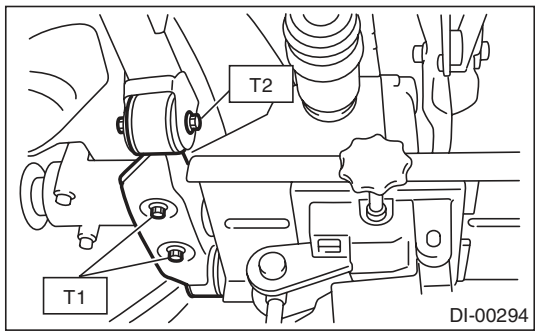


(A) Rear differential front member

B: INSTALLATION

Using new self-locking nuts, install the rear differential front member.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)



C: INSPECTION

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

9. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	(1) Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered or excessively worn sliding surface of companion flange.	Repair or replace.
	(2) Clogged or damaged air breather.	Clean, repair or replace.
	(3) Loose bolts on side retainer, or incorrectly fitted O-ring.	Tighten the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attaching bolts or damaged gasket.	Tighten the bolts to specified torque. Replace gasket and apply liquid gasket.
	(5) Loose oil filler or oil drain plug.	Retighten and apply liquid gasket.
	(6) Wear, damage or incorrect fitting of side retainer or 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.	Add specified oil to the specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Improper backlash for hypoid gear.	Replace.
	(2) Insufficient or excessive preload for side, rear or front bearing.	Readjust or replace.
	(3) Excessive backlash for differential gear.	Replace gear or thrust washer. (For T-type (except for GT spec. B 6MT model), replace the differential case assembly.)
	(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 disassembling.	(1) Excessive backlash for hypoid gear.	Readjust.
	(2) Improper tooth contact of the hypoid gear	Readjust. (Drive pinion adjustment and backlash adjustment)
	(3) Excessive backlash for differential gear.	Replace gear or thrust washer. (For T-type (except for GT spec. B 6MT model), replace the differential case assembly.)
	(4) Insufficient preload for front or rear bearing.	Readjust.
	(5) Loose drive pinion nut.	Tighten to the specified torque.
	(6) Loose bolts and nuts such as side retainer attachment bolt.	Tighten to the specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace. (For T-type (except for GT spec. B 6MT model), replace the differential case assembly.)
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Seized or damaged side bearing.	Replace.

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

1. General Description

A: NOTE

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

2. Transfer Case and Extension Case Assembly

A: NOTE

For removal, installation and inspection, refer to the “5MT” section. <Ref. to 5MT-38, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch

A: NOTE

For removal, installation and inspection, refer to the “4AT” or “5AT” section.
4AT model:
<Ref. to 4AT-70, Transfer Clutch.>
5AT model:
<Ref. to 5AT-70, Transfer Clutch.>

4. Extension Case

A: NOTE

For removal, installation and inspection, refer to the “4AT”, “5AT” or “6MT” section.
4AT model:
<Ref. to 4AT-68, Extension Case.>
5AT model:
<Ref. to 5AT-68, Extension Case.>
6MT model:
<Ref. to 6MT-43, Extension Case.>

5. Oil Seal

A: NOTE

For replacement and inspection, refer to the “4AT”, “5AT”, “5MT” or “6MT” section.
4AT model:
<Ref. to 4AT-44, Extension Case Oil Seal.> <Ref. to 4AT-45, Differential Side Retainer Oil Seal.>
5AT model:
<Ref. to 5AT-49, Extension Case Oil Seal.> <Ref. to 5AT-50, Differential Side Retainer Oil Seal.>
5MT model:
<Ref. to 5MT-33, Oil Seal.> <Ref. to 5MT-34, Differential Side Retainer Oil Seal.>
6MT model:
<Ref. to 6MT-28, Oil Seal.> <Ref. to 6MT-29, Differential Side Retainer Oil Seal.>

6. Transfer Drive Gear

A: NOTE

For removal, installation and inspection, refer to the “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-42, Transfer Drive Gear.>
6MT model:
<Ref. to 6MT-53, Transfer Drive Gear.>

7. Transfer Driven Gear

A: NOTE

For removal, installation and inspection, refer to the “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-44, Transfer Driven Gear.>
6MT model:
<Ref. to 6MT-55, Transfer Driven Gear.>

8. Reduction Drive Gear

A: NOTE

For removal, installation and inspection, refer to the “4AT” section. <Ref. to 4AT-77, Reduction Drive Gear.>

9. Center Differential Carrier

A: NOTE

For removal, installation and inspection, refer to the “5AT” section. <Ref. to 5AT-77, Center Differential Carrier.>

10. Reduction Driven Gear

A: NOTE

For removal, installation and inspection, refer to the “4AT” or “5AT” section.
4AT model:
<Ref. to 4AT-75, Reduction Driven Gear.>
5AT model:
<Ref. to 5AT-74, Reduction Driven Gear.>

11.Center Differential

A: NOTE

For removal, installation and inspection, refer to the “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-46, Center Differential.>
6MT model:
<Ref. to 6MT-57, Center Differential.>

12. Transfer Clutch Pressure Test

A: NOTE

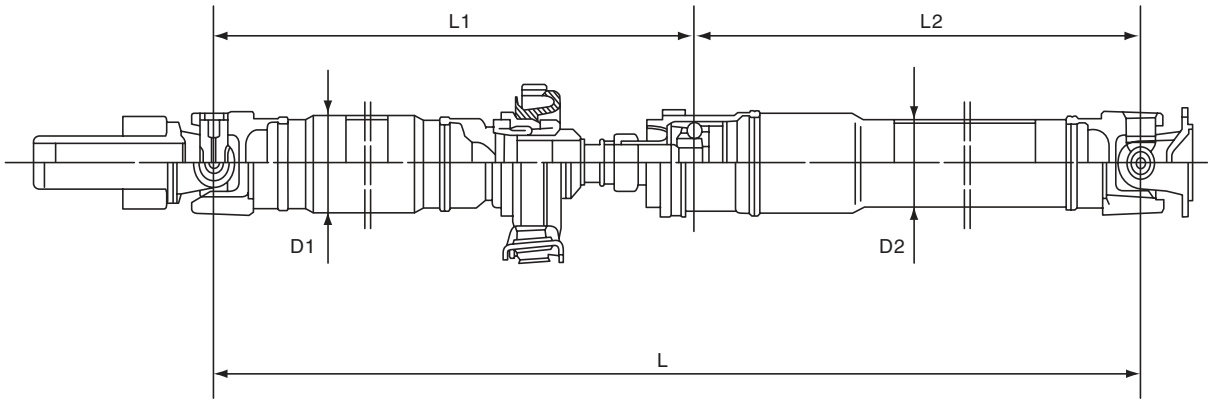
For inspection, refer to “4AT” or “5AT” section.
4AT model:
<Ref. to 4AT-34, Transfer Clutch Pressure Test.>
5AT model:
<Ref. to 5AT-37, Transfer Clutch Pressure Test.>

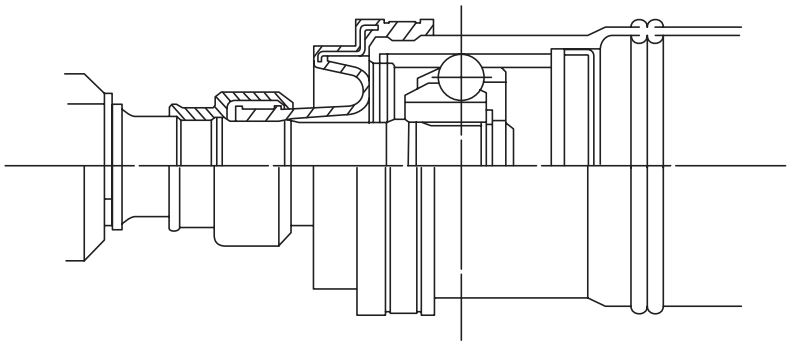
1. General Description

A: SPECIFICATION

1. PROPELLER SHAFT

Model			5MT	6MT	4AT	5AT
Propeller shaft type			EDJ			
Propeller shaft length: L		mm (in)	1,483 (58.39)	1,423 (56.02)	1,423 (56.02)	1,310 (51.57)
Front propeller shaft Joint-to-joint length: L_1		mm (in)	735 (28.9)	675 (26.6)	675 (26.6)	562 (22.1)
Rear propeller shaft Joint-to-Joint length: L_2		mm (in)	748 (29.4)			
Outer diameter of tube:	mm (in)	D_1	63.5 (2.50)			
		D_2	57.5 (2.26)			

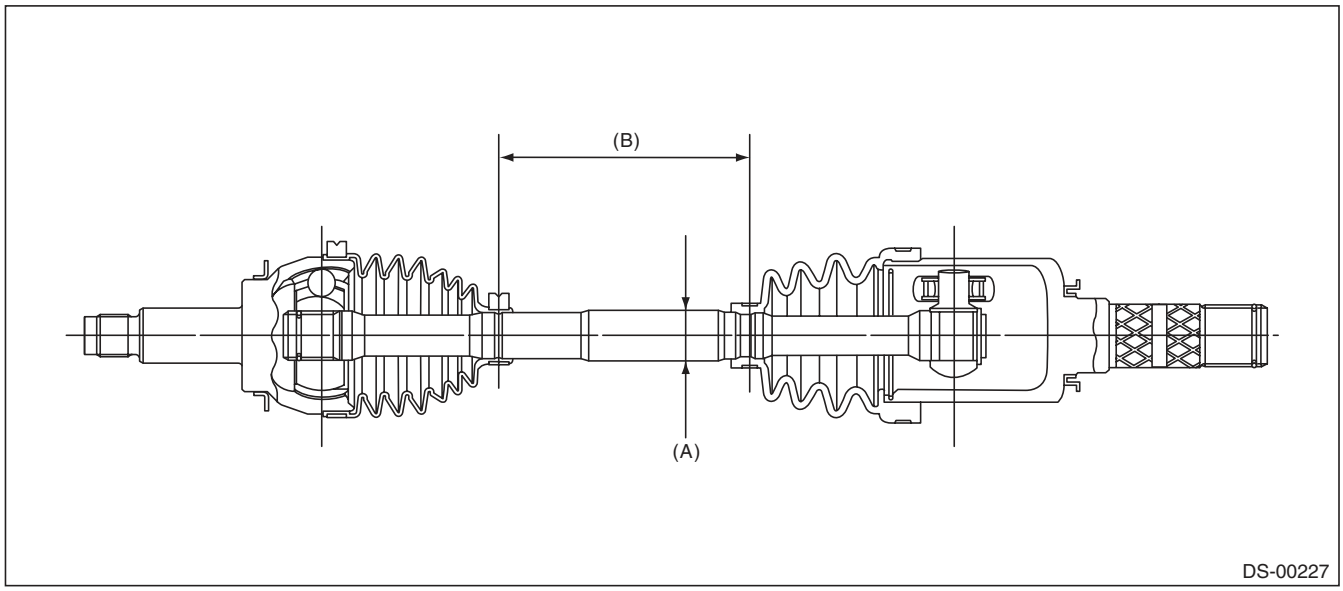




DS-00226

2. FRONT DRIVE SHAFT ASSEMBLY

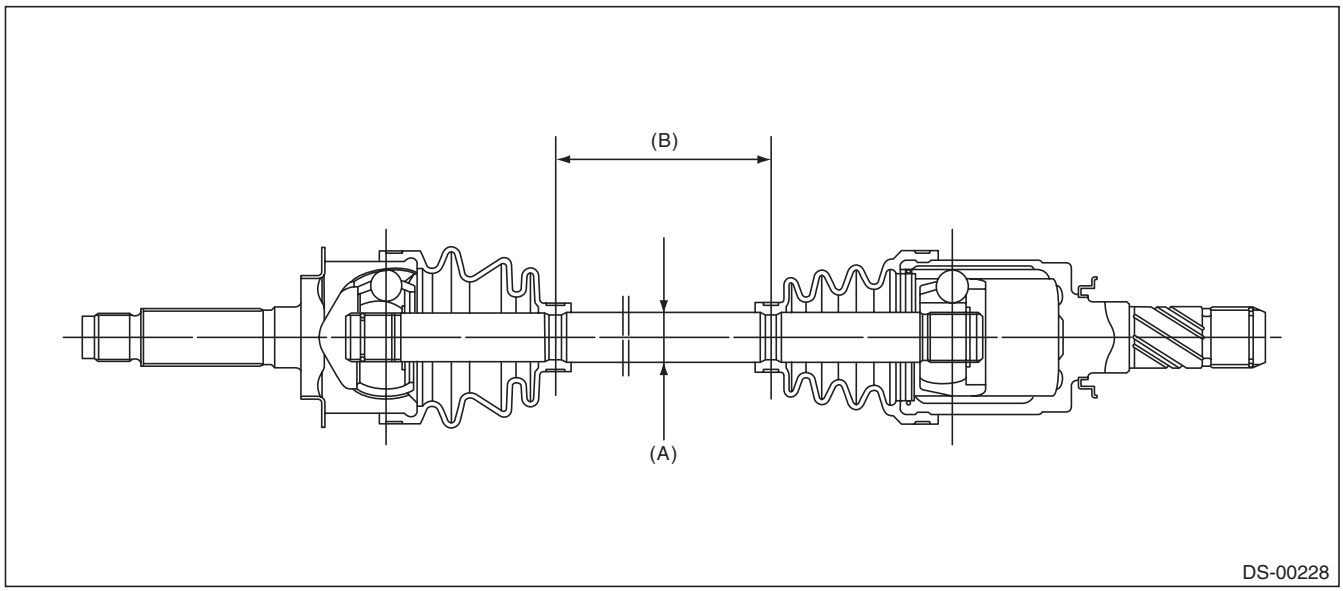
Model	Type of drive shaft	Axle diameterϕ D mm (in)	Axle length L mm (in)
Turbo 5MT, 6MT	EBJ + PTJ	26 (1.0)	332.5 (13.09)
Other than above	EBJ + PTJ	26 (1.0)	349.6 (13.76)



(A) Axle diameter (B) Axle length

3. REAR DRIVE SHAFT ASSEMBLY

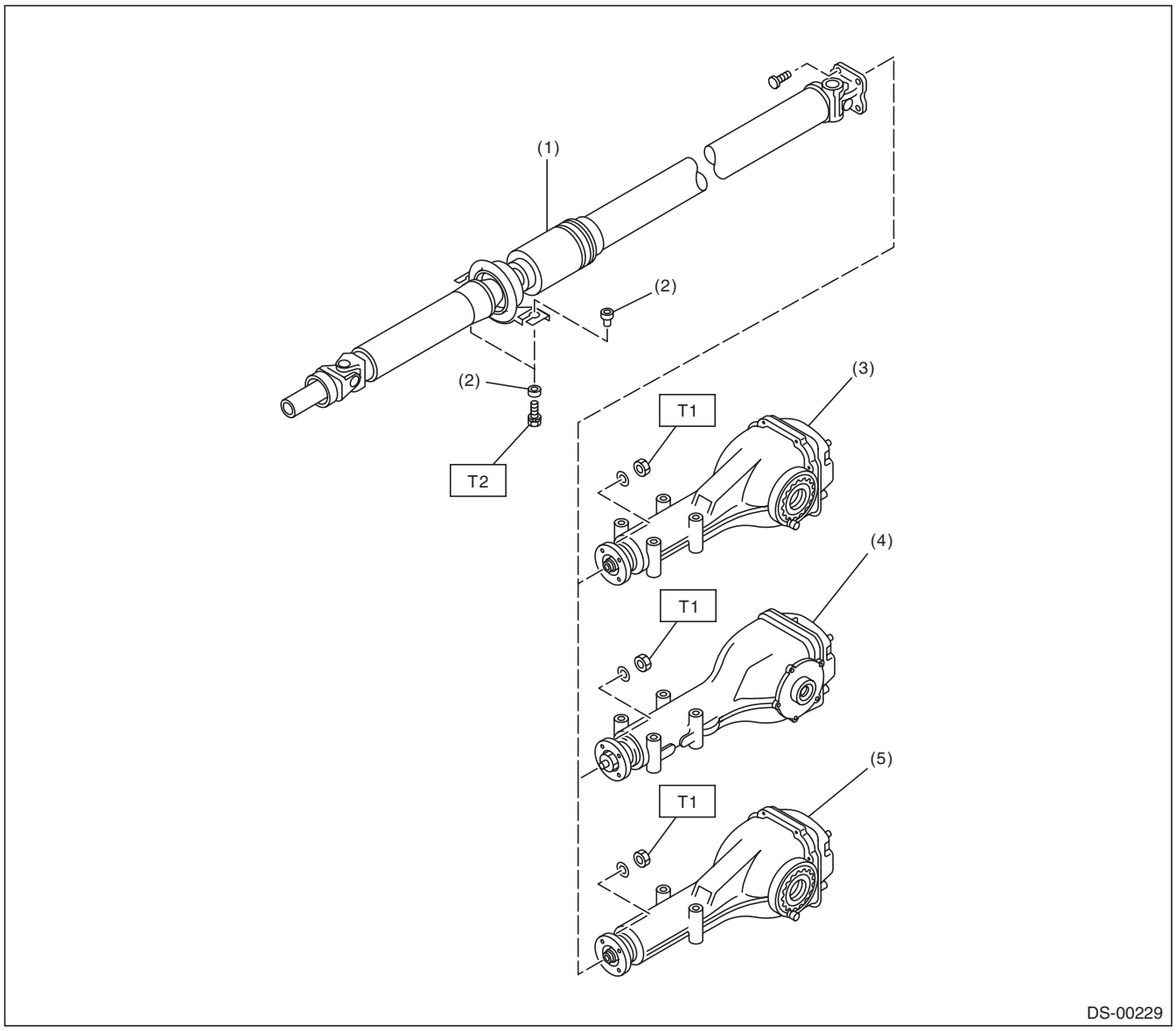
Model	Type of drive shaft	Axle diameterϕ D mm (in)	Axle length L mm (in)
2.5 i AT	BJ + DOJ	22 (0.87)	382 (15.04)
6MT	EBJ + DOJ	22 (0.87)	331.8 (13.06)
Other than above	EBJ + DOJ	22 (0.87)	375.1 (14.77)



(A) Axle diameter (B) Axle length

B: COMPONENT

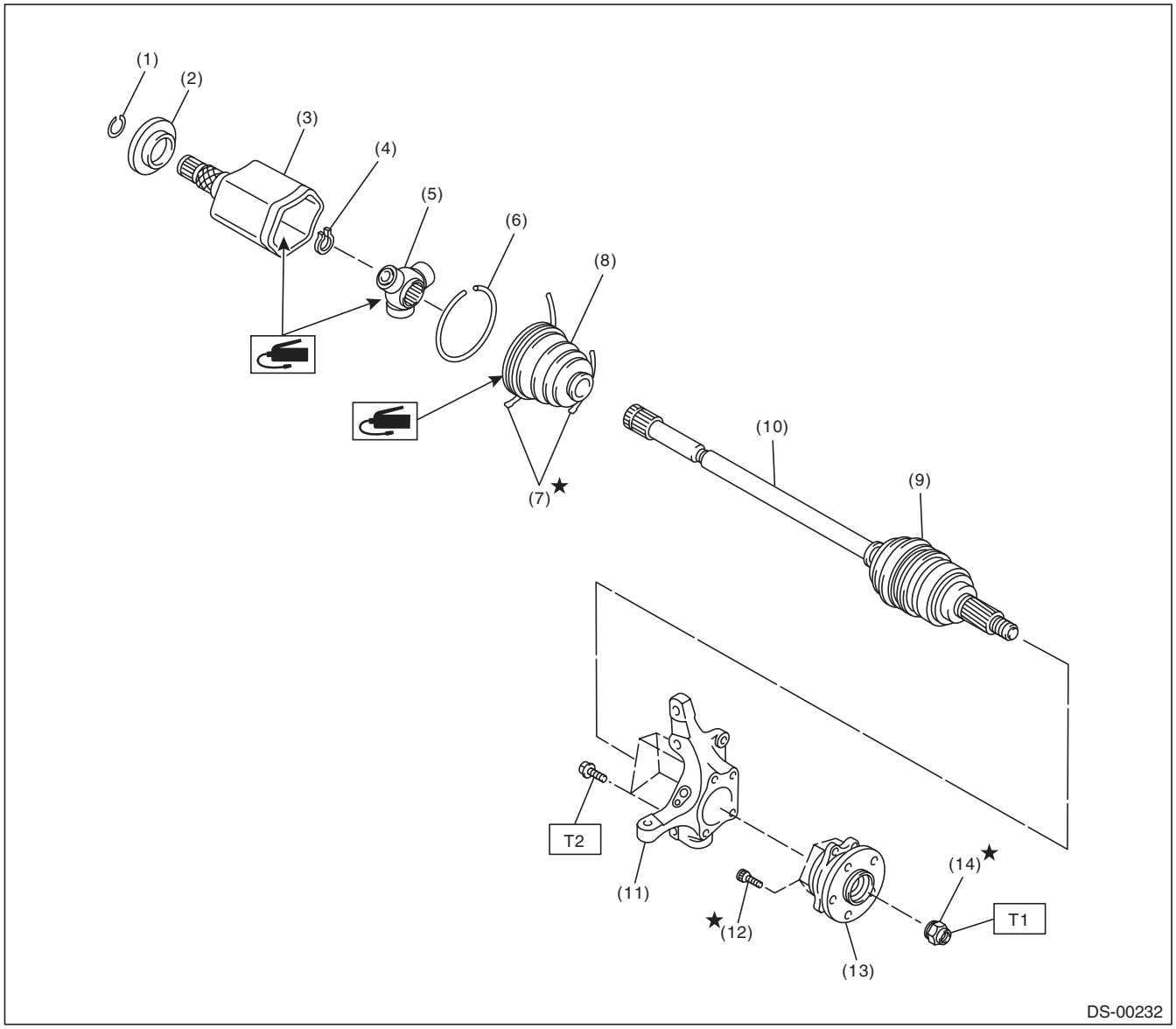
1. PROPELLER SHAFT



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

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

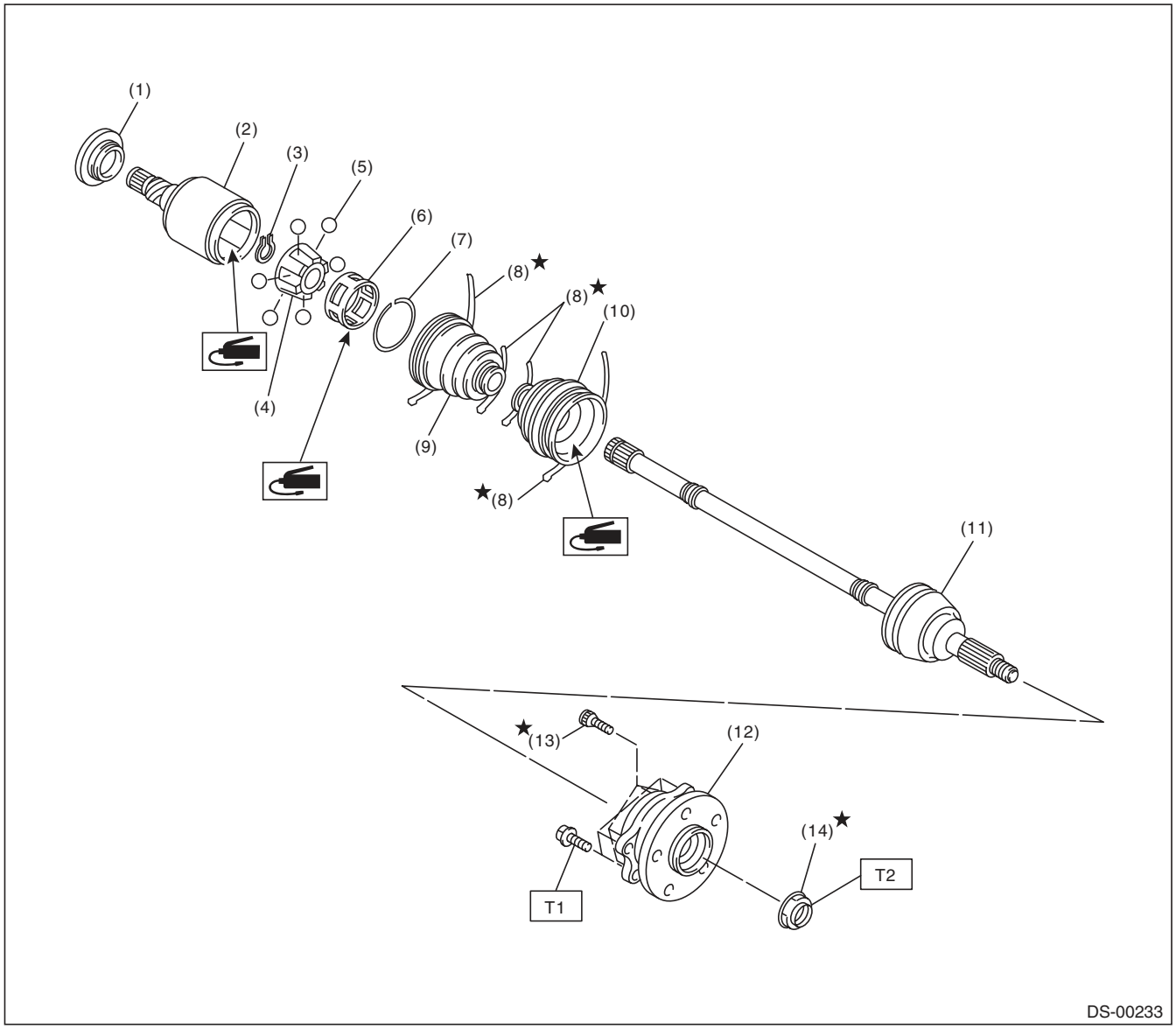
2. FRONT AXLE



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

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

3. REAR AXLE



(1) Baffle plate (DOJ)
(2) Outer race (DOJ)
(3) Snap ring
(4) Inner race
(5) Ball
(6) Cage
(7) Snap ring
(8) Boot band
(9) Boot (DOJ)
(10) Boot (BJ)
(11) BJ shaft ASSY (2.5 i AT model)
EBJ shaft ASSY (Except for 2.5 i AT model)
(12) Rear hub unit bearing
(13) Hub bolt
(14) Axle nut

Tightening torque:N·m (kgf-m, ft-lb)
T1: 65 (6.6, 47.9)
T2: 240 (24.5, 177)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolving 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 materials such as wood blocks, aluminum plates, or waste cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

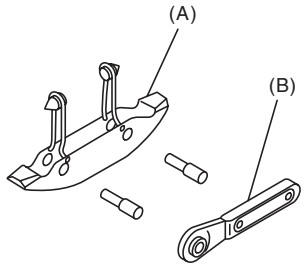
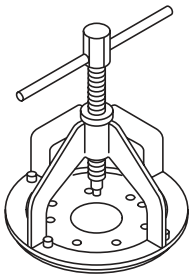
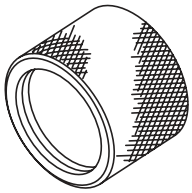
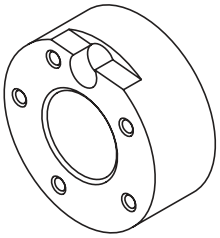
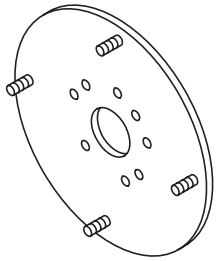
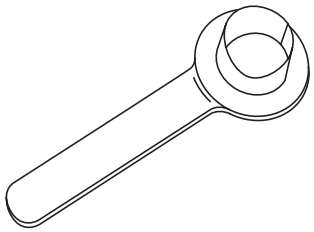
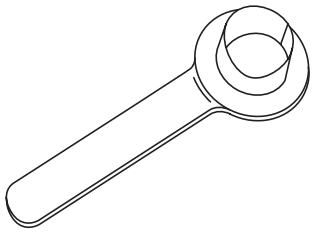
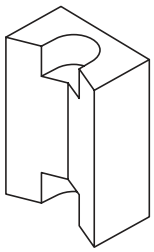
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening the boot band. (A) Jig for the band (B) Ratchet wrench
 ST-926470000	926470000	AXLE SHAFT PULLER	• Used for removing the axle shaft. • Used together with the AXLE SHAFT PULLER PLATE (28099PA110).
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.
 ST-927080000	927080000	HUB STAND	Used for assembling hub bolt in hub.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA110	28099PA110	AXLE SHAFT PULLER PLATE	Exchange with the plate of the AXLE SHAFT PULLER (926470000) to use.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to the rear differential. • For protecting the oil seal.
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	• Used for installing front drive shaft into front differential. • For protecting the oil seal.
 ST28399AG000	28399AG000	HUB STAND	Used for extracting hub bolt.

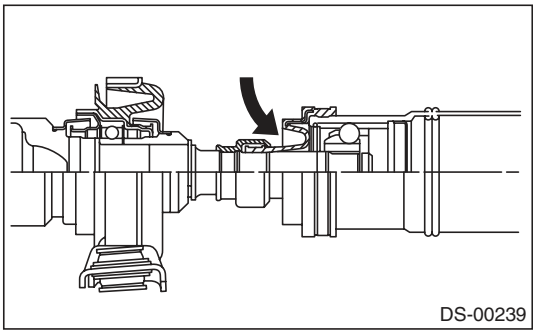
2. GENERAL TOOL

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

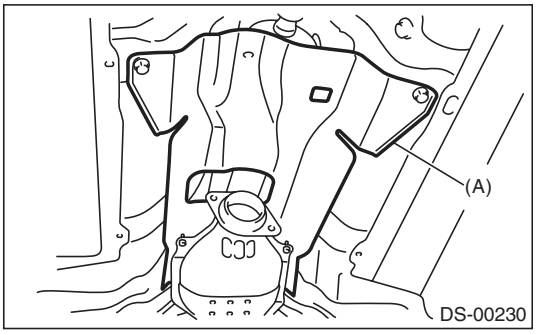
2. Propeller Shaft

A: REMOVAL

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

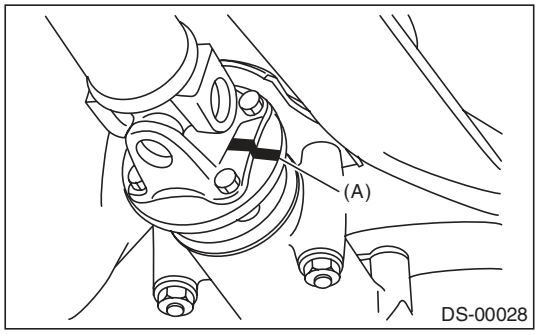


1) Disconnect the ground cable from the battery.
2) Shift the select lever or gear shift lever to neutral.
3) Release the parking brake.
4) Lift up the vehicle.
5) Remove the center exhaust pipe.
6) Remove the rear exhaust pipe and muffler.
7) Remove the heat shield cover.



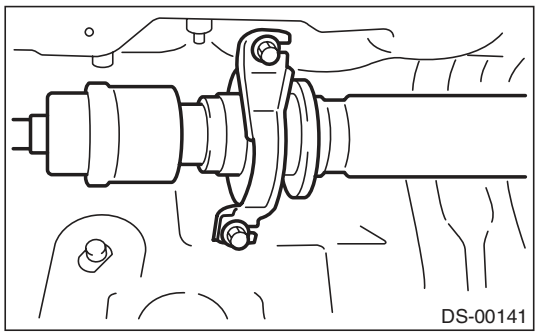
(A) Heat shield cover

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



(A) Alignment mark

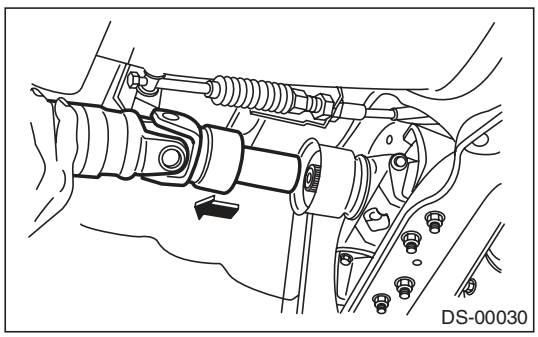
9) Remove the three bolts holding the propeller shaft to the rear differential.
10) Remove the remaining bolt.
11) Remove the two bolts which hold center bearing to vehicle body.



12) Remove the propeller shaft from transmission.

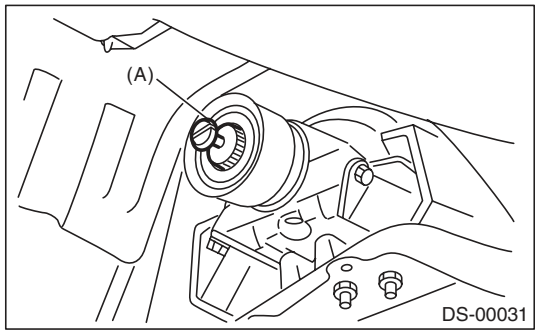
CAUTION:
• Be careful not to damage oil seals and frictional surface of the sleeve yoke.
• Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing propeller shaft.

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



13) Install an extension cap to the transmission.

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

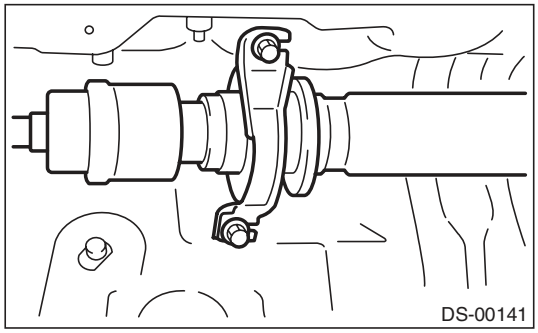


(A) Extension cap

B: INSTALLATION

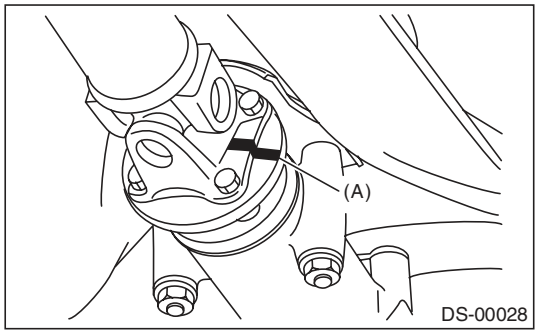
1) Insert the sleeve yoke into the transmission and attach center bearing to body.

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



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

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



(A) Alignment mark

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

C: INSPECTION

NOTE:
Do not disassemble propeller shaft. Check the following and replace if necessary.
- Tube surface for dents of cracks
- Splines for deformation or abnormal wear
- Unsmooth joint operation or abnormal noise
- Center bearing for free play, noise or non-smooth operation.
- Oil seals for abnormal wear or damage
- Damaged center bearing

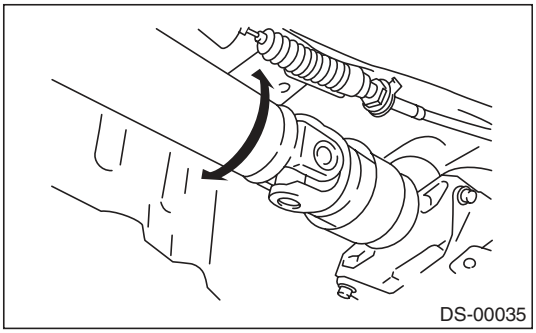
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

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

2. SPLINES AND BEARING

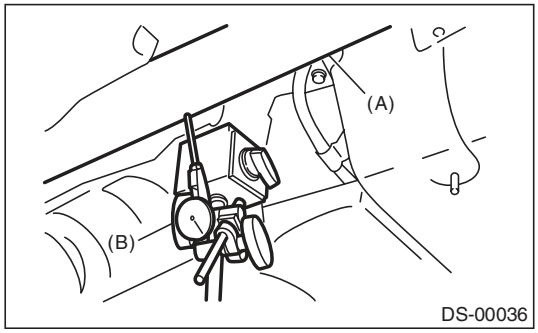
1) Remove the center exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to see if abnormal free play exists at spiders and bearings.



3. RUNOUT OF PROPELLER SHAFT

1) Remove the center exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Set the dial gauge with its indicator stem at the center of the propeller shaft tube.
5) Turn the propeller shaft slowly by hands to check for runout of the propeller shaft.

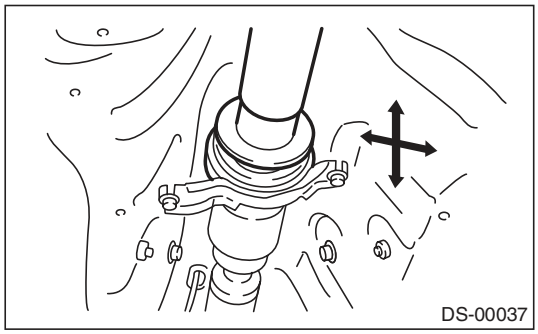
Runout:
Service limit 0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

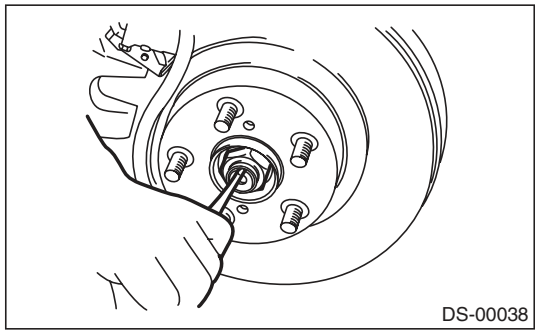
1) Remove the front and center exhaust pipes.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Move the propeller shaft near the center bearing up, down, left, right by hand, to check for any abnormal free play of the bearings.



3. Front Axle

A: REMOVAL

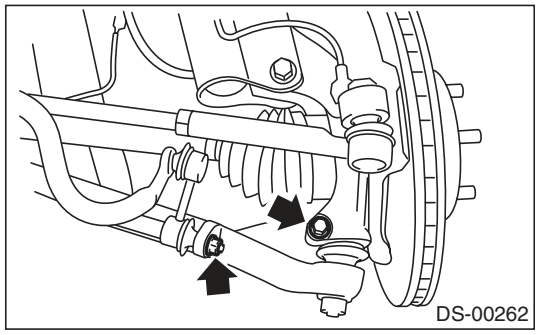
1) Disconnect the ground cable from battery.
2) Lift up the vehicle, and remove the front wheels.
3) Lift the crimped section of axle nut.


DS-00038

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

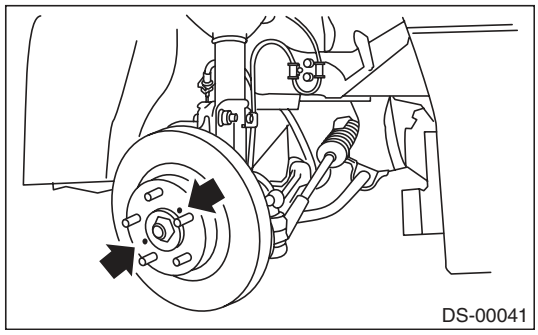
CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

5) Remove the stabilizer link.

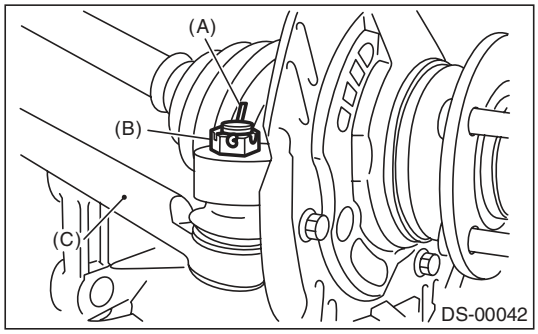

DS-00262

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

NOTE:
If it is difficult to remove the disc rotor from the hub, drive the 8 mm bolt into the threaded end of rotor, and then remove the rotor.


DS-00041

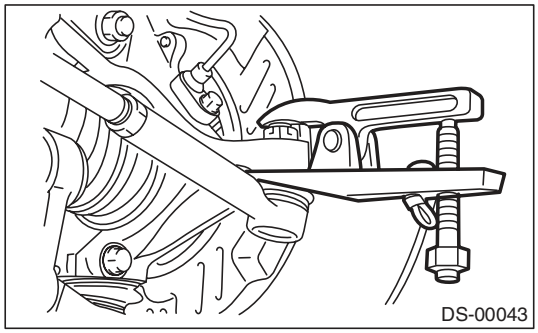
8) Remove the cotter pin and castle nut securing the tie-rod end to the housing knuckle arm.



DS-00042

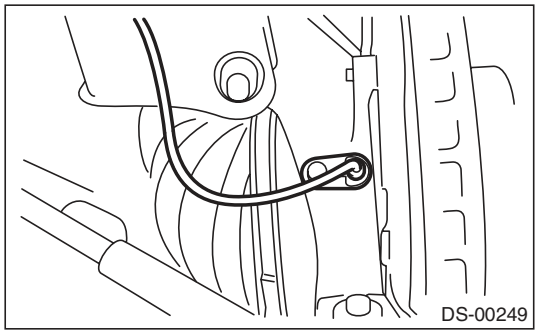
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

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

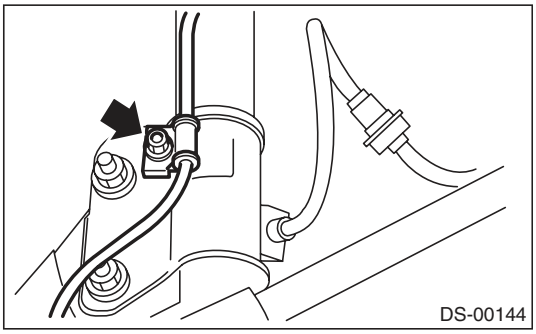

DS-00043

CAUTION:
When removing tie-rod, do not hit the tie-rod end with hammer.

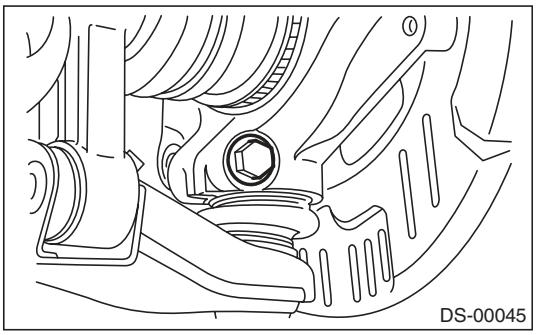
10) Remove the ABS wheel speed sensor assembly and harness.


DS-00249

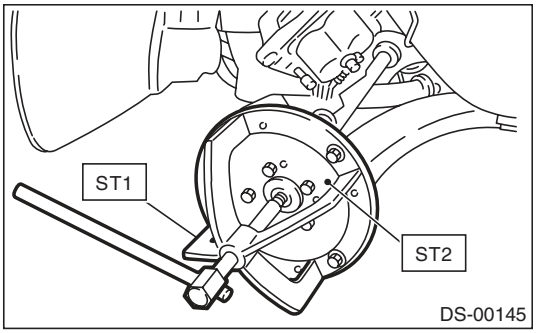
11) Remove the bolts which secure the sensor harness to the strut.



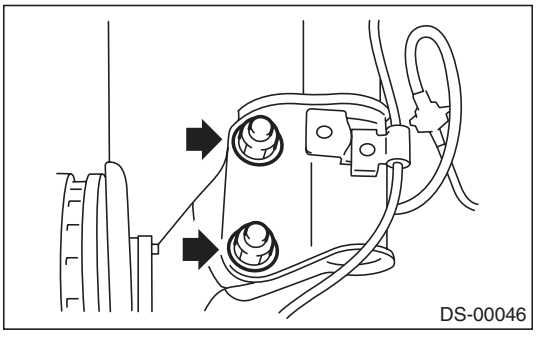
12) Remove the front arm ball joint from the housing.



13) Remove the front drive shaft from the transmission.
14) Remove the front drive shaft assembly from the hub. If it is hard to remove, use the ST.
ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER PLATE



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



B: INSTALLATION

1) Align the alignment mark on the camber adjusting bolt head, and tighten the housing and strut using a new self-locking nut.

Tightening torque:
155 N·m (15.8 kgf-m, 114.3 ft-lb)

2) Install the front drive shaft. <Ref. to DS-22, INSTALLATION, Front Drive Shaft.>
3) Install the front arm ball joint to the housing.

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

4) Install the ABS sensor harness to the strut.
5) Install the ABS wheel speed sensor on the housing.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

6) Install the disc rotor to hub.
7) Install the disc brake caliper on the housing.

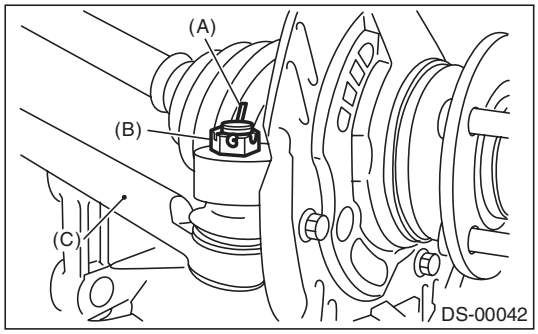
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

8) Install the stabilizer link.
9) Connect the tie-rod end ball joint to the knuckle arm with a castle nut.

Tightening torque:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting the tie-rod, do not hit the cap at bottom of tie-rod end with a hammer.

10) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



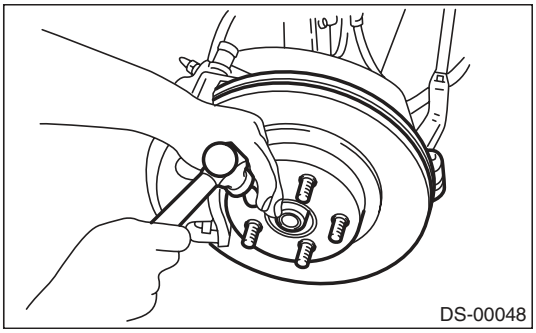
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

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

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

CAUTION:
• Install the wheel after installation of 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 the wheel bearing.

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

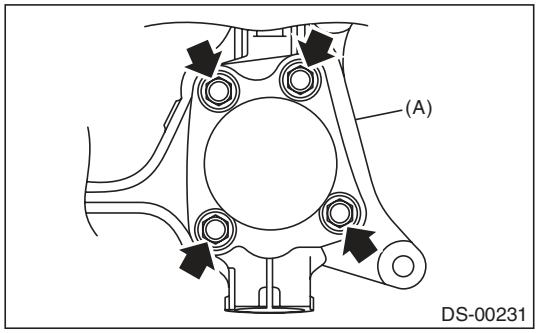


13) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

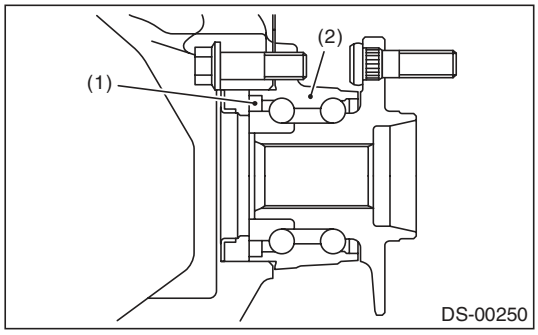
C: DISASSEMBLY

1) Remove the four bolts from the housing, and remove the front hub unit bearing and disc cover.



(A) Housing

CAUTION:
• Do not get closer the tool which charged magnetism to magnetic encoder.
• Be careful not to damage the magnetic encoder.



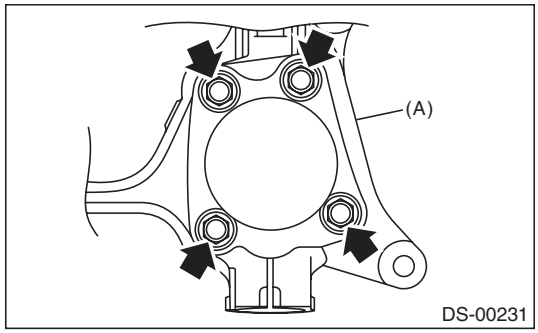
(1) Magnetic encoder
(2) Front hub unit bearing

2) Disassemble the front hub unit bearing. <Ref. to DS-18, DISASSEMBLY, Front Hub Unit Bearing.>

D: ASSEMBLY

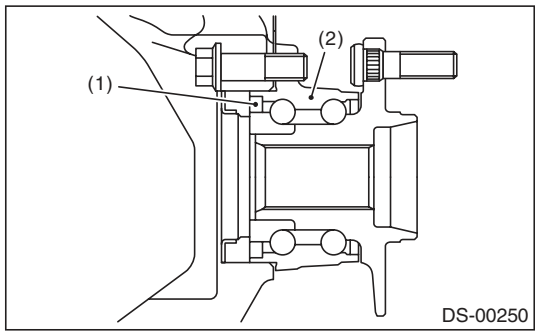
1) Assemble the front hub unit bearing. <Ref. to DS-18, ASSEMBLY, Front Hub Unit Bearing.>
2) Place the disc cover between housing and front hub unit, and tighten the four bolts.

Tightening torque:
65 N·m (6.6 kgf-m, 47.9 ft-lb)



(A) Housing

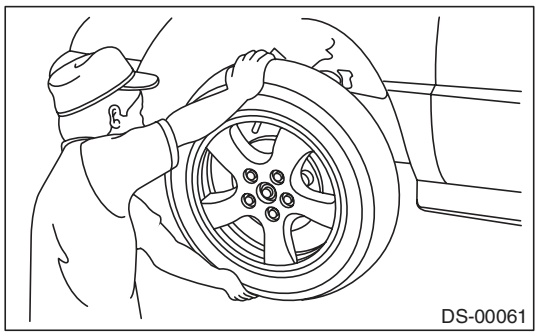
CAUTION:
• Do not get closer the tool which charged magnetism to magnetic encoder.
• Be careful not to damage the magnetic encoder.



(1) Magnetic encoder
(2) Front hub unit bearing

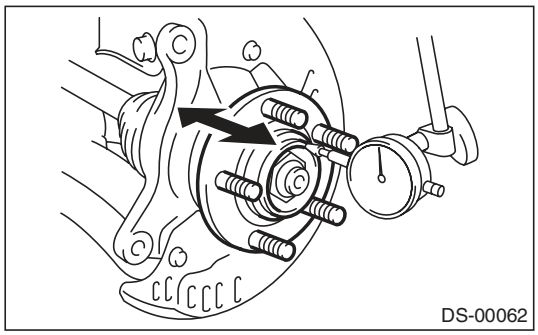
E: INSPECTION

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



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

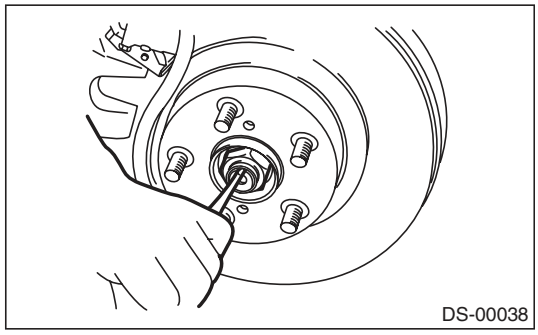
Service limit:
Maximum: 0.05 mm (0.0020 in)



4. Front Hub Unit Bearing

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Lift up the vehicle, and remove the front wheels.
3) Lift the crimped section of axle nut.

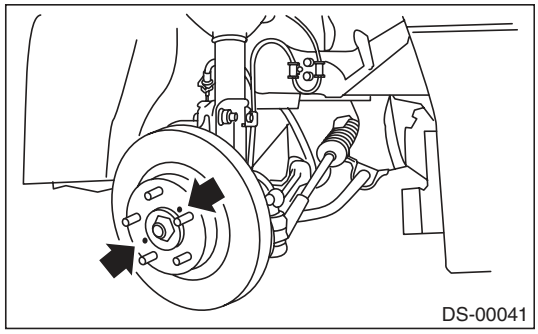


4) Remove the axle nut using a socket wrench while depressing the brake pedal.

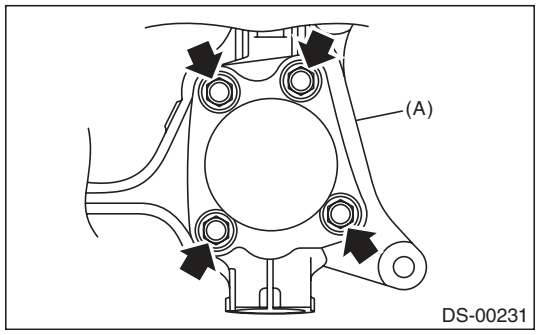
CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

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

NOTE:
If it is difficult to remove the disc rotor from the hub, drive the 8 mm bolt into the threaded end of rotor, and then remove the rotor.

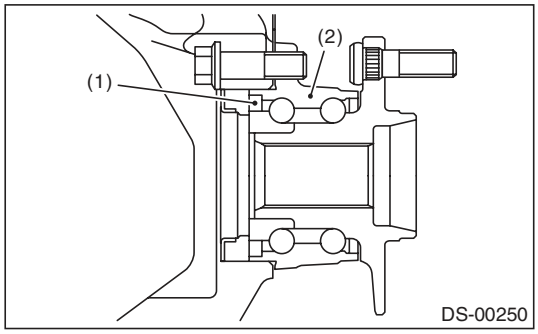


7) Remove the four bolts from the housing.



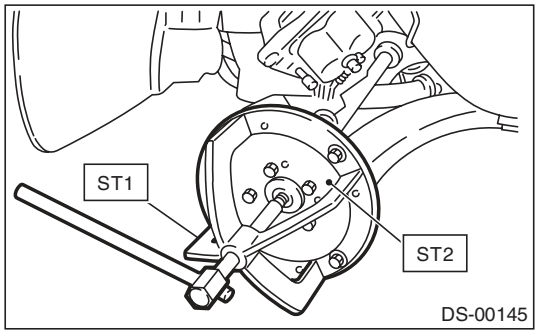
(A) Housing

CAUTION:
• Do not get closer the tool which charged magnetism to magnetic encoder.
• Be careful not to damage the magnetic encoder.



(1) Magnetic encoder
(2) Front hub unit bearing

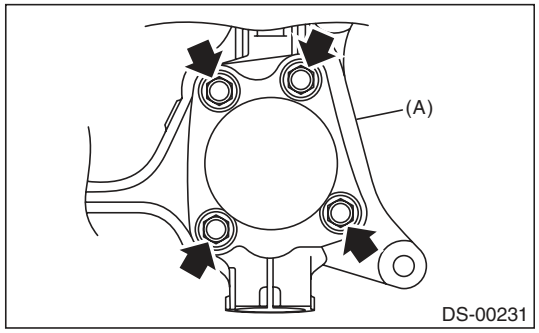
8) Remove the front hub unit bearing. If it is hard to remove, use the ST.
ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER PLATE



B: INSTALLATION

1) Place the disc cover between housing and front hub unit, and tighten the four bolts.

Tightening torque:
65 N·m (6.6 kgf-m, 47.9 ft-lb)



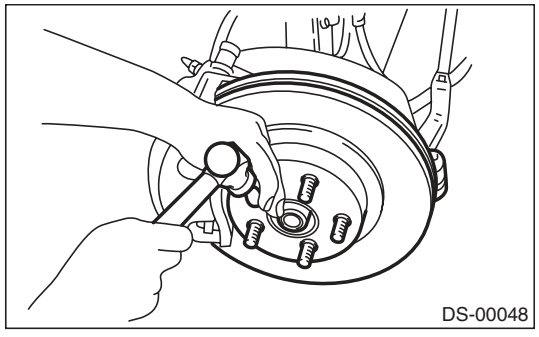
(A) Housing

2) Install the front drive shaft. <Ref. to DS-22, INSTALLATION, Front Drive Shaft.>
3) Tighten the axle nut temporarily.
4) Install the disc rotor to hub.
5) Install the disc brake caliper on the housing.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)
6) While depressing the brake pedal, tighten a new axle nut to the specified torque and lock it securely.

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

CAUTION:
• Install the wheel after installation of 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 the wheel bearing.
7) After tightening the axle nut, lock it securely.



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

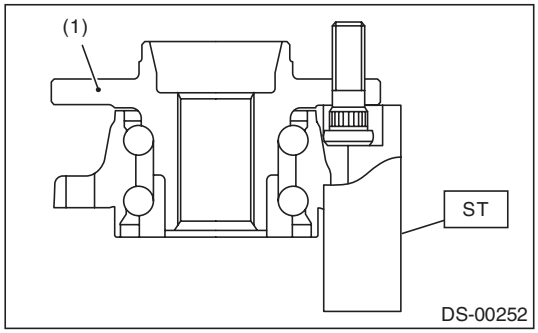
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

C: DISASSEMBLY

Using the ST and a hydraulic press, push out the hub bolts.
ST 28399AG000 HUB STAND

CAUTION:
• Be careful not to hammer the hub bolts. This may deform the hub.
• Do not reuse the hub bolt.

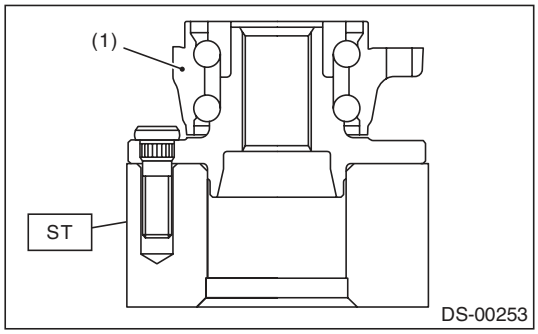
NOTE:
Since the hub unit bearing can not be disassembled, only hub bolts can be removed.



(1) Front hub unit bearing

D: ASSEMBLY

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



(1) Front hub unit bearing

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

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

E: INSPECTION

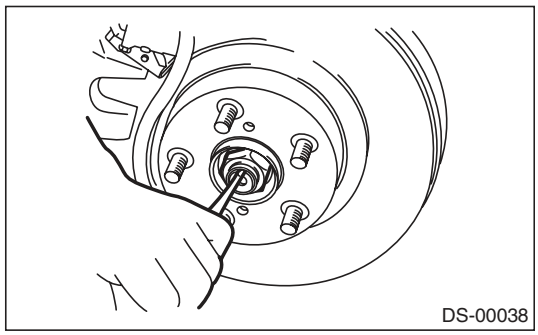
Refer to “Front Axle” for inspection procedures. <Ref. to DS-16, INSPECTION, Front Axle.>

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

5. Rear Hub Unit Bearing

A: REMOVAL

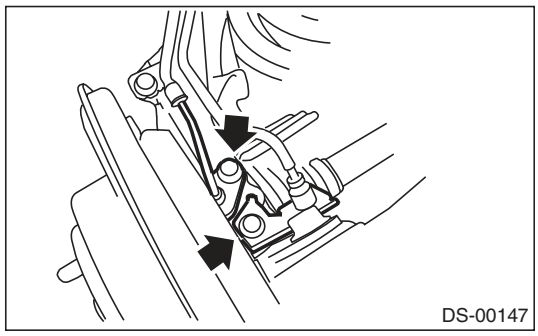
1) Disconnect the ground cable from the battery.
2) Lift up the vehicle, then remove the rear wheels.
3) Lift the crimped section of axle nut.



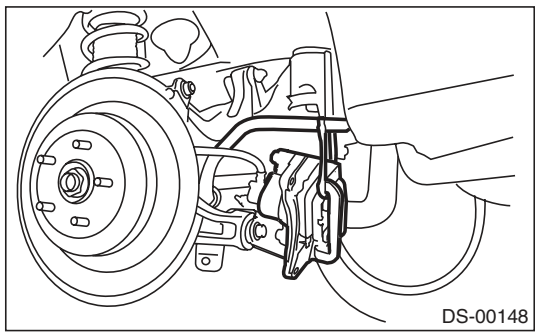
4) While applying the parking brake, remove the axle nut using a socket wrench.

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

5) Release the parking brake.
6) Remove the rear ABS wheel speed sensor.



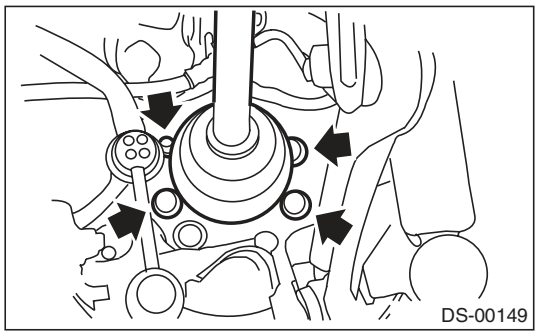
7) Remove the disc brake caliper from back plate, and suspend it from the stabilizer using a wire.



8) Remove the disc rotor from the hub.

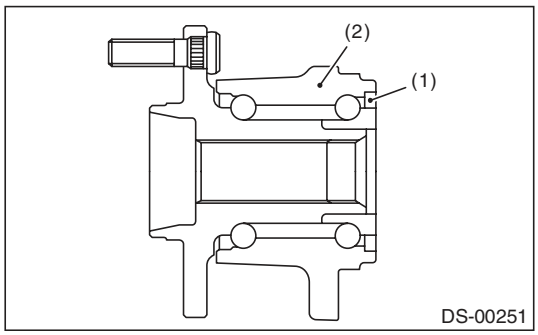
NOTE:
• Mark the mating surface of hub and disc rotor before removing the disc rotor to avoid confusing when installing.
• If it is difficult to remove the disc rotor from the hub, drive the 8 mm bolt into the threaded end of rotor, and then remove the rotor.

9) Remove the four bolts from rear arm.

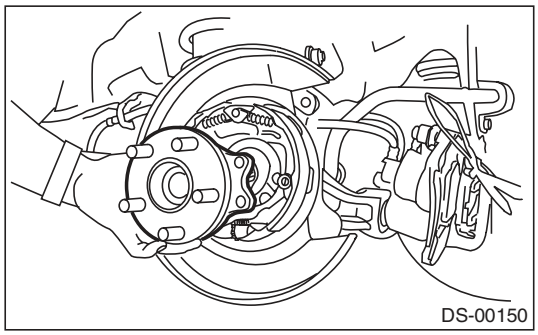


10) Remove the hub unit bearing.

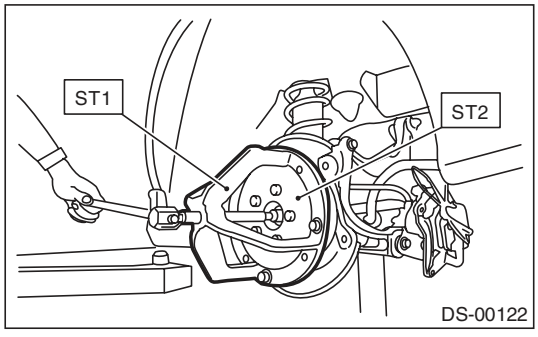
CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encoder.



(1) Magnetic encoder
(2) Rear hub unit bearing



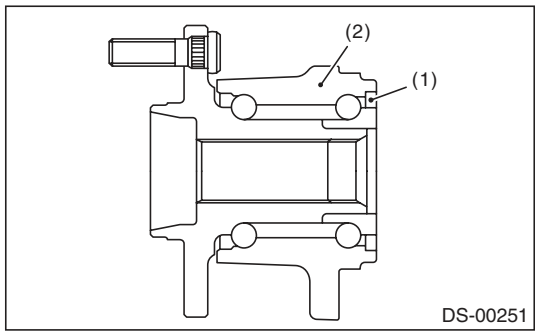
NOTE:
If it is hard to remove, use the ST.
ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER PLATE



B: INSTALLATION

1) Aligning the hub unit bearing to the mounting hole of the back plate, install the hub unit assembly and back plate. Tighten the axle nut temporarily.

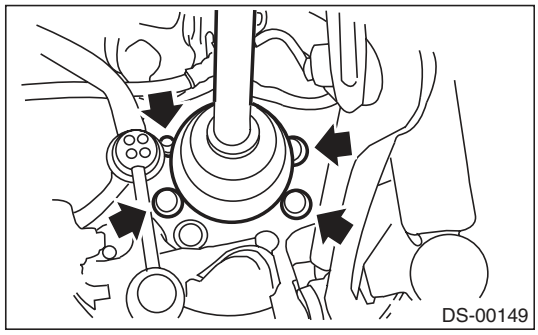
CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encoder.



(1) Magnetic encoder
(2) Rear hub unit bearing

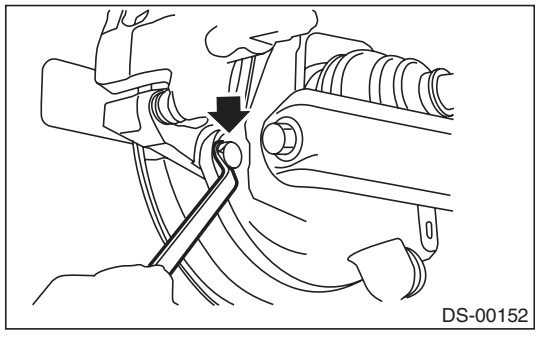
2) Tighten the four bolts.

Tightening torque:
65 N·m (6.6 kgf-m, 47.9 ft-lb)

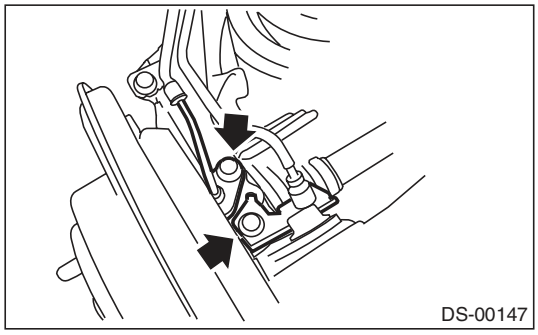


3) Remove the axle nut.
4) Draw the rear drive shaft into specified position.
5) Tighten the new axle nut temporarily.
6) Install the disc rotor to hub.
7) Install the disc brake caliper on the back plate.

Tightening torque:
66 N·m (6.7 kgf-m, 48.7 ft-lb)



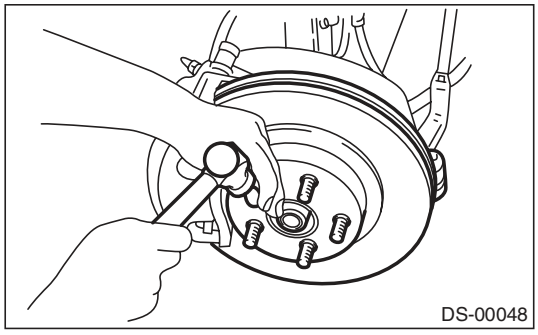
8) Install the rear ABS wheel speed sensor and brake cable bracket.



9) Adjust the parking brake lever stroke by turning the adjuster. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>
10) While applying the parking brake and depressing the brake pedal, tighten a new axle nut to the specified torque and lock it securely.

Tightening torque:
240 N·m (24.5 kgf-m, 177 ft-lb)

CAUTION:
• Install the wheel after installation of axle nut. Failure to follow this rule may damage the wheel bearing.
• Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.
11) After tightening the axle nut, lock it securely.



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

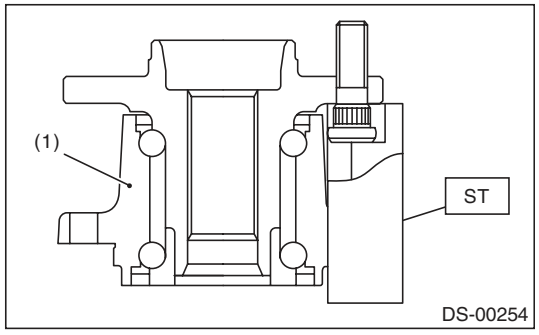
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

C: DISASSEMBLY

Using the ST and a hydraulic press, push out the hub bolts.
ST 28399AG000 HUB STAND

CAUTION:
- **Be careful not to hammer the hub bolts. This may deform the hub.**
- **Do not reuse the hub bolt.**

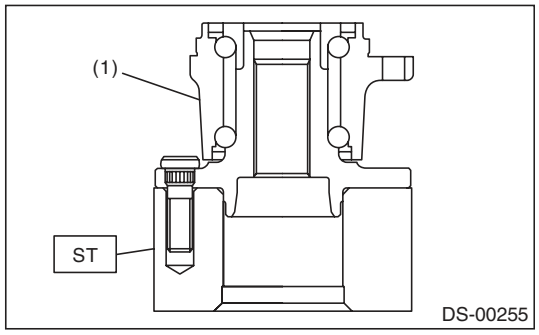
NOTE:
Since the hub unit bearing can not be disassembled, only hub bolts can be removed.



(1) Rear hub unit bearing

D: ASSEMBLY

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



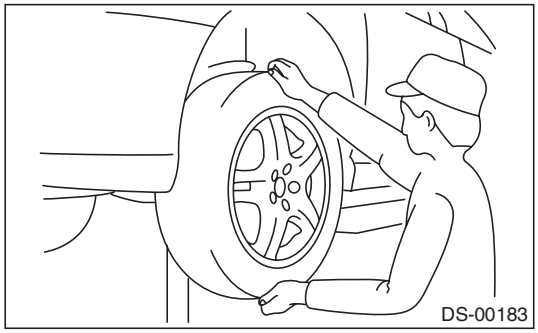
(1) Rear hub unit bearing

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

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

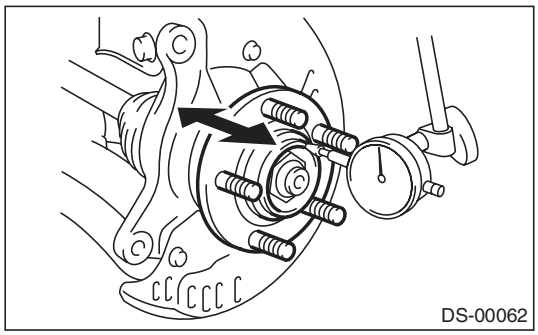
E: INSPECTION

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 play exceeds the limit value.

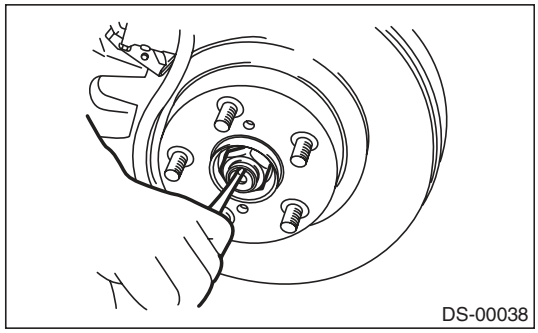
Service limit:
Maximum: 0.05 mm (0.0020 in)



6. Front Drive Shaft

A: REMOVAL

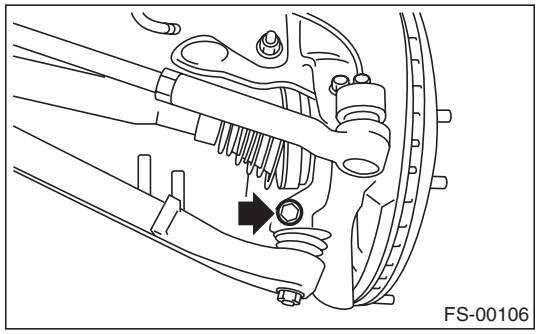
1) Disconnect the ground cable from the battery.
2) Lift up the vehicle, and remove the front wheels.
3) Drain the transmission gear oil. (MT model)
4) Drain the differential gear oil. (AT model)
5) Lift the crimped section of axle nut.



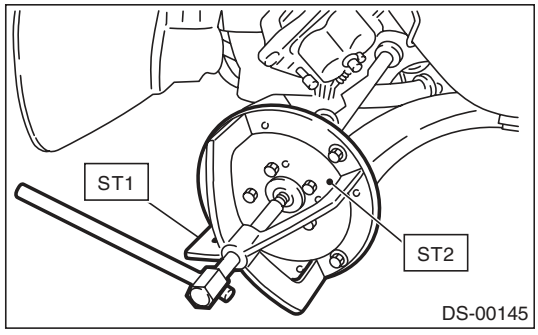
6) Remove the axle nut using a socket wrench while depressing the brake pedal.

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

7) Remove the stabilizer link from front arm.
8) Disconnect the front arm ball joint from the housing.



9) Remove the front drive shaft assembly. If it is hard to remove, use ST1 and ST2.
ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER PLATE



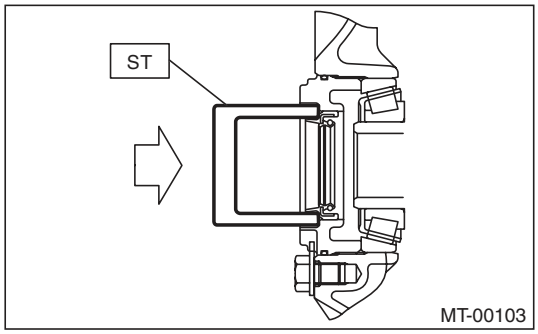
10) Using a bar, remove the front drive shaft from transmission.

CAUTION:
Be careful not to allow the bar to damage holder area.

B: INSTALLATION

1) Using the ST, replace the differential side retainer oil seal with a new seal.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

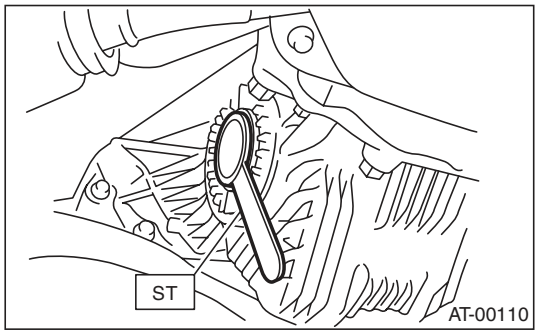
NOTE:
After pulling out the drive shaft, be sure to replace with a new oil seal.



2) Insert the EBJ into hub splines.
3) Draw the drive shaft into specified position.

CAUTION:
Do not hammer drive shaft when installing it.

4) Tighten the axle nut temporarily.
5) Using the ST, install the front drive shaft to transmission.
ST 28399SA010 OIL SEAL PROTECTOR



6) Connect the front arm ball joint to the housing.

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

7) Install the stabilizer link.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

CAUTION:
Be sure to use a new self-locking nut.

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

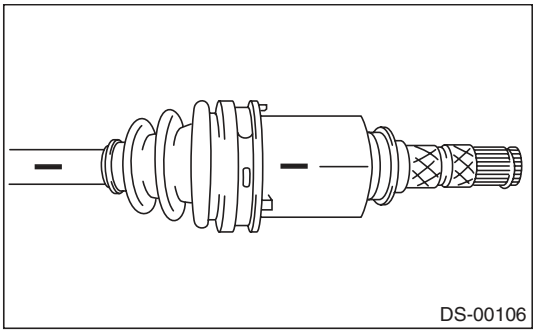
Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
• Install the wheel after installation of axle nut. Failure to follow this rule may damage the wheel bearing.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

9) After tightening axle nut, lock it securely.
10) Fill the transmission gear oil. (MT model)
11) Fill the differential gear oil. (AT model)

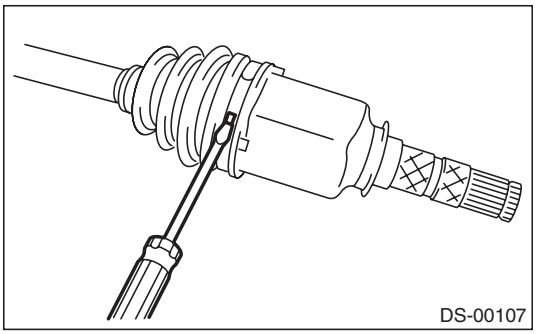
C: DISASSEMBLY

1) Place alignment marks on the shaft and outer race.

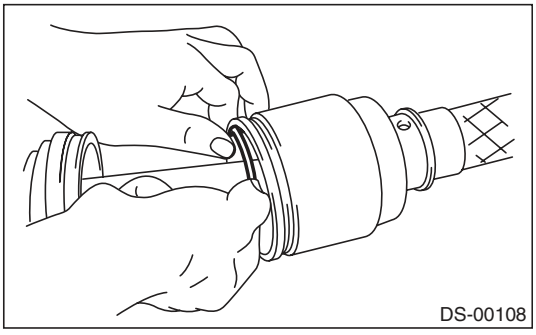

DS-00106

2) Remove the PTJ boot band and boot.

CAUTION:
Be careful not to damage the boot.


DS-00107

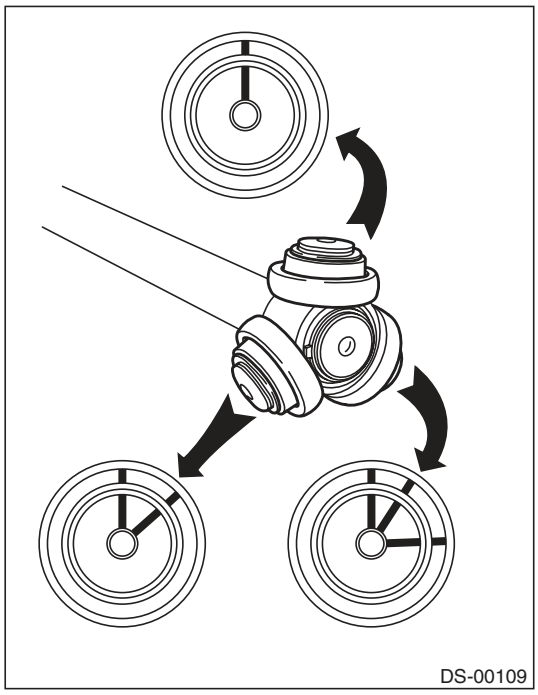
3) Remove the snap ring from PTJ outer race.


DS-00108

4) Remove the PTJ outer race from shaft assembly.
5) Wipe off grease.

CAUTION:
The grease is a special type of grease. Do not mix with other grease.

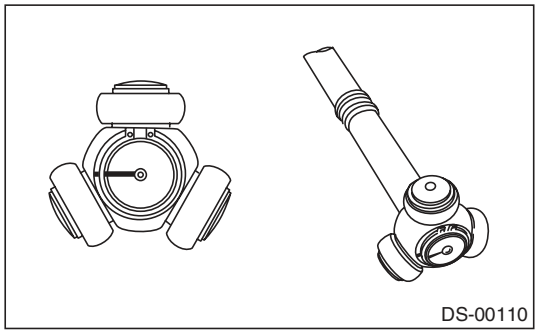
6) Place alignment marks on the roller kit and trunnion.


DS-00109

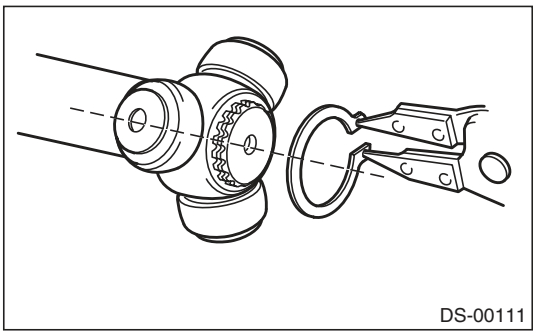
7) Remove the roller kit from trunnion.

CAUTION:
Be careful with the roller kit position.

8) Place alignment marks on the trunnion and shaft.


DS-00110

9) Remove the snap ring and trunnion.


DS-00111

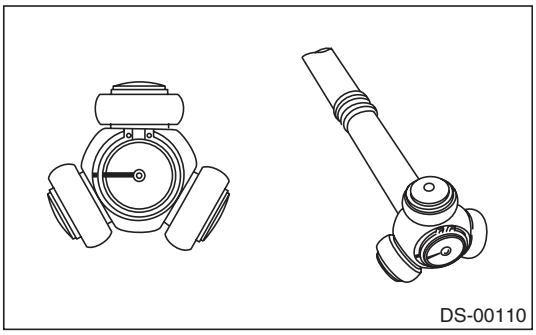
CAUTION:
Be sure to wrap shaft splines with vinyl tape to protect the boot from scratches.
10) Remove the PTJ boot.

NOTE:
The BJ is a non-disassembly part, so the axle disassembly stops here.

D: ASSEMBLY

NOTE:
Use specified grease.

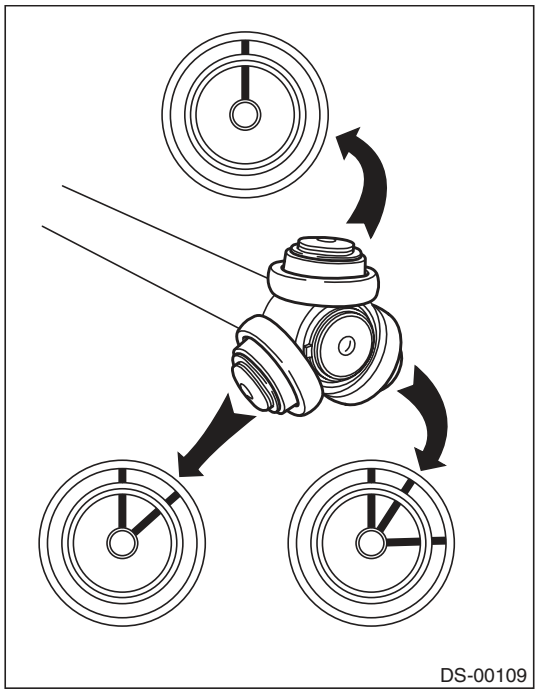
PTJ side:
NKG302
1) Place the PTJ boot at the center of shaft.
2) Align alignment marks and install the trunnion on the shaft.


DS-00110

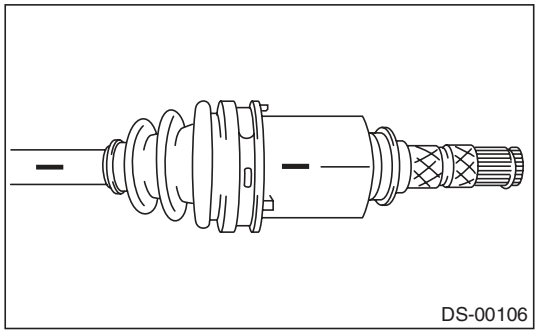
3) Install the snap ring to shaft.

CAUTION:
Confirm that the snap ring is completely fitted in shaft groove.
4) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of PTJ outer race.
5) Apply a thin coat of specified grease to the roller kit and trunnion.
6) Align alignment marks on roller kit and trunnion and install the roller kit.

CAUTION:
Be careful with the roller kit position.


DS-00109

7) Align the alignment marks of the shaft and outer race, and install the outer race.


DS-00106

8) Install the snap ring in the groove on PTJ outer race.

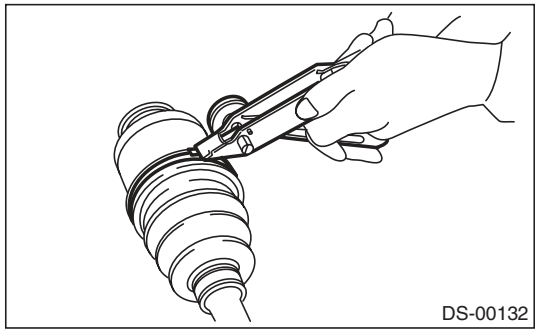
CAUTION:
Pull the shaft lightly and assure that the snap ring is completely fitted in the groove.
9) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.
10) Install the PTJ boot taking care not to twist it.

CAUTION:
• The large end of PTJ boot and the boot groove shall be cleaned completely so as to be free from grease and other substances.
• When installing PTJ boot, position outer race of PTJ at center of its travel.

11) Put a new band through the clip and wind twice in the band groove of the boot.
12) Pinch the end of band with pliers. Hold the clip and tighten securely.

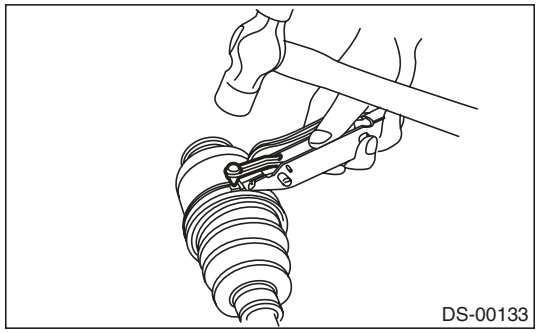
NOTE:
When tightening boot, use care so that the air within the boot is appropriate.
13) Tighten the band using the ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.



14) Tap the clip with the punch provided at the end of the ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.



15) Cut off the band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Make sure that the end of the band is in close contact with clip.
16) Extend and retract the PTJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
- PTJ (pillow tripod joint)

Check for seizure, corrosion, damage, wear and excessive play.
- EBJ (high-efficiency compact ball fixed joint)

Check for seizure, corrosion, damage and excessive play.
- Shaft

Check for excessive bending, twisting, damage and wear.
- Boot

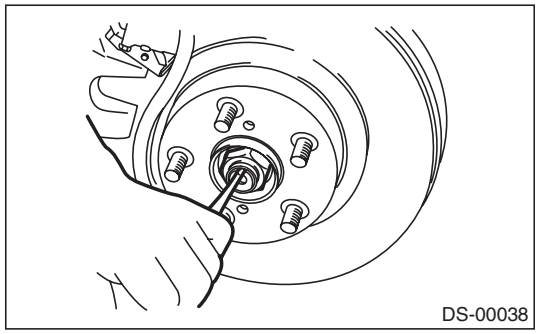
Check for wear, warping, breakage and scratches.
- Grease

Check for discoloration and fluidity.

7. Rear Drive Shaft

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift up the vehicle, and then remove the rear wheels.
3) Lift the crimped section of axle nut.

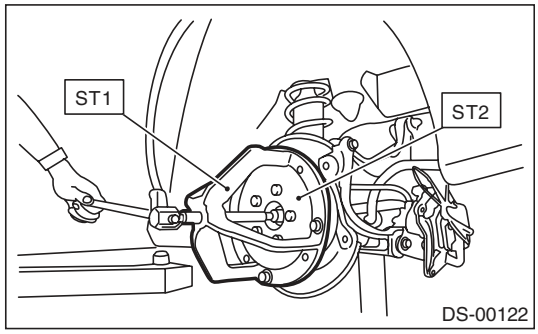


4) While applying the parking brake, remove the axle nut using a socket wrench.

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

5) Remove the rear differential assembly.
• T-type
<Ref. to DI-30, REMOVAL, Rear Differential (T-type).>
• VA-type
<Ref. to DI-56, REMOVAL, Rear Differential (VA-type).>
6) Remove the axle nut and rear drive shaft. If it is hard to remove, use ST1 and ST2.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

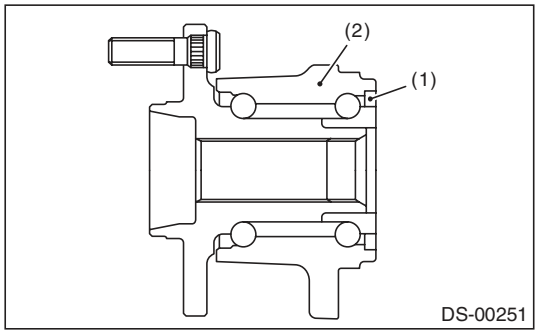
CAUTION:
• Do not hammer drive shaft when removing.
• Do not damage the oil seal and magnetic encoder.



B: INSTALLATION

1) Insert the BJ or EBJ into the rear hub splines.

CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encoder.



(1) Magnetic encoder
(2) Rear hub unit bearing

2) Draw the rear drive shaft into specified position.

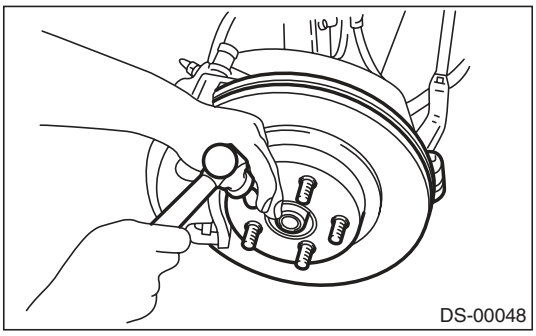
CAUTION:
Do not hammer drive shaft when installing it.

3) Tighten the axle nut temporarily.
4) Install the rear differential assembly.
• T-type
<Ref. to DI-32, INSTALLATION, Rear Differential (T-type).>
• VA-type
<Ref. to DI-58, INSTALLATION, Rear Differential (VA-type).>
5) While applying the parking brake and depressing the brake pedal, tighten a new axle nut to the specified torque and lock it securely.

Tightening torque:
240 N·m (24.5 kgf-m, 177 ft-lb)

CAUTION:
• Install the wheel after installation of axle nut. Failure to follow this rule may damage the wheel bearing.
• Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

6) Lock the axle nut securely.



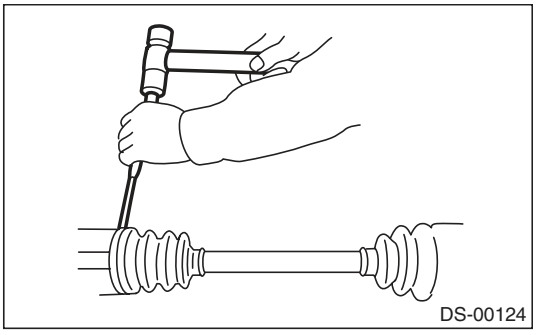
7) Install the wheel.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

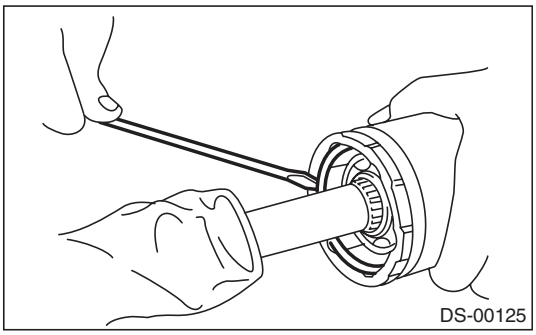
C: DISASSEMBLY

1) Straighten the bent claw at the larger end of the DOJ boot.
2) Loosen the band by means of screwdriver or pliers.

CAUTION:
Be careful not to damage the 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.
5) Pry and remove the round circlip at the neck of DOJ outer race with a screwdriver.

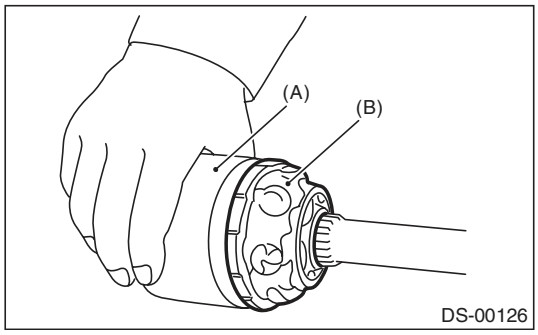


6) Take out the DOJ outer race from the shaft assembly.

7) Wipe off the grease and take out the ball bearings.

CAUTION:
The grease is a special grease (grease for constant velocity joints). Do not mix with other greases.

NOTE:
Disassemble 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) Using pliers, remove the snap ring fixing the inner race to the shaft.
10) Take out the DOJ inner race.
11) Take off the DOJ cage from shaft and remove the DOJ boot.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

12) Remove the BJ boot or EBJ boot in the same procedure as the DOJ boot.

NOTE:
Further disassembly of axle is impossible because the BJ and EBJ cannot be disassembled.

D: ASSEMBLY

NOTE:
Use specified grease.

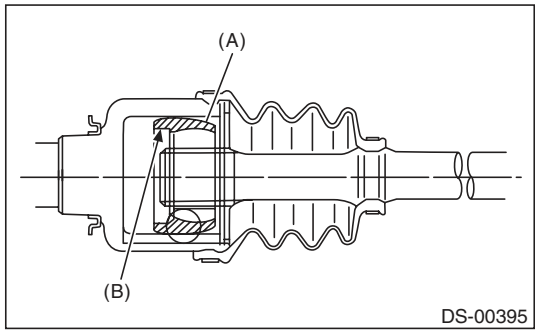
BJ, EBJ side:
NKG106

DOJ side:
NKG205

1) Install the BJ or EBJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz.) of specified grease.
2) Place the DOJ boot at the center of shaft.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.
3) Insert the DOJ cage onto shaft.

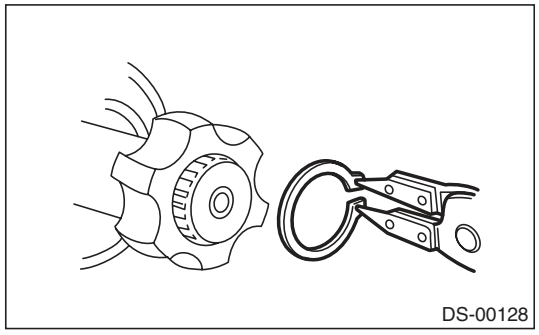
NOTE:
Insert the cage with the cutout portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cutout portion

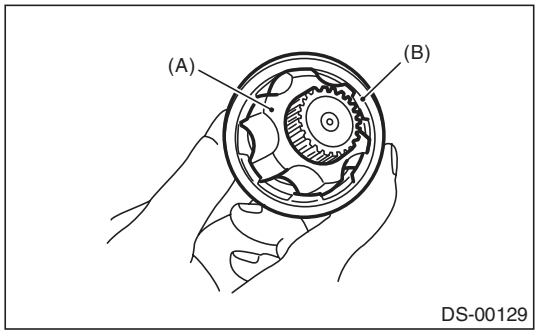
4) Install the DOJ inner race on shaft and fix the snap ring in place with pliers.

NOTE:
Confirm that the snap ring is completely fitted in the shaft groove.



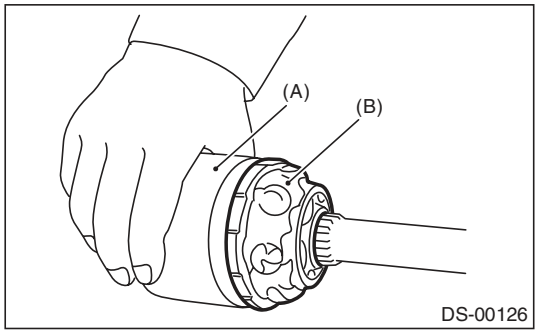
5) Install the cage to inner race fixed upon shaft.

NOTE:
Fit the cage with the protruding section aligned with the track on the inner race, and turn by a half pitch.



(A) Inner race
(B) Cage

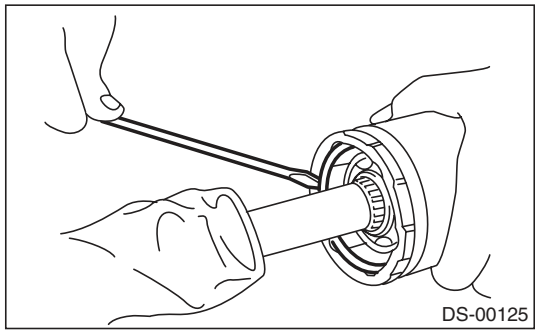
6) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the inner side of the DOJ outer race.
7) Apply a thin coat of specified grease to the cage pocket and six ball bearings.
8) Insert the six ball bearings into the cage pocket.
9) Align the outer race track and ball positions, and place the shaft, inner race, cage and ball bearings in the original positions, and then fix outer race in place.



(A) Outer race
(B) Grease

10) Install the snap ring in the groove on the DOJ outer race.

NOTE:
• Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
• Use care not to place the matched position of snap ring in the ball groove of outer race.
• Pull the shaft lightly and assure that the snap ring is completely fitted in the groove.

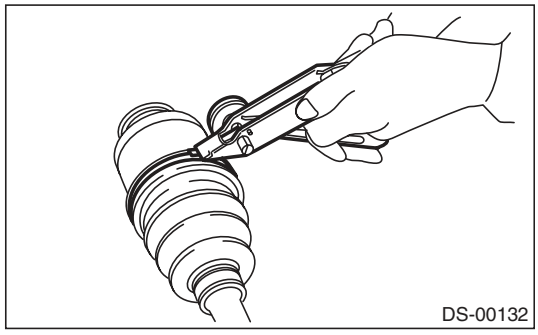

DS-00125

11) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to the shaft.
12) Install the DOJ boot taking care not to twist it.

NOTE:
• The inside of the large end of DOJ boot and the 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 the stroke.
13) Put a new band through the clip and wind twice in the band groove of the boot.
14) Pinch the end of band with pliers. Hold the clip and tighten securely.

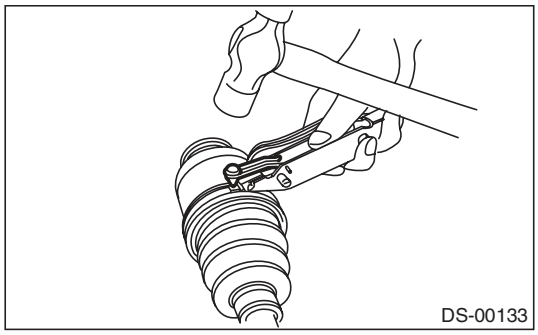
NOTE:
When tightening boot, use care so that the air within the boot is appropriate.
15) Tighten the band using the ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.


DS-00132

16) Tap the clip with the punch provided at the end of the ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tap to an extent that the boot underneath is not damaged.


DS-00133

17) Cut off the band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

NOTE:
Be careful so that the end of the band is in close contact with clip.
18) Install the BJ boot or EBJ boot in the same procedure as a DOJ boot.
19) Extend and retract the DOJ repeatedly to provide an equal coating of grease.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. Repair or replace if defective.
• DOJ (Double Offset Joint)
Check for seizure, corrosion, damage, wear and excessive play.
• EBJ (High-efficiency Compact Ball Fixed Joint)
Check for seizure, corrosion, damage, wear and excessive play.
• Shaft
Check for excessive bending, twisting, damage and wear.
• BJ (Bell Joint)
Check for seizure, corrosion, damage and excessive play.
• Boot
Check for wear, warping, breakage and scratches.
• Grease
Check for discoloration and fluidity.

8. General Diagnostic Table

A: INSPECTION

NOTE:
Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Corrective action
Noise or vibration from propeller shaft	Center bearing	Check the center bearing. <Ref. to DS-12, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>
	Runout of propeller shaft	Check for deflection of the propeller shaft. <Ref. to DS-12, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>
	Loose or gap at connections	Check the joints and connectors. <Ref. to DS-12, JOINTS AND CONNECTIONS, INSPECTION, Propeller Shaft.>
		Check the spline and bearing. <Ref. to DS-12, SPLINES AND BEARING, INSPECTION, Propeller Shaft.>
Abnormal wheel vibration	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-7, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-23, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-16, INSPECTION, Rear Shock Absorber.>
	Front drive shaft	Check the front drive shaft. <Ref. to DS-25, INSPECTION, Front Drive Shaft.>
	Rear drive shaft	Check the rear drive shaft. <Ref. to DS-29, INSPECTION, Rear Drive Shaft.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-21, INSPECTION, Rear Hub Unit Bearing.>
Noise from the underbody	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-7, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-23, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-16, INSPECTION, Rear Shock Absorber.>

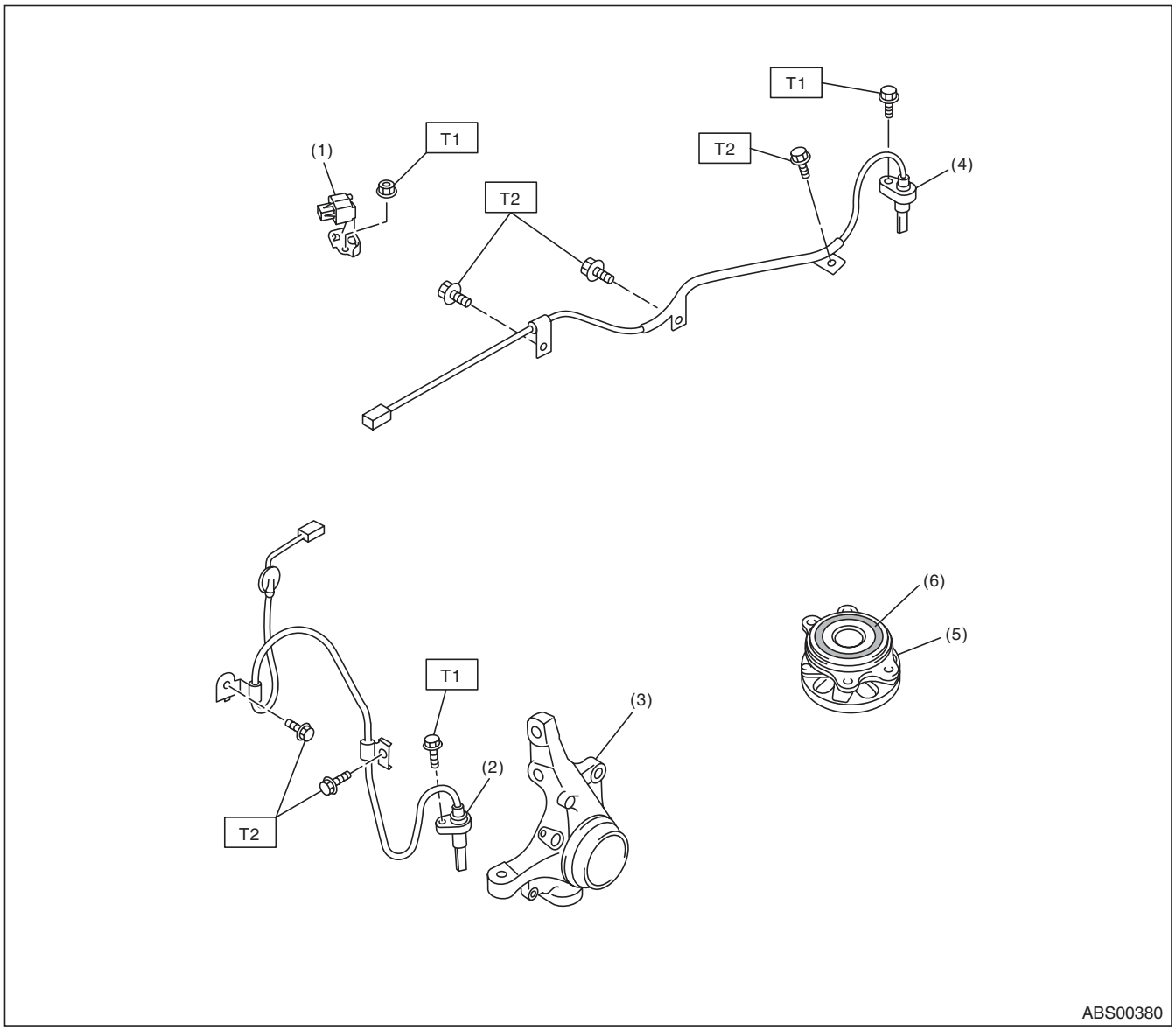
1. General Description

A: SPECIFICATION

Item				Specification or identification
ABS wheel speed sensor	ABS wheel speed sensor gap (for reference)		Front	0.77 — 1.43 mm (0.030 — 0.056 in)
			Rear	0.64 — 1.56 mm (0.025 — 0.061 in)
	Identifications of harness (marks, color)	Front	RH	K1 (White)
			LH	K2 (Yellow)
		Rear	RH	K5 (White)
			LH	K6 (Yellow)
G sensor	G sensor voltage			2.3±0.2 V
ABSCM&H/U identification	AT (Except for OUTBACK)			JG
	MT (Except for OUTBACK)			JH
	AT (OUTBACK)			JK
	MT (OUTBACK)			JM

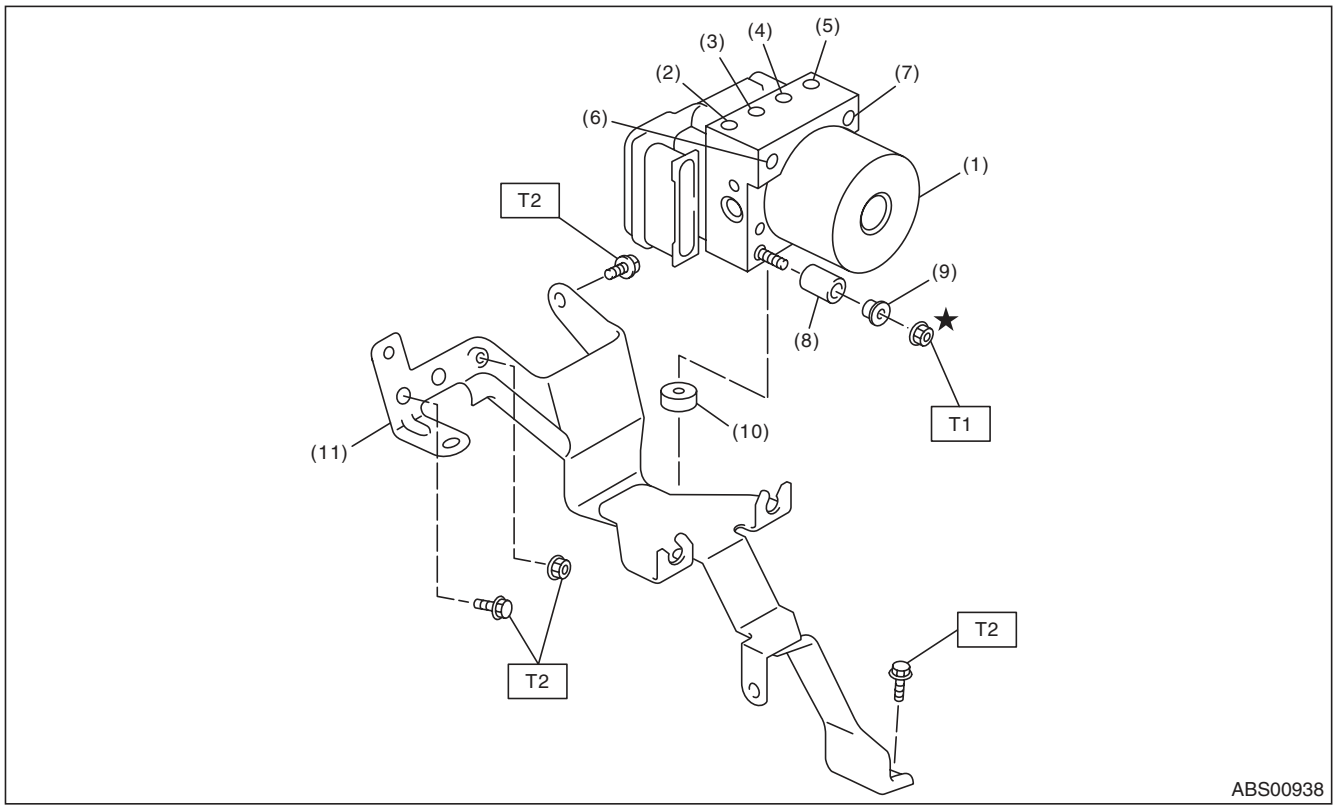
B: COMPONENT

1. ABS WHEEL SPEED SENSOR



(1)	G sensor	(4)	Rear ABS wheel speed sensor LH	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Front ABS wheel speed sensor LH	(5)	Hub unit bearing	***T1: 7.5 (0.76, 5.5)***
(3)	Front housing	(6)	Magnetic encoder	***T2: 33 (3.3, 24)***

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) Front outlet RH
(3) Rear outlet LH
(4) Rear outlet RH
(5) Front outlet LH
(6) Primary inlet
(7) Secondary inlet
(8) Damper
(9) Spacer
(10) Damper
(11) Bracket

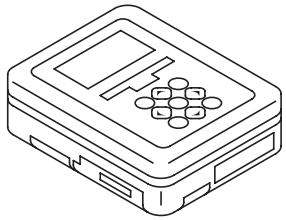
Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.3, 24)

C: CAUTION

• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

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

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring the sensor.
TORX® bit E5	Used for replacing the ABSCM.

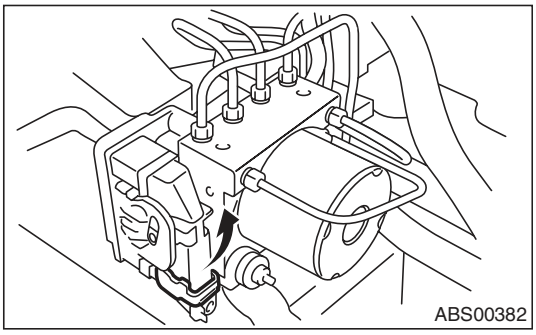
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Use compressed air to remove water and dust around the ABSCM&H/U.

NOTE:
If the terminals become dirty, it may cause improper contact.
3) Lift the lock lever and disconnect the ABSCM&H/U connector.

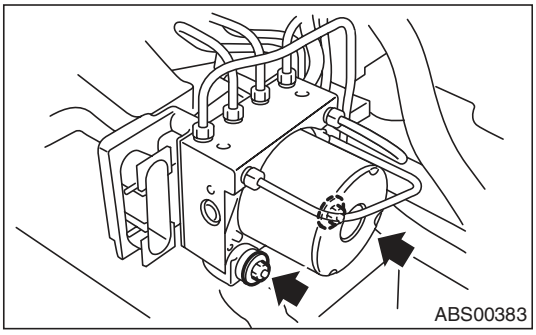
CAUTION:
Do not pull on the harness when disconnecting the connector.



4) Remove the harness clip.
5) Disconnect the brake pipes from the ABSCM&H/U.
6) Wrap the brake pipe with a vinyl bag so as not to spill the brake fluid on the vehicle body.

CAUTION:
If brake fluid is spilled on the vehicle body, wash it off immediately with water and wipe clean.
7) Remove the nuts and remove the ABSCM&H/U.

CAUTION:
- **Do not drop or bump the ABSCM&H/U.**
- **Do not turn the ABSCM&H/U upside down or place it sideways for storage.**
- **Be careful not to let foreign matter enter into ABSCM&H/U.**
- **Be careful that no water enters the connectors.**



8) Remove the ABSCM&H/U bracket.

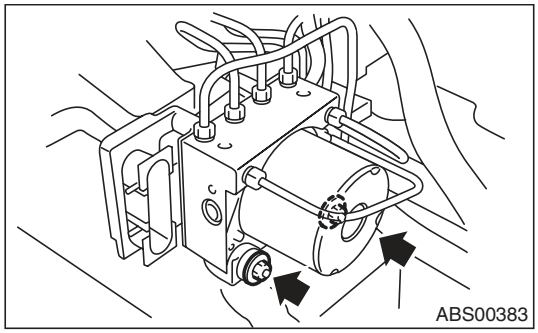
B: INSTALLATION

1) Install the ABSCM&H/U bracket.

Tightening torque:
33 N·m (3.3 kgf-m, 24 ft-lb)
2) Align the damper groove of the ABSCM&H/U to the bracket side claw, and install the ABSCM&H/U with new nuts (Part No. 023506000).

NOTE:
Check the identification marks of the ABSCM&H/U.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



3) Connect the brake pipes to their correct ABSCM&H/U positions.

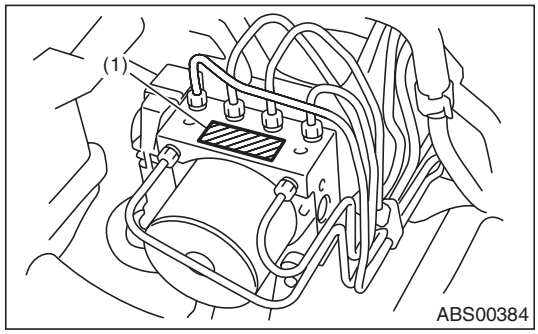
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)
4) Using a harness clip, secure the ABSCM&H/U harness to the bracket.
5) Connect the connector to the ABSCM&H/U.

NOTE:
- Be sure to remove all foreign matter from inside the connector before connecting.
- Make sure the ABSCM&H/U connector is securely locked.

6) Bleed air from the brake system.

C: INSPECTION

1) Check the condition of connection and settlement of connector.
2) Check the mark used for ABSCM&H/U identification.
Refer to “SPECIFICATION” for the identification mark. <Ref. to ABS-2, SPECIFICATION, General Description.>



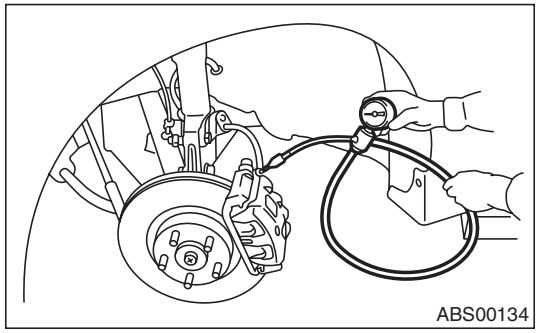
(1) Identification mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift up the vehicle, and remove the wheels.
2) Remove the air bleeder screws from FL and FR caliper bodies.
3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:
• Use a pressure gauge used exclusively for brake fluid measurement.
• Do not use the pressure gauge used for the measurement of transmission oil. Doing so will cause the piston seal to expand and deform.

NOTE:
Wrap sealing tape around the pressure gauge.



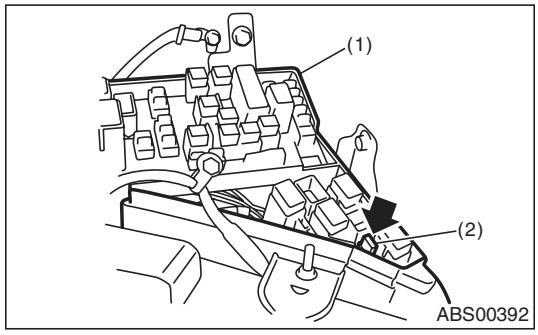
4) Bleed air from the pressure gauges and the FL and FR caliper bodies.
5) Perform ABS sequence control.
<Ref. to ABS-10, ABS Sequence Control.>
6) When the hydraulic unit begins to work, first the FL side performs decompression, hold and compression, and then the FR side performs decompression, hold 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. Depress the brake pedal and check that the kick-back is normal, and tightness is normal.

	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm^2, 511 psi)	3,500 kPa (36 kgf/cm^2, 511 psi)
When depressurized	500 kPa (5 kgf/cm^2, 73 psi) or less	500 kPa (5 kgf/cm^2, 73 psi) or less
When pressurized	3,500 kPa (36 kgf/cm^2, 511 psi) or more	3,500 kPa (36 kgf/cm^2, 511 psi) or more

8) Disconnect the pressure gauges from FL and FR caliper bodies.
9) Install the air bleeder screws of FL and FR caliper bodies.
10) Remove the air bleeder screws from RL and RR caliper bodies.
11) Connect two pressure gauges to RL and RR caliper bodies.
12) Bleed air from the brake system.
13) Bleed air from RL and RR caliper bodies, and pressure gauge.
14) Perform ABS sequence control.
<Ref. to ABS-10, ABS Sequence Control.>
15) When the hydraulic unit begins to work, first the RR side performs decompression, hold and compression, and then the RL side performs decompression, hold and compression.
16) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets specification. Depress the brake pedal and check that the kick-back is normal, and tightness is normal.
17) Disconnect the pressure gauge from the RL and RR caliper bodies.
18) Install the air bleeder screws of RL and RR caliper bodies.
19) Bleed air from the brake system.

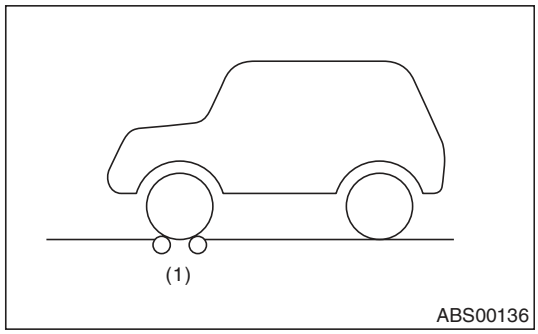
2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER

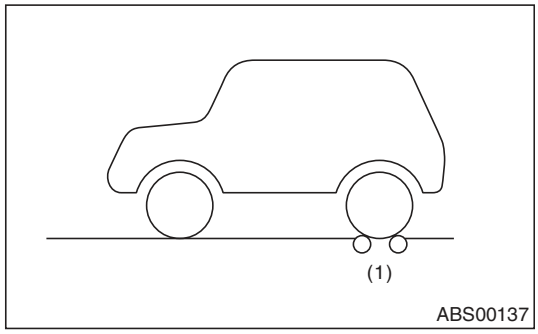
1) Install the spare fuse to the FWD connector located in the main fuse box for models without AT VTD.



(1) Main fuse box
(2) FWD connector

2) Since the MT model and AT VTD model cannot cut off the AWD circuit, set the wheels other than the measured one on free rollers.
3) Prepare for ABS sequence control.
<Ref. to ABS-10, ABS Sequence Control.>
4) Set the front wheels or rear wheels on the brake tester and set the gear to “neutral”.





(1) Brake tester

5) Operate the brake tester.
6) Perform ABS sequence control.
<Ref. to ABS-10, ABS Sequence Control.>
7) When the hydraulic unit begins to work, check the following work sequence.
(1) The FL wheel performs decompression, hold and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, hold and compression in sequence, and subsequently the RL wheel repeats the cycle.
8) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets specification.

	Front wheel	Rear wheel
Initial value	1,000 N (102 kgf, 225 lb)	1,000 N (102 kgf, 225 lb)
When depressurized	500 N (51 kgf, 112 lb) or less	500 N (51 kgf, 112 lb) or less
When pressurized	1,000 N (102 kgf, 225 lb) or more	1,000 N (102 kgf, 225 lb) or more

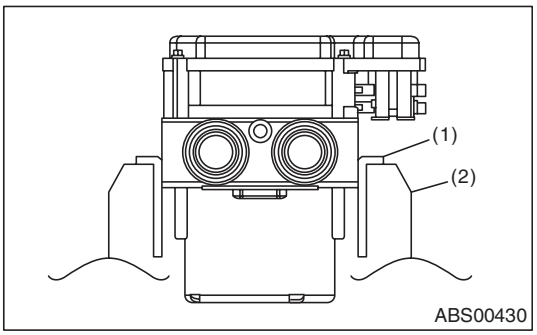
9) After the inspection, depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

D: REPLACEMENT

CAUTION:
• Because the seal of the ABSCM cannot be replaced, do not pull or peel it by lifting it up.
• Because the screw of the H/U will become slightly worn in every replacement procedure, 5 times is the maximum number of times for replacement. If a problem is found such as not being able to torque the screw to specifications even before 5 replacement operations are performed, replace the H/U body.
• When installing the ABSCM, always use new screws.
• When the sealing surface of the ABSCM or H/U is dirty or damaged and it cannot be removed or repaired, replace with a new part.
1) Remove the ABSCM&H/U bracket. <Ref. to ABS-6, REMOVAL, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2) To prevent entry of foreign objects and brake fluid leakage, plug the oil pressure port of the ABSCM&H/U using a screw plug, etc.

3) Set the pump motor section of the removed ABSCM&H/U face down on a vise.

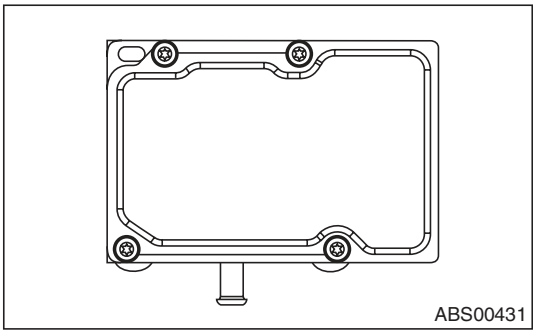
NOTE:
Before securing a part in a vise, place cushioning material such as wood blocks, aluminum plate or cloth between the part and the vise.



(1) Aluminum plate, etc.
(2) Vise

4) Using TORX® bit E5, remove the four screws of ABSCM.

NOTE:
These screws cannot be reused.



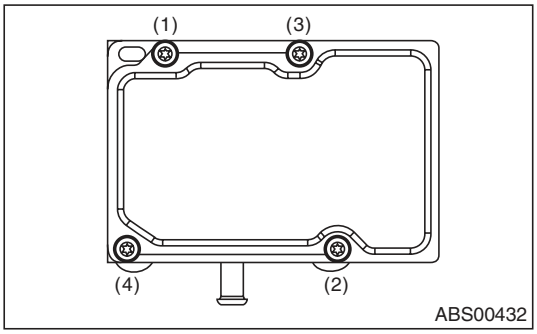
5) Slowly pull out the ABSCM upward from the H/U.

NOTE:
To prevent damaging of coil section, remove the ABSCM straight up from H/U without twisting.
6) Make sure there is no dirt or damage on the sealing surface of the H/U.

CAUTION:
• Do not clean the ABSCM and H/U by applying compressed air.
• Even if damage is found on the H/U seal, do not attempt repair by filing or with a metal scraper. To remove the seal residue, always use a plastic scraper. Do not use chemical such as paint thinner, etc., to clean.
7) Position the coil of the new ABSCM to align with the H/U valve.
8) To prevent deformation of the ABSCM housing cover, hold the corner of ABSCM and install it to the H/U without tilting.
9) Using a TORX® bit E5, attach/tighten new screws 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 mating surface between the ABSCM and H/U.
11) Using a TORX® bit E5, tighten the screws 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 gap in the mating surface between ABSCM and H/U.
13) Install the ABSCM&H/U to the vehicle.

3. ABS Sequence Control

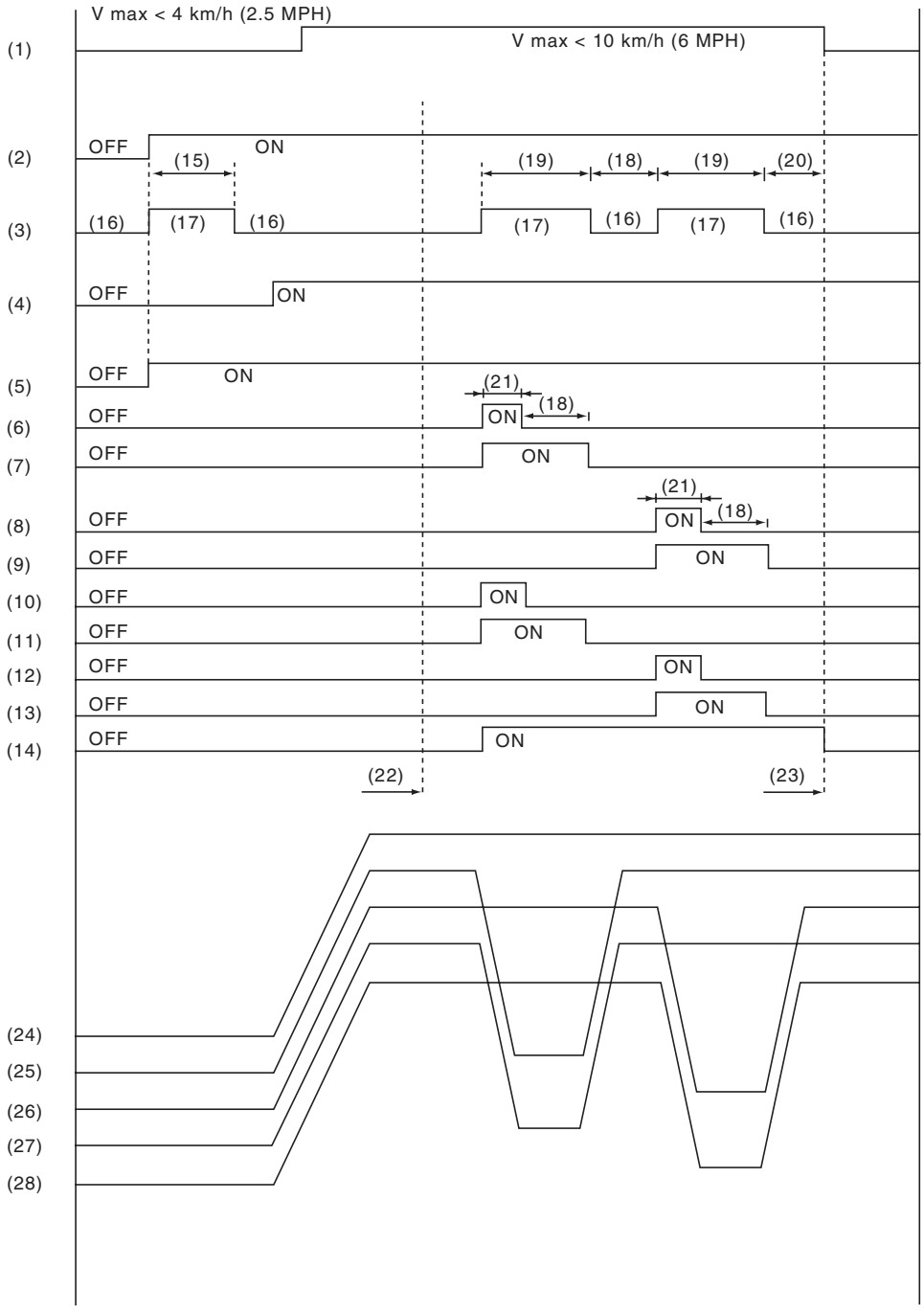
A: OPERATION

1) While the ABS sequence control is being performed, the operation of the hydraulic unit can be checked using the brake tester or pressure gauge after the hydraulic unit solenoid valve operation.
2) ABS sequence control can be started by the Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:
In the event of any trouble, the ABS sequence control will not operate.
1) Connect the Subaru Select Monitor to data link connector under the driver's side instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Run the "PC application for Subaru Select Monitor".
4) Set the Subaru Select Monitor to "Brake Control" mode.
5) When the "Function Check Sequence" is selected, the "ABS sequence control" will start.
6) Execute the following operations when the message "Press the brake pedal so that the brake pedal force is between 100 and 150 kgf" is displayed.
   (1) When using a brake tester, press the brake pedal pad with a force of 1,000 N (102 kgf, 225 lb).
   (2) When using a pressure gauge, press the brake pedal so that the pressure gauge indicates 3,500 kPa (36 kg/cm^2, 511 psi).
7) Press the [OK] key after "Press OK" is displayed.
8) The brake system being operated is displayed on the Subaru Select Monitor.

2. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00943

(1) All wheel speed
(2) Ignition key
(3) ABS warning light
(4) Stop light switch
(5) Valve relay
(6) FL decompression valve
(7) FL compression valve
(8) FR decompression valve
(9) FR compression valve
(10) RR decompression valve
(11) RR compression valve
(12) RL decompression valve
(13) RL compression valve
(14) Pump motor
(15) 1.5 sec.
(16) Light OFF
(17) Light ON
(18) 1.0 sec.
(19) 1.4 sec.
(20) 0.6 sec.
(21) 0.4 sec.
(22) Point A
(23) Reset
(24) Master cylinder pressure
(25) FL wheel cylinder pressure
(26) FR wheel cylinder pressure
(27) RR wheel cylinder pressure
(28) RL wheel cylinder pressure

NOTE:
The control operation starts from point A.

B: SPECIFICATION

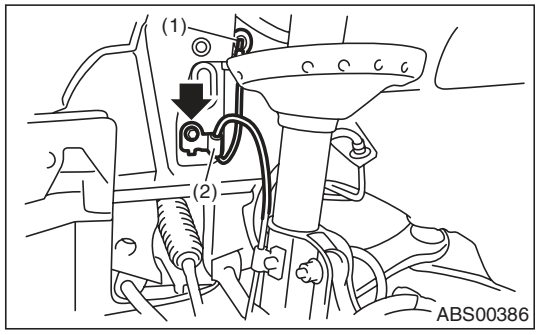
1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is released during ABS sequence control and the stop light switch is becomes OFF.
3) After completion of ABS sequence control.
4) When a malfunction is detected.

4. Front ABS Wheel Speed Sensor

A: REMOVAL

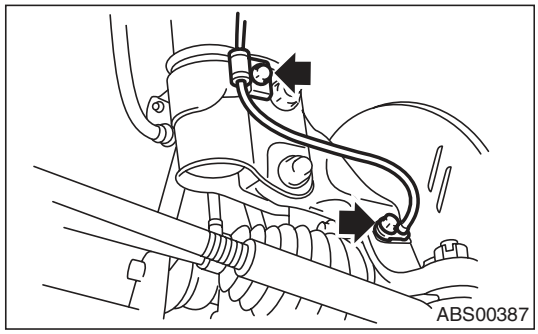
1) Disconnect the ground cable from the battery.
2) Disconnect the ABS wheel speed sensor connector located next to the front strut mounting house in the engine compartment.
3) Remove the sensor harness bracket.



(1) To the front ABS wheel speed sensor connector
(2) Sensor harness bracket

4) Remove the bolts which secure the sensor harness to the front strut.
5) Remove the front ABS wheel speed sensor from housing.

CAUTION:
• Be careful not to damage the sensor.
• Do not apply excessive force to the sensor harness.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Sensor:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Bracket:
33 N·m (3.3 kgf-m, 24 ft-lb)

CAUTION:
Be careful not to damage the sensor.

NOTE:
• Check the identification (mark) on the harness to make sure there is no warpage. (RH: K1 (White), LH: K2 (Yellow))
• Check if the harness is not pulled and does not come in contact with the suspension or body during steering wheel effort.

C: INSPECTION

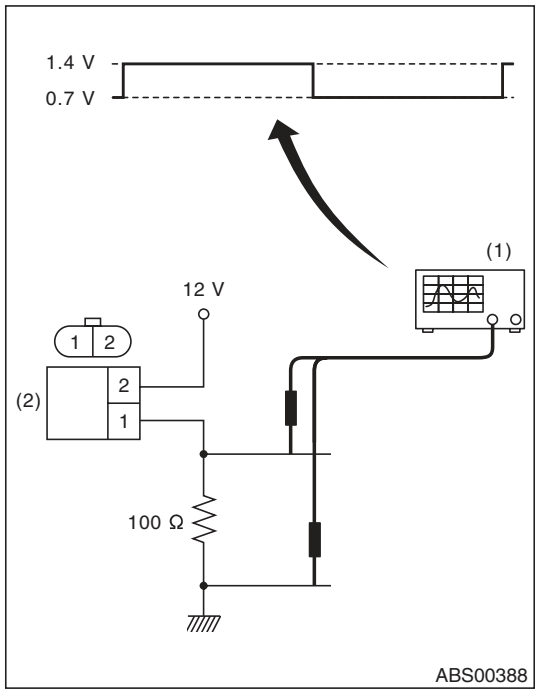
1. CHECK WITH SUBARU SELECT MONITOR

1) Connect the Subaru Select Monitor to data link connector.
2) Select {Current Data Display & Save}. Check if the speed indicated on the display changes in the same manner as the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position.
3) If the speed indicated on the display does not change, check the ABS wheel speed sensor. <Ref. to ABS-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>

2. ABS WHEEL SPEED SENSOR

1) Check the tip of the ABS wheel speed sensor for foreign particles or damage. If necessary, clean the tip or replace the ABS wheel speed sensor.
2) Connect a 12 V power supply to No. 2 terminal of sensor connector as shown in the figure, then attach resistance to the No. 1 terminal. Rotate the wheel at about 2.75 km/h (2 MPH), and measure the voltage using an oscilloscope.

Standard value of output voltage:
0.7 — 1.4 V



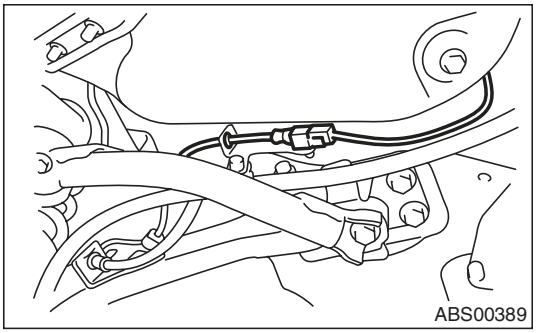
(1) Oscilloscope
(2) ABS wheel speed sensor

NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new part.

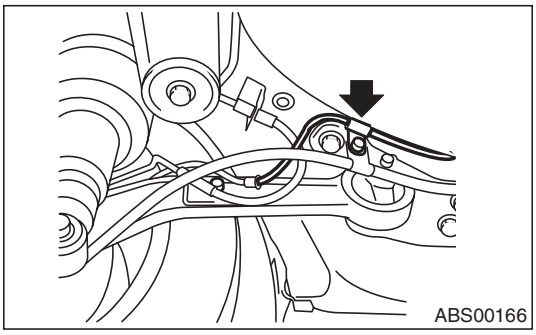
5. Rear ABS Wheel Speed Sensor

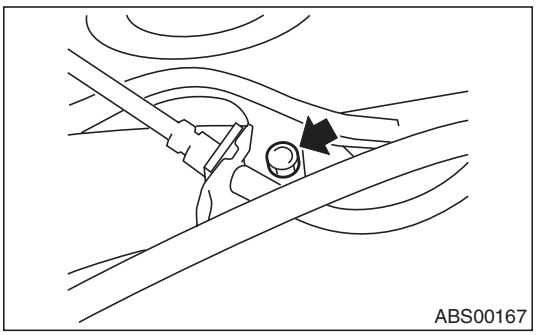
A: REMOVAL

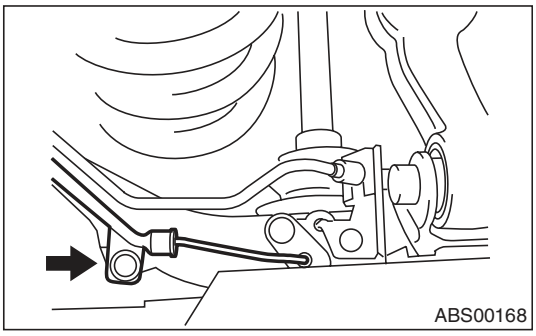
1) Disconnect the ground cable from the battery.
2) Disconnect the connector from the rear ABS wheel speed sensor.


ABS00389

3) Remove the sensor harness bracket from the rear arm.

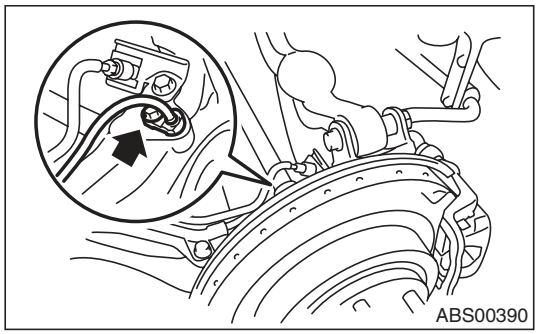

ABS00166


ABS00167


ABS00168

4) Remove the rear ABS wheel speed sensor from the rear arm.

CAUTION:
- **Be careful not to damage the sensor.**
- **Do not apply excessive force to the sensor harness.**


ABS00390

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be careful not to damage the sensor.

Tightening torque:
Sensor:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Bracket:
33 N·m (3.3 kgf-m, 24 ft-lb)

NOTE:
Check the identification (mark) on the harness to make sure there is no warpage. (RH: K5 (White), LH: K6 (Yellow))

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

<Ref. to ABS-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>

6. Front Magnetic Encoder

A: REMOVAL

Refer to “Front Hub Bearing” for removal, because the front magnetic encoder is integrated with front hub bearing.
<Ref. to DS-17, REMOVAL, Front Hub Unit Bearing.>

B: INSTALLATION

Refer to “Front Hub Bearing” for installation, because the front magnetic encoder is integrated with front hub bearing.
<Ref. to DS-18, INSTALLATION, Front Hub Unit Bearing.>

C: INSPECTION

Visually check the magnetic encoder for any damage. If necessary, replace with a new hub unit bearing.

NOTE:
Because the magnetic encoder is integrated with front hub unit bearing assembly, replace the hub unit bearing with a new part if there is any defect found on the magnetic encoder.

7. Rear Magnetic Encoder

A: REMOVAL

Refer to “Rear Hub Unit Bearing” for removal, because the rear magnetic encoder is integrated with rear hub unit bearing.
<Ref. to DS-19, REMOVAL, Rear Hub Unit Bearing.>

B: INSTALLATION

Refer to “Rear Hub Unit Bearing” for installation, because the rear magnetic encoder is integrated with rear hub unit bearing.
<Ref. to DS-20, INSTALLATION, Rear Hub Unit Bearing.>

C: INSPECTION

Visually check the magnetic encoder parts for any damage. If necessary, replace with a new hub unit bearing.

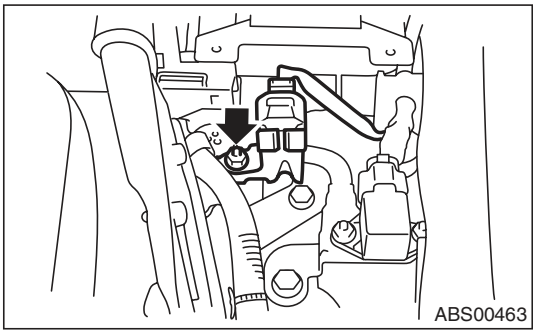
NOTE:
Because the magnetic encoder is integrated with rear hub unit bearing assembly, replace the hub unit bearing with a new part if there is any defect found on the magnetic encoder.

8. G Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console box.
<Ref. to EI-54, REMOVAL, Console Box.>
3) Disconnect the connector from G sensor.
4) Remove the G sensor from the body.

CAUTION:
- **Do not drop or bump the G sensor.**
- **The G sensor integrated with the bracket. Do not disassemble.**



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not drop or bump the G sensor.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: INSPECTION

	Step	Check	Yes	No
1	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Set the Subaru Select Monitor to the {Brake Control System} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output value.	Is the value –1.2 — 1.2 m/s^2 when the vehicle is in horizontal position?	Go to step **2**.	Repair the harness connector between the G sensor and ABSCM&H/U. Or replace G sensor.
2	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the G sensor from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display.	Is the value 8.1 — 11.2 m/s^2 when G sensor is inclined forward to 90°?	Go to step **3**.	Repair the harness connector between the G sensor and ABSCM&H/U. Or replace G sensor.
3	**CHECK G SENSOR.** Read the Subaru Select Monitor display.	Is the value –8.1 — –11.2 m/s^2 when G sensor is inclined backward 90°?	G sensor is normal.	Repair the harness connector between the G sensor and ABSCM&H/U. Or replace G sensor.

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
Remove foreign matter (dust, water, oil etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check harness for open or short circuits, shake the suspected trouble spot or connector.
- Refer to “Check List for Interview”. <Ref. to ABS(diag)-3, Check List for Interview.>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to ABS(diag)-3, Check List for Interview.> 2) Before performing diagnostics, check the components which might affect ABS problems. <Ref. to ABS(diag)-7, INSPECTION, General Description.>	Are components which might affect the ABS problem operating correctly?	Go to step **2**.	Repair or replace each component.
2	**CHECK INDICATION OF DTC ON SCREEN.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. NOTE: If the communication function of the Subaru Select Monitor cannot be executed properly, check the communication circuit. <Ref. to ABS(diag)-15, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 4) Read the DTC. <Ref. to ABS(diag)-18, 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 GENERAL DIAGNOSIS.** 1) Perform the inspection by referring to “General Diagnostic Table”. <Ref. to ABS(diag)-62, General Diagnostic Table.> 2) Perform the Clear Memory Mode. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC. <Ref. to ABS(diag)-18, Read Diagnostic Trouble Code (DTC).> Check the DTC is not displayed.	Does the ABS warning light go off after turning the ignition switch to ON?	Finish the diagnosis.	Check the combination meter circuit. <Ref. to ABS(diag)-25, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>
4	**PERFORM DIAGNOSIS.** 1) Refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-29, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the cause of trouble. 3) Perform the Clear Memory Mode. <Ref. to ABS(diag)-20, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 5) Read the DTC. <Ref. to ABS(diag)-18, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Repeat step 1 to 4 until DTC does not appear.	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Check the following items regarding condition of the vehicle.

1. STATE OF ABS WARNING LIGHT

ABS warning light illuminates.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on When and for how long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after starting engine, engine is running) ❑ ON (after starting engine, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition ON. ❑ Immediately after turning the ignition to START.		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While 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 other electrical parts are operating		
	• Parts name: • Operating condition:		

2. STATE OF BRAKE WARNING LIGHT

Brake warning light illuminates.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on ❑ When pulling the parking brake lever. ❑ When releasing the parking brake lever. When and for how long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after starting engine, engine is running) ❑ ON (after starting engine, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition ON. ❑ Immediately after turning the ignition to START.		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While 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 other electrical parts are operating		
	• Parts name: • Operating condition:		

3. SYMPTOMS

<table>
<tr><td rowspan="11">ABS operating condition</td><td colspan="3">❑ Does not operate.</td></tr>
<tr><td>❑ Operates only when applying the brakes suddenly.</td><td>Vehicle speed:</td><td>km/h
MPH</td></tr>
<tr><td colspan="3">Procedures for stepping on the 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
❑ Thump
❑ 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">❑ Sticks
❑ Weak pedal resistance
❑ Strong pedal resistance
❑ Others:</td></tr>
<tr><td colspan="3">a) Directional stability cannot be obtained or the steering does not respond 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 out
❑ Others:</td></tr>
<tr><td colspan="3">b) Directional stability cannot be obtained or the steering does not respond 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 out
❑ Others:</td></tr>
<tr><td colspan="3">c) Poor brake performance: ❑ Yes / ❑ No</td></tr>
<tr><td>What kind:</td><td colspan="2">❑ Braking distance is long.
❑ Brakes lock or drag.
❑ Pedal stroke is long.
❑ Pedal sticks.
❑ Others:</td></tr>
<tr><td colspan="3">d) Poor acceleration: ❑ Yes / ❑ No</td></tr>
<tr><td>What kind:</td><td colspan="2">❑ Fails to 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>

Check List for Interview

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	❑ Dry ❑ 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 ❑ While accelerating ❑ While 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) Loaded state:	
	k) Repair parts are used.: ❑ Yes / ❑ No	
	Contents:	
	l) Others:	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor and ABSCM&H/U.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use 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 item which might affect ABS problems.

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage:
12 V or more

Specific gravity:
1.260 or more

2. GROUND

Check the tightening torque of ground (GB-7) bolt of ABS.

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.
• When using the brake tester <Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
• When not using the brake tester <Ref. to ABS-7, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

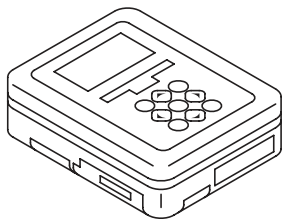
Check the brake pad and rotor.
• Front <Ref. to BR-13, INSPECTION, Front Brake Pad.> <Ref. to BR-14, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-19, INSPECTION, Rear Brake Pad.> <Ref. to BR-21, INSPECTION, Rear Disc Rotor.>

7. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOL

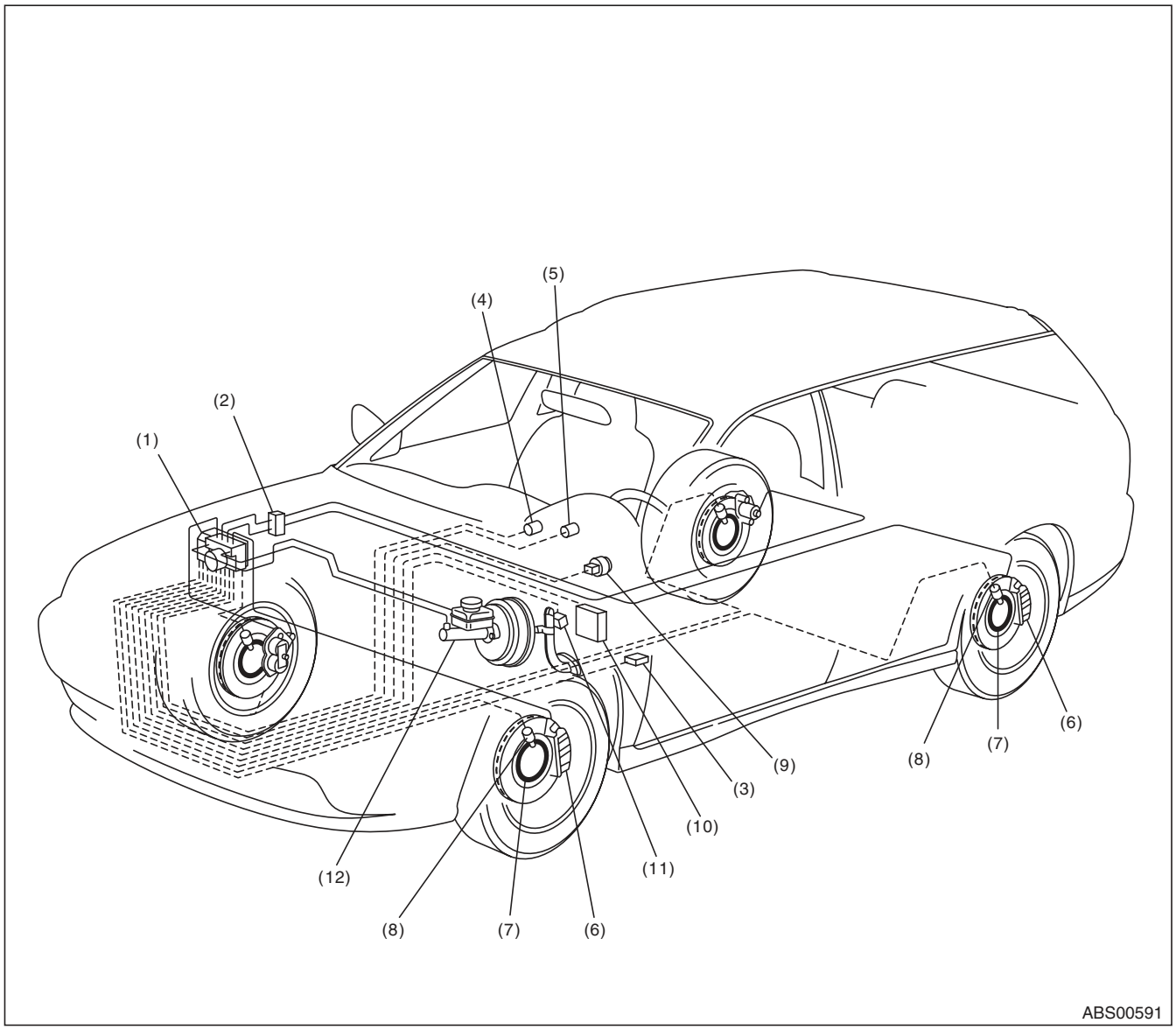
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

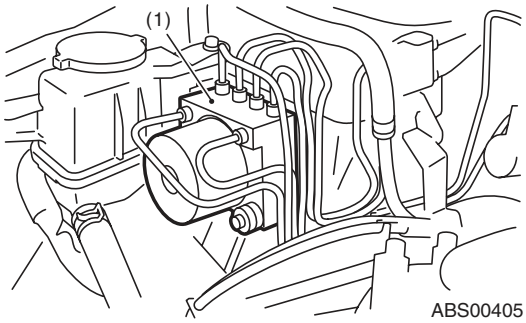
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

4. Electrical Component Location

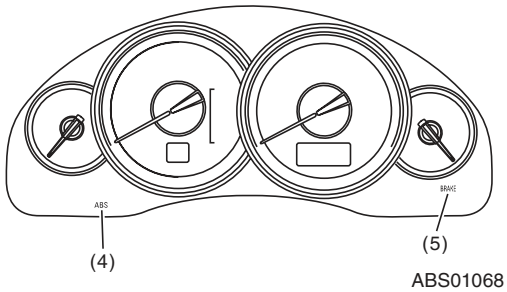
A: LOCATION



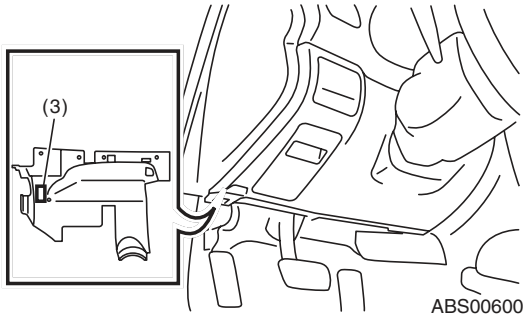
(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) Two-way connector
(3) Data link connector (For Subaru Select Monitor)
(4) ABS warning light
(5) Brake and EBD warning light
(6) Caliper body
(7) Magnetic encoder seal
(8) ABS wheel speed sensor
(9) G sensor
(10) Transmission control module (TCM) (AT model)
(11) Stop light switch
(12) Master cylinder



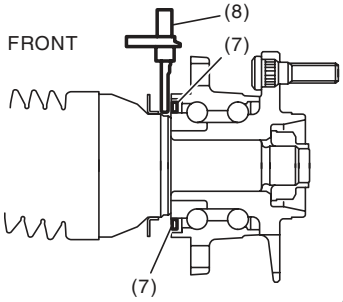
ABS00405



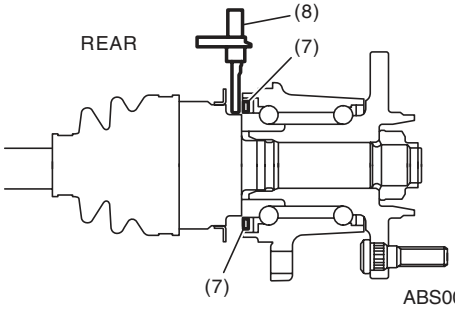
ABS01068



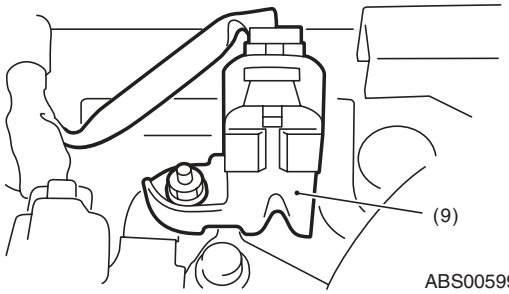
ABS00600



ABS00408



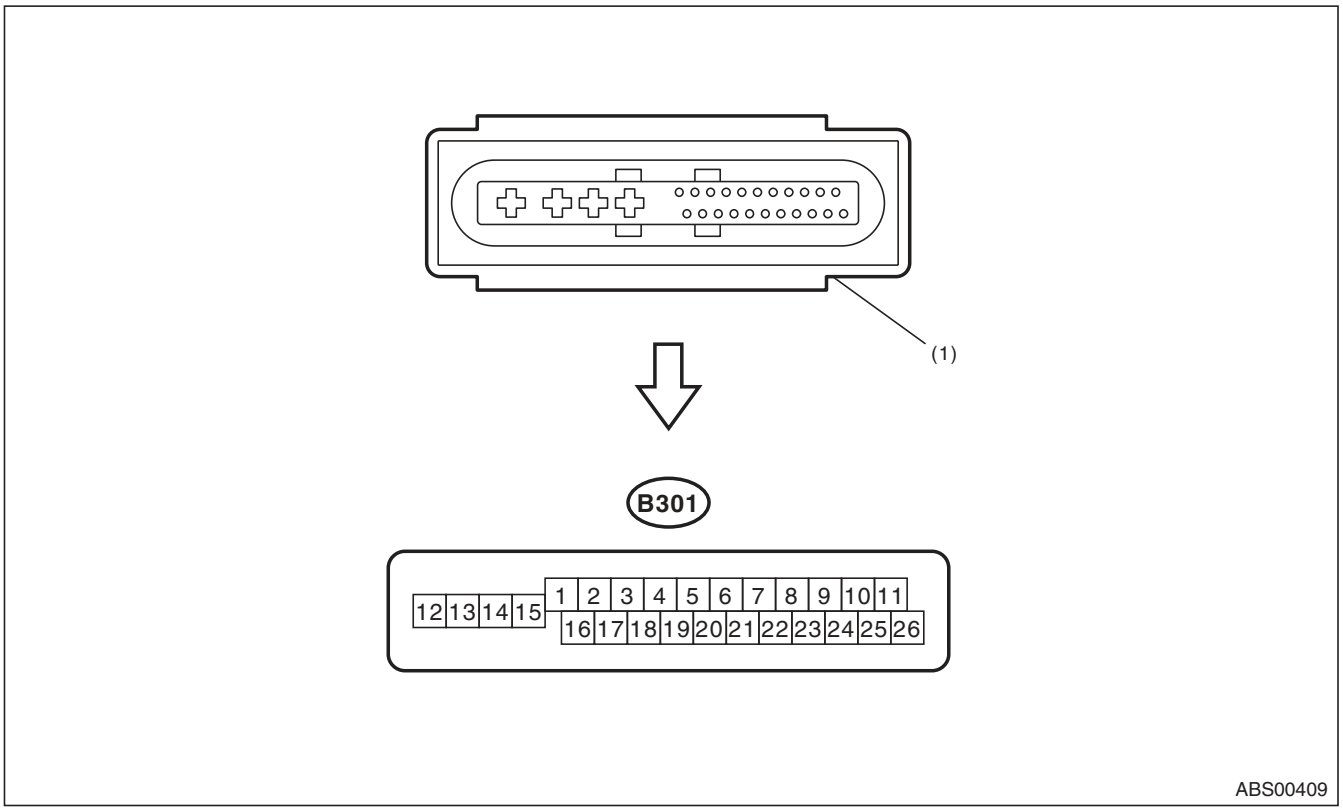
ABS00407



ABS00599

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



(1) ABS control module and hydraulic control unit (ABSCM&H/U) connector

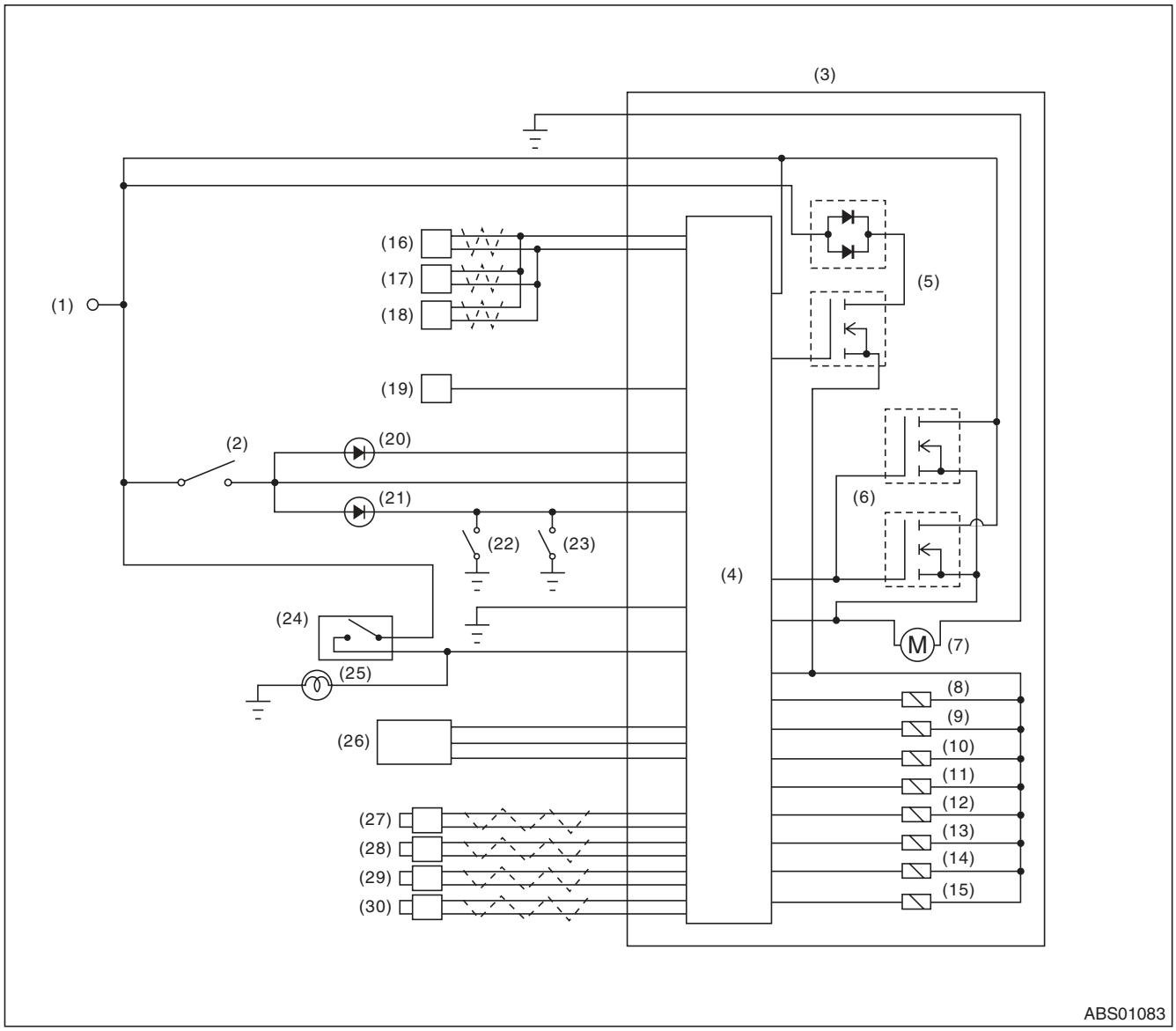
NOTE:
- Terminal numbers in ABSCM&H/U connector are shown in the figure.
- ABS warning light illuminates when the connector is removed from ABSCM&H/U.

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	Power supply	16 — 15	4.5 — 16.5 V
		Signal	1	5.9 — 16.8 mA: Rectangle waveform
	Front RH wheel	Power supply	5 — 15	4.5 — 16.5 V
		Signal	6	5.9 — 16.8 mA: Rectangle waveform
	Rear LH wheel	Power supply	2 — 15	4.5 — 16.5 V
		Signal	17	5.9 — 16.8 mA: Rectangle waveform
	Rear RH wheel	Power supply	3 — 15	4.5 — 16.5 V
		Signal	4	5.9 — 16.8 mA: Rectangle waveform
CAN communication line (+)			26	2.5 — 1.5 V pulse signal
CAN communication line (–)			11	3.5 — 2.5 V pulse signal
Valve relay power supply *1			14 — 15	10 — 15 V
Motor relay power supply *1			13 — 15	10 — 15 V
G sensor	Power supply		24 — 10	4.75 — 5.25 V
	Ground		10	—
	Output		21 — 10	2.1 — 2.5 V when the vehicle is on level surface
Stop light switch *1			20 — 15	1.5 V or less 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 1.5 V or less 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 1.5 V or less after 1.5 seconds passed.
Subaru Select Monitor			7 — 15	1.5 V or less when no data is received. 0 ←→ 12 V pulse (in communication)
Power supply *1			18 — 15	10 — 15 V when the ignition switch is ON.
Grounding line			15	—
Vehicle speed output signal			23 — 15	0 ←→ 5 V pulse

*1: Measure the I/O signal voltage after disconnecting the connector from the ABSCM&H/U terminal.

B: WIRING DIAGRAM



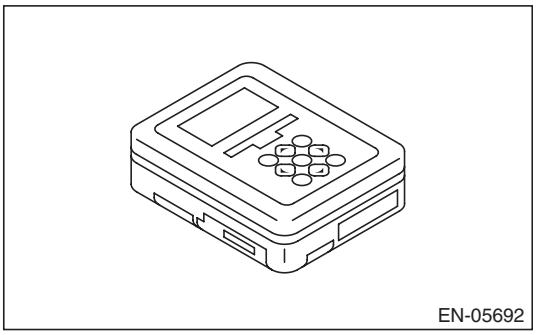
(1)	Battery	(11)	Front outlet solenoid valve RH	(21)	Brake warning light
(2)	Ignition switch	(12)	Rear inlet solenoid valve LH	(22)	Parking brake switch
(3)	ABS control module and hydraulic control unit (ABSCM&H/U)	(13)	Rear outlet solenoid valve LH	(23)	Brake fluid level switch
		(14)	Rear inlet solenoid valve RH	(24)	Stop light switch
(4)	ABS control module	(15)	Rear outlet solenoid valve RH	(25)	Stop light
(5)	Valve relay	(16)	Body integrated unit	(26)	G sensor
(6)	Motor relay	(17)	Engine control module (ECM)	(27)	Front ABS wheel speed sensor LH
(7)	Motor	(18)	Transmission control module (TCM)	(28)	Front ABS wheel speed sensor RH
(8)	Front inlet solenoid valve LH	(19)	Data link connector	(29)	Rear ABS wheel speed sensor LH
(9)	Front outlet solenoid valve LH	(20)	ABS warning light	(30)	Rear ABS wheel speed sensor RH
(10)	Front inlet solenoid valve RH				

6. Subaru Select Monitor

A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

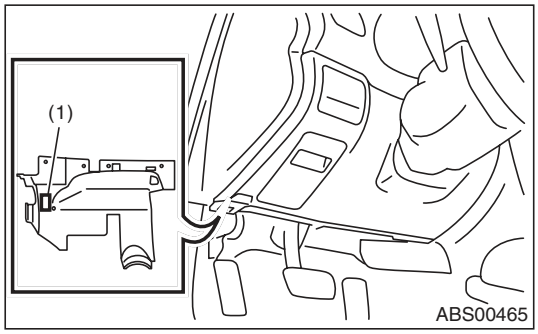
1) Prepare the Subaru Select Monitor kit. <Ref. to ABS(diag)-7, SPECIAL TOOL, PREPARATION TOOL, General Description.>



2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable between SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).



(1) Data link connector

CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.

6) Start the PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".

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

8) If communication is not possible between the ABS and the Subaru Select Monitor, check the communication circuit. <Ref. to ABS(diag)-15, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

2. READ CURRENT DATA

1) On the «Main Menu» display, select the {Each System Check}.
2) On the «System Selection Menu» display, select the {Brake Control System}.
3) Click the [OK] button after the {ABS} is displayed.
4) On the «Brake Control Diagnosis» display, select the {Current Data Display & Save}.
5) On the «Data Display Menu» display, select the data display method.
6) Using the scroll key, scroll the display screen up or down until necessary data is shown.

• A list of the support data is shown in the following table.

Display	Contents to be displayed	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h or MPH
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h or MPH
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h or MPH
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h or MPH
BLS Signal	Brake ON/OFF is displayed.	ON or OFF
G-Sensor	Vehicle acceleration detected by analog G sensor is displayed.	m/s (m/s^2)
Valve Relay Signal	Valve relay operation signal is displayed.	ON or OFF
ABS Warning Light	ON operation of the ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of the EBD warning light is displayed.	ON or OFF
M. Relay monitor Voltage	Motor relay monitor voltage is displayed.	V
ABS_CM Power 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 procedures, refer to the "PC application help for Subaru Select Monitor".

3. ABS SEQUENCE CONTROL

Display	Contents to be displayed	Index No.
ABS Sequence Control Mode	Operate the valve and pump motor continuously to perform the ABS sequence control.	<Ref. to ABS-10, ABS Sequence Control.>

4. FREEZE FRAME DATA

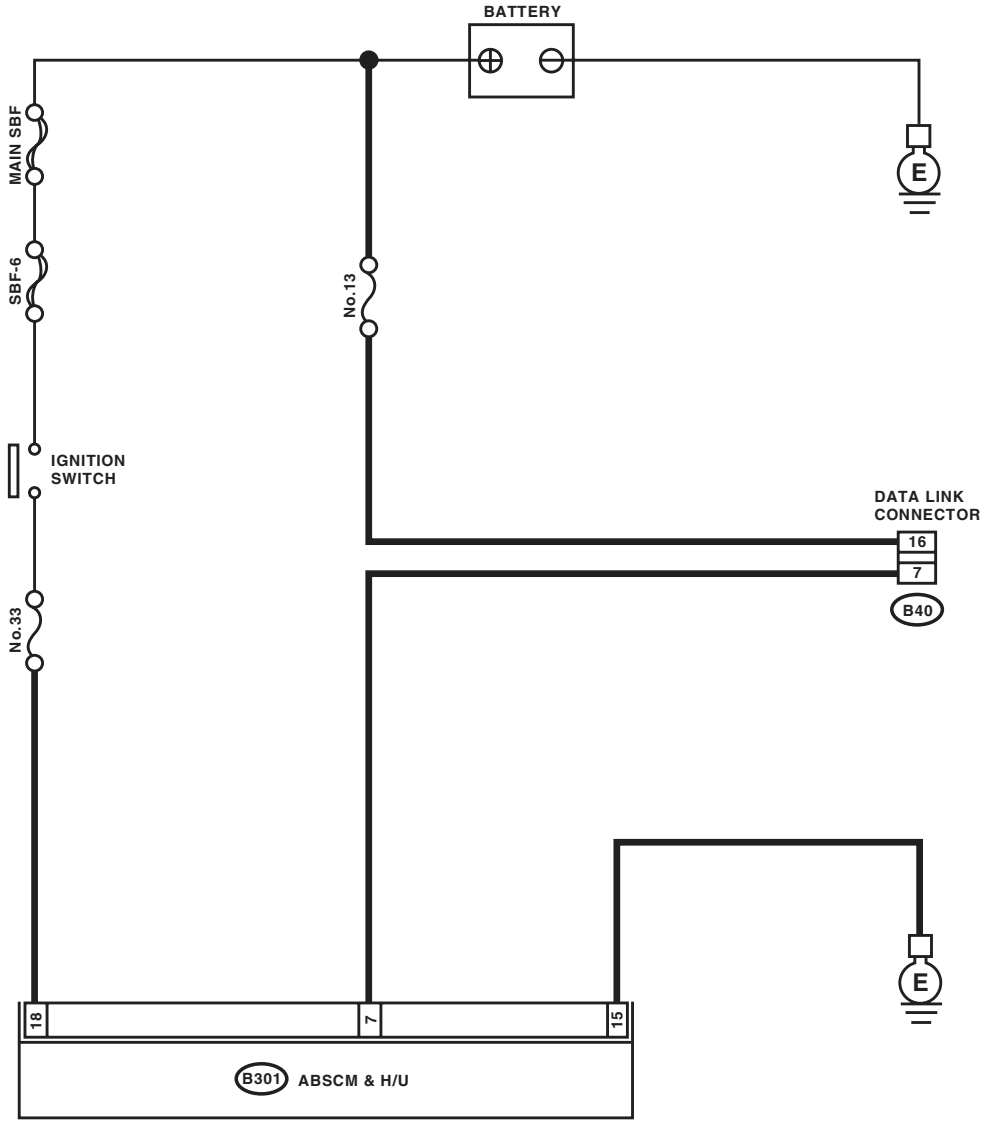
NOTE:
• Data stored at the time of trouble occurrence is shown on display.
• Each time a trouble occurs, the latest information is stored in the freeze frame data in memory.
• Up to 3 freeze frame data will be stored.
• If freeze frame data is not stored in memory properly (due to a drop in ABS control module power supply etc.), a DTC suffixed with a question mark "?" is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.

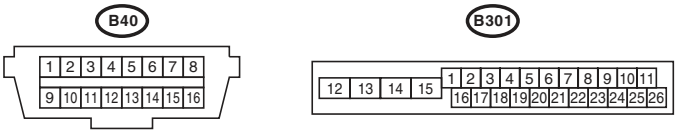
Display	Contents to be displayed
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed in km/h or MPH.
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed in km/h or MPH.
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed in km/h or MPH.
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed in km/h or MPH.
ABS_CM Power Voltage	Voltage (V) supplied to ABSCM&H/U is displayed.
G-Sensor	Vehicle acceleration detected by analog G sensor is displayed.
M. Relay monitor Voltage	Motor relay condition is displayed.
BLS Signal	Brake ON/OFF is displayed.
Vehicle Speed	Vehicle speed calculated by ABS control module is displayed.
ABS Control Flag	ABS control condition is displayed.
Power Supply Failure	Whether abnormal voltage occurred or not is displayed during malfunction.

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Communication is impossible between ABS and Subaru Select Monitor.
WIRING DIAGRAM:





ABS00905

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch ON?	Go to step **2**.	Turn the ignition switch to ON, and select ABS mode using Subaru Select Monitor.
2	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage 11 V or more?	Go to step **3**.	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at the battery terminal?	Repair or tighten the battery terminal.	Go to step **4**.
4	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Is the system name displayed on the Subaru Select Monitor?	Go to step **8**.	Go to step **5**.
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name displayed on the Subaru Select Monitor?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6**.
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U, ECM and TCM. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the harness and connector between each control module and data link connector.
7	**CHECK ABSCM&H/U OUTPUT SIGNAL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8**.	Repair the harness and connector between each control module and data link connector.
8	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR.** Measure the resistance between ABSCM&H/U connector and data link connector. ***Connector & terminal*** ***(B301) No. 7 — (B40) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **9**.	Repair 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 ABSCM&H/U connector into ABSCM&H/U.
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **11**.	Repair open circuit of harness between ABSCM&H/U and battery.

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance of the harness between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12**.	Repair the open circuit and poor contact of the harness between ABSCM&H/U and connector.
12	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) On the «Main Menu» display, select the {Each System Check}.
2) On the «System Selection Menu» display, select the {Brake Control System}.
3) Click the [OK] button after the {ABS} is displayed.
4) On the «Brake Control Diagnosis» display, select the {Diagnostic Code(s) Display}.
5) Record the DTC and data.

NOTE:
• For detailed operation procedures, refer to the “PC application help for Subaru Select Monitor”.
• For details concerning DTCs, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>
• Up to 3 DTCs are displayed in the order of detection.
• If a particular DTC is not stored in memory properly at the occurrence of problem (due to a drop in ABSCM&H/U power supply etc.), the DTC suffixed with a question mark “?” is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.
• If “No diagnostic Code Present” is displayed, check combination meter or harness. <Ref. to ABS(diag)-25, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>
• When the ABS warning light is OFF and “No diagnostic Code Present” is displayed, the system is operating properly.

Display	Contents to be displayed
(Current)	The current DTC is displayed on Subaru Select Monitor display screen.
(Old)	The latest DTC in previous troubles is displayed on Subaru Select Monitor display screen.
(Older)	The second latest DTC from the history of previous problems is displayed on the Subaru Select Monitor display screen.
(Before 3)	The third latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as much as possible.
Drive the vehicle at a speed of 40 km/h (25 MPH) or more for at least one minute.

9. Clear Memory Mode

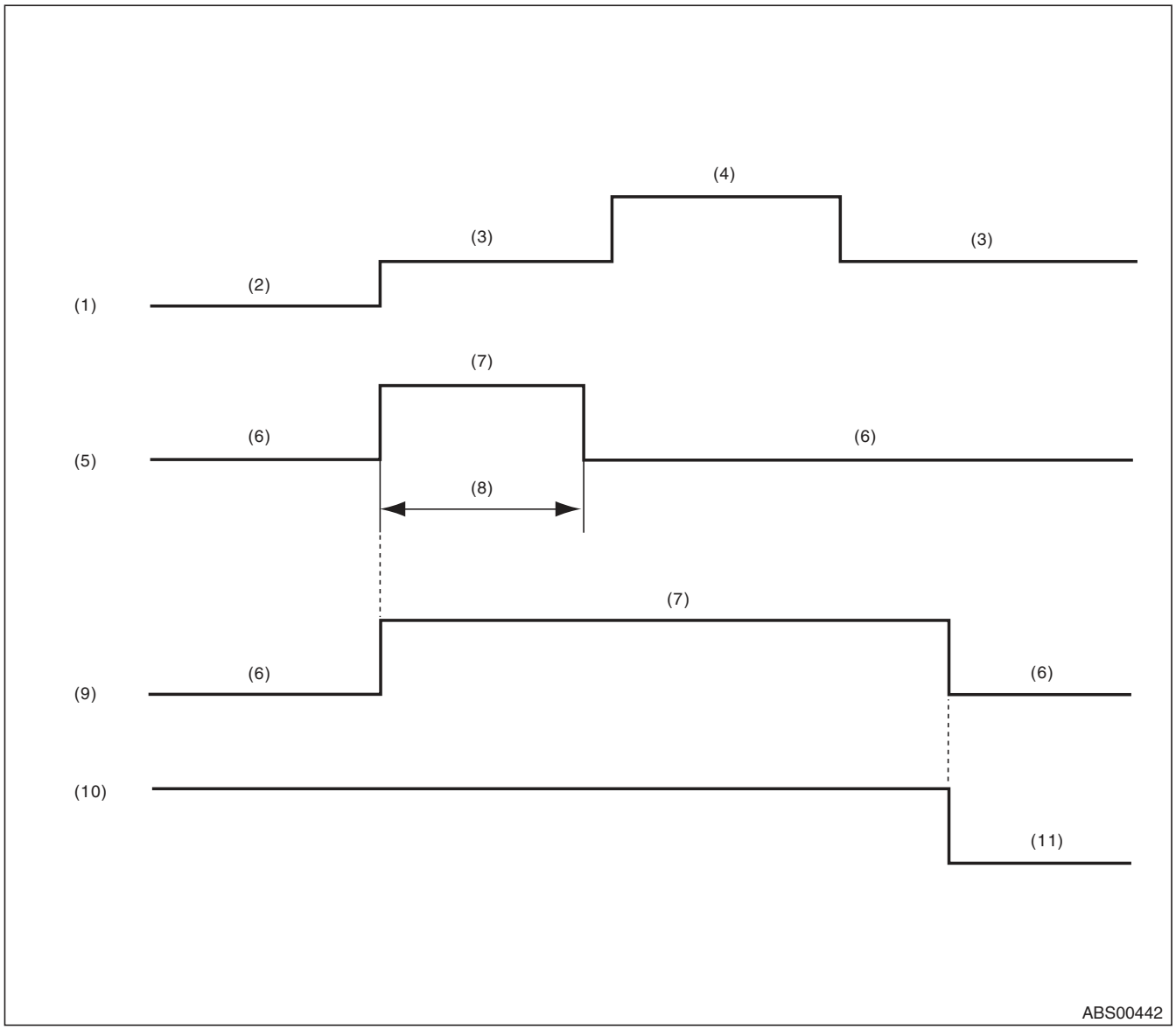
A: OPERATION

1) On the «Main Menu» display, select {Each System Check}.
2) On the «System Selection Menu» display, select the {Brake Control System}.
3) Click the [OK] button after the {ABS} is displayed.
4) On the «Brake Control Diagnosis» display, select the {Clearing Memory}.
5) When the “Clear Memory?” is shown on the screen, click the [Yes] button.
6) When “Done” and “Turn Ignition Switch OFF” are shown on the display screen, turn the ignition switch to OFF.

NOTE:
For detailed operation procedures, refer to the “PC application help for Subaru Select Monitor”.

10. ABS Warning Light / Brake Warning Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Engine start
(5) ABS warning light
(6) Light OFF
(7) Light ON
(8) 1.5 sec.
(9) Brake warning light (EBD warning light)
(10) Parking brake
(11) Released

ABS Warning Light / Brake Warning Light Illumination Pattern

1) When the ABS warning light and brake warning light do not illuminate in accordance with this illumination pattern, it can be thought that there is an electrical problem.
2) When the ABS warning light remains constantly OFF, check the combination meter circuit. <Ref. to ABS(diag)-23, ABS WARNING LIGHT DOES NOT COME ON, ABS Warning Light / Brake Warning Light Illumination Pattern.>
3) When ABS warning light does not go off, check the combination meter circuit. <Ref. to ABS(diag)-25, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>
4) When the brake warning light does not go off, check the brake warning circuit and the combination meter circuit. <Ref. to ABS(diag)-27, BRAKE WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>

NOTE:
Even though the ABS warning light does not go off after approximately 1.5 seconds from ABS warning light illumination, the ABS function operates normally when the warning light goes off while driving at approximately 12 km/h (7 MPH). However, the ABS system does not work while the ABS warning light is illuminated.

B: ABS WARNING LIGHT DOES NOT COME ON

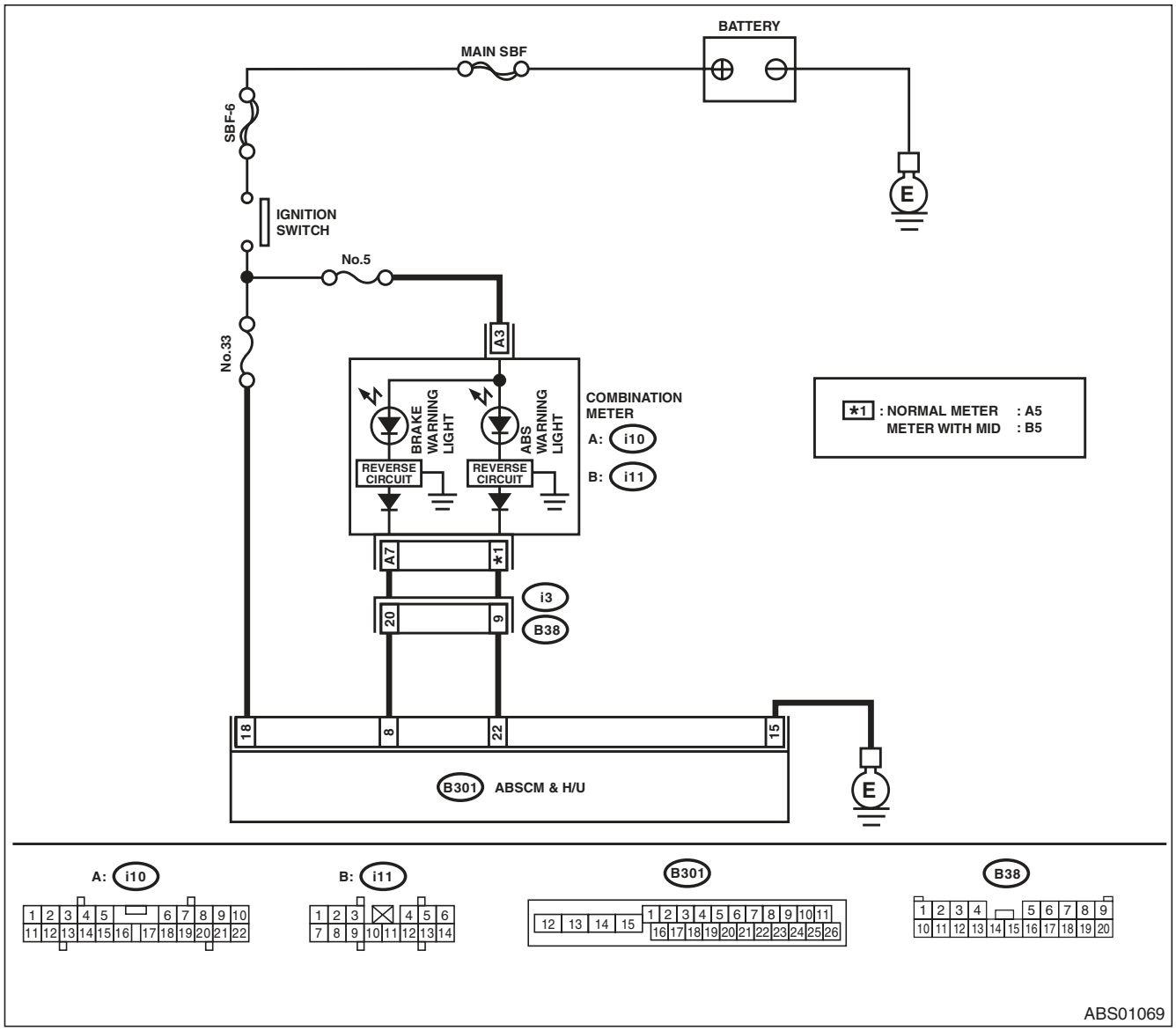
DETECTING CONDITION:

- Defective combination meter
- Defective harness

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



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)-18, 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 to OFF. 2) Disconnect the connector (B301) from the ABSCM&H/U. 3) Disconnect the connector (i10) (Model with the normal meter) or (i11) (Model with the meter with MID) from the combination meter. 4) Measure the resistance between ABSCM connector and chassis ground. ***Connector & terminal*** ***(B301) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair harness and connector between ABSCM&H/U and combination meter.
4	**CHECK ABSCM.** 1) Connect the connector (B301) to the ABSCM&H/U. 2) Turn the ignition to ON. 3) Measure the resistance between the combination meter connector and chassis ground soon after the ignition switch is turned to ON (within 1.5 seconds). ***Connector & terminal*** ***Model with the normal meter*** ***(i10) No. 5 — Chassis ground:*** ***Model with the meter with MID*** ***(i11) No. 5 — Chassis ground:***	Is the resistance 1 MΩ or more?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

C: ABS WARNING LIGHT DOES NOT GO OFF

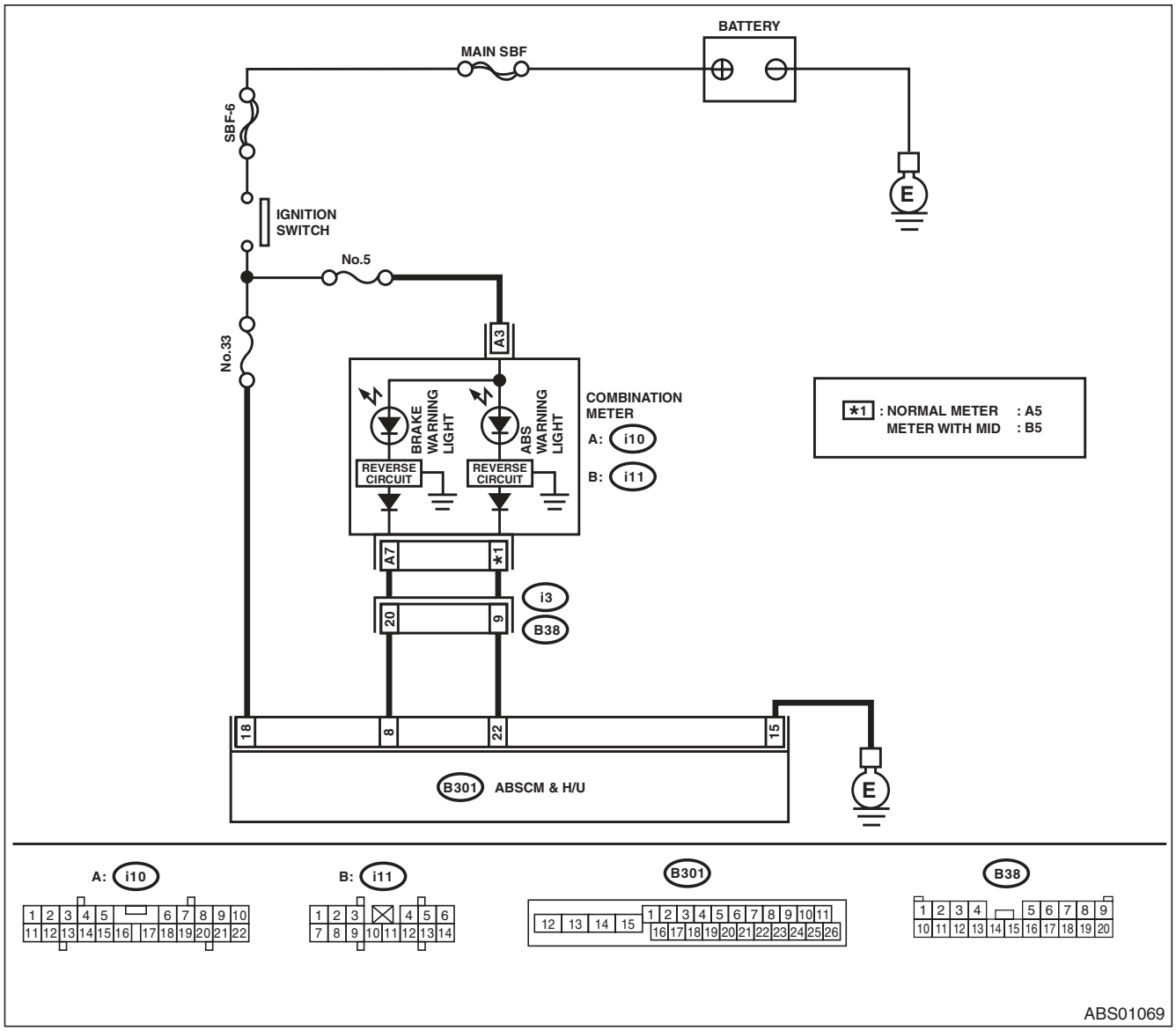
DETECTING CONDITION:

- Defective combination meter
- Open circuit in harness

TROUBLE SYMPTOM:

When starting the engine, the ABS warning light is kept on.

WIRING DIAGRAM:



ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-18, 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 to OFF. 2) Disconnect the connector (B301) from the ABSCM&H/U. 3) Disconnect the connector (i10) (Model with the normal meter) or (i11) (Model with the meter with MID) from the combination meter. 4) Measure the resistance between ABSCM connector and combination meter connector. ***Connector & terminal*** ***Model with the normal meter*** ***(B301) No. 22 — (i10) No. 5:*** ***Model with the meter with MID*** ***(B301) No. 22 — (i11) No. 5:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair harness and connector between ABSCM&H/U and combination meter.
3	**CHECK POOR CONTACT IN CONNECTOR.** Check for poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **4**.
4	**CHECK ABSCM.** 1) Connect the connector (B301) to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***Model with the normal meter*** ***(i10) No. 5 — Chassis ground:*** ***Model with the meter with MID*** ***(i11) No. 5 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: BRAKE WARNING LIGHT DOES NOT GO OFF

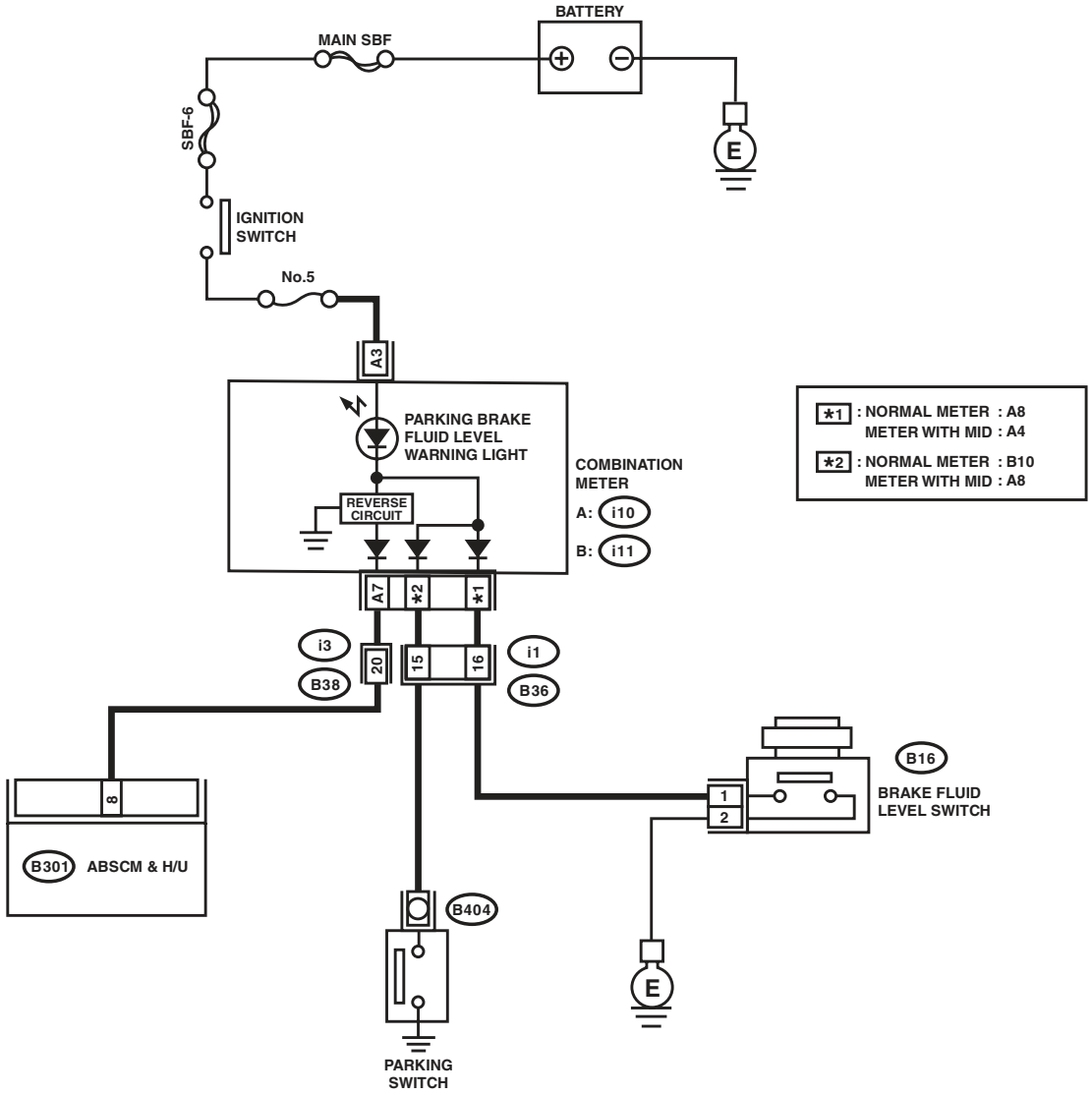
DETECTING CONDITION:

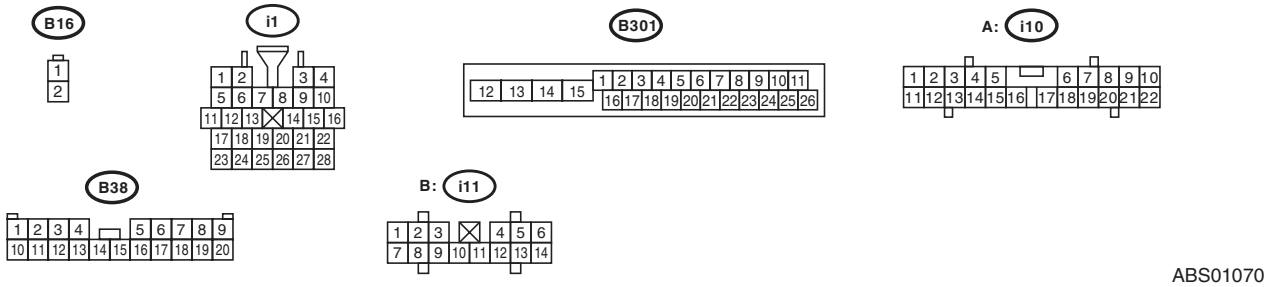
- Brake warning light circuit is shorted.
- Defective sensor/connector

TROUBLE SYMPTOM:

After starting the engine, the brake warning light remains lit though the parking lever is released.

WIRING DIAGRAM:





ABS01070

ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Check that the ABSCM&H/U connector is inserted to ABSCM&H/U until the clamp locks onto it.	Is the connector firmly inserted?	Go to step **2**.	Insert the ABSCM&H/U connector until the clamp locks completely.
2	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-18, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3**.
3	**CHECK BRAKE FLUID AMOUNT.** Check the amount of brake fluid in the reservoir tank of the master cylinder.	Is the amount of brake fluid between the lines of “MAX” and “MIN”?	Go to step **4**.	Replenish brake fluid to the specified value.
4	**CHECK BRAKE FLUID LEVEL SWITCH.** 1) Disconnect the level switch connector (B16) from master cylinder. 2) Measure the resistance of master cylinder terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the master cylinder.
5	**CHECK PARKING BRAKE SWITCH.** 1) Disconnect the connector (B404) from parking brake switch. 2) Release the parking brake. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the parking brake switch.
6	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connectors (i10 and i11) from the combination meter. 2) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***Model with the normal meter*** ***(i10) No. 8 — Chassis ground:*** ***(i11) No. 10 — Chassis ground:*** ***Model with the meter with MID*** ***(i10) No. 8 — Chassis ground:*** ***(i10) No. 4 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the harness connector between combination meter and parking brake switch.
7	**CHECK HARNESS.** 1) Disconnect the connector (B301) from the ABSCM&H/U. 2) Disconnect the connector (i10) from the combination meter. 3) Measure the resistance between the ABSCM&H/U connector and combination meter connector. ***Connector & terminal*** ***(B301) No. 8 — (i10) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **8**.	Repair the harness between the ABSCM&H/U and the combination meter.
8	**CHECK POOR CONTACT IN CONNECTOR.** Check for poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **9**.
9	**CHECK ABSCM.** 1) Connect the connector to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 7 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Content of diagnosis		Display	Reference target
C0101	ABS wheel speed sensor malfunction (Broken wire, short)	Rear ABS wheel speed sensor RH	Rear Right ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-31, DTC C0101 ABS WHEEL SPEED SENSOR MALFUNCTION RR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0102		Rear ABS wheel speed sensor LH	Rear Left ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-31, DTC C0102 ABS WHEEL SPEED SENSOR MALFUNCTION RL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0103		Front ABS wheel speed sensor RH	Front Right ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-31, DTC C0103 ABS WHEEL SPEED SENSOR MALFUNCTION FR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0104		Front ABS wheel speed sensor LH	Front Left ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-32, DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0105	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of rear ABS wheel speed sensor RH	Rear Right ABS Sensor Signal	<Ref. to ABS(diag)-34, DTC C0105 REAR ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0106		Abnormal signal of rear ABS wheel speed sensor LH	Rear Left ABS Sensor Signal	<Ref. to ABS(diag)-34, DTC C0106 REAR ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0107		Abnormal signal of front ABS wheel speed sensor RH	Front Right ABS Sensor Signal	<Ref. to ABS(diag)-34, DTC C0107 FRONT ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0108		Abnormal signal of front ABS wheel speed sensor LH	Front Left ABS Sensor Signal	<Ref. to ABS(diag)-35, DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0109	Power voltage malfunction		Power Supply Voltage Failure	<Ref. to ABS(diag)-47, DTC C0109 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0110	ABS control module malfunction		Electrical Control Module	<Ref. to ABS(diag)-45, DTC C0110 ABS CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0111	Motor/motor relay on failure		Motor and Motor Relay	<Ref. to ABS(diag)-52, DTC C0111 MOTOR/MOTOR RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0114	Defective valve relay		Valve Relay	<Ref. to ABS(diag)-50, DTC C0114 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Content of diagnosis		Display	Reference target
C0115	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal ABS wheel speed sensor on any one of four sensors	Any One of Four ABS Sensors Signal	<Ref. to ABS(diag)-38, DTC C0115 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0116	Stop light switch circuit malfunction		Brake Light Switch	<Ref. to ABS(diag)-54, DTC C0116 FAULTY STOP LIGHT SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0118	Faulty G sensor output voltage		G Sensor Failure	<Ref. to ABS(diag)-56, DTC C0118 G SENSOR OUTPUT VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0119	Abnormal G sensor output signal		G Sensor Signal	<Ref. to ABS(diag)-59, DTC C0119 G SENSOR OUTPUT SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0120	Inlet valve malfunction in hydraulic unit	Front inlet valve LH	FL Hold Valve malfunction	<Ref. to ABS(diag)-40, DTC C0120 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0121	Outlet valve malfunction in hydraulic unit	Front outlet valve LH	FL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-42, DTC C0121 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0122	Inlet valve malfunction in hydraulic unit	Front inlet valve RH	FR Hold Valve malfunction	<Ref. to ABS(diag)-40, DTC C0122 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0123	Outlet valve malfunction in hydraulic unit	Front outlet valve RH	FR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-42, DTC C0123 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0124	Inlet valve malfunction in hydraulic unit	Rear inlet valve LH	RL Hold Valve malfunction	<Ref. to ABS(diag)-40, DTC C0124 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0125	Outlet valve malfunction in hydraulic unit	Rear outlet valve LH	RL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-42, DTC C0125 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0126	Inlet valve malfunction in hydraulic unit	Rear inlet valve RH	RR Hold Valve malfunction	<Ref. to ABS(diag)-41, DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0127	Outlet valve malfunction in hydraulic unit	Rear outlet valve RH	RR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-43, DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0140	Defective CAN communication		Improper CAN communication	<Ref. to ABS(diag)-49, DTC C0140 CAN COMMUNICATION MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC C0101 ABS WHEEL SPEED SENSOR MALFUNCTION RR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
Refer to DTC C0104 for diagnostic procedure. <Ref. to ABS(diag)-32, DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC C0102 ABS WHEEL SPEED SENSOR MALFUNCTION RL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
Refer to DTC C0104 for diagnostic procedure. <Ref. to ABS(diag)-32, DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC C0103 ABS WHEEL SPEED SENSOR MALFUNCTION FR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
Refer to DTC C0104 for diagnostic procedure. <Ref. to ABS(diag)-32, DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC C0104 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

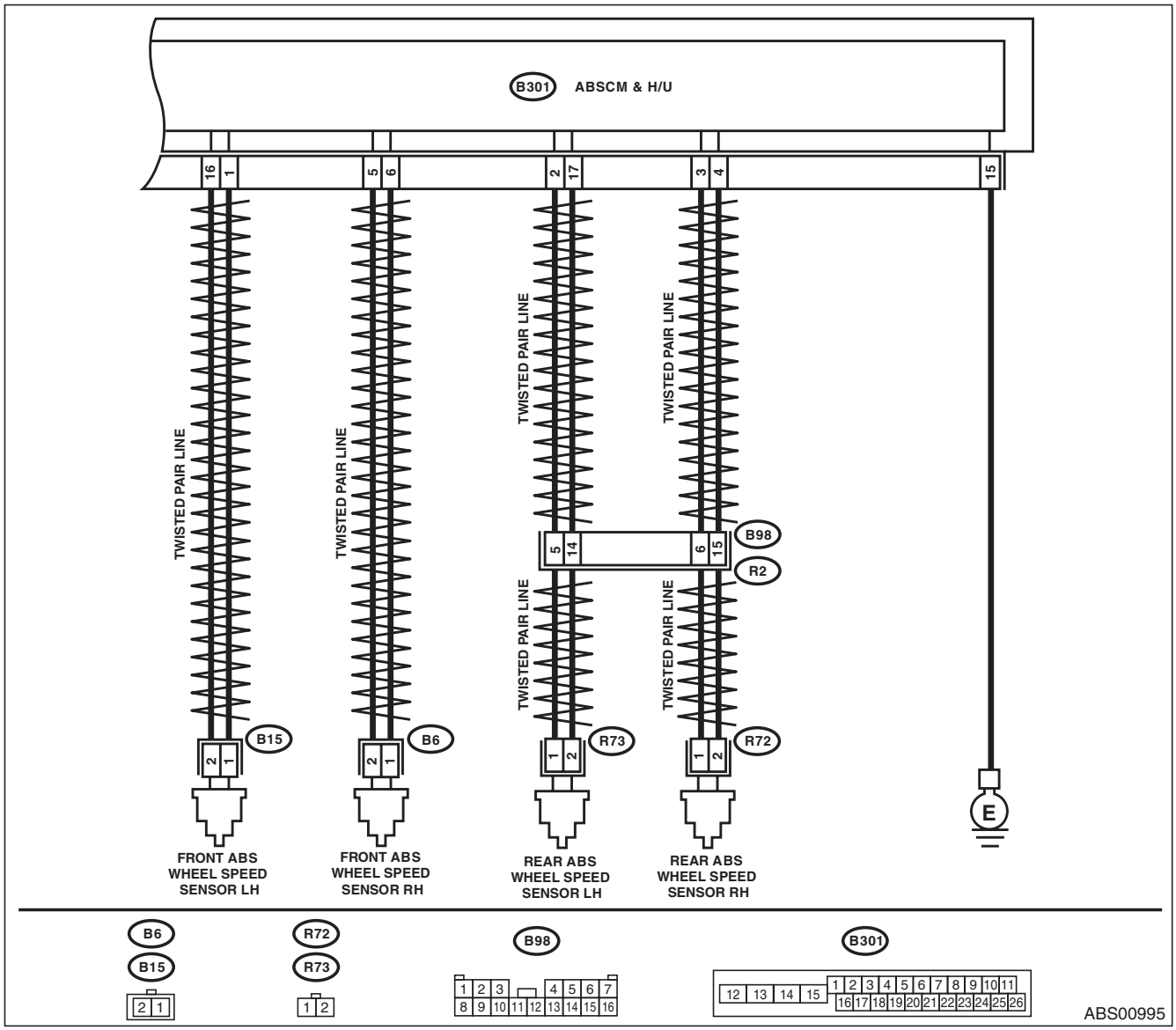
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTOR.** Check if there is poor contact between ABSCM&H/U and ABS wheel speed sensor.	Is there poor contact?	Repair the connector.	Go to step **2**.
2	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector (B301) from the ABSCM&H/U. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector and ABS wheel speed sensor connector. ***Connector & terminal*** ***DTC C0101*** ***(B301) No. 3 — (R72) No. 1:*** ***(B301) No. 4 — (R72) No. 2:*** ***DTC C0102*** ***(B301) No. 2 — (R73) No. 1:*** ***(B301) No. 17 — (R73) No. 2:*** ***DTC C0103*** ***(B301) No. 5 — (B6) No. 2:*** ***(B301) No. 6 — (B6) No. 1:*** ***DTC C0104*** ***(B301) No. 16 — (B15) No. 2:*** ***(B301) No. 1 — (B15) No. 1:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
3	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC C0101*** ***(B301) No. 4 — Chassis ground:*** ***DTC C0102*** ***(B301) No. 17 — Chassis ground:*** ***DTC C0103*** ***(B301) No. 6 — Chassis ground:*** ***DTC C0104*** ***(B301) No. 1 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
4	**CHECK ABS WHEEL SPEED SENSOR POWER SUPPLY CIRCUIT.** 1) Connect ABSCM&H/U connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ABS wheel speed sensor connector and chassis ground. ***Connector & terminal*** ***DTC C0101*** ***(R72) No. 1 (+) — Chassis ground (–):*** ***DTC C0102*** ***(R73) No. 1 (+) — Chassis ground (–):*** ***DTC C0103*** ***(B6) No. 2 (+) — Chassis ground (–):*** ***DTC C0104*** ***(B15) No. 2 (+) — Chassis ground (–):***	Is the voltage 5 — 16 V?	Go to step **6**.	Go to step **5**.

	Step	Check	Yes	No
5	**CHECK THE ABSCM&H/U POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — (B301) No. 15 (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Check the generator, battery and ABSCM&H/U power supply circuit.
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to ABS-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Is the pattern the same waveform as shown in the figure?	Go to step **7**.	Replace the ABS wheel speed sensor.
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8**.
8	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

E: DTC C0105 REAR ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
Refer to DTC C0108 for diagnostic procedure. <Ref. to ABS(diag)-35, DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC C0106 REAR ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
Refer to DTC C0108 for diagnostic procedure. <Ref. to ABS(diag)-35, DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC C0107 FRONT ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
Refer to DTC C0108 for diagnostic procedure. <Ref. to ABS(diag)-35, DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC C0108 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

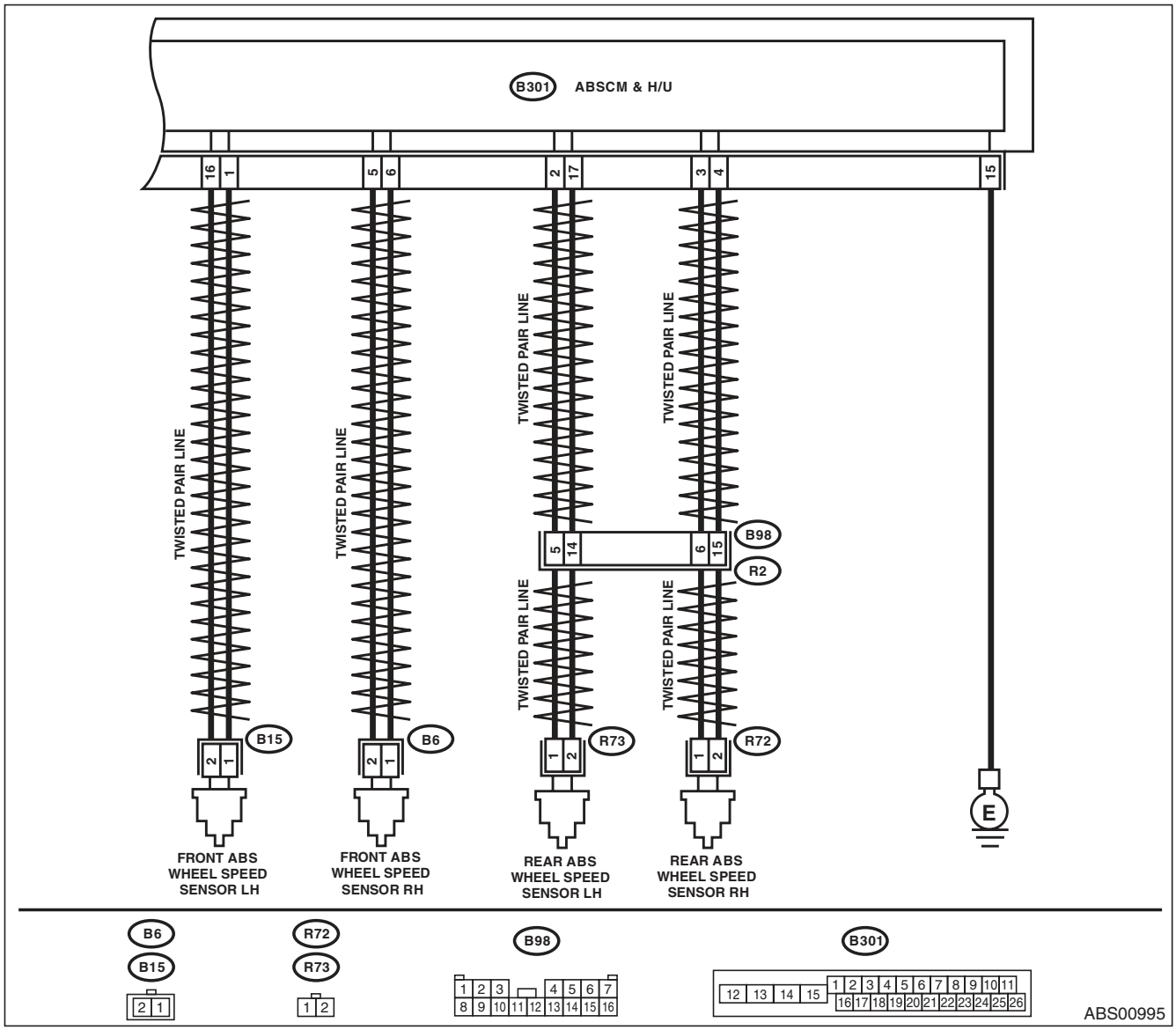
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in the Subaru Select Monitor. 2) Read the output of the faulty ABS wheel speed sensor.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step **2**.	Go to step **7**.
2	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.** Make sure the radio wave devices and electronic components are installed correctly.	Are the radio wave devices and electronic components installed correctly?	Go to step **4**.	Install the radio wave devices and electronic components properly.
4	**CHECK CAUSE OF SIGNAL NOISE.** Check if the noise sources (such as an antenna) are installed near the sensor harness.	Are noise sources installed?	Install the noise sources apart from sensor harness.	Go to step **5**.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6**.
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.
7	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **8**.	Tighten the ABS wheel speed sensor installation bolts.
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to ABS-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for one rotation or more?	Go to step **10**.	Go to step **9**.
9	**CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.**	Are there foreign matter, breakage or damage at the tip of ABS wheel speed sensor or magnetic encoder?	Remove dirt thoroughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step **10**.
10	**CHECK CAUSE OF SIGNAL NOISE.** Make sure the radio wave devices and electronic components are installed correctly.	Are the radio wave devices and electronic components installed correctly?	Go to step **11**.	Install the radio wave devices and electronic components properly.

	Step	Check	Yes	No
11	**CHECK CAUSE OF SIGNAL NOISE.** Check if the noise sources (such as an antenna) are installed near the sensor harness.	Is the noise sources installed?	Go to step **12**.	Install the noise sources apart from sensor harness.
12	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13**.
13	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

I: DTC C0115 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS

DTC DETECTING CONDITION:

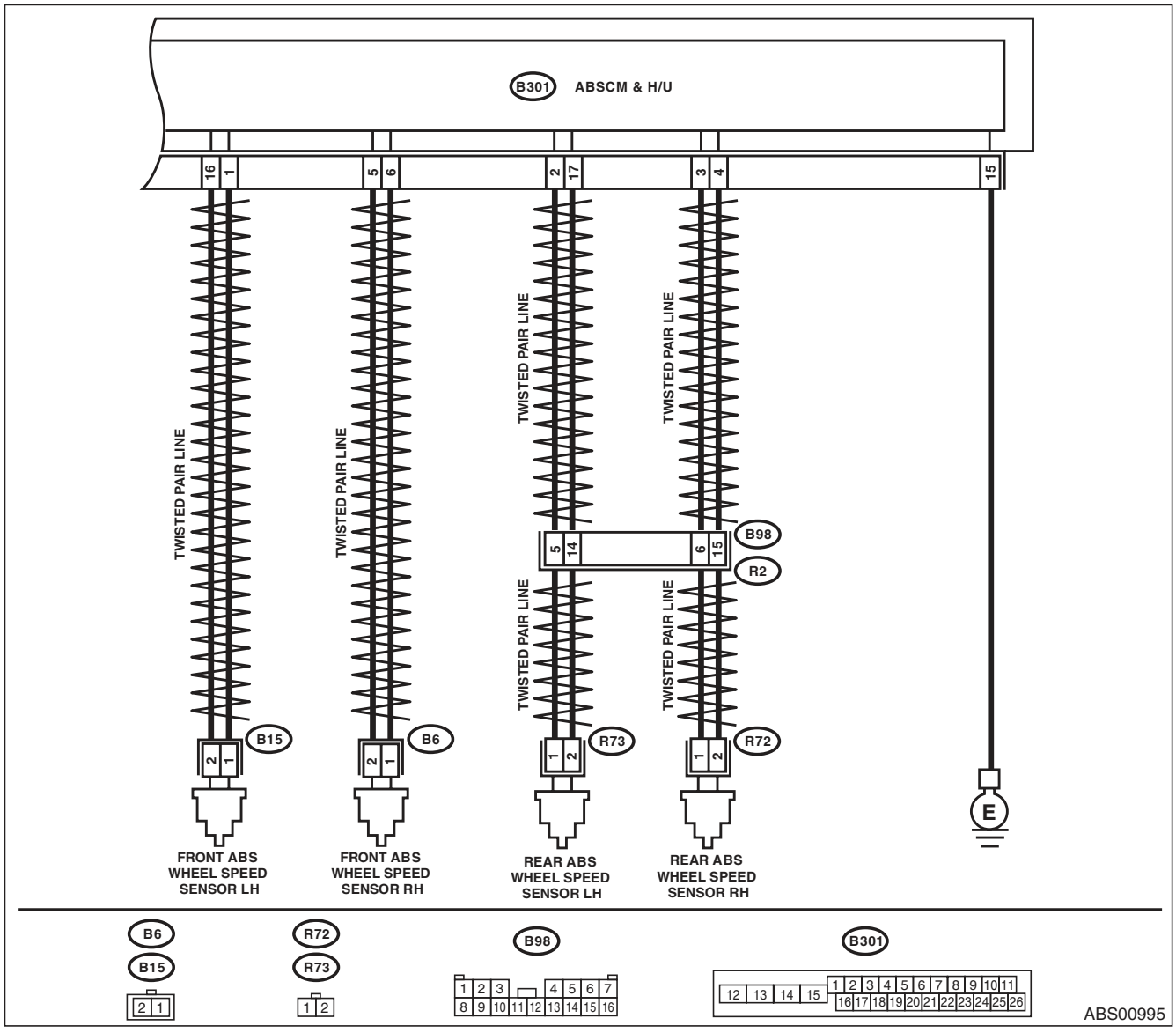
- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective magnetic encoder
- When a wheel is turned freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light illuminates as well as the ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.** Check if the wheels have been turned freely for one minute or more, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface.	Did the wheels turn freely?	ABS is normal. Clear the memory. NOTE: This diagnostic trouble code may sometimes occur if the wheels turn freely for a long time, for example when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way.	Go to step **2**.
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3**.	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4**.
4	**CHECK TIRE INFLATION PRESSURE.**	Is the tire pressure correct?	Go to step **5**.	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)? (For four wheels)	Go to step **6**.	Tighten the ABS wheel speed sensor installation bolts.
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to ABS-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for one rotation or more?	Go to step **8**.	Go to step **7**.
7	**CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.**	Are there foreign matter, breakage or damage at the tip of ABS wheel speed sensor or magnetic encoder?	Remove dirt thoroughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step **8**.
8	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **9**.

Step		Check	Yes	No
9	CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

J: DTC C0120 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC C0126 for diagnostic procedure. <Ref. to ABS(diag)-41, DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC C0122 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC C0126 for diagnostic procedure. <Ref. to ABS(diag)-41, DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC C0124 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC C0126 for diagnostic procedure. <Ref. to ABS(diag)-41, DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC C0126 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

DTC DETECTING CONDITION:

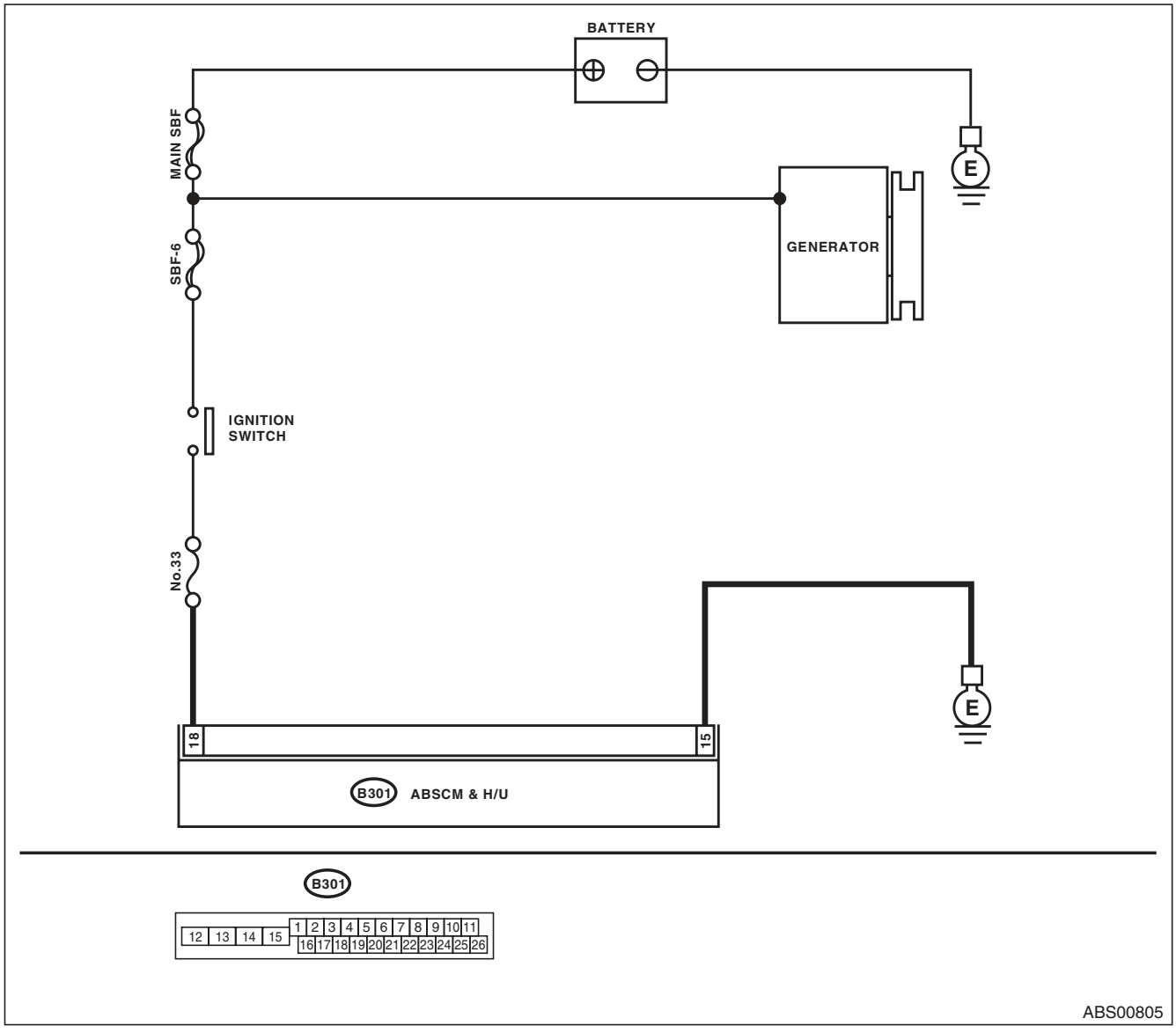
- Defective harness connector
- Defective inlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light illuminates as well as the ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the ABSCM&H/U power circuit.
2	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4**.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

N: DTC C0121 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC C0127 for diagnostic procedure. <Ref. to ABS(diag)-43, DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC C0123 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC C0127 for diagnostic procedure. <Ref. to ABS(diag)-43, DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC C0125 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC C0127 for diagnostic procedure. <Ref. to ABS(diag)-43, DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC C0127 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

DTC DETECTING CONDITION:

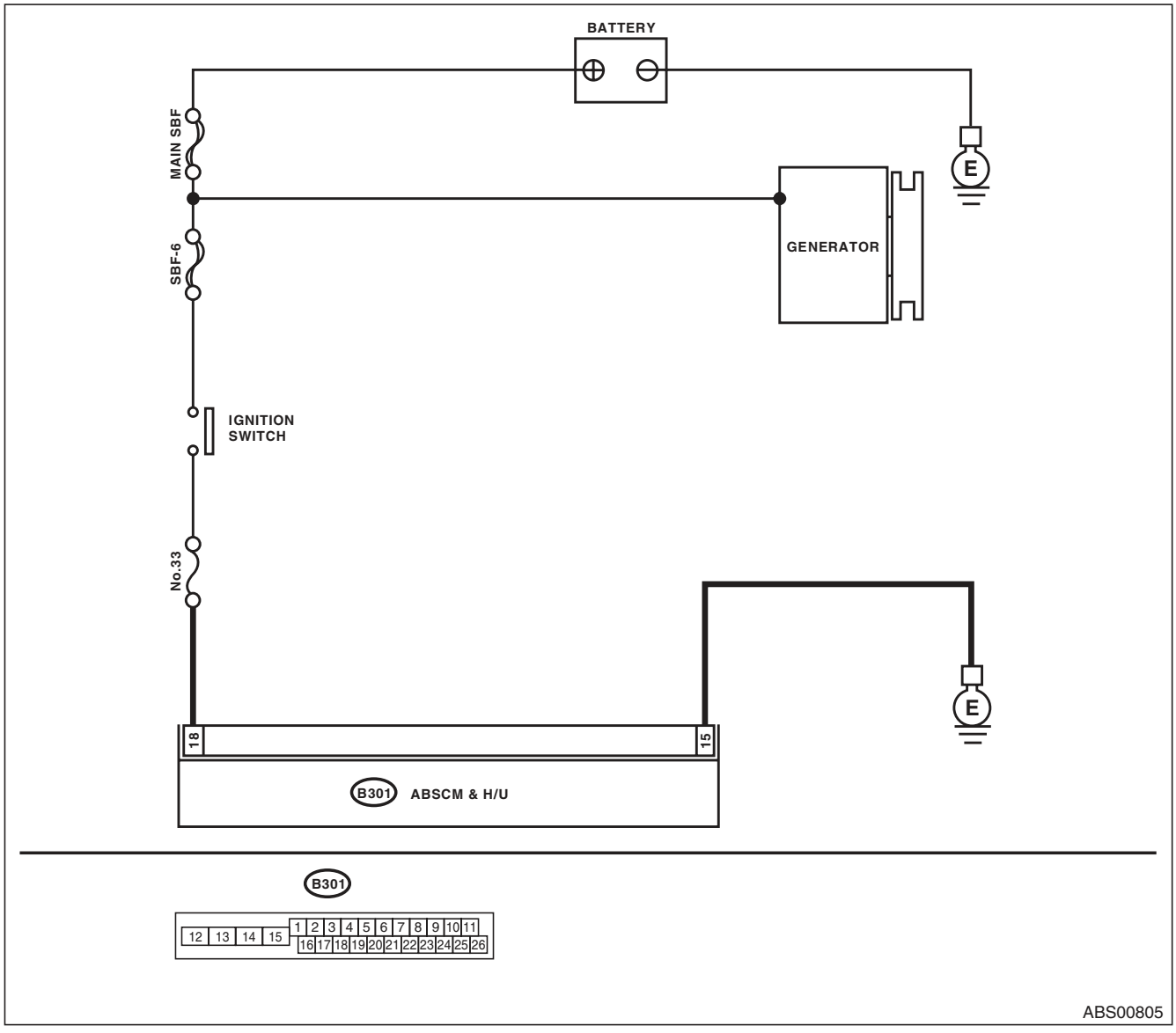
- Defective harness connector
- Defective outlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light illuminates as well as the ABS warning light.

WIRING DIAGRAM:



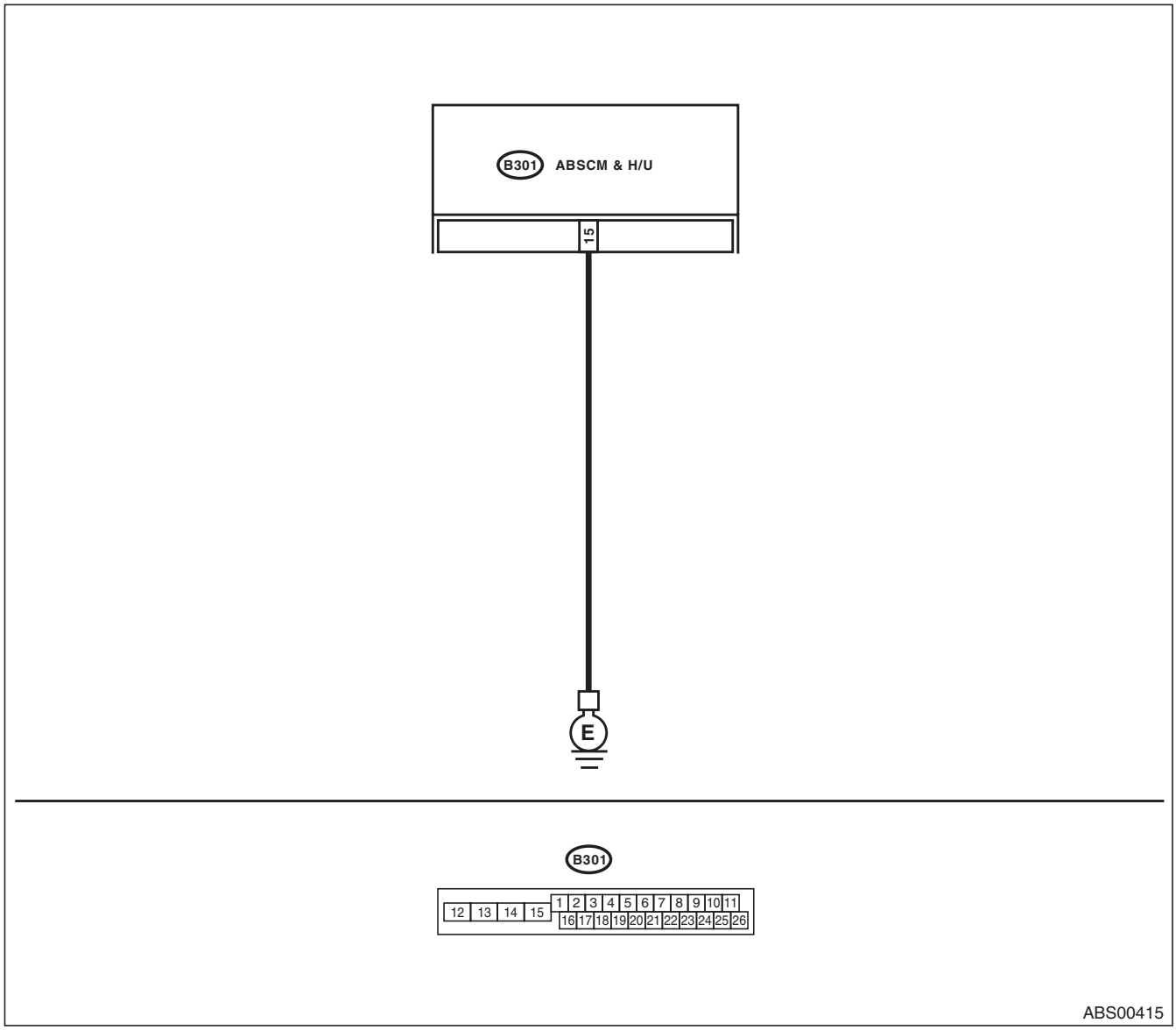
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the ABSCM&H/U power circuit.
2	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4**.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

R: DTC C0110 ABS CONTROL MODULE MALFUNCTION

DTC DETECTING CONDITION:
Defective ABSCM&H/U
TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light illuminates as well as the ABS warning light.
WIRING DIAGRAM:



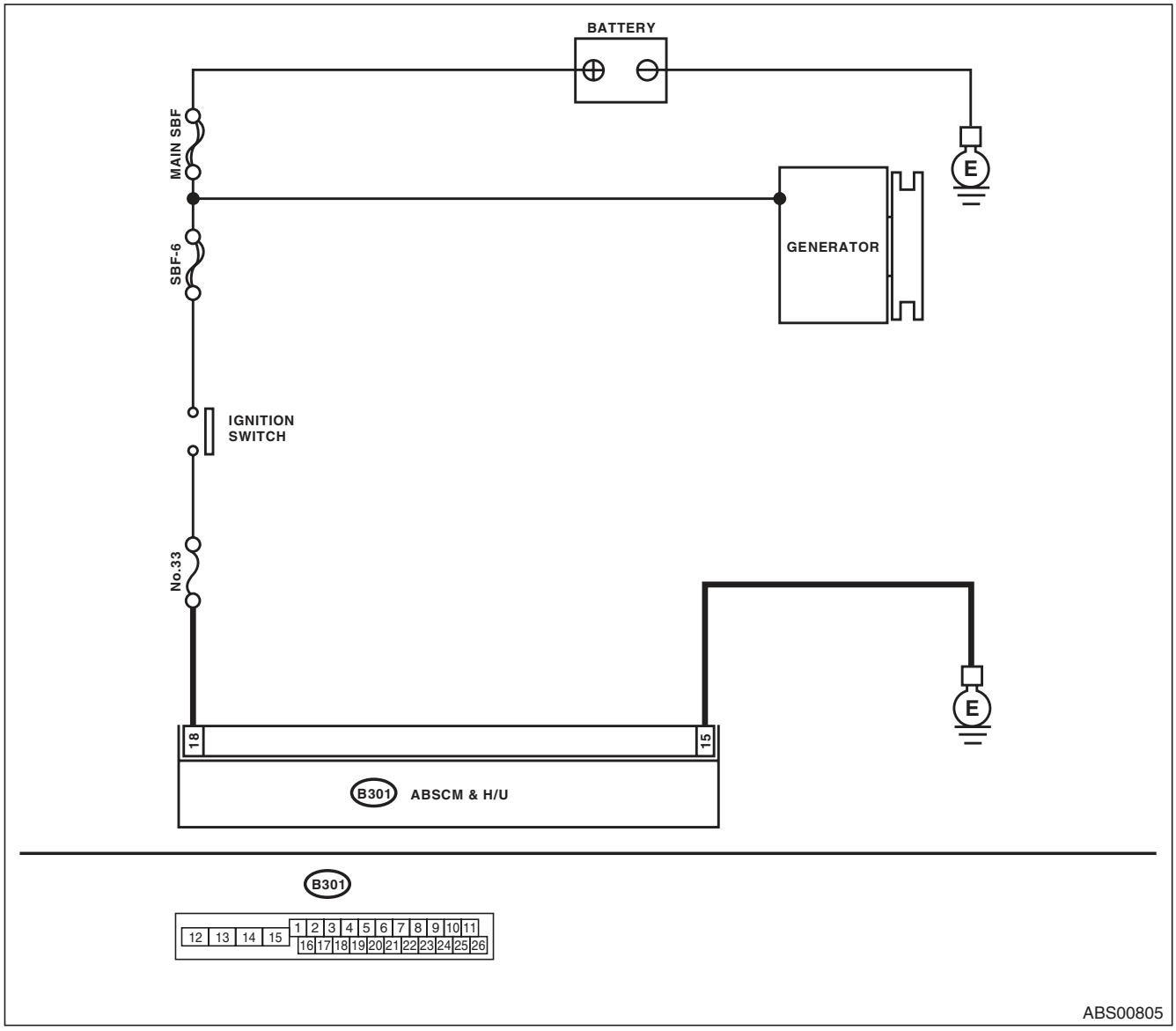
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between the ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2**.	Repair the ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact of the connector between the battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.**	Is the car telephone or the radio properly installed?	Go to step **4**.	Properly install the car telephone or the radio.
4	**CHECK CAUSE OF SIGNAL NOISE.**	Is there a noise source (such as an antenna) installed near the sensor harness?	Install the noise source apart from the sensor harness.	Go to step **5**.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6**.
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

S: DTC C0109 POWER VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:
Power supply 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, the brake warning light illuminates in addition to ABS warning light. Both warning lights go off if voltage returns.
WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator terminal B and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the generator.
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightened securely?	Go to step **3**.	Tighten the terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect the ABSCM&H/U connectors. 2) Run the engine at idle. 3) Operate devices such as headlights, air conditioner, defogger, etc. which produce an electrical load. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Repair the ABSCM&H/U power circuit.
4	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5**.	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6**.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7**.
7	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

T: DTC C0140 CAN COMMUNICATION MALFUNCTION

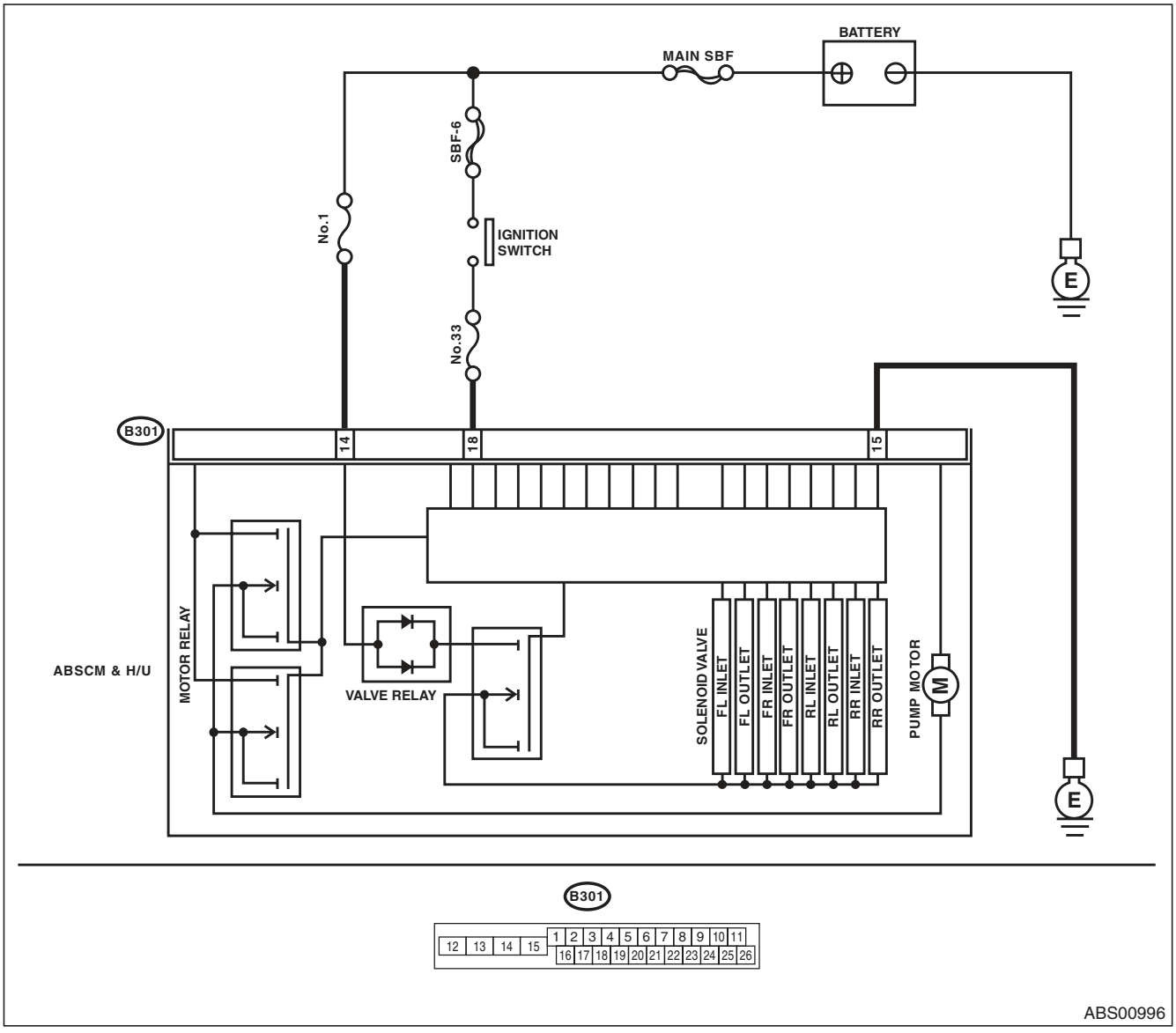
DTC DETECTING CONDITION:
Defective CAN communication
TROUBLE SYMPTOM:
Possibly the vehicle speed cannot output on CAN.

	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-27, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Repair it according to DTC of LAN system.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

U: DTC C0114 VALVE RELAY MALFUNCTION

DTC DETECTING CONDITION:
Defective valve relay
TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate depending on the trouble contents.

NOTE:
Brake warning light illuminates as well as ABS warning light when EBD does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):*** ***(B301) No. 14 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the harness connector between battery and ABSCM&H/U.
2	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the ABSCM&H/U ground harness.
3	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure the resistance between the ABSCM&H/U terminals. ***Terminals*** ***No. 14 — No. 15:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **5**.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6**.
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

V: DTC C0111 MOTOR/MOTOR RELAY MALFUNCTION

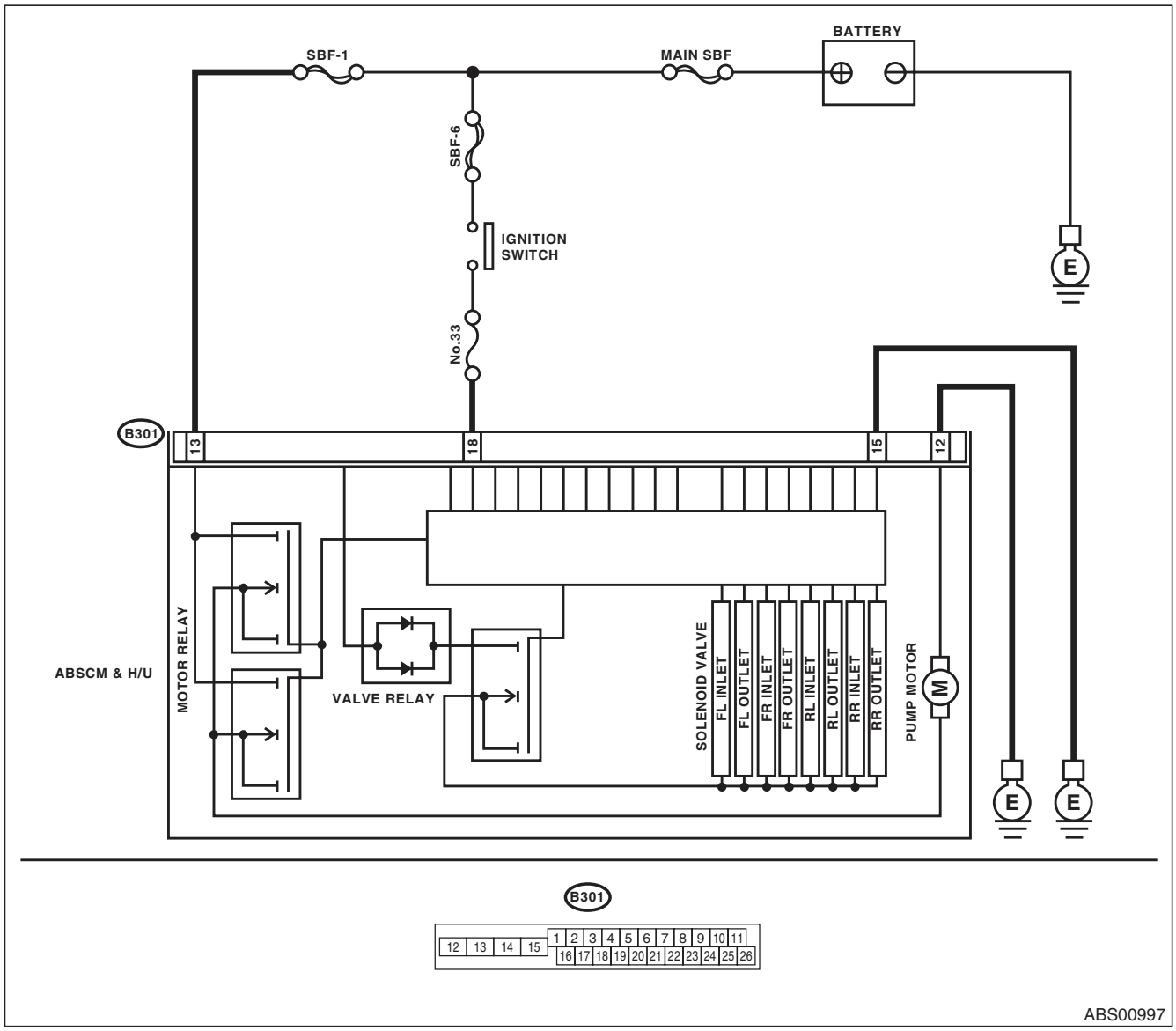
DTC DETECTING CONDITION:

- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



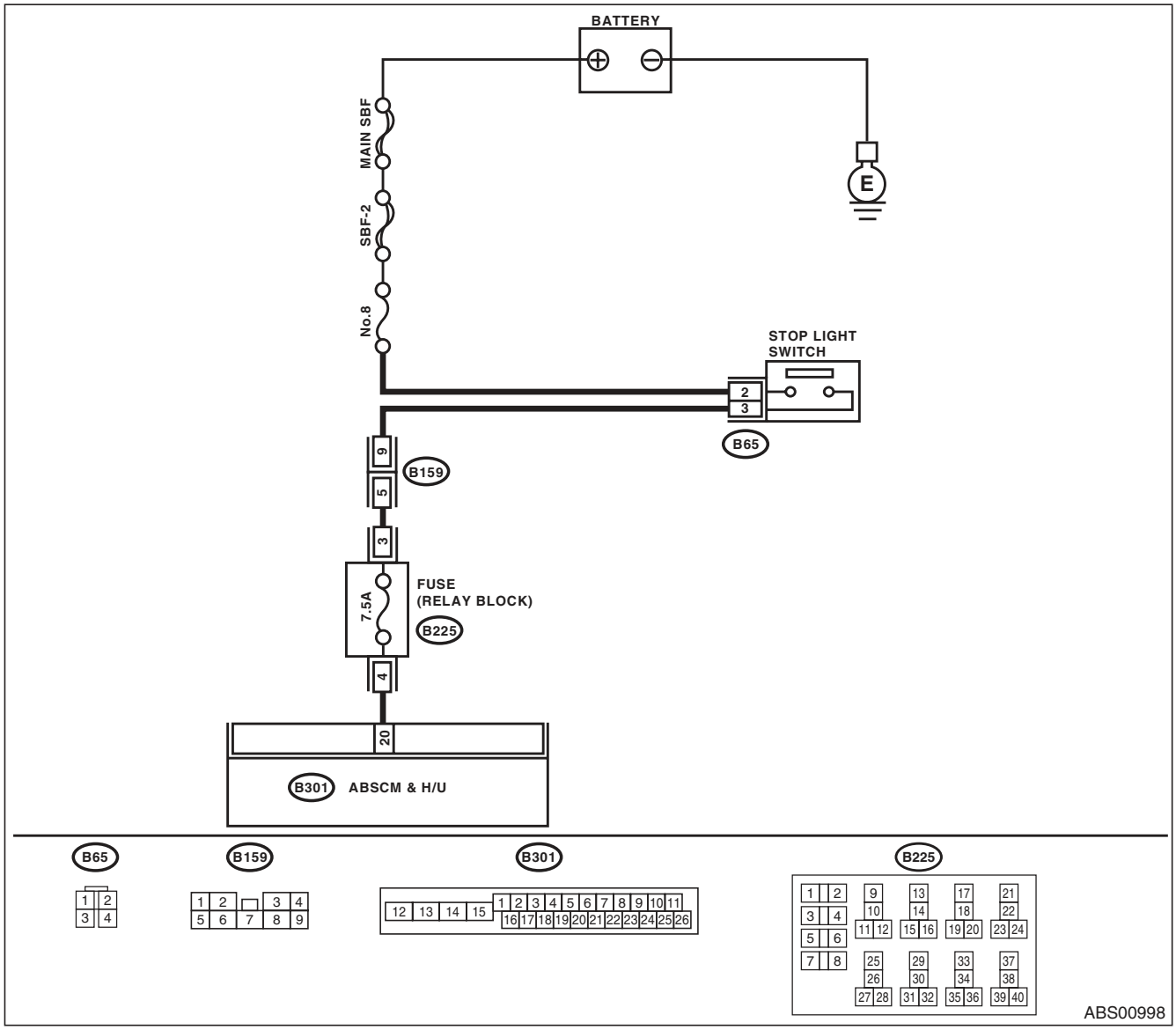
	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the harness connector between battery and ABSCM&H/U.
2	**CHECK INSTALLATION OF MOTOR GROUND.**	Is the motor ground terminal installation bolt tightened to 33 N·m (3.3 kgf-m, 24.3 ft-lb)?	Go to step **3**.	Tighten the motor ground terminal installation bolt.
3	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 12 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Repair the ABSCM&H/U ground harness.
4	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **5**.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
5	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **6**.	Repair the ABSCM&H/U ground harness.
6	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **7**.
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8**.
8	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

W: DTC C0116 FAULTY STOP LIGHT SWITCH

DTC DETECTING CONDITION:

Defective stop light switch

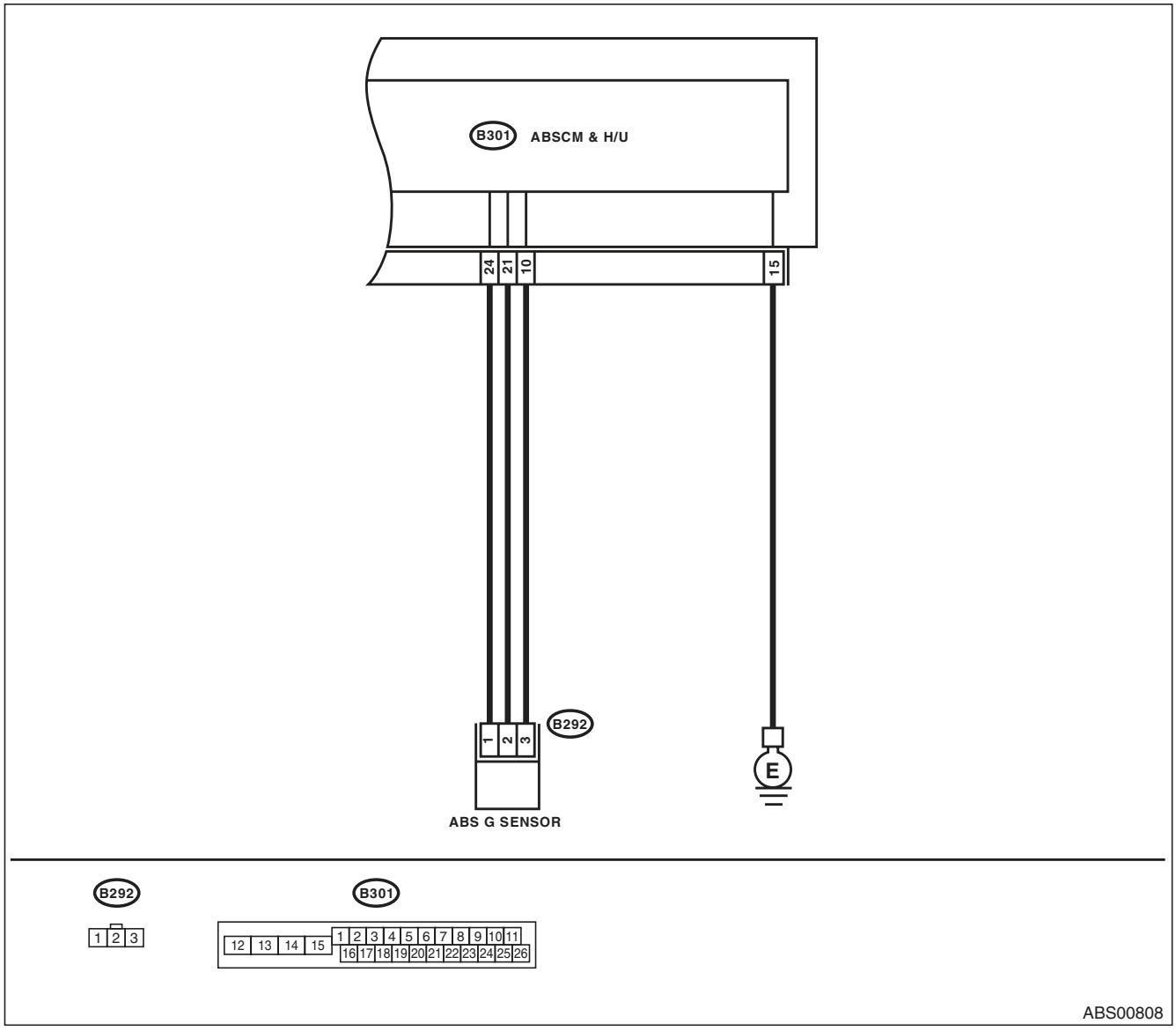
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in the Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch signal in Subaru Select Monitor.	Is "OFF" displayed on the screen?	Go to step **2**.	Go to step **3**.
2	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor.	Is "ON" displayed on the screen?	Go to step **6**.	Go to step **3**.
3	**CHECK IF STOP LIGHTS ILLUMINATE.** Depress the brake pedal.	Does the stop light illuminate?	Go to step **4**.	Repair the stop light circuit.
4	**CHECK FUSE.** Check the relay block fuse (B225).	Is the fuse OK?	Go to step **5**.	Replace the fuse.
5	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Depress the brake pedal. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 20 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Repair the harness between stop light switch and ABSCM&H/U connector.
6	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in the connector between stop light switch and ABSCM&H/U?	Repair the connector.	Go to step **7**.
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8**.
8	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

X: DTC C0118 G SENSOR OUTPUT VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:
Defective G sensor
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:

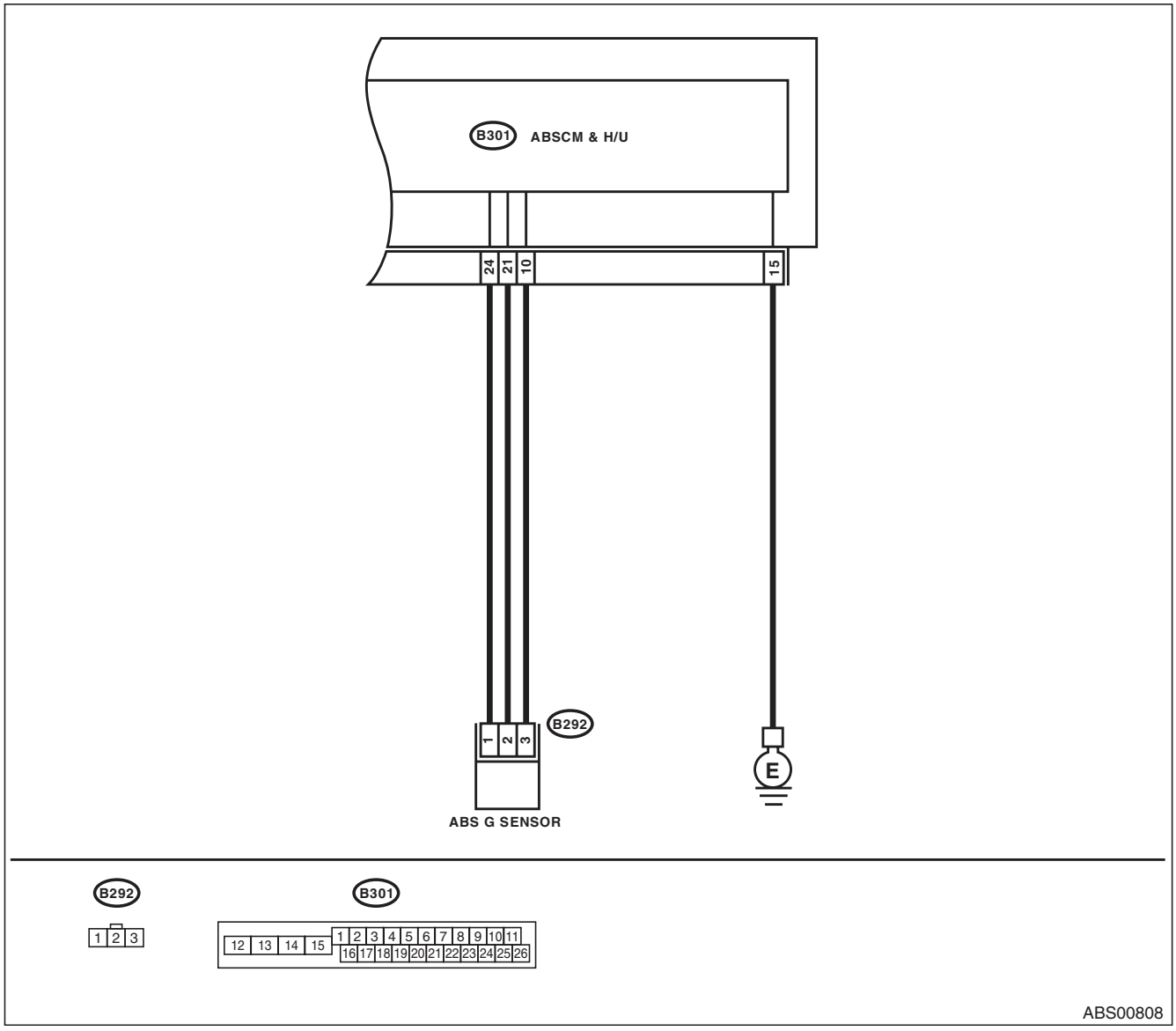


	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in the Subaru Select Monitor. 2) Read the G sensor output on Subaru Select Monitor.	Is the reading indicated on display –1.2 — 1.2 m/s when the G sensor is horizontal?	Go to step **2**.	Go to step **5**.
2	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **3**.
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4**.
4	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
5	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect the 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 the 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 ABSCM&H/U connectors. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 21 — No. 10:***	Is the resistance 3.6 — 3.8 kΩ?	Go to step **7**.	Repair the harness connector between the G sensor and ABSCM&H/U.
7	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from the G sensor. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 21 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Repair the harness between the 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-18, G Sensor.>

	Step	Check	Yes	No
9	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.6 — 4.1 V when the G sensor is inclined forward to 90°?	Go to step **10**.	Replace the G sensor. <Ref. to ABS-18, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 1.0 V when G sensor is inclined back 90°?	Go to step **11**.	Replace the G sensor. <Ref. to ABS-18, G Sensor.>
11	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **12**.
12	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13**.
13	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Y: DTC C0119 G SENSOR OUTPUT SIGNAL MALFUNCTION

DTC DETECTING CONDITION:
Defective G sensor
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.**	Have the wheels spun free of load when the vehicle is lifted up, or during driving on a rough road?	ABS is normal. Clear the memory.	Go to step **2**.
2	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in the Subaru Select Monitor. 2) Read the Subaru Select Monitor display.	Is the reading indicated on display –1.2 — 1.2 m/s when the G sensor is horizontal?	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} in the Subaru Select Monitor. 6) Read the Subaru Select Monitor display.	Is the value indicated on the screen 8.1 — 11.2 m/s when G sensor is inclined forward to 90°?	Go to step **4**.	Replace the G sensor. <Ref. to ABS-18, G Sensor.>
4	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** Read the Subaru Select Monitor display.	Is the value indicated on the screen –8.1 — –11.2 m/s when G sensor is inclined backward to 90°?	Go to step **5**.	Replace the G sensor. <Ref. to ABS-18, G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **6**.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7**.
7	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 21 — No. 10:***	Is the resistance 3.6 — 3.8 kΩ?	Go to step **9**.	Repair the harness connector between the G sensor and ABSCM&H/U.
9	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 21 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **10**.	Repair the harness connector between the G sensor and ABSCM&H/U.

	Step	Check	Yes	No
10	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **11**.	Replace the G sensor. <Ref. to ABS-18, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.6 — 4.1 V when the G sensor is inclined forward to 90°?	Go to step **12**.	Replace the G sensor. <Ref. to ABS-18, G Sensor.>
12	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 1.0 V when G sensor is inclined back 90°?	Go to step **13**.	Replace the G sensor. <Ref. to ABS-18, G Sensor.>
13	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to ABS(diag)-20, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to ABS(diag)-19, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14**.
14	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-29, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

13. General Diagnostic Table

A: INSPECTION

Symptom		Problem parts
Vehicle instability during braking	Vehicle is pulled to either right or left side.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pad) • 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 (pad) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor brake performance	Long braking/stopping distance	• ABSCM&H/U (solenoid valve) • Brake (pad) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	• ABSCM&H/U (solenoid valve, motor) • ABS wheel speed sensor • Incorrect wiring or piping connections
	Brake drag	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Master cylinder • Brake (caliper and piston) • Parking brake • Axle & wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle vertical pitching	• Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pad) • 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 the ABSCM&H/U	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Brake line
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Master cylinder • Brake (caliper, piston, pad and rotor) • Brake line • Brake booster and check valve • Suspension play or fatigue
	Noise from rear of vehicle	• ABS wheel speed sensor • Brake (caliper, piston, pad and rotor) • Parking brake • Brake line • Suspension play or fatigue

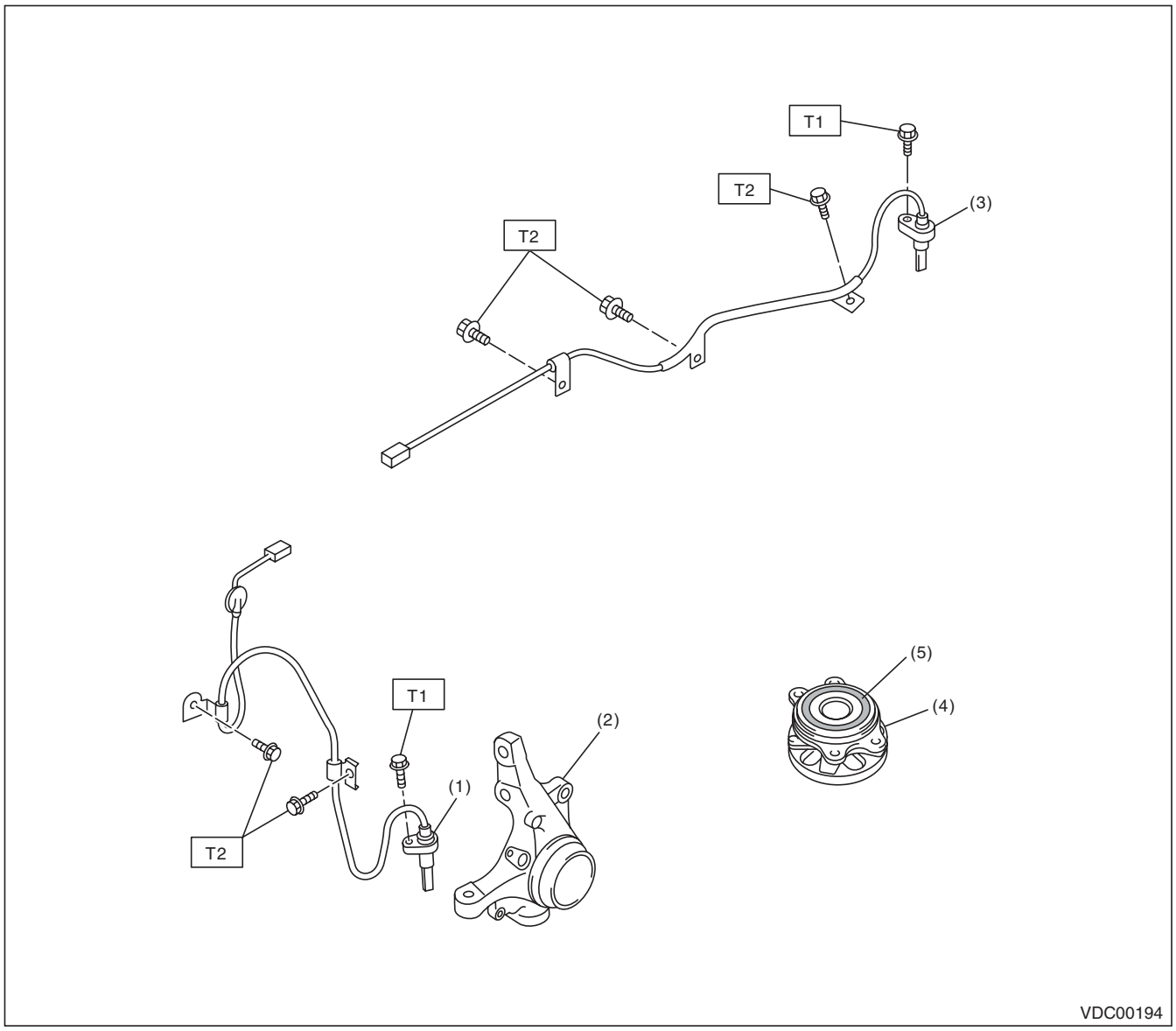
1. General Description

A: SPECIFICATION

Item				Specification or identification
ABS wheel speed sensor	ABS wheel speed sensor gap (for reference)	Front		0.77 — 1.43 mm (0.030 — 0.056 in)
		Rear		0.64 — 1.56 mm (0.025 — 0.061 in)
	Identifications of harness (marks, color)	Front	RH	K1 (White)
			LH	K2 (Yellow)
		Rear	RH	K5 (White)
			LH	K6 (Yellow)
VDCCM&H/U Identification	AT: 2.5GT SED, OBK 2.5XT, OBK 3.0R			T3
	AT: 3.0R (18 inch tire)			T7
	AT: OBK 2.5i, 2.5i SED, 3.0R (17 inch tire)			TA
	MT: 2.5GT-B, OBK 2.5XT			T4
	MT: OBK 2.5i, 2.5i SED			TB

B: COMPONENT

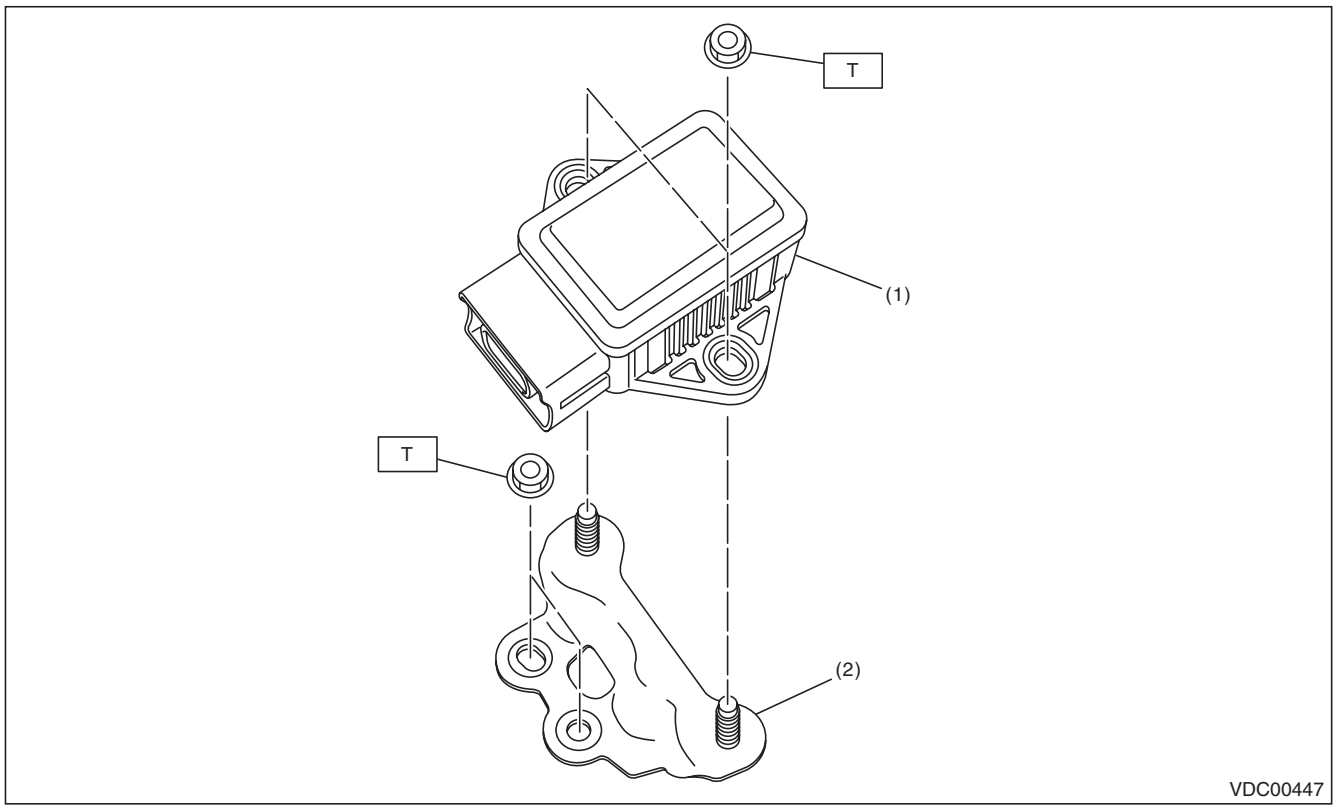
1. ABS WHEEL SPEED SENSOR



(1)	Front ABS wheel speed sensor	(4)	Hub unit bearing
(2)	Front housing	(5)	Magnetic encoder
(3)	Rear ABS wheel speed sensor		

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 24)

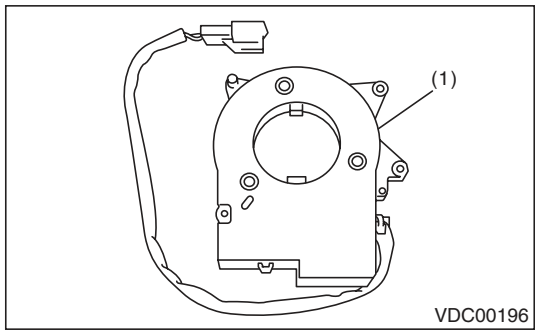
2. YAW RATE & LATERAL G SENSOR



(1) Yaw rate & lateral G sensor (2) Bracket

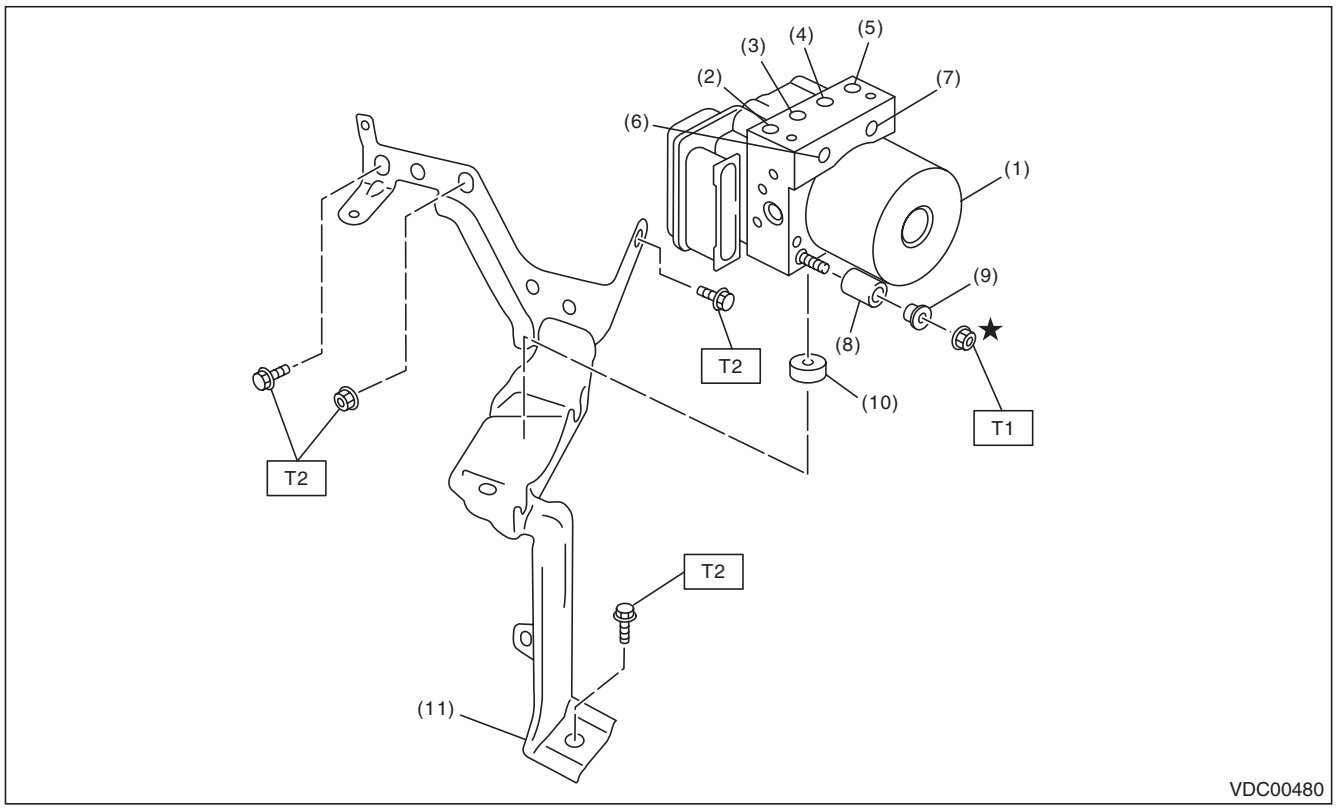
Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

3. STEERING ANGLE SENSOR



(1) Steering angle sensor

4. VDC CONTROL MODULE & HYDRAULIC CONTROL UNIT (VDCCM&H/U)



(1) VDC control module & hydraulic control unit (VDCCM&H/U)
(2) Front RH outlet
(3) Rear LH outlet
(4) Rear RH outlet
(5) Front LH outlet
(6) Primary inlet
(7) Secondary inlet
(8) Damper
(9) Spacer
(10) Damper
(11) Bracket

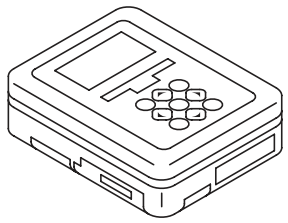
Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 24)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

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

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring the sensor.
TORX® bit E5	Used for replacing VDC control module.

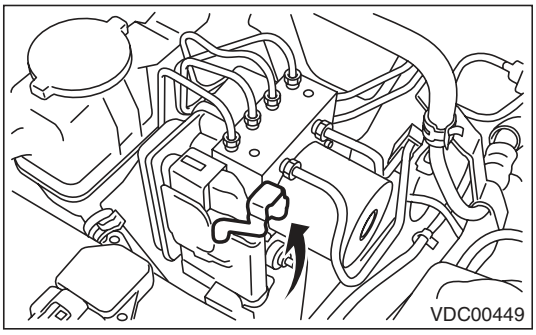
2. VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Use compressed air to remove moisture and dust around the VDCCM&H/U.

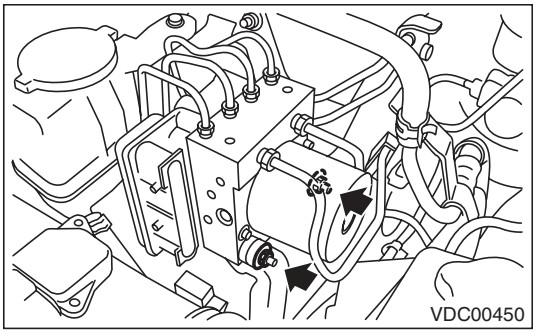
NOTE:
If the terminals become dirty, it may cause improper contact.
3) Lift the lock lever and Disconnect the VDCCM&H/U connector.

CAUTION:
Do not pull on the harness when disconnecting the connector.



4) Disconnect the brake pipes from the VDCCM&H/U.
5) Wrap the brake pipe with a vinyl bag so as not to spill the brake fluid on the vehicle body.

CAUTION:
If brake fluid is spilled on the vehicle body, wash it off immediately with water and wipe clean.
6) Remove the nuts and remove the VDCCM&H/U.



CAUTION:
- **Do not drop or bump the VDCCM&H/U.**
- **Do not turn the VDCCM&H/U upside down or place it sideways during storage.**
- **Be careful not to let foreign matter enter the VDCCM&H/U.**
- **Be careful that no water enters the connectors.**

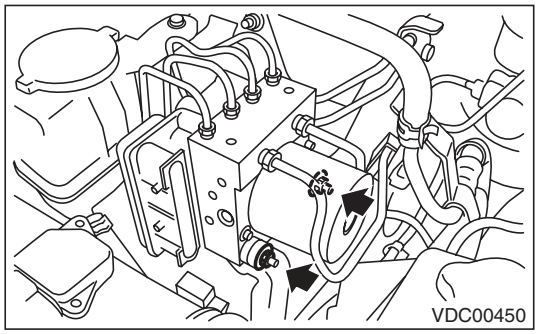
7) Remove the VDCCM&H/U bracket.

B: INSTALLATION

1) Install the VDCCM&H/U bracket.

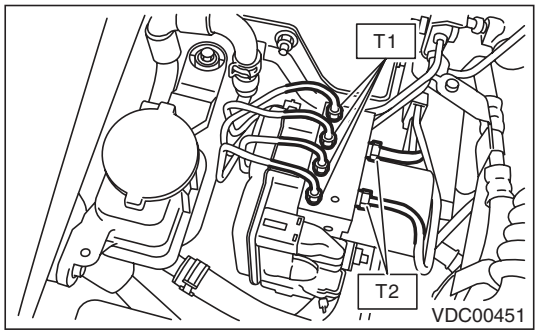
Tightening torque:
33 N·m (3.4 kgf-m, 24 ft-lb)
2) Install the VDCCM&H/U with a new nut (Part No. 023506000) by aligning the damper groove of the VDCCM&H/U to the bracket side claw.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



3) Connect the brake pipes to their correct VDCCM&H/U positions.

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 11.1 ft-lb)
T2: 19 N·m (1.9 kgf-m, 14.0 ft-lb)



4) Connect the VDCCM&H/U connector.

NOTE:
- Be sure to remove all foreign matter from inside the connector before connecting.
- Make sure the VDCCM&H/U connector is securely locked.

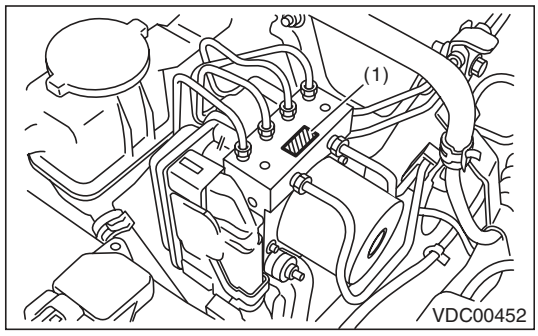
5) Bleed air from the brake system.
6) Check the parameter to confirm that the applied models and grades of the relevant vehicle are included. <Ref. to VDC(diag)-17, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>

7) If the applied model and grade of the target vehicle are not included on the {Parameter Check} display screen, perform parameter selection and registration. <Ref. to VDC(diag)-16, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

NOTE:
• When the VDCCM&H/U is replaced with a new part, be sure to perform the selection and registration operation.
• For the selection and registration of parameter, the Subaru Select Monitor is required.
• When no data is registered, ABS/EBD/VDC warning light illuminates and the DTC "Parameter selection failure" is detected.

C: INSPECTION

1) Check the condition of connection and settlement of connector.
2) Check the mark used for VDCCM&H/U identification.
Refer to "SPECIFICATION" for the identification mark. <Ref. to VDC-2, SPECIFICATION, General Description.>



(1) Identification mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

<Ref. to ABS-7, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER

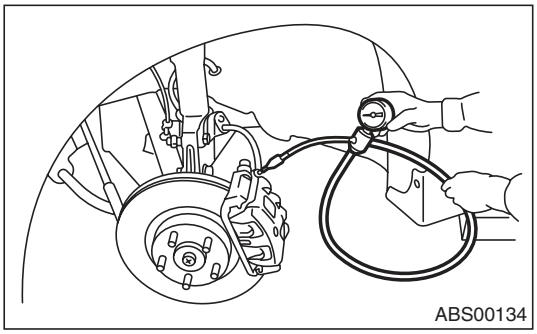
<Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

3. CHECKING THE HYDRAULIC UNIT VDC OPERATION USING A PRESSURE GAUGE

1) Lift up the vehicle, and remove the wheels.
2) Remove the air bleeder screws from FL and FR caliper bodies.
3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:
• Use a pressure gauge used exclusively for brake fluid measurement.
• Do not use a pressure gauge used for the measuring transmission oil pressure, as the piston seal may expand and deform.

NOTE:
Wrap sealing tape around the pressure gauge.



4) Bleed air from the pressure gauge.
5) Perform VDC sequence control.
<Ref. to VDC-13, VDC Sequence Control.>
6) When the hydraulic unit begins to work, first the FL side performs compression, hold, and decompression, and then the FR side performs compression, hold, and decompression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets specification. Depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

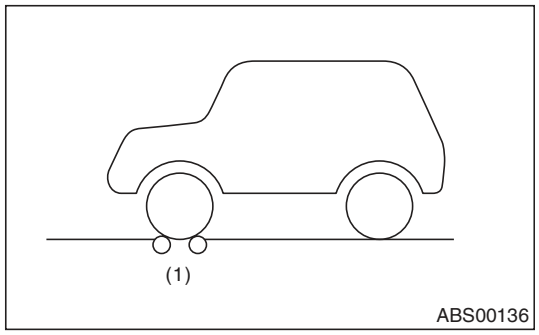
	Front wheel	Rear wheel
When pressurized	3,000 kPa (31 kgf/cm^2, 441 psi) or more	3,000 kPa (31 kgf/cm^2, 441 psi) or more
When depressurized	500 kPa (5 kgf/cm^2, 73 psi) or less	500 kPa (5 kgf/cm^2, 73 psi) or less

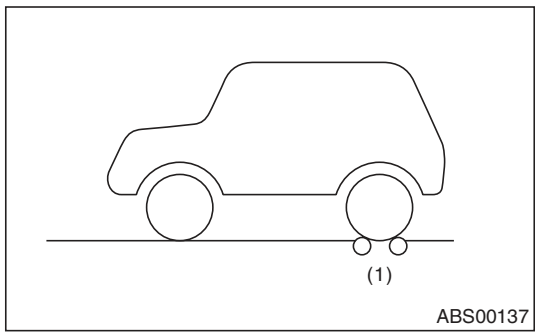
8) Disconnect the pressure gauges from FL and FR caliper bodies.
9) Install the air bleeder screws of FL and FR caliper bodies.
10) Remove the air bleeder screws from RL and RR caliper bodies.
11) Connect two pressure gauges to RL and RR caliper bodies.

12) Bleed air from RL and RR caliper bodies, and pressure gauge.
13) Perform VDC sequence control.
<Ref. to VDC-13, VDC Sequence Control.>
14) When the hydraulic unit begins to work, first the RR side performs compression, hold, and decompression, and then the RL side performs compression, hold, and decompression.
15) Read the values indicated on the pressure gauges and check if it is within specification. Depress the brake pedal and check that it is not abnormally hard, and tightness is normal.
16) Disconnect the pressure gauge from the RL and RR caliper bodies.
17) Install the air bleeder screws of RL and RR caliper bodies.
18) Bleed air from the brake line.

4. CHECK HYDRAULIC UNIT VDC OPERATION WITH BRAKE TESTER

1) Set wheels other than the one to measure on free rollers.
2) Prepare to operate the VDC sequence control.
<Ref. to VDC-13, VDC Sequence Control.>
3) Set the front wheels or rear wheels on the brake tester and set the select lever position to the “N” range.





(1) Brake tester

4) Operate the brake tester.
5) Perform VDC sequence control.
<Ref. to VDC-13, VDC Sequence Control.>
6) When the hydraulic unit begins to work, check the following work sequence.
(1) The FL wheel performs compression, hold and decompression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs compression, hold and decompression in sequence, and subsequently the RL wheel repeats the cycle.
7) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets specification.

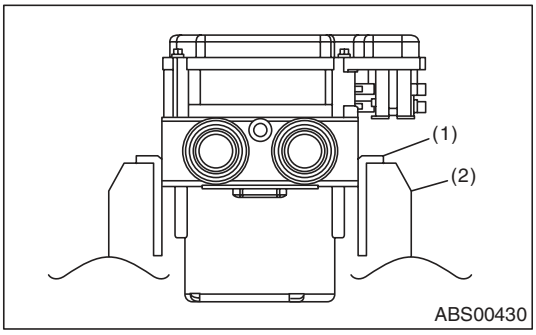
	Front wheel	Rear wheel
When pressurized	2,000 N (203 kgf, 447 lb) or more	2,000 N (203 kgf, 447 lb) or more
When depressurized	500 N (51 kgf, 112 lb) or less	500 N (51 kgf, 112 lb) or less

8) After the inspection, depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

D: REPLACEMENT

CAUTION:
• Because the pressure sensor built into the H/U is easily damaged by static electricity, start the operation after performing static electricity measures.
• Be careful not to touch the sensors in the H/U to prevent damage.
• Because the seal of the VDCCM cannot be replaced, do not pull or peel it by lifting it up.
• Because the screw of the H/U will become slightly worn in every replacement procedure, 5 times is the maximum number of times for replacement. If a problem is found such as not being able to torque the screw to specifications even before 5 replacement operations are performed, replace the H/U body.
• When installing the VDCCM, always use new screws.
• When the sealing surface of the VDCCM or H/U is dirty or damaged and it cannot be cleaned or repaired, replace with a new part.
1) Remove the VDCCM&H/U. <Ref. to VDC-7, REMOVAL, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
2) To prevent entry of foreign objects and brake fluid leakage, plug the oil pressure port of the VDCCM&H/U using a screw plug, etc.
3) Set the pump motor section of the removed VDCCM&H/U face down on a vise.

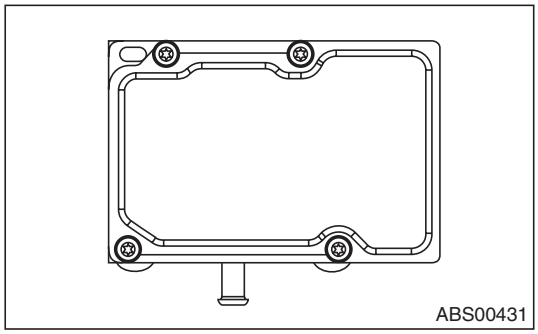
NOTE:
Before securing a part in a vise, place cushioning material such as wood blocks, aluminum plate or cloth between the part and the vise.



(1) Aluminum plate, etc.
(2) Vise

4) Using TORX® bit E5, remove the four screws of VDCCM.

NOTE:
These screws cannot be reused.



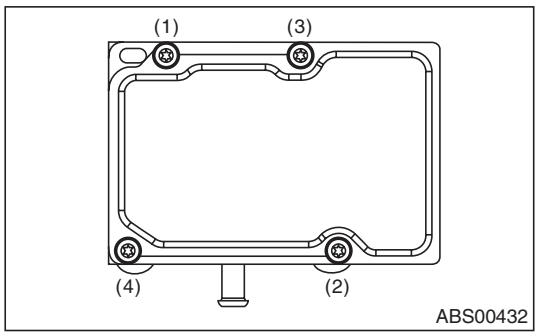
5) Slowly pull out the VDCCM upward from the H/U.

NOTE:
To prevent damaging of coil section, remove the VDCCM straight up from H/U without twisting.
6) Make sure there is no dirt or damage on the sealing surface of the H/U.

CAUTION:
• Do not clean the VDCCM&H/U by applying compressed air.
• Even if damage is found on the H/U seal, do not attempt repair by filing or with a metal scraper. To remove the seal residue, always use a plastic scraper. Do not use chemical such as paint thinner, etc., to clean.
7) Position the coil of the new VDCCM to align with the H/U valve.
8) To prevent deformation of the VDCCM housing cover, hold the corner of VDCCM and install it to the H/U without tilting.
9) Using a TORX® bit E5, attach/tighten new screws 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 mating surface between the VDCCM&H/U.

11) Using a TORX® bit E5, tighten the screws 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 gap in the mating surface between VDCCM&H/U.
13) Install the VDCCM&H/U to the vehicle.
14) Bleed air from the brake system.
15) Perform the selection and registration operation of parameter. <Ref. to VDC(diag)-16, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

NOTE:
• After replacing the VDCCM, be sure to perform the selection and registration operation of parameter.
• For the selection and registration of parameter, the Subaru Select Monitor is required.
• When no data is registered, ABS/EBD/VDC warning light illuminates and the DTC “Parameter selection error” is detected.

16) Check the parameter to confirm that the applied models and grades of the relevant vehicle are included. <Ref. to VDC(diag)-17, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>
17) If the applied models and grades of the relevant vehicle are not included, perform the selection and registration operation of parameter with the {Confirm Parameter} screen again. <Ref. to VDC(diag)-16, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>
18) Execute Clear Memory after parameter selection and registration operations because the DTC for “Parameter selection error” is memorized.

E: ADJUSTMENT

When the following replacement, removal and installation are performed, be sure to perform the centering of the steering angle sensor and zero point setting of yaw rate & lateral G sensor.
• VDCCM&H/U
• Steering angle sensor
• Yaw rate & lateral G sensor
• Steering wheel parts (Including airbag)
• Suspension parts
• Wheel alignment adjustment

1) Park the vehicle straight on a level surface. (Engine operation in the “P” or “N” range)
2) Check that steering wheel is positioned at the center. (When the center position is not correct, adjust the wheel alignment.)
3) Set the Subaru Select Monitor to the vehicle, and select the {Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point} in the «Function Check Sequence» screen. (Follow the steps on the display.)
4) On the «Brake Control System» display, select the {Current Data Display & Save}, and check that the steering angle sensor shows “0 deg”.
5) When the “0 deg” is not displayed, repeat the above steps and check that the “0 deg” is displayed.
6) Drive the vehicle for 10 minutes, and check that the ABS and VDC warning light is not illuminated.
7) Check that there is no unnecessary VDC operation or steering control loss. If there is a malfunction, repeat the steps above.

3. ABS Sequence Control

A: OPERATION

<Ref. to ABS-10, OPERATION, ABS Sequence Control.>

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

<Ref. to ABS-10, ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR, OPERATION, ABS Sequence Control.>

2. CONDITIONS FOR ABS SEQUENCE CONTROL

<Ref. to ABS-11, CONDITIONS FOR ABS SEQUENCE CONTROL, OPERATION, ABS Sequence Control.>

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

<Ref. to ABS-12, CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL, SPECIFICATION, ABS Sequence Control.>

4. VDC Sequence Control

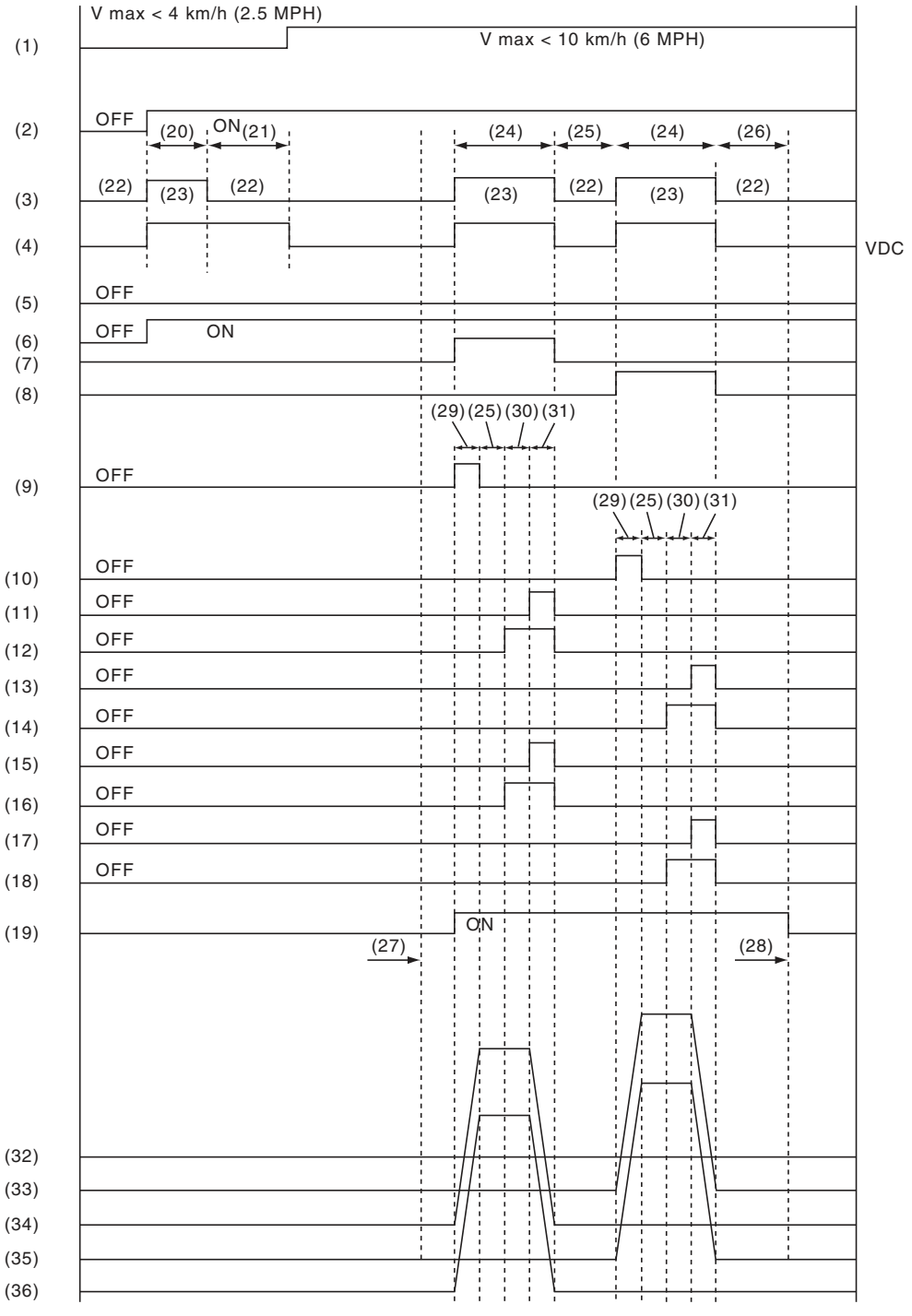
A: OPERATION

1) While the VDC sequence control is performed, the operation of the hydraulic unit can be checked using the brake tester or pressure gauge after the hydraulic unit solenoid valve is operated.
2) VDC sequence control can be started by Subaru Select Monitor.

1. VDC SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:
In the event of any trouble, sequence control will not operate.
1) Connect the Subaru Select Monitor to data link connector under the driver's side instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Run the "PC application for Subaru Select Monitor".
4) Set the Subaru Select Monitor to "Brake Control" mode.
5) When the "VDC Inspection Mode" is selected from the "Function Check Sequence" menu, the "VDC sequence control" will start.
6) Press "OK" will be displayed. Press the "OK" key.
7) Operation points will be displayed on Subaru Select Monitor.

2. CONDITIONS FOR VDC SEQUENCE CONTROL



VDC00275

(1) All wheel speed
(2) Ignition key
(3) ABS warning light
(4) VDC warning light
(5) Stop light switch
(6) Valve relay
(7) VDC switching valve 1 FL
(8) VDC switching valve 1 FR
(9) VDC switching valve 2 FL
(10) VDC switching valve 2 FR
(11) FL decompression valve
(12) FL compression valve
(13) FR decompression valve
(14) FR compression valve
(15) RR decompression valve
(16) RR compression valve
(17) RL decompression valve
(18) RL compression valve
(19) Pump motor
(20) 1.5 seconds
(21) Approx. 3 seconds
(22) Light OFF
(23) Light ON
(24) 3.4 seconds
(25) 1 second
(26) 1.6 seconds
(27) Point A
(28) Reset
(29) 0.8 seconds
(30) 1.2 seconds
(31) 0.4 seconds
(32) Master cylinder pressure
(33) FR wheel cylinder pressure
(34) FL wheel cylinder pressure
(35) RL wheel cylinder pressure
(36) RR wheel cylinder pressure

NOTE:
The control operation starts from point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

When the following conditions develop, the VDC sequence control stops and VDC operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is pressed during sequence control and the stop light switch is set to ON.
3) After completion of VDC sequence control.
4) When a malfunction is detected.

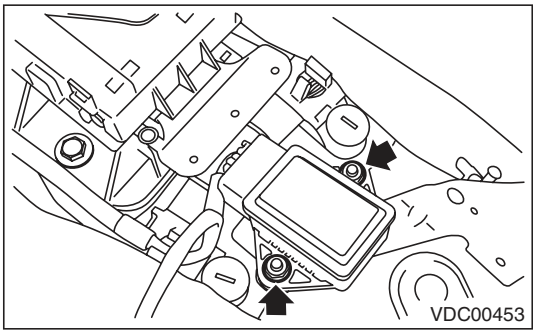
5. Yaw Rate and Lateral G Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console box.
<Ref. to EI-54, Console Box.>
3) Disconnect the connector from yaw rate & lateral G sensor.
4) Remove the yaw rate & lateral G sensor.

B: INSTALLATION

Install in the reverse order of removal.



Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

CAUTION:
After completion of installation, set the following two positions.
• Positioning to the center of steering angle sensor
• Positioning the yaw rate & lateral G sensors to zero
The above procedure is required for the VDC-CM&H/U to identify the vehicle position afterward. For the setting procedures of the 2 steps above, refer to "VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)". <Ref. to VDC-11, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

C: INSPECTION

1. YAW RATE & LATERAL G SENSOR

	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor connector to the data link connector. 3) Turn the ignition switch to ON. 4) Set the Subaru Select Monitor connector to the {Brake Control System} mode. 5) Select {Current Data Display & Save}. 6) Read the output of the yaw rate & lateral G sensor.	Are the indicated values as follows when the vehicle is placed horizontally? Lateral G sensor: –1.5 — 1.5 m/s, Yaw rate sensor: –4 — 4 deg/s	Go to step **2**.	Repair the harness connector between yaw rate & lateral G sensor and VDCCM&H/U. Or replace the yaw rate & lateral G sensor.
2	**CHECK LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the yaw rate & lateral G sensors from vehicle. (Do not disconnect the connector.) 3) Read the display of Subaru Select Monitor. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the value 6.8 — 12.8 m/s when the yaw rate & lateral G sensor is inclined 90° to the right?	Go to step **3**.	Repair the harness connector between yaw rate & lateral G sensor and VDCCM&H/U. Or replace the yaw rate & lateral G sensor.
3	**CHECK LATERAL G SENSOR.** Read the display of Subaru Select Monitor. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the value –6.8 — –12.8 m/s when the yaw rate & lateral G sensor is inclined 90° to the right?	Yaw rate & lateral G sensors are normal.	Repair the harness connector between yaw rate & lateral G sensor and VDCCM&H/U. Or replace the yaw rate & lateral G sensor.

6. Steering Angle Sensor

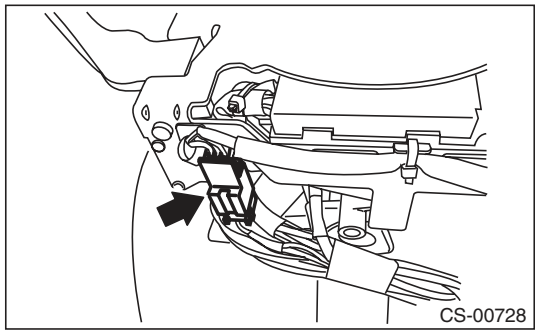
A: REPLACEMENT

CAUTION:
• Do not perform the removal except when the replacement.
• When replacing three times or more, replace the combination switch as assembly to protect the threads.

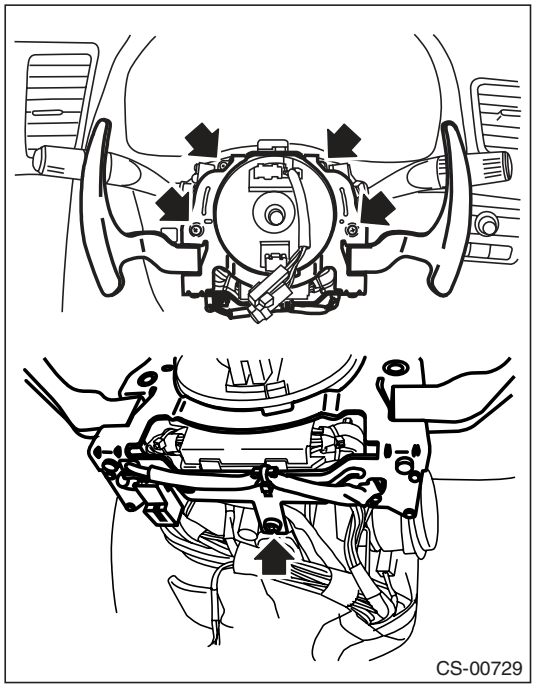
1) Set the steering wheel in a straight-ahead position.
2) Disconnect the ground cable from battery.
3) Remove the airbag module.
<Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" when performing the airbag module repair service.
<Ref. to AB-4, CAUTION, General Description.>

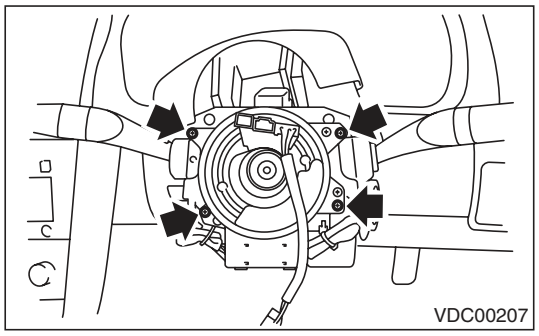
4) Remove the steering wheel.
<Ref. to PS-13, REMOVAL, Steering Wheel.>
5) Remove the screws and remove the steering column lower cover.
6) Remove the two screws securing the steering column upper cover.
7) Disconnect the connector of paddle shift assembly. (Model with paddle shift)


CS-00728

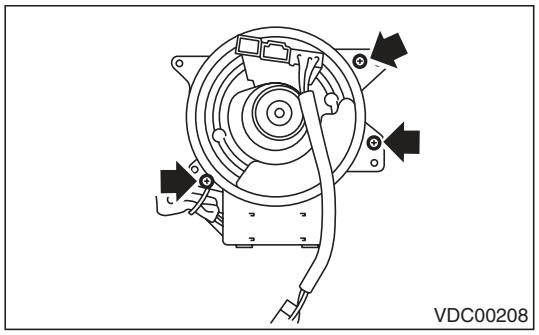
8) Remove the paddle shift assembly. (Model with paddle shift)


CS-00729

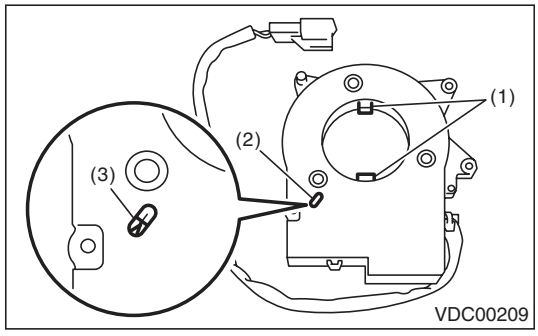
9) Disconnect the connector of roll connector and steering angle sensor.
10) Remove the screws which secure the roll connector to steering column.


VDC00207

11) Remove the vinyl tape binding the harness, and remove the steering angle sensor from roll connector.


VDC00208

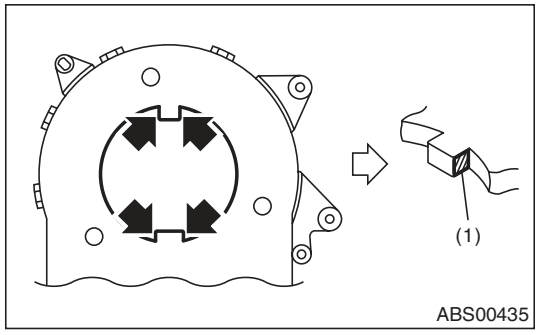
12) Turn the protrusion portion of new steering angle sensor to match the alignment mark of inspection hole.



(1) Protrusion portion
(2) Inspection hole
(3) Alignment mark

CAUTION:
Be careful not to allow foreign matter to enter into inspection hole.

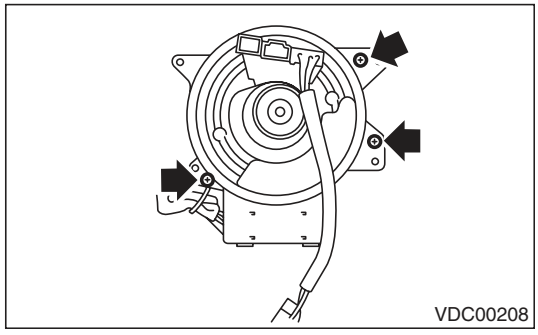
13) Align the center of roll connector.
<Ref. to AB-25, INSTALLATION, Roll Connector.>
14) Apply the grease provided with the new part on the four locations of the protrusion on the steering angle sensor.



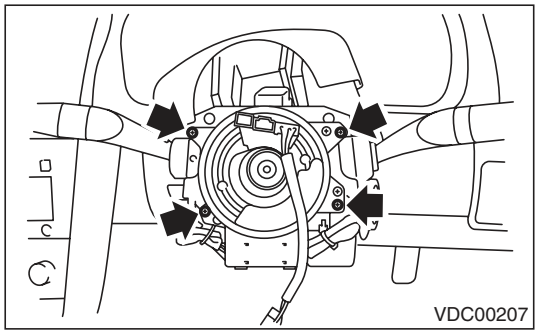
(1) Grease application location

15) Align the position of the protrusion and install roll connector to steering angle sensor.

Tightening torque:
0.5 N·m (0.05 kgf-m, 0.36 ft-lb)



16) Install the roll connector to combination switch and bind the harness with vinyl tape as originally bound.



17) Install the paddle shift. (Model with paddle shift)
18) Install the steering wheel.
<Ref. to PS-13, INSTALLATION, Steering Wheel.>

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

19) Install the airbag module to the steering wheel.
<Ref. to AB-14, INSTALLATION, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing the service operation.
<Ref. to AB-4, CAUTION, General Description.>

20) Connect the ground cable to battery.

CAUTION:
After completion of installation, adjust the following two positions.
• Positioning to the center of steering angle sensor
• Positioning the yaw rate & lateral G sensors to zero
The above procedure is required for the VDC-CM to identify vehicle position afterward. For the setting procedures of the 2 steps above, refer to "VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)". <Ref. to VDC-11, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

7. Front ABS Wheel Speed Sensor

A: NOTE

Vehicles equipped with VDC have the same ABS wheel speed sensor as installed on vehicles equipped with ABS. Refer to “Front ABS Wheel Speed Sensor” for removal, installation and inspection procedures.
<Ref. to ABS-13, Front ABS Wheel Speed Sensor.>

8. Rear ABS Wheel Speed Sensor

A: NOTE

Vehicles equipped with VDC have the same ABS wheel speed sensor as installed on vehicles equipped with ABS. Refer to “Rear ABS Wheel Speed Sensor” for removal, installation and inspection procedures.
<Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>

9. Front Magnetic Encoder

A: NOTE

Vehicles equipped with VDC have the same magnetic encoder as installed on vehicles equipped with ABS. Refer to “Front Magnetic Encoder” for removal, installation and inspection procedures.
<Ref. to ABS-16, Front Magnetic Encoder.>

10. Rear Magnetic Encoder

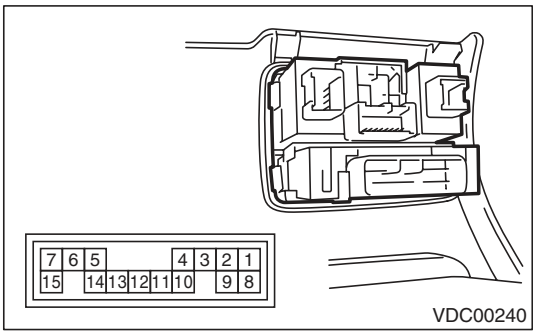
A: NOTE

Vehicles equipped with VDC have the same magnetic encoder as installed on vehicles equipped with ABS. Refer to “Rear Magnetic Encoder” for removal, installation and inspection procedures.
<Ref. to ABS-17, Rear Magnetic Encoder.>

11. VDC OFF Switch

A: REMOVAL

1) Remove the instrument panel lower cover.
2) Remove the screws, and then remove the VDC OFF switch.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the resistance between the VDC OFF switch terminals.

Switch position	Terminal No.	Standard
OFF	5 — 15	1 MΩ or more
ON	5 — 15	Less than 1 Ω

If NG, replace the VDC OFF switch.

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
Remove foreign matter (dust, water, oil etc.) from the VDCCM&H/U connector during removal and installation.

NOTE:
- To check the harness for open or short circuits, shake problem spot or connector.
- Refer to “Check List for Interview”. <Ref. to VDC(diag)-4, Check List for Interview.>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to VDC(diag)-4, Check List for Interview.> 2) Before performing diagnostics, check the component which might affect VDC problems. <Ref. to VDC(diag)-8, INSPECTION, General Description.>	Is the component that might influence the VDC problem normal?	Go to step **2**.	Repair or replace each component.
2	**CHECK INDICATION OF DTC.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. 4) Read the DTC using the Subaru Select Monitor. <Ref. to VDC(diag)-21, OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to VDC(diag)-18, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 5) Record all DTCs and freeze frame data.	Is DTC displayed on the Subaru Select Monitor?	Go to step **4**.	Go to step **3**.
3	**PERFORM GENERAL DIAGNOSTICS.** 1) Perform the inspection by referring to “General Diagnostic Table”. <Ref. to VDC(diag)-101, INSPECTION, General Diagnostic Table.> 2) Perform the Clear Memory Mode. <Ref. to VDC(diag)-23, OPERATION, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, PROCEDURE, Inspection Mode.> 4) Read the DTC. <Ref. to VDC(diag)-21, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Check the DTC is not displayed.	Do the VDC warning light and ABS warning light go off after starting the engine?	Finish the diagnosis.	Check the combination meter circuit. <Ref. to VDC(diag)-29, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-31, VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.>

	Step	Check	Yes	No
4	**PERFORM DIAGNOSIS.** 1) Refer to “List of Diagnostic Trouble Code (DTC)”. NOTE: For the DTC list, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-34, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the cause of trouble. 3) Perform the Clear Memory Mode. <Ref. to VDC(diag)-23, OPERATION, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, PROCEDURE, Inspection Mode.> 5) Read the DTC. <Ref. to VDC(diag)-21, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Repeat step 4 until DTC is not shown.	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Check the following item about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light illuminates.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When/How long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after starting engine, engine is running) ❑ ON (after starting engine, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition switch to ON ❑ Immediately after turning the ignition switch to START		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While 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 other electrical parts are operating		
	• Part name: • Operating condition:		

2. STATE OF VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT

VDC warning light and VDC OFF indicator light illuminate.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When/How long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after starting engine, engine is running) ❑ ON (after starting engine, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition switch to ON ❑ Immediately after turning the ignition switch to START		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While 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 other electrical parts are operating		
	• Part name: • Operating condition:		

3. STATE OF VDC INDICATOR LIGHT

VDC operation indicator light illuminate.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When/How long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after starting engine, engine is running) ❑ ON (after starting engine, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition switch to ON ❑ Immediately after turning the ignition switch to START		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While 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 other electrical parts are operating		
	• Part name: • Operating condition:		

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others:
	b) Ambient temperature	°C (°F)
	c) Road	❑ Inner city ❑ Suburbs ❑ Highway ❑ Local street ❑ Uphill ❑ Downhill ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Straight road ❑ Sharp curve ❑ Gentle curve ❑ S-curve ❑ Road with a slope on both sides ❑ Others:
	d) Road surface	❑ Dry ❑ Wet ❑ Covered with fresh snow ❑ Covered with hardened snow ❑ Frozen slope ❑ Others:

Check List for Interview

Condition	a) Brakes	Deceleration: G
		❑ Continuous / ❑ Intermittent
	b) Accelerator	Acceleration: G
		❑ Continuous / ❑ Intermittent
	c) Vehicle speed	km/h | MPH
		❑ Advancing ❑ While accelerating ❑ While decelerating ❑ At low speed ❑ When turning ❑ Others:
	d) Tire inflation pressure	Front RH tire: kPa
		Front LH tire: kPa
		Rear RH tire: kPa
		Rear LH tire: kPa
	e) Degree of wear	Front RH tire:
		Front LH tire:
		Rear RH tire:
		Rear LH tire:
	f) Steering wheel	❑ Sharp turning ❑ Gentle turning ❑ Straight forward motion ❑ Gentle return ❑ Sharp return
	g) Tire/Wheel size	❑ Specified size ❑ Except specification ( )
	h) Tire variation	❑ Summer tire ❑ Studless tire (Brand:)
	i) Tire chain is attached: ❑ Yes / ❑ No	
	j) T-type tire is used: ❑ Yes / ❑ No	
	k) Condition of suspension alignment:	
	l) Loading state:	
	m) Repair parts are used: ❑ Yes / ❑ No	
	• Contents:	
	n) Others:	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor and VDCCM&H/U.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor and VDCCM&H/U.

B: INSPECTION

Before performing diagnosis, check the following items which might affect VDC problems.

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage:
12 V or more

Specific gravity:
1.260 or more

2. GROUND

Check the tightening torque of ground (GB-7) bolt of VDC.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

3. BRAKE FLUID

1) Check the brake fluid level.
2) Check the brake fluid for leaks.

4. HYDRAULIC UNIT

Check the hydraulic unit.
• With brake tester <Ref. to VDC-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDC-CM&H/U).>
• Without brake tester <Ref. to VDC-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDC-CM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

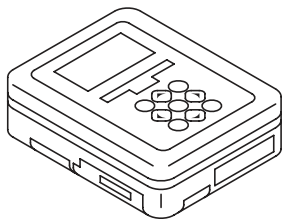
Check the brake pad and rotor.
• Front <Ref. to BR-13, INSPECTION, Front Brake Pad.> <Ref. to BR-14, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-19, INSPECTION, Rear Brake Pad.> <Ref. to BR-21, INSPECTION, Rear Disc Rotor.>

7. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOL

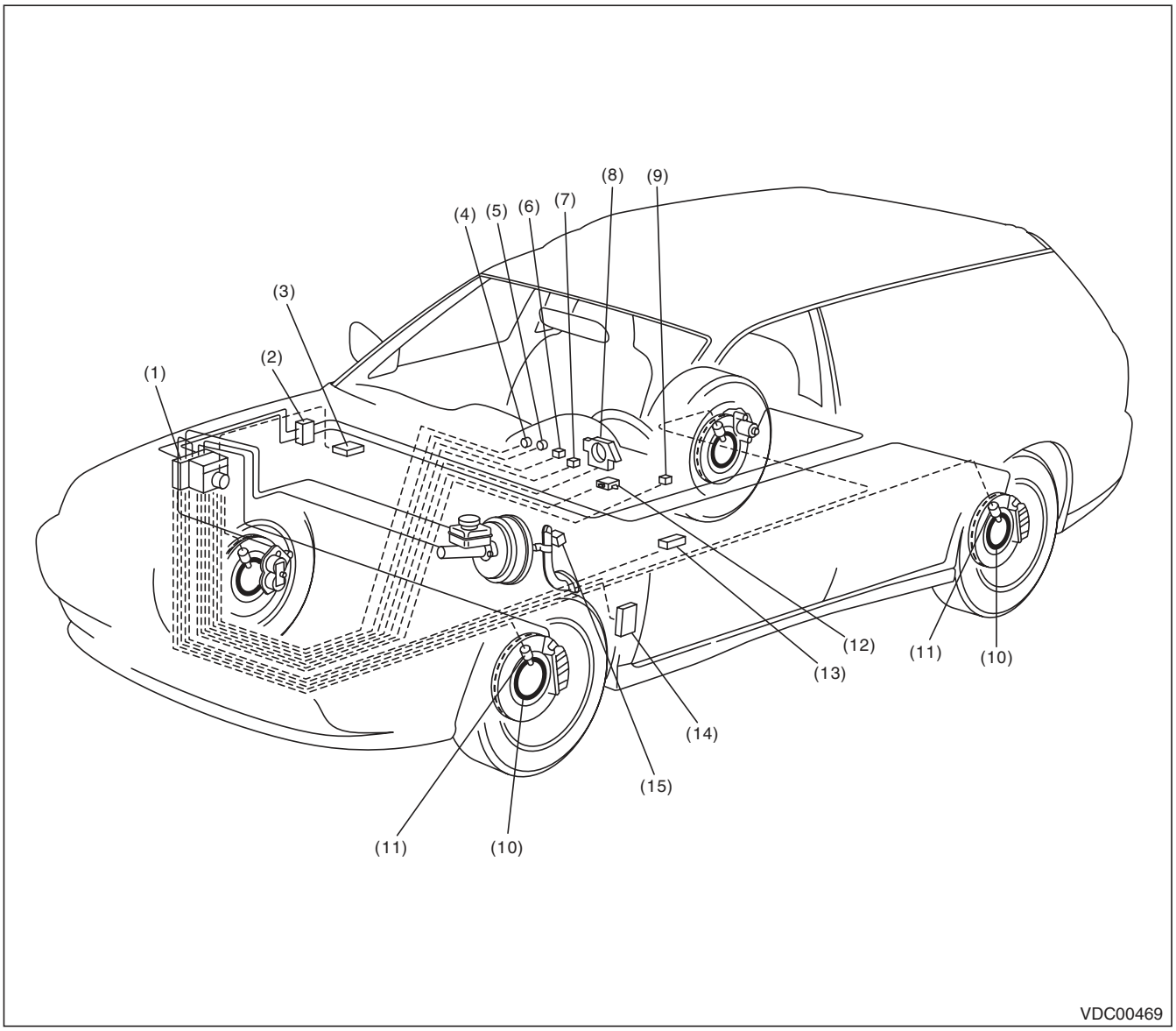
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

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

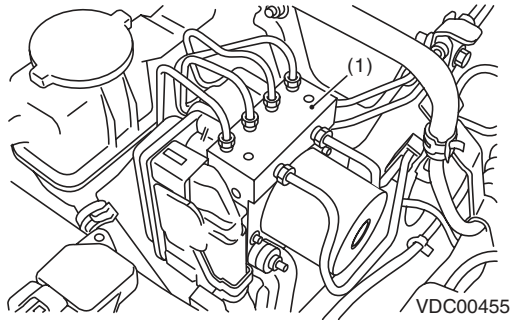
4. Electrical Component Location

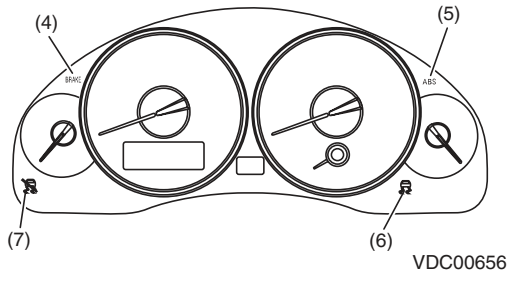
A: LOCATION

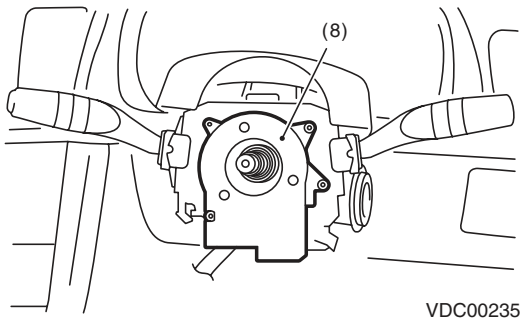


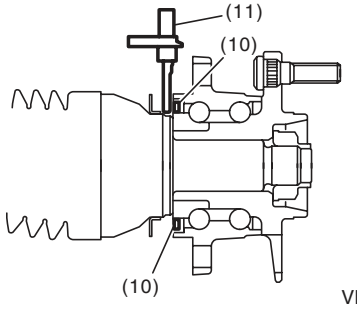
(1) VDC control module and hydraulic control unit (VDCCM&H/U)
(2) Connector
(3) Transmission control module (TCM)
(4) Brake warning light (EBD warning light)
(5) ABS warning light
(6) VDC indicator light
(7) VDC warning light and VDC OFF indicator light
(8) Steering angle sensor
(9) VDC OFF switch
(10) Magnetic encoder
(11) ABS wheel speed sensor
(12) Yaw rate & lateral G sensor
(13) Data link connector
(14) Engine control module (ECM)
(15) Stop light switch

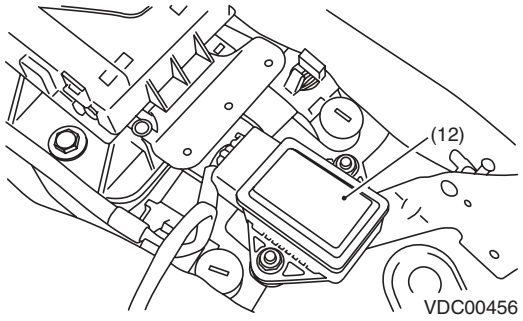
Electrical Component Location

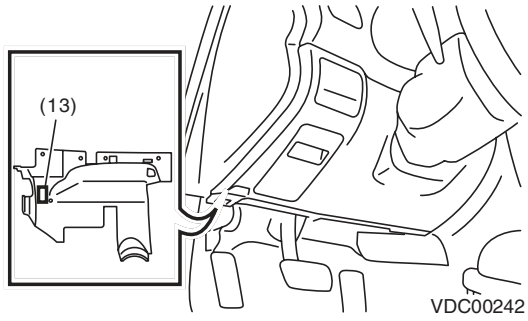






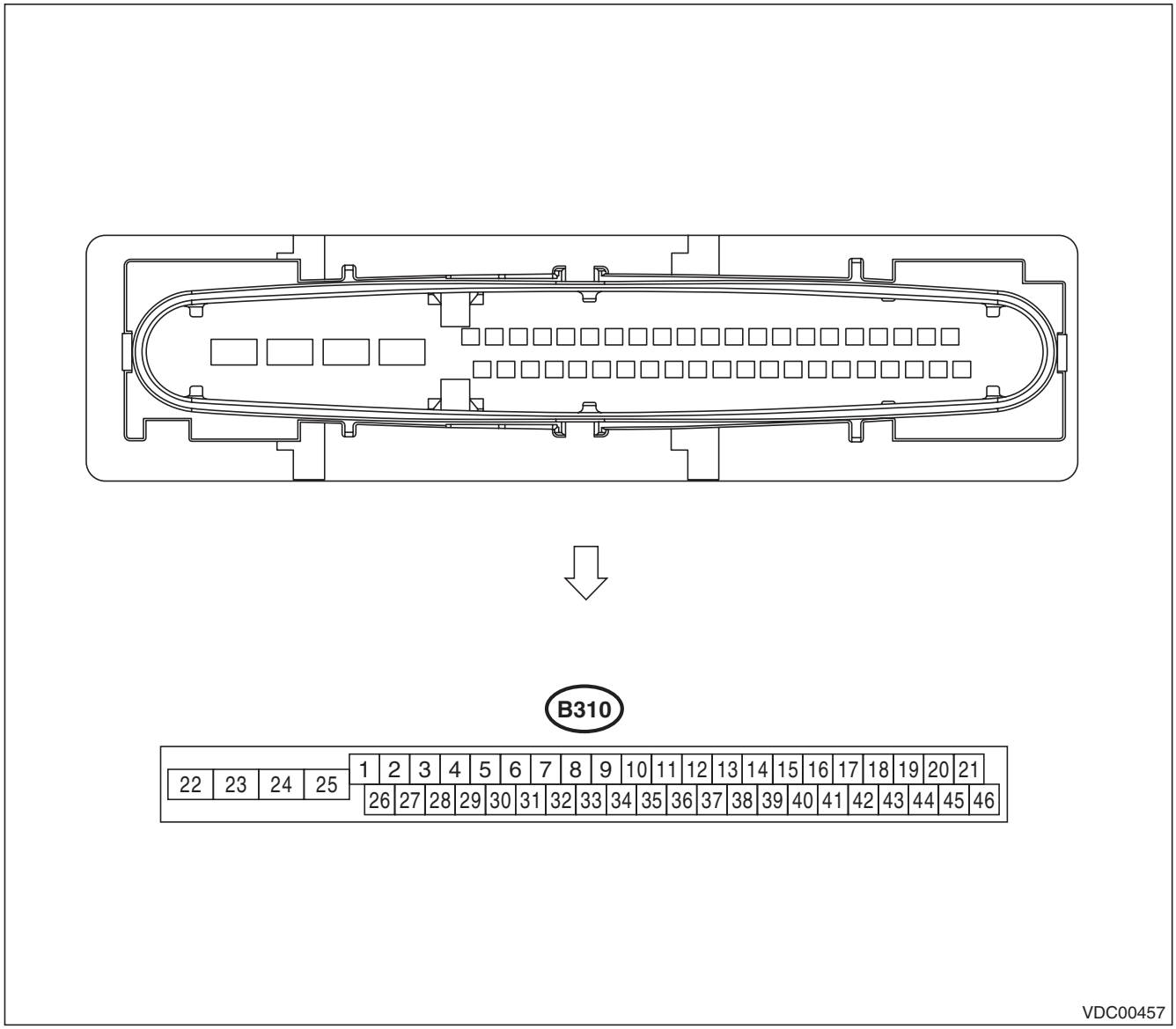






5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

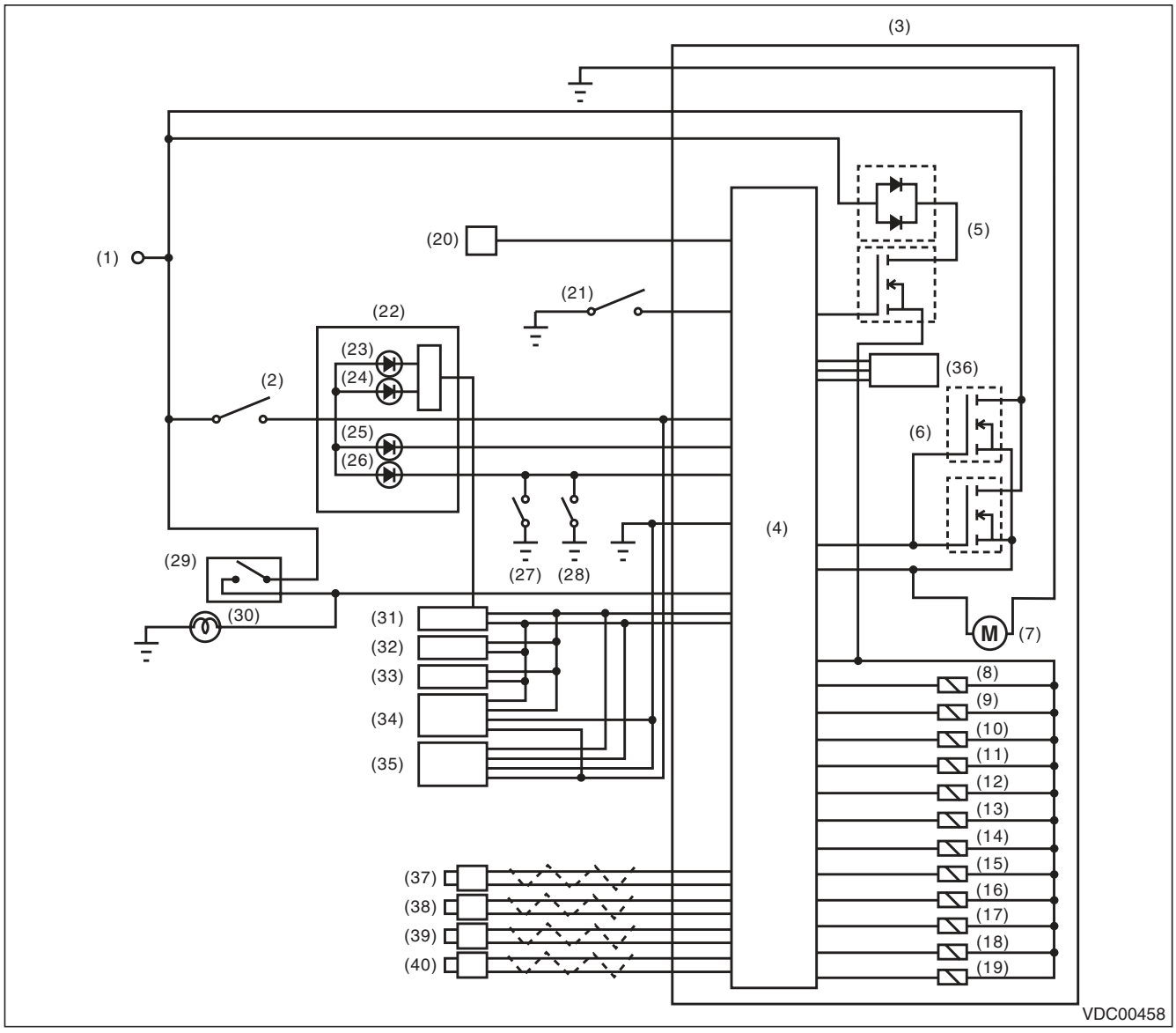


NOTE:
- Terminal numbers in VDCCM&H/U connector are shown in the figure.
- When the connector is removed from VDCCM&H/U, the ABS warning light, VDC warning light and VDC OFF indicator light illuminate.

Control Module I/O Signal

Content			Terminal No. (+) — (–)	Input/Output signal
				Measured value and measuring conditions
Power supply			28 — 25	10 — 15 V when the ignition switch is ON.
ABS wheel speed sensor	Front LH wheel	Power supply	26 — 25	4.5 — 16.5 V
		Signal	1	5.9 — 16.8 mA: Rectangle waveform
	Front RH wheel	Power supply	5 — 25	4.5 — 16.5 V
		Signal	6	5.9 — 16.8 mA: Rectangle waveform
	Rear LH wheel	Power supply	2 — 25	4.5 — 16.5 V
		Signal	27	5.9 — 16.8 mA: Rectangle waveform
	Rear RH wheel	Power supply	3 — 25	4.5 — 16.5 V
		Signal	4	5.9 — 16.8 mA: Rectangle waveform
CAN communication line (+)			35	2.5 — 1.5 V pulse signal
CAN communication line (–)			10	3.5 — 2.5 V pulse signal
Valve relay power supply			24 — 25	10 — 15 V when the ignition switch is ON.
Motor relay power supply			23 — 22	10 — 15 V when the ignition switch is ON.
ABS warning light			32 — 25	After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds, and 1.5 V or less after 1.5 seconds passed.
Brake warning light (EBD warning light)			8 — 25	After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds, and 1.5 V or less after 1.5 seconds passed.
Stop light switch			30 — 25	1.5 V or less when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.
Subaru Select Monitor			7 — 25	0 ←→ 12 V pulse (in communication)
Vehicle speed output signal			33	0 ←→ 12 V pulse
Ground			25	—

B: WIRING DIAGRAM



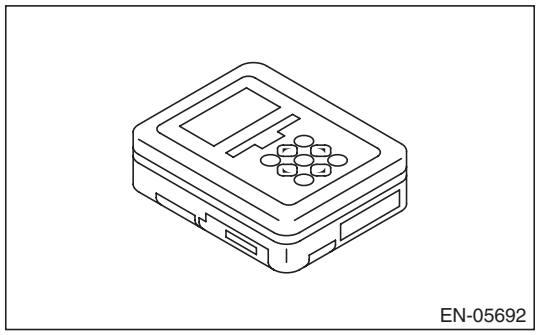
(1) Battery
(2) Ignition switch
(3) VDC control module and hydraulic control unit (VDCCM&H/U)
(4) VDC control module
(5) Valve relay
(6) Motor relay
(7) Motor
(8) Front inlet solenoid valve LH
(9) Front outlet solenoid valve LH
(10) Front inlet solenoid valve RH
(11) Front outlet solenoid valve RH
(12) Rear inlet solenoid valve LH
(13) Rear outlet solenoid valve LH
(14) Rear inlet solenoid valve RH
(15) Rear outlet solenoid valve RH
(16) Primary cut solenoid valve
(17) Primary suction solenoid valve
(18) Secondary cut solenoid valve
(19) Secondary suction solenoid valve
(20) Data link connector
(21) VDC OFF switch
(22) Combination meter
(23) VDC indicator light
(24) VDC warning light and VDC OFF indicator light
(25) ABS warning light
(26) Brake warning light
(27) Parking brake switch
(28) Brake fluid level switch
(29) Stop light switch
(30) Stop light
(31) Body integrated unit
(32) Engine control module (ECM)
(33) Transmission control module (TCM)
(34) Steering angle sensor
(35) Yaw rate & lateral G sensor
(36) Pressure sensor
(37) Front ABS wheel speed sensor LH
(38) Front ABS wheel speed sensor RH
(39) Rear ABS wheel speed sensor LH
(40) Rear ABS wheel speed sensor RH

6. Subaru Select Monitor

A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

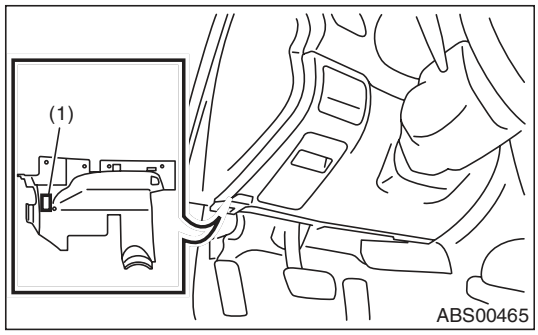
1) Prepare the Subaru Select Monitor kit. <Ref. to VDC(diag)-8, SPECIAL TOOL, PREPARATION TOOL, General Description.>



2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable between SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).



(1) Data link connector

CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.

6) Start the PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".

NOTE:
For detailed operation procedure, refer to the "PC application help for Subaru Select Monitor".

8) If VDC and Subaru Select Monitor cannot communicate, check the communication circuit. <Ref. to VDC(diag)-18, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

2. READ CURRENT DATA

1) On the «Main Menu» display, select the {Each System Check}.
2) On the «System Selection Menu» display, select the {Brake Control System}.
3) Click the [OK] button after the {VDC} is displayed.
4) On the «Brake Control Diagnosis» display, select the {Current Data Display & Save}.
5) On the «Data Display Menu» display, select the data display method.
6) Using the scroll key, scroll the display screen up or down until necessary data is shown.

• A list of the support data is shown in the following table.

Display	Contents to be displayed	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h or MPH
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h or MPH
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h or MPH
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h or MPH
Steering Angle Sensor Op	Steering angle detected by steering angle sensor is displayed.	deg
Yaw Rate Sensor Output	Vehicle angular speed detected by yaw rate sensor is displayed.	deg/s
Pressure Sensor Output	Brake fluid pressure detected by pressure sensor is displayed.	bar
Lateral G Sensor output	Vehicle lateral acceleration detected by lateral G sensor is displayed.	m/s (m/s^2)
ABS_CM Power Voltage	Voltage supplied to VDCCM&H/U is displayed.	V
E/G Control Stop Flag	Engine control command signal is displayed.	1 or 0
ABS Control Flag	ABS operation condition is displayed.	ON or OFF
EBD Control Flag	EBD operation condition is displayed.	ON or OFF
TCS Control Flag	TCS operation condition is displayed.	ON or OFF
VDC Control Flag	VDC operation condition is displayed.	ON or OFF
OFF Lamp	ON/OFF condition of VDC OFF indicator light is displayed.	ON or OFF
EBD Warning Light	ON operation of the EBD warning light is displayed.	ON or OFF
ABS Warning Light	ON operation of the ABS warning light is displayed.	ON or OFF
VDC Warning Light	ON operation of the VDC warning light is displayed.	ON or OFF
Valve Relay Signal	Valve relay operation signal is displayed.	ON or OFF
Motor Relay Signal	Motor relay operation signal is displayed.	ON or OFF
M. Relay monitor Voltage	Voltage applied to the motor relay is displayed.	V
OFF SW Signal	Operation condition of VDC OFF switch is displayed.	ON or OFF
Brake Switch	Brake ON/OFF is displayed.	ON or OFF

NOTE:
For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

3. FUNCTION CHECK

Display	Contents of display	Index No.
ABS Sequence Control Mode	Operate the valve and pump motor continuously to perform the ABS sequence control.	<Ref. to ABS-10, ABS Sequence Control.>
VDC Check Mode	Operate the valve and pump motor continuously to perform the VDC sequence control.	<Ref. to VDC-13, VDC Sequence Control.>
Set mode Str. A.Sen.N&Lat.GSen.0p	Set the steering angle sensor neutral position and the lateral G sensor “0” point.	<Ref. to VDC-18, Steering Angle Sensor.>

4. FREEZE FRAME DATA

NOTE:
• Data stored at the time of trouble occurrence is shown on display.
• Each time a trouble occurs, the latest information is stored in the freeze frame data in memory.
• If a freeze frame data is not properly stored in memory (due to a drop in VDCCM power supply, etc.), a DTC suffixed with a question mark "?" will appear on the Subaru Select Monitor display. This shows it may be an unreliable reading.

Display	Contents to be displayed
Steering Angle Sensor Op	Steering angle detected by steering angle sensor is displayed.
Yaw Rate Sensor Output	Vehicle angular speed detected by yaw rate sensor is displayed.
Lateral G Sensor output	Vehicle lateral acceleration detected by lateral G sensor is displayed.
Pressure Sensor Output	Brake fluid pressure detected by pressure sensor is displayed.
Vehicle Speed	Vehicle speed calculated by VDC control module is displayed.
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed in km/h or MPH.
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed in km/h or MPH.
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed in km/h or MPH.
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed in km/h or MPH.
Accel. Opening Angle	Acceleration opening is displayed.
Engine Speed	Engine speed on malfunction occurrence is displayed.
Gear Position	Gear position on malfunction occurrence is displayed.
ABS_CM Power Voltage	Voltage supplied to VDC control module is displayed.
Steering angle flag	Whether the absolute angle of the steering angle sensor was determined is displayed.
E/G Control Stop Flag	Engine control command signal is displayed.
VDC Control Flag	VDC control condition is displayed.
EBD Control Flag	EBD control condition is displayed.
TCS Control Flag	TCS control condition is displayed.
ABS Control Flag	ABS control condition is displayed.
OFF Switch Detection	ON/OFF condition of the VDC operated by the driver is displayed.
Brake Switch	Brake ON/OFF is displayed.

5. PARAMETER SELECTION

CAUTION:
• Subaru Select Monitor is required for parameter selection.
• This function can be used for the replacement VDCCM&H/U and VDCCM.

NOTE:
• When a VDCCM is replaced with a replacement, use this function to select and register parameters to the VDCCM.
• For confirmation of applied models, refer to the "Model number plate" attached to the vehicles. <Ref. to ID-2, IDENTIFICATION, Identification.>
• If a wrong applied model is written, it can be rewritten.
• When no data is registered, ABS/EBD/VDC warning light illuminates and the DTC "Parameter selection error" is detected.
1) Connect the Subaru Select Monitor.
2) On the «Main Menu» display, select the {Each System Check}.
3) On the «System Selection Menu» display, select the {Brake Control System}.
4) Click the [OK] button after the {VDC} is displayed.
5) On the «Brake Control Diagnosis» display, select the {Selection of Parameter}.
6) Check the applied model indicated in the "Model number plate". <Ref. to ID-2, IDENTIFICATION, Identification.>
7) Enter the applied model of 7-digit alphanumeric characters and press the [Enter] key.
8) When the confirmation screen indicating the vehicle information appears, check that the correct applied model and grade are displayed and click the [OK] button.

NOTE:
When the displayed applied model and grade are different from those of the vehicle, perform registration operations again after clicking the [OK] button.
9) Execute Clear Memory after parameter selection and registration operations because the DTC for "Parameter selection error" is memorized.

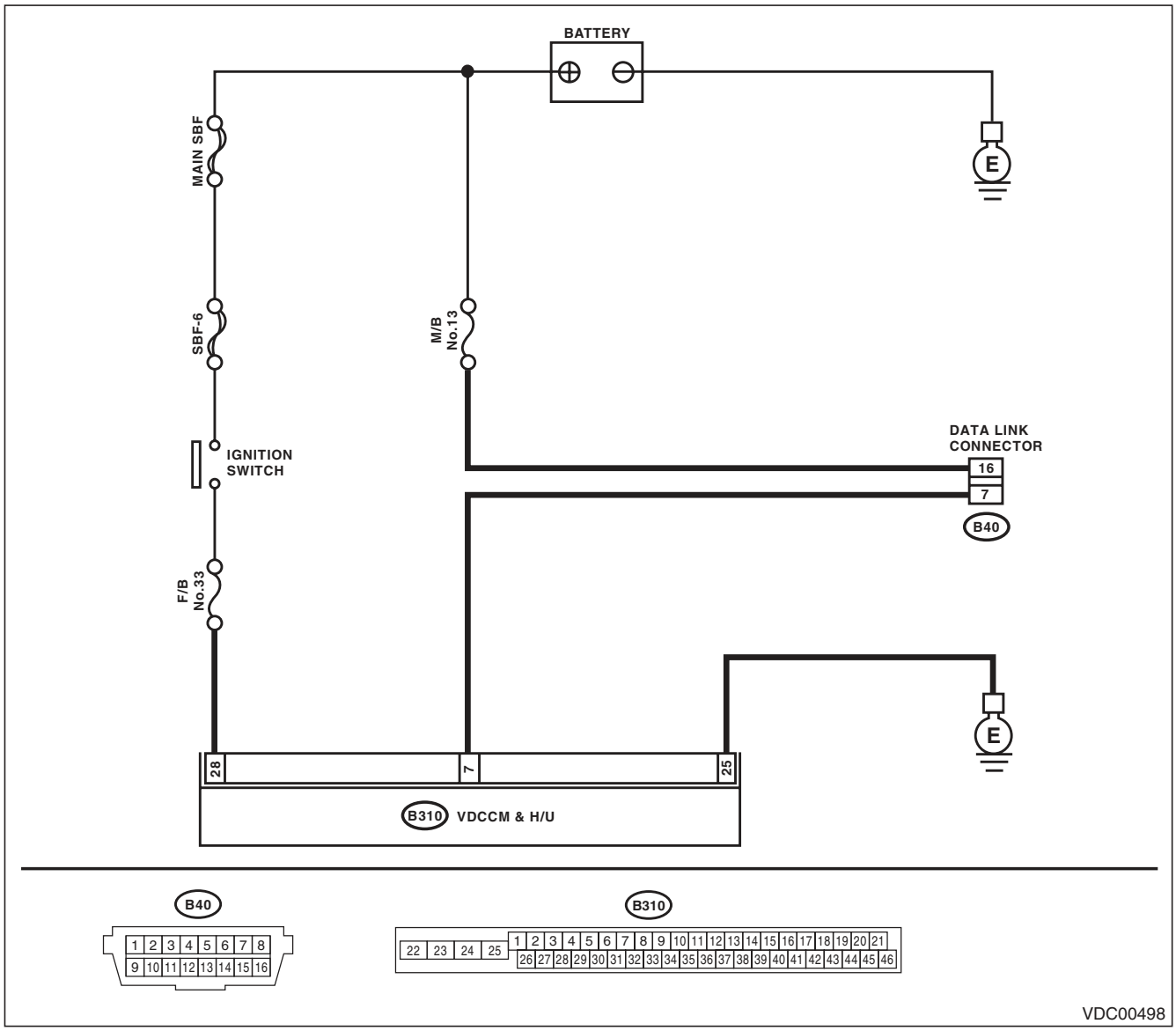
6. PARAMETER CHECK

NOTE:
The parameter data registered in the VDCCM is shown on the display.
1) Connect the Subaru Select Monitor.
2) On the «Main Menu» display, select the {Each System Check}.
3) On the «System Selection Menu» display, select the {Brake Control System}.
4) Click the [OK] button after the {VDC} is displayed.
5) On the «Brake Control Diagnosis» display, select the {Confirm on parameter}.
6) On the {Confirm on parameter} display screen, check that the applied model and grade of the target vehicle are included, and click the [OK] button.
7) If the applied model and grade of the target vehicle are not included on the {Confirm on parameter} display screen, perform parameter selection and registration. <Ref. to VDC(diag)-16, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Communication is impossible between VDC and Subaru Select Monitor.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch ON?	Go to step **2**.	Turn the ignition switch to ON, and select VDC mode using Subaru Select Monitor.
2	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage 11 V or more?	Go to step **3**.	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at the battery terminal?	Repair or tighten the battery terminal.	Go to step **4**.
4	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Go to step **8**.	Go to step **5**.
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U, ECM and TCM. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR VDCCM&H/U.** 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8**.	Repair the harness and connector between each control module and data link connector.
8	**CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND DATA LINK CONNECTOR.** Measure the resistance between VDCCM&H/U connector and data link connector. ***Connector & terminal*** ***(B310) No. 7 — (B40) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **9**.	Repair harness and connector between VDCCM&H/U and data link connector.
9	**CHECK INSTALLATION OF VDCCM&H/U CONNECTOR.** Turn the ignition switch to OFF.	Is the VDCCM&H/U connector inserted into VDCCM&H/U until the clamp locks onto it?	Go to step **10**.	Insert VDCCM&H/U connector into VDCCM&H/U.
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power supply voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **11**.	Repair open circuit in harness between VDCCM&H/U and battery.

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Measure the resistance of harness between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12**.	Repair the open circuit of VDCCM&H/U ground harness and poor contact of connector.
12	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) On the «Main Menu» display, select the {Each System Check}.
2) On the «System Selection Menu» display, select the {Brake Control System}.
3) Click the [OK] button after the {VDC} is displayed.
4) On the «Brake Control Diagnosis» display, select the {Diagnostic Code(s) Display}.
5) Record the DTC and data.

NOTE:
• For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.
• For details concerning DTCs, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>
• Up to 3 DTCs are displayed in the order of detection.
• If a particular DTC is not stored in memory properly at the occurrence of problem (due to a drop in VDCCM&H/U power supply etc.), the DTC suffixed with a question mark “?” is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.

Display	Contents to be displayed
(Current)	The current DTC is displayed on Subaru Select Monitor display screen.
(Old)	The latest DTC in previous troubles is displayed on Subaru Select Monitor display screen.
(Older)	The second latest DTC in previous troubles is displayed on Subaru Select Monitor display screen.
(Before 3)	The third latest DTC in previous troubles is displayed on Subaru Select Monitor display screen.

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as much as possible.
Drive the vehicle at least ten minutes.

NOTE:
Make sure the vehicle is not dragged to one side under usual driving condition.

9. Clear Memory Mode

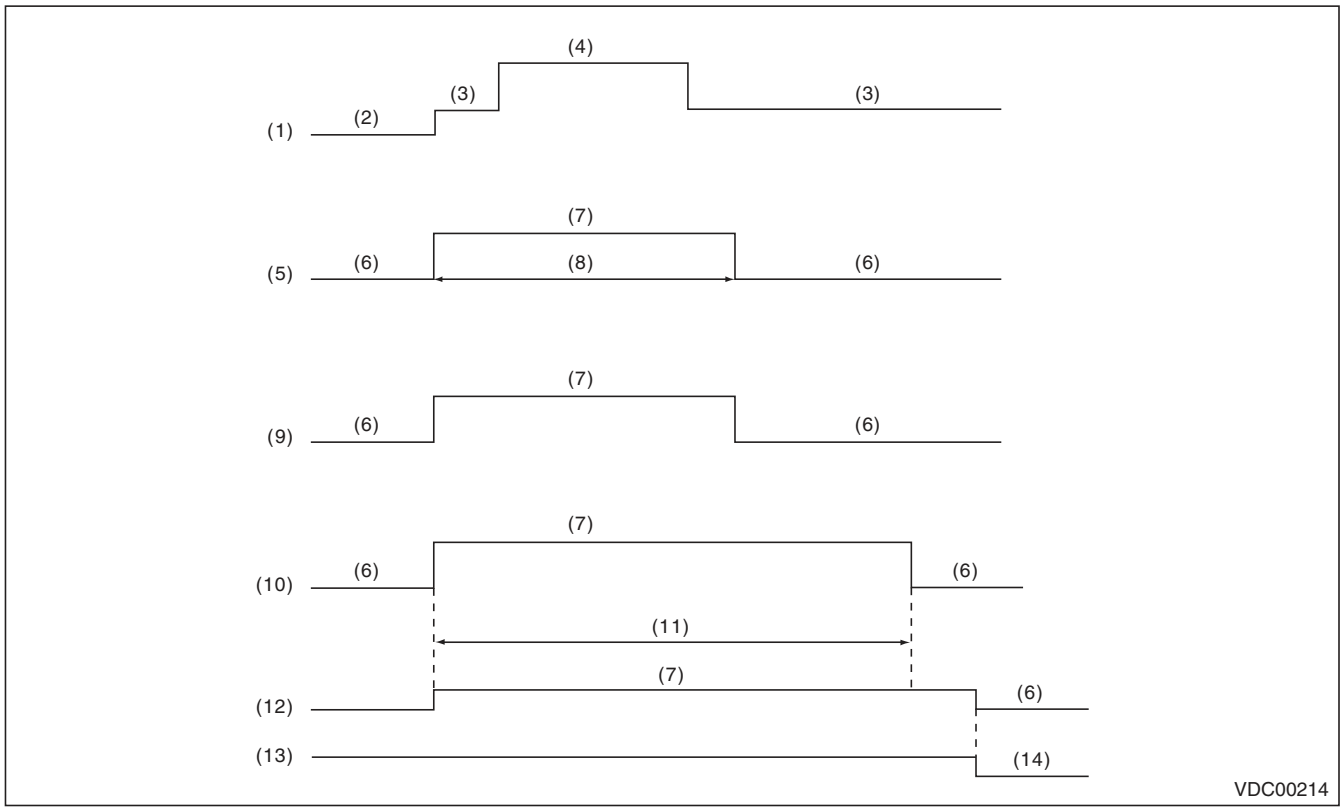
A: OPERATION

1) On the «Main Menu» display, select the {Each System Check}.
2) On the «System Selection Menu» display, select the {Brake Control System}.
3) Click the [OK] button after the {VDC} is displayed.
4) On the «Brake Control Diagnosis» display, select the {Clearing Memory}.
5) When the “Clear Memory?” is shown on the screen, click the [Yes] button.
6) When “Done” and “Turn off the ignition switch.” are shown on the display screen, turn the ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

10. Warning Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Engine start
(5) ABS warning light
(6) Light OFF
(7) Light ON
(8) 2 seconds
(9) VDC indicator light
(10) VDC warning light and VDC OFF indicator light
(11) Several seconds (depending on engine coolant temperature)
(12) Brake warning light (EBD warning light)
(13) Parking brake
(14) Released

1) When warning lights or indicator lights do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When warning lights or indicator lights remain constantly OFF, check the combination meter circuit or CAN communication circuit. <Ref. to VDC(diag)-26, VDC WARNING LIGHT, VDC OFF INDICATOR LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON, Warning Light Illumination Pattern.>
3) When ABS warning light does not go off, check the combination meter circuit. <Ref. to VDC(diag)-29, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>
4) When the VDC indicator light, VDC warning light and VDC OFF indicator light do not go off, check the combination meter circuit or CAN communication circuit. <Ref. to VDC(diag)-30, VDC INDICATOR LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-31, VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.>

NOTE:
• Even though the ABS warning light does not go off after 2 seconds from ABS warning light illumination, the ABS system operates normally when the warning light goes off while driving at approximately 12 km/h (7 MPH). However, the ABS system does not work while the ABS warning light is illuminated.
• It may take several minutes before VDC warning light and VDC OFF indicator light goes off if the vehicle is parked under low temperature for a specified time. This is not defective because it is resulted from low engine coolant temperature.
• With the vehicle jack-up/lift-up or set on free rollers, when the wheels lock or spin after starting the engine, ABS warning light, VDC warning light and VDC OFF indicator light may illuminate because VDCCM&H/U detects the abnormal conditions from ABS wheel speed sensors. In this case, this is not a malfunction. Perform the Clear Memory Mode.

B: VDC WARNING LIGHT, VDC OFF INDICATOR LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), VDC indicator light, VDC warning light and VDC OFF indicator light do not illuminate.

NOTE:
When pressing the VDC OFF switch for 10 seconds or more, the VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the OFF operation enabled status is restored.

	Step	Check	Yes	No
1	**CHECK OTHER INDICATOR LIGHT.** Turn the ignition switch to ON.	Does other indicator light illuminate soon after “ON”.	Go to step **2**.	Perform the self-diagnosis of combination meter.
2	**CHECK VDCCM.** When the engine does not start, display the current data of VDCCM using Subaru Select Monitor.	Is “VDC Warning Light” output set to “ON”?	Go to step **3**.	Replace the VDCCM only.
3	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-27, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **4**.
4	**CHECK COMBINATION METER.** Check the combination meter.	Is combination meter OK?	Replace the VDCCM only.	Repair the combination meter assembly.

C: ABS WARNING LIGHT DOES NOT COME ON

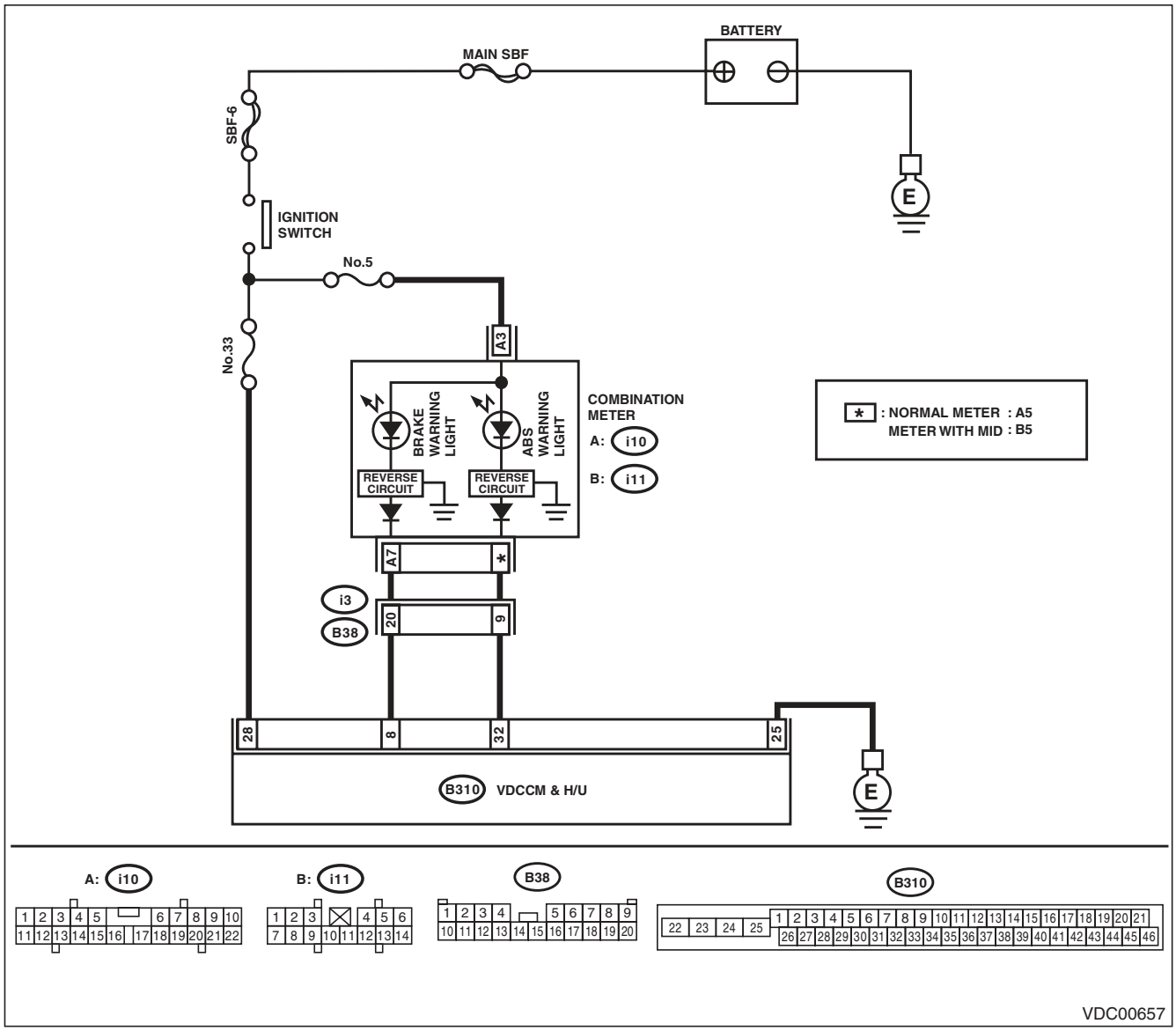
DETECTING CONDITION:

- Defective combination meter
- Defective harness

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OTHER LIGHTS TURN ON.** Turn the ignition switch to ON. (engine OFF)	Do other warning lights illuminate?	Go to step **2**.	Check the combination meter.
2	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-21, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3**.
3	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B310) from the VDCCM&H/U. 3) Disconnect the connector (i10) or (i11) from the combination meter. 4) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 32 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the harness connector between VDCCM&H/U and combination meter.
4	**CHECK VDCCM.** 1) Connect the connector (B310) to VDCCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between the combination meter connector and chassis ground soon after the ignition switch is turned to ON (within 2 seconds). ***Connector & terminal*** ***Normal meter model*** ***(i10) No. 5 — Chassis ground:*** ***Meter with MID model*** ***(i11) No. 5 — Chassis ground:***	Is the resistance 1 MΩ or more?	Check the combination meter.	Replace the VDCCM only.

D: ABS WARNING LIGHT DOES NOT GO OFF

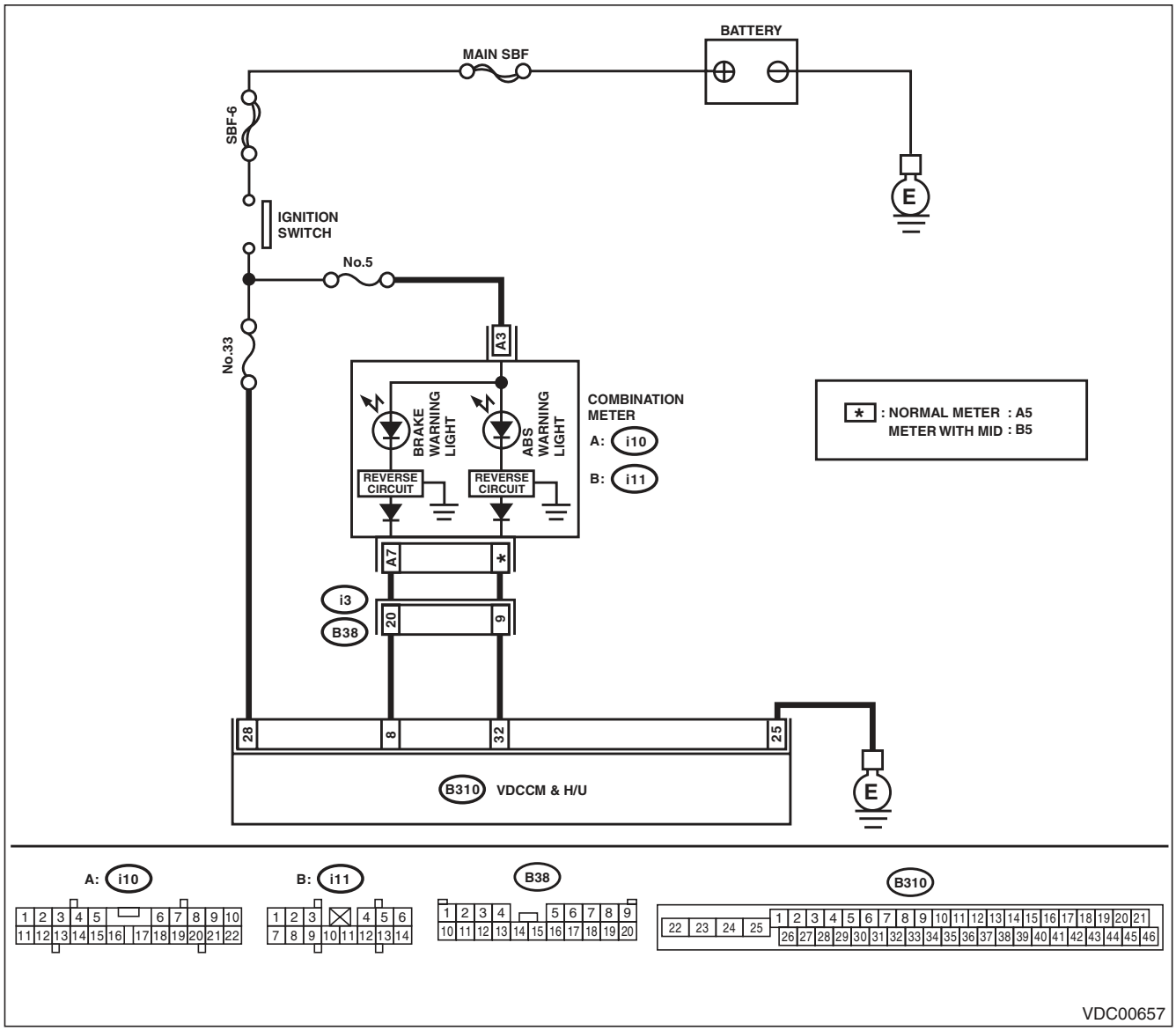
DETECTING CONDITION:

- Defective combination meter
- Open circuit of harness

TROUBLE SYMPTOM:

When starting the engine, the ABS warning light is kept ON.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-21, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B310) from the VDCCM&H/U. 3) Disconnect the connector (i10) or (i11) from the combination meter. 4) Measure the resistance between VDCCM&H/U connector and combination meter connector. ***Connector & terminal*** ***Normal meter model*** ***(B310) No. 32 — (i10) No. 5:*** ***Meter with MID model*** ***(B310) No. 32 — (i11) No. 5:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the harness connector between VDCCM&H/U and combination meter.
3	**CHECK POOR CONTACT IN CONNECTOR.** Check for poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **4**.
4	**CHECK VDCCM.** 1) Connect the connector (B310) to VDCCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***Normal meter model*** ***(i10) No. 5 — Chassis ground:*** ***Meter with MID model*** ***(i11) No. 5 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the VDCCM only.

E: VDC INDICATOR LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When starting the engine, VDC indicator light is kept ON.

Step		Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-21, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-27, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **3**.
3	**CHECK COMBINATION METER.** Check the combination meter.	Is combination meter OK?	Replace the VDCCM only.	Repair the combination meter.

F: VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT DO NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication
- Defective engine
- VDC OFF switch is shorted.

TROUBLE SYMPTOM:

When starting the engine, VDC OFF indicator light is kept ON.

NOTE:
When pressing the VDC OFF switch for 10 seconds or more, the VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the OFF operation enabled status is restored.

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-21, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK ENGINE.**	Does the malfunction indicator light illuminate?	Repair the engine.	Go to step **3**.
3	**CHECK ENGINE COOLANT TEMPERATURE.** Warm up the engine and check if VDC warning light and VDC OFF indicator light illumination condition changes.	When the engine coolant temperature is too low, VDC warning light and VDC OFF indicator light illuminate. Do the lights go off when the engine is warmed up?	Normal operation	Go to step **4**.
4	**CHECK VDC OFF SWITCH.** Remove and check VDC OFF switch. <Ref. to VDC-24, VDC OFF Switch.>	Is the VDC OFF switch normal?	Go to step **5**.	Replace the VDC OFF switch.
5	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-27, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **6**.
6	**CHECK COMBINATION METER.** Check the combination meter.	Is combination meter OK?	Replace the VDCCM only.	Repair the combination meter.

G: BRAKE WARNING LIGHT DOES NOT GO OFF

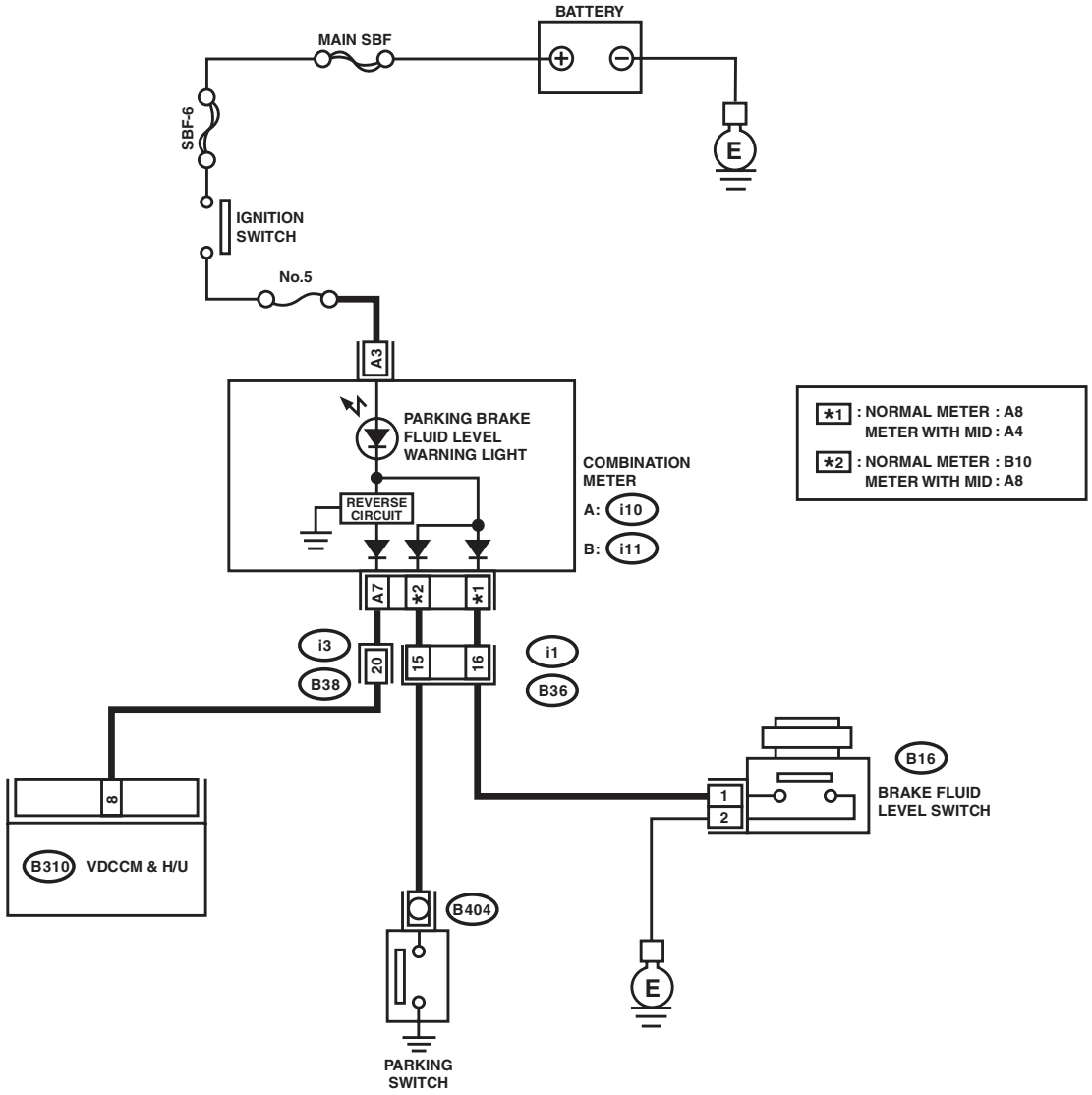
DETECTING CONDITION:

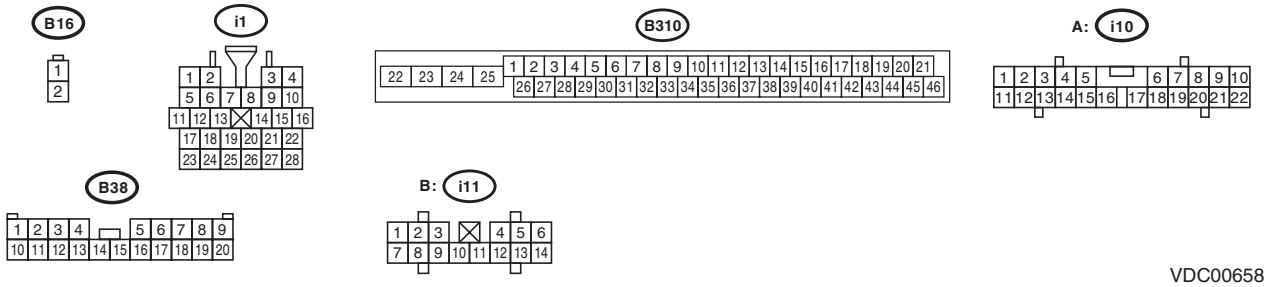
- Brake warning light circuit is shorted.
- Defective sensor/connector

TROUBLE SYMPTOM:

After starting the engine, the brake warning light remains lit though the parking lever is released.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK INSTALLATION OF VDCCM&H/U CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Check that the VDCCM&H/U connector is inserted until it is locked by clamp.	Is the connector firmly inserted?	Go to step **2**.	Insert the VDCCM&H/U connector until it is locked by clamp.
2	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-21, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3**.
3	**CHECK BRAKE FLUID AMOUNT.** Check the amount of brake fluid in the reservoir tank of master cylinder.	Is the amount of brake fluid between the lines of “MAX” and “MIN”?	Go to step **4**.	Replenish brake fluid to the specified value.
4	**CHECK BRAKE FLUID LEVEL SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the level switch connector (B16) from master cylinder. 3) Measure the resistance of master cylinder terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the master cylinder.
5	**CHECK PARKING BRAKE SWITCH.** 1) Disconnect the connector (B404) from parking brake switch. 2) Release the parking brake. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the parking brake switch.
6	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connectors (i10 and i11) from the combination meter. 2) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***Normal meter model*** ***(i10) No. 8 — Chassis ground:*** ***(i11) No. 10 — Chassis ground:*** ***Meter with MID model*** ***(i10) No. 8 — Chassis ground:*** ***(i10) No. 4 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the harness connector between combination meter and brake fluid level switch or parking brake switch.
7	**CHECK HARNESS CONNECTOR.** 1) Disconnect the connector (B310) from the VDCCM&H/U. 2) Disconnect the connector (i10) from combination meter. 3) Measure the resistance between VDCCM&H/U connector and combination meter connector. ***Connector & terminal*** ***(B310) No. 8 — (i10) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **8**.	Repair the harness connector between VDCCM&H/U and combination meter.
8	**CHECK POOR CONTACT IN CONNECTOR.** Check for poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **9**.
9	**CHECK VDCCM.** 1) Connect the connector (B310) to VDCCM&H/U. 2) Turn the ignition to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 7 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the VDCCM only.

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Detailed code	Display	Content of diagnosis	Reference target
C0021	07B0H	Front Right ABS Sensor Circuit Open or Shorted Battery	Open/high input of front ABS wheel speed sensor RH	<Ref. to VDC(diag)-39, DTC C0021 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0022	072FH 0736H 0737H 0738H 073AH 073CH	Front Right ABS Sensor Signal	Front ABS wheel speed sensor RH signal malfunction	<Ref. to VDC(diag)-42, DTC C0022 FRONT RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0023	06B0H	Front Left ABS Sensor Circuit Open or Shorted Battery	Open/high input of front ABS wheel speed sensor LH	<Ref. to VDC(diag)-39, DTC C0023 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0024	062FH 0636H 0637H 0638H 063AH 063CH	Front Left ABS Sensor Signal	Front ABS wheel speed sensor LH signal malfunction	<Ref. to VDC(diag)-42, DTC C0024 FRONT LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0025	09B0H	Rear Right ABS Sensor Circuit Open or Shorted Battery	Open/high input of rear ABS wheel speed sensor RH	<Ref. to VDC(diag)-39, DTC C0025 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0026	092FH 0936H 0937H 0938H 093AH 093CH	Rear Right ABS Sensor Signal	Rear ABS wheel speed sensor RH signal malfunction	<Ref. to VDC(diag)-42, DTC C0026 REAR RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0027	08B0H	Rear Left ABS Sensor Circuit Open or Shorted Battery	Open/high input of rear ABS wheel speed sensor LH	<Ref. to VDC(diag)-40, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0028	082FH 0836H 0837H 0838H 083AH 083CH	Rear Left ABS Sensor Signal	Rear ABS wheel speed sensor LH signal malfunction	<Ref. to VDC(diag)-43, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0029	0A11H 0A21H 0A42H 0A46H 0A50H	Any One of Four ABS Sensors Signal	ABS wheel speed sensor signal malfunction in one of four wheels	<Ref. to VDC(diag)-46, DTC C0029 ANY OF WHEEL SENSORS SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0031	0DB8H 0DC0H	FR Hold Valve malfunction	Front inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0031 FR HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0032	0EB8H 0EC0H	FR Pressure Reducing Valve malfunction	Front outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0032 FR PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Content of diagnosis	Reference target
C0033	0BB8H 0BC0H	FL Hold Valve malfunction	Front inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0033 FL HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0034	0CB8H 0CC0H	FL Pressure Reducing Valve malfunction	Front outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0034 FL PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0035	11B8H 11C0H	RR Hold Valve malfunction	Rear inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0035 RR HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0036	12B8H 12C0H	RR Pressure Reducing Valve malfunction	Rear outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0036 RR PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0037	0FB8H 0FC0H	RL Hold Valve malfunction	Rear inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0037 RL HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0038	10B8H 10C0H	RL Pressure Reducing Valve malfunction	Rear outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0038 RL PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0039	0FB5H 11B5H 1AB5H	Any One of Four Solenoid Valves	Solenoid valve malfunction in one of four wheels	<Ref. to VDC(diag)-49, DTC C0039 ANY ONE OF FOUR SOLENOID VALVES, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0041	—	Electrical Control Module	VDC control module malfunction	<Ref. to VDC(diag)-52, DTC C0041 ECM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1620H 1630H 16C0H	Parameter selection error	VDC control module parameter selection failure	<Ref. to VDC(diag)-54, DTC C0041 PARAMETER SELECTION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0042	0316H 031CH 0322H 0324H	Power Supply Voltage Failure	Power voltage malfunction	<Ref. to VDC(diag)-55, DTC C0042 POWER SUPPLY VOLTAGE FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0044	2921H	TCM Communication Circuit	CAN communication failure of transmission control module	<Ref. to VDC(diag)-57, DTC C0044 TCM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0045	2922H 2932H	Incorrect VDC Control Module specifications	Different VDC control module specification	<Ref. to VDC(diag)-58, DTC C0045 INCORRECT VDC CONTROL MODULE SPECIFICATIONS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2923H	TCM malfunction	AT control module malfunction	<Ref. to VDC(diag)-60, DTC C0045 TCM MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Detailed code	Display	Content of diagnosis	Reference target
C0047	150EH 1512H 1513H 1514H 1518H 1519H 151AH 151BH 151DH 151EH 151FH 1520H 1531H 1540H 15C0H	Improper CAN communication	Improper CAN communication	<Ref. to VDC(diag)-61, DTC C0047 CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0051	021FH 0220H 0221H 0280H 0281H 02B0H 02B1H 02C0H	Valve Relay	Valve Relay	<Ref. to VDC(diag)-63, DTC C0051 VALVE RELAY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0052	0580H	Motor and Motor Relay OFF Failure	Motor/motor relay OFF malfunction	<Ref. to VDC(diag)-65, DTC C0052 MOTOR AND MOTOR RELAY OFF FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	05A0H	Motor and Motor Relay ON Failure	Motor/motor relay ON malfunction	<Ref. to VDC(diag)-67, DTC C0052 MOTOR AND MOTOR RELAY ON FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	0560H	Motor malfunction	Motor	<Ref. to VDC(diag)-68, DTC C0052 MOTOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0054	04B0H	BLS Circuit Open	BLS Circuit Open	<Ref. to VDC(diag)-69, DTC C0054 BLS CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	043CH	BLS ON malfunction	BLS ON malfunction	<Ref. to VDC(diag)-71, DTC C0054 BLS ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	04C1H	BLS OFF Malfunction	BLS OFF Malfunction	<Ref. to VDC(diag)-73, DTC C0054 BLS OFF MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0057	2931H	ECM Communication Circuit	CAN communication failure of engine control module	<Ref. to VDC(diag)-75, DTC C0057 ECM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2933H	ECM Control System	Coordinate control prohibition of engine control module	<Ref. to VDC(diag)-76, DTC C0057 ECM CONTROL SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0061	19B8H 19C0H	Normal Opening Valve 1 malfunction	Secondary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0061 NORMAL OPENING VALVE 1 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0062	1AB8H 1AC0H	Normal Opening Valve 2 malfunction	Primary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0062 NORMAL OPENING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0063	1BB8H 1BC0H	Normal Closing Valve 1 malfunction	Secondary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0063 NORMAL CLOSING VALVE 1 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Content of diagnosis	Reference target
C0064	1CB8H 1CC0H	Normal Closing Valve 2 malfunction	Primary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0071	2130H	Steering Angle Sensor Offset is too big	Excessive steering angle sensor output offset	<Ref. to VDC(diag)-77, DTC C0071 STEERING ANGLE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2134H	Change range of Steering Angle Sensor is too big	Excessive variation amount of steering angle sensor output	<Ref. to VDC(diag)-79, DTC C0071 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	212EH 2132H 2136H 2138H 213CH 2150H 2151H 2152H 2153H 2154H 2155H 2156H 2157H 2158H 2159H 215AH	Steering Angle Sensor Op	Steering angle sensor output	<Ref. to VDC(diag)-81, DTC C0071 STEER ANGLE SENSOR OP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2104H	Steering angle sensor malfunction	Steering angle sensor power supply malfunction	<Ref. to VDC(diag)-83, DTC C0071 STEERING ANGLE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0072	1E03H 1E1AH 1E1EH 1E22H 1E26H 1E28H 1E2CH 1E34H 1E38H 1E3AH 1E3CH 1E3FH 1EACH	Yaw Rate Sensor Output	Yaw rate sensor output	<Ref. to VDC(diag)-85, DTC C0072 ABNORMAL YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1E04H 1E05H 1E07H	Voltage inputted to Yaw Rate Sensor exceeds specification	Yaw rate sensor power supply/output	<Ref. to VDC(diag)-87, DTC C0072 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1EAAH	Abnormal Yaw Rate Sensor reference voltage	Yaw rate sensor reference	<Ref. to VDC(diag)-89, DTC C0072 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1E30H	Change range of Yaw Rate Sensor Signal is too big	Excessive variation amount of yaw rate sensor output	<Ref. to VDC(diag)-91, DTC C0072 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1E06H 1EABH 1EAEH	Yaw Rate Sensor Communication	Yaw rate sensor communication	<Ref. to VDC(diag)-94, DTC C0072 YAW RATE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Detailed code	Display	Content of diagnosis	Reference target
C0073	1D46H 1D47H	Lateral G Sensor offset is too big	Excessive amount of lateral G sensor output offset	<Ref. to VDC(diag)-96, DTC C0073 LATERAL G SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D44H 1D45H 1DA0H 1DA2H	Lateral G Sensor output	Lateral G sensor output	<Ref. to VDC(diag)-96, DTC C0073 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D49H	Excessive Lateral G Sensor signal	Excessive lateral G sensor output	<Ref. to VDC(diag)-97, DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1DA4H	Lateral G Sensor Communication	Lateral G sensor communication	<Ref. to VDC(diag)-93, DTC C0073 LATERAL G SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0074	1F4EH 1F90H 1FA1H 1FB0H 1FB1H 1FC0H	Pressure Sensor	Pressure sensor	<Ref. to VDC(diag)-99, DTC C0074 PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0081	2201H 2202H	System Failure	System Failure	<Ref. to VDC(diag)-100, DTC C0081 SYSTEM FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC C0021 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:
For the diagnostic procedure, refer to DTC C0027 “RL WHEEL SPEED SENSOR CIRCUIT OPEN/HIGH INPUT”. <Ref. to VDC(diag)-40, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC C0023 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:
For the diagnostic procedure, refer to DTC C0027 “RL WHEEL SPEED SENSOR CIRCUIT OPEN/HIGH INPUT”. <Ref. to VDC(diag)-40, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC C0025 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:
For the diagnostic procedure, refer to DTC C0027 “RL WHEEL SPEED SENSOR CIRCUIT OPEN/HIGH INPUT”. <Ref. to VDC(diag)-40, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

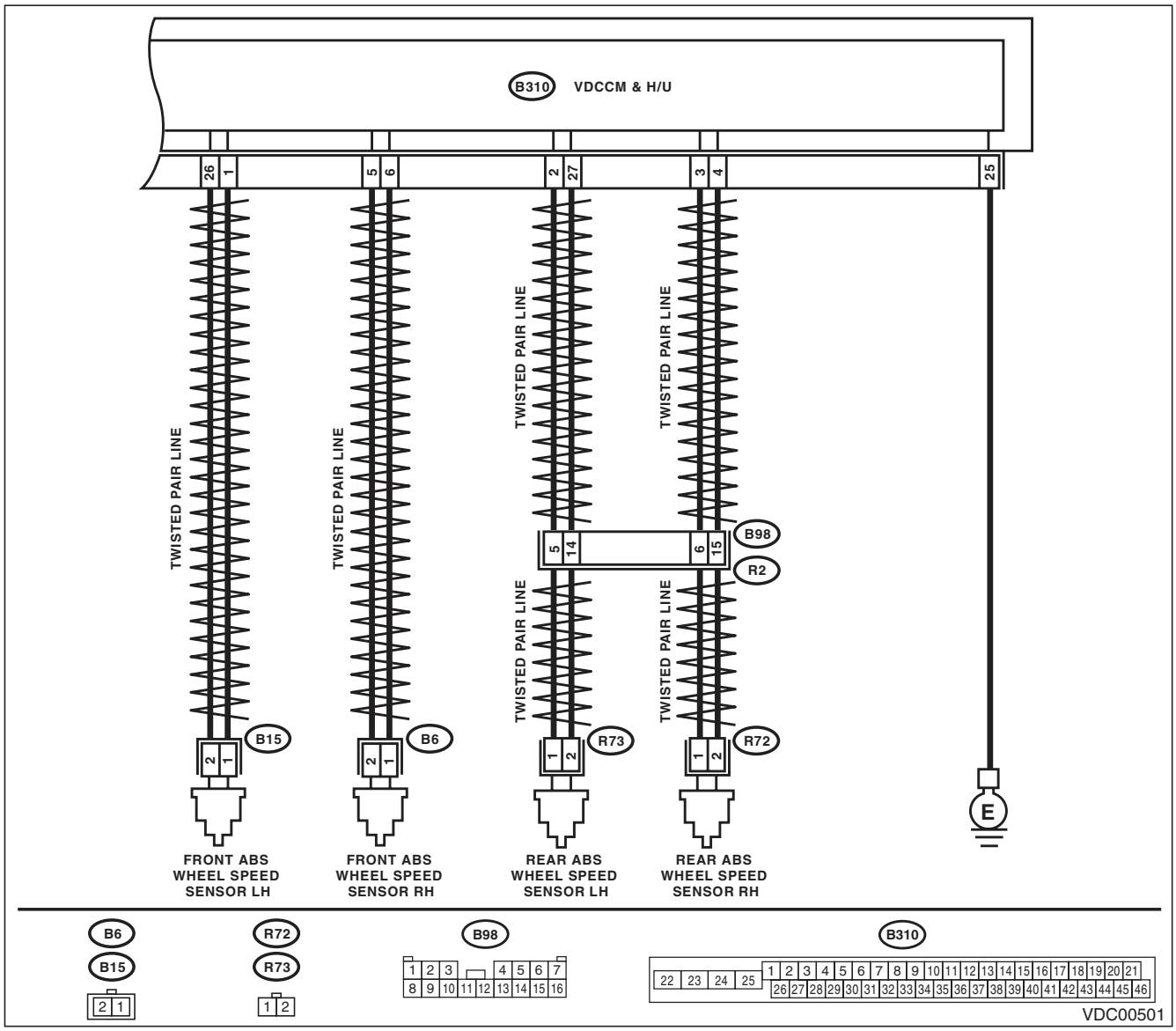
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTOR.** Check if there is poor contact between VDCCM&H/U and ABS wheel speed sensor.	Is there poor contact?	Repair the connector.	Go to step **2**.
2	**CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector (B310) from the VDCCM&H/U. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance between VDCCM&H/U connector and ABS wheel speed sensor connector. ***Connector & terminal*** ***DTC C0021*** ***(B310) No. 6 — (B6) No. 1:*** ***(B310) No. 5 — (B6) No. 2:*** ***DTC C0023*** ***(B310) No. 1 — (B15) No. 1:*** ***(B310) No. 26 — (B15) No. 2:*** ***DTC C0025*** ***(B310) No. 3 — (R72) No. 1:*** ***(B310) No. 4 — (R72) No. 2:*** ***DTC C0027*** ***(B310) No. 2 — (R73) No. 1:*** ***(B310) No. 27 — (R73) No. 2:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the harness connector between VDCCM&H/U and ABS wheel speed sensor.
3	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC C0021*** ***(B310) No. 6 — Chassis ground:*** ***DTC C0023*** ***(B310) No. 1 — Chassis ground:*** ***DTC C0025*** ***(B310) No. 4 — Chassis ground:*** ***DTC C0027*** ***(B310) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the harness connector between VDCCM&H/U and ABS wheel speed sensor.
4	**CHECK ABS WHEEL SPEED SENSOR POWER SUPPLY CIRCUIT.** 1) Connect the VDCCM&H/U connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ABS wheel speed sensor connector and chassis ground. ***Connector & terminal*** ***DTC C0021*** ***(B6) No. 2 (+) — Chassis ground (–):*** ***DTC C0023*** ***(B15) No. 2 (+) — Chassis ground (–):*** ***DTC C0025*** ***(R72) No. 1 (+) — Chassis ground (–):*** ***DTC C0027*** ***(R73) No. 1 (+) — Chassis ground (–):***	Is the voltage 5 — 16 V?	Go to step **6**.	Go to step **5**.

	Step	Check	Yes	No
5	**CHECK VDCCM&H/U POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector terminals. ***Connector & terminal*** ***(B310) No. 28 (+) — (B310) No. 25 (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Check the generator, battery and VDCCM&H/U power supply circuit.
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to ABS-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Is the pattern the same waveform as shown in the figure?	Go to step **7**.	Replace the ABS wheel speed sensor.
7	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, PROCEDURE, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

E: DTC C0022 FRONT RIGHT ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC C0028 “RL WHEEL SPEED SENSOR SIGNAL”. <Ref. to VDC(diag)-43, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC C0024 FRONT LEFT ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC C0028 “RL WHEEL SPEED SENSOR SIGNAL”. <Ref. to VDC(diag)-43, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC C0026 REAR RIGHT ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC C0028 “RL WHEEL SPEED SENSOR SIGNAL”. <Ref. to VDC(diag)-43, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC C0028 REAR LEFT ABS SENSOR SIGNAL

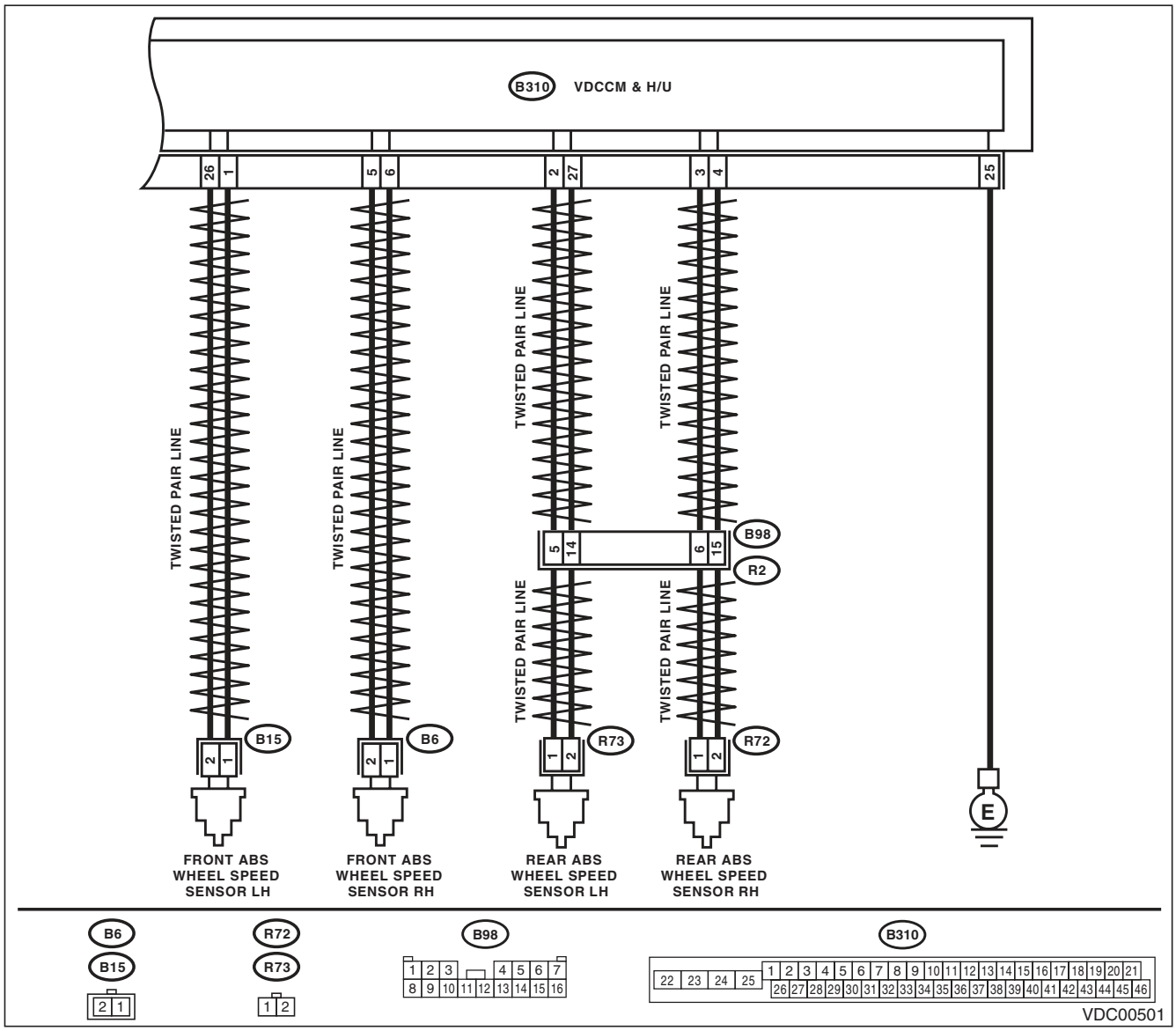
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in the Subaru Select Monitor. 2) Read the defective ABS wheel speed sensor output.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step **2**.	Go to step **7**.
2	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.** Make sure the radio wave devices and electronic components are installed correctly.	Are the radio wave devices and electronic components installed correctly?	Go to step **4**.	Install the radio wave devices and electronic components properly.
4	**CHECK CAUSE OF SIGNAL NOISE.** Check if the noise sources (such as an antenna) are installed near the sensor harness.	Are noise sources installed?	Install the noise sources apart from sensor harness.	Go to step **5**.
5	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, PROCEDURE, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.
7	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **8**.	Tighten the ABS wheel speed sensor installation bolts.
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to ABS-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for one rotation or more?	Go to step **10**.	Go to step **9**.
9	**CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.**	Are there foreign matter, breakage or damage at the tip of ABS wheel speed sensor or magnetic encoder?	Remove dirt thoroughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step **10**.
10	**CHECK CAUSE OF SIGNAL NOISE.** Make sure the radio wave devices and electronic components are installed correctly.	Are the radio wave devices and electronic components installed correctly?	Go to step **11**.	Install the radio wave devices and electronic components properly.

	Step	Check	Yes	No
11	**CHECK CAUSE OF SIGNAL NOISE.** Check if the noise sources (such as an antenna) are installed near the sensor harness.	Is the noise sources installed?	Go to step **12**.	Install the noise sources apart from sensor harness.
12	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, PROCEDURE, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **13**.
13	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

I: DTC C0029 ANY OF WHEEL SENSORS SIGNAL

DTC DETECTING CONDITION:

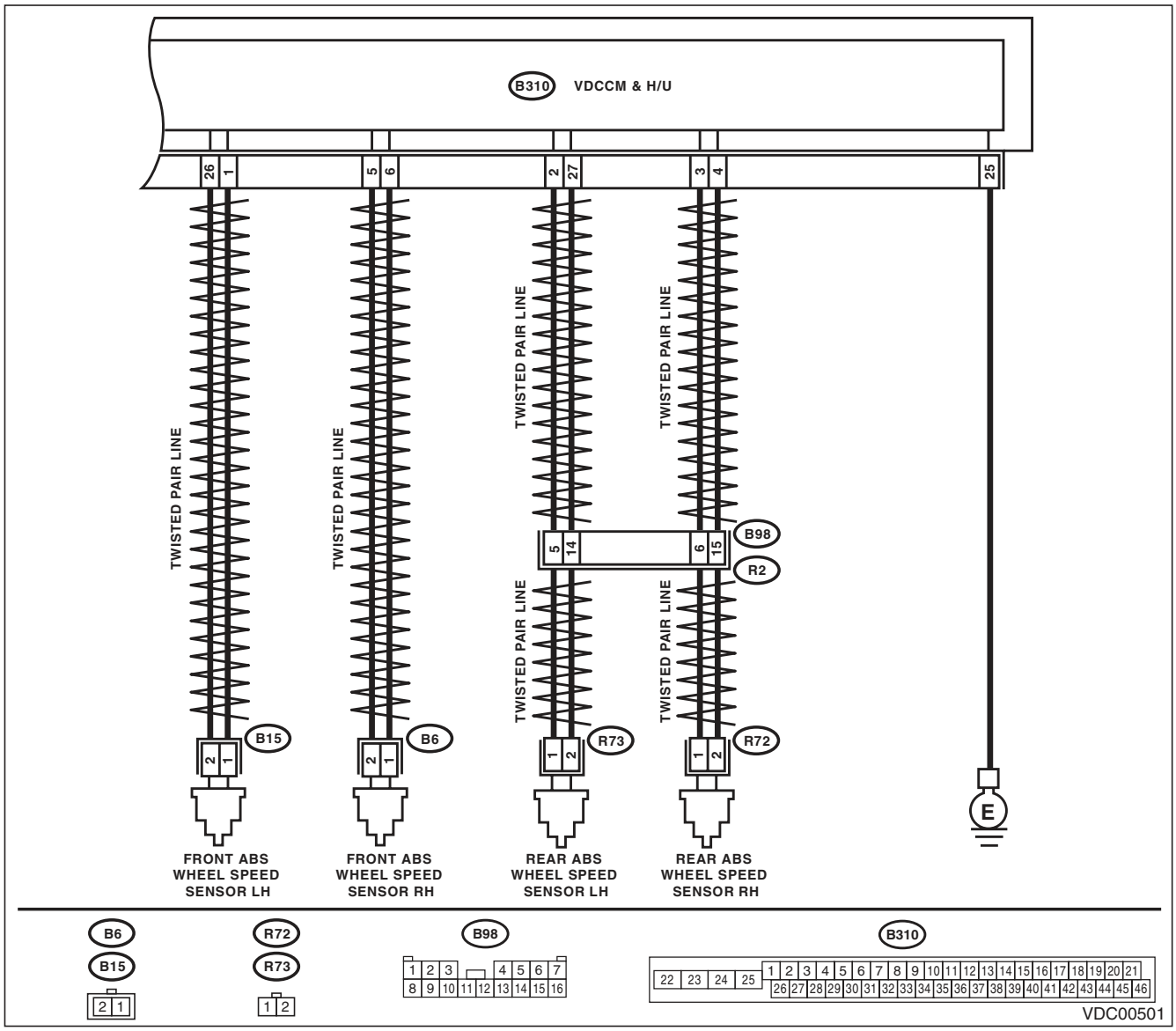
- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Defective magnetic encoder
- When a wheel is turned freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

NOTE:
Brake warning light illuminates as well as ABS warning light when EBD does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.** Check if the wheels have been turned freely for one minute or more, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface.	Did the wheels turn freely?	VDC is normal. Clear the memory. NOTE: This diagnostic trouble code may sometimes occur if the wheels turn freely for a long time, for example when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way.	Go to step **2**.
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3**.	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4**.
4	**CHECK TIRE INFLATION PRESSURE.**	Is the tire pressure correct?	Go to step **5**.	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)? (For four wheels)	Go to step **6**.	Tighten the ABS wheel speed sensor installation bolts.
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to ABS-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for one rotation or more?	Go to step **8**.	Go to step **7**.
7	**CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.**	Are there foreign matter, breakage or damage at the tip of ABS wheel speed sensor or magnetic encoder?	Remove dirt thoroughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step **8**.
8	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, PROCEDURE, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **9**.

Step		Check	Yes	No
9	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

J: DTC C0031 FR HOLD VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC C0032 FR PRESSURE REDUCING VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC C0033 FL HOLD VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC C0034 FL PRESSURE REDUCING VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC C0035 RR HOLD VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC C0036 RR PRESSURE REDUCING VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC C0037 RL HOLD VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC C0038 RL PRESSURE REDUCING VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC C0039 ANY ONE OF FOUR SOLENOID VALVES

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

S: DTC C0061 NORMAL OPENING VALVE 1 MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

T: DTC C0062 NORMAL OPENING VALVE 2 MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC C0063 NORMAL CLOSING VALVE 1 MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “VDC SWITCHING VALVE 2 (P)”. <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

V: DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION

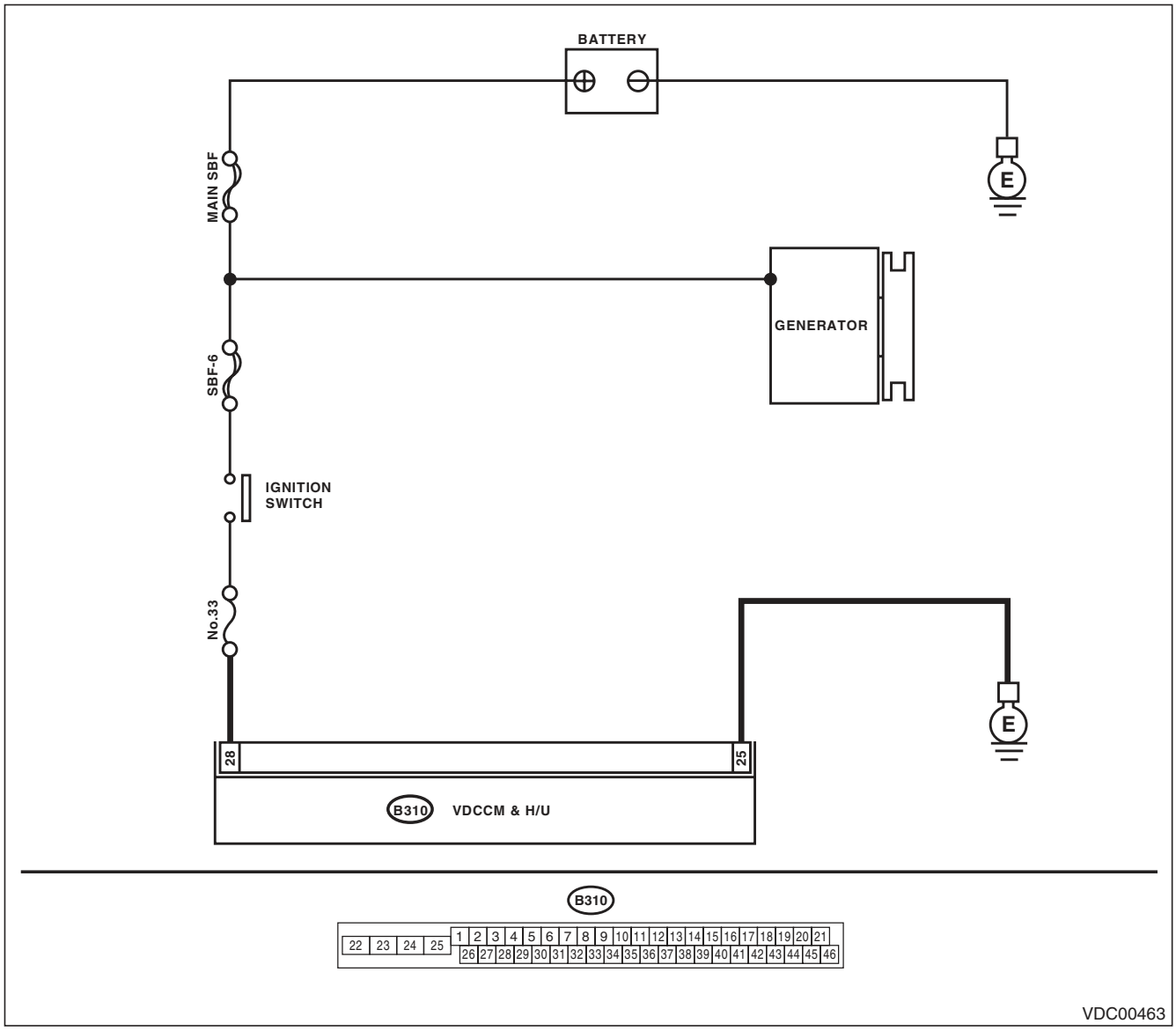
DTC DETECTING CONDITION:

- Defective harness connector
- Defective VDCH/U solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:

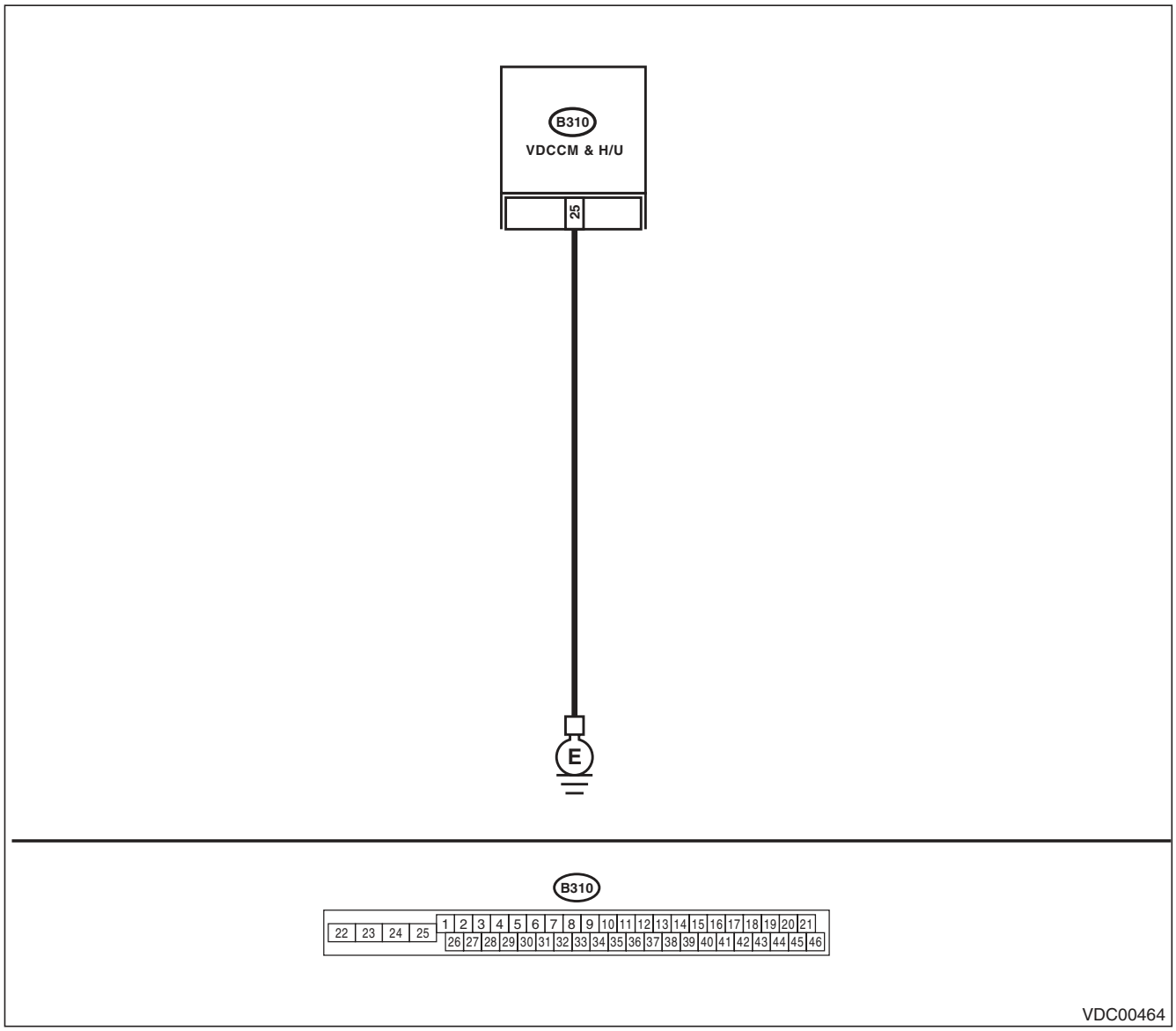


	Step	Check	Yes	No
1	**CHECK VDCCM&H/U INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the power supply circuit.
2	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the VDCCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **4**.
4	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

W: DTC C0041 ECM

DTC DETECTING CONDITION:
Defective VDCCM&H/U
TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Measure the resistance between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2**.	Repair the VDCCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact of the connector between the battery, ignition switch and VDCCM&H/U?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.**	Are the radio wave devices and electronic components installed correctly?	Go to step **4**.	Install the radio wave devices and electronic components properly.
4	**CHECK CAUSE OF SIGNAL NOISE.**	Is there a noise source (such as an antenna) installed near the sensor harness?	Install the noise source apart from the sensor harness.	Go to step **5**.
5	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

X: DTC C0041 PARAMETER SELECTION ERROR

DTC DETECTING CONDITION:
VDCCM parameter selection failure
TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

NOTE:
When the VDCCM or VDCCM&H/U is replaced, this DTC may be memorized.

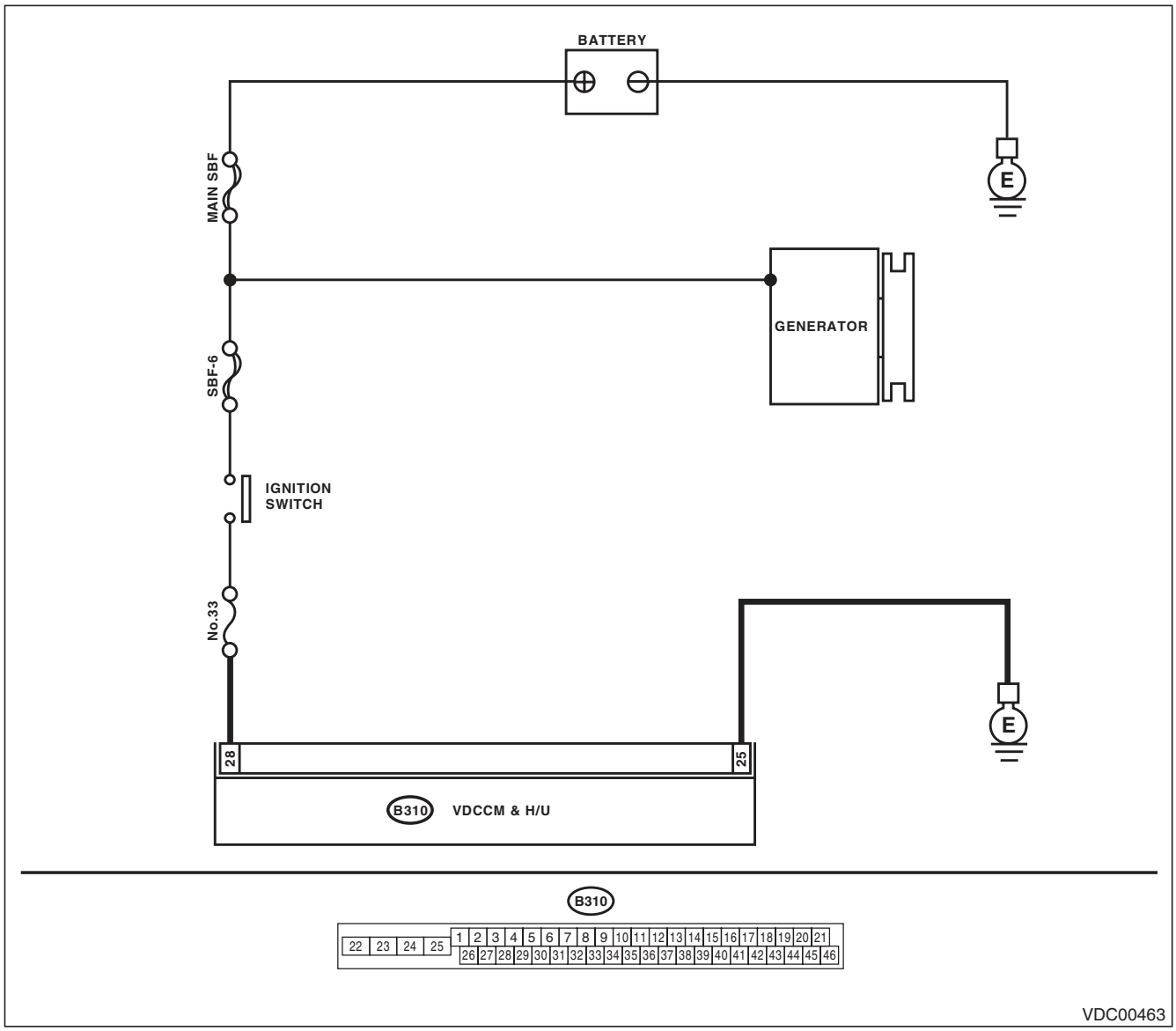
	Step	Check	Yes	No
1	**CHECK VDCCM&H/U REPLACEMENT HISTORY.**	Is there replacement history of VDCCM alone?	Go to step **2**.	Go to step **3**.
2	**CHECK VDCCM IDENTIFICATION NUMBER.** Check the identification number on the sticker attached on the VDCCM side. AT: T3 (2.5 L turbo models and OUTBACK 3.0 L models) T7 (Sedan 3.0L with 18 inch tire model) TA (2.5L non-turbo model and sedan 3.0L with 17 inch tire model) MT: T4 (2.5L turbo model) TB (2.5L non-turbo model)	Is the identification number correct?	Go to step **4**.	Replace the VDCCM only.
3	**CHECK VDCCM&H/U IDENTIFICATION NUMBER.** Check the identification number stamped on the upper side of the H/U. AT: T3 (2.5 L turbo models and OUTBACK 3.0 L models) T7 (Sedan 3.0L with 18 inch tire model) TA (2.5L non-turbo model and sedan 3.0L with 17 inch tire model) MT: T4 (2.5L turbo model) TB (2.5L non-turbo model)	Is the identification number correct?	Go to step **4**.	Replace the VDCCM&H/U.
4	**CHECK PARAMETER SELECTED FOR VDCCM.** <Ref. to VDC(diag)-17, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>	Does the parameter registered to the VDCCM match with the target vehicle?	Replace the VDCCM only.	Select and register the correct parameter. <Ref. to VDC(diag)-16, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

Y: DTC C0042 POWER SUPPLY VOLTAGE FAILURE

DTC DETECTING CONDITION:
Improper VDCCM&H/U power supply voltage
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD may not operate.
- VDC does not operate.

NOTE:
Warning lights go off if voltage returns.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator terminal B and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the generator.
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals clamped tightly?	Go to step **3**.	Tighten the terminal.
3	**CHECK VDCCM&H/U INPUT VOLTAGE.** 1) Disconnect the connector from the VDCCM&H/U. 2) Run the engine at idle. 3) Operate devices such as headlights, air conditioner, defogger, etc. which produce an electrical load. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5**.	Repair the VDCCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Z: DTC C0044 TCM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:
No CAN signal from TCM.
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-27, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **2**.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in TCM connector?	Repair the connector.	Go to step **3**.
3	**CHECK TCM.**	Is the TCM normal?	Go to step **4**.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).> <Ref. to 5AT-60, Transmission Control Module (TCM).>
4	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only.	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AA:DTC C0045 INCORRECT VDC CONTROL MODULE SPECIFICATIONS

DTC DETECTING CONDITION:
Different control module specification
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

NOTE:
When parameter selection for VDCCM is improper, this DTC may be memorized.

	Step	Check	Yes	No
1	**CHECK VDCCM REPLACEMENT HISTORY.**	Is there replacement history of VDCCM alone?	Go to step **2**.	Go to step **3**.
2	**CHECK VDCCM IDENTIFICATION NUMBER.** Check the identification number on the sticker attached on the VDCCM side. AT: T3 (2.5 L turbo models and OUTBACK 3.0 L models) T7 (Sedan 3.0L with 18 inch tire model) TA (2.5L non-turbo model and sedan 3.0L with 17 inch tire model) MT: T4 (2.5L turbo model) TB (2.5L non-turbo model)	Is the identification number correct?	Go to step **4**.	Replace the VDCCM only.
3	**CHECK VDCCM&H/U IDENTIFICATION NUMBER.** Check the identification number stamped on the upper side of the H/U. AT: T3 (2.5 L turbo models and OUTBACK 3.0 L models) T7 (Sedan 3.0L with 18 inch tire model) TA (2.5L non-turbo model and sedan 3.0L with 17 inch tire model) MT: T4 (2.5L turbo model) TB (2.5L non-turbo model)	Is the identification number correct?	Go to step **4**.	Replace the VDCCM&H/U.
4	**CHECK PARAMETER SELECTED FOR VDCCM.** <Ref. to VDC(diag)-17, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>	Does the parameter registered to the VDCCM match with the target vehicle?	Go to step **5**.	Select and register the correct parameter. <Ref. to VDC(diag)-16, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>
5	**CHECK TCM SPECIFICATION.** Check the TCM specification.	Is the specification of TCM same as vehicle specification?	Go to step **6**.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).> <Ref. to 5AT-60, Transmission Control Module (TCM).>
6	**CHECK AT SYSTEM.** 1) Start the engine. 2) Check the DTC in AT system.	Is DTC of AT system displayed?	Repair the AT system.	Go to step **7**.

	Step	Check	Yes	No
7	**CHECK ECM SPECIFICATION.** Check the ECM specification.	Is the specification of ECM same as vehicle specification?	Go to step **8**.	Replace the ECM. <Ref. to FU(H4SO)-39, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-52, Engine Control Module (ECM).> <Ref. to FU(H6DO)-38, Engine Control Module (ECM).>
8	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only.	Go to step **9**.
9	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AB:DTC C0045 TCM MALFUNCTION

DTC DETECTING CONDITION:
Defective TCM
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK AT SYSTEM.** 1) Start the engine. 2) Check the DTC in AT system.	Is DTC of AT system displayed?	Repair the AT system.	Go to step **2**.
2	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only.	Go to step **3**.
3	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AC:DTC C0047 CAN COMMUNICATION

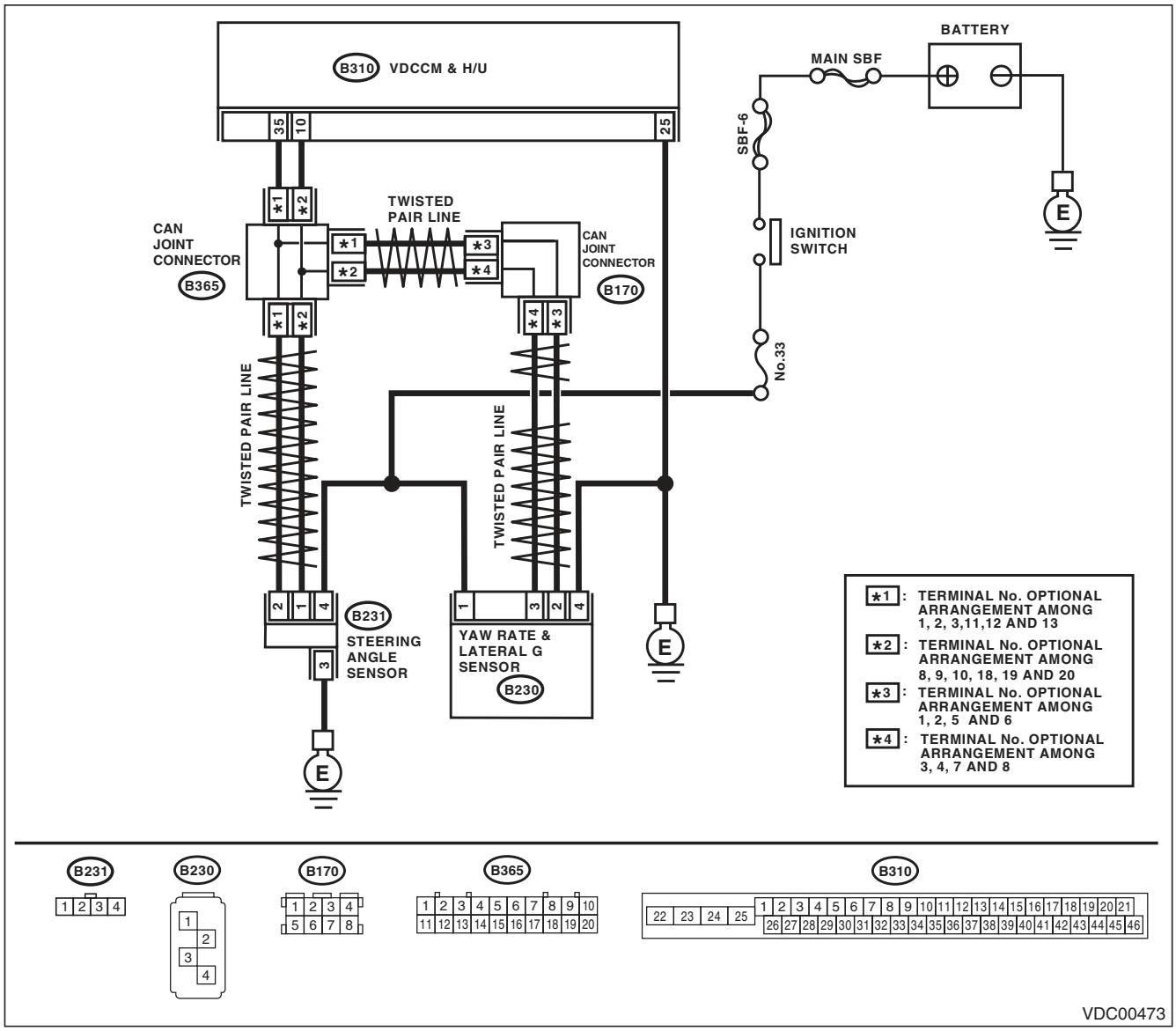
DTC DETECTING CONDITION:

CAN communication line circuit is open or shorted.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-27, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **2**.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM&H/U connector?	Repair the connector.	Go to step **3**.
3	**CHECK OUTPUT OF STEERING ANGLE SENSOR.** Connect the Subaru Select Monitor and check output of the steering angle sensor.	Does the output signal change?	Go to step **4**.	Check output of the steering angle sensor. <Ref. to VDC(diag)-81, DTC C0071 STEER ANGLE SENSOR OP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
4	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR.** Connect the Subaru Select Monitor and check output of the yaw rate & lateral G sensor.	Does the output signal change?	Go to step **5**.	Check output of the yaw rate & lateral G sensor. <Ref. to VDC(diag)-94, DTC C0072 YAW RATE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
5	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Temporary poor contact occurs.

AD:DTC C0051 VALVE RELAY

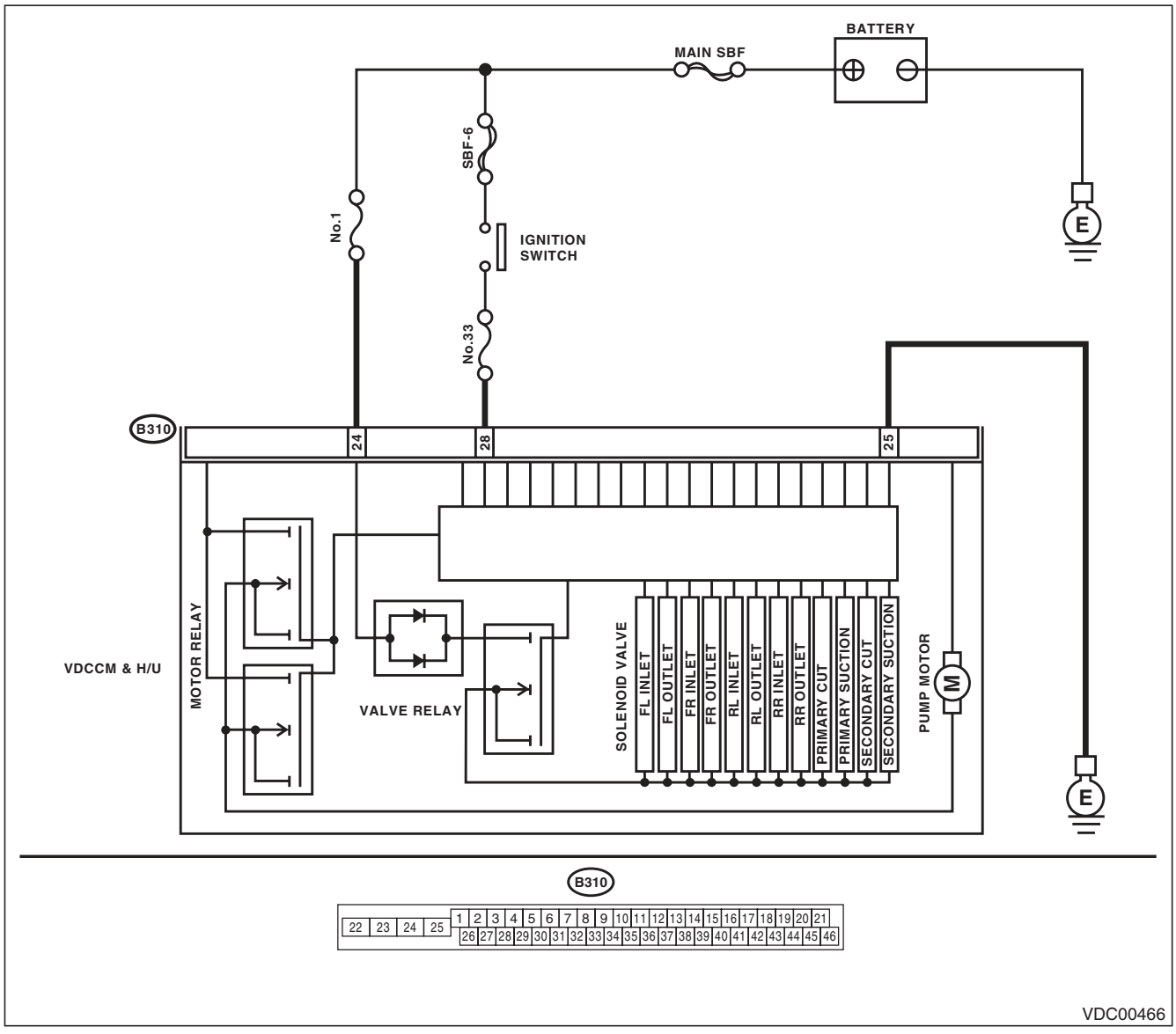
DTC DETECTING CONDITION:

Defective valve relay

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VDCCM&H/U INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):*** ***(B310) No. 24 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the power supply circuit.
2	**CHECK VDCCM&H/U INPUT VOLTAGE.** Calculate the voltage difference measured in step 1. A: (B310) No. 28 (+) — Chassis ground (–): B: (B310) No. 24 (+) — Chassis ground (–):	Is the voltage difference between A and B 2 V or more?	Repair the power supply circuit.	Go to step **3**.
3	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Repair the VDCCM&H/U ground harness.
4	**CHECK VDCCM&H/U VALVE RELAY.** Measure the resistance between VDCCM&H/U connector terminals. ***Connector & terminal*** ***(B310) No. 24 — (B310) No. 25:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the VDCCM&H/U.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AE:DTC C0052 MOTOR AND MOTOR RELAY OFF FAILURE

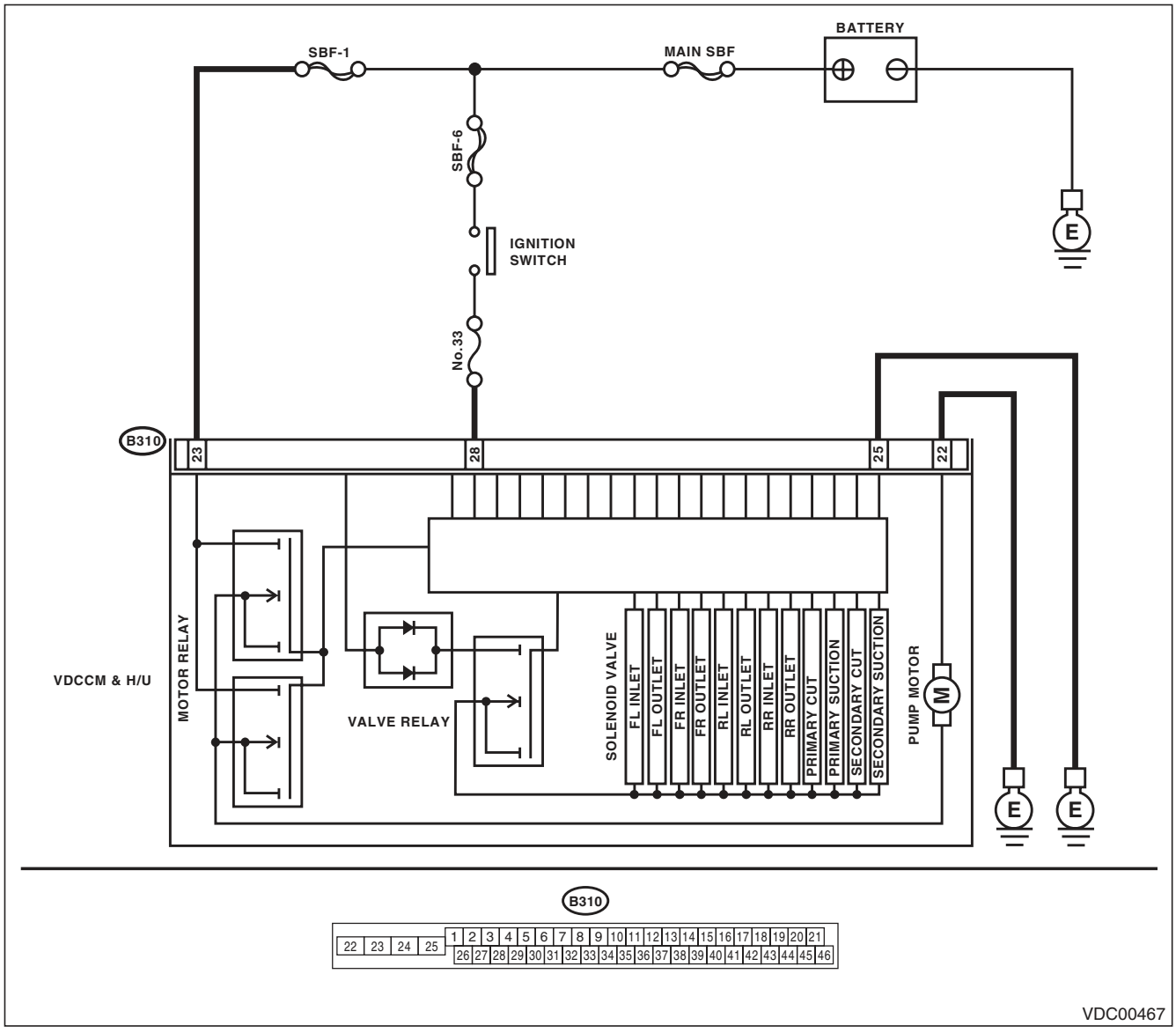
DTC DETECTING CONDITION:

- Defective motor and motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VDCCM&H/U INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the VDCCM&H/U power supply circuit.
2	**CHECK INSTALLATION OF MOTOR GROUND.**	Is the motor ground terminal installation bolt tightened 33 N·m (3.4 kgf-m, 24.3 ft-lb)?	Go to step **3**.	Tighten the motor ground terminal installation bolt.
3	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:*** ***(B310) No. 22 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Repair the VDCCM&H/U ground harness.
4	**CHECK VDCCM&H/U MOTOR RELAY.** Measure the resistance between VDCCM&H/U connector terminals. ***Terminals*** ***No. 23 — No. 22:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the VDCCM&H/U.
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

AF:DTC C0052 MOTOR AND MOTOR RELAY ON FAILURE

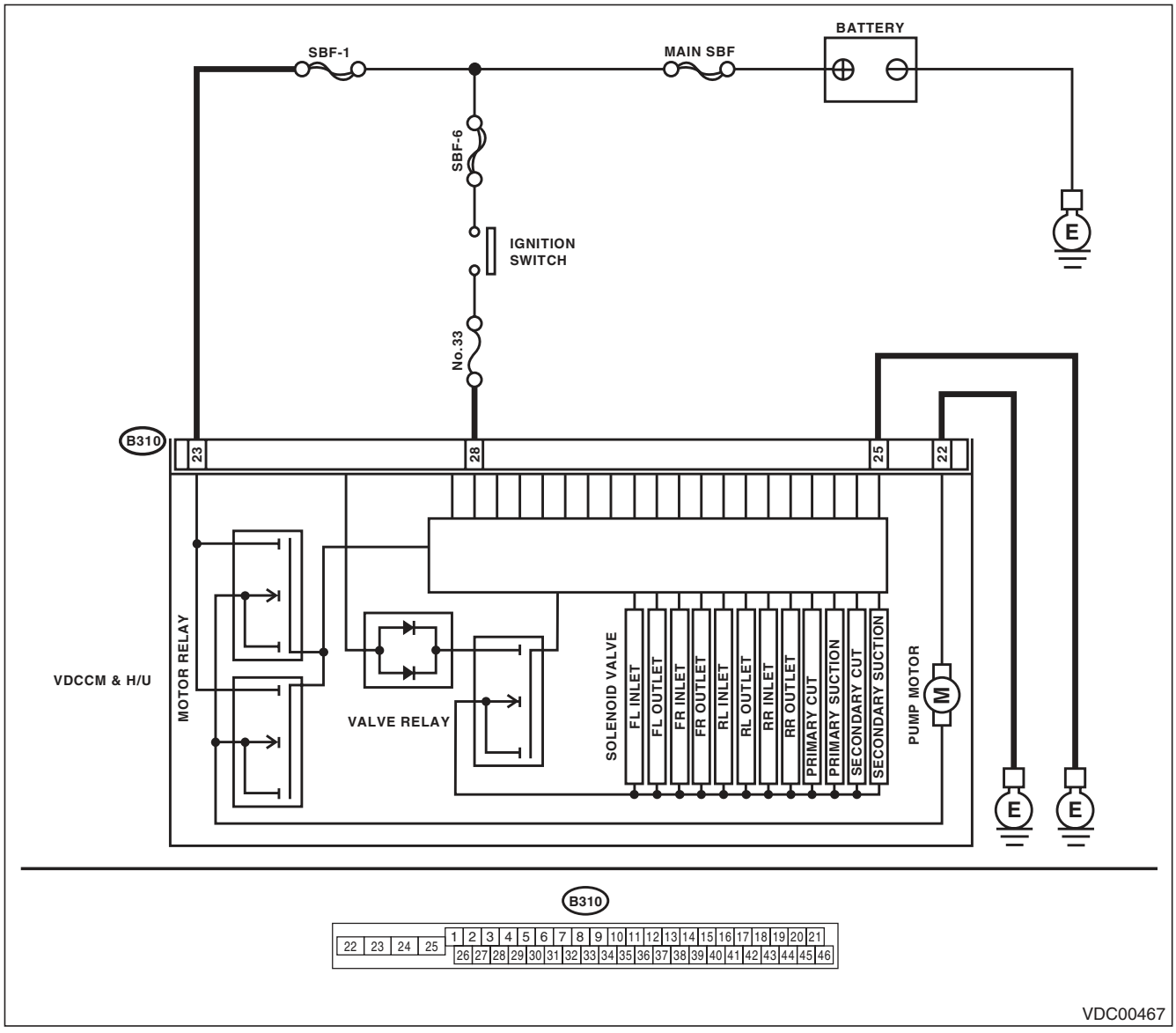
DTC DETECTING CONDITION:

- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VDCCM&H/U MOTOR RELAY.** 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U connector terminals. ***Terminals*** ***No. 23 — No. 22:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
2	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **3**.
3	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

AG:DTC C0052 MOTOR MALFUNCTION

DTC DETECTING CONDITION:

- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

NOTE:
For the diagnostic procedure, refer to DTC C0052 “MOTOR/MOTOR RELAY OFF FAILURE”. <Ref. to VDC(diag)-65, DTC C0052 MOTOR AND MOTOR RELAY OFF FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AH:DTC C0054 BLS CIRCUIT OPEN

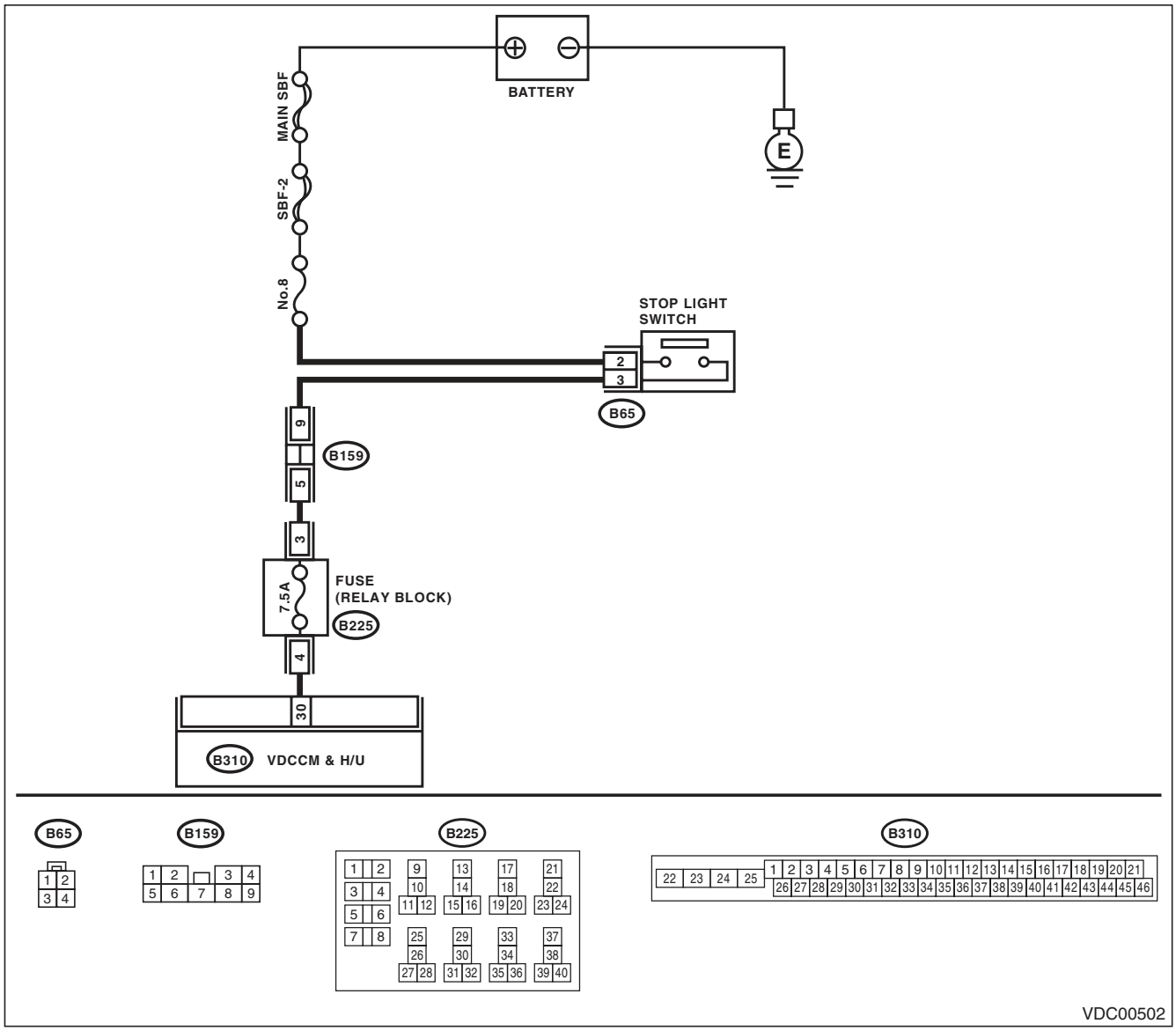
DTC DETECTING CONDITION:

Defective stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:

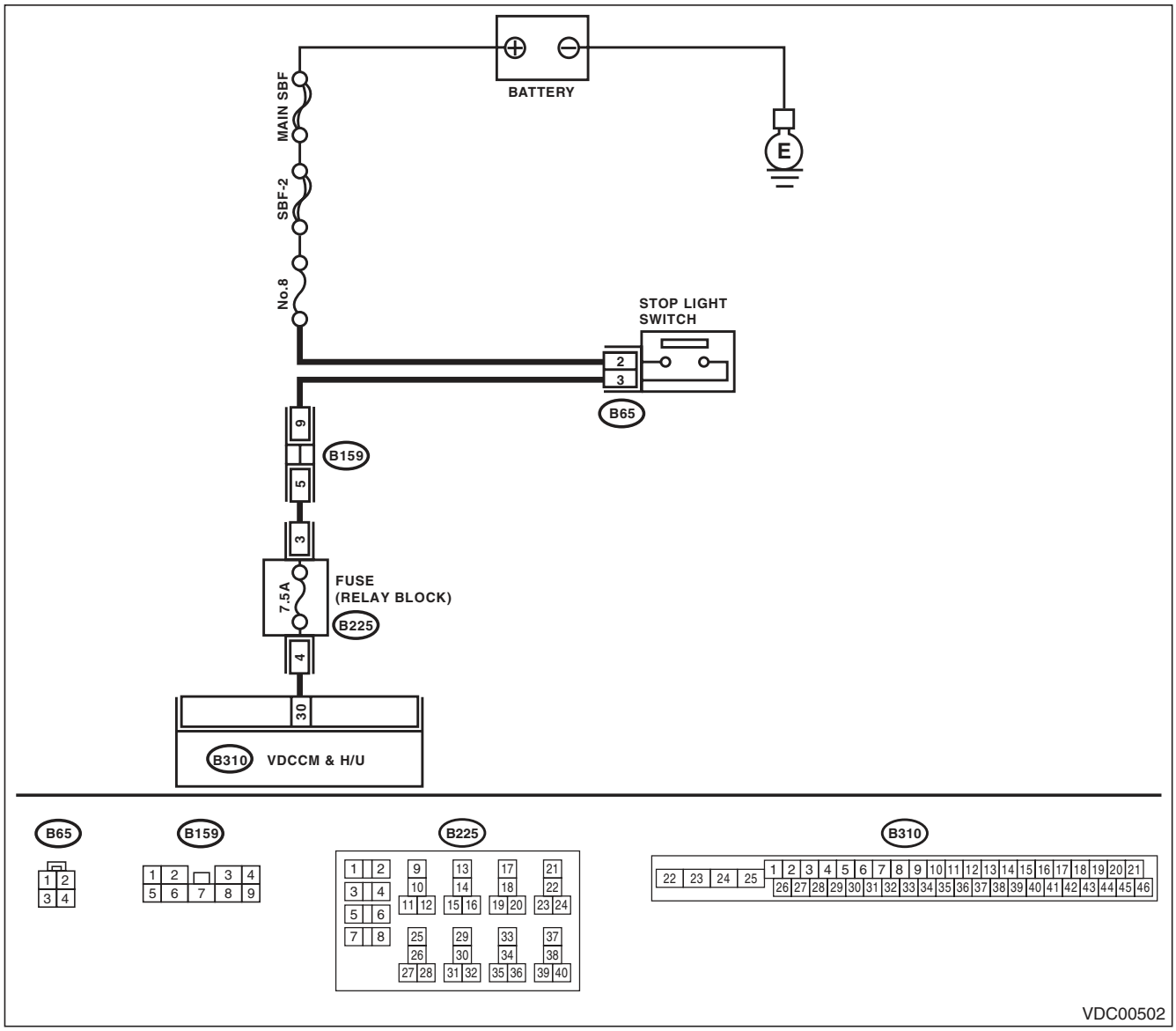


	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH WITH SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in the Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch output in Subaru Select Monitor.	Is OFF displayed on the display screen?	Go to step **2**.	Go to step **3**.
2	**CHECK OUTPUT OF STOP LIGHT SWITCH WITH SUBARU SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor.	Is ON displayed on the display screen?	Go to step **6**.	Go to step **3**.
3	**CHECK IF STOP LIGHTS ILLUMINATE.** Depress the brake pedal.	Does the stop light illuminate?	Go to step **4**.	Repair the stop light circuit.
4	**CHECK FUSE.** Check the fuse (B225) in the relay block.	Is the fuse OK?	Go to step **5**.	Replace the fuse.
5	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Repair the harness between stop light switch and VDCCM&H/U connector.
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between stop light switch and VDCCM&H/U?	Repair the connector.	Go to step **7**.
7	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AI: DTC C0054 BLS ON MALFUNCTION

DTC DETECTING CONDITION:
Defective stop light switch
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch connector. 3) Measure the resistance of stop light switch terminals.	Is the resistance 1 MΩ or more when switch is OFF (when pedal is not depressed)?	Go to step **2**.	Replace the stop light switch.
2	**INTERVIEWING CUSTOMERS.** Make sure that the operation was performed in which accelerator pedal and brake pedal were depressed simultaneously (with depressing brake pedal with left foot).	Were the acceleration pedal and brake pedal depressed simultaneously?	System is normal. (DTC may be recorded while brake is applied during driving.)	Go to step **3**.
3	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **4**.
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AJ:DTC C0054 BLS OFF MALFUNCTION

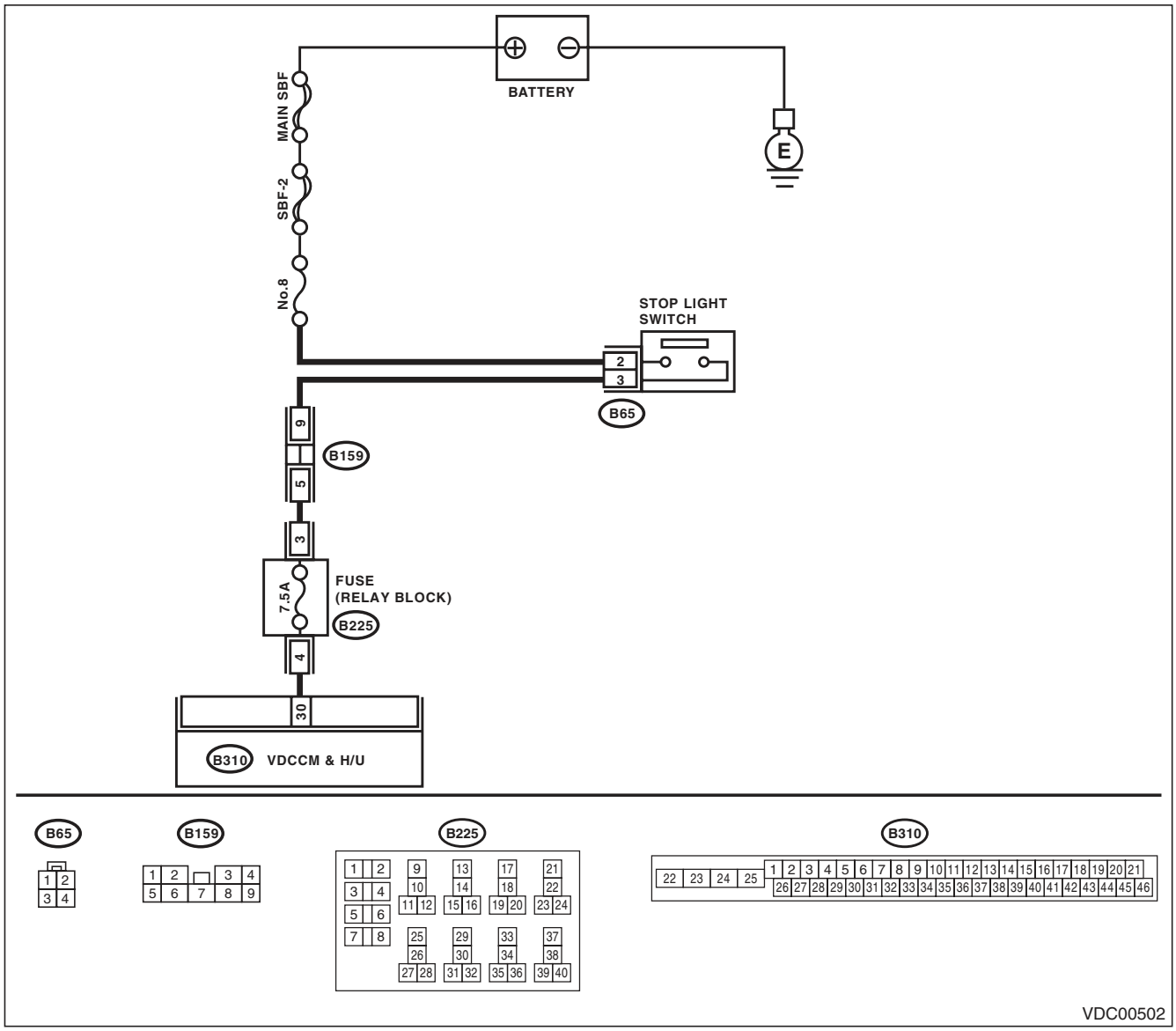
DTC DETECTING CONDITION:

Defective stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch connector. 3) Measure the resistance of stop light switch terminals.	Is the resistance 0.5 Ω or less when the switch is ON (when pedal is depressed)?	Go to step **2**.	Replace the stop light switch.
2	**CHECK POWER SUPPLY OF STOP LIGHT SWITCH.** Measure the voltage between the stop light switch terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **3**.	Repair the power supply circuit of stop light.
3	**CHECK STOP LIGHT SWITCH HARNESS.** 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and stop light switch. ***Connector & terminal*** ***(B65) No. 3 — (B310) No. 30:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Repair the stop light switch circuit.
4	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between stop light switch and VDCCM&H/U?	Repair the connector.	Go to step **5**.
5	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AK:DTC C0057 ECM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:
No CAN signal from ECM.
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-27, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step **2**.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in ECM connector?	Repair the connector.	Go to step **3**.
3	**CHECK ECM.**	Is ECM normal?	Go to step **4**.	Replace the ECM.
4	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AL:DTC C0057 ECM CONTROL SYSTEM

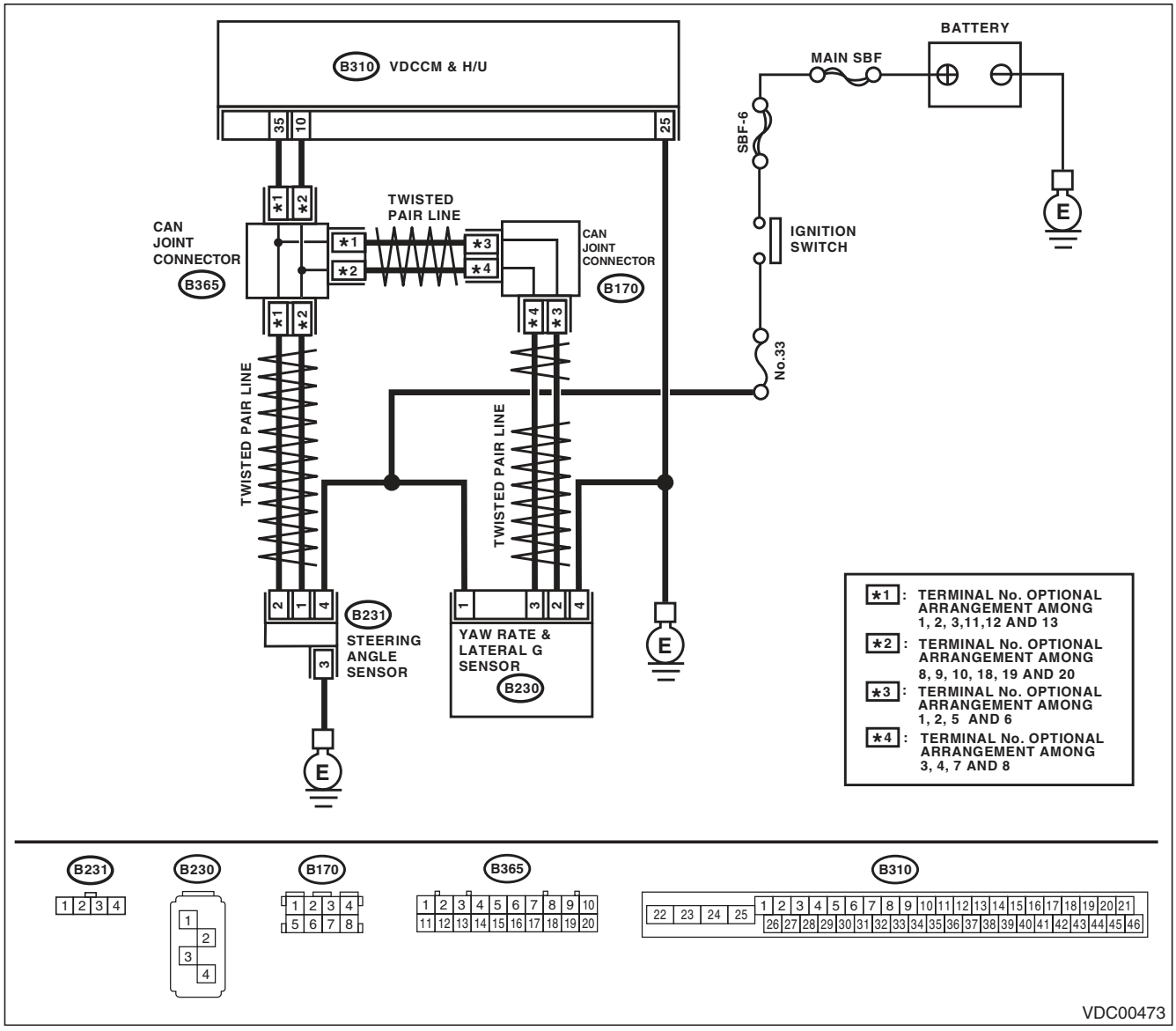
DTC DETECTING CONDITION:
Cooperation control prohibition of ECM
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

NOTE:
Warning lights go off if the cooperation control of ECM returns.

	Step	Check	Yes	No
1	**CHECK WARNING LIGHT.** Check whether the VDC warning light illuminates after driving for 1 minute or more at a speed of 10 km/h or more.	Does the VDC warning light illuminate?	Go to step **2**.	VDC is normal. Perform the Clear Memory Mode. NOTE: If cranking operation is performed while driving, DTC may be memorized.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in ECM connector?	Repair the connector.	Go to step **3**.
3	**CHECK ECM.**	Is ECM normal?	Go to step **4**.	Replace the ECM.
4	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AM:DTC C0071 STEERING ANGLE SENSOR OFFSET IS TOO BIG

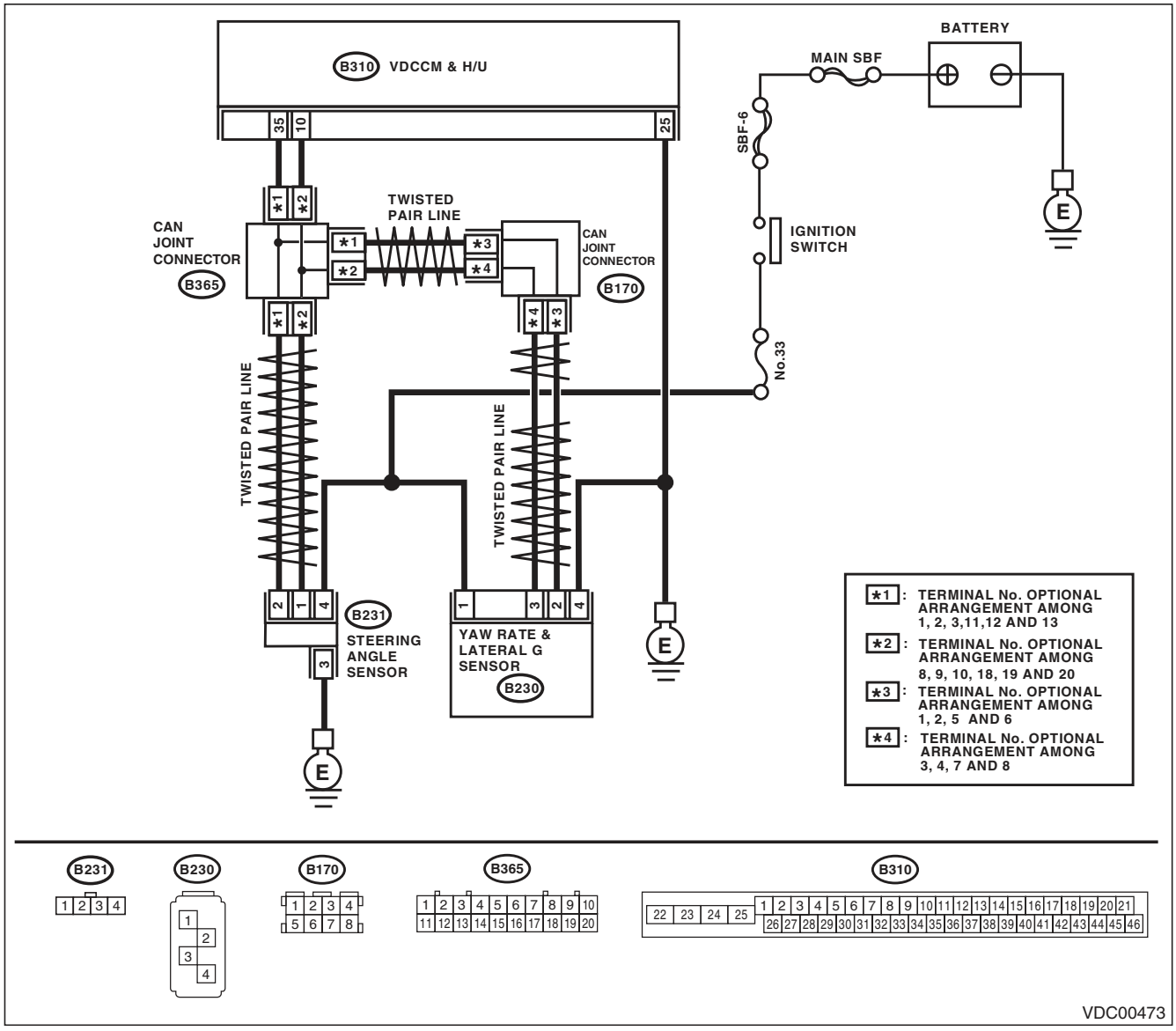
DTC DETECTING CONDITION:
Defective steering angle sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Check the steering wheel for deviation from center.	Is the deviation from the center of steering wheel less than 5°?	Go to step **2**.	Perform the centering adjustment of steering wheel.
2	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **3**.
3	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AN:DTC C0071 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG

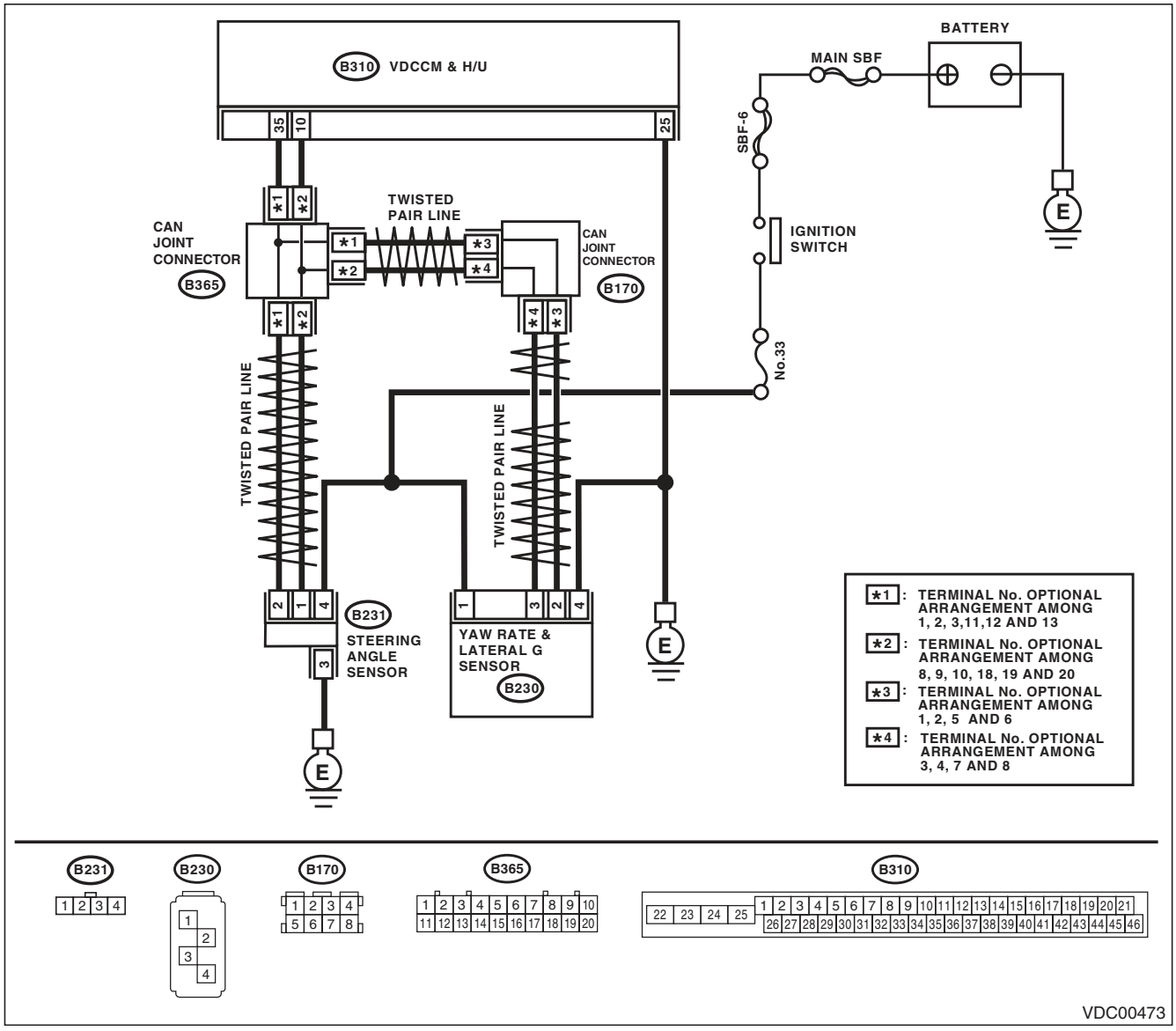
DTC DETECTING CONDITION:
Defective steering angle sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **2**.
2	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AO:DTC C0071 STEER ANGLE SENSOR OP

DTC DETECTING CONDITION:
Signal does not come from steering angle sensor.
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POWER SUPPLY FOR STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from steering angle sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the power supply circuit of steering angle sensor.

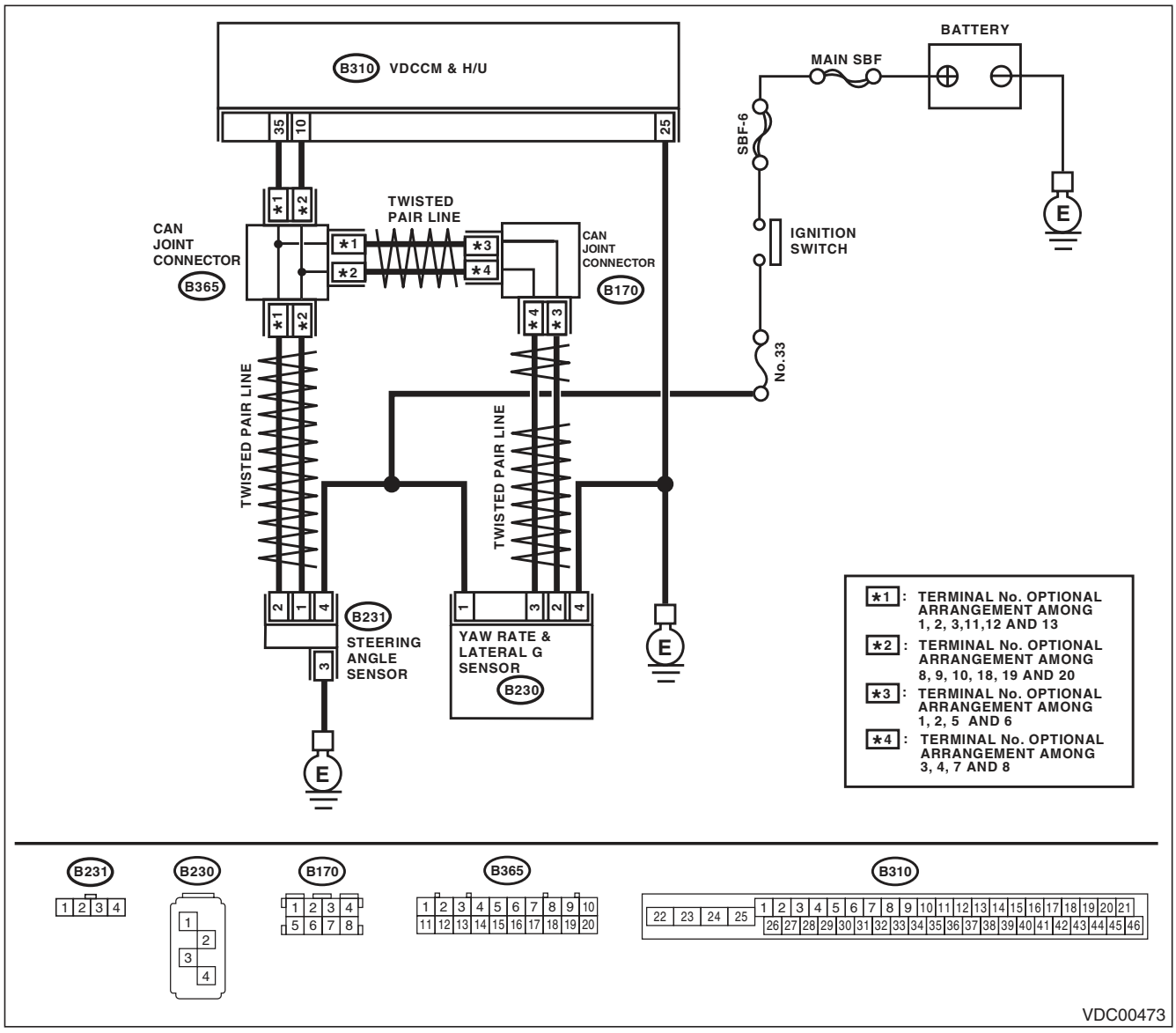
	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.** Measure the resistance between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair ground circuit in the steering angle sensor.
3	**CHECK STEERING ANGLE SENSOR HARNESS.** 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and steering angel sensor. ***Connector & terminal*** ***(B231) No. 1 — (B310) No. 10:*** ***(B231) No. 2 — (B310) No. 35:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Repair the harness between the steering angle sensor and VDCCM&H/U.
4	**CHECK GROUND SHORT CIRCUIT OF STEERING ANGLE SENSOR HARNESS.** Measure the resistance between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 1 — Chassis ground:*** ***(B231) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the harness between the steering angle sensor and VDCCM&H/U.
5	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **6**.	Go to step **7**.
6	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Original steering angle sensor malfunction

AP:DTC C0071 STEERING ANGLE SENSOR MALFUNCTION

DTC DETECTING CONDITION:
Defective steering angle sensor
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

NOTE:
- Warning light does not illuminate though problem is detected.
- The ABS and VDC operate normally if voltage returns.

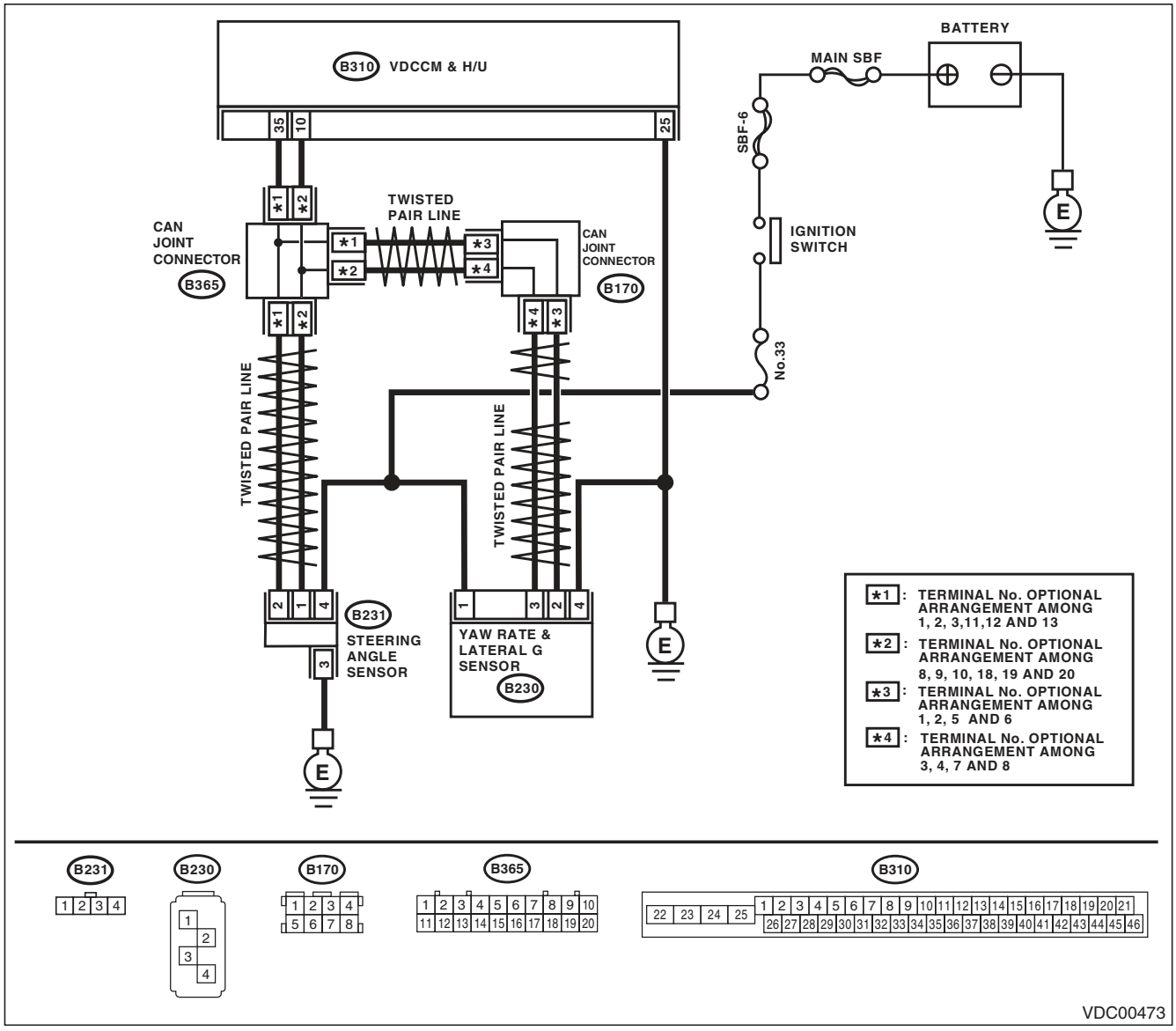
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from steering angle sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the power supply circuit of steering angle sensor.
2	**CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.** Measure the resistance between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair ground circuit in the steering angle sensor.
3	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **4**.	Go to step **5**.
4	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Original steering angle sensor malfunction

AQ:DTC C0072 ABNORMAL YAW RATE SENSOR OUTPUT

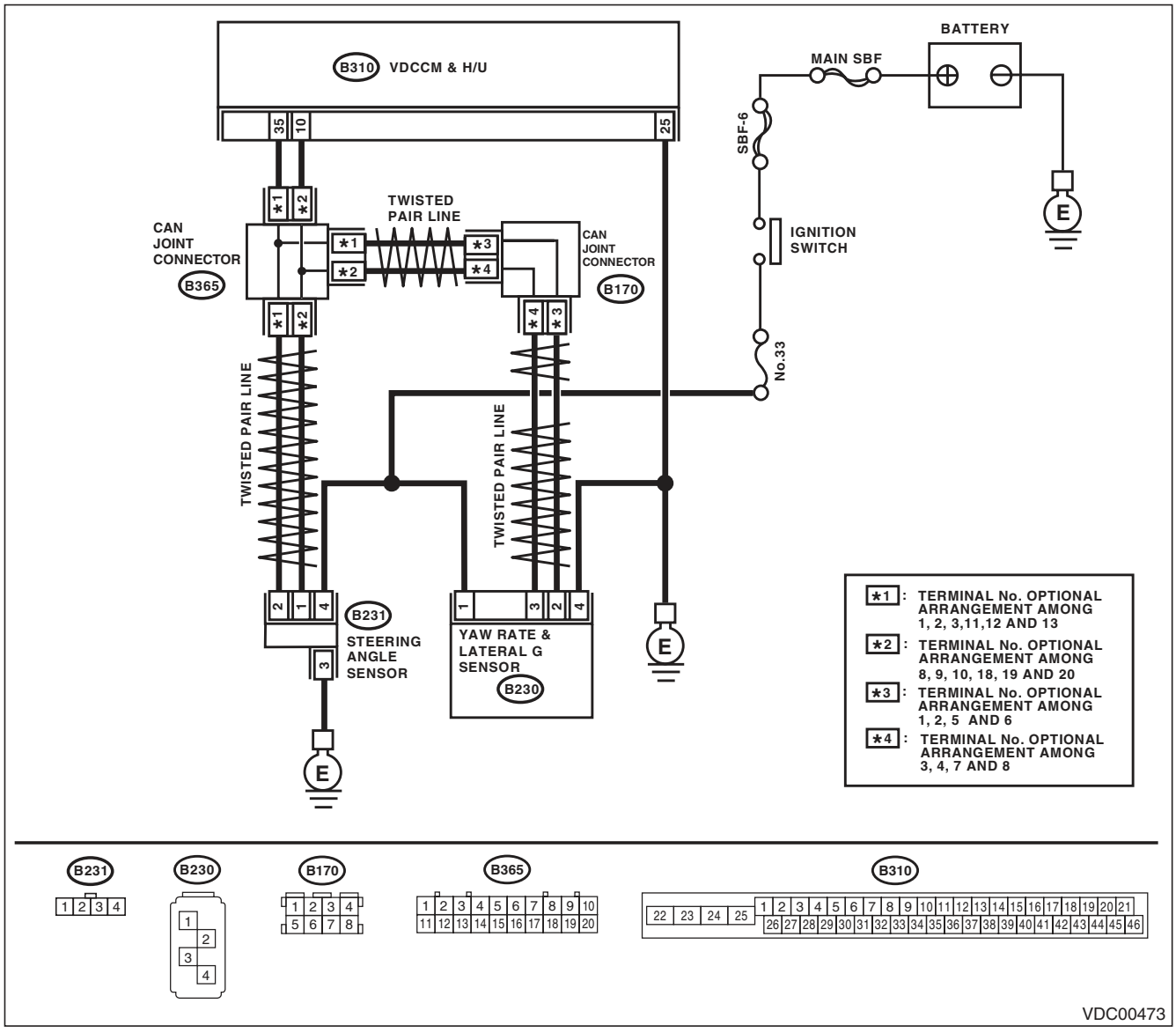
DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVING PLACE.** Check if the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Did the vehicle run the road with banks or sandy surface (which does not mean a dirt road)?	VDCCM&H/U may record DTC when the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Go to step **2**.
2	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.**	Is the yaw rate & lateral G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **3**.	Tighten the yaw rate & lateral G sensor installation bolt.
3	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR WITH SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in the Subaru Select Monitor. 4) Read the yaw rate output displayed on display.	Is the reading indicated on monitor display –4 — 4 deg/s?	Go to step **4**.	Replace the yaw rate & lateral G sensor.
4	**CHECK OUTPUT OF STEERING ANGLE SENSOR WITH SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in the Subaru Select Monitor. 4) Read the steering angle sensor output displayed on display.	Is the reading indicated on monitor display –5 — 5°?	Go to step **5**.	Perform the centering adjustment of steering wheel.
5	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **6**.	Go to step **7**.
6	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & lateral G sensor. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Malfunction is found in original yaw rate & lateral G sensor.

AR:DTC C0072 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION

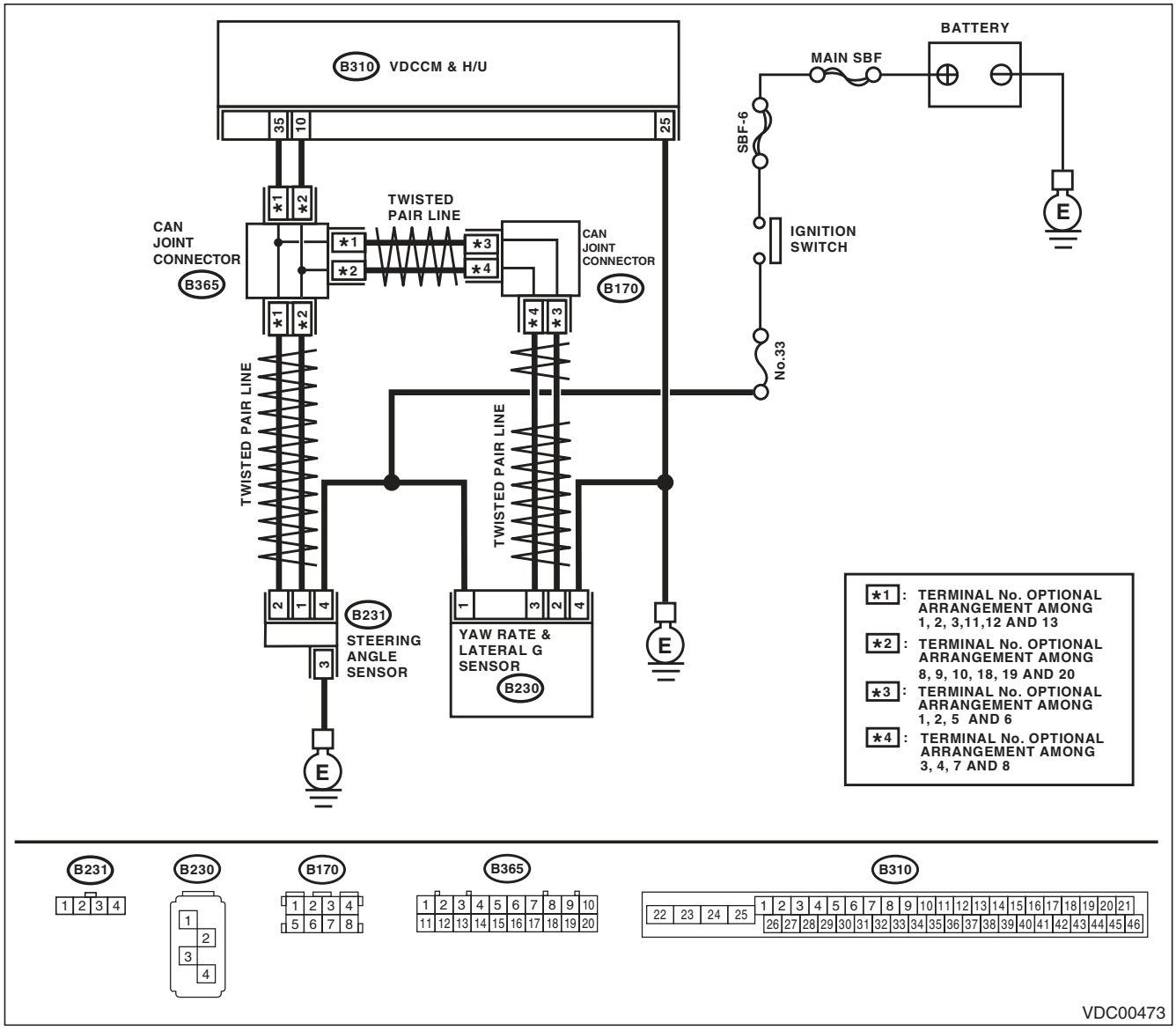
DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the power supply circuit of the yaw rate & lateral G sensor.
2	**CHECK YAW RATE & LATERAL G SENSOR GROUND CIRCUIT.** Measure the resistance between the yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 4 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the ground circuit of the yaw rate & lateral G sensor.
3	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the yaw rate & lateral G sensor.	Go to step **4**.
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AS:DTC C0072 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE

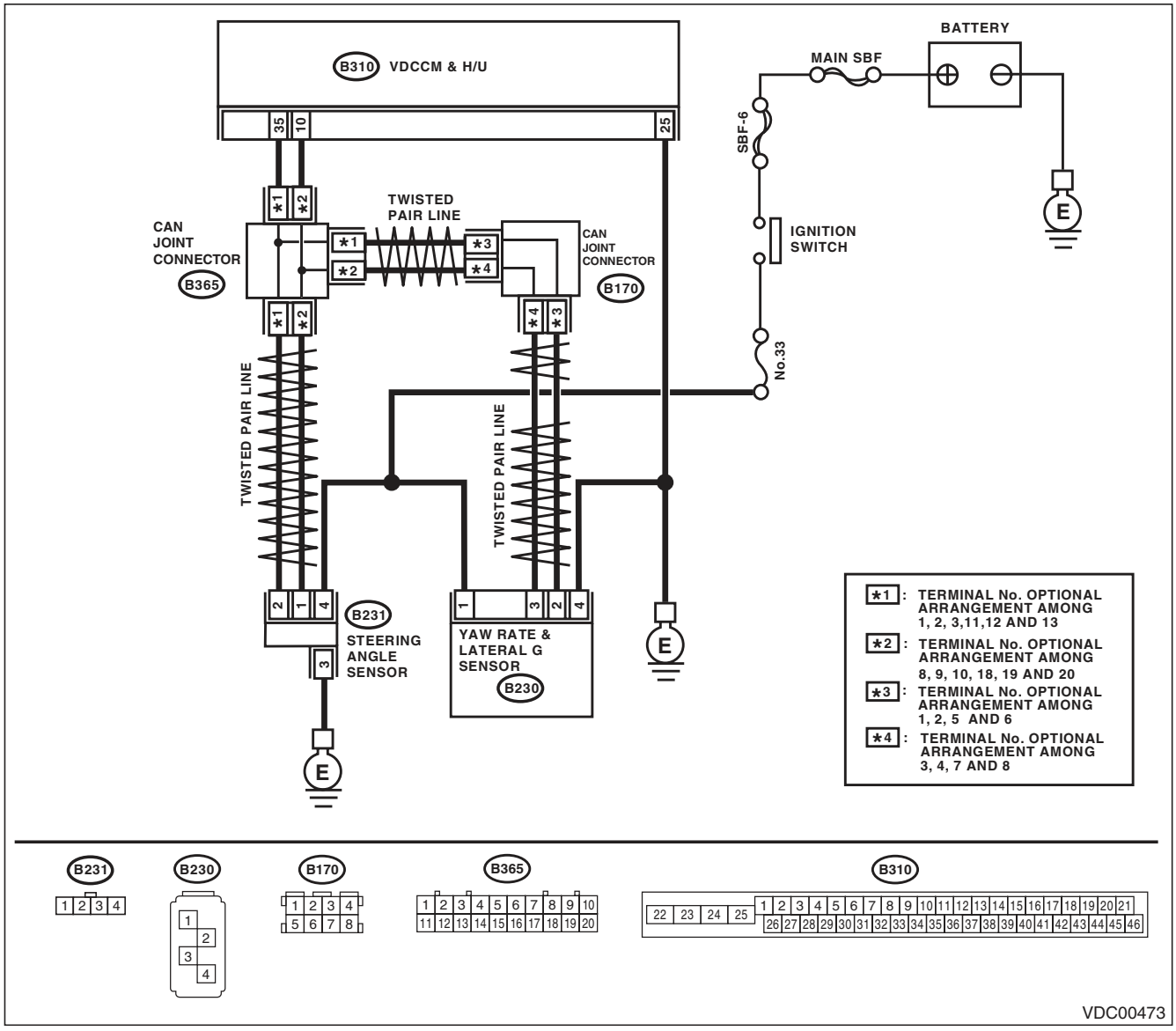
DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the power supply circuit of the yaw rate & lateral G sensor.
2	**CHECK YAW RATE & LATERAL G SENSOR GROUND CIRCUIT.** Measure the resistance between the yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 4 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the ground circuit of the yaw rate & lateral G sensor.
3	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the yaw rate & lateral G sensor.	Go to step **4**.
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AT:DTC C0072 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG

DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVING PLACE.** Check if the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Did the vehicle run the road with banks or sandy surface (which does not mean a dirt road)?	VDCCM&H/U may record DTC when the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Go to step **2**.
2	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.**	Is the yaw rate & lateral G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **3**.	Tighten the yaw rate & lateral G sensor installation bolt.

	Step	Check	Yes	No
3	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Repair the power supply circuit of the yaw rate & lateral G sensor.
4	**CHECK YAW RATE & LATERAL G SENSOR GROUND CIRCUIT.** Measure the resistance between the yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 4 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5**.	Repair the ground circuit of the yaw rate & lateral G sensor.
5	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR WITH SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in the Subaru Select Monitor. 4) Read the yaw rate output displayed on display.	Is the reading indicated on monitor display –4 — 4 deg/s?	Go to step **6**.	Replace the yaw rate & lateral G sensor.
6	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **7**.	Go to step **8**.
7	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & lateral G sensor. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **9**.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
9	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Malfunction is found in original yaw rate & lateral G sensor.

AU:DTC C0073 LATERAL G SENSOR COMMUNICATION

DTC DETECTING CONDITION:

Communication failure between lateral G sensor and VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

NOTE:

For the diagnostic procedure, refer to DTC C0072 “YAW RATE SENSOR COMMUNICATION”. <Ref. to VDC(diag)-94, DTC C0072 YAW RATE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC C0072 YAW RATE SENSOR COMMUNICATION

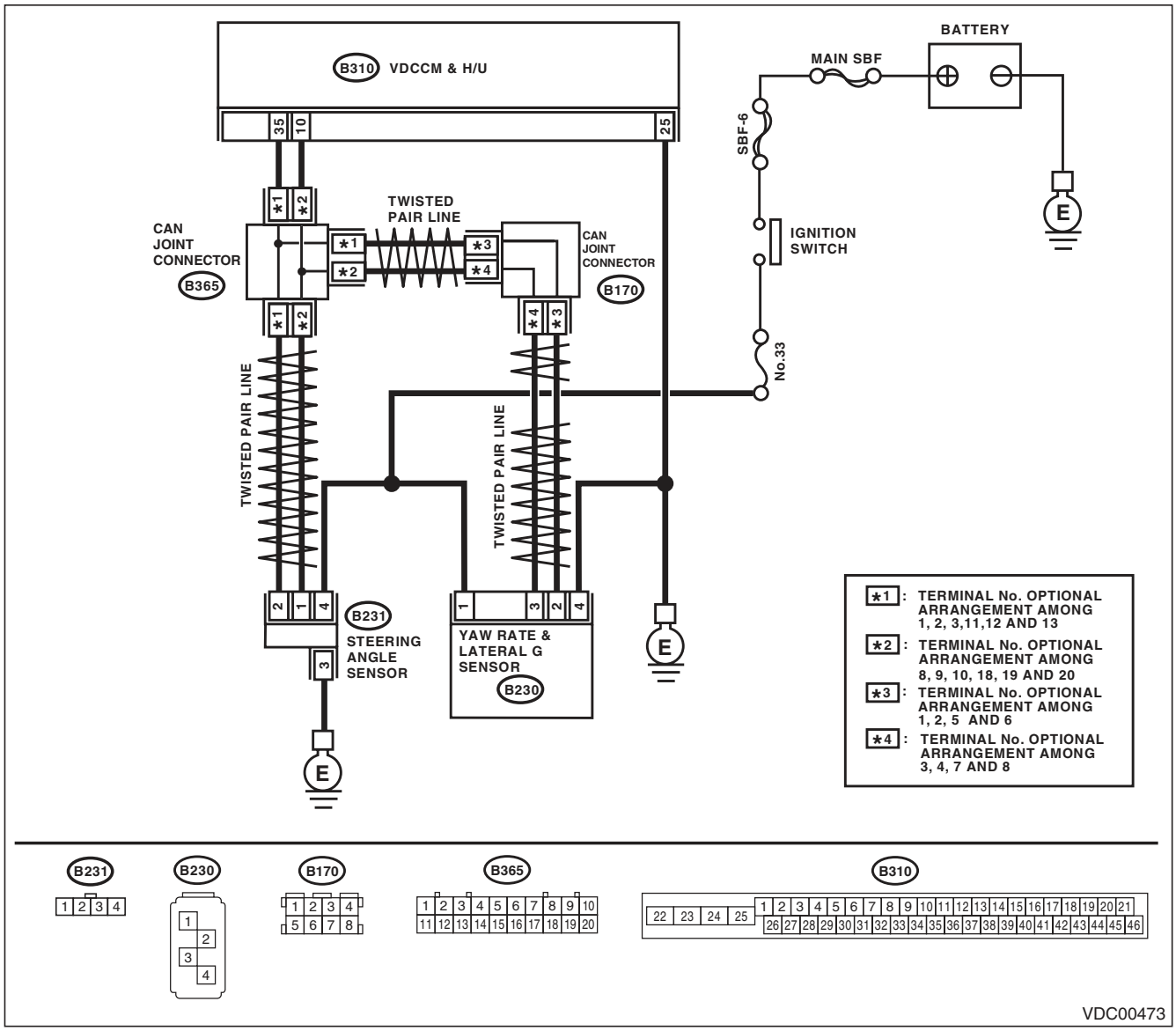
DTC DETECTING CONDITION:

Communication failure between yaw rate sensor and VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POWER SUPPLY FOR YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the power supply circuit of the yaw rate & lateral G sensor.

	Step	Check	Yes	No
2	**CHECK YAW RATE & LATERAL G SENSOR GROUND CIRCUIT.** Measure the resistance between the yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 4 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the ground circuit of the yaw rate & lateral G sensor.
3	**CHECK YAW RATE & LATERAL G SENSOR HARNESS.** 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM& H/U and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B230) No. 3 — (B310) No. 10:*** ***(B230) No. 2 — (B310) No. 35:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Repair the harness between yaw rate & lateral G sensor and VDCCM& H/U.
4	**CHECK GROUND SHORT CIRCUIT FOR YAW RATE & LATERAL G SENSOR HARNESS.** Measure the resistance between the yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 2 — Chassis ground:*** ***(B230) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the harness between yaw rate & lateral G sensor and VDCCM& H/U.
5	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **6**.	Go to step **7**.
6	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & lateral G sensor. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Malfunction is found in original yaw rate & lateral G sensor.

AW:DTC C0073 LATERAL G SENSOR OFFSET IS TOO BIG

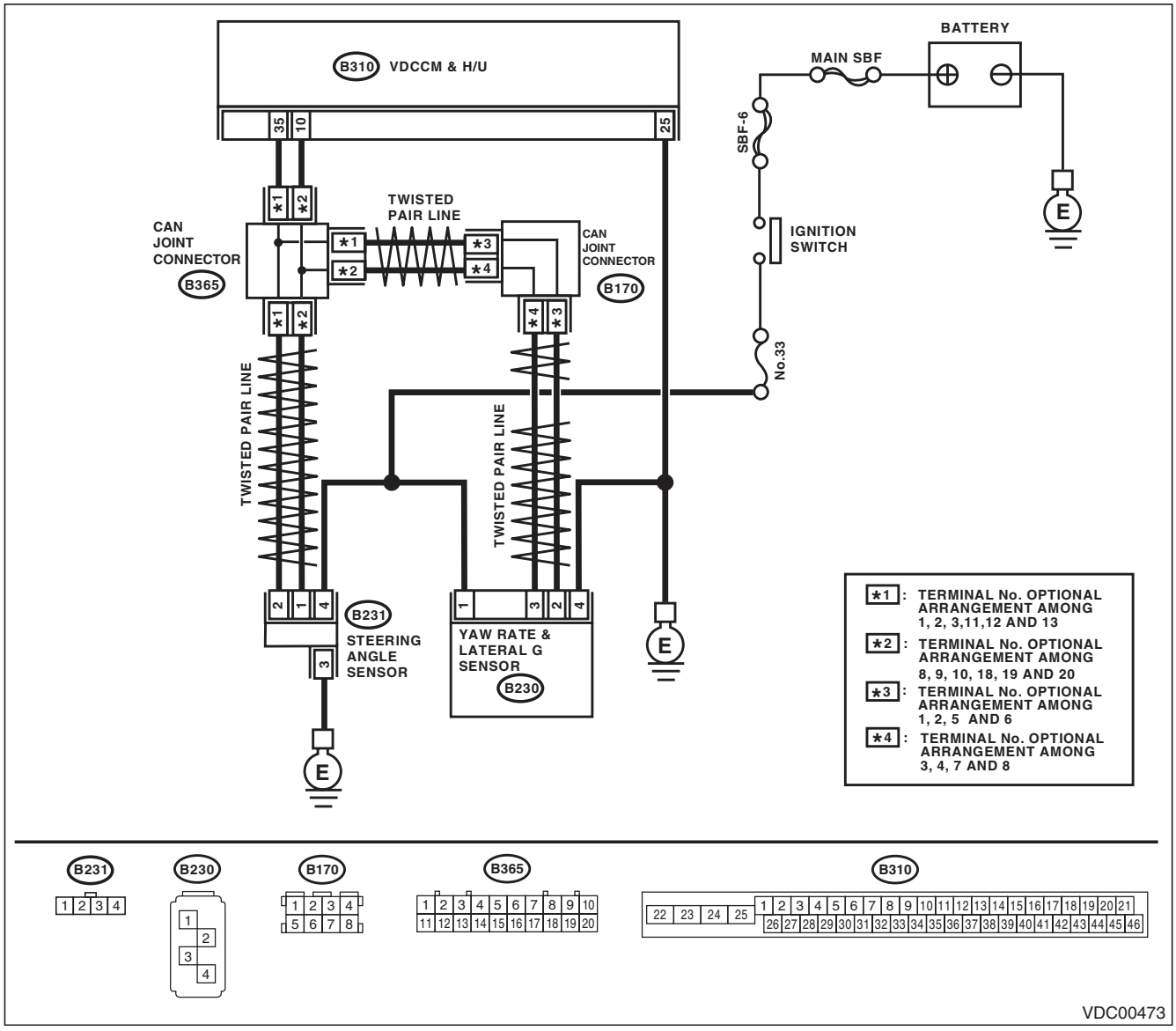
NOTE:
For the diagnostic procedure, refer to DTC C0073 “EXCESSIVE LATERAL G SENSOR SIGNAL”. <Ref. to VDC(diag)-97, DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AX:DTC C0073 ABNORMAL LATERAL G SENSOR OUTPUT

NOTE:
For the diagnostic procedure, refer to DTC C0073 “EXCESSIVE LATERAL G SENSOR SIGNAL”. <Ref. to VDC(diag)-97, DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AY:DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL

DTC DETECTING CONDITION:
Lateral G sensor malfunction
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.**	Is the yaw rate & lateral G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **2**.	Tighten the yaw rate & lateral G sensor installation bolt.
2	**CHECK LATERAL G SENSOR OUTPUT.** 1) Park the vehicle on a level surface. 2) Select {Current Data Display & Save} in the Subaru Select Monitor. 3) Read the lateral G sensor output displayed on screen.	Is the indicated reading on the monitor display –1.5 — 1.5 m/s^2?	Go to step **3**.	Replace the yaw rate & lateral G sensor.
3	**CHECK LATERAL G SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & lateral G sensors from vehicle. 3) Turn the ignition switch to ON, and select the {Current Data Display & Save} in Subaru Select Monitor. 4) Read the lateral G sensor output displayed on screen.	When the yaw rate & lateral G sensor is inclined 90° to the right, is the indicated value 6.8 — 12.8 m/s^2?	Go to step **4**.	Replace the yaw rate & lateral G sensor.
4	**CHECK LATERAL G SENSOR.** Read the lateral G sensor output displayed on screen.	When the yaw rate & lateral G sensor is inclined 90° to the left, is the indicated value –6.8 — –12.8 m/s^2?	Go to step **5**.	Replace the yaw rate & lateral G sensor.
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between VDCCM& H/U and yaw rate & lateral G sensor?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-10, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AZ:DTC C0074 PRESSURE SENSOR

DTC DETECTING CONDITION:
Defective pressure sensor
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH CIRCUIT.** Check stop light switch open circuit.	Is the stop light switch circuit OK?	Go to step **2**.	Repair the stop light switch circuit. NOTE: If there is malfunction in the stop light circuit, DTC may be memorized.
2	**CHECK OUTPUT OF PRESSURE SENSOR WITH SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the pressure sensor output displayed on display.	When the brake pedal is released, is the displayed value –40 — 40 bar?	Go to step **3**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3	**CHECK OUTPUT OF PRESSURE SENSOR WITH SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the pressure sensor output displayed on display.	When operating the brake pedal, does the pressure sensor output value on the display change according to the brake pedal operation?	Go to step **4**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4	**CHECK PRESSURE SENSOR.** 1) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 3) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

BA:DTC C0081 SYSTEM FAILURE

DTC DETECTING CONDITION:
VDC long time sequential control
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in the VDCCM& H/U and yaw rate & lateral G sensor connector?	Repair the connector.	Go to step **2**.
2	**CHECK VDCCM&H/U.** 1) Replace the yaw rate & lateral G sensor. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-23, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-22, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U.	Malfunction is found in original yaw rate & lateral G sensor.

13.General Diagnostic Table

A: INSPECTION

Symptom		Main probable cause	Other probable cause
Poor brake performance	Long braking/ stopping distance	• VDCCM&H/U • Brake pad • Aeration to brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Master cylinder • Brake caliper • Disc rotor • Brake pipe • Brake booster
	Wheel locks.	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Incorrect wiring or piping connections	• Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake caliper • Brake pipe
	Brake drag	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Parking brake • Axle and wheels • Brake pedal play	• Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake pad • Brake pipe
	Long brake pedal stroke	• Aeration to brake line • Brake pedal play	• VDCCM&H/U • Master cylinder • Brake caliper • Brake pad • Brake pipe • Brake booster
	Vehicle vertical pitching	• VDCCM&H/U • Road surface (uneven) • Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation
Poor brake performance	Unstable or uneven braking	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Brake caliper • Brake pad • Road surface (uneven) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Master cylinder • Disc rotor • Brake pipe • Axle and wheels • Road with crowns or banks • Suspension play or fatigue (reduced damping)

General Diagnostic Table

Symptom		Main probable cause	Other probable cause
Vibration or noise • When braking suddenly • When accelerating suddenly • While driving on a slippery road	Excessive brake pedal vibration	• Road surface (uneven) • Incorrect wiring or piping connections	• VDCCM&H/U • Brake booster • Suspension play or fatigue (reduced damping)
	Noise from VDCH/U	• VDCCM&H/U (mount bushing) • Defective ABS wheel speed sensor or sensor gap • Brake pipe	• VDCCM&H/U • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation
	Noise from the front side of vehicle	• VDCCM&H/U (mount bushing) • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Brake pad • Disc rotor • Brake pipe • Brake booster • Suspension play or fatigue (reduced damping)	• Axle and wheels • Tire specifications, tire wear and air pressures
	Noise from the rear side of vehicle	• Defective ABS wheel speed sensor or sensor gap • Brake caliper • Brake pad • Disc rotor • Parking brake • Brake pipe • Suspension play or fatigue (reduced damping)	• Axle and wheels • Tire specifications, tire wear and air pressures
Engine does not accelerate or goes into a stall when accelerating suddenly or driving on a slippery surface.		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Parking brake • Incorrect wiring or piping	• Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake pad • Brake pipe
Poor change-direction-operation stability of TCS	Deviation to right or left direction	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake caliper • Brake pad • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Disc rotor • Brake pipe • Axle and wheels • Suspension play or fatigue (reduced damping)
	Vehicle spin	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Brake pad • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Brake caliper • Brake pipe

Symptom	Main probable cause	Other probable cause
Steering wheel drag while driving	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Incorrect wiring or piping connections • Power steering system	• Brake caliper • Brake pad • Disc rotor • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Suspension play or fatigue (reduced damping) • Tire specifications, tire wear and air pressures
VDC operates while driving normally.	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & lateral G sensor or improper installation • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Suspension play or fatigue (reduced damping) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Power steering system	
VDC OFF indicator light does not illuminate when the VDC OFF switch is depressed. NOTE: When pressing VDC OFF switch for 10 seconds or more, VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the previous status is restored.	• Harness • Combination meter • VDC OFF switch	

1. General Description

A: SPECIFICATION

Model			2.5 i, -BASE, 2.5 i-LTD, 3.0 R, OUTBACK 2.5i, -BASE, -LTD, -LLB, OUTBACK 3.0 R -LTD, OUTBACK 2.5XT -LTD	2.5GT-LTD, 3.0 R-LTD, 2.5GT-B
Front disc brake	Size		16-inch type	17-inch type
	Type		Disc (Floating type, ventilated)	
	Effective disc diameter	mm (in)	244 (4.61)	261 (10.28)
	Disc thickness × Diameter	mm (in)	24 × 294 (0.94 × 11.57)	30 × 316 (1.18 × 12.44)
	Effective cylinder diameter		42.8 (1.685) × 2	
	Pad dimensions (Length × Width × Thickness)	mm (in)	117.8 × 50.5 × 11.0 (4.638 × 1.988 × 0.433)	130.0 × 53.5 × 11.0 (5.118 × 2.106 × 0.433)
	Clearance adjustment		Automatic adjustment	
Rear disc brake	Size		15-inch type	
	Type		Disc (Floating type, solid)	Disc (Floating type, ventilated)
	Effective disc diameter	mm (in)	238 (9.37)	254 (10.0)
	Disc thickness × Diameter	mm (in)	10 × 274 (0.39 × 10.79)	18 × 290 (0.71 × 11.42)
	Effective cylinder diameter	mm (in)	38.1 (1.500)	
	Pad dimensions (Length × Width × Thickness)	mm (in)	92.0 × 33.0 × 9.0 (3.622 × 1.299 × 0.354)	82.4 × 33.7 × 9.0 (3.244 × 1.327 × 0.354)
	Clearance adjustment		Automatic adjustment	
Master cylinder	Type		Tandem	
	Effective diameter	mm (in)	23.8 (15/16)	
	Reservoir type		Sealed type	
	Brake fluid reservoir capacity	cm^3 (cu in)	205 (12.51)	
Brake booster	Type		Vacuum suspended	
	Effective diameter	mm (in)	208 + 229 (8.19 + 9.02)	
Brake line			Dual circuit system	
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.** **• When filling with brake fluid, be careful not to allow any dust to enter the reservoir.** **• Use new SUBARU genuine brake fluid when replacing or refilling the fluid.**			FMVSS No. 116, DOT3, or DOT4	

NOTE:
Refer to “PB” section for parking brake specifications. <Ref. to PB-2, SPECIFICATION, General Description.>

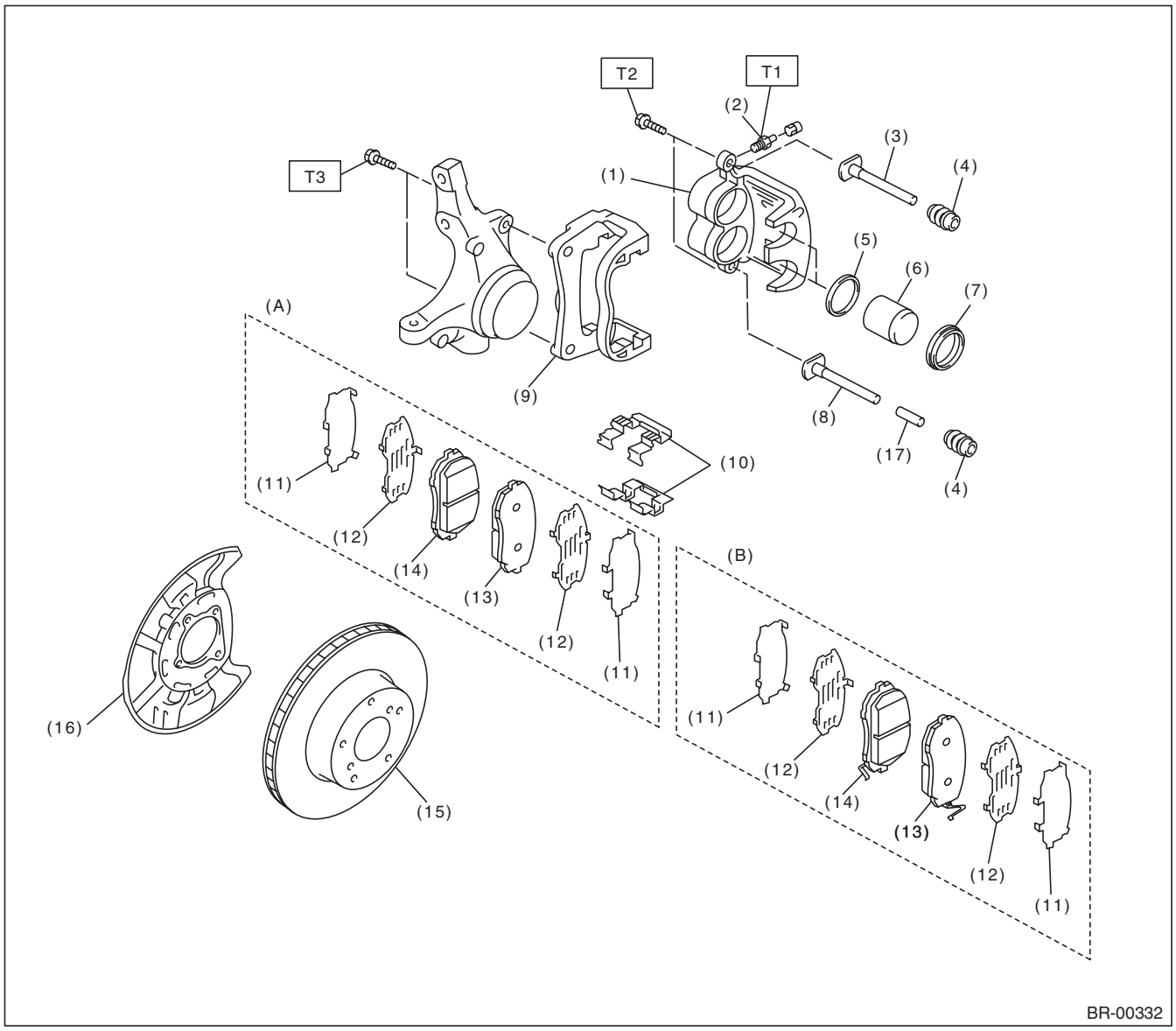
Contents			Specification	Service limit
Front brake	Pad thickness mm (in)	Except for 17-inch type	11 (0.43)	1.5 (0.059)
		17-inch type	11 (0.43)	1.5 (0.059)
	Disc thickness mm (in)	Except for 17-inch type	24 (0.94)	22 (0.87)
		17-inch type	30 (1.18)	28 (1.10)
	Disc runout mm (in)		—	0.05 (0.0020)
Rear brake (Disc type)	Pad thickness mm (in)	Solid disc	9.0 (0.354)	1.5 (0.059)
		Ventilated disc	9.0 (0.354)	1.5 (0.059)
	Disc thickness mm (in)	Solid disc	10 (0.39)	8.5 (0.335)
		Ventilated disc	18 (0.71)	16 (0.63)
	Disc runout mm (in)		—	0.05 (0.0020)
Parking brake	Inside diameter mm (in)		170 (6.69)	171 (6.73)
	Lining thickness mm (in)		3.2 (0.126)	1.5 (0.059)
	Lever stroke		5 — 6 notches/200 N (20 kgf, 45 lb)	

		Brake pedal force N (kgf, lb)	Fluid pressure kPa (kgf/cm^2, psi)
Brake booster	Brake fluid pressure with engine stopped	147 (15, 33)	545 (6, 79)
		294 (30, 66)	1,564 (16, 227)
	Brake fluid pressure with engine running and vacuum pressure at 66.7 kPa (500 mmHg, 19.69 inHg)	147 (15, 33)	6,003 (61, 870)
		294 (30, 66)	11,273 (115, 1,635)

Brake pedal	Free play mm (in)	0.5 — 2 (0.02 — 0.08) [When pulling the brake pedal upward with a force of less than 10 N (1 kgf, 2 lb)]

B: COMPONENT

1. FRONT DISC BRAKE

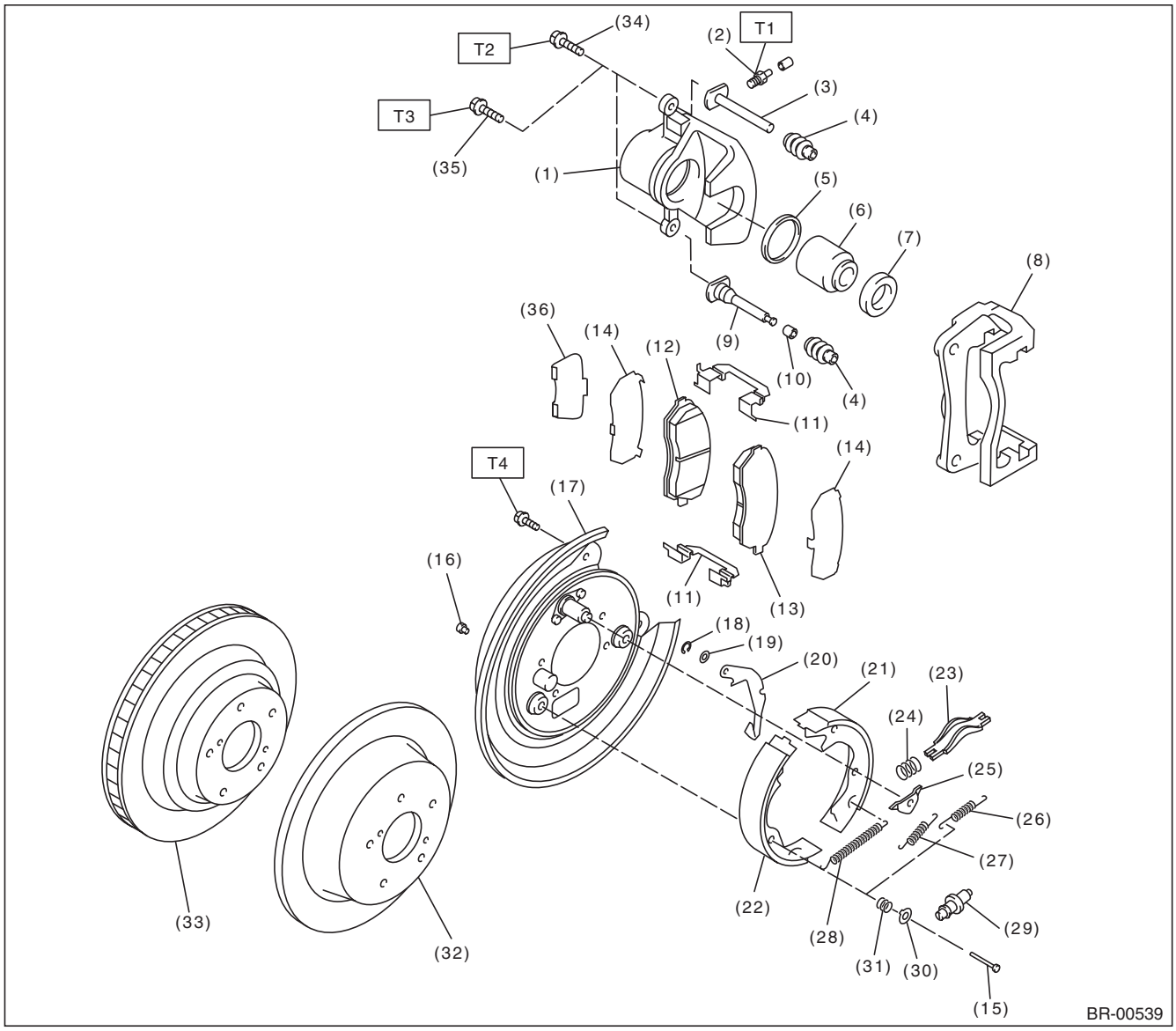


(A) 16-inch type
(B) 17-inch type

(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (black)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (silver)
(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: 27 (2.8, 19.9)
T3: 120 (12.2, 88.5)

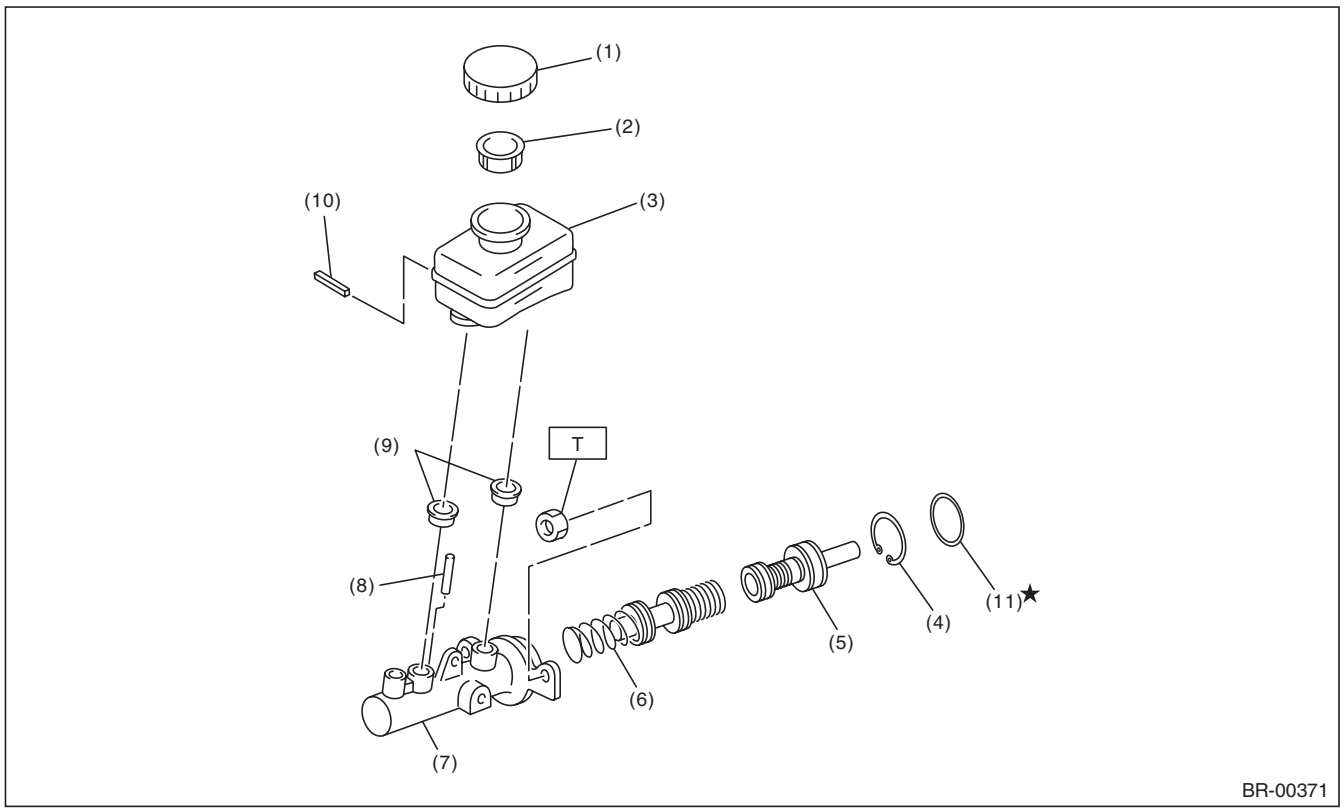
2. REAR DISC BRAKE



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (black)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Support
(9) Lock pin (silver)
(10) Bushing
(11) Pad clip
(12) Inner pad
(13) Outer pad
(14) Shim
(15) Shoe hold-down pin
(16) Cover
(17) Back plate
(18) Retainer
(19) Spring washer
(20) Parking brake lever
(21) Parking brake shoe (secondary)
(22) Parking brake shoe (primary)
(23) Strut
(24) Strut shoe spring
(25) Shoe guide plate
(26) Secondary shoe return spring
(27) Primary shoe return spring
(28) Adjusting spring
(29) Adjuster
(30) Shoe hold-down cup
(31) Shoe hold-down spring
(32) Disc rotor (solid type)
(33) Disc rotor (ventilated type)
(34) Bolt (for solid disc brake)
(35) Bolt (for ventilated disc brake)
(36) Shim (for solid disc brake)

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 27 (2.8, 19.9)
T3: 37 (3.7, 27.2)
T4: 66 (6.7, 48.7)

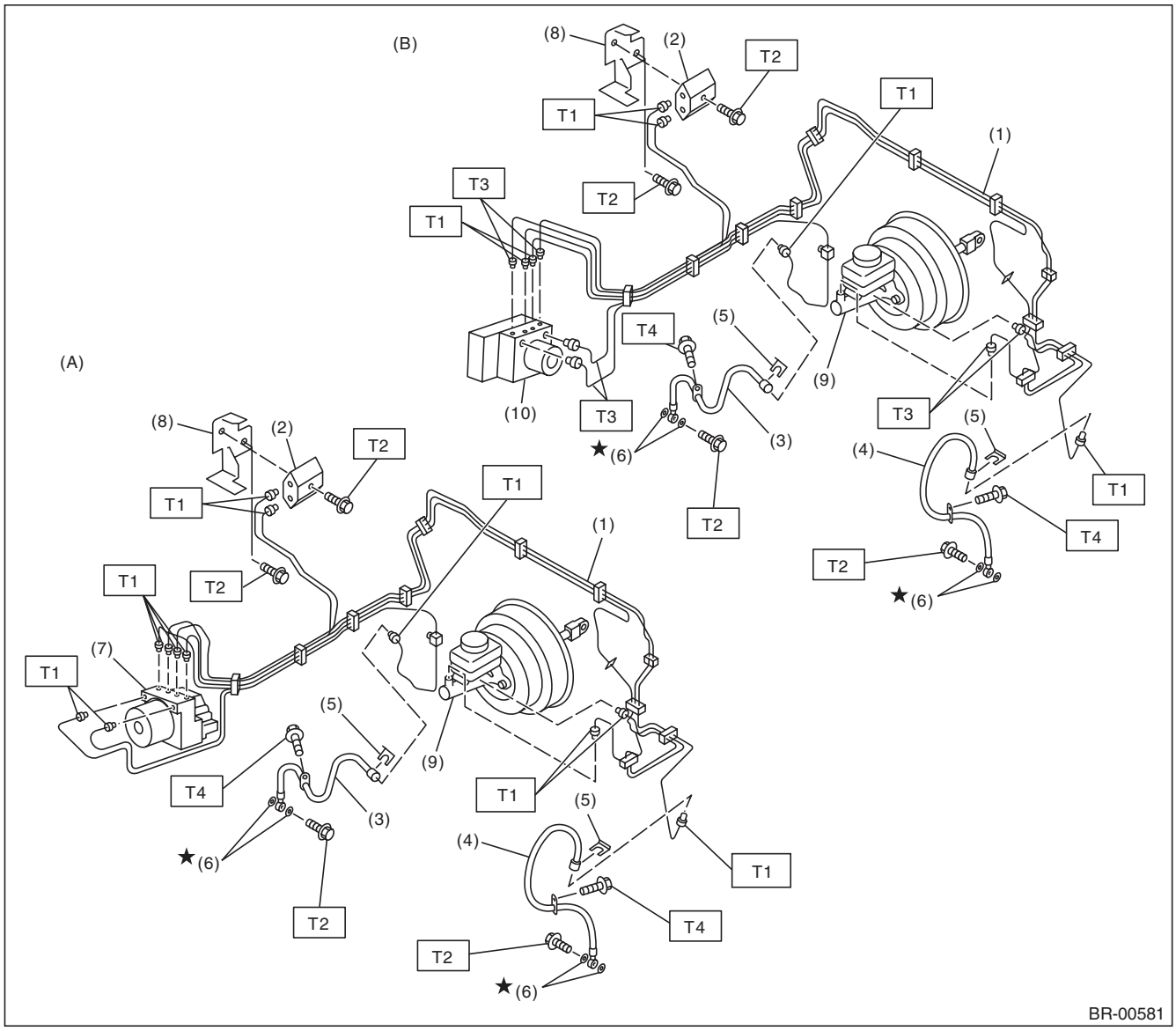
3. MASTER CYLINDER



(1) Cap
(2) Filter
(3) Reservoir tank
(4) C-ring
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin
(9) Seal
(10) Pin
(11) O-ring

Tightening torque:N·m (kgf-m, ft-lb)
T: 13 (1.3, 9.6)

4. FRONT BRAKE PIPES AND HOSES



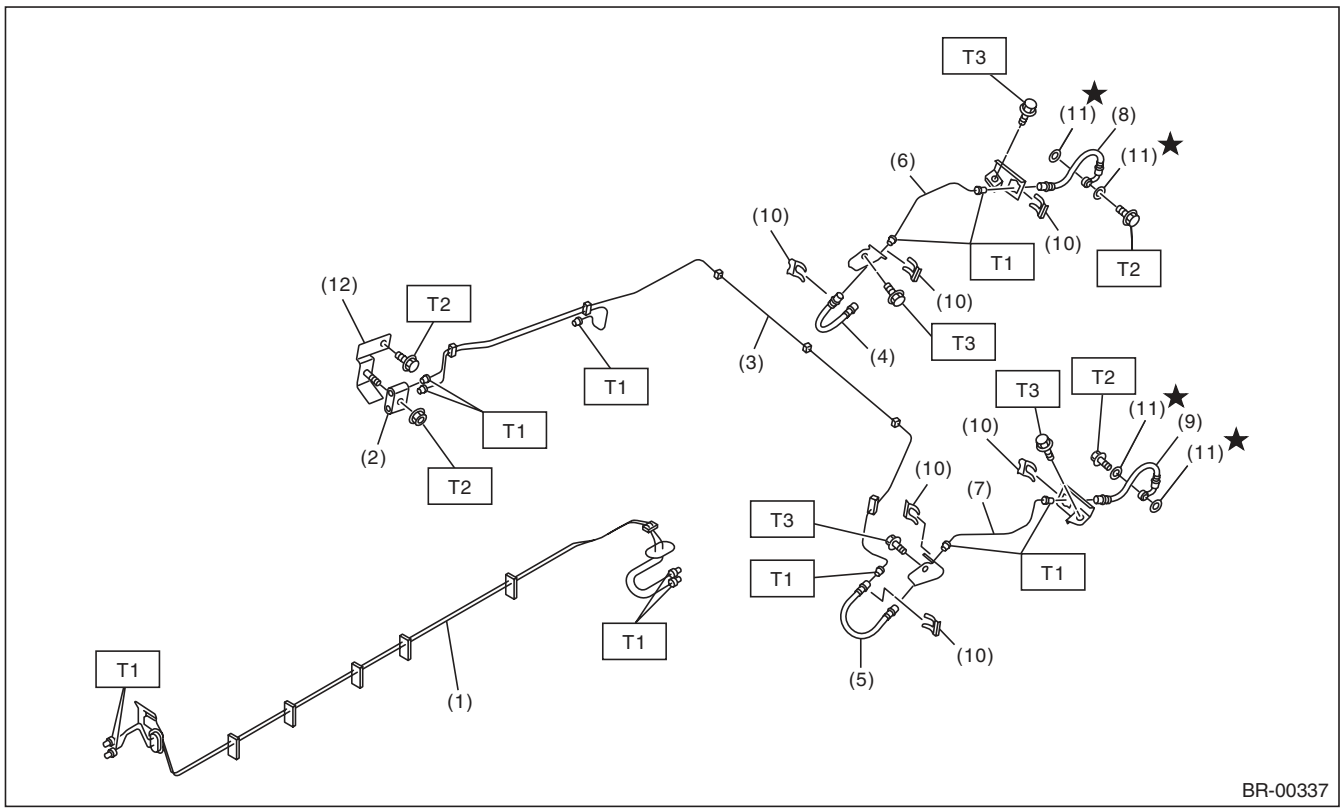
(A) Model with ABS

(B) Model with vehicle dynamics control (VDC)

(1) Front brake pipe ASSY
(2) Two-way connector
(3) Front brake hose RH
(4) Front brake hose LH
(5) Clamp
(6) Gasket
(7) ABS control module and hydraulic control unit (ABSCM&H/U)
(8) Bracket
(9) Master cylinder
(10) VDC control module and hydraulic control unit (VDCCM&H/U)

Tightening torque:N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 19 (1.9, 14.0)
T4: 33 (3.4, 24.3)

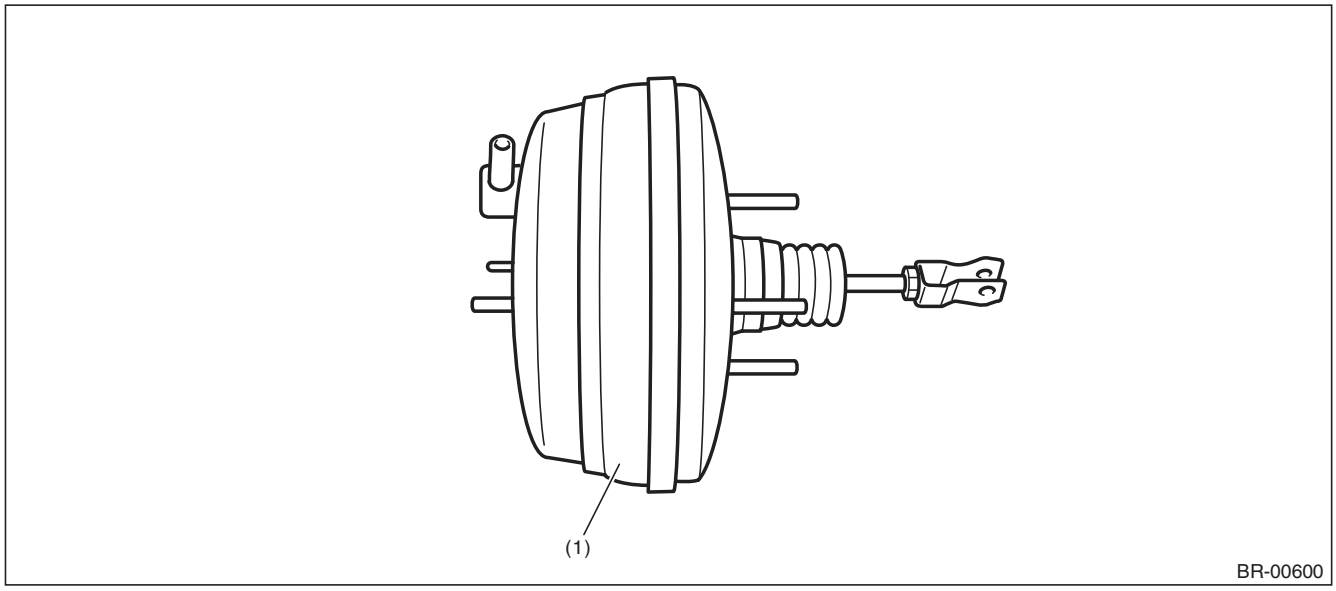
5. CENTER AND REAR BRAKE PIPES AND HOSES



(1)	Center brake pipe ASSY	(7)	Rear brake pipe LH
(2)	Two-way connector	(8)	Rear brake hose rear RH
(3)	Rear brake pipe ASSY	(9)	Rear brake hose rear LH
(4)	Rear brake hose RH	(10)	Clamp
(5)	Rear brake hose LH	(11)	Gasket
(6)	Rear brake pipe RH	(12)	Bracket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 24.3)

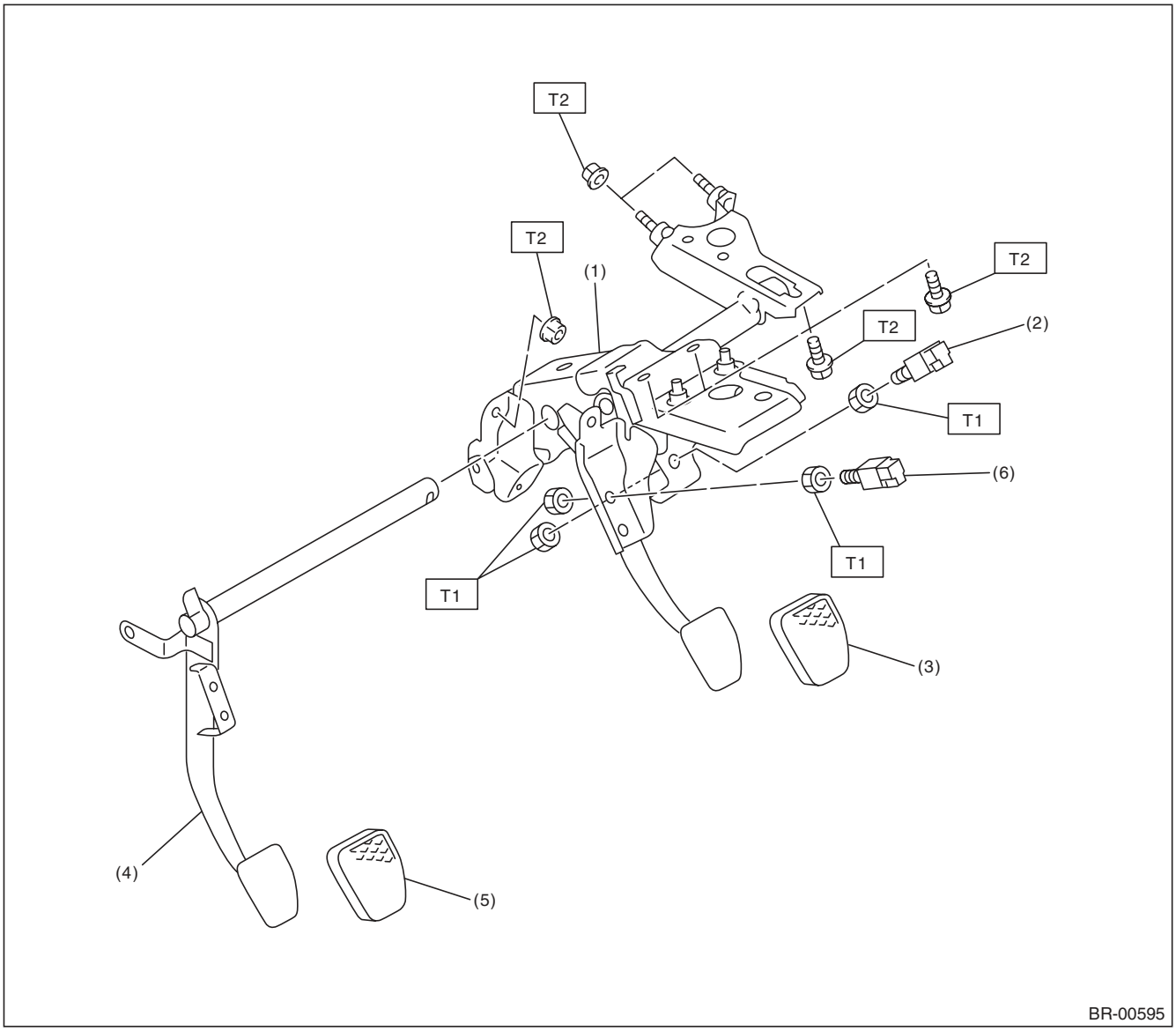
6. BRAKE BOOSTER



(1) Brake booster

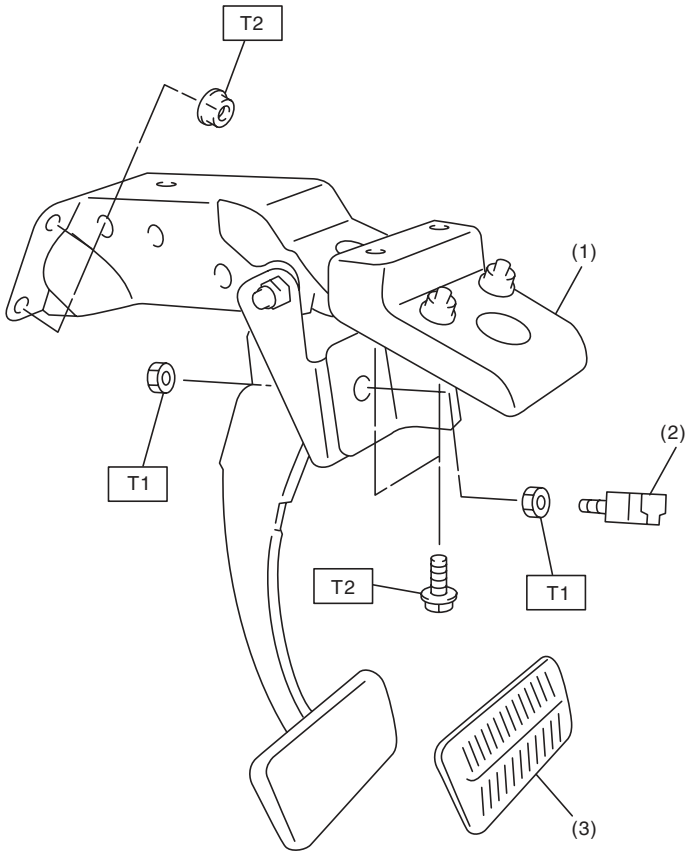
7. BRAKE PEDAL

- MT model



(1)	Brake pedal ASSY	(4)	Clutch pedal	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Stop light switch	(5)	Clutch pedal pad	***T1: 8 (0.8, 5.8)***
(3)	Brake pedal pad	(6)	Clutch switch	***T2: 18 (1.8, 13.0)***

- AT model



BR-00338

(1) Brake pedal ASSY
(2) Stop light switch
(3) Brake pedal pad

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)

C: CAUTION

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

D: PREPARATION TOOL

1. GENERAL TOOL

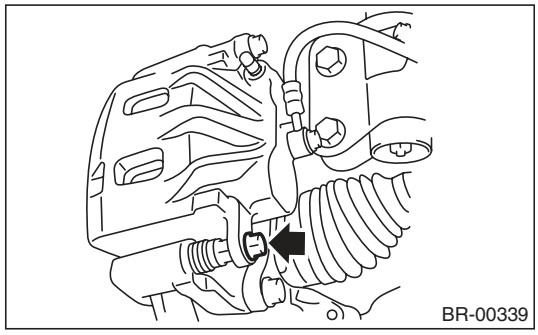
TOOL NAME	REMARKS
Snap ring pliers	Used for removing and installing snap rings.

2. Front Brake Pad

A: REMOVAL

1. 16-INCH TYPE

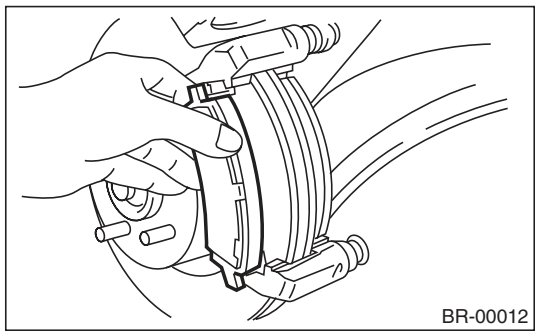
1) Lift up the vehicle, and remove the front wheels.
2) Remove the caliper bolt.



3) Raise the caliper body and support it.

NOTE:
Do not disconnect the brake hose from the caliper body.

4) Remove the pad.



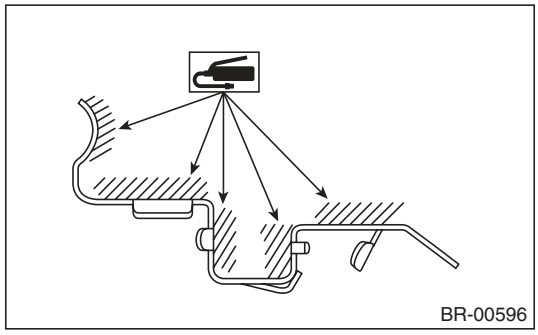
2. 17-INCH TYPE

Refer to 16-inch type. <Ref. to BR-12, 16-INCH TYPE, REMOVAL, Front Brake Pad.>

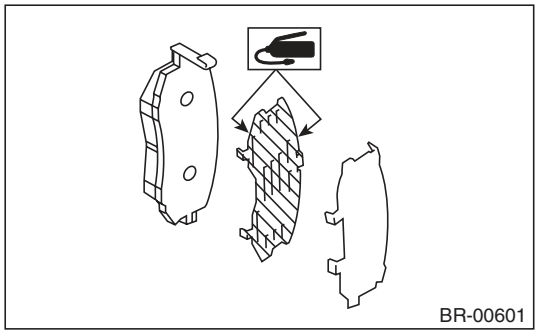
B: INSTALLATION

1. 16-INCH TYPE

1) Apply a thin coat of Molykote M7439 (Part No. K0777YA000) or grease contained in the pad kit to the pad clip.



2) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.

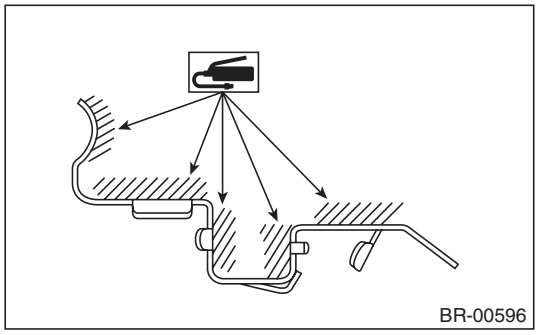


3) Install the pad to support.
4) Install the caliper body to the support.

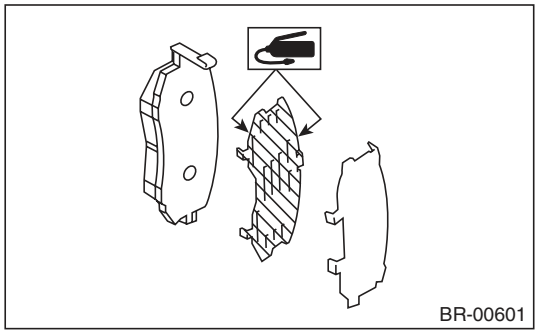
Tightening torque:
27 N·m (2.8 kgf-m, 19.9 ft-lb)

2. 17-INCH TYPE

1) Apply a thin coat of Molykote M7439 (Part No. K0777YA000) or grease contained in the pad kit to the pad clip.

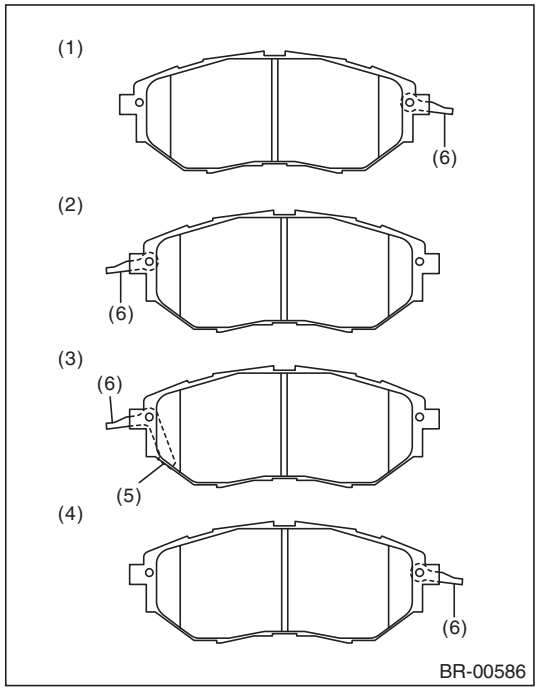


2) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



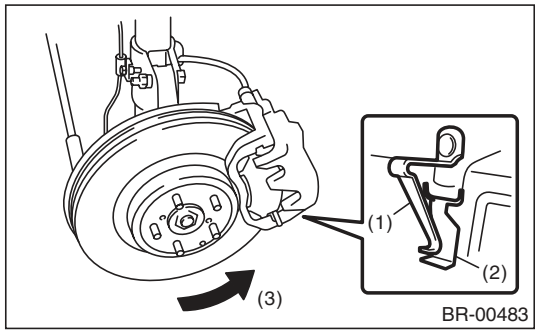
3) Install the pad to support.

NOTE:
Install the pad indicator in proper direction.



(1) LH — IN
(2) LH — OUT
(3) RH — IN
(4) RH — OUT
(5) Pad indicator
(6) Pad return spring

CAUTION:
• Be sure to install so that the pad return spring faces the input side of the direction of brake rotor rotation, as shown in the figure.
• Correctly install the pad return spring to the supporting surface of the pad clip as shown in the figure.
• If the pad return spring is deformed or damaged, replace the brake pad.



(1) Pad return spring
(2) Supporting surface of pad clip
(3) Direction of brake rotor rotation

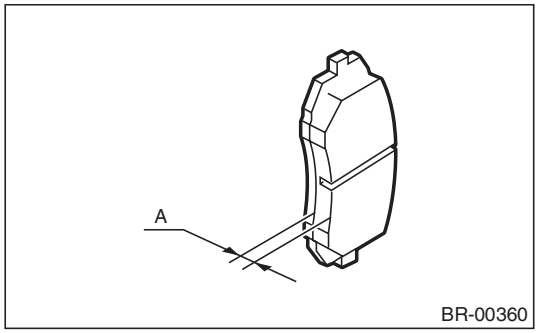
4) Install the caliper body to the support.

Tightening torque:
27 N·m (2.8 kgf-m, 19.9 ft-lb)

C: INSPECTION

1. 16-INCH TYPE

Check thickness A of the pad.

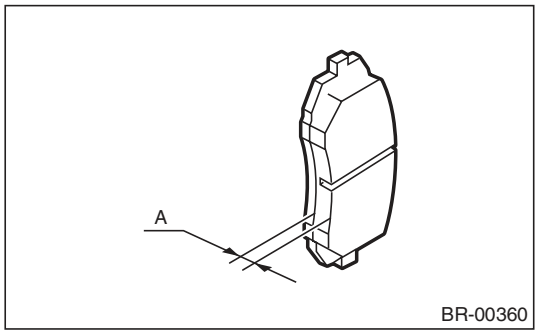


Pad thickness mm (in)	Standard	11 (0.43)
	Wear limit	1.5 (0.059)

NOTE:
• Always replace the pads of both wheels and both sides as a set.
• Replace pad clips if they are twisted or worn.
• Replace the pad if there is oil or grease on it.

2. 17-INCH TYPE

Check the pad thickness A.



Pad thickness mm (in)	Standard	11 (0.43)
	Wear limit	1.5 (0.059)

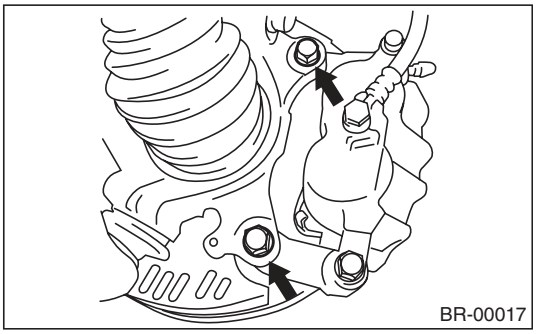
NOTE:
• Always replace the pads of both wheels and both sides as a set.
• Replace the pad if there is oil or grease on it.

3. Front Disc Rotor

A: REMOVAL

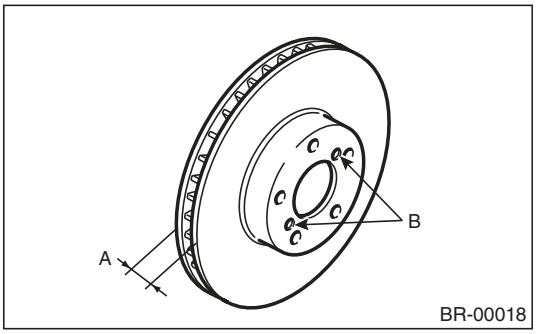
1. 16-INCH TYPE

1) Lift up the vehicle, and remove the front wheels.
2) Remove the caliper body and the support from housing, and suspend it from the strut using a wire.



3) Remove the disc rotor.

NOTE:
If it is difficult to remove the disc rotor from the hub, drive an 8 mm bolt into the threaded section (B) of the rotor, then remove the rotor.



4) Remove mud and foreign matter from the caliper body assembly and the support.

2. 17-INCH TYPE

Refer to 16-inch type. <Ref. to BR-14, 16-INCH TYPE, REMOVAL, Front Disc Rotor.>

B: INSTALLATION

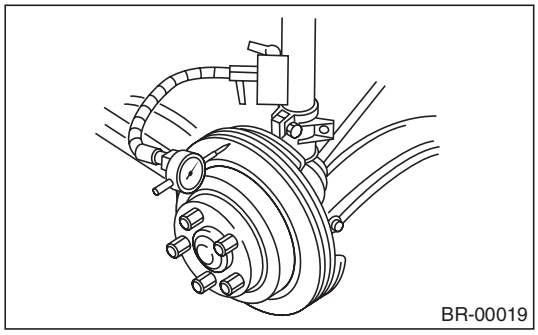
1) Install the disc rotor.
2) Install the caliper body and the support to housing.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

3) Install the front wheels.

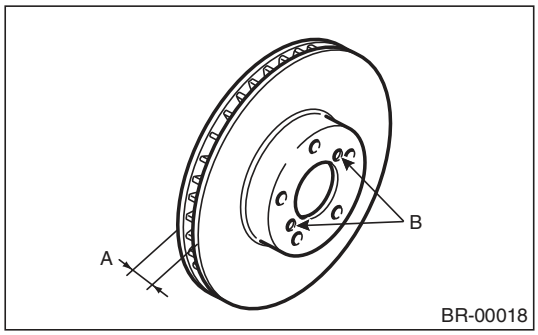
C: INSPECTION

1) Check the front wheel bearing play and axle hub runout before the inspection of disc rotor runout limit. <Ref. to DS-16, INSPECTION, Front Axle.>
2) Secure the disc rotor by tightening the five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward from the disc rotor outer circumference. Rotate the disc rotor to check runout. If the disc rotor runout exceeds the limit, resurface the disc rotor. After grinding, check the thickness of the disc rotor according to the procedure in step 4).



Disc rotor runout limit:
0.05 mm (0.0020 in)

4) Set a micrometer 10 mm (0.39 in) inward from the disc rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



		Standard	Limit	Disc rotor outer diameter
Disc rotor thickness A mm (in)	16″	24 (0.94)	22 (0.87)	294 (11.57)
	17″	30 (1.18)	28 (1.10)	316 (12.44)

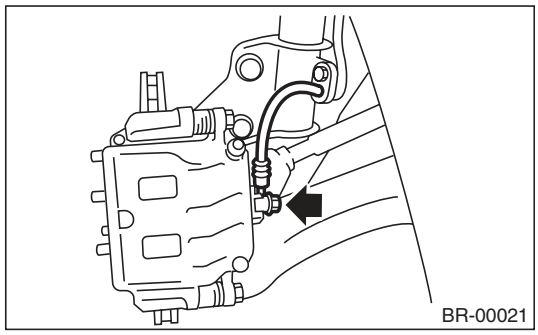
4. Front Disc Brake Assembly

A: REMOVAL

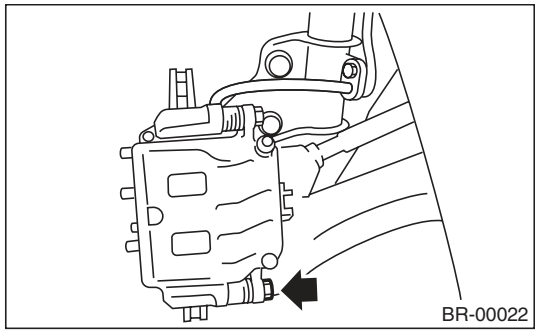
1. 16-INCH TYPE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water and wipe away completely.

1) Lift up the vehicle, and remove the front wheels.
2) Remove the union bolt, and disconnect the brake hose from the caliper body assembly.

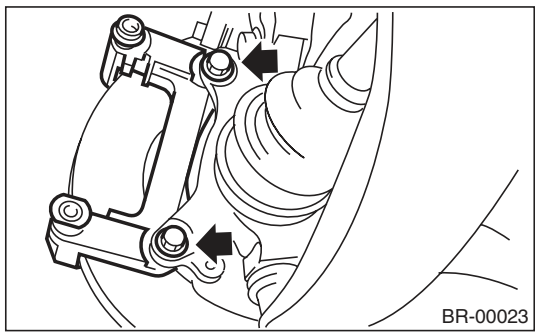


3) Remove the bolt securing the lock pin to caliper body.



4) Raise the caliper body, and then move it toward vehicle center to separate it from the support.
5) Remove the support from housing.

NOTE:
Remove the support only when replacing the rotor or support. It is not necessary to remove it when servicing the caliper body assembly.



6) Remove mud and foreign matter from the caliper body assembly and the support.

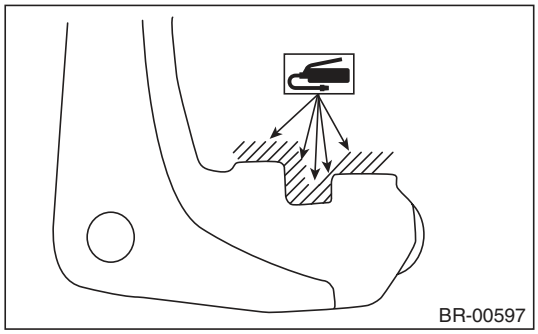
2. 17-INCH TYPE

Refer to 16-inch type. <Ref. to BR-15, 16-INCH TYPE, REMOVAL, Front Disc Brake Assembly.>

B: INSTALLATION

1. 16-INCH TYPE

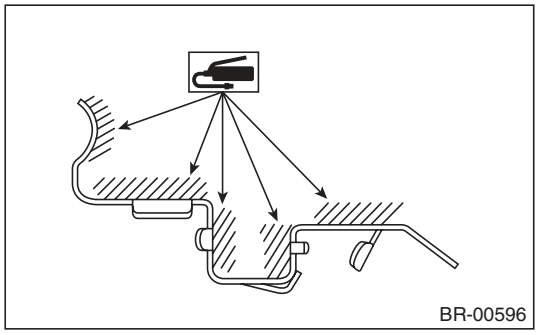
1) Apply a thin coat of Molykote M7439 (Part No. K0777YA000) or grease contained in the pad kit to the support.



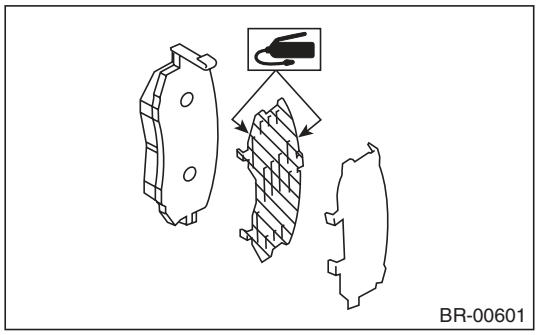
2) Install the support to the housing.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

3) Apply a thin coat of Molykote M7439 (Part No. K0777YA000) or grease contained in the pad kit to the pad clip.



4) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



5) Install the pad to support.
6) Install the caliper body to the support.

Tightening torque:
27 N·m (2.8 kgf-m, 19.9 ft-lb)

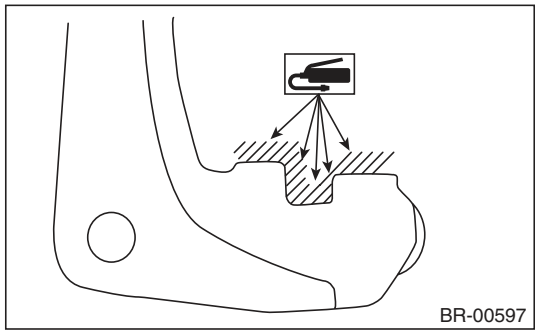
7) Connect the brake hose using a new brake hose gasket.

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

8) Bleed air from the brake system.

2. 17-INCH TYPE

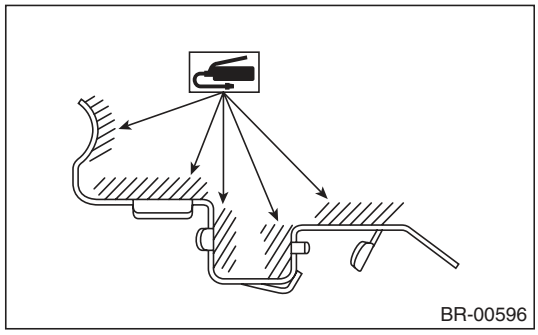
1) Apply a thin coat of Molykote M7439 (Part No. K0777YA000) or grease contained in the pad kit to the support.



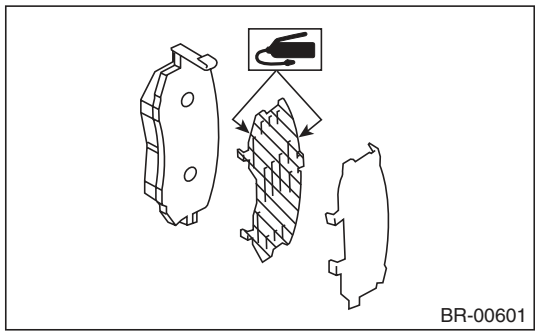
2) Install the support to the housing.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

3) Apply a thin coat of Molykote M7439 (Part No. K0777YA000) or grease contained in the pad kit to the pad clip.

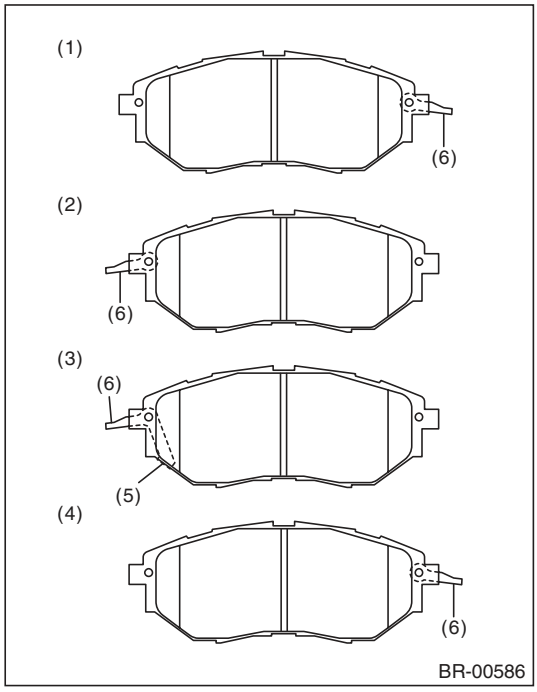


4) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



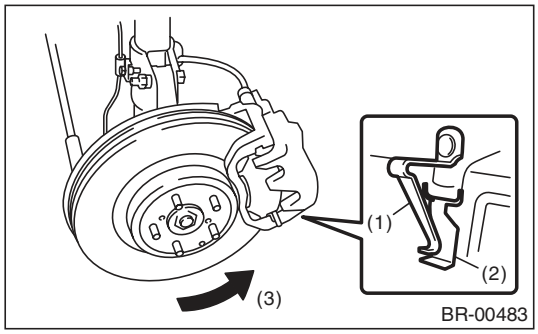
5) Install the pad to support.

NOTE:
Install the pad indicator in proper direction.



(1) LH — IN
(2) LH — OUT
(3) RH — IN
(4) RH — OUT
(5) Pad indicator
(6) Pad return spring

CAUTION:
• Be sure to install so that the pad return spring faces the input side of the direction of brake rotor rotation, as shown in the figure.
• Correctly install the pad return spring to the supporting surface of the pad clip as shown in the figure.
• If the pad return spring is deformed or damaged, replace the brake pad.



(1) Pad return spring
(2) Supporting surface of pad clip
(3) Direction of brake rotor rotation

6) Install the caliper body to the support.
7) Connect the brake hose using a new brake hose gasket.

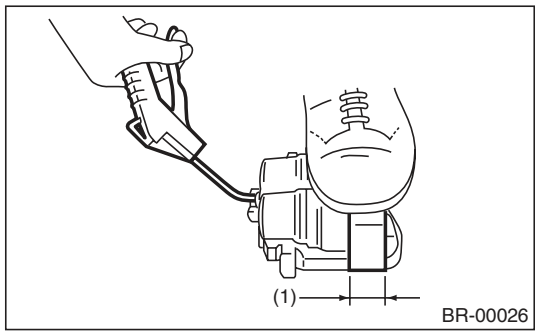
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)
8) Bleed air from the brake system.

C: DISASSEMBLY

1. 16-INCH TYPE

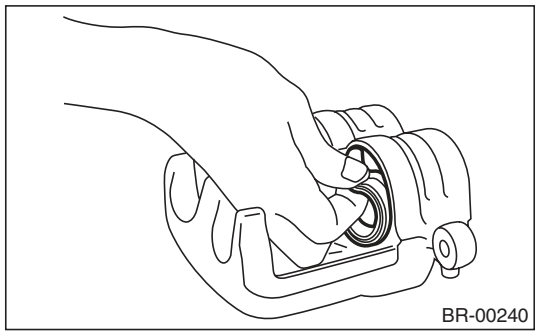
1) Remove mud and foreign matter from the caliper body assembly and the support.

CAUTION:
Be careful not to allow foreign matter to enter the brake hose connector.
2) Place a wooden block in the caliper body as shown in the figure to prevent the piston from jumping out and being damaged.
3) Gradually apply compressed air via the brake hose installation hole to push the piston out.



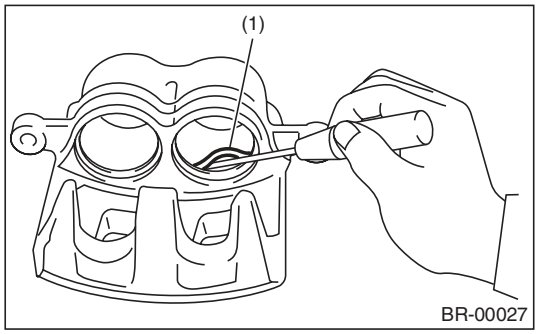
(1) Place a wooden block of 30 mm (1.18 in) width.

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. 17-INCH TYPE

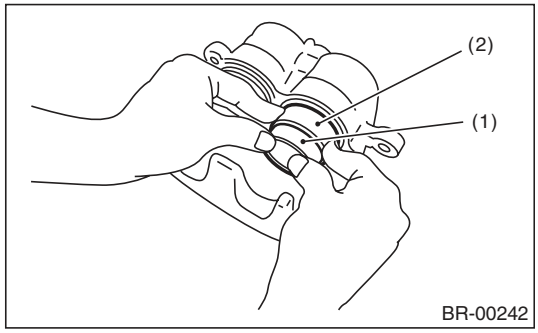
Refer to 16-inch type. <Ref. to BR-17, 16-INCH TYPE, DISASSEMBLY, Front Disc Brake Assembly.>

D: ASSEMBLY

1. 16-INCH TYPE

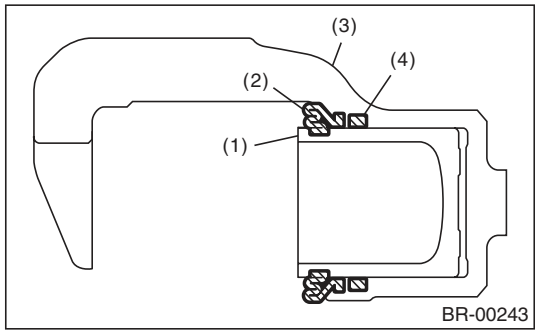
1) Clean the inside of the caliper body using brake fluid.
2) Apply a coat of brake fluid to piston seal and install the piston seal to the caliper body groove.
3) Apply a coat of brake fluid to the inner surface of cylinder and the entire outer surface of the piston.
4) Apply grease contained in the piston seal kit to the boot, and install it to the groove at the end of the cylinder.
5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



(1) Piston
(2) Piston boot

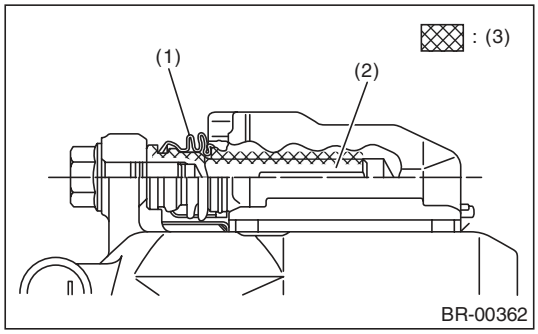
6) Position the boot in the grooves on cylinder and piston.



(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply grease contained in the piston seal kit to the lock pin, guide pin outer surface, cylinder inner surface, and boot grooves.

8) Insert the lock pin and guide pin boot into the support.



(1) Pin boot
(2) Lock pin or guide pin
(3) Grease applied area

CAUTION:
After inserting the lock pin and guide pin into the specified locations, check by hand that the pin moves and slides smoothly with no abnormalities when it reaches the end.

2. 17-INCH TYPE

Refer to 16-inch type. <Ref. to BR-18, 16-INCH TYPE, ASSEMBLY, Front Disc Brake Assembly.>

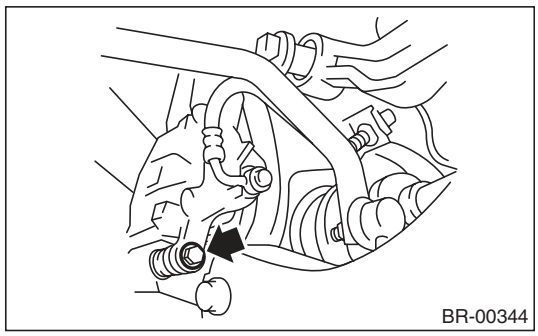
E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

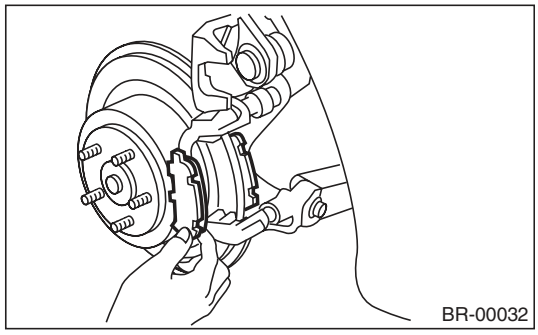
1) Lift up the vehicle, and remove the rear wheels.
2) Remove the caliper bolt.



3) Raise the caliper body and support it.

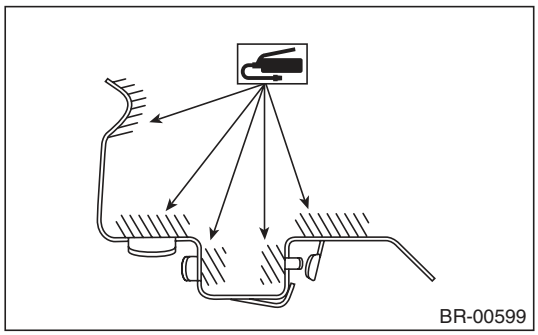
NOTE:
Do not disconnect the brake hose from the caliper body.

4) Remove the pads.



B: INSTALLATION

1) Apply a thin coat of Molykote M7439 (Part No. K0777YA000) or grease contained in the pad kit to the pad clip.

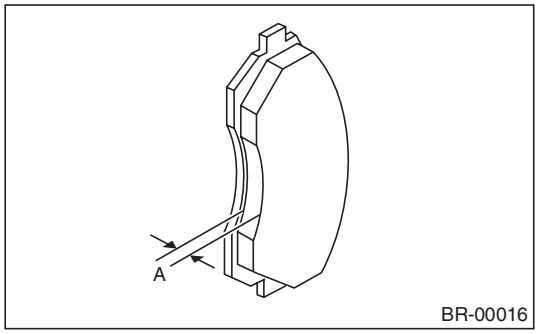


2) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) or grease contained in the pad kit to the contact surface between the pad and shim.
3) Install the pad to support.
4) Install the caliper body to the support.

Tightening torque:
Solid disc brake model
27 N·m (2.8 kgf-m, 19.9 ft-lb)
Ventilated disc brake model
37 N·m (3.7 kgf-m, 27.2 ft-lb)

C: INSPECTION

Check the pad thickness A.



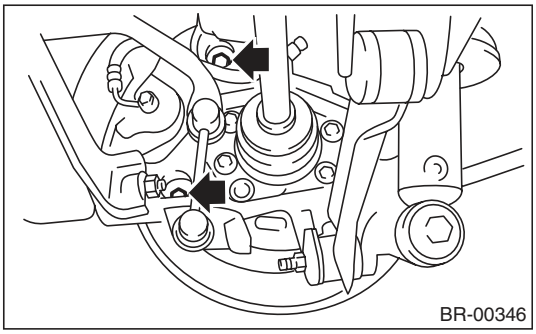
Type of disc rotor		Solid	Ventilated
Pad thickness mm (in)	Standard	9.0 (0.35)	9.0 (0.35)
	Wear limit	1.5 (0.059)	1.5 (0.059)

NOTE:
• Always replace the pads of both wheels and both sides as a set.
• Replace pad clips if they are twisted or worn.
• A wear indicator is installed on the inner disc brake pad. If the pad is worn to the limit, the end of wear indicator contacts disc rotor, and a squeaking sound is heard as the wheel rotates. If the sound is heard, replace the pad.
• Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

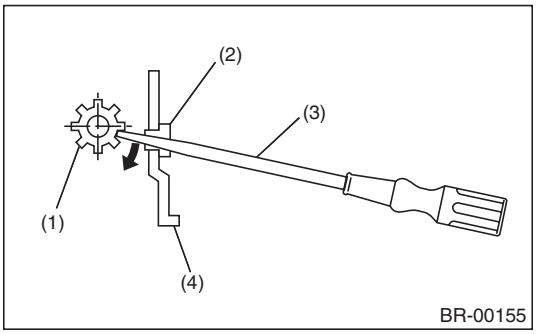
1) Lift up the vehicle, then remove the rear wheels.
2) Release the parking brake.
3) Remove the two mounting bolts, and remove the disc brake assembly.



4) Suspend the disc brake assembly so that the hose is not stretched.
5) Remove the disc rotor.

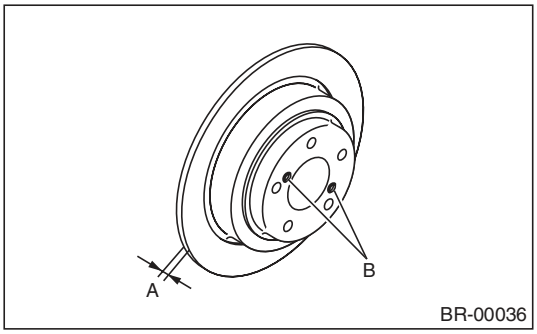
NOTE:
If it is difficult to remove the disc rotor, perform the following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until the brake shoe is far enough away to allow removal of the disc rotor.



(1) Adjusting screw
(2) Cover
(3) Flat tip screwdriver
(4) Back plate

(2) If it is difficult to remove the disc rotor from the hub, drive an 8 mm bolt into the threads B of the rotor, then remove the rotor.

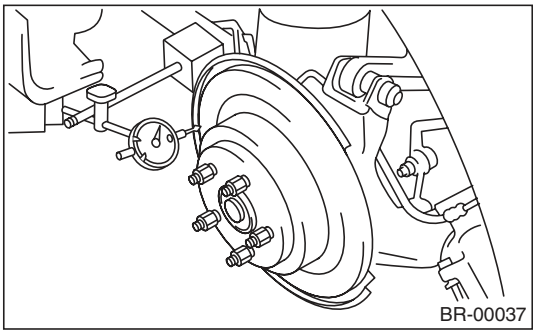


B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

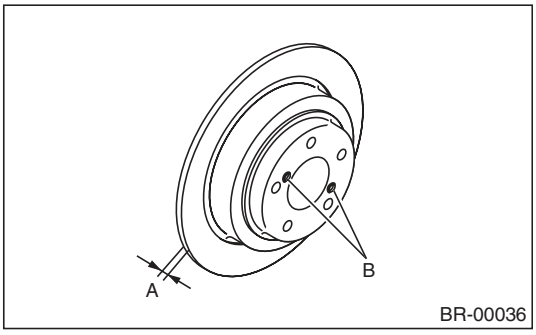
C: INSPECTION

1) Check the rear wheel bearing play and axle hub runout before inspecting the disc rotor runout limit. <Ref. to DS-21, INSPECTION, Rear Hub Unit Bearing.>
2) Secure the disc rotor by tightening the five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward from the disc rotor outer circumference. Rotate the disc rotor to check runout. If the disc rotor runout exceeds the limit, resurface the disc rotor. After grinding, check the thickness of the disc rotor according to the procedure in step 4).



Disc rotor runout limit:
0.05 mm (0.0020 in)

4) Set a micrometer 10 mm (0.39 in) inward from the disc rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of the disc rotor exceeds the service limit, replace with a new disc rotor.



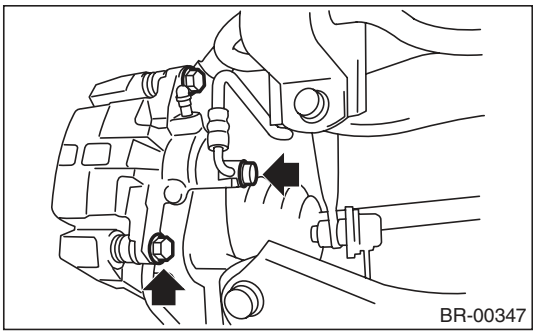
		Standard	Limit	Disc outer dia.
Disc rotor thickness A mm (in)	Solid disc	10 (0.39)	8.5 (0.335)	274 (10.79)
	Ventilated disc	18 (0.71)	16 (0.63)	290 (11.42)

7. Rear Disc Brake Assembly

A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water and wipe away completely.

1) Lift up the vehicle, then remove the rear wheels.
2) Disconnect the brake hose from caliper body assembly.
3) Remove the caliper lower bolt.



4) Raise the caliper body, and then move it toward vehicle center to separate it from the support.
5) Remove the support from housing.

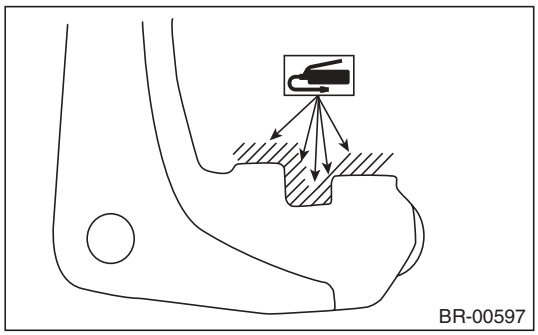
NOTE:
Remove the support only when replacing the rotor or support. It is not necessary to remove it when servicing the caliper body assembly.

6) Remove mud and foreign matter from the caliper body assembly and the support.

CAUTION:
Be careful not to allow foreign matter to enter the brake hose connector.

B: INSTALLATION

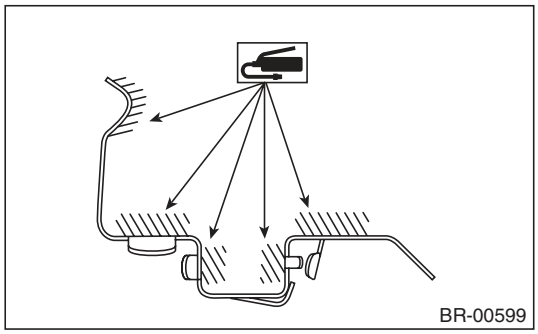
1) Apply a thin coat of Molykote M7439 (Part No. K0777YA000) or grease contained in the pad kit to the support.



2) Install the support to the housing.

Tightening torque:
66 N·m (6.7 kgf-m, 48.7 ft-lb)

3) Apply a thin coat of Molykote M7439 (Part No. K0777YA000) or grease contained in the pad kit to the pad clip.



4) Apply a thin coat of Molykote AS880N (Part No. K0779YA010) or grease contained in the pad kit to the contact surface between the pad and shim.
5) Install the pad to support.
6) Install the caliper body to the support.

Tightening torque:
Solid disc brake model
27 N·m (2.8 kgf-m, 19.9 ft-lb)
Ventilated disc brake model
37 N·m (3.7 kgf-m, 27.2 ft-lb)

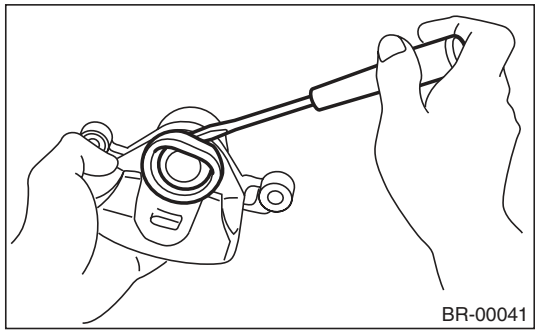
7) Connect the brake hose using a new brake hose gasket.

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

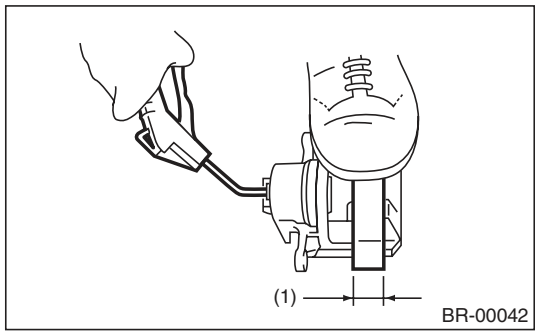
8) Bleed air from the brake system.

C: DISASSEMBLY

1) Remove the piston boot.



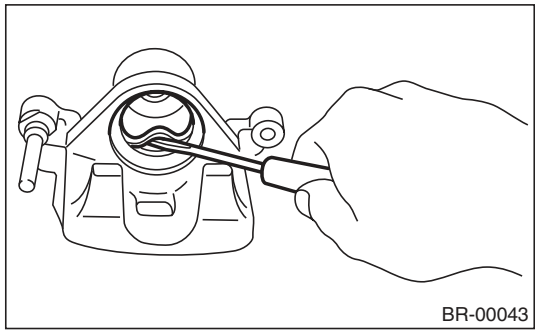
2) Place a wooden block in the caliper body as shown in the figure to prevent the piston from jumping out and being damaged.
3) Gradually apply compressed air via the brake hose installation hole to push the piston out.



(1) Place a wooden block of 30 mm (1.18 in) width.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



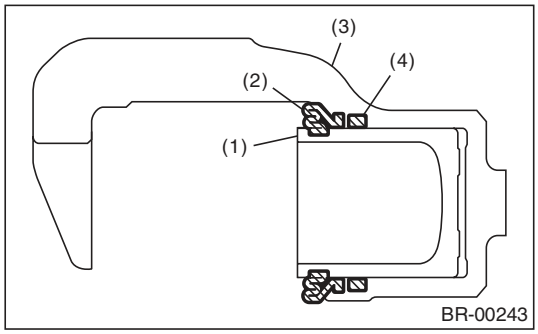
5) Remove the lock pin sleeve and boot from caliper body.
6) Remove the guide pin boot.

D: ASSEMBLY

1) Clean the inside of the caliper body using brake fluid.
2) Apply a coat of brake fluid to piston seal and install the piston seal to the caliper body groove.
3) Apply a coat of brake fluid to the inner surface of cylinder and the entire outer surface of the piston.
4) Apply grease contained in the piston seal kit to the boot, and install it to the groove at the end of the cylinder.
5) Insert the piston into cylinder.

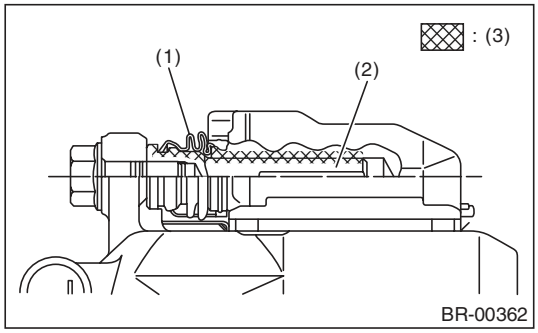
CAUTION:
Do not force the piston into cylinder.

6) Position the boot in the grooves on piston and cylinder.



(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply grease contained in the piston seal kit to the guide pin, outer periphery, sleeve periphery, cylinder inner surface, and boot grooves.



(1) Pin boot
(2) Lock pin or guide pin
(3) Grease applied area

8) Insert the guide pin boot to the support.
9) Install the lock pin boot to the support, and then insert the lock pin sleeve into the specified position.

CAUTION:
Insert the lock pin and guide pin into position, and make sure that they slide and seat properly.

E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

8. Master Cylinder

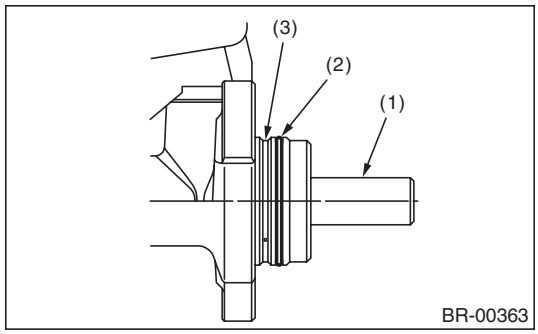
A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water and wipe away completely.
1) Drain brake fluid from the reservoir tank completely.
2) Disconnect the harness connector of the fluid level gauge.
3) Remove the brake pipe from the master cylinder.
4) Remove the master cylinder mounting nuts, and remove the master cylinder from the brake booster.

B: INSTALLATION

1) Replace the O-ring for the master cylinder with a new part.

CAUTION:
Be careful not to install the O-ring in the wrong location.



(1) Primary piston
(2) O-ring
(3) Do not install the O-ring on this groove.

2) Install in the reverse order of removal.

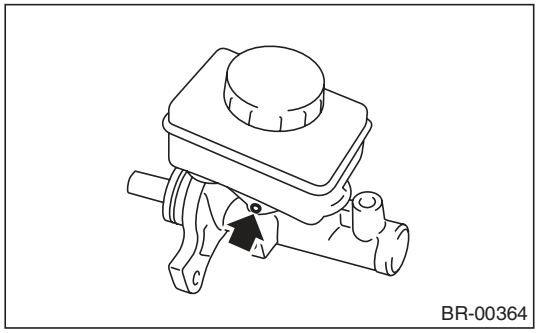
Tightening torque:
Master cylinder mounting nut
13 N·m (1.3 kgf-m, 9.6 ft-lb)
Piping flare nut
Model with ABS
15 N·m (1.5 kgf-m, 10.8 ft-lb)
Model with VDC
19 N·m (1.9 kgf-m, 14.0 ft-lb)

CAUTION:
Be sure to use recommended brake fluid.
3) Bleed air from brake system. <Ref. to BR-32, PROCEDURE, Air Bleeding.>

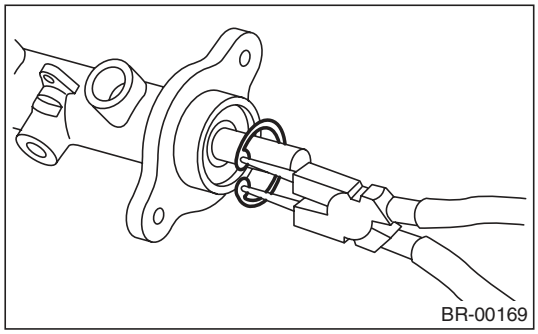
C: REPLACEMENT

1) Remove mud and dirt from the surface of brake master cylinder.
2) Secure the master cylinder in a vise.

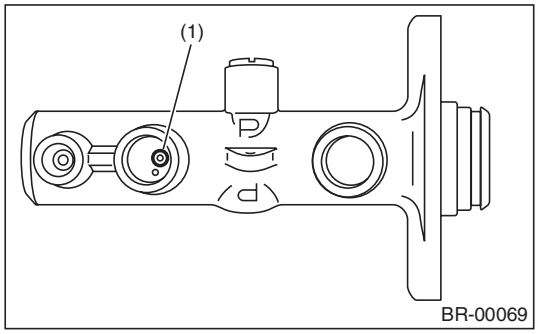
NOTE:
To avoid damaging the master cylinder, place between aluminum plates or other material when holding with a vise.
3) Remove the pin which secures the master cylinder and reservoir tank, then remove the reservoir tank and seal.



4) While pushing in the primary piston, remove the C-ring using pliers.



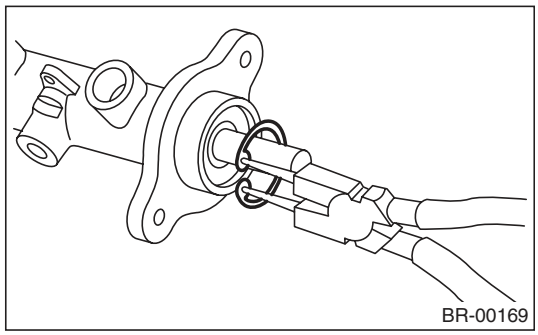
5) While pushing in the primary piston, remove the straight pin from the port on the reservoir tank attachment location using a magnet pick-up tool.



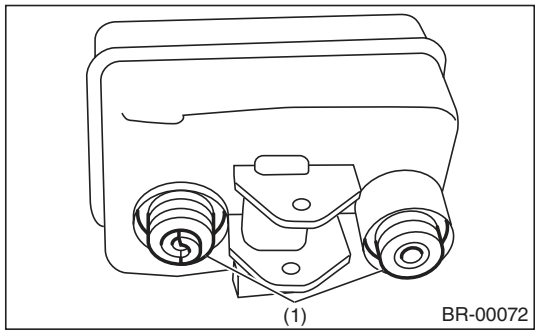
(1) Straight pin

6) Extract the primary piston assembly and secondary piston assembly straight out while taking care not to scratch the inner surface of the cylinder.

7) Clean the inside of master cylinder with brake fluid. Check the inside of the cylinder for damage, deformation and wear. Replace the master cylinder as assembly if faulty.
8) Apply brake fluid to the inner surface of master cylinder and piston assembly.
9) Make sure that the inner surface of master cylinder and the piston assembly are free of foreign matter. Install the primary piston assembly and the secondary piston assembly to master cylinder, while taking care not to scratch the master cylinder inner surface.
10) While pushing-in the primary piston, install the cylinder pin.
11) While pushing-in the primary piston, install the C-ring to the groove using pliers.



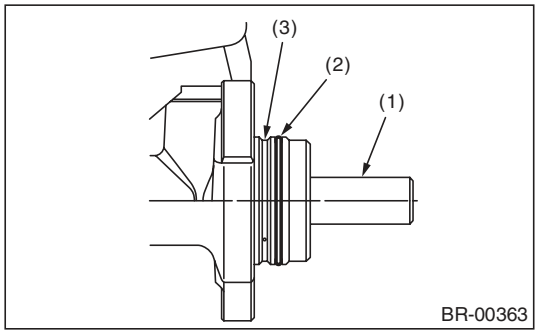
CAUTION:
Make sure the C-ring is installed to the groove securely.
12) Install the seal to reservoir tank.



(1) Seal

13) Install the reservoir tank to the master cylinder, and secure with pin.

14) Replace the O-ring for the master cylinder with a new part.



(1) Primary piston
(2) O-ring
(3) Do not install the O-ring on this groove.

D: INSPECTION

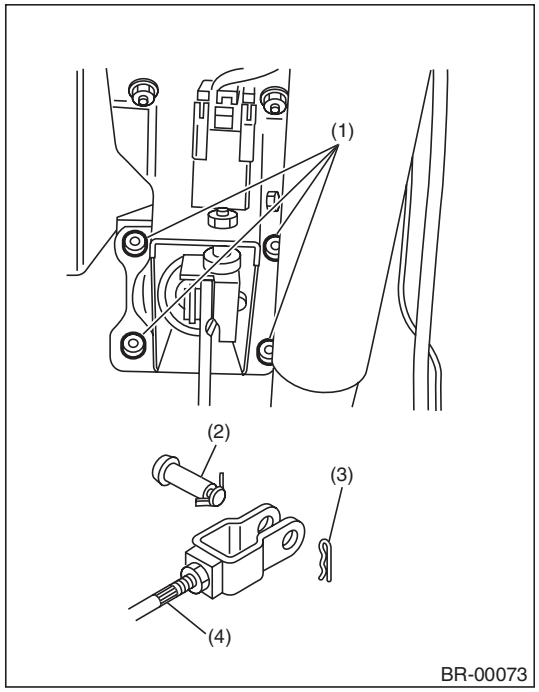
Inspect for oil leakage from the master cylinder.

NOTE:
After replacing the piston kit, if an oil leakage is found even though there is no damage or scratches on the inside of the cylinder, the master cylinder inner wall may be worn. In this case, replace the master cylinder as an assembly.

9. Brake Booster

A: REMOVAL

1) Remove or disconnect the following parts in the engine compartment.
   (1) Disconnect the connector of brake fluid level gauge.
   (2) Remove the brake pipe from the master cylinder.
   (3) Remove the master cylinder installation nut.
   (4) Disconnect the vacuum hose from brake booster.
2) Remove the following parts from the pedal bracket.
   (1) Snap pin and clevis pin
   (2) Four brake booster installation nuts

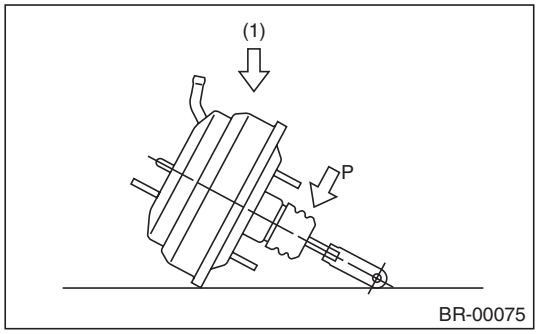


(1) Nut
(2) Clevis pin
(3) Snap pin
(4) Operating rod

3) Remove the brake booster while avoiding the brake pipe.

NOTE:
• Make sure that the booster shell and vacuum pipe are not subject to strong impacts.
• Be careful not to drop the brake booster. If the booster is dropped, replace it.
• Use special care when handling the operating rod. If excessive force is applied to the operating rod, the angle may change by ±3°, and it may result in damage to power piston cylinder.
• Be careful when placing the brake booster on floor.
• Do not change the push rod length.

CAUTION:
• Do not disassemble the brake booster.
• If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by "P" may become damaged.



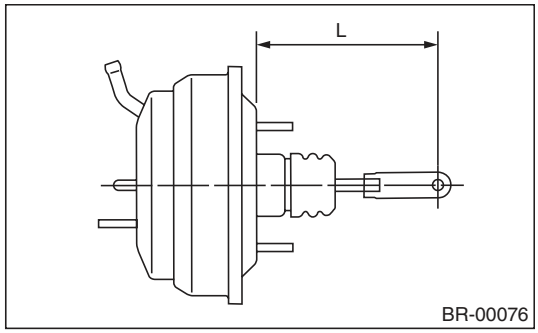
(1) Force

B: INSTALLATION

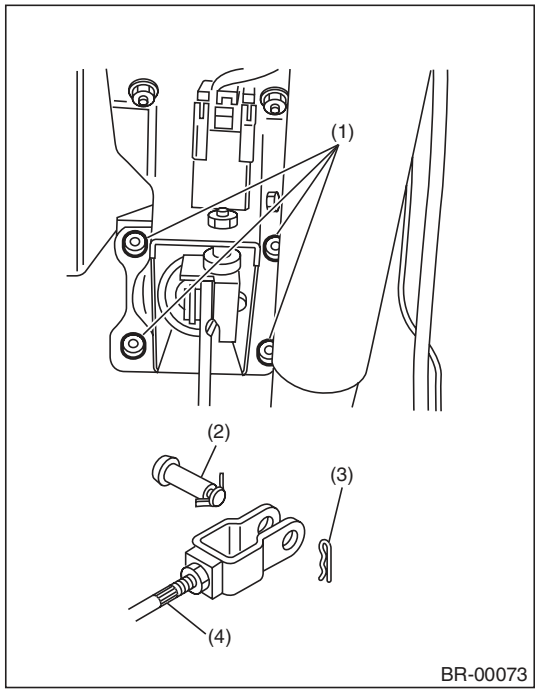
1) Check and adjust the operating rod of the brake booster.

Specification L:
136.5 mm (5.38 in)

If it is out of specification, adjust it with the brake booster operating rod.

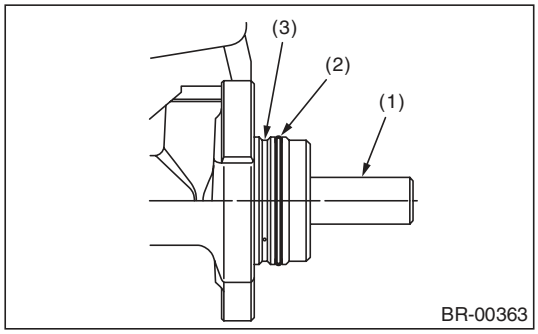


2) Mount the brake booster in position.
3) Connect the operating rod to brake pedal with clevis pin and snap pin.



(1) Nut
(2) Clevis pin
(3) Snap pin
(4) Operating rod

NOTE:
Apply a thin coat of SUNLIGHT 2 (Part No. 003602010) to the clevis pin.
4) Connect the vacuum hose to the brake booster.
5) After replacing the O-ring, install the master cylinder to brake booster.

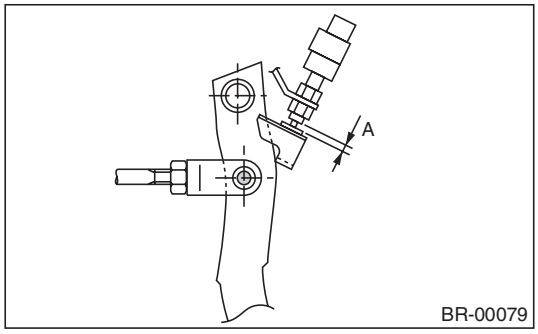


(1) Primary piston
(2) O-ring
(3) Do not install the O-ring on this groove.

6) Connect the brake pipes to the master cylinder.
7) Connect the connector of the brake fluid level gauge.
8) Measure the clearance between the threaded end of the stop light switch and the stopper.
If it is not within the specification, adjust it by adjusting the position of the stop light switch. <Ref. to BR-40, ADJUSTMENT, Stop Light Switch.>

CAUTION:
Be careful not to rotate the stop light switch.

Stop light switch clearance A:
0.3 mm (0.012 in)



9) Apply grease to the operating rod connecting pin to prevent it from wear.
10) Bleed air from brake system.

Tightening torque (air bleeder screw):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

11) Perform a road test to make sure the brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

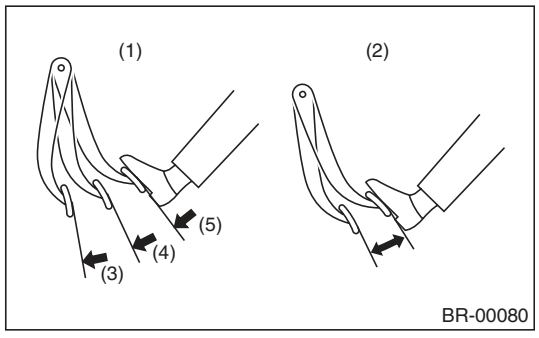
CAUTION:
When checking operation, be sure to apply the parking brake securely.

• Check without gauges

This method can not determine exactly what part is defective. But it is possible to identify the outline of the defect by performing the check according to the following procedures.

• Air tightness check

Start the engine, and idle it for 1 to 2 minutes, then turn it OFF. Depress the brake pedal several times applying the normal pedal force. The pedal stroke should be the longest at the 1st depression, and it should become shorter at each successive depression. If no change occurs in the pedal height when pressed, the brake booster is faulty.

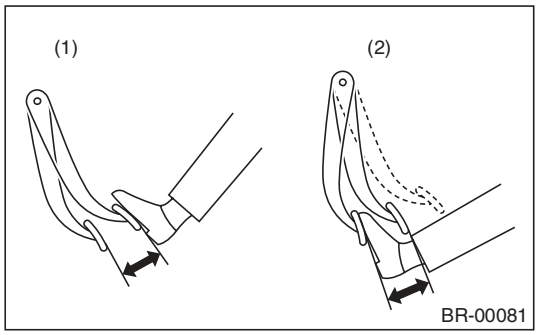


(1) Normal operation
(2) Not OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In case of defective operation, inspect the condition of the check valve and vacuum hose as well.
• Replace them if faulty, and perform the test again.
• If no improvement is observed, check precisely with gauges.

• Operation check

1) While the engine is OFF, depress the brake pedal several times applying the same pedal force, to check for a change in pedal height.



(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 slowly toward the floor. If the pedal height does not change, the brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

• Loaded air tightness check

Depress the brake pedal while the engine is running, and turn the engine to OFF while the pedal is depressed. Keep the pedal depressed for 30 seconds. If the pedal height does not change, the function of brake booster is normal. If the pedal height increases, it is faulty.

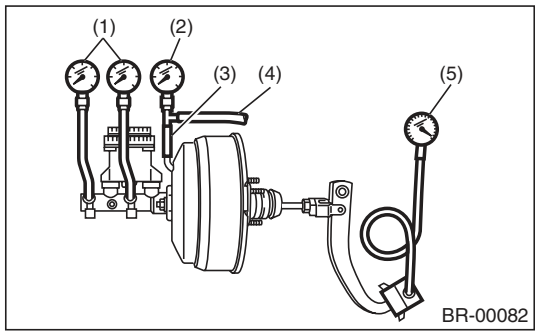
NOTE:
If faulty, check precisely with gauges.

2. OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to apply the parking brake securely.

• Check with gauges

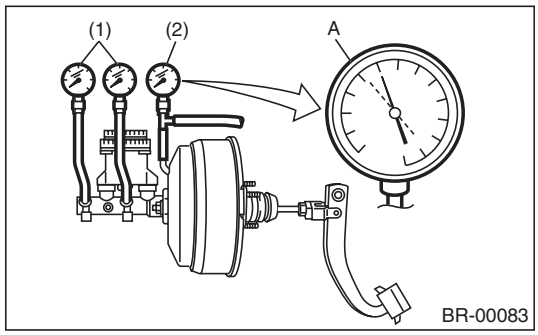
Connect the gauge as shown in the figure. After bleeding air from the pressure gauge, perform the checks.



(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 vacuum pressure indicates point A of the vacuum gauge = 66.7 kPa (500 mmHg, 19.69 inHg). Do not depress the brake pedal at this time.

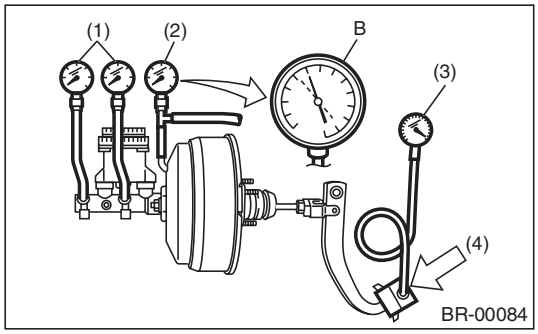


(1) Pressure gauge
(2) Vacuum gauge

2) Stop the engine and check the gauge. If the vacuum pressure drop within 15 seconds after stopping the engine is 3.3 kPa (25 mmHg, 0.98 inHg) or less, the function of brake booster is normal.
If faulty, the cause may be one of the following.
• Check valve malfunction
• Leak from vacuum hose
• Leak from shell joint section or stud bolt welded section
• Damaged diaphragm
• Leak from valve body seal and bearing section
• Leak from plate and seal assembly section
• Leak from poppet valve assembly section

• Loaded air tightness check

1) Start the engine and depress the brake pedal with a pedal force of 196 N (20 kgf, 44 lb). Keep the engine running and keep the pedal pressed until a vacuum of point B = 66.7 kPa (500 mmHg, 19.69 inHg) is indicated on the vacuum gauge.



(1) Pressure gauge
(2) Vacuum gauge
(3) Pedal force gauge
(4) Depressed

2) Stop the engine and check the vacuum gauge.
If the vacuum pressure drop within 15 seconds after stopping the engine is 3.3 kPa (25 mmHg, 0.98 inHg) or less, the function of brake booster is normal.
If defective, refer to “AIR TIGHTNESS CHECK”.
<Ref. to BR-29, INSPECTION, Brake Booster.>
3) If the brake booster is faulty, replace it with a new part.

• Lack of boost action check

Turn the engine OFF, and set the value of the vacuum gauge to “0”. Then, check the fluid pressure when the brake pedal is depressed. The pressure must be greater than the specification listed.

Brake pedal operation force N (kgf, lb)	147 (15, 33)	294 (30, 66)
Fluid pressure kPa (kg/cm^2, psi)	545 (6, 79)	1,564 (16, 227)

• Boosting action check

Set the vacuum gauge reading to 66.7 kPa (500 mmHg, 19.69 inHg) with the engine running. Then, check the fluid pressure when the brake pedal is depressed. The pressure must be greater than the specification listed.

Brake pedal operation force N (kgf, lb)	147 (15, 33)	294 (30, 66)
Fluid pressure kPa (kg/cm^2, psi)	6,003 (61, 871)	11,273 (115, 1,635)

10. Brake Fluid

A: INSPECTION

1) Check that the brake fluid level is between “MIN” and “MAX”. If out of the specified range, refill or drain fluid. If the fluid level is close to “MIN”, check the brake pad for wear and refill the fluid.
2) Check the fluid for discoloration. If the fluid color has changed excessively, drain the fluid and refill with new fluid.

B: REPLACEMENT

CAUTION:
• Do not let brake fluid come into contact with the painted surface of the vehicle body. Wash away with water immediately and wipe off if it is spilled by accident.
• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.
• Be careful not to allow dirt or dust to enter the reservoir tank.

NOTE:
• During the operation, keep the reservoir tank filled with brake fluid to eliminate entry of air.
• Operate the brake pedal slowly.
• For convenience and safety, two people should do the work.
• The required amount of brake fluid is approximately 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for the entire brake system.
1) Lift up the vehicle and set rigid racks at the specified locations, or keep the vehicle lifted.
2) Remove both the front and rear wheels.
3) Drain brake fluid from the reservoir tank.
4) Refill the reservoir tank with the recommended brake fluid.

Recommended brake fluid:
Refer to the specification of “General Description”. <Ref. to BR-2, SPECIFICATION, General Description.>
Perform the same procedure as for bleeding the brake line, until new brake fluid comes out from vinyl tube. <Ref. to BR-32, PROCEDURE, Air Bleeding.>

11. Air Bleeding

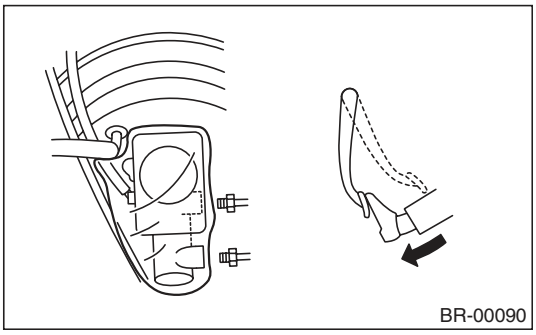
A: PROCEDURE

CAUTION:
• Do not let brake fluid come into contact with the painted surface of the vehicle body. Wash away with water immediately and wipe off if it is spilled by accident.
• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.
• Be careful not to allow dirt or dust to enter the reservoir tank.

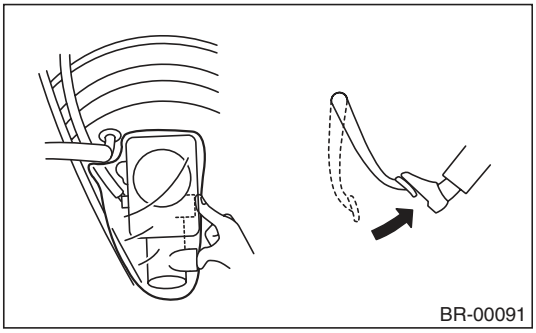
1. MASTER CYLINDER

NOTE:
• When the master cylinder is disassembled or the reservoir tank is empty, bleed the master cylinder.
• If bleeding of the master cylinder is not necessary, omit the following procedures, and perform bleeding of the brake line. <Ref. to BR-32, BRAKE LINE, PROCEDURE, Air Bleeding.>
1) Fill the reservoir tank of the master cylinder with brake fluid.

NOTE:
While bleeding air, keep the reservoir tank filled with brake fluid to prevent entry of air.
2) Disconnect the brake line at primary and secondary sides.
3) Wrap the master cylinder with a plastic bag.
4) Depress the brake pedal slowly and hold it.


BR-00090

5) Plug the outlet plug with your finger, and then release the brake pedal.


BR-00091

6) Repeat steps 4) and 5) several times.
7) Remove the plastic bag.
8) Install the brake pipe to the master cylinder.

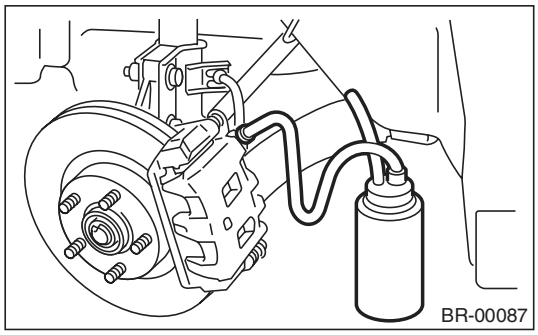
Tightening torque:
Model with ABS
15 N·m (1.5 kgf-m, 10.8 ft-lb)
Model with VDC
19 N·m (1.9 kgf-m, 14.0 ft-lb)

9) Bleed air from the brake line. <Ref. to BR-32, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

1) When the master cylinder is disassembled or the reservoir tank is empty, bleed the master cylinder before bleeding the brake line. <Ref. to BR-32, MASTER CYLINDER, PROCEDURE, Air Bleeding.>
2) Fill the reservoir tank of the master cylinder with brake fluid.

NOTE:
While bleeding air, keep the reservoir tank filled with brake fluid to prevent entry of air.
3) Attach one end of the vinyl tube to the air bleeder and the other end to the brake fluid container.


BR-00087

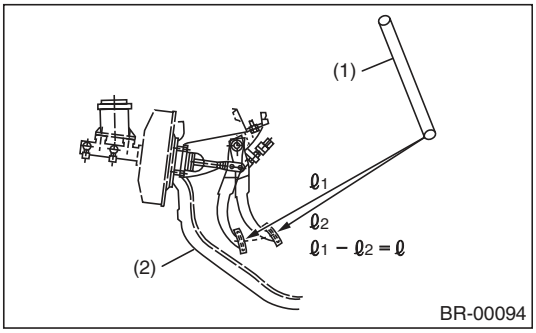
4) Depress the brake pedal several times, and hold it.
5) Loosen the air bleeder screw to drain brake fluid. Tighten the air bleeder quickly, and release the brake pedal.
6) Repeat the steps 4) to 5) until there are no more air bubbles in the vinyl tube.
7) Repeat the steps from 2) to 6) above to bleed air from each wheel.

NOTE:
Perform the operation in the order from the farthest wheel cylinder from the master cylinder.
8) Securely tighten the air bleeder screws.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

9) Check that there are no brake fluid leaks in the entire system.

10) Check the pedal stroke.
Run the engine at idle after warming up the engine, and depress the brake pedal with a force of 500 N (51 kgf, 112 lb). Measure the distance between the brake pedal and steering wheel. Release the pedal, and measure the distance between pedal and steering wheel again.



(1) Steering wheel
(2) Toe board

Specification of pedal stroke:
When depressing the pedal with a force of 500 N (51 kgf, 112 lbf).
95 mm (3.74 in) or less

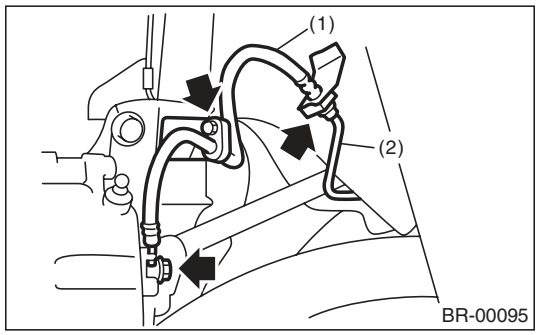
11) If the distance is more than specification, there is a possibility of air being caught in the brake line. Bleed the brake line of all air until the pedal stroke meets the specification.
12) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-10, ABS Sequence Control.>
13) Check the pedal stroke again.
14) If the distance is more than specification, there is a possibility of air being caught in the hydraulic unit. Repeat above steps 2) to 9) until the pedal stroke meets the specification.
15) Fill the reservoir tank with brake fluid up to the “MAX” level.
16) Test run the vehicle and ensure that the brakes operate normally.

12. Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

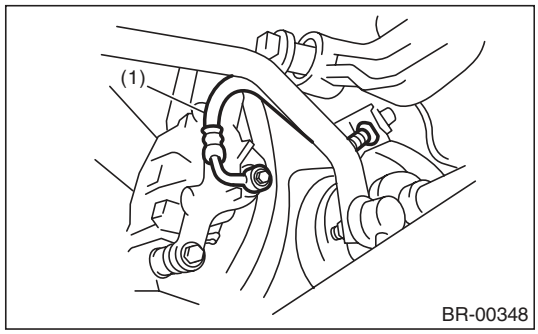
1) Separate the brake pipe from brake hose using a flare nut wrench.
2) Remove the clamp, the strut mount bolts, and union bolt.



(1) Brake hose
(2) Brake pipe

2. REAR BRAKE HOSE

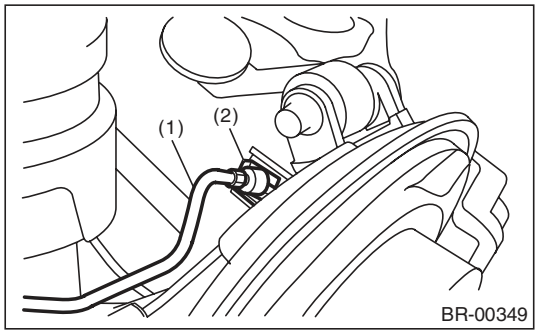
1) Remove the union bolt from the rear brake caliper.



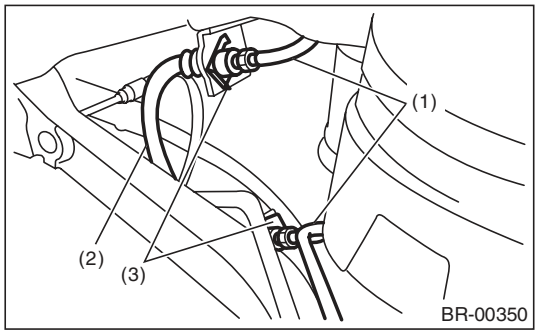
(1) Brake hose

2) Separate the brake pipe from brake hose using a flare nut wrench.

3) Remove the clamp, and then remove the brake hose.



(1) Brake pipe
(2) Brake hose clamp



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

B: INSTALLATION

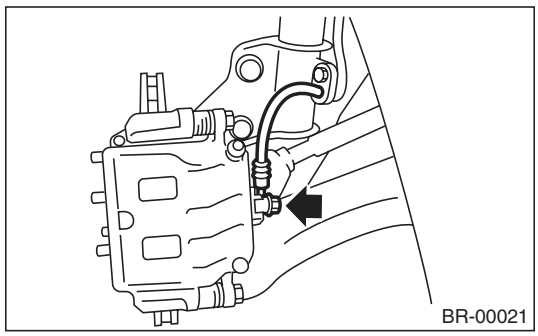
1. FRONT BRAKE HOSE

1) Secure the brake hose to strut mount.

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

2) Install the brake hose to the caliper using a new gasket.

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



3) Position the disc in straight position and route the brake hose through the hole in the bracket on the wheel apron side.

CAUTION:
Do not twist the brake hose.

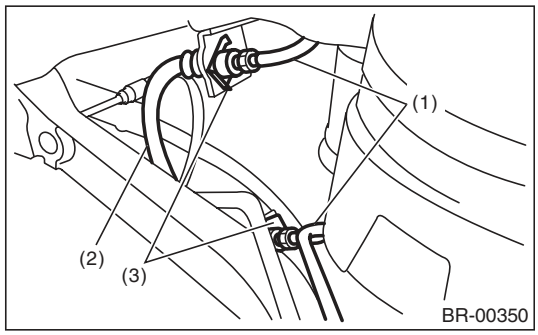
4) Temporarily tighten the flare nut which connects brake pipe and hose.
5) Secure the brake hose to wheel apron bracket with clamp.
6) Tighten the flare nut to the specified torque.

Tightening torque (brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

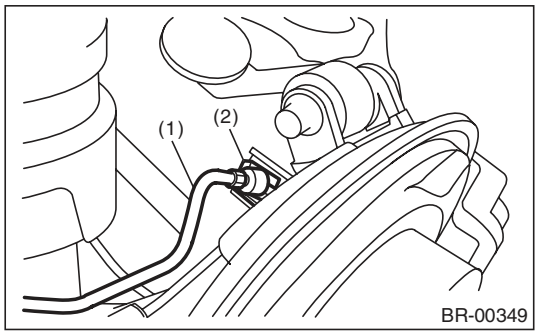
7) Bleed air from brake system.

2. REAR BRAKE HOSE

1) Route the brake hose through the hole of bracket, and lightly tighten the flare nut to connect brake pipe.
2) Insert the clamp to secure brake hose.



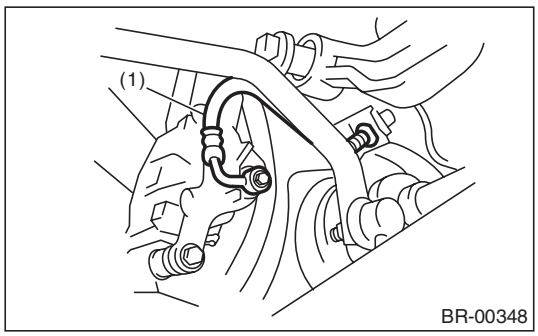
(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp



(1) Brake pipe
(2) Brake hose clamp

3) Install the brake hose to rear brake caliper using a new gasket.

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



(1) Brake hose

4) Tighten the flare nut to the specified torque.

Tightening torque (brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

5) Bleed air from the brake system.

C: INSPECTION

Make sure there are no cracks, breakage or damage on hoses. Check the joint for fluid leakage. If any cracks, breakage, damage or fluid leakage is found, repair or replace the hose.

13.Brake Pipe

A: REMOVAL

NOTE:
The 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, do not bend.

B: INSTALLATION

NOTE:
The 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, do not bend.
• After installing the brake pipe and hose, perform air bleed.
• After installing the brake hoses, make sure that they do not contact the tires or suspension assembly, etc.

Brake pipe tightening torque:
<Ref. to BR-7, FRONT BRAKE PIPES AND HOSES, COMPONENT, General Description.>
<Ref. to BR-8, CENTER AND REAR BRAKE PIPES AND HOSES, COMPONENT, General Description.>

C: INSPECTION

Make sure there are no cracks, breakage or damage on hoses. Check the joint for fluid leakage. If any cracks, breakage, damage or fluid leakage is found, repair or replace the pipes.

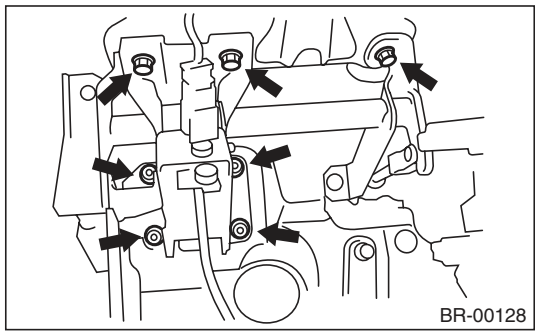
NOTE:
Use a mirror when inspecting back sides and other locations which are hard to see.

14.Brake Pedal

A: REMOVAL

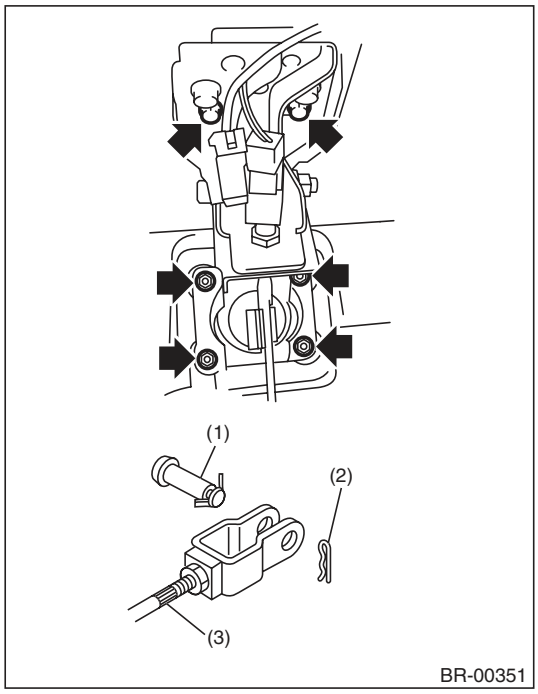
1. MT MODEL

1) Remove the steering shaft.
2) Disconnect the connector (stop light switch etc.) from the pedal bracket.
3) Remove the clevis pin which secures the lever and push rod.
4) Remove the nut which secures the clutch master cylinder.
5) Remove the bolt and nut which secures the pedal bracket.



2. AT MODEL

1) Remove the steering shaft.
2) Disconnect the connector (stop light switch etc.) from the pedal bracket.
3) Remove the clevis pin which secures the lever and push rod.
4) Remove the bolt and nut which secures the pedal bracket.



(1) Clevis pin
(2) Snap pin
(3) Operating rod

B: INSTALLATION

1) Install in the reverse order of removal.

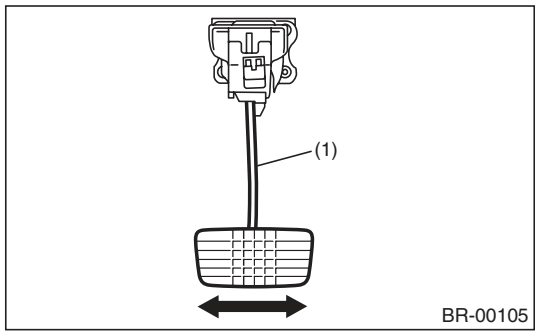
CAUTION:
Always use a new clevis pin.
2) Check the brake pedal after installation. <Ref. to BR-38, INSPECTION, Brake Pedal.>

C: INSPECTION

1) Move the brake pedal pads in a horizontal direction with a force of approx. 10 N (1 kgf, 2 lb), and check that the pedal deflection is in the range of specifications.

CAUTION:
If excessive deflection is noted, replace with a new bushing.

Deflection of brake pedal:
Limit
5.0 mm (0.197 in) or less

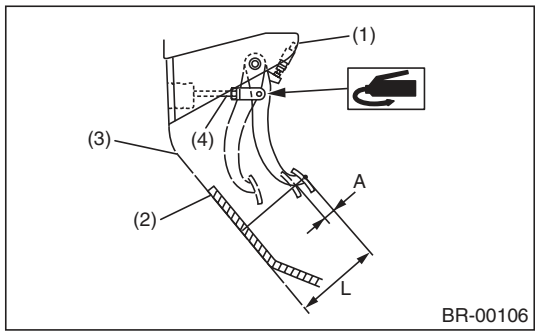


(1) Brake pedal

2) Check the position of the pedal pad.

Pedal height L:
150 — 160 mm (5.91 — 6.30 in)

Brake pedal free play A:
0.5 — 2 mm (0.02 — 0.08 in) [When pulling the brake pedal upward with a force of less than 10 N (1 kgf, 2 lb).]



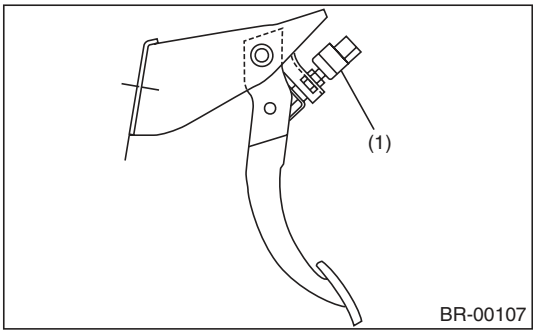
(1) Stop light switch
(2) Mat
(3) Toe board
(4) Brake booster operating rod

3) If it is not within the specification, adjust it by adjusting the brake booster operating rod length.

15.Stop Light Switch

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Disconnect the stop light switch connector.
3) Loosen the nuts, unscrew the stop light switch, and remove stop light switch.

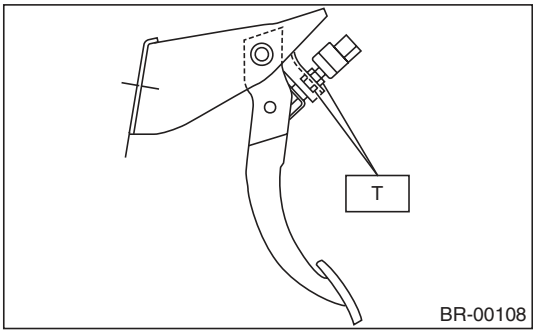


(1) Stop light switch

B: INSTALLATION

1) Install the stop light switch onto the bracket with screws and position it with the nut.
2) Adjust the stop light switch position, and then tighten the nut.
<Ref. to BR-40, ADJUSTMENT, Stop Light Switch.>

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

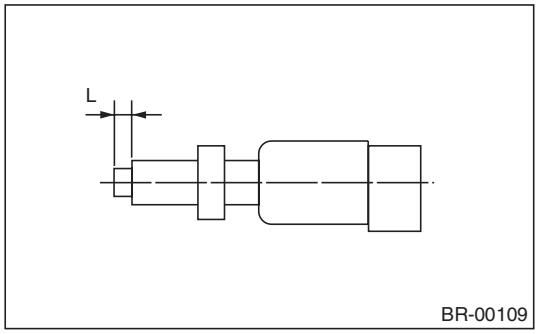


C: INSPECTION

1. CHECK SPECIFIED POSITION

1) If the stop light switch does not operate properly (or if it is not secured at the specified position), replace with a new part.

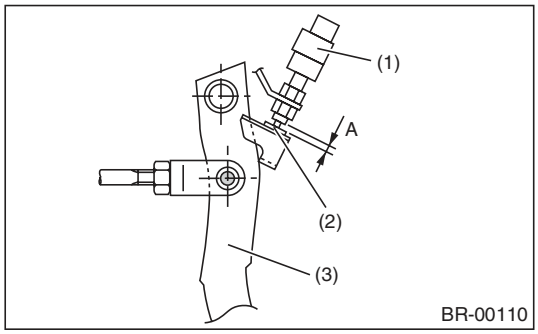
Specified position L:
2 mm (0.079 in)



2) Measure the clearance between the threaded end of the stop light switch and the stopper.

CAUTION:
Be careful not to rotate the stop light switch.

Stop light switch clearance A:
0.3 mm (0.012 in)



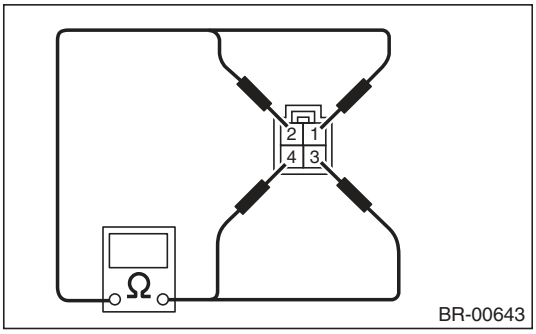
(1) Stop light switch
(2) Stopper
(3) Brake pedal

3) If it is not within the specification, adjust it by adjusting the position of the stop light switch.

CAUTION:
Be careful not to rotate the stop light switch.

2. CHECK RESISTANCE

1) If the stop light switch does not operate properly, replace with a new part.
2) Measure the resistance of stop light switch terminals.

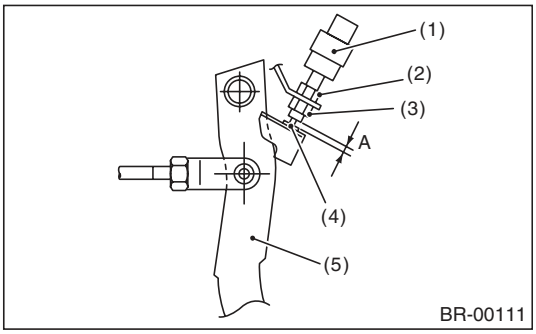


Pedal	Terminal No.	Standard value
Released	1 and 4	Less than 1 Ω
	2 and 3	1 MΩ or more
Depressed	1 and 4	1 MΩ or more
	2 and 3	Less than 1 Ω

D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance between the threaded end of the stop light switch and stopper (A) becomes 0.3 mm (0.012 in). Then, tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(1) Stop light switch
(2) Lock nut A
(3) Lock nut B
(4) Stopper
(5) Brake pedal

NOTE:
Tighten lock nut B until the threaded end of switch contacts the stopper. Hold the switch so that it does not rotate, and loosen the lock nut B approx. 60°. The clearance (A) will become 0.3 mm (0.012 in).

16. General Diagnostic Table

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(2) Entry of air into the hydraulic mechanism	Bleed air.
	(3) Wear, deteriorated surface material, water or fluid on lining	Replace, grind or clean.
	(4) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on lining or rotor	Correct the cause of fluid leakage, and clean or replace.
	(2) Rotor defective	Repair or replace the rotor.
	(3) Improper lining contact, deteriorated surface, deteriorated or worn lining material	Repair by grinding, or replace.
	(4) Deformed back plate	Correct or replace.
	(5) Overinflation of tires	Adjust the air pressure.
	(6) Defective wheel alignment	Adjust alignment.
	(7) Loose back plate or support installation bolt	Tighten to the specified torque.
	(8) Faulty wheel bearing	Replace.
	(9) Defective hydraulic system	Replace the cylinder, brake pipe or hose.
	(10) Unstable performance of the parking brake	Check, adjust or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(4) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Repair or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Improper disc caliper operation	Correct or replace.
	(7) Faulty wheel bearing	Replace.
5. Brake noise (1) (creaking sound)	(1) Hardened or deteriorated brake pad	Replace the pad.
	(2) Worn brake pad	Replace the pad.
	(3) Loose back plate or support installation bolt	Tighten to the specified torque.
	(4) Loose wheel bearing	Tighten to the specified torque.
	(5) Dirty rotor	Clean the rotor, or clean and replace brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn brake pad	Replace the pad.
	(2) Improperly installed pad	Correct or replace the pad.
	(3) Loose or bent rotor	Retighten or replace.
7. Brake noise (3) (click sound)	Excessively worn pad or support	Replace the pad or the support.

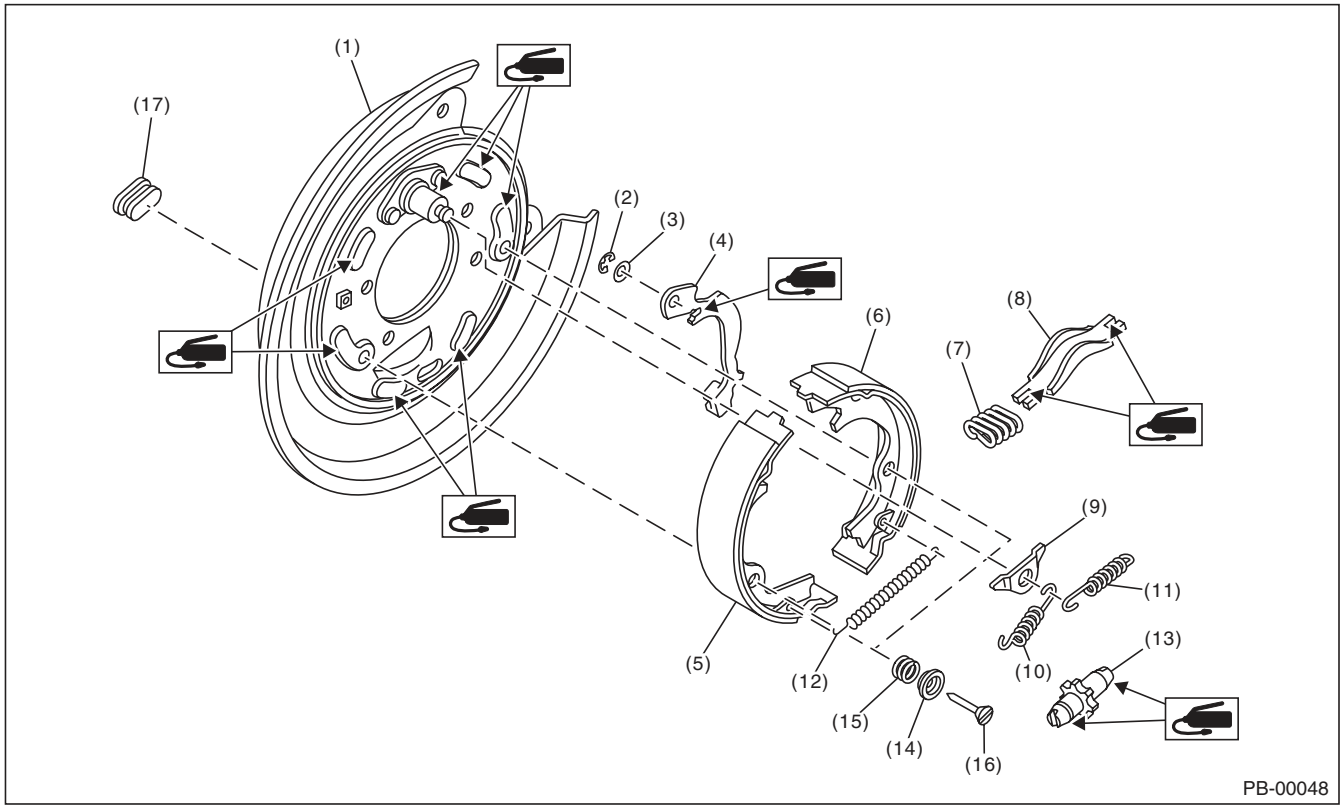
1. General Description

A: SPECIFICATION

Type		Mechanical, drum in disc rear brakes
Effective drum diameter	mm (in)	170 (6.69)
Lining dimensions (Length × Width × Thickness)	mm (in)	163.1 × 30.0 × 3.2 (6.421 × 1.181 × 0.126)
Clearance adjustment		Manual adjustment
Lever stroke	notches/N (kgf, lb)	5 — 6/200 (20.4, 45)

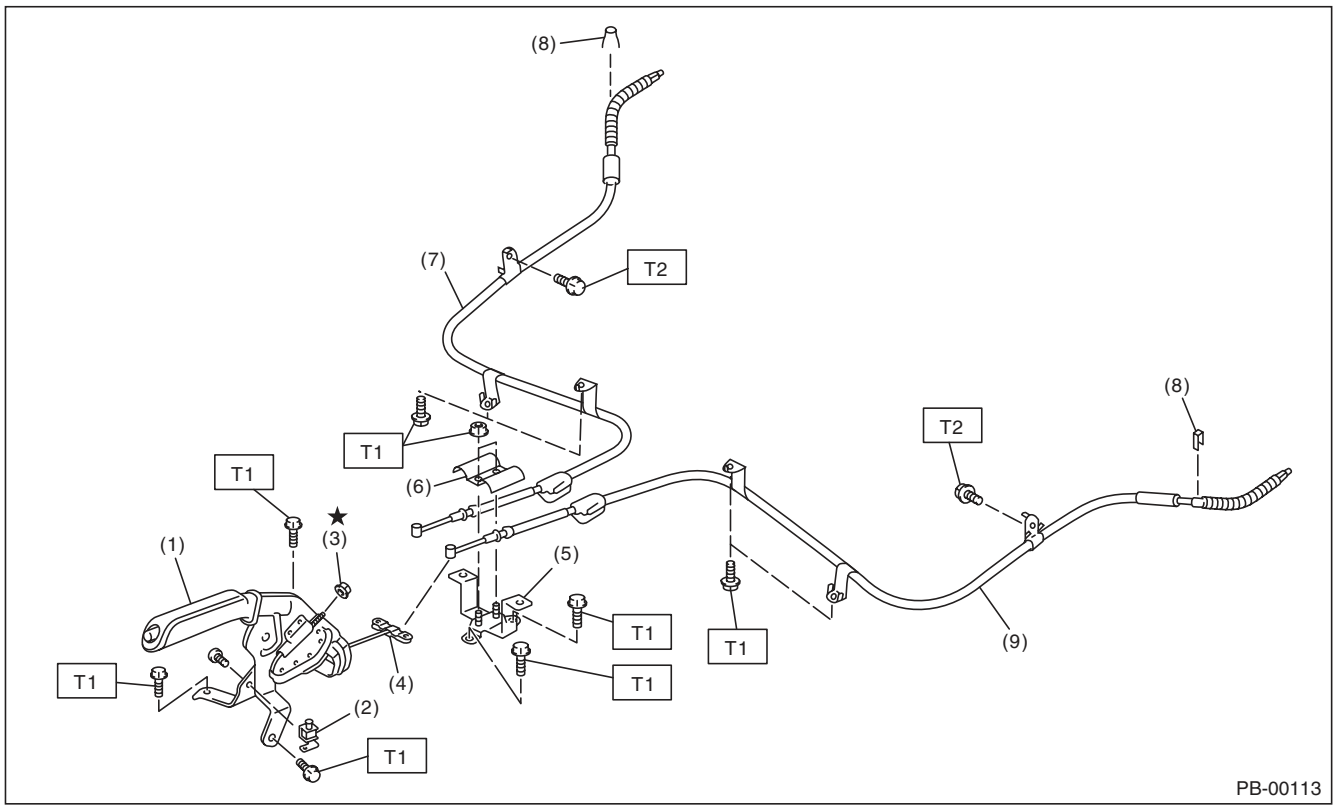
B: COMPONENT

1. PARKING BRAKE (REAR DISC BRAKE)



(1) Back plate
(2) Retainer
(3) Spring washer
(4) Lever
(5) Parking brake shoe (Primary)
(6) Parking brake shoe (Secondary)
(7) Strut spring
(8) Strut
(9) Shoe guide plate
(10) Primary return spring
(11) Secondary return spring
(12) Adjusting spring
(13) Adjuster
(14) Shoe hold-down cup
(15) Shoe hold-down spring
(16) Shoe hold-down pin
(17) Adjusting hole cover

2. PARKING BRAKE CABLE



(1) Parking brake lever
(2) Parking brake switch
(3) Adjusting nut (Self-locking nut)
(4) Equalizer
(5) Bracket
(6) Clamp
(7) Parking brake cable RH
(8) Clamp
(9) Parking brake cable LH

Tightening torque:N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 33 (3.4, 24.3)

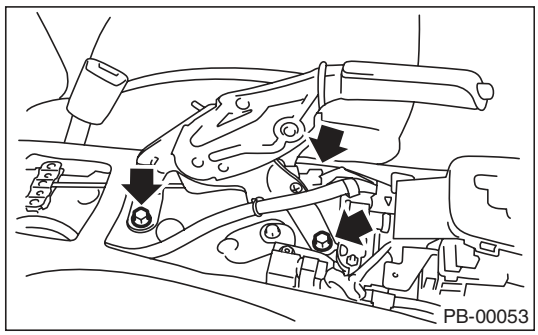
C: CAUTION

• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
• Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. of different grades or manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before securing a part in a vise, place cushioning material such as wood blocks, aluminum plate or cloth between the part and the vise.
• Make sure grease does not come into contact with the parking shoes.

2. Parking Brake Lever

A: REMOVAL

1) Set the wheel stoppers to tires.
2) Remove the console box.
3) Disconnect the parking brake switch connector.
4) Remove the parking cable adjusting nut (self-locking nut).
5) Remove the parking brake lever.



B: INSTALLATION

1) Install in the reverse order of removal.

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

2) Install a new adjusting nut (self-locking nut).
3) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

1) Operate the parking brake lever 3 to 4 times and fully return the lever.
2) While slowly pulling the parking brake lever upward, count the notches.

Lever stroke:
5 to 6 notches when pulled with a force of 200 N (20.4 kgf, 45 lb)

If it is not within the specified value, adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

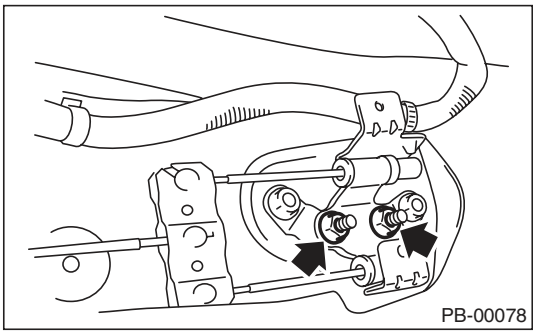
D: ADJUSTMENT

Adjust the parking lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

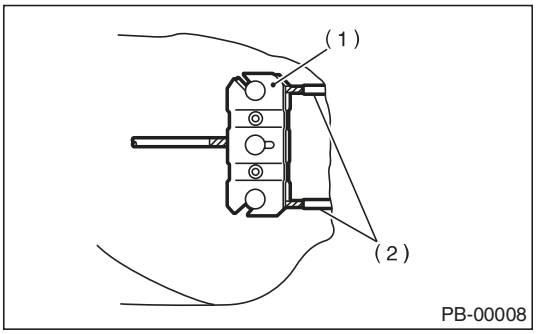
3. Parking Brake Cable

A: REMOVAL

1) Remove the rear seat cushion.
2) Remove the console box.
3) Remove the parking cable adjusting nut (self-locking nut).
4) Remove the parking brake lever. <Ref. to PB-4, REMOVAL, Parking Brake Lever.>
5) Roll up the floor mat and remove the clamps.

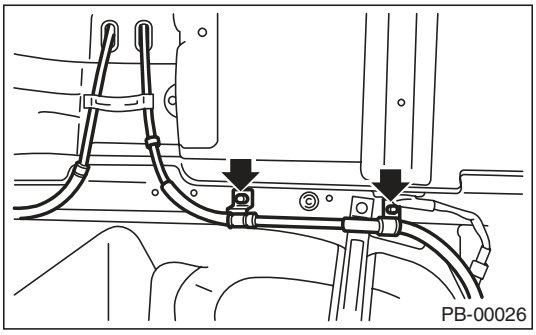


6) Remove the inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

7) Lift up the vehicle, and then remove the rear wheels.
8) Remove the parking brake cable from rear brake. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
9) Remove the clamp from the rear brake.
10) Remove the cable clamp from the rear arm bracket.
11) Remove the cable clamp from rear floor.



12) Remove the cable assembly.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Be sure to pass the cable through the tunnel in the cable guide.
2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

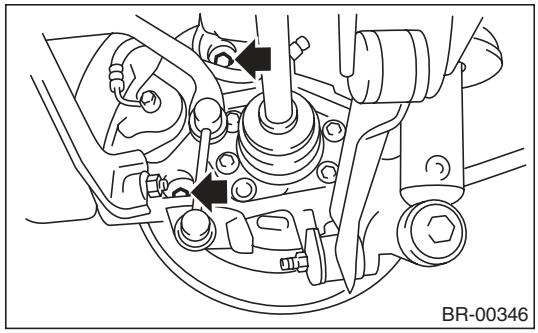
C: INSPECTION

Check and replace the removed cable if damaged, rusty or faulty.
1) Check the cable for smooth operation.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends and cracks.
4) Check the boot for damage, cracks, and corrosion.

4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

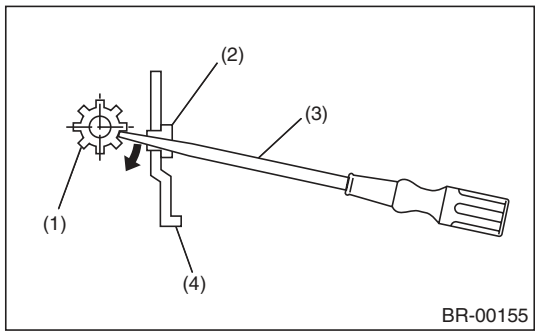
1) Release the parking brake.
2) Remove the two mounting bolts and remove the brake caliper assembly.



3) Suspend the brake caliper assembly so that the hose is not stretched.
4) Remove the disc rotor.

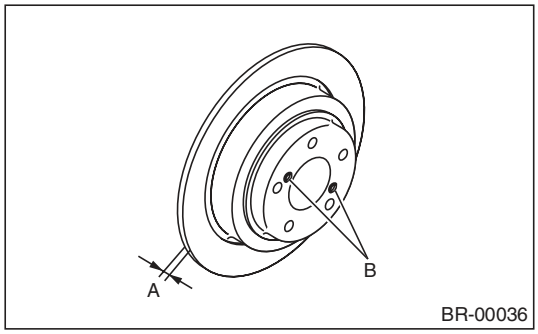
NOTE:
If the disc rotor is difficult to remove, try the following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until the brake shoe moves adequately away from the disc rotor.

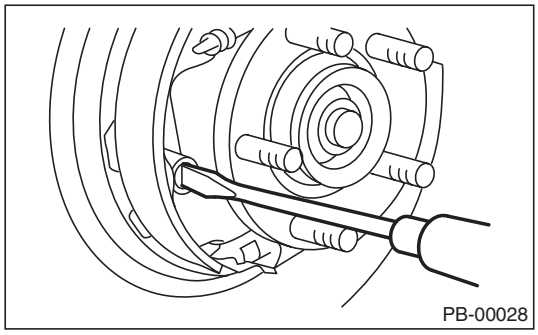


(1) Adjuster
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

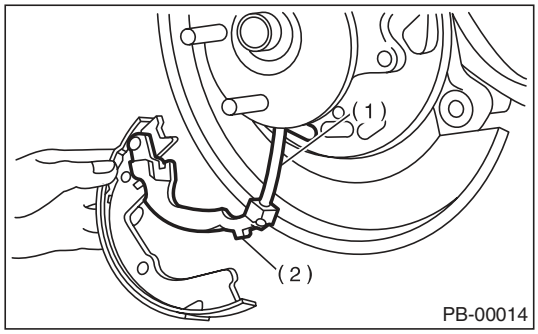
(2) If disc rotor is seized on the hub, drive the disc rotor out by pushing two 8 mm bolts in holes B on the rotor.



5) Remove the shoe return spring from the parking brake assembly.
6) Remove the front shoe hold down spring and pin.



7) Remove the strut and strut spring.
8) Remove the adjuster assembly from the parking brake assembly.
9) Remove the brake shoe.
10) Remove the rear shoe hold down spring and pin with pliers.
11) Remove the parking brake cable from lever.



(1) Parking brake cable
(2) Lever

12) Using a flat tip screwdriver, raise the retainer. Remove the parking lever and washer from brake shoe.

B: INSTALLATION

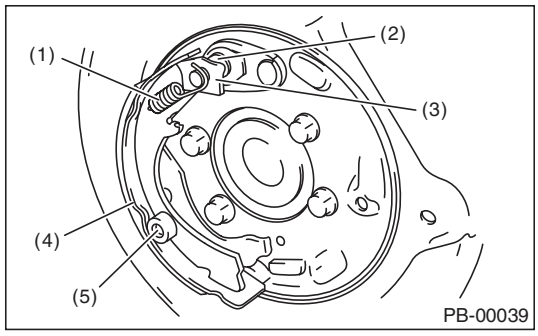
CAUTION:
Be sure the lining surface is free from oil and grease.

1) Apply brake grease to the following locations.

Brake grease:
Brake Grease (Part No. 003602002)

- Six contact surfaces of the shoe rim and back plate gasket
- Contact surface of the shoe wave and the anchor pin
- Contact surface of the lever and strut
- Contact surface of the shoe wave and the adjuster assembly
- Contact surface of the shoe wave and the strut
- Contact surface of the lever and the shoe wave

2) Insert the primary side brake shoe into the anchor pin groove.
3) Secure the brake shoe with the shoe hold-down pin and cup.
4) Install the plate to the anchor pin, then install the primary return spring.

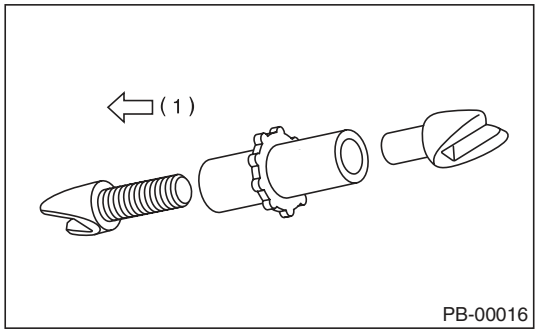


(1) Primary return spring
(2) Anchor pin
(3) Plate
(4) Primary shoe
(5) Shoe hold-down pin and shoe hold-down cup

5) Install the parking brake cable to the lever.

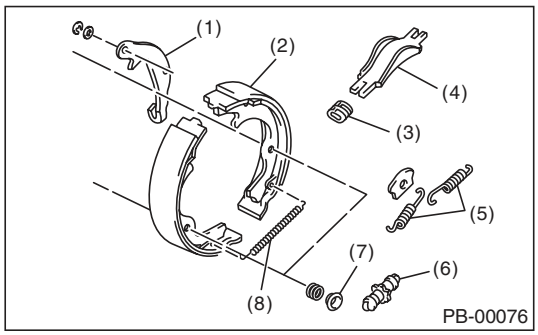
6) Install the strut and adjuster, then secure the secondary side brake shoe with the shoe hold-down pin and cup.

NOTE:
- Install the strut spring of both right and left wheel facing vehicle front.
- Install the adjuster assembly with screw section on the left side.



(1) LH

7) Install the secondary return spring and the adjusting spring.



(1) Lever
(2) Secondary brake shoe
(3) Strut spring
(4) Strut
(5) Return spring
(6) Adjuster
(7) Shoe hold-down cup
(8) Adjusting spring

8) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
9) Drive the vehicle to break-in the parking brake lining.
(1) Drive the vehicle at about 35 km/h (22 MPH).
(2) With the parking brake release button pushed in, pull the parking brake lever gently.
(3) Drive the vehicle for about 200 m (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat again from step (1).
(5) After breaking-in, re-adjust the parking brakes.

C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

Disc rotor inside diameter:
Standard:
170 mm (6.69 in)
Service limit:
171 mm (6.73 in)

2) Measure the lining thickness. If it exceeds the limit, replace shoe assembly.

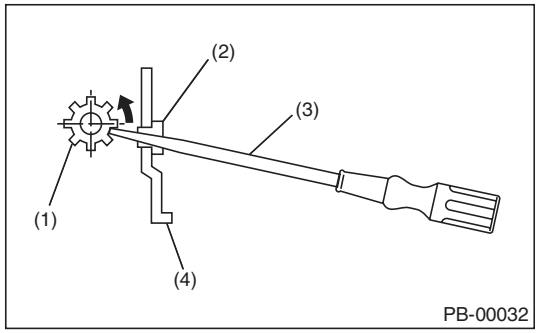
Lining thickness:
Standard:
3.2 mm (0.126 in)
Service limit:
1.5 mm (0.059 in)

NOTE:
Replace the right and left brake shoe as a set.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Return the parking brake lever fully.
2) Remove the adjusting hole cover from the back plate.
3) Turn the adjusting screw using a flat tip screwdriver until the brake shoe is in close contact with the disc rotor.



(1) Adjusting screw
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

4) Turn back (downward) the adjusting screw 3 to 4 notches.

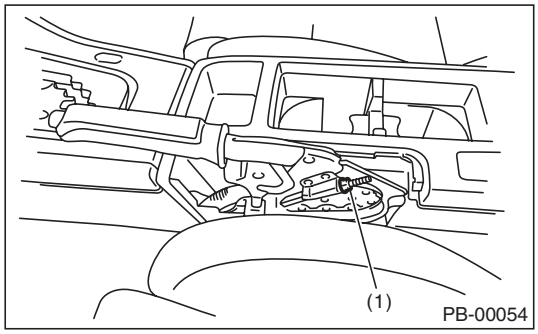
CAUTION:
Check there is no brake drag.

5) Install the adjusting hole cover to the back plate.
6) Adjust the parking lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

2. LEVER STROKE

1) Adjust the shoe clearance before adjusting lever stroke. <Ref. to PB-8, SHOE CLEARANCE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
2) Remove the parking lever cover.
3) Operate the parking brake lever 3 to 4 times.
4) Turn the adjusting nut until the lever stroke is at the specified value.

Lever stroke:
5 to 6 notches when pulled with a force of 200 N (20.4 kgf, 45 lb)



(1) Adjusting nut (Self-locking nut)

5) Check there is no brake drag.
6) Install the parking lever cover.

5. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Brake drag	Parking brake lever not adjusted correctly.	Adjust.
	Parking brake cable does not move.	Correct or replace.
	Parking brake shoe clearance is maladjusted.	Adjust.
	Return spring is faulty.	Replace.
Noise from brake	Return spring is faulty.	Replace.
	Shoe hold-down spring faulty.	Replace.

1. General Description

A: SPECIFICATION

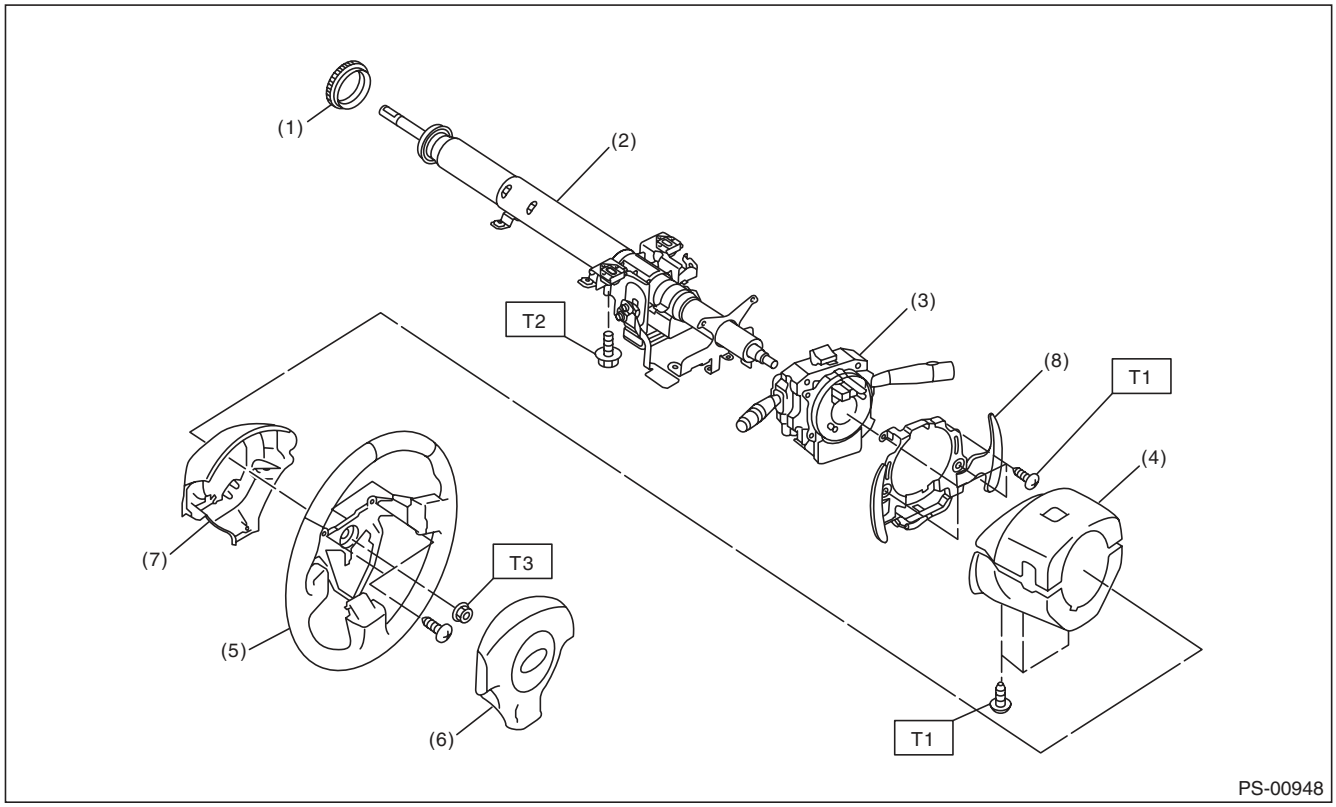
Model			Except for 3.0 R	3.0 R
Whole system	Minimum turning radius m (ft)		Except for 3.0 R-LTD, 2.5 GT spec. B: 5.4 (17.8) 3.0 R-LTD, 2.5 GT spec. B: 5.8 (19)	
	Steering angle	Inner wheel	Except for 3.0 R-LTD, 2.5 GT spec. B: 37.6°±1.5° 3.0 R-LTD, 2.5 GT spec. B: 33.8°±1.5°	
		Outer wheel	Except for 3.0 R-LTD, 2.5 GT spec. B: 33.0°±1.5° 3.0 R-LTD, 2.5 GT spec. B: 30.2°±1.5°	
	Steering wheel diameter mm (in)		375 (14.76)	
	Lock to lock turn		3.0 R-LTD, 2.5 GT-B: 2.6, 2.5 GT: 2.8, Others: 3.2	
Gearbox	Type		Rack and Pinion, Integral	
	Backlash		0 (Automatic adjusting)	
	Valve (Power steering system)		Rotary valve	
Pump (Power steering system)	Type		Vane pump	
	Oil tank		Installed on body	
	Specific output cm^3 (cu in)/rev.		8.5 (0.519)	9.6 (0.586)
	Relief pressure kPa (kg/cm^2, psi)		Non-turbo: 7,350 — 8,050 (75 — 82, 1,067 — 1,167) Turbo: 8,100 — 8,800 (83 — 90, 1,174 — 1,276)	8,300 — 9,000 (85 — 92, 1,204 — 1,305)
	Hydraulic fluid control		Engine speed sensitive	
	Hydraulic fluid ℓ (USqt, Imp qt)		1,000 rpm: 6.15 (6.5, 5.4) 3,000 rpm: 5.5 (5.8, 4.8)	1,000 rpm: 6.5 (6.9, 5.7) 3,000 rpm: 5.5 (5.8, 4.8)
	RPM range rpm		680 — 9,600	
	Direction of rotation		Clockwise	
Hydraulic oil (Power steering system)	Capacity ℓ (US qt, Imp qt)	Oil tank	0.2 (0.2, 0.2)	
		Whole system	0.7 (0.7, 0.6)	

Steering wheel	Free play mm (in)			17 (0.67)
Steering shaft	Clearance between the steering wheel and column cover mm (in)			3.0 (0.12)
Steering gearbox (Power steering system)	Rack shaft play in the radial direction	Right-turn steering mm (in)		0.12 (0.005) or less
	Input shaft play	In radial direction mm (in)		0.26 (0.01) or less
		In axial direction mm (in)		Without play
	Rotation resistance N (kgf, lb)			Maximum allowable value: 11.3 (1.15, 2.54) or less Difference between right and left sliding resistance: 24% or less
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
		Rotation resistance N (kgf, lb)		9.22(0.94, 2.07) or less
	Regular pressure (Unloaded) kPa (kg/cm^2, psi)			981(10, 142) or less
Steering wheel effort (Power steering system)	At standstill with engine idling on paved road N (kgf, lb)			29.4(3.0, 6.6) or less
	At standstill with engine stalled on paved road N (kgf, lb)			294.2(30, 66.2) or less

Recommended power steering fluid
SUBARU ATF or ATF DEXRON III

B: COMPONENT

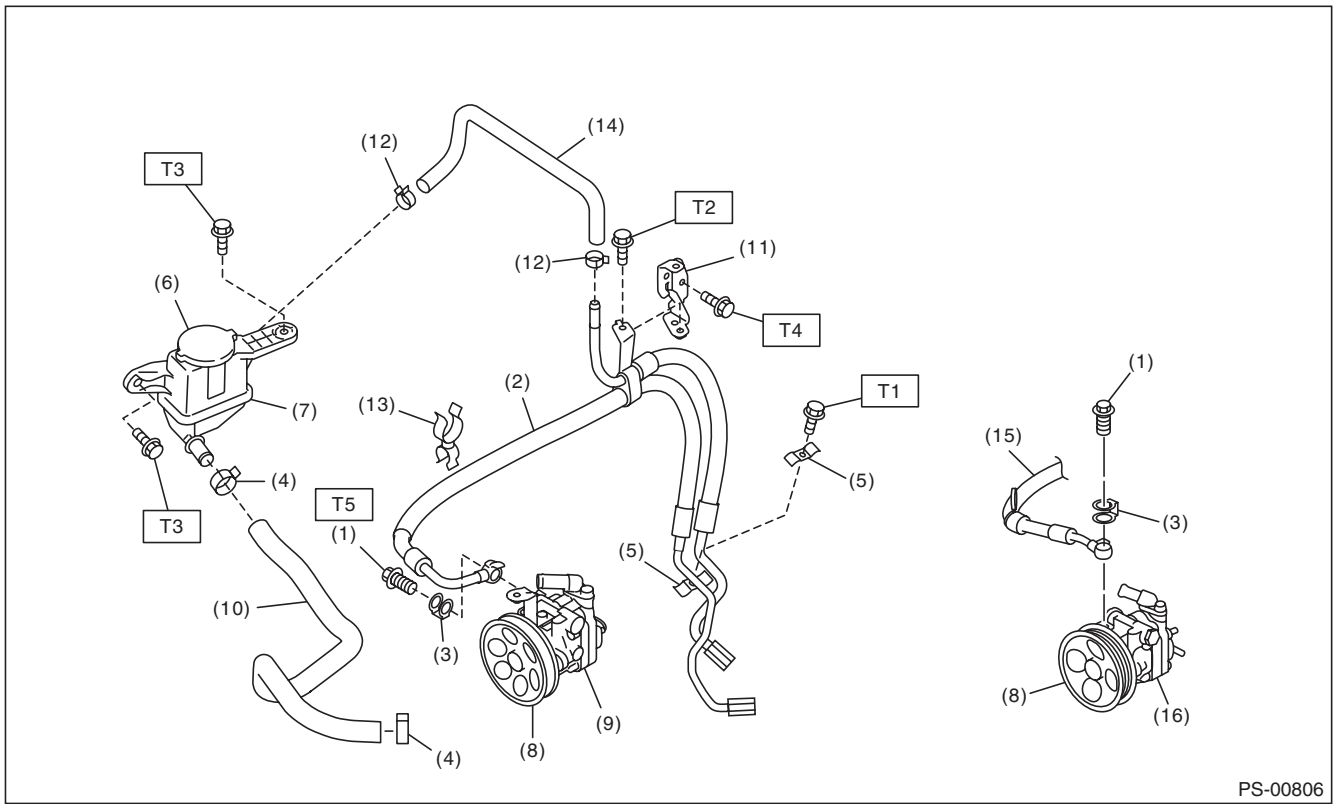
1. STEERING WHEEL AND COLUMN



(1)	Bushing	(5)	Steering wheel	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Steering shaft	(6)	Airbag module	***T1: 1.2 (0.12, 0.9)***
(3)	Steering roll connector	(7)	Steering wheel lower cover	***T2: 25 (2.5, 18.4)***
(4)	Column cover	(8)	Paddle shift	***T3: 39 (4.0, 28.8)***

2. POWER ASSISTED SYSTEM

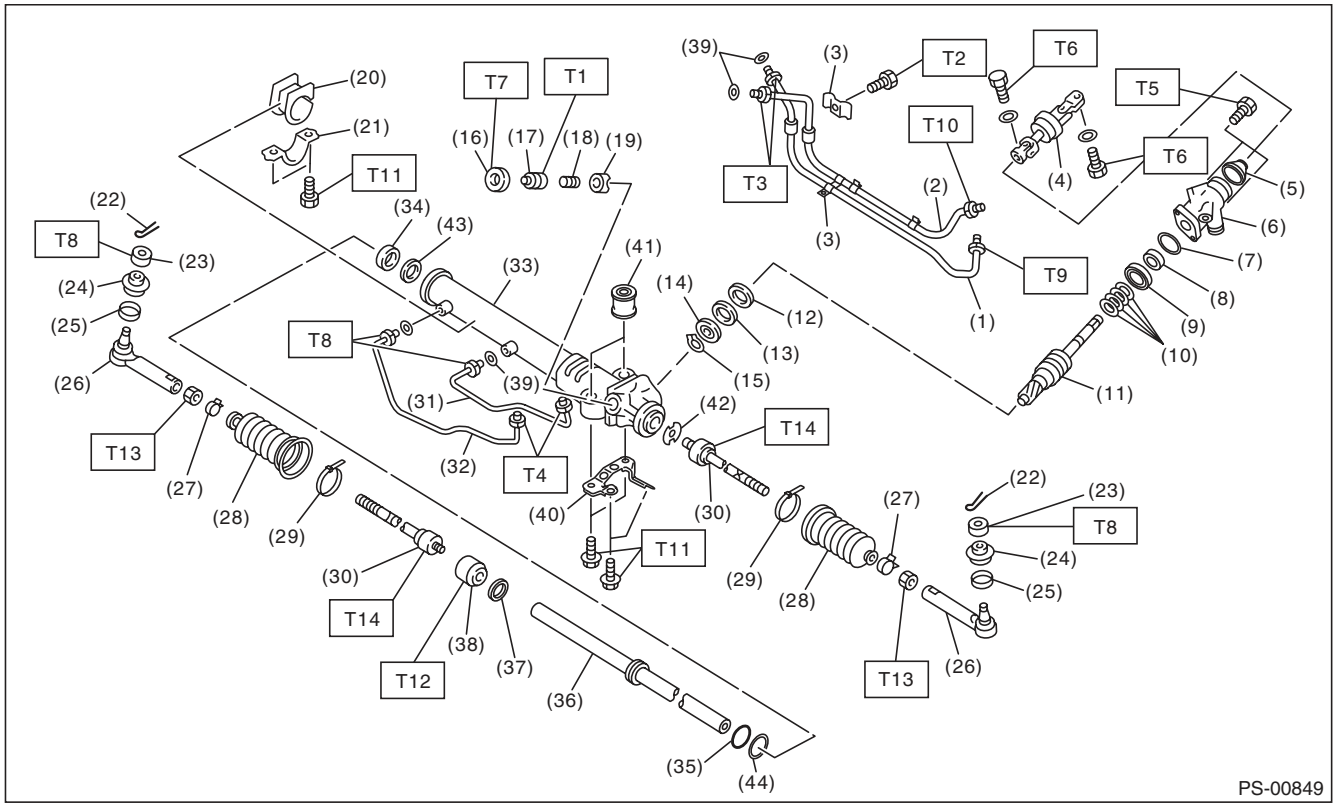
- Hose and tank



(1)	Eye bolt	(9)	Oil pump (H4 model)
(2)	Hose (H4 model)	(10)	Suction hose
(3)	Eye bolt gasket	(11)	Hose bracket
(4)	Clip	(12)	Clip
(5)	Clamp E	(13)	Clip
(6)	Cap	(14)	Return hose
(7)	Reservoir tank	(15)	Hose (H6 model)
(8)	Pulley	(16)	Oil pump (H6 model)

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.53)
T2: 10 (1.02, 7.4)
T3: 13 (1.32, 9.6)
T4: 18 (1.84, 13.3)
T5: 40 (4.1, 29.5)

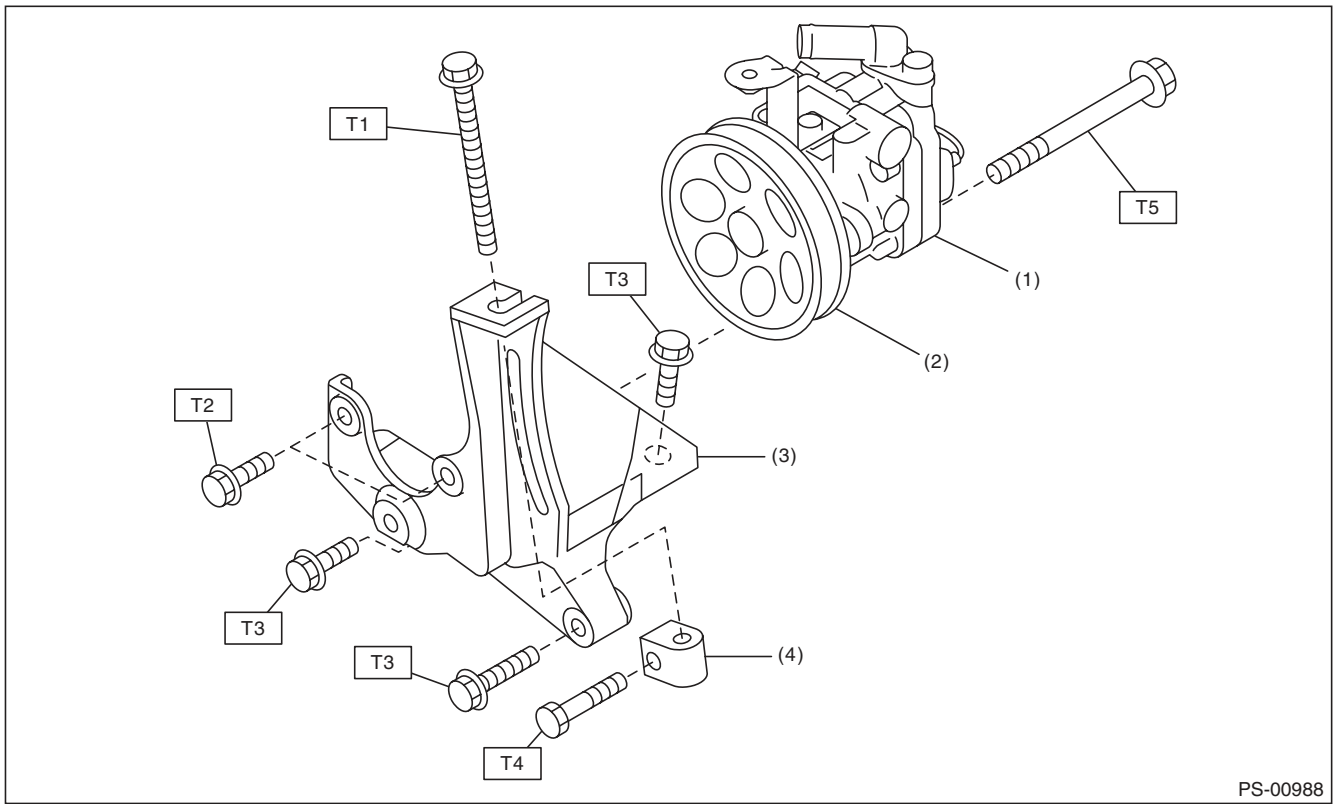
- Gearbox



(1)	Feed pipe	(21)	Clamp	(41)	Bushing
(2)	Return pipe	(22)	Cotter pin	(42)	Lock washer
(3)	Clamp plate	(23)	Castle nut	(43)	Back-up washer
(4)	Universal joint	(24)	Dust cover	(44)	O-ring
(5)	Dust seal	(25)	Clip		
(6)	Valve housing	(26)	Tie-rod end	***Tightening torque:N·m (kgf-m, ft-lb)***	
(7)	O-ring	(27)	Clip	***T1:***	***3.9 (0.4, 2.9)***
(8)	Oil seal	(28)	Boot	***T2:***	***9 (0.9, 6.6)***
(9)	Bushing	(29)	Band	***T3:***	***15 (1.5, 10.8)***
(10)	Seal ring	(30)	Tie-rod	***T4:***	***17 (1.7, 12.5)***
(11)	Pinion & valve ASSY	(31)	Pipe B	***T5:***	***20 (2.0, 14.8)***
(12)	Oil seal	(32)	Pipe A	***T6:***	***24 (2.4, 17.7)***
(13)	Back-up washer	(33)	Steering body	***T7:***	***25 (2.5, 18.4)***
(14)	Ball bearing	(34)	Oil seal	***T8:***	***27 (2.75, 19.9)***
(15)	Snap ring	(35)	Piston ring	***T9:***	***37 (3.8, 27.3)***
(16)	Lock nut	(36)	Rack	***T10:***	***29 (3.0, 21.4)***
(17)	Adjusting screw	(37)	Oil seal	***T11:***	***60 (6.1, 44.1)***
(18)	Spring	(38)	Holder	***T12:***	***70 (7.1, 51.6)***
(19)	Sleeve	(39)	O-ring	***T13:***	***85 (8.7, 62.7)***
(20)	Adapter	(40)	Bracket	***T14:***	***88 (9.0, 64.9)***

3. OIL PUMP

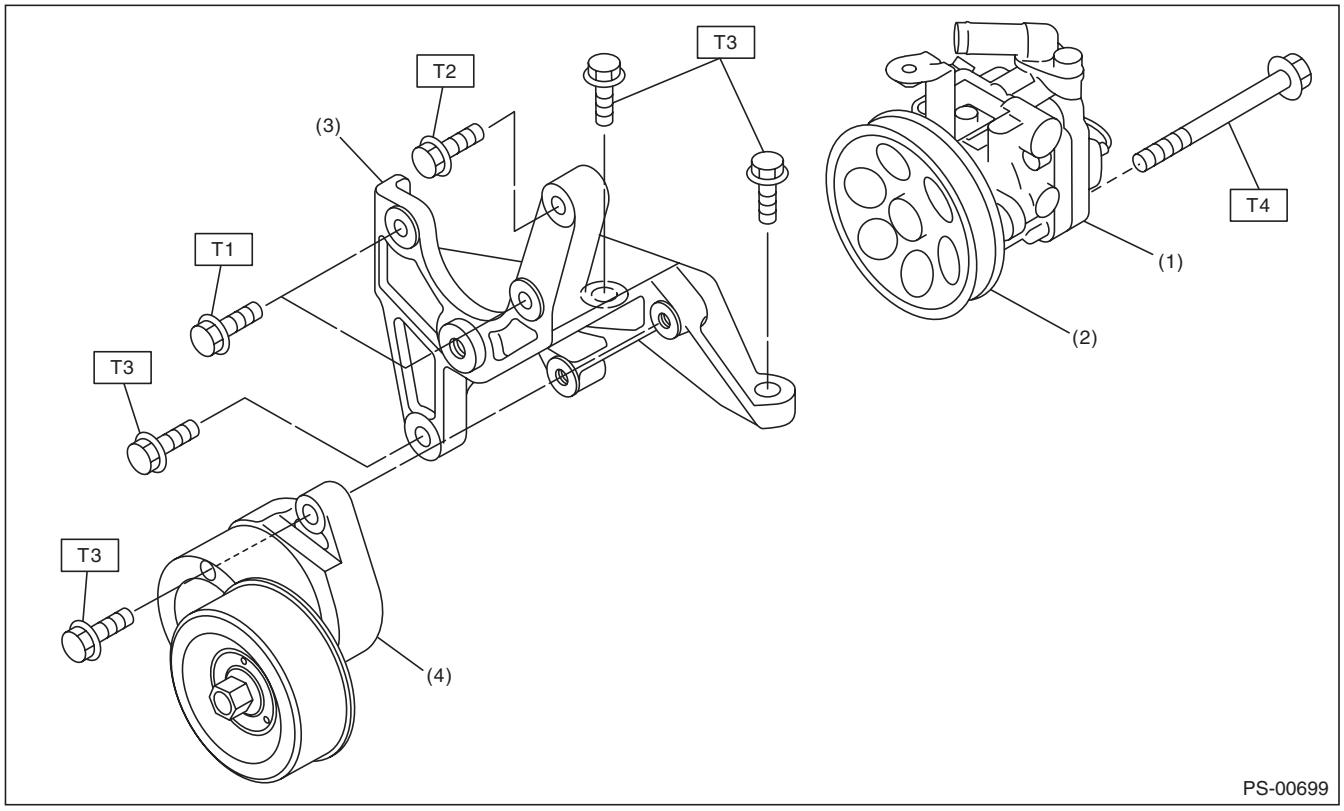
- H4 model



(1) Oil pump
(2) Pulley
(3) Bracket
(4) Belt tension nut

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 15.7 (1.6, 11.6)
T3: 22 (2.2, 15.9)
T4: 25 (2.5, 18.4)
T5: 48.4 (4.9, 35.7)

- H6 model



(1) Oil pump
(2) Pulley
(3) Bracket
(4) Belt tensioner

Tightening torque:N·m (kgf-m, ft-lb)
T1: 15.7 (1.6, 11.6)
T2: 25 (2.5, 18.4)
T3: 33 (3.4, 24.3)
T4: 37.3 (3.8, 27.5)

C: CAUTION

• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
• Use SUBARU genuine power steering fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. of different grades or manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before securing a part on a vise, place cushioning material such as wooden blocks, aluminum plate or cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

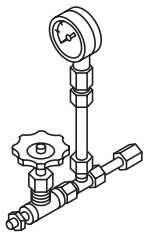
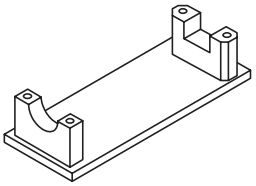
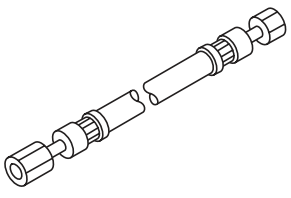
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pressure.
 ST-926200000	926200000	STAND	• Used when inspecting characteristic of gearbox assembly and disassembling it. • Used together with BOSS D (34199AG000).
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used together with PRESSURE GAUGE (925711000).

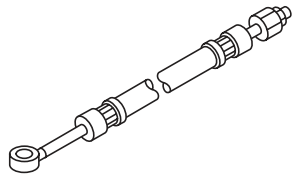
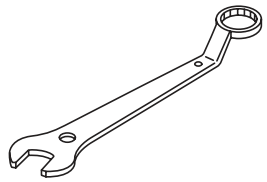
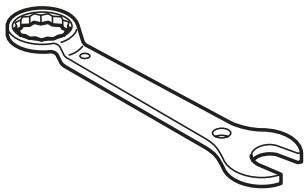
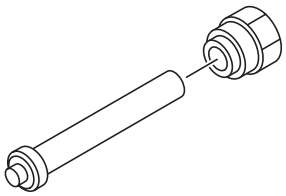
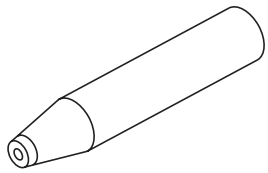
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used together with PRESSURE GAUGE (925711000).
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gear-box.
 ST34099PA100	34099PA100	SPANNER	Used when measuring the rotating resistance of gearbox assembly.
 ST-926420000	926420000	PLUG	When fluid leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check fluid leaking points.
 ST-926390001	926390001	COVER & REMOVER ASSY	Used for installing rack assembly.

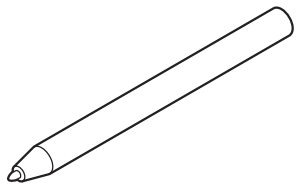
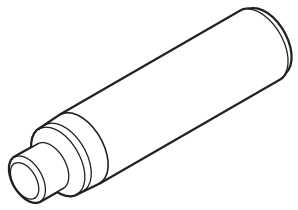
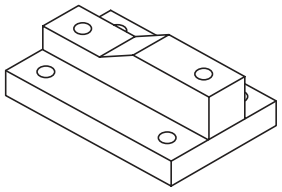
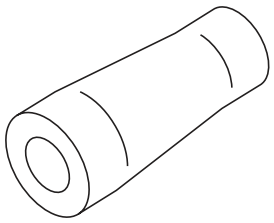
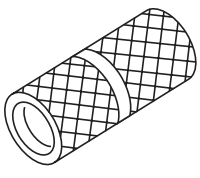
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA060	34099FA060	PUNCH HOLDER	Used for crimping.
 ST34199FE000	34199FE000	INSTALLER & REMOVER	Used for removing and installing the rack oil seal (outer & inner).
 ST34199AG000	34199AG000	BOSS D	• Used when inspecting characteristic of gear-box assembly and disassembling it. • Used together with STAND (926200000).
 ST34199AG030	34199AG030	GUIDE	Used for installing seal ring of rack.
 ST34199AG070	34199AG070	FORMER	Used for forming seal ring of pinion.

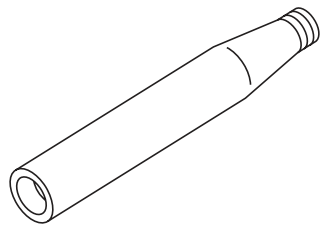
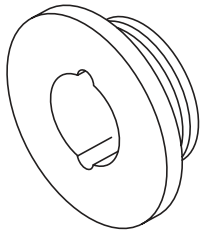
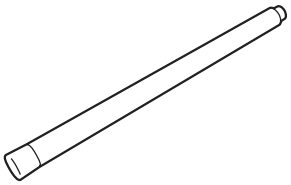
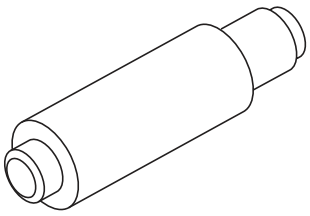
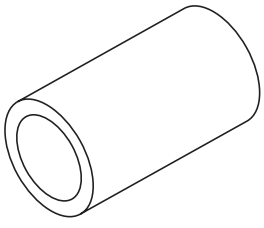
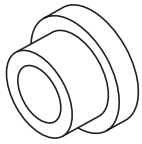
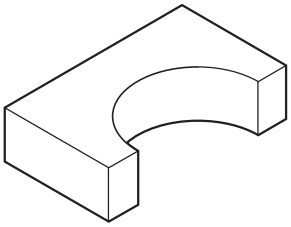
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AG020	34199AG020	GUIDE	Used for installing seal ring of pinion.
 ST34199AG050	34199AG050	GUIDE G (24)	• Used for forming seal ring of rack. • Used together with FORMER PISTON (34199AG080).
 ST34099FA140	34099FA140	OIL SEAL REMOVER	Used for removing oil seal.
 ST34199AG090	34199AG090	INSTALLER & REMOVER	• Used for installing oil seal of valve housing. • Used together with the SEAL INSTALLER. (34099FA130) • Used for installing ball bearing of valve housing. • Used for removing oil seal and ball bearing from valve housing.
 ST34199AG080	34199AG080	FORMER PISTON	• Used for forming seal ring of rack. • Used together with the GUIDE G (24) (34199AG050).

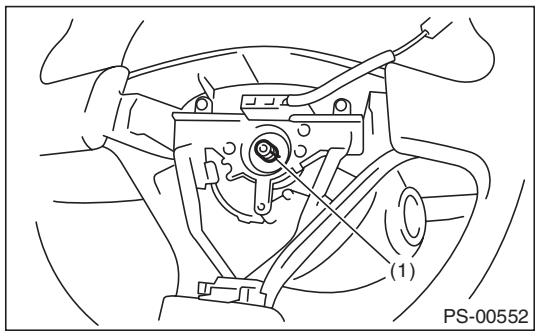
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AG010	34199AG010	INSTALLER	Used for pressing-fit oil seal of gearbox cylinder.
 ST34199FE020	34199FE020	BASE	Used for crimping.

2. Steering Wheel

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Set the tire to the straight-ahead position.
3) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>
4) Place alignment marks on the steering wheel and steering shaft.



(1) Alignment mark

5) Remove the steering wheel nut, and then draw out the steering wheel from shaft using steering puller.

B: INSTALLATION

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>
1) Align the center position of the roll connector. <Ref. to AB-25, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align the alignment marks on the steering wheel and steering shaft.

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

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert the roll connector guide pin into the guide hole on the lower end of the steering wheel surface. Avoid damaging the pin.

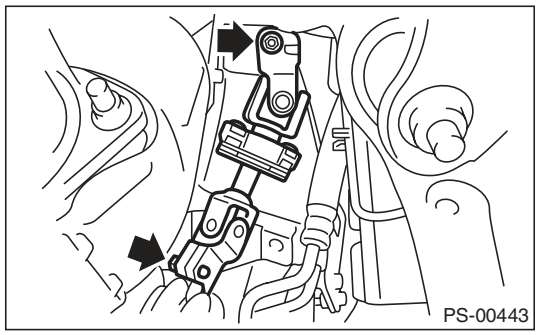
C: INSPECTION

1) Check the steering wheel for deformation. If the deformation is excessive, replace the steering wheel.
2) Check the splines on the steering wheel for damage. If the damage is excessive, replace the steering wheel.

3. Universal Joint

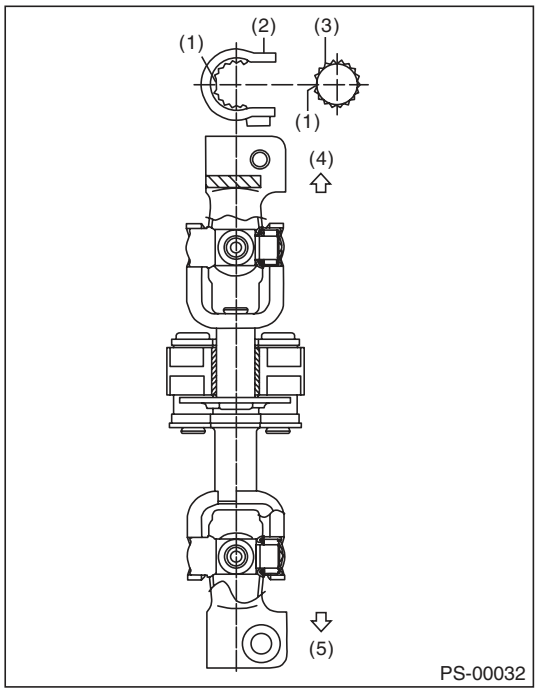
A: REMOVAL

1) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
2) Place alignment marks on universal joint.
3) Remove the universal joint bolt, and then remove the universal joint.



B: INSTALLATION

1) Align the cutout portion at serrated section of the column shaft and yoke, then install the universal joint into column shaft.



(1) Cutout portion
(2) Yoke
(3) Column shaft
(4) Column shaft side
(5) Gearbox side

2) Install the universal joint to the serrations of gearbox assembly by matching alignment marks.
3) Tighten the bolts.

Tightening torque:
24 N·m (2.4 kgf-m, 17.7 ft-lb)

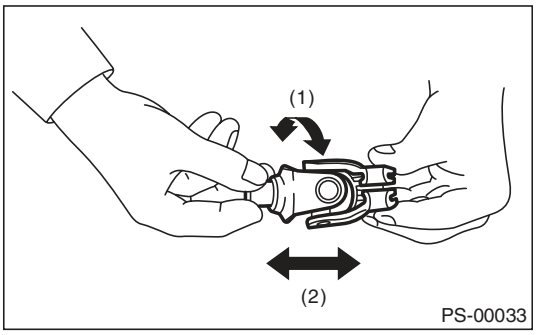
CAUTION:
Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

4) Align the center position of the roll connector. <Ref. to AB-25, ADJUSTMENT, Roll Connector.>
5) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>

C: INSPECTION

Check for wear, damage or any other faults. Replace as necessary.

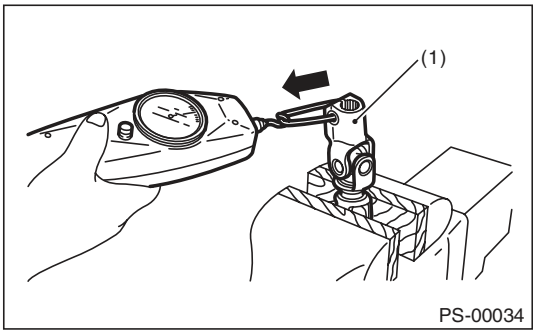
Service limit:
Universal joint play: 0 mm (0 in)
Maximum swing torque: 0.3 N (0.03 kgf, 0.07 lb)



(1) Swing torque
(2) Play

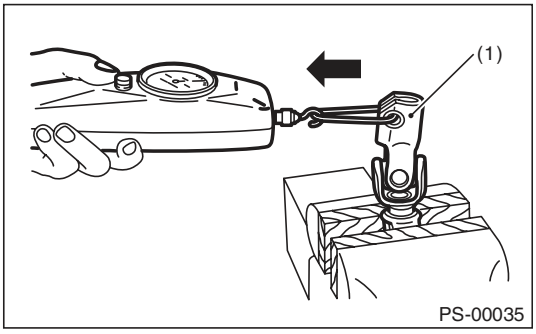
Measure the swing torque of universal joint.

Service limit:
Maximum load: 3.8 N (0.39 kgf, 0.86 lb) or less



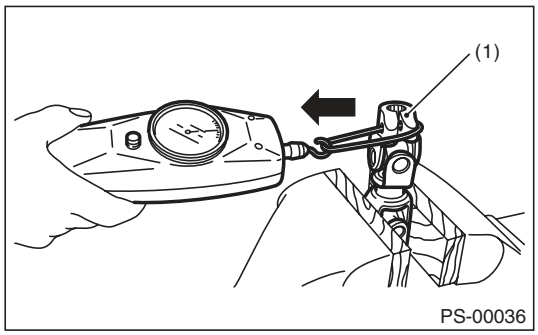
(1) Yoke (Gearbox side)

Service limit:
Maximum load: 3.8 N (0.39 kgf, 0.86 lb) or less



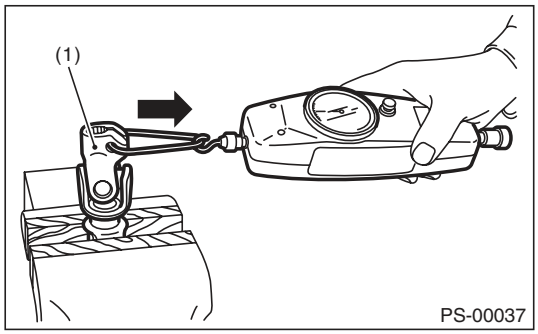
(1) Yoke (Gearbox side)

Service limit:
Maximum load: 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

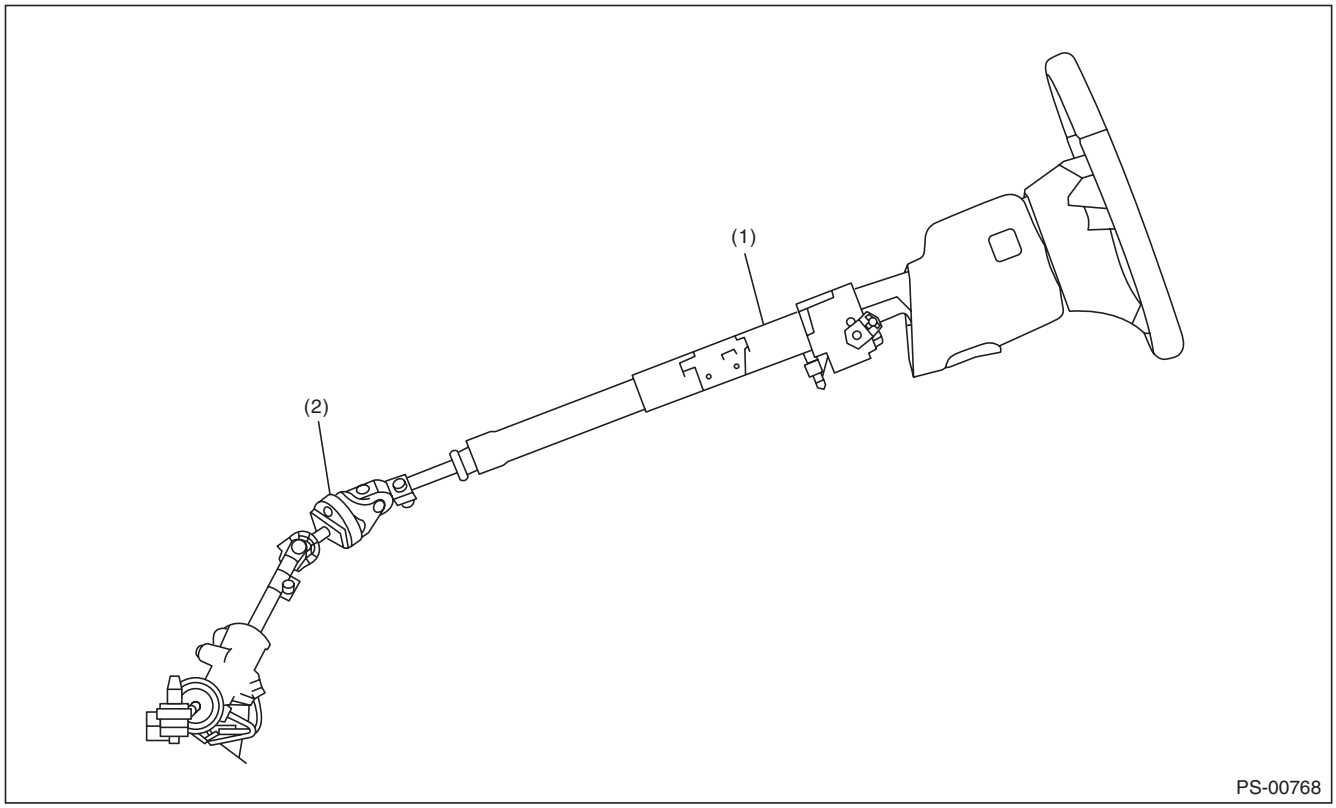
Service limit:
Maximum load: 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

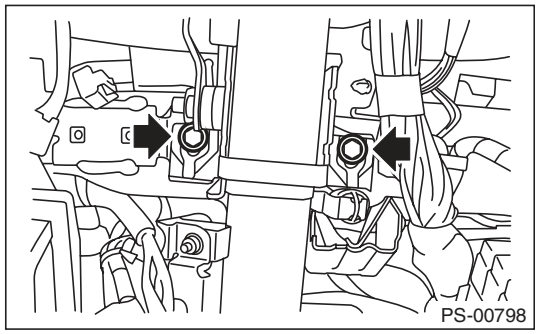
4. Tilt Steering Column

A: REMOVAL



(1) Tilt steering column (2) Universal joint

1) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
2) Remove the universal joint. <Ref. to PS-14, REMOVAL, Universal Joint.>
3) Remove the instrument panel lower cover under.
4) Remove the instrument panel lower cover upper.
5) Remove all connectors from the steering column.
6) Remove the two bolts under instrument panel securing the steering column.

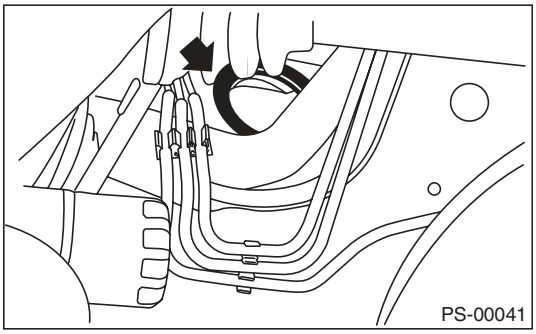


7) Pull out the steering shaft assembly from the hole on toe board.

CAUTION:
• Be sure to remove the universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing other parts.
• Do not loosen the tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

1) Install the grommet to the toe board.



2) Insert the end of the steering shaft into the toe board grommet.
3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)
4) Connect all the connectors under the instrument panel.
5) Connect the airbag system connector at the harness spool.

NOTE:
Make sure to apply double lock.
6) Install the instrument panel lower cover with tilt lever held in the lowered position.
7) Install the universal joint. <Ref. to PS-14, INSTALLATION, Universal Joint.>
8) Align the center position of the roll connector. <Ref. to AB-25, ADJUSTMENT, Roll Connector.>
9) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>

CAUTION:
Insert the roll connector guide pin into the guide hole on lower end of steering wheel surface to prevent damage.

C: DISASSEMBLY

Remove the two screws securing the upper steering column covers, and the two screws securing the combination switch, and then remove related parts.

D: ASSEMBLY

Insert the combination switch to the upper column shaft, and install the upper column cover. Then route the ignition key harness and combination switch harness between the column cover mounting bosses.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

CAUTION:
Do not overtorque the screw.

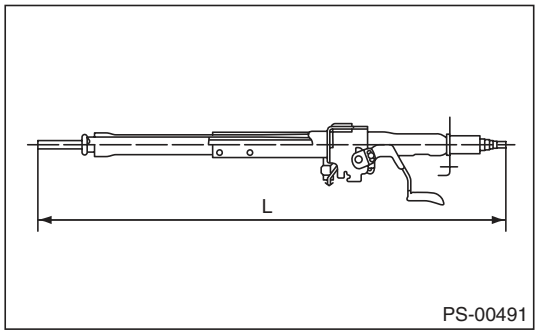
E: INSPECTION

1. BASIC INSPECTION

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

Standard: Overall length L

Tilt & telescopic column (measure the minimum length)
Except for OUTBACK model
818.6 $^{+1.5\ mm}_{-1.5\ mm}$ (32.23 $^{+0.059\ in}_{-0.059\ in}$)
OUTBACK model
810.4 $^{+1.5\ mm}_{-1.5\ mm}$ (31.89 $^{+0.059\ in}_{-0.059\ in}$)



2. INSPECTION OF AIRBAG SYSTEM

Refer to “Airbag System” for airbag inspection procedures. <Ref. to AB-14, INSPECTION, Driver’s Airbag Module.>

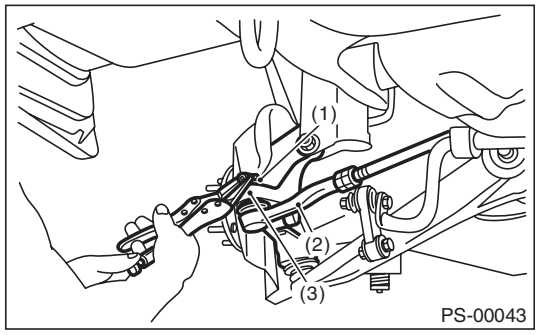
5. Steering Gearbox

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Loosen the front wheel nuts.
4) Lift up the vehicle, and remove the front wheels.
5) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
6) Remove the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

WARNING:
Be careful not to burn yourself because the exhaust pipe is hot.

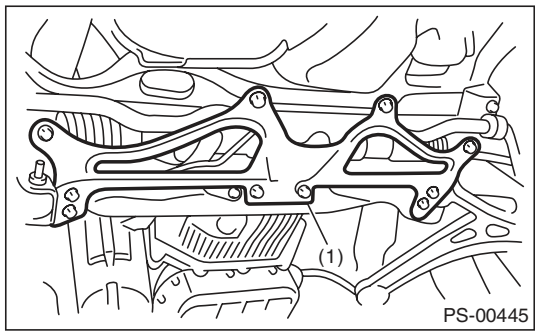
7) After pulling off the cotter pin and removing the castle nut, use a puller to remove the tie-rod end from the knuckle arm.



(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

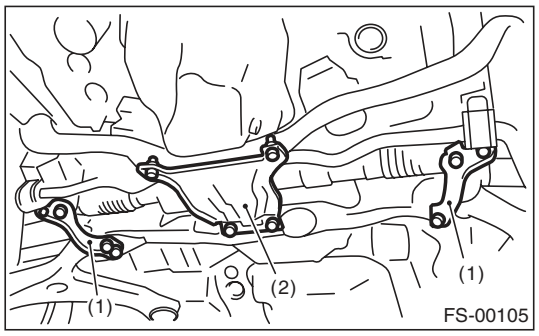
8) Remove the front crossmember support plate, jack-up plate and front stabilizer. <Ref. to FS-15, REMOVAL, Front Stabilizer.>

- Large type



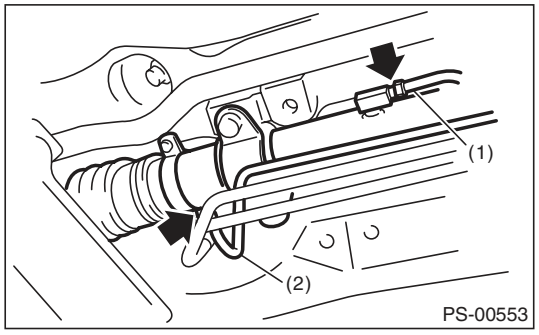
(1) Front crossmember support plate

- Small type



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

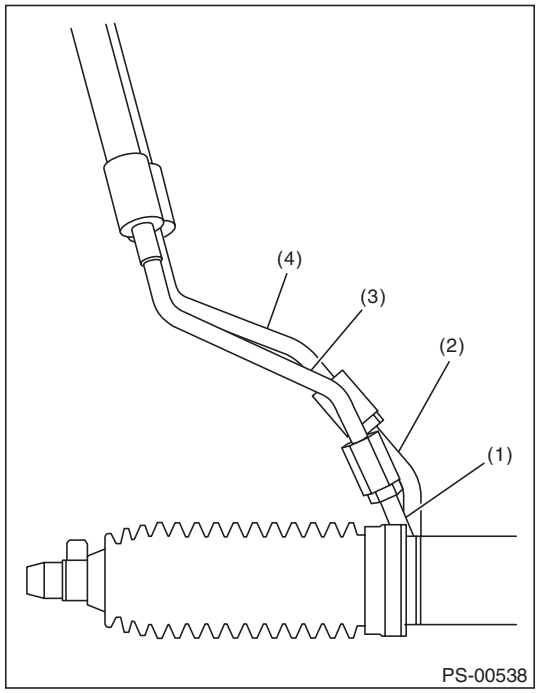
9) Remove the one pipe joint at the center of the gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



(1) Pipe A
(2) Pipe B

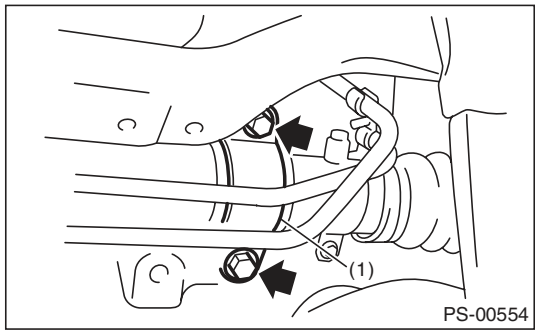
10) Remove the universal joint. <Ref. to PS-14, REMOVAL, Universal Joint.>

11) Disconnect the pipe C from pressure hose first, then disconnect pipe D from the return hose.



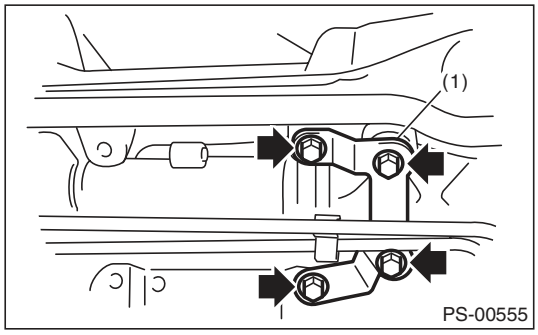
(1) Pipe C
(2) Pipe D
(3) Pressure hose
(4) Return hose

12) Remove the clamp bolts securing the gearbox to the crossmember, and remove the clamp.



(1) Clamp

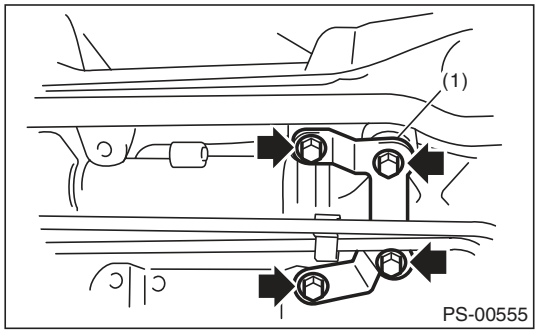
13) Remove the bolts which secure the gearbox bracket, and remove the bracket and gearbox.



(1) Bracket

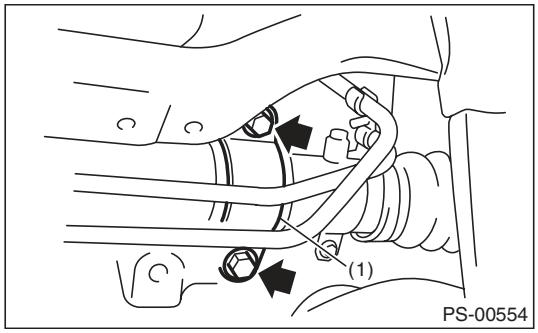
B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage gearbox boot.
2) Install the gearbox and bracket. Temporarily tighten the bolts.



(1) Bracket

3) Insert bolts through the clamp to temporarily tighten the gearbox to the crossmember bracket.



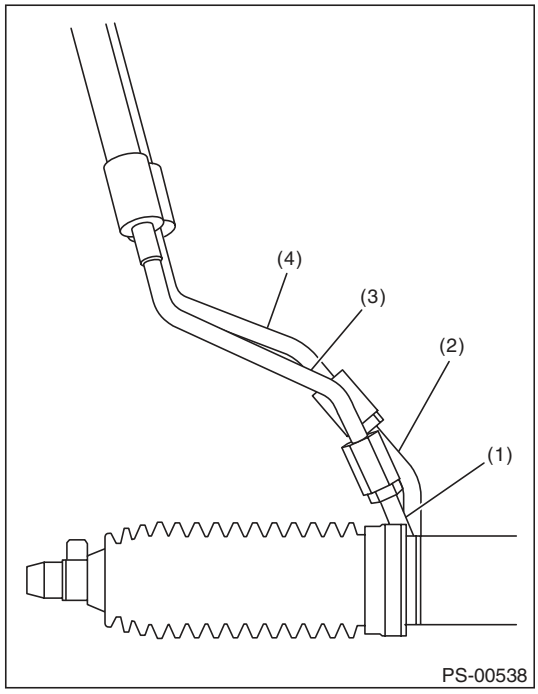
(1) Clamp

4) Tighten the bolts temporarily holding the gearbox clamp and bracket together to the specified torque.

Tightening torque:
60 N·m (6.1 kgf-m, 44.1 ft-lb)

5) Connect pipe D to the return hose, then connect pipe C to the pressure hose.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



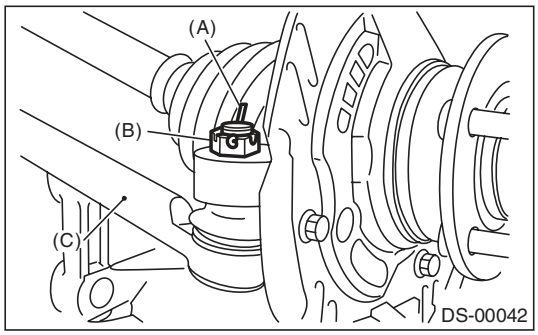
(1) Pipe C
(2) Pipe D
(3) Pressure hose
(4) Return hose

6) Install the universal joint. <Ref. to PS-14, INSTALLATION, Universal Joint.>
7) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

Castle nut tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit the cap at the bottom of tie-rod end with hammer.

8) After tightening the castle nut to the specified tightening torque, tighten it further within 60° until the cotter pin hole is aligned with slot in the nut. Fit the cotter pin into the nut, and then bend the pin to lock.



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

9) Install the front stabilizer. <Ref. to FS-15, INSTALLATION, Front Stabilizer.>
10) Install the front crossmember support plate and jack-up plate.
11) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
12) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
13) Install the front wheels.
14) Tighten the wheel nuts to the specified torque.

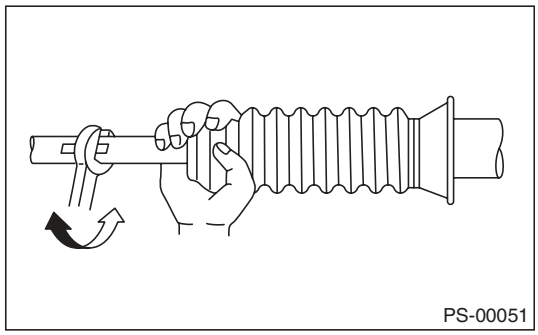
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

15) Lower the vehicle.
16) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
17) Align the center position of the roll connector. <Ref. to AB-25, ADJUSTMENT, Roll Connector.>
18) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>
19) Connect the ground cable to battery.
20) Pour fluid into the oil tank, and bleed air. <Ref. to PS-53, Power Steering Fluid.>
21) Check for fluid leaks.
22) Check the fluid level in oil tank.

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

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

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


PS-00051

C: DISASSEMBLY

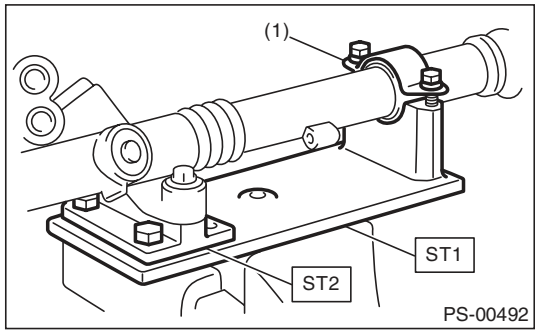
1. RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes C and D, which are fixed to clamp plate, as a unit.

2) Secure the gearbox removed from vehicle in a vise using ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

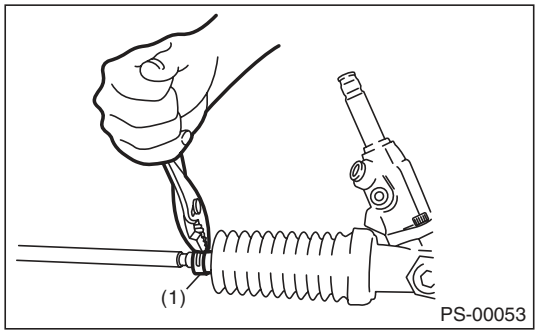
CAUTION:
Secure the gearbox in a vise using ST as shown in the figure. Do not secure the gearbox without this ST.



(1) Clamp

3) Remove the tie-rod end and lock nut from gearbox.

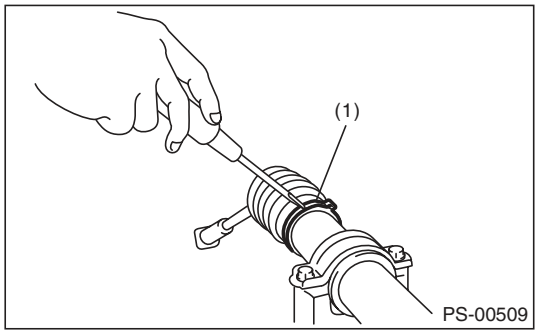
4) Remove the small clip from the boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

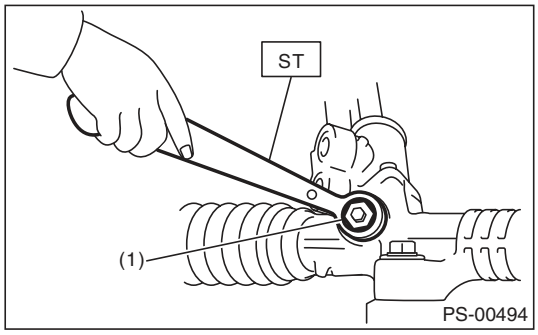
5) Using a flat tip screwdriver, remove the band from boot.

NOTE:
Replace the boot if there is damage, cracks or deterioration.



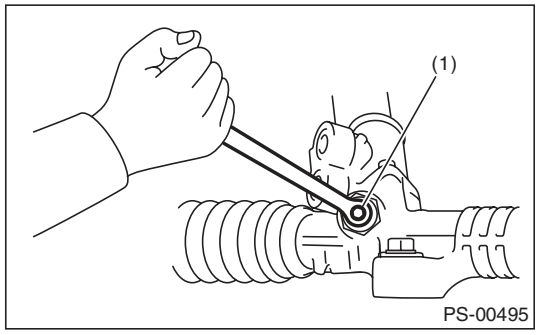
(1) Band

6) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



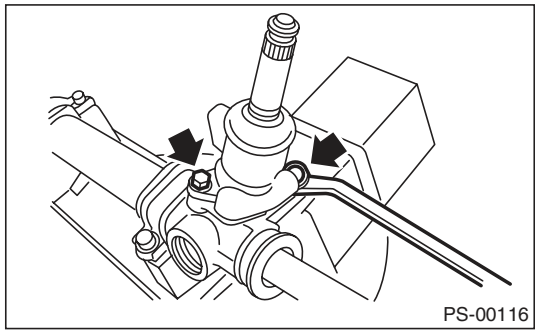
(1) Lock nut

7) Tighten the adjusting screw until it can no longer be tightened.

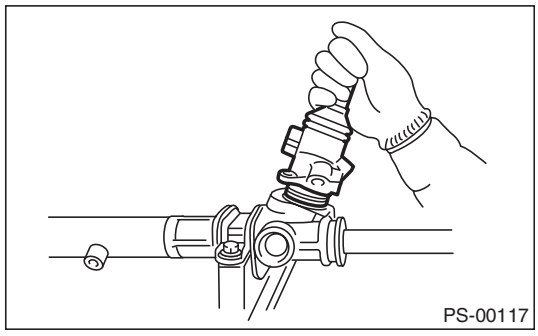


(1) Adjusting screw

8) Remove the tie-rod using ST.
ST 926230000 SPANNER
9) Loosen the adjusting screw, and remove the spring and sleeve.
10) Remove the two bolts securing valve assembly.

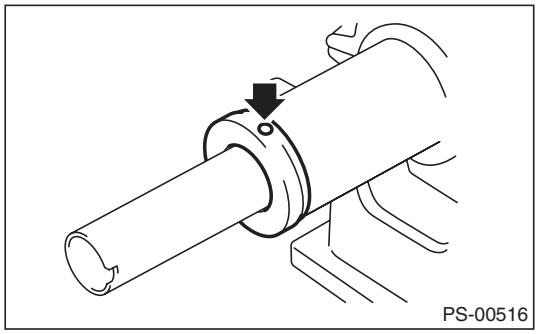


11) Carefully draw out the input shaft and remove the valve assembly.



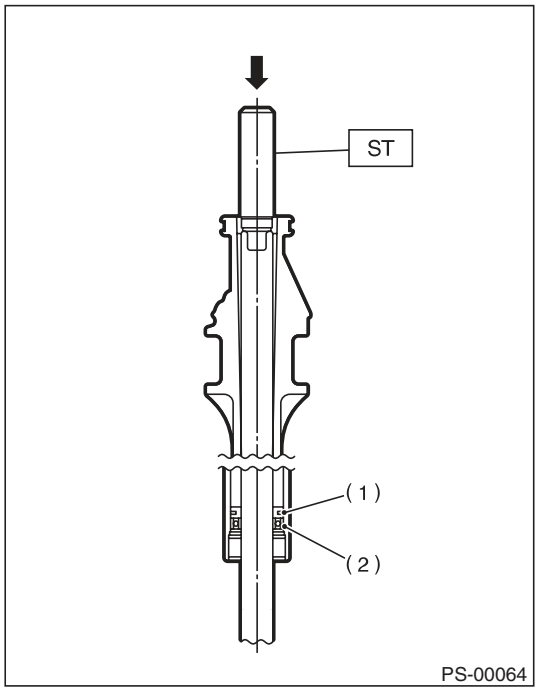
12) Using a drill, release the crimping of holder.

CAUTION:
Make a hole of 2 mm (0.08 in) depth using a drill with 3 mm (0.12 in) diameter.



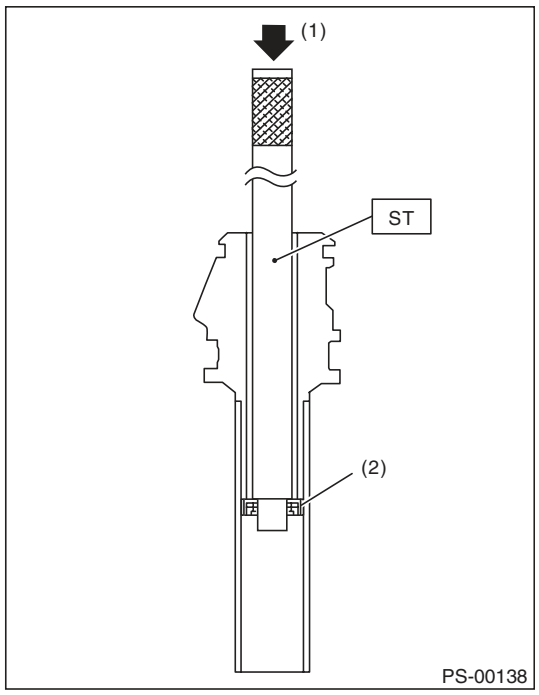
13) Remove the holder.
14) Attach the ST to the pinion housing side of the rack, and push out the rack together with the outer side oil seal.
ST 34199FE000 INSTALLER & REMOVER

NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.



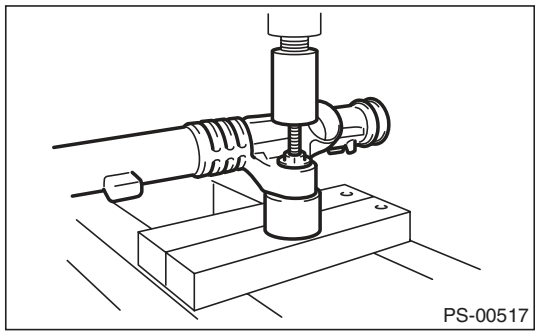
(1) Rack piston
(2) Outer side oil seal

15) Insert the ST from pinion housing side and remove the oil seal using a press.
ST 34099FA140 OIL SEAL REMOVER



(1) Press
(2) Oil seal

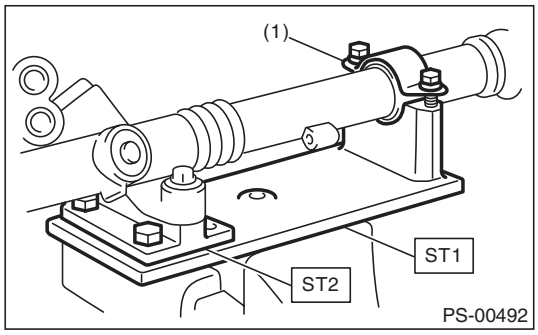
16) Using a press, remove the bushing of gearbox installation portion.



2. CONTROL VALVE

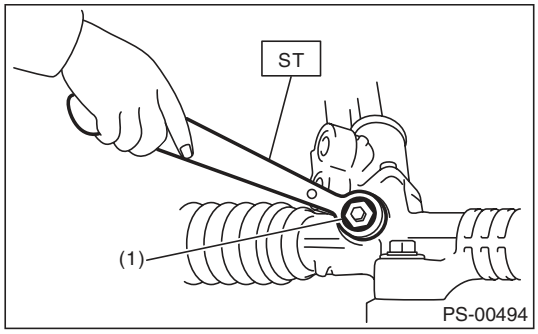
1) Disconnect the pipes A and B from gearbox.
2) Secure the gearbox removed from vehicle in a vise using ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

CAUTION:
Secure the gearbox in a vise using ST as shown in the figure. Do not secure the gearbox without this ST.



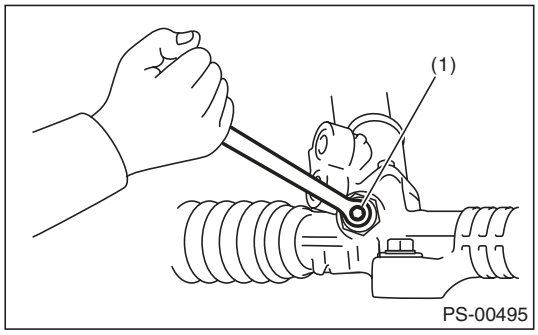
(1) Clamp

3) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



(1) Lock nut

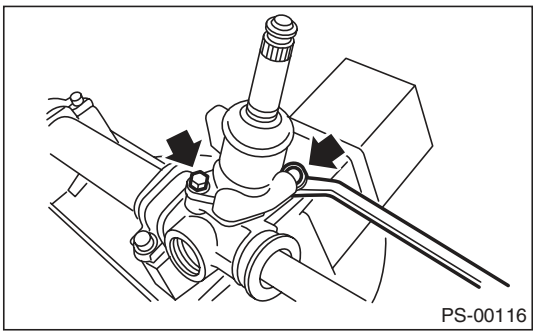
4) Tighten the adjusting screw until it can no longer be tightened.



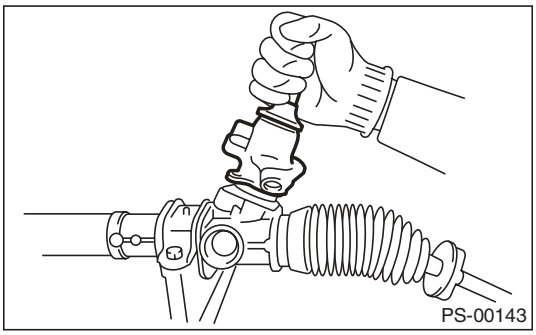
(1) Adjusting screw

5) Loosen the adjusting screw, and remove the spring and sleeve.

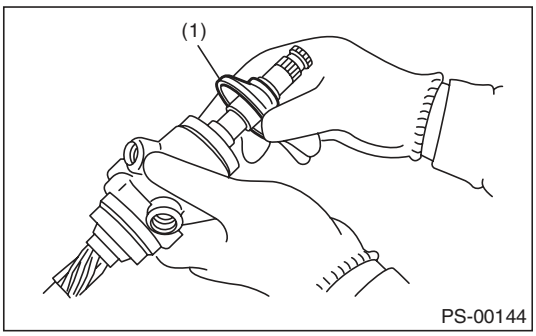
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft and remove the valve assembly.

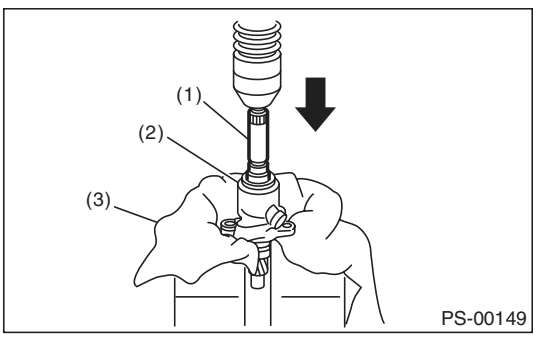


8) Put a vinyl tape around the spline portion, and slide the dust cover to remove.



(1) Dust cover

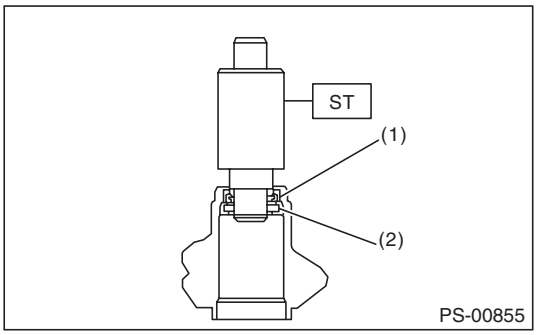
9) Using a press, remove the pinion & valve assembly from valve housing.



(1) Pinion & valve ASSY
(2) Valve housing
(3) Cloth

10) Using the ST and a press, remove the bushing and oil seal from the valve housing.
ST 34199AG090 INSTALLER & REMOVER

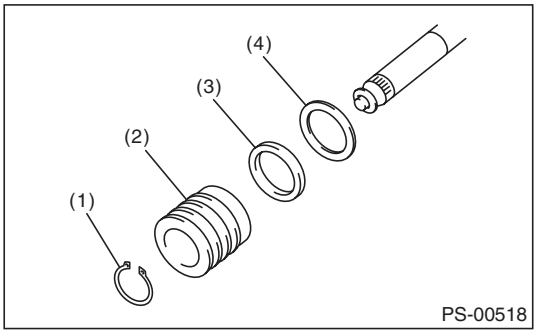
CAUTION:
• Do not apply a force to the end surface of valve housing.
• Do not reuse the oil seal after removal.



(1) Oil seal
(2) Bushing

11) Using a snap ring pliers, remove the snap ring, valve, oil seal and back-up washer.

CAUTION:
Be careful not to scratch the pinion and valve assembly.

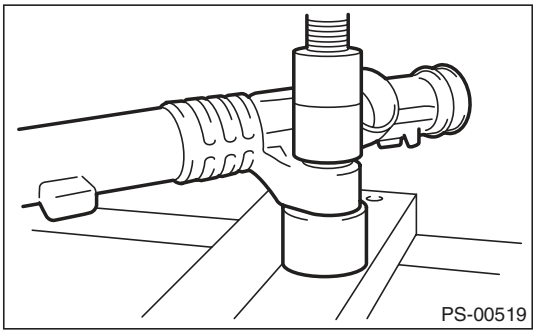


(1) Snap ring
(2) Valve
(3) Oil seal
(4) Back-up ring

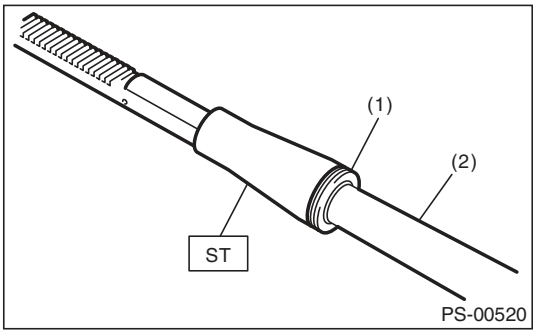
D: ASSEMBLY

1. RACK HOUSING ASSEMBLY

1) Using a press, install the bushing to gearbox installation portion.

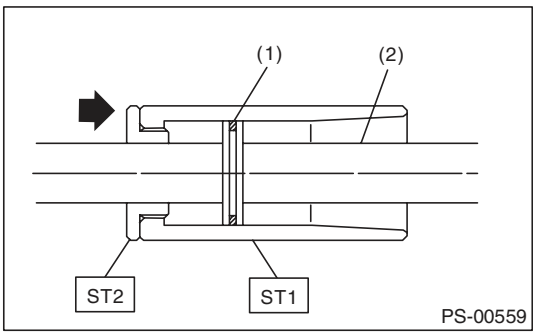


2) Insert the ST to rack.
ST 34199AG030 GUIDE



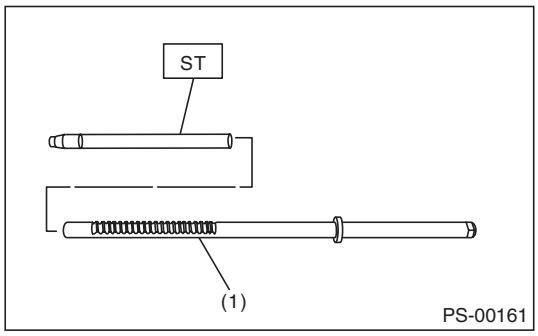
(1) Seal ring
(2) Rack

3) Install the seal ring to piston portion of rack.
4) Using the ST, form the seal ring properly.
ST1 34199AG080 FORMER PISTON
ST2 34199AG050 GUIDE G (24)



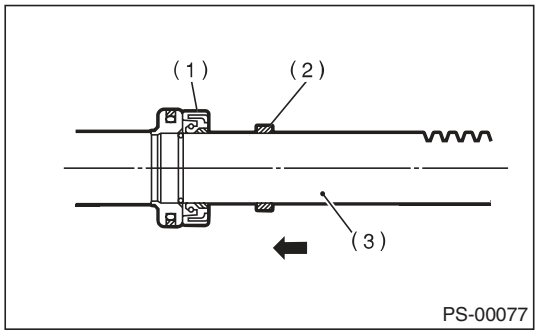
(1) Seal ring
(2) Rack

5) Attach the ST to the teeth of rack assembly, and insert the oil seal into the rack.
ST 926390001 COVER & REMOVER



(1) Rack ASSY

6) Remove the ST from the rack assembly.
7) Install the back-up washer from the gear side of rack.



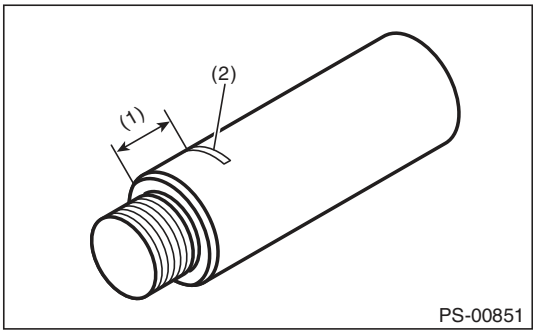
(1) Oil seal
(2) Back-up washer
(3) Rack

8) Check the threaded end of holder and gearbox cylinder end for burrs, damage, etc. Correct if faulty.
9) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Then insert the rack into steering body from cylinder side.
10) Temporarily tighten a new holder to the gearbox cylinder.

11) Put a mark at the specified position measured from the end surface of ST, as shown in the figure.

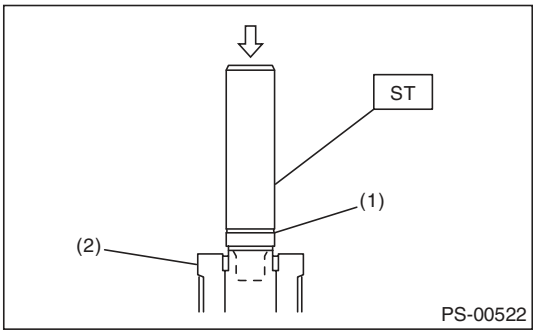
Specified position:
Except for 2.5 GT-B and 3.0 R-LTD:
13.5 mm (0.53 in)
2.5 GT-B and 3.0 R-LTD:
18.9 mm (0.74 in)

ST 34199FE000 INSTALLER & REMOVER



(1) 13.5 mm (0.53 in) or 18.9 mm (0.74 in)
(2) Put a mark.

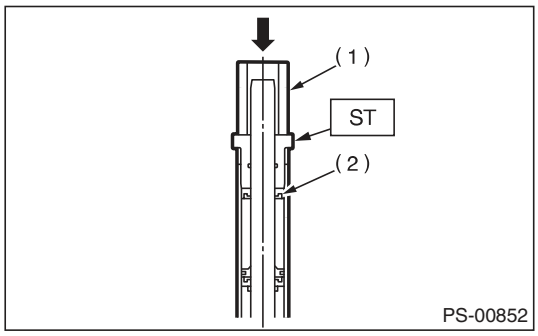
12) Set the ST to the end of rack.
ST 34199FE000 INSTALLER & REMOVER
13) Using a press, press-fit until the mark on ST is aligned to the end surface of holder.



(1) Mark
(2) Holder

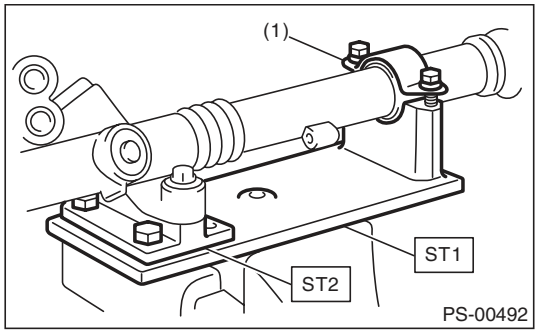
14) Remove the ST and holder.
15) Insert the outer side oil seal into the rack using the same procedure as steps 5) and 6).
ST 926390001 COVER & REMOVER

16) Make the ST and the pipe through the rack, and then press-fit the outer side oil seal using a press.
ST 34199AG010 INSTALLER



(1) Pipe
(2) Outer side oil seal

17) Secure the gearbox in a vise using ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

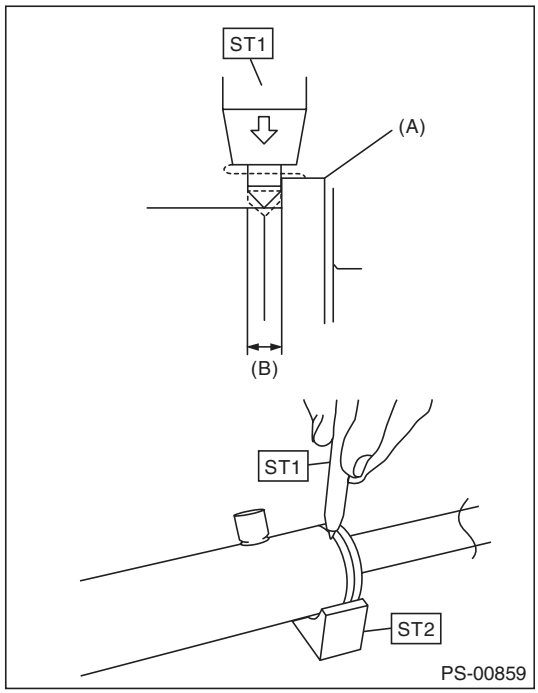


(1) Clamp

18) Tighten a new holder.

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

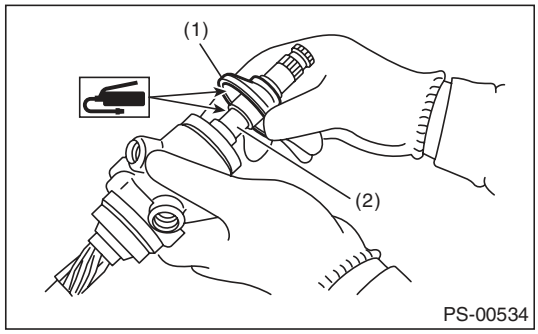
19) Using the ST, crimp so that the diameter of punch hole is 2 — 2.5 mm (0.08 — 0.10 in) and is aligned to the position of 2 mm (0.08 in) from gearbox cylinder end surface.
ST1 34099FA060 PUNCH HOLDER
ST2 34199FE020 BASE



(A) Holder
(B) 2 mm (0.08 in)

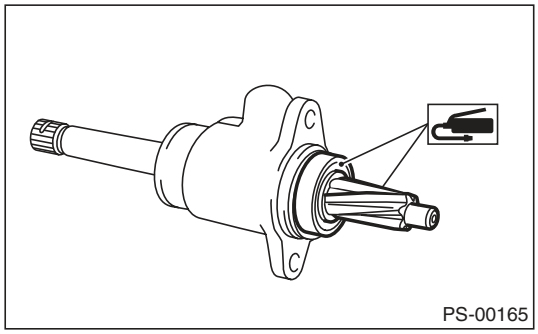
20) Put a vinyl tape around the spline portion and apply genuine grease to the dust cover and install to valve assembly.

CAUTION:
Be sure to install the dust cover to groove of shaft.

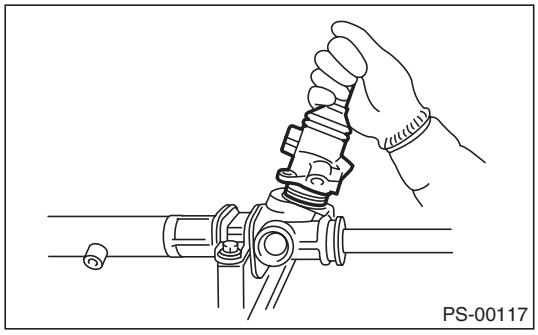


(1) Dust cover
(2) Groove

21) Apply the genuine grease to the pinion gear and bearing of valve assembly.



22) Install a new gasket on valve assembly. Insert the valve assembly into place while facing the rack teeth toward pinion.



23) Tighten the bolts alternately to secure the valve assembly.

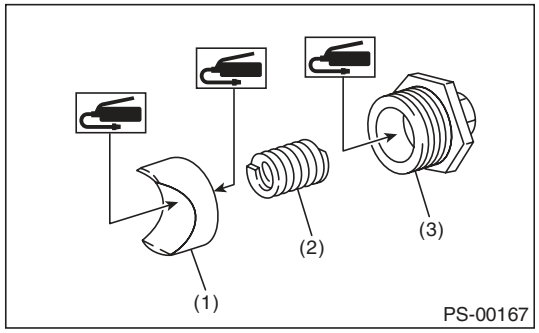
Tightening torque:
20 N·m (2.0 kgf-m, 14.8 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.
24) Temporarily install the tie-rod to rack end, and then operate the rack from lock to lock for two or three times to make it fit in.

CAUTION:
Operating the rack from lock to lock without installing tie-rods may damage the oil seal. Always install the left and right tie-rods.
25) Apply liquid gasket to 1/3 or more of entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141

26) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw. Then install on the steering body.



(1) Sleeve
(2) Spring
(3) Adjusting screw

27) Tighten the adjusting screw to the specified torque, then loosen it.

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

28) Tighten the adjusting screw to the specified torque, then loosen it 20°.

Tightening torque:
3.9 N·m (0.4 kgf-m, 2.9 ft-lb)

29) Remove the tie-rod.
30) Adjust the adjustment screw until the rotational resistance of gearbox is within specifications. <Ref. to PS-35, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>
31) Apply liquid gasket to lock nut and install it into adjusting screw. While holding the adjusting screw with wrench, tighten the lock nut using ST.

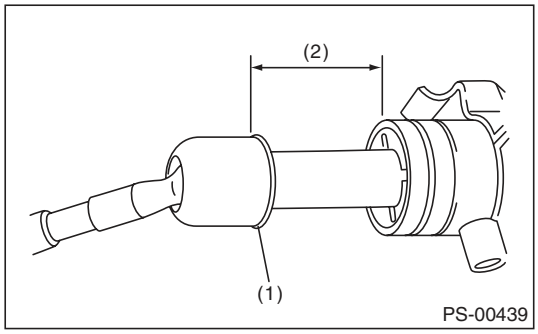
Liquid gasket:
THREE BOND 1141
ST 926230000 SPANNER

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

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.
32) Extend the rack approx. 40 mm (1.57 in) from steering body.

33) Install the tie-rod and new lock washer into rack.

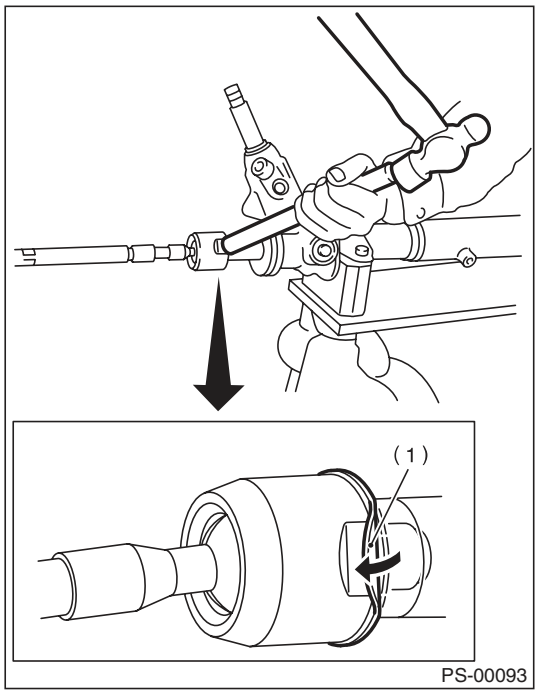
Tightening torque:
90 N·m (9.1 kgf-m, 65.8 ft-lb)



(1) Lock washer
(2) Approx. 40 mm (1.57 in)

34) Bend the lock washer and crimp it.

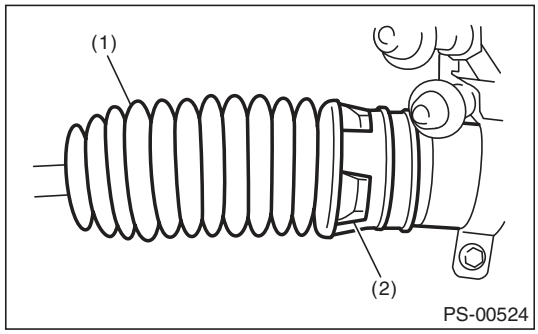
CAUTION:
Be careful not to scratch the rack when crimping lock washer.



(1) Lock washer

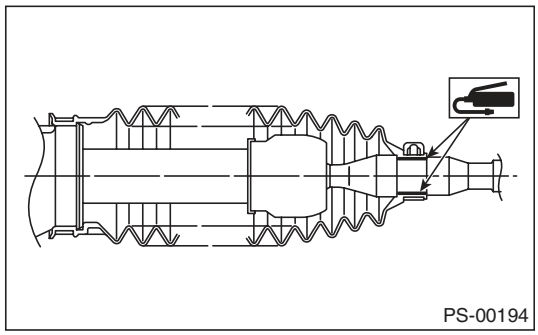
35) Apply a coat of grease to the tie-rod groove, and then install the boot to the housing.

CAUTION:
Right side boot has groove for identification, be sure to install the right and left of boot.

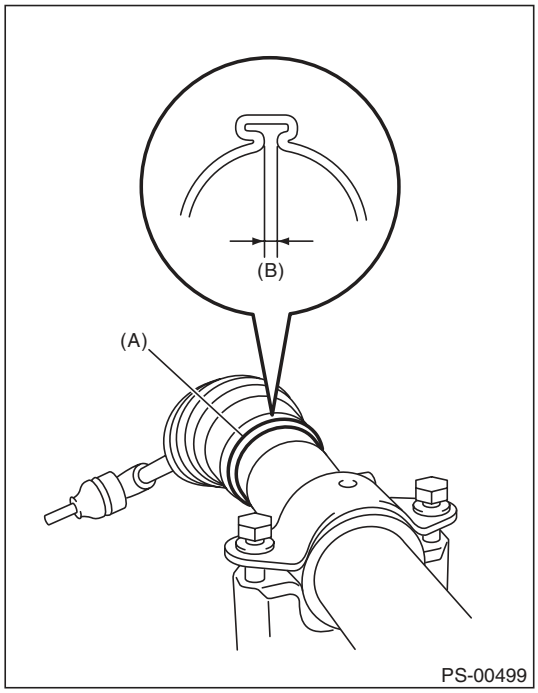


(1) Right side boot
(2) Groove for identification

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.

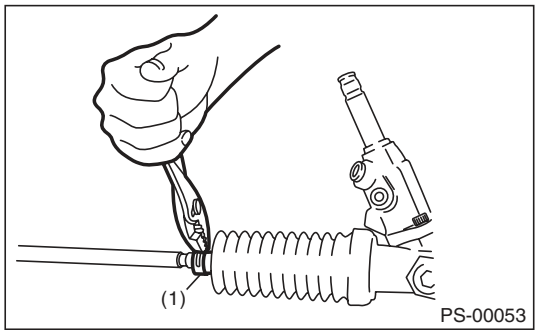


36) Install a new boot band. Using band clamp pliers, crimp it so that the clearance of crimping portion becomes 2 mm (0.079 in) or less.



(A) Boot band
(B) 2 mm (0.079 in) or less

37) Fix the boot end with small clip.

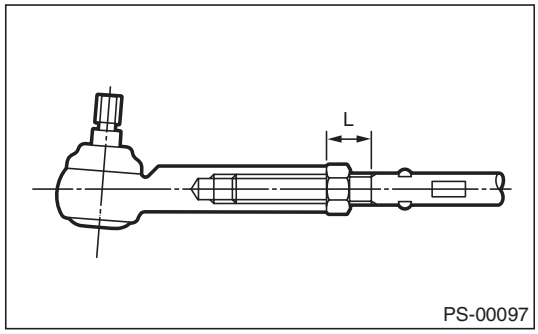


(1) Clip

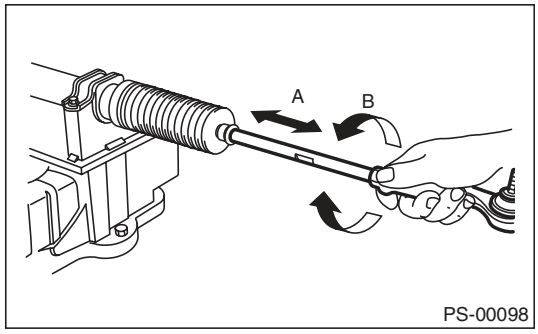
38) After installing, check that the boot end is installed to the groove of the tie-rod.

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

Installed tie-rod length L:
31 mm (1.22 in)



40) Inspect the gearbox as follows.
Holding the “A” tie-rod end, repeat movement from lock to lock two or three times as quickly as possible.
Holding the “B” tie-rod end, turn a few times as slowly as possible.
Finally, make sure that the boot is installed in the specified position without inflating.

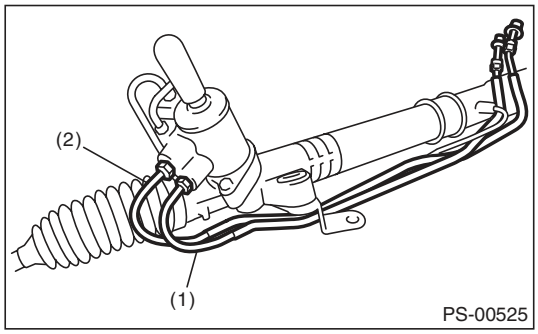


41) Remove the gearbox from ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D
42) Install the four pipes on gearbox.
(1) Connect the pipes A and B to the four pipe joints of gearbox.

Tightening torque:
Refer to the component parts. <Ref. to PS-4, POWER ASSISTED SYSTEM, COMPONENT, General Description.>

(2) Connect the pipes C and D to gearbox.

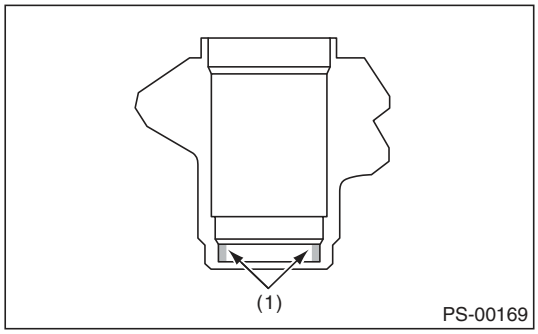
Tightening torque:
Pipe C: 37 N·m (3.8 kgf-m, 27.3 ft-lb)
Pipe D: 29 N·m (3.0 kgf-m, 21.4 ft-lb)



(1) Pipe C
(2) Pipe D

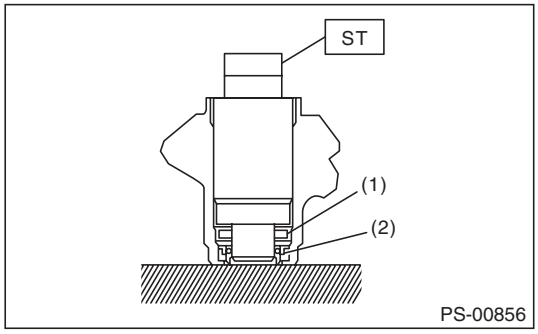
2. CONTROL VALVE ASSEMBLY

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.



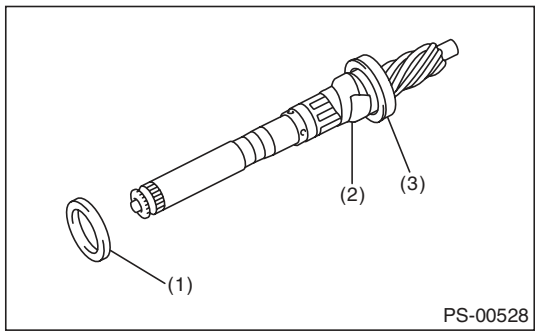
(1) Apply fluid.

3) Apply grease to the oil seal.
4) Verify the direction of oil seal.
5) Using the ST and a press, install the oil seal and the bushing in valve housing.
ST 34199AG090 INSTALLER & REMOVER



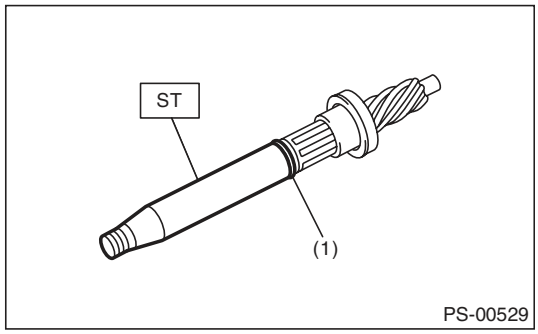
(1) Bushing
(2) Oil seal

6) Apply vinyl tape to the groove of pinion.
7) Install the back-up ring and oil seal to pinion, and then remove the vinyl tape.



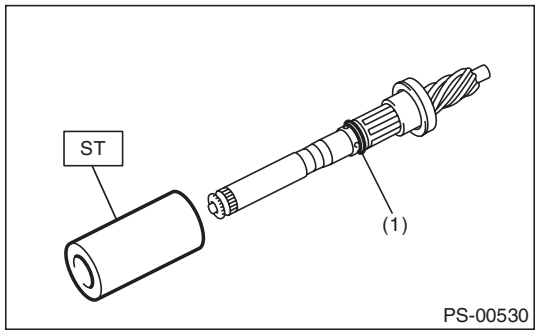
(1) Oil seal
(2) Vinyl tape
(3) Back-up ring

8) Attach the ST to pinion, and install the seal ring.
ST 34199AG020 GUIDE



(1) Seal ring

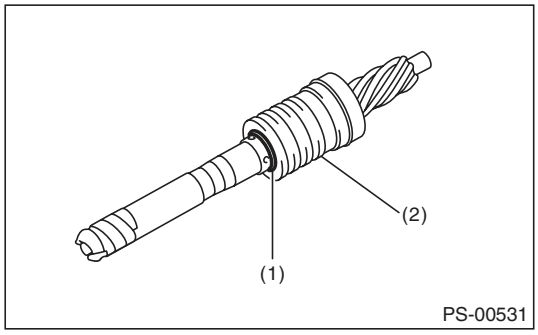
9) Remove the ST GUIDE, and form the seal ring properly using ST FORMER.
ST 34199AG070 FORMER



(1) Seal ring

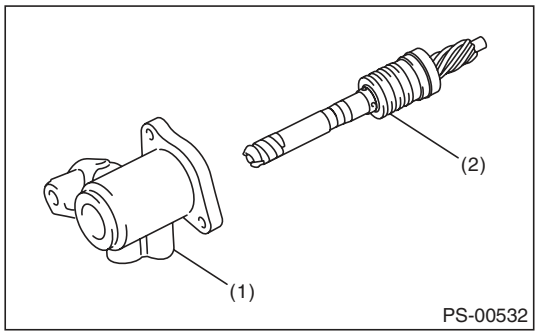
10) Put vinyl tape around pinion shaft spline to protect oil seal from damage.

11) Install the valve to pinion, and install the snap ring.



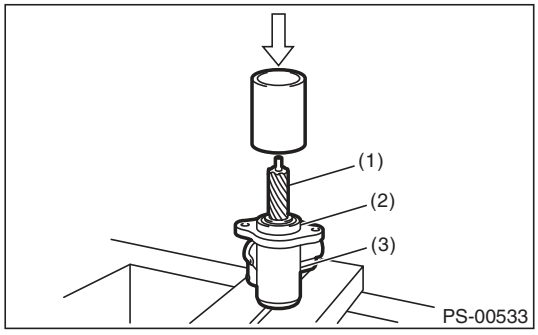
(1) Snap ring
(2) Valve

12) Attach the pinion and valve assembly into the valve housing.



(1) Valve housing
(2) Pinion & valve ASSY

13) Using a press, push the outer race of bearing and press-fit the pinion & valve assembly into housing.

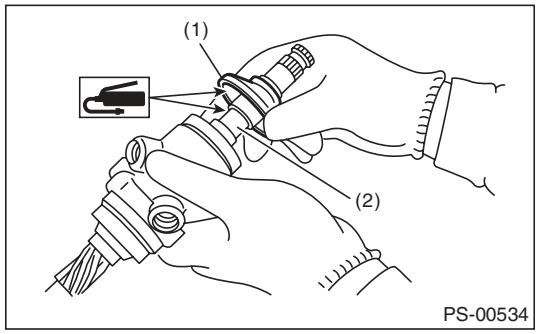


(1) Pinion & valve ASSY
(2) Bearing
(3) Housing

14) Apply the specified grease to dust cover.

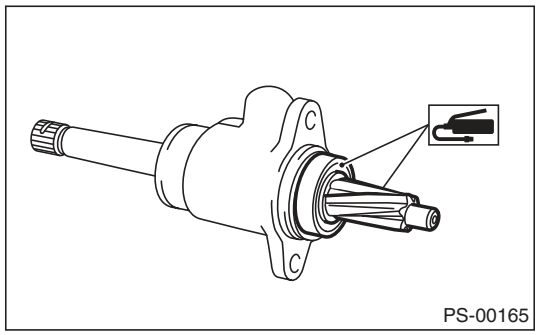
15) Install the dust cover on valve assembly.

CAUTION:
Be sure to install the dust cover to groove of shaft.

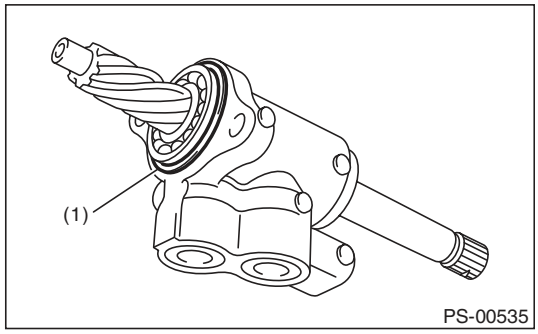


(1) Dust cover
(2) Groove

16) Apply the genuine grease to the pinion gear and bearing of valve assembly.

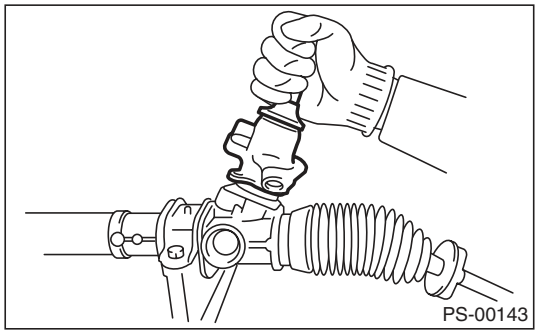


17) Install new O-ring to valve assembly.



(1) O-ring

18) Insert the valve assembly into place while facing the rack teeth toward pinion.



19) Tighten the bolts alternately to secure the valve assembly.

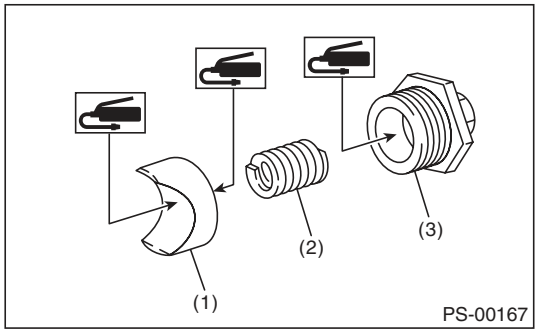
Tightening torque:
20 N·m (2.0 kgf-m, 14.8 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.

20) Apply liquid gasket to 1/3 or more of entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141 (Part No. 004403006)

21) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw. Then install on the steering body.



(1) Sleeve
(2) Spring
(3) Adjusting screw

22) Tighten the adjusting screw to the specified torque, then loosen it.

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

23) Tighten the adjusting screw to the specified torque, then loosen it 20°.

Tightening torque:
3.9 N·m (0.4 kgf-m, 2.9 ft-lb)

24) Adjust the adjustment screw until the rotational resistance of gearbox is within specifications. <Ref. to PS-35, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>
25) Apply liquid gasket to lock nut and install it into adjusting screw. While holding the adjusting screw with wrench, tighten the lock nut using ST.

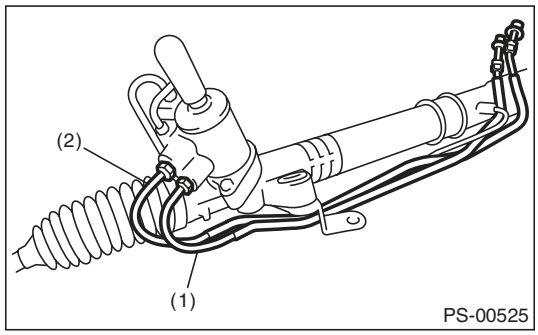
Liquid gasket:
THREE BOND 1141
ST 926230000 SPANNER

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

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.
26) Remove the gearbox from ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D
27) Install the four pipes on gearbox.
(1) Connect the pipes A and B to gearbox.

Tightening torque:
Refer to the component parts. <Ref. to PS-4, POWER ASSISTED SYSTEM, COMPONENT, General Description.>
(2) Connect the pipes C and D to gearbox.

Tightening torque:
Pipe C: 37 N·m (3.8 kgf-m, 27.3 ft-lb)
Pipe D: 29 N·m (3.0 kgf-m, 21.4 ft-lb)



(1) Pipe C
(2) Pipe D

E: INSPECTION

1. BASIC INSPECTION

1) Clean all the 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) Bent input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new part.
3	Rack & pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of the gearbox and sliding resistance of rack, check if the rack & pinion engage uniformly and smoothly with each other. (Refer to Service limit.) (2) Pull out the entire rack to allow viewing of the teeth, and check for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bending of the rack shaft (2) Bending of the cylinder portion (3) Crack or damage on the cast iron portion	Replace the gearbox with a new part.
		(4) Wear or damage on rack bushing	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with new part. (Refer to Service limit.)
		(5) Wear on input shaft bearing	If the free play of input shaft in radial and axial direction is out of the specified range, replace the gearbox with a new part. (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 of dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipe	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT

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

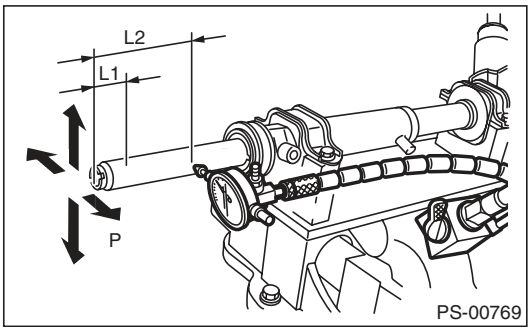
NOTE:
When making a measurement, vise the gearbox using ST. Never vise the gearbox by inserting aluminum plates etc. between vise and gearbox.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

3. RACK SHAFT PLAY IN THE RADIAL DIRECTION

Right-turn steering:

Service limit
0.12 mm (0.005 in) or less

On condition
Weighting point
L1: 10 mm (0.39 in)
P: 98 N (10 kgf, 22 lb)
Measuring point
L2: 25 mm (0.98 in)

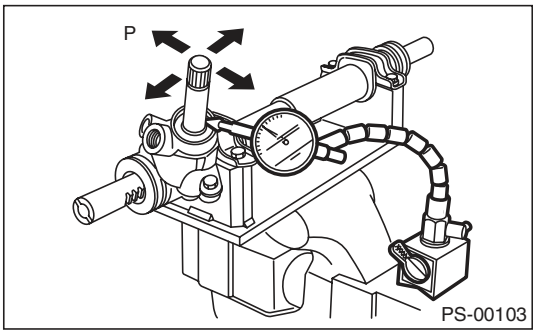


4. INPUT SHAFT PLAY

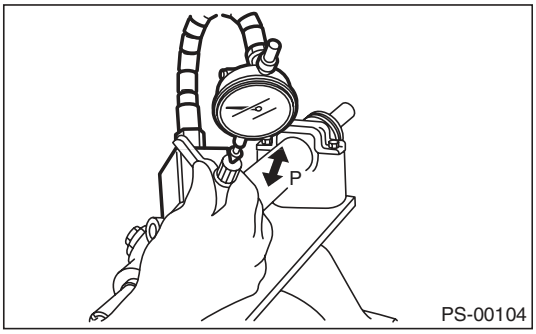
In radial direction:

Service limit
0.26 mm (0.01 in) or less

On condition
P: 98 N (10 kgf, 22 lb)



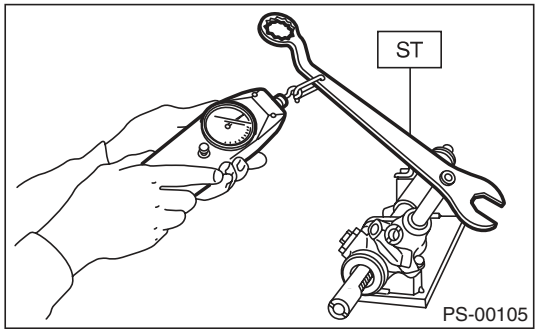
In axial direction:
Without play



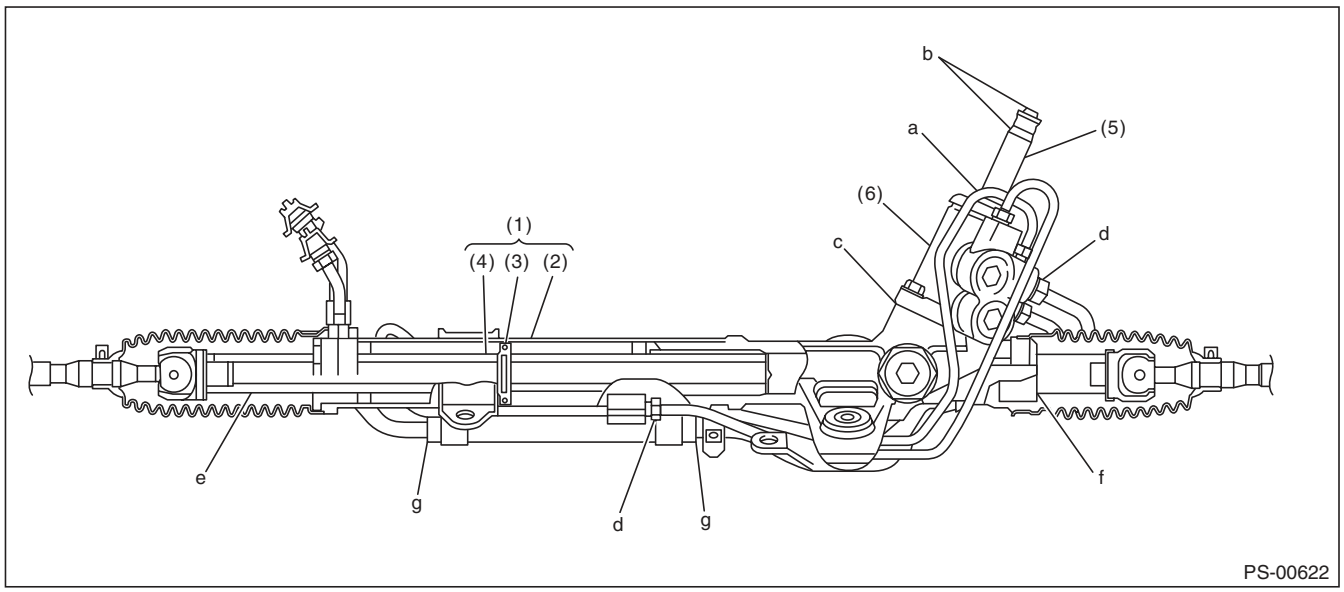
5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit:
Maximum allowable resistance:
11.3 N (1.15 kgf, 2.54 lb) or less.
Difference between right and left turning resistance:
24% or less



6. OIL LEAKAGE



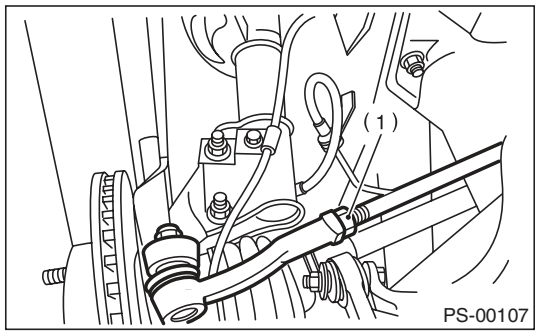
(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

1) Lift up the vehicle.
2) If a fluid leak is found, clean the fluid completely from the suspect area, and turn the steering wheel approx. 30 to 40 times to the left and right from lock to lock, with the engine running, and check again for leaks immediately, and also after a few hours have passed.
3) Cause and solution for oil leakage from “a”
The oil seal is damaged. Replace the valve assembly with a new part.
4) Cause and solution for oil leakage from “b”
The torsion bar O-ring is damaged. Replace the valve assembly with a new part.
5) Cause and solution for oil leakage from “c”
The oil seal is damaged. Replace the valve assembly or oil seal with a new part.
6) Cause and solution for oil leakage from “d”
The pipe is damaged. Replace the faulty pipe or O-ring.
7) Cause and solution for oil leakage from “g”.
The hose is damaged. Replace the hose with a new part.
8) If leak is other than a, b, c, d or g, or if oil is leaking from gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from surrounding portions. Then, turn the steering wheel from lock to lock about 30 to 40 times with the engine running, then re-inspect the leaking area immediately after and several hours after this operation.
(1) Leakage from “e”
The cylinder seal is damaged. Replace the rack bushing with a new part.
(2) Leakage from “f”
There are two possible causes. Perform the following step first. Remove the pipe assembly B from the valve housing, and close the circuit using ST.
ST 926420000 PLUG
Turn the steering wheel from lock to lock approx. 30 to 40 times with the engine running, then inspect the leaked portion immediately after and several hours after this operation.
• If leakage from “f” is noted again:
The oil seal of pinion and valve assembly is damaged. Replace the pinion & valve assembly with a new part. Or replace the oil seal and the parts that are damaged during disassembly with new parts.
• If oil stops leaking from “f”:
The oil seal of rack housing is damaged. Replace the oil seal and parts that are damaged during disassembly with new parts.

F: ADJUSTMENT

1) Adjust the front toe.
<Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



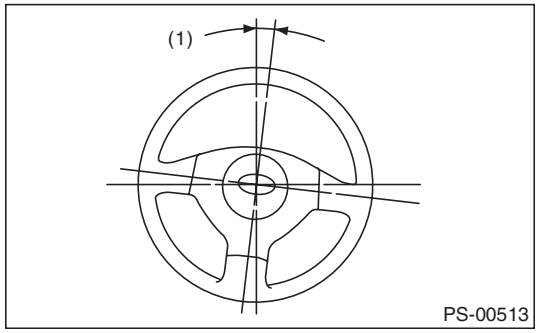
(1) Lock nut

2) Adjust the steering angle of the wheels.

Standard of steering angle:

Model	Except for 2.5 GT spec.B and 3.0 R-LTD	2.5 GT spec.B and 3.0 R-LTD
Inner wheel	37.6°±1.5°	33.8°±1.5°
Outer wheel	33.0°±1.5°	30.2°±1.5°

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of the steering wheel, correctly re-install the steering wheel.



(1) 5° or less

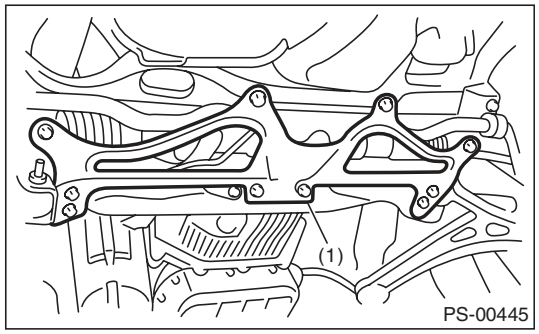
4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction from each other by the same angle.

6. Pipe Assembly

A: REMOVAL

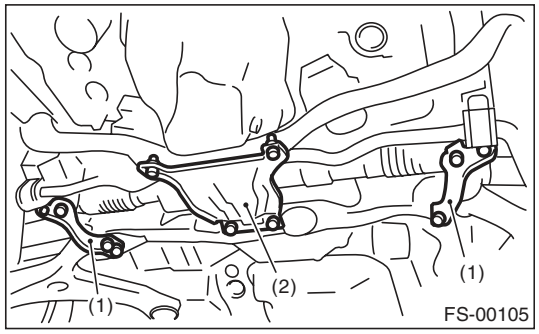
1) Disconnect the ground cable from the battery.
2) Lift up the vehicle, and then remove the front crossmember support plate and jack-up plate.

- Large type



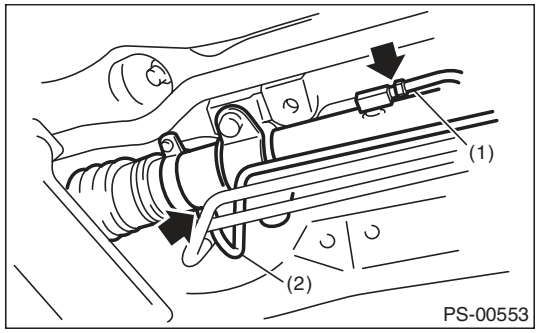
(1) Front crossmember support plate

- Small type



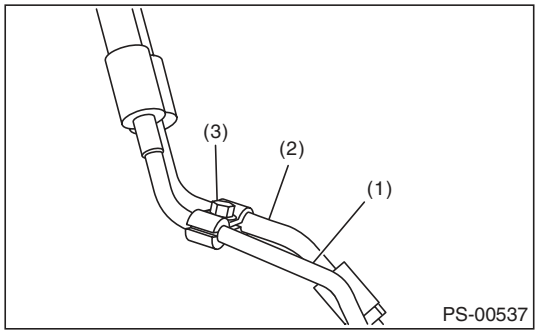
(1) Crossmember support plate
(2) Jack-up plate

3) Remove the one pipe joint at the center of the gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



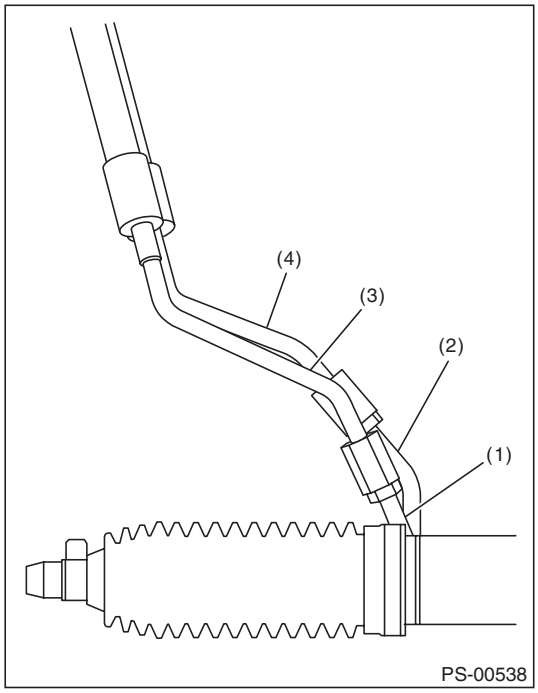
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from return hose and pressure hose.



(1) Return hose
(2) Pressure hose
(3) Clamp E

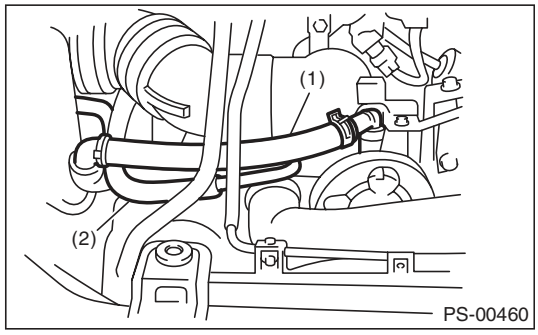
5) Disconnect the pipe D from return hose and pipe C from pressure hose.



(1) Pipe C
(2) Pipe D
(3) Pressure hose
(4) Return hose

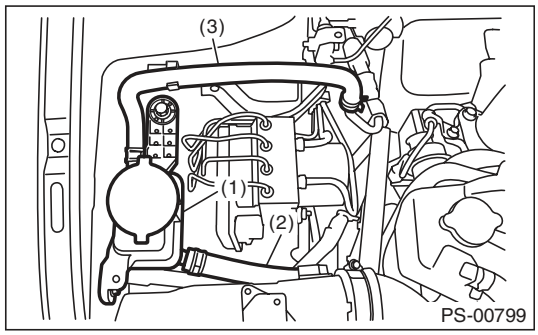
6) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.> <Ref. to IN(H4SO)-8, REMOVAL, Air Intake Duct.>

7) Disconnect the suction hose and pressure hose from oil pump.



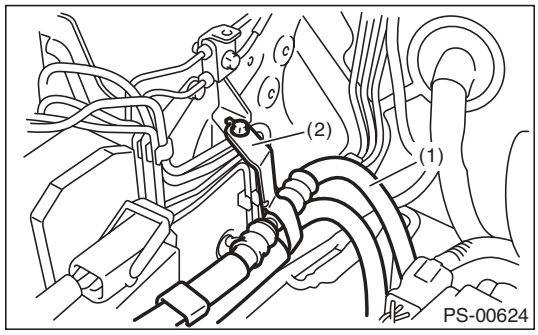
(1) Suction hose
(2) Pressure hose

8) Disconnect the suction hose and return hose from the reservoir tank.



(1) Reservoir tank
(2) Suction hose
(3) Return hose

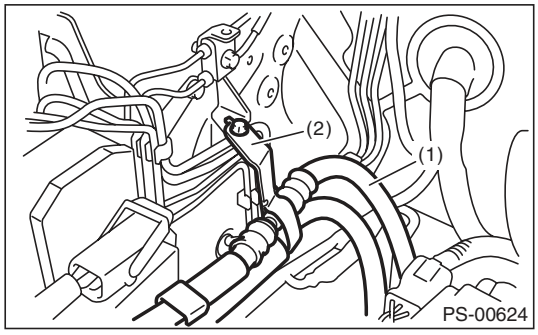
9) Remove the hose bracket and take out the hose assembly from vehicle.



(1) Hose ASSY
(2) Hose bracket

B: INSTALLATION

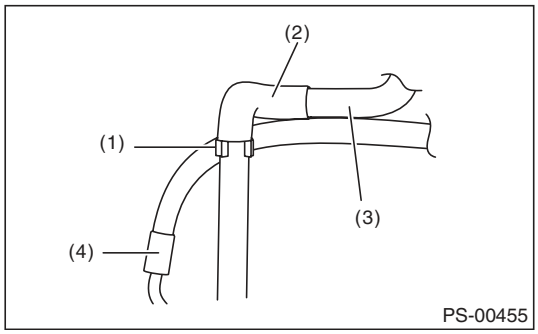
1) Temporarily tighten the hose bracket bolt.



(1) Hose ASSY
(2) Hose bracket

2) Install the plastic clip to the pressure hose and suction hose.

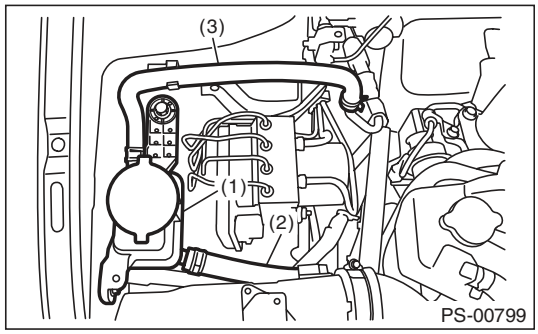
CAUTION:
Align the installation position of the plastic clip with the protector edge of the suction hose.



(1) Plastic clip
(2) Protector
(3) Suction hose
(4) Pressure hose

3) Connect the suction hose and return hose to the reservoir tank.

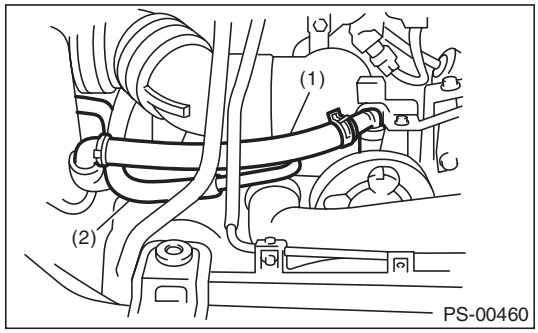
CAUTION:
Firmly insert the plastic clip of return hose to the bracket.



(1) Reservoir tank
(2) Suction hose
(3) Return hose

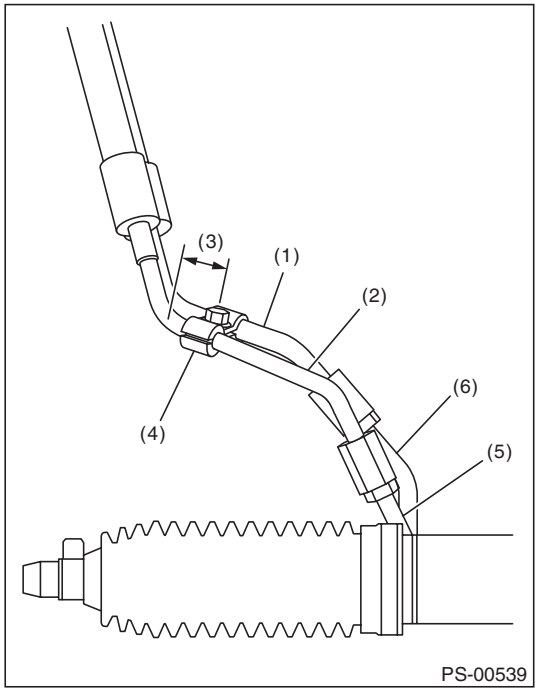
4) Connect the suction hose and pressure hose to the oil pump. Tighten the eye bolt of pressure hose.

Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)



(1) Suction hose
(2) Pressure hose

5) Temporarily connect pressure hose and pipe C, and the return hose and pipe D. Place clamp E at the position shown in the figure, and tighten the bolt temporarily.



(1) Return hose
(2) Pressure hose
(3) Approx. 18 mm (0.71 in)
(4) Clamp E
(5) Pipe C
(6) Pipe D

6) Tighten clamp E.

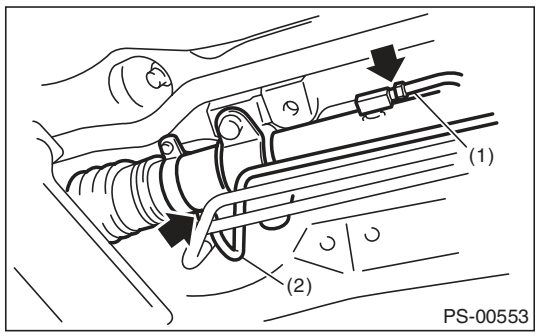
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

7) Tighten the pressure hose and pipe C, and the return hose and pipe D.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

8) Connect pipes A and B to the four pipe joints of the gearbox.

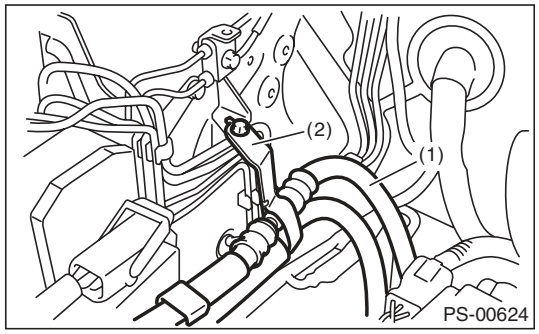
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to PS-4, POWER ASSISTED SYSTEM, COMPONENT, General Description.>



(1) Pipe A
(2) Pipe B

9) Install the front crossmember support plate and jack-up plate.
10) Lower the vehicle.
11) Tighten the bolts which hold the hose bracket.

Tightening torque:
10 N·m (1.02 kgf-m, 7.4 ft-lb)



(1) Hose ASSY
(2) Hose bracket

12) Install the air intake duct. <Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.> <Ref. to IN(H4SO)-8, INSTALLATION, Air Intake Duct.>
13) Connect the ground cable to battery.
14) Fill with the specified fluid.

CAUTION:
Never start the engine before filling with fluid; otherwise the vane pump may become seized.
15) Finally, check the clearance between pipes or hoses as shown in the figure indicated in "General Diagnostic Table". <Ref. to PS-58, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>

C: INSPECTION

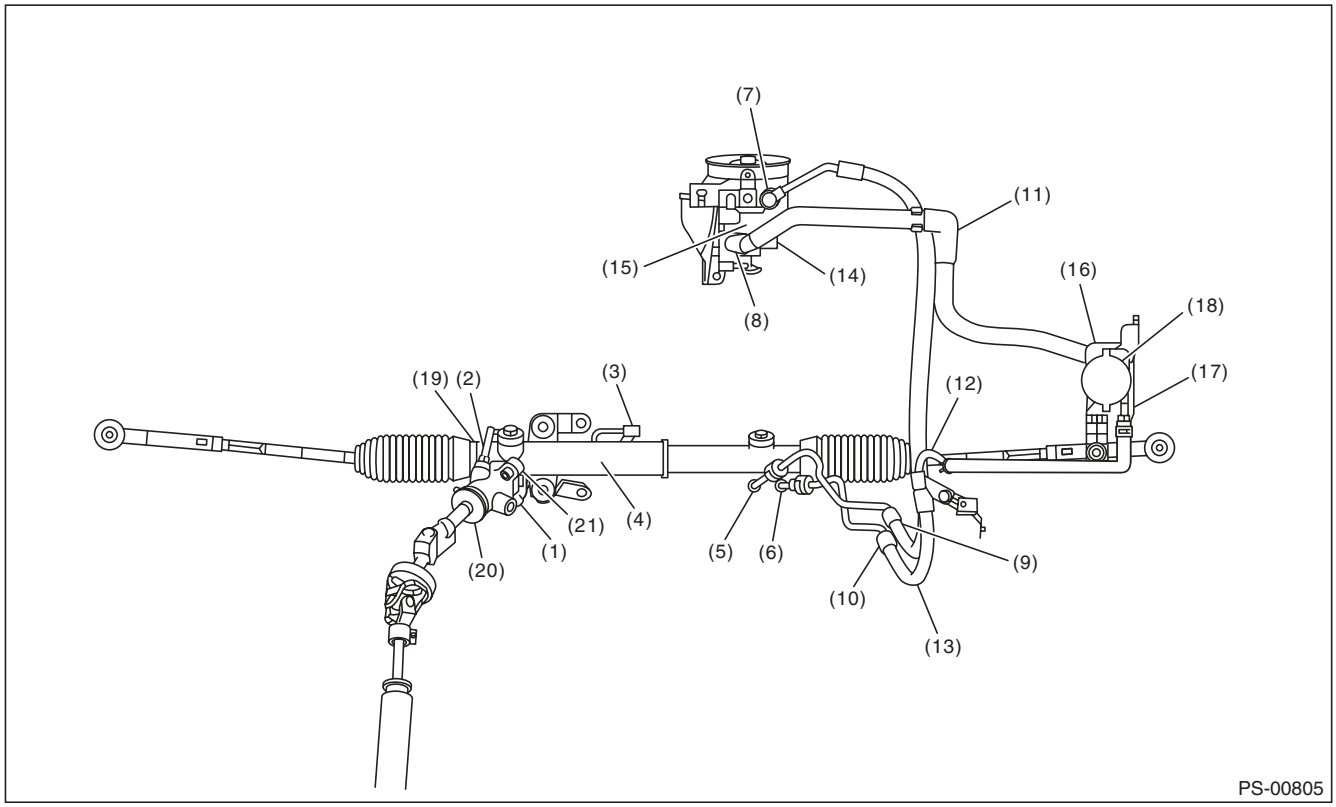
Check all disassembled parts for wear, damage or other problems. Repair or replace the defective parts as necessary.

Part	Maintenance parts	Corrective action
Pipe	• O-ring fitting surface damage • Nut damage • Pipe damage	Replace with a new part.
Clamp	• Loose clamps	Replace with a new part.
Hose	• Flare surface damage • Flare nut damage • Outer surface cracks • Outer surface wear • Clip damage • End coupling or adapter deformation	Replace with a new part.

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. Wipe off hoses immediately if any of these come into contact with the hoses.
Since resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather areas and a driving condition in which many steering operations are required in short time.
Continuous discharge of the relief valve for 5 seconds or more will reduce the service lives of hoses, oil pump, fluid, etc., due to over heating.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of the relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Disconnection of the return hose	Improper connection	Repair.
	Loosening of the clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid slightly leaking out of hose	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the parts if defective.
	Improper stop position of pitching stopper	Replace the parts if defective.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customers.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, engine oil, electrolyte adhere on the hose surface	Replace. Be careful during service work.
	Too many uses in extremely cold weather	Replace. Instruct customers.

NOTE:
There are conditions in which a fluid leak is diagnosed, but is not actually leaking. 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.



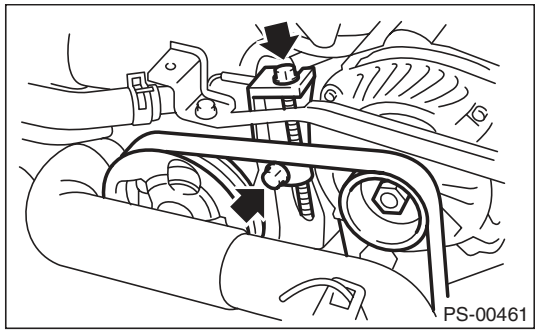
Fluid leaking area	Possible cause	Corrective action
Leakage from pipe and hose connections numbered with (1) through (8) in the figure	Insufficient tightening of flare nut, adhesion of dirt, damage to flare or flare nut or eye bolt	Loosen and retighten. Replace if ineffective.
	Improper installation of hose or clamp	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring, gasket pipe or hose with new part, if still no improvement, replace the gearbox as well.
Leakage from hose (9) through (13) in the figure	Crack or damage in hose	Replace with a new part.
	Crack or damage in hose hardware	Replace with a new part.
Leakage from surrounding of cast iron portion of oil pump, (14) and (15) in the figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank, (16) and (17) in the figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck of (18)	Damaged cap gasket	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	Fluid level too high	Adjust the fluid level.
Leakage from power cylinder of gearbox area (19) in the figure	Damaged oil seal	Replace the oil seal.
Leakage from (20), (21) in the figure and control valve of gearbox	Damaged gasket or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

7. Oil Pump

A: REMOVAL

1. H4 MODEL

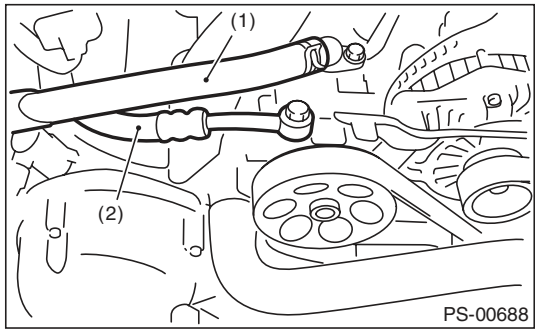
1) Disconnect the ground cable from the battery.
2) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.> <Ref. to IN(H4SO)-8, REMOVAL, Air Intake Duct.>
3) Remove the pulley belt cover.
4) Loosen the belt tension securing bolt and generator securing bolt, then remove the power steering pump V-belt.



5) Disconnect the connector from the power steering pressure switch.
6) Disconnect the pressure hose and suction hose from the oil pump.

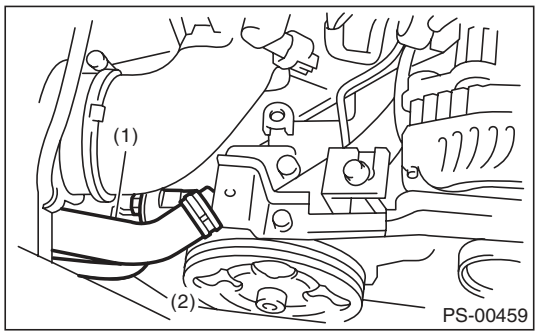
CAUTION:
• Do not allow fluid to come into contact with the pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends with clean cloth.

• Non-turbo model



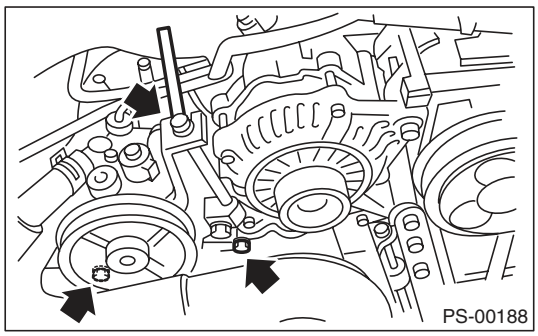
(1) Suction hose
(2) Pressure hose

• Turbo model



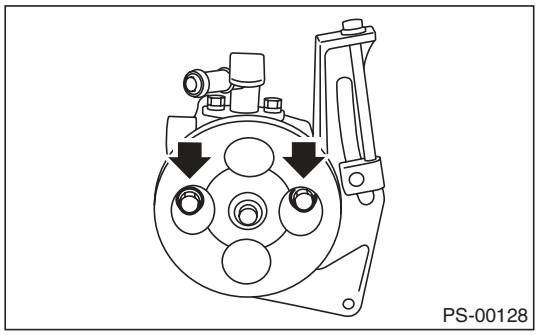
(1) Suction hose
(2) Pressure hose

7) Remove the installation bolt of the power steering pump bracket.



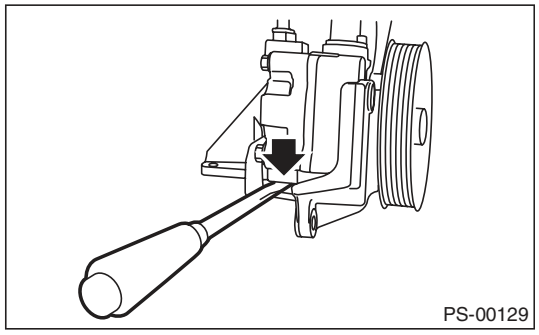
8) Place the oil pump bracket in a vise, and remove the two bolts from the front side of the oil pump.

CAUTION:
When securing the oil pump bracket in a vise, hold the oil pump bracket with the least possible force between two pieces of wood.



9) Remove the bolt from the rear side of oil pump.

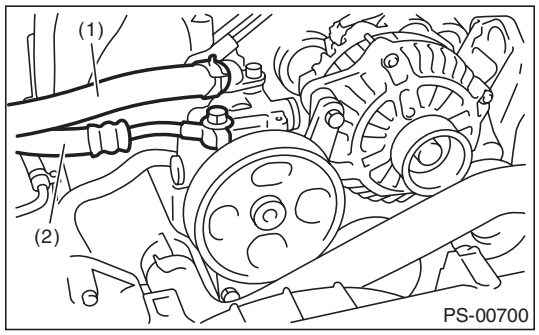
10) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



2. H6 MODEL

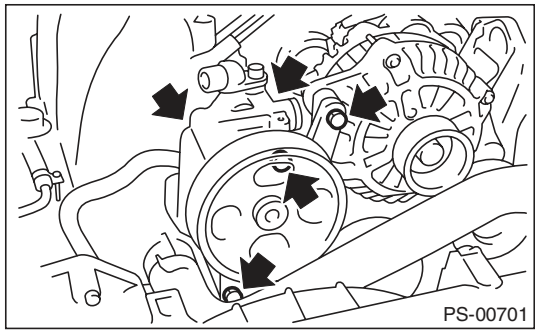
1) Disconnect the ground cable from the battery.
2) Remove the cover of the pulley belt.
3) Remove the V-belts.
4) Remove the power steering pressure switch connector.
5) Remove the tensioner adjuster.
6) Disconnect the pressure hose and suction hose from the oil pump.

CAUTION:
• Do not allow fluid to flow from the hose end and contact the pulley belt.
• To prevent foreign objects from entering the hose, cover the hose openings with a clean cloth.



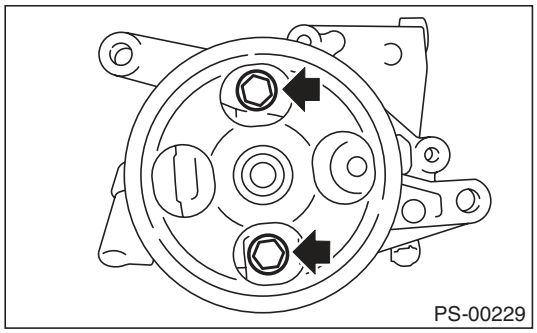
(1) Suction hose
(2) Pressure hose

7) Remove the bolts which holds the power steering pump bracket.

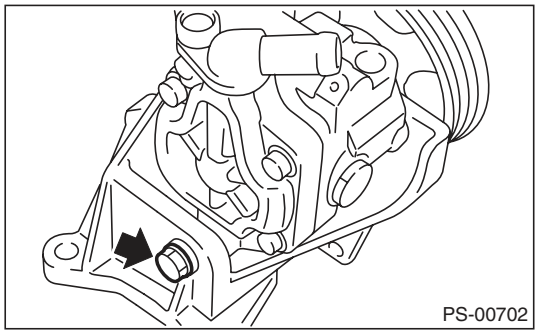


8) Place the oil pump bracket in a vise, and remove the two bolts from the front side of the oil pump.

CAUTION:
When securing the oil pump bracket in a vice, hold the oil pump bracket with the least possible force between two pieces of wood.



9) Remove the bolt from the back side of the oil pump.



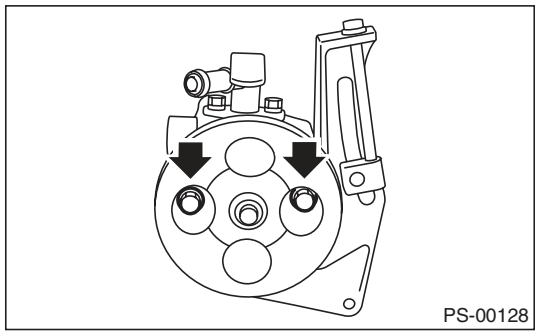
10) Remove the oil pump from the bracket.

B: INSTALLATION

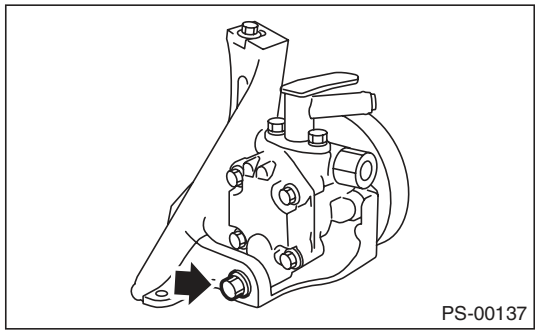
1. H4 MODEL

1) Install the oil pump to the bracket.

Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

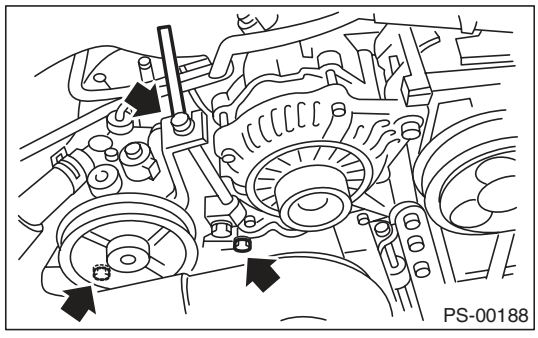


Tightening torque:
48.4 N·m (4.9 kgf-m, 35.7 ft-lb)



2) Attach the installation bolts of the power steering pump bracket.

Tightening torque:
<Ref. to PS-6, OIL PUMP, COMPONENT, General Description.>



3) After installing the oil pump, fill the fluid while rotating the pulley by hand to bleed air from the oil pump.

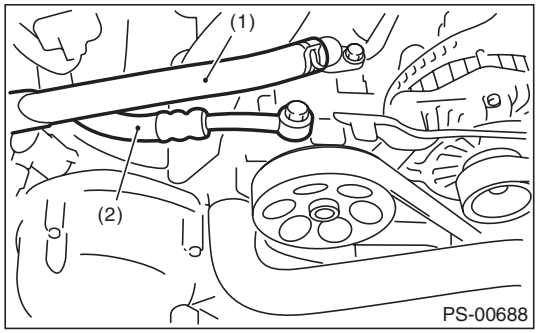
CAUTION:
Always fill the oil pump with the fluid to prevent abnormal noise and seizure of the oil pump.

4) Connect the pressure hose and suction hose.

Tightening torque:
Eye bolt
40 N·m (4.1 kgf-m, 29.5 ft-lb)

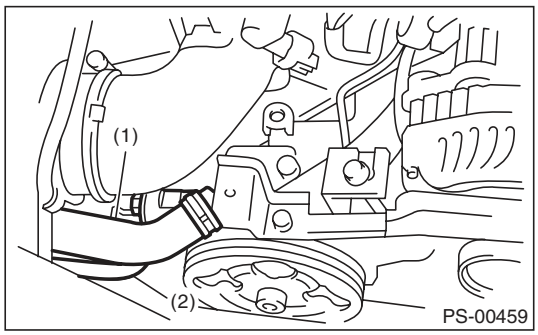
CAUTION:
Be careful not to twist hoses. Twisted hoses may contact other parts.

- Non-turbo model



(1) Suction hose
(2) Pressure hose

- Turbo model



(1) Suction hose
(2) Pressure hose

5) Connect the power steering pressure switch connector.
6) Install the V-belts to the oil pump.
7) Check the tension of the V-belt.
<Ref. to ME(H4SO)-40, INSPECTION, V-belt.>
8) Tighten the lock bolt of the belt tension nut.

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

9) Install the pulley belt cover.
10) Install the air intake duct.
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.> <Ref. to IN(H4SO)-8, INSTALLATION, Air Intake Duct.>
11) Connect the ground cable to battery.

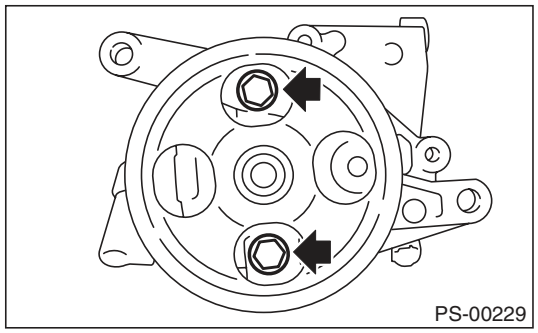
12) Fill with the specified power steering fluid. <Ref. to PS-53, Power Steering Fluid.>

CAUTION:
Never start the engine before filling with fluid; otherwise the vane pump may become seized.

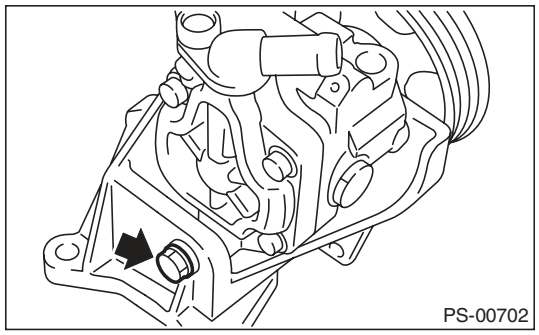
2. H6 MODEL

1) Install the oil pump to the bracket.

Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

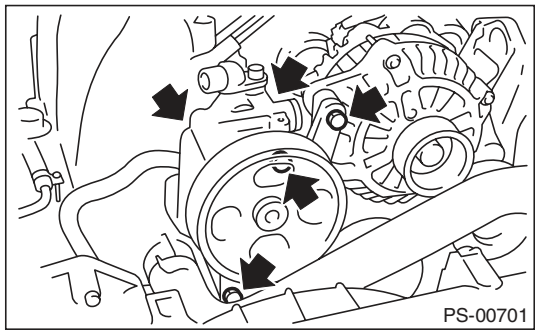


Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten the bolt which attaches the power steering pump bracket.

Tightening torque:
<Ref. to PS-6, OIL PUMP, COMPONENT, General Description.>



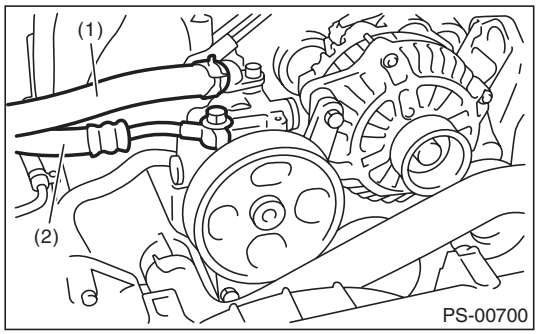
3) After installing the oil pump, fill the fluid while rotating the pulley by hand to bleed air from the oil pump.

CAUTION:
Always fill the oil pump with the fluid to prevent abnormal noise and seizure of the oil pump.

4) Connect the pressure hose and suction hose.

Tightening torque:
Eye bolt
40 N·m (4.1 kgf-m, 29.5 ft-lb)

CAUTION:
Be careful not to twist hoses. Twisted hoses may contact other parts.



(1) Suction hose
(2) Pressure hose

5) Connect the power steering pressure switch connector.
6) Install the tensioner adjuster.
7) Install the V-belts.
8) Install the pulley belt cover.
9) Connect the ground cable to battery.
10) Pour the specified power steering fluid. <Ref. to PS-53, Power Steering Fluid.>

CAUTION:
Never start the engine before filling with fluid; otherwise the vane pump may become seized.

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and replace faulty parts.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new part.
		(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 part.
2	Pulley	(1) Damage	Replace with a new part.
		(2) Bend	Measure the V groove deflection. If it exceeds the service limit, replace the pulley with a new part.
3	Oil pump (Interior)	(1) Faulty or seized of vane pump	Check the rotating resistance of pulley. If it exceeds the service limit, replace the oil pump with new part.
		(2) Bend in the shaft or damage to bearing	If the a string is wrapped on the pulley and rotated, and the oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump, replace the oil pump with a new part.
4	O-ring	Cracking or deterioration	Replace with a new part.
5	Bracket	Crack	Replace with a new part.

2. SERVICE LIMIT

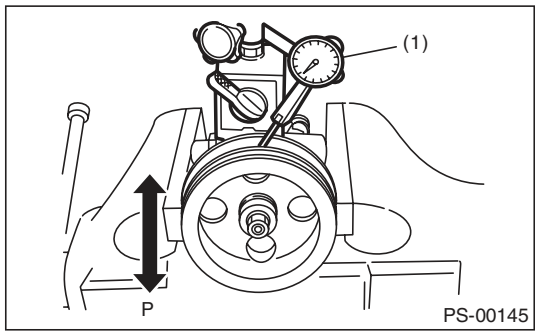
Make a measurements as follows. If it exceeds the service limit, replace with a new part.

CAUTION:
• When securing the oil pump on a vise, hold the oil pump with the least possible force between two pieces of wood.
• Do not set the outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

1) Play of the pulley shaft

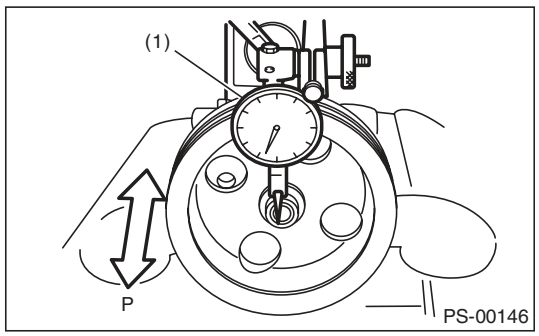
Condition:
P: When applying the force of 9.8 N (1.0 kgf, 2.2 lb)

Service limit:
Play in the radial direction (Direction ⬅ ➡)
0.4 mm (0.016 in) or less



(1) Dial gauge

Axial play (Direction ⇦ ⇨)
0.9 mm (0.035 in) or less

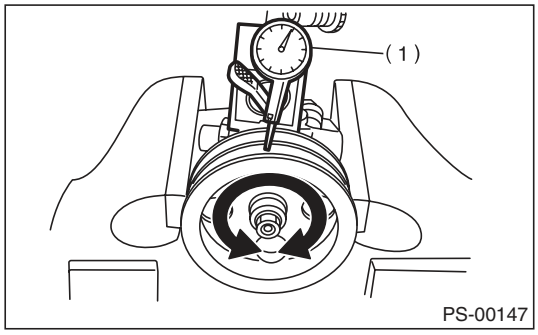


(1) Dial gauge

2) Deflection of the pulley groove

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 gauge.

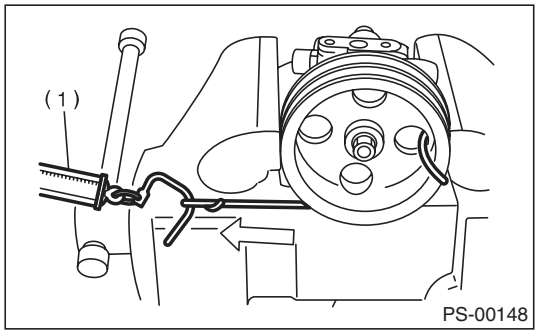


(1) Dial gauge

3) Rotating resistance of pulley

Service limit:
Maximum load: 9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:
• A rather higher value may be indicated when pulley starts turning.
• Measure the load during rotation to make a judgment.



(1) Spring scale

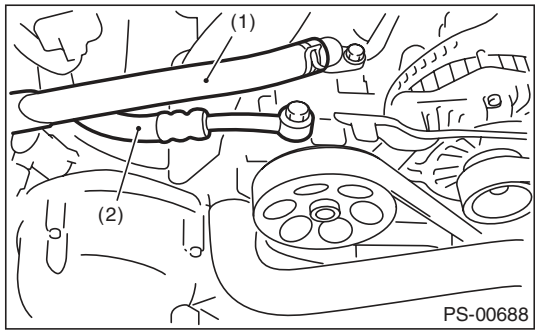
3. HYDRAULIC PRESSURE

NOTE:
• To measure hydraulic pressure correctly, be sure to complete all the items in “INSPECTION”, prior to performing the measurement. <Ref. to PS-54, INSPECTION, General Diagnostic Table.>
• Do not leave the valve of pressure gauge closed or hold the steering wheel at lock for 5 seconds or more in any case, this can damage the oil pump.
• Before attaching a pressure gauge, place a waste cloth at locations where fluid can be expected to spill. Wipe off any spilt fluid completely after the measurement.

1) Regular pressure measurement
(1) Connect the ST1, ST2 and ST3.

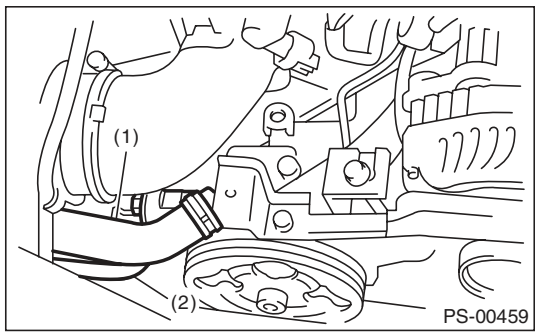
ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

(2) Remove the air intake duct.
(3) Disconnect the pipe C from pump.
(4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), attach the ST2 to pump instead of pressure hose.
• Non-turbo model



(1) Suction hose
(2) Pressure hose

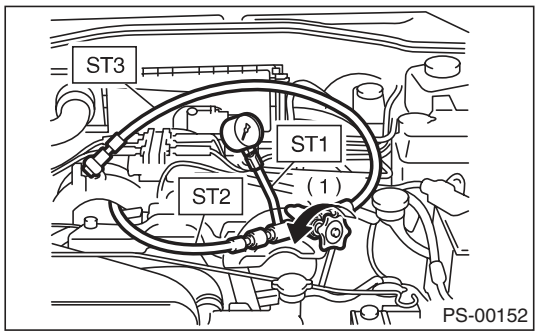
• Turbo model



(1) Suction hose
(2) Pressure hose

(5) Attach the ST3 to the end of pressure hose which is 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
ST3 34099AC010 ADAPTER HOSE A



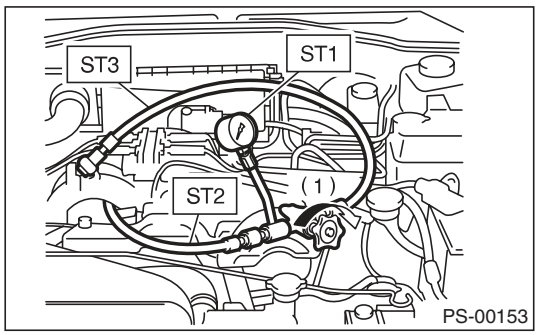
(1) Valve

Service limit:
981 kPa (10 kg/cm^2, 142 psi) or less

(9) If it is not within the specification, replace the problem part for the following problems. (Pipe or hose clogged, leaks from fluid line, and mixture of foreign matter 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.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



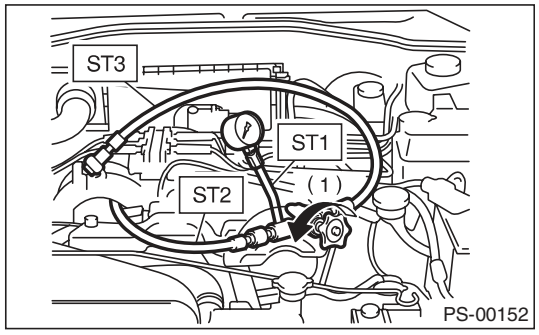
(1) Valve

Service limit:
H4 non-turbo model:
7,350 — 8,050 kPa
(75 — 82 kg/cm^2, 1,067 — 1,165 psi)
H4 turbo model:
8,100 — 8,800 kPa
(83 — 90 kg/cm^2, 1,174 — 1,276 psi)
H6 model:
8,300 — 9,000 kPa
(85 — 92 kg/cm^2, 1,204 — 1,305 psi)

(4) If it is not within the specification, replace the oil pump.

3) Measure the working pressure.
(1) Using the ST, measure the working pressure.
(2) Open the valve.
(3) Measure the working pressure of control valve by turning steering wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



(1) Valve

Service limit:
7,650 — 8,330 kPa
(78 — 85 kg/cm^2, 1,110 — 1,208 psi)

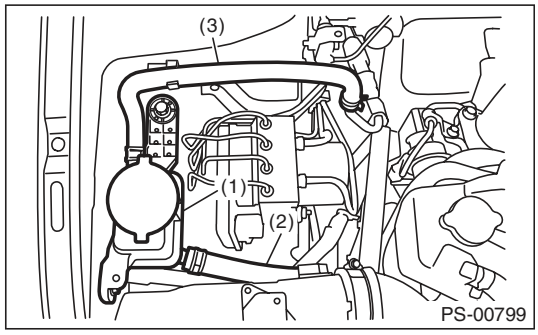
(4) If it is out of specification, measure the steering effort. <Ref. to PS-57, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specification, replace the control valve itself or control valve and pinion as a single unit, using new parts.

8. Reservoir Tank

A: REMOVAL

1) Drain fluid from the reservoir tank.
2) Disconnect the hose from reservoir tank.

CAUTION:
To prevent foreign matter from entering the hose and pipe, cover the open ends of them with clean cloth.



(1) Reservoir tank
(2) Suction hose
(3) Return hose

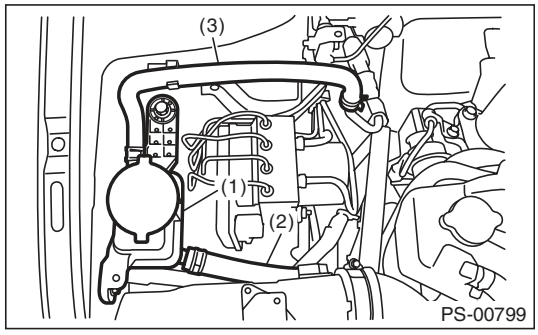
3) Remove the reservoir tank from the body.

B: INSTALLATION

1) Install the reservoir tank to the body.

Tightening torque:
13 N·m (1.32 kgf-m, 9.6 ft-lb)

2) Connect the hose to the reservoir tank.



(1) Reservoir tank
(2) Suction hose
(3) Return hose

3) Replenish power steering fluid up to the specified level. <Ref. to PS-53, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage or damage. If a failure is found, replace the reservoir tank.

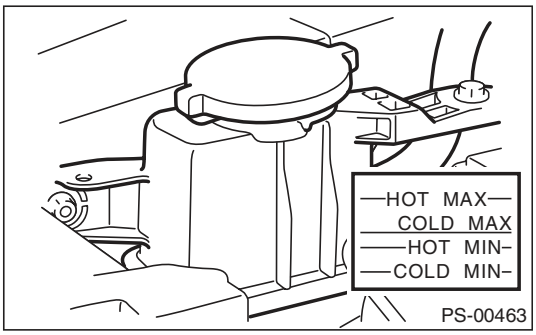
9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid
SUBARU ATF or ATF DEXRON III

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 of reservoir tank with vehicle on level surface and engine stopped.
If the level is at “MIN.” point or below, add fluid to keep the level in the specified range of the indicator. If fluid level is at “MAX.” point or above, drain fluid by using a syringe or the like.
(1) Check at power steering fluid temperature 20°C (68°F); read the fluid level on the “COLD” side.
(2) Check at power steering fluid temperature 80°C (176°F); read the fluid level on the “HOT” side.



C: REPLACEMENT

1) Lift up the vehicle.
2) Remove the crossmember support.
3) Remove the pipe joint in the center of gearbox, and connect the vinyl hose to the pipe and joint. Wipe fluid off while turning the steering wheel.
4) Add the specified fluid to reservoir tank at “MAX” level.
5) Continue to turn the steering wheel slowly from lock to lock until the bubbles stop appearing on oil surface while keeping the fluid at the level in the Step 4).
6) If the steering wheel is turned in a low fluid level condition, air will be sucked into the pipe. If air has entered, leave it for about half an hour and then repeat step 5) again.
7) Start the engine and let it idle.
8) Continue to turn the steering wheel slowly from lock to lock again until the bubbles stop appearing on oil surface, while keeping the fluid at the level in Step 4).
Normally bubbles will stop appearing after turning the steering wheel from lock to lock three times.
9) In case bubbles do not stop appearing in the tank, leave it for about half an hour and then repeat from step 4) again.
10) Lower the vehicle, and then idle the engine.
11) Continue to turn the steering wheel from lock to lock until the bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
12) In case the following happens, leave it about half an hour and then perform step 8) to 11) again.
(1) The fluid level changes by 3 mm (0.12 in) or more.
(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.

10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Steering effort is heavy in all ranges. • Steering effort is heavy at stand still. • Steering wheel vibrates when turning.	1. Pulley belt • Unequal length of pulley belts • Contact with oil or grease • Looseness or damage of the pulley belt • Poor uniformity of the 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 tire out of specifications*1 • Improper wheel out of specifications*1 • Tires not properly inflated	Replace or reinflate.
	3. Fluid • Low fluid level • Air entry in fluid • Dust entry in fluid • Fluid deterioration • Inadequate warm up of fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idle speed • Lower idle speed • Excessive drop of idle speed at start or when turning the steering wheel *3	Adjust or instruct customer.
	5. Measure the hydraulic pressure. <Ref. to PS-48, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure the steering wheel effort. <Ref. to PS-57, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other • Returning force of steering wheel to center is poor. • Steering wheel vibrates when turning.	1. Fluid line • Folded hose • Flattened pipe	Repair or replace.
	2. Tire and wheel • Flat tire • Mixed use of different tires • Mixed use of different wheels • Abnormal wear of tire • Unequal tread remaining • Unequal pressure of tire	Adjust, fix or replace.
	3. Front alignment • Improper or unequal caster • Improper or unequal toe-in • Loose suspension connections	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • Unbalanced weight	Replace, adjust or instruct customer.
	5. Measure the steering wheel effort. <Ref. to PS-57, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If the tires or wheels are wider than standard, the load to the power steering system is increased. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before reaching maximum turning angle. In this case, steering effort may be heavy. When the measured hydraulic pressure is normal, there is no abnormal thing.
*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn the steering wheel from stop to stop several times to warm up fluid. If steering effort reduces normally, function is normal.
*3 In cold weather or with insufficient warm up of the engine, steering effort may be heavy due to excessive drop of idle rpm when turning the steering wheel. In this case, start the vehicle with increasing engine speed than usual. If steering effort reduces normally, function is normal.

1. NOISE AND VIBRATION

CAUTION:
Do not keep the relief valve operated for five seconds or more at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• A screeching noise may be heard immediately after the engine start in extremely cold conditions. 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 characteristics in extremely cold condition.
• The oil pump normally makes a small whining noise due to its mechanism. Even if a noise is 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 driving.
• When turning the steering wheel with the brake applied when the vehicle is parked, a screeching noise may be generated by the brake disc and pads. This is not a fault in the steering system.
• There may be a small vibration around the steering devices when turning the steering wheel at standstill, even though the component parts are operating properly.
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
These conditions do not indicate a problem in the system.
Confirm vibration for an AT model, by applying the parking brake on a concrete surface, shifting into the “D” range, and turning the steering wheel repeatedly from slow to rapid, step by step.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Do not keep this condition for five seconds or more.)	Normal operation
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is defective.	Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-42, INSPECTION, Pipe Assembly.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loose oil pump pulley or other pulley(s)	Retighten.
	Looseness of linkage, play of steering, improper tightening (looseness) of suspension joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace faulty parts in the gearbox or oil pump.
Knocking When turning steering wheel in both directions with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Insufficient tightening or play in the tie-rod or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Air in vane pump	Inspect and retighten the fluid line connection. Refill the fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Oil pump pulley bearing seized	Replace the oil pump.
	Folded hose, flattened pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Improper adjustment of pulley belt Damaged or over tensioned pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Warpage or dirty V-groove surface of oil pump pulley	Clean or replace.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

Trouble	Possible cause	Corrective action
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the faulty part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Faulty inside of hose or pipe Flattened hose or pipe	Correct or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Faulty pipe of gearbox or faulty hose	Replace the faulty parts of the gearbox or the hose.
Whine or growl (intermittent or continuous) While engine is running with/ without steering turned.	Looseness of oil pump, oil pump bracket attachment	Retighten.
	Fault inside of oil pump or hose	Replace the oil pump or hose, if the noise can be heard when vehicle is running as well as being stopped.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and check.
Grinding noise (continuous) While engine is running with the steering turned.	Fault inside of gearbox	Replace the faulty parts of gearbox.
	Faulty steering shaft bearing	Apply grease or replace.
	Occurs when turning the steering wheel with brakes (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Engine speed is too low.	Adjust, and notify customer.
	Air in vane pump	Repair faulty part Vent air.
	Damaged valve in oil pump or gearbox	Replace the faulty parts in gearbox and oil pump.
	Excessive play in steering, looseness of suspension parts	Retighten.

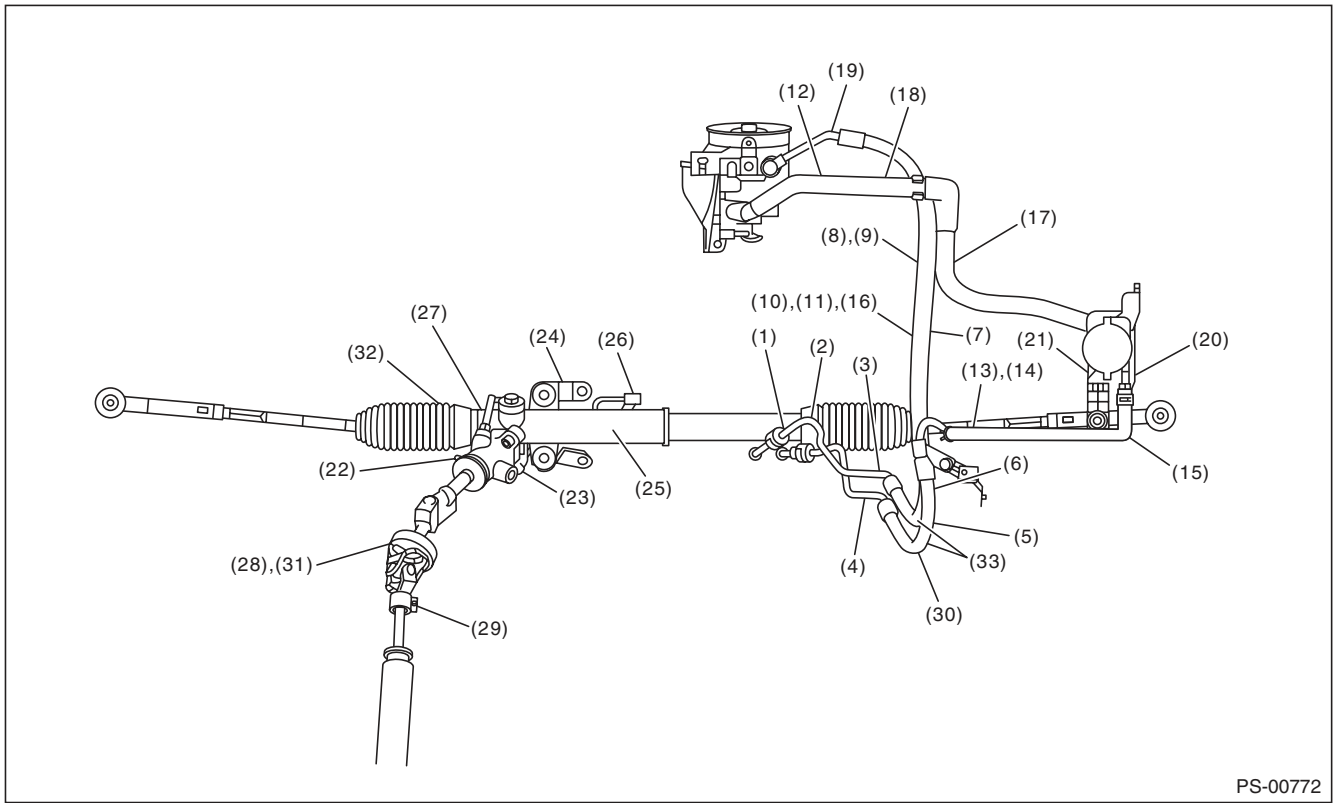
2. MEASUREMENT OF STEERING EFFORT

	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on paved road. 2) Start the engine. 3) Idle the engine. 4) Install a spring scale on the steering wheel. 5) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts. NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed of 2,000 rpm or more, steering effort may be heavy. This is caused by flow characteristic of the fluid in the oil pump and is not a defect.	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lb)?	Go to step **2**.	Adjust the backlash.
2	**CHECK STEERING EFFORT.** 1) Stop the engine. 2) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.	Is the steering effort less than 294.2 N (30 kgf, 66.2 lb)?	Go to step **3**.	Perform the adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is the steering effort less than 2.26 N (0.23 kgf, 0.51 lb)?	Go to step **4**.	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure the steering wheel effort.	Is the difference of steering effort between right and left less than 20%?	Go to step **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-15, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 7.3 N (0.74 kgf, 1.64 lb)?	Go to step **6**.	Replace with a new part.
6	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-15, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 3.8 N (0.39 kgf, 0.86 lb)?	Go to step **7**.	Replace with a new part.
7	**CHECK FRONT WHEEL.** Check the front wheels.	Does the front wheels have unsteady revolution or rattling, or does the brake drag?	Inspect, readjust and replace if necessary.	Go to step **8**.
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends.	If the tie-rod ends of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **9**.
9	**CHECK BALL JOINT.** Remove the ball joint.	If the ball joints of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **10**.
10	**CHECK GEARBOX.** Measure the rotating of gearbox. <Ref. to PS-35, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the rotating resistance of steering gearbox less than 11.3 N (1.15 kgf, 2.54 lb)? Is the difference between right and left sides less than 24%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

3. INSPECTION OF CLEARANCE

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

Location	Minimum allowance mm (in)
(1) Crossmember to Hose ASSY	3 (0.12)
(2) Front exhaust pipe to Hose ASSY (Turbo model)	15 (0.59)
(3) Front frame side to Hose ASSY	10 (0.39)
(4) Turbo cover to Hose ASSY (Turbo model)	10 (0.39)
(5) Master cylinder to Return hose (Turbo model)	10 (0.39)
(6) Master cylinder to Hose clip (Model with vehicle dynamics control (VDC))	10 (0.39)
(7) VDC H/U to Hose ASSY (Model with vehicle dynamics control (VDC))	5 (0.20)
(8) Air cleaner to Hose ASSY (Turbo model)	5 (0.20)
(9) Air boot to Hose ASSY	10 (0.39)
(10) Protector to Hose ASSY (Turbo model, DOHC non-turbo model)	10 (0.39)
(11) Blow-by hose to Hose ASSY (Turbo model)	8 (0.31)
(12) Over flow hose to Hose ASSY (Turbo model)	8 (0.31)
(13) Brake pipe to Return hose (Model with ABS)	10 (0.39)
(14) Front suspension bracket to Return hose	5 (0.20)
(15) Front wheel apron to Return hose	5 (0.20)
(16) VDC H/U bracket to Suction hose (Model with vehicle dynamics control (VDC))	5 (0.20)
(17) Air cleaner case to Suction hose	5 (0.20)
(18) Air intake duct to Suction hose (Turbo model)	10 (0.39)
(19) Air duct to Suction hose (Turbo model)	10 (0.39)
(20) Front wheel apron to Reservoir tank	5 (0.20)
(21) VDC H/U to Reservoir tank (Model with vehicle dynamics control (VDC))	5 (0.20)
(22) Valve housing to DOJ (MT model)	12 (0.47)
(23) Valve housing to Crossmember (Hole)	1 (0.04)
(24) Bracket to Crossmember	1 (0.04)
(25) Cylinder to Crossmember	5 (0.20)
(26) Elbow to Crossmember	1 (0.04)
(27) Cylinder to Exhaust pipe	18 (0.71)
(28) Universal joint coupling to Turbo cover (Turbo model)	15 (0.59)
(29) Universal joint column side yoke to Master cylinder (Closest point of approach when the universal joint turns by 360°) (OUTBACK model)	5 (0.20)
(30) Cruise control to Hose ASSY (Model with cruise control)	10 (0.39)
(31) Universal joint coupling to ATF level gauge	10 (0.39)
(32) Boot to Exhaust pipe	18 (0.71)
(33) Return hose to Pressure hose	No contact between hoses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