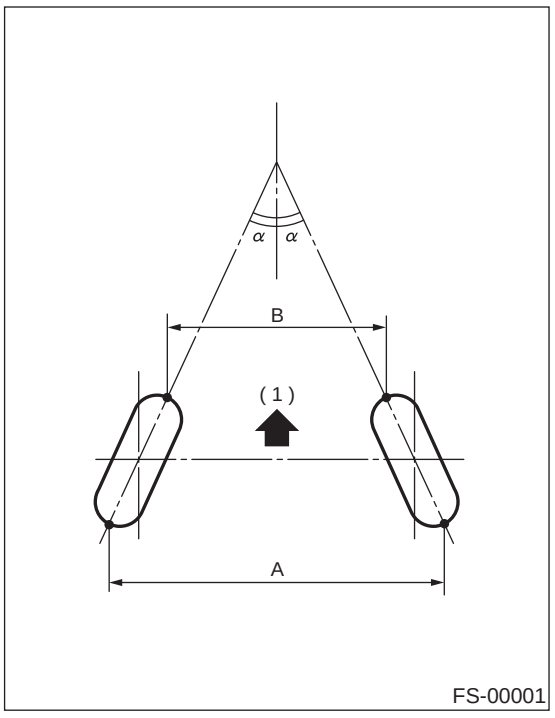
1. General Description

A: SPECIFICATIONS

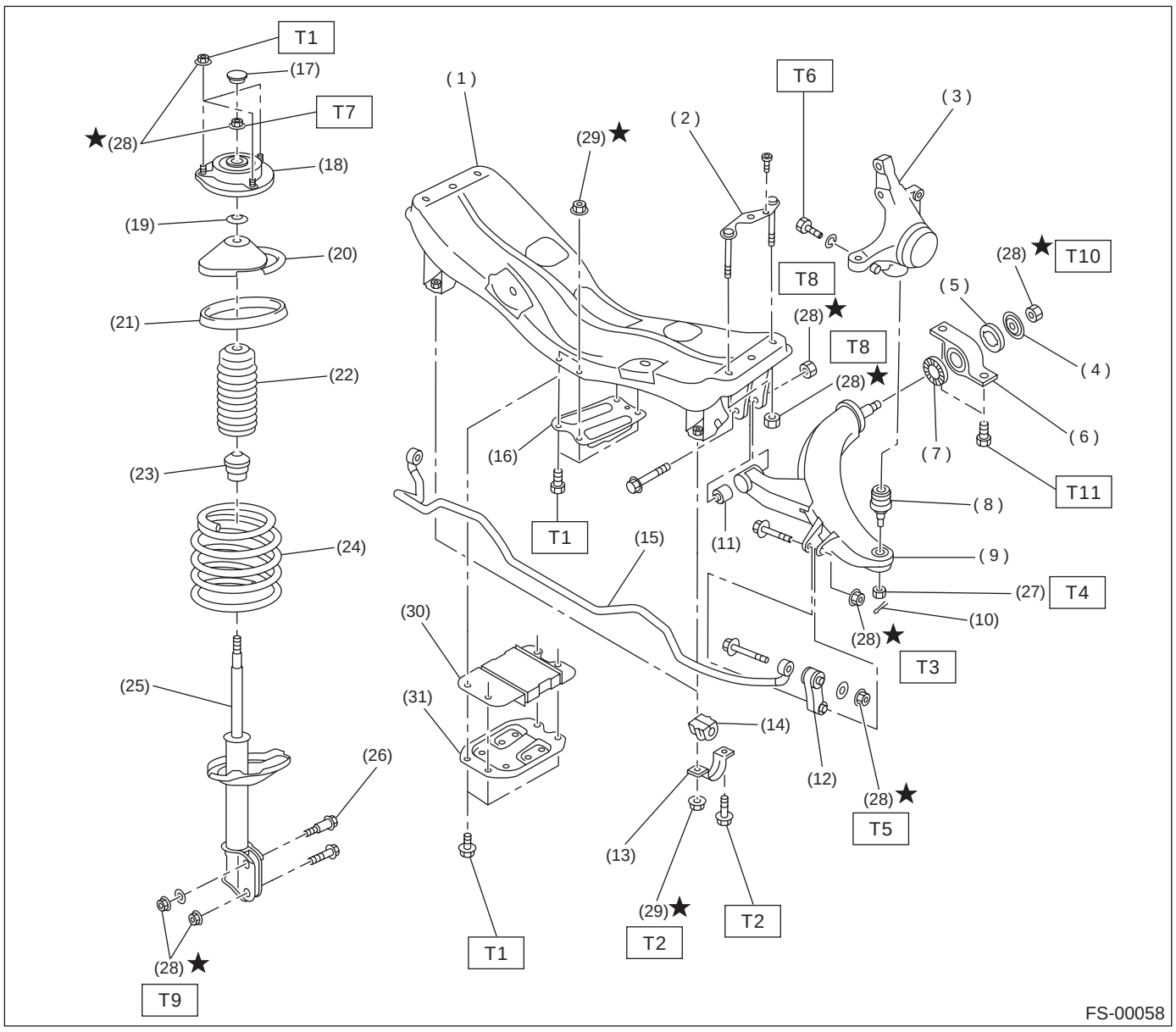
	Model	Sedan	Wagon	OUTBACK
Front	Camber (Tolerance: ±0°30′)	–0°05′	–0°05′	0°20′
	Caster	3°05′	2°50′	2°40′
	Toe-in	0±3 mm (0±0.12 in) Each toe angle: ±0°15′		
	Kingpin angle	14°15′	14°15′	13°30′
	Wheel arch height [Tolerance: +12/–24 mm (+0.47/–0.94 in)]	388 mm (15.28 in)	388 mm (15.28 in)	424 mm (16.69 in)
	Diameter of stabilizer	21 mm (0.79 in)		

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



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

B: COMPONENT



FS-00058

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

Tightening torque: N·m (kgf-m, ft-lb)

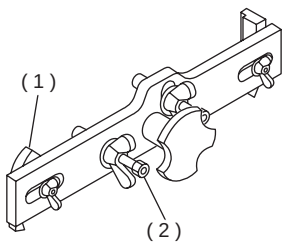
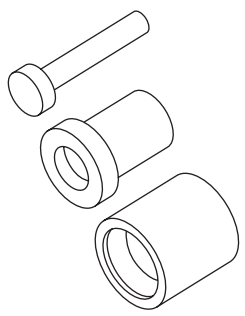
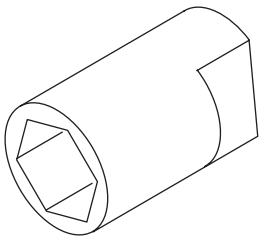
T1:	***20 (2.0, 14.5)***
T2:	***25 (2.5, 18.1)***
T3:	***30 (3.1, 22)***
T4:	***39 (4, 29)***
T5:	***45 (4.6, 33)***
T6:	***50 (5.1, 37)***
T7:	***54 (5.5, 39.8)***
T8:	***100 (10.2, 74)***
T9:	***152 (16, 116)***
T10:	***186 (19.0, 137)***
T11:	***245 (25.0, 181)***

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380002	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing transverse link bushing.
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Dial gauge	Used for damper strut measurement.

2. Wheel Alignment

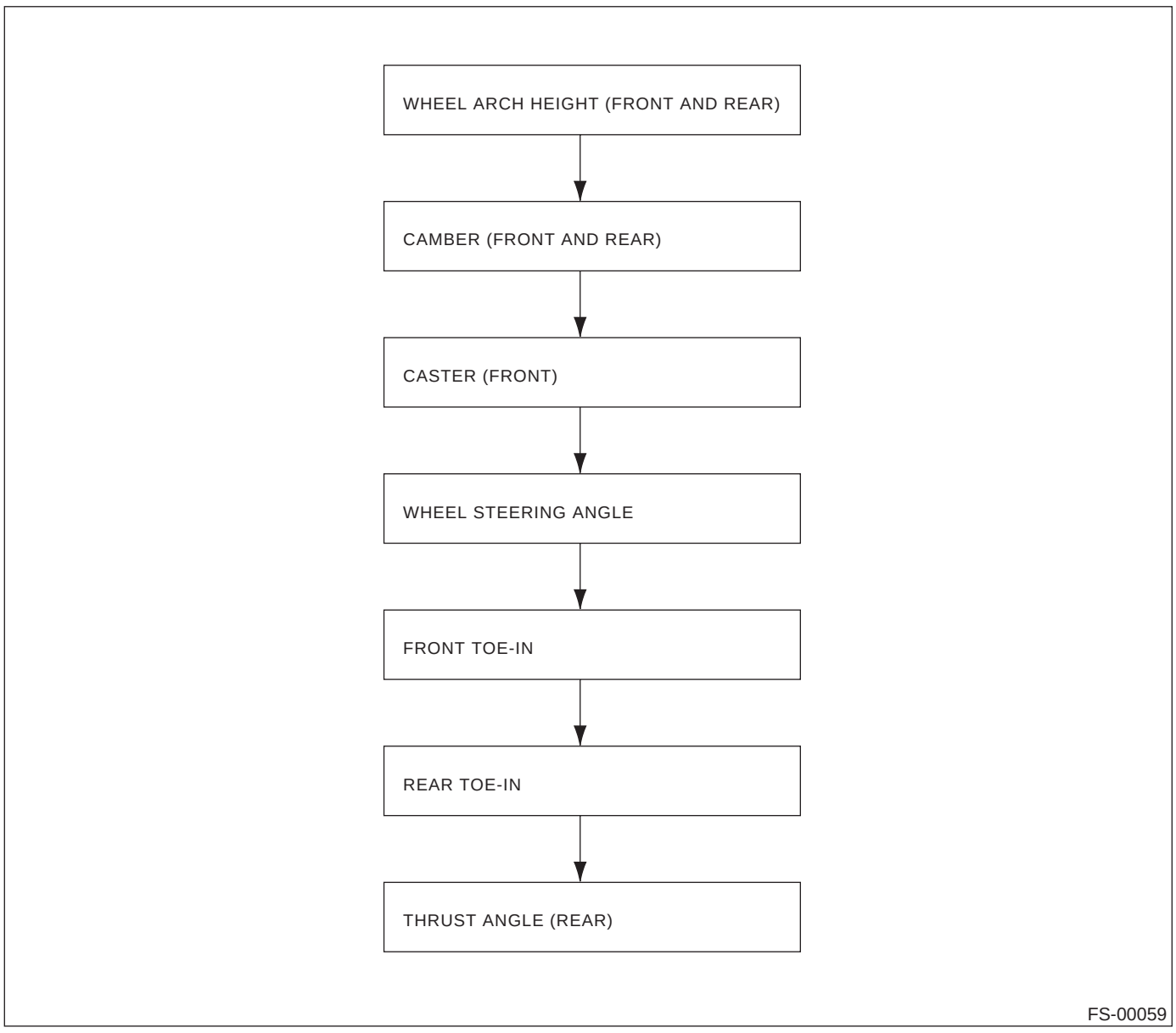
A: INSPECTION

Check the following items before taking wheel alignment measurement.

Check items before taking wheel alignment measurement:

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

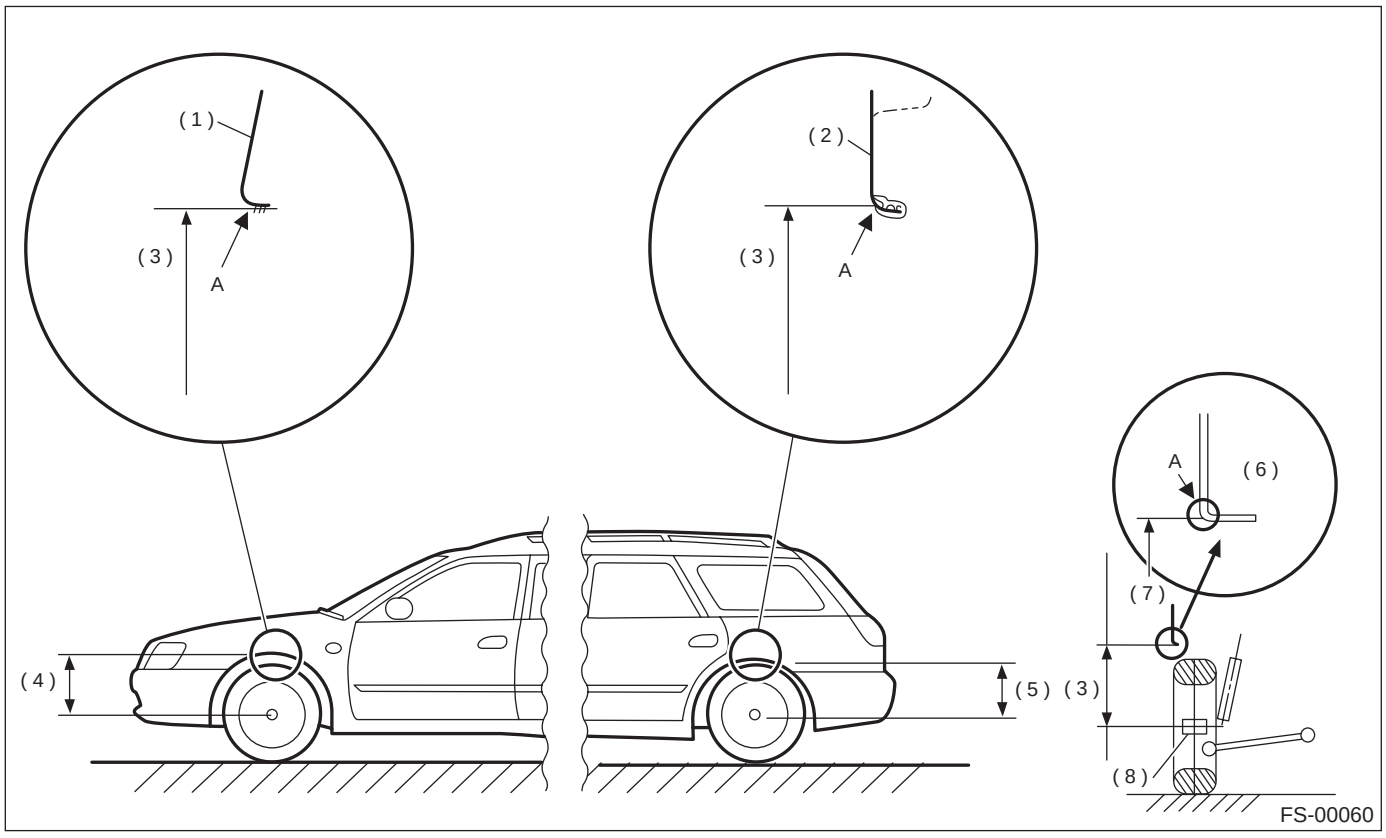
Check, adjust and/or measure wheel alignment in accordance with procedures indicated in figure:



WHEEL ALIGNMENT

1. WHEEL ARCH HEIGHT

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



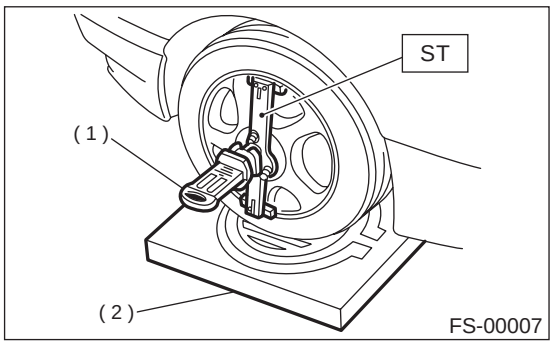
(1) Front fender
(2) Outer rar quarter
(3) Wheel arch height
(4) Front wheel arch height
(5) Rear wheel arch height
(6) Cross-section of arch
(7) Measuring point
(8) End of spindle

Model	Specified wheel arch height
Sedan	$388^{+12}/_{-24}$ mm ($15.28^{+0.47}/_{-0.94}$ in)
Wagon	$388^{+12}/_{-24}$ mm ($15.28^{+0.47}/_{-0.94}$ in)
OUTBACK	$424^{+12}/_{-24}$ mm ($16.69^{+0.47}/_{-0.94}$ in)

2. CAMBER

• Inspection

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



(1) Alignment gauge
(2) Turning radius gauge

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

NOTE:
Refer to the “SPECIFICATIONS” for the camber values.
Front: <Ref. to FS-2, SPECIFICATIONS, General Description.>
Rear: <Ref. to RS-2, SPECIFICATIONS, General Description.>

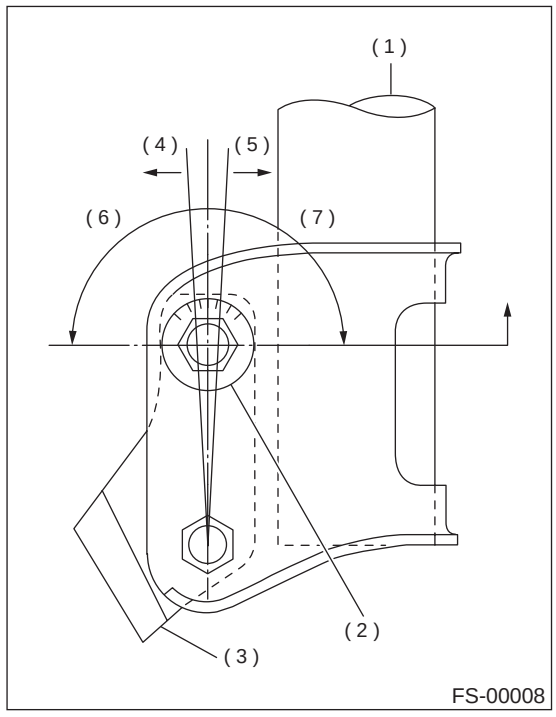
• Front Camber Adjustment

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

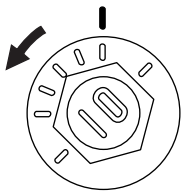
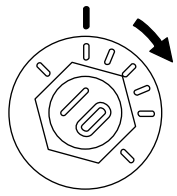
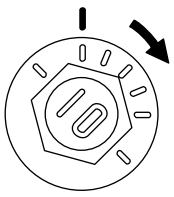
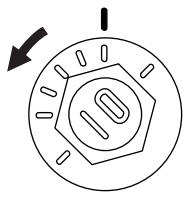
CAUTION:
• When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.
• Discard loosened self-locking nut and replace with a new one.

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

NOTE:
Moving the adjusting bolt by one scale graduation changes camber by approximately 0°10′.



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

	Left side	Right side
Camber is increased.	 FS-00009 Rotate counter-clockwise.	 FS-00010 Rotate clockwise.
Camber is decreased.	 FS-00010 Rotate clockwise.	 FS-00009 Rotate counter-clockwise.

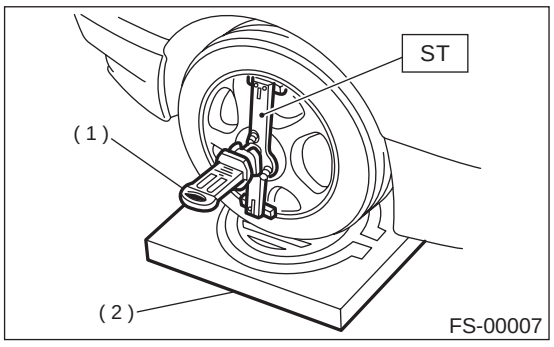
3) Tighten the two self-locking nuts.

Tightening torque:
152 N·m (16 kgf-m, 116 ft-lb)

3. CASTER

• Inspection

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



(1) Alignment gauge
(2) Turning radius gauge

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

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

4. STEERING ANGLE

• Inspection

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

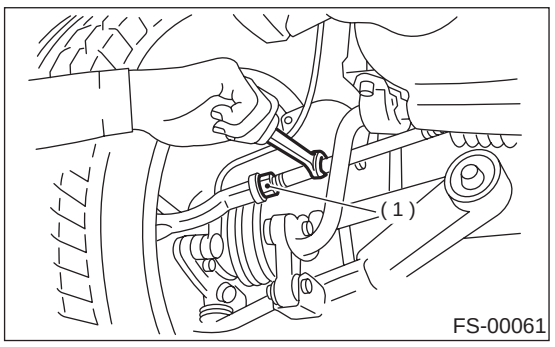
Steering angle:

Model	*Except OUTBACK*	*OUTBACK*
Inner wheel	*36.3°±1.5°*	*34.5°±1.5°*
Outer wheel	*31.6°±1.5°*	*30.3°±1.5°*

• Adjustment

Turn tie-rod to adjust steering angle of both inner and outer wheels.

CAUTION:
- **Check toe-in.**
- **Correct boot if it is twisted.**



(1) Lock nut

5. FRONT WHEEL TOE-IN

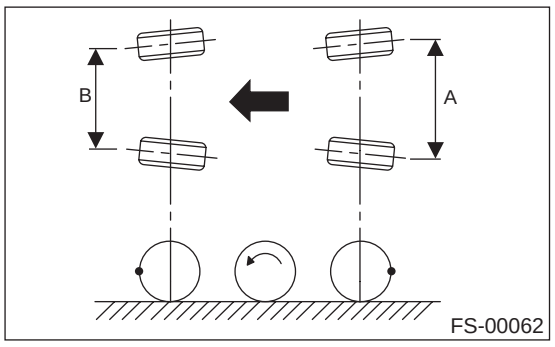
• Inspection

1) Using a toe gauge, measure front wheel toe-in.

Toe-in:
0±3 mm (0±0.12 in)

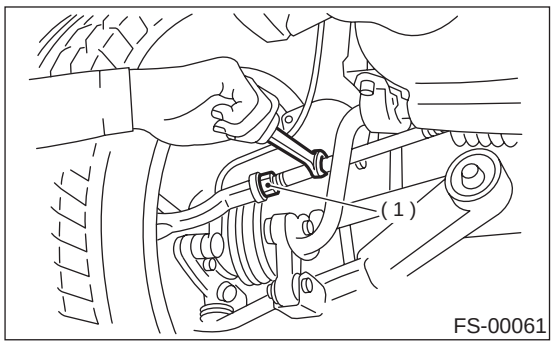
2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance “A” between marks.
3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.
4) Measure distance “B” between left and right marks. Toe-in can then be obtained by the following equation:

A – B = Toe-in



• Adjustment

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



(1) Lock nut

3) Tighten tie-rod lock nut.

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

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

NOTE:
Check the left and right wheel steering angle is within specifications.

6. REAR WHEEL TOE-IN

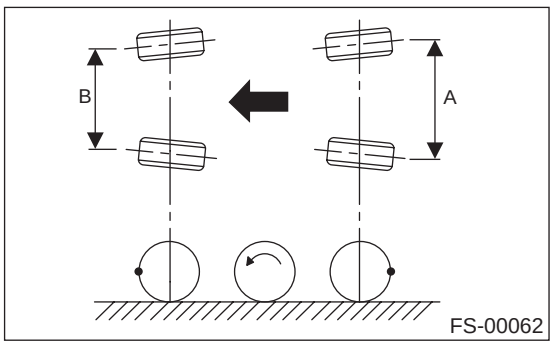
• Inspection

1) Using a toe-in gauge, measure rear wheel toe-in.

Toe-in:
0±3 mm (0±0.12 in)

2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance “A” between marks.
3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.
4) Measure distance “B” between left and right marks. Toe-in can then be obtained by the following equation:

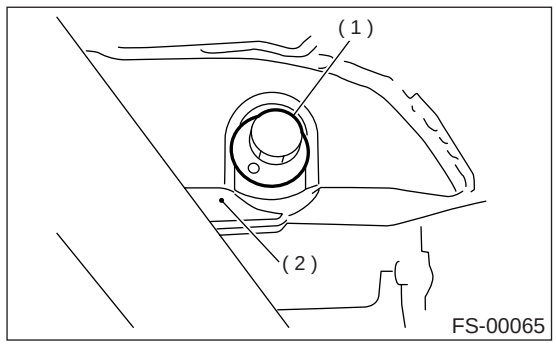
A – B = Toe-in



• Adjustment

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

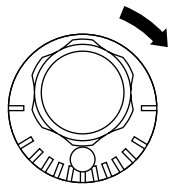
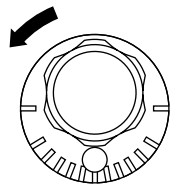
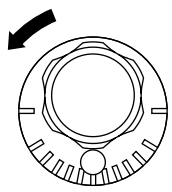
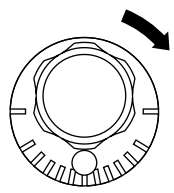
CAUTION:
• When loosening or tightening adjusting bolt, hold bolt head and turn self-locking nut.
• Discard loosened self-locking nut and replace with a new one.



(1) Adjusting bolt
(2) Link rear

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

NOTE:
When left and right wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approximately 3 mm (0.12 in).

	Left side	Right side
Toe-in is increased.	 FS-00066 Rotate clockwise.	 FS-00067 Rotate counter-clockwise.
Toe-in is decreased.	 FS-00067 Rotate counter-clockwise.	 FS-00066 Rotate clockwise.

3) Tighten self-locking nut.

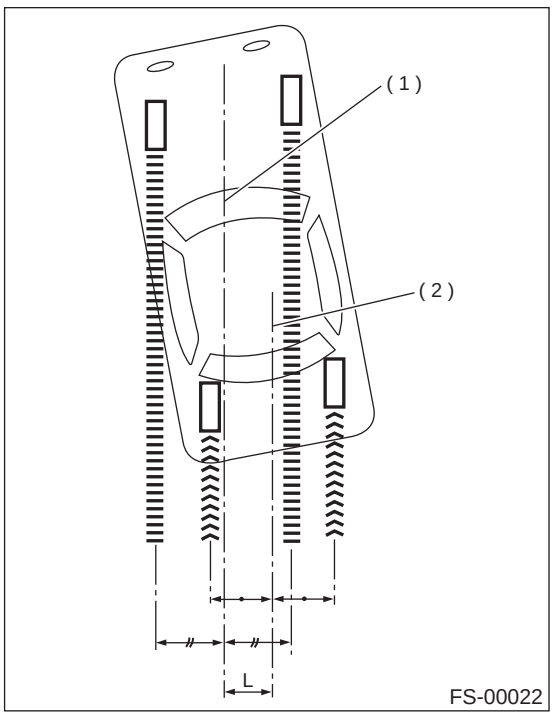
Tightening torque:
120 N·m (12.2 kgf-m, 88 ft-lb)

7. THRUST ANGLE

• Inspection

1) Position vehicle on a level surface.
2) Move vehicle 3 to 4 meters directly forward.
3) Determine locus of both front and rear axles.
4) Measure distance “L” between center line of loci of the axles.

Thrust angle:
Less than 30′ when “L” is equal to or less than 23 mm (0.91 in).

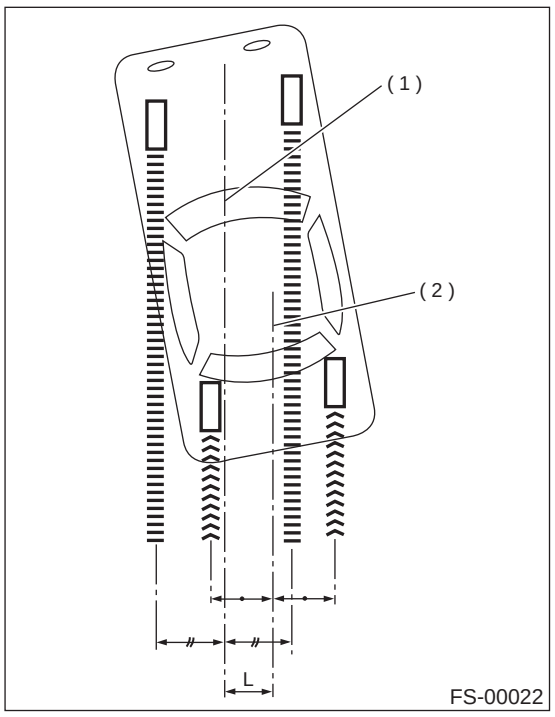


(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

• Adjustment

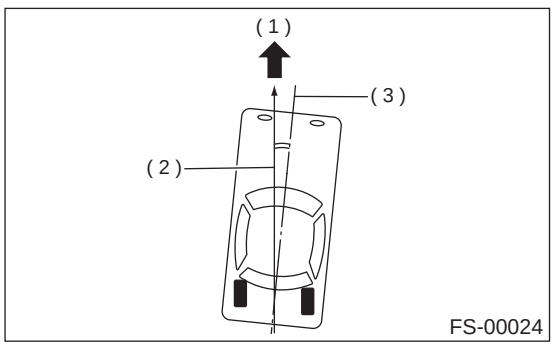
1) Make thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.
3) When left and right adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approximately 10′ [“L” is almost equal to 7.5 mm (0.295 in)].

Thrust angle:
0°±30′



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

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

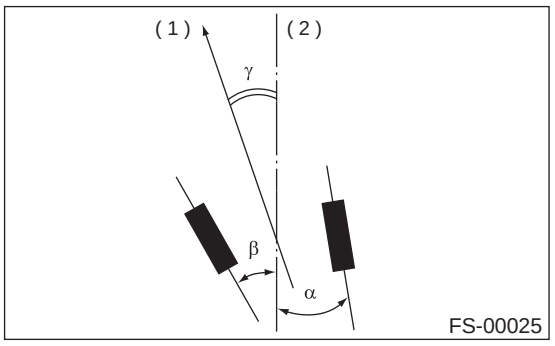


(1) Front
(2) Thrust angle
(3) Body center line

Thrust angle: r = (α – β)/2

α: Right rear wheel toe-in angle
β: Left rear wheel toe-in angle

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

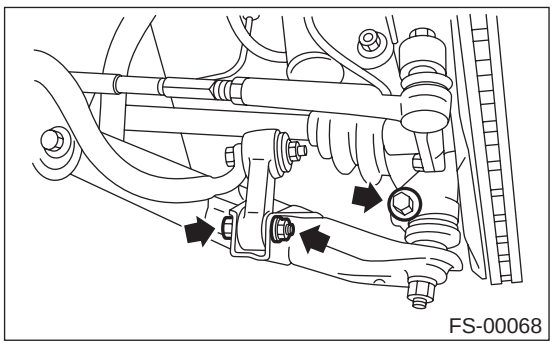


(1) Front
(2) Body center line

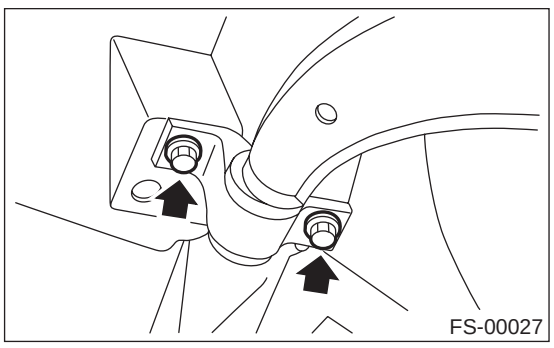
3. Front Transverse Link

A: REMOVAL

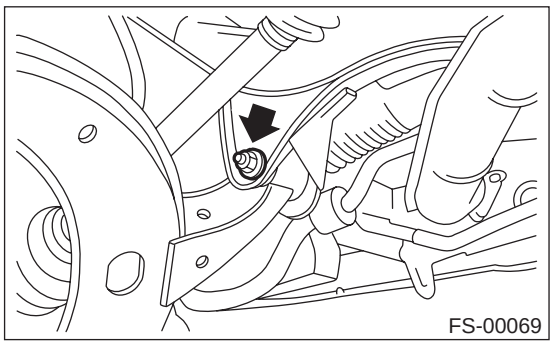
1) Set vehicle on a lift.
2) Disconnect ground cable from battery.
3) Lift-up the vehicle and remove the wheel.
4) Disconnect stabilizer link from transverse link.
5) Remove bolt securing ball joint of transverse link to housing.


FS-00068

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


FS-00027

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


FS-00069

B: INSTALLATION

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

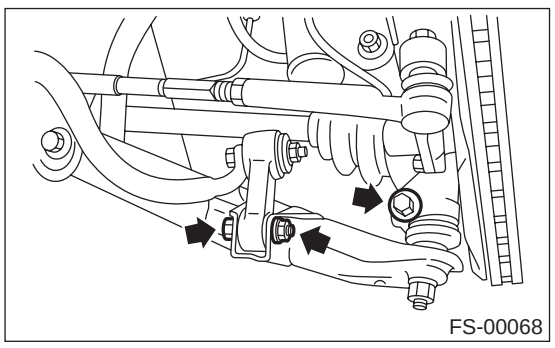
NOTE:
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

2) Install bolts used to connect transverse link to crossmember and temporarily tighten with nut.

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

3) Insert ball joint into housing.
4) Connect stabilizer link to transverse link, and temporarily tighten bolts.

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


FS-00068

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

Tightening torque:
30 N·m (3.1 kgf-m, 22 ft-lb)

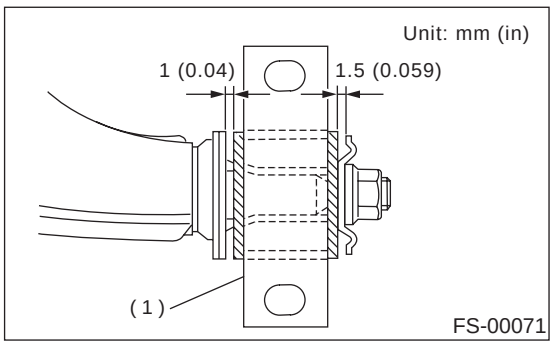
(2) Transverse link and crossmember

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

(3) Transverse link rear bushing and body

Tightening torque:
245 N·m (25 kgf-m, 181 ft-lb)

NOTE:
• Move rear bushing back and forth until transverse link-to-rear bushing clearance is established (as indicated in figure.) before tightening.
• Check wheel alignment and adjust if necessary.

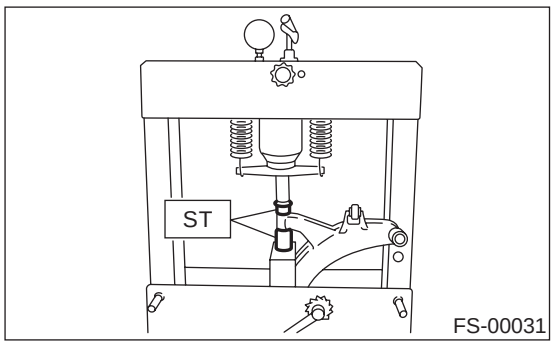


(1) Rear bushing

C: DISASSEMBLY

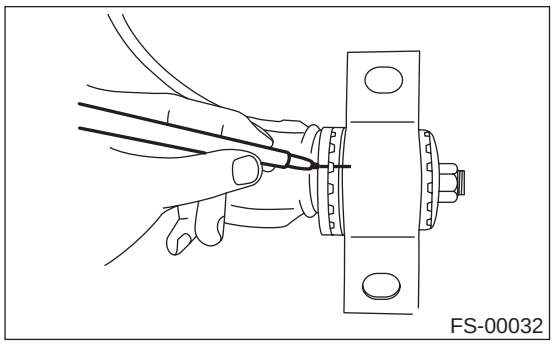
1. FRONT BUSHING

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



2. REAR BUSHING

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

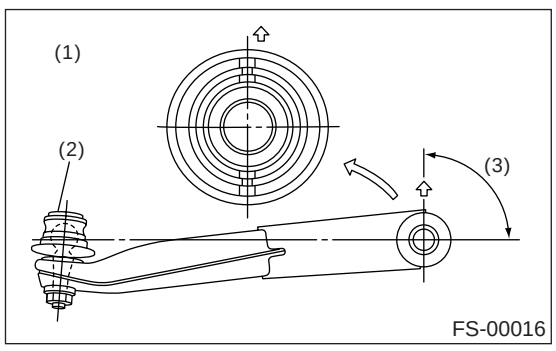


D: ASSEMBLY

1. FRONT BUSHING

To reassemble, reverse disassembly procedures.

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



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

2. REAR BUSHING

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

CAUTION:
• Discard loosened self-locking nut and replace with a new one.
• While holding rear bushing so as not to change position of aligning marks, tighten self-locking nut.

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

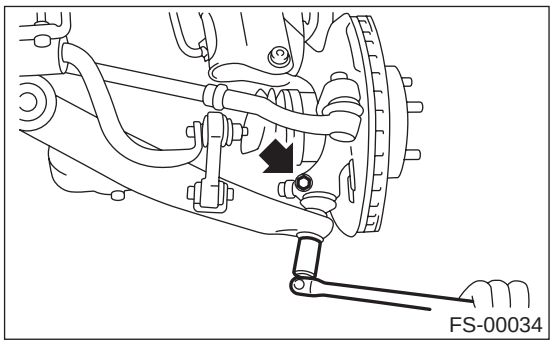
E: INSPECTION

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

4. Front Ball Joint

A: REMOVAL

1) Set vehicle on a lift.
2) Disconnect ground cable from battery.
3) Lift-up the vehicle and remove the wheel.
4) Pull out the cotter pin from the ball stud, remove the castle nut, and extract the ball stud from the transverse link.
5) Remove the bolt securing the ball joint to the housing.


FS-00034

6) Extract the ball joint from the housing.

B: INSTALLATION

1) Install ball joint onto housing.

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

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

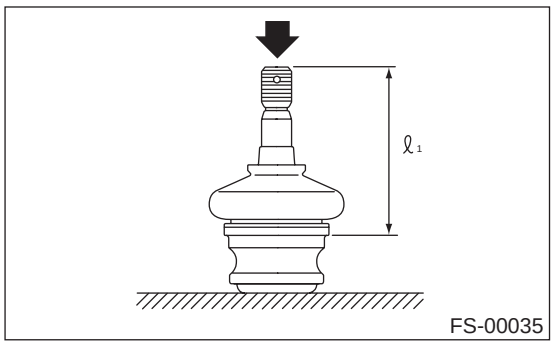
2) Connect ball joint to transverse link.

Tightening torque (Castle nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

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

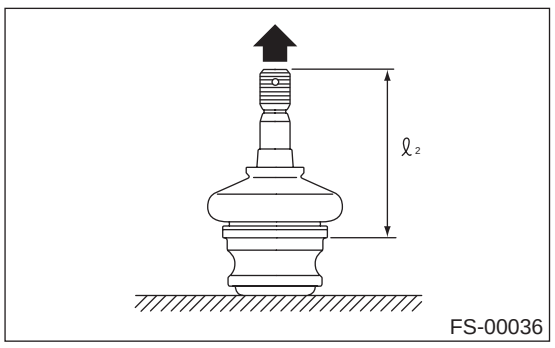
C: INSPECTION

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



FS-00035

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



FS-00036

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

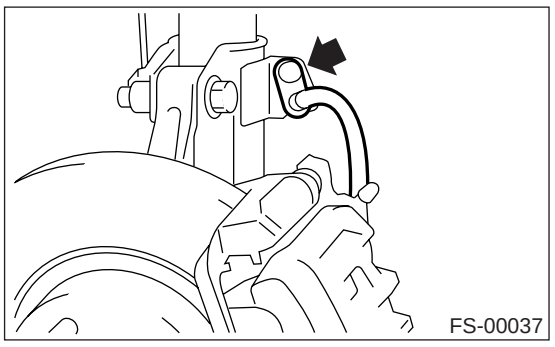
FRONT BALL JOINT
Specified play for replacement: S
Less than 0.3 mm (0.012 in)

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

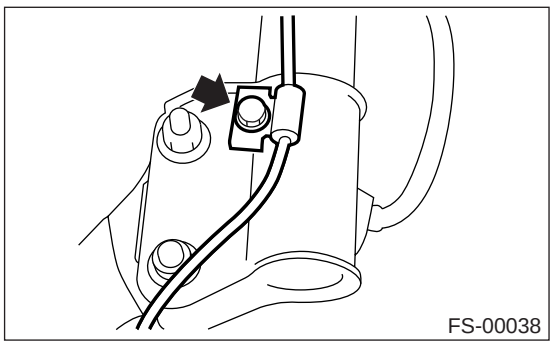
5. Front Strut

A: REMOVAL

1) Set vehicle on a lift.
2) Disconnect ground cable from battery.
3) Lift-up the vehicle and remove the wheel.
4) Remove bolt securing brake hose to strut.



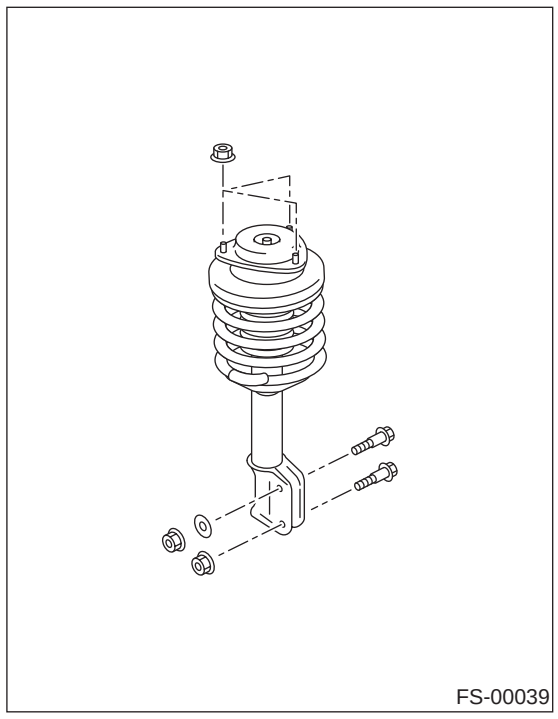
5) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
6) Remove bolt securing the ABS sensor harness.



7) Remove two bolts securing housing to strut.

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

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



B: INSTALLATION

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

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

2) Position aligning mark on camber adjustment bolt with aligning mark on lower side of strut.

CAUTION:
• While holding head of adjusting bolt, tighten self-locking nut.
• Be sure to use new self-locking nut.

Tightening torque:
152 N·m (16 kgf-m, 112 ft-lb)

3) Install ABS sensor harness to strut.

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

4) Install bolts which secure brake hose to strut.

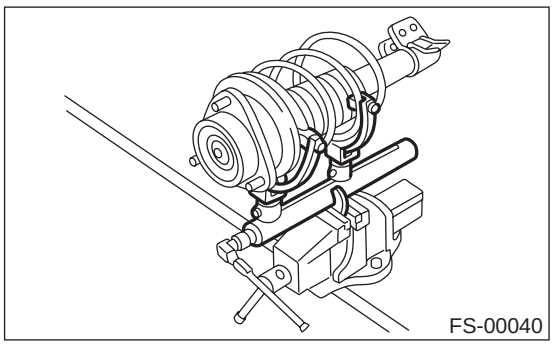
Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

5) Install wheels.

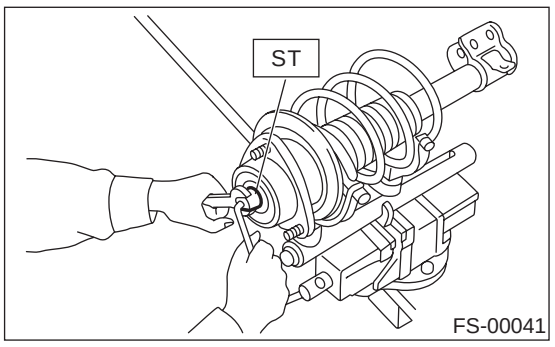
NOTE:
Check wheel alignment and adjust if necessary.

C: DISASSEMBLY

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


FS-00040

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



FS-00041

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

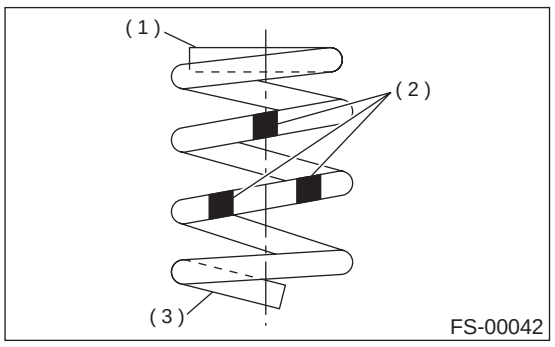
D: ASSEMBLY

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

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

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

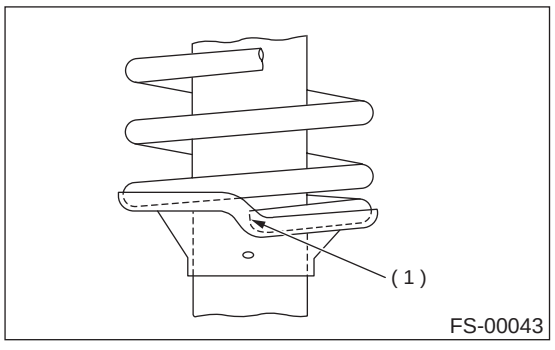
NOTE:
Make sure that the vertical installing direction of coil spring is as shown in figure.



FS-00042

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

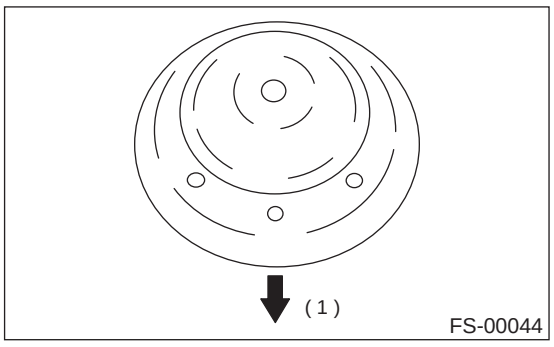
5) Set the coil spring correctly so that its end face (1) fits well into the spring seat as shown in the figure.



FS-00043

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

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



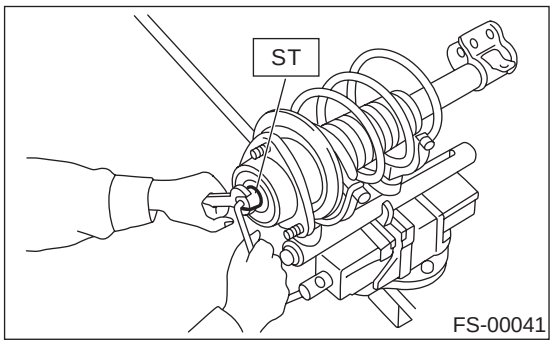
(1) Outside of body

8) Install strut mount to the piston rod, and tighten the self-locking nut temporarily.

CAUTION:
Be sure to use a new self-locking nut.

9) Using hexagon wrench to prevent strut rod from turning, tighten self-locking nut with ST.
ST 927760000 STRUT MOUNT SOCKET

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



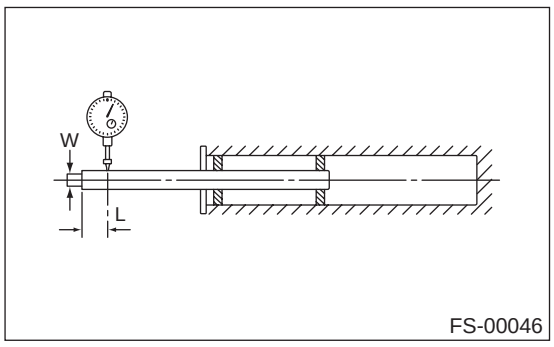
10) Loosen the coil spring carefully.

E: INSPECTION

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

1. DAMPER STRUT

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



The free play is determined by the following equation:

Play = P_1, P_2

Limit of play:
Less than 0.8 mm (0.031 in)

If the play is greater, replace the strut.

2. STRUT MOUNT

Check rubber part for creep, cracks and deterioration, and replace it with new one if defective.

3. DUST COVER

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

4. COIL SPRING

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

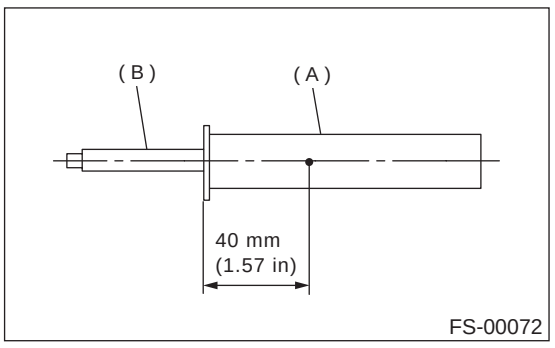
5. HELPER

Replace it with new one if cracked or damaged.

F: DISPOSAL

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

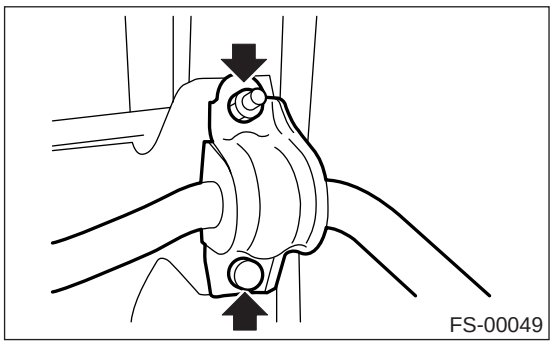
1) Place the gas filled strut (A) on a flat and level surface with piston rod (B) fully extended.
2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make a hole in area shown in the figure.



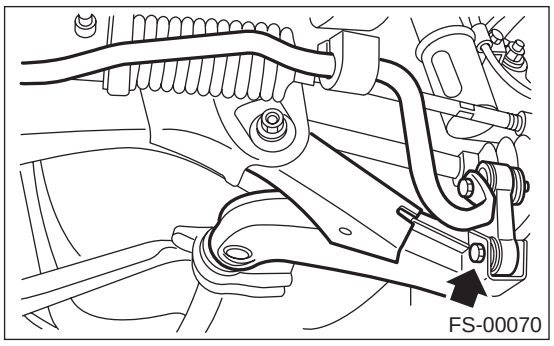
6. Front Stabilizer

A: REMOVAL

1) Jack-up the front part of the vehicle and support it with safety stand (rigid racks).
2) Remove jack-up plate from lower part of crossmember.
3) Remove bolts which secure stabilizer to crossmember.


FS-00049

4) Remove bolts which secure stabilizer link to front transverse link.

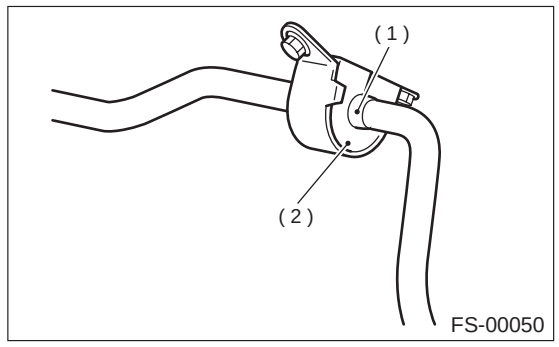

FS-00070

B: INSTALLATION

CAUTION:
Discard old self-locking nut and replace with a new one.

1) Install in the reverse order of removal.

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



FS-00050

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

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

Tightening torque:
Jack-up plate to crossmember:
20 N·m (2.0 kgf-m, 14 ft-lb)
Stabilizer link to front transverse link:
30 N·m (3.1 kgf-m, 22 ft-lb)
Stabilizer to crossmember:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

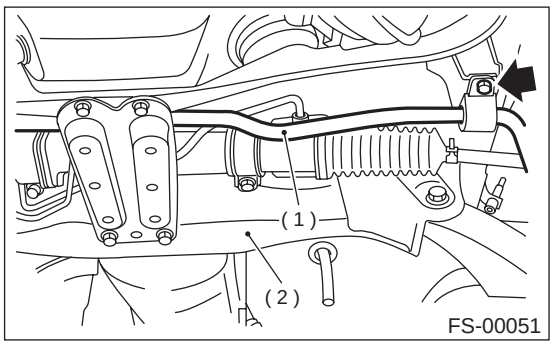
C: INSPECTION

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

7. Front Crossmember

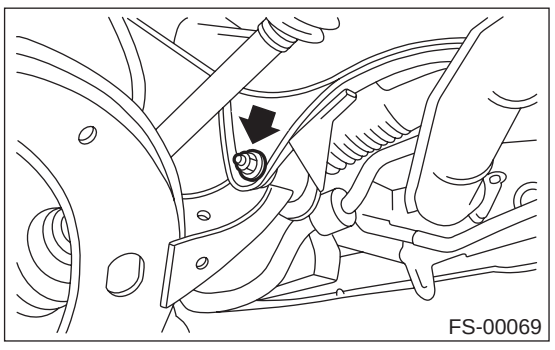
A: REMOVAL

1) Set vehicle on a lift.
2) Disconnect ground cable from battery.
3) Lift-up vehicle and remove front tires and wheels.
4) Remove both stabilizer and jack-up plate.

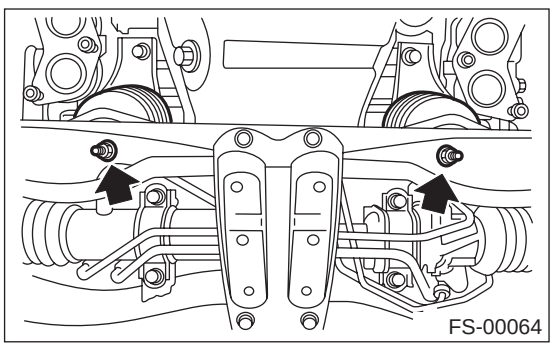


(1) Front stabilizer
(2) Front crossmember

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



8) Remove nuts attaching engine mount cushion rubber to crossmember.



9) Remove steering universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
10) Disconnect power steering pipe from steering gear box.
11) Lift engine by approx. 10 mm (0.39 in) by using chain block.
12) Support crossmember with a jack, remove nuts securing crossmember to body and gradually lower crossmember along with steering gearbox.

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

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Always tighten rubber bushing when wheels are in full contact with the ground and vehicle is at curb weight.

Tightening torque:
Transverse link bushing to crossmember:
100 N·m (10.2 kgf-m, 74 ft-lb)
Stabilizer to bushing:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Tie-rod end to housing:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)
Front cushion rubber to crossmember:
75 N·m (7.6 kgf-m, 55 ft-lb)
Universal joint to pinion shaft:
24 N·m (2.4 kgf-m, 17.4 ft-lb)
Crossmember to body:
100 N·m (10.2 kgf-m, 74 ft-lb)

2) Purge air from power steering system.

NOTE:
Check wheel alignment and adjust if necessary.

C: INSPECTION

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

8. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

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

2. POOR RIDE COMFORT

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

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

3. NOISE

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

GENERAL DIAGNOSTIC TABLE

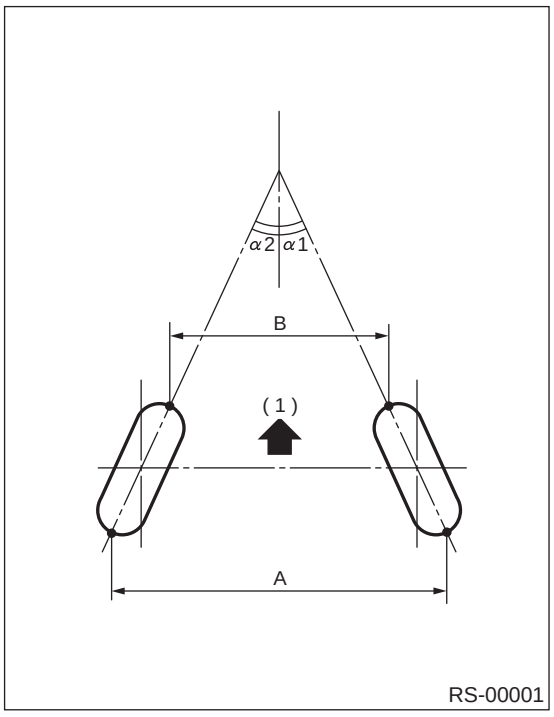
MEMO:

1. General Description

A: SPECIFICATIONS

Item	Sedan	Wagon	OUTBACK
Camber (tolerance: ±0°45′)	–0°30′	–0°20′	–0°10′
Toe-in	0±3 mm (0±0.12 in) Each toe-in angle: ±0°15′		
Wheel arch height [tolerance: $^{+12}/_{-24}$ mm ($^{+0.47}/_{-0.94}$ in)]	371 mm (14.61 in)	381 mm (15.00 in)	421 mm (16.57 in)
Thrust angle	0°±30′		
Diameter of stabilizer	16 mm (0.63 in)		

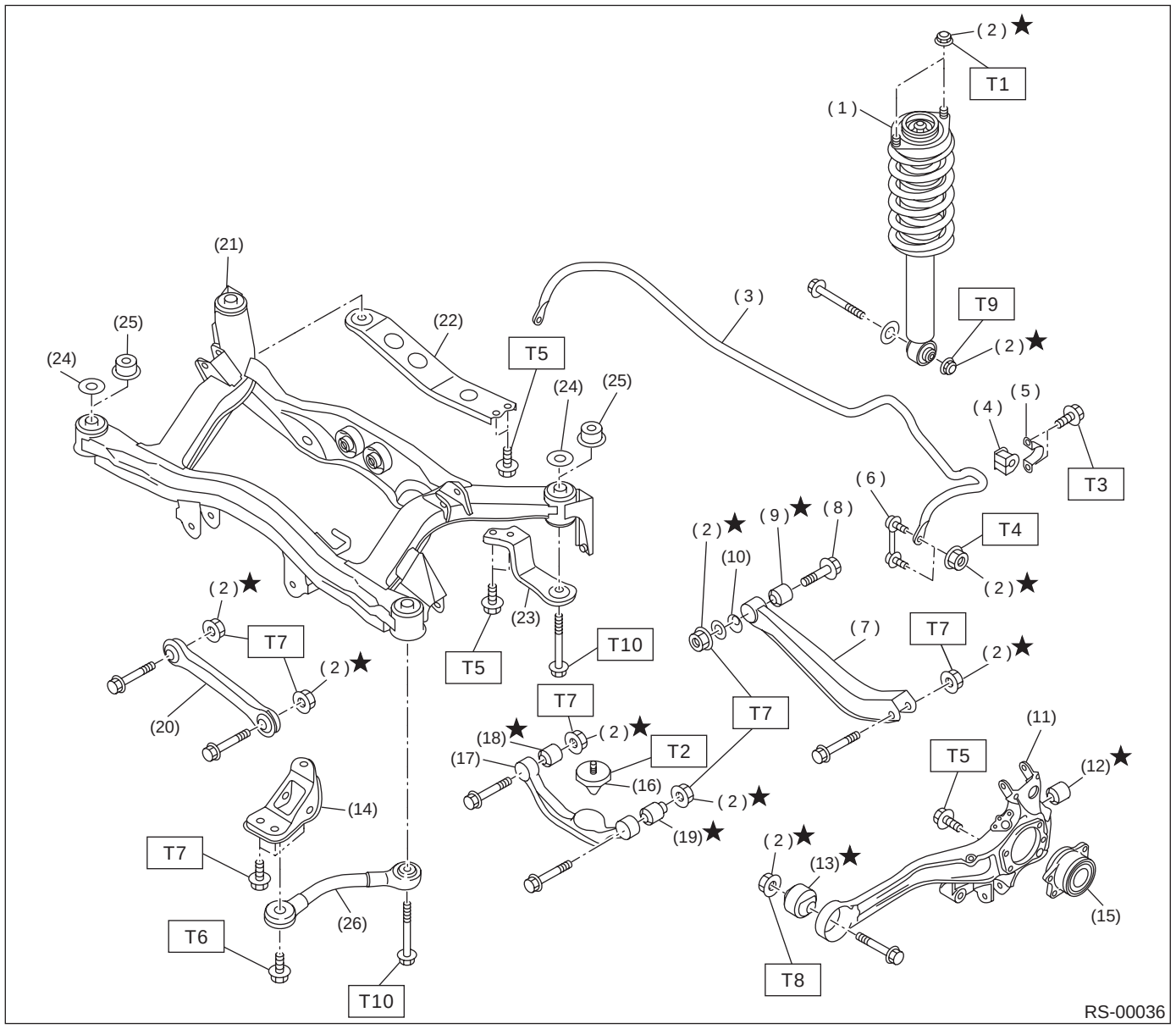
NOTE:
• Front and rear toe-in and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the middle value of specification.
• The other items indicated in the specification table cannot be adjusted. If the other items exceed specifications, check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



(1) Front
A – B = Positive: Toe-in, Negative: Toe-out
α1, α2: Each toe-in angle

B: COMPONENT

1. REAR SUSPENSION

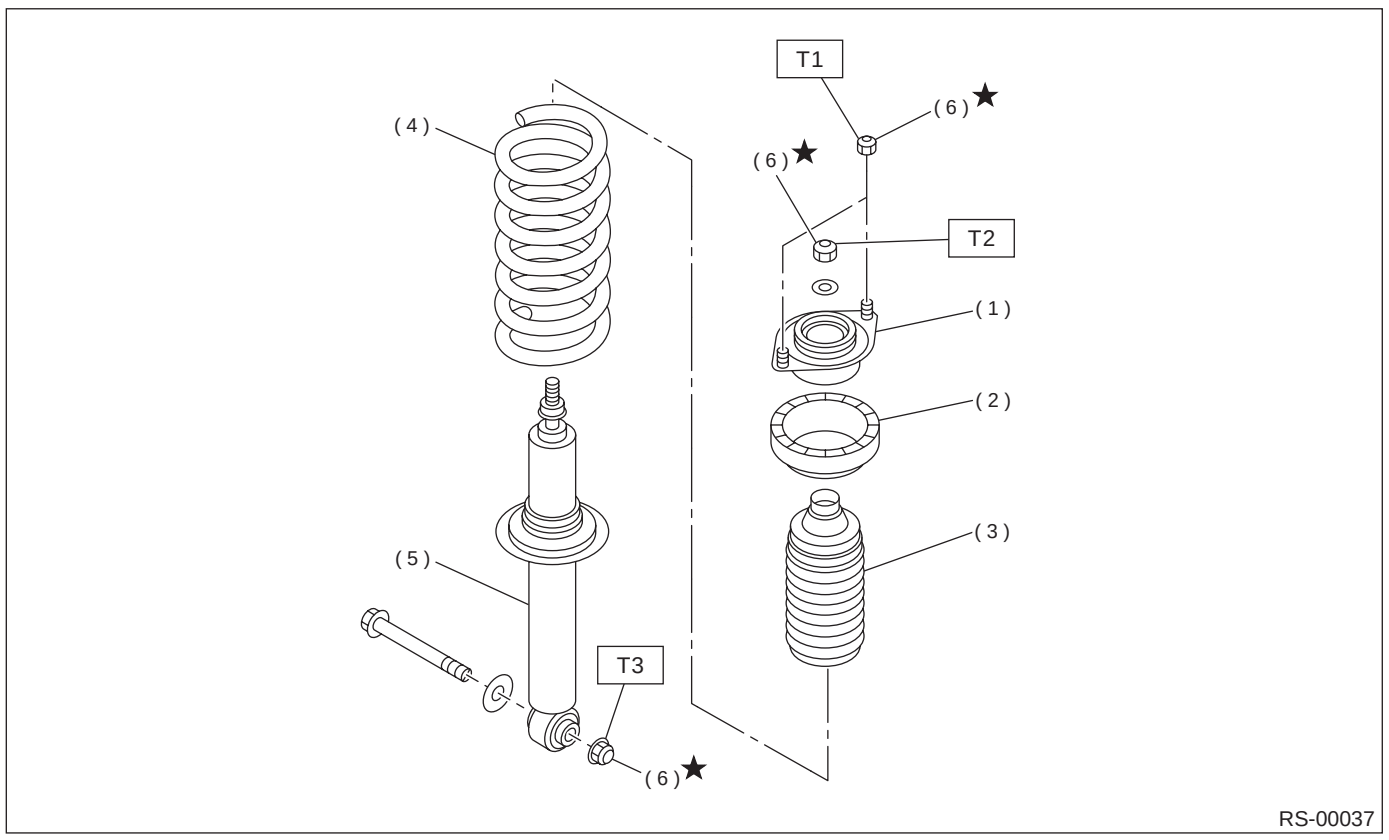


(1) Shock absorber
(2) Self-locking nut
(3) Stabilizer
(4) Stabilizer bushing
(5) Clamp
(6) Stabilizer link
(7) Link rear
(8) Adjusting bolt
(9) Link rear bushing
(10) Adjusting washer
(11) Rear arm
(12) Rear arm rear bushing
(13) Rear arm front bushing
(14) Rear arm bracket
(15) Hub bearing unit
(16) Helper
(17) Link upper
(18) Link upper bushing (Inside)
(19) Link upper bushing (Outside)
(20) Link front
(21) Rear sub frame
(22) Support sub frame (RH)
(23) Support sub frame (LH)
(24) Stopper upper (Except OUTBACK model)
(25) Stopper upper (OUTBACK MODEL)
(26) Support sub frame front

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***30 (3.1, 22.4)***
T2:	***32 (3.3, 24)***
T3:	***40 (4.1, 30)***
T4:	***44 (4.5, 32.5)***
T5:	***65 (6.6, 48)***
T6:	***80 (8.2, 59)***
T7:	***120 (12.2, 88)***
T8:	***150 (15.3, 111)***
T9:	***160 (16.3, 118)***
T10:	***175 (17.8, 129)***

2. SHOCK ABSORBER



(1) Mount
(2) Rubber seat upper
(3) Dust cover
(4) Coil spring
(5) Shock absorber
(6) Self-locking nut

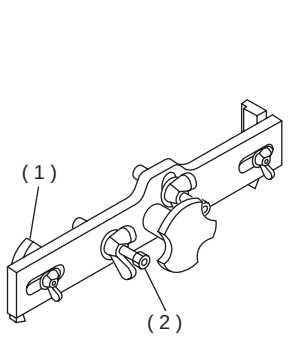
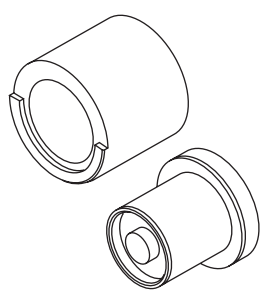
Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22.4)
T2: 35 (3.6, 26)
T3: 160 (16.3, 118)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380002	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST20099AE000	20099AE000	INSTALLER & REMOVER	Used for replacing link rear bushing.

GENERAL DESCRIPTION

REAR SUSPENSION

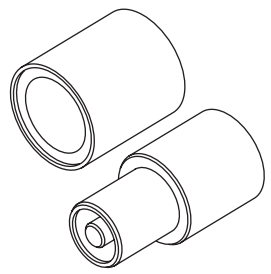
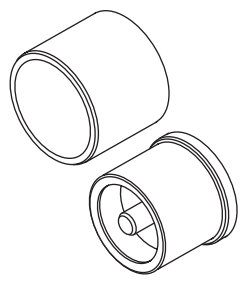
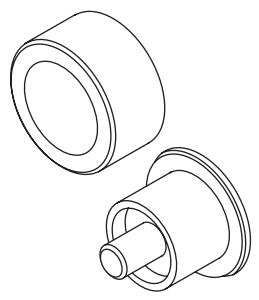
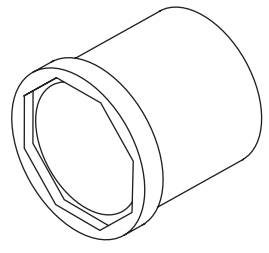
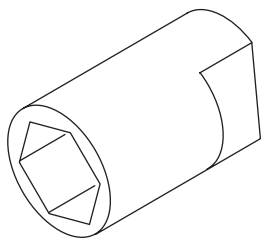
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099AE010	20099AE010	INSTALLER & REMOVER	Used for replacing link upper bushing.
 ST20099AE020	20099AE020	INSTALLER & REMOVER SET	Used for replacing rear arm front bushing.
 ST20099AE040	20099AE040	INSTALLER & REMOVER SET	Used for replacing rear arm rear bushing.
 ST20099AE030	20099AE030	HELPER SOCKET WRENCH	Used for replacing helper.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Transmission jack	Used for suspension assembly/disassembly.
Bearing puller	Used for removing bushings.

2. Wheel Alignment

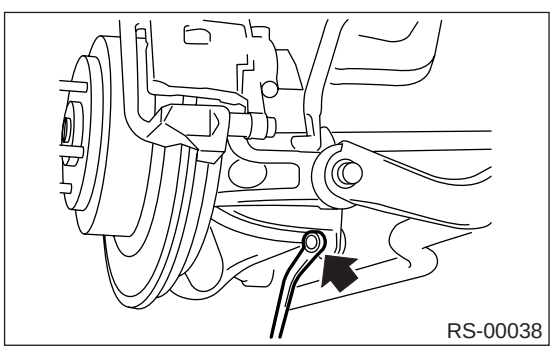
A: INSPECTION

NOTE:
The front and rear wheel alignment must be measured and/or adjusted at once to obtain accuracy.
Measure and/or adjust the rear wheel alignment together with the front.
Follow the procedure in “FS” section “Wheel Alignment” for measurement and/or adjustment of wheel alignment. <Ref. to FS-6, Wheel Alignment.>

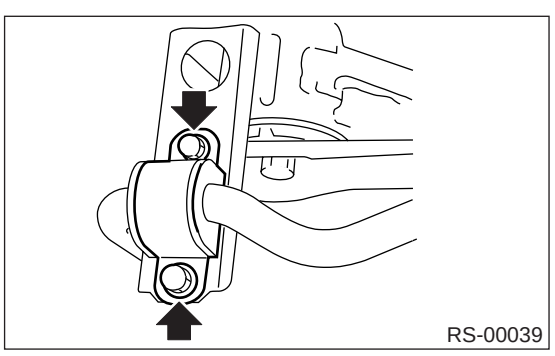
3. Rear Stabilizer

A: REMOVAL

1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).
2) Remove bolts which secure stabilizer link to rear arm.


RS-00038

3) Remove bolts which secure stabilizer to sub frame.


RS-00039

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Ensure that bushing and stabilizer have the same identification colors when installing.

CAUTION:
Discard old self-locking nut and replace with a new one.

Tightening torque:
Stabilizer link to rear arm
44 N·m (4.5 kgf-m, 32.5 ft-lb)
Clamp to sub frame
40 N·m (4.1 kgf-m, 30 ft-lb)

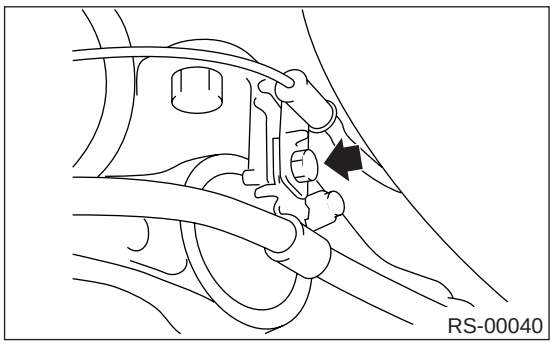
C: INSPECTION

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

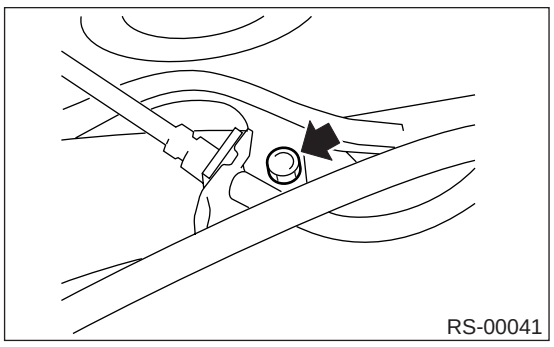
4. Rear Arm

A: REMOVAL

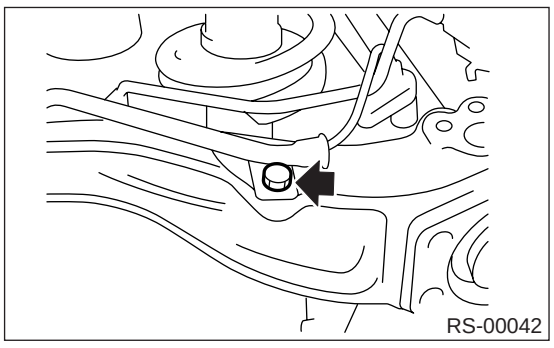
1) Lift-up the vehicle and remove rear wheel.
2) Remove support sub frame front.
<Ref. to RS-21, REMOVAL, Support Sub Frame Front.>
3) Remove bearing unit.
<Ref. to DS-23, REMOVAL, Hub Unit Bearing.>
4) Remove bolt securing parking brake cable clamp to rear arm.


RS-00040

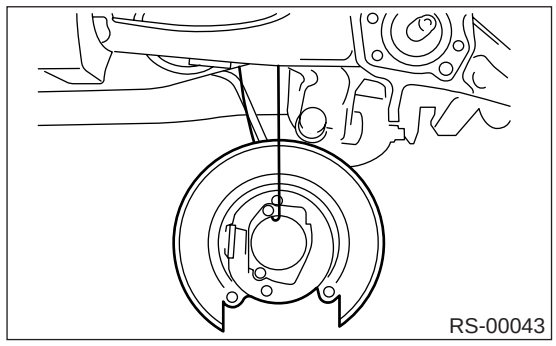
5) Remove bolt securing brake hose to rear arm.


RS-00041

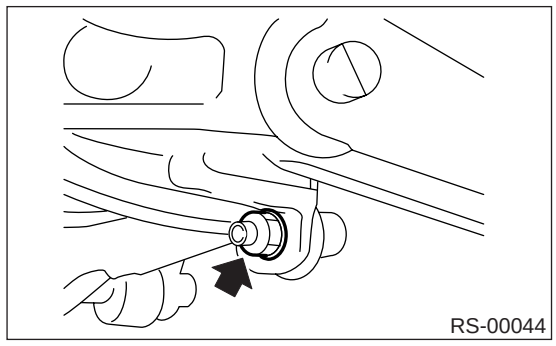
6) Remove bolt securing ABS sensor to rear arm.


RS-00042

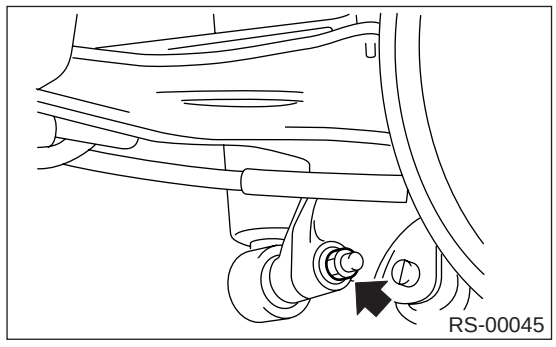
7) Suspend the back plate from sub frame.


RS-00043

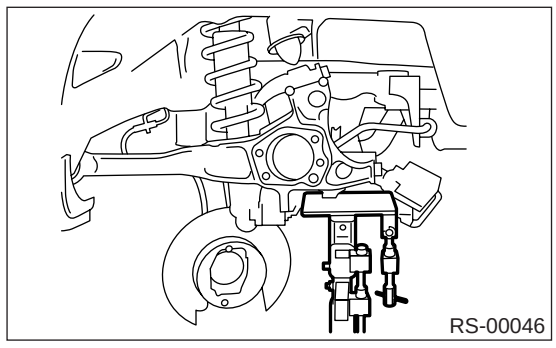
8) Remove nut securing stabilizer link to rear arm.


RS-00044

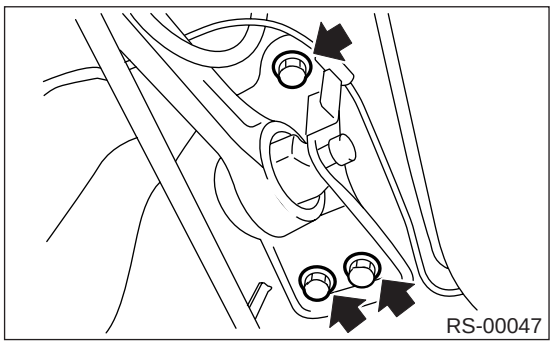
9) Remove bolt securing shock absorber to rear arm.


RS-00045

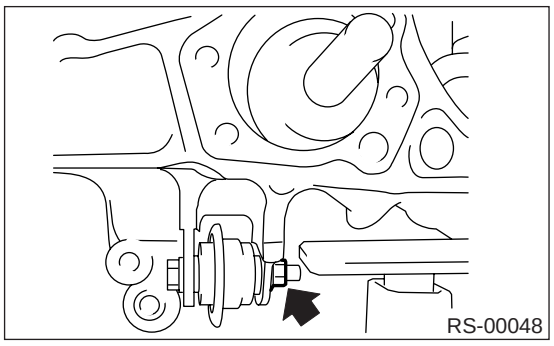
10) Use transmission jack to support rear arm horizontally.


RS-00046

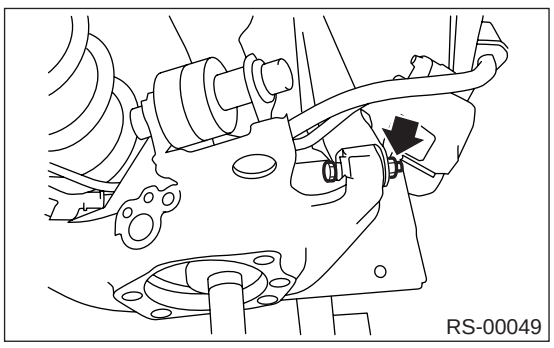
11) Remove bolt securing rear arm to body.


RS-00047

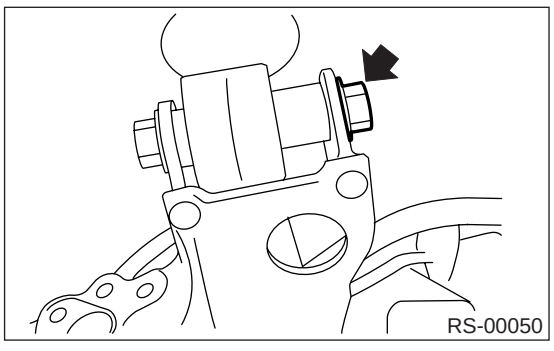
12) Loosen nut securing link front to rear arm.


RS-00048

13) Loosen nut securing link rear to rear arm.


RS-00049

14) Loosen nut securing link upper to rear arm.


RS-00050

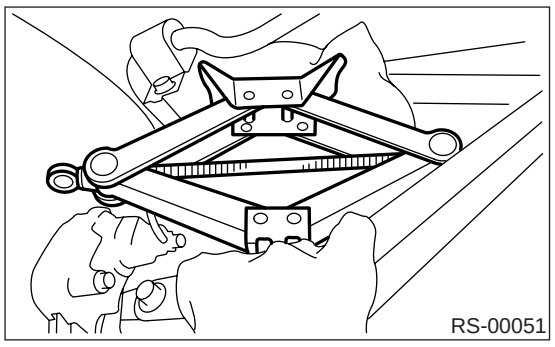
15) Remove bolts securing rear arm to links and remove rear arm.

B: INSTALLATION

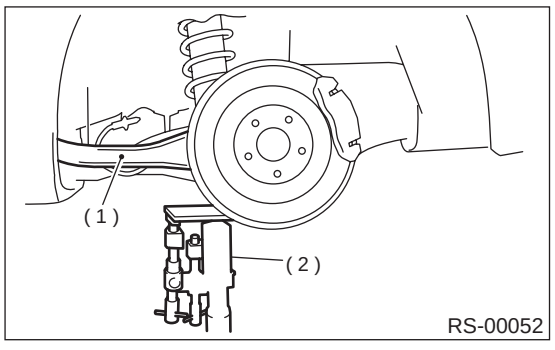
CAUTION:
Discard old self-locking nut and replace with a new one.

1) Use a transmission jack to support the rear arm.
2) Install rear arm and temporarily tighten bolts securing rear arm to links.
3) Install bearing unit.
<Ref. to DS-24, INSTALLATION, Hub Unit Bearing.>
4) Install bolt securing ABS sensor to rear arm.
5) Install bolt securing brake hose to rear arm.
6) Install bolt securing parking brake cable clamp to rear arm.
7) Place jack (furnished with vehicle) upside down and position it between link rear and sub frame. Adjust jack position so rear shock absorber is aligned with rear arm at their corresponding holes. Install lower shock absorber bolts.

CAUTION:
Put a cloth between jack and its mating area to protect link rear and sub frame from scratches.


RS-00051

8) Using transmission jack, support rear arm horizontally and tighten nuts and bolts securing rear arm, link front, link rear, link upper and shock absorber.



RS-00052

(1) Rear arm
(2) Transmission jack

9) Install support sub frame front.

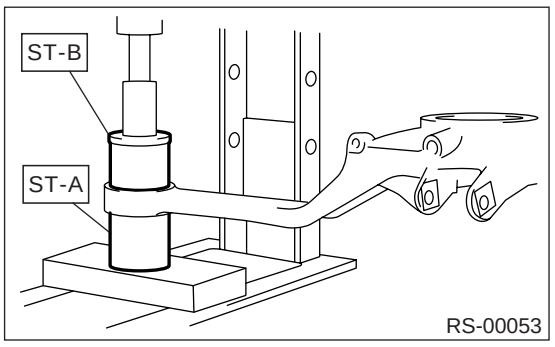
NOTE:
Check wheel alignment and adjust if necessary.

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

C: DISASSEMBLY

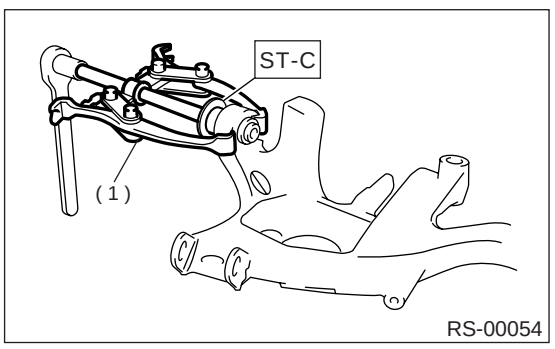
1. FRONT BUSHING

1) Using ST-A, B, press front bushing out of place.
ST-A, B 20099AE020INSTALLER & REMOVER SET
(1) Set ST-A in position with larger inside diameter side facing up.
(2) Set rear arm with protruded bushing side facing down.
(3) Place ST-B on upper side of bushing, then press bushing out of position.



2. REAR BUSHING

Using ST-C and bearing puller, press rear bushing out of place.
ST-C 20099AE040INSTALLER & REMOVER SET



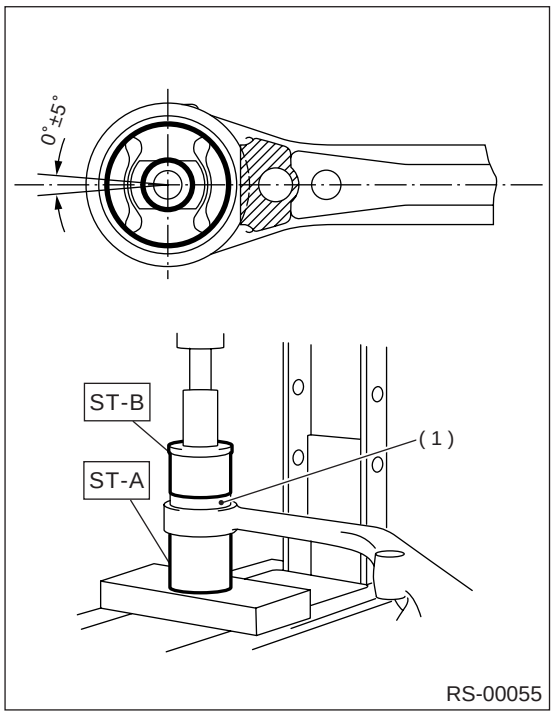
(1) Bearing puller

D: ASSEMBLY

1. FRONT BUSHING

1) Using ST-A, B, press bushing into rear arm.
ST-A, B 20099AE020INSTALLER & REMOVER SET
(1) Set ST-A in position with smaller inside diameter side facing up.
(2) Set rear arm in position with outer side of vehicle body facing down.
(3) Place bushing on upper side of rear arm.
(4) Place ST-B on upper side of bushing, then press bushing into position.

CAUTION:
• Install bushing with painted side facing up.
• Install front bushing in the proper direction, as shown in figure.



(1) Bushing

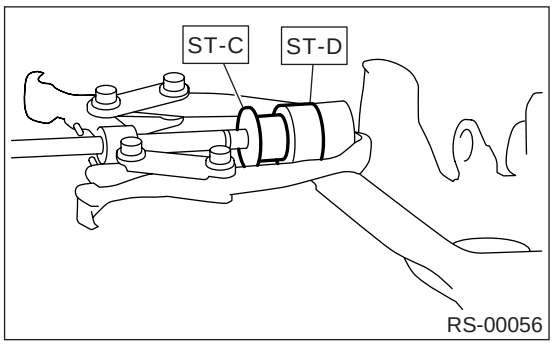
2. REAR BUSHING

1) Using ST-C, D and bearing puller, press bushing into rear arm.

ST-C, D 20099AE040INSTALLER & REMOVER SET

(1) Insert bushing into bore in ST-D.

(2) Set ST-C, ST-D and bearing puller in position, as shown in the figure, and press bushing into position.



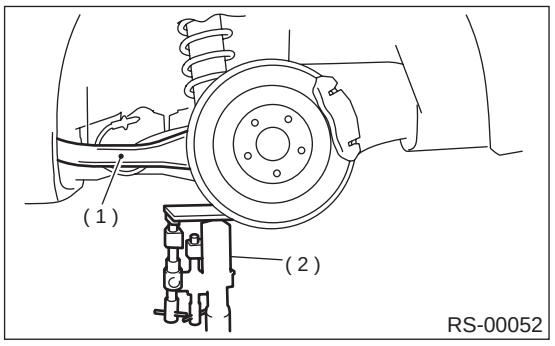
E: INSPECTION

Check rear arm for bends, corrosion or damage.

5. Link Upper

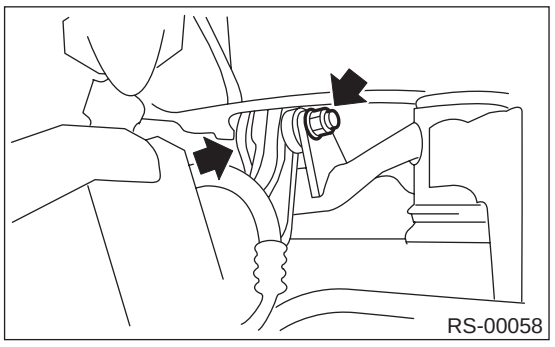
A: REMOVAL

1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
2) Use transmission jack to support rear arm horizontally.

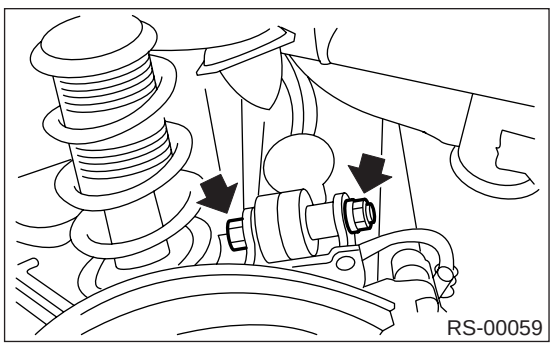


(1) Rear arm
(2) Transmission jack

3) Remove bolt securing link upper to sub frame.



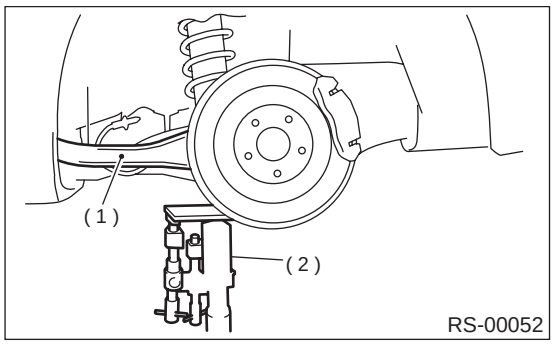
4) Remove bolts which secure link upper to rear arm and detach link upper.



B: INSTALLATION

Install in the reverse order of removal, observing the following instructions.

CAUTION:
• Using transmission jack, support rear arm horizontally, install link upper and tighten nuts to specified torque.



(1) Rear arm
(2) Transmission jack

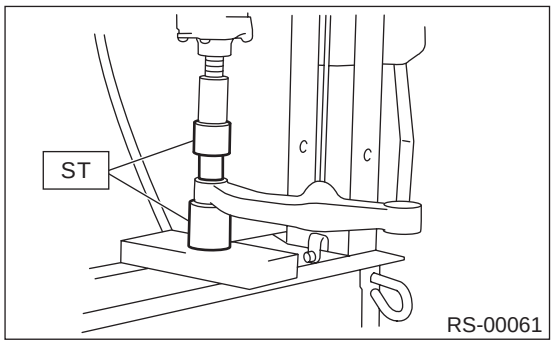
- **Tighten nut when installing adjusting bolt.**
- **Replace self-locking nut.**

NOTE:
Check wheel alignment and adjust if necessary.

Tightening torque:
120 N·m (12.2 kgf-m, 88 ft-lb)

C: DISASSEMBLY

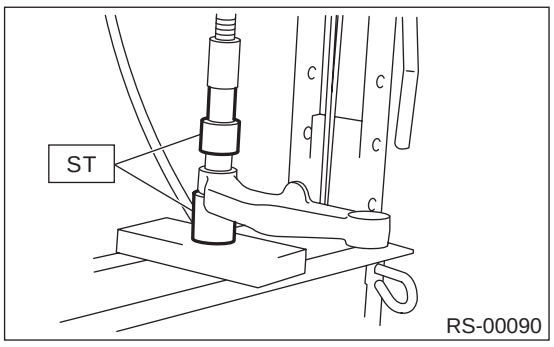
Using ST, press bushing out of place.
ST 20099AE010 INSTALLER & REMOVER



D: ASSEMBLY

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

CAUTION:
Outer bushing has a “directional” design. Be sure to install bushing with longer inner housing side facing vehicle rear.



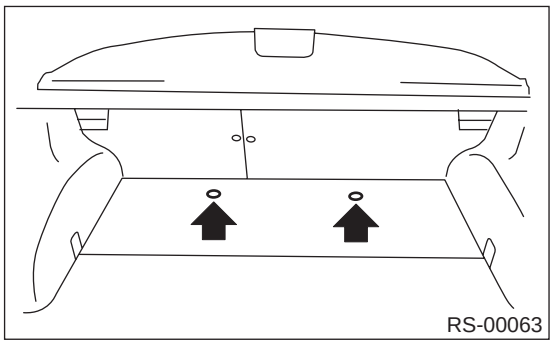
E: INSPECTION

Visually check link upper for damage or bends.

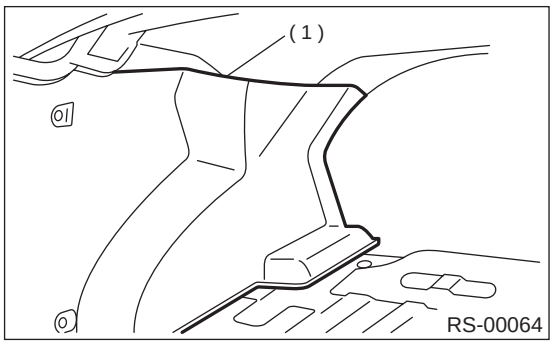
6. Rear Shock Absorber

A: REMOVAL

1) Lift-up vehicle and remove rear wheels.
2) Remove clip and detach floor mat. (Wagon model)

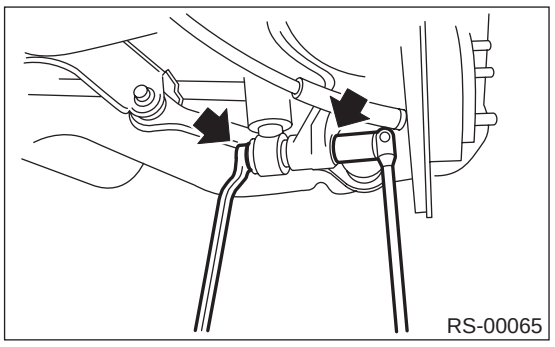


3) Detach trunk mat. (Sedan model)
4) Roll up the trunk side trim. (Sedan model)



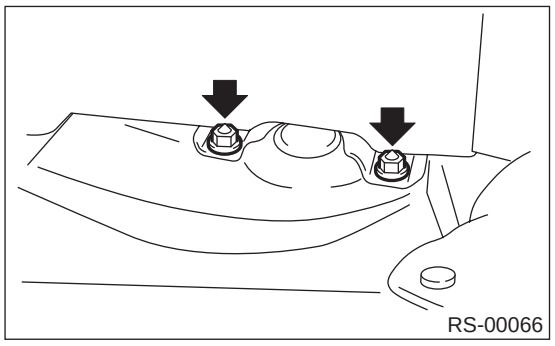
(1) Trunk side trim

5) Remove bolt securing shock absorber to rear arm.

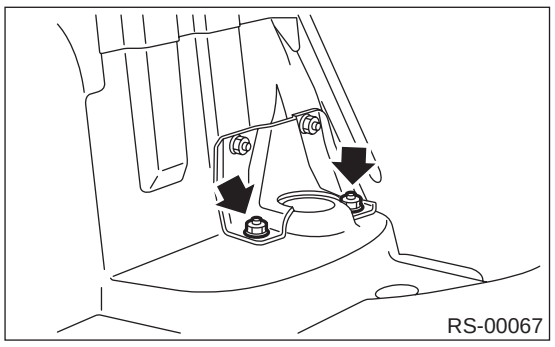


6) Use a jack to support the shock absorber.
7) Remove nuts securing shock absorber mount to body.

• **Wagon**



• **Sedan**



8) Remove shock absorber.

B: INSTALLATION

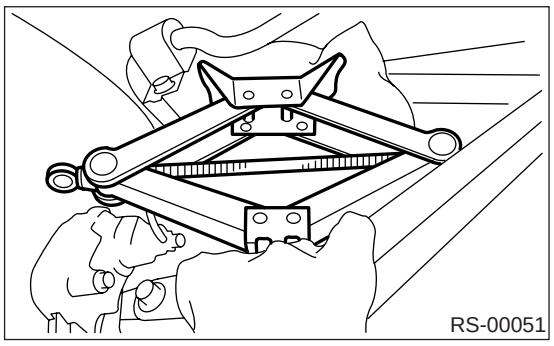
1) Use a jack to support the shock absorber.
2) Tighten self-locking nut used to secure shock absorber to vehicle body.

CAUTION:
Use a new self-locking nut.

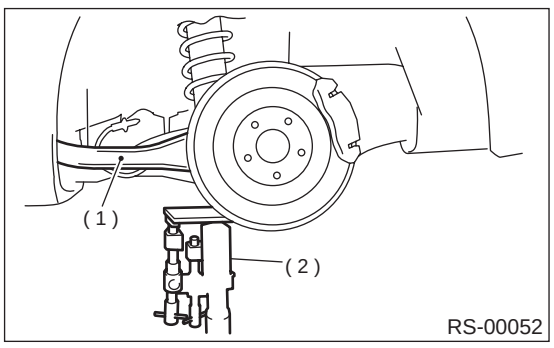
Tightening torque:
30 N·m (3.1 kgf-m, 22 ft-lb)

3) Place jack (furnished with vehicle) upside down and position it between link rear and sub frame. Adjust jack position so rear shock absorber is aligned with rear arm at their corresponding holes. Install lower shock absorber bolts.

CAUTION:
Put a cloth between jack and its mating area to protect link rear and sub frame from scratches.


RS-00051

4) Using transmission jack, support rear arm horizontally and tighten shock absorber nuts and bolts to specified torque.



RS-00052

(1) Rear arm
(2) Transmission jack

Tightening torque:
160 N·m (16.3 kgf-m, 118 ft-lb)

CAUTION:
Use a new self-locking nut.

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

NOTE:
Check wheel alignment and adjust if necessary.

C: DISASSEMBLY

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

D: ASSEMBLY

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

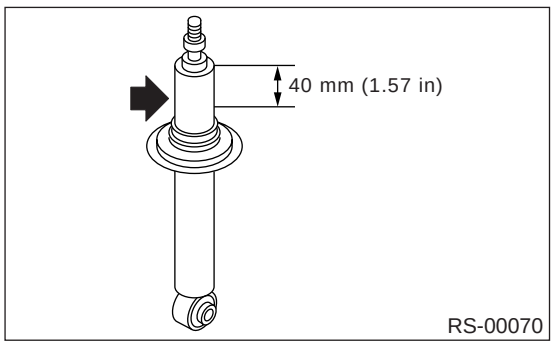
E: INSPECTION

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

F: DISPOSAL

CAUTION:
• Before handling shock absorber, be sure to wear goggles to protect eyes from gas, oil and/or filings.
• Completely discharge the gas from the shock absorber before disposal. Follow the disposal procedure outlined below.
• Do not disassemble shock absorber or place into a fire.
• Drill holes before disposing of shock absorber.

1) Place shock absorber on a flat and level surface with piston rod fully extended.
2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, drill 30 mm (1.18 in) deep holes in areas shown in the figure.

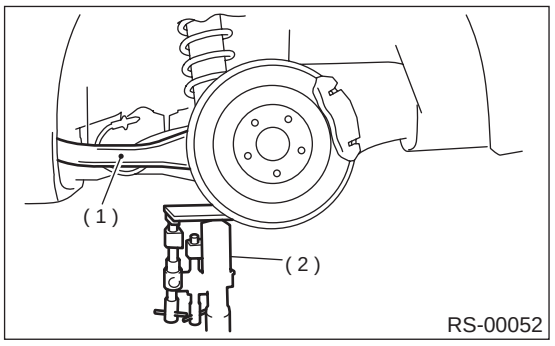


RS-00070

7. Link Front

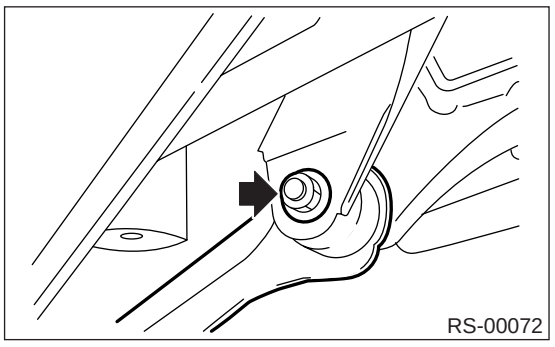
A: REMOVAL

1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
2) Use transmission jack to support rear arm horizontally.

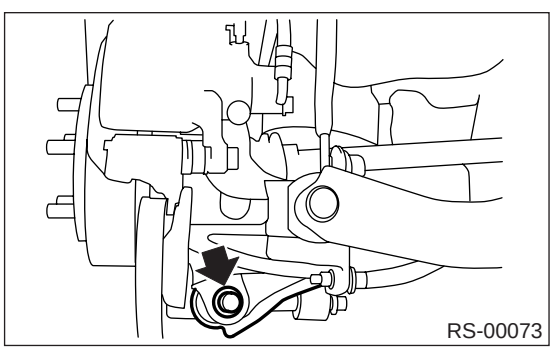


(1) Rear arm
(2) Transmission jack

3) Remove bolt securing link front to sub frame.



4) Remove bolts which secure link front to rear arm and detach link front.

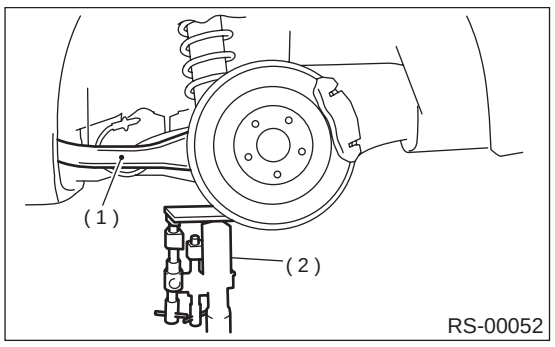


NOTE:
Link front bushing cannot be replaced alone. Always replace link front and bushing as a single unit.

B: INSTALLATION

Install in the reverse order of removal, observing the following instructions.

CAUTION:
• Using transmission jack, support rear arm horizontally, install link front and tighten nuts to specified torque.



(1) Rear arm
(2) Transmission jack

• Install link front with protruded side facing front.

(1) Front

• Replace self-locking nut.

NOTE:
Check wheel alignment and adjust if necessary.

Tightening torque:
120 N·m (12.2 kgf-m, 88 ft-lb)

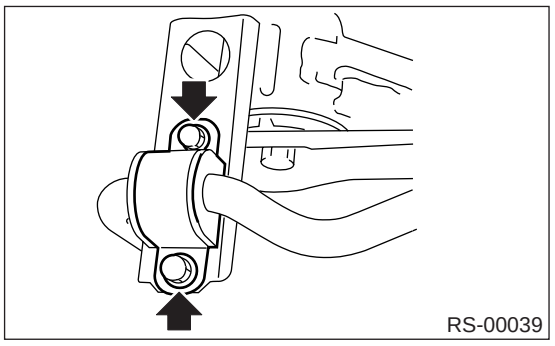
C: INSPECTION

Visually check link front for damage or bends.

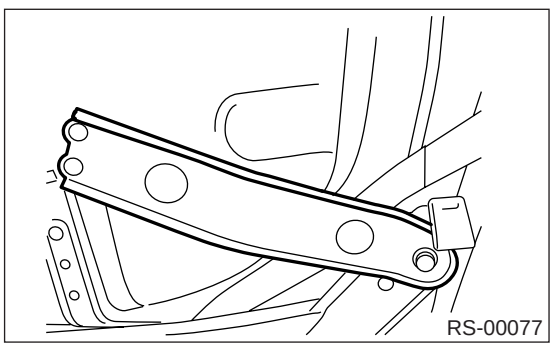
8. Link Rear

A: REMOVAL

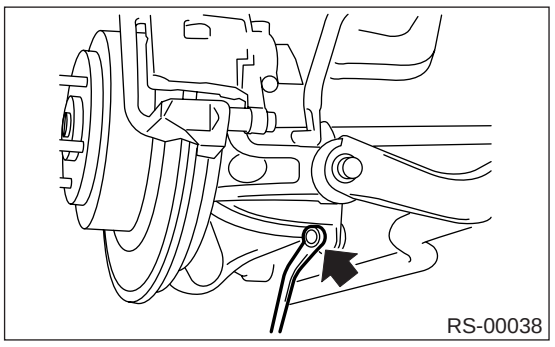
1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
2) Remove bolt securing stabilizer clamps to sub frame.



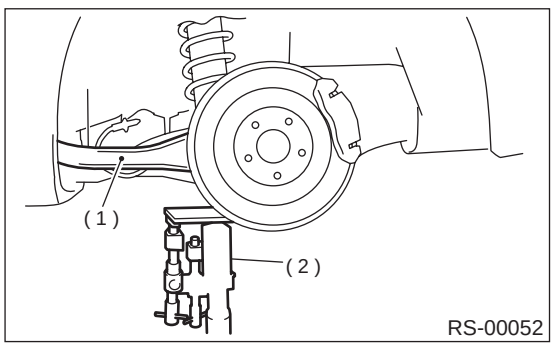
3) Remove support sub frame RH. (When removing RH side link rear.)



4) Remove stabilizer link.

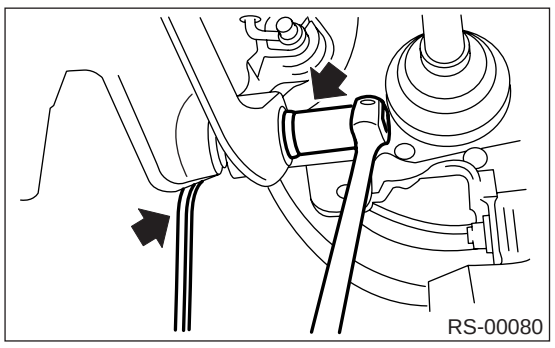


5) Use transmission jack to support rear arm horizontally.



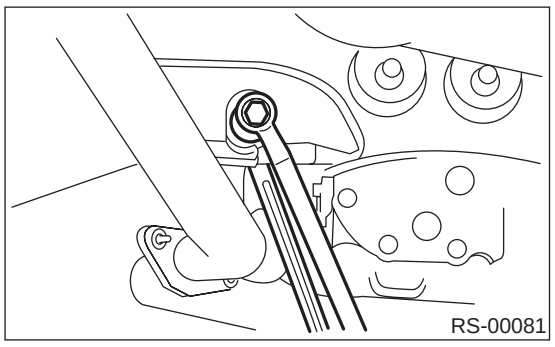
(1) Rear arm
(2) Transmission jack

6) Remove bolt securing link rear to rear arm.



7) Scribe an alignment mark on link rear adjusting bolt and sub frame.
8) Remove bolts securing link rear to sub frame, detach link rear.

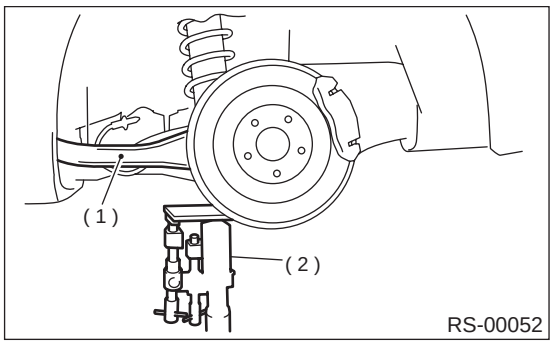
CAUTION:
To loosen adjusting bolt, always loosen nut while holding the head of adjusting bolt.



B: INSTALLATION

Install in the reverse order of removal, observing the following instructions.

CAUTION:
• Using transmission jack, support rear arm horizontally, install link rear and tighten nuts to specified torque.



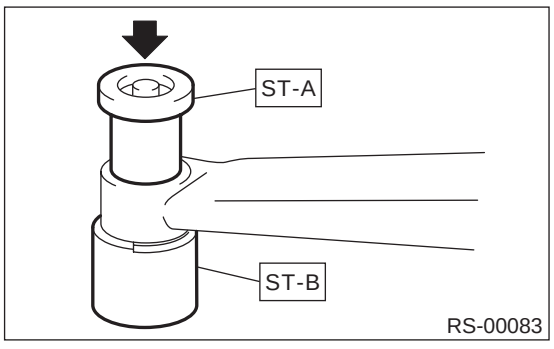
(1) Rear arm
(2) Transmission jack

- **Tighten nut when installing adjusting bolt.**
- **Replace self-locking nut.**

NOTE:
Check wheel alignment and adjust if necessary.

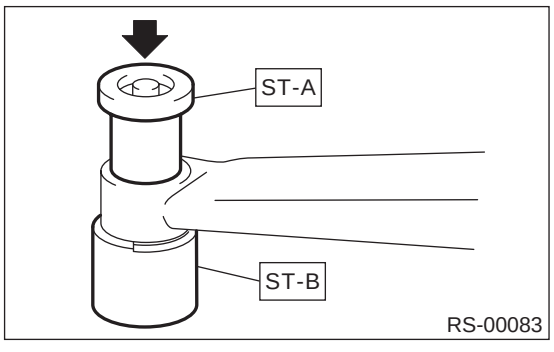
C: DISASSEMBLY

Using ST-A, B, press bushing out of place.
ST-A, B 20099AE000INSTALLER & REMOVER



D: ASSEMBLY

Using ST-A and ST-B, press bushing into place.
ST-A, B 20099AE000INSTALLER & REMOVER



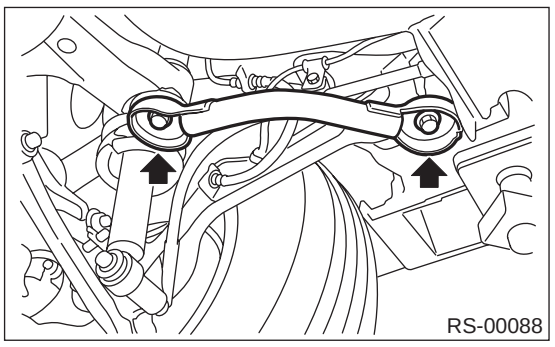
E: INSPECTION

Visually check link rear for damage or bends.

9. Support Sub Frame Front

A: REMOVAL

1) Lift-up the vehicle, using support stand to support rear sub frame.
2) Remove support sub frame front.



B: INSTALLATION

1) Install in reverse order of removal.

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

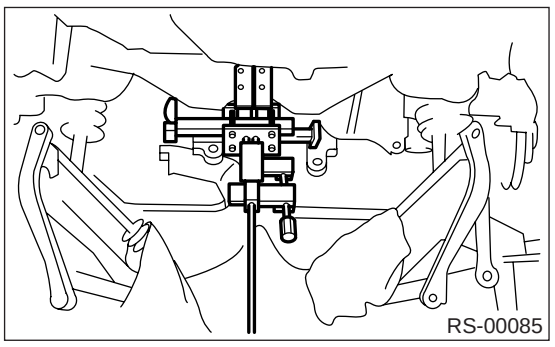
C: INSPECTION

Visually check support sub frame front for damage or bends.

10.Rear Sub Frame

A: REMOVAL

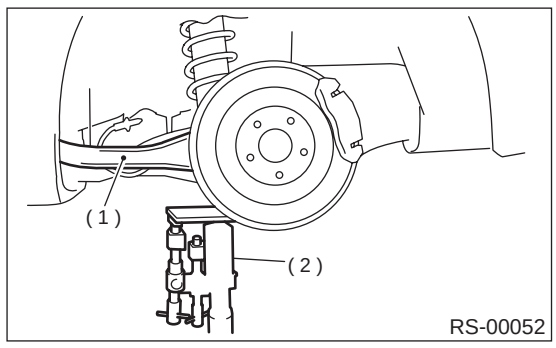
1) Separate front exhaust pipe and rear exhaust pipe.
2) Remove rear exhaust pipe and muffler.
3) Remove rear differential.
With T-type
<Ref. to DI-24, REMOVAL, Rear Differential for T-type.>
With VA-type
<Ref. to DI-41, REMOVAL, Rear Differential for VA-type.>
4) Disconnect link front from sub frame.
<Ref. to RS-18, REMOVAL, Link Front.>
5) Disconnect link rear from sub frame.
<Ref. to RS-19, REMOVAL, Link Rear.>
6) Disconnect link upper from sub frame.
<Ref. to RS-14, REMOVAL, Link Upper.>
7) Place transmission jack under sub frame.


RS-00085

8) Remove support sub frame front.
9) After removing bolts, remove sub frame and support sub frame from vehicle body.

B: INSTALLATION

1) Install in reverse order of removal.
2) For installation and tightening torque of rear differential.
With T-type
<Ref. to DI-25, INSTALLATION, Rear Differential for T-type.>
With VA-type
<Ref. to DI-42, INSTALLATION, Rear Differential for VA-type.>
3) Using transmission jack, support rear arm horizontally and tighten nuts and bolts securing rear arm, link front, link rear, link upper and shock absorber.



RS-00052

(1) Rear arm
(2) Transmission jack

4) Install support sub frame front.

NOTE:
Check wheel alignment and adjust if necessary.

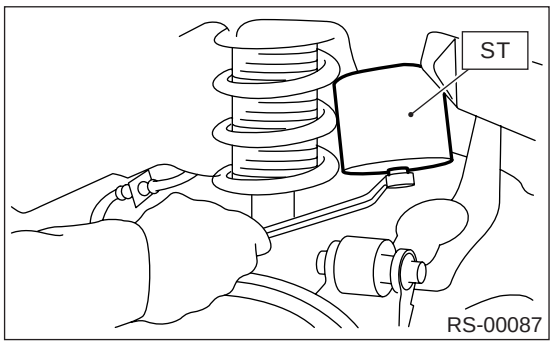
C: INSPECTION

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

11.Helper

A: REMOVAL

1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).
2) Using ST, remove helper.
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 helper for cracks, fatigue or damage.

12.General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

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

2. POOR RIDE COMFORT

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

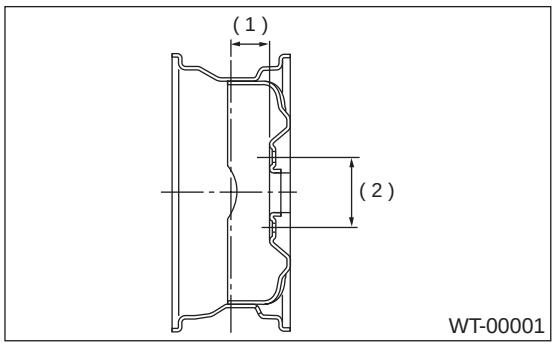
Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace coil springs with new ones.
(4) Fault in operation of damper strut and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or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

3. NOISE

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

1. General Description

A: SPECIFICATIONS



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

		Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Except OUTBACK	Front and Rear	P195/60R15 87H	15 × 6JJ	55 (2.17)	100 (3.94) dia.
		P205/60R15 90H	15 × 6JJ	55 (2.17)	
		P205/55R16 89H	16 × 6 1/2JJ	55 (2.17)	
	T-type tire	T135/70D16, T145/80R16	16 × 4T	50 (1.97)	
OUTBACK	Front and Rear	P225/60R16 97H	16 × 6 1/2JJ	48 (1.89)	
	T-type tire	T145/80R16	16 × 4T	50 (1.97)	

		Tire size	Tire inflation pressure kPa (kg/cm^2, psi)	
			Light load	Trailler towing
Except OUTBACK	Front and Rear	P195/60R15 87H	Ft: 230 (2.3, 33) Rr: 220 (2.2, 32)	—
		P205/60R15 90H		
		P205/55R16 89H	Ft: 220 (2.2, 32) Rr: 210 (2.1, 30)	
	T-type tire	T135/70D16, T145/80R16	420 (4.2, 60)	—
OUTBACK model	Front and Rear	225/60R16 97H	Ft: 210 (2.1, 30) Rr: 200 (2.0, 29)	Ft: 210 (2.1, 30) Rr: 220 (2.2, 32)
	T-type tire	T145/80R16	420 (4.2, 60)	—

NOTE:
“T-type” tire for temporary use is supplied as a spare tire.

1. SERVICE DATA

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

2. ADJUSTING PARTS

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

Balance weight part number (For steel wheel)	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)
—	55 g (1.94 oz)
28101AA111	60 g (2.12 oz)

Balance weight part number (For aluminum wheel)	Weight
23141GA462	5 g (0.18 oz)
23141GA472	10 g (0.35 oz)
23141GA482	15 g (0.53 oz)
23141GA492	20 g (0.71 oz)
23141GA502	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

B: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Air Pressure Gauge	Used for measuring tire air pressure.
Dial Gauge	Used for measuring wheel runout.

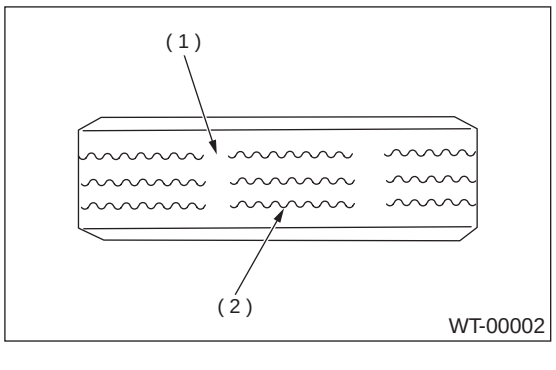
2. Tire

A: INSPECTION

1) Take stone, glass, nail etc. off the tread groove.
2) Replace tire:

CAUTION:
• When replacing a tire, make sure to use only the same size, construction and load range as originally installed.
• Avoid mixing radial, belted bias or bias tires on the vehicle.

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



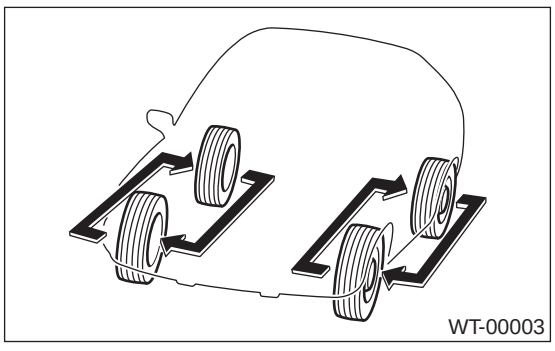
(1) Tread wear indicator
(2) Tire tread

3) When extremely biased wear on tire tread can been seen, after replacing tire, check wheel alignment. <Ref. to FS-6, Wheel Alignment.>

1. TIRE ROTATION

If tires are maintained at the same positions for a long period of time, uneven wear results. Therefore, they should be periodically rotated.
This lengthens service life of tires.

CAUTION:
When rotating tires, replace unevenly worn or damaged tires with new ones.



3. Steel Wheel

A: REMOVAL

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

NOTE:
• While removing wheels, prevent hub bolts from damage.

NOTE:
• Place wheels with their outer sides facing upward to prevent wheels from damage.

B: INSTALLATION

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

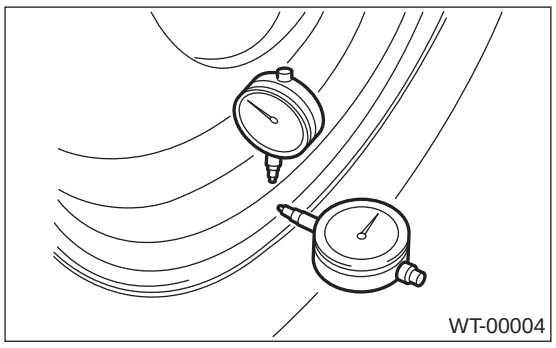
Wheel nut tightening torque:
88 N·m (9 kgf-m, 65 ft-lb)

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

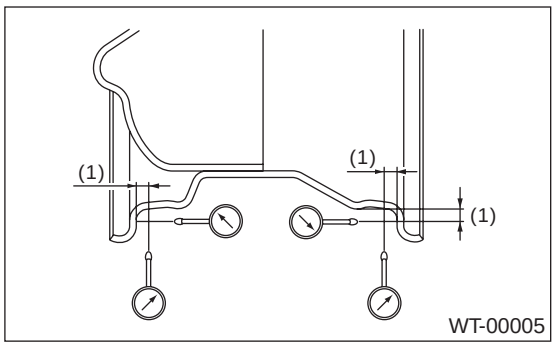
5) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

C: INSPECTION

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



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



(1) Approx. 7 mm (0.28 in)

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

4. Aluminum Wheel

A: REMOVAL

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

B: INSTALLATION

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

C: INSPECTION

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

Rim runout:

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

D: CAUTION

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

5. Wheel Balancing

A: REPLACEMENT

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

Balance weight part number (For steel wheel)	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)
—	55 g (1.94 oz)
28101AA111	60 g (2.12 oz)

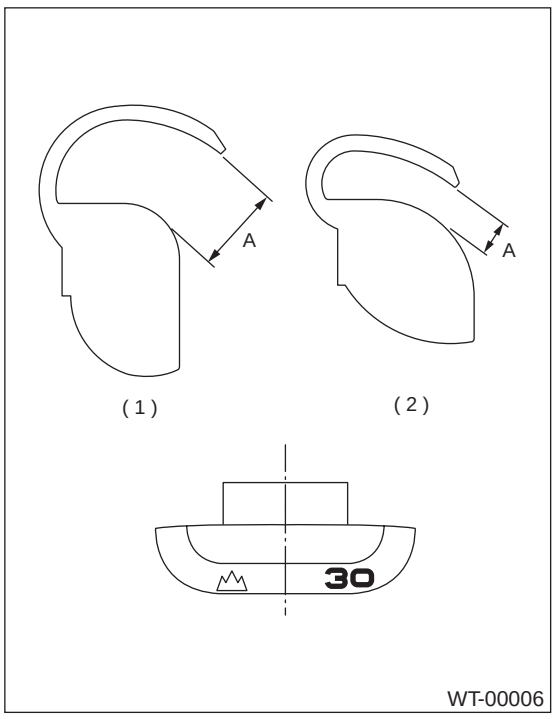
Balance weight part number (For aluminum wheel)	Weight
23141GA462	5 g (0.18 oz)
23141GA472	10 g (0.35 oz)
23141GA482	15 g (0.53 oz)
23141GA492	20 g (0.71 oz)
23141GA502	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

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

B: INSPECTION

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

CAUTION:
• 55 g (1.94 oz) weight used with aluminum wheel is not available.
• Balance weights are available for use with any of 14- to 16-inch wheels.



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

Service limit: A
Weight for steel wheel;
2.16 mm (0.085 in)
Weight for aluminum wheel;
4.5 mm (0.177 in)

6. “T-type” Tire

A: NOTE

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

CAUTION:
• Do not use a tire chain with the “T-type” tire. Because of the smaller tire size, a tire chain will not fit properly and will result in damage to the vehicle and the tire.
• Do not drive at a speed greater than 80 km/h (50 MPH).
• Drive as slowly as possible and avoid passing over bumps.

B: REPLACEMENT

Refer to Removal and Installation of Steel Wheel for removal/installation of “T-type” tires. <Ref. to WT-5, Steel Wheel.>

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

C: INSPECTION

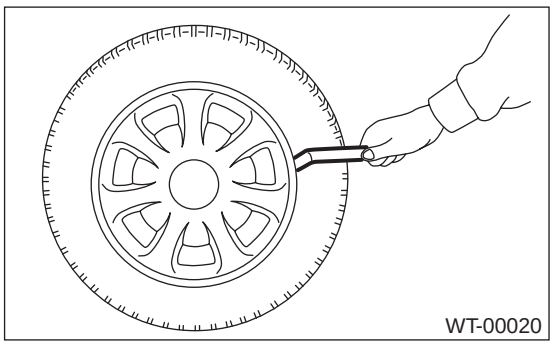
1) Check tire inflation pressure.
Specification:
420 kPa (4.2 kg/cm^2, 60 psi)
2) Take stones, glass, nails, etc. out of the tread groove.
3) Check tires for deformation, cracks, partial wear, or wear.

CAUTION:
Replace the tire with a new one.

7. Full Wheel Cap

A: REMOVAL

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



B: INSTALLATION

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

C: INSPECTION

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

8. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Front wheel shimmy	• Worn or improperly inflated of tire.	Replace
	• Wheel is out of balance.	Adjustment
Abnormal tire wear	• Improperly inflated of tire.	Replace
Sways/pitches	• Worn or improperly inflated of tire.	Replace
Wander/pulls	• Worn or improperly inflated of tire.	Replace

1. General Description

A: SPECIFICATIONS

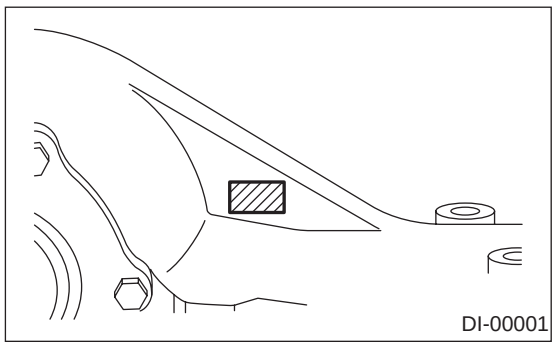
When replacing a rear differential assembly, select the correct one according to the following table.

NOTE:
Using the different rear differential assembly causes the drive line and tires to “drag” or emit abnormal noise.

MODEL	2.5 L			
	BRIGHTON and L		Except BRIGHTON and L	
	MT	AT	MT	AT
	T-type	VA-type	T-type	
Rear differential type	T1	XK	JE (with LSD)	CD (with LSD)
Gear	Hypoid gear			
Gear ratio (Number of gear teeth)	3.900 (39/10)	4.111 (37/9)	4.111 (37/9)	4.444 (40/9)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)	0.9 ℓ (1.0 US qt, 0.8 Imp qt)	0.8 ℓ (0.8 US qt, 0.7 Imp qt)	
Rear differential gear oil	GL-5			

MODEL	3.0 L	
	OUTBACK SEDAN, OUTBACK	
	With VDC	Without VDC
	T-type	
Rear differential type	T2	JE (with LSD)
Gear	Hypoid gear	
Gear ratio (Number of gear teeth)	4.111 (37/9)	
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)	
Rear differential gear oil	GL-5	

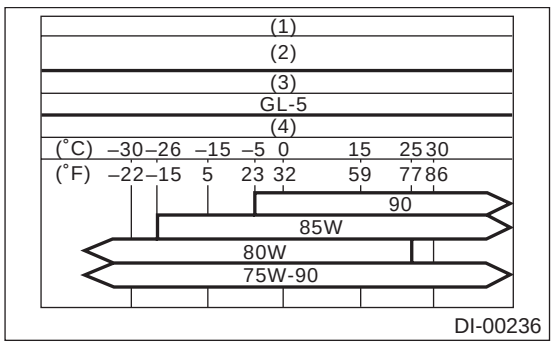
• Identification



• Rear differential gear oil

Recommended oil

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



(1) Item
(2) Rear differential gear oil
(3) API Classification
(4) SAE Viscosity No. and Application Temperature

1. SERVICE DATA

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	New bearing	T-type	19.6 — 28.4 (2.0 — 2.9, 4.4 — 6.4)
		VA-type	12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3)
	Used bearing	T-type	8.34 — 16.67 (0.85 — 1.7, 1.87 — 3.75)
Side gear backlash mm (in)		T-type	0.10 — 0.20 (0.0039 — 0.0079)
		VA-type	0.05 — 0.15 (0.0020 — 0.0059)
Side bearing standard width mm (in)			20.00 (0.7874)
Crown gear to drive pinion backlash mm (in)		T-type	0.10 — 0.20 (0.0039 — 0.0079)
		VA-type	0.10 — 0.15 (0.0039 — 0.0059)
Crown gear runout on its back surface mm (in)			Less than 0.05 (0.0020)

2. ADJUSTING PARTS

• VA-type

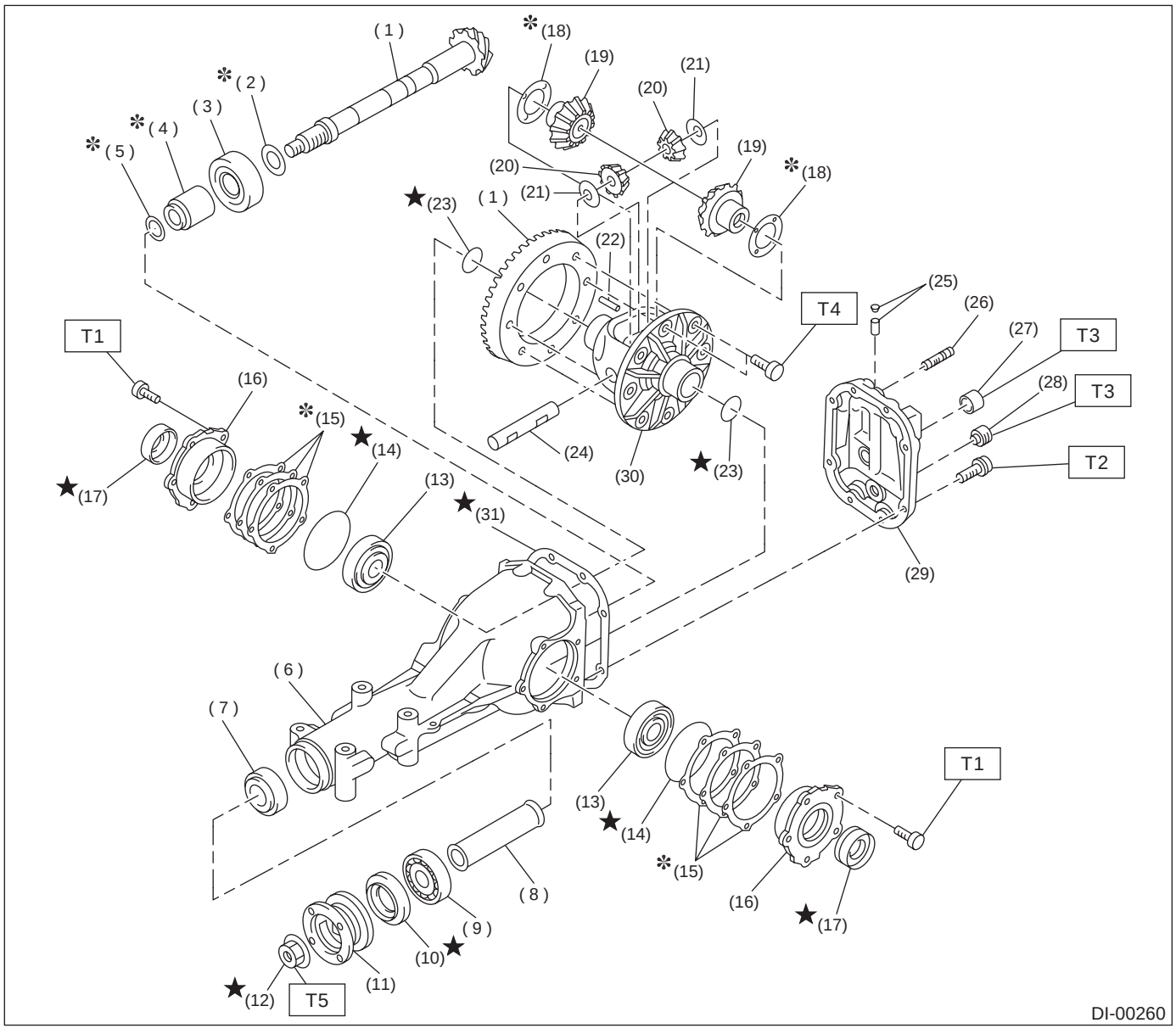
Item	Part No.	Length or thickness
Preload adjusting spacer	32288AA040	52.3 mm (2.059 in)
	32288AA050	52.5 mm (2.067 in)
	31454AA100	52.6 mm (2.071 in)
	32288AA060	52.7 mm (2.075 in)
	31454AA110	52.8 mm (2.079 in)
	32288AA070	52.9 mm (2.083 in)
	31454AA120	53.0 mm (2.087 in)
	32288AA080	53.1 mm (2.091 in)
	32288AA090	53.3 mm (2.098 in)
Preload adjusting washer	38336AA000	1.500 mm (0.0591 in)
	38336AA120	1.513 mm (0.0596 in)
	38336AA010	1.525 mm (0.0600 in)
	38336AA130	1.538 mm (0.0606 in)
	38336AA020	1.550 mm (0.0610 in)
	38336AA140	1.563 mm (0.0615 in)
	38336AA030	1.575 mm (0.0620 in)
	38336AA150	1.588 mm (0.0625 in)
	38336AA040	1.600 mm (0.0630 in)
	38336AA160	1.613 mm (0.0635 in)
	38336AA050	1.625 mm (0.0640 in)
	38336AA170	1.638 mm (0.0645 in)
	38336AA060	1.650 mm (0.0650 in)
	38336AA180	1.663 mm (0.0655 in)
	38336AA070	1.675 mm (0.0659 in)
	38336AA190	1.688 mm (0.0665 in)
	38336AA080	1.700 mm (0.0669 in)
	38336AA200	1.713 mm (0.0674 in)
	38336AA090	1.725 mm (0.0679 in)
	38336AA210	1.738 mm (0.0684 in)
	38336AA100	1.750 mm (0.0689 in)
	38336AA220	1.763 mm (0.0694 in)
	38336AA110	1.775 mm (0.0699 in)
Pinion height adjusting shim	32295AA200	0.150 mm (0.0059 in)
	32295AA210	0.175 mm (0.0069 in)
	32295AA220	0.200 mm (0.0079 in)
	32295AA230	0.225 mm (0.0089 in)
	32295AA240	0.250 mm (0.0098 in)
	32295AA250	0.275 mm (0.0108 in)
Side gear thrust washer	803135011	0.925 — 0.950 mm (0.0364 — 0.0374 in)
	803135012	0.950 — 0.975 mm (0.0374 — 0.0384 in)
	803135013	0.975 — 1.000 mm (0.0384 — 0.0394 in)
	803135014	1.000 — 1.025 mm (0.0394 — 0.0404 in)
	803135015	1.025 — 1.050 mm (0.0404 — 0.0413 in)

• T-type

Item	Part No.	Length or thickness
Preload adjusting spacer	383695201	56.2 mm (2.213 in)
	383695202	56.4 mm (2.220 in)
	383695203	56.6 mm (2.228 in)
	383695204	56.8 mm (2.236 in)
	383695205	57.0 mm (2.244 in)
	383695206	57.2 mm (2.252 in)
Preload adjusting washer	383705200	2.59 mm (0.1020 in)
	383715200	2.57 mm (0.1012 in)
	383725200	2.55 mm (0.1004 in)
	383735200	2.53 mm (0.0996 in)
	383745200	2.51 mm (0.0988 in)
	383755200	2.49 mm (0.0980 in)
	383765200	2.47 mm (0.0972 in)
	383775200	2.45 mm (0.0965 in)
	383785200	2.43 mm (0.0957 in)
	383795200	2.41 mm (0.0949 in)
	383805200	2.39 mm (0.0941 in)
	383815200	2.37 mm (0.0933 in)
	383825200	2.35 mm (0.0925 in)
	383835200	2.33 mm (0.0917 in)
	383845200	2.31 mm (0.0909 in)
Pinion height adjusting shim	383495200	3.09 mm (0.1217 in)
	383505200	3.12 mm (0.1228 in)
	383515200	3.15 mm (0.1240 in)
	383525200	3.18 mm (0.1252 in)
	383535200	3.21 mm (0.1264 in)
	383545200	3.24 mm (0.1276 in)
	383555200	3.27 mm (0.1287 in)
	383565200	3.30 mm (0.1299 in)
	383575200	3.33 mm (0.1311 in)
	383585200	3.36 mm (0.1323 in)
	383595200	3.39 mm (0.1335 in)
	383605200	3.42 mm (0.1346 in)
	383615200	3.45 mm (0.1358 in)
	383625200	3.48 mm (0.1370 in)
	383635200	3.51 mm (0.1382 in)
	383645200	3.54 mm (0.1394 in)
	383655200	3.57 mm (0.1406 in)
	383665200	3.60 mm (0.1417 in)
	383675200	3.63 mm (0.1429 in)
	383685200	3.66 mm (0.1441 in)
Side gear thrust washer (Without LSD)	383445201	0.75 — 0.80 mm (0.0295 — 0.0315 in)
	383445202	0.80 — 0.85 mm (0.0315 — 0.0335 in)
	383445203	0.85 — 0.90 mm (0.0335 — 0.0354 in)
Side bearing retainer shim	383475201	0.20 mm (0.0079 in)
	383475202	0.25 mm (0.0098 in)
	383475203	0.30 mm (0.0118 in)
	383475204	0.40 mm (0.0157 in)
	383475205	0.50 mm (0.0197 in)

B: COMPONENT

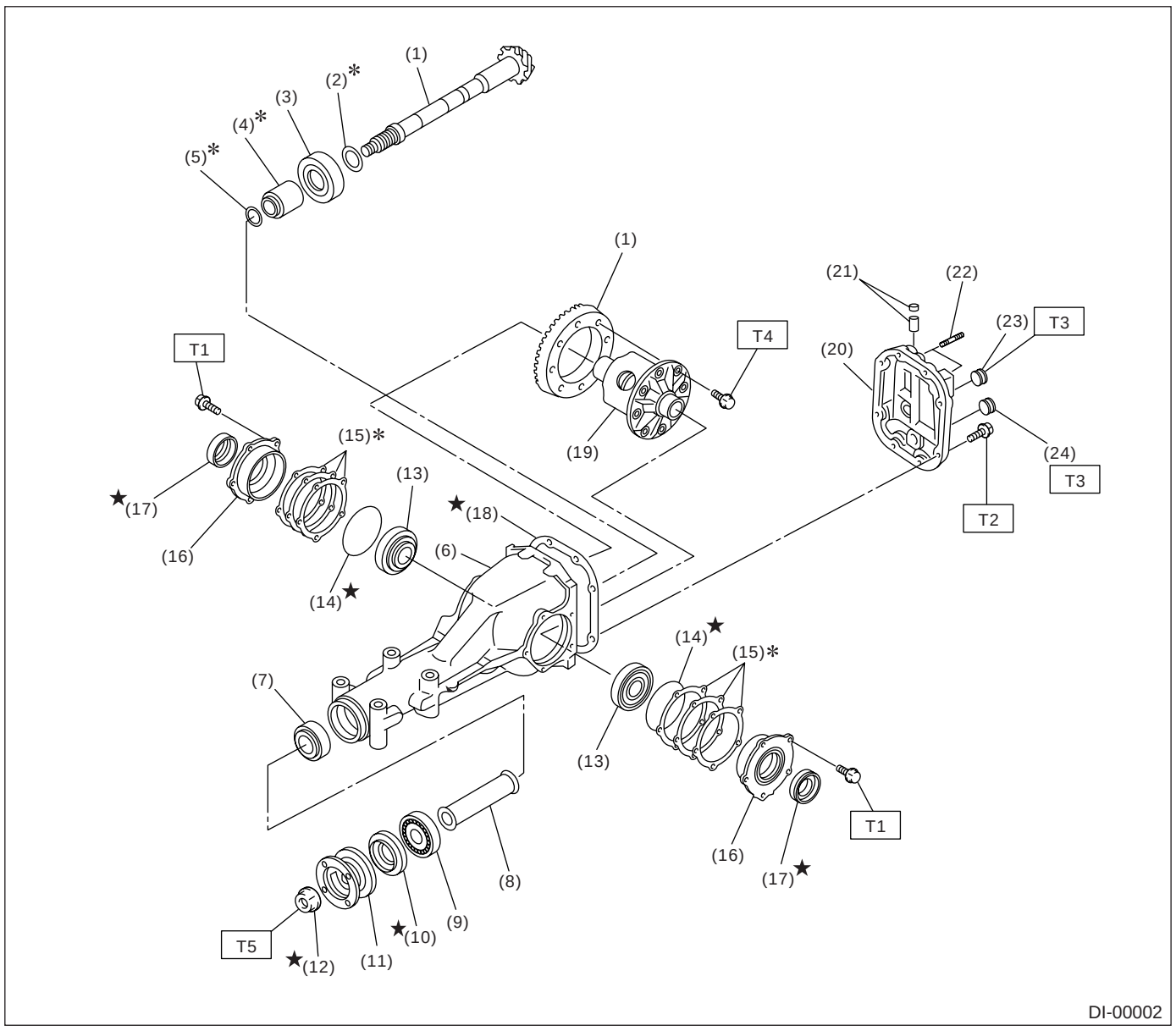
1. REAR DIFFERENTIAL FOR T-TYPE WITHOUT LSD



(1) Pinion crown 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) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Side gear thrust washer
(19) Side gear
(20) Pinion mate gear
(21) Pinion mate gear washer
(22) Pinion shaft lock pin
(23) Circlip
(24) Pinion mate shaft
(25) Air breather cap
(26) Stud bolt
(27) Oil filler plug
(28) Oil drain plug
(29) Rear cover
(30) Differential case
(31) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10.5 (1.07, 7.7)
T2: 29.4 (3.00, 21.7)
T3: 49.0 (5.0, 36.2)
T4: 103.0 (10.50, 75.9)
T5: 181.4 (18.50, 133.8)

2. REAR DIFFERENTIAL FOR T-TYPE WITH LSD

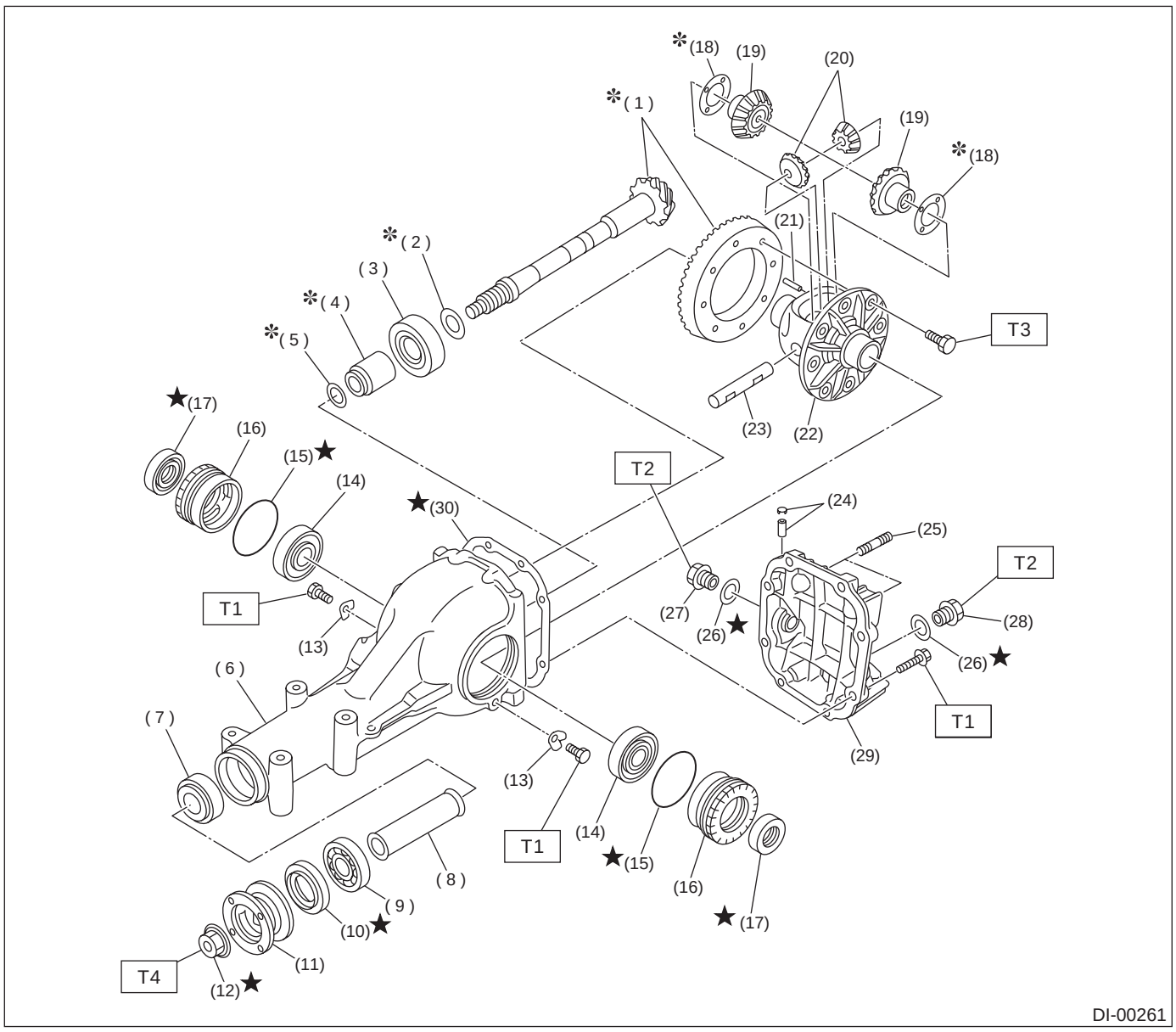


DI-00002

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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10.5 (1.07, 7.7)
T2: 29.0 (3.00, 21.7)
T3: 49.0 (5.00, 36.2)
T4: 103.0 (10.50, 75.9)
T5: 181.4 (18.50, 133.8)

3. REAR DIFFERENTIAL FOR VA-TYPE

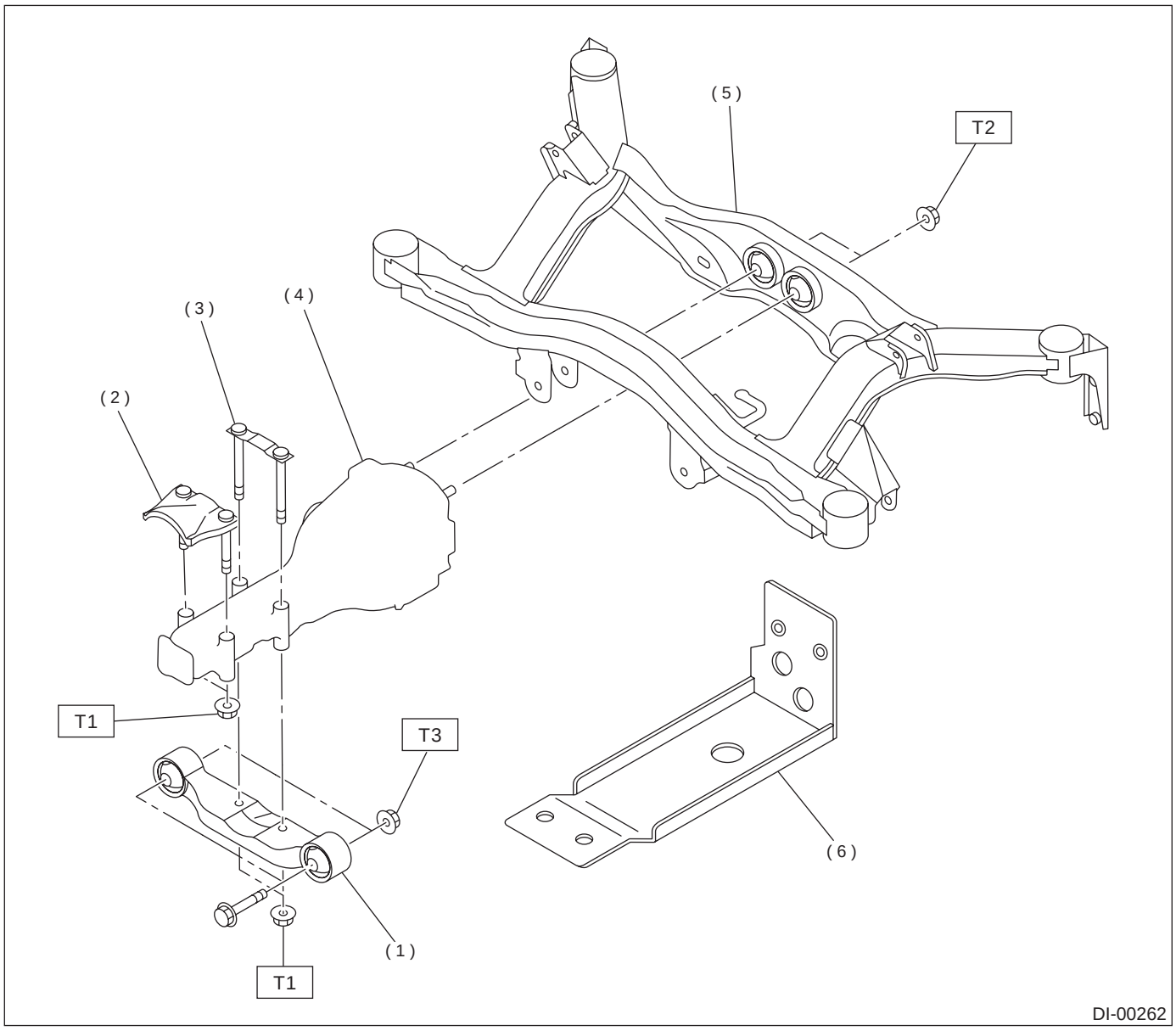


DI-00261

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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 34 (3.5, 25.3)
T3: 62 (6.3, 45.6)
T4: 188 (19.2, 139)

4. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Rear differential front member
(2) Protector
(3) Rear differential member plate
(4) Rear differential ASSY
(5) Sub frame
(6) Rear differential protector (if equipped)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 65 (6.6, 48)
T2: 70 (7.1, 51)
T3: 110 (11.2, 81)

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOLS

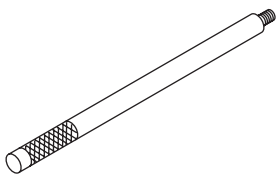
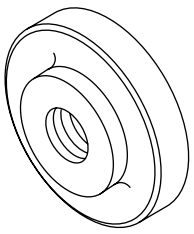
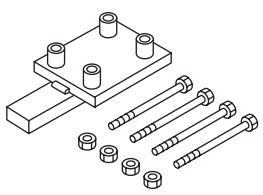
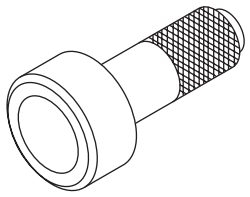
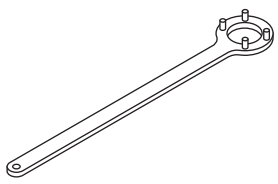
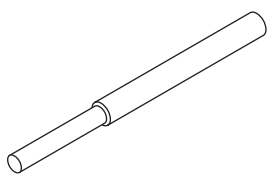
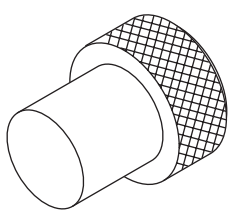
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing front and rear bearing cone.
 ST-398477702	398477702	DRIFT	Used press-fitting the bearing cone of differential carrier (front).
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly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

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

DIFFERENTIALS

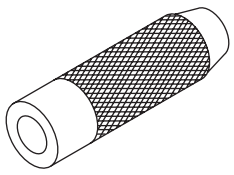
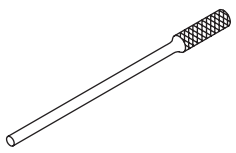
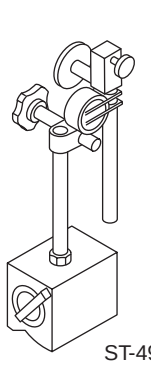
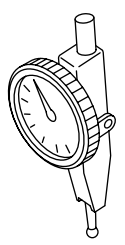
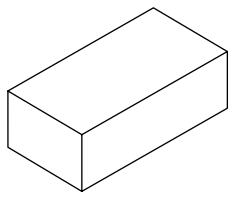
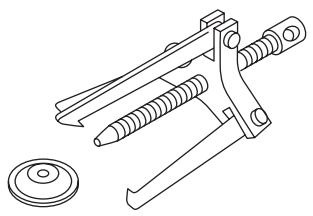
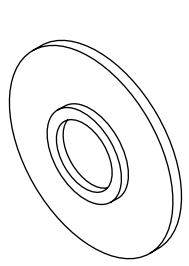
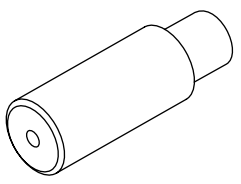
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899580100	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash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

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507704	398507704	BLOCK	Used for adjusting pinion height and preload.
 ST-399703600	399703600	PULLER ASSY	Use for removing companion flange.
 ST-398177700	398177700	INSTALLER	• Used for installing rear bearing cone. • For T-type.
 ST-398457700	398457700	ATTACHMENT	• Used for removing side bearing retainer. • For T-type.

DIFFERENTIALS

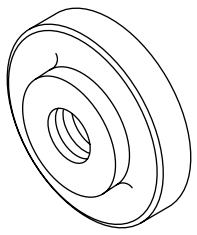
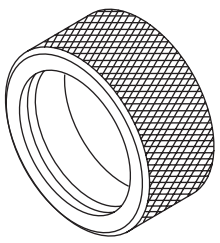
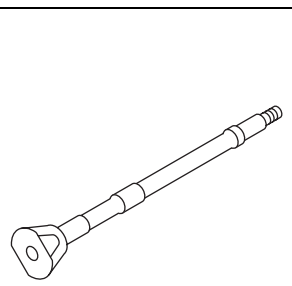
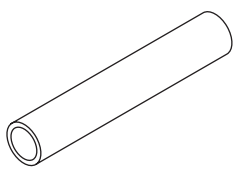
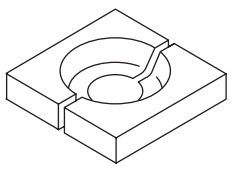
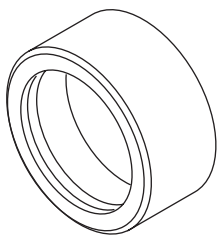
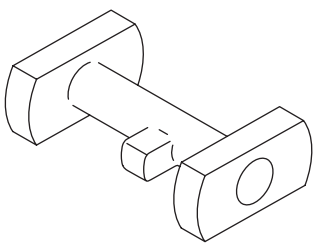
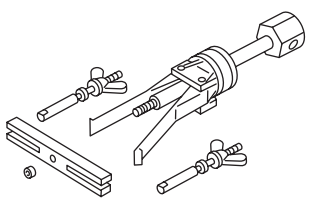
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477703	398477703	DRIFT 2	• Used for press-fitting the bearing race (rear) of differential carrier. • For T-type.
 ST-398437700	398437700	DRIFT	• Used for installing side oil seal. • For T-type.
 ST-398507702	398507702	DUMMY SHAFT	• Used for adjusting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

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398517700	398517700	REPLACER	• Used for removing rear bearing cone. • For T-type.
 ST-398487700	398487700	DRIFT	• Used for press-fitting the side bearing cone. • For T-type.
 ST-398507701	398507701	GAUGE	• Used for adjusting pinion height. • For T-type.
 ST-398527700	398527700	PULLER ASSY	• Used for removing oil seal and side bearing cup. • For T-type.

DIFFERENTIALS

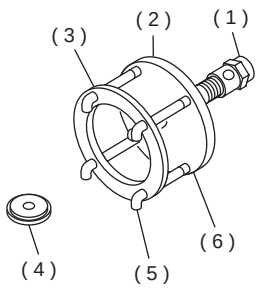
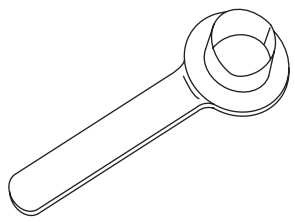
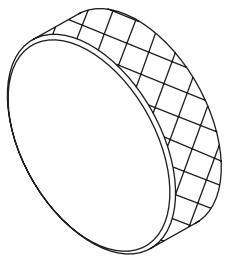
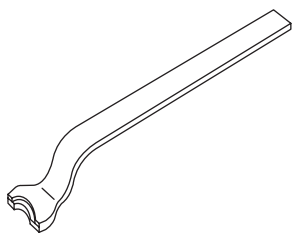
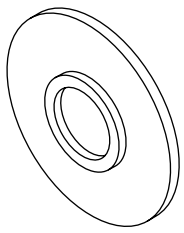
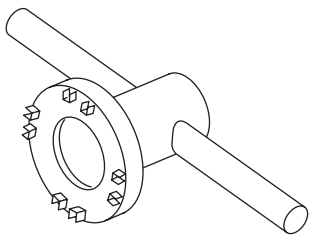
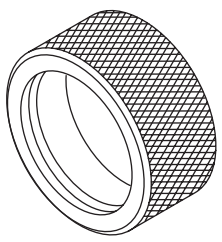
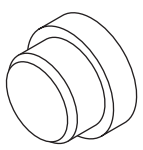
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399527700	399527700	PULLER SET	• Used for extracting side bearing cone. (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000) • For T-type.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST-398237700	398237700	GAUGE	• Used for installing side bearing. • For T-type.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	• Used for removing rear drive shaft from rear differential. • For T-type.

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

DIFFERENTIALS

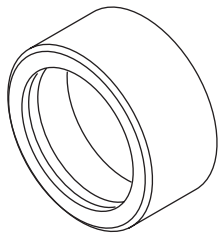
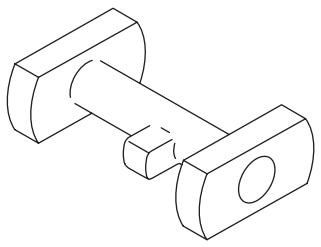
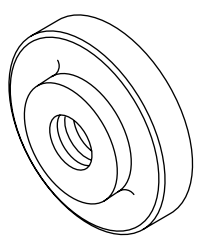
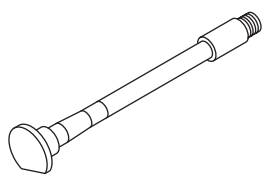
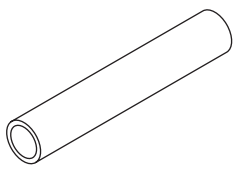
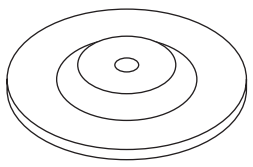
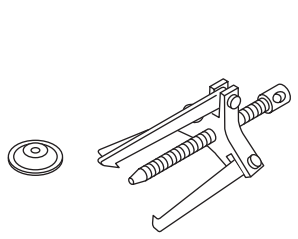
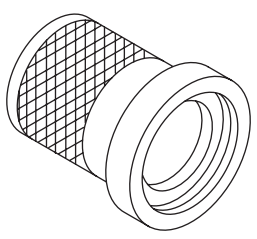
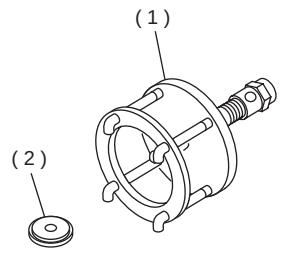
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498485400	498485400	DRIFT	• Used for installing side bearing cone. • For VA-type.
 ST-498505501	498505501	GAUGE	• Used for adjusting pinion height. • For VA-type.
 ST-498447110	498447110	BEARING OUTER RACE DRIFT	• Used for press-fitting the bearing race (front) of differential carrier. • For VA-type.
 ST-498447150	498447150	DUMMY SHAFT	• Used for adjusting pinion height and pre-load. • For VA-type.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST32285AA000	32285AA000	DUMMY COLLAR	• Used for adjusting pinion height and pre-load. • For VA-type.
 ST-499705404	499705404	SEAT	• Used for removing side bearing race. • Used with PULLER ASSY (499705401). • For VA-type.
 ST-499705401	499705401	PULLER ASSY	• Used for removing side bearing race. • Used with SEAT (499705404). • For VA-type.
 ST-899874100	899874100	INSTALLER	• Used for installing companion flange. • For VA-type.

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899524100	899524100	DIFFERENTIAL BEARING PULLER SET	• Used for removing side bearing cone of differential. • For VA-type. (1) Puller (2) Cap

2. GENERAL PURPOSE TOOLS

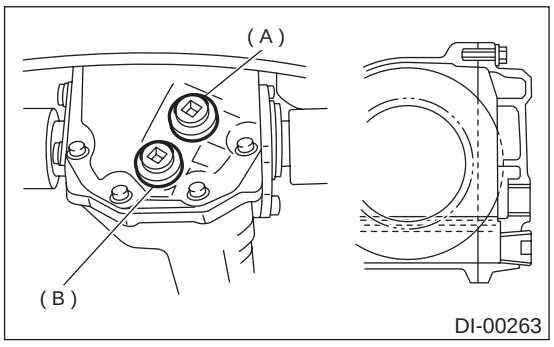
TOOL NAME	REMARKS
Transmission Jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer. (T-type)
Thickness Gauge	Used for measuring clearance.
Tire Lever	Used for removal of rear drive shaft. (VA-type)

2. Differential Gear Oil

A: INSPECTION

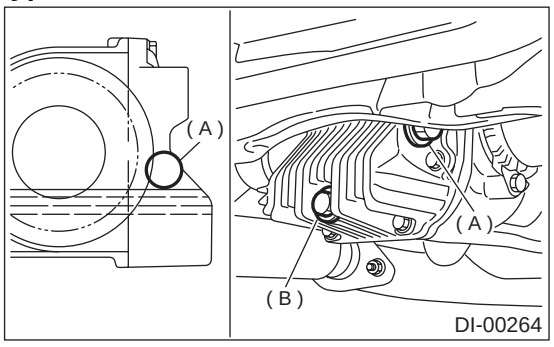
1) Take out filler plug, and replace gear oil if it is contaminated or deteriorated. <Ref. to DI-21, REPLACEMENT, Differential Gear Oil.>
2) Check gear oil level is up to the bottom part of filler bolt. If the level is low, refill up to the bottom of filler bolt.

T-type



(A) Filler plug
(B) Drain plug

VA-type



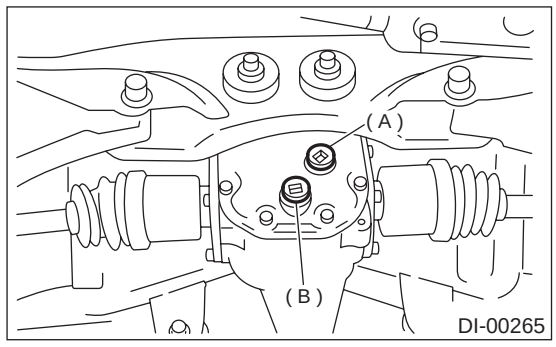
(A) Filler plug
(B) Drain plug

B: REPLACEMENT

1) Disconnect ground cable from battery.
2) Jack-up vehicle and support it with sturdy racks.
3) Remove the oil drain plug and filler plug, and drain the gear oil.

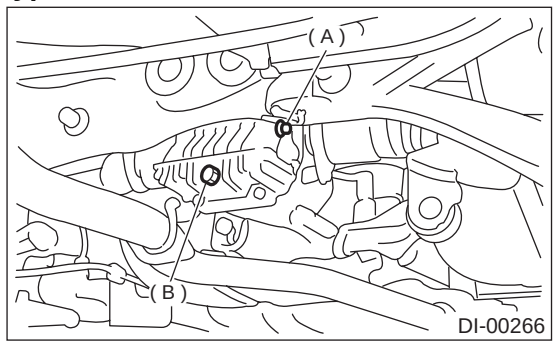
CAUTION:
Be careful not to burn your hands, because gear oil becomes extremely hot after running.

T-type



(A) Filler plug
(B) Drain plug

VA-type



(A) Filler plug
(B) Drain plug

4) Tighten oil drain plug.

NOTE:
- Apply fluid packing to drain plug in T-type.
- VA-type uses a new aluminum gasket.

Fluid packing:
THREE BOND 1105 (Part No.: 004403010) or equivalent

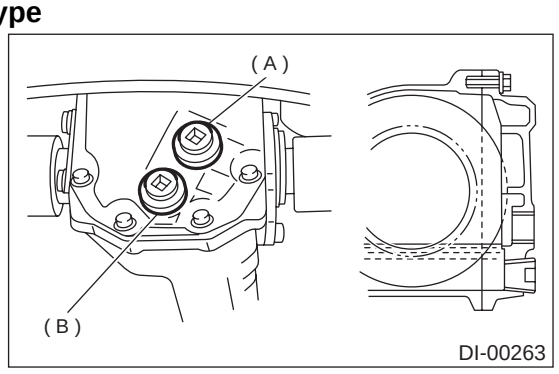
Tightening torque:
T-type;
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type;
34 N·m (3.5 kgf-m, 25.3 ft-lb)

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

CAUTION:
Carefully refill oil while watching the level. Excess or insufficient oil must be avoided.

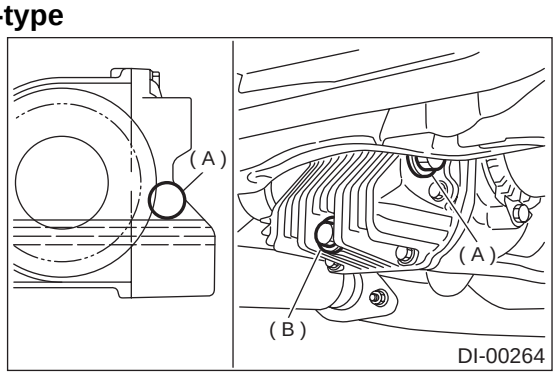
Oil capacity:
T-type;
0.8 ℓ (0.8 US qt, 0.7 Imp qt)
VA-type;
0.9 ℓ (1.0 US qt, 0.81Imp qt)

T-type



(A) Filler plug
(B) Drain plug

VA-type



(A) Filler plug
(B) Drain plug

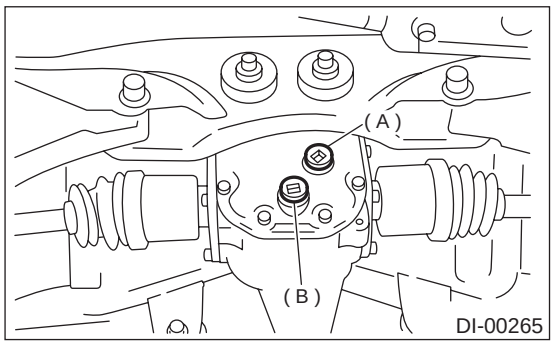
6) Install filler plug.

NOTE:
- Apply fluid packing to filler plug in T-type.
- VA-type uses a new aluminum gasket.

Fluid packing:
THREE BOND 1105 (Part No.: 004403010) or equivalent

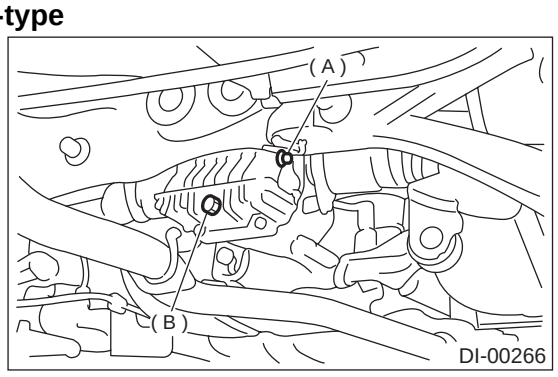
Tightening torque:
T-type;
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type;
34 N·m (3.5 kgf-m, 25.3 ft-lb)

T-type



(A) Filler plug
(B) Drain plug

VA-type



(A) Filler plug
(B) Drain plug

3. Front Differential

A: NOTE

1. AT MODEL

For front differential of automatic transmission, refer to "AT" section. <Ref. to AT-123, Front Differential.>

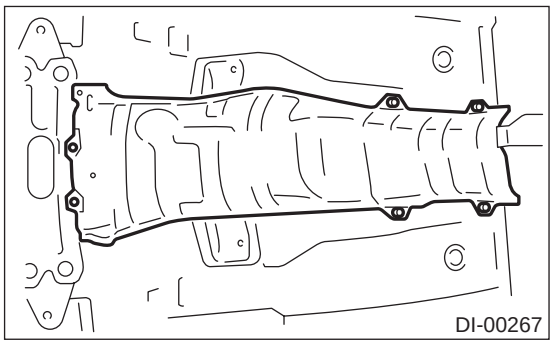
2. MT MODEL

For front differential of manual transmission, refer to “MT” section. <Ref. to MT-67, Front Differential Assembly.>

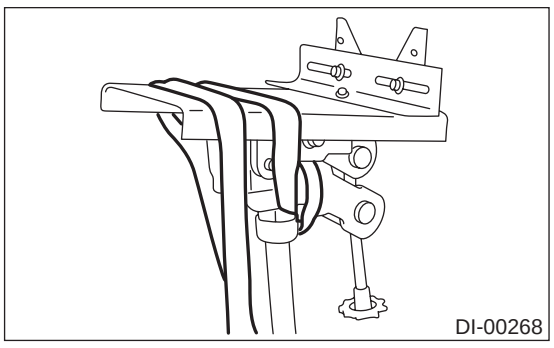
4. Rear Differential for T-type

A: REMOVAL

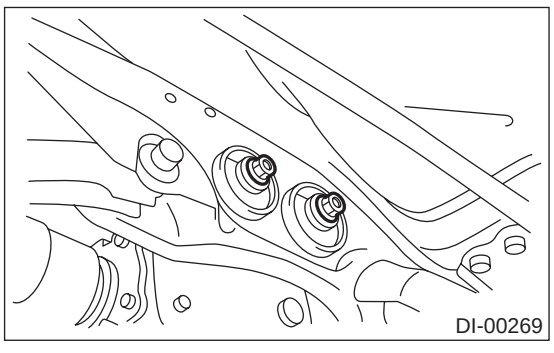
1) Disconnect ground cable from battery.
2) Move select lever or gear shift lever to “N”.
3) Loosen wheel nuts.
4) Release the parking brake.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
8) Remove heat shield cover.


DI-00267

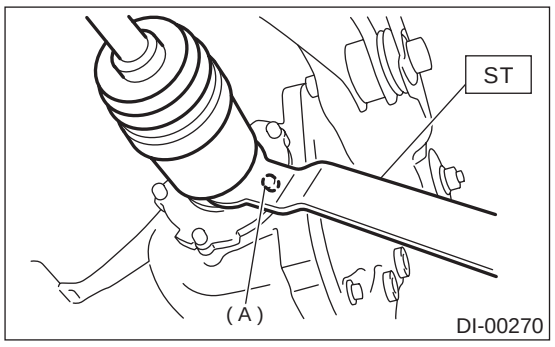
9) Remove propeller shaft.
<Ref. to DS-14, REMOVAL, Propeller Shaft.>
10) Remove rear differential protector (if equipped).
11) Prepare a transmission jack and a band.


DI-00268

12) Loosen self-locking nuts connecting rear differential to rear crossmember.


DI-00269

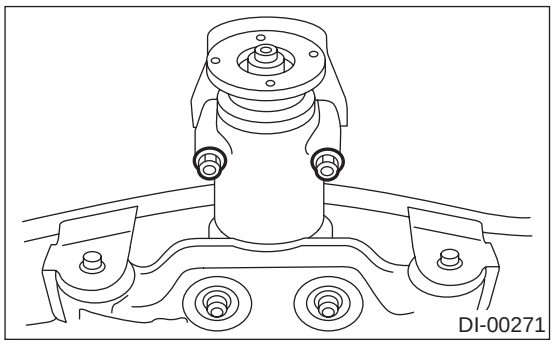
13) Remove DOJ of rear drive shaft from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER



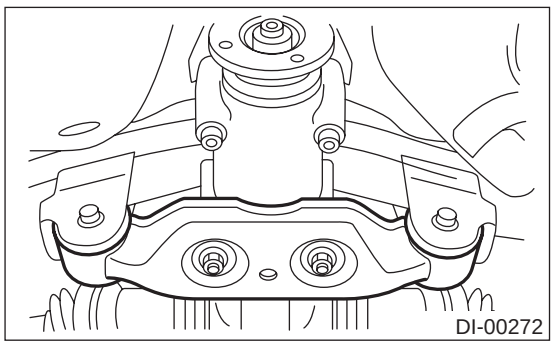
DI-00270

(A) Bolt

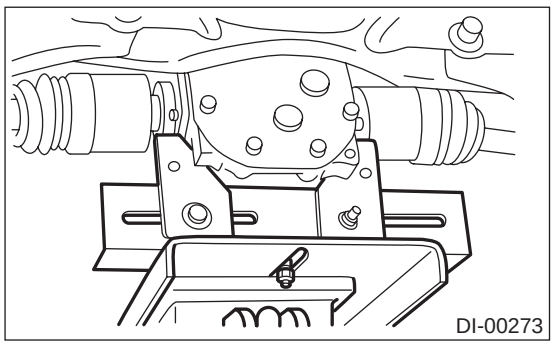
14) Remove protector nuts.


DI-00271

15) Remove rear differential front member.

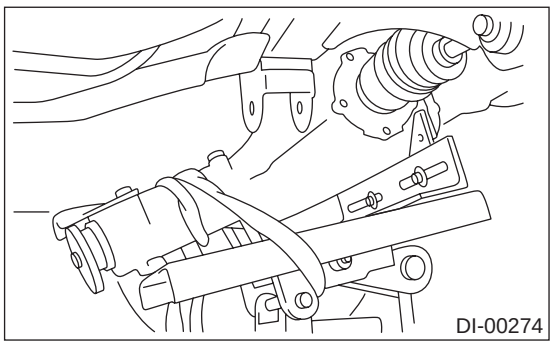

DI-00272

16) Support rear differential with transmission jack.

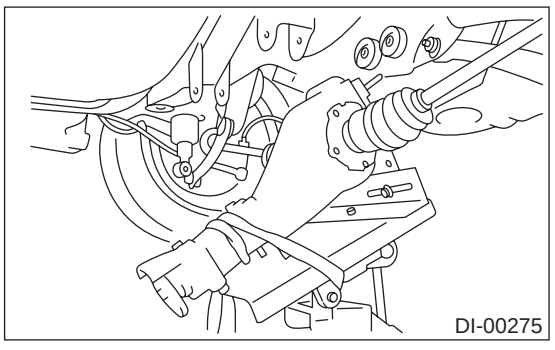

DI-00273

17) Be sure to secure differential to transmission jack by hand.
18) Remove self-locking nuts connecting rear differential to crossmember.
19) Remove rear differential stud bolt from rear crossmember bushing.

NOTE:
Carefully adjust angle and position of transmission jack and jack stand as required during stud bolt removal.


DI-00274

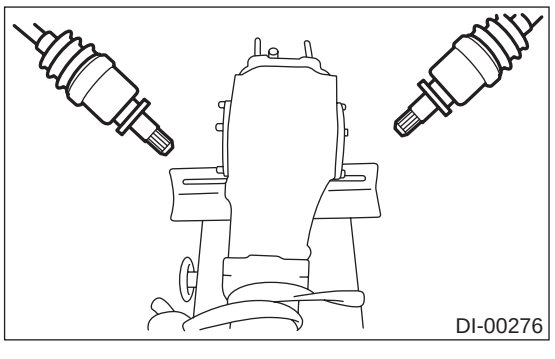
20) After removing rear differential stud bolt from rear crossmember, lower transmission jack stand. Do not allow rear drive shaft to strike lateral link bolt.


DI-00275

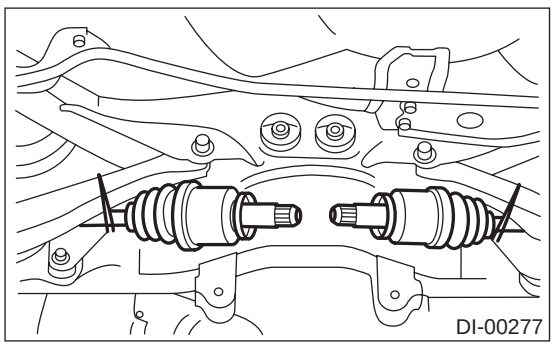
21) Pull out axle shaft from rear differential.

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

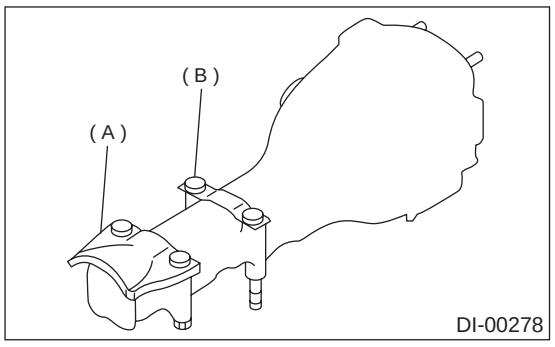
ST 28099PA100 DRIVE SHAFT REMOVER


DI-00276

22) Take down transmission jack.
23) Secure rear drive shaft to lateral link use wire.


DI-00277

24) Remove protector and rear differential member plate from rear differential.

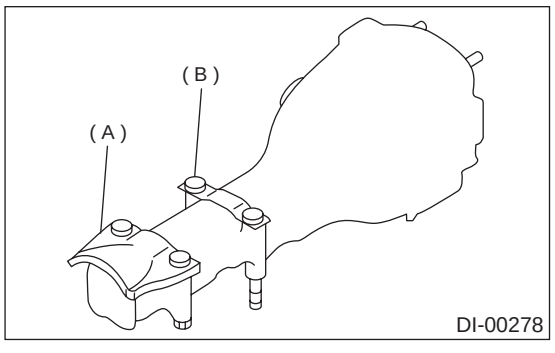


DI-00278

(A) Protector
(B) Rear differential member plate

B: INSTALLATION

1) Install protector and rear differential member plate to rear differential.



DI-00278

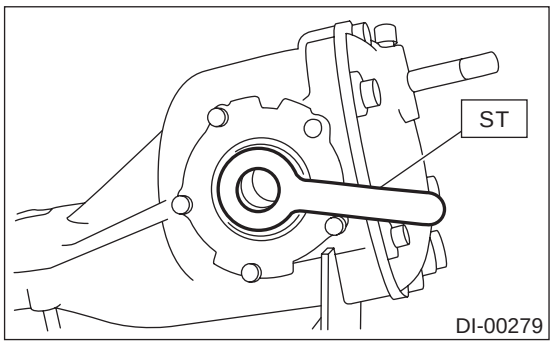
(A) Protector
(B) Rear differential member plate

2) Set rear differential to transmission jack.

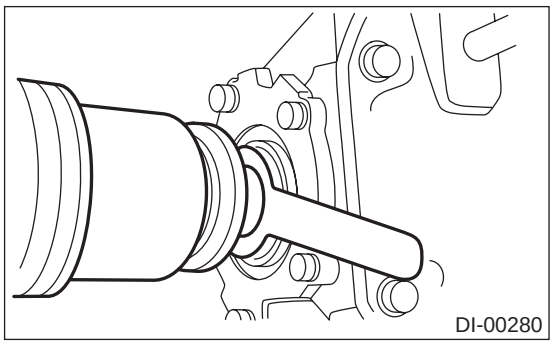
NOTE:
Secure rear differential to transmission jack using a band.

3) Install ST to rear differential.

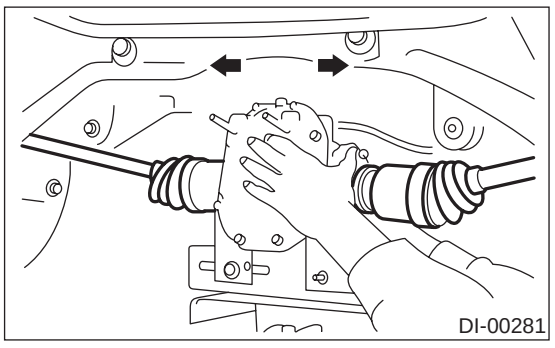
ST 28099PA090 OIL SEAL PROTECTOR



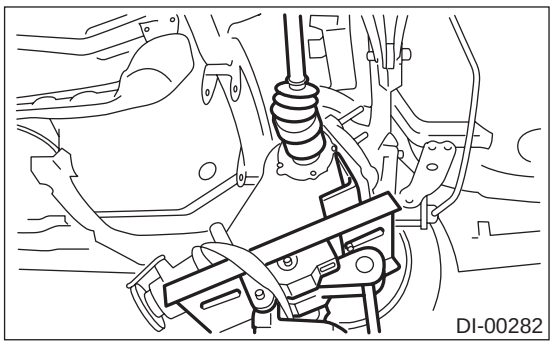
4) Insert the spline shaft until the spline portion is inside the side oil seal.



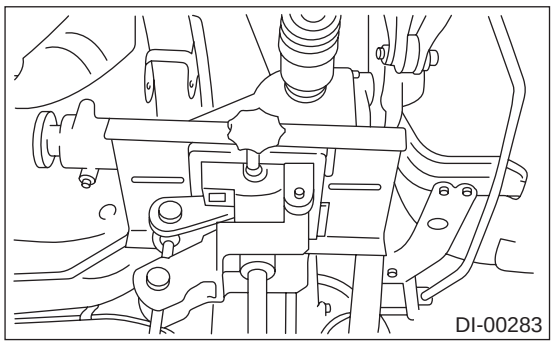
5) Remove ST from rear differential.
ST 28099PA090 OIL SEAL PROTECTOR
6) Completely insert axle shaft into rear differential by pressing rear differential.



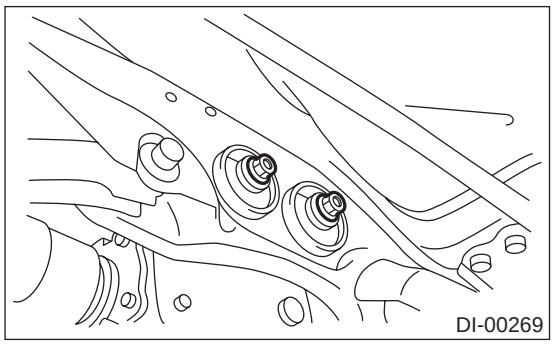
7) Adjust transmission jack as required so rear differential stud bolt is properly inserted into rear crossmember bushing.



8) After rear differential stud bolt has been inserted into rear crossmember bushing, raise transmission jack to make jack rear differential level.

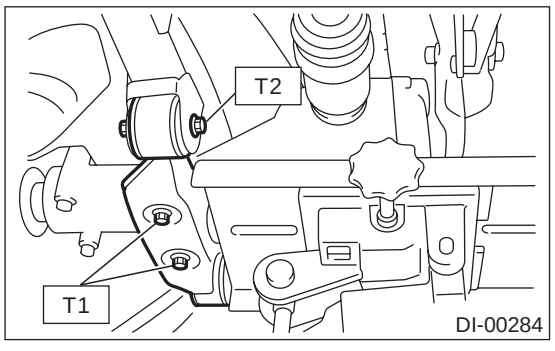


9) Temporarily tighten rear crossmember self-locking nuts.



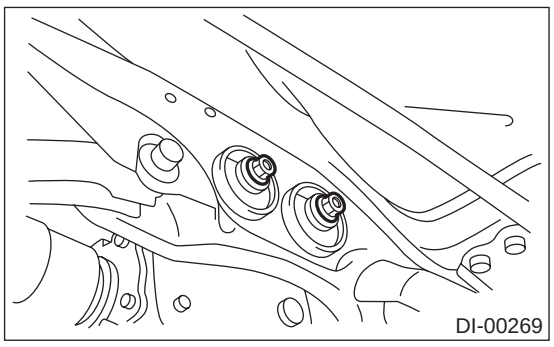
10) Remove band from rear differential. Raise rear differential just enough to move transmission jack away from it.
11) Install rear differential front member.

Tightening torque:
T1: 65 N·m (6.6 kgf-m, 48 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



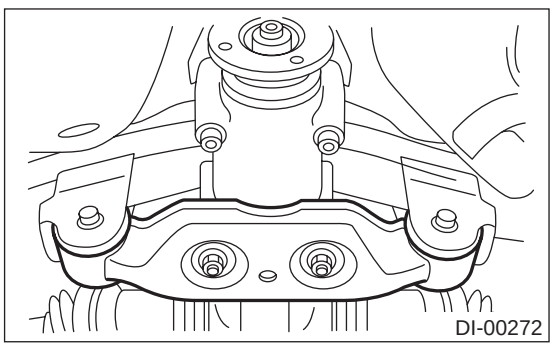
12) Tighten self-locking nuts.

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



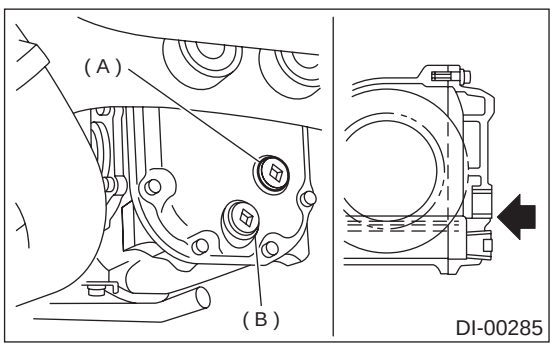
13) Tighten protector nut.

Tightening torque:
65 N·m (6.6 kgf-m, 48.0 ft-lb)



14) Take down transmission jack.
15) Install propeller shaft.
<Ref. to DS-15, INSTALLATION, Propeller Shaft.>
16) Install heat shield cover.
17) Install rear exhaust pipe and muffler.
18) After installing rear differential carrier on vehicle, remove filler plug and replenish gear oil up to upper level mark.

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



(A) Filler plug
(B) Drain plug

19) Tighten filler plug.

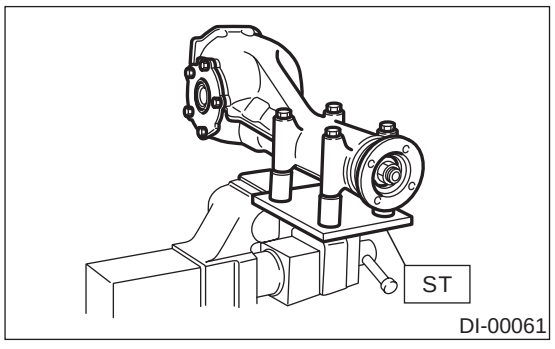
NOTE:
Apply fluid packing to plug.

Fluid packing:
THREE BOND 1105 (Part No. 04403010) or equivalent

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

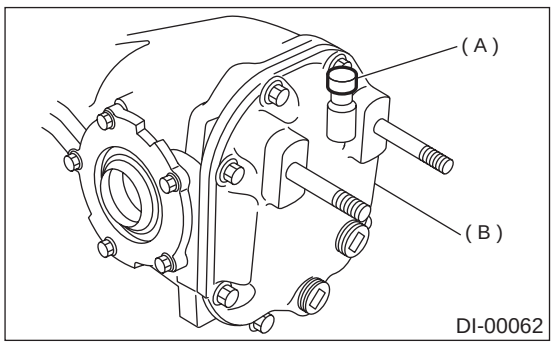
C: DISASSEMBLY

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



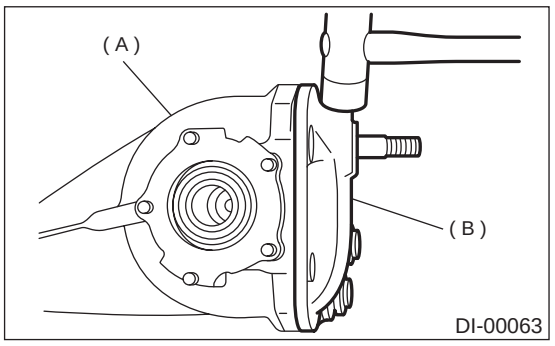
2) Drain gear oil by removing plug.
3) Remove the air breather cap.

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



(A) Air breather cap
(B) Rear cover

4) Remove rear cover by loosening bolts.

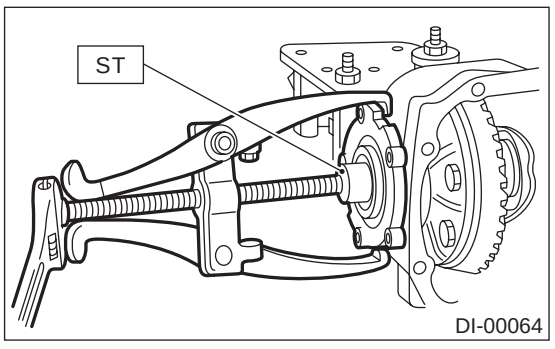


(A) Rear cover
(B) Differential carrier

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

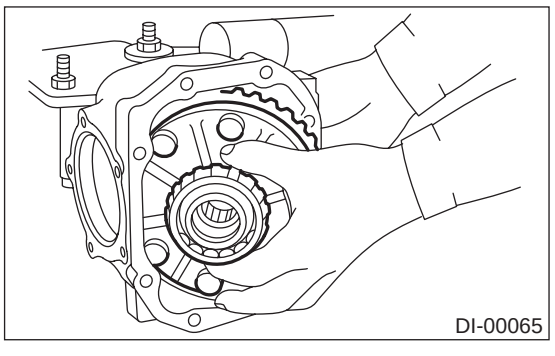
NOTE:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

ST 398457700 ATTACHMENT



6) Pull out differential case assembly from differential carrier.

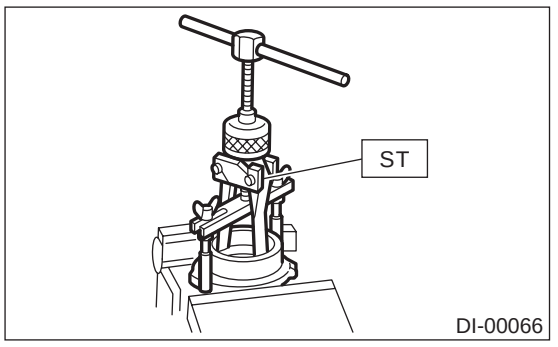
CAUTION:
Be careful not to hit the teeth against the case.



7) Remove O-ring from side bearing retainer.
8) Remove oil seal from side bearing retainer.

9) Pull bearing cup from side bearing retainer using ST.

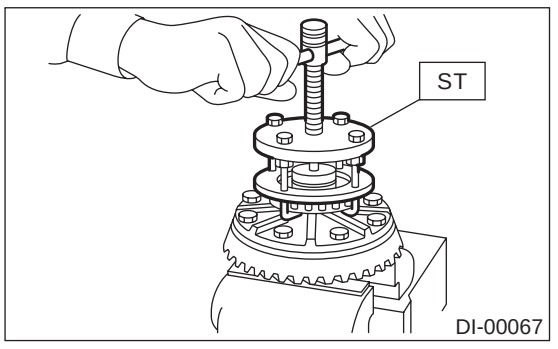
ST 398527700 PULLER ASSY



10) Extract bearing cone with ST.

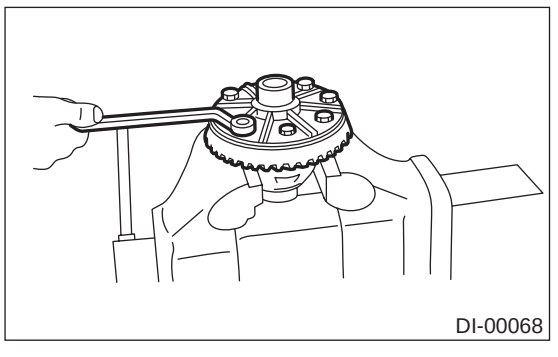
NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set puller so that its claws catch the edge of the bearing cone.
• Never mix up the right and left hand bearing races and cones.

ST 399527700 PULLER SET



11) Remove crown gear by loosening crown gear bolts.

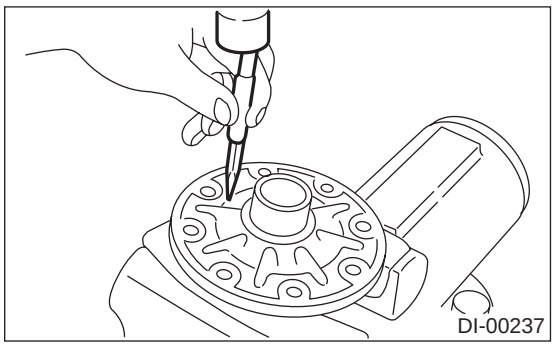
NOTE:
Further disassembling is not allowed.



12) Drive out pinion shaft lock pin from crown gear side. (Without LSD)

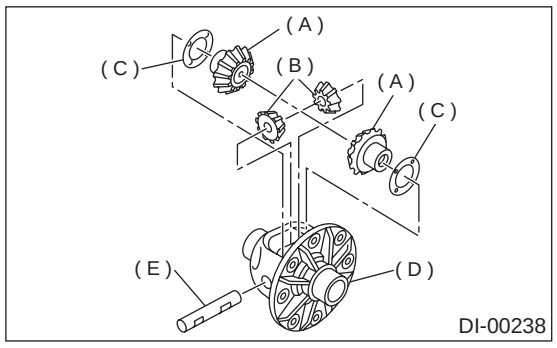
NOTE:
The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.

ST 899904100 STRAIGHT PIN REMOVER



13) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Without LSD)

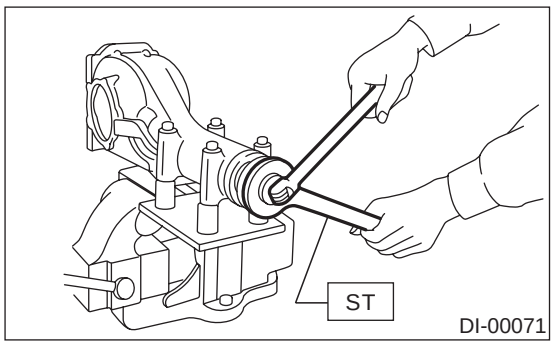
NOTE:
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



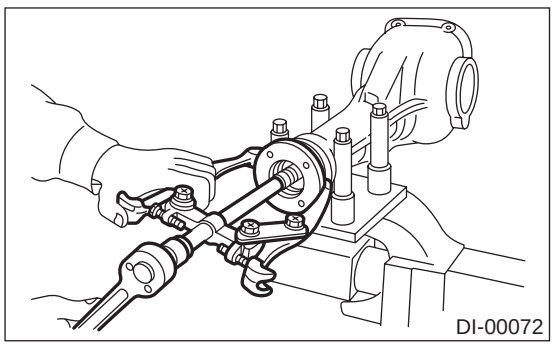
(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

14) Hold companion flange with ST and remove drive pinion nut.

ST 498427200 FLANGE WRENCH



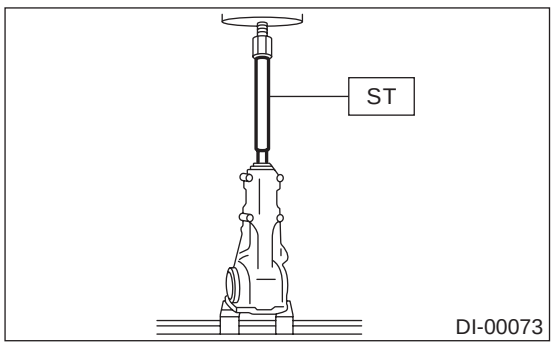
15) Extract the companion flange with a puller.



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

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

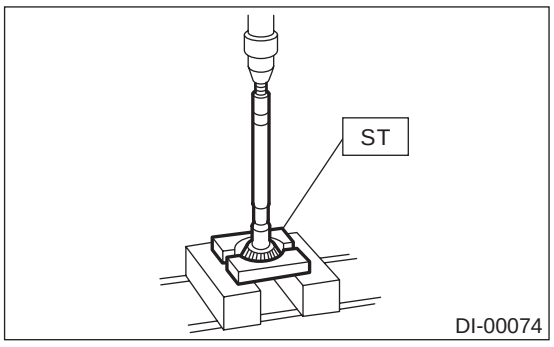
ST 398467700 DRIFT



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

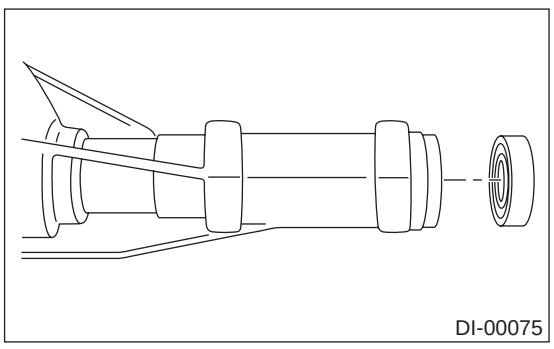
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



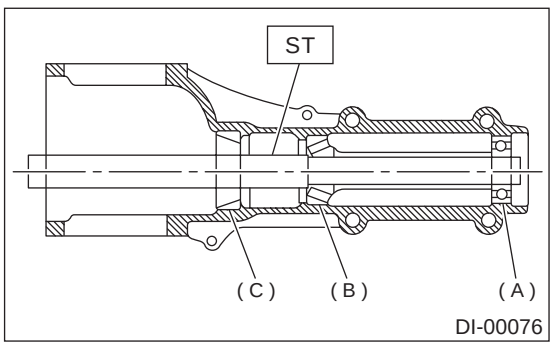
18) Remove front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



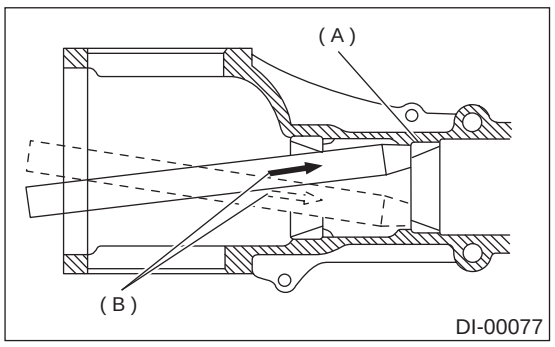
19) Remove pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT



(A) Pinion bearing
(B) Front bearing
(C) Rear bearing cup

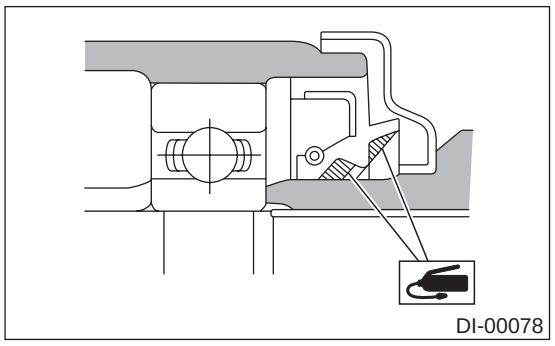
20) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.



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

D: ASSEMBLY

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

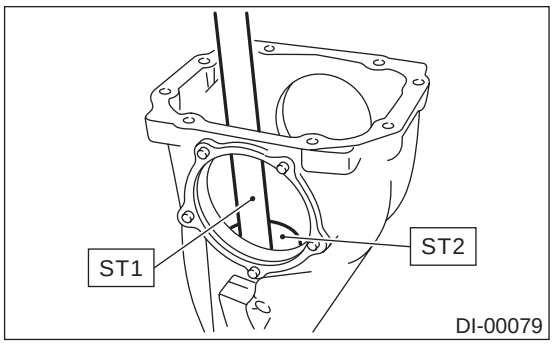


- Use new O-ring and gasket.

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

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

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



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

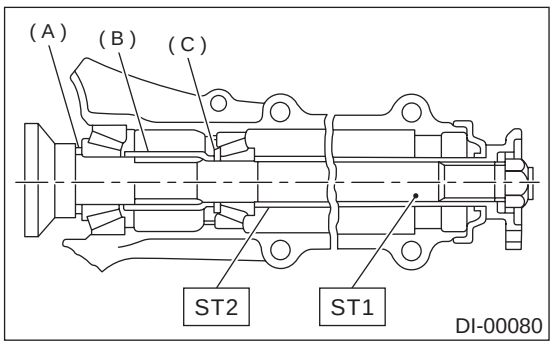
ST1 398477701 HANDLE
ST2 398477702 DRIFT

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

NOTE:
If no deformation is found in pre-disassembly inspection, re-use the used washer if not deformed.

(4) Then install preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



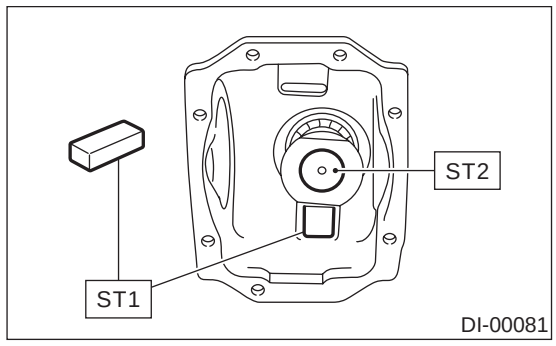
(A) Pinion height adjusting shim
(B) Preload adjusting spacer
(C) Preload adjusting washer

(5) Turn ST1 with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

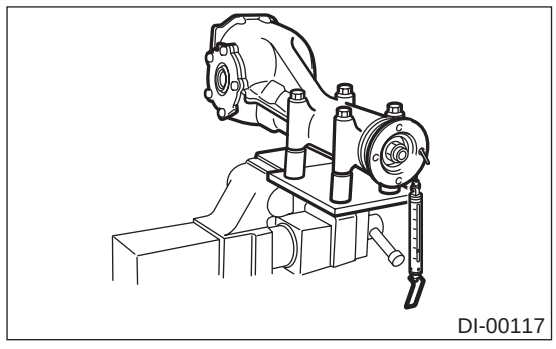
NOTE:
- Use a new lock nut.
- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST2 with ST1 as shown in the figure.

ST1 398507704 BLOCK
ST2 398507702 DUMMY SHAFT

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



Front and rear bearing preload
For new bearing: 19.6 — 28.4 N (2.0 — 2.9 kgf, 4.4 — 6.4 lb) at companion flange bolt hole
For used bearing: 8.34 — 16.67 N (0.85 — 1.7 kgf, 1.87 — 3.75 lb) at companion flange bolt hole



	Part No.	Thickness mm (in)
Preload adjusting washer	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
	Part No.	Length mm (in)
Preload adjusting spacer	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)

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

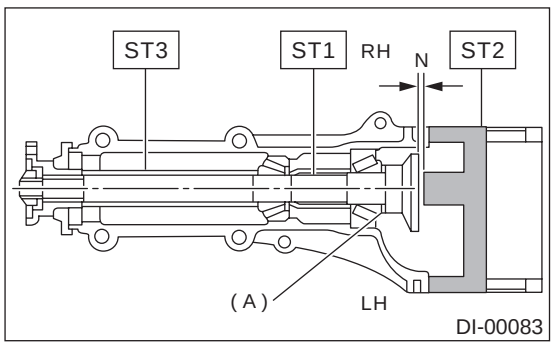
(1) Before this step, adjustment of pinion bearing preload must be completed for ST1, ST2 and ST3.

Front and rear bearing preload
For new bearing: 19.6 — 28.4 N (2.0 — 2.9 kgf, 4.4 — 6.4 lb) at companion flange bolt hole
For used bearing: 8.34 — 16.67 N (0.85 — 1.7 kgf, 1.87 — 3.75 lb) at companion flange bolt hole

Adjusting preload for front and rear bearings

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

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

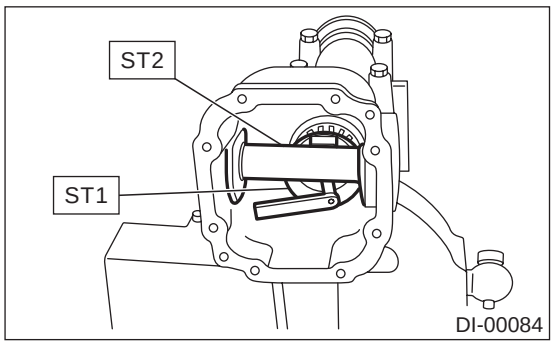


(A) Pinion height adjusting shim

(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 shim to be inserted from the following formula, and replace the temporarily installed shim with this one.

T = To + N – (H x 0.01) – 0.20 mm (0.0079 in)

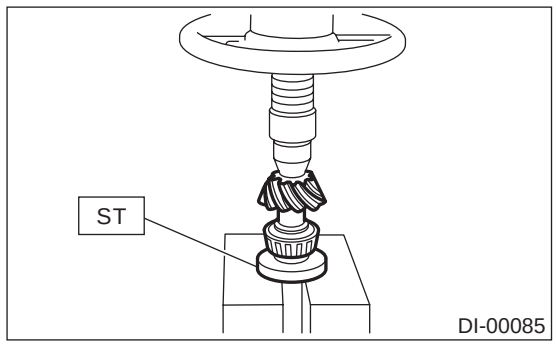
NOTE:
Use copies of this page.

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

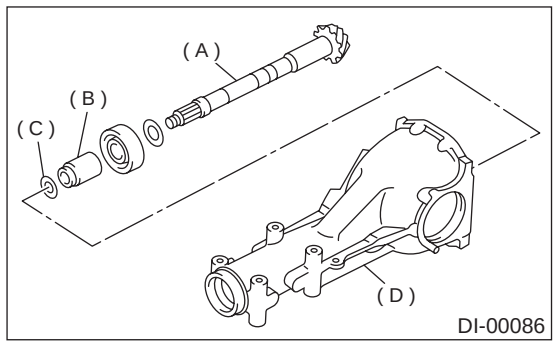
(Example of calculation)
To = 2.20 + 1.20 = 3.40 mm
N = 0.23 mm
H = + 1
T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42
Result: Thickness = 3.42 mm
Therefore use the shim 383605200.

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

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

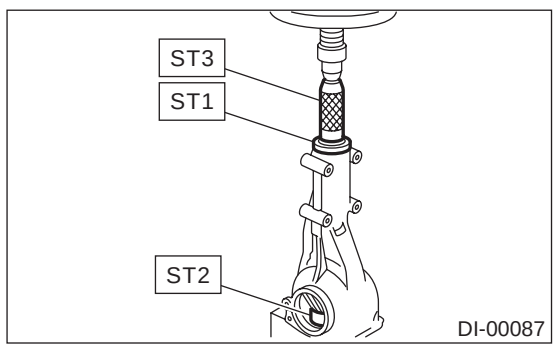


4) Insert drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.

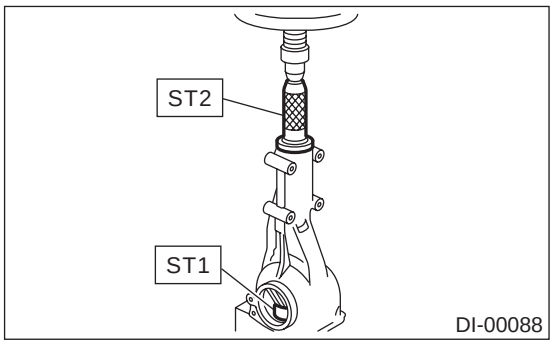


(A) Drive pinion
(B) Bearing adjusting spacer
(C) Washer
(D) Differential carrier

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

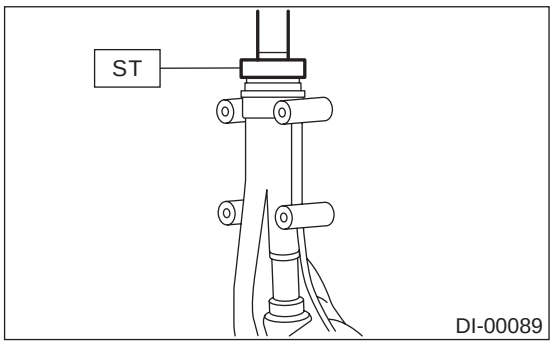


6) Insert spacer, then press-fit pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



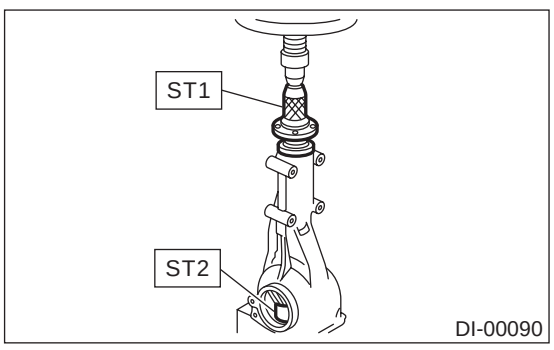
7) Fit a new oil seal with ST.

NOTE:
• Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease between the oil seal lips.
ST 498447120 OIL SEAL INSTALLER



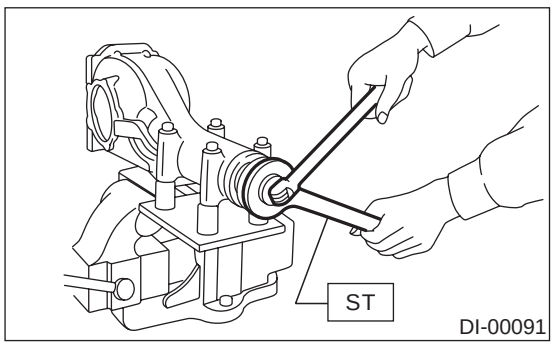
8) Press-fit companion flange with ST1 and ST2.

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



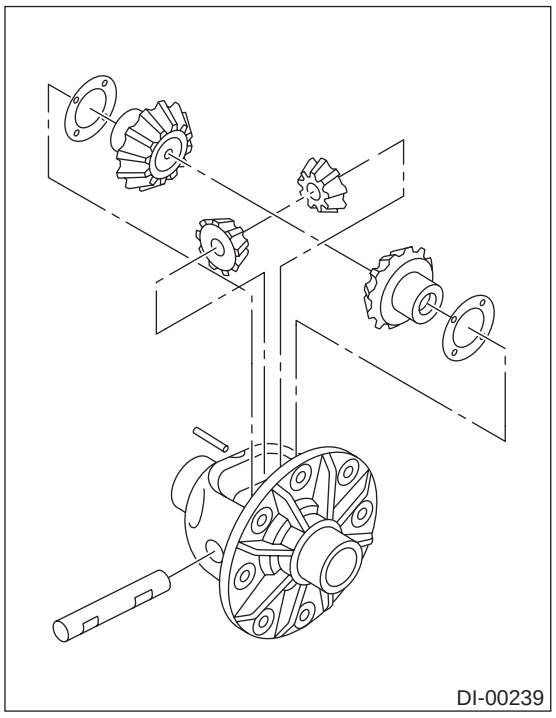
9) Install new self-locking nut. Then fix and tighten companion flange with ST.
ST 498427200 FLANGE WRENCH

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



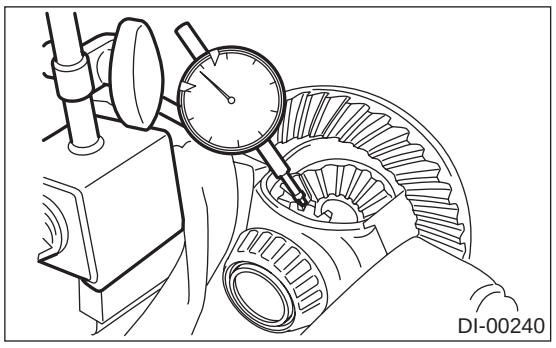
10) Assembling differential case
Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

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



(1) Measure the side gear backlash.

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



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

Side gear thrust washer	
Part No.	Thickness mm (in)
383445201	0.75 — 0.80 (0.0295 — 0.0315)
383445202	0.80 — 0.85 (0.0315 — 0.0335)
383445203	0.85 — 0.90 (0.0335 — 0.0354)
383445204	0.90 — 0.95 (0.0354 — 0.0374)
383445205	0.95 — 1.00 (0.0374 — 0.0394)

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

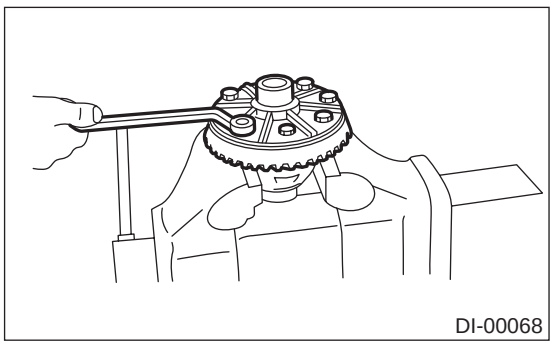
11) Install crown gear on differential case.

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

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

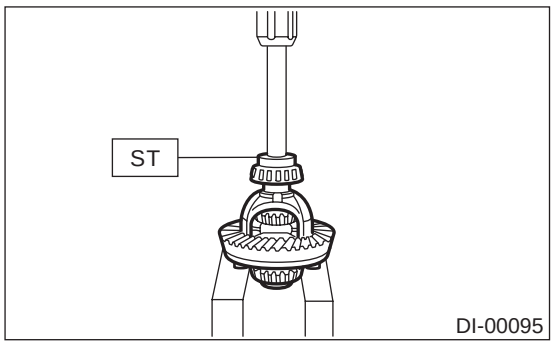
• Tighten diagonally while tapping the bolt heads.

Tightening torque:
103 N·m (10.5 kgf-m, 76 ft-lb)



12) Press side bearing onto differential case with ST.
ST 398237700 DRIFT

NOTE:
When replacing bearing cone, replace it with bearing cap as a set.



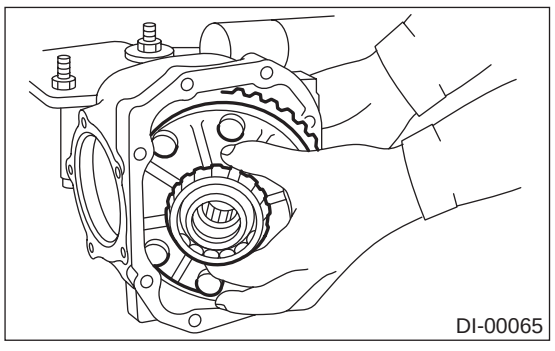
13) Install bearing cup to side bearing retainer.

NOTE:
• Press in while be careful not to scratch bearing cup and side bearing retainer.
• When replacing bearing cup, replace it with bearing cone as a set.

14) Using ST, press in new oil seal to side bearing retainer.
ST 398437700 DRIFT

NOTE:
Apply thin oil gear oil on the mating surface of side bearing retainer and oil seal.

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



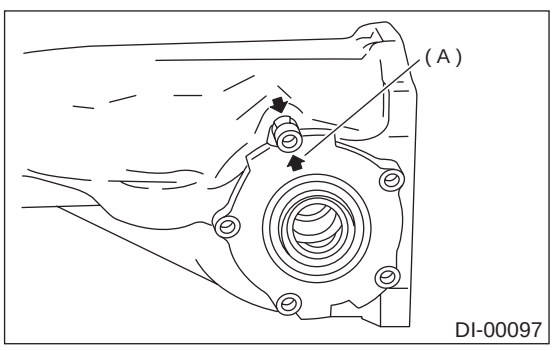
(3) Install side retainer shims to the left and right retainers from which they were removed.

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

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

(4) Align arrow marked on differential carrier with that marked on side retainer during installation.

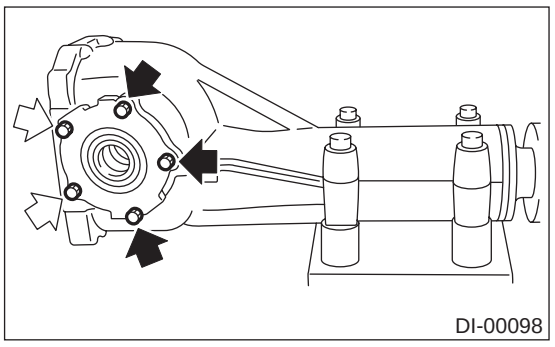
NOTE:
Be careful that side bearing outer race is not damaged by bearing roller.



(A) Arrow mark

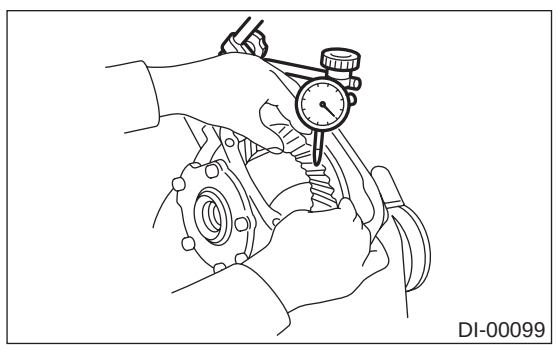
(5) Tighten side bearing retainer bolts.

Tightening torque:
10.5 N·m (1.07 kgf-m, 7.7 ft-lb)



(6) Measure the crown gear-to-drive pinion backlash. Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.
If the measured backlash is not within the specified range, adjust side bearing retainer shims as follows:
Backlash is over 0.2 mm (0.008 in):
Reduce the shim thickness of crown gear backside and increase crown gear tooth-side.
Backlash is less than 0.1 mm (0.004 in):
Increase the shim thickness of crown gear backside and reduce crown gear tooth-side.

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

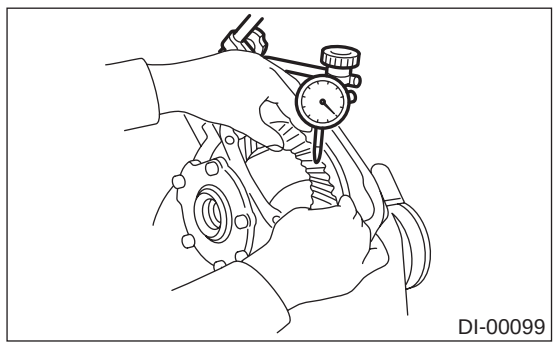


(7) At the same time, measure the turning resistance of drive pinion. Compare with the resistance when differential case is not installed, if the increase of the resistance is not within the specified range, adjust thickness of side bearing retainer shims so that the back- and tooth-sides are the same thickness.

Turning resistance increase:
2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

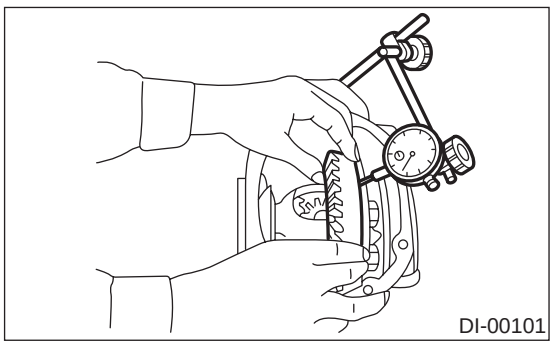
16) Re-check crown gear-to-pinion backlash.

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



17) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotate smoothly.

Limit of runout:
Less than 0.05 mm (0.0020 in)

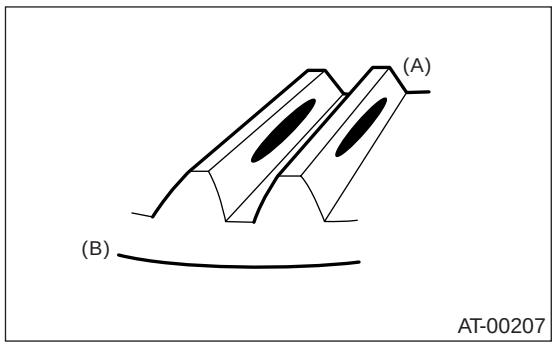

DI-00101

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

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

- Correct tooth contact

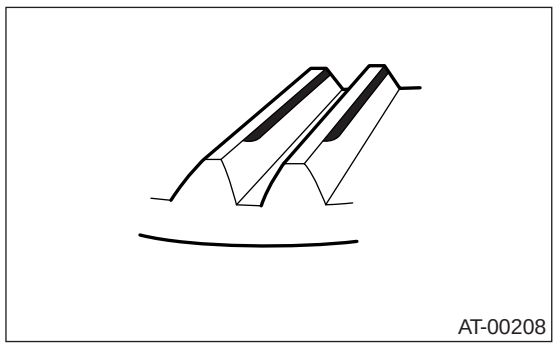
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)



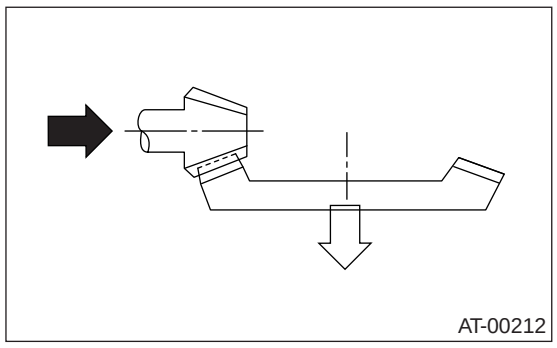
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

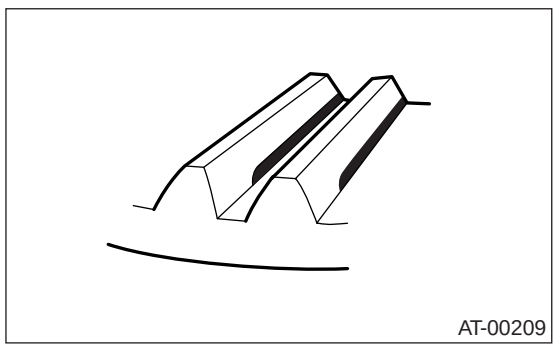

AT-00208

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

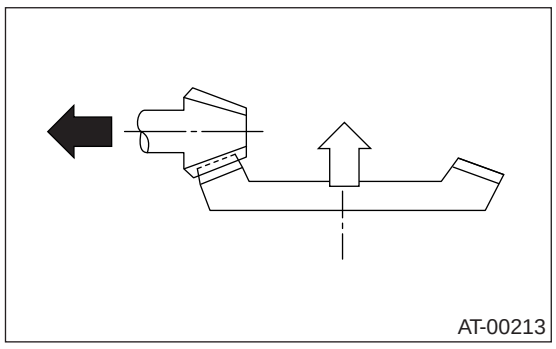

AT-00212

- Flank contact

Checking item: Backlash is too small.
Contact pattern

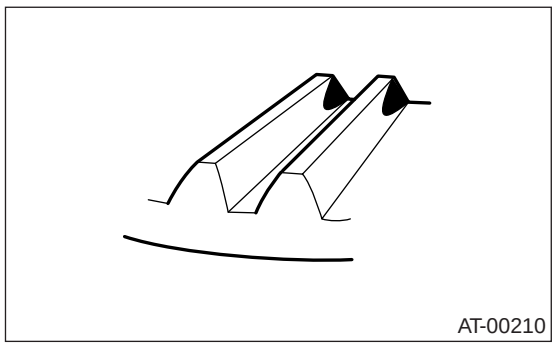

AT-00209

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

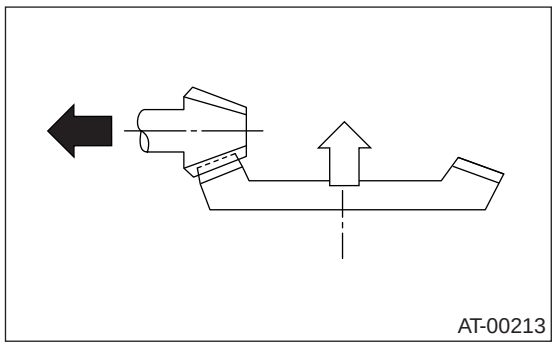


- Toe contact (Inside end contact)

Checking item: Contact area is small.
Contact pattern

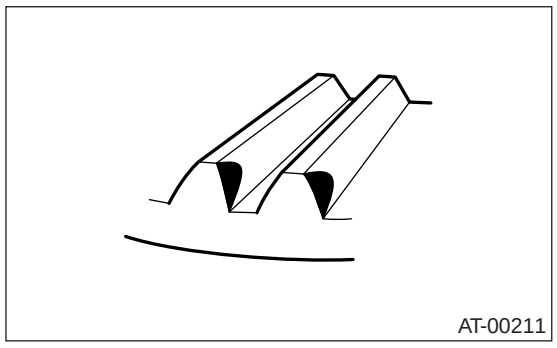


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

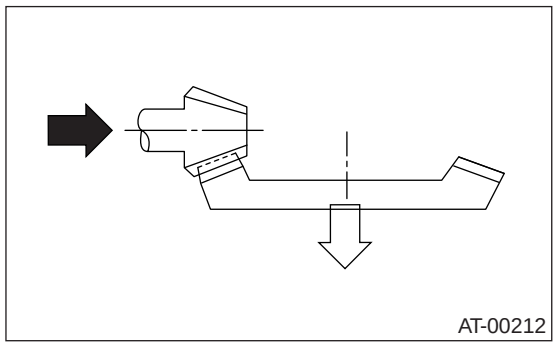


- Heel contact (Outside end contact)

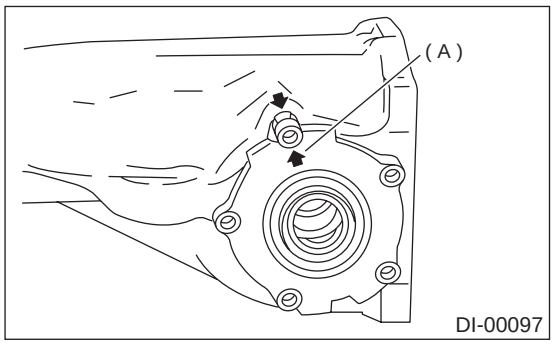
Checking item: Contact area is small.
Contact pattern



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



19) If proper tooth contact is not obtained, once again adjust the drive pinion height changing RH and LH side bearing retainer shims and the hypoid gear backlash.
20) Remove left and right side bearings.
21) Install left and right side bearing retainer, O-rings and side retainer shims.
22) Align the arrow mark on differential carrier with the mark on side retainer during installation.

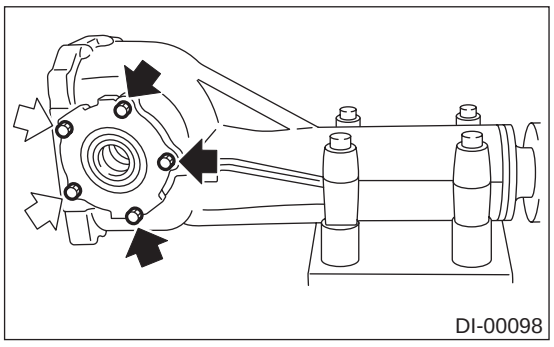


(A) Arrow mark

23) Tighten the side bearing retainer bolts.

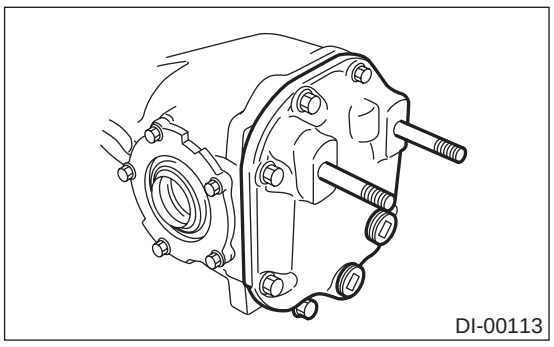
Lock Tite:
THREE BOND 1105 (Part No. 004403010) or equivalent

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


DI-00098

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

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


DI-00113

E: INSPECTION

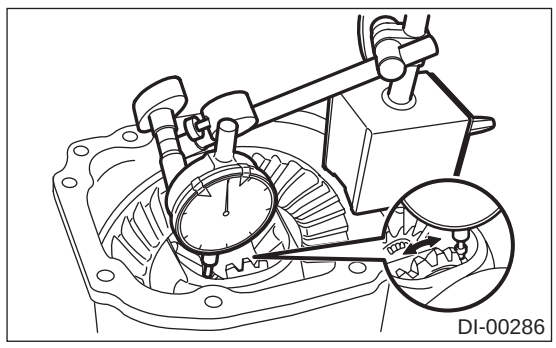
Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.
1) Crown gear and drive pinion
• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear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

1. SIDE GEAR BACKLASH

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

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

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

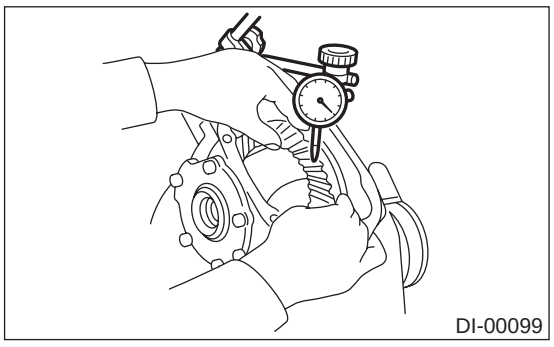

DI-00286

2. CROWN GEAR BACKLASH

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

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

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

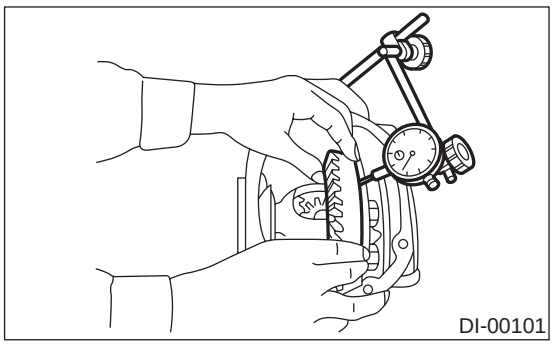

DI-00099

3. CROWN GEAR RUNOUT

Using a dial gauge, check the crown gear runout.

Crown gear runout:
Less than 0.05 mm (0.0020 in)

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


DI-00101

4. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

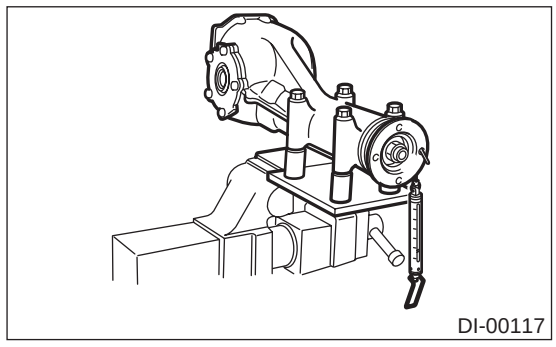
Inspect tooth contact between crown gear and driven pinion. <Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Turning resistance increase:
2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

If the increase of the resistance is not within the specification, adjust the side bearing retainer shims.


DI-00117

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust side gear backlash.
<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

2. CROWN GEAR BACKLASH

Adjust crown gear backlash.
<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear.
<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

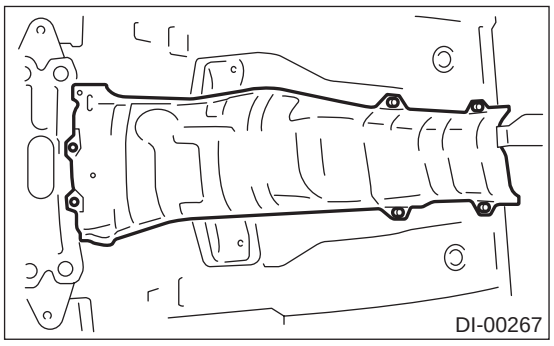
4. TOTAL PRELOAD

Adjust side bearing shim.
<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

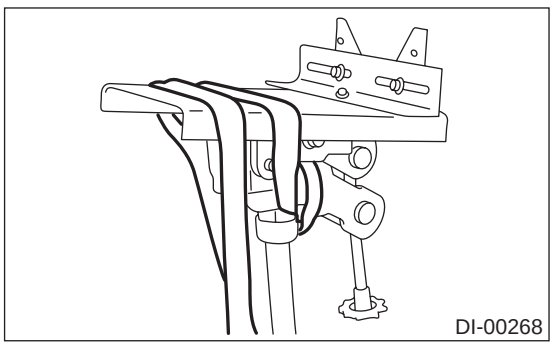
5. Rear Differential for VA-type

A: REMOVAL

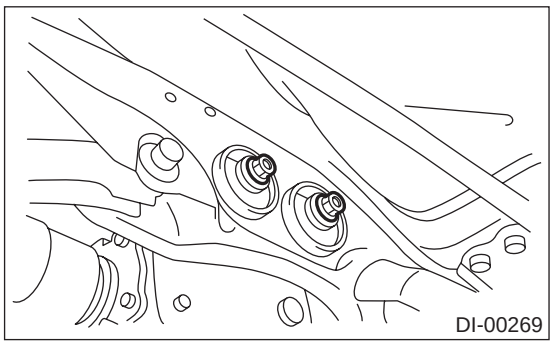
1) Disconnect ground cable from battery.
2) Move select lever or gear shift lever to “N”.
3) Loosen wheel nuts.
4) Release the parking brake.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
8) Remove heat shield cover.


DI-00267

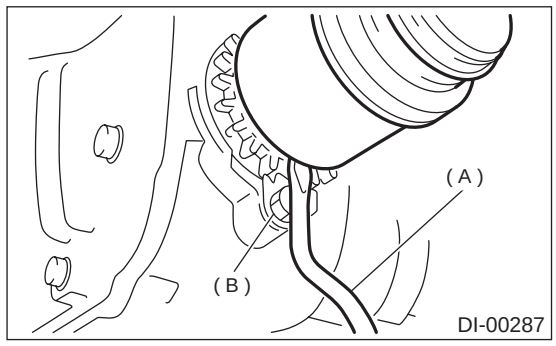
9) Remove propeller shaft.
<Ref. to DS-14, REMOVAL, Propeller Shaft.>
10) Prepare a transmission jack and a band.


DI-00268

11) Loosen self-locking nuts connecting rear differential to rear crossmember.


DI-00269

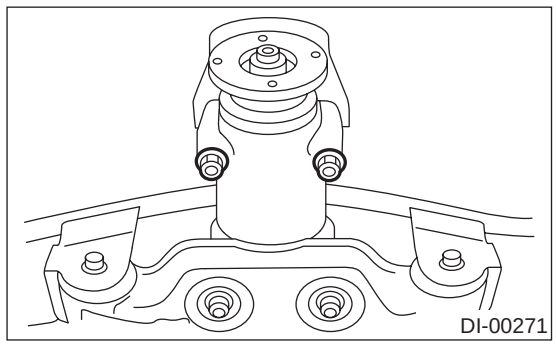
12) Remove DOJ of rear drive shaft from rear differential.



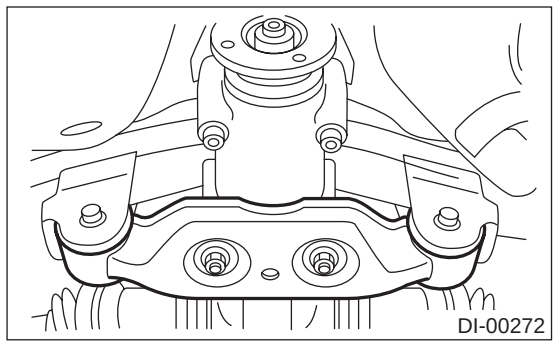
DI-00287

(A) Tire lever
(B) Bolt

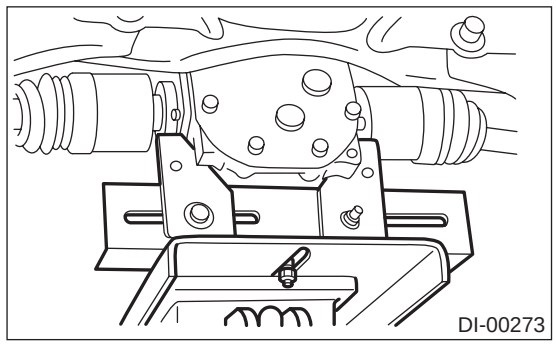
13) Remove protector nuts.


DI-00271

14) Remove nuts which secure rear differential front member.

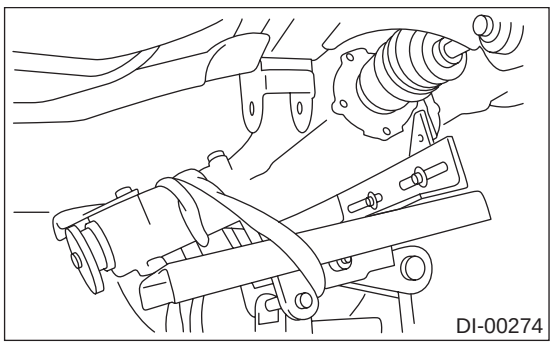

DI-00272

15) Support rear differential with transmission jack.

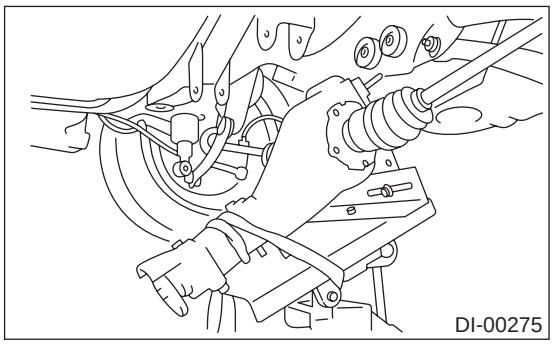

DI-00273

16) Remove rear differential front member.
17) Fix rear differential at band.
18) Remove self-locking nuts connecting rear differential to rear crossmember.
19) Remove rear differential stud bolt from rear crossmember bushing.

NOTE:
Carefully adjust angle and position of transmission jack and jack stand as required during stud bolt removal.

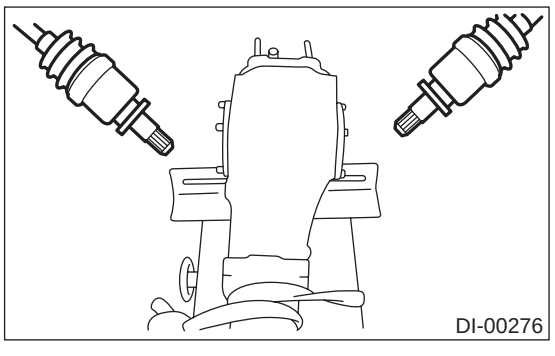

DI-00274

20) After removing rear differential stud bolt from rear crossmember, lower transmission jack stand. Do not allow rear drive shaft to strike lateral link bolt.

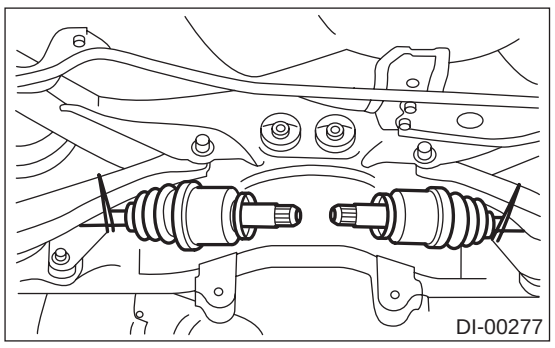

DI-00275

21) Pull out axle shaft from rear differential.

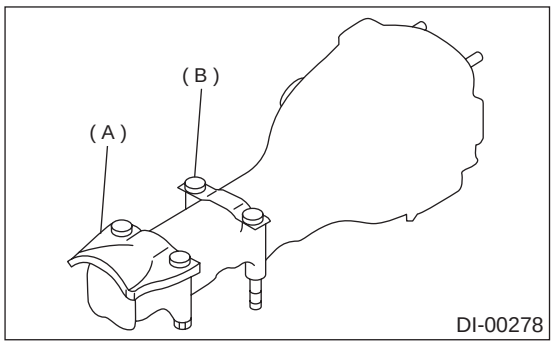
NOTE:
If axle shaft is difficult to remove from rear differential, use a tire lever to remove it.


DI-00276

22) Take down transmission jack.
23) Secure rear drive shaft to lateral link using wire.


DI-00277

24) Remove protector and rear differential member plate from rear differential.

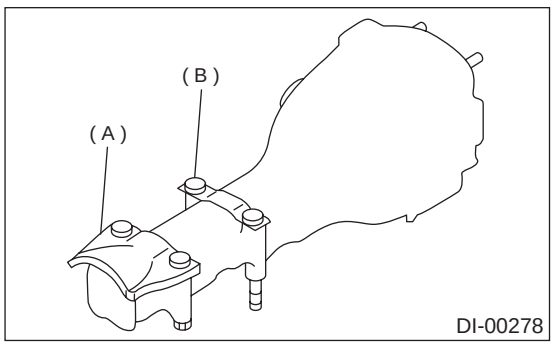


DI-00278

(A) Protector
(B) Rear differential member plate

B: INSTALLATION

1) Insert protector and plate to rear differential.



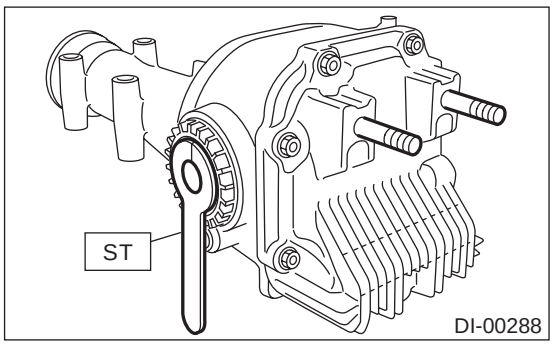
DI-00278

(A) Protector
(B) Rear differential member plate

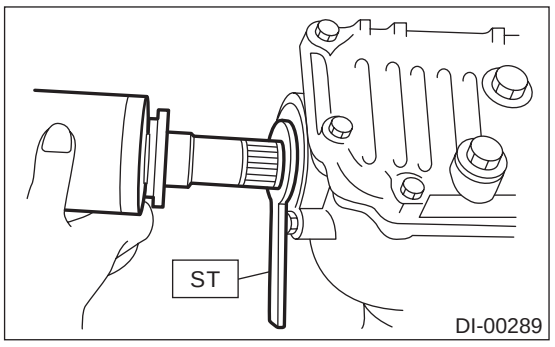
2) Set rear differential to transmission jack.

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

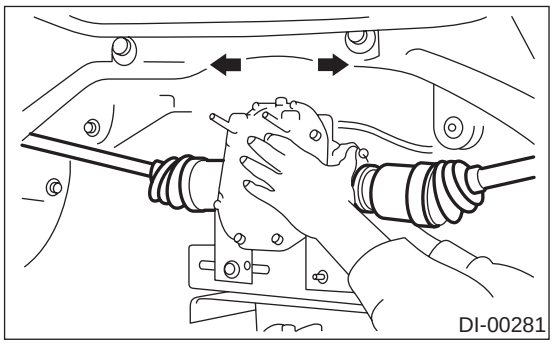
3) Install ST to rear differential.
ST 28099PA090 OIL SEAL PROTECTOR



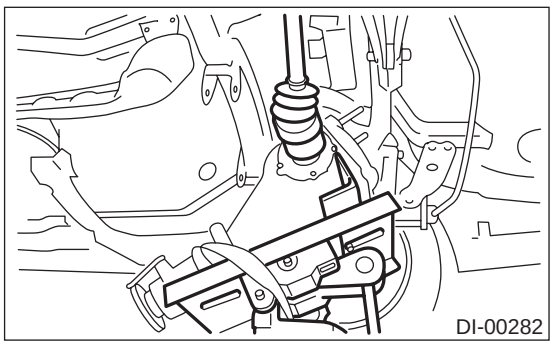
4) Insert the spline shaft until the spline portion is inside the side oil seal.



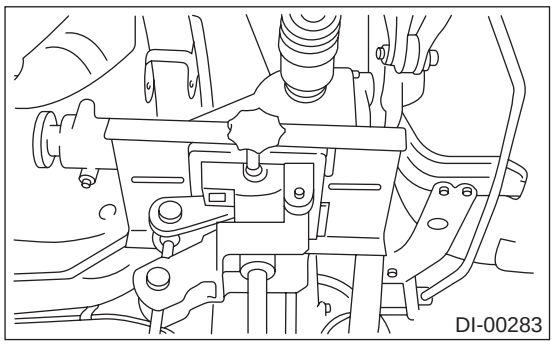
5) Remove ST from rear differential.
ST 28099PA090 OIL SEAL PROTECTOR
6) Completely insert axle shaft into rear differential by pressing rear differential.



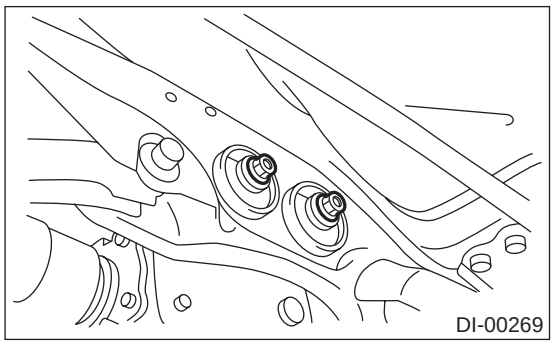
7) Adjust transmission jack as required so rear differential stud bolt is properly inserted into rear crossmember bushing.



8) After rear differential stud bolt has been inserted into rear crossmember bushing, raise transmission jack to make jack rear differential level.

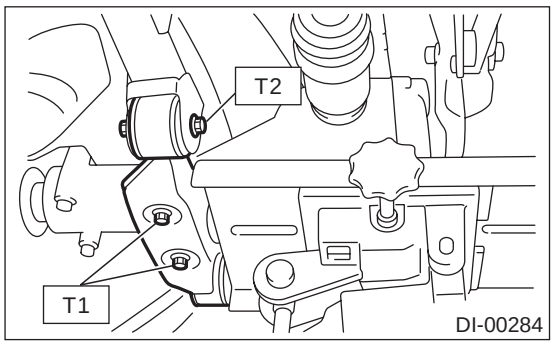


9) Temporarily tighten rear crossmember self-locking nuts.



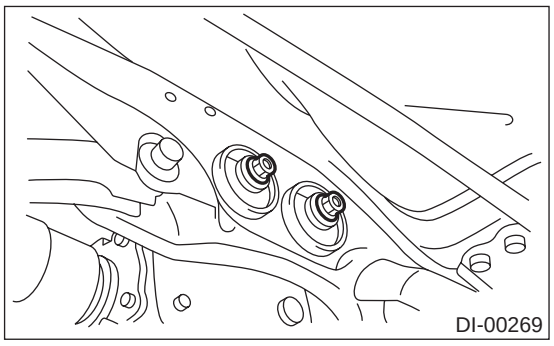
10) Remove band from rear differential. Raise rear differential just enough to move transmission jack away from it.
11) Install rear differential front member.

Tightening torque:
T1: 65 N·m (6.6 kgf-m, 48 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



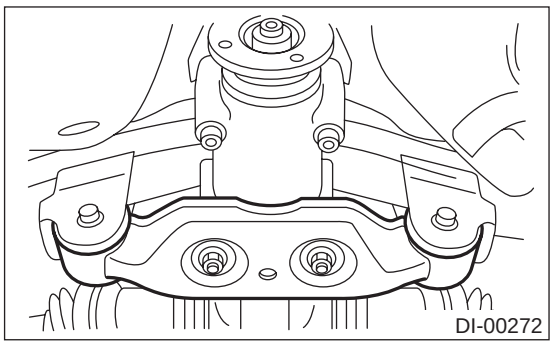
12) Tighten self-locking nuts.

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


DI-00269

13) Tighten protector nut.

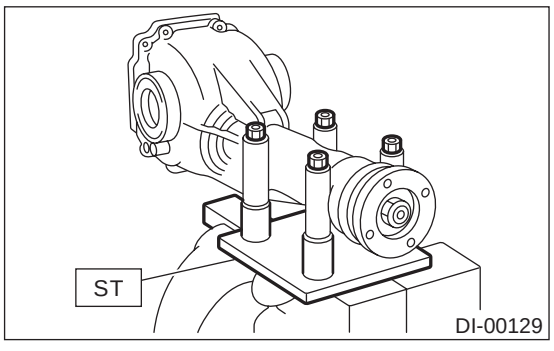
Tightening torque:
65 N·m (6.6 kgf-m, 48.0 ft-lb)


DI-00272

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

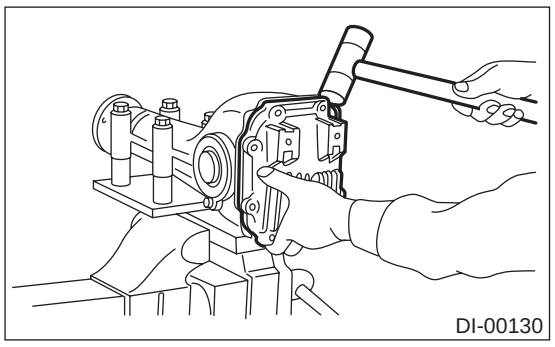
C: DISASSEMBLY

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



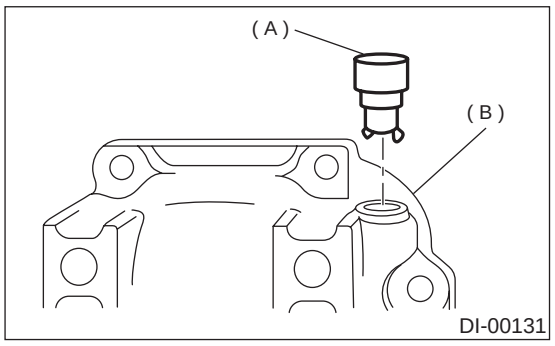
DI-00129

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


DI-00130

4) Replace air breather cap.

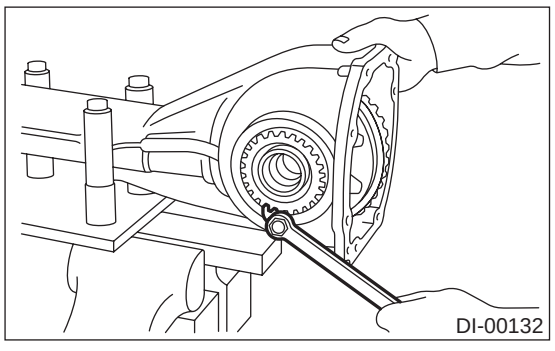
NOTE:
Do not attempt to replace the air breather cap unless necessary.



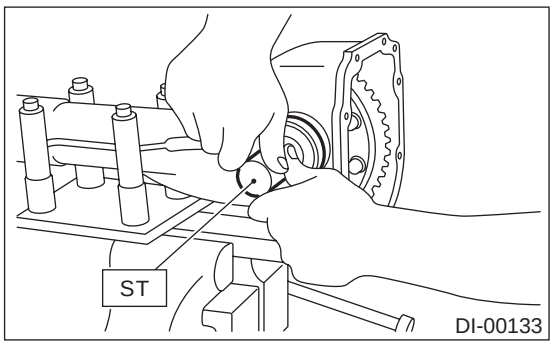
DI-00131

(A) Air breather cap
(B) Rear cover

5) Remove right and left lock plates.

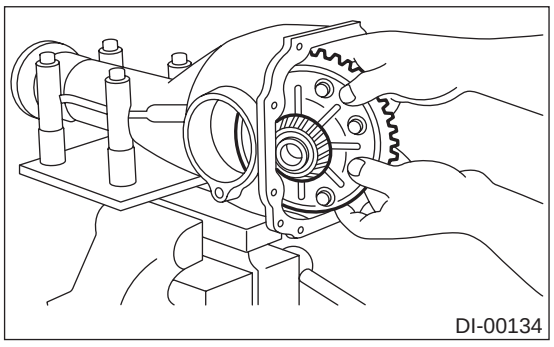

DI-00132

6) Remove right and left holders with ST.
ST 399780111 WRENCH

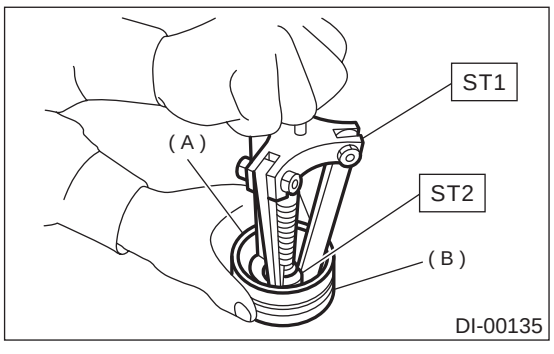


7) Pull out differential assembly from differential case.

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

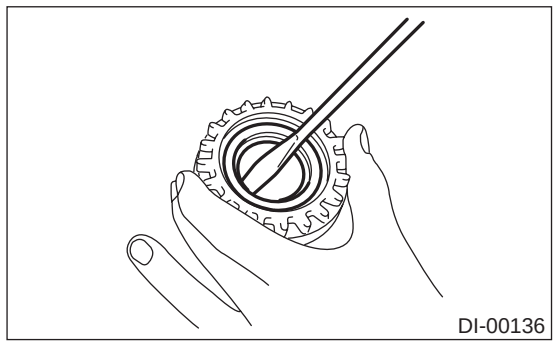


8) Remove bearing race from right and left holders with ST1 and ST2.
ST1 499705401 PULLER ASSY
ST2 499705404 SEAT



(A) Bearing race
(B) Holder

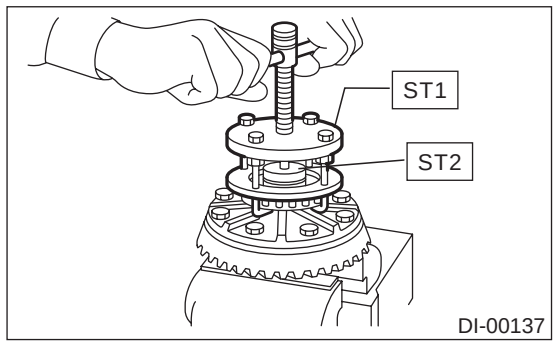
9) Remove oil seal from right and left holders with screwdriver.



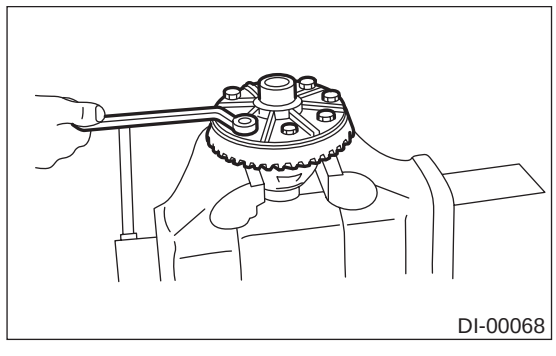
10) Extract bearing cone with ST1 and ST2.

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

ST1 899524100 PULLER SET
ST2 399520105 SEAT



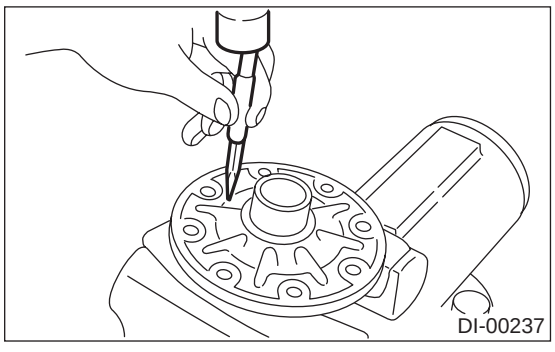
11) Remove crown gear by loosening crown gear bolts.



12) Drive out pinion shaft lock pin from crown gear side.

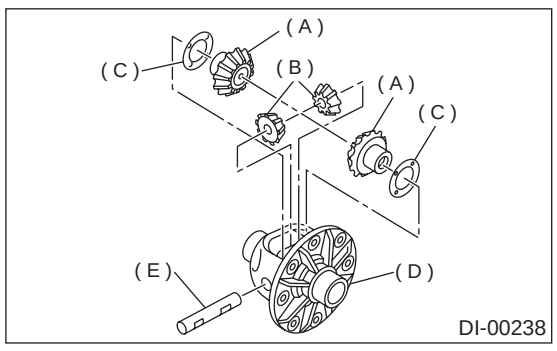
NOTE:
The lock pin is staked at the pin hole end on the differential case; do not drive it out forcibly before unstaking it.

ST 899904100 STRAIGHT PIN REMOVER



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

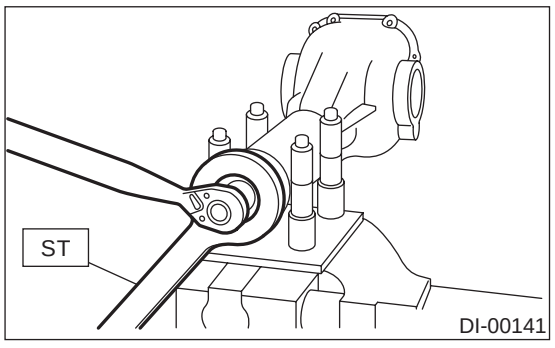
NOTE:
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



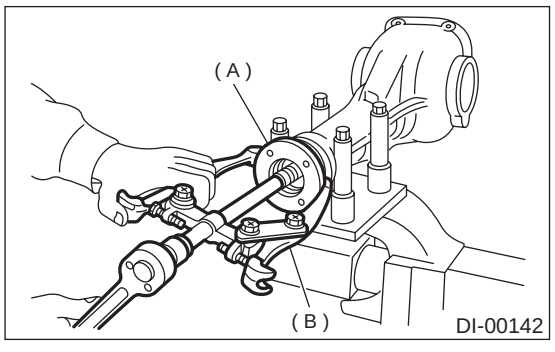
(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

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

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.

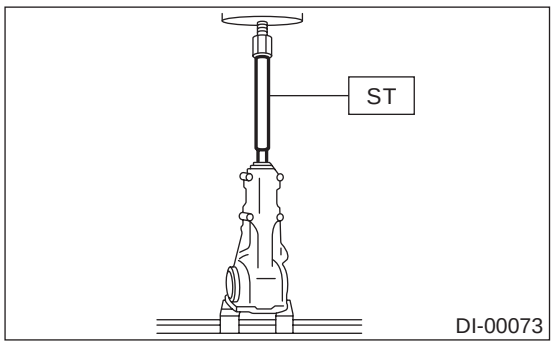


(A) Companion
(B) Puller

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

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

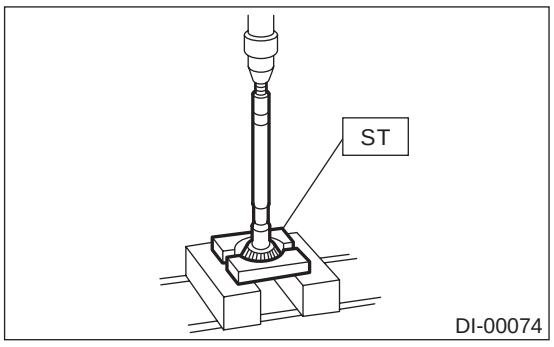
ST 398467700 DRIFT



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

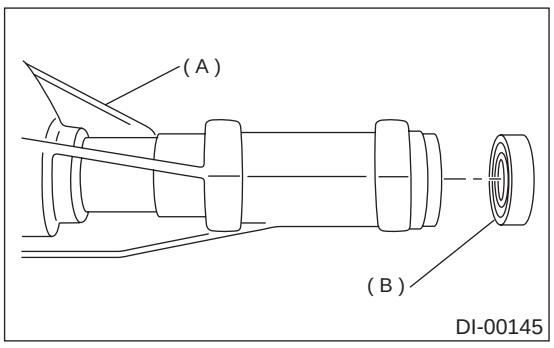
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER



18) Remove front oil seal from differential carrier using ST.

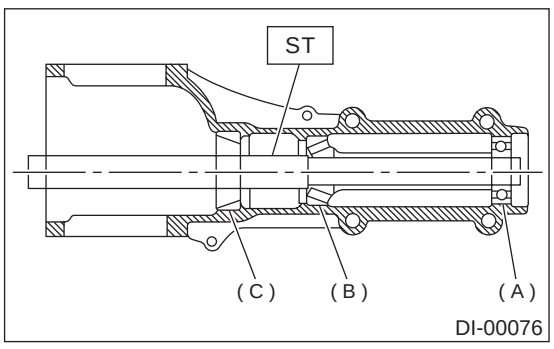
ST 398527700 PULLER ASSY



(A) Differential carrier
(B) Front oil seal

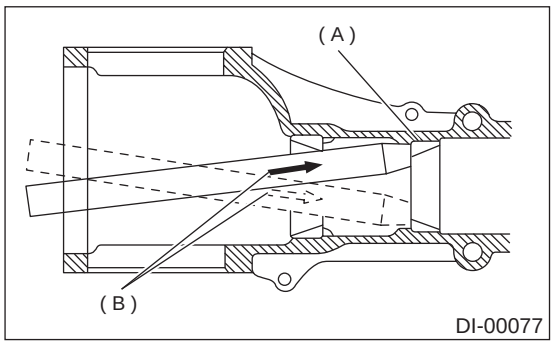
19) Remove pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT



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

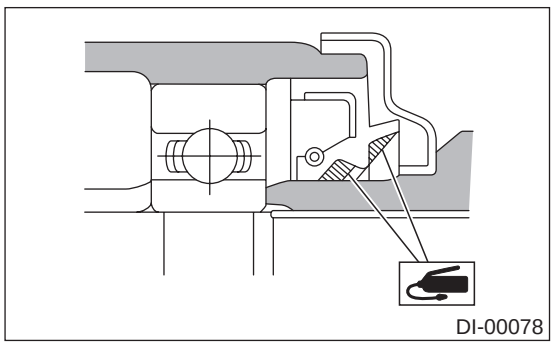
20) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.



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

D: ASSEMBLY

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



- Use new O-ring and gasket.

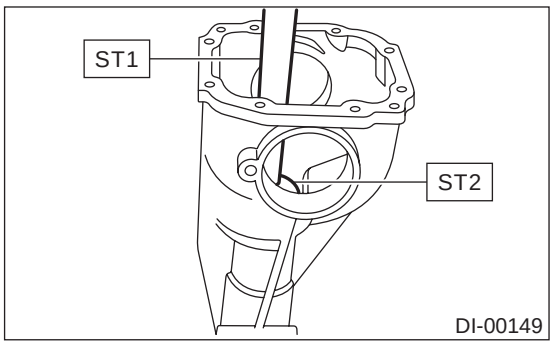
1) Adjust preload for front and rear bearings.
Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

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

ST1 398477701 HANDLE
ST2 398477702 DRIFT

(2) Press front bearing race (front) into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 498447110 DRIFT



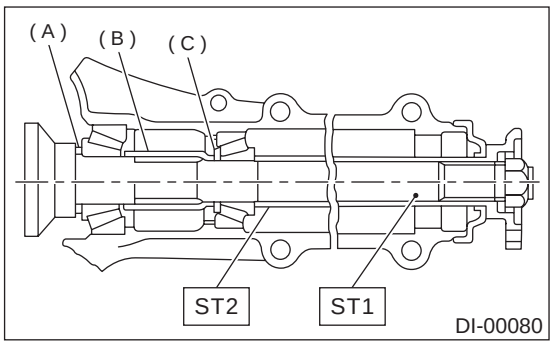
(3) Insert new front bearing cone.

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

NOTE:
If no deformation is found in pre-disassembly inspection, re-use the used washer if not deformed.

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

ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR



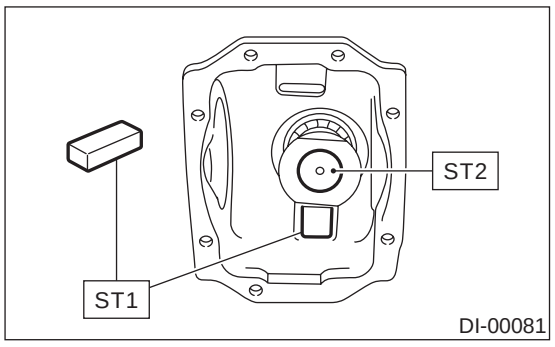
(A) Pinion height adjusting shim
(B) Preload adjusting spacer
(C) Preload adjusting washer

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

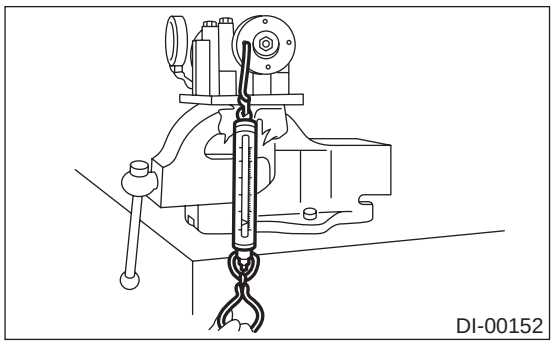
NOTE:
Use a new self-locking nut.
• Be careful not to give excessive preload.
• When tightening the drive pinion nut, lock ST2 with ST1 as shown in the figure.

ST1 398507704 BLOCK
ST2 498447150 DUMMY SHAFT

Tightening torque:
188 N·m (19.2 kgf-m, 139 ft-lb)



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



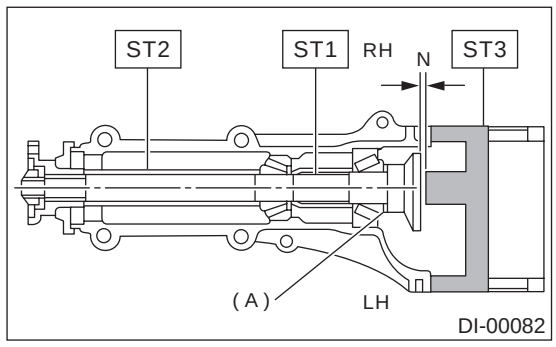
	Part No.	Thickness mm (in)
Preload adjusting washer	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
	Part No.	Length mm (in)
Preload adjusting spacer	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)

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

(1) After completion of adjustment, keep the condition of ST1, ST2 and ST3.

NOTE:
Install the original or temporally selected pinion height adjusting shim.

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

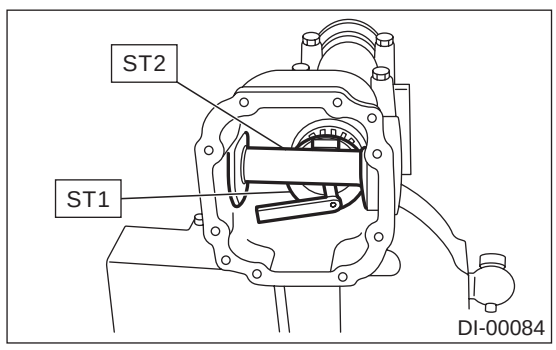


(A) Pinion height adjusting shim

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

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

ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE



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

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

T = To + N – 0.05 (mm)

where

T = Thickness of pinion height adjusting shim (mm)

To = Thickness of shim originally installed (mm)

N = Reading of thickness gauge (mm)

H = Figure marked on drive pinion head

(Example of calculation)

To = 0.15 mm

N = 0.1 mm

T = 0.15 + 0.1 – 0.05 = 0.2 mm

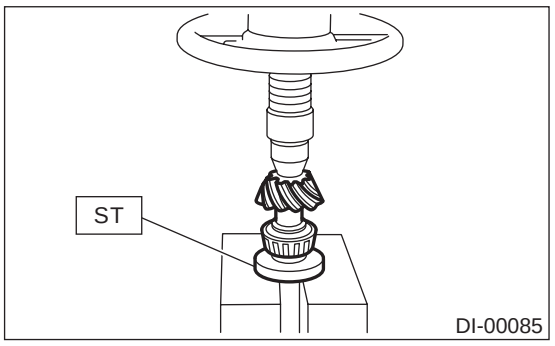
Result: Thickness = 0.2 mm

Therefore use the 32295AA220.

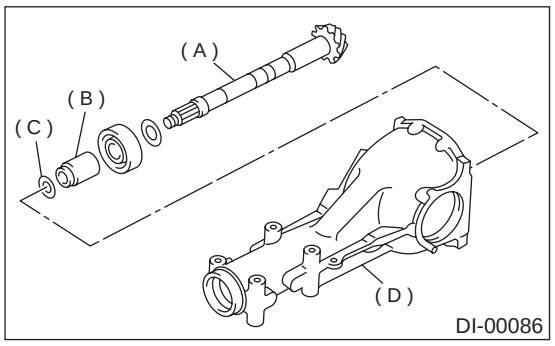
Pinion height adjusting shim	
Part No.	Thickness mm (in)
32295AA200	0.150 (0.0059)
32295AA210	0.175 (0.0069)
32295AA220	0.200 (0.0079)
32295AA230	0.225 (0.0089)
32295AA240	0.250 (0.0098)
32295AA250	0.275 (0.0108)

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

ST 498175500 INSTALLER



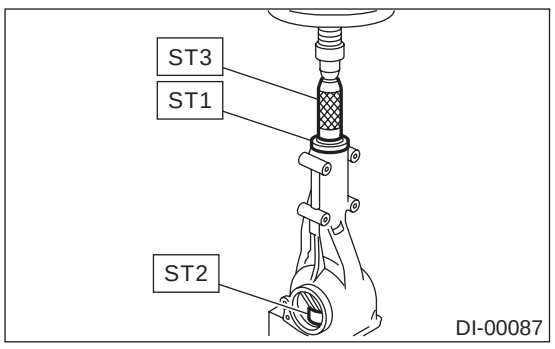
4) Insert drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



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

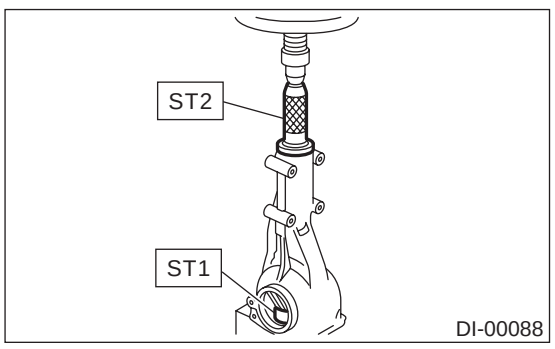
5) Press-fit front bearing cone into carrier with ST1, ST2 and ST3.

ST1 32285AA000 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



6) Insert spacer, then press-fit pilot bearing with ST1 and ST2.

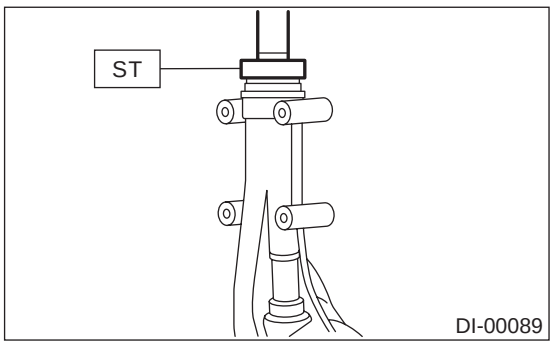
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Fit a new oil seal with ST.

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

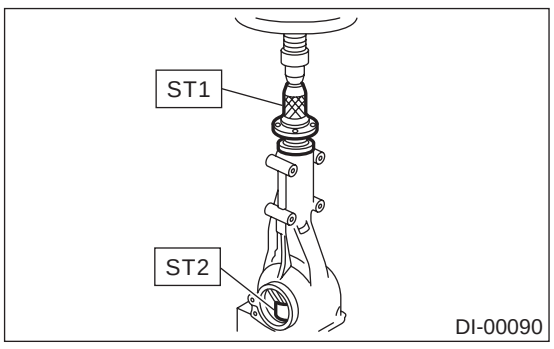
ST 498447120 OIL SEAL INSTALLER



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

NOTE:
Be careful not to damage bearing.

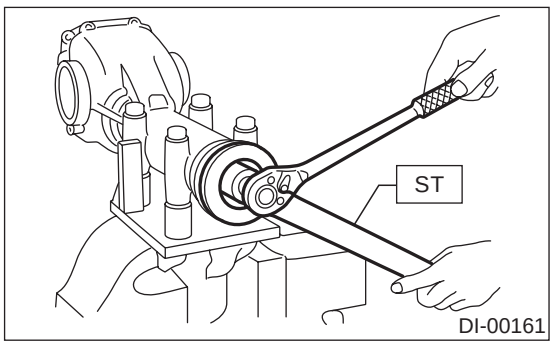
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



9) Install self-locking nut. Then tighten it with ST.

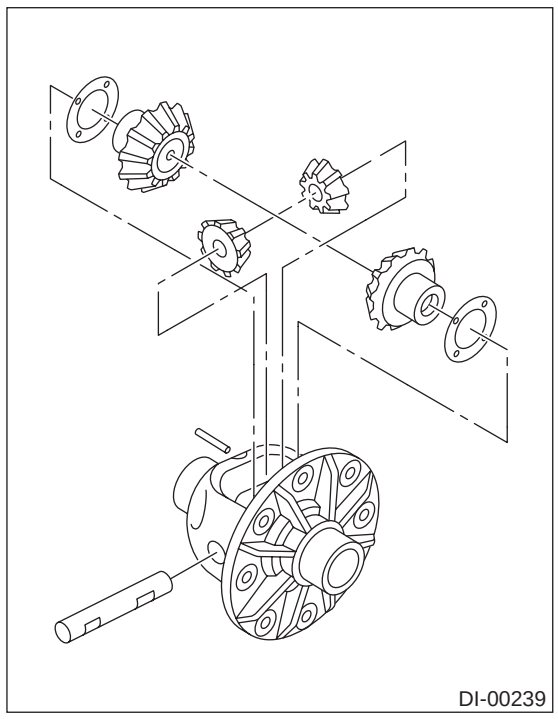
ST 398427200 FLANGE WRENCH

Tightening torque:
188 N·m (19.2 kgf-m, 139 ft-lb)



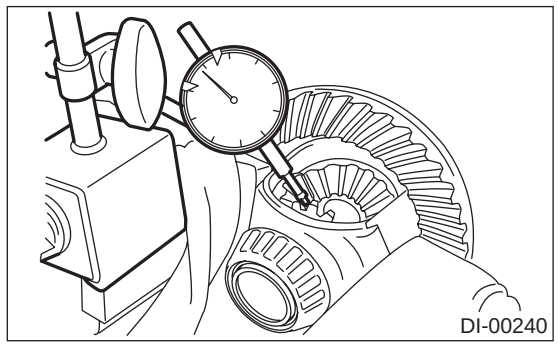
10) Assembling differential case
Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

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



(1) Measure the side gear backlash.

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



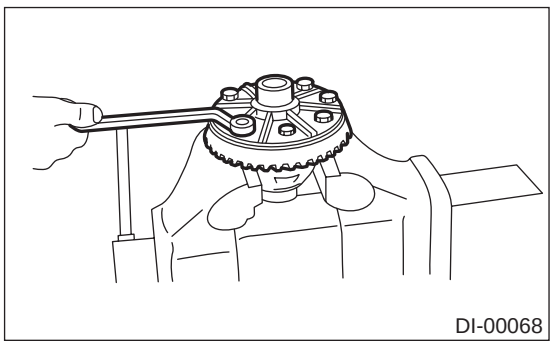
(2) Adjust the side gear backlash as specified by selecting side gear thrust washer.

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

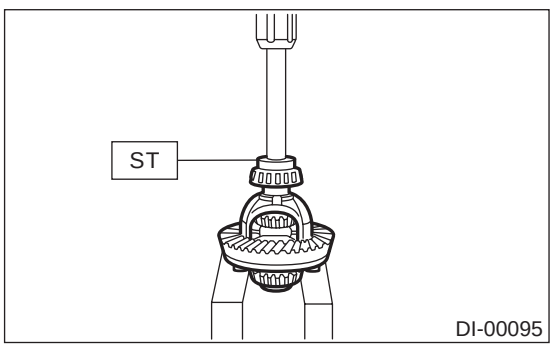
(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After driving in pinion shaft lock pin, stake the both sides of the hole to prevent pin from falling off.
(5) Install crown gear on differential case.

NOTE:
Tighten diagonally while tapping the bolt heads.

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

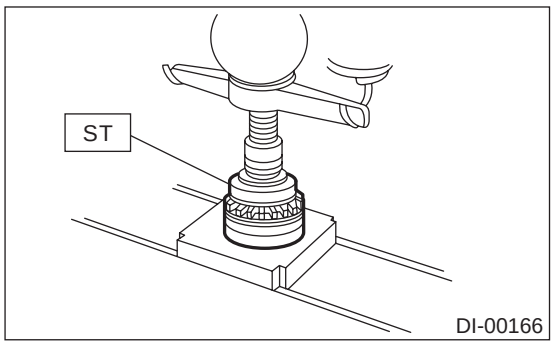

DI-00068

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



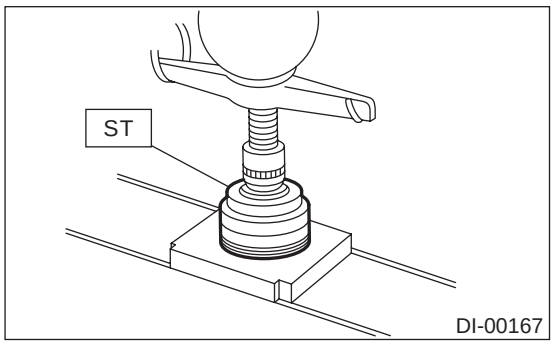
DI-00095

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



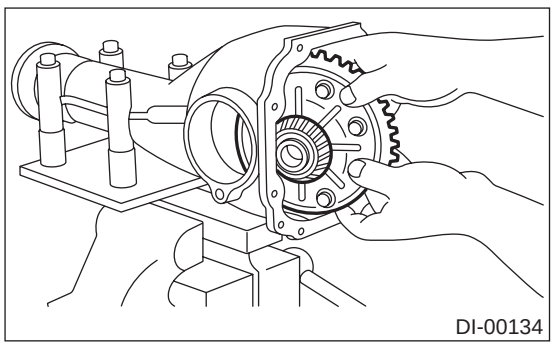
DI-00166

(2) Install bearing race into right and left holders.
ST 398477702 BEARING OUTER RACE DRIFT



DI-00167

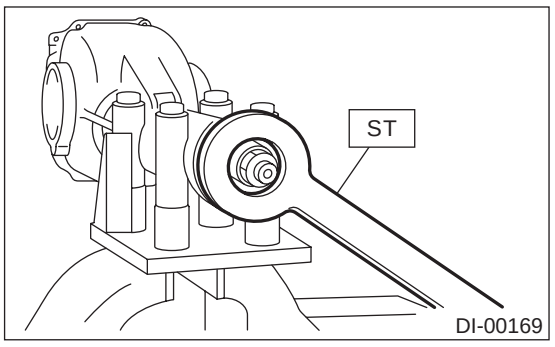
(3) Install the differential case assembly into differential carrier in the reverse order of disassembly.


DI-00134

13) Perform adjustment of backlash of pinion crown gear set and adjustment of preload of differential side bearing.

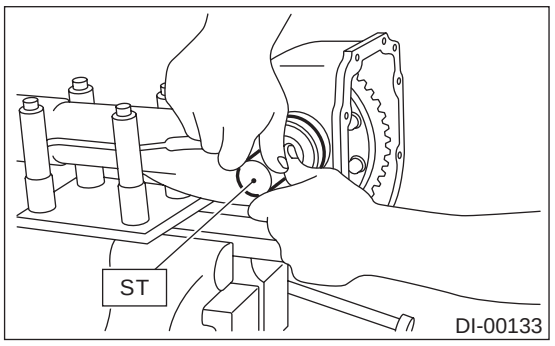
(1) Turn drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



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

ST 399780111 WRENCH



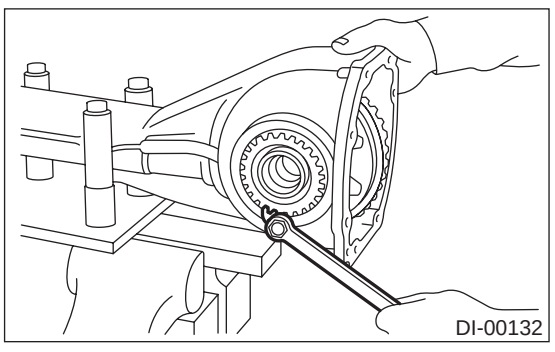
(3) Back off side (left-side) holder approximately 1 1/2 teeth of holder, and tighten left-side holder by approximately 2 teeth (approximately 1 1/2 + 1/2 teeth).

[Back off amount of side (left-side) holder + 1/2 tooth.]

This + 1/2 tooth gives preload.

(4) Temporarily tighten lock plate.

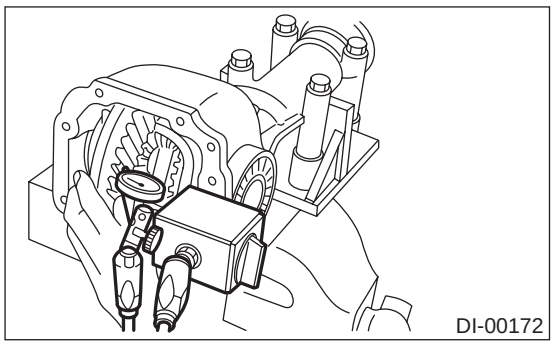
NOTE:
Turn over lock plate to displace holder 1/2 tooth.



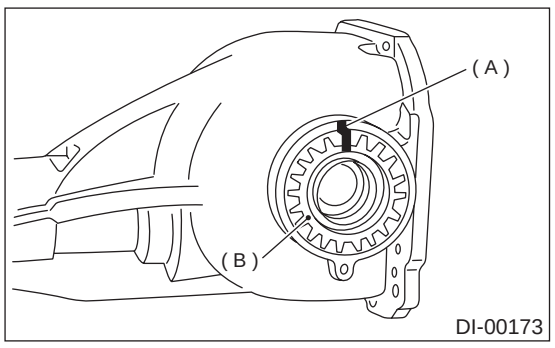
(5) Measure the crown gear-to-drive pinion backlash. Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.

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

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



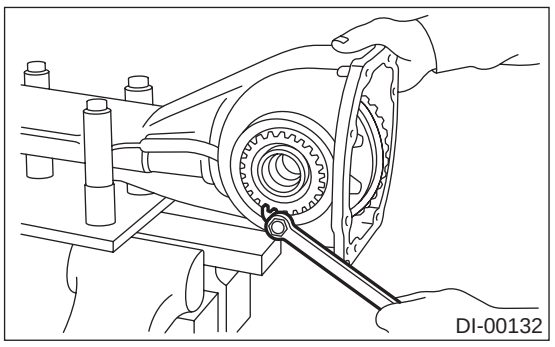
14) Draw a matching mark on both differential carrier and holder. Remove holder one side at a time. Replace in the original position after inserting an O-ring and applying grease to threaded portion.



(A) Matching mark
(B) Holder

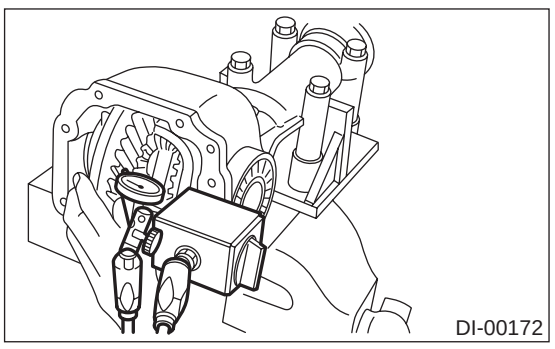
15) Tighten bolt of lock plate to specified torque.

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



16) Re-check crown gear-to-pinion backlash.

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



17) Checking and adjusting tooth contact of crown gear.

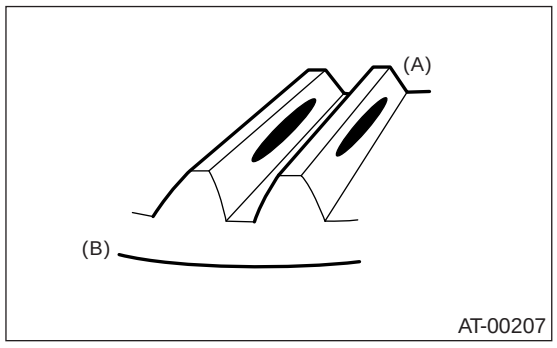
(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in “TOOTH CONTACT PATTERN”.

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

- Correct tooth contact

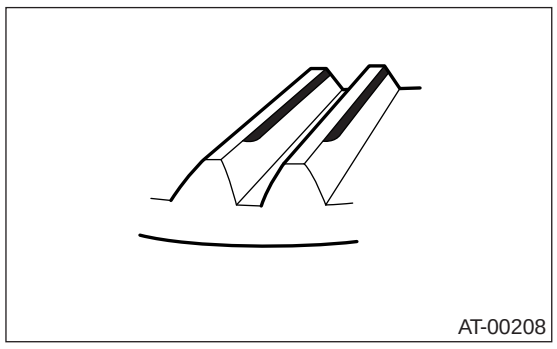
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)



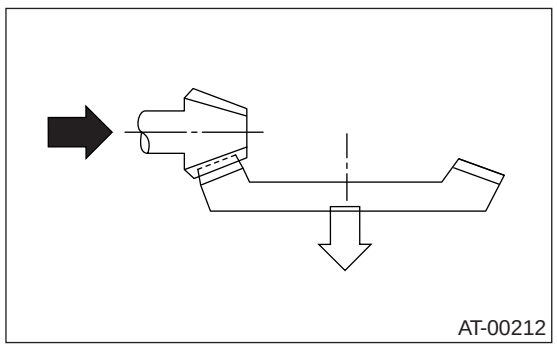
(A) Toe side
(B) Heel side

- Face contact

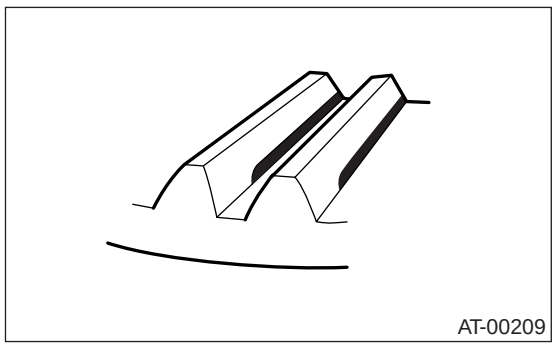
Checking item: Backlash is too large.
Contact pattern



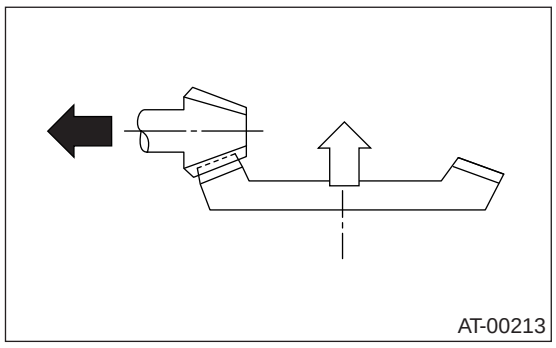
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



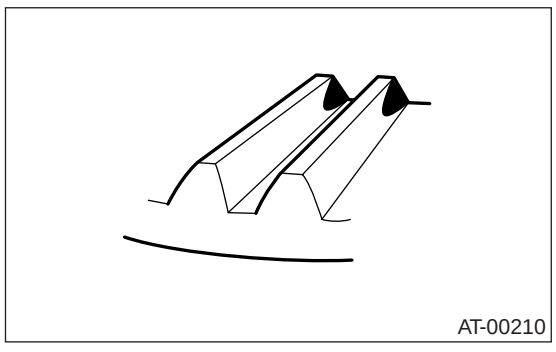
• Flank contact
Checking item: Backlash is too small.
Contact pattern



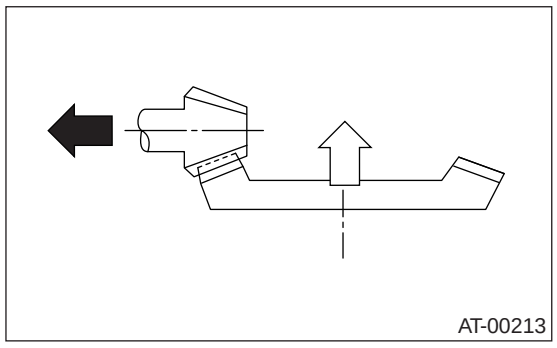
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



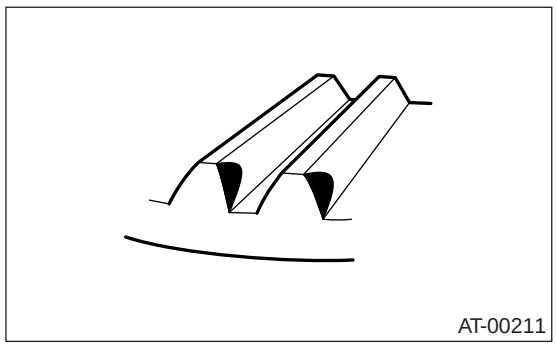
• Toe contact (Inside end contact)
Checking item: Contact area is small.
Contact pattern



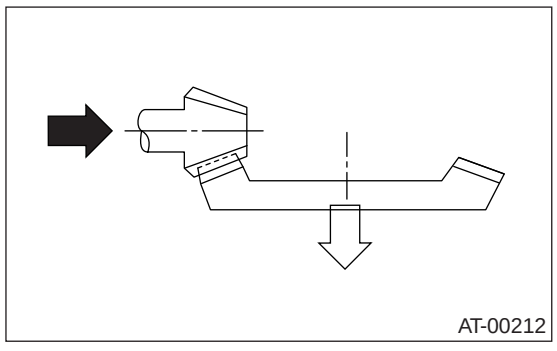
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



• Heel contact (Outside end contact)
Checking item: Contact area is small.
Contact pattern



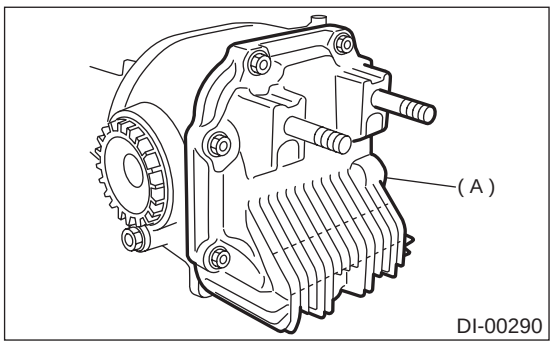
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



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

18) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.
19) Install new gasket and rear cover, and tighten bolts to specified torque.

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



(A) Rear cover

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

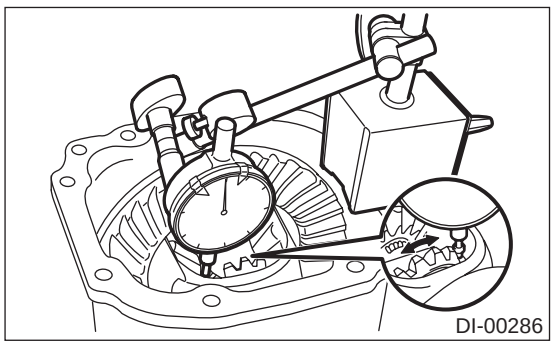
1) Crown gear and drive pinion
• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.
• If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected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

1. SIDE GEAR BACKLASH

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

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

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

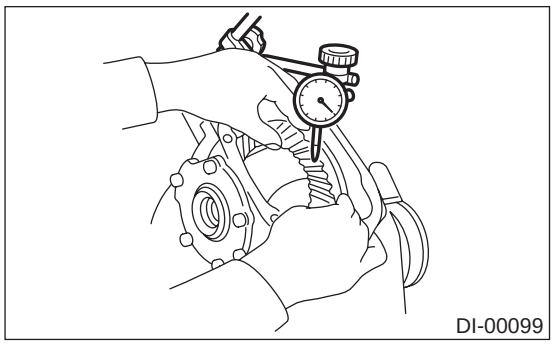


2. CROWN GEAR BACKLASH

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

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

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

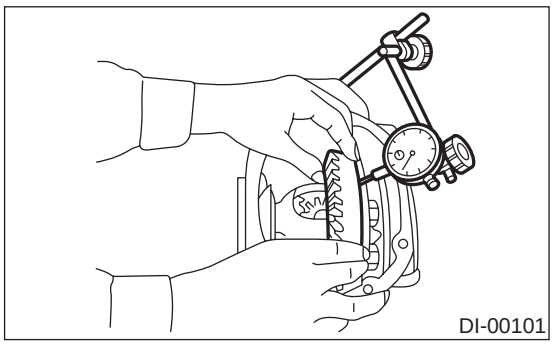


3. CROWN GEAR RUNOUT

Using a dial gauge, check the crown gear runout.

Crown gear runout:
Less than 0.05 mm (0.0020 in)

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



4. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Inspect tooth contact between crown gear and drive pinion.
<Ref. to DI-47, ASSEMBLY, Rear Differential for VA-type.>

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust side gear backlash.
<Ref. to DI-47, ASSEMBLY, Rear Differential for VA-type.>

2. CROWN GEAR BACKLASH

Adjust crown gear backlash.
<Ref. to DI-47, ASSEMBLY, Rear Differential for VA-type.>

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear.
<Ref. to DI-47, ASSEMBLY, Rear Differential for VA-type.>

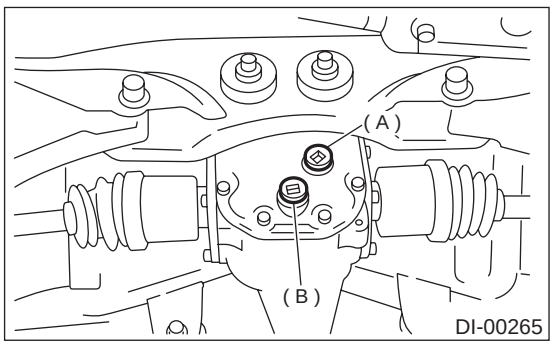
6. Rear Differential Front Oil Seal

A: INSPECTION

Check front oil seal portion for oil leakage, if any leak is found, replace the oil seal and inspect propeller shaft.

B: REPLACEMENT

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



(A) Filler plug
(B) Drain plug

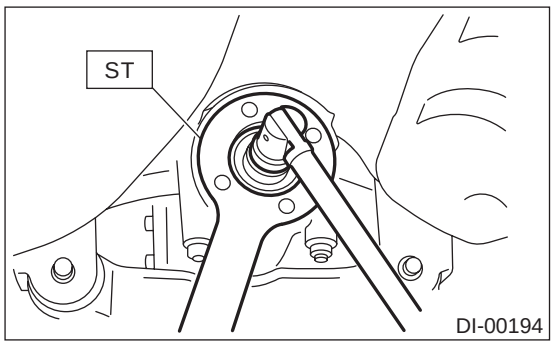
5) Install oil drain plug.

NOTE:
- Apply fluid packing to oil drain plug in T-type.
- VA-type uses a new aluminum gasket.

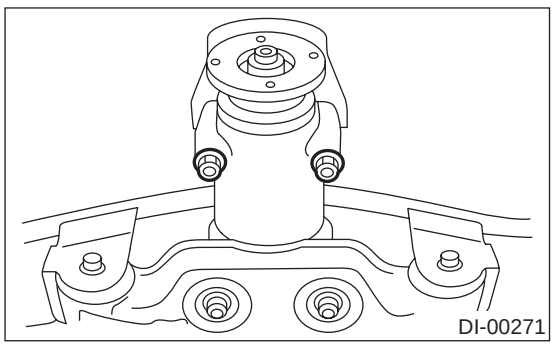
Fluid packing:
THREE BOND 1105 (Part No.:004403010) or equivalent

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

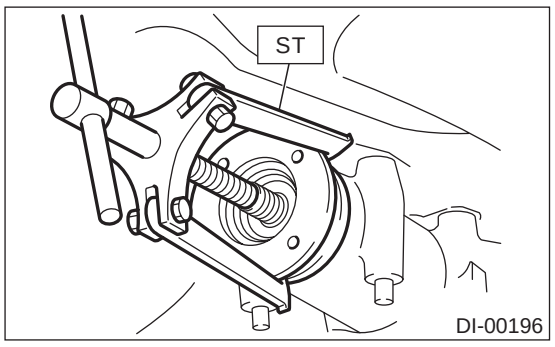
6) Jack-up rear wheels and support the vehicle body with sturdy racks.
7) Remove rear exhaust pipe and muffler.
8) Remove propeller shaft from body. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
9) Remove self-locking nut while holding companion flange with ST.
ST 498427200 FLANGE WRENCH



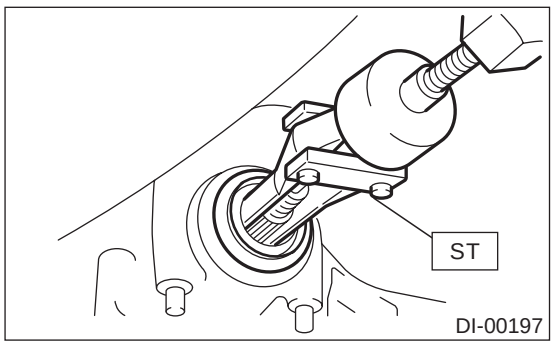
10) Remove protector nuts.



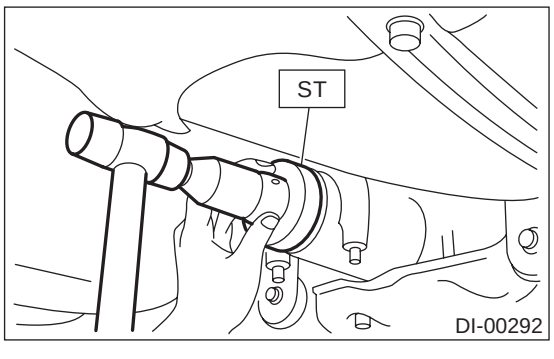
11) Extract companion flange using ST.
ST 399703600 PULLER ASSY



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



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

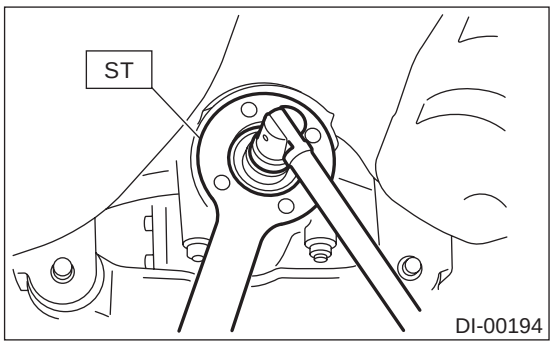


14) Install companion flange.

NOTE:
Use a plastic hammer to install companion flange.

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

Tightening torque:
181.4 N·m (18.50 kgf-m, 133.8 ft-lb)

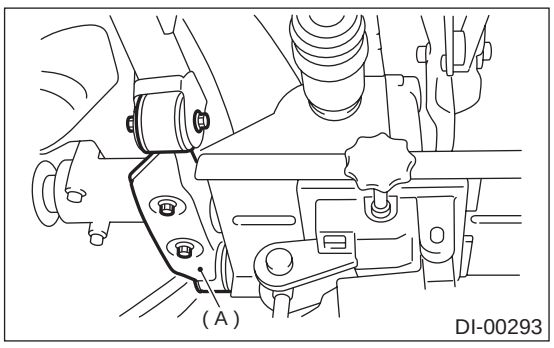


16) Reassembling procedure hereafter is the reverse of the disassembling.

7. Rear Differential Front Member

A: REMOVAL

1) Disconnect ground cable from battery.
2) Jack-up the vehicle.
3) Using a transmission jack, support rear differential, and remove rear differential front member.

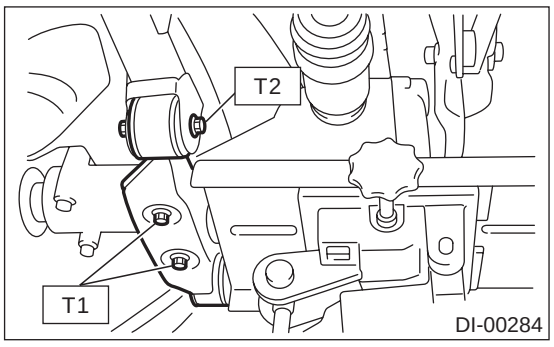


(A) Rear differential front member

B: INSTALLATION

1) Install rear differential front member.

Tightening torque:
T1: 65 N·m (6.6 kgf-m, 48 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



C: INSPECTION

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

8. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered, or excessively worn sliding surface of companion flange.	Repair or replace.
	Clogged or damaged air breather.	Clean, repair or replace.
	Loose bolts on side retainer, or incorrectly fitted O-ring.	Tighten bolts to specified torque. Replace O-ring.
	Loose rear cover attaching bolts or damaged gasket.	Tighten bolts to specified torque. Replace gasket and apply liquid packing.
	Loose oil filler or drain plug.	Retighten and apply liquid packing.
	Wear, damage or incorrectly fitting for side retainer and oil seal.	Repair or replace.
2. Seizure NOTE: Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	Insufficient backlash for hypoid gear.	Readjust or replace.
	Excessive preload for side, rear, or front bearing.	Readjust or replace.
	Insufficient or improper oil used.	Replace seized part and fill with specified oil to specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	Improper backlash for hypoid gear.	Replace.
	Insufficient or excessive preload for side, rear, or front bearing.	Readjust or replace.
	Excessive backlash for differential gear.	Replace gear or thrust washer.
	Loose bolts and nuts such as crown gear bolt.	Retighten.
	Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly.	Excessive backlash for hypoid gear.	Readjust.
	Excessive backlash for differential gear.	Replace gear or thrust washer.
	Insufficient preload for front or rear bearing.	Readjust.
	Loose drive pinion nut.	Tighten to specified torque.
	Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	Damaged differential gear.	Replace.
	Excessive wear or damage of thrust washer.	Replace.
	Broken pinion mate shaft.	Replace.
	Seized or damaged side bearing.	Replace.
6. Gear noises NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	Improper tooth contact of hypoid gear.	Readjust or replace hypoid gear set.
	Improper backlash for hypoid gear.	Readjust.
	Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
	Seized hypoid gear.	Replace hypoid gear set.
	Improper preload for front or rear bearings.	Readjust.
	Seized, scored, or chipped front or rear bearing.	Replace.
	Seized, scored, or chipped side bearing.	Replace.
	Vibrating differential carrier.	Replace.

GENERAL DIAGNOSTIC TABLE

DIFFERENTIALS

MEMO:

1. General Description

A: NOTE

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

2. Transfer Case and Extension for MT

A: NOTE

For removal, installation and inspection work, refer to “MT” section. <Ref. to MT-38, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch and Extension for AT

A: NOTE

For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-89, Transfer Clutch.>

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to “AT” section or “MT” section.
AT model:
<Ref. to AT-48, Extension Case Oil Seal.>
MT model:
<Ref. to MT-33, Oil Seal.>

5. Transfer Drive Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to “MT” section. <Ref. to MT-42, Transfer Drive Gear.>

6. Transfer Driven Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to “MT” section. <Ref. to MT-44, Transfer Driven Gear.>

7. Reduction Drive Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-103, Reduction Drive Gear.>

8. Reduction Drive Gear with VTD

A: NOTE

For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-103, Reduction Drive Gear.>

9. Reduction Driven Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-100, Reduction Driven Gear.>

10.Reduction Driven Gear with VTD

A: NOTE

For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-100, Reduction Driven Gear.>

11.Center Differential

A: NOTE

For removal, installation and inspection work, refer to “AT” or “MT” section.
AT model:
<Ref. to AT-105, Center Differential Carrier.>
MT model:
<Ref. to MT-46, Center Differential.>

12.Transfer Clutch Pressure Test

A: NOTE

For transfer clutch pressure work, refer to “AT” section. <Ref. to AT-38, Transfer Clutch Pressure Test.>

13.Transfer Duty Solenoid and Valve Body

A: NOTE

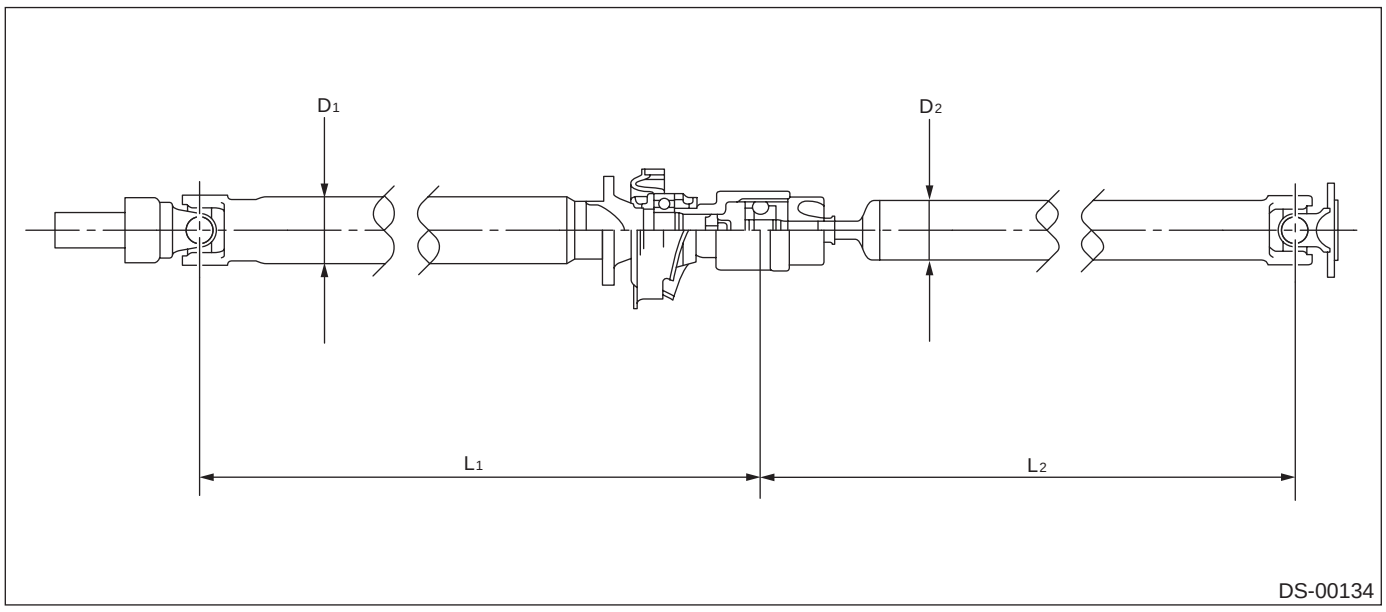
For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-70, Transfer Duty Solenoid and Valve Body.>

1. General Description

A: SPECIFICATIONS

1. PROPELLER SHAFT

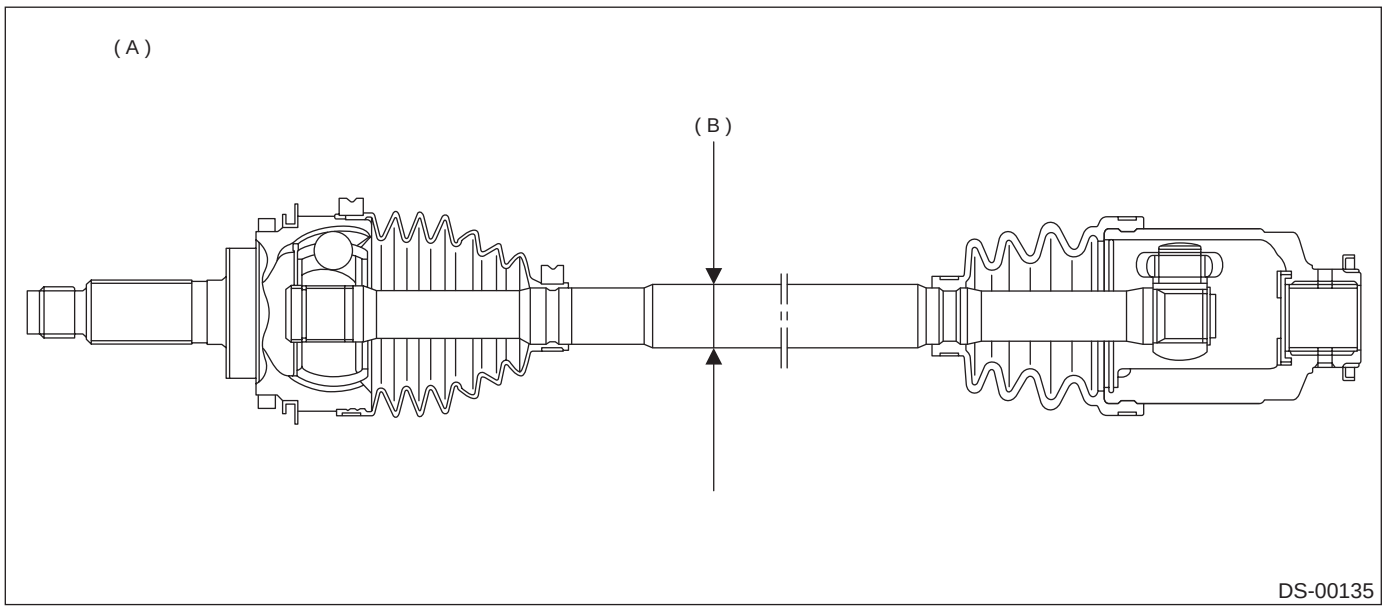
Propeller shaft type		DOJ type
Front propeller shaft Joint-to-joint length: L_1 mm (in)	AT	629 (24.76)
	MT	688 (27.09)
Rear propeller shaft Joint-to-joint length: L_2 mm (in)	773 (30.43)	
Outside diameter of tube: mm (in)	D_1	63.5 (2.500)
	D_2	57.0 (2.244)



DS-00134

2. FRONT DRIVE SHAFT ASSEMBLY

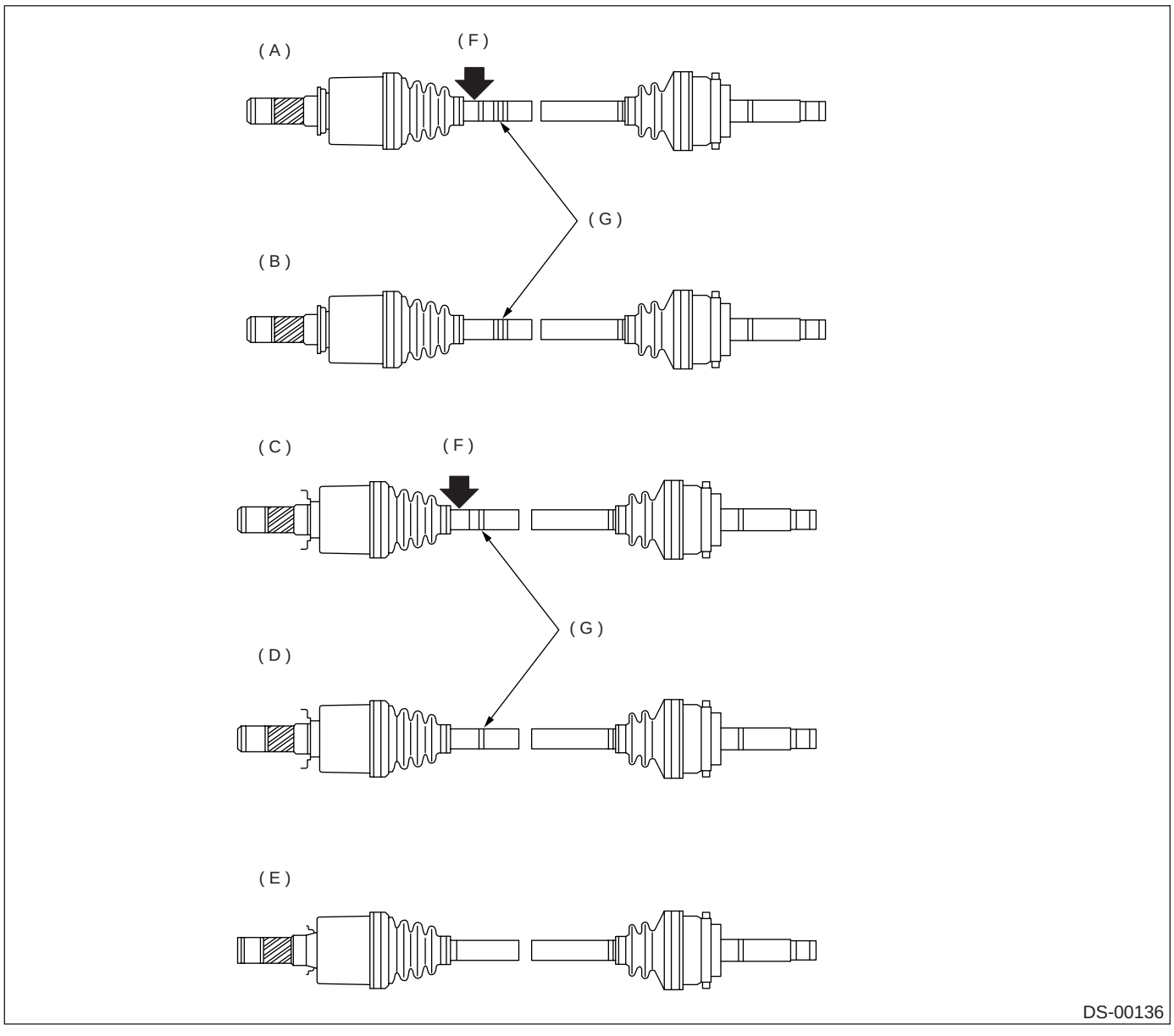
Type of drive shaft assembly	SHAFT
	Shaft diameter
BJ87+SFJ82	26 mm (1.02 in)



(A) BJ87+SFJ82
(B) Measuring point

3. REAR DRIVE SHAFT ASSEMBLY

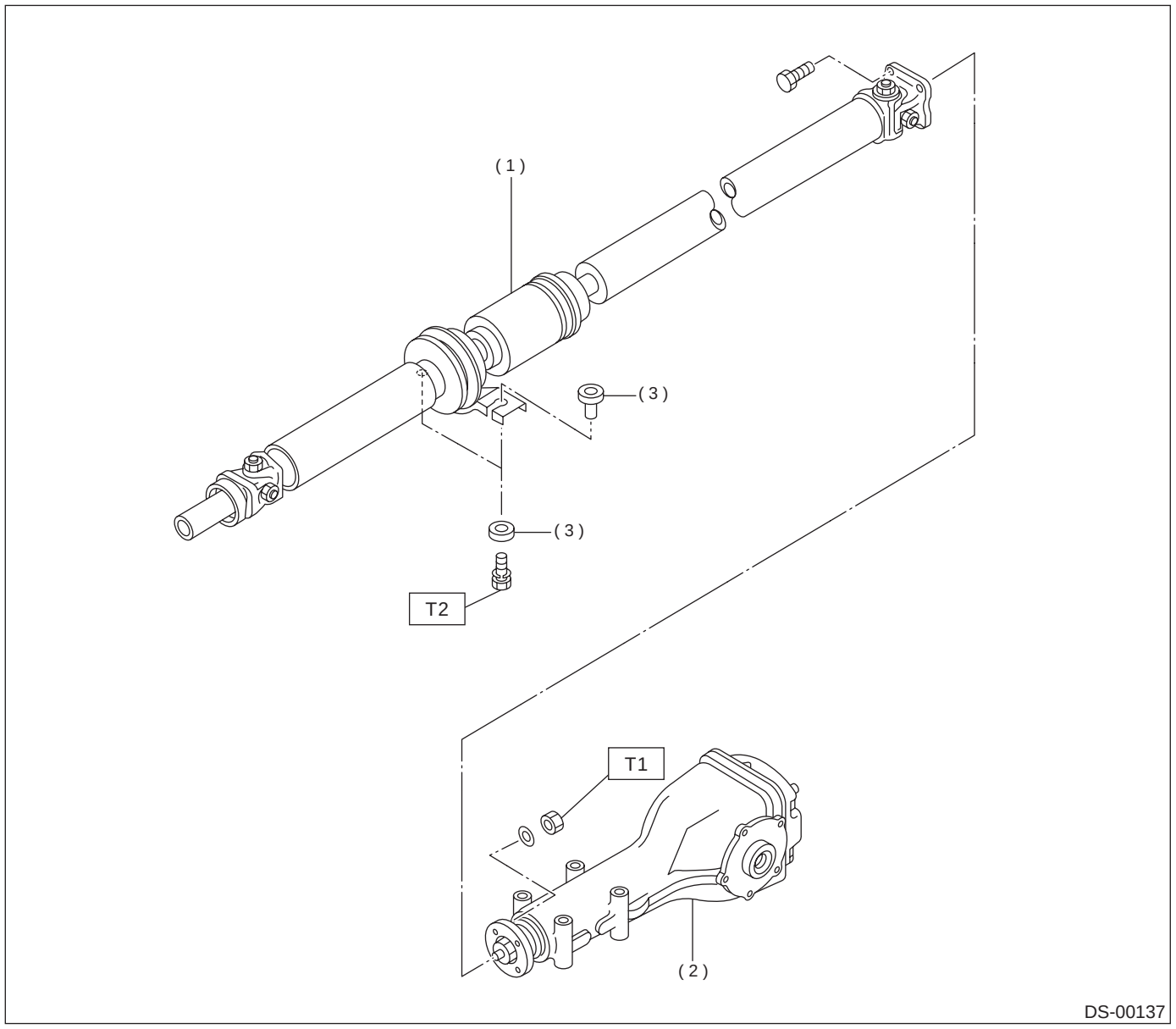
Type of axle shaft assembly	SHAFT
	No. of identification, protrusion on shaft
82AC-RH, 82AC-LH	2 (Two)
79AC-RH, 79AC-LH	1 (One)
79AC	None



(A) 82AC-RH
(B) 82AC-LH
(C) 79AC-RH
(D) 79AC-LH
(E) 79AC
(F) Indication mark of RH
(G) Identification protrusion

B: COMPONENT

1. PROPELLER SHAFT

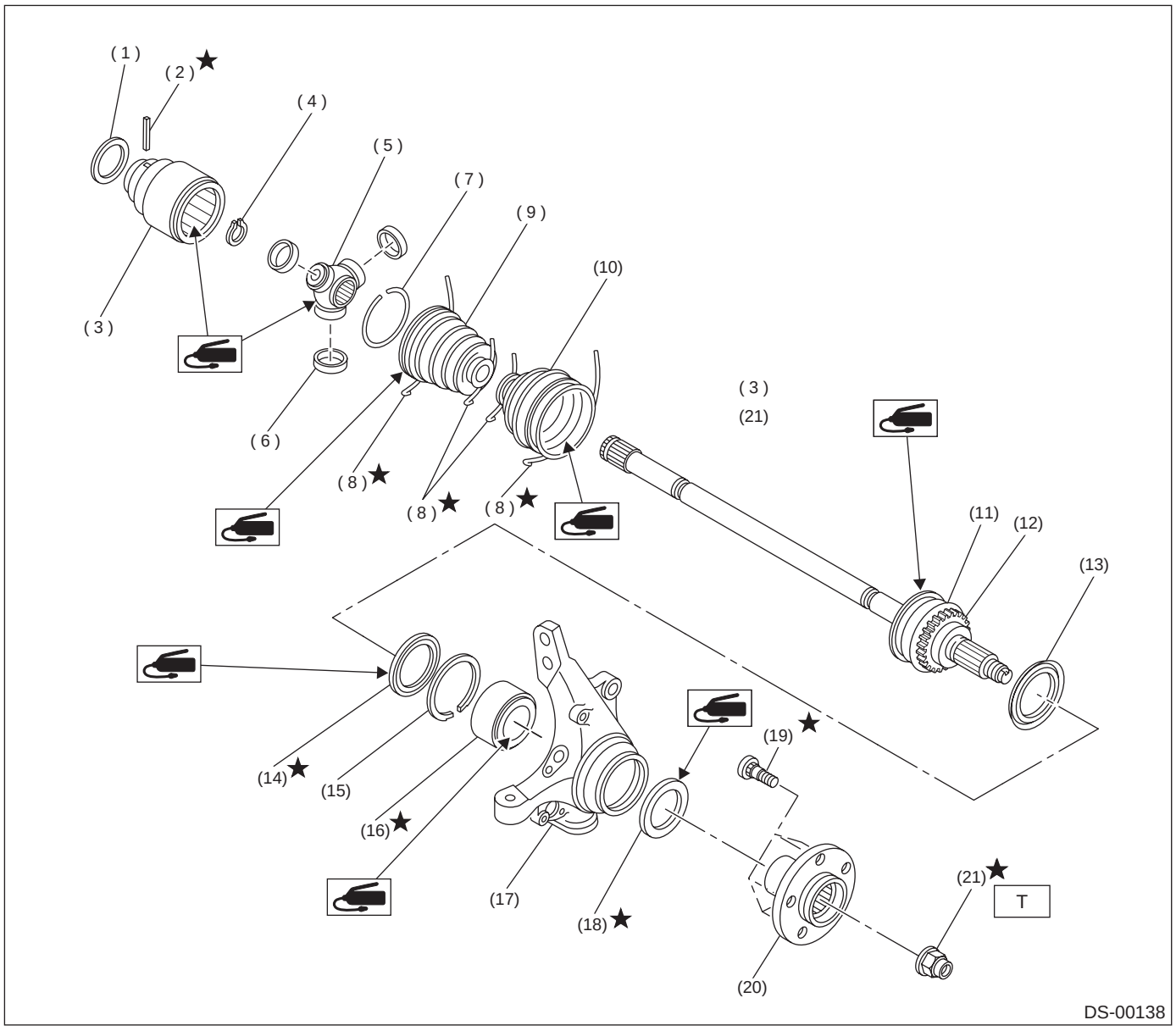


DS-00137

(1) Propeller shaft
(2) Rear differential
(3) Bushing

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

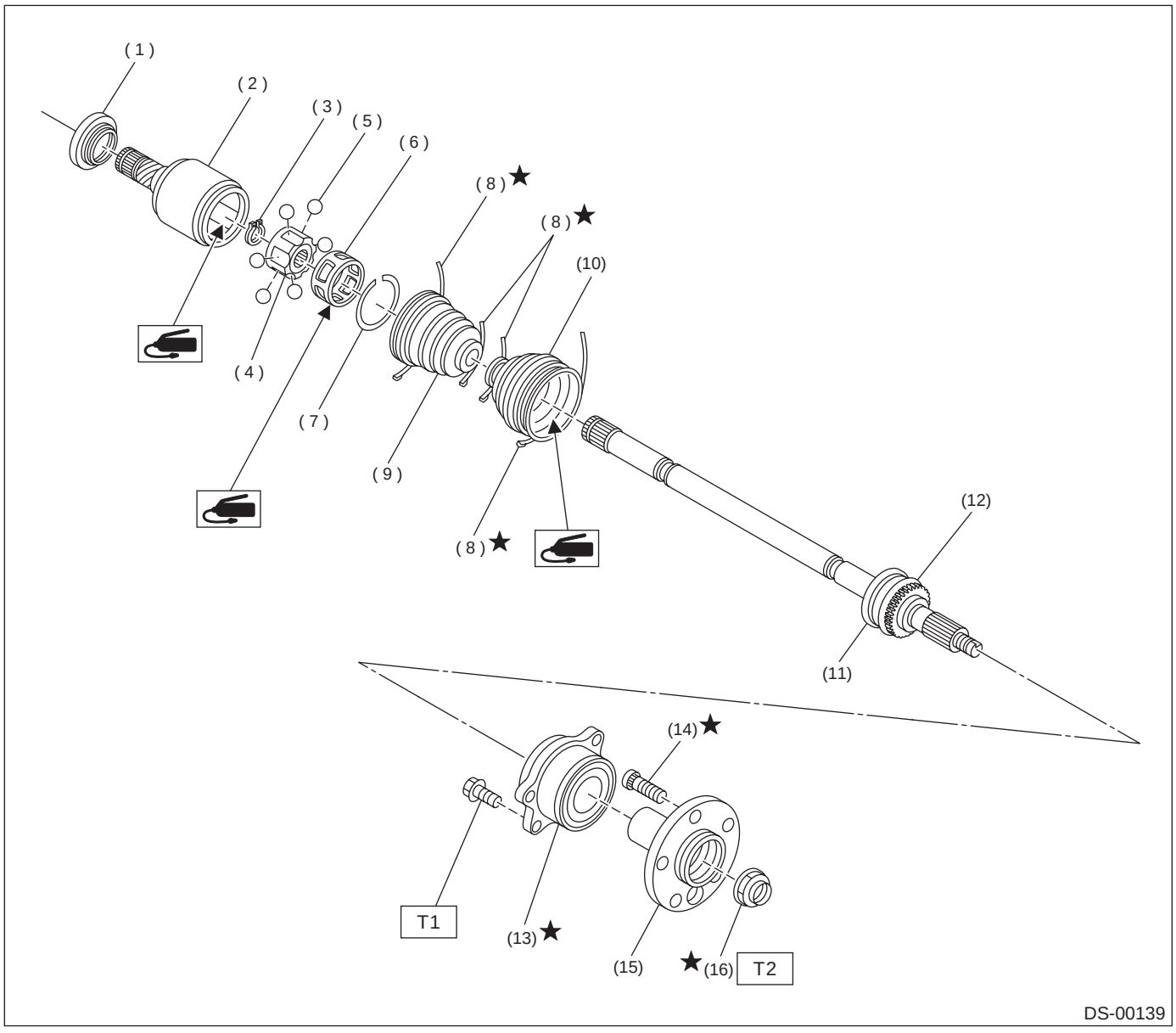
2. FRONT AXEL



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

Tightening torque: N·m (kgf-m, ft-lb)
T: 216 (22, 159)

3. REAR AXLE



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

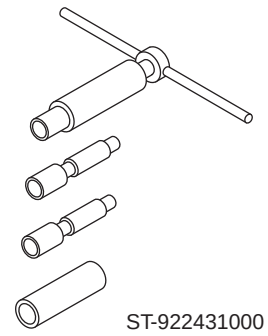
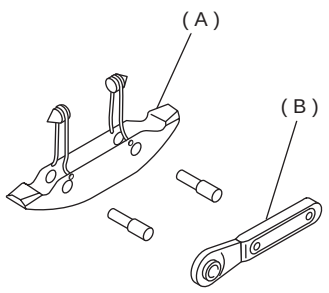
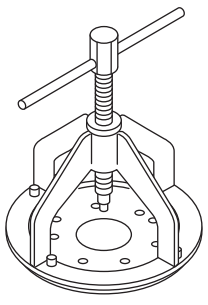
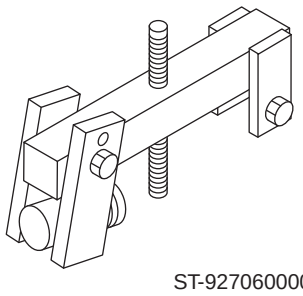
Tightening torque: N·m (kgf-m, ft-lb)
T1: 66 (6.7, 48.5)
T2: 235 (24, 174)

C: CAUTION

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

D: MPREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-922431000	922431000	AXLE SHAFT INSTALLER	• Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 ST-925091000	925091000	BAND TIGHTEN-ING TOOL	• Used for tightening boot band. (A) Jig for band (B) Ratchet wrench
 ST-926470000	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 ST-927060000	927060000	HUB REMOVER	• Used for removing front hub. • Used with HUB STAND (927080000).

DRIVE SHAFT SYSTEM

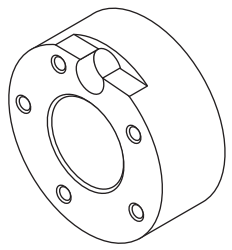
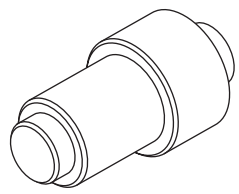
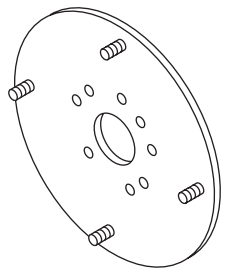
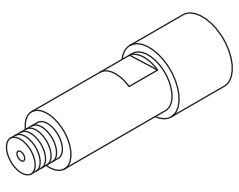
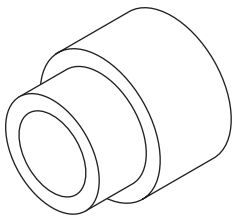
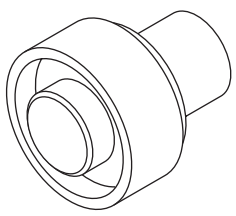
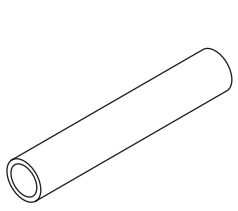
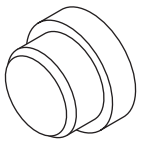
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927080000	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.
 ST-927100000	927100000	BEARING PULLER	• Used for disassembling and assembling front housing bearing. • Used with HOUSING STAND (927400000).
 ST-927140000	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).
 ST-927390000	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927400000	927400000	HOUSING STAND	• Used for disassembling and assemblig front housing bearing. • Used with BEARING PULLER (927100000).
 ST-927410000	927410000	OIL SEAL INSTALLER	• Used for installing oil seal into front housing. • Used with HOUSING STAND (927400000).
 ST-398507703	398507703	DUMMY COLLAR	Used for removing hub ASSY from hub unit.
 ST-399520105	399520105	SEAT	Used for removing inner race from hub ASSY.

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

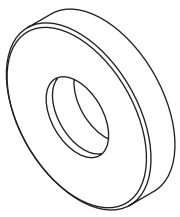
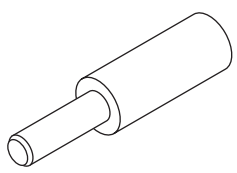
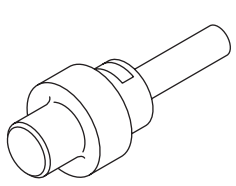
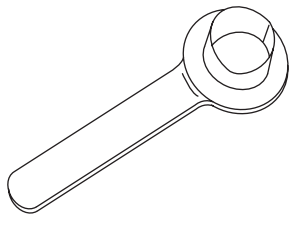
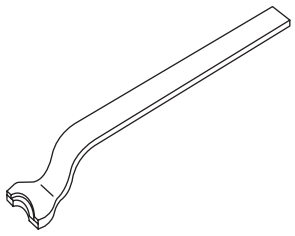
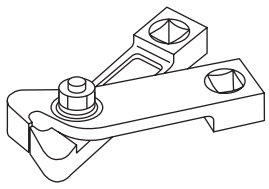
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28499AE000	28499AE000	BEARING SPACER	Used for installing hub unit into hub ASSY.
 ST-927120000	927120000	HUB INSTALLER	Used for installing hub.
 ST-927450000	927450000	HUB INSTALLER	• Used for installing hub unit into hub ASSY. • Used with BEARING SPACER (28499AE000) and HUB STAND (927080000).
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.
 ST28099AC000	28099AC000	BOOT BAND PLIERS	Used for tightening front BJ boot band.

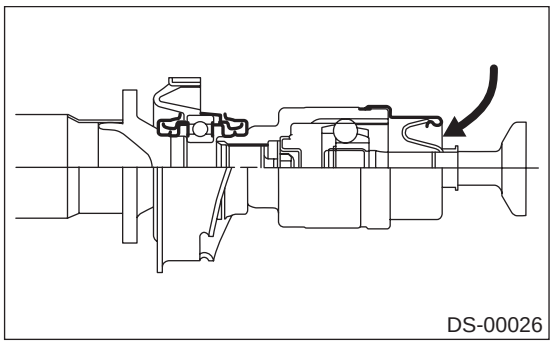
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Puller	Used for removing ball joint from knuckle arm.
Dial Gauge	Used for inspecting propeller shaft run-out.
Snap Ring Pliers	Used for installing and removing snap ring.

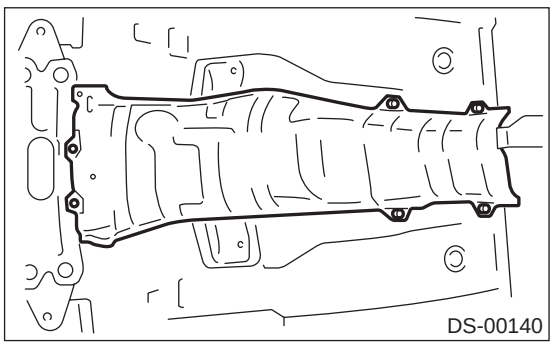
2. Propeller Shaft

A: REMOVAL

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


DS-00026

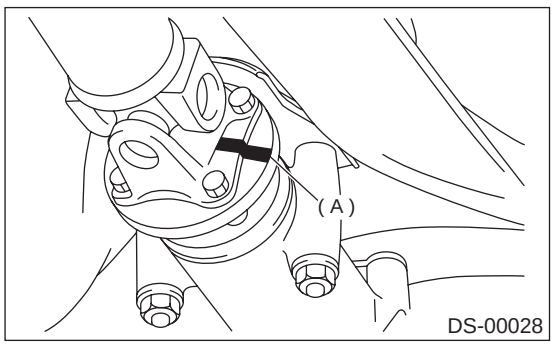
1) Disconnect ground cable from battery.
2) Move select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Jack-up vehicle and support it with sturdy racks.
5) Remove center exhaust pipes.
6) Remove rear exhaust pipe and muffler.
7) Remove heat shield cover.


DS-00140

8) Put matching marks on propeller shaft and rear differential.

9) Remove the four bolts which hold propeller shaft to rear differential.

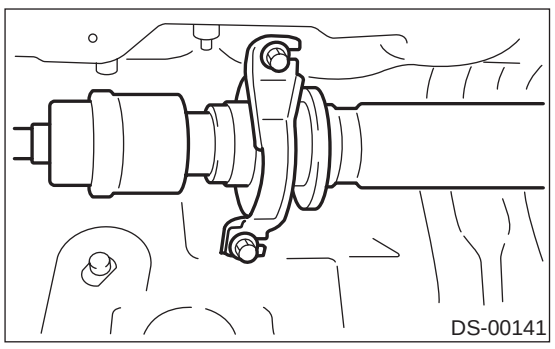
NOTE:
Remove all but one bolt.



DS-00028

(A) Matching mark

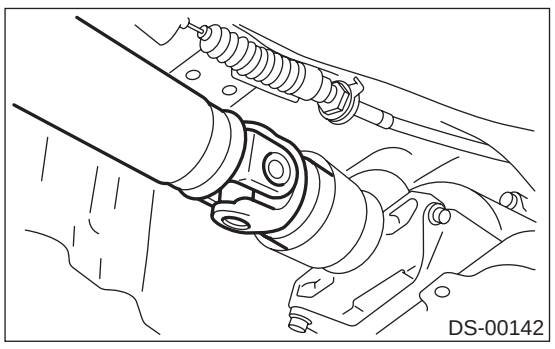
10) Remove the two bolts which hold center bearing to vehicle body.


DS-00141

11) Remove propeller shaft from transmission.

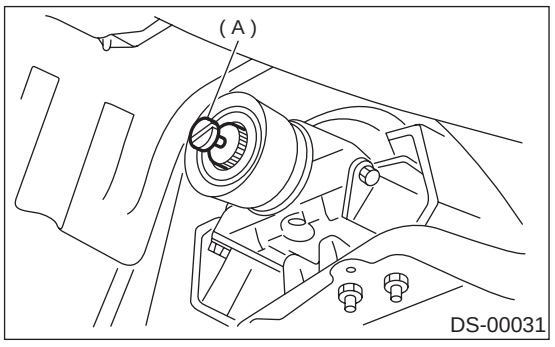
CAUTION:
Be sure not to damage oil seals and the frictional surface of sleeve yoke.

NOTE:
• Be sure to use an empty oil can to catch oil flowing out when removing propeller shaft.
• Be sure to plug the opening in transmission after removal of propeller shaft.


DS-00142

12) Install the extension cap to transmission.

NOTE:
If extension cap is not available, cover the opening with a vinyl bag in order to prevent gear oil or ATF leakage.

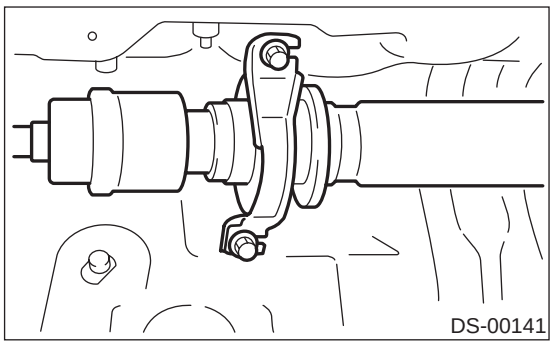


(A) Extension cap

B: INSTALLATION

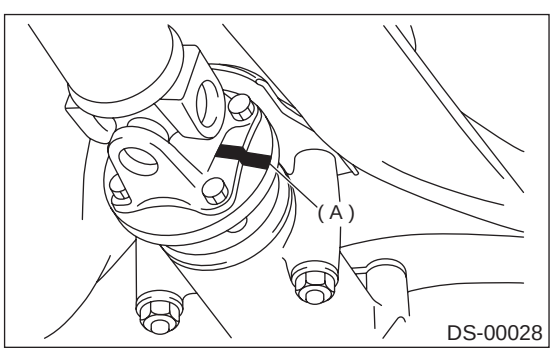
1) Insert sleeve yoke into transmission and attach center bearing to vehicle body.

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



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

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



(A) Matching mark

3) Install heat shield cover.
4) Install center exhaust pipes.
5) Install rear exhaust pipe and muffler.

C: INSPECTION

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

1) Tube surfaces for dents or cracks
2) Splines for deformation or abnormal wear
3) Joints for non-smooth operation or abnormal noise
4) Center bearing for free play, noise or non-smooth operation
5) Oil seals for abnormal wear or damage
6) Center bearing for breakage

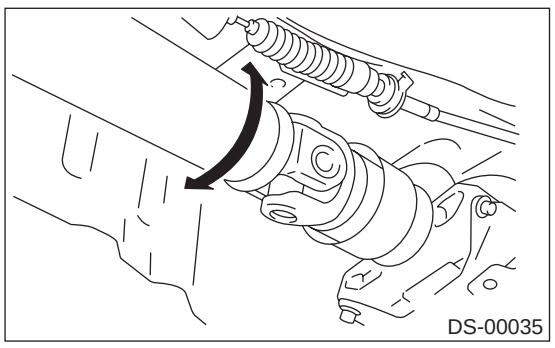
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

1) Remove center exhaust pipes.
2) Remove heat shield cover.
3) Check for any looseness of yoke flange connecting bolts and center bearing retaining bolts.

2. SPLINES AND BEARING LOCATIONS

1) Remove center exhaust pipes.
2) Remove rear exhaust pipe and muffler.
3) Remove heat shield cover.
4) Turn 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.

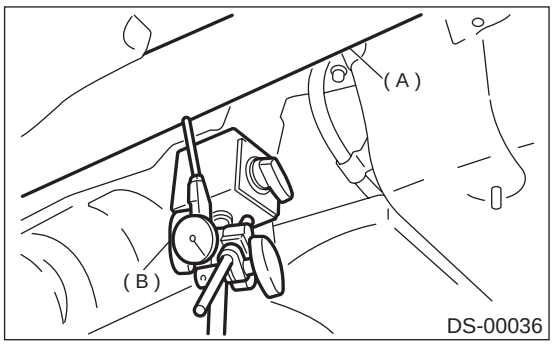


3. RUNOUT OF PROPELLER SHAFT

1) Remove center exhaust pipes.
2) Remove rear exhaust pipe and muffler.
3) Remove heat shield cover.
4) Turn rear wheels by hand to check for “runout” of propeller shaft.

NOTE:
Measure runout with a dial gauge at the center of front and rear propeller shaft tubes.

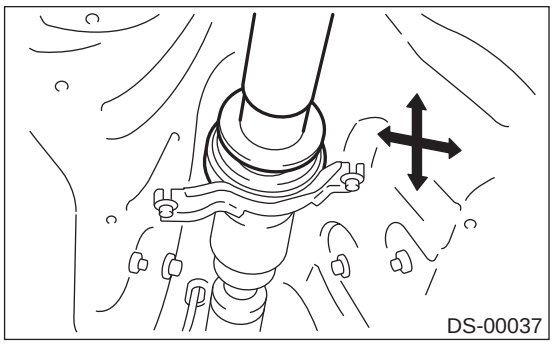
Runout:
Limit 0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

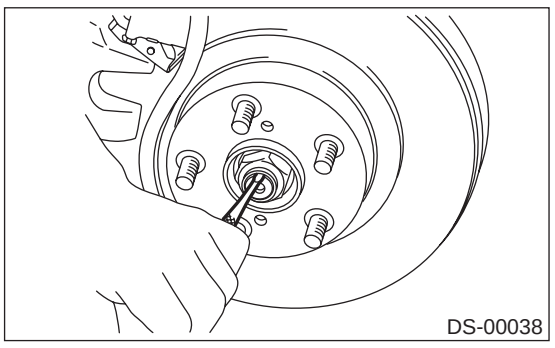
1) Remove front and center exhaust pipes.
2) Remove rear exhaust pipe and muffler.
3) Remove heat shield cover.
4) While holding propeller shaft near center bearing with your hand, move it up and down, and left and right to check for any abnormal bearing free play.



3. Front Axle

A: REMOVAL

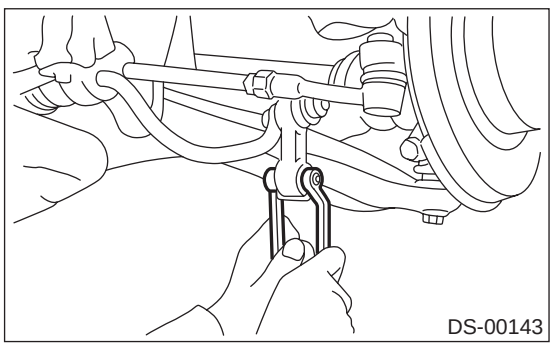
1) Disconnect ground cable from battery.
2) Jack-up vehicle, support it with safety stands, and remove front wheels.
3) Unlock axle nut.



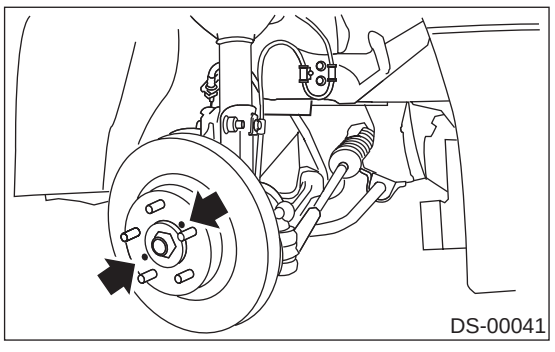
4) Remove axle nut using a socket wrench.

CAUTION:
Be sure to loose and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

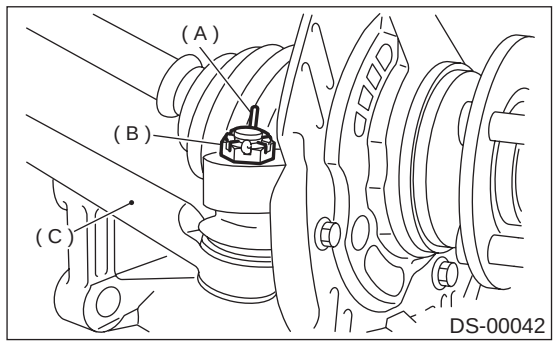
5) Remove stabilizer link.



6) Remove disc brake caliper from housing, and suspend it from strut using a wire.
7) Remove disc rotor from hub.
If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on the rotor.

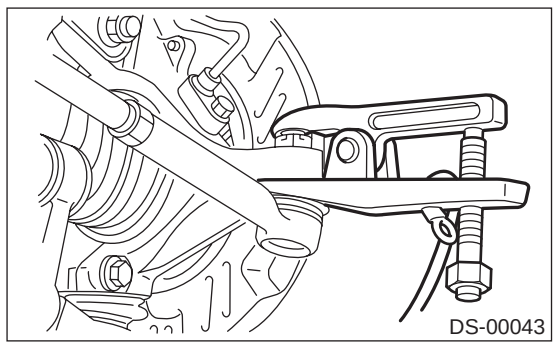


8) Remove cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

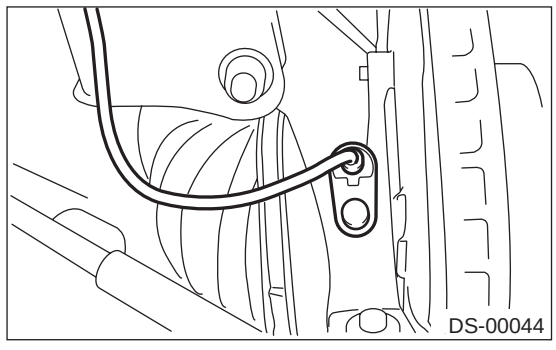


(A) Cotter pin
(B) Castle nut
(C) Tie-rod

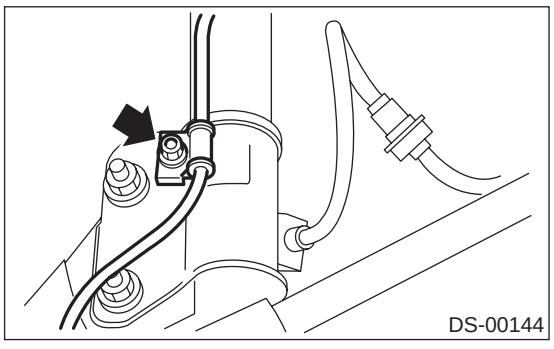
9) Using a puller, remove tie-rod ball joint from knuckle arm.



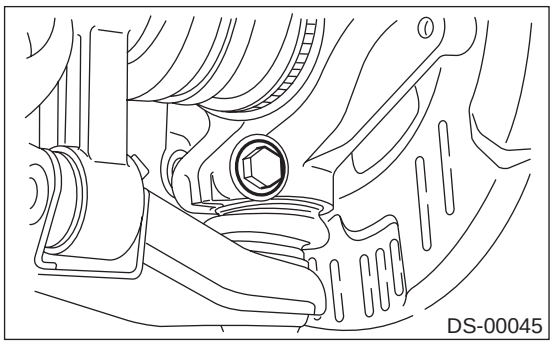
10) Remove ABS sensor assembly and harness in advance.



11) Remove bolt which secures sensor harness to strut.

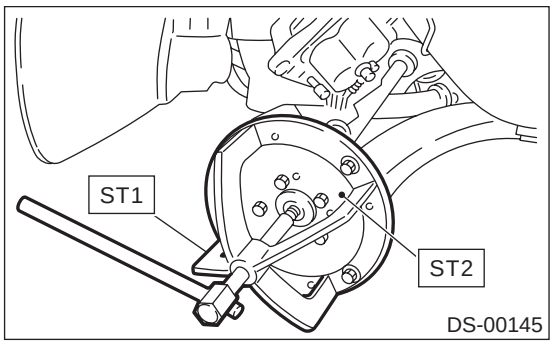

DS-00144

12) Remove transverse link ball joint from housing.


DS-00045

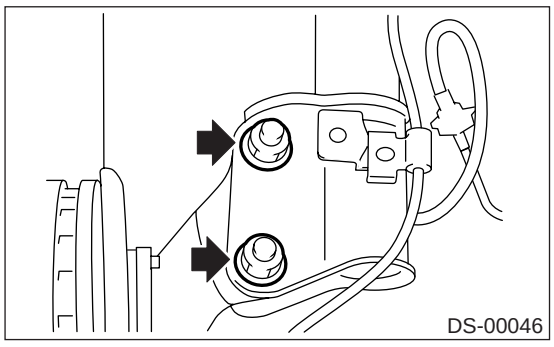
13) Remove SFJ from transmission spindle.
14) Remove front drive shaft assembly from hub. If it is hard to remove, use STs.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
• Be careful not to damage oil seal lip and tone wheel when removing front drive shaft.
• When replacing front drive shaft, also replace inner oil seal.



DS-00145

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


DS-00046

B: INSTALLATION

1) While aligning alignment mark on camber adjusting bolt head, connect housing and strut.

CAUTION:
Use a new self-locking nut.

Tightening torque:
177 N·m (18.0 kgf-m, 130 ft-lb)

2) Install front drive shaft. <Ref. to DS-28, INSTALLATION, Front Drive Shaft.>
3) Install transverse link ball joint to housing.

Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)

4) Install ABS sensor harness on strut.
5) Install ABS sensor on housing.

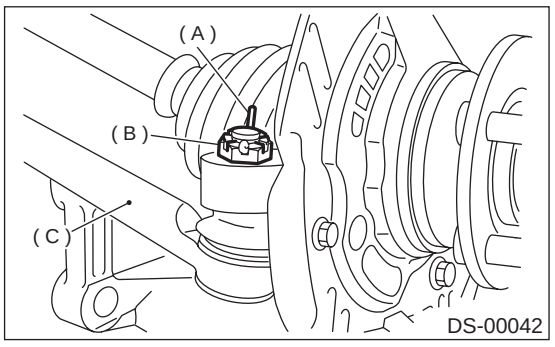
Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

6) Install disc rotor on hub.
7) Install disc brake caliper on housing.

Tightening torque:
78 N·m (8 kgf-m, 57.9 ft-lb)

8) Connect stabilizer link.
9) Connect tie-rod end ball joint and knuckle arm with a castle nut, and insert cotter pin into tie-rod end.

Tightening torque:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)



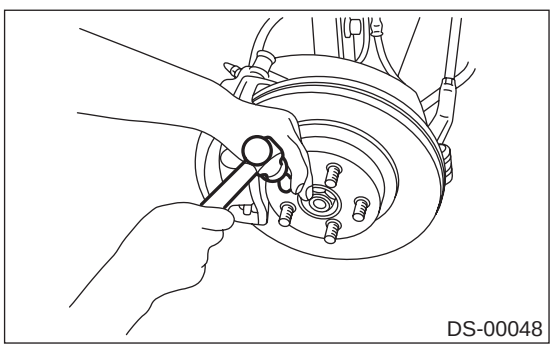
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

10) While depressing brake pedal, tighten axle nut and lock it securely.

Tightening torque:
216 N·m (22 kgf-m, 159 ft-lb)

CAUTION:
• Use a new axle nut (3.0 L model: Olive color, 2.5 L model: Gold color).
• Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

11) After tightening axle nut, lock it securely.

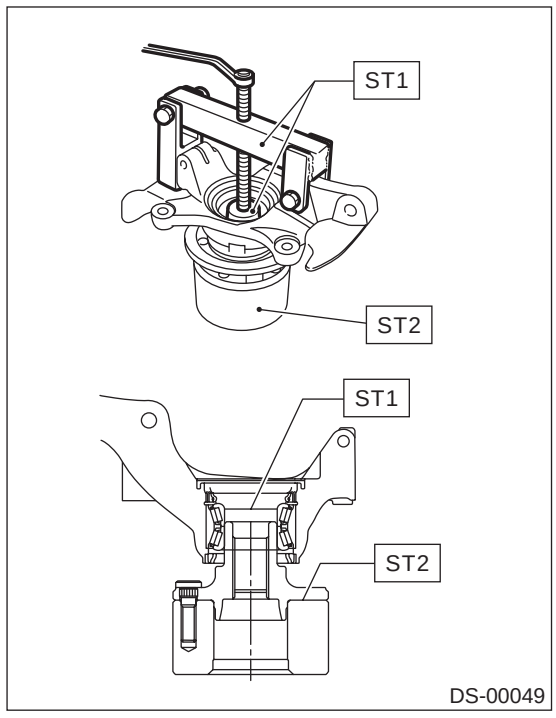


12) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:
88 N·m (9 kgf-m, 65 ft-lb)

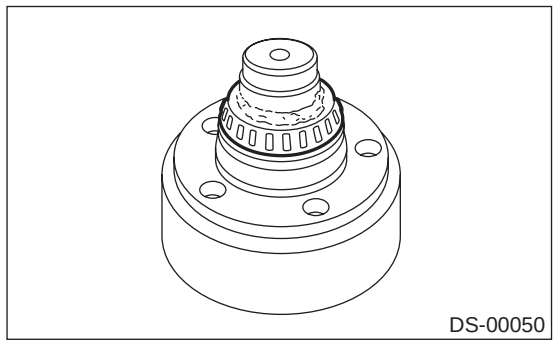
C: DISASSEMBLY

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

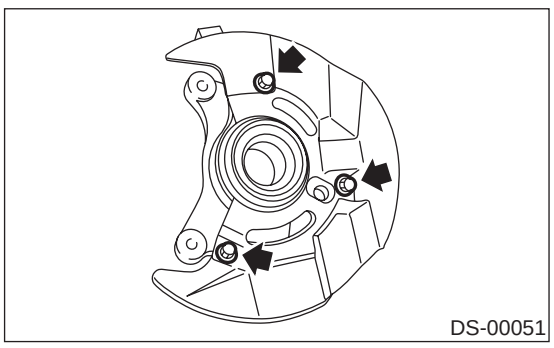


If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

CAUTION:
• Be careful not to scratch polished area of hub.
• Be sure to install inner race on the side of outer race from which it was removed.



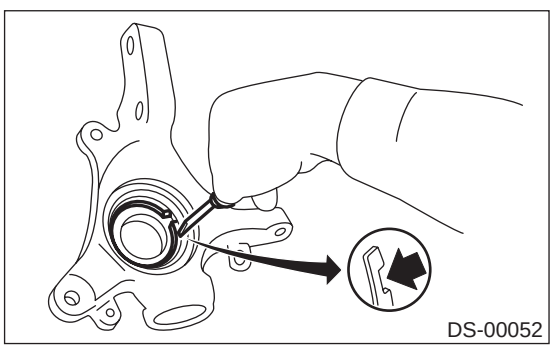
3) Remove disc cover from housing.



4) Using a standard screwdriver, remove outer and inner oil seals.

CAUTION:
Do not use old oil seals.

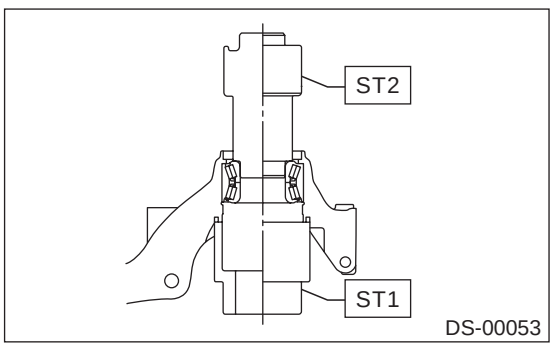
5) Using flat-bladed screwdriver, remove snap ring.



6) Using ST1, support housing securely.

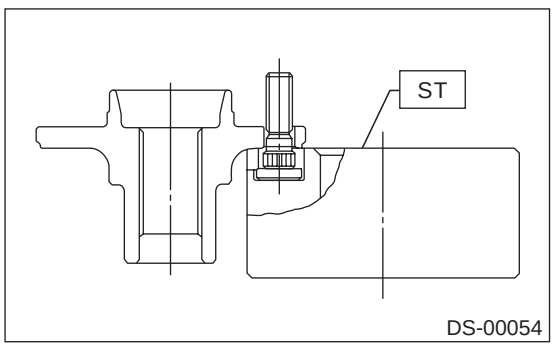
7) Using ST2, press inner race to drive out outer bearing.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING REMOVER

CAUTION:
- **Do not remove outer race unless it is faulty.**
- **Discard outer race after removal.**
- **Do not replace inner or outer race separately; always replace as a unit.**



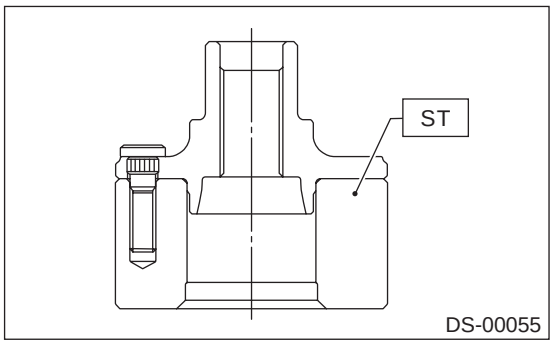
8) Using ST and a hydraulic press, drive hub bolts out.
ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer hub bolts. This may deform hub.



D: ASSEMBLY

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



2) Using a hydraulic press, press new hub bolts into place.

CAUTION:
Be sure to press hub bolts until their seating surfaces contact the hub.

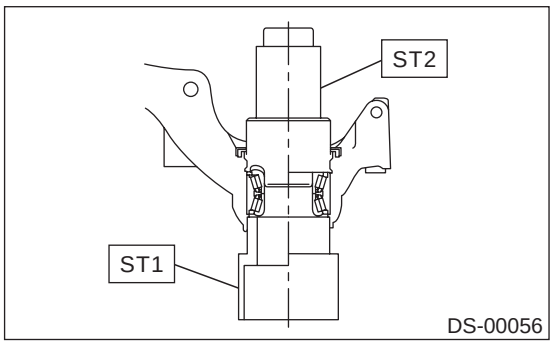
NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

3) Clean dust or foreign particles from inside the housing.

4) Using ST1 and ST2, press a new bearing into place.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING REMOVER

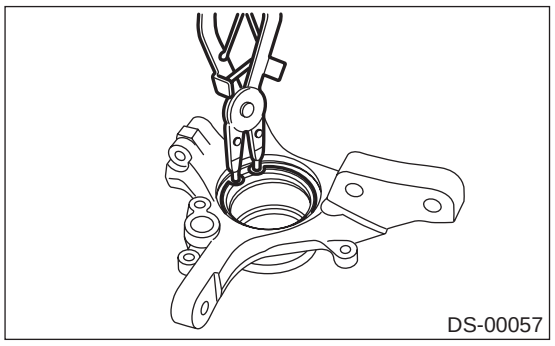
CAUTION:
• Always press outer race when installing bearing.
• Be careful not to remove plastic lock from inner race when installing bearing.
• Charge bearing with new grease when outer race is not removed.

Specified grease:
SHELL 6459N

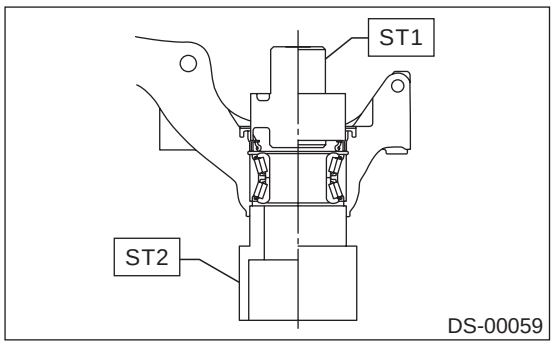


5) Using pliers, install snap ring in its groove.

CAUTION:
Make sure to install it firmly to groove.

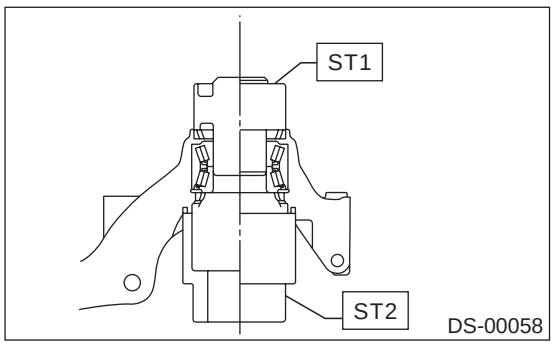


6) Using ST1 and ST2, press inner oil seal until it contacts circlip.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



7) Invert ST and housing.
ST 927400000 HOUSING STAND

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



9) Apply sufficient grease to oil seal lip.

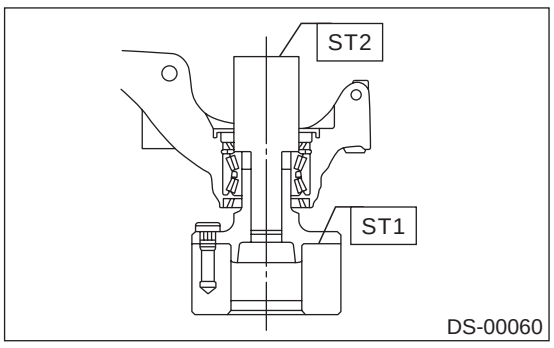
Specified grease
SHELL 6459N

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

10) Install disc cover to housing the three bolts.

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

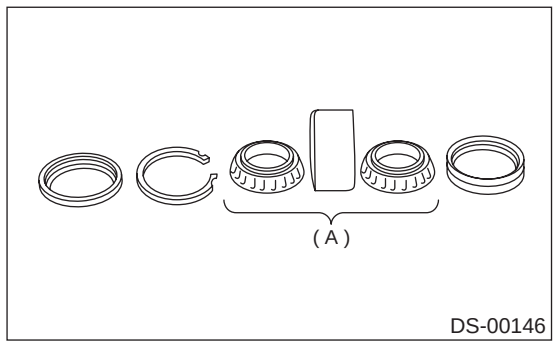
11) Attach hub to ST1 securely.
12) Clean dust or foreign particles from the polished surface of hub.
13) Using ST2, press bearing into hub by driving inner race.
ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER



E: INSPECTION

Check the removed parts for wear and damage. If defective, replace with new ones.

CAUTION:
• If bearing is faulty, replace it as the bearing set.
• Be sure to replace oil seal at every overhaul.



(A) Replace as a set.

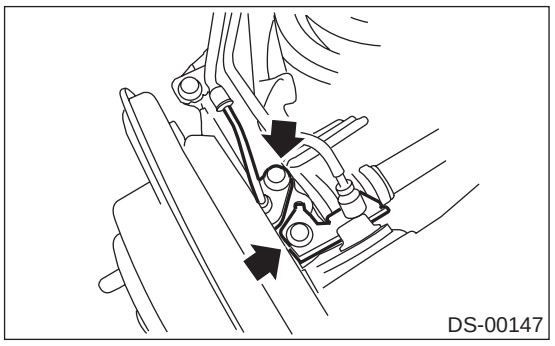
4. Hub Unit Bearing

A: REMOVAL

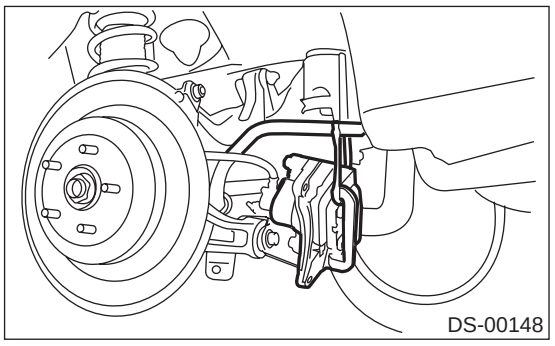
1) Disconnect ground cable from battery.
2) Jack-up vehicle, and remove rear wheel cap and wheels.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

3) Unlock axle nut.
4) Remove axle nut using a socket wrench.
5) Return parking brake lever.
6) Remove ABS sensor.


DS-00147

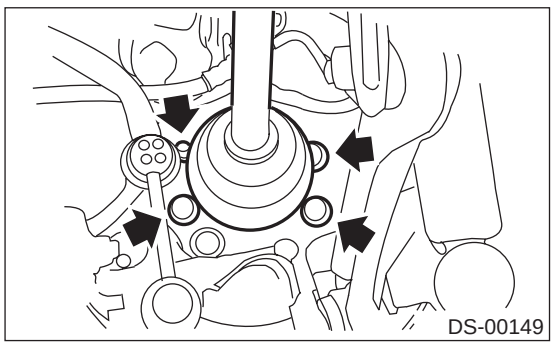
7) Remove brake caliper from back plate and suspend it from stabilizer using a piece of wire.


DS-00148

8) Remove disc rotor from hub.

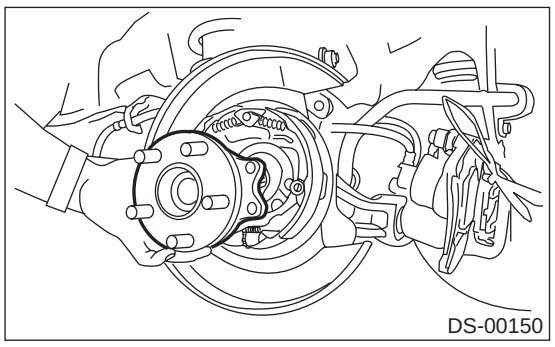
NOTE:
• Before removing disc rotor, mark the matching surface of hub and disc rotor so as not to be confused when installing.
• If disc rotor seizes up within hub, drive it out by installing an 8 mm bolt into disc rotor bolt hole.

9) Remove four bolts from rear arm.

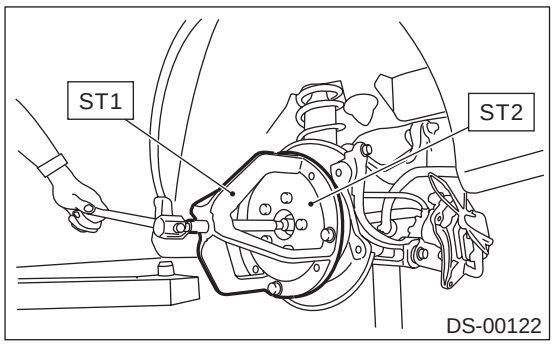

DS-00149

10) Remove hub unit bearing.

CAUTION:
Be careful not to damage tone wheel.


DS-00150

If it is hard to remove, use STs.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

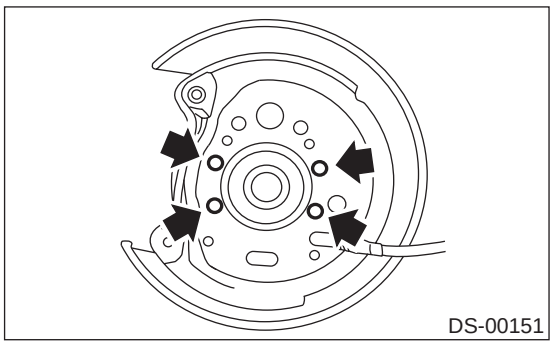


DS-00122

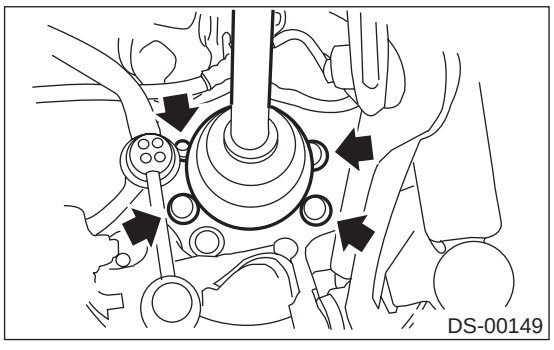
B: INSTALLATION

1) Align hub unit bearing with back plate at mounting holes and install hub unit assembly and back plate. Temporarily tighten axle nuts.

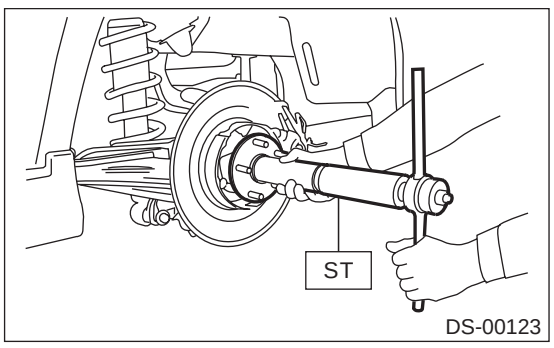
CAUTION:
Be careful not to damage tone wheel.


DS-00151

2) Tighten four bolts to back plate.


DS-00149

3) Remove axle nut.
4) Using ST1 and ST2, pull axle shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

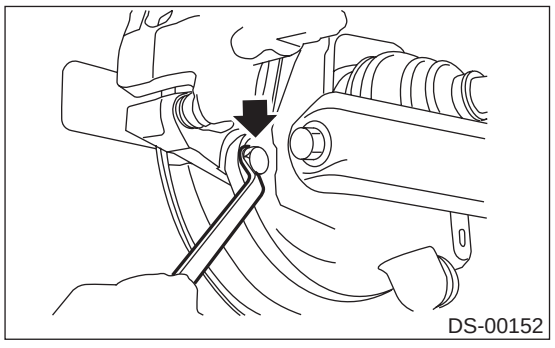


DS-00123

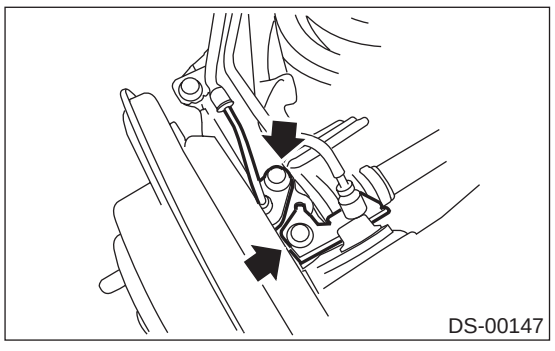
5) Temporarily tighten axle nuts.
6) Install disc rotor on hub.

7) Install disc brake caliper on back plate.

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


DS-00152

8) Install rear ABS sensor and brake cable bracket.

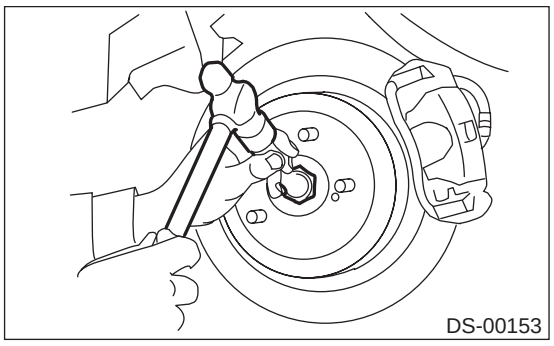

DS-00147

9) Adjust parking brake lever stroke by turning adjuster. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

10) Move brake lever back to apply brakes. While depressing brake pedal, tighten axle nut using a socket wrench. Lock axle nut after tightening.

Tightening torque:
235 N·m (24 kgf-m, 174 ft-lb)

CAUTION:
• Use a new axle nut for rear use only (Olive color).
• Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.


DS-00153

11) Install wheel and tighten wheel nuts to specified torque.

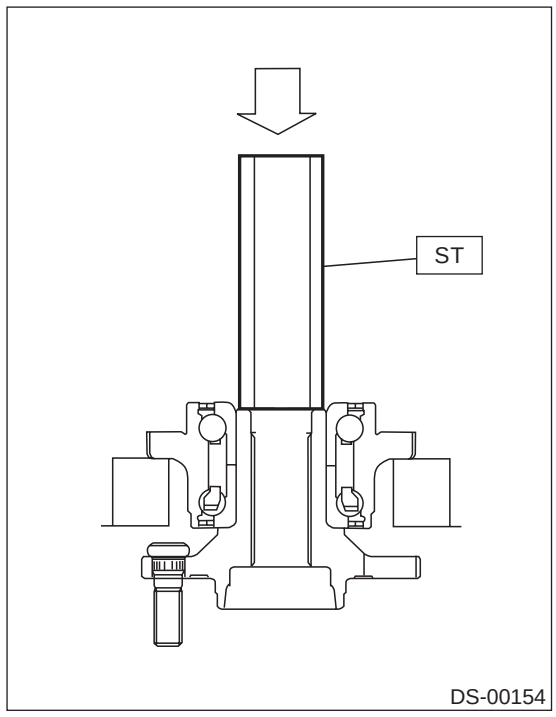
Tightening torque:
88 N·m (9 kgf-m, 65 ft-lb)

C: DISASSEMBLY

1) Using ST, remove hub unit from hub assembly.

CAUTION:
Securely set hub assembly so that it does not lean.

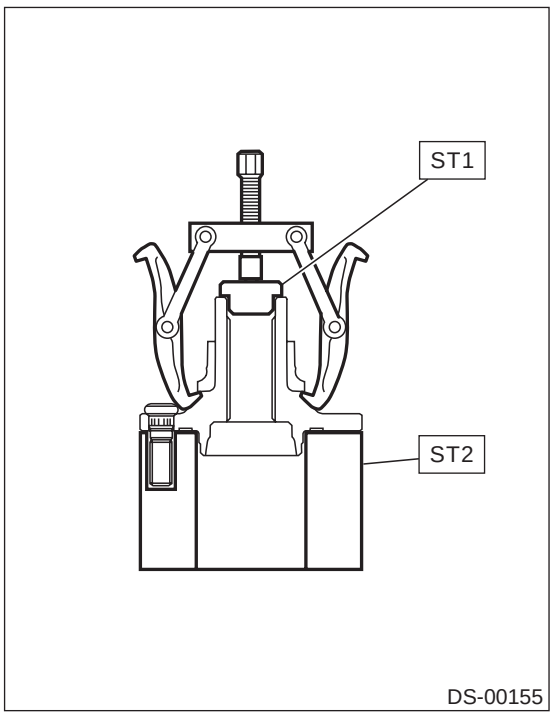
ST 398507703 DUMMY COLLAR



DS-00154

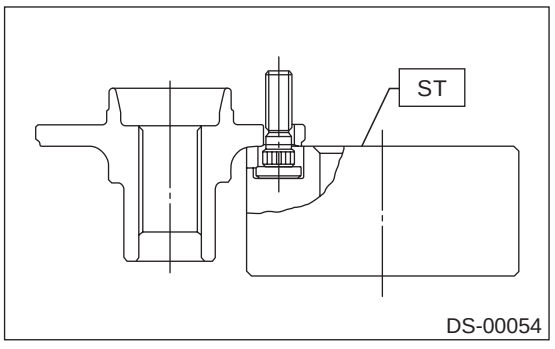
2) Using ST and a puller (common hand tool), remove bearing inner race.
ST1 399520105 SEAT
ST2 927080000 HUB STAND

CAUTION:
• Do not remove hub unit bearing unless damaged.
• Do not re-use hub unit bearing after removal.



3) Using ST, press hub bolt out.
ST 927080000 HUB STAND

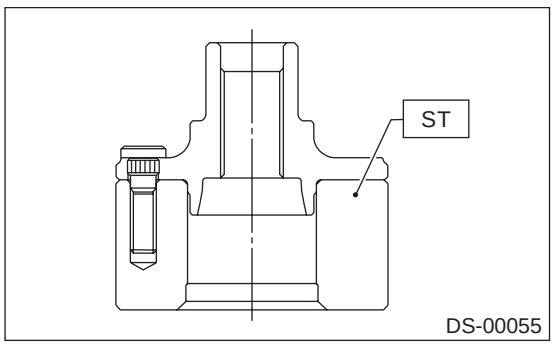
CAUTION:
Be careful not to hammer hub bolts. This may deform hub.



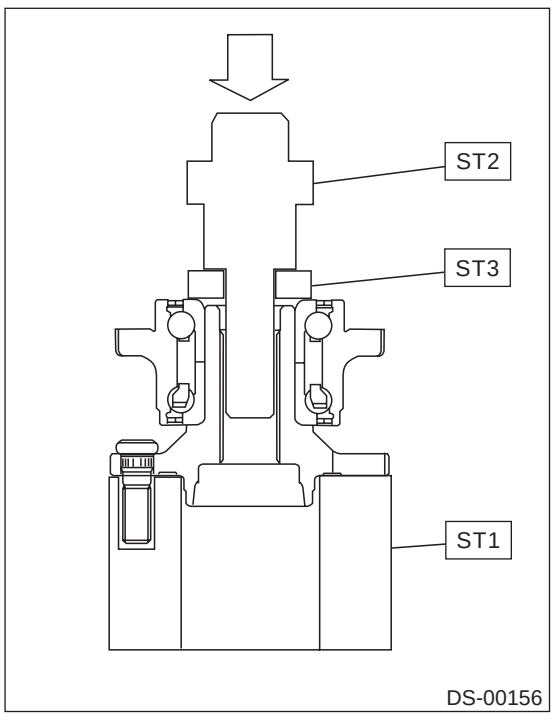
D: ASSEMBLY

1) Using ST, press new hub bolt into place.

CAUTION:
• Ensure hub bolt closely contacts hub.
• Use a 12 mm (0.47 in) hole in the ST to prevent hub bolt from tilting during installation.
ST 927080000 HUB STAND



2) Using ST1, ST2 and ST3, press hub unit bearing into hub.
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER
ST3 28499AE000 SPACER



CAUTION:
• Always press inner race when installing hub unit bearing.
• Use a new hub unit bearing.

E: INSPECTION

Check the removed parts for wear and damage. If defective, replace with new ones.

CAUTION:
If a bearing is faulty, replace it as a hub unit bearing.

5. Front Drive Shaft

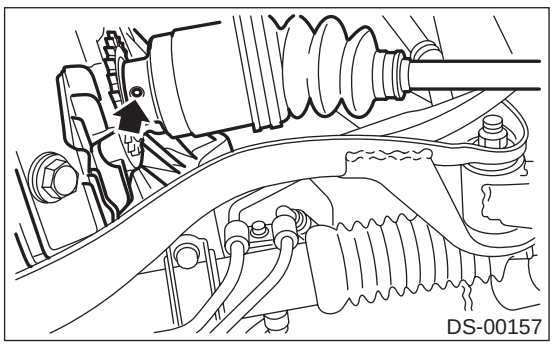
A: REMOVAL

1) Disconnect ground cable from battery.
2) Jack-up vehicle, support it with safety stands (rigid rocks), and remove front wheel cap and wheels.
3) Unlock axle nut.
4) Depress brake pedal and remove axle nut using a socket wrench.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

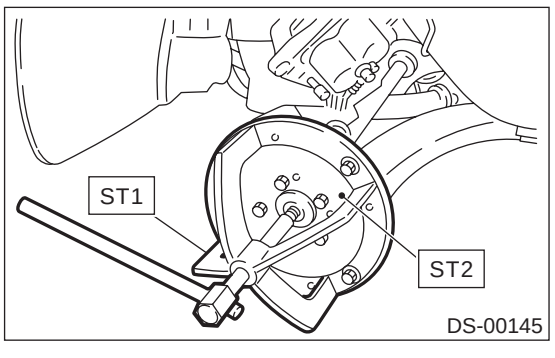
5) Remove stabilizer link from transverse link.
6) Disconnect transverse link from housing.
7) Remove spring pin which secures transmission spindle to SFJ.

CAUTION:
Use a new spring pin.



8) Remove front drive shaft assembly. If it is hard to remove, use ST1 and ST2.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
• Be careful not to damage oil seal lip and tone wheel when removing front drive shaft.
• When front drive shaft is to be replaced, also replace inner oil seal.



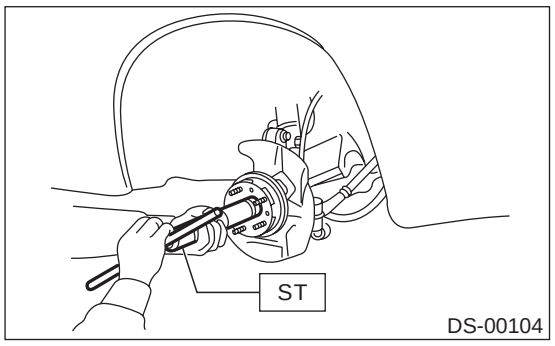
B: INSTALLATION

1) Insert BJ into hub splines.

CAUTION:
Be careful not to damage inner oil seal lip and tone wheel.

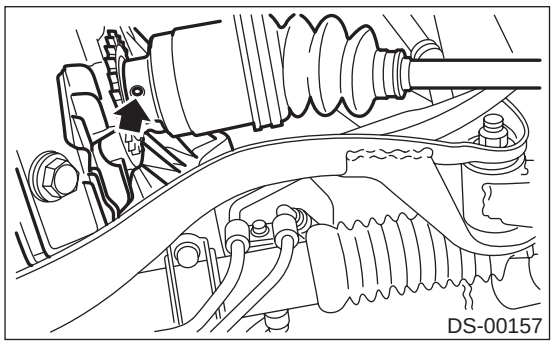
2) Using ST1 and ST2, pull drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

CAUTION:
Do not hammer drive shaft when installing it.



3) Tighten axle nut temporarily.
4) Install SFJ on transmission spindle and drive spring pin into place.

CAUTION:
Always use a new spring pin.



5) Connect transverse link to housing.

Tightening torque (self-locking nut):
49 N·m (5.0 kgf-m, 36 ft-lb)

CAUTION:
Use a new self-locking nut.

6) Install stabilizer bracket.

7) While depressing brake pedal, tighten axle nut to the specified torque.

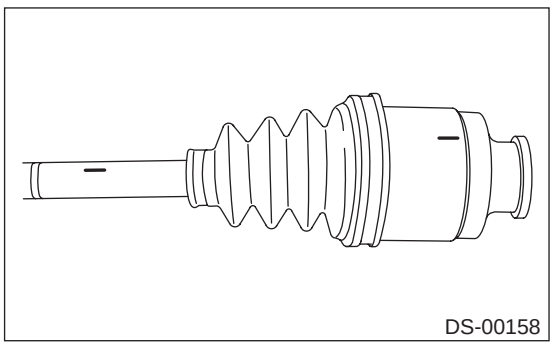
Tightening torque:
216 N·m (22 kgf-m, 159 ft-lb)

CAUTION:
• Use a new axle nut (3.0 L model: Olive color, 2.5 L model: Gold color).
• Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

8) After tightening axle nut, lock it securely.

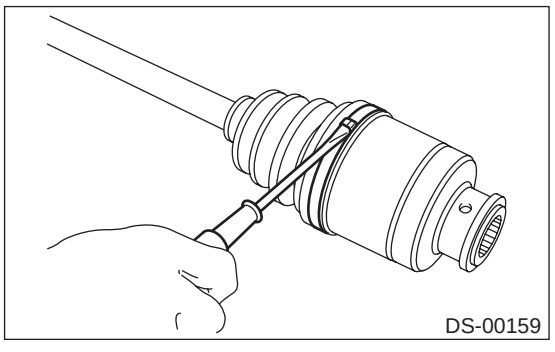
C: DISASSEMBLY

1) Place alignment marks on shaft and outer race.

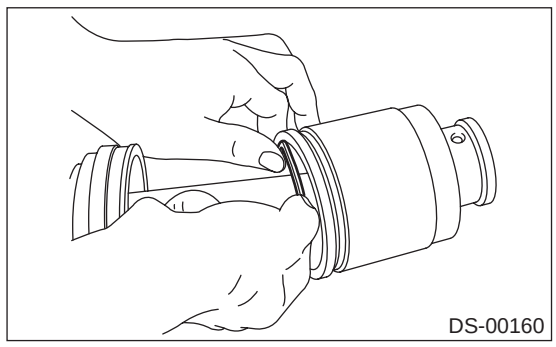

DS-00158

2) Remove SFJ boot band and boot.

CAUTION:
Be careful not to damage boot.


DS-00159

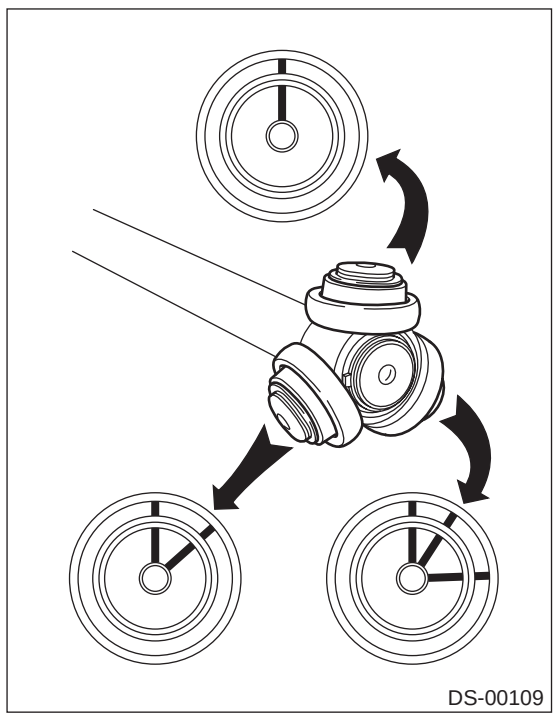
3) Remove circlip from SFJ outer race using screwdriver.


DS-00160

4) Remove SFJ outer race from shaft assembly.
5) Wipe off grease.

CAUTION:
The grease is a special grease. Do not confuse with other greases.

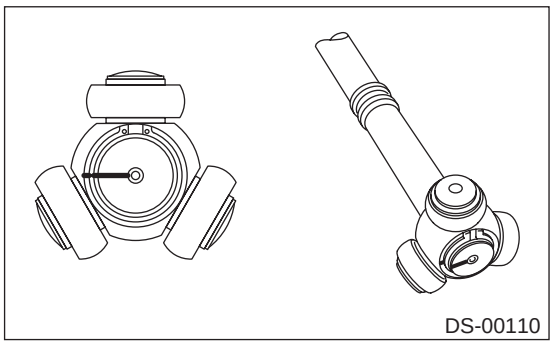
6) Place alignment mark on free ring and trunnion.


DS-00109

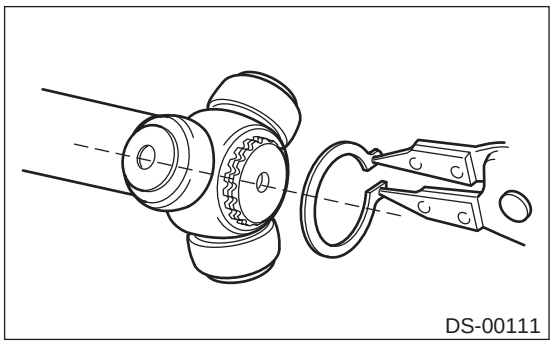
7) Remove free ring from trunnion.

CAUTION:
Be careful with the free ring position.

8) Place alignment mark on trunnion and shaft.


DS-00110

9) Remove snap ring and trunnion.


DS-00111

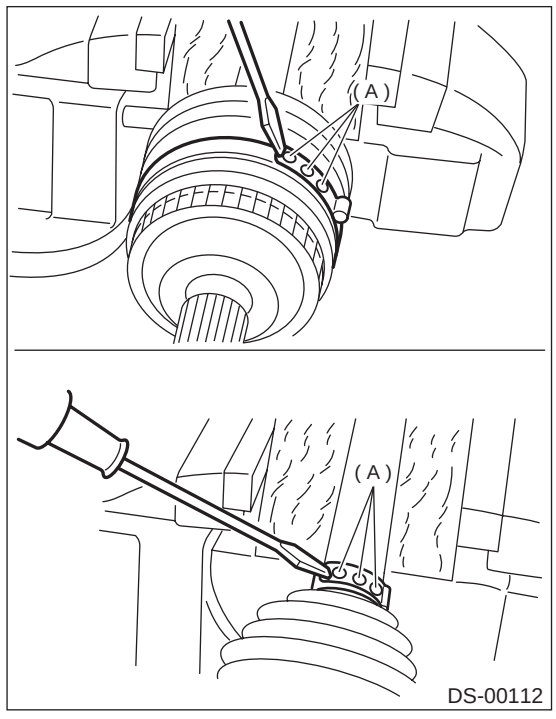
CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

10) Remove SFJ boot.

11) Place drive shaft in a vise between wooden blocks.

CAUTION:
Do not place drive shaft directly in the vise; use wooden block.

12) Raise boot band claws by means of screwdriver and hammer.

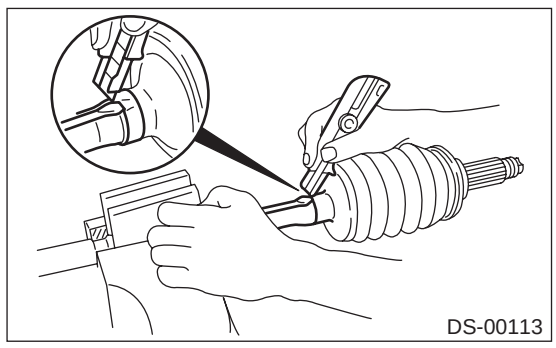


DS-00112

(A) Boot band claws

13) Cut and remove the boot.

CAUTION:
The boot must be replaced with a new one whenever it is removed.


DS-00113

14) Thus, disassembly of axle is completed, but BJ cannot be disassembled.

D: ASSEMBLY

CAUTION:
Use specified grease.

BJ side:
NTG2218 (Part No. 28093AA000)

SFJ side:
SSG6003 (Part No. 28093TA000)

1) Place BJ boot and small boot band on BJ side of shaft.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

2) Place drive shaft in a vise.

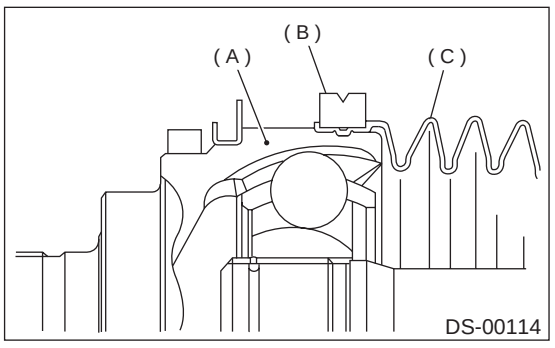
CAUTION:
Do not place drive shaft directly in the vise; use wooden blocks.

3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to BJ.

4) Apply an even coat of specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.

NOTE:
The inside of the larger end of BJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.

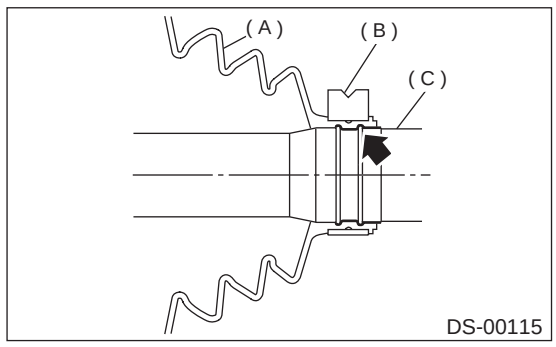
5) Install boot projecting portion to BJ groove.



(A) BJ
(B) Large boot band
(C) Boot

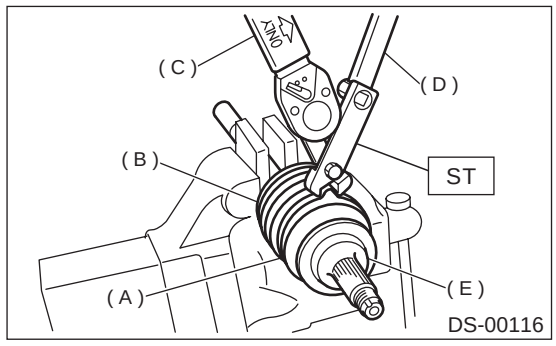
6) Set large boot band in place.

7) Install boot projecting portion to shaft groove.



(A) Boot
(B) Small boot band
(C) Shaft

8) Tighten boot bands using ST, torque wrench and socket flex handle.
ST 28099AC000 BOOT BAND PLIER

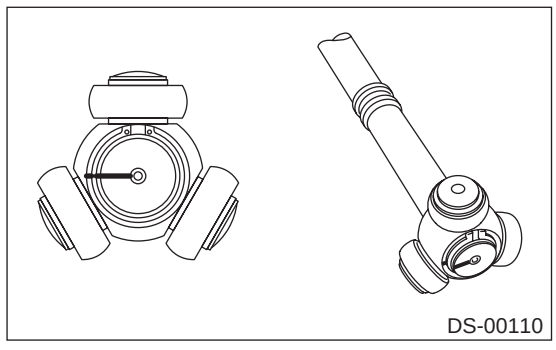


(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) BJ

Tightening torque:
Large boot band
157 N·m (16.0 kgf-m, 116 ft-lb) or more
Small boot band
133 N·m (13.6 kgf-m, 98 ft-lb) or more

9) Place SFJ boot at the center of shaft.

10) Align alignment marks and install trunnion on shaft.



11) Install snap ring to shaft.

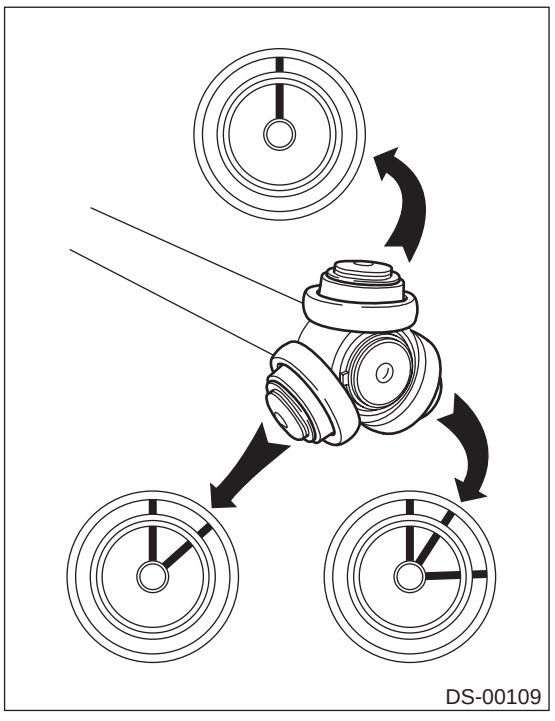
CAUTION:
Confirm that the snap ring is completely fitted in the shaft groove.

12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of SFJ outer race.

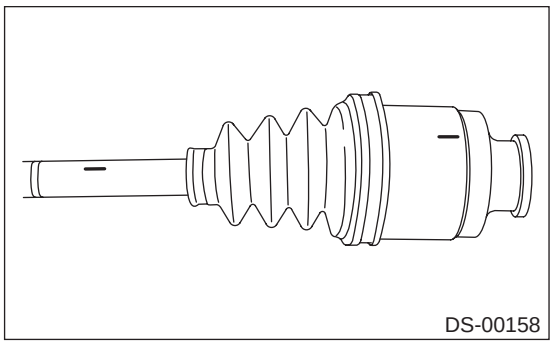
13) Apply a coat of specified grease to free ring and trunnion.

14) Align alignment marks on free ring and trunnion and install free ring.

CAUTION:
Be careful with the free ring position.


DS-00109

15) Align alignment marks on shaft and outer race, and install outer race.


DS-00158

16) Install circlip in the groove on SFJ outer race.

CAUTION:
Pull the shaft lightly and assure that the circlip is completely fitted in the groove.

17) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.

18) Install SFJ boot taking care not to twist it.

CAUTION:
• The inside of the larger end of SFJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.
• When installing SFJ boot, position outer race of SFJ at center of its travel.

19) Put a band through the clip and wind twice in alignment with band groove of boot.

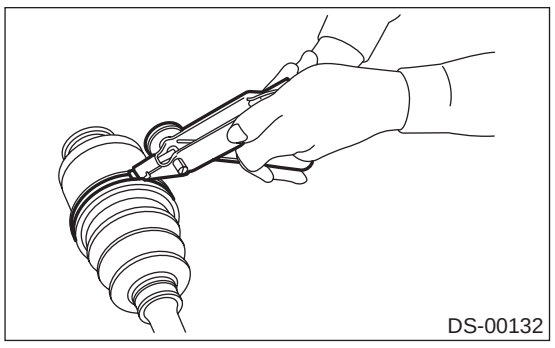
CAUTION:
Use a new band.

20) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:
When tightening boot, exercise care so that the air within the boot is appropriate.

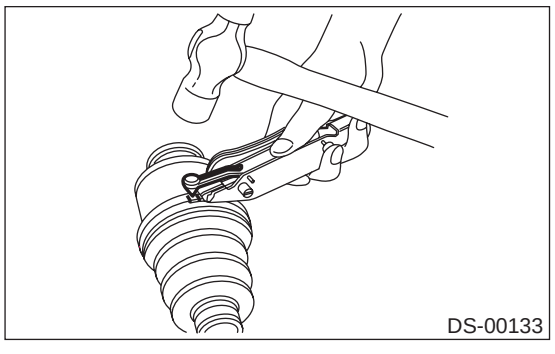
21) Tighten band by using ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten band until it cannot be moved by hand.


DS-00132

22) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.


DS-00133

23) Cut off band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Be careful so that the end of the band is in close contact with clip.

24) Fix up boot on BJ in the same manner.

NOTE:
Extend and retract SFJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) DOJ (Double Offset Joint)
Check seizure, corrosion, damage, wear and excessive play.
2) SFJ (Shudder-less Free-ring tripod Joint)
Check seizure, corrosion, damage and excessive play.
3) Shaft
Check excessive bending, twisting, damage and wear.
4) BJ (Bell Joint)
Check seizure, corrosion, damage and excessive play.
5) Boot
Check for wear, warping, breakage or scratches.
6) Grease
Check for discoloration or fluidity.

6. Rear Drive Shaft

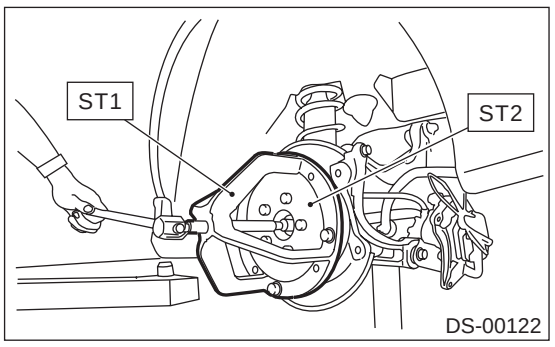
A: REMOVAL

1) Disconnect ground cable from battery.
2) Lift-up vehicle, and remove rear wheel cap and wheels.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

3) Unlock axle nut.
4) Remove axle nut using a socket wrench.
5) Remove rear differential assembly.
With T-type
<Ref. to DI-24, REMOVAL, Rear Differential for T-type.>
With VA-type
<Ref. to DI-41, REMOVAL, Rear Differential for VA-type.>
6) Remove axle nut and drive shaft. If it is hard to remove, use ST1 and ST2.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
Be careful not to damage tone wheel when removing rear drive shaft.



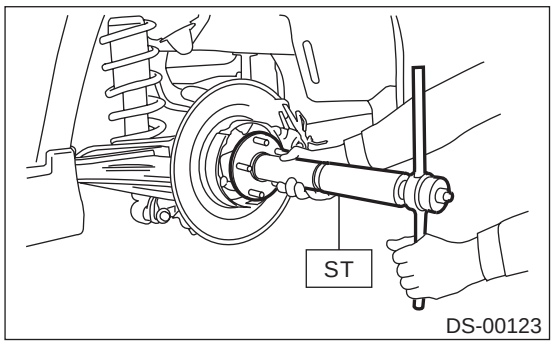
B: INSTALLATION

1) Insert BJ into rear hub splines.

CAUTION:
Be careful not to damage tone wheel.

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

CAUTION:
Do not hammer drive shaft when installing it.



3) Tighten axle nut temporarily.
4) Install rear differential.
With T-type
<Ref. to DI-25, INSTALLATION, Rear Differential for T-type.>
With VA-type
<Ref. to DI-42, INSTALLATION, Rear Differential for VA-type.>
5) While depressing brake pedal, tighten axle nut using a socket wrench.

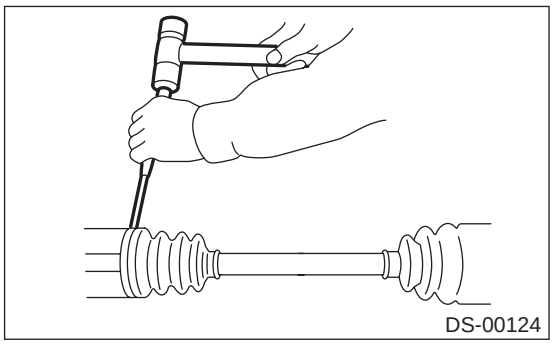
Tightening torque:
235 N·m (24 kgf-m, 174 ft-lb)

CAUTION:
• Use a new axle nut for rear use only (Olive color).
• Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

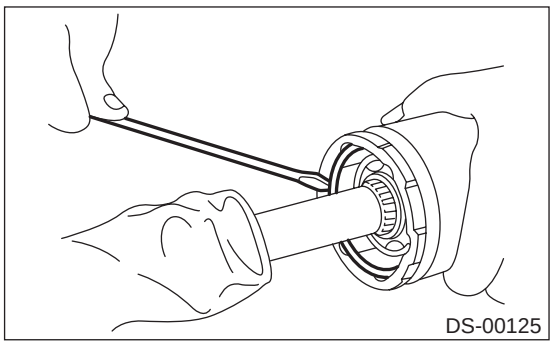
6) After tightening axle nut, lock it securely.

C: DISASSEMBLY

1) Straighten bent claw of larger end of DOJ boot.
2) Loosen band by means of screwdriver or pliers, being careful not to damage the boot.


DS-00124

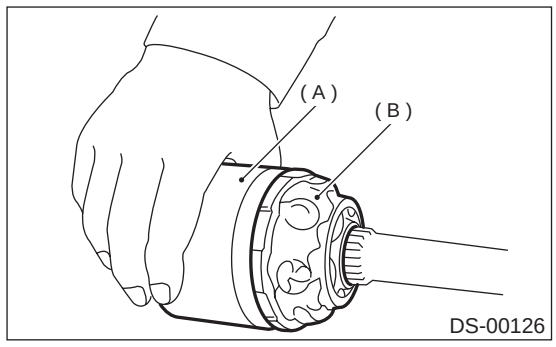
3) Remove boot band on the small end of DOJ boot in the same manner.
4) Remove the larger end of DOJ boot from DOJ outer race.
5) Pry and remove round circlip located at the neck of DOJ outer race with a screwdriver.


DS-00125

6) Take out DOJ outer race from shaft assembly.
7) Wipe off grease and take out balls.

CAUTION:
The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.

NOTE:
Disassemble exercising care not to lose balls (6 pcs).



DS-00126

(A) Outer race
(B) Grease

8) To remove the cage from the inner race, turn the cage by a half pitch to the track groove of the inner race and shift the cage.
9) Remove snap ring, which fixes inner race to shaft, by using pliers.
10) Take out DOJ inner race.
11) Take off DOJ cage from shaft and remove DOJ boot.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

12) Remove BJ boot in the same procedure as DOJ boot.
13) Thus, disassembly of axle is completed, but BJ is unable to be disassembled.

D: ASSEMBLY

CAUTION:
Use specified grease.

BJ side:
Molylex No. 2 (Part No. 723223010)

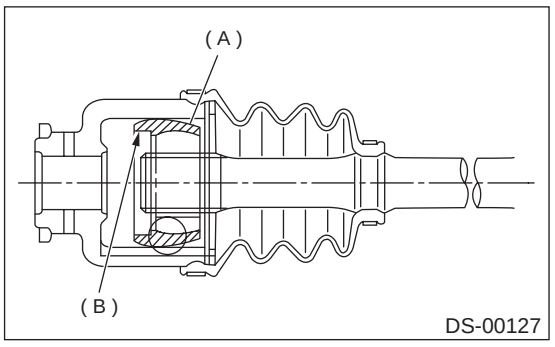
DOJ side:
VU-3A702 (Yellow) (Part No. 23223GA050)

1) Install BJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
2) Place DOJ boot at the center of shaft.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

3) Insert DOJ cage onto shaft.

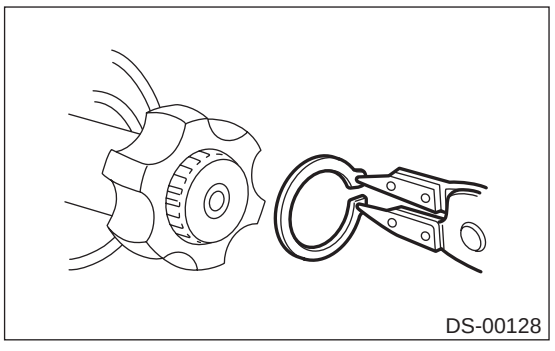
NOTE:
Insert the cage with the cut-out portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cut-out portion

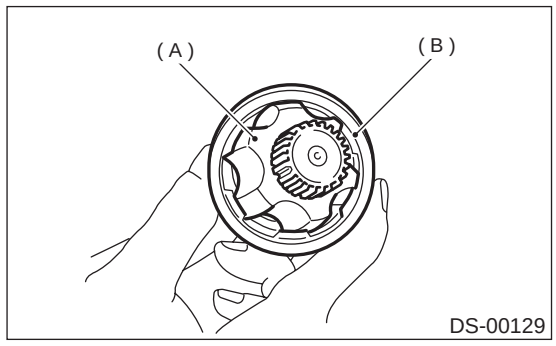
4) Install DOJ inner race on shaft and fit snap ring with pliers.

NOTE:
Confirm that the snap ring is completely fitted in the shaft groove.



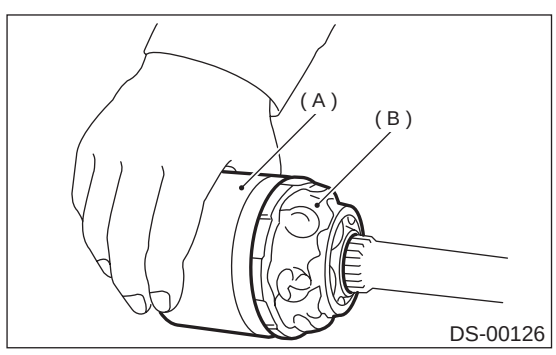
5) Install cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:
Fit the cage with the protruded part aligned with the track on the inner race and then turn by a half pitch.



(A) Inner race
(B) Cage

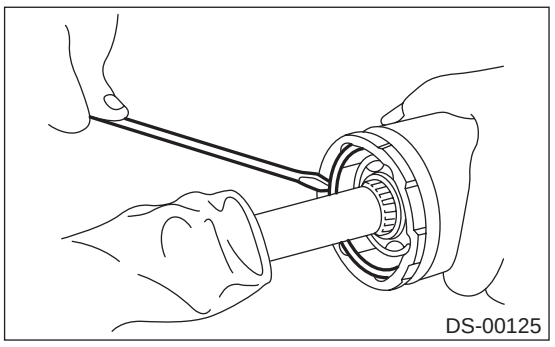
6) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.
7) Apply a coat of specified grease to the cage pocket and six balls.
8) Insert six balls into the cage pocket.
9) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit outer race.



(A) Outer race
(B) Grease

10) Install circlip in the groove on DOJ outer race.

NOTE:
• Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
• Exercise care not to place the matched position of circlip in the ball groove of outer race.
• Pull the shaft lightly and assure that the circlip is completely fitted in the groove.


DS-00125

11) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.
12) Install DOJ boot taking care not to twist it.

NOTE:
• The inside of the larger end of DOJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.
• When installing DOJ boot, position outer race of DOJ at center of its travel.

13) Put a band through the clip and wind twice in alignment with band groove of boot.

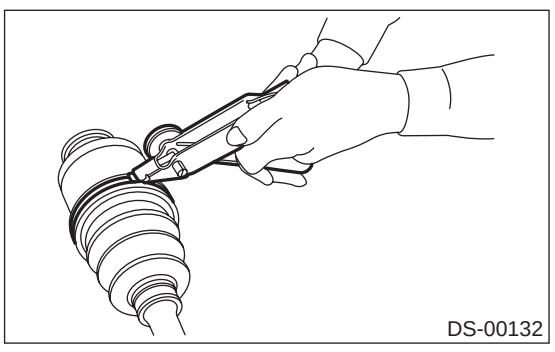
CAUTION:
Use a new band.

14) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:
When tightening boot, exercise care so that the air within the boot is appropriate.

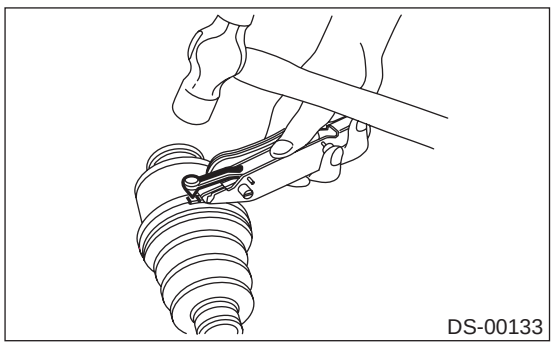
15) Tighten band by using ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten band until it cannot be moved by hand.


DS-00132

16) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.


DS-00133

17) Cut off band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Be careful so that the end of the band is in close contact with clip.

18) Fix up boot on BJ in the same manner.

NOTE:
Extend and retract DOJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) DOJ (Double Offset Joint)
Check seizure, corrosion, damage, wear and excessive play.
2) SFJ (Shudder-less Free-ring tripod Joint)
Check seizure, corrosion, damage and excessive play.
3) Shaft
Check excessive bending, twisting, damage and wear.
4) BJ (Bell Joint)
Check seizure, corrosion, damage and excessive play.
5) Boot
Check for wear, warping, breakage or scratches.
6) Grease
Check for discoloration or fluidity.

7. 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	Remedy
1. Vibration of propeller shaft NOTE: Vibration is caused by propeller shaft during operation and is transferred to vehicle body. Generally vibration increases in proportion to vehicle speed.	(1) Worn or damaged universal joint.	Replace.
	(2) Unbalanced propeller shaft due to bend or dent.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Worn or damaged center bearing and damaged center mounting rubber.	Replace.
2. Tapping when starting and noise while cruising, caused by propeller shaft.	(1) Worn or damaged universal joint.	Replace.
	(2) Worn spline of sleeve yoke.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Loose installation of joint.	Replace.
	(5) Worn or damaged center bearing and damaged center mounting rubber.	Replace.

Vehicle-id:
SIE-id::A:INSPECTION
~

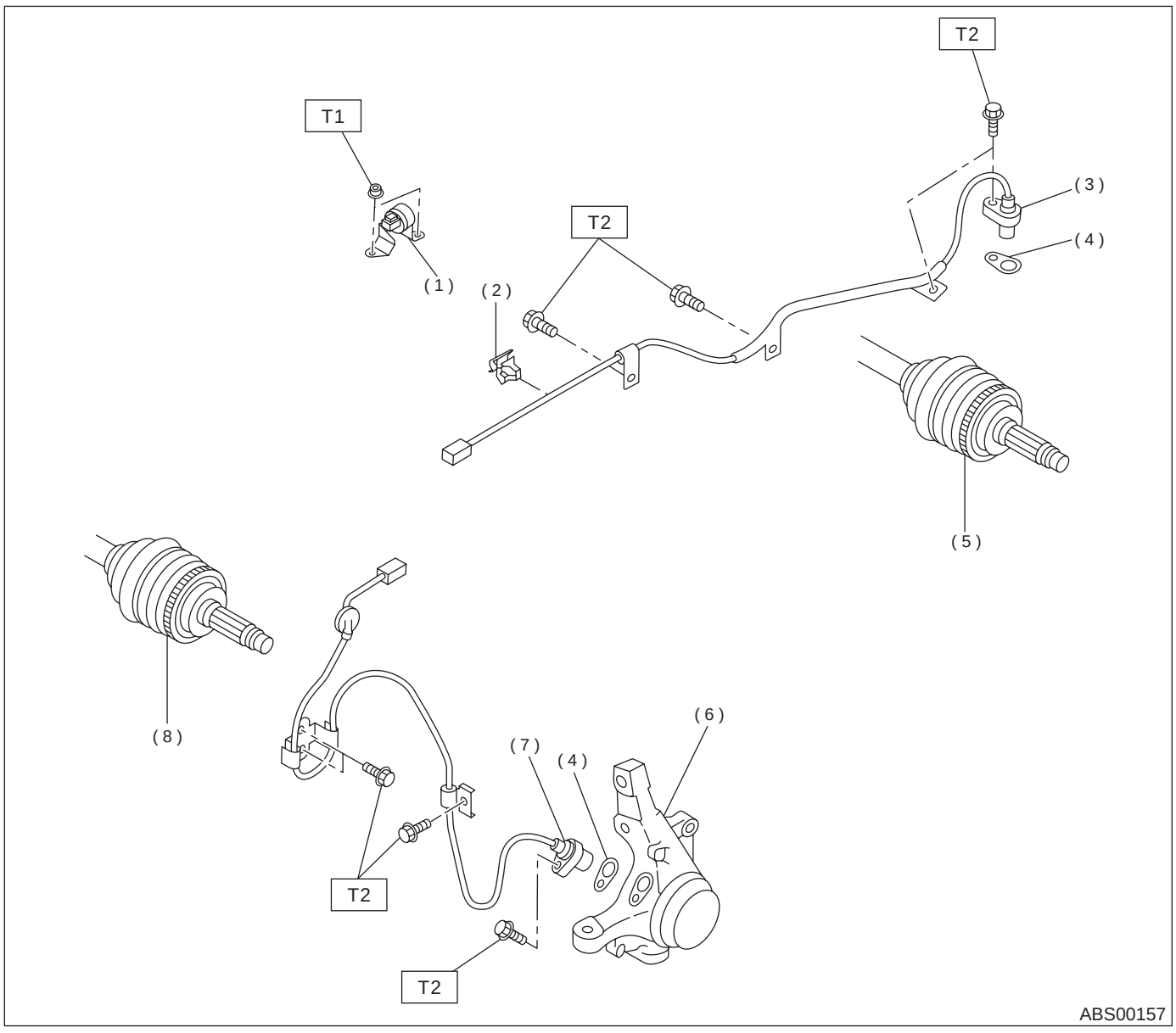
1. General Description

A: SPECIFICATIONS

Item				Standard or remarks
ABS sensor	ABS sensor gap		Front	0.3 — 0.8 mm (0.012 — 0.031 in)
			Rear	0.44 — 0.94 mm (0.0173 — 0.0370 in)
	ABS sensor resistance			1.25±0.25 kΩ
	Marks of the harness	Front LH	Except OUTBACK	Yellow
			OUTBACK	Brown
		Front RH	Except OUTBACK	White
			OUTBACK	Light blue
		Rear LH		Yellow
		Rear RH		White
G sensor	G sensor voltage			2.3±0.2 V
ABS control module and hydraulic control unit (ABSCM&H/U) marks	AT (Except OUTBACK)			CG
	MT (Except OUTBACK)			CH
	AT (OUTBACK)			CI
	MT (OUTBACK)			CJ

B: COMPONENT

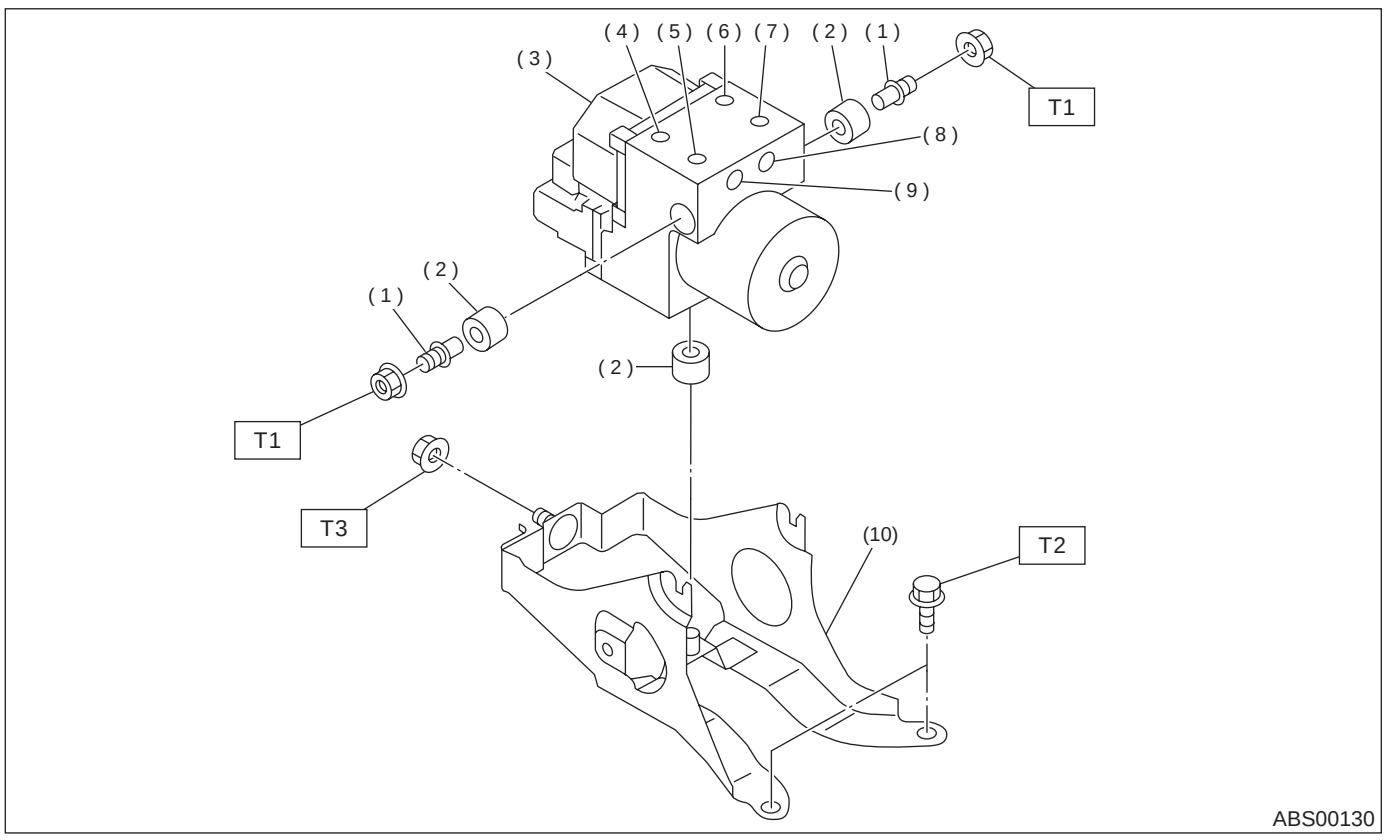
1. SENSOR



(1) G sensor
(2) Clip
(3) Rear ABS sensor LH
(4) ABS spacer
(5) Tone wheel (Rear)
(6) Housing
(7) Front ABS sensor LH
(8) Tone wheel (Front)

Tightening torque: N.m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 32 (3.3, 24)

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



(1) Stud bolt
(2) Damper
(3) ABS control module and hydraulic control unit
(4) Front-LH outlet
(5) Secondary inlet
(6) Front-RH outlet
(7) Primary inlet
(8) Rear-LH outlet
(9) Rear-RH outlet
(10) Bracket

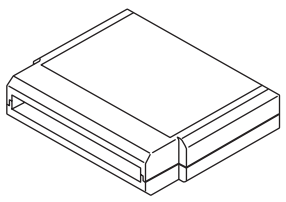
Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.06)
T2: 32 (3.3, 24)
T3: 38 (3.9, 28)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Pressure Gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

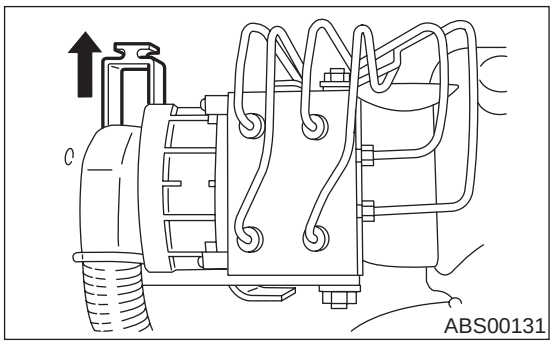
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove air intake duct from engine compartment to facilitate removal of ABSCM&H/U.
3) Use an air gun to get rid of water around the ABSCM&H/U.

CAUTION:
The contact will be insufficient if the terminal gets wet.

4) Pull off the lock of the ABSCM&H/U connector to remove it.



5) Disconnect connector from ABSCM&H/U.

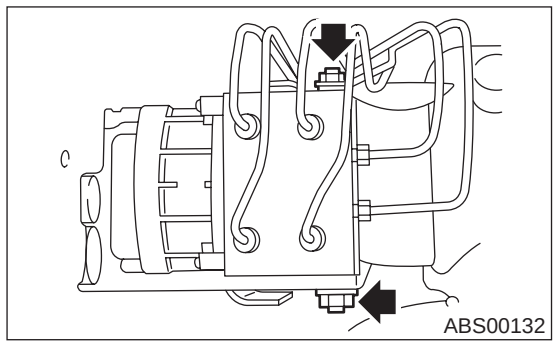
CAUTION:
Be careful not to let water or other foreign matter contact the ABSCM&H/U terminal.

6) Unlock cable clip.
7) Disconnect brake pipes from ABSCM&H/U.

CAUTION:
Wrap brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

8) Remove ABSCM&H/U ground terminal from bracket.
9) Remove ABSCM&H/U from engine compartment.

CAUTION:
• ABSCM&H/U cannot be disassembled. Do not attempt to loosen bolts and nuts.
• Do not drop or bump ABSCM&H/U.
• Do not turn the ABSCM&H/U upside down or place it on its side.
• Be careful to prevent foreign particles from getting into ABSCM&H/U.
• Apply a coat of rust-preventive wax (Nippeco LT or GB) to bracket attaching bolt after tightening.
• Do not pull harness when disconnecting connector.



B: INSTALLATION

1) Install ABSCM&H/U.

CAUTION:
Confirm that the specifications of the ABSCM&H/U conforms to the vehicle specifications.

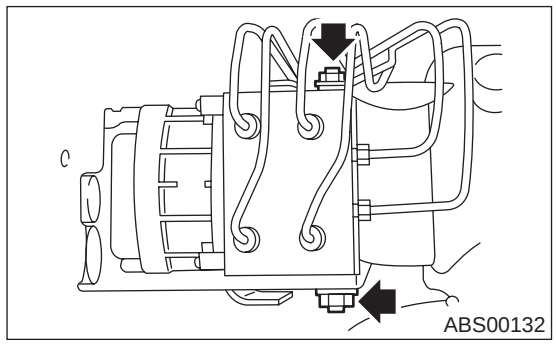
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Install ABSCM&H/U ground terminal to bracket.

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

3) Connect brake pipes to their correct ABSCM&H/U connections.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



4) Using cable clip, secure ABSCM&H/U harness to bracket.
5) Connect connector to ABSCM&H/U.

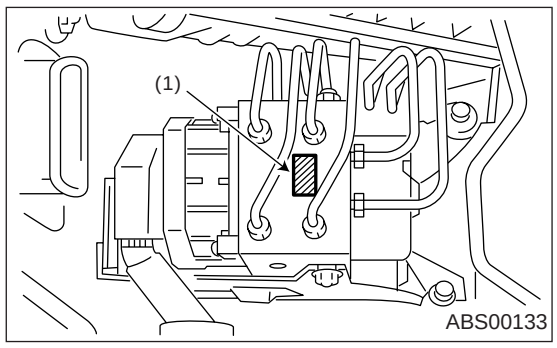
CAUTION:
• Be sure to remove all foreign matter from inside the connector before connecting.
• Ensure that the ABSCM&H/U connector is securely locked.

6) Install air intake duct.
7) Connect ground cable to battery.
8) Bleed air from the brake system.

C: INSPECTION

1) Check connected and fixed condition of connector.
2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
CG	AT (Except OUTBACK)
CH	MT (Except OUTBACK)
CI	AT (OUTBACK)
CJ	MT (OUTBACK)



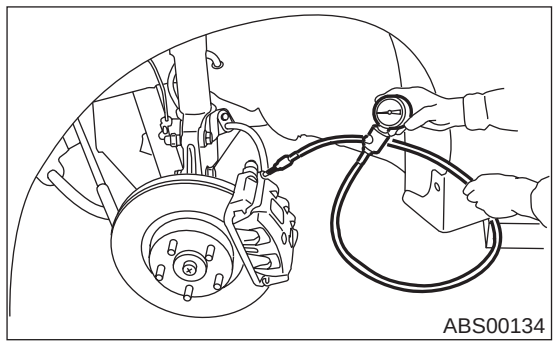
(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up vehicle and remove wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.



4) Bleed air from the pressure gauges.
5) Perform ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

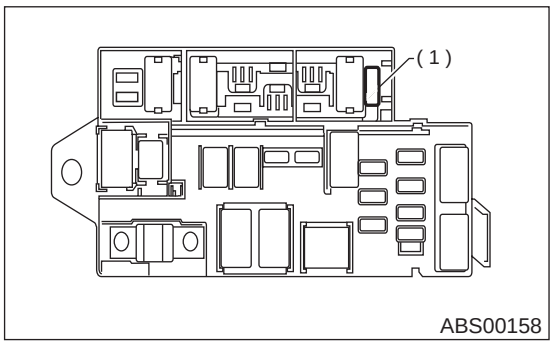
	Front wheel	Rear wheel
Initial value	3,432 kPa (35 kg/cm^2, 498 psi)	3,432 kPa (35 kg/cm^2, 498 psi)
When decompressed	490 kPa (5 kg/cm^2, 71 psi) or less	490 kPa (5 kg/cm^2, 71 psi) or less
When compressed	3,432 kPa (35 kg/cm^2, 498 psi) or more	3,432 kPa (35 kg/cm^2, 498 psi) or more

8) Remove pressure gauges from FL and FR caliper bodies.
9) Remove air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.

17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from brake line.

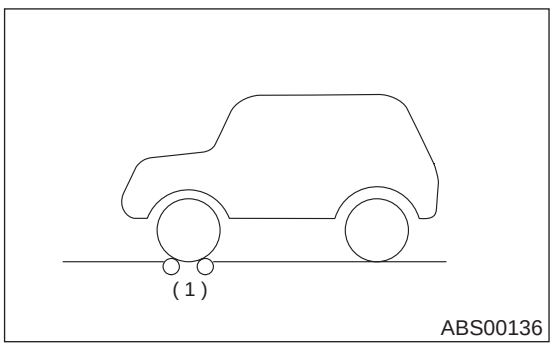
2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

1) In the case of AWD AT vehicles, install a spare fuse with the FWD connector in the main fuse box to simulate FWD vehicles.

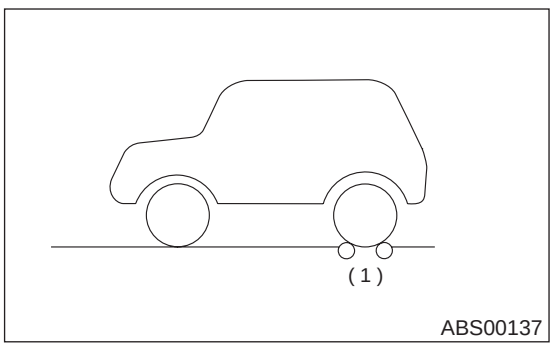


(1) FWD connector

2) Prepare for operating ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at “neutral”.



(1) Brake tester



(1) Brake tester

4) Operate the brake tester.
5) Perform ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
6) Hydraulic unit begins to work; and check the following working sequence.
(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.
7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	981 N (100 kgf, 221 lb)	981 N (100 kgf, 221 lb)
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less
When compressed	981 N (100 kgf, 221 lb) or more	981 N (100 kgf, 221 lb) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

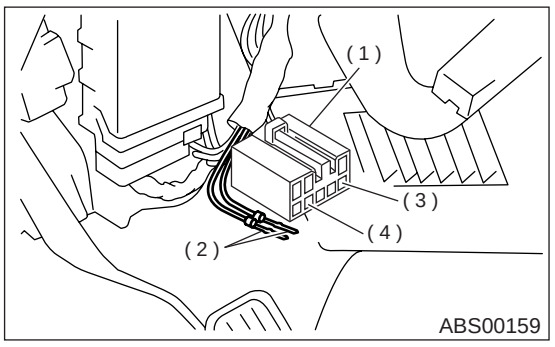
3. ABS Sequence Control

A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) ABS sequence control can be started by diagnosis connector or select monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 5 and No. 8 of the diagnosis connector beside driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Set the speed of all wheels at 2.75 km/h (2 MPH) or less.
3) Turn ignition switch OFF.
4) Within 0.5 seconds after the ABS warning light goes out, depress the brake pedal and hold it immediately after ignition switch is turned to ON.

CAUTION:
Do not depress the clutch pedal.

NOTE:
• When the ignition switch is set to on, the brake pedal must not be depressed.
• Engine must not operate.

5) After completion of ABS sequence control, turn ignition switch OFF.

2. ABS SEQUENCE CONTROL WITH SELECT MONITOR

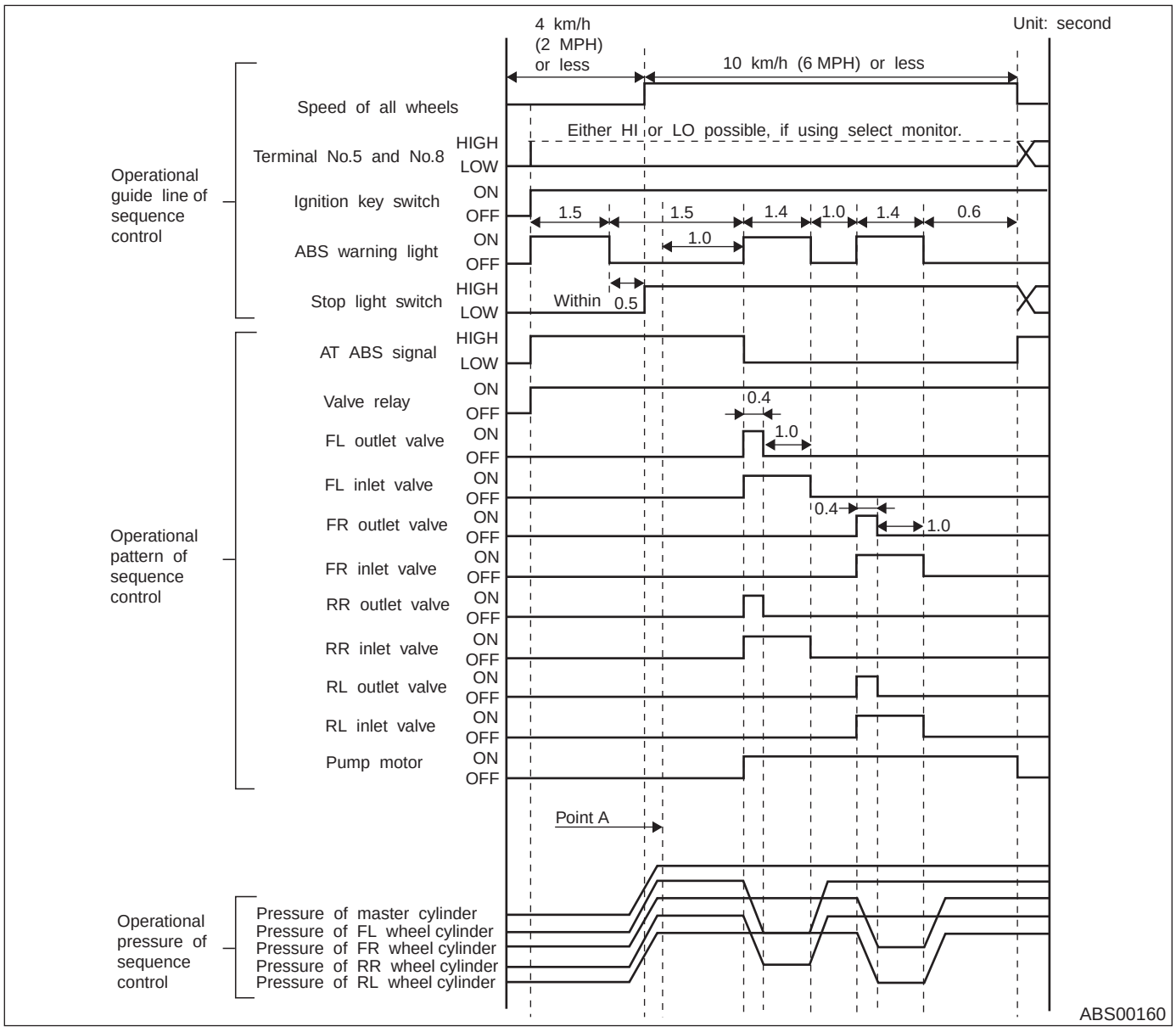
NOTE:
• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to “ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR”.
<Ref. to ABS-9, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, ABS Sequence Control.>
• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect select monitor to data link connector under driver's seat instrument panel lower cover.
2) Turn ignition switch ON.
3) Turn select monitor switch ON.
4) Put select monitor to “BRAKE CONTROL” mode.
5) When “Function check sequence” is selected, `ABS sequence control' will start.
6) The message `Press Brake Pedal Firmly' is displayed as follows:
(1) When using the brake tester, depress brake pedal with braking force of 981 N (100 kgf, 221 lb).
(2) When using the pressure gauge, depress brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kg/cm^2, 498 psi).

CAUTION:
Do not depress the clutch pedal.

7) When the message “Press YES” is displayed, press «YES» key.
8) Operation points will be displayed on select monitor.

3. CONDITIONS FOR ABS SEQUENCE CONTROL



NOTE:
- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

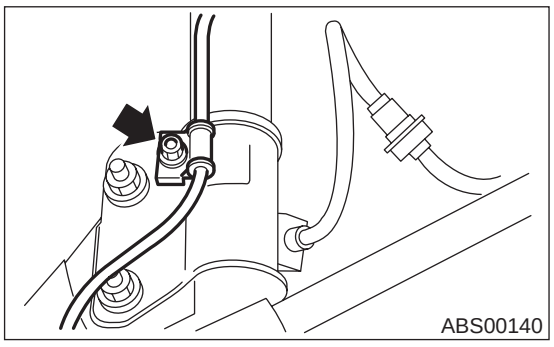
1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When terminal No. 5 or No. 8 are separated from diagnosis terminals. (When select monitor is not used.)
3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
4) When brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When select monitor is not used.)
5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When select monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When select monitor is used.)

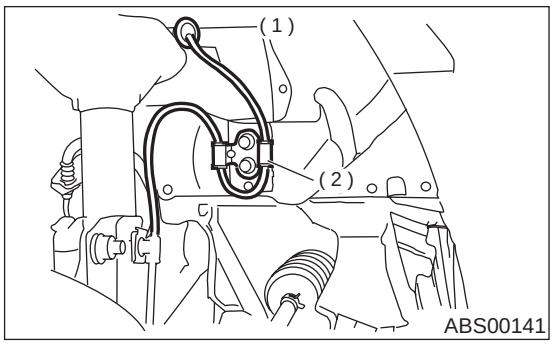
4. Front ABS Sensor

A: REMOVAL

1) Disconnect battery ground cable.
2) Disconnect front ABS sensor connector located next to front strut mounting house in engine compartment.
3) Remove bolts which secure sensor harness to strut.



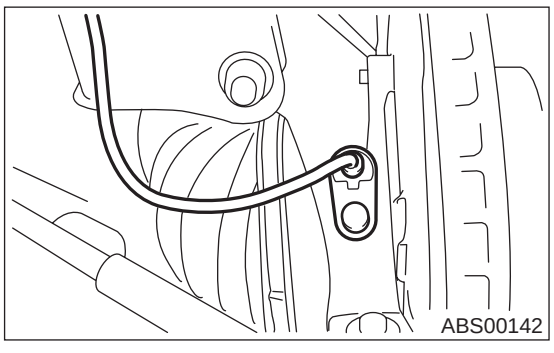
4) Remove bolts which secure sensor harness to body.



(1) To front ABS sensor connector
(2) Bracket

5) Remove bolts which secure front ABS sensor to housing, and remove front ABS sensor.

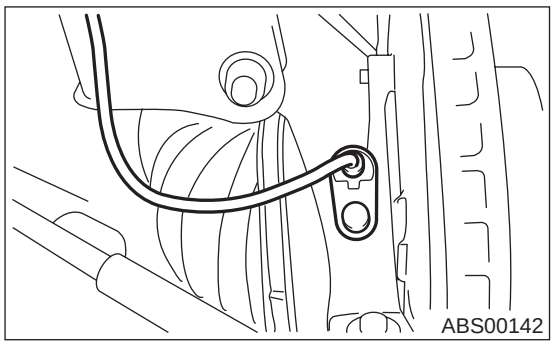
CAUTION:
• Be careful not to damage pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull sensor harness during removal.



B: INSTALLATION

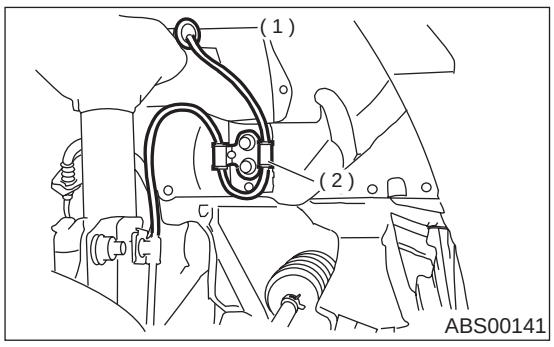
1) Temporarily install front ABS sensor on housing.

CAUTION:
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.



2) Install front ABS sensor on strut and wheel apron bracket.

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

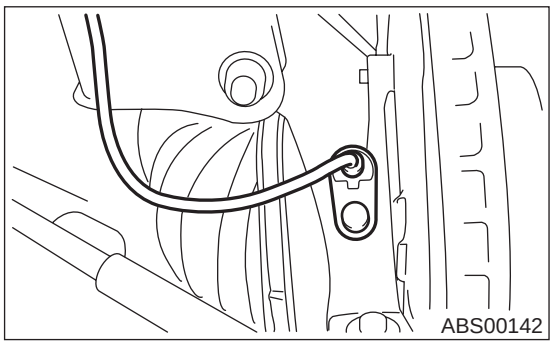


(1) To front ABS sensor connector
(2) Bracket

3) Place a thickness gauge between ABS sensor's pole piece and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten ABS sensor on housing to specified torque.

ABS sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

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



CAUTION:
Check the marks on the harness to make sure that no distortion exists.

Model	LH	RH
Except OUTBACK	Yellow	White
OUTBACK	Brown	Light blue

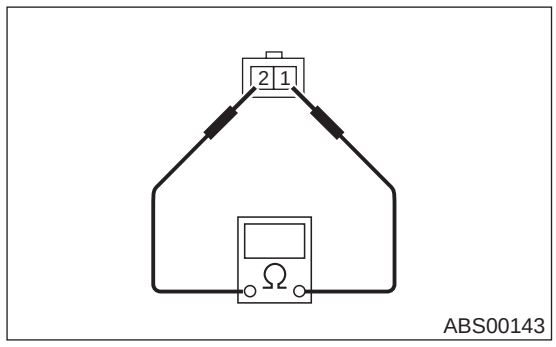
NOTE:
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

4) After confirmation of the ABS sensor clearance, connect connector to ABS sensor.
5) Connect connector to battery ground cable.

C: INSPECTION

1. ABS SENSOR

1) Check pole piece of ABS sensor for foreign particles or damage. If necessary, clean pole piece or replace ABS sensor.
2) Measure ABS sensor resistance.



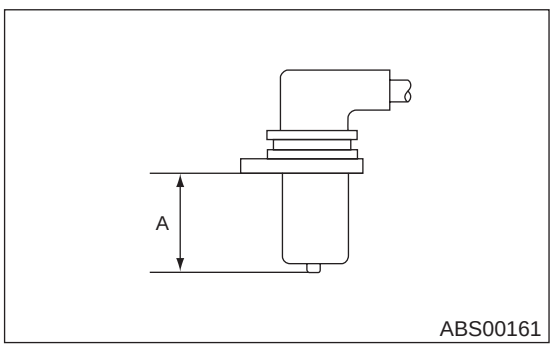
Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

CAUTION:
If resistance is outside the standard value, replace ABS sensor with new one.

NOTE:
Check ABS sensor cable for discontinuity. If necessary, replace with a new one.

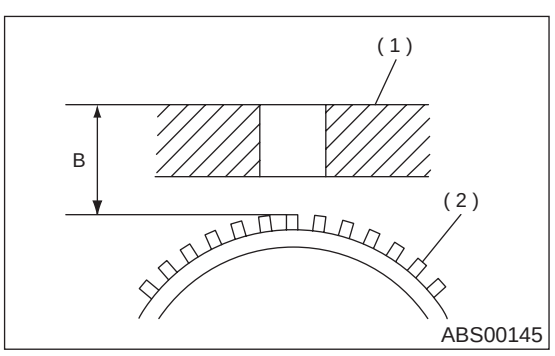
2. SENSOR GAP

1) Measure the distance “A” between ABS sensor surface and sensor pole face.



2) Measure the distance “B” between surface where the front axle housing meets the ABS sensor, and the tone wheel.

NOTE:
Measure so that the gauge touches the tone wheel teeth top.



(1) Axle housing
(2) Tone wheel

3) Find the gap between the ABS sensor pole face and the surface of the tone wheel teeth by putting the measured valves in the formula below and calculating.

ABS sensor clearance = B – A

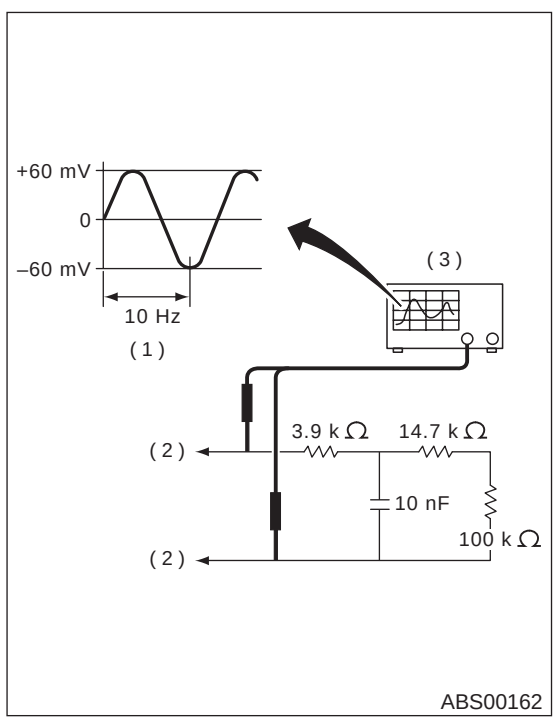
ABS sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

NOTE:
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install resistor and condenser, then rotate wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:
Regarding terminal No., please refer to item 1. ABS SENSOR.



(1) Standard output voltage:
Approx. 120 mV (When it is 10 Hz)
(2) To terminal
(3) Oscilloscope

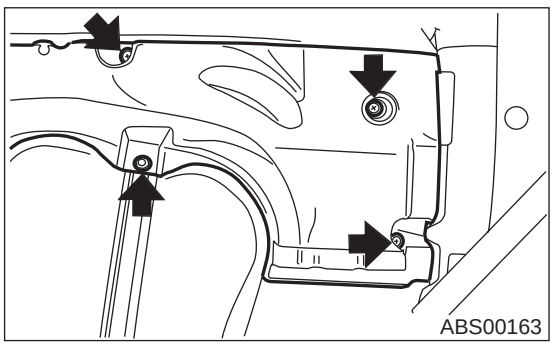
D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

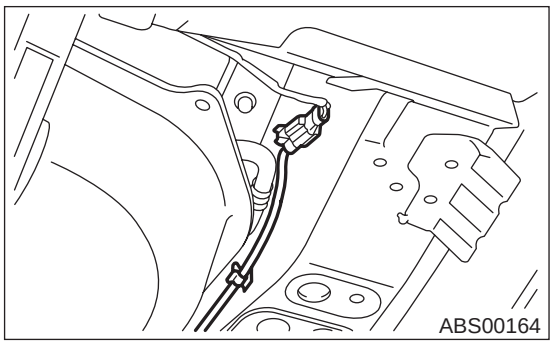
5. Rear ABS Sensor

A: REMOVAL

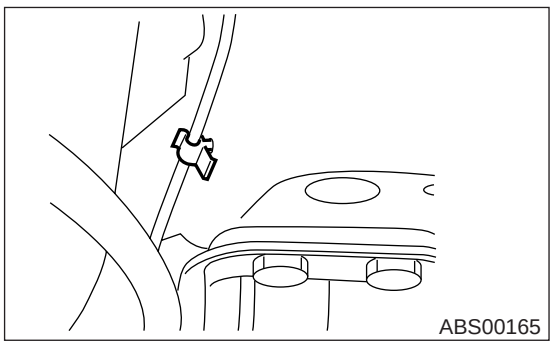
1) Disconnect battery ground cable.
2) Lift-up the vehicle.
3) Remove fuel tank cover.


ABS00163

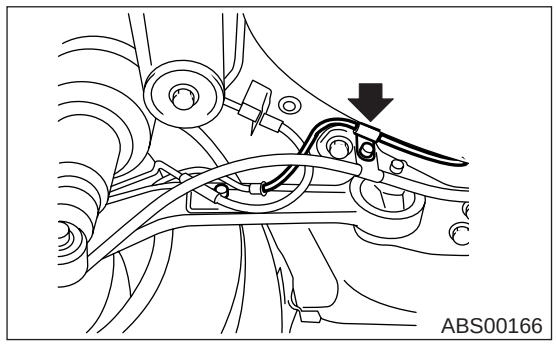
4) Disconnect rear ABS sensor connector.

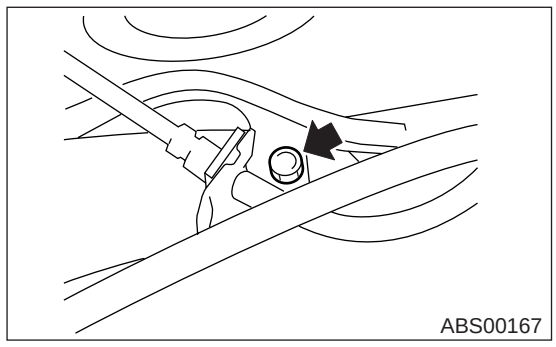

ABS00164

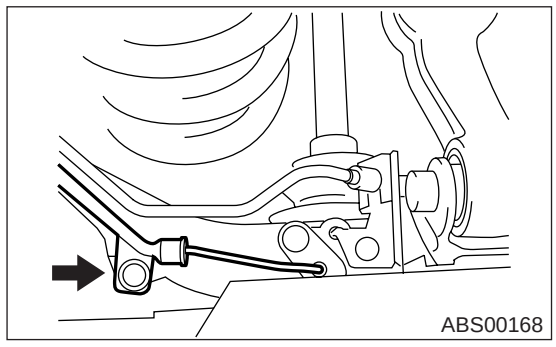
5) Remove rear sensor harness from clip on body side.


ABS00165

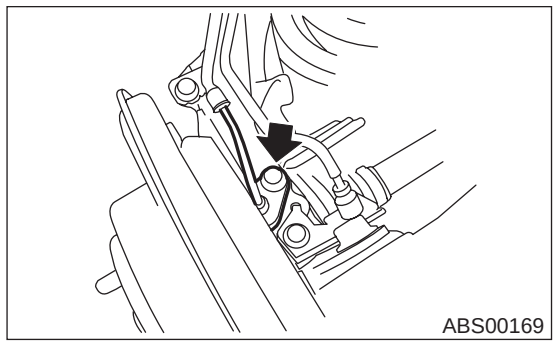
6) Remove bolts which hold rear sensor harness brackets.


ABS00166


ABS00167


ABS00168

7) Remove rear ABS sensor from rear arm.


ABS00169

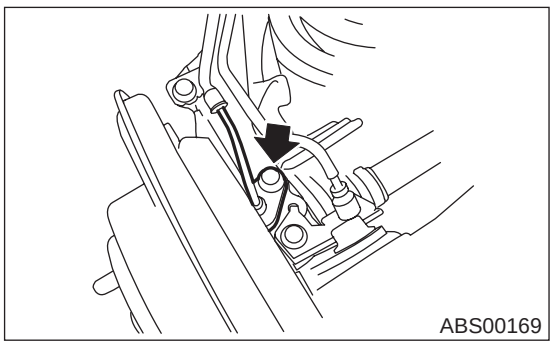
8) When inspecting rear tone wheel, remove rear drive shaft as rear tone wheel is unitized with BJ assembly of rear drive shaft.
<Ref. to DS-34, REMOVAL, Rear Drive Shaft.>

CAUTION:
• Be careful not to damage pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull sensor harness during removal.

B: INSTALLATION

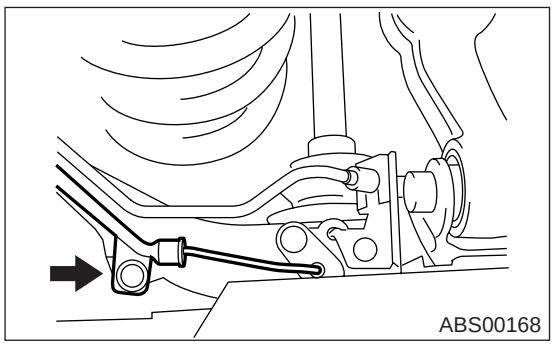
1) Install rear drive shaft to the vehicle.
<Ref. to DS-34, INSTALLATION, Rear Drive Shaft.>
2) Temporarily install rear ABS sensor on rear arm.

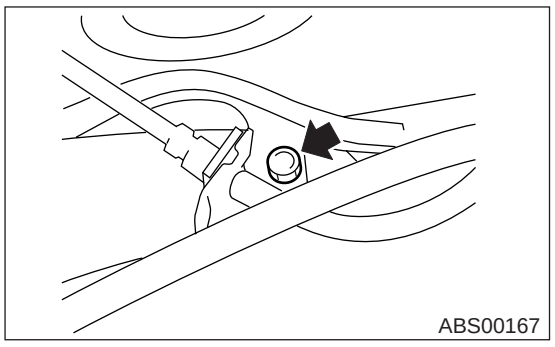
CAUTION:
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.


ABS00169

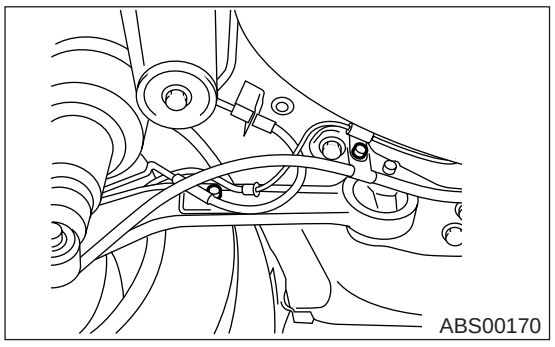
3) Install rear sensor harness brackets in the original positions and install harness on the clip.

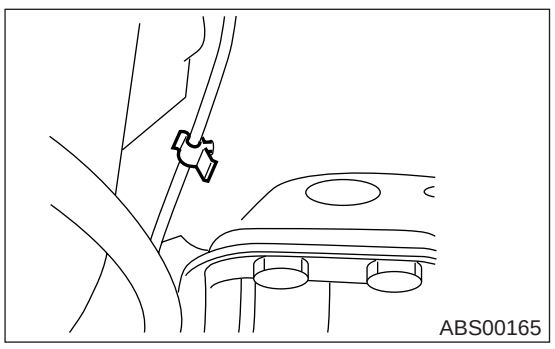
Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)


ABS00168


ABS00167

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


ABS00170


ABS00165

4) Place a thickness gauge between ABS sensor's and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten ABS sensor on rear arm to specified torque.

ABS sensor standard clearance:
0.44 — 0.94 mm (0.0173 — 0.0370 in)

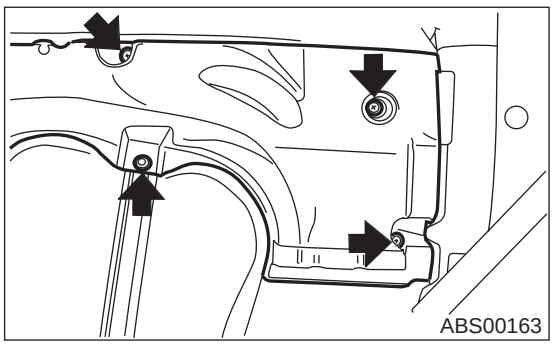
Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

CAUTION:
Check the marks on the harness to make sure that no distortion exists.

	LH	RH
Mark	Yellow	White

NOTE:
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

5) After confirmation of the ABS sensor clearance, connect connector to ABS sensor and install fuel tank cover.

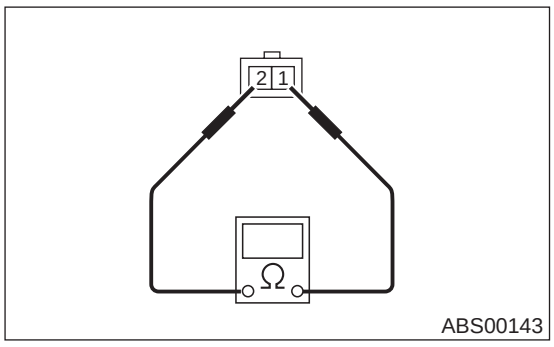


6) Connect connector to battery ground cable.

C: INSPECTION

1. ABS SENSOR

1) Check pole piece of ABS sensor for foreign particles or damage. If necessary, clean pole piece or replace ABS sensor.
2) Measure ABS sensor resistance.



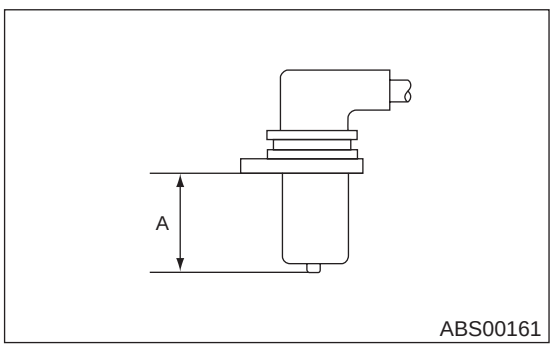
Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

CAUTION:
If resistance is outside the standard value, replace ABS sensor with new one.

NOTE:
Check ABS sensor cable for discontinuity. If necessary, replace with a new one.

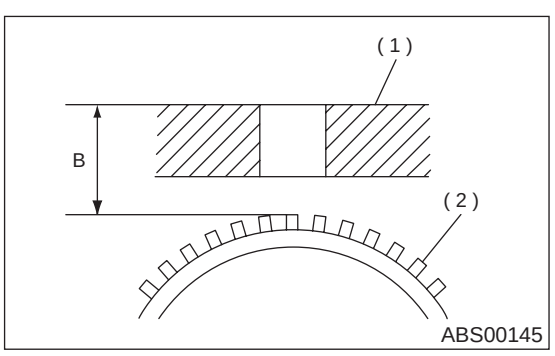
2. SENSOR GAP

1) Measure the distance “A” between ABS sensor surface and sensor pole face.



2) Measure the distance “B” between surface where the front axle housing meets the ABS sensor, and the tone wheel.

NOTE:
Measure so that the gauge touches the tone wheel teeth top.



(1) Axle housing
(2) Tone wheel

3) Find the gap between the ABS sensor pole face and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.

ABS sensor clearance = B – A

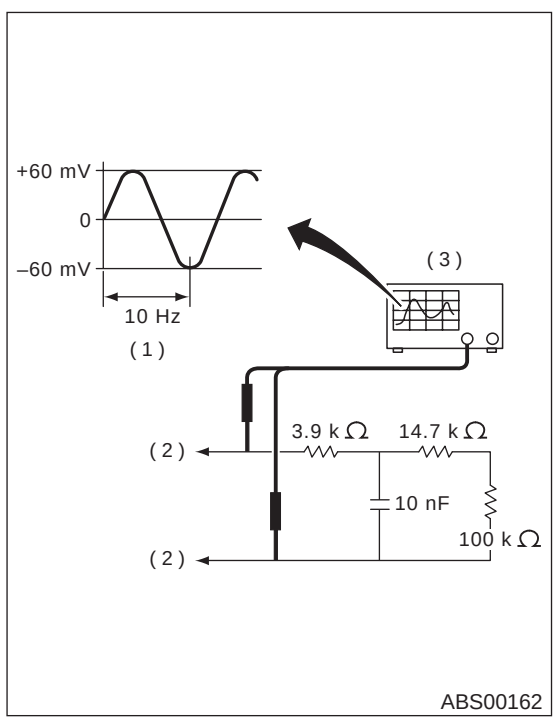
ABS sensor standard clearance:
0.44 — 0.94 mm (0.0173 — 0.0370 in)

NOTE:
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install resistor and condenser, then rotate wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:
Regarding terminal No., refer to item 1. ABS SENSOR.



(1) Standard output voltage:
Approx. 120 mV (When it is 10 Hz)
(2) To terminal
(3) Oscilloscope

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

6. Front Tone Wheel

A: REMOVAL

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-28, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-28, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check tone wheels teeth (44 pieces) for cracks or dents. If necessary, replace tone wheel with a new one.

NOTE:
Replace BJ assembly with new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

7. Rear Tone Wheel

A: REMOVAL

Refer to Rear Drive Shaft, because rear tone wheel is integrated with rear drive shaft.
<Ref. to DS-34, REMOVAL, Rear Drive Shaft.>

B: INSTALLATION

Refer to Rear Drive Shaft, because rear tone wheel is integrated with rear drive shaft.
<Ref. to DS-34, INSTALLATION, Rear Drive Shaft.>

C: INSPECTION

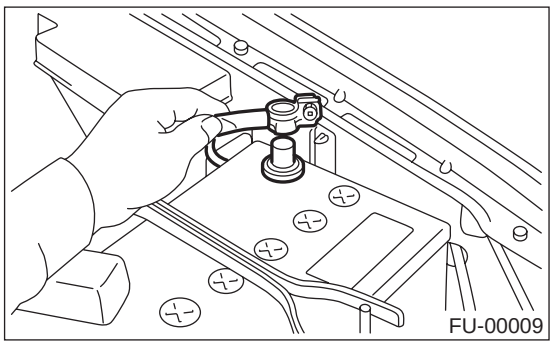
Visually check tone wheels teeth (44 pieces) for cracks or dents. If necessary, replace tone wheel with a new one.

NOTE:
Replace BJ assembly with new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

8. G Sensor

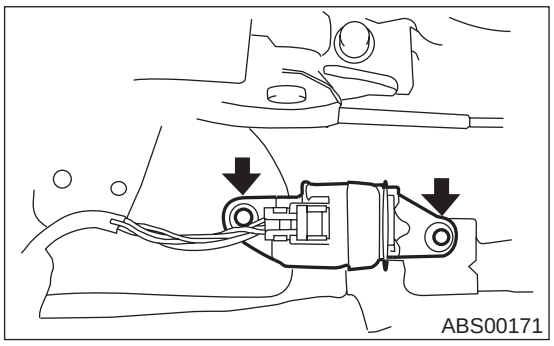
A: REMOVAL

1) Disconnect battery ground cable.



2) Remove console cover.
<Ref. to EI-36, REMOVAL, Console Box.>
3) Disconnect connector from G sensor.
4) Remove G sensor from body.

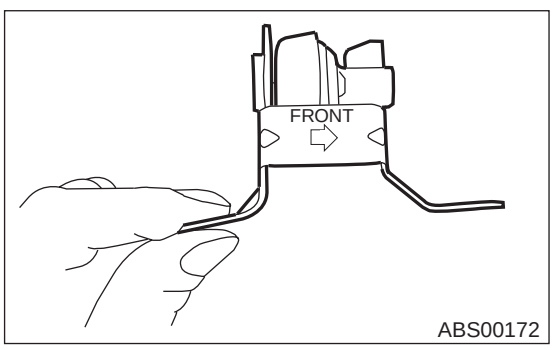
CAUTION:
Do not drop or bump G sensor.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Do not install G sensor in the wrong direction. There is an arrow mark on the sensor showing which side faces the vehicle front.



C: INSPECTION

	Step	Value	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have SUBARU SELECT MONITOR?	Go to step **5.**	Go to step **2.**
2	**CHECK G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. ***Connector & terminal:*** ***(R70) No. 2 (+) — No. 3 (–)***	Is the voltage 2.3±0.2 V when G sensor is horizontal?	Go to step **3.**	Replace G sensor.
3	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal:*** ***(R70) No. 2 (+) — No. 3 (–)***	Is the voltage 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace G sensor.
4	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal:*** ***(R70) No. 2 (+) — No. 3 (–)***	Is the voltage 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace G sensor.
5	**CHECK G SENSOR.** 1) Turn ignition switch to OFF. 2) Connect select monitor connector to data link connector. 3) Turn select monitor into {BRAKE CONTROL} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output voltage.	Is the indicated reading 2.3±0.2 V when the vehicle is in horizontal position?	Go to step **6.**	Replace G sensor.
6	**CHECK G SENSOR.** 1) Remove console box. 2) Remove G sensor from vehicle. (Do not disconnect connector.) 3) Read the select monitor display.	Is the indicated reading 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step **7.**	Replace G sensor.
7	**CHECK G SENSOR.** Read the select monitor display.	Is the indicated reading 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace G sensor.

1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

CAUTION:
Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
• To check harness for broken wires or short circuits, shake it while holding it or the connector.
• When ABS warning light illuminates, read and record diagnostic trouble code (DTC) indicated by ABS warning light.

	Step	Value	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS-5, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the ABS problem. <Ref. to ABS-8, INSPECTION, General Description.> Is the component part that might influence the ABS problem normal?	Component part is normal.	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC).** Calling up diagnostic trouble code (DTC). <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).> Is ABS warning light normal?	ABS warning light is normal.	Go to step **3.**	Inspect using diagnostic chart for ABS warning light failure.<Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.> NOTE: Call up diagnostic trouble code (DTC) again after inspecting ABS warning light. <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).>
3	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** NOTE: Record all diagnostic trouble codes (DTC). Is only the start code displayed?	Only the start code displayed.	Go to step **4.**	Go to step **5.**

Step		Value	Yes	No
4	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to ABS-145, General Diagnostics Table.> 2) Perform the clear memory mode. <Ref. to ABS-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> Calling up the diagnostic trouble code (DTC). <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).> Is only the start code displayed?	Only the start code displayed.	Complete the diagnosis.	Go to step **5.**
5	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with Diagnostic Connector”.<Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.> NOTE: For diagnostic trouble code (DTC) list, refer to “List of Diagnostics Trouble Code (DTC)”. <Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to ABS-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).> Is only the start code displayed?	Only the start code displayed.	Complete the diagnosis.	Inspect using “Diagnostics Chart with Diagnostic Connector”. <Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

CAUTION:
Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- Check list for interview. <Ref. to ABS-25, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).>

Step		Value	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS-5, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the ABS problem. <Ref. to ABS-8, INSPECTION, General Description.> Is unit that might influence the ABS problem normal?	Component part is normal.	Go to step **2.**	Repair or replace each unit.

	Step	Value	Yes	No
2	**CHECK INDICATION OF TROUBLE CODE DISPLAY.** 1) Turn ignition switch to OFF. 2) Connect the SUBARU SELECT MONITOR to data link connector. 3) Turn ignition switch to ON and SUBARU SELECT MONITOR to ON. NOTE: If the communication function of the select monitor cannot be executed normally, check the communication circuit. <Ref. to ABS-78, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.> 4) Read diagnostic trouble code (DTC). <Ref. to ABS-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5) Record all diagnostic trouble codes (DTC) and frame data. Is the DTC displayed?	DTC not indicated.	Go to step **3.**	Go to step **4.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to ABS-145, General Diagnostics Table.> 2) Perform the clear memory mode. <Ref. to ABS-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 4) Calling up the diagnostic trouble code (DTC). <Ref. to ABS-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Confirm that no DTC is displayed. Does ABS warning light remain off?	ABS warning light remains off.	Complete the diagnosis.	Go to step **4.**
4	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with Subaru Select Monitor”.<Ref. to ABS-78, Diagnostics Chart with Subaru Select Monitor.> NOTE: For diagnostic trouble code (DTC) list, refer to “List of Diagnostics Trouble Code (DTC)”. <Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to ABS-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to ABS-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Confirm that no DTC is displayed. Does ABS warning light remain off?	ABS warning light remains off.	Complete the diagnosis.	Inspect using “Diagnostics Chart with Subaru Select Monitor”. <Ref. to ABS-<Ref. to ABS-78, Diagnostics Chart with Subaru Select Monitor.>, Diagnostics Chart with Subaru Select Monitor.>

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine is running) ❑ On after starting (Engine is stop)		
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.		
	❑ When advancing	km/h to	km/h
		MPH to	MPH
	❑ While traveling at a constant speed	km/h	MPH
	❑ When decelerating	km/h to	km/h
		MPH to	MPH
	❑When turning to right	Steering angle :	deg
		Steering time :	sec
	❑ When turning to left	Steering angle :	deg
		Steering time :	sec
	❑ When moving other electrical parts		
	• Parts name : • Operating condition :		

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

2. SYMPTOMS

ABS operating condition	❑ Performs no work.		
	❑ Operates only when abruptly applying brakes.	Vehicle speed :	km/h MPH
	• How to step on brake pedal :		
	a) Operating time :		sec
	b) Operating noise : ❑ Produce / ❑ Does not produce		
	• What kind of noise?	❑ Knock ❑ Gong gong ❑ Bong ❑ Buzz ❑ Gong gong buzz ❑ Others :	
	c) Reaction force of brake pedal		
		❑ Stick ❑ Press down once with a clunk ❑ Press and released ❑ Others :	
Behavior of vehicle	a) Directional stability cannot be obtained or steering arm refuses to work when applying brakes : ❑ Yes / ❑ No		
	• When :	❑ Vehicle turns to right ❑ Vehicle turns to left ❑ Spins ❑ Others :	
	b) Directional stability cannot be obtained or steering arm refuses to work when accelerating : ❑ Yes / ❑ No		
	• When :	❑ Vehicle turns to right ❑ Vehicle turns to left ❑ Spins ❑ Others :	
	c) Brakes are out of order : ❑ Yes / ❑ No		
	• What :	❑ Braking distance is long ❑ Brakes lock or drag ❑ Pedal stroke is long ❑ Pedal sticks ❑ Others :	
	d) Poor acceleration : ❑ Yes / ❑ No		
	• What :	❑ Fails to accelerate ❑ Engine stalls ❑ Others :	
	e) Occurrence of vibration : ❑ Yes / ❑ No		
	• Where • What kind :		
	f) Occurrence of abnormal noise : ❑ Yes / ❑ No		
	• Where • What kind :		
	g) Occurrence of other phenomena : ❑ Yes / ❑ No		
	• What kind :		

3. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others :	
	b) Ambient temperature	°F (°C)	
	c) Road	❑ Urban area ❑ Suburbs ❑ Highway ❑ General road ❑ Ascending slope ❑ Descending slope ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Others :	
	d) Road surface	❑ Dry ❑ Wet ❑ New-fallen snow ❑ Compressed snow ❑ Frozen slope ❑ Others :	
Condition	a) Brakes	Deceleration :	g
		❑ Continuous / ❑ Intermittent	
	b) Accelerator	Acceleration :	g
		❑ Continuous / ❑ Intermittent	
	c) Vehicle speed	km/h	MPH
		❑ Advancing ❑ Accelerating ❑ Reducing speed ❑ Low speed ❑ Turning ❑ Others :	
	d) Tire inflation pressure	Front RH tire :	kPa
		Front LH tire :	kPa
		Rear RH tire :	kPa
		Rear LH tire :	kPa
	e) Degree of wear	Front RH tire :	
		Front LH tire :	
		Rear RH tire :	
		Rear LH tire :	
	f) Genuine parts are used. : ❑ Yes / ❑ No		
	g) Chain is passed around tires. : ❑ Yes / ❑ No		
	h) T tire is used. : ❑ Yes / ❑ No		
	i) Condition of suspension alignment :		
	j) Loading state :		
	k) Repair parts are used. : ❑ Yes / ❑ No		
	• What :		
	l) Others :		

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS sensor, ABS control module and hydraulic control unit.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage airbag system wiring harness when servicing the ABS sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect ABS problems:

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

1) Check brake fluid level.
2) Check brake fluid leakage.

3. HYDRAULIC UNIT

Check the hydraulic unit.
• With brake tester <Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
• Without brake tester <Ref. to ABS-7, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

4. BRAKE DRAG

Check brake drag.

5. BRAKE PAD AND ROTOR

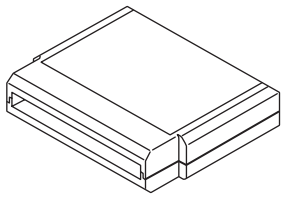
Check brake pad and rotor.
• Front <Ref. to BR-14, INSPECTION, Front Brake Pad.> and <Ref. to BR-15, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-19, INSPECTION, Rear Brake Pad.> and <Ref. to BR-20, INSPECTION, Rear Disc Rotor.>

6. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOLS

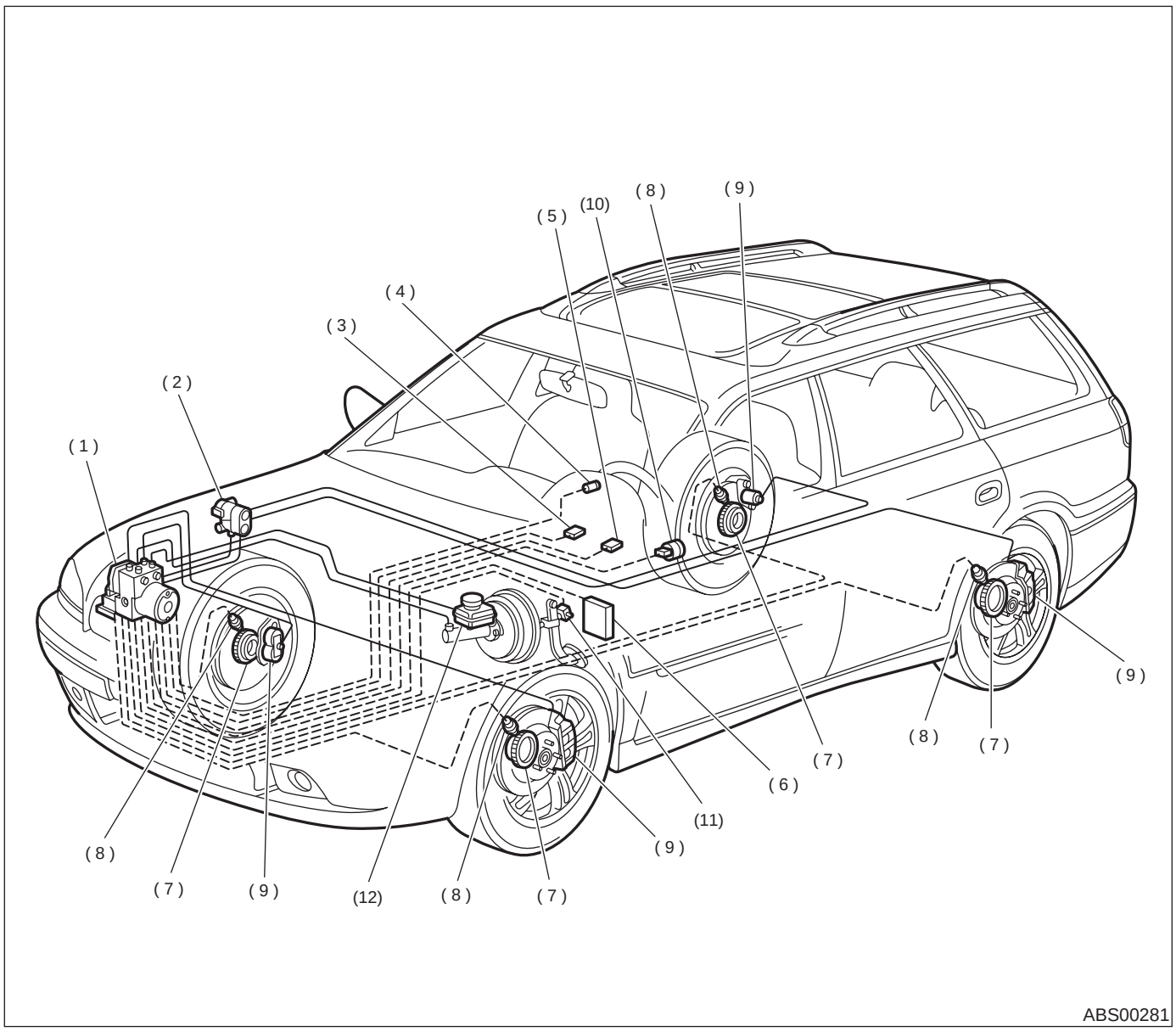
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

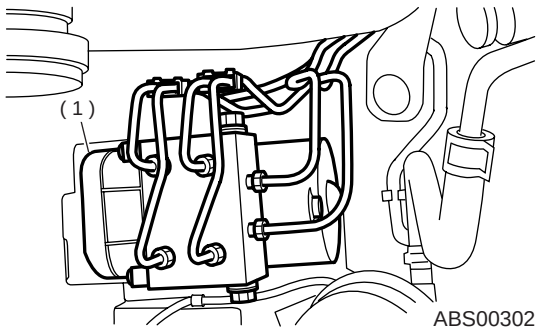
4. Electrical Components Location

A: LOCATION

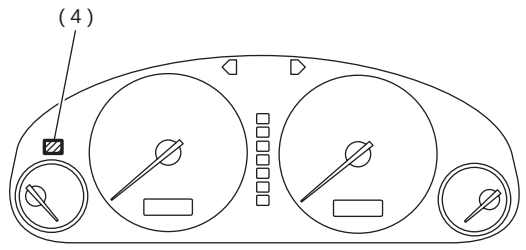


(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) Proportioning valve
(3) Diagnosis connector
(4) ABS warning light
(5) Data link connector (for Subaru select monitor)
(6) Transmission control module (only AT vehicle)
(7) Tone wheel
(8) ABS sensor
(9) Wheel cylinder
(10) G sensor
(11) Stop light switch
(12) Master cylinder

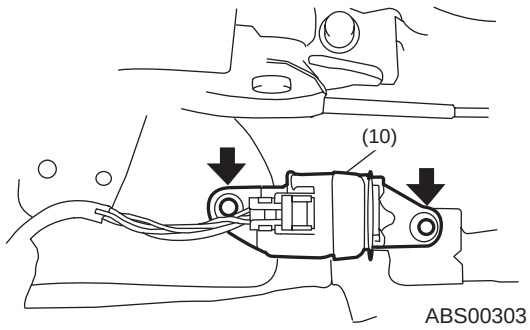
ELECTRICAL COMPONENTS LOCATION



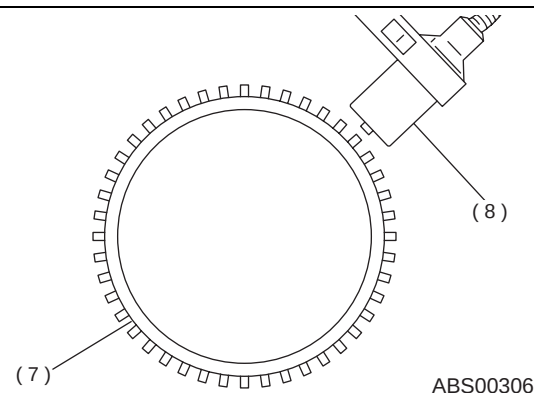
ABS00302



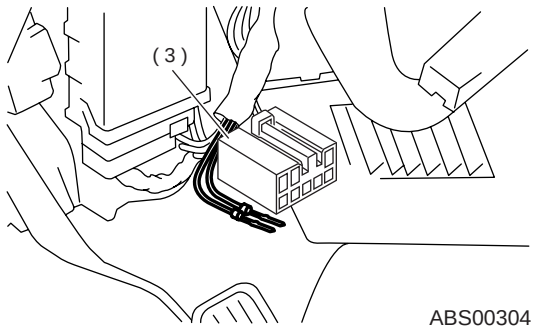
ABS00305



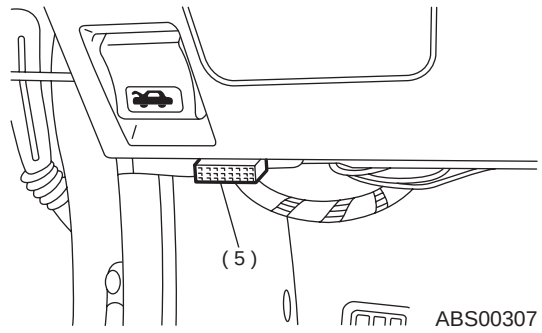
ABS00303



ABS00306



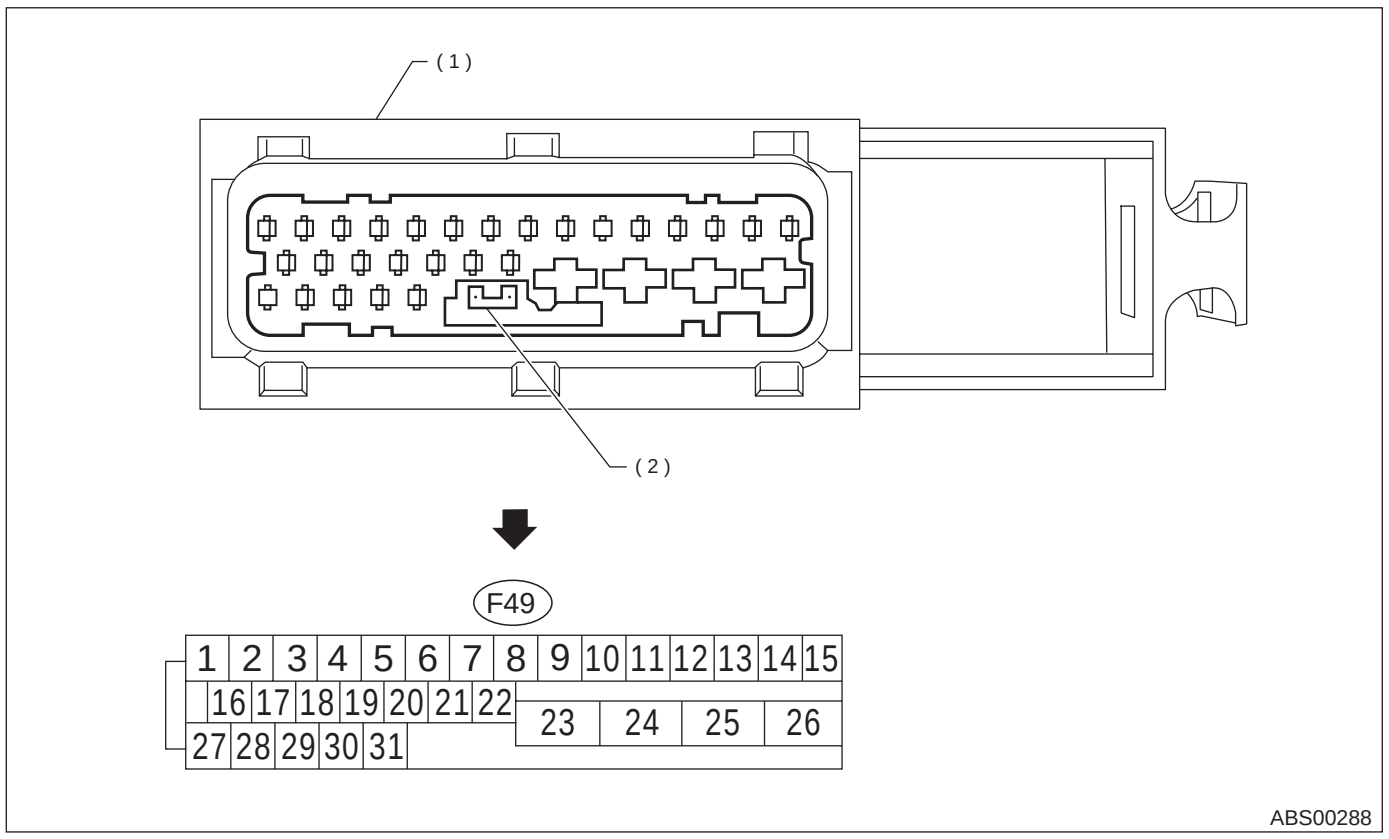
ABS00304



ABS00307

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



(1) ABSCM&HU connector
(2) Connector switch

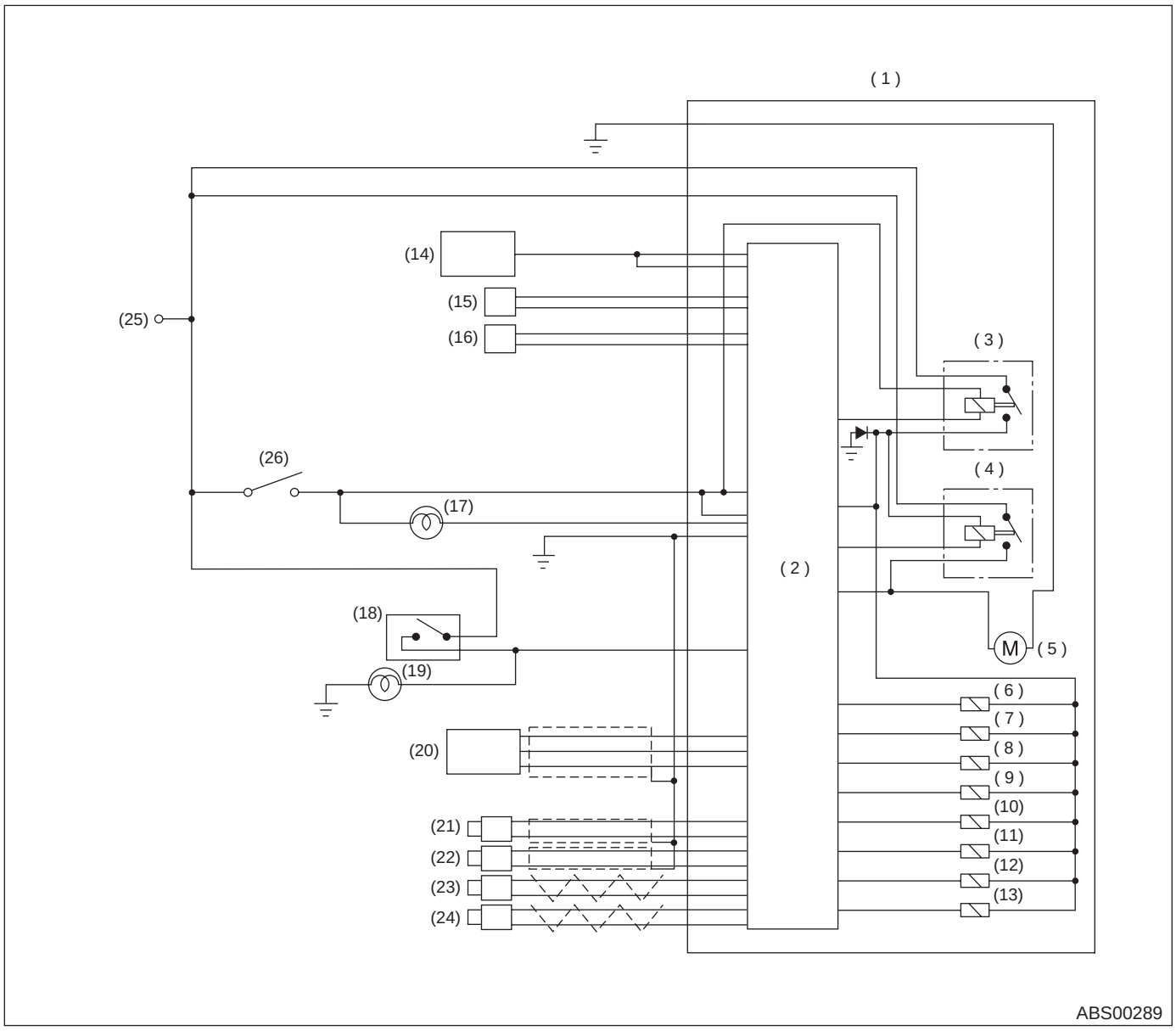
NOTE:
• The terminal numbers in the ABS control module and hydraulic control unit connector are as shown in the figure.
• When the connector is removed from the ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

CONTROL MODULE I/O SIGNAL

Contents		Terminal No. (+)—(–)	Input/Output signal Measured value and measuring conditions
ABS sensor*2 (Wheel speed sensor)	Front left wheel	9—10	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	11—12	
	Rear left wheel	7—8	
	Rear right wheel	14—15	
Valve relay power supply		24—23	10 — 15 V
Motor relay power supply		25—23	10 — 15 V
G sensor*2	power supply	30—28	4.75 — 5.25 V
	ground	28	—
	output	6—28	2.3±0.2 V when vehicle is in horizontal position.
Stop light switch*1		2—23	Less than 1.5 V when the stop light is OFF and, 10 — 15 V when the stop light is ON.
ABS warning light*2		22—23	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
AT ABS signal*2 (AT model only)		31—23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
ABS operation signal monitor*2		3—23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
Select monitor*2	Data is received.	20—23	Less than 1.5 V when no data is received.
	Data is sent.	5—23	4.75 — 5.25 V when no data is sent.
ABS diagnosis connector*2	Terminal No. 3	29—23	10 — 15 V when ignition switch is ON.
	Terminal No. 6	4—23	10 — 15 V when ignition switch is ON.
Power supply*1		1—23	10 — 15 V when ignition switch is ON.
Grounding line		23	—
Grounding line		26	—

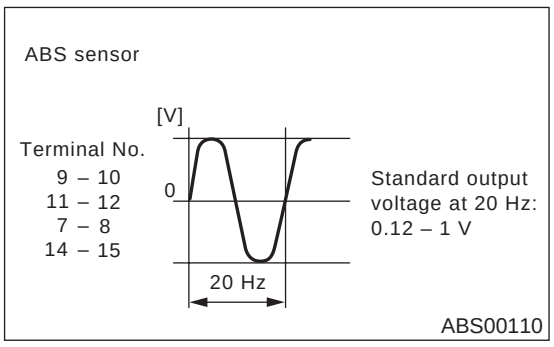
*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.
*2: Measure the I/O signal voltage at connector (B62) or (F55).

B: SCHEMATIC



(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) ABS control module area
(3) Valve relay
(4) Motor relay
(5) Motor
(6) Front left inlet solenoid valve
(7) Front left outlet solenoid valve
(8) Front right inlet solenoid valve
(9) Front right outlet solenoid valve
(10) Rear left inlet solenoid valve
(11) Rear left outlet solenoid valve
(12) Rear right inlet solenoid valve
(13) Rear right outlet solenoid valve
(14) Transmission control module (only AT model)
(15) Diagnosis connector
(16) Data link connector
(16) Data link connector
(17) ABS warning light
(18) Stop light switch
(19) Stop light
(20) G sensor
(21) Front left ABS sensor
(22) Front right ABS sensor
(23) Rear left ABS sensor
(24) Rear right ABS sensor
(25) Battery
(26) IGN

C: WAVEFORM

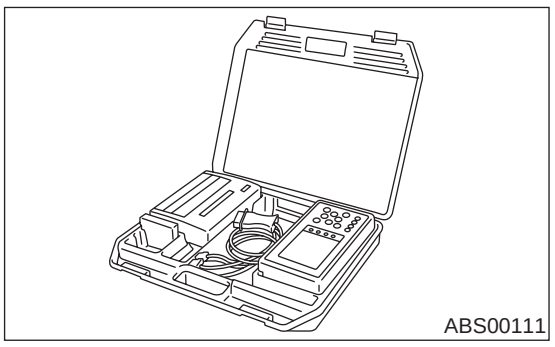


6. Subaru Select Monitor

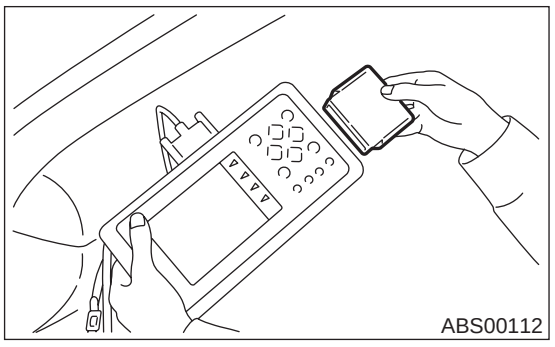
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

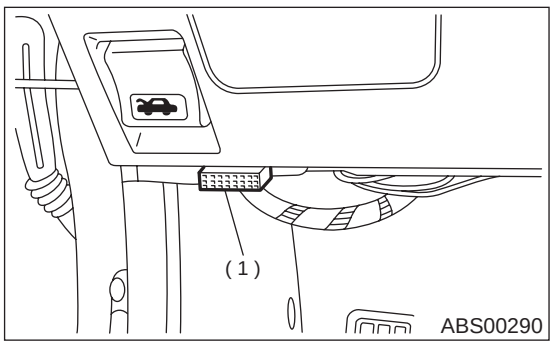
1) Prepare Subaru Select Monitor kit.


ABS00111

2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to ABS-9, SPECIAL TOOLS, PREPARATION TOOL, General Description.>


ABS00112

4) Connect Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).

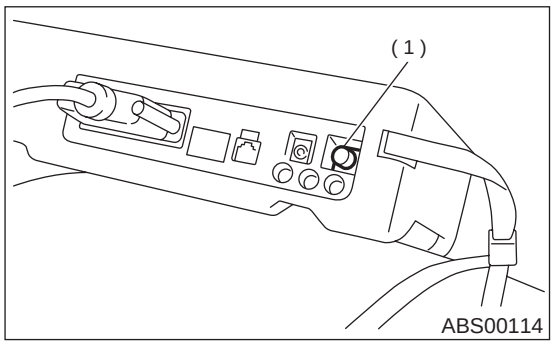


ABS00290

(1) Data link connector

(2) Connect diagnosis cable to data link connector.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



ABS00114

(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control System} and press the [YES] key.
8) Press the [YES] key after displayed the information of ABS type.
9) On the «ABS Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
10) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the LIST OF DIAGNOSTICS TROUBLE CODE. <Ref. to ABS-24, List of Diagnostics Trouble Code (DTC).>
• A maximum of 3 DTC are displayed in order of occurrence.
• If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark “?”, appears on the select monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
Latest	The most recent trouble code appears on the select monitor display.
Old	The second most recent trouble code appears on the select monitor display.
Older	The third most recent trouble code appears on the select monitor display.
Reference	A specified period of time proceeding trouble code appears on the select monitor display.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the «YES» key.
2) On the «System Selection Menu» display screen, select the {Brake Control System} and press the «YES» key.
3) Press the «YES» key after displayed the information of ABS type.
4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display & Save} and press the «YES» key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the «YES» key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Display screen	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by the Front Right ABS sensor is displayed	km/h or MPH
FL Wheel Speed	Wheel speed detected by the Front Left ABS sensor is displayed	km/h or MPH
RR Wheel Speed	Wheel speed detected by the Rear Right ABS sensor is displayed	km/h or MPH
RL Wheel Speed	Wheel speed detected by the Rear Left ABS sensor is displayed	km/h or MPH
Stop Light Switch	Stop light switch signal	ON or OFF
Stop Light Switch	Stop light switch monitor voltage is displayed.	V
G sensor output Signal	Refers to vehicle acceleration detecting by the analog G sensor. It appears on the select monitor display in volts.	V
Valve Relay Signal	Valve Relay Signal	ON or OFF
Motor Relay Signal	Motor Relay Signal	ON or OFF
ABS Signal to TCM	ABS operation signal from ABS control module to TCM	ON or OFF
ABS Warning Lamp	ON operation of the ABS warning light is displayed.	ON or OFF
Motor Relay Monitor	Operating condition of the motor relay is displayed.	ON or OFF
Valve Relay Monitor	Operating condition of the valve relay is displayed.	ON or OFF
CCM Signal	ABS operation signal from ABS control module to TCM	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the «YES» key.
2) On the «System Select Menu» display screen, select {Brake System} and press the «YES» key.
3) Press the «YES» key after displayed the information of ABS type.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press the «YES» key.

Display screen	Contents to be monitored
Clear memory?	Function of clearing trouble code.

5) When the “Done” and “turn ignition switch OFF” are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. ABS SEQUENCE CONROL

Display screen	Contents to be monitored	Index No.
ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to ABS-9, ABS Sequence Control.>

5. FREEZE FRAME DATA

NOTE:
- Data stored at the time of trouble occurrence is shown on display.
- Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
- If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a DTC, preceded by a question mark “?”, appears on the select monitor display. This shows it may be an unreliable reading.
- In case of no trouble code, the initial value of freeze frame data will be displayed.

Display screen	Contents to be monitored	Initial value
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed in km/h or mile/h.	255 km/h [158 mile/h]
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed in km/h or mile/h.	↑
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed in km/h or mile/h.	↑
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor is displayed in km/h or mile/h.	↑
ABSCM power voltage	Power (in volts) supplied to ABSCM&H/U appears on the select monitor display.	18 V
G sensor output voltage	Refers to vehicle acceleration detected by the analog G sensor. It appears on the select monitor display in volts.	5 V
Motor relay monitor	Motor relay operation monitor signal	ON
Stop light switch	Stop light switch signal	OFF
ABS signal to TCM	ABS operation signal from ABS control module to TCM	OFF
ABS-AT control	ABS operation signal from ABS control module to TCM	OFF
ABS operation signal	ABS operation signal	ON

6. ANALOG DATA ARE DISPLAYED.

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor is displayed in km/h or mile/h.
Stop light switch	Stop light switch monitor voltage is displayed.
G sensor output voltage	Refers to vehicle acceleration detecting by the analog G sensor. It appears on the select monitor display in volts.

7. ON/OFF DATA ARE DISPLAYED.

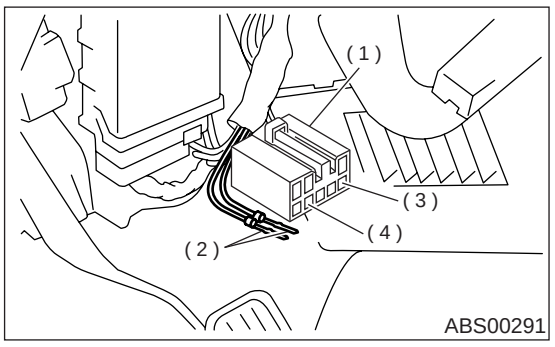
Display screen	Contents to be monitored
Stop light switch	Stop light switch signal
Valve relay signal	Valve relay signal
Motor relay signal	Motor relay signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS warning light	ABS warning light
Valve relay monitor	Valve relay operation monitor signal
Motor relay monitor	Motor relay operation monitor signal
CCM signal	ABS operation signal from ABS control module to TCM

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

1) Take out diagnosis connector from side of driver's seat heater unit.

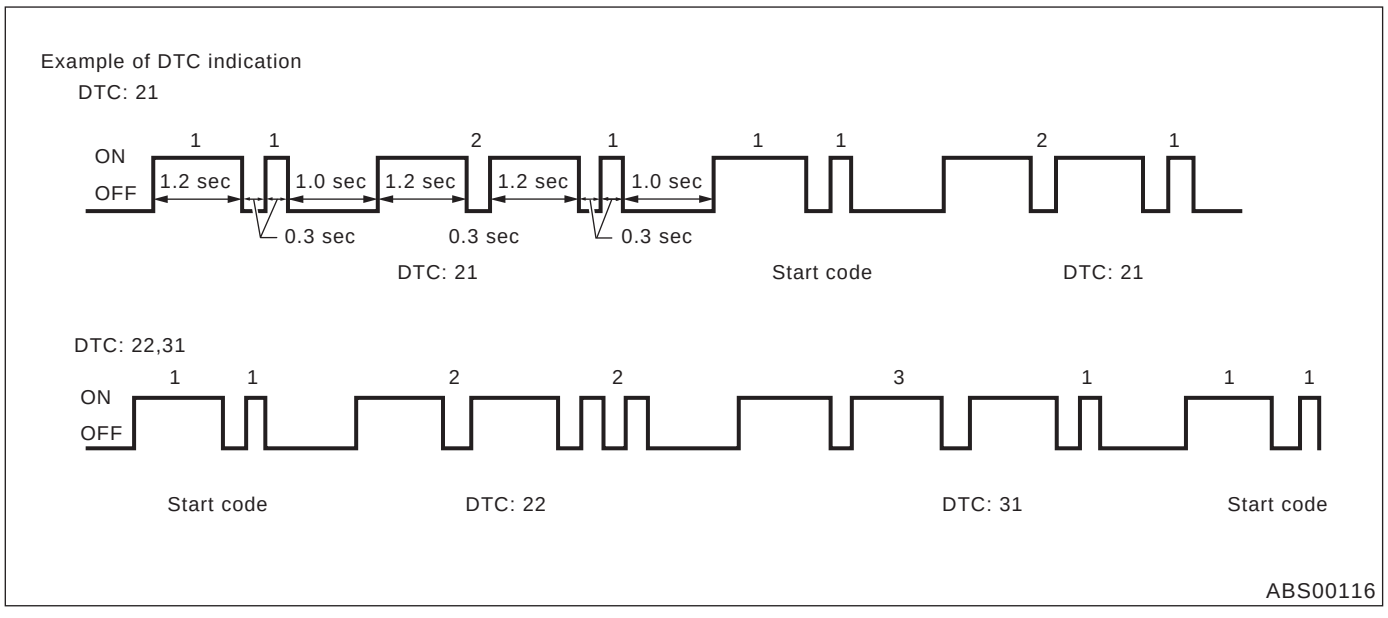


(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Turn ignition switch OFF.
3) Connect diagnosis connector terminal 8 to diagnosis terminal.
4) Turn ignition switch ON.
5) ABS warning light is set in the diagnostic mode and blinks to identify diagnostic trouble code (DTC).

6) After the start code (11) is shown, the diagnostic trouble codes (DTC) will be shown in order of the last information first.
These repeat for a maximum of 3 minutes.

NOTE:
- When there are no diagnostic trouble codes (DTC) in memory, only the start code (11) is shown.
- When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in the EEP ROM as a diagnostic trouble code (DTC). When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand diagnostic trouble codes (DTC). <Ref. to ABS-16, Subaru Select Monitor.>

8. Inspection Mode

A: OPERATION

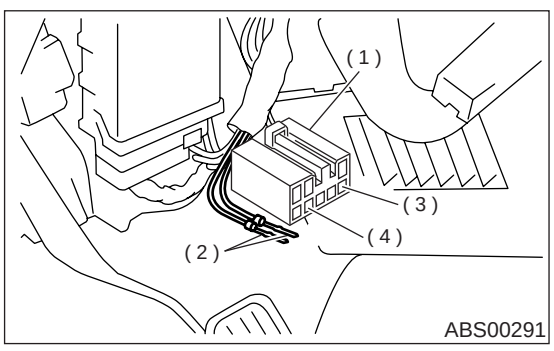
Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

9. Clear Memory Mode

A: OPERATION

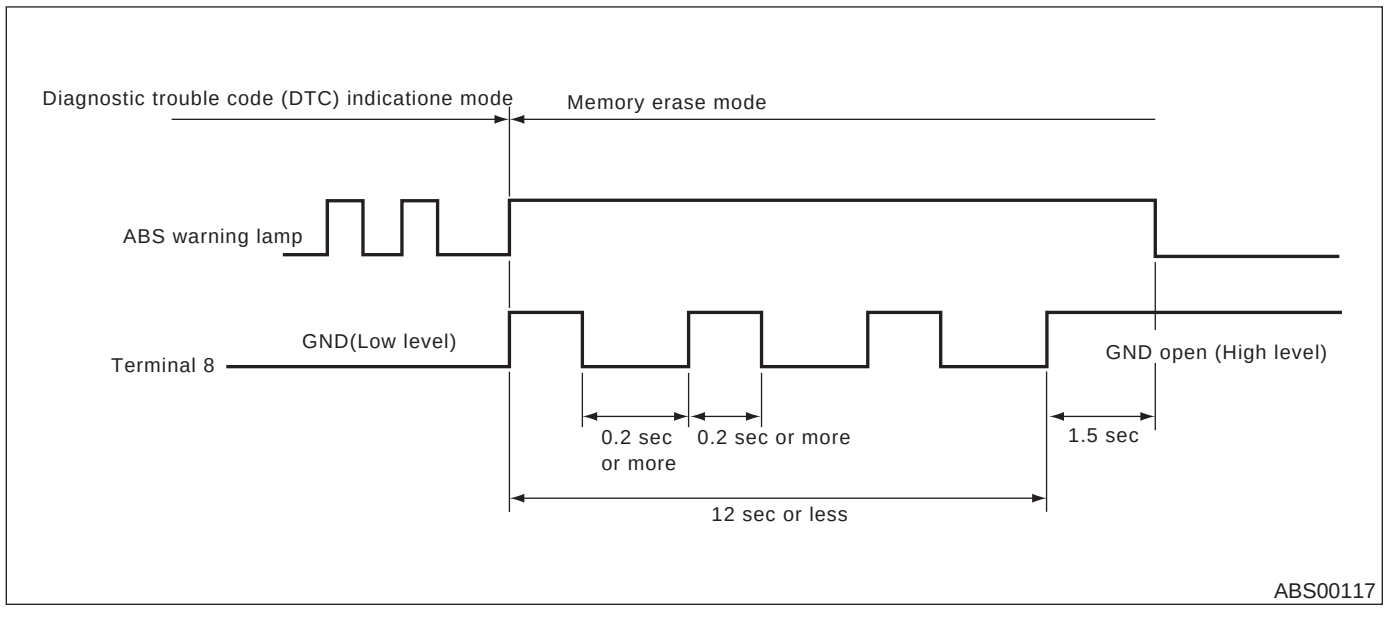
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a diagnostic trouble code (DTC), disconnect diagnosis connector terminal 8 from diagnosis terminal.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 8 and diagnosis terminal for at least 0.2 seconds each time.



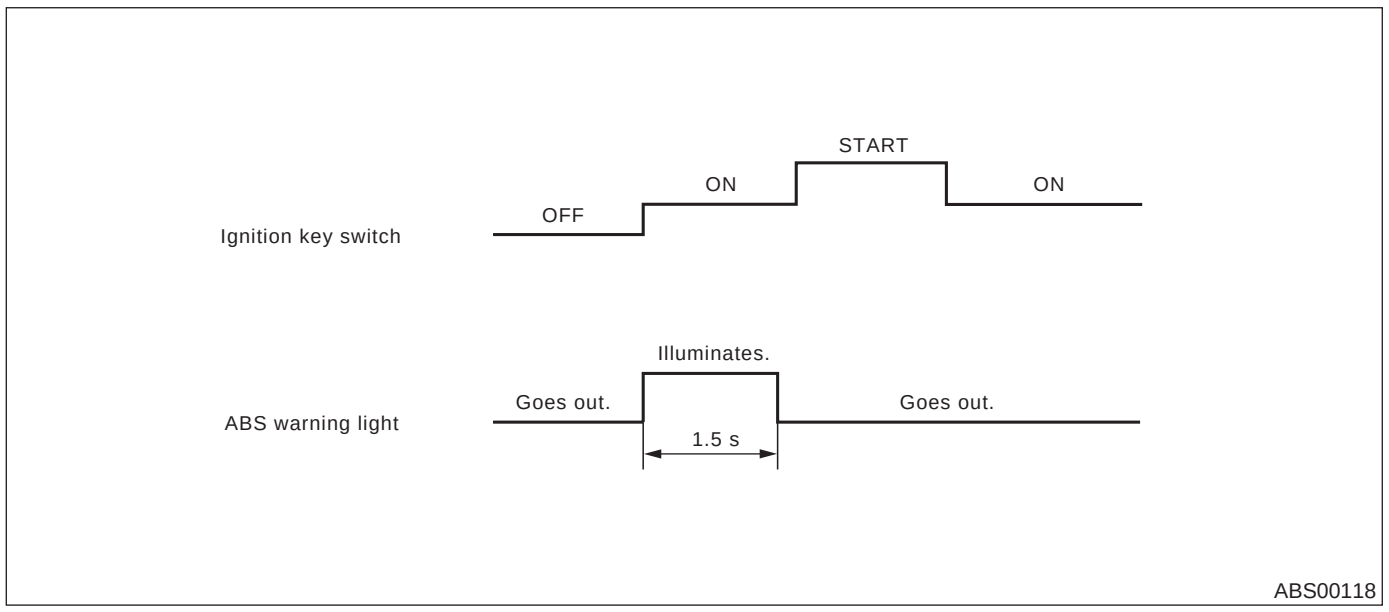
NOTE:
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear diagnostic trouble codes (DTC). <Ref. to ABS-16, Subaru Select Monitor.>

10.ABS Warning Light Illumination Pattern

A: INSPECTION



1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit. <Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.>

NOTE:
Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the ABS warning light is illuminated.

11.List of Diagnostics Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC No.	Contents of diagnosis		Index No.
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor	<Ref. to ABS-38, DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
23		Front left ABS sensor	<Ref. to ABS-38, DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
25		Rear right ABS sensor	<Ref. to ABS-38, DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
27		Rear left ABS sensor	<Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor	<Ref. to ABS-44, DTC 22 ABNORMAL ABS SENSOR (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
24		Front left ABS sensor	<Ref. to ABS-44, DTC 24 ABNORMAL ABS SENSOR (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
26		Rear right ABS sensor	<Ref. to ABS-44, DTC 26 ABNORMAL ABS SENSOR (REAR RH), Diagnostics Chart with Diagnosis Connector.>
28		Rear left ABS sensor	<Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>
29		Any one of four	<Ref. to ABS-50, DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR), Diagnostics Chart with Diagnosis Connector.>
31	Abnormal solenoid valve circuit(s) in ABS control module and hydraulic unit	Front right inlet valve	<Ref. to ABS-53, DTC 31 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
32		Front right outlet valve	<Ref. to ABS-56, DTC 32 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
33		Front left inlet valve	<Ref. to ABS-53, DTC 33 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
34		Front left outlet valve	<Ref. to ABS-56, DTC 34 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
35		Rear right inlet valve	<Ref. to ABS-53, DTC 35 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Chart with Diagnosis Connector.>
36		Rear right outlet valve	<Ref. to ABS-56, DTC 36 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Chart with Diagnosis Connector.>
37		Rear left inlet valve	<Ref. to ABS-54, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>
38		Rear left outlet valve	<Ref. to ABS-58, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

DTC No.	Contents of diagnosis	Index No.
41	Abnormal ABS control module	<Ref. to ABS-60, DTC 41 ABNORMAL ABS CONTROL MODULE, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.	<Ref. to ABS-62, DTC 42 SOURCE VOLTAGE IS ABNORMAL., Diagnostics Chart with Diagnosis Connector.>
44	A combination of AT control abnormal	<Ref. to ABS-64, DTC 44 A COMBINATION OF AT CONTROL ABNORMAL, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay	<Ref. to ABS-68, DTC 51 ABNORMAL VALVE RELAY, Diagnostics Chart with Diagnosis Connector.>
52	Abnormal motor and/or motor relay	<Ref. to ABS-70, DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY, Diagnostics Chart with Diagnosis Connector.>
54	Abnormal stop light switch	<Ref. to ABS-72, DTC 54 ABNORMAL STOP LIGHT SWITCH, Diagnostics Chart with Diagnosis Connector.>
56	Abnormal G sensor output voltage	<Ref. to ABS-74, DTC 56 ABNORMAL G SENSOR OUTPUT VOLTAGE, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

DTC No.	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Select monitor communication failure	<Ref. to ABS-78, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.>
—	No trouble code	Although no diagnostic trouble code appears on the select monitor display, the ABS warning light remains on.	<Ref. to ABS-82, NO TROUBLE CODE, Diagnostics Chart with Subaru Select Monitor.>
21	Open or short circuit in front right ABS sensor circuit	Open or short circuit in front right ABS sensor circuit	<Ref. to ABS-85, DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
22	Front right ABS sensor abnormal signal	Front right ABS sensor abnormal signal	<Ref. to ABS-91, DTC 22 FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
23	Open or short circuit in front left ABS sensor circuit	Open or short circuit in front left ABS sensor circuit	<Ref. to ABS-85, DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
24	Front left ABS sensor abnormal signal	Front left ABS sensor abnormal signal	<Ref. to ABS-91, DTC 24 FRONT LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
25	Open or short circuit in rear right ABS sensor circuit	Open or short circuit in rear right ABS sensor circuit	<Ref. to ABS-85, DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
26	Rear right ABS sensor abnormal signal	Rear right ABS sensor abnormal signal	<Ref. to ABS-91, DTC 26 REAR RIGHT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
27	Open or short circuit in rear left ABS sensor circuit	Open or short circuit in rear left ABS sensor circuit	<Ref. to ABS-86, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
28	Rear left ABS sensor abnormal signal	Rear left ABS sensor abnormal signal	<Ref. to ABS-92, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
29	Abnormal ABS sensor signal on any one of four sensor	Abnormal ABS sensor signal on any one of four	<Ref. to ABS-98, DTC 29 ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR, Diagnostics Chart with Subaru Select Monitor.>
31	Front right inlet valve malfunction	Front right inlet valve malfunction	<Ref. to ABS-101, DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
32	Front right outlet valve malfunction	Front right outlet valve malfunction	<Ref. to ABS-104, DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

DTC No.	Display screen	Contents of diagnosis	Index No.
33	Front left inlet valve malfunction	Front left inlet valve malfunction	<Ref. to ABS-101, DTC 33 FRONT LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
34	Front left outlet valve malfunction	Front left outlet valve malfunction	<Ref. to ABS-104, DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
35	Rear right inlet valve malfunction	Rear right inlet valve malfunction	<Ref. to ABS-101, DTC 35 REAR RIGHT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
36	Rear right outlet valve malfunction	Rear right outlet valve malfunction	<Ref. to ABS-104, DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
37	Rear left inlet valve malfunction	Rear left inlet valve malfunction	<Ref. to ABS-102, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
38	Rear left outlet valve malfunction	Rear left outlet valve malfunction	<Ref. to ABS-106, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
41	ABS control module malfunction	ABS control module and hydraulic control unit malfunction	<Ref. to ABS-108, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too low	Power supply voltage too low	<Ref. to ABS-110, DTC 42 POWER SUPPLY VOLTAGE TOO LOW, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too high	Power supply voltage too high	<Ref. to ABS-112, DTC 42 POWER SUPPLY VOLTAGE TOO HIGH, Diagnostics Chart with Subaru Select Monitor.>
44	ABS-AT control (Non Controlled)	ABS-AT control (Non Controlled)	<Ref. to ABS-114, DTC 44 ABS-AT CONTROL (NON CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>
44	ABS-AT control (Controlled)	ABS-AT control (Controlled)	<Ref. to ABS-116, DTC 44 ABS-AT CONTROL (CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS-118, DTC 51 VALVE RELAY MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay ON failure	Valve relay ON failure	<Ref. to ABS-120, DTC 51 VALVE RELAY ON FAILURE, Diagnostics Chart with Subaru Select Monitor.>
52	Open circuit in motor relay circuit	Open circuit in motor relay circuit	<Ref. to ABS-122, DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
52	Motor relay ON failure	Motor relay ON failure	<Ref. to ABS-124, DTC 52 MOTOR RELAY ON FAILURE, Diagnostics Chart with Subaru Select Monitor.>
52	Motor malfunction	Motor malfunction	<Ref. to ABS-126, DTC 52 MOTOR MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
54	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS-128, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
56	Open or short circuit in G sensor circuit	Open or short circuit in G sensor circuit	<Ref. to ABS-130, DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
56	Battery short in G sensor circuit	Battery short in G sensor circuit	<Ref. to ABS-134, DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
56	Abnormal G sensor high μ output	Abnormal G sensor high μ output	<Ref. to ABS-138, DTC 56 ABNORMAL G SENSOR HIGH M OUTPUT, Diagnostics Chart with Subaru Select Monitor.>
56	Detection of G sensor stick	Detection of G sensor stick	<Ref. to ABS-142, DTC 56 DETECTION OF G SENSOR STICK, Diagnostics Chart with Subaru Select Monitor.>

MEMO:

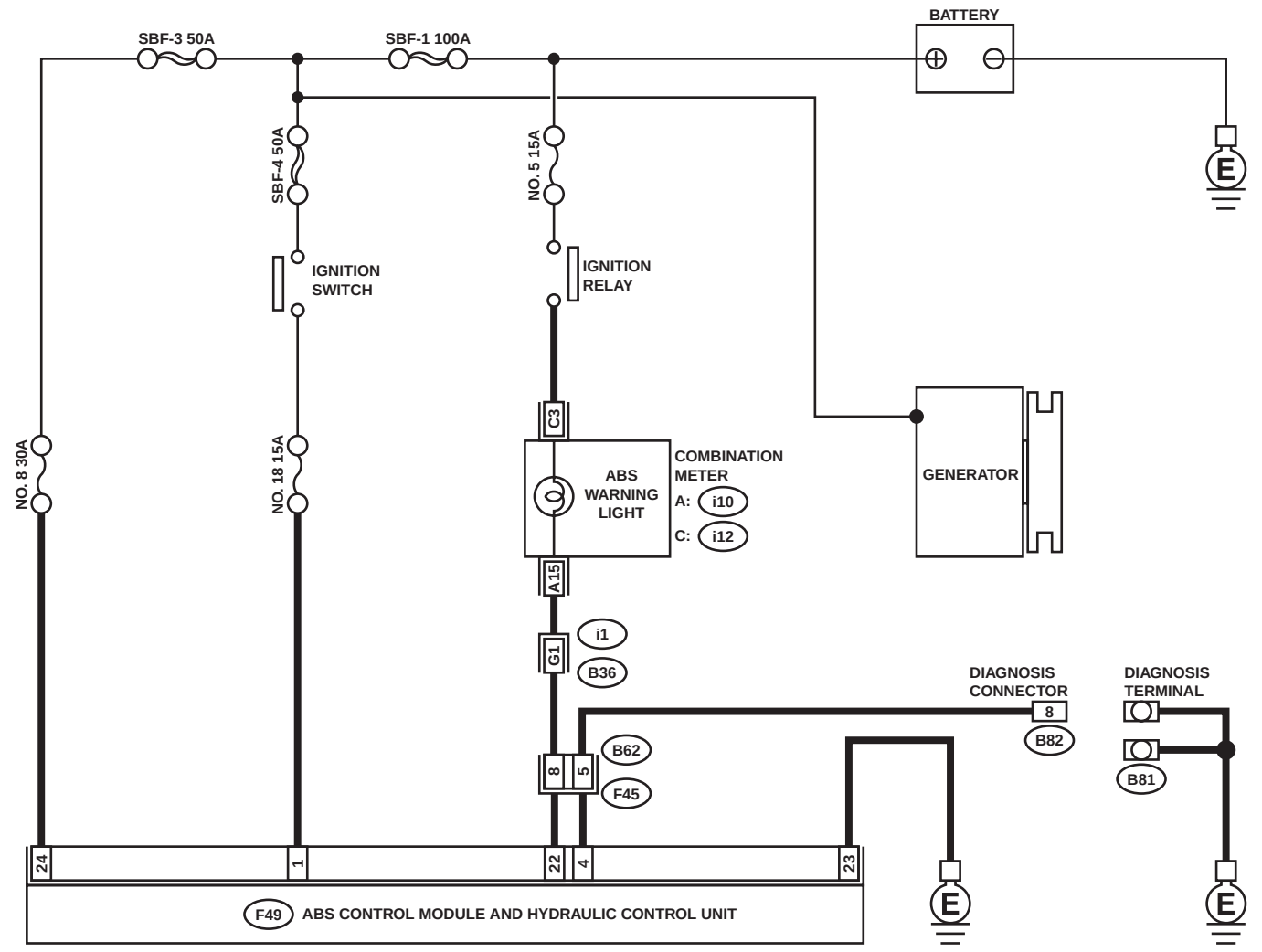
12.Diagnostics Chart with Diagnosis Connector

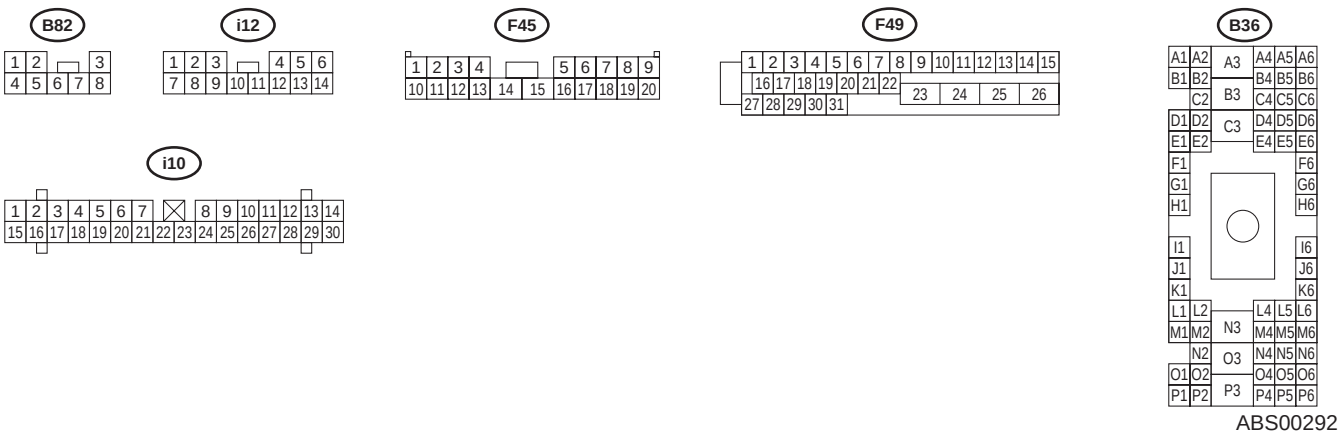
A: ABS WARNING LIGHT DOES NOT COME ON.

DIAGNOSIS:
- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:
- When ignition switch is turned ON (engine OFF), ABS warning light does not come on

WIRING DIAGRAM:





ABS00292

Vehicle-id:
SIE-id::A: ABS Warning Light Does Not Come On.
~

	Step	Value	Yes	No
1	**CHECK IF OTHER WARNING LIGHTS TURN ON.** Turn ignition switch to ON (engine OFF). Do other warning lights turn on?	Other warning light turns on.	Go to step **2.**	Repair combination meter. -<Ref. to IDI-12, Combination Meter Assembly.>
2	**CHECK ABS WARNING LIGHT BULB.** 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove ABS warning light bulb from combination meter. Is ABS warning light bulb OK?	OK.	Go to step **3.**	Replace ABS warning light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
3	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1) Disconnect connector (B62) from connector (F45). 2) Measure voltage between connector (B62) and chassis ground. ***Connector & terminal*** ***(B62) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	3 V	Go to step **4.**	Repair warning light harness.
4	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between connector (B62) and chassis ground. ***Connector & terminal*** ***(B62) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	3 V	Go to step **5.**	Repair warning light harness.
5	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Install ABS warning light bulb from combination meter. 3) Install combination meter. 4) Turn ignition switch to ON. 5) Measure voltage between connector (B62) and chassis ground. ***Connector & terminal*** ***(B62) No. 8 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **6.**	Repair wiring harness.
6	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	3 V	Go to step **7.**	Repair wiring harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	3 V	Go to step **8.**	Repair wiring harness.
8	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — GND:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **9.**	Repair ABSCM&H/U ground harness.
9	**CHECK WIRING HARNESS.** Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **10.**	Repair harness/ connector.
10	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connectors between combination meter and ABSCM&H/U?	There is no poor contact.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair connector.

Vehicle-id:
SIE-id::A:ABS Warning Light Does Not Come On.
~

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

MEMO:

Vehicle-id:
SIE-id::A: ABS Warning Light Does Not Come On.
~

B: ABS WARNING LIGHT DOES NOT GO OFF.

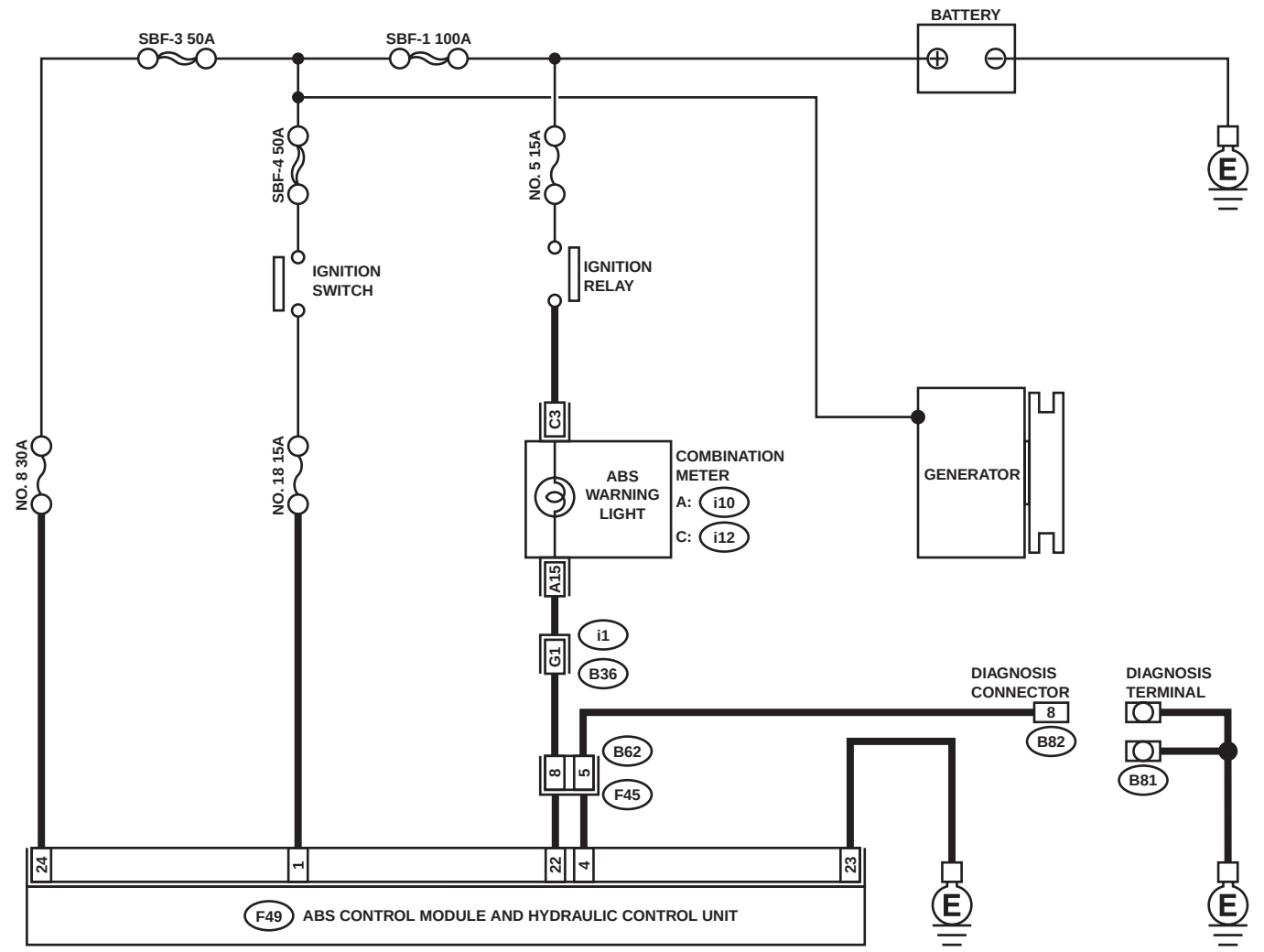
DIAGNOSIS:

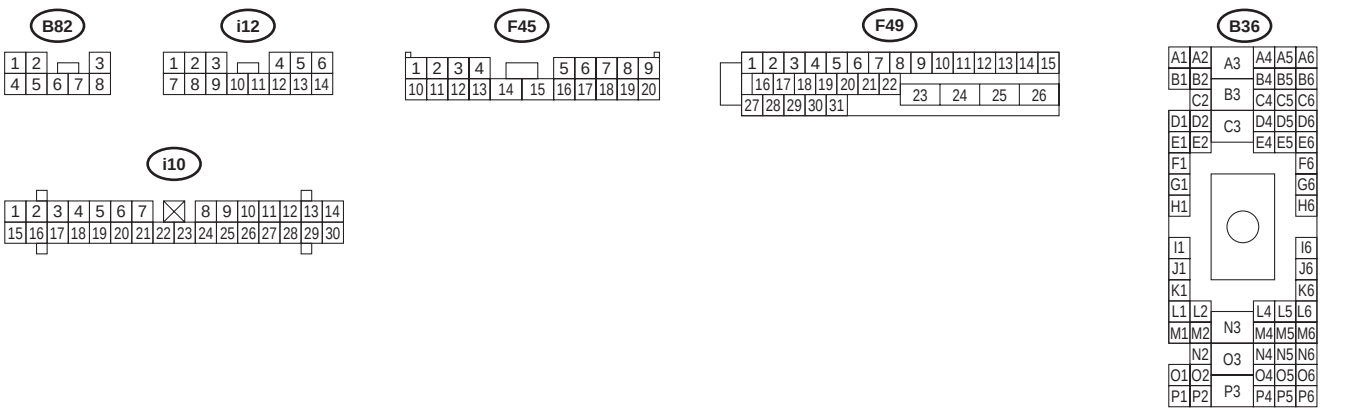
- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while ABS warning light is kept ON.

WIRING DIAGRAM:





ABS00292

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn ignition switch to OFF. Is ABSCM&H/U connector inserted into ABSCM until the clamp locks onto it?	Connector is locked securely.	Go to step **2.**	Insert ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.
2	**CHECK DIAGNOSIS TERMINAL.** Measure resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair diagnosis terminal harness.
3	**CHECK DIAGNOSIS LINE.** 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 4 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **4.**	Repair harness connector between ABSCM&H/U and diagnosis connector.
4	**CHECK GENERATOR.** 1) Start the engine. 2) Idle the engine. 3) Measure voltage between generator and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **5.**	Repair generator. H4 engine model: <Ref. to SC(H4SO)-15, Generator.> H6 engine model: <Ref. to SC(H6DO)-14, Generator.>
5	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF. Is there poor contact at battery terminal?	There is no poor contact.	Go to step **6.**	Repair battery terminal.
6	**CHECK POWER SUPPLY OF ABSCM.** 1) Disconnect connector from ABSCM&H/U. 2) Start engine. 3) Idle the engine. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **7.**	Repair ABSCM&H/U power supply circuit.
7	**CHECK WIRING HARNESS.** 1) Disconnect connector (F45) from connector (B62). 2) Turn ignition switch to ON. Does the ABS warning light turn on?	ABS warning light remains off.	Go to step **8.**	Repair front wiring harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
8	**CHECK ABSCM&H/U TERMINAL.** 1) Turn ignition switch to OFF. 2) Check for damage at the ABSCM&H/U terminal. Is the any damage on termianl?	There is no damage on terminal.	Go to step **9.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
9	**CHECK ABSCM&H/U.** Measure resistance between ABSCM&H/U terminals. ***Terminal*** ***No. 22 — No. 23:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **10.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
10	**CHECK WIRING HARNESS.** Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **11.**	Repair harness.
11	**CHECK WIRING HARNESS.** 1) Connect connector to ABSCM&H/U. 2) Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:*** Is the measured value within the specified range?	1 MΩ	Go to step **12.**	Repair harness.
12	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.** Is there poor contact in ABSCM&H/U connector?	There is no poor contact.	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

MEMO:

Vehicle-id:
SIE-id::B:ABS Warning Light Does Not Go Off.
～

C: DIAGNOSTIC TROUBLE CODE (DTC) DOES NOT APPEAR.

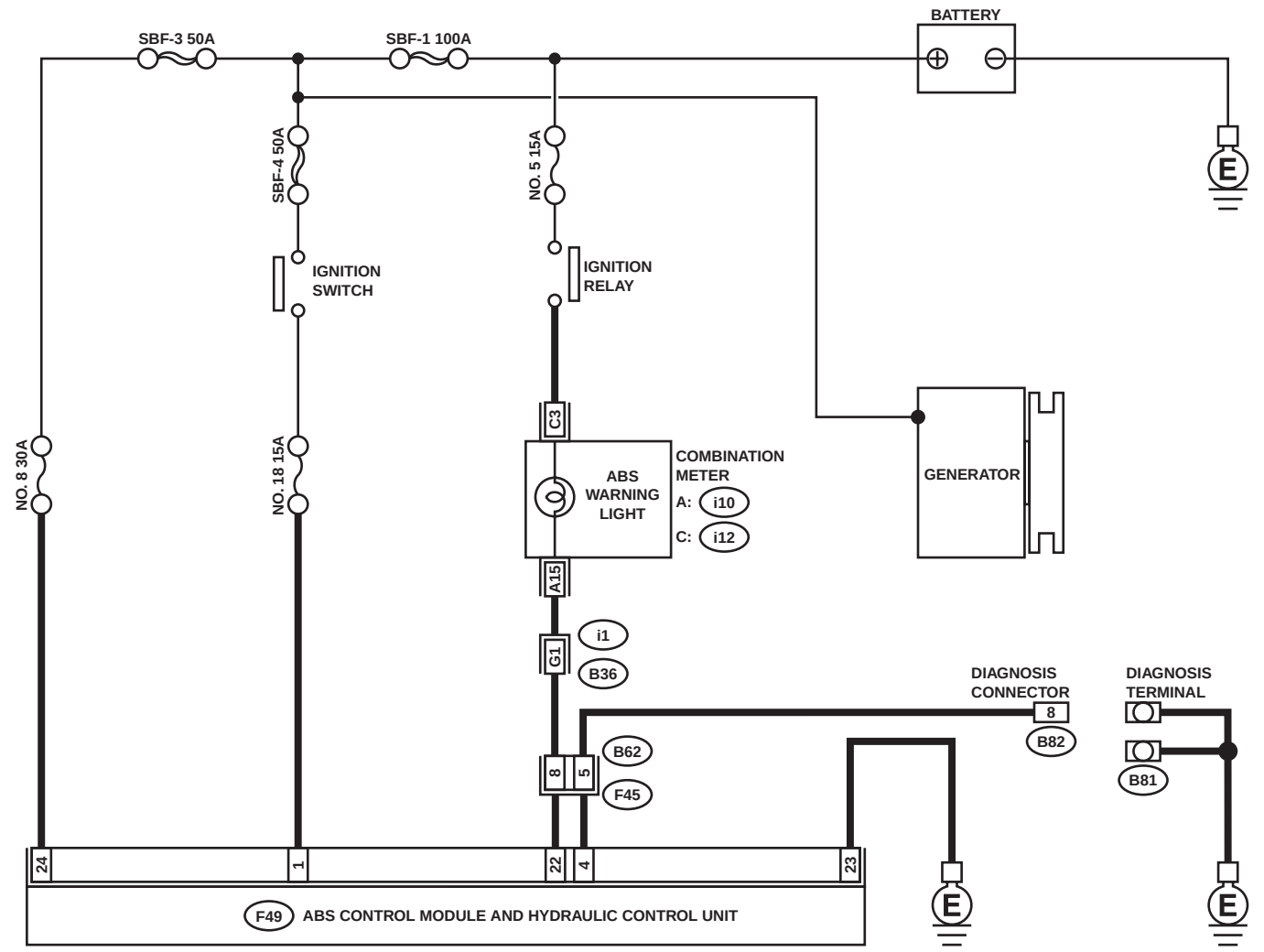
DIAGNOSIS:

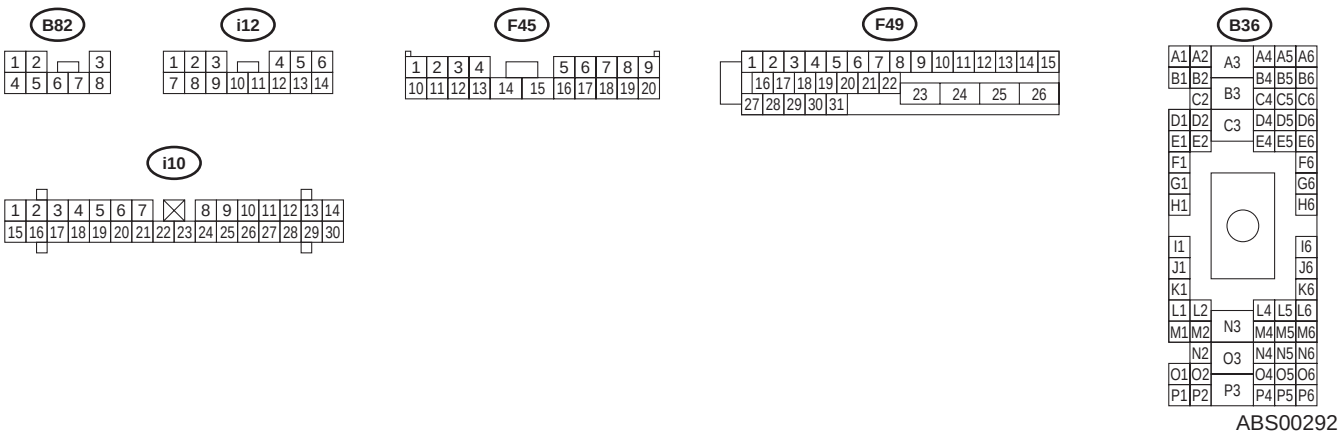
- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

WIRING DIAGRAM:





ABS00292

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

Step		Value	Yes	No
1	**CHECK DIAGNOSIS TERMINAL.** 1) Turn ignition switch to OFF. 2) Measure resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair diagnosis terminal harness.
2	**CHECK DIAGNOSIS LINE.** 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 4 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair harness connector between ABSCM&H/U and diagnosis connector.
3	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.** Is there poor contact in ABSCM&H/U connector?	There is no poor contact.	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

E: DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

F: DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

Vehicle-id:
SIE-id::D:DTC 21 Abnormal ABS Sensor (Open Circuit or Input Voltage Too High) (Front RH)
~

MEMO:

Vehicle-id:
SIE-id::F: DTC 25 Abnormal ABS Sensor (Open Circuit or Input Voltage Too High) (Rear RH)
～

G: DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH)

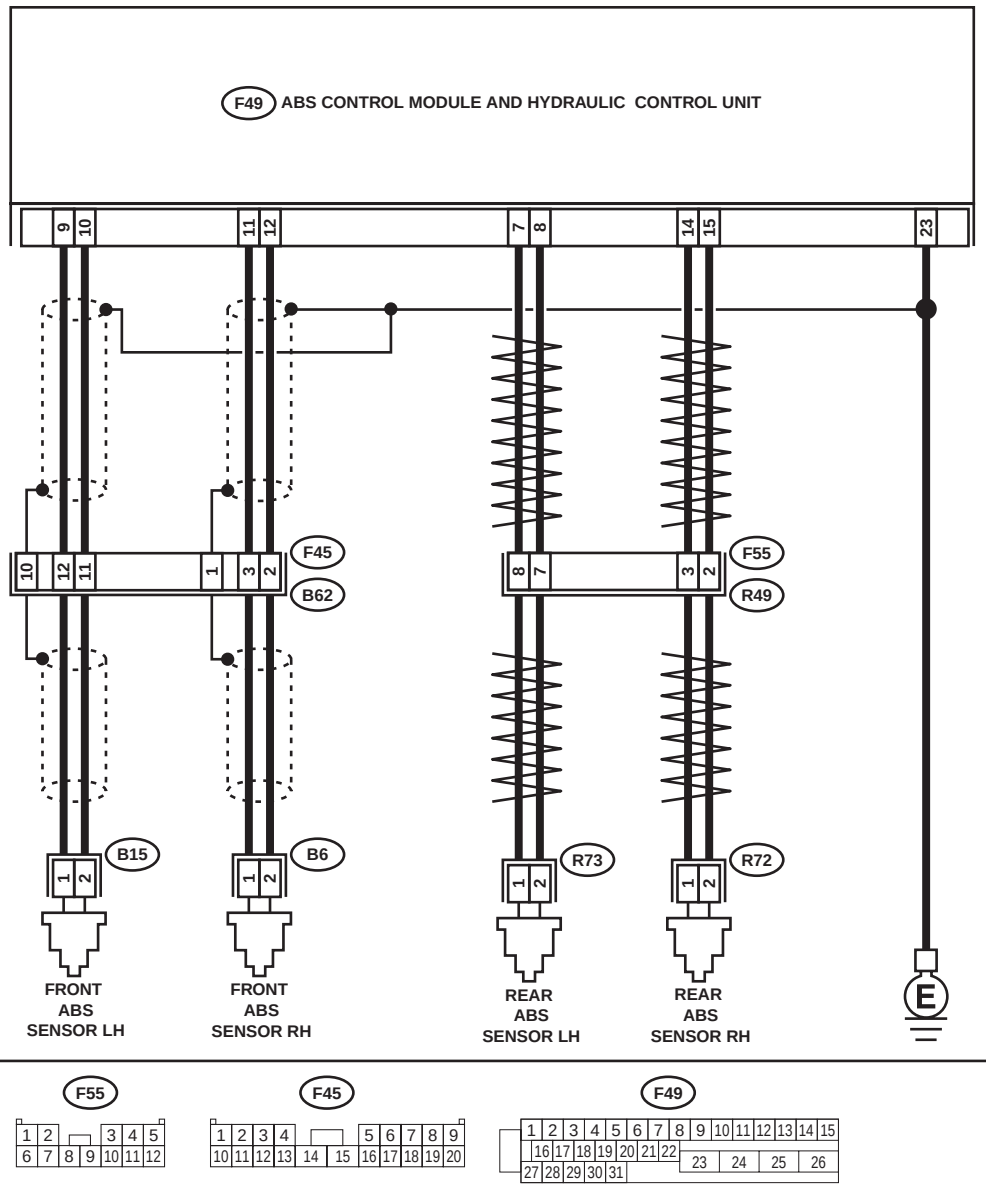
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00293

Vehicle-id:
SIE-id::G:DTC 27 Abnormal ABS Sensor (Open Circuit or Input Voltage Too High) (Rear LH)
～

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step **2.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
2	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Disconnect connector from ABSCM&H/U. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **3.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
3	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **4.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
4	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 — No. 12:*** ***DTC 23 / (F49) No. 9 — No. 10:*** ***DTC 25 / (F49) No. 14 — No. 15:*** ***DTC 27 / (F49) No. 7 — No. 8:*** Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step **5.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
5	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **6.**	Repair harness between ABSCM&H/U and ABS sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **7.**	Repair harness between ABSCM&H/U and ABS sensor.
7	**CHECK INSTALLATION OF ABS SENSOR.** Turn ignition switch to OFF. Are the ABS sensor installation bolts tightened with the specified torque?	32 N·m (3.3 kgf-m, 24 ft-lb)	Go to step **8.**	Tighten ABS sensor installation bolts securely.
8	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **9.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
9	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **10.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
10	**CHECK GROUND SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **11.**	Replace ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
11	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 — Chassis ground:*** ***DTC 23 / (F49) No. 9 — Chassis ground:*** ***DTC 25 / (F49) No. 14 — Chassis ground:*** ***DTC 27 / (F49) No. 7 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **12.**	Repair harness between ABSCM&H/U and ABS sensor. Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
12	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **13.**	Repair connector.
13	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **14.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
14	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.	Proceed with the diagnosis corresponding to the DTC.

H: DTC 22 ABNORMAL ABS SENSOR (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

I: DTC 24 ABNORMAL ABS SENSOR (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

J: DTC 26 ABNORMAL ABS SENSOR (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

Vehicle-id:
SIE-id::H:DTC 22 Abnormal ABS Sensor (Front RH)
~

MEMO:

Vehicle-id:
SIE-id::J:DTC 26 Abnormal ABS Sensor (Rear RH)
～

K: DTC 28 ABNORMAL ABS SENSOR (REAR LH)

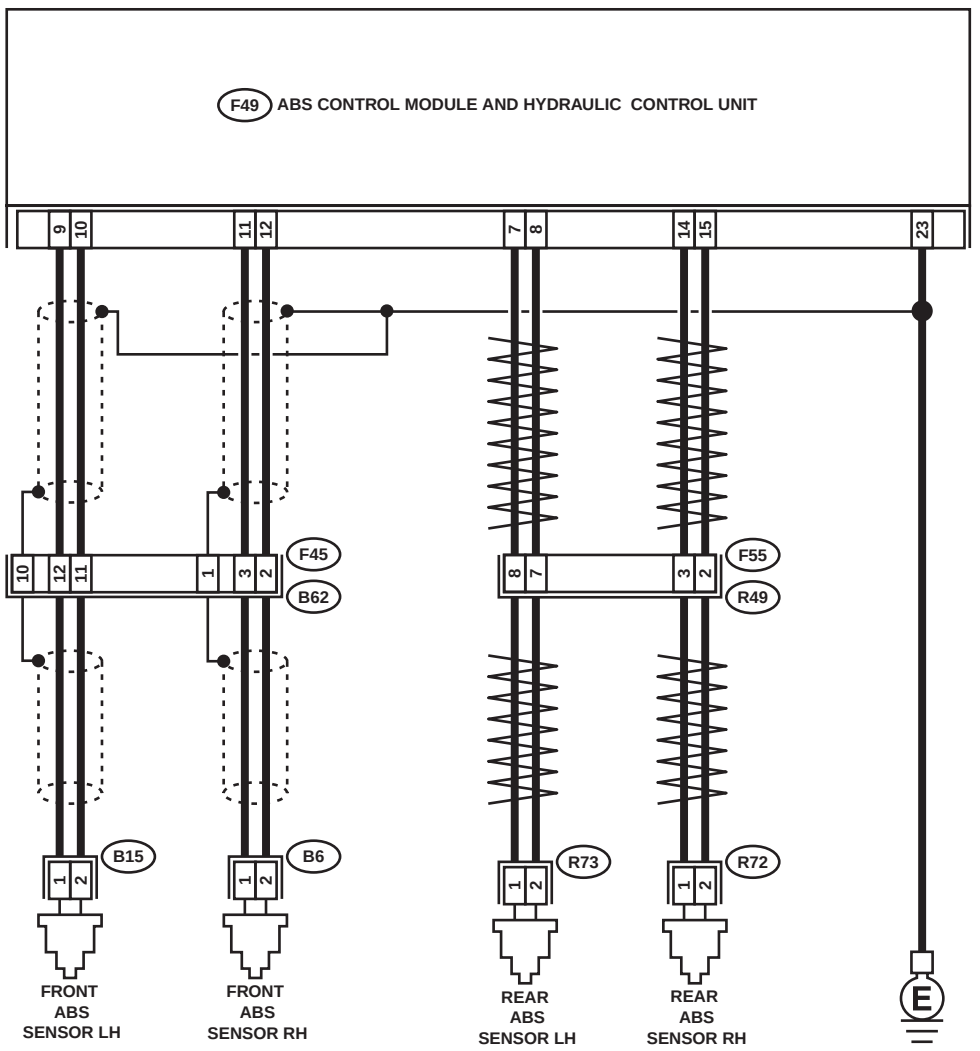
DIAGNOSIS:

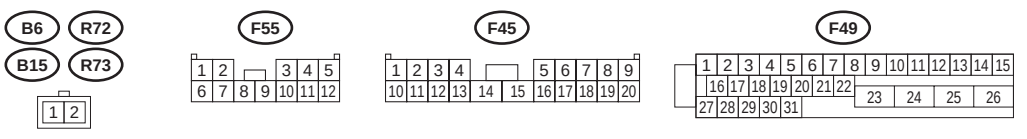
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00293

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK INSTALLATION OF ABS SENSOR.** Turn ignition switch to OFF. Are the ABS sensor installation bolts tightened with the specified torque?	32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Go to step **2.**	Tighten ABS sensor installation bolts securely.
2	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **3.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
3	**PREPARE OSCILLOSCOPE.** Is an oscilloscope available?	Available.	Go to step **4.**	Go to step **5.**
4	**CHECK ABS SENSOR SIGNAL.** 1) Lift-up the vehicle. 2) Turn ignition switch OFF. 3) Connect the oscilloscope to the connector. 4) Turn ignition switch ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS control module sometimes stores the trouble code 29. ***Connector & terminal*** ***DTC 22 / (B62) No. 3 (+) — No. 2 (–):*** ***DTC 24 / (B62) No. 12 (+) — No. 11 (–):*** ***DTC 26 / (F55) No. 3 (+) — No. 2 (–):*** ***DTC 28 / (F55) No. 8 (+) — No. 7 (–):*** Is the measured value same as the specified value?	Oscilloscope pattern is as in figure.	Go to step **8.**	Go to step **7.**
5	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor or drum from hub in accordance with trouble code. Is the ABS sensor piece or the tone wheel contaminated by mud or other foreign matter?	ABS sensor piece or the tone wheel is not contaminated.	Go to step **6.**	Thoroughly remove mud or other foreign matter.
6	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged in the ABS sensor piece or the tone wheel?	Not broken or damaged.	Go to step **7.**	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **8.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
8	**CHECK RESISTANCE OF ABS SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step **9.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
9	**CHECK GROUND SHORT OF ABS SENSOR.** Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **10.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
10	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1) Connect connector to ABS sensor. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — No. 12:*** ***DTC 24 / (F49) No. 9 — No. 10:*** ***DTC 26 / (F49) No. 14 — No. 15:*** ***DTC 28 / (F49) No. 7 — No. 8:*** Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step **11.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
11	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — Chassis ground:*** ***DTC 24 / (F49) No. 9 — Chassis ground:*** ***DTC 26 / (F49) No. 14 — Chassis ground:*** ***DTC 28 / (F49) No. 7 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **12.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
12	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — GND:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **13.**	Repair ABSCM&H/U ground harness.
13	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **14.**	Repair connector.
14	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step **15.**	Properly install the car telephone or the wireless transmitter.
15	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step **16.**	Install the noise sources apart from the sensor harness.
16	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (B62) No. 1 — Chassis ground:*** ***DTC 24 / (B62) No. 10 — Chassis ground:*** NOTE: For the **DTC 26** and **28**: Go to step **17.** Is the measured value less than the specified value?	0.5 Ω	Go to step **17.**	Repair shield harness.
17	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **18.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary noise interference.	Proceed with the diagnosis corresponding to the DTC.

L: DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR)

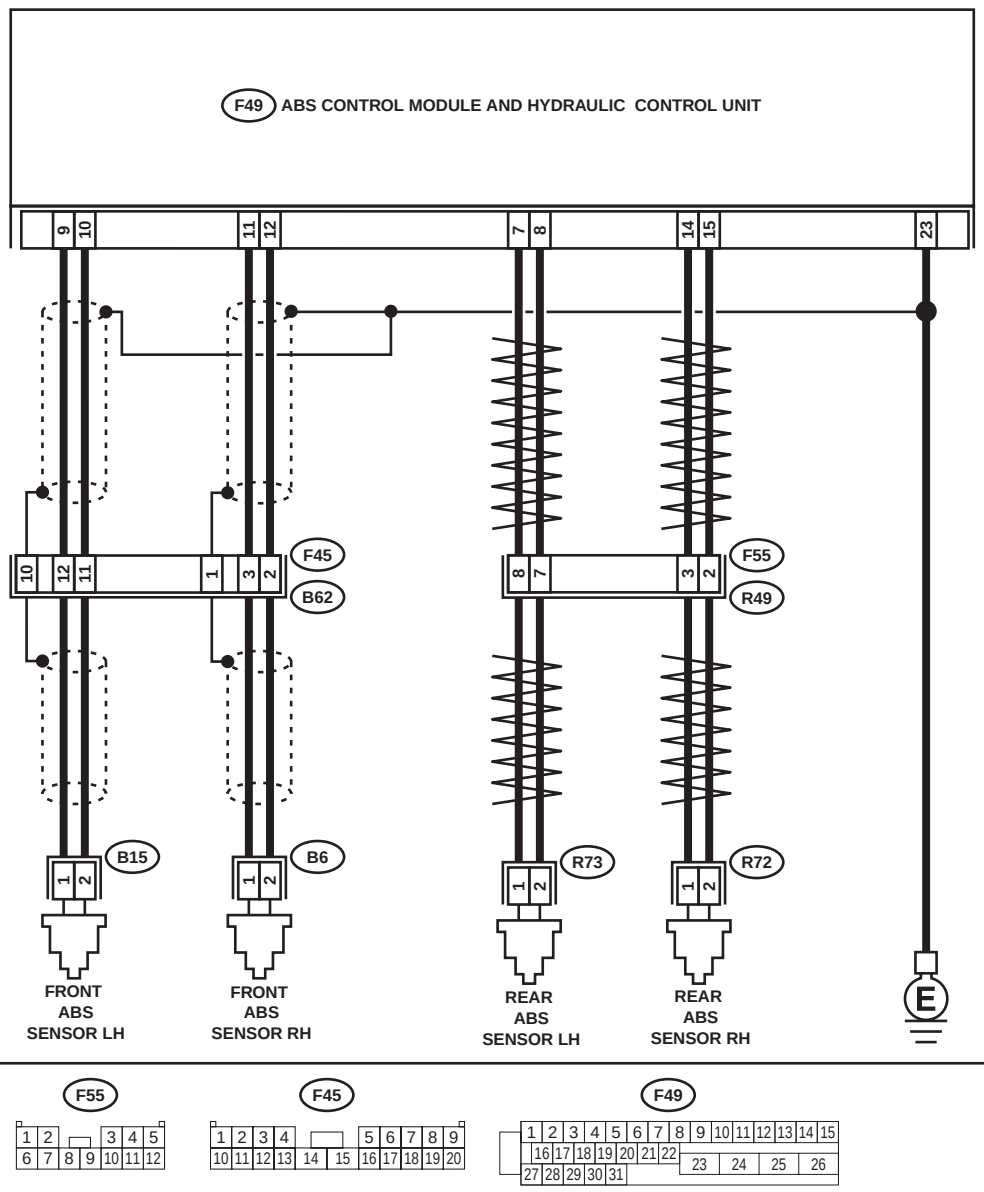
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Turning wheels freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00293

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY.** Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Wheels have not turned freely.	Go to step **2.**	NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur. The ABS is normal. Erase the DTC.
2	**CHECK TIRE SPECIFICATIONS.** Turn ignition switch to OFF. Are the tire specifications correct?	Correct specification.	Go to step **3.**	Replace tire.
3	**CHECK WEAR OF TIRE.** Is the tire worn excessively?	Not worn excessively.	Go to step **4.**	Replace tire.
4	**CHECK TIRE PRESSURE.** Is the tire pressure correct?	Correct tire pressure.	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** Are the ABS sensor installation bolts tightened with the specified torque?	32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Go to step **6.**	Tighten ABS sensor installation bolts.
6	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.** Is an oscilloscope available?	Available.	Go to step **8.**	Go to step **9.**
8	**CHECK ABS SENSOR SIGNAL.** 1) Lift up the vehicle. 2) Turn ignition switch OFF. 3) Connect the oscilloscope to the connector. 4) Turn ignition switch ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the DTC 29. ***Connector & terminal*** ***(B62) No. 3 (+) — No. 2 (–) (Front RH):*** ***(B62) No. 12 (+) — No. 11 (–) (Front LH):*** ***(F55) No. 3 (+) — No. 2 (–) (Rear RH):*** ***(F55) No. 8 (+) — No. 7 (–) (Rear LH):*** Is the measured value same with the specified value?	Oscilloscope pattern is as shown in figure.	Go to step **12.**	Go to step **9.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub. Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	ABS sensor piece or the tone wheel is not contaminated.	Go to step **10.**	Thoroughly remove dirt or other foreign matter.
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged teeth in the ABS sensor piece or the tone wheel?	Not broken or damaged.	Go to step **11.**	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
11	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **12.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
12	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **13.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

M: DTC 31 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-54, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

N: DTC 33 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-54, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

O: DTC 35 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-54, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

Vehicle-id:
SIE-id::M:DTC 31 Abnormal Inlet Solenoid Valve Circuit(s) in ABSCM&H/U (Front RH)
~

P: DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH)

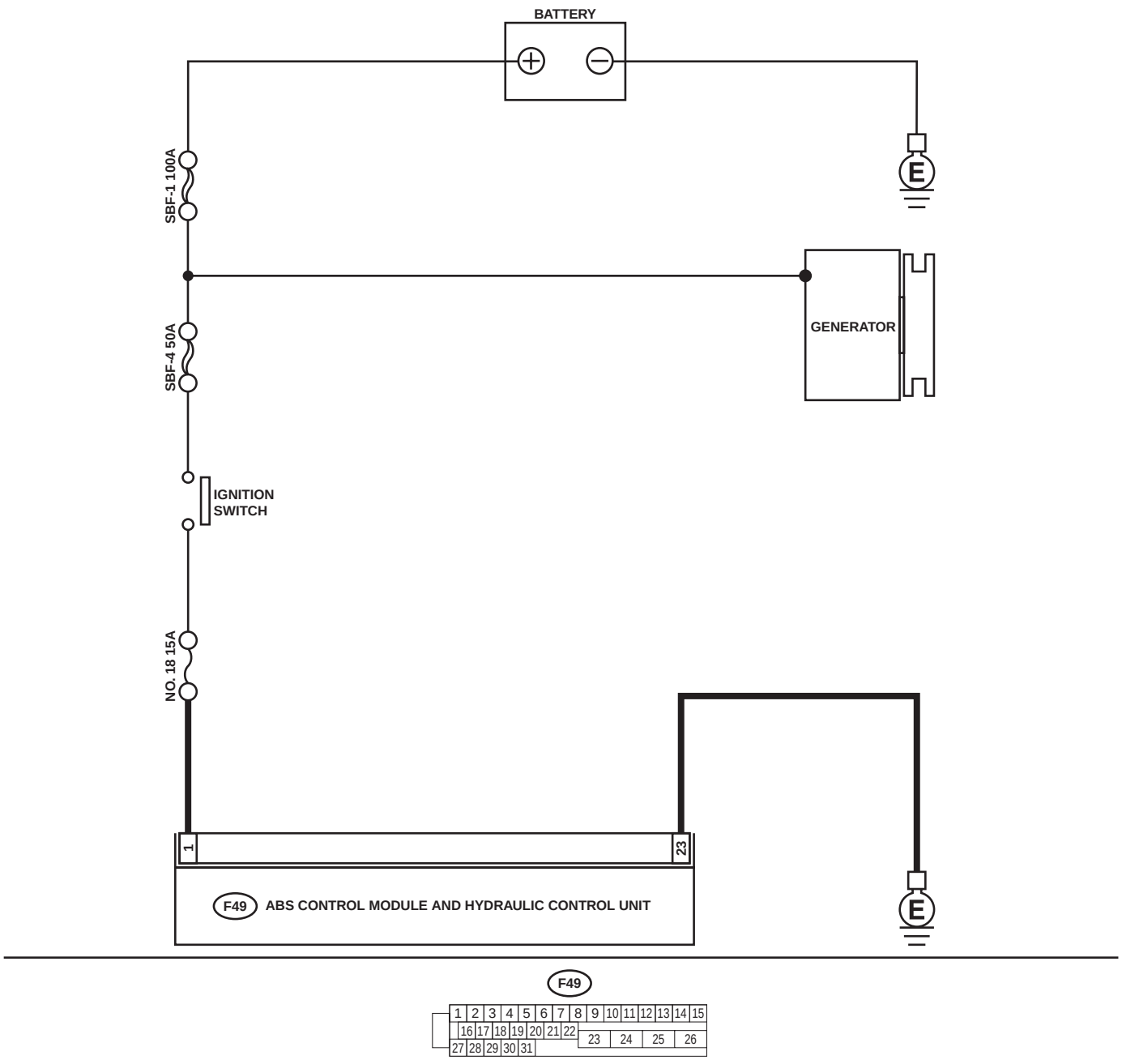
DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00294

Vehicle-id:
SIE-id::P:DTC 37 Abnormal Inlet Solenoid Valve Circuit(s) in ABSCM&H/U (Rear LH)
~

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **2.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair connector.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **5.**	Rece ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

Vehicle-id:
SIE-id::P:DTC 37 Abnormal Inlet Solenoid Valve Circuit(s) in ABSCM&H/U (Rear LH)
～

Q: DTC 32 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-58, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

R: DTC 34 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-58, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

S: DTC 36 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-58, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

Vehicle-id:
SIE-id::Q:DTC 32 Abnormal Outlet Solenoid Valve Circuit(s) in ABSCM&H/U (Front RH)
～

MEMO:

Vehicle-id:
SIE-id::S:DTC 36 Abnormal Outlet Solenoid Valve Circuit(s) in ABSCM&H/U (Rear RH)
～

T: DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH)

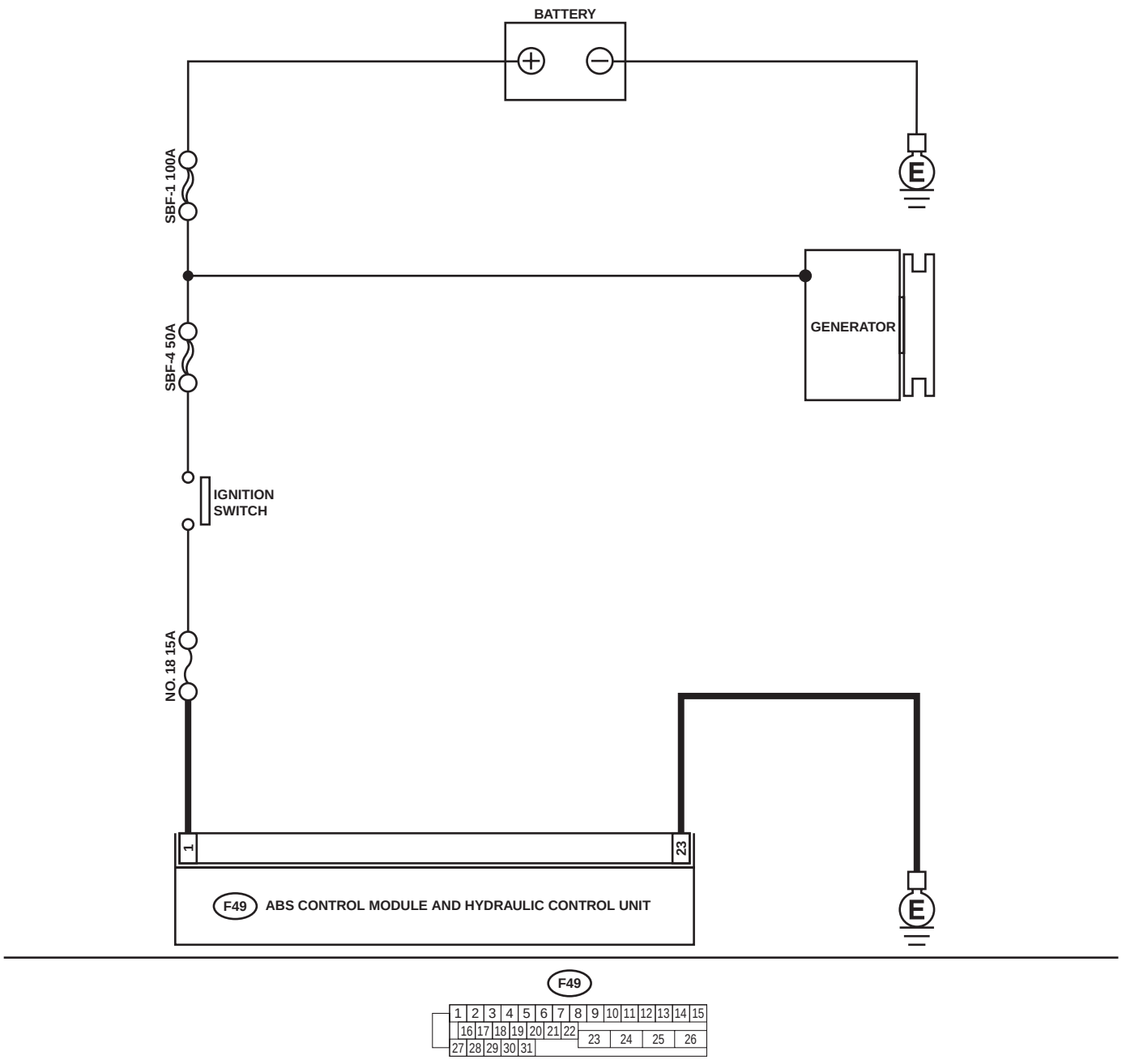
DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00294

Vehicle-id:
SIE-id::T: DTC 38 Abnormal Outlet Solenoid Valve Circuit(s) in ABSCM&H/U (Rear LH)
~

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 and 15 V	Go to step **2.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair connector.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **5.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

Vehicle-id:
SIE-id::T:DTC 38 Abnormal Outlet Solenoid Valve Circuit(s) in ABSCM&H/U (Rear LH)
~

U: DTC 41 ABNORMAL ABS CONTROL MODULE

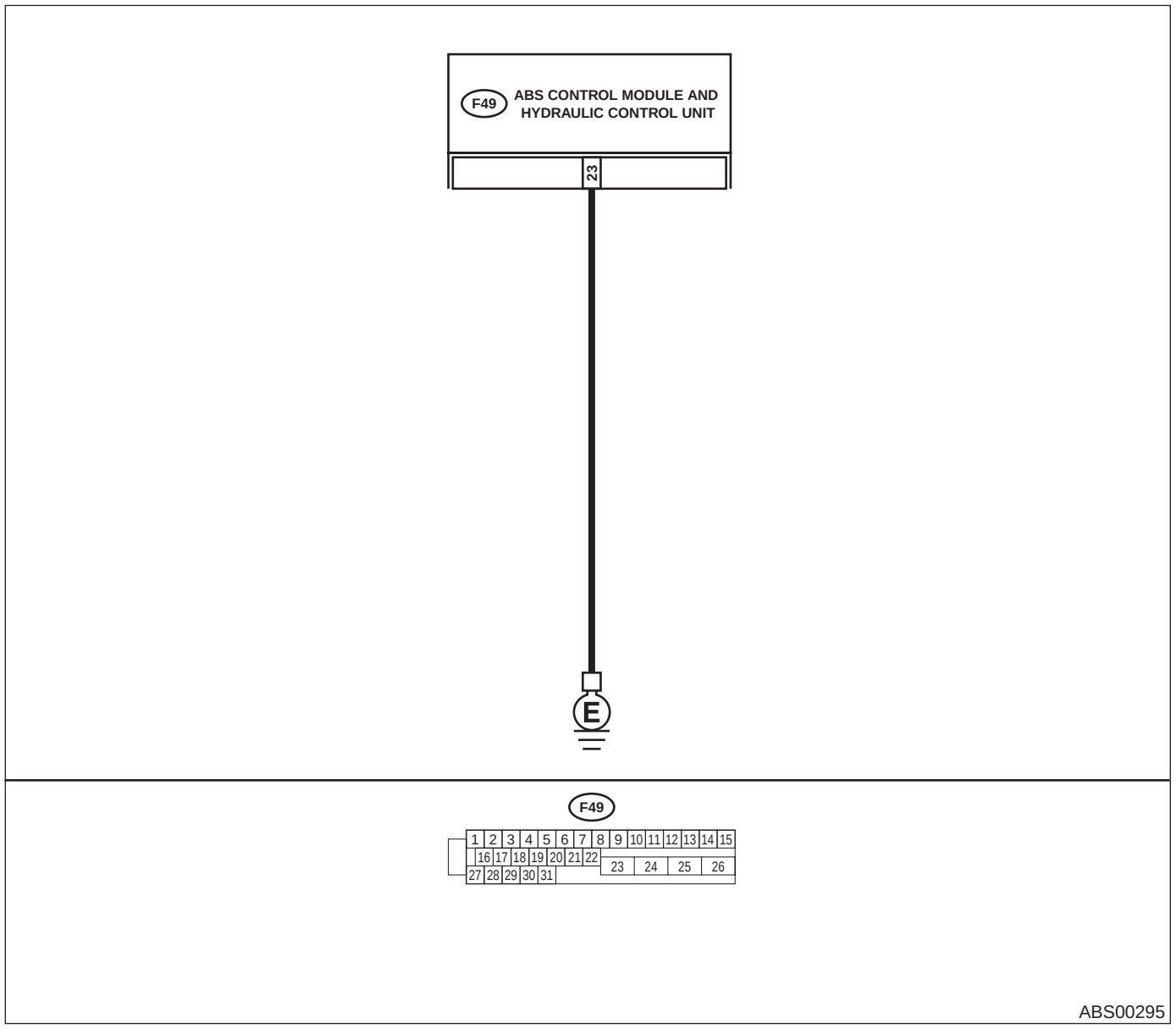
DIAGNOSIS:

- Faulty ABSCM&H/U.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



Step		Value	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	There is no poor contact.	Go to step **3.**	Repair connector.
3	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Installed properly	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step **5.**	Install the noise sources apart from the sensor harness.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not indicated.	Go to step **6.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

V: DTC 42 SOURCE VOLTAGE IS ABNORMAL.

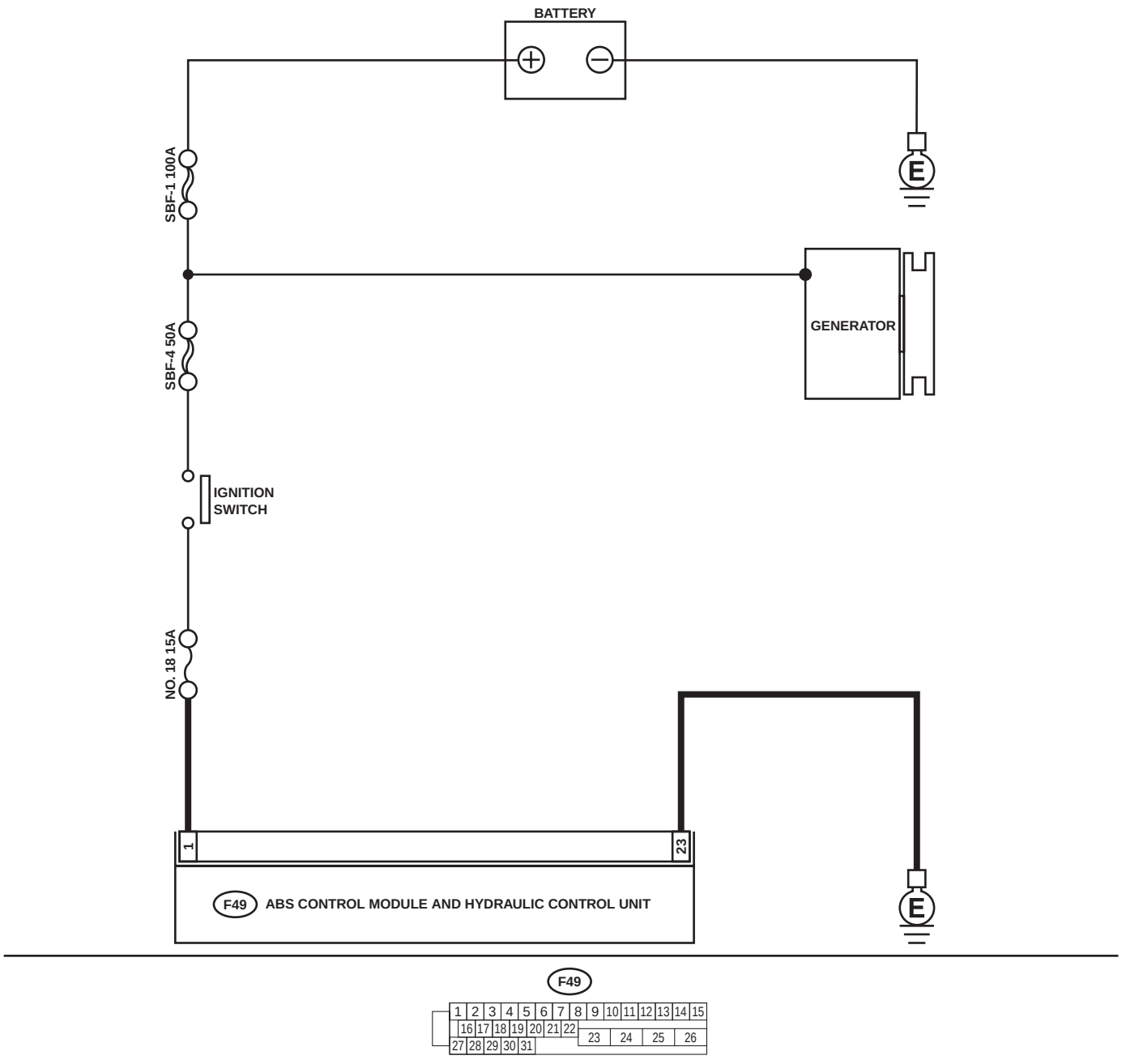
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low or high.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00294

Vehicle-id:
SIE-id::V:DTC 42 Source Voltage Is Abnormal.
~

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:*** Is the measured value within the specified range?	10 - 17 V	Go to step **2.**	Repair generator. H4 engine model: <Ref. to SC-<Ref. to SC(H4SO)-15, Generator.>, Generator.> H6 engine model: <Ref. to SC(H6)-<Ref. to SC(H6DO)-14, Generator.>, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Terminals are tightened securely.	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 17 V	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **6.**	Repair connector.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **7.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

W: DTC 44 A COMBINATION OF AT CONTROL ABNORMAL

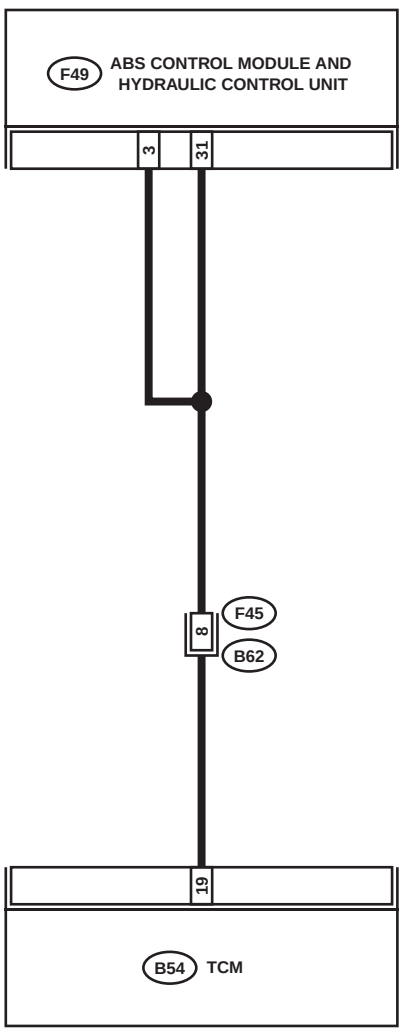
DIAGNOSIS:

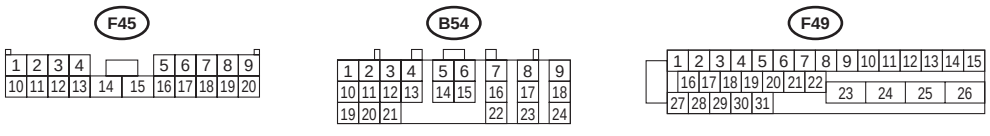
- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00296

	Step	Value	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check specifications of the mark to the ABSCM&H/U. ***CG: AT (Except OUTBACK)*** ***CH: MT (Except OUTBACK)*** ***CI: AT (OUTBACK)*** ***CJ: MT (OUTBACK)*** Do the vehicle specification and the specification of ABSCM&HU match?	Both are the same specifications.	Go to step **2.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair harness between TCM and ABSCM&H/U.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **4.**	Repair harness between TCM and ABSCM&H/U.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Repair harness between TCM and ABSCM&H/U.
5	**CHECK TCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn ignition switch to ON. 4) Measure voltage between TCM connector terminal and chassis ground. ***Connector & terminal*** ***(B54) No. 19 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **7.**	Go to step **6.**
6	**CHECK AT.** Is the AT functioning normally?	Function of AT is normal.	Replace TCM.	Repair AT.
7	**CHECK OPEN CIRCUIT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **8.**	Repair harness/ connector between TCM and ABSCM&H/U.
8	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between TCM and ABSCM&H/U?	There is no poor contact.	Go to step **9.**	Repair connector.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

Step		Value	Yes	No
9	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **10.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
10	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

MEMO:

Vehicle-id:
SIE-id::W:DTC 44 A Combination of AT Control Abnormal
～

X: DTC 51 ABNORMAL VALVE RELAY

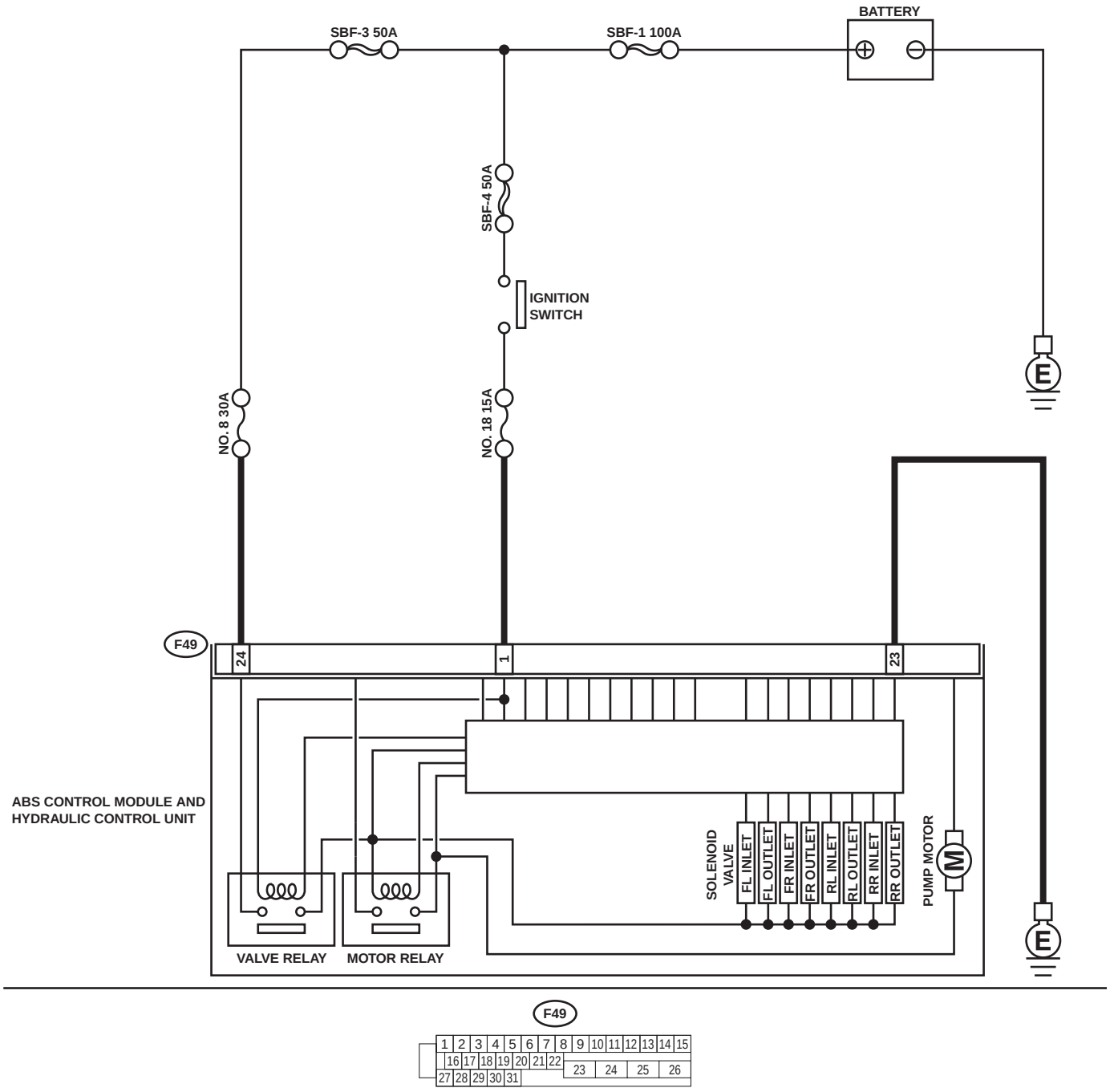
DIAGNOSIS:

- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00297

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***(F49) No. 24 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **2.**	Repair harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure resistance between ABSCM&H/U and terminals. ***Terminals*** ***No. 23 (+) — No. 24 (–):*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **5.**	Repair connector.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **6.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

Y: DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY

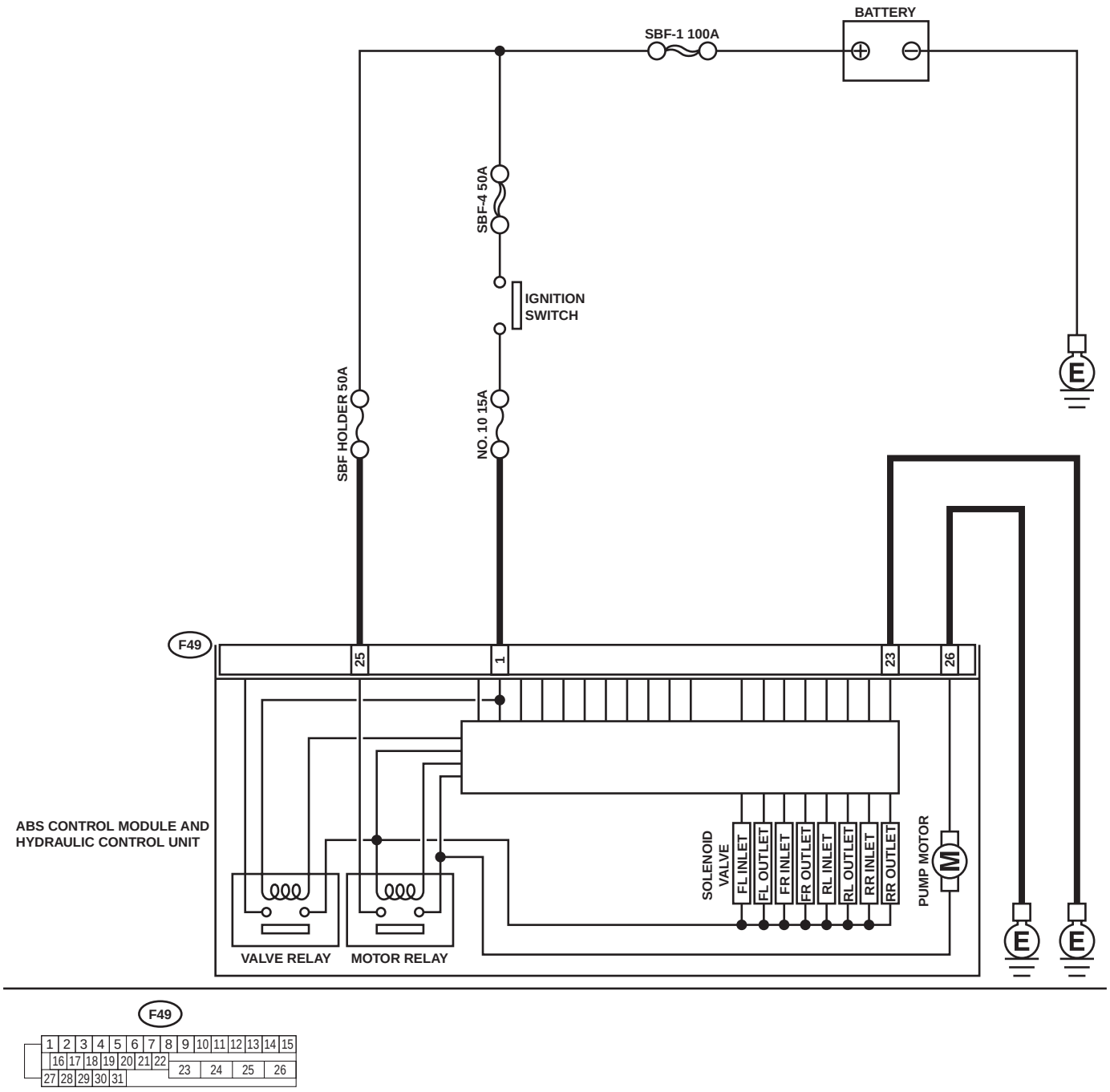
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00298

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 25 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **2.**	Repair harness/ connector between battery and ABSCM&H/U and check fuse SBF-holder.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 26 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Operating sound is produced.	Go to step **6.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **7.**	Repair connector.
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **8.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
8	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

Z: DTC 54 ABNORMAL STOP LIGHT SWITCH

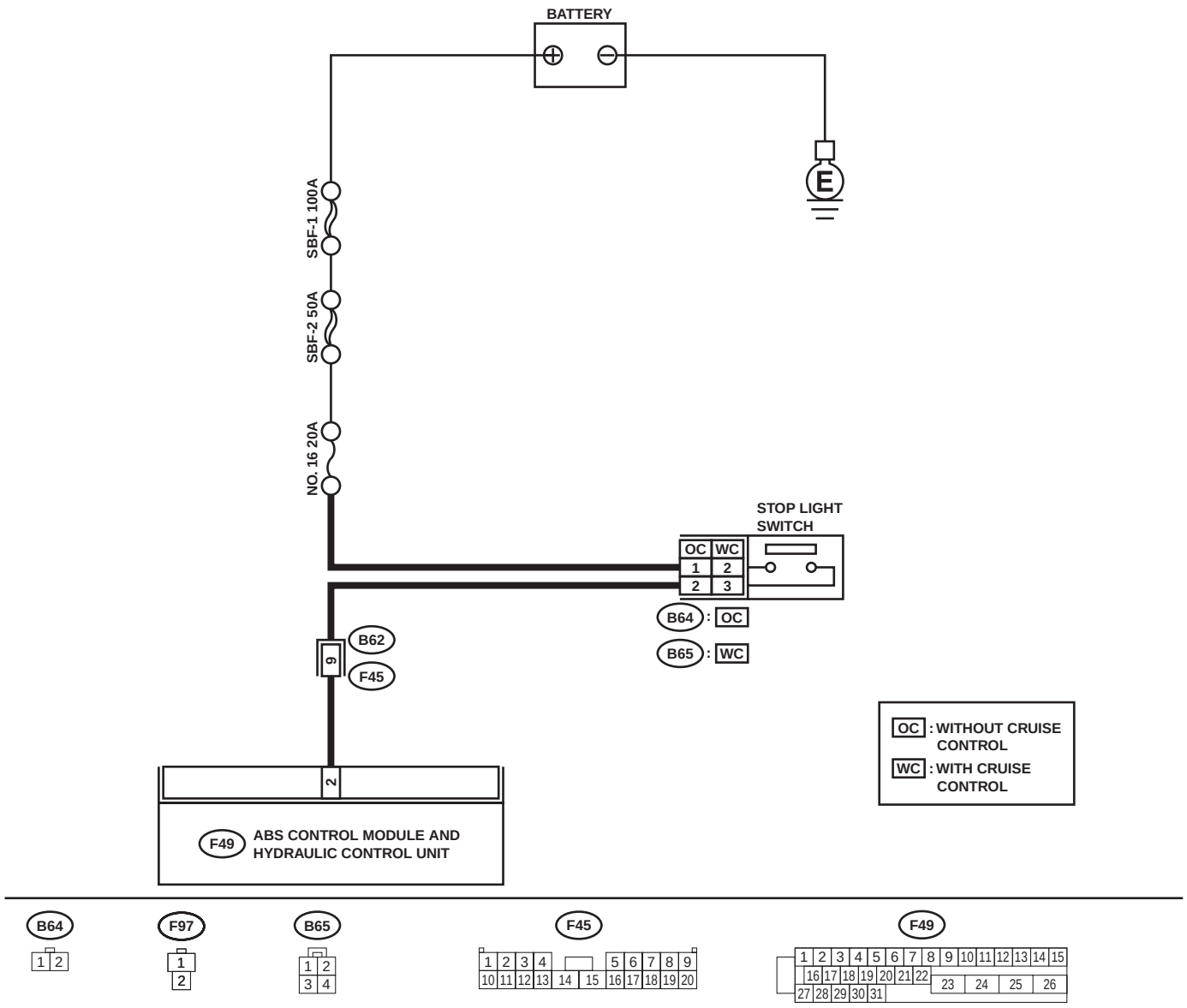
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00299

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK STOP LIGHTS COME ON.** Depress the brake pedal. Do stop lights come on?	Stop lights come on.	Go to step **2.**	Repair stop lights circuit.
2	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Depress brake pedal. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 2 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **3.**	Repair harness between stop light switch and ABSCM&H/U.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between stop light switch and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair connector.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **5.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

AA:DTC 56 ABNORMAL G SENSOR OUTPUT VOLTAGE

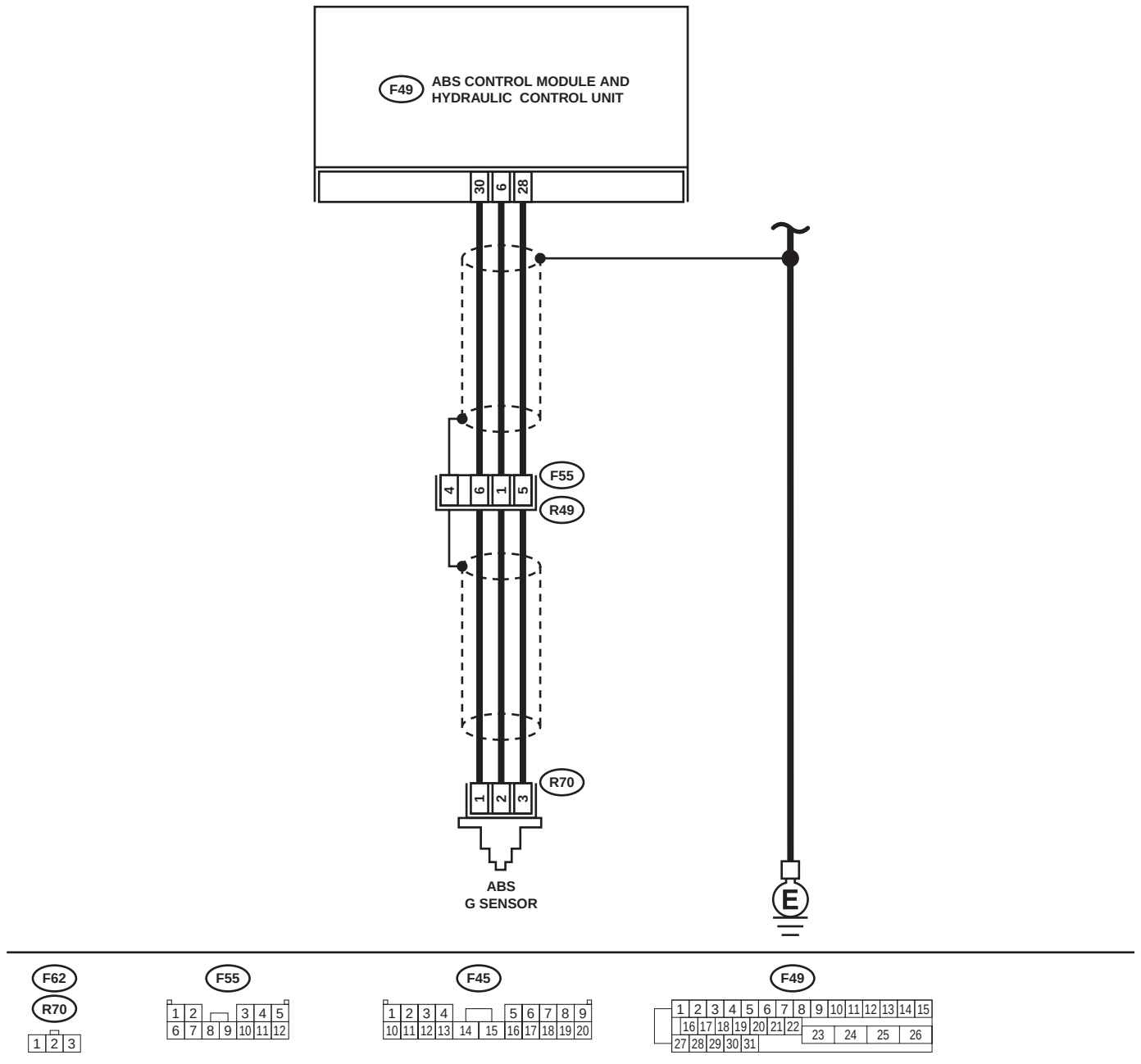
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00300

Vehicle-id:
SIE-id::AA:DTC 56 Abnormal G Sensor Output Voltage
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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK WHEELS FOR FREE TURNING.** Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?	Wheels have not turned freely.	Go to step **2.**	The ABS is normal. Erase the DTC.
2	**CHECK SPECIFICATIONS OF ABSCM&H/U.** Check specifications of the mark to the ABSCM&H/U. ***CG: AT (Except OUTBACK)*** ***CH: MT (Except OUTBACK)*** ***CI: AT (OUTBACK)*** ***CJ: MT (OUTBACK)*** Does the vehicle specification and the ABSCM&H/U specification match?	Both are the same specifications.	Go to step **3.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> **CAUTION:** **Be sure to turn ignition switch to OFF when removing ABSCM&H/U.**
3	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect G sensor from body. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 1 (+) — No. 3 (–):*** Is the measured value within the specified range?	4.75 - 5.25 V	Go to step **4.**	Repair harness/ connector between G sensor and ABSCM&H/U.
4	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:*** Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step **5.**	Repair harness/ connector between G sensor and ABSCM&H/U.
5	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect connector from G sensor. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **6.**	Repair harness between G sensor and ABSCM&H/U.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **7.**	Repair harness between G sensor and ABSCM&H/U.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **8.**	Repair harness between G sensor and ABSCM&H/U.
8	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 28 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **9.**	Repair harness between G sensor and ABSCM&H/U. Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
9	**CHECK G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Connect connector to ABSCM&H/U. 5) Turn ignition switch to ON. 6) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the measured value within the specified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step **10.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
10	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the measured value within the specified range when G sensor is inclined forward to 90°?	3.7 - 4.1 V	Go to step **11.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
11	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the measured value within the specified range when G sensor is inclined backward to 90°?	0.5 - 0.9 V	Go to step **12.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
12	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **13.**	Repair connector.
13	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **14.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

Step		Value	Yes	No
14	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

13.Diagnostics Chart with Subaru Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

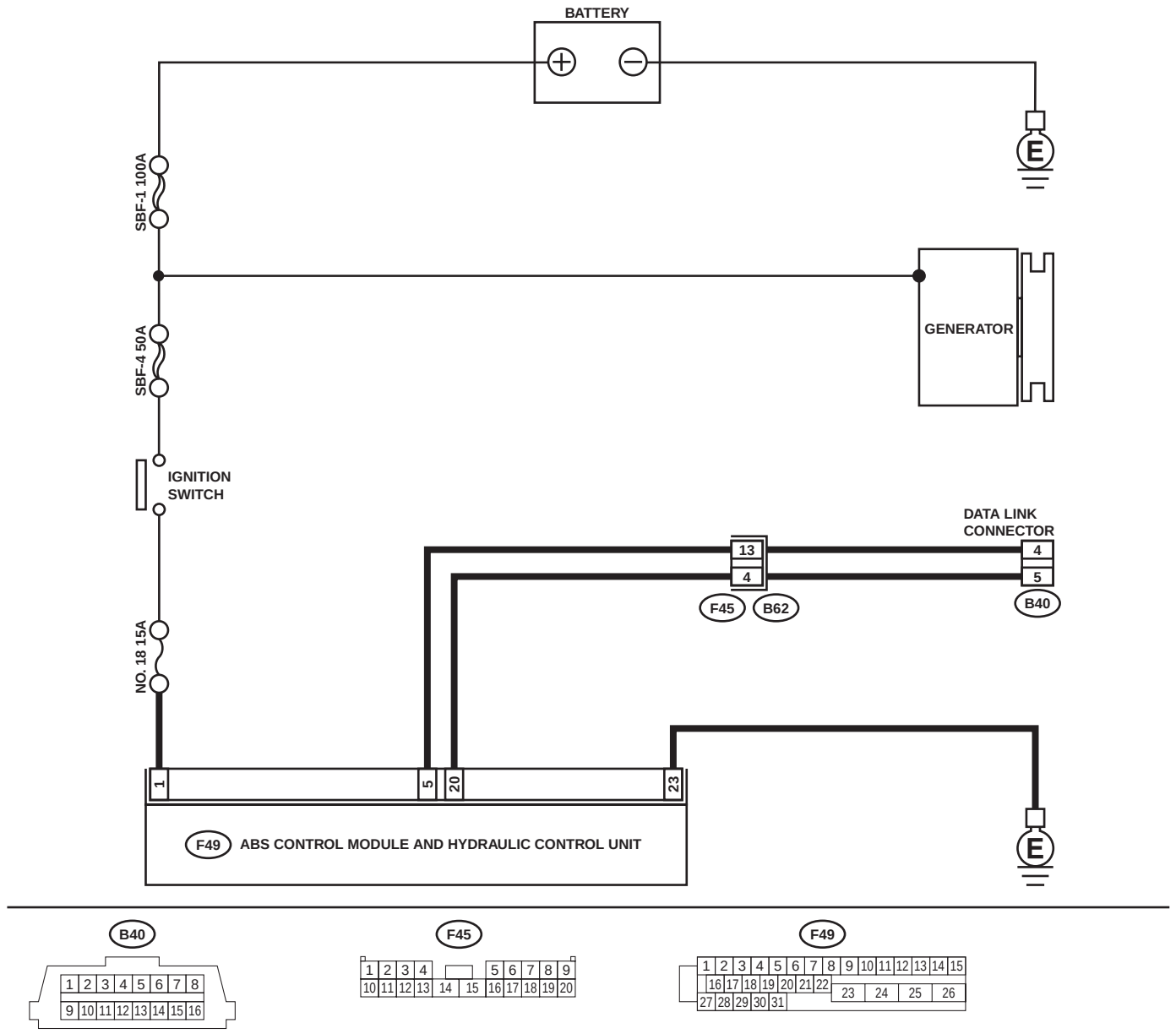
DIAGNOSIS:

- Faulty harness connector

TROUBLE SYMPTOM:

- ABS warning light remains on.

WIRING DIAGRAM:



ABS00301

Vehicle-id:
SIE-id::A:Communication for Initializing Impossible
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DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK IGNITION SWITCH.** Is ignition switch to ON?	Ignition switch is to ON.	Go to step **2.**	Turn ignition switch to ON, and select ABS mode using the select monitor.
2	**CHECK BATTERY.** 1) Turn ignition switch to OFF. 2) Measure battery voltage. Does the measured value exceed the specified value?	11 V	Go to step **3.**	Charge or replace battery.
3	**CHECK BATTERY TERMINAL.** Is there poor contact at battery terminal?	There is no poor contact.	Go to step **4.**	Repair or tighten battery terminal.
4	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to ON. 2) Using the select monitor, check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor?	Name and year of the system are displayed.	Go to step **7.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to OFF. 2) Disconnect ABSCM&H/U connector. 3) Check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor?	Name and year of the system are displayed.	Go to step **7.**	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect ABSCM&H/U, cruise control module and immobilizer control module connectors. 3) Measure resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **7.**	Repair harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR ABSCM&H/U.** 1) Turn ignition switch to ON. 2) Measure voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 (+) — Chassis ground (–):*** ***(B40) No. 4 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	1 V	Repair harness and connector between each control module and data link connector.	Go to step **8.**

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
8	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR.** Measure resistance between ABSCM&H/U connector and data link connector. ***Connector & terminal*** ***(F49) No. 20 — (B40) No. 5:*** ***(F49) No. 5 — (B40) No. 4:*** Is the measured value less than the specified value?	0.5 Ω	Repair harness and connector between ABSCM&H/U and data link connector.	Go to step **9.**
9	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn ignition switch to OFF. Is ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it?	ABSCM&HU connector inserted securely.	Go to step **10.**	Insert ABSCM&H/U connector into ABSCM&H/U.
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn ignition switch to ON (engine OFF). 2) Measure ignition power supply voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **11.**	Repair open circuit in harness between ABSCM&H/U and battery.
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U and transmission. 3) Measure resistance of harness between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	1 Ω	Go to step **12.**	Repair open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in control module power supply, ground line and data link connector?	There is no poor contact.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair connector.

MEMO:

Vehicle-id:
SIE-id::A: Communication for Initializing Impossible
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B: NO TROUBLE CODE

DIAGNOSIS:

- ABS warning light circuit is shorted.

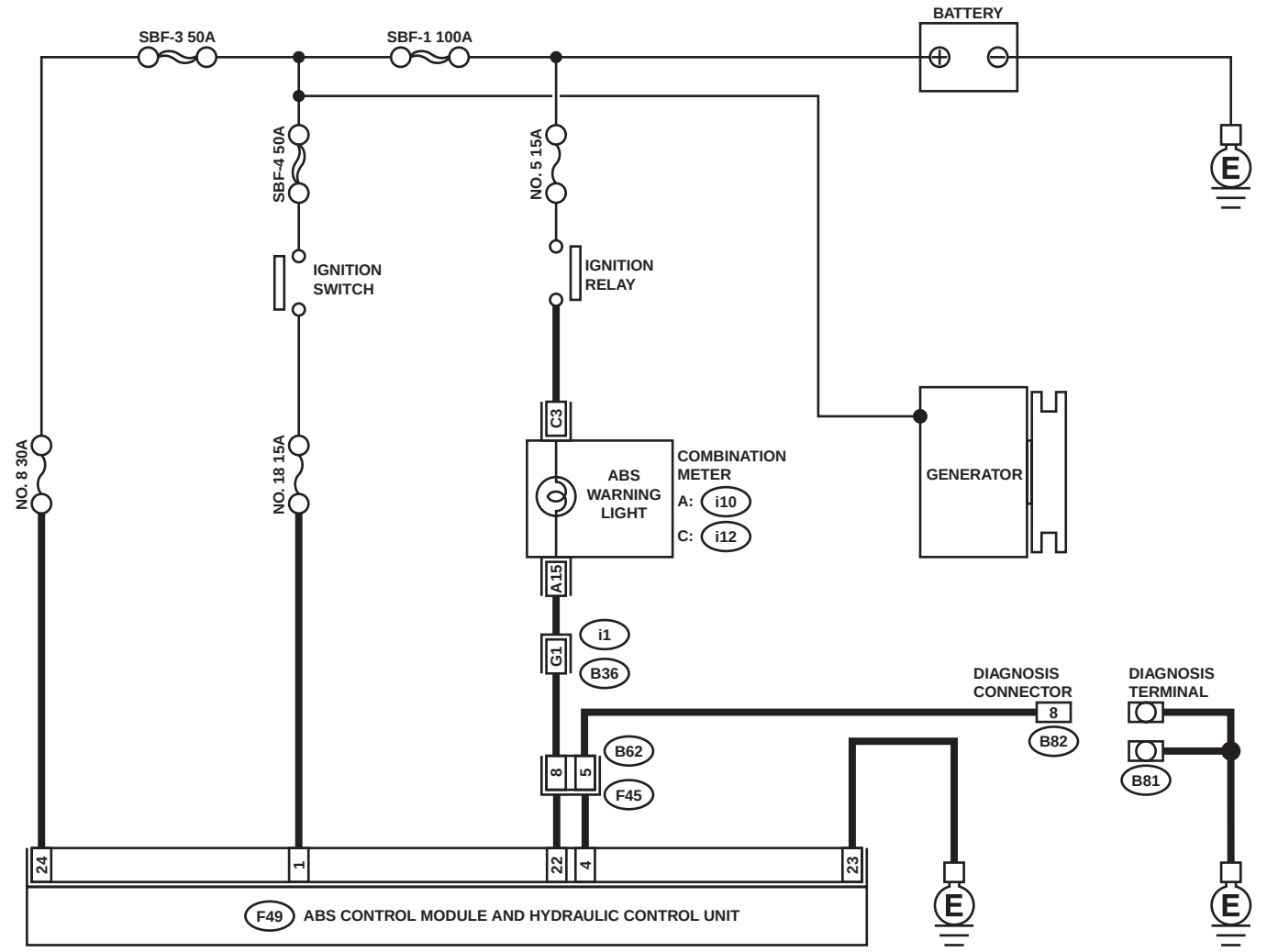
TROUBLE SYMPTOM:

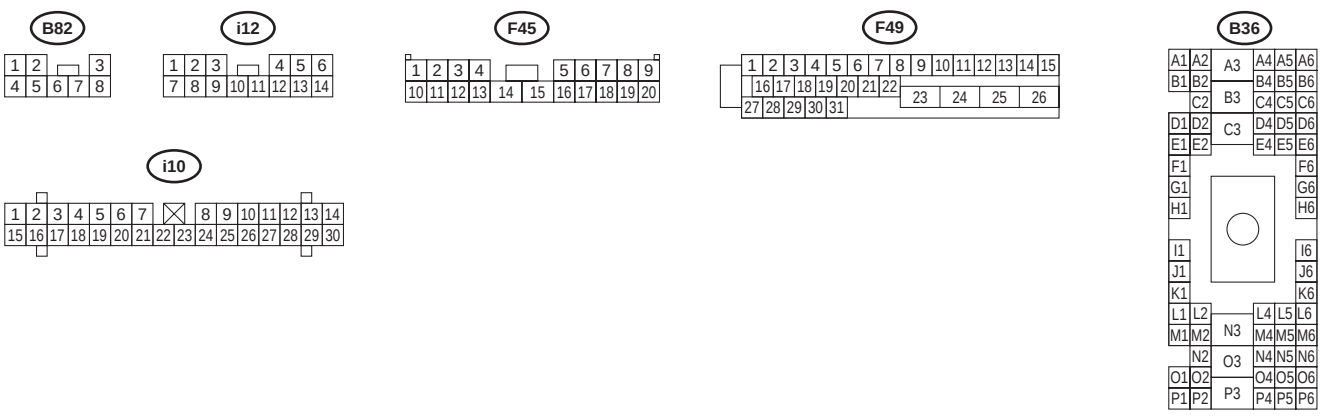
- ABS warning light remains on.
- NO TROUBLE CODE displayed on the select monitor.

NOTE:
When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on the select monitor, the system is in normal condition.

Vehicle-id:
SIE-id::B: No Trouble Code
~

WIRING DIAGRAM:





ABS00292

Step		Value	Yes	No
1	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F45) from connector (B62). 3) Turn ignition switch to ON. Does the ABS warning light turn on?	ABS warning light does not turn on.	Go to step **2.**	Repair front wiring harness.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
2	**CHECK PROJECTION AT ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Check for broken projection at the ABSCM&H/U terminal. Is there any damage on ABSCM&HU terminal?	There is no damage on terminal.	Go to step **3.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK ABSCM&H/U.** Measure resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 22 — No. 23:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK WIRING HARNESS.** Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair harness.
5	**CHECK WIRING HARNESS.** 1) Connect connector to ABSCM&H/U. 2) Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **6.**	Repair harness.
6	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.** Is there poor contact in ABSCM&H/U connector?	There is no poor contact.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair connector.

C: DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-86, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

D: DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-86, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

E: DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-86, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

Vehicle-id:
SIE-id::C:DTC 21 Open or Short Circuit in Front Right ABS Sensor Circuit
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F: DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT

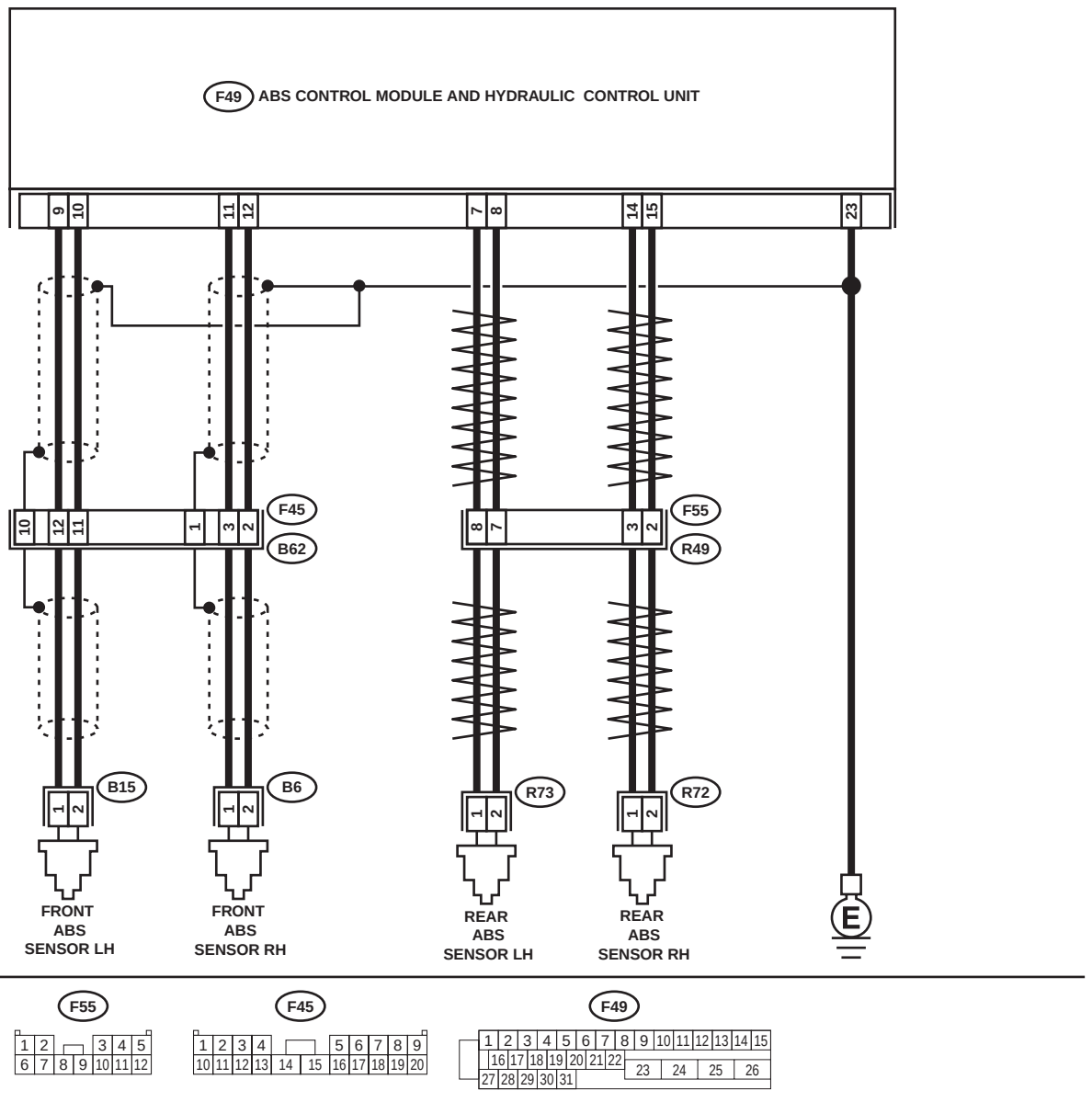
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00293

Vehicle-id:
SIE-id::F:DTC 27 Open or Short Circuit in Rear Left ABS Sensor Circuit
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DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode. Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Change as same.	Go to step **2.**	Go to step **8.**
2	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened with the specified torque?	32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Go to step **3.**	Tighten ABS sensor installation bolts securely.
3	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **4.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **5.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **6.**	Repair connector.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **7.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
8	**CHECK ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step **9.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
9	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Disconnect connector from ABSCM&H/U. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **10.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
10	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **11.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
11	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 — No. 12:*** ***DTC 23 / (F49) No. 9 — No. 10:*** ***DTC 25 / (F49) No. 14 — No. 15:*** ***DTC 27 / (F49) No. 7 — No. 8:*** Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step **12.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.

	Step	Value	Yes	No
12	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **13.**	Repair harness between ABSCM&H/U and ABS sensor.
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **14.**	Repair harness between ABSCM&H/U and ABS sensor.
14	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened with the specified torque?	32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Go to step **15.**	Tighten ABS sensor installation bolts securely.
15	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
16	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value within the specified range?	0.05 mm (0.0020 in)	Go to step **17.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
17	**CHECK GROUND SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **18.**	Replace ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 — Chassis ground:*** ***DTC 23 / (F49) No. 9 — Chassis ground:*** ***DTC 25 / (F49) No. 14 — Chassis ground:*** ***DTC 27 / (F49) No. 7 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **19.**	Repair harness between ABSCM&H/U and ABS sensor. And replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
19	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **20.**	Repair connector.
20	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **21.**	Replace ABSCM&H/U.
21	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.	Proceed with the diagnosis corresponding to the DTC.

G: DTC 22 FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-92, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>

H: DTC 24 FRONT LEFT ABNORMAL ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-92, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>

I: DTC 26 REAR RIGHT ABNORMAL ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-92, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>

Vehicle-id:
SIE-id::G:DTC 22 Front Right Abnormal ABS Sensor Signal
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J: DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL

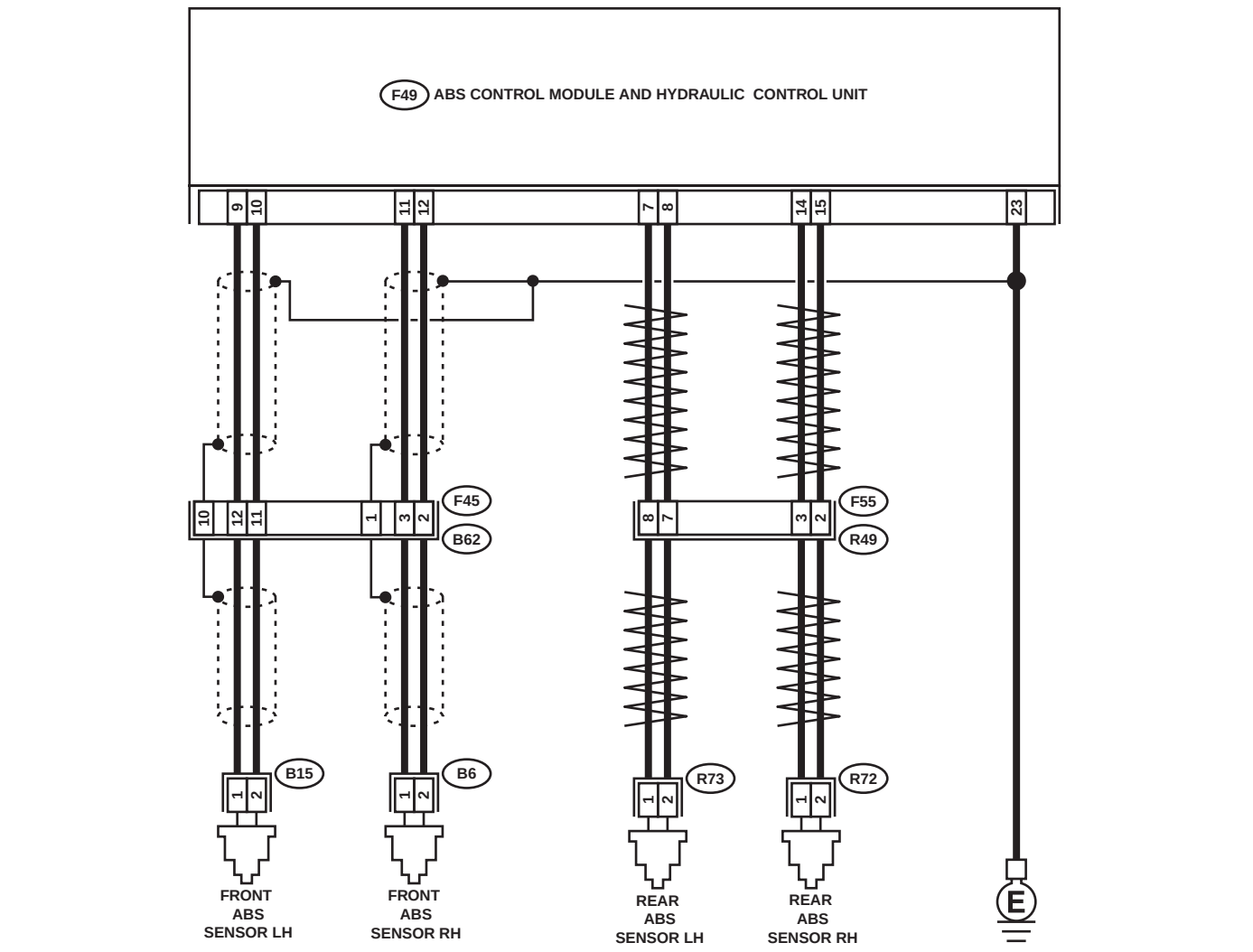
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00293

Vehicle-id:
SIE-id::J:DTC 28 Rear left Abnormal ABS Sensor Signal
~

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode. Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Change as same.	Go to step **2.**	Go to step **8.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **3.**	Repair connector.
3	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step **5.**	Install the noise sources apart from the sensor harness.
5	**CHECK SHIELD CIRCUIT.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (B62) No. 1 — Chassis ground:*** ***DTC 24 / (B62) No. 10 — Chassis ground:*** Is the measured value less than the specified value? NOTE: For the **DTC 26** and **28**: Go to step **6.**	0.5 Ω	Go to step **6.**	Repair shield harness.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **7.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary noise interference.	Proceed with the diagnosis corresponding to the DTC.
8	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened with the specified torque?	32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Go to step **9.**	Tighten ABS sensor installation bolts securely.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
9	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **10.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
10	**PREPARE OSCILLOSCOPE.** Is an oscilloscope available?	Available.	Go to step **11.**	Go to step **12.**
11	**CHECK ABS SENSOR SIGNAL.** 1) Lift-up the vehicle. 2) Turn ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn ignition switch to ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the trouble code 29. ***Connector & terminal*** ***DTC 22 / (B62) No. 3 (+) — No. 2 (–):*** ***DTC 24 / (B62) No. 12 (+) — No. 11 (–):*** ***DTC 26 / (F55) No. 3 (+) — No. 2 (–):*** ***DTC 28 / (F55) No. 8 (+) — No. 7 (–):*** Is the measured value same with the specified value?	Oscilloscope pattern is as shown in figure.	Go to step **15.**	Go to step **12.**
12	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub in accordance with diagnostic trouble code. Is the ABS sensor piece or the tone wheel contaminated by mud or other foreign matter?	ABS sensor piece or the tone wheel is not contaminated.	Go to step **13.**	Thoroughly remove dirt or other foreign matter.
13	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged in the ABS sensor piece or the tone wheel?	No broken or damaged.	Go to step **14.**	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
14	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **15.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

	Step	Value	Yes	No
15	**CHECK RESISTANCE OF ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step **16.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
16	**CHECK GROUND SHORT OF ABS SENSOR.** Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **17.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
17	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1) Connect connector to ABS sensor. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — No. 12:*** ***DTC 24 / (F49) No. 9 — No. 10:*** ***DTC 26 / (F49) No. 14 — No. 15:*** ***DTC 28 / (F49) No. 7 — No. 8:*** Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step **18.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
18	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — Chassis ground:*** ***DTC 24 / (F49) No. 9 — Chassis ground:*** ***DTC 26 / (F49) No. 14 — Chassis ground:*** ***DTC 28 / (F49) No. 7 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **19.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
19	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — GND:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **20.**	Repair ABSCM&H/U ground harness.
20	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **21.**	Repair connector.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
21	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step **22.**	Properly install the car telephone or the wireless transmitter.
22	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step **23.**	Install the noise sources apart from the sensor harness.
23	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (B62) No. 1 — Chassis ground:*** ***DTC 24 / (B62) No. 10 — Chassis ground:*** Is the measured value less than the specified value? NOTE: For the **DTC 26** and **28**: Go to step **24.**	0.5 Ω	Go to step **24.**	Repair shield harness.
24	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **25.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
25	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary noise interference.	Proceed with the diagnosis corresponding to the DTC.

MEMO:

Vehicle-id:
SIE-id::J:DTC 28 Rear left Abnormal ABS Sensor Signal
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K: DTC 29 ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR

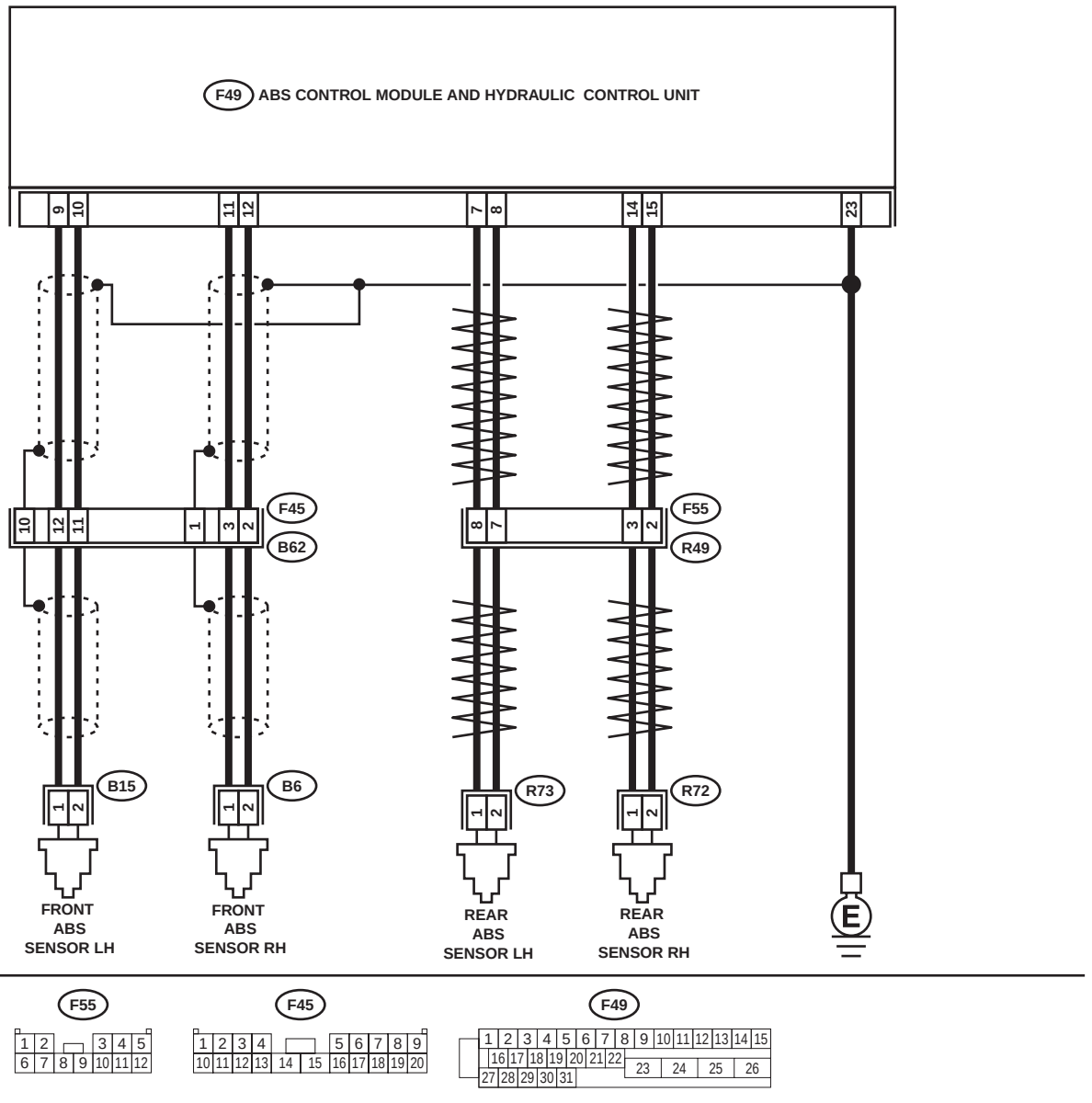
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00293

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK WHEELS FOR FREE TURNING.** Have wheels been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Wheels have not turned freely.	Go to step **2.**	The ABS is normal. Erase the diagnostic trouble code. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.
2	**CHECK TIRE SPECIFICATIONS.** Turn ignition switch to OFF. Are the tire specifications correct?	Correct specification.	Go to step **3.**	Replace tire.
3	**CHECK WEAR OF TIRE.** Is the tire worn excessively?	Not worn excessively.	Go to step **4.**	Replace tire.
4	**CHECK TIRE PRESSURE.** Is the tire pressure correct?	Correct tire pressure.	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened with the specified torque?	32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Go to step **6.**	Tighten ABS sensor installation bolts securely.
6	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.** Is an oscilloscope available?	Available.	Go to step **8.**	Go to step **9.**
8	**CHECK ABS SENSOR SIGNAL.** 1) Lift up the vehicle. 2) Turn ignition switch to OFF. 3) Connect the oscilloscope to the connector (B62) in accordance with trouble code. 4) Turn ignition switch to ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the DTC 29. ***Connector & terminal*** ***(B62) No. 3 (+) — No. 2 (–) (Front RH):*** ***(B62) No. 12 (+) — No. 11 (–) (Front LH):*** ***(F55) No. 3 (+) — No. 2 (–) (Rear RH):*** ***(F55) No. 8 (+) — No. 7 (–) (Rear LH):*** Is the measured value same as the specified value?	Oscilloscope pattern is as shown in figure.	Go to step **12.**	Go to step **9.**

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub. Is the ABS sensor piece or the tone wheel contaminated by mud or other foreign matter?	ABS sensor piece or the tone wheel is not contaminated.	Go to step **10.**	Thoroughly remove mud or other foreign matter.
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged teeth in the ABS sensor piece or the tone wheel?	Not broken or damaged.	Go to step **11.**	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
11	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **12.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
12	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **13.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

L: DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-102, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

M: DTC 33 FRONT LEFT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-102, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

N: DTC 35 REAR RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-102, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

Vehicle-id:
SIE-id::L:DTC 31 Front Right Inlet Valve Malfunction
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O: DTC 37 REAR LEFT INLET VALVE MALFUNCTION

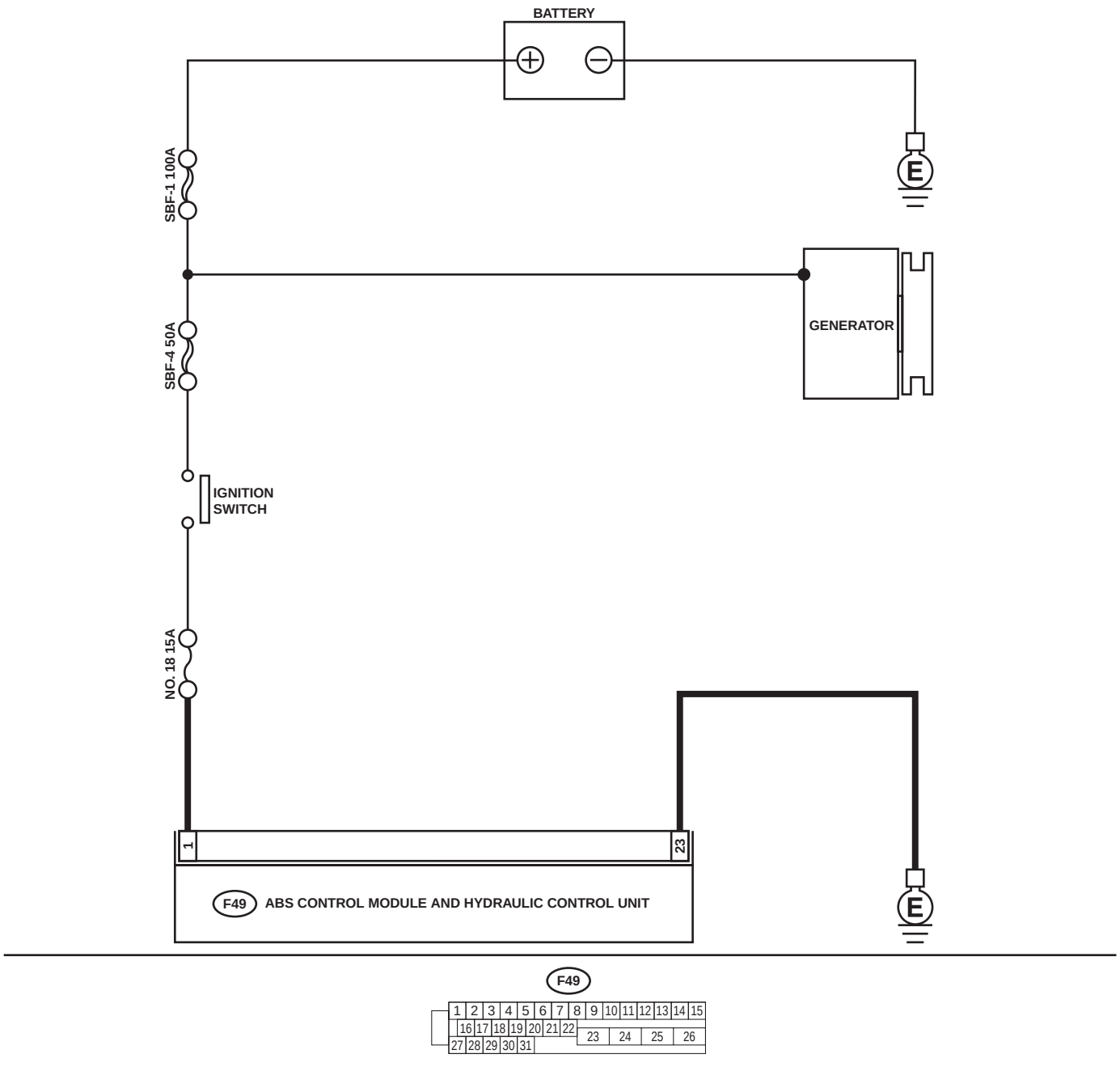
DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00294

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **2.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair connector.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **5.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

P: DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-106, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

Q: DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-106, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

R: DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-106, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

Vehicle-id:
SIE-id::P:DTC 32 Front Right Outlet Valve Malfunction
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MEMO:

Vehicle-id:
SIE-id::R:DTC 36 Rear Right Outlet Valve Malfunction
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DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

S: DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION

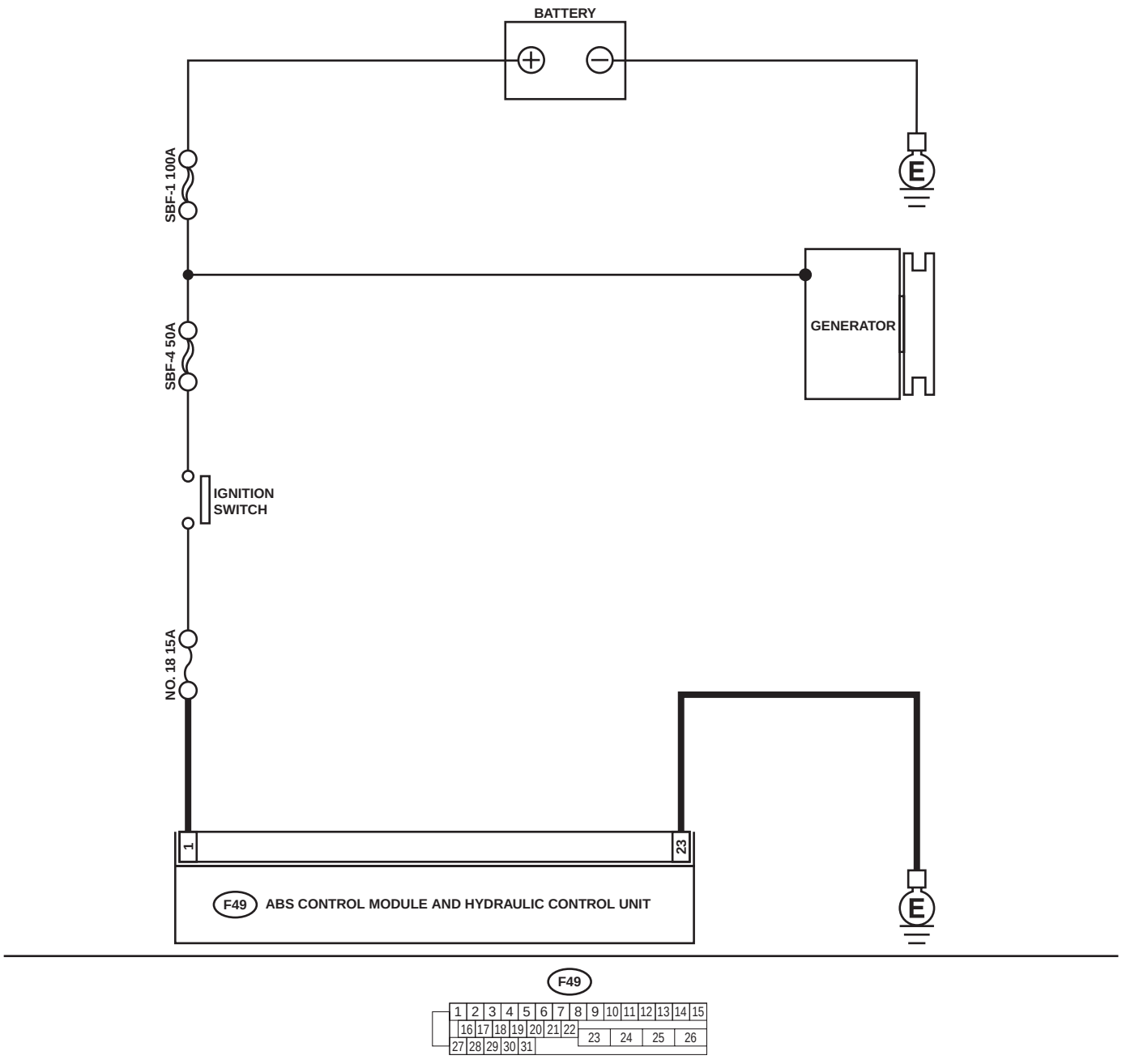
DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00294

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

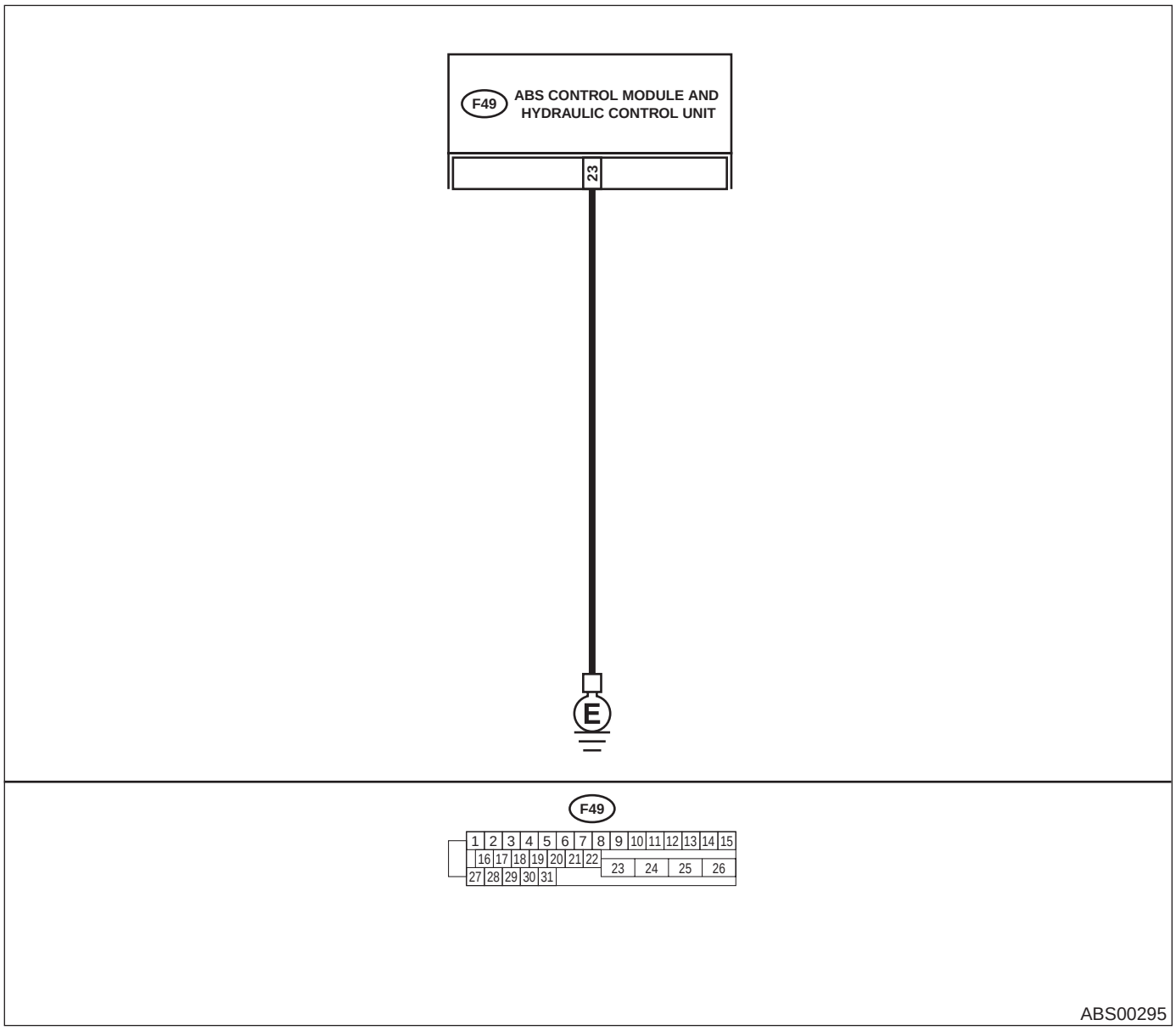
	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **2.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair connector.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not indicated.	Go to step **5.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

T: DTC 41 ABS CONTROL MODULE MALFUNCTION

DIAGNOSIS:
- Faulty ABSCM&H/U

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



Step		Value	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	There is no poor contact.	Go to step **3.**	Repair connector.
3	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step **5.**	Install the noise sources apart from the sensor harness.
5	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not indicated.	Go to step **6.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

U: DTC 42 POWER SUPPLY VOLTAGE TOO LOW

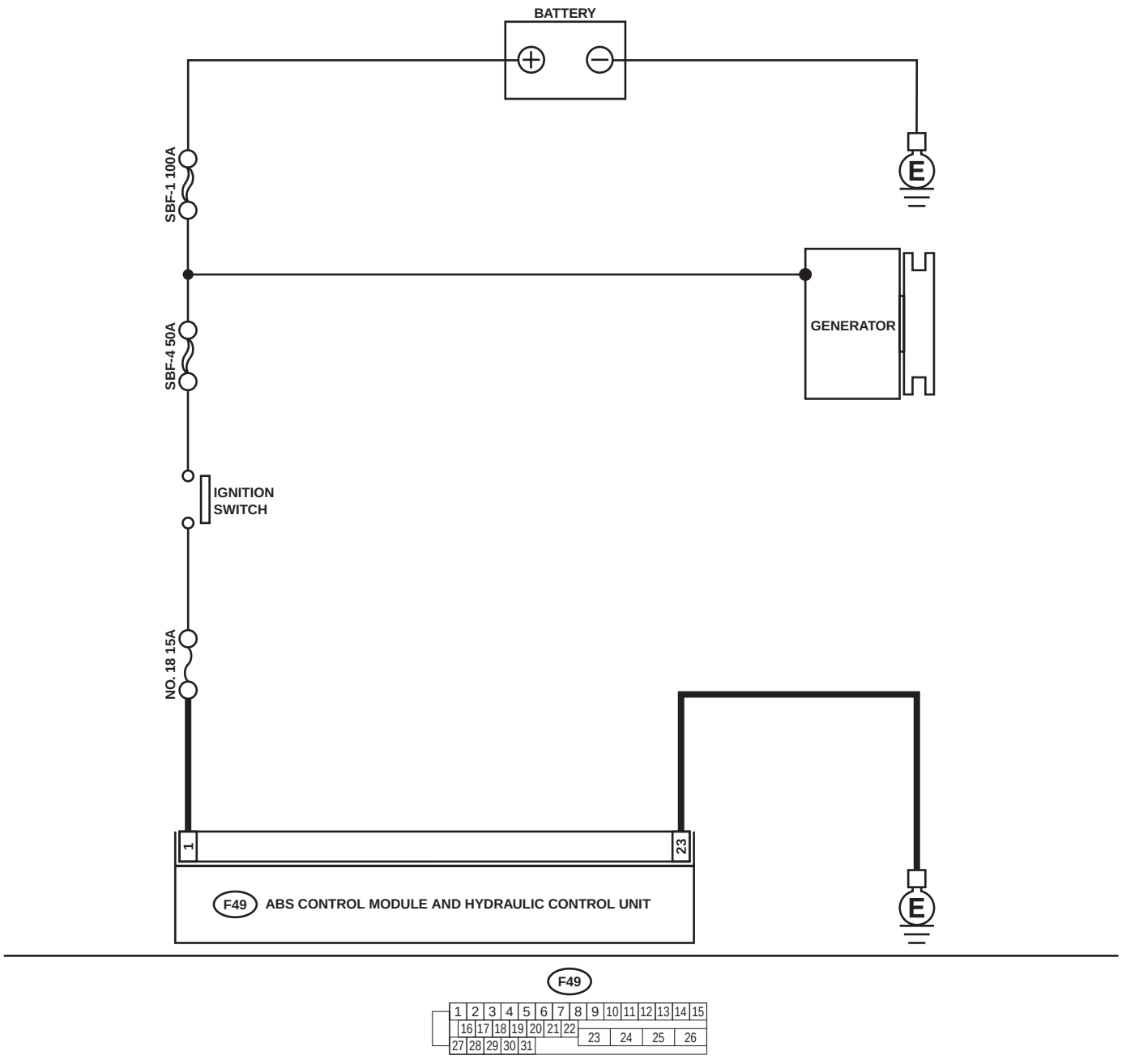
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00294

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:*** Is the measured value within the specified range?	10 - 15 V	Go to step **2.**	i) Repair generator. ii) H4 engine model: iii) <Ref. to SC(H4SO)-15, Generator.> iv) H6 engine model: v) <Ref. to SC(H6DO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Terminals are tightened securely.	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **6.**	Repair connector.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **7.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

V: DTC 42 POWER SUPPLY VOLTAGE TOO HIGH

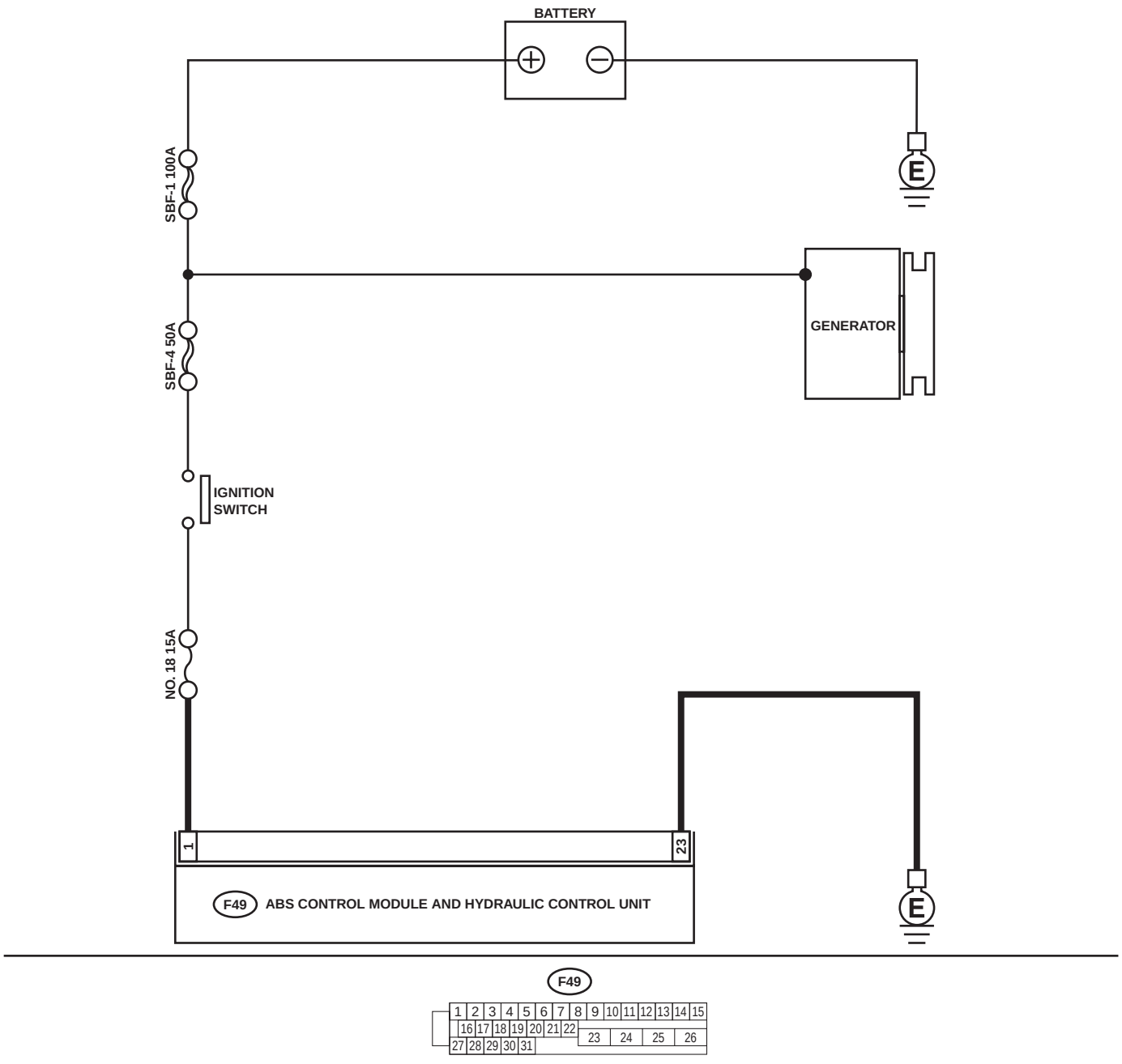
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is high.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00294

Vehicle-id:
SIE-id::V:DTC 42 Power Supply Voltage Too High
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DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:*** Is the measured value within the specified range?	10 - 17 V	Go to step **2.**	i) Repair generator. ii) H4 engine model: iii) <Ref. to SC(H4SO)-15, Generator.> iv) H6 engine model: v) <Ref. to SC(H6DO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Terminals are tightened securely.	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 17 V	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **6.**	Repair connector.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **7.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

W: DTC 44 ABS-AT CONTROL (NON CONTROLLED)

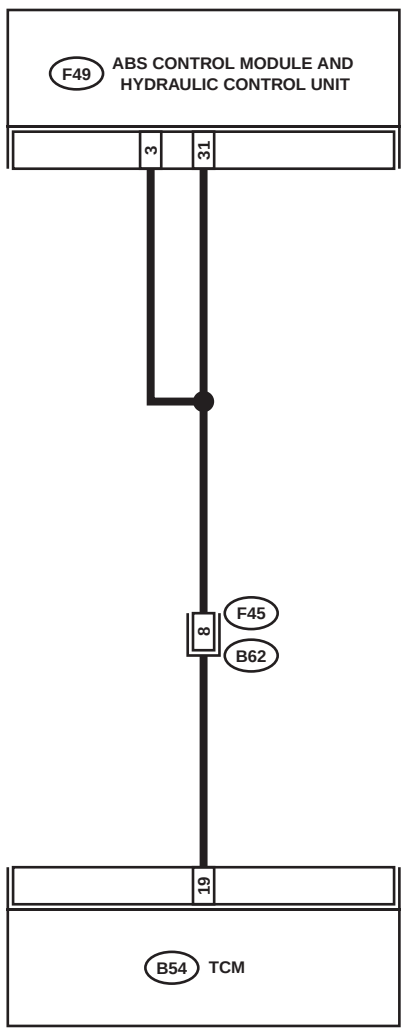
DIAGNOSIS:

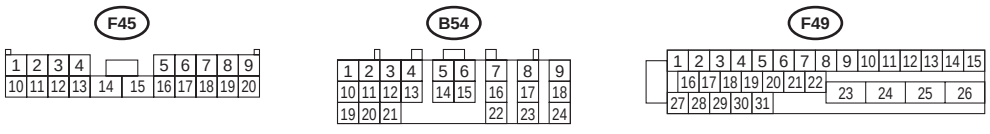
- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00296

Vehicle-id:
SIE-id::W:DTC 44 ABS-AT Control (Non Controlled)
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DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check specifications of the mark to the ABSCM&H/U. ***CG: AT (except OUTBACK)*** ***CH: MT (except OUTBACK)*** ***CI: AT (OUTBACK)*** ***CJ: MT (OUTBACK)*** Do the vehicle specification and the specification of ABSCM&HU match?	Both are the same specifications.	Go to step **2.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair harness between TCM and ABSCM&H/U.
3	**CHECK TCM.** 1) Connect all connectors to TCM. 2) Turn ignition switch to ON. 3) Measure voltage between TCM connector terminal and chassis ground. ***Connector & terminal*** ***(B54) No. 19 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **5.**	Go to step **4.**
4	**CHECK AT.** Is the AT functioning normally?	Function of AT is normal.	Replace TCM.	Repair AT.
5	**CHECK OPEN CIRCUIT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **6.**	Repair harness/ connector between TCM and ABSCM&H/U.
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between TCM and ABSCM&H/U?	There is no poor contact.	Go to step **7.**	Repair connector.
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **8.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
8	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

X: DTC 44 ABS-AT CONTROL (CONTROLLED)

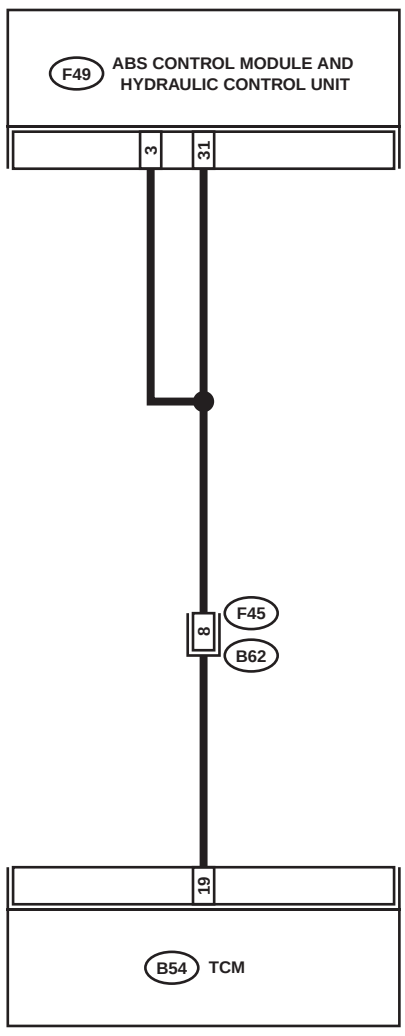
DIAGNOSIS:

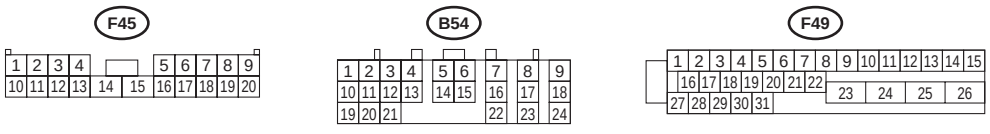
- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00296

	Step	Value	Yes	No
1	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Disconnect connector from ABSCM&H/U. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **2.**	Repair harness between TCM and ABSCM&H/U.
2	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **3.**	Repair harness between TCM and ABSCM&H/U.
3	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 13 V	Go to step **4.**	Repair harness/ connector between TCM and ABSCM&H/U.
4	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connectors between TCM and ABSCM&H/U?	There is no poor contact.	Go to step **5.**	Repair connector.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **6.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

Y: DTC 51 VALVE RELAY MALFUNCTION

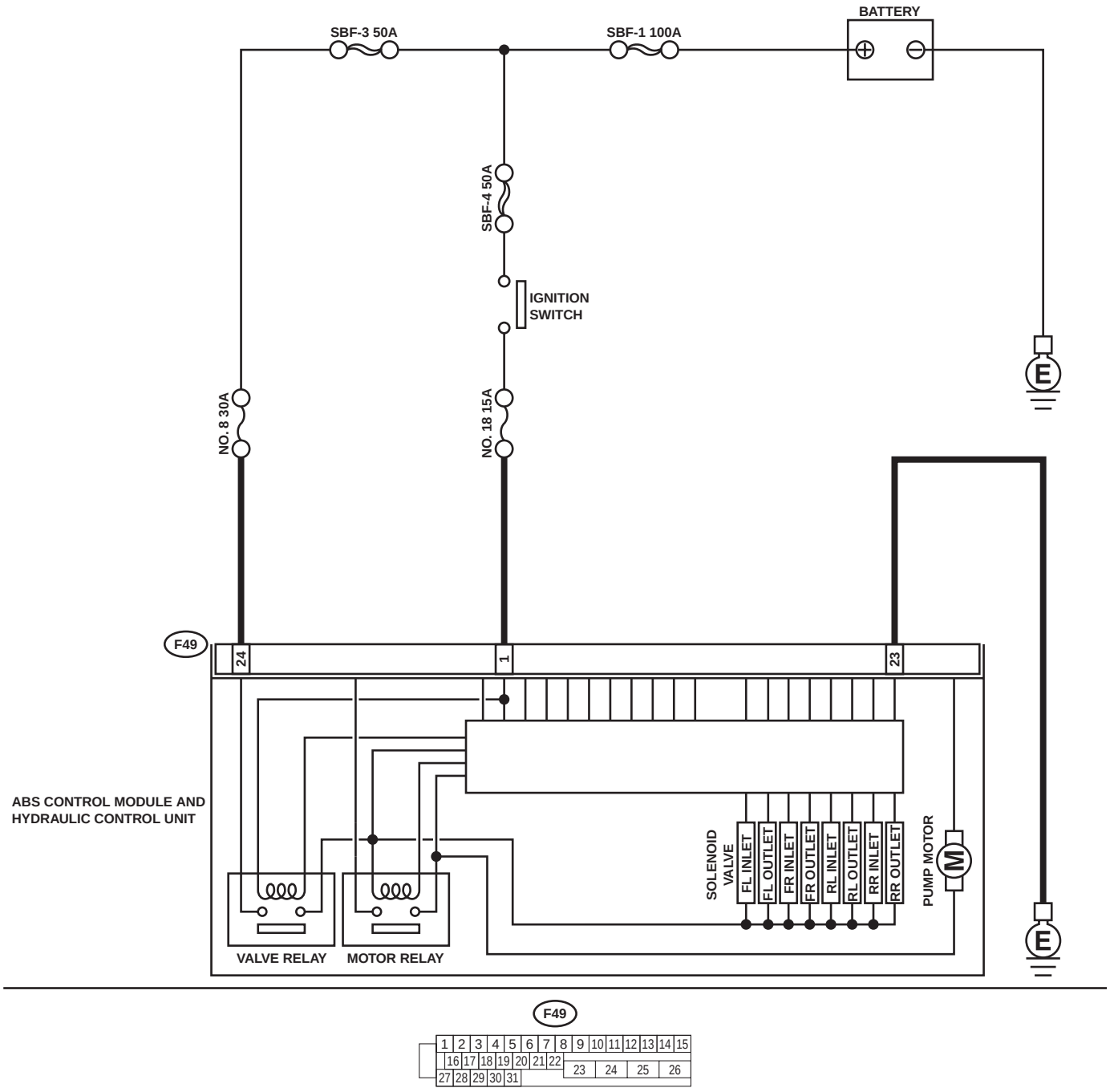
DIAGNOSIS:

- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00297

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***(F49) No. 24 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **2.**	Repair harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair connector.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **5.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

Z: DTC 51 VALVE RELAY ON FAILURE

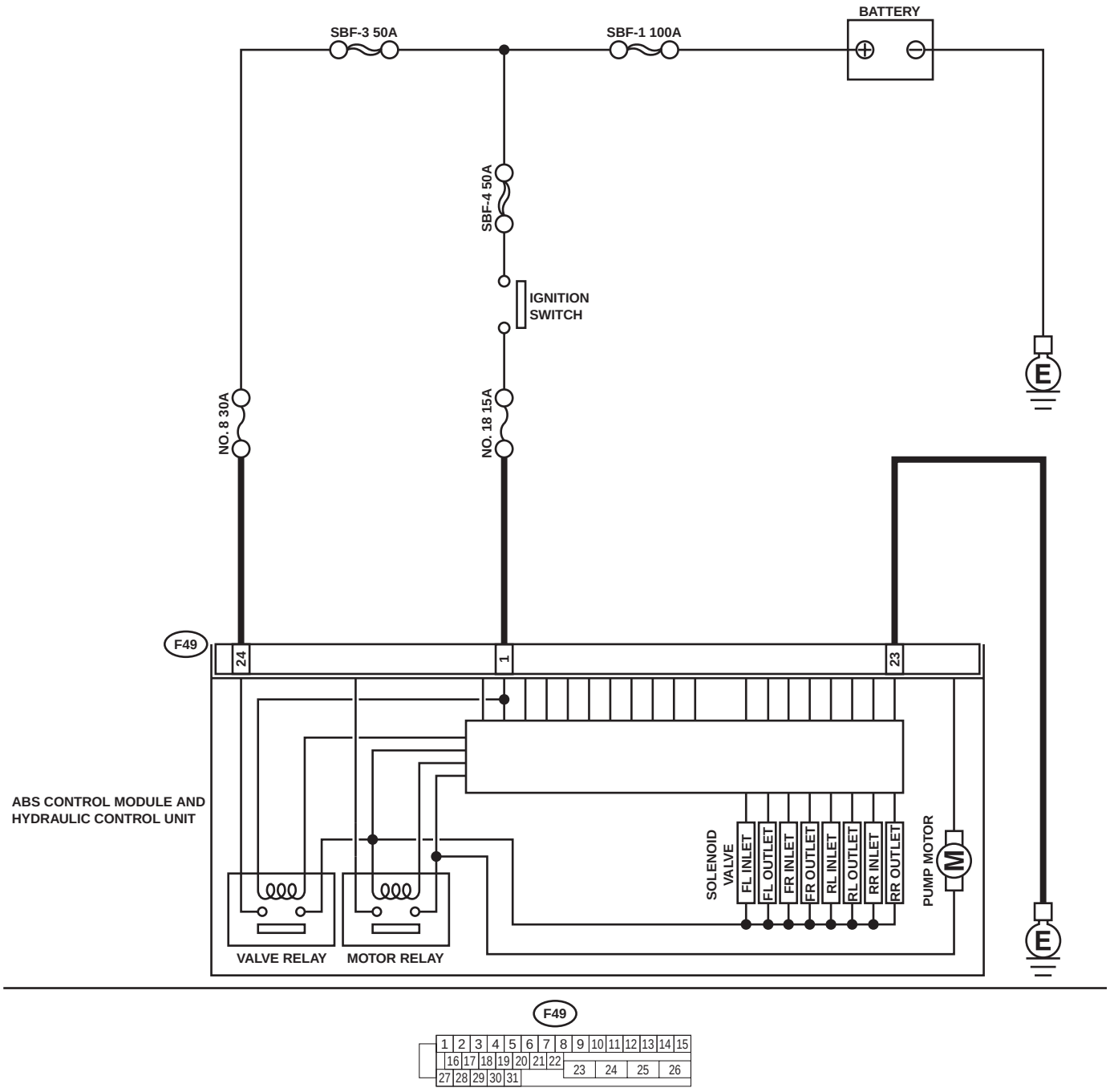
DIAGNOSIS:

- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00297

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 23 (+) — No. 24 (–):*** Does the measured value exceed the specified value?	1 MΩ	Go to step **2.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **3.**	Repair connector.
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

Vehicle-id:
SIE-id::Z:DTC 51 Valve Relay on Failure
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AA:DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT

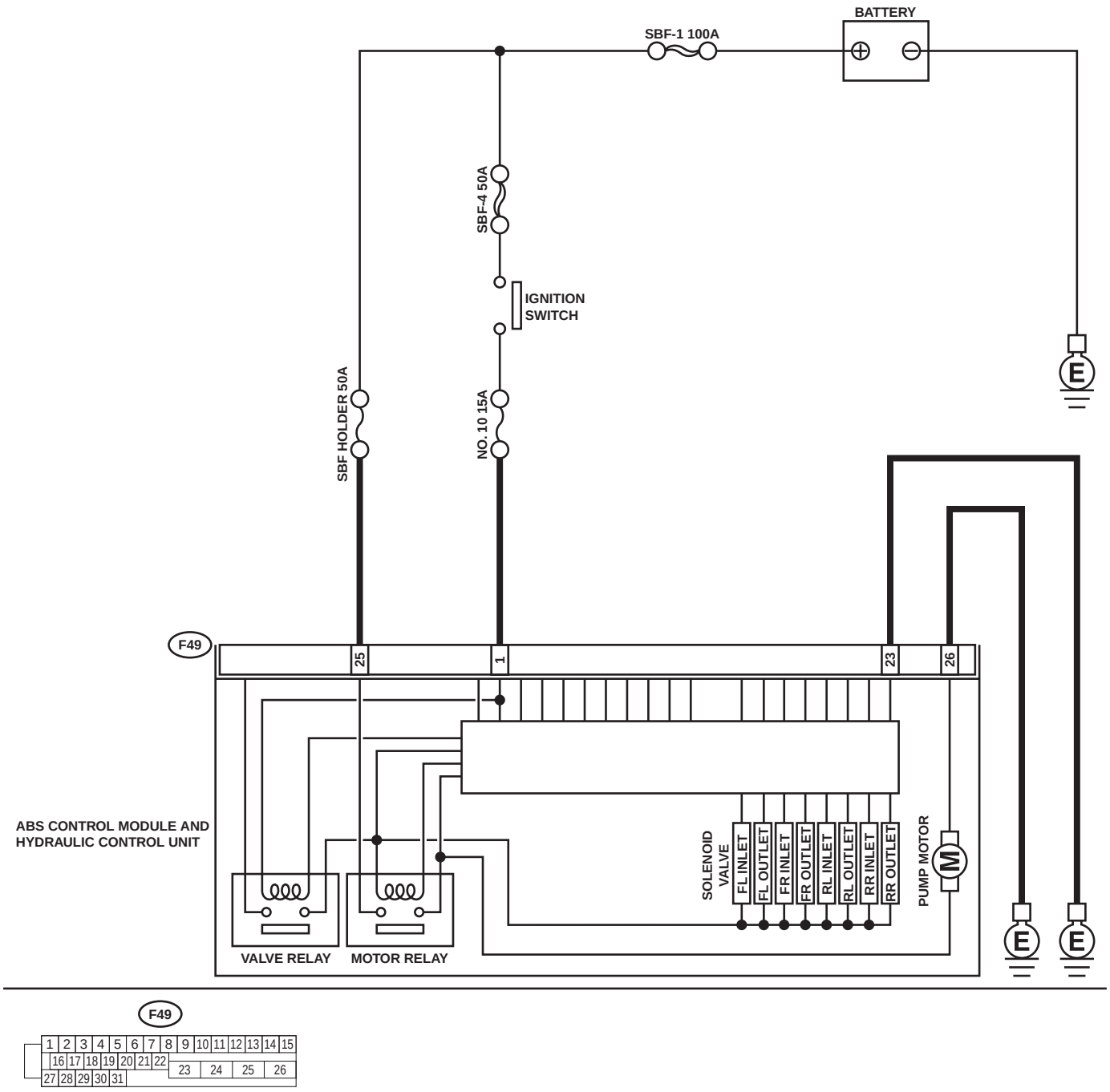
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00298

Vehicle-id:
SIE-id::AA:DTC 52 Open Circuit in Motor Relay Circuit
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DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

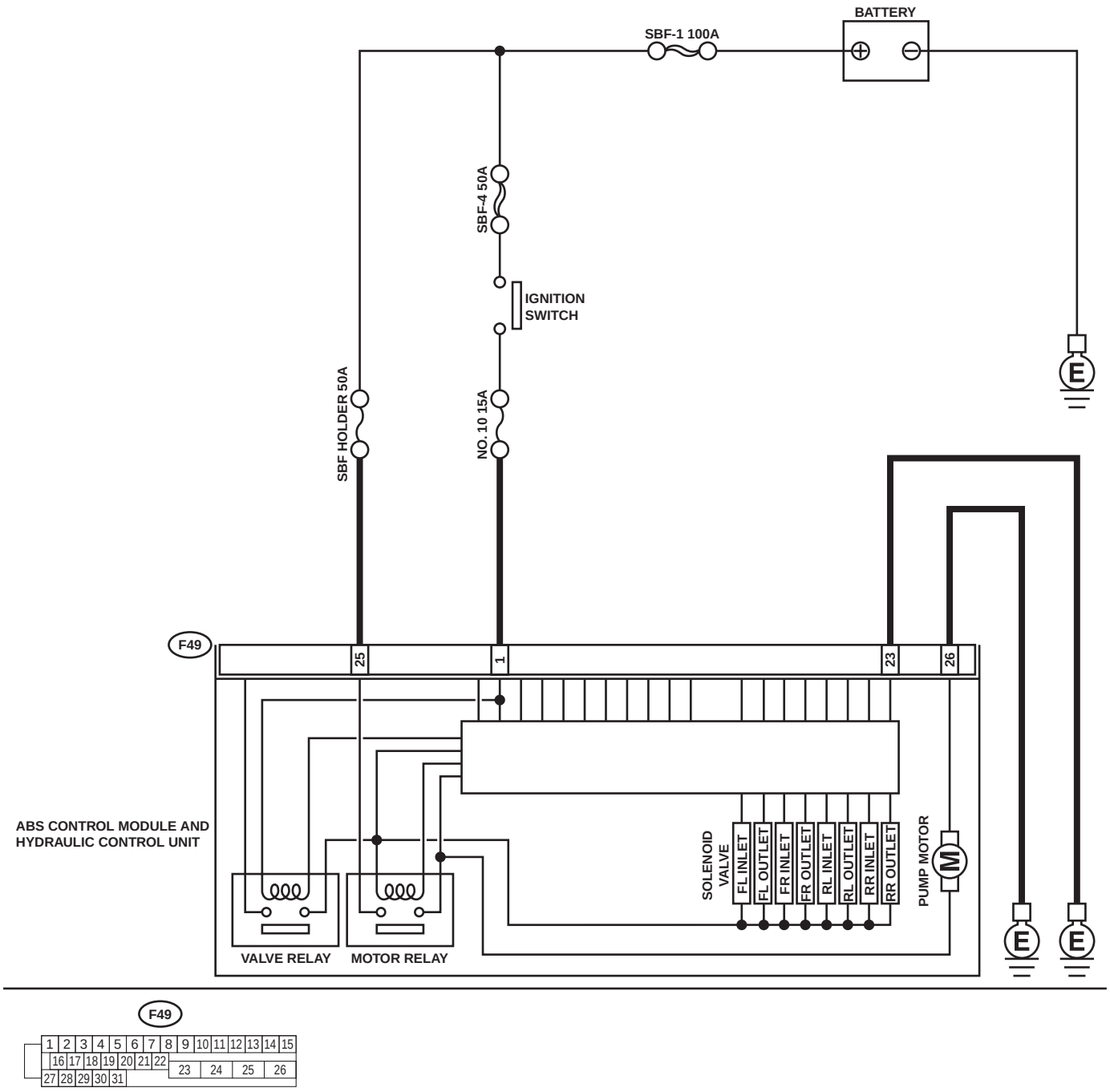
	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 25 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **2.**	Repair harness/ connector between battery and ABSCM&H/U and check fuse SBF6.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 26 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence?	Operating sound is produced.	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **5.**	Repair connector.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **6.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

AB:DTC 52 MOTOR RELAY ON FAILURE

DIAGNOSIS:
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



ABS00298

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK MOTOR RELAY IN ABSCM&H/U.** Measure resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 25 — No. 26:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **2.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence control?	There is no poor contact.	Go to step **3.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	Operating sound is produced.	Go to step **4.**	Repair connector.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **5.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

Vehicle-id:
SIE-id::AB:DTC 52 Motor Relay on Failure
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AC:DTC 52 MOTOR MALFUNCTION

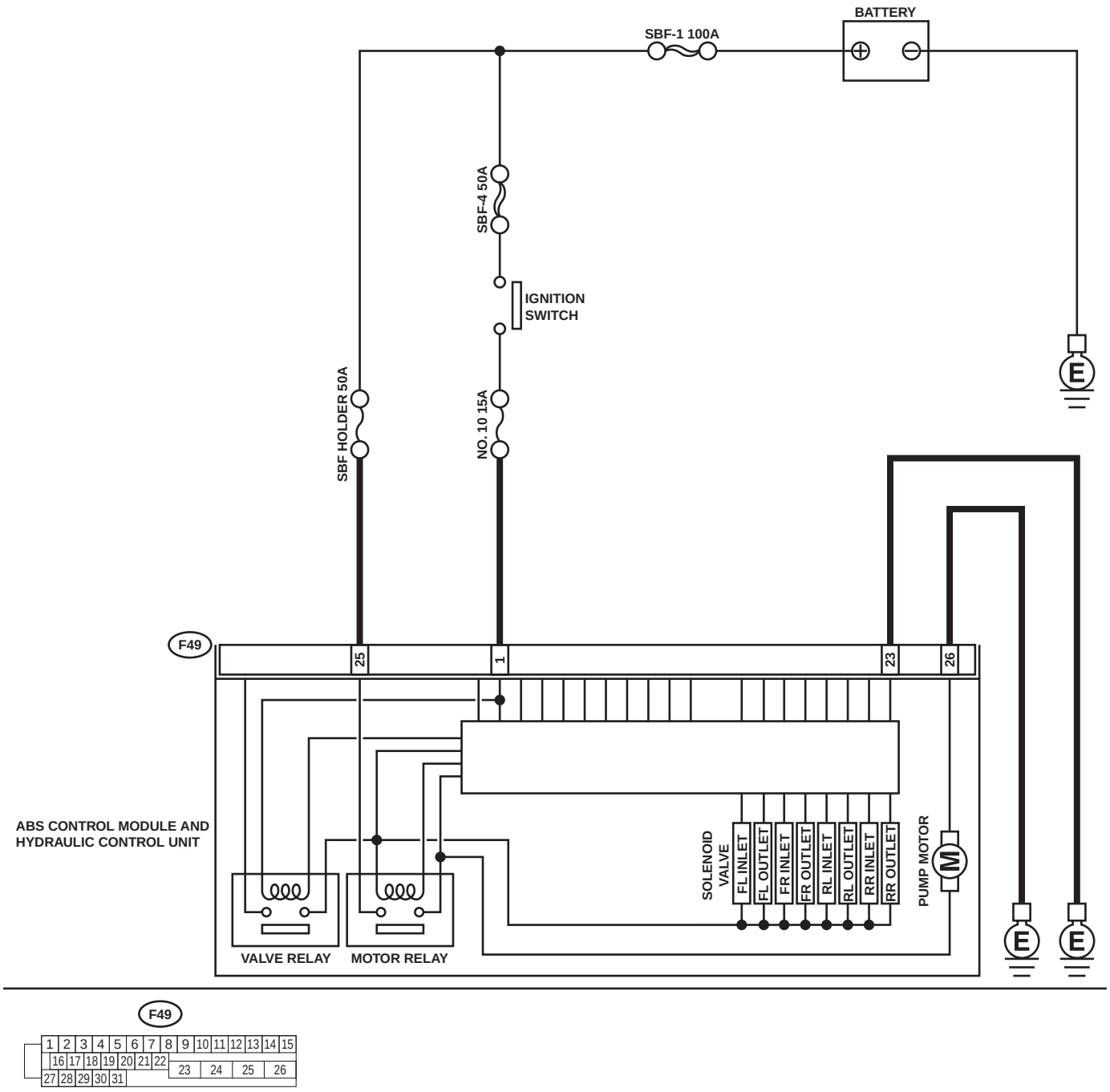
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00298

Vehicle-id:
SIE-id::AC:DTC 52 Motor Malfunction
~

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 25 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 13 V	Go to step **2.**	Repair harness/ connector between battery and ABSCM&H/U and check fuse SBF6.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 26 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 - 15 V	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Operating sound is produced.	Go to step **6.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **7.**	Repair connector.
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **8.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
8	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

AD:DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

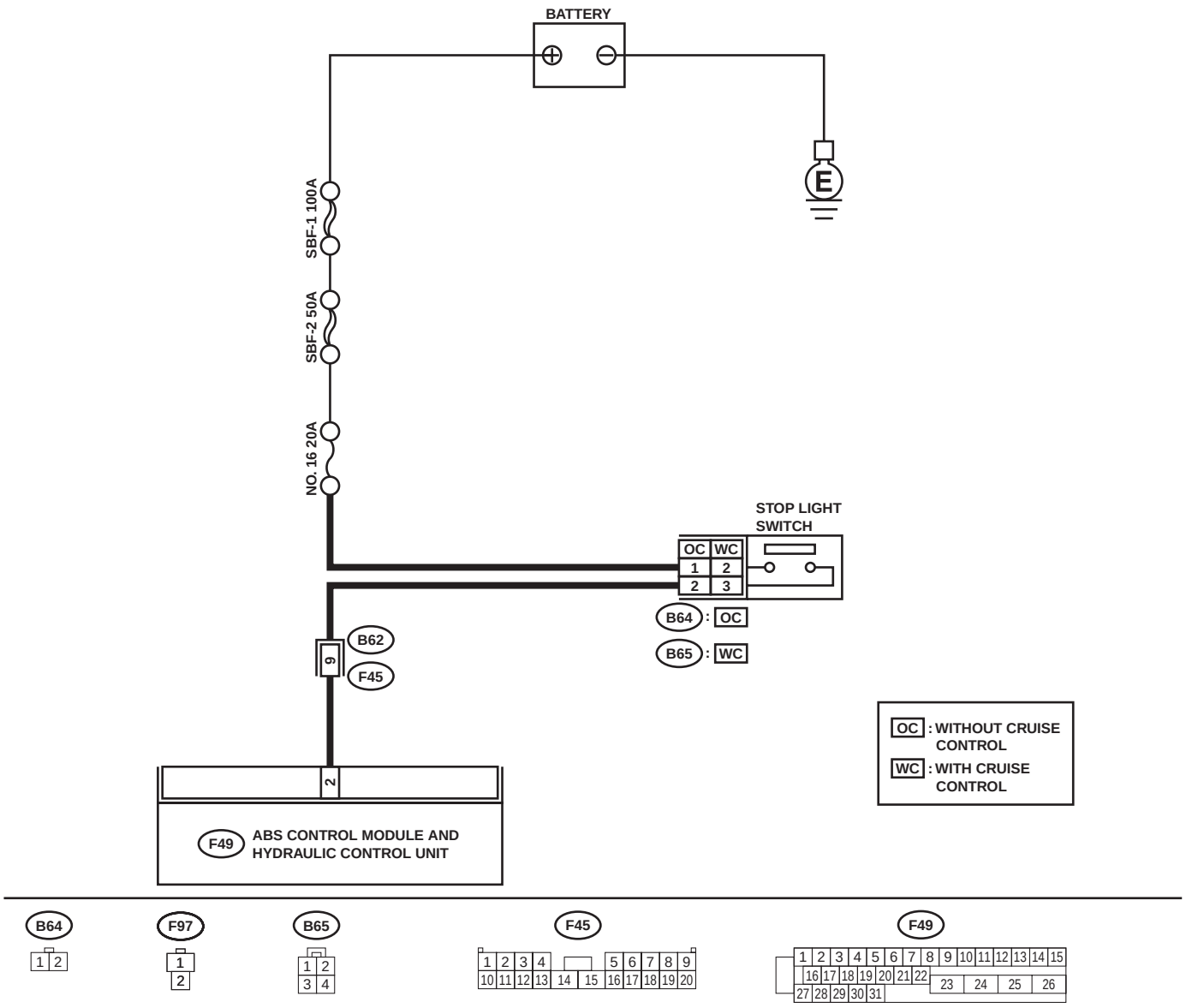
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00299

Vehicle-id:
SIE-id::AD:DTC 54 Stop Light Switch Signal Circuit Malfunction
~

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Release the brake pedal. 3) Read the stop light switch output in the select monitor data display. Is the reading indicated on monitor display less than the specified value?	1.5 V	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in the select monitor data display. Is the reading indicated on monitor display within the specified range?	10 - 15 V	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal. Do stop lights turn on?	Stop lights come on.	Go to step **4.**	Repair stop lights circuit.
4	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Depress brake pedal. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 2 — Chassis ground:*** Is the measured value within the specified range?	10 - 15 V	Go to step **5.**	Repair harness between stop light switch and ABSCM&H/U connector.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between stop light switch and ABSCM&H/U?	There is no poor contact.	Go to step **6.**	Repair connector.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **7.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

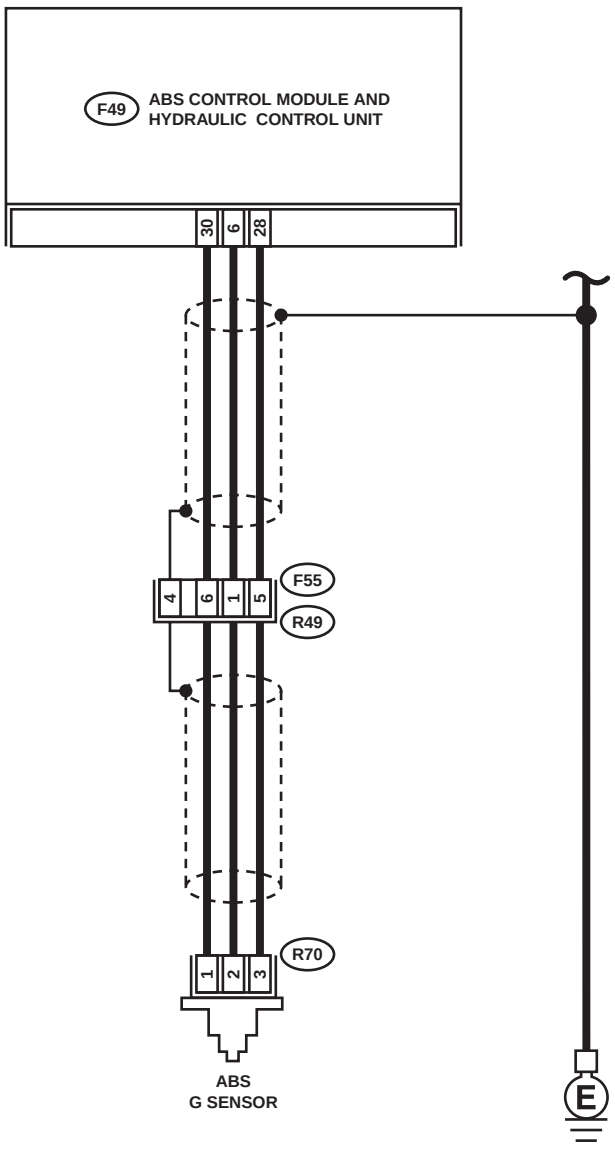
DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

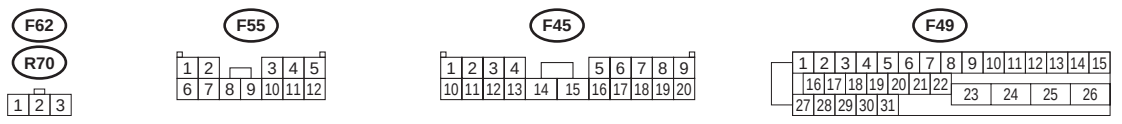
AE:DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





ABS00300

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the G sensor output in select monitor data display. Is the G sensor output on the monitor display within the specified range when the G sensor is in horizontal position?	2.1 - 2.5 V	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **3.**	Repair connector.
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
5	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect G sensor from body. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 1 (+) — No. 3 (–):*** Is the measured value within the specified range?	4.75 - 5.25 V	Go to step **6.**	Repair harness/ connector between G sensor and ABSCM&H/U.
6	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:*** Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step **7.**	Repair harness/ connector between G sensor and ABSCM&H/U.
7	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect connector from G sensor. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair harness between G sensor and ABSCM&H/U.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
8	**CHECK G SENSOR.** 1) Connect connector to G sensor. 2) Connect connector to ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage between within the specified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step **9.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
9	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage between within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step **10.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
10	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage between within the specified range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step **11.**	Replace G sensor. <Ref. to ABS-21, G SENSOR, .>
11	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **12.**	Repair connector.
12	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **13.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

MEMO:

Vehicle-id:
SIE-id::AE:DTC 56 Open or Short Circuit in G Sensor Circuit
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AF:DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT

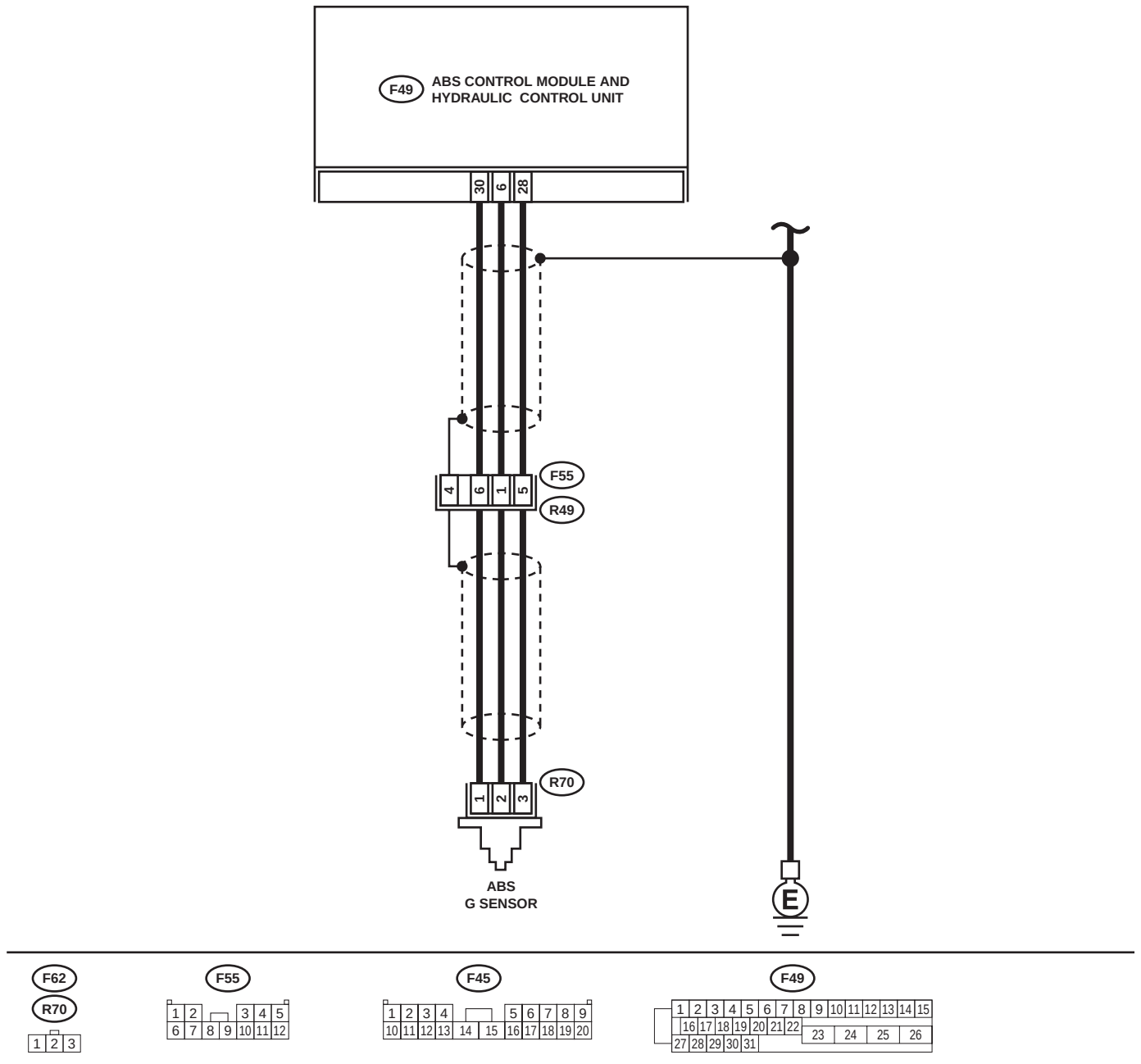
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00300

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the G sensor output in select monitor data display. Is the G sensor output on the monitor display between within the specified range when the G sensor is in horizontal position?	2.1 - 2.5 V	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **3.**	Repair connector.
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
5	**CHECK FREEZE FRAME DATA.** 1) Select “Freeze frame data” on the select monitor. 2) Read front right wheel speed on the select monitor display. Is the front right wheel speed on monitor display same as the specified value?	0 km/h (0 MPH)	Go to step **6.**	Go to step **16.**
6	**CHECK FREEZE FRAME DATA.** Read front left wheel speed on the select monitor display. Is the front left wheel speed on monitor display same as the specified value?	0 km/h (0 MPH)	Go to step **7.**	Go to step **16.**
7	**CHECK FREEZE FRAME DATA.** Read rear right wheel speed on the select monitor display. Is the rear right wheel speed on monitor display same as the specified value?	0 km/h (0 MPH)	Go to step **8.**	Go to step **16.**
8	**CHECK FREEZE FRAME DATA.** Read rear left wheel speed on the select monitor display. Is the rear left wheel speed on monitor display same as the specified value?	0 km/h (0 MPH)	Go to step **9.**	Go to step **16.**
9	**CHECK FREEZE FRAME DATA.** Read G sensor output on the select monitor display. Does measured value exceed the specified value on monitor display?	3.65 V	Go to step **10.**	Go to step **16.**

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
10	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:*** Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step **11.**	Repair harness/ connector between G sensor and ABSCM&H/U.
11	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect connector from G sensor. 4) Disconnect connector from ABSCM&H/U. 5) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **12.**	Repair harness between G sensor and ABSCM&H/U.
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **13.**	Repair harness between G sensor and ABSCM&H/U.
13	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **14.**	Repair connector.
14	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **15.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
15	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
16	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect G sensor from body. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 1 (+) — No. 3 (–):*** Is the measured value within the specified range?	4.75 - 5.25 V	Go to step **17.**	Repair harness/ connector between G sensor and ABSCM&H/U.

	Step	Value	Yes	No
17	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:*** Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step **18.**	Repair harness/ connector between G sensor and ABSCM&H/U.
18	**CHECK G SENSOR.** 1) Connect connector to G sensor. 2) Connect connector to ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage within th especified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step **19.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
19	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step **20.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
20	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage within the specifed range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step **21.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
21	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **22.**	Repair connector.
22	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **23.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
23	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

AG:DTC 56 ABNORMAL G SENSOR HIGH M OUTPUT

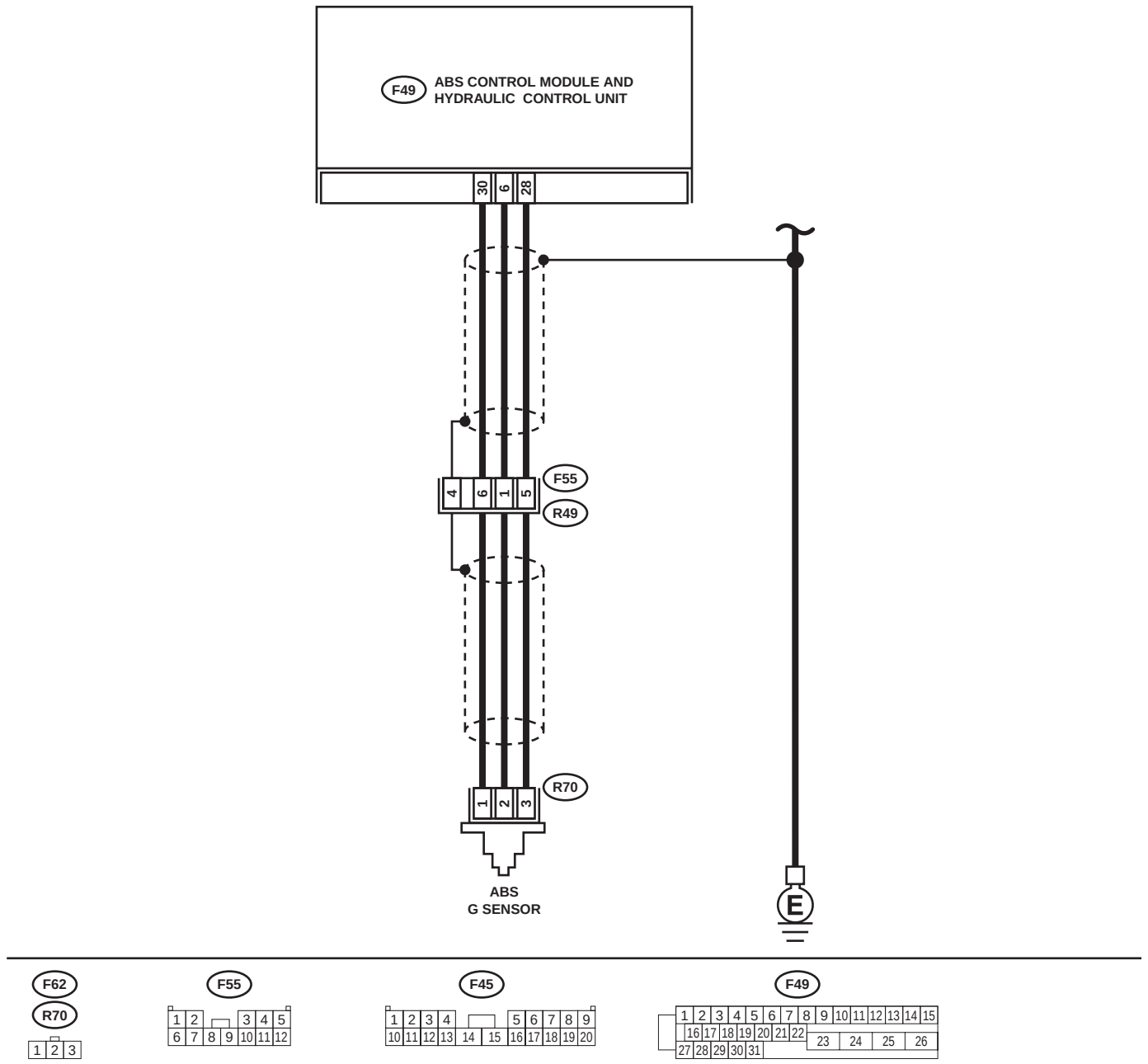
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00300

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read G sensor output on the select monitor display. Is the G sensor output on monitor display within the specified range when the G sensor is in horizontal position?	2.1 - 2.5 V	Go to step **2.**	Go to step **6.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **3.**	Repair connector.
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
5	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:*** Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step **6.**	Repair harness/ connector between G sensor and ABSCM&H/U.
6	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 28 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **7.**	Repair harness between G sensor and ABSCM&H/U. Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK G SENSOR.** 1) Remove console box. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Connect connector to ABSCM&H/U. 5) Turn ignition switch to ON. 6) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage within the specified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step **8.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
8	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step **9.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
9	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage within the specified range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step **10.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
10	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **11.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
11	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

Vehicle-id:
SIE-id::AG:DTC 56 Abnormal G Sensor High μ Output
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MEMO:

Vehicle-id:
SIE-id::AG:DTC 56 Abnormal G Sensor High μ Output
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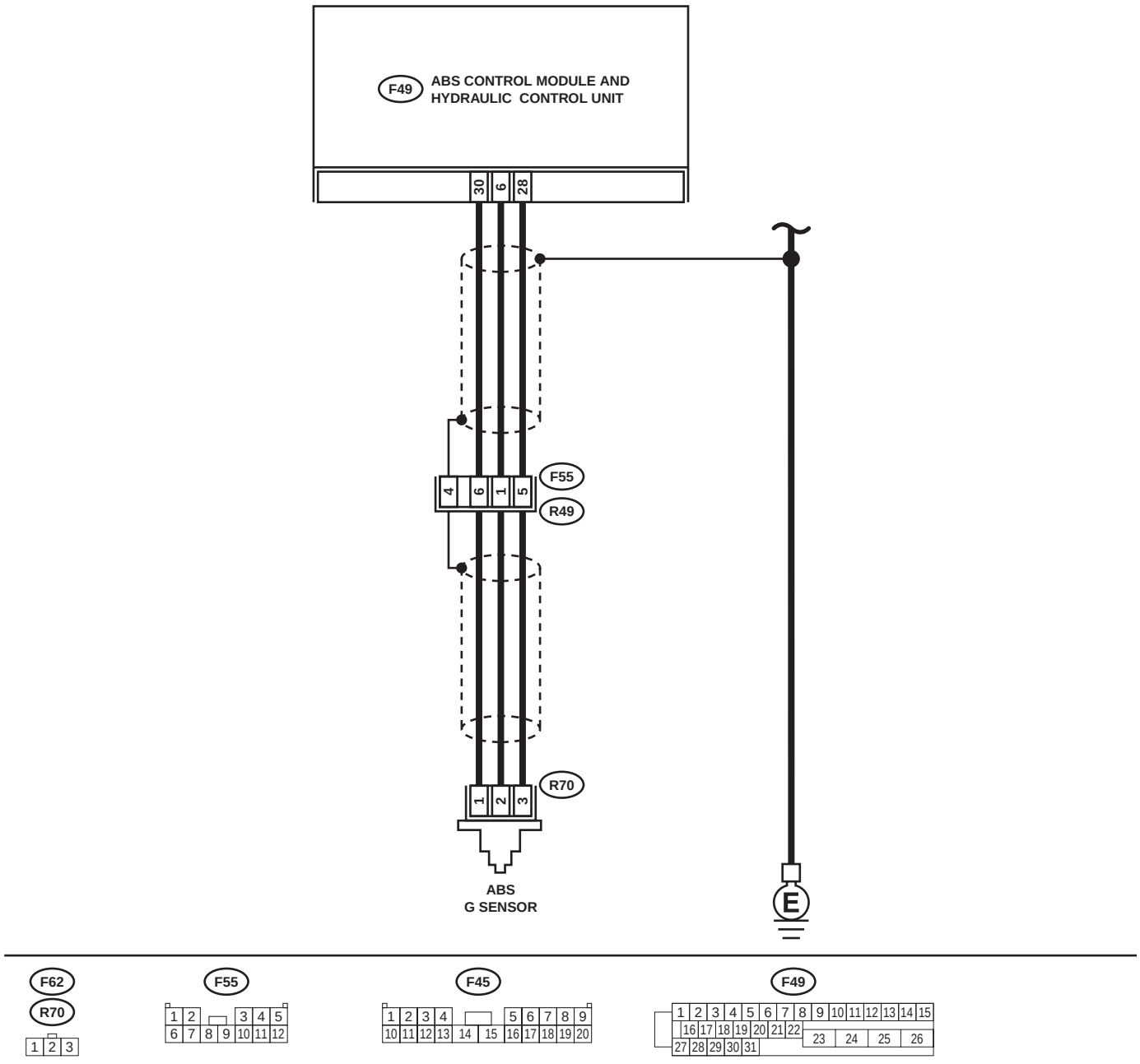
AH:DTC 56 DETECTION OF G SENSOR STICK

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



ABS00300

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK WHEELS FOR FREE TURNING.** Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?	Wheel have not turned freely.	Go to step **2.**	The ABS is normal. Erase the trouble code.
2	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the select monitor display. Is the G sensor output on the monitor display within the specified range when the vehicle is in horizontal position?	2.1 - 2.5 V	Go to step **3.**	Go to step **8.**
3	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Remove G sensor from vehicle. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Select “Current data display & Save” on the select monitor. 6) Read the select monitor display. Is the G sensor output on the monitor display within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step **4.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
4	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** Read the select monitor display. Is the G sensor output on the monitor display within the specified range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step **5.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **6.**	Repair connector.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **7.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
8	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:*** Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step **9.**	Repair harness/ connector between G sensor and ABSCM&H/U.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
9	**CHECK G SENSOR.** 1) Remove console box. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Connect connector to ABSCM&H/U. 5) Turn ignition switch to ON. 6) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage within the specified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step **10.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
10	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step **11.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
11	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):*** Is the voltage within the specified range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step **12.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
12	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step **13.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13	**CHECK ANY OTHER DTC APPEARANCE.** Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

14.General Diagnostics Table

A: INSPECTION

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either side.	• ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Wheel alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	• ABSCM&H/U (solenoid valve) • ABS sensor • Brake (pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor braking	Long braking/stopping distance	• ABSCM&H/U (solenoid valve) • Brake (pads) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	• ABSCM&H/U (solenoid valve, motor) • ABS sensor • Incorrect wiring or piping connections
	Brake dragging	• ABSCM&H/U (solenoid valve) • ABS sensor • Master cylinder • Brake (caliper & piston) • Parking brake • Axle & wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle pitching	• Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	• ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Excessive pedal vibration	• Incorrect wiring or piping connections • Road surface (uneven)
	Noise from ABSCM&H/U	• ABSCM&H/U (mount bushing) • ABS sensor • Brake piping
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS sensor • Master cylinder • Brake (caliper & piston, pads, rotor) • Brake piping • Brake booster & check valve • Suspension play or fatigue
	Noise from rear of vehicle	• ABS sensor • Brake (caliper & piston, pads, rotor) • Parking brake • Brake piping • Suspension play or fatigue

GENERAL DIAGNOSTICS TABLE

MEMO:

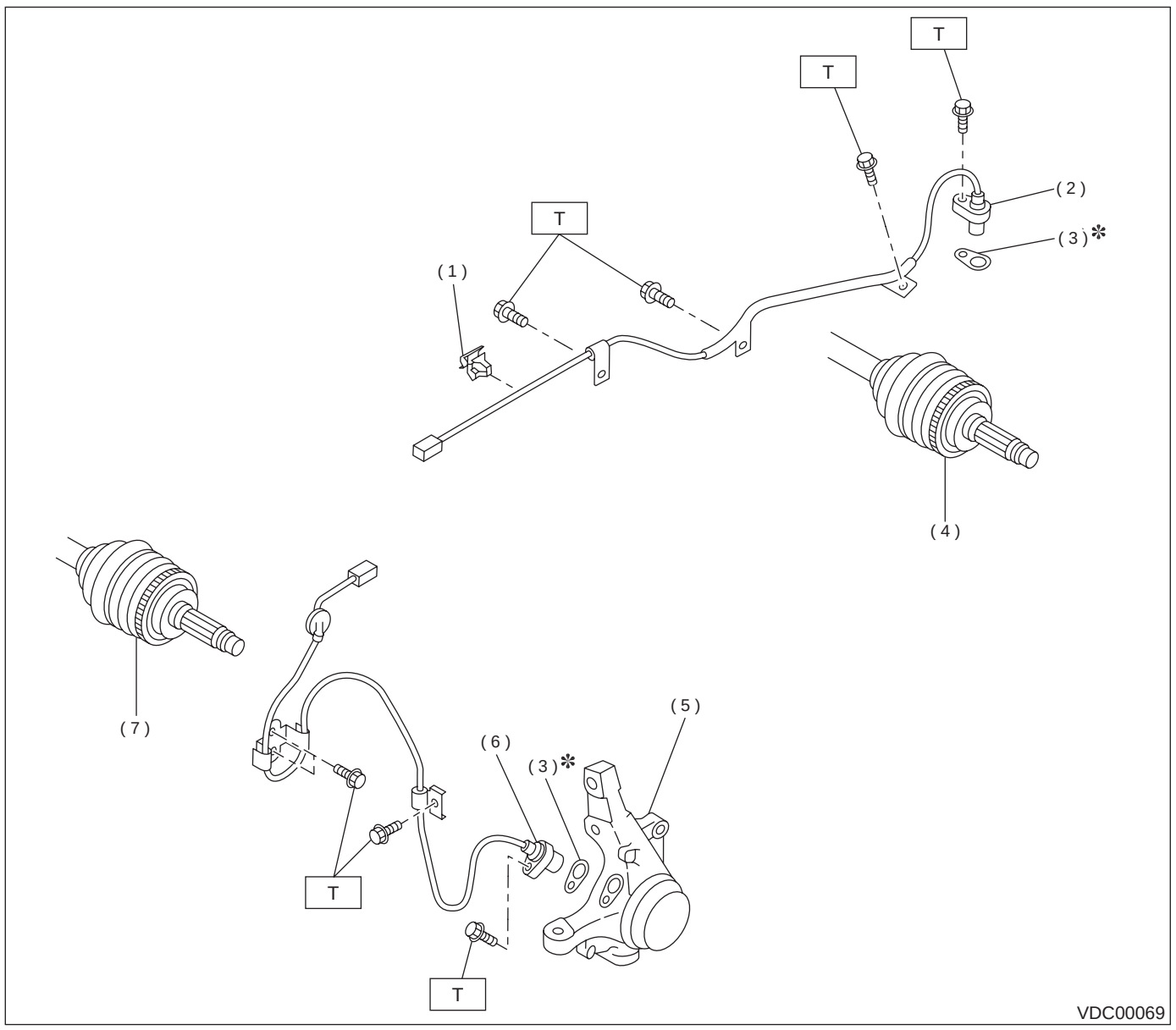
1. General Description

A: SPECIFICATIONS

Item			Standard or remarks
ABS sensor	ABS sensor gap	Front	0.3 — 0.8 mm (0.012 — 0.031 in)
		Rear	0.44 — 0.94 mm (0.0173 — 0.0370 in)
	ABS sensor resistance		1.25±0.25 kΩ
	Marks of the harness	Front LH	Brown
		Front RH	Light blue
		Rear LH	Yellow
		Rear RH	White
Yaw rate and lateral G sensor	Lateral G sensor voltage		2.5±0.2 V
VDC hydraulic control unit marks			D2
VDC control module marks			P

B: COMPONENT

1. ABS SENSOR

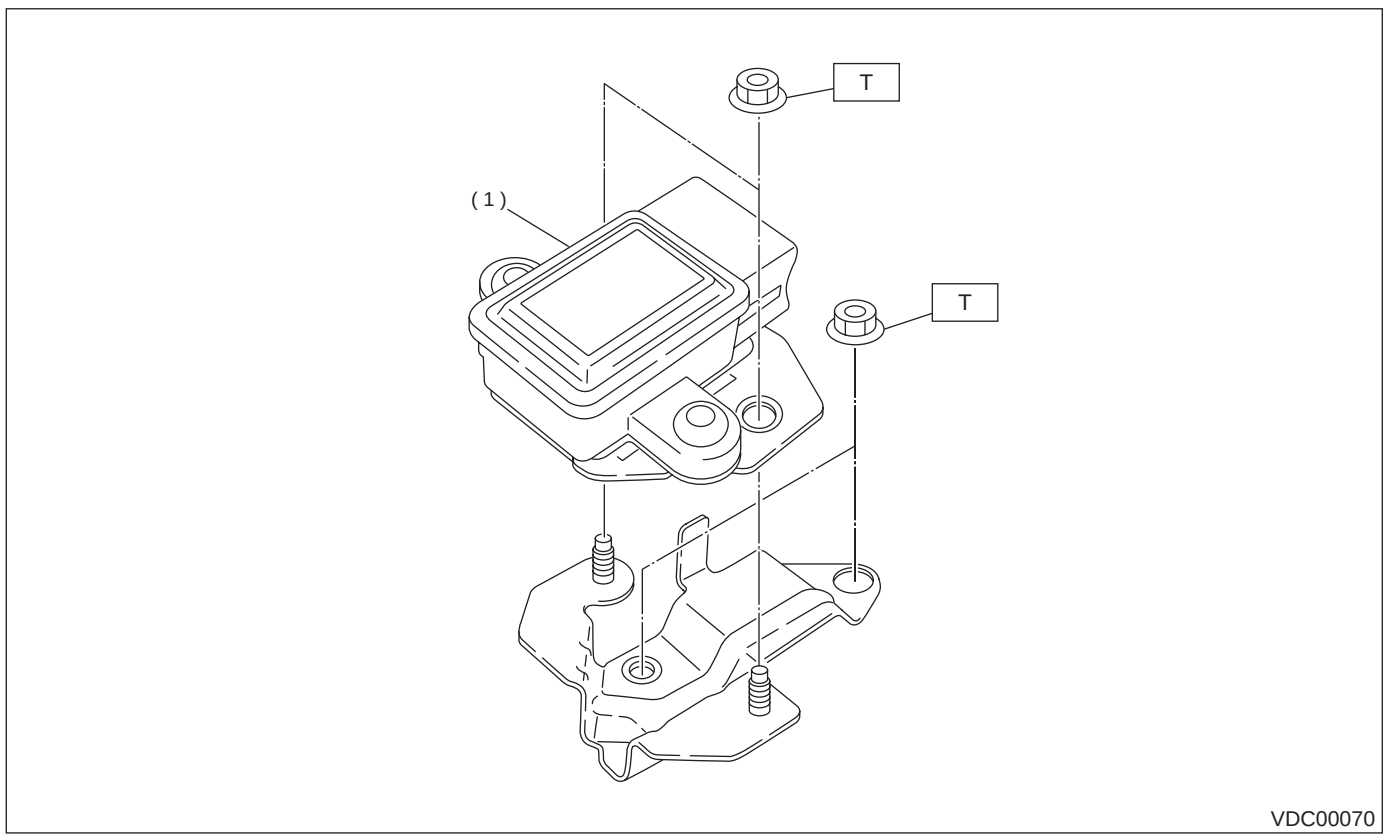


VDC00069

(1) Clip
(2) Rear ABS sensor
(3) ABS spacer
(4) Tone wheel (Rear)
(5) Housing
(6) Front ABS sensor
(7) Tone wheel (Front)

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

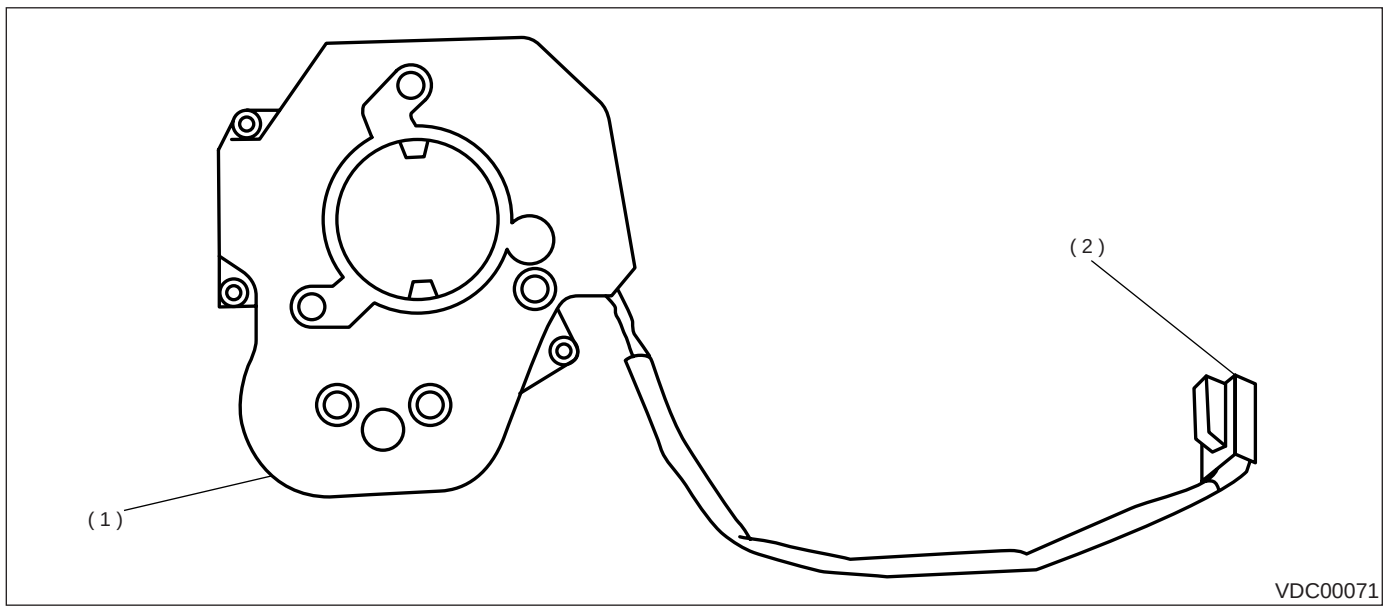
2. YAW RATE AND LATERAL G SENSOR



(1) Yaw rate and lateral G sensor

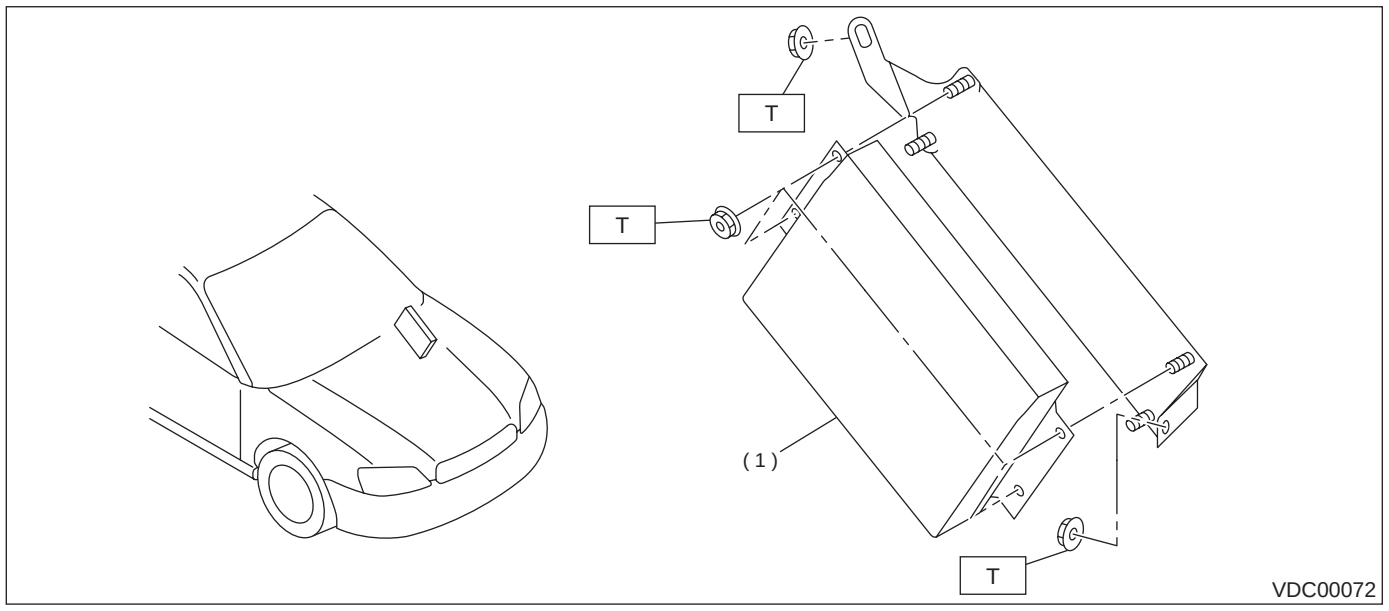
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

3. STEERING ANGLE SENSOR



(1) Steering angle sensor (2) Connector

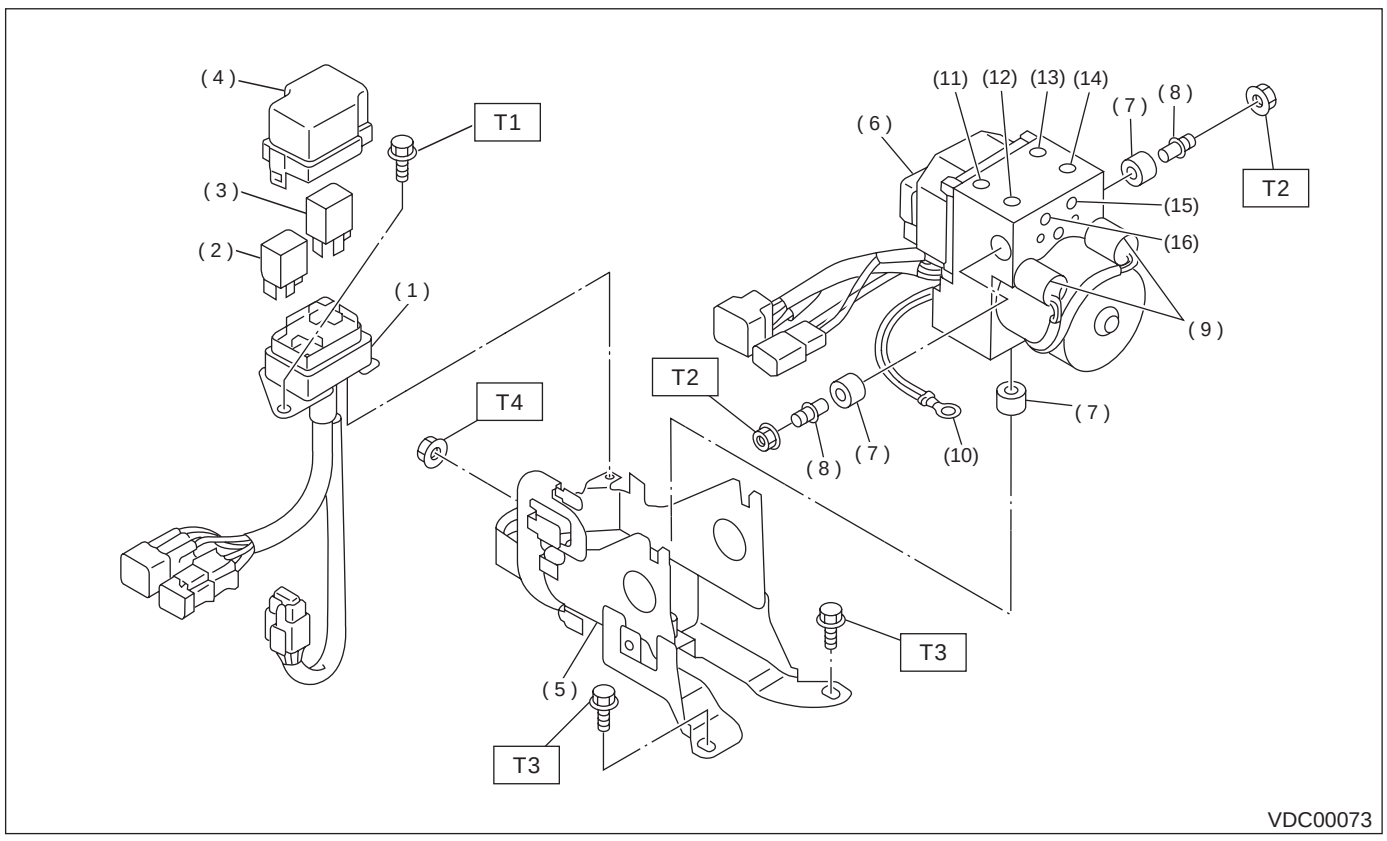
4. VDC CONTROL MODULE (VDCCM)



(1) VDC control module

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

5. HYDRAULIC CONTROL UNIT (H/U)



(1) Relay box
(2) Motor relay
(3) Valve relay
(4) Cap
(5) Bracket
(6) Hydraulic control unit
(7) Damper
(8) Stud bolt
(9) Pressure sensor
(10) Ground terminal
(11) Front-LH outlet
(12) Secondary inlet
(13) Front-RH outlet
(14) Primary inlet
(15) Rear-LH outlet
(16) Rear-RH outlet

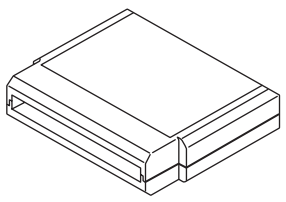
Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 24.6)
T4: 38 (3.9, 28)

C: CAUTION

- Wear working clothing, including, a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

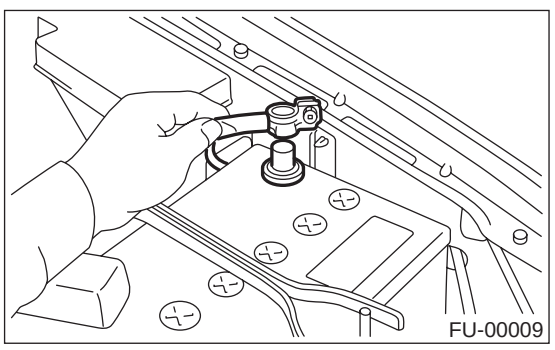
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Pressure Gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

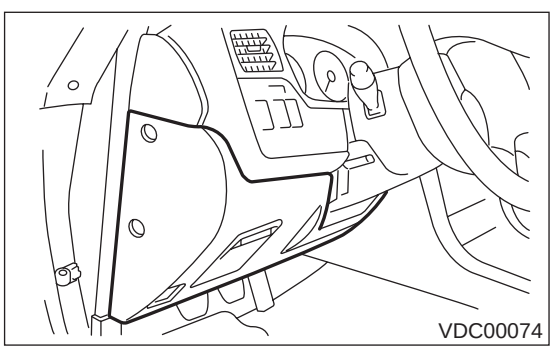
2. VDC Control Module (VDC-CM)

A: REMOVAL

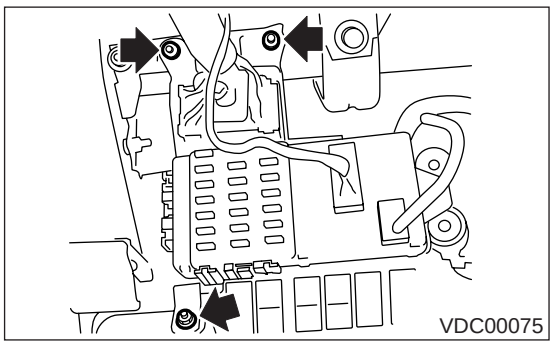
1) Disconnect battery ground cable.



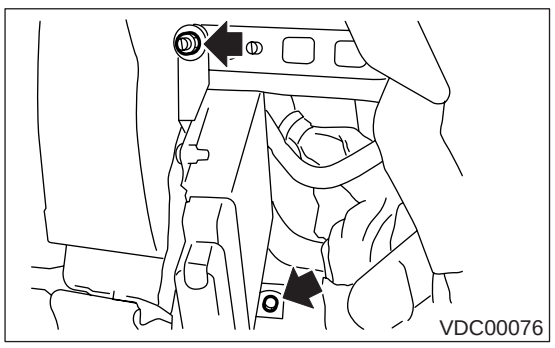
2) Remove lower cover of instrument panel and disconnect connectors on the back side of the cover.



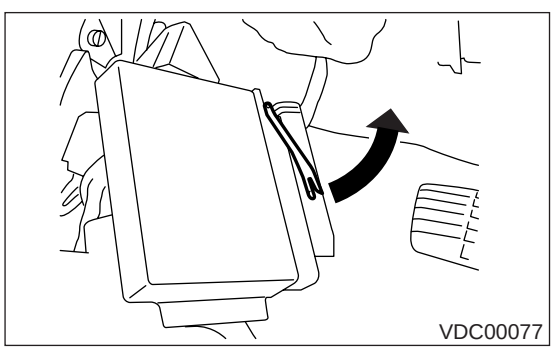
3) Remove three bolts which secure the fuse box onto body side, then move the fuse box aside.



4) Remove two bolts which install VDCCM onto body side bracket.



5) Disconnect connector from VDCCM by pulling up the securing holder.



6) Remove VDCCM.

B: INSTALLATION

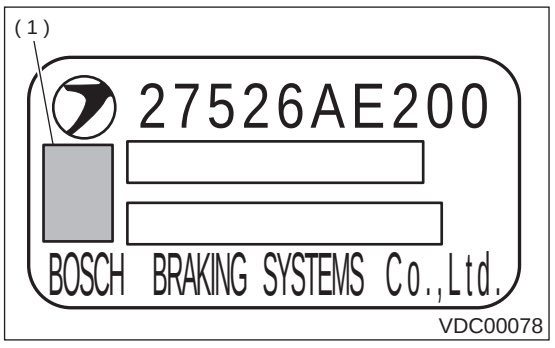
Install in the reverse order of removal.

CAUTION:
After completion of installation procedure, the following two position settings must be made.
- **Steering angle sensor center positioning**
- **Yaw rate and lateral G sensor 0 positioning**

These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>.

C: INSPECTION

Check the VDCCM identification mark.



(1) Specification mark

Vehicle specifications	VDCCM identification mark
Six cylinder engine	P

D: ADJUSTMENT

Always conduct steering angle sensor center positioning and yaw rate and lateral G sensor 0 positioning whenever you have replaced, removed or installed the following items.

- VDCCM
- Steering angle sensor
- Yaw rate and lateral G sensor
- Steering wheel parts (including airbag)
- Suspension parts
- Adjustment of wheel alignment

1. WITHOUT SUBARU SELECT MONITOR

1) Park the vehicle in a straight ahead position on a horizontal surface.
2) Confirm the steering wheel center position. (If the center position is not accurate, adjust wheel alignment.)
3) Drive the vehicle approx. 10 km (6 MPH) preferably on a straight road, then turn ignition switch OFF. Then drive the vehicle approx. 10 km (6 MPH) again confirming that ABS and VDC warning lights do not go ON while vehicle is being driven. Also make sure there are no abnormalities of the VDC function or steering operation.

NOTE:
If it is not possible to drive the vehicle, use SUBARU SELECT MONITOR.
<Ref. to VDC-9, WITH SUBARU SELECT MONITOR, ADJUSTMENT, VDC Control Module (VDCCM).>

4) If there are any abnormalities found, conduct the procedure over again.

2. WITH SUBARU SELECT MONITOR

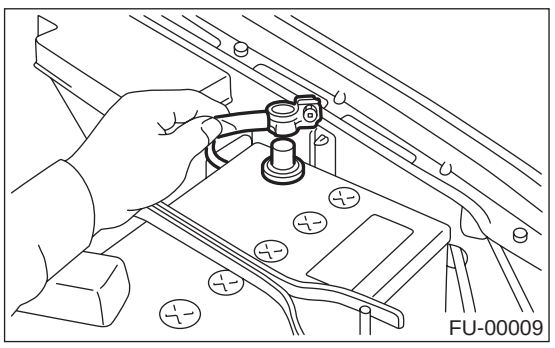
1) Park the vehicle in a straight ahead position on a horizontal surface. (Engine running in gear position of P or N)
2) Confirm the steering wheel center position. (If the center position is not accurate, adjust wheel alignment.)
3) Set the SUBARU SELECT MONITOR on the vehicle and select “Set Mode Str.A.Sen.N & Lat.Gsen.0p” in “Function Check Sequence” display menu. (Follow the instructions in the display.)
4) Select “Current Data display & Save” in {Brake Control System} display menu and confirm if the steering angle sensor is indicated as “0 deg”.
5) If the display does not indicate {0 deg}, conduct the procedure over again and make sure it indicates “0 deg”.
6) Drive the vehicle approx. 10 minutes and confirm that ABS and VDC warning lights do not go ON while vehicle is being driven.
7) If there are any abnormalities in VDC function or steering operation found while vehicle is being driven, conduct the procedure over again.

3. Hydraulic Control Unit (H/U)

A: REMOVAL

1. HYDRAULIC UNIT (H/U)

1) Disconnect ground cable from battery.



2) Remove air intake duct from engine compartment to facilitate removal of hydraulic unit.
3) Disconnect connector from hydraulic unit.

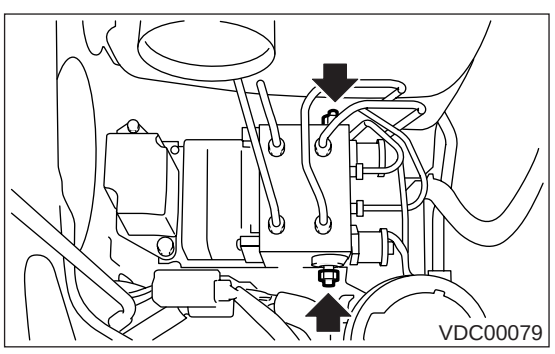
CAUTION:
Be careful not to let water or other foreign matter contact the H/U terminal.

4) Unlock cable clip.
5) Disconnect brake pipes from hydraulic unit.

CAUTION:
Wrap brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

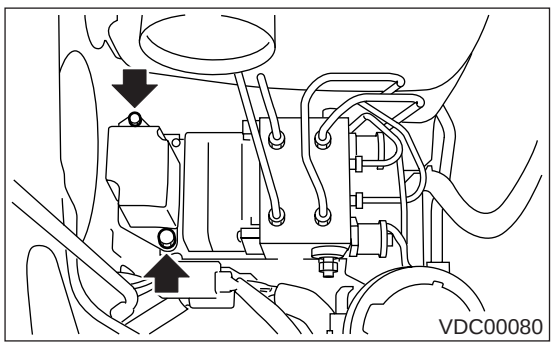
6) Remove nuts and bolt which secure hydraulic unit bracket, and remove hydraulic unit from engine compartment.

CAUTION:
• Hydraulic unit cannot be disassembled. Do not attempt to loosen bolts and nuts.
• Do not drop or bump hydraulic unit.
• Do not turn the hydraulic unit upside down or place it on its side.
• Be careful to prevent foreign particles from getting into hydraulic unit.
• When a new hydraulic unit is installed, apply a coat of rust-preventive wax (Nippeco LT or GB) to bracket attaching bolt after tightening.
• Do not pull harness disconnecting harness connector.



2. RELAY BOX

1) Disconnect ground cable from battery.
2) Remove air intake duct from engine compartment to facilitate removal of relay box.
3) Disconnect connector from relay box.
4) Unlock cable clip.
5) Remove nuts which secure relay box, and remove relay box and connector bracket.

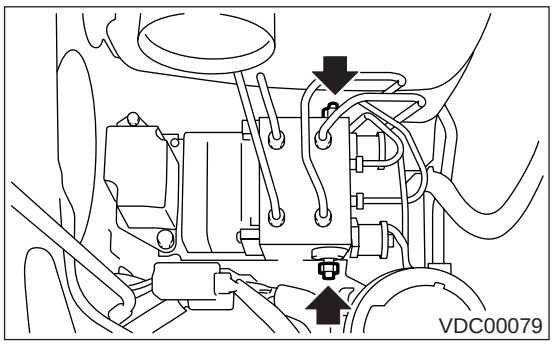


CAUTION:
Do not drop or bump relay box.

B: INSTALLATION

1. HYDRAULIC UNIT (H/U)

1) Install hydraulic unit.



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

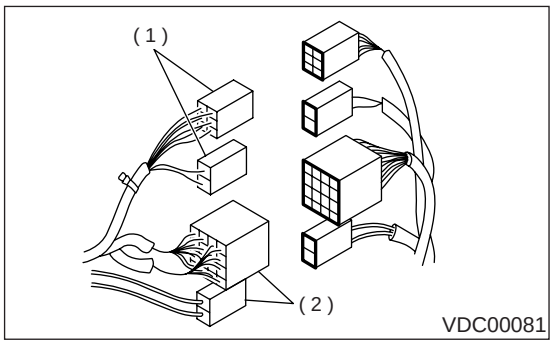
2) Connect hydraulic unit ground cable to body.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

3) Connect brake pipes to their correct hydraulic unit connections.
4) Secure hydraulic unit connector to connector bracket.

CAUTION:
Align connector with mating receptacle.

5) Connect connector to hydraulic unit.



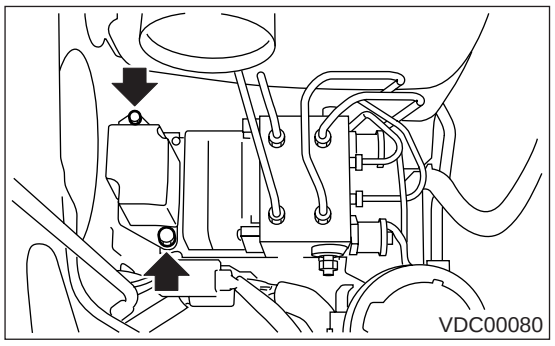
(1) Relay box connector
(2) Hydraulic unit connector

6) Install air intake duct.
7) Connect ground cable to battery.
8) Bleed air from the brake system.

2. RELAY BOX

1) Install relay box and connector bracket.

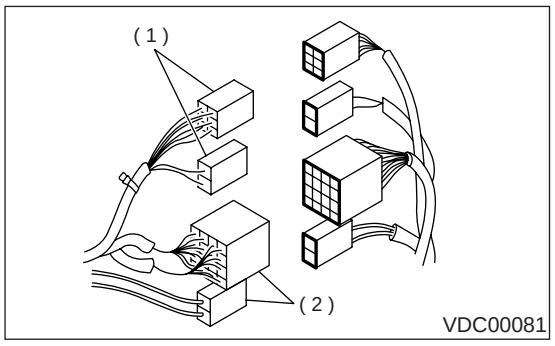
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



2) Secure relay box connector to connector bracket.

CAUTION:
Align connector with mating receptacle.

3) Connect connector to relay box.

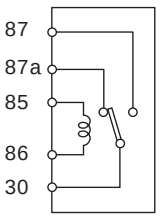
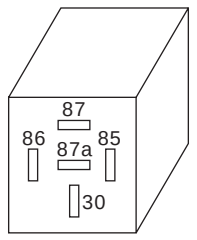
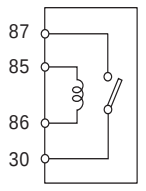
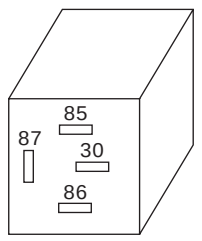


(1) Relay box connector
(2) Hydraulic unit connector

4) Install air intake duct.
5) Connect ground cable to battery.

C: INSPECTION

1) Check connected and fixed condition of connector.
2) Check valve relay and motor relay for discontinuity or short circuits.

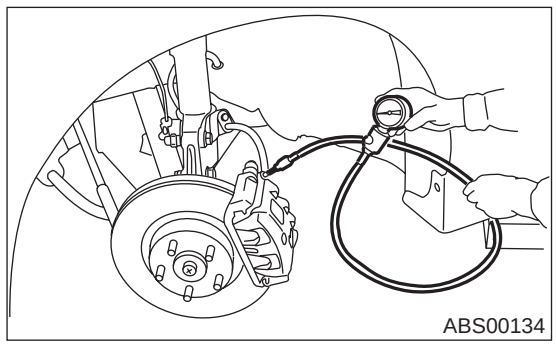
	Condition	Terminal number	Standard	Diagram	Terminal location
Valve relay	Turning off electricity.	85 — 86	103±10 Ω	 VDC00082	 VDC00083
		30 — 87a	103±10 Ω		
		30 — 87	More than 1 MΩ		
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87a	More than 1 MΩ		
		30 — 87	Less than 0.5 Ω		
Motor relay	Turning off electricity.	85 — 86	80±10 Ω	 VDC00084	 VDC00085
		30 — 87	More than 1 MΩ		
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87	Less than 0.5 Ω		

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up vehicle and remove wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.


ABS00134

4) Bleed air from the pressure gauges.
5) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.

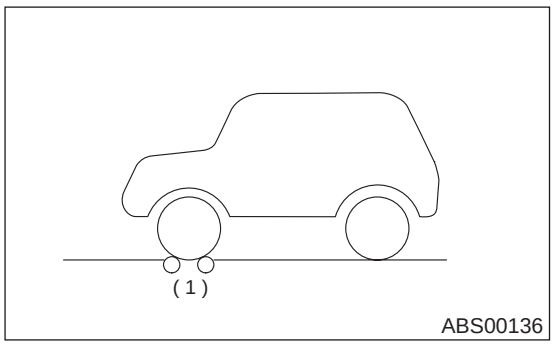
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
Initial value	3,432 kPa (35 kg/cm^2, 498 psi)	3,432 kPa (35 kg/cm^2, 498 psi)
When decompressed	490 kPa (5 kg/cm^2, 71 psi) or less	490 kPa (5 kg/cm^2, 71 psi) or less
When compressed	3,432 kPa (35 kg/cm^2, 498 psi) or more	3,432 kPa (35 kg/cm^2, 498 psi) or more

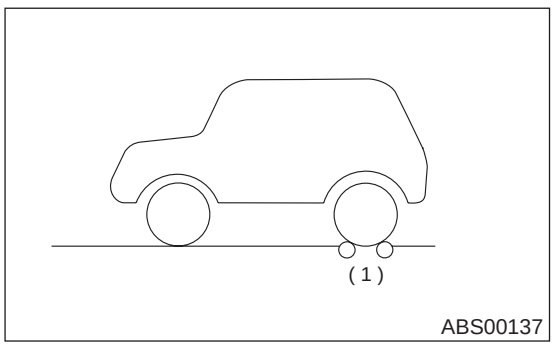
8) Remove pressure gauges from FL and FR caliper bodies.
9) Remove air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard values.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from brake line.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

1) Prepare for operating ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
2) Set the front wheels or rear wheels on the brake tester and set the select lever's position at “neutral”.



(1) Brake tester



(1) Brake tester

3) Operate the brake tester.
4) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
5) When the hydraulic unit begins to work, check the following working sequence.
(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.

6) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	981 N (100 kgf, 221 lb)	981 N (100 kgf, 221 lb)
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less
When compressed	981 N (100 kgf, 221 lb) or more	981 N (100 kgf, 221 lb) or more

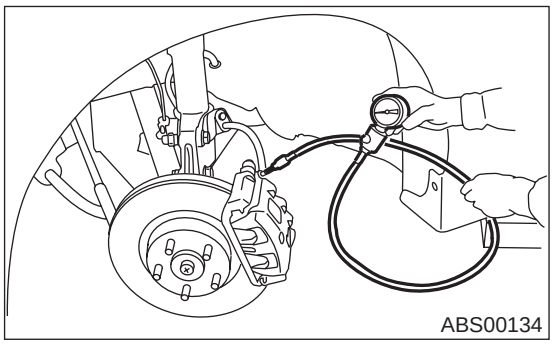
7) After checking, also check if any irregular brake pedal tightness is felt.

3. CHECKING THE HYDRAULIC UNIT VDC OPERATION BY PRESSURE GAUGE

1) Lift-up vehicle and remove wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.



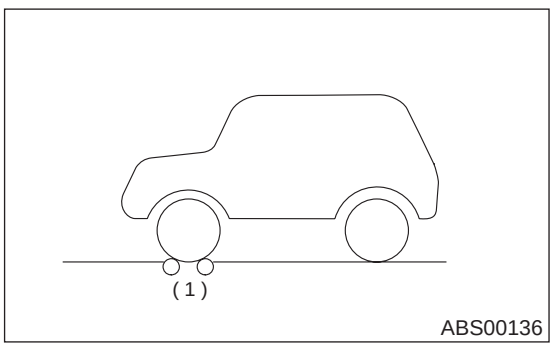
4) Bleed air from the pressure gauges.
5) Perform VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
When compressed	2,942 kPa (30 kg/cm^2, 427 psi) or more	1,961 kPa (20 kg/cm^2, 284 psi) or more
When decompressed	490 kPa (5 kg/cm^2, 71 psi) or less	490 kPa (5 kg/cm^2, 71 psi) or less

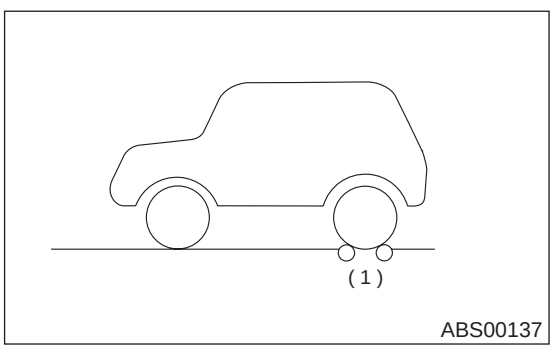
8) Remove pressure gauges from FL and FR caliper bodies.
9) Remove air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from brake line.

4. CHECKING THE HYDRAULIC UNIT VDC OPERATION WITH BRAKE TESTER

1) Prepare for operating VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
2) Set the front wheels or rear wheels on the brake tester and set the select lever's position at “neutral”.



(1) Brake tester



(1) Brake tester

3) Operate the brake tester.
4) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
5) When the hydraulic unit begins to work, check the following working sequence.
(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.
6) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
When compressed	1,961 N (200 kgf, 441 lb) or more	981 N (100 kgf, 221 lb) or more
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less

7) After checking, also check if any irregular brake pedal tightness is felt.

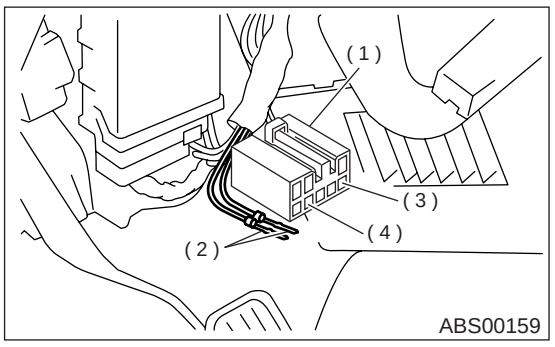
4. ABS Sequence Control

A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) ABS sequence control can be started by diagnosis connector or select monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 5 and No. 8 of the diagnosis connector beside driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Set the speed of all wheels at 2.75 km/h (2 MPH) or less.
3) Turn ignition switch OFF.
4) Within 0.5 seconds after the ABS and VDC warning light goes out, depress the brake pedal and hold it immediately after ignition switch is turned to ON.

CAUTION:
Do not depress the clutch pedal.

NOTE:
• When the ignition switch is set to on, the brake pedal must not be depressed.
• Engine must not operate.

5) After completion of ABS sequence control, turn ignition switch OFF.

2. ABS SEQUENCE CONTROL WITH SELECT MONITOR

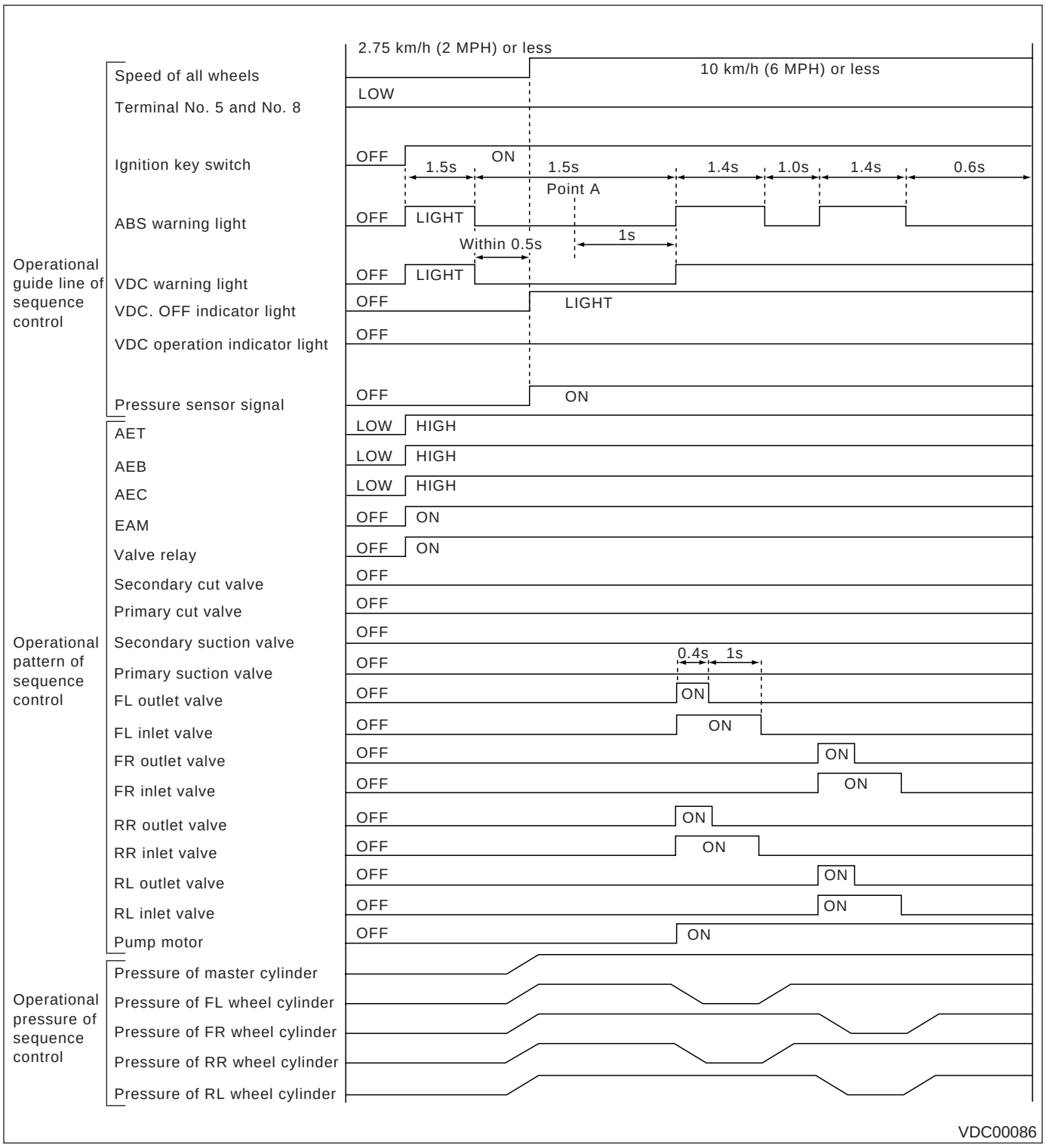
NOTE:
• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to “ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR”.
<Ref. to VDC-16, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, ABS Sequence Control.>
• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect select monitor to data link connector beside driver's seat instrument panel lower cover.
2) Turn ignition switch ON.
3) Turn select monitor switch ON.
4) Put select monitor to “BRAKE CONTROL” mode.
5) When “Function check sequence” is selected, `ABS sequence control' will start.
6) The message `Press Brake Pedal Firmly' is displayed as follows:
(1) When using the brake tester, depress brake pedal with braking force of 981 N (100 kgf, 221 lb).
(2) When using the pressure gauge, depress brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kg/cm^2, 498 psi).

CAUTION:
Do not depress the clutch pedal.

7) When the message “Press YES” is displayed, press «YES» key.
8) Operation points will be displayed on select monitor.

3. CONDITIONS FOR ABS SEQUENCE CONTROL



NOTE:
- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When terminal No. 5 or No. 8 are separated from diagnosis terminals. (When select monitor is not used.)
3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
4) When brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When select monitor is not used.)
5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When select monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When select monitor is used.)

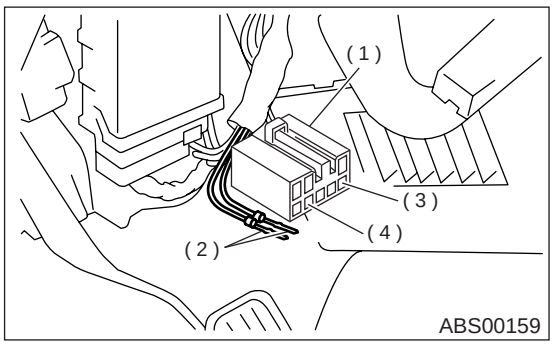
5. VDC Sequence Control

A: OPERATION

1) Under the VDC sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) VDC sequence control can be started by diagnosis connector or select monitor.

1. VDC SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 5 and No. 8 of the diagnosis connector beside driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Set the speed of all wheels at 2.75 km/h (2 MPH) or less.
3) Turn ignition switch OFF.
4) Turn ignition switch ON and start engine immediately, confirming that ABS and VDC warning light goes ON and then OFF. After ABS and VDC warning light goes OFF, within 0.5 seconds depress the brake pedal once, then within 3 second depress the brake pedal twice more and release it.

CAUTION:
Do not depress the clutch pedal.

NOTE:
• When the ignition switch is set to on, the brake pedal must not be depressed.
• Engine must operate.
• If the VDC sequence control does not start, do the procedure over again.

5) After completion of VDC sequence control, turn ignition switch OFF.

2. VDC SEQUENCE CONTROL WITH SELECT MONITOR

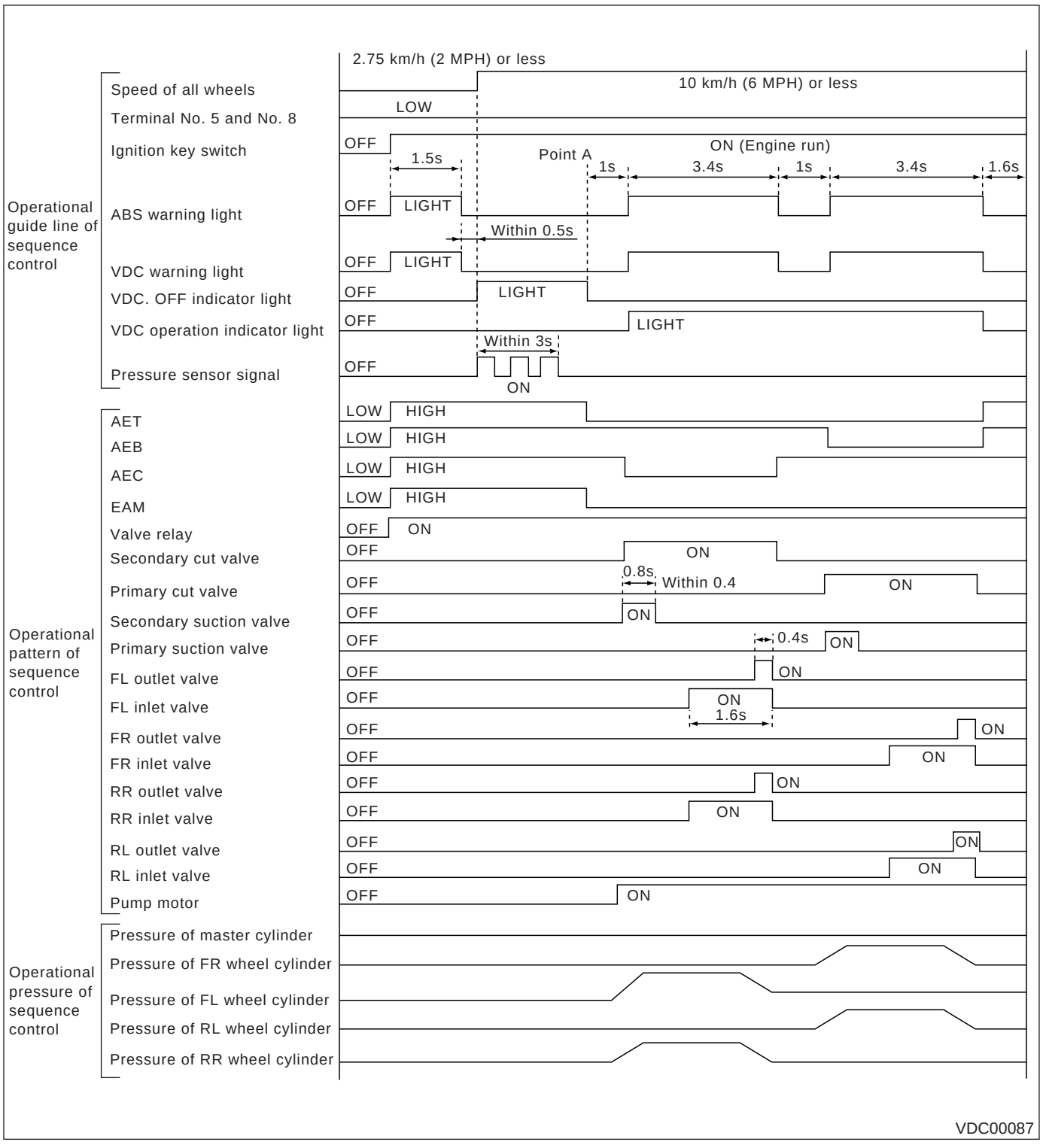
NOTE:
• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to “VDC SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR”.
<Ref. to VDC-19, VDC SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, VDC Sequence Control.>
• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect select monitor to data link connector beside driver's seat instrument panel lower cover.
2) Turn ignition switch ON.
3) Turn select monitor switch ON.
4) Put select monitor to “BRAKE CONTROL” mode.
5) Select “VDC Check Mode” in {Function check sequence} menu to start `VDC sequence control'.

CAUTION:
Do not depress the clutch pedal.

6) When the message “Press YES” is displayed, press «YES» key.
7) Operation points will be displayed on select monitor.

3. CONDITIONS FOR VDC SEQUENCE CONTROL



NOTE:
- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

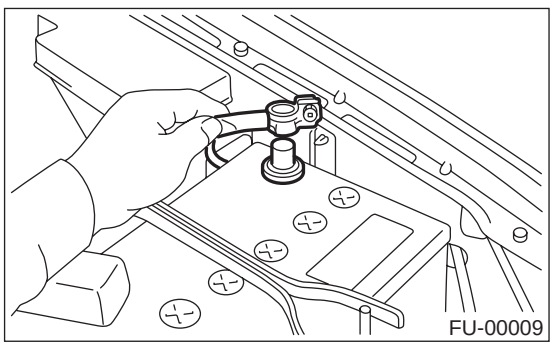
1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

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 terminal No. 5 or No. 8 are separated from diagnosis terminals. (When select monitor is not used.)
3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
4) When brake pedal is depressed after ignition key is turned to ON, and before VDC warning light goes out. (When select monitor is not used.)
5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after VDC warning light goes out. (When select monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When select monitor is used.)

6. Yaw Rate and Lateral G Sensor

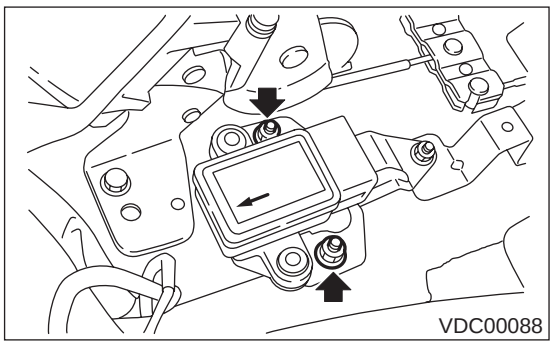
A: REMOVAL

1) Disconnect battery ground cable.

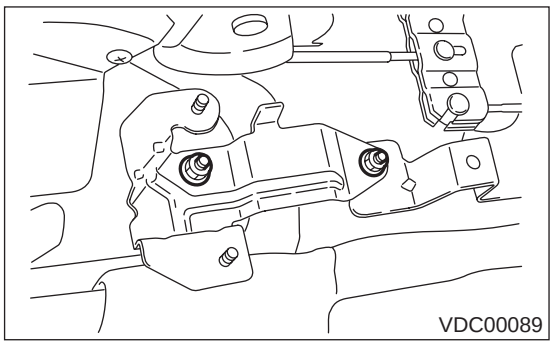


2) Remove console cover.
<Ref. to EI-36, Console Box.>
3) Disconnect connector from yaw rate and lateral G sensor.
4) Remove yaw rate and lateral G sensor.

CAUTION:
Do not drop or bump yaw rate and lateral G sensor.



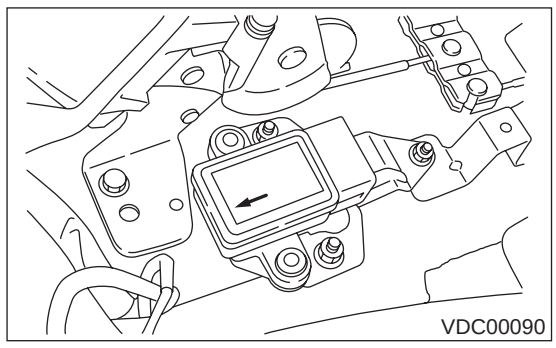
5) Remove bracket from body.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Do not install yaw rate and lateral G sensor in the wrong direction. There is an arrow on the sensor showing which side faces the front of the vehicle.



CAUTION:
After completion of installation procedure, the following two position settings must be made.
- **Steering angle sensor center positioning**
- **Yaw rate and lateral G sensor 0 positioning**

These procedures are necessary for VDCCM to later recognize what position the vehicle is in.
For procedures for the above two settings, <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>.

C: INSPECTION

1. LATERAL G SENSOR SIGNAL

	Step	Value	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have SUBARU select Monitor?	Go to step **5.**	Go to step **2.**
2	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Move the vehicle to a flat location. 2) Turn ignition switch to OFF. 3) Connect connector to yaw rate and lateral G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–)*** Is the voltage within the specified range when yaw rate and lateral G sensor is horizontal?	2.5±0.2 V	Go to step **3.**	Replace yaw rate and lateral G sensor.
3	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Remove yaw rate and lateral G sensor from vehicle. 2) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–)*** NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory. Is the voltage within the specified range when yaw rate and lateral G sensor is inclined right to 90°?	3.5±0.2 V	Go to step **4.**	Replace yaw rate and lateral G sensor.
4	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–)*** NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory. Is the voltage within the specified range when yaw rate and lateral G sensor is inclined left to 90°?	1.5±0.2 V	Go to step **5.**	Replace yaw rate and lateral G sensor.

	Step	Value	Yes	No
5	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Connect select monitor connector to data link connector. 3) Turn ignition switch to ON. 4) Turn select monitor into {BRAKE CONTROL} mode. 5) Set the display in the {Current Data Display & Save} mode. 6) Read the yaw rate and lateral G sensor output voltage. NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory. Is the indicated reading within the specified range when the vehicle is in horizontal position?	2.5±0.2 V	Go to step **6.**	Replace yaw rate and lateral G sensor.
6	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Remove console box. 2) Remove yaw rate and lateral G sensor from vehicle. (Do not disconnect connector.) 3) Read the select monitor display. NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory. Is the voltage within the specified range when yaw rate and lateral G sensor is inclined right to 90°?	3.5±0.2 V	Go to step **7.**	Replace yaw rate and lateral G sensor.
7	**CHECK YAW RATE AND LATERAL G SENSOR.** Read the select monitor display. NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory. Is the voltage within the specified range when yaw rate and lateral G sensor is inclined left to 90°?	1.5±0.2 V	Yaw rate and lateral G sensor is normal.	Replace yaw rate and lateral G sensor.

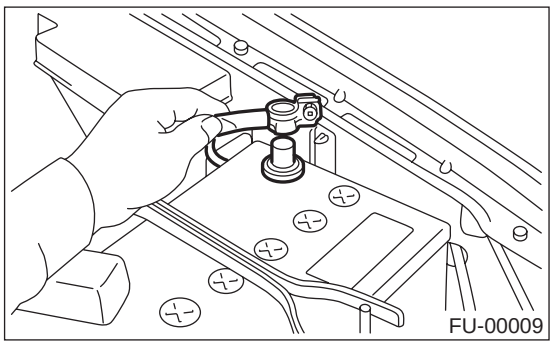
2. YAW RATE SENSOR SIGNAL

Step		Value	Yes	No
1	**CHECK YAW RATE AND LATERAL G SENSOR USING OSCILLOSCOPE.** 1) Connect all connectors. 2) Set oscilloscope to TCM connector terminals. Positive probe; (R100) No. 4 Earth lead; (R100) No. 6 3) Start the engine. 4) Measure signal voltage indicated on oscilloscope. <Ref. to VDC-18, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> Is the voltage within the specified range?	2.1 V — 2.9 V	Go to step **2.**	Replace yaw rate and lateral G sensor is normal.
2	**CHECK YAW USING OSCILLOSCOPE.** 1) Turn ignition switch to OFF. 2) Set oscilloscope to TCM connector terminals. Positive probe; (R100) No. 2 Earth lead; (R100) No. 6 3) Start the engine. 4) Measure signal voltage indicated on oscilloscope. <Ref. to VDC-18, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> Is the voltage within the specified range?	5 V	Yaw rate and lateral G sensor is normal.	Replace yaw rate and lateral G sensor.

7. Steering Angle Sensor

A: REMOVAL

1) Disconnect battery ground cable.

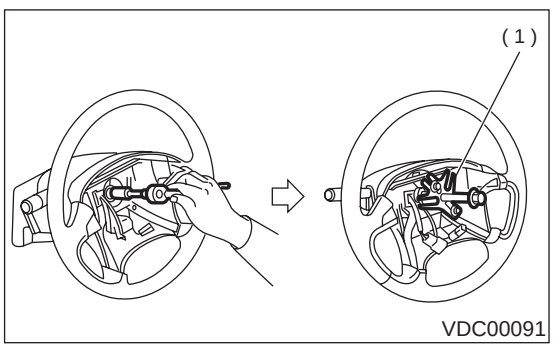


2) Remove airbag module.
<Ref. to AB-13, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to “Airbag System” before performing airbag module service (if so equipped).
<Ref. to AB-3, CAUTION, General Description.>

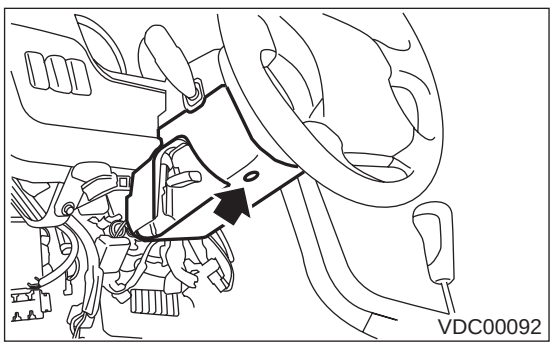
3) Remove steering wheel nut, then draw out steering wheel from shaft using steering puller.

NOTE:
Steering wheel must be removed at the straight ahead position.

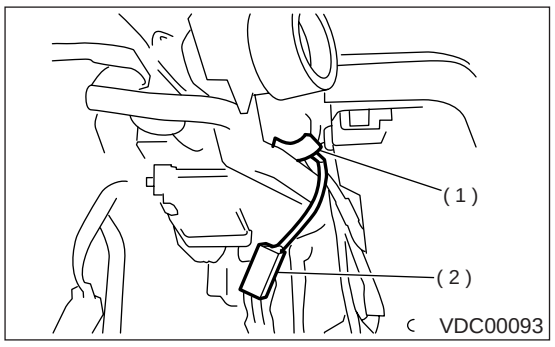


(1) Steering puller

4) Remove the screw securing lower steering column cover.

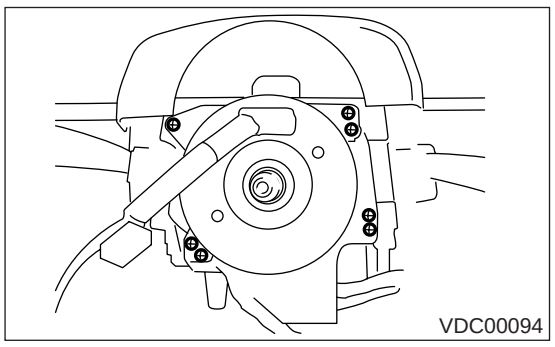


5) Remove two screws securing upper steering column cover.
6) Release the lock of harness band and disconnect connector of steering angle sensor.

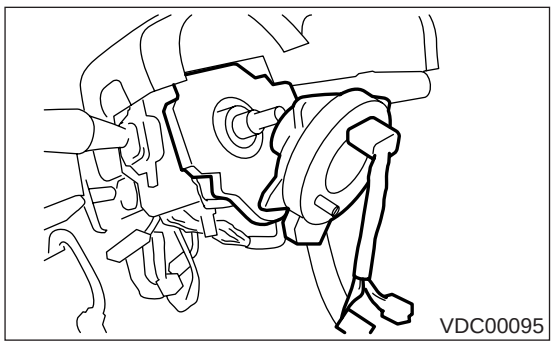


(1) Harness band
(2) Connector

7) Remove bolts which hold roll connector and steering angle sensor onto steering column.



8) Remove roll connector and steering angle sensor.

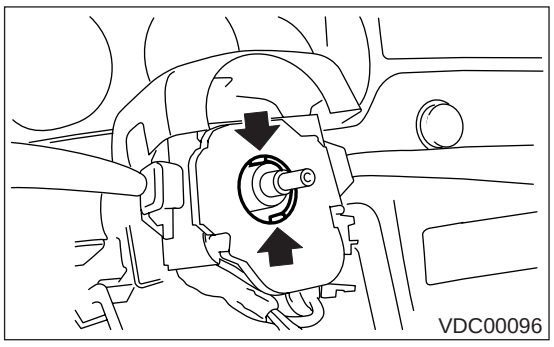


NOTE:
Do not turn steering angle sensor as it's center position has been recognized by VDCCM.

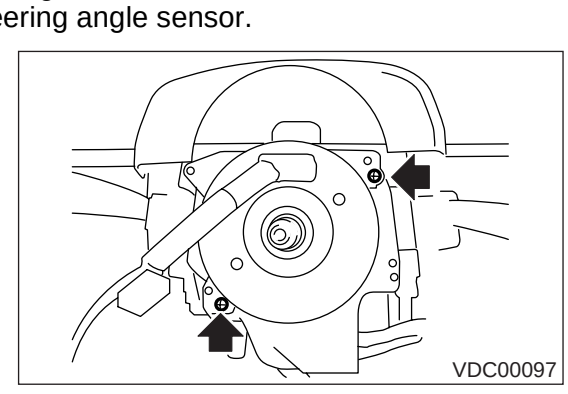
B: INSTALLATION

CAUTION:
Ensure that front wheels are set in straight forward direction.

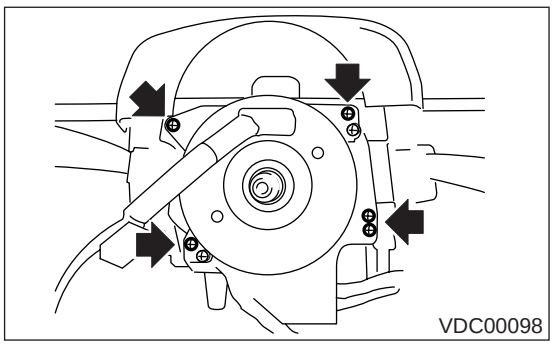
1) Place steering angle sensor on steering column, confirming that the sensor is positioned as in the figure.


VDC00096

2) Conduct centering of roll connector.
<Ref. to AB-20, INSTALLATION, Roll Connector.>
3) Place roll connector over steering angle sensor and tighten bolts which secure roll connector and steering angle sensor.


VDC00097

4) Tighten bolts which install roll connector and steering angle sensor onto steering column.


VDC00098

5) Set steering wheel to neutral and install it onto steering shaft.

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

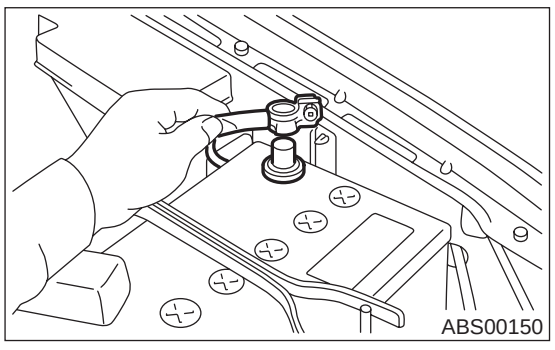
Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

6) Install airbag module to steering wheel.
<Ref. to AB-13, INSTALLATION, Driver's Airbag Module.>

WARNING:
Always refer to “Airbag System” before performing the service operation.
<Ref. to AB-3, CAUTION, General Description.>

7) Connect battery ground cable.


ABS00150

CAUTION:
After completion of installation procedure, the following two position settings must be made.
- **Steering angle sensor center positioning**
- **Yaw rate and lateral G sensor 0 positioning**

These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>.

C: INSPECTION

Refer to “VDC section” for inspection procedures of steering angle sensor.
<Ref. to VDC-112, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>

8. Front ABS Sensor

A: NOTE

The ABS sensor installed on VDC equipped vehicles is the same as the one on ABS equipped vehicles; therefore, for removal, inspection and installation, refer to “ABS” section.
<Ref. to ABS-12, Front ABS Sensor.>

9. Rear ABS Sensor

A: NOTE

The ABS sensor installed on VDC equipped vehicles is the same as the one on ABS equipped vehicles; therefore, for removal, inspection and installation, refer to “ABS” section.
<Ref. to ABS-15, Rear ABS Sensor.>

10.Front Tone Wheel

A: NOTE

As front tone wheel is integrated with front drive shaft, refer to “DS section” for removal, installation, and inspection procedures.
<Ref. to DS-28, Front Drive Shaft.>

11.Rear Tone Wheel

A: NOTE

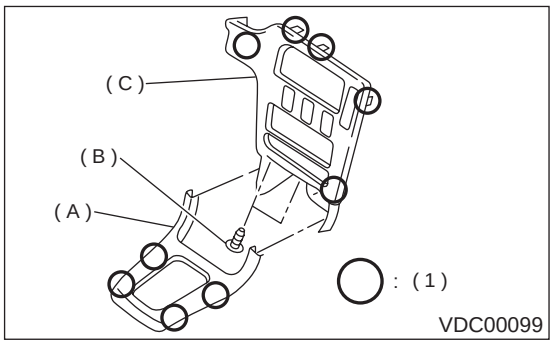
As rear tone wheel is integrated with rear drive shaft, refer to “DS section” for removal, installation, and inspection procedures.
<Ref. to DS-34, Rear Drive Shaft.>

12.VDC Off Switch

A: REMOVAL

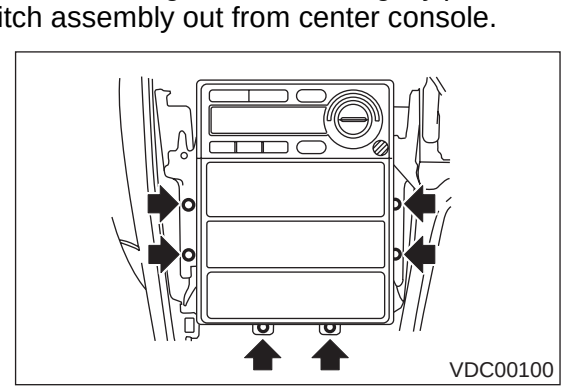
1. LHD MODEL

1) Remove screws and clip from instrument panel lower cover.
2) Remove front cover (A) while disconnecting connector.
3) Remove two screws (B) and then remove center panel (C) while disconnecting connector.

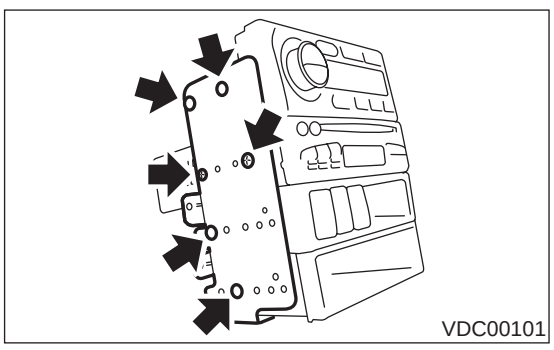


(1) Hook pawl

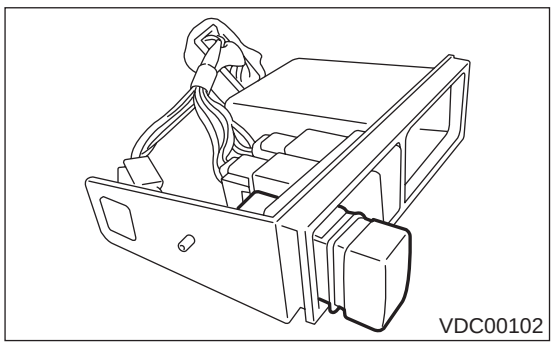
4) Remove fitting screws, and slightly pull radio and switch assembly out from center console.



5) Disconnect electric connectors and antenna feeder cord and then disconnect heater control unit.
6) Remove screw and detach the bracket and then remove switch panel.



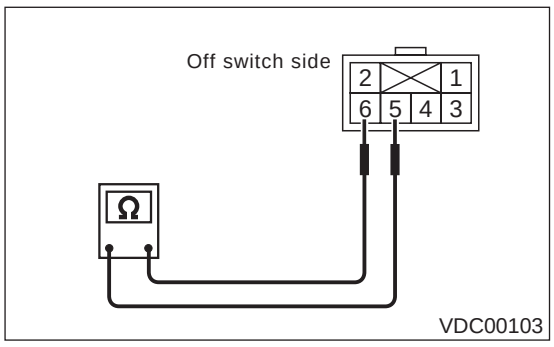
7) Remove VDC off switch by pushing it outward.



B: INSTALLATION

Install is in the reverse order of removal.

C: INSPECTION



Check continuity between VDC off switch terminals.

Switch position	Tester connection	Specified condition
OFF	6 — 5	More than 1 MΩ
ON	6 — 5	Less than 1 Ω

If NG, replace VDC off switch.

1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to VDC-6, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the VDC problem. <Ref. to VDC-9, INSPECTION, General Description.> Is unit that might influence the VDC problem normal?	Normal	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC).** Calling up diagnostic trouble code (DTC). <Ref. to VDC-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is diagnostic trouble code (DTC) readable?	Can be read.	Go to step **3.**	Inspect using diagnostic chart for warning light failure. <Ref. to VDC-33, Diagnostics Chart with Diagnosis Connector.> NOTE: Call up diagnostic trouble code (DTC) again after inspecting warning light. <Ref. to VDC-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>
3	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** Is only the start code issued? NOTE: Record all diagnostic trouble codes (DTCs).	Only start code indicated.	Go to step **4.**	Go to step **5.**
4	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to VDC-267, General Diagnostic Table.> 2) Perform the clear memory mode. <Ref. to VDC-25, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to VDC-24, Inspection Mode.> Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is only the start code issued?	Only start code indicated.	Complete the diagnosis.	Go to step **5.**

Step		Value	Yes	No
5	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with Diagnostic Connector”.<Ref. to VDC-33, Diagnostics Chart with Diagnosis Connector.> NOTE: For diagnostic trouble code (DTC) list, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC-27, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to VDC-25, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to VDC-24, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is only the start code issued?	Only start code indicated.	Complete the diagnosis.	Inspect using “Diagnostics Chart with Diagnostic Connector”. <Ref. to VDC-33, Diagnostics Chart with Diagnosis Connector.>

CAUTION:
Remove foreign matter (dust, water, etc.) from the VDCCM connector during removal and installation.

NOTE:
- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- When ABS and/or VDC warning light illuminates, read and record diagnostic trouble code (DTC) indicated by ABS warning light.

2. WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to VDC-6, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the VDC problem. <Ref. to VDC-9, INSPECTION, General Description.> Is unit that might influence the VDC problem normal?	Normal	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF TROUBLE CODE DISPLAY.** 1) Turn ignition switch to OFF. 2) Connect the SUBARU SELECT MONITOR to data link connector. 3) Turn ignition switch to ON and SUBARU SELECT MONITOR to ON. 4) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Record all diagnostic trouble codes (DTCs) and frame data. Is the corresponding DTC displayed?	Corresponding DTC indicated.	Go to step **3.**	Go to step **4.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to VDC-267, INSPECTION, General Diagnostic Table.> 2) Perform the clear memory mode. <Ref. to VDC-25, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to VDC-24, OPERATION, Inspection Mode.> 4) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is no diagnostic trouble code (DTC) displayed or do VDC and ABS warning lights constantly remain on?	No DTC indicated, and VDC and ABS warning light remain on.	Complete the diagnosis.	Go to step **4.**

Step		Value	Yes	No
4	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with Subaru Select Monitor”.<Ref. to VDC-128, Diagnostics Chart with Select Monitor.> NOTE: For diagnostic trouble code (DTC) list, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC-29, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to VDC-25, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to VDC-24, OPERATION, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is no diagnostic trouble code (DTC) displayed or do VDC and ABS warning lights constantly remain on?	No DTC indicated, and VDC and ABS warning light remain on.	Complete the diagnosis.	Inspect using “Diagnostics Chart with Subaru Select Monitor”. <Ref. to VDC-128, Diagnostics Chart with Select Monitor.>

NOTE:
- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- Check list for interview. <Ref. to VDC-6, Check List for Interview.>

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS AND/OR VDC WARNING LIGHT

ABS and/or VDC warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine running)		
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.		
	❑ When advancing	km/h to	km/h
		MPH to	MPH
	❑ While traveling at a constant speed	km/h	MPH
	❑ When decelerating	km/h to	km/h
		MPH to	MPH
	❑When turning to right	Steering angle :	deg
		Steering time :	sec
	❑ When turning to left	Steering angle :	deg
		Steering time :	sec
	❑ When moving other electrical parts		
	• Parts name : • Operating condition :		

2. STATE OF VDC OFF INDICATOR LIGHT

VDC OFF indicator light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine is running) ❑ On after starting (Engine is stop)		
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.		
	❑ When advancing	km/h to	km/h
		MPH to	MPH
	❑ While traveling at a constant speed	km/h	MPH
	❑ When decelerating	km/h to	km/h
		MPH to	MPH
	❑When turning to right	Steering angle :	deg
		Steering time :	sec
	❑ When turning to left	Steering angle :	deg
		Steering time :	sec
	❑ When moving other electrical parts		
	• Parts name : • Operating condition :		

3. STATE OF VDC OPERATION INDICATOR LIGHT

VDC operation indicator light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine running) ❑ On after starting (Engine stopped)		
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.		
	❑ When advancing		km/h to km/h
			MPH to MPH
	❑ While traveling at a constant speed	km/h	MPH
	❑ When decelerating		km/h to km/h
			MPH to MPH
	❑When turning to right	Steering angle :	deg
		Steering time :	sec
	❑ When turning to left	Steering angle :	deg
		Steering time :	sec
	❑ When moving other electrical parts		
	• Parts name : • Operating condition :		

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others :
	b) Ambient temperature	°C (°F)
	c) Road	❑ Urban area ❑ Suburbs ❑ Highway ❑ General road ❑ Ascending slope ❑ Descending slope ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Straight ❑ Sharp curve ❑ Slow curve ❑ S-shaped curve ❑ Road with inclination on each side ❑ Others :
	d) Road surface	❑ Dry ❑ Wet ❑ New-fallen snow ❑ Compressed snow ❑ Frozen slope ❑ Others :

CHECK LIST FOR INTERVIEW

VDC (DIAGNOSTICS)

Condition	a) Brakes	Deceleration : g
		❑ Continuous / ❑ Intermittent
	b) Accelerator	Acceleration : g
		❑ Continuous / ❑ Intermittent
	c) Vehicle speed	km/h | MPH
		❑ Advancing ❑ Accelerating ❑ Reducing speed ❑ Low speed ❑ Turning ❑ Others :
	d) Tire inflation pressure	Front RH tire : kPa
		Front LH tire : kPa
		Rear RH tire : kPa
		Rear LH tire : kPa
	e) Degree of wear	Front RH tire :
		Front LH tire :
		Rear RH tire :
		Rear LH tire :
	f) Steering wheel	❑ Sharp turn ❑ Slow turn ❑ Straight-ahead operation ❑ Returned slowly ❑ Returned quickly
	g) Tire/wheel size	❑ Specified ❑ Other than specified ( )
	h) Tire type	❑ Summer tire ❑ Studless tire (Brand name:)
	i) Chain is passed around tires. : ❑ Yes / ❑ No	
	j) T tire is used. : ❑ Yes / ❑ No	
	k) Condition of suspension alignment :	
	l) Loading state :	
	m) Repair parts are used. : ❑ Yes / ❑ No	
	• What :	
	n) Others :	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS sensor, ABS control module and hydraulic control unit.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage airbag system wiring harness when servicing the ABS sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect VDC problems:

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

1) Check brake fluid level.
2) Check brake fluid leakage.

3. HYDRAULIC UNIT

Check the hydraulic unit VDC.
• With brake tester <Ref. to VDC-13, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, Hydraulic Control Unit (H/U).>
• Without brake tester <Ref. to VDC-14, CHECKING THE HYDRAULIC UNIT VDC OPERATION BY PRESSURE GAUGE, INSPECTION, Hydraulic Control Unit (H/U).>

4. BRAKE DRAG

Check brake drag.

5. BRAKE PAD AND ROTOR

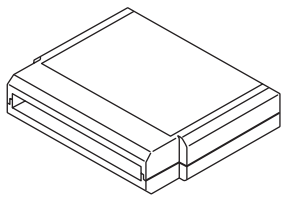
Check brake pad and rotor.
• Front <Ref. to BR-14, INSPECTION, Front Brake Pad.><Ref. to BR-15, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-19, INSPECTION, Rear Brake Pad.><Ref. to BR-20, INSPECTION, Rear Disc Rotor.>

6. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOLS

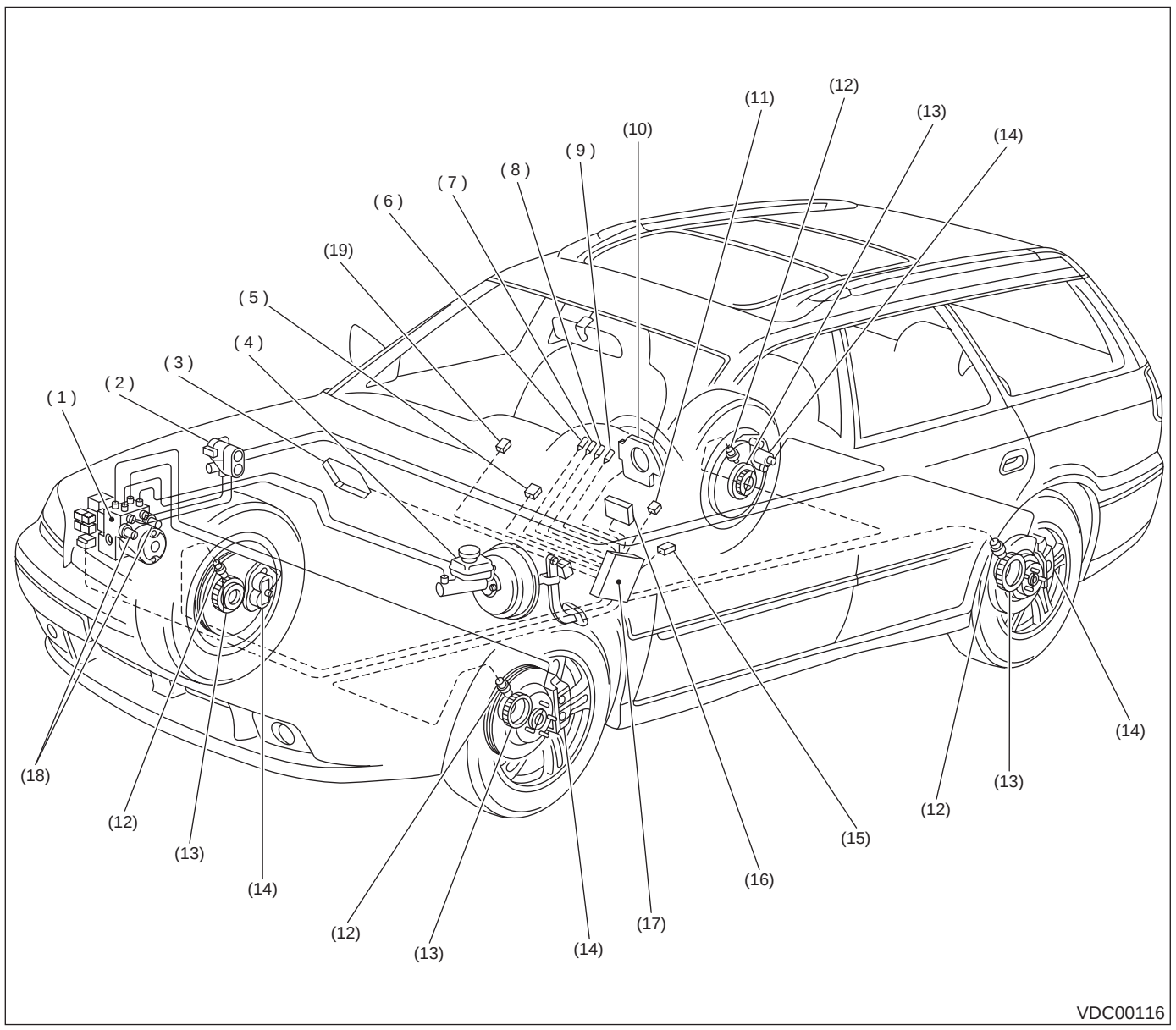
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-2082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONI-TOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

4. Electrical Components Location

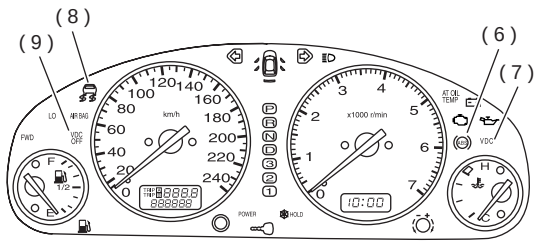
A: LOCATION



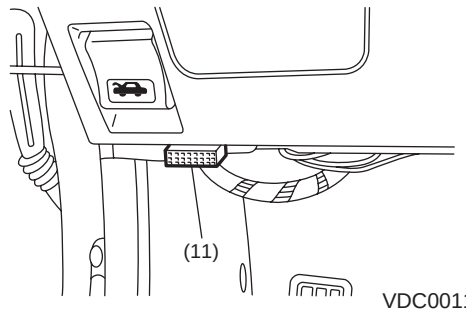
(1) VDC hydraulic control unit (VDCH/U)
(2) Proportioning valve
(3) Engine control module
(4) Master cylinder
(5) Diagnosis connector
(6) ABS warning light
(7) VDC warning light
(8) VDC operating indicator light
(9) VDC OFF indicator light
(10) Steering angle sensor
(11) Data link connector (for SUBARU select monitor)
(12) ABS sensor
(13) Tone wheel
(14) Wheel cylinder
(15) Yaw rate & lateral G sensor
(16) Transmission control module
(17) VDC control module (VDCCM)
(18) Pressure sensor
(19) VDC OFF switch

ELECTRICAL COMPONENTS LOCATION

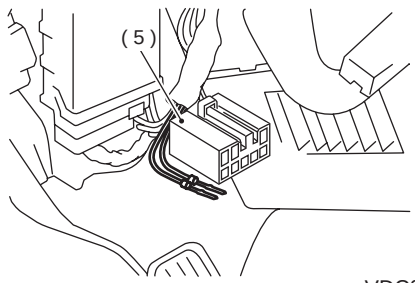
VDC (DIAGNOSTICS)



VDC00156

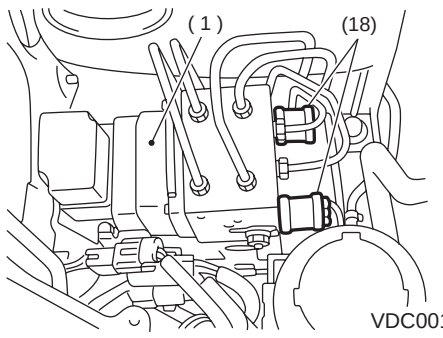


VDC00118

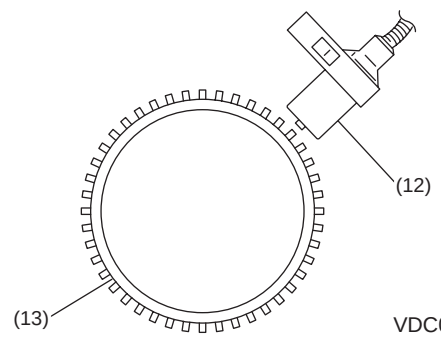


VDC00119

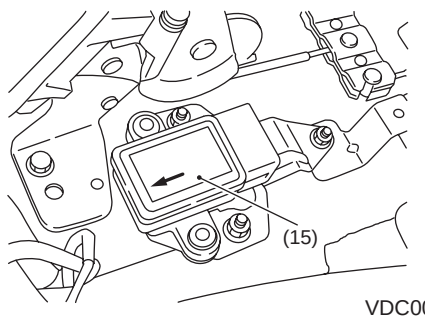
VDC00157



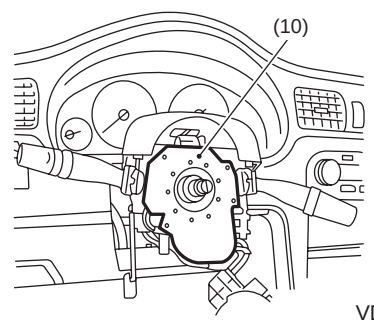
VDC00121



VDC00122



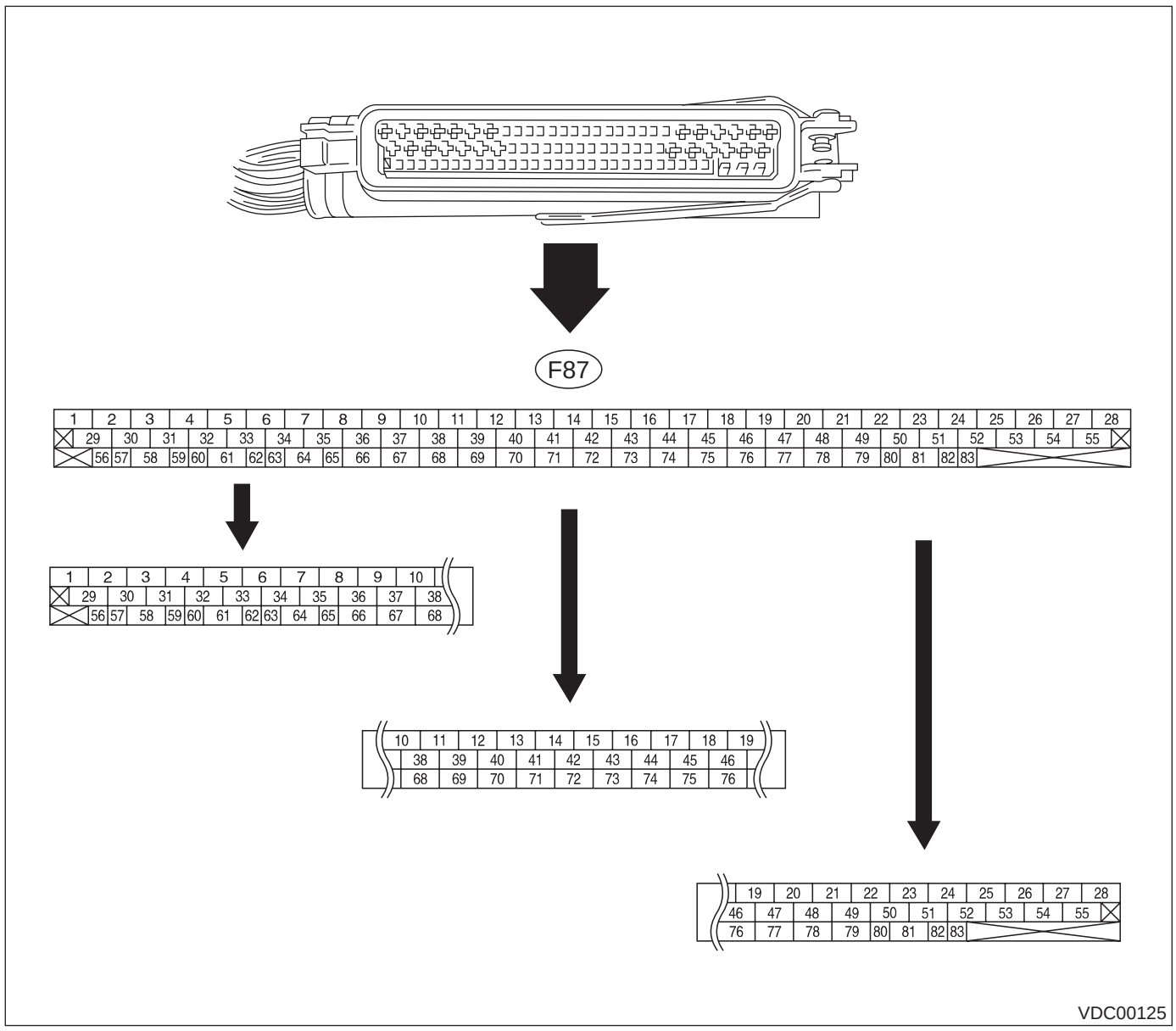
VDC00123



VDC00124

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:
- The terminal numbers in the VDC control module connector are as shown in the figure.
- When the connector is removed from the VDCCM, the connector switch closes the circuit between terminal No. 53, No. 54 and No. 55. The ABS and VDC warning light illuminate.

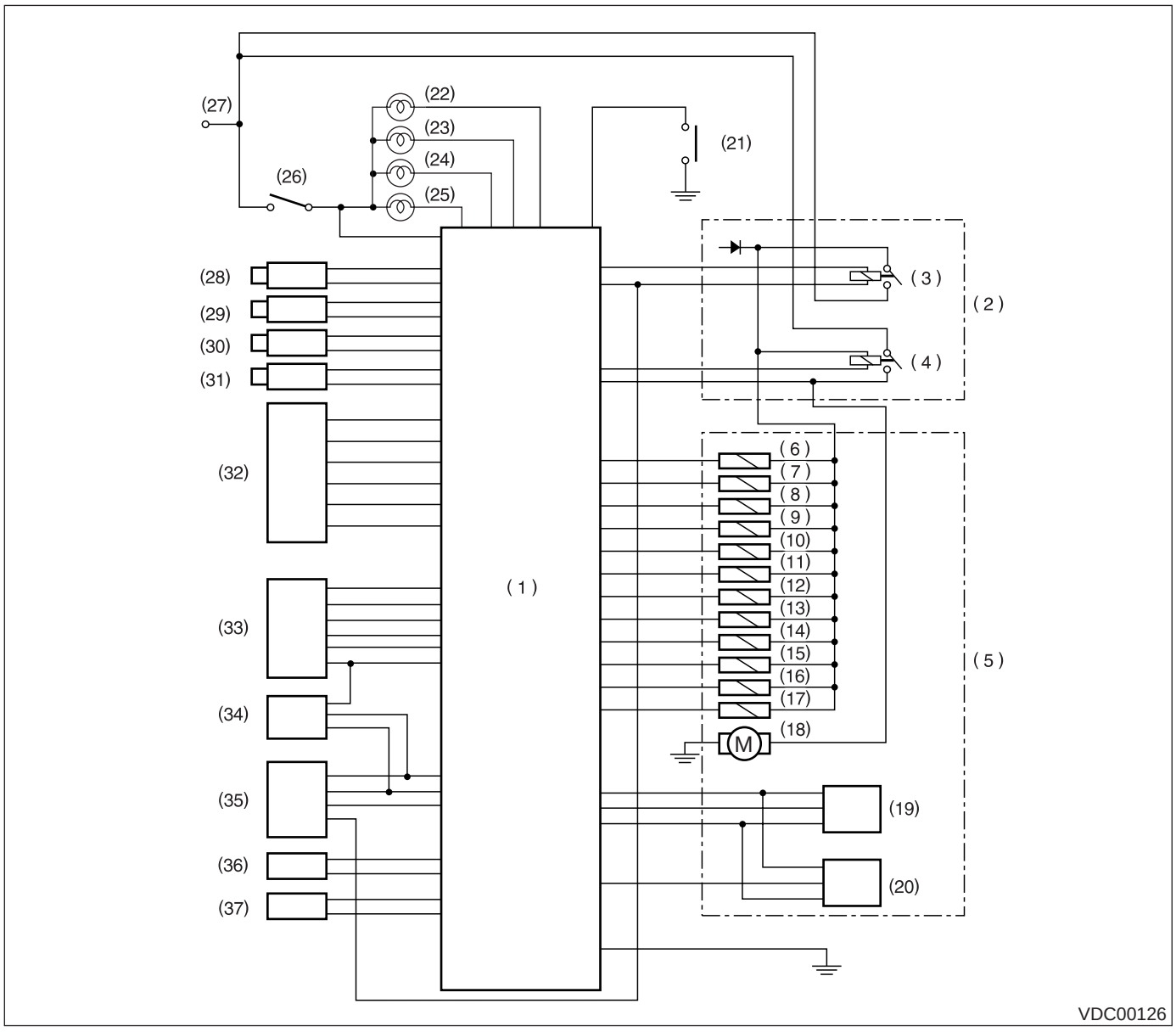
CONTROL MODULE I/O SIGNAL

Contents		Terminal No. (+)—(–)	Input/Output signal Measured value and measuring condition
Ignition switch		28—1	10 — 15 V when ignition switch is ON.
ABS sensor (Wheel speed sensor)	Front left wheel	49—19	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	14—15	
	Rear left wheel	16—17	
	Rear right wheel	18—46	
Yaw rate and lateral G sensor	Output (Lateral G sensor)	70—64	2.2 — 2.8 V when vehicle is in horizontal position.
	Power supply	63—64	10 — 15 V when ignition switch is ON.
	Output (Yaw rate sensor)	65—64	Wave form <Ref. to VDC-18, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Reference (Yaw rate sensor)	66—64	2.1 — 2.9 V
	Test	67—64	40 ms pulse signal with a cycle of 5 — 1 V <Ref. to VDC-18, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Ground	64	—
CAN communication line (+)		81—1	2.5 — 1.5 V pulse signal <Ref. to VDC-18, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
CAN communication line (–)		83—1	3.5 — 2.5 V pulse signal <Ref. to VDC-18, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
Engine module	AET	21—1	1.5 V or less (ABS/TCS/VDC operating); 10 V or more (ABS/TCS/VDC not operating)
	AEB	43—1	10 — 15 V (Ignition switch ON and vehicle at standstill)
	AEC	8—1	10 — 15 V (Ignition switch ON and vehicle at standstill)
	EAS	75—1	3.5 — 1.5 V pulse signal
	EAC	45—1	3.5 — 1.5 V pulse signal
	Revolution	9—1	10 — 1.5 V pulse signal
Relay box	Valve relay power supply	27—1	10 — 15 V when ignition switch is ON.
	Valve relay coil	47—1	Less than 1.5 V when ignition switch is ON.
	Motor relay coil	22—1	1.5 V or less (ABS/TCS/VDC operating); 10 V or more (ABS/TCS/VDC not operating)
	Motor monitoring	10—1	10 V or less (ABS/TCS/VDC operating); 1.5 V or more (ABS/TCS/VDC not operating)
Hydraulic control unit	Front left inlet solenoid valve	24—1	10 — 15 V when the valve is OFF and less than 1.5 V when the valve is ON.
	Front right inlet solenoid valve	30—1	
	Rear left inlet solenoid valve	31—1	
	Rear right inlet solenoid valve	23—1	
	Front left outlet solenoid valve	51—1	
	Front right outlet solenoid valve	3—1	
	Rear left outlet solenoid valve	4—1	
	Rear right outlet solenoid valve	50—1	
	Primary cut solenoid valve	25—1	
	Secondary cut solenoid valve	26—1	
	Primary suction solenoid valve	29—1	
	Secondary suction solenoid valve	2—1	
Pressure sensor	Power supply	78—76	4.75 — 5.25 V when ignition switch is ON.
	Primary output	77—76	0.48 — 0.72 V (Brake pedal released)
	Ground	76	—
	Secondary output	36—76	0.48 — 0.72 V (Brake pedal released)
VDC operation indicator light		32—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
VDC OFF indicator light		52—1	1.5 V or less (Ignition switch ON and VDC OFF indicator light ON); 10 — 15 V (Ignition switch ON and VDC OFF indicator light OFF)

CONTROL MODULE I/O SIGNAL

VDC warning light		53—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
ABS warning light		54—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
Diagnosis connector	Terminal No. 8	13	—
	Terminal No. 5	74	—
Select monitor	Data is received.	11—1	Less than 1.5 V when no data is received.
	Data is sent.	38—1	4.75 — 5.25 V when no data is sent.
VDC OFF switch		40—1	10 — 15 V when ignition switch is ON. 0 V (While pushing the switch)
Ground		1	—
Ground		55	—

B: SCHEMATIC



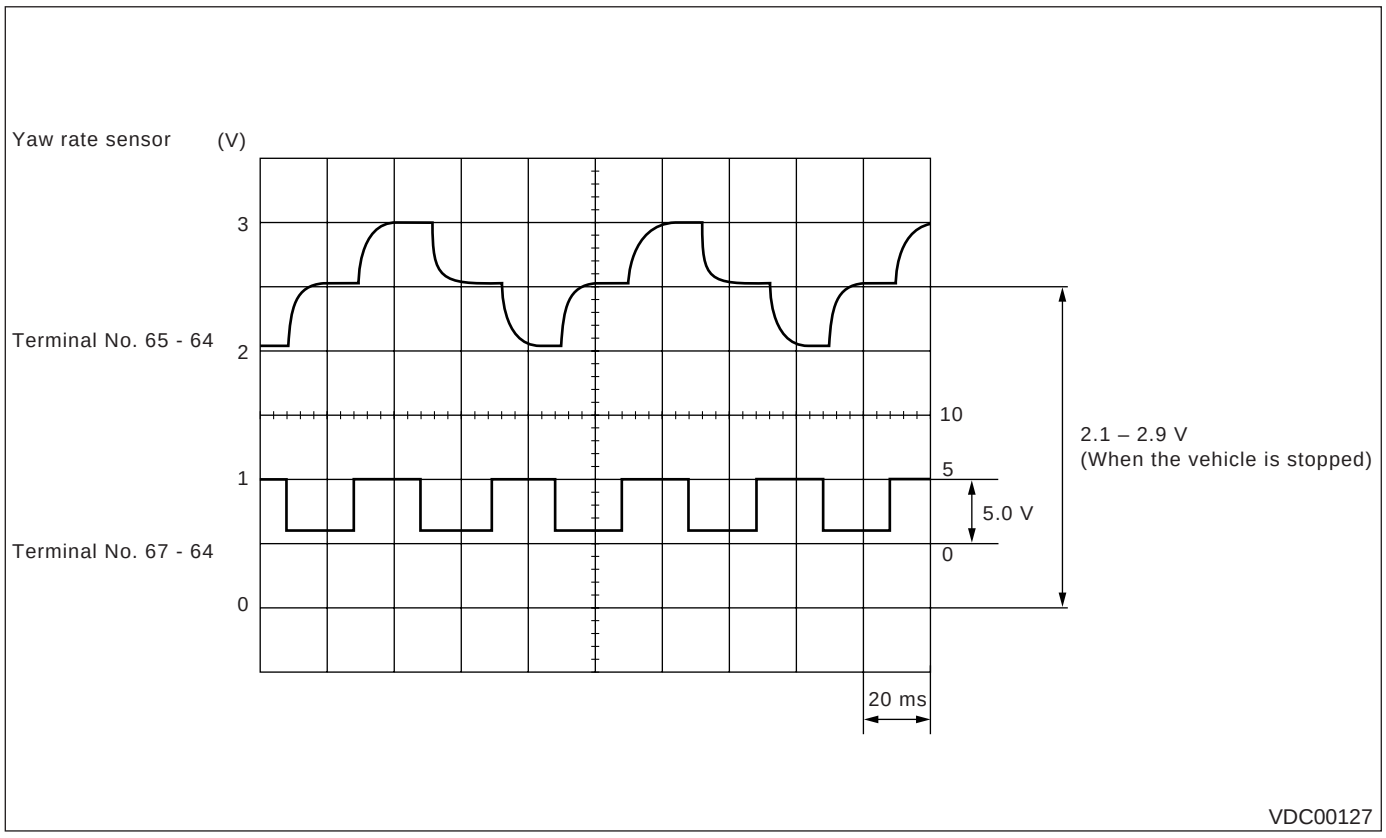
(1) VDC control module
(2) Relay box
(3) Valve relay
(4) Motor relay
(5) Hydraulic control unit
(6) Front left inlet solenoid valve
(7) Front left outlet solenoid valve
(8) Front right inlet solenoid valve
(9) Front right outlet solenoid valve
(10) Rear left inlet solenoid valve
(11) Rear left outlet solenoid valve
(12) Rear right inlet solenoid valve
(13) Rear right outlet solenoid valve
(14) Primary suction solenoid valve
(15) Primary cut solenoid valve
(16) Secondary suction solenoid valve
(17) Secondary cut solenoid valve
(18) Motor
(19) Primary pressure sensor
(20) Secondary pressure sensor
(21) VDC OFF switch
(22) ABS warning light
(23) VDC warning light
(24) VDC operating indicator light
(25) VDC OFF indicator light
(26) Ignition relay
(27) BATTERY
(28) Front left ABS sensor
(29) Front right ABS sensor
(30) Rear left ABS sensor
(31) Rear right ABS sensor
(32) Yaw rate and lateral G sensor
(33) Engine control module
(34) Transmission control module
(35) Steering angle sensor
(36) Diagnosis connector
(37) Data link connector

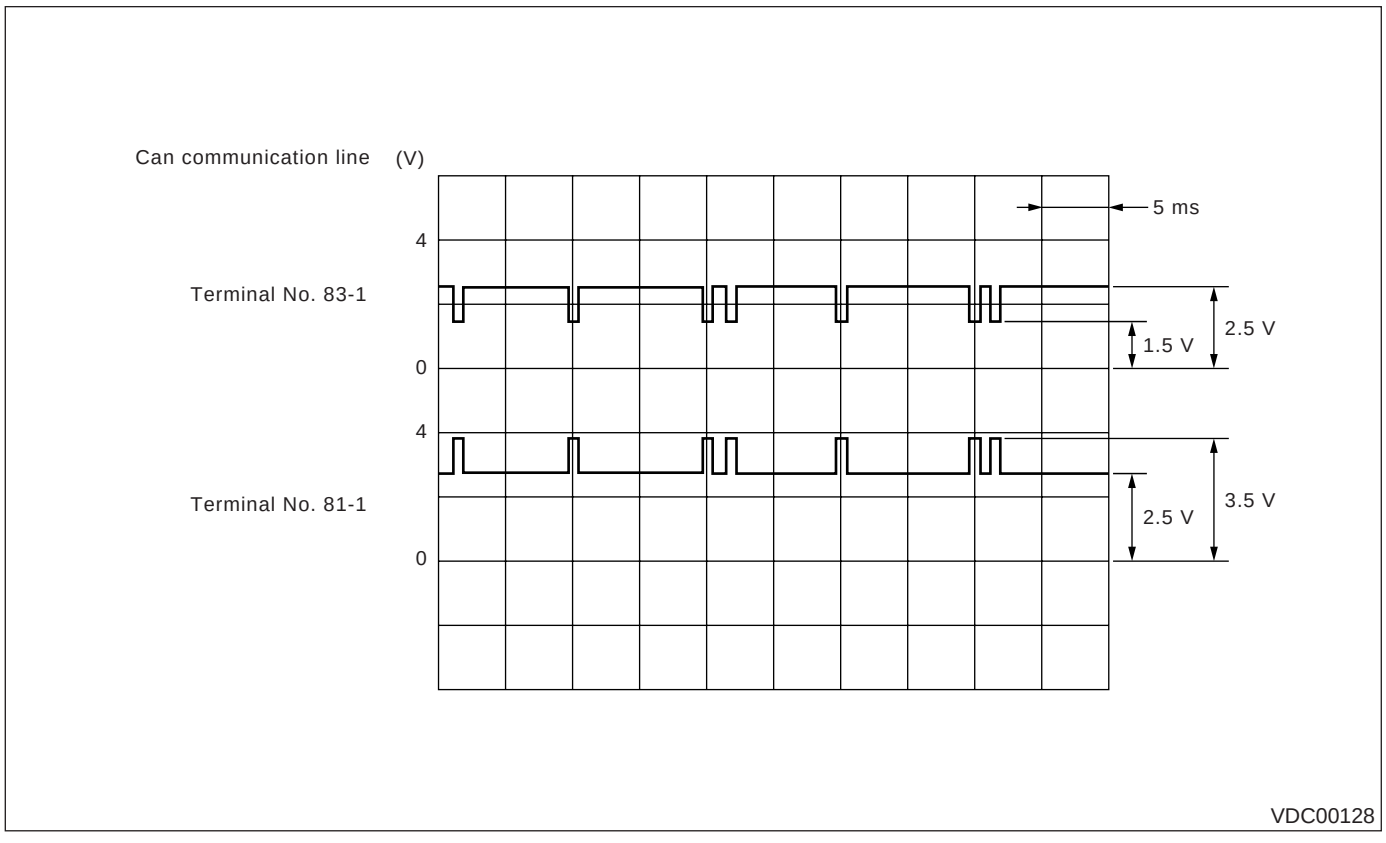
C: MEASUREMENT

Measure input/output signal voltage.

NOTE:
Measure with the VDCCM connector cover removed. <Ref. to VDC-19, VDCCM Connector Cover.>

1. WAVEFORM



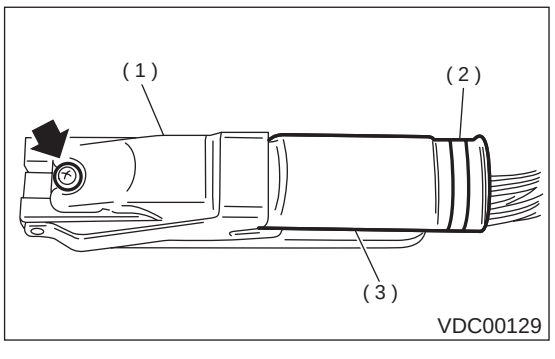


6. VDCCM Connector Cover

A: REMOVE

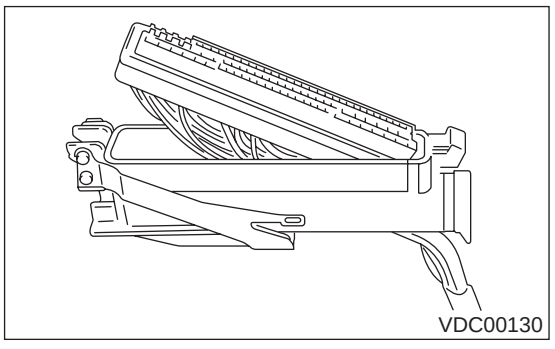
1) Turn ignition switch OFF.
2) Disconnect connector from VDCCM.
3) Remove band.
4) Remove cable clamp cover.
5) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.



(1) Connector cover
(2) Band
(3) Cable clamp cover

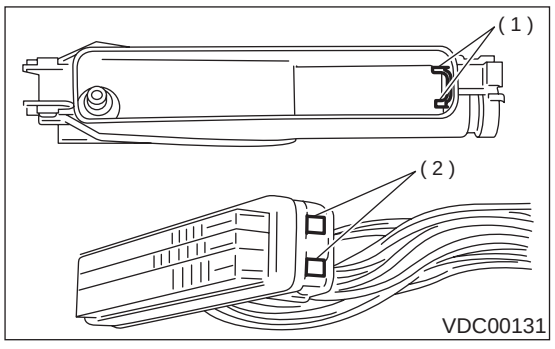
6) Remove connector cover.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Align connector cover rib with connector hole before installation.



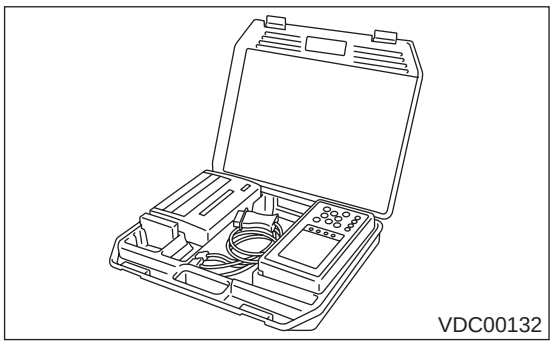
(1) Rib
(2) Hole

7. Subaru Select Monitor

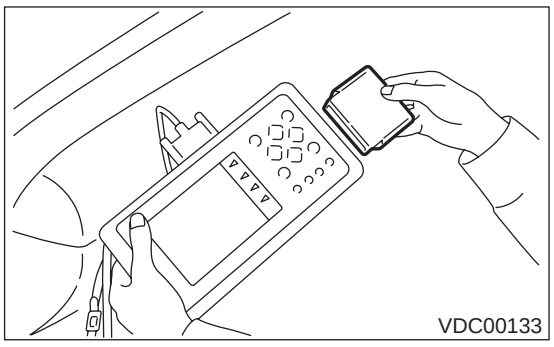
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE

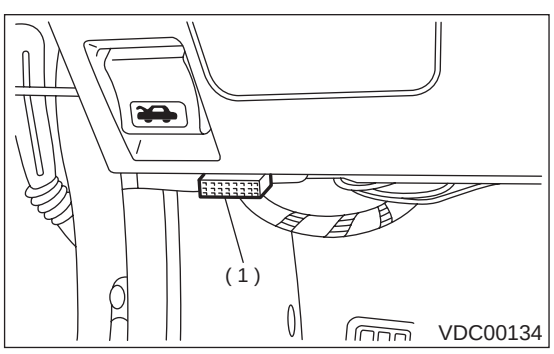
1) Prepare Subaru Select Monitor kit.


VDC00132

2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to VDC-10, SPECIAL TOOLS, PREPARATION TOOL, General Description.>


VDC00133

4) Connect Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).

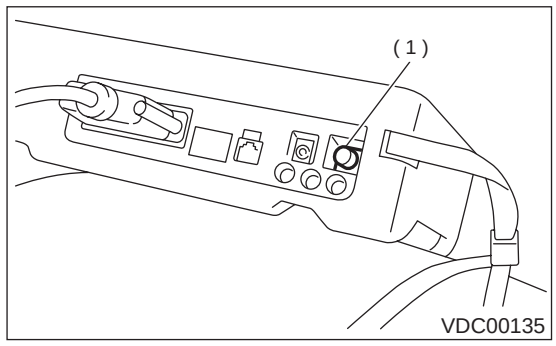


VDC00134

(1) Data link connector

(2) Connect diagnosis cable to data link connector.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.

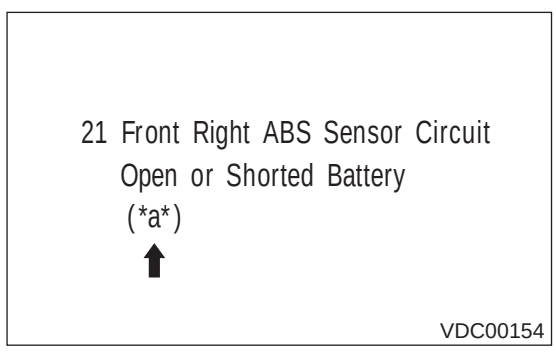


VDC00135

(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control System} and press the [YES] key.
8) Press the [YES] key after displayed the information of engine type.
9) On the «Brake Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
10) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the DIAGNOSTIC TROUBLE CODE LIST.
<Ref. to VDC-27, List of Diagnostic Trouble Code (DTC).>
• A maximum of 3 trouble codes are displayed in order of occurrence.



VDC00154

a refers to the troubles in order of occurrence (Latest, Old, Older).

Display screen	Contents to be monitored
Latest	The most recent trouble code appears on the select monitor display.
Old	The second most recent trouble code appears on the select monitor display.
Older	The third most recent trouble code appears on the select monitor display.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select {Each System Check} and press the «YES» key.
2) On the «System Selection Menu» display screen, select {Brake Control System} and press «YES» key.
3) Press the «YES» key after the VDC type is displayed.
4) On the «Brake Control Diagnosis» display screen, select {Current Data Display & Save} and press the «YES» key.
5) On the «Data Display Menu» display screen, select {Data Display} and press the «YES» key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Display screen	Contents to be monitored.	Unit of measure
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed.	km/h or MPH
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed.	km/h or MPH
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed.	km/h or MPH
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor is displayed.	km/h or MPH
Steering angle sensor	Steering wheel angle detected by the steering angle sensor is displayed.	deg
Yaw rate sensor	Vehicle's angular velocity detected by the yaw rate sensor is displayed.	deg/s
Lateral G sensor	Vehicle's lateral acceleration detected by the lateral G sensor is displayed.	V
Pressure sensor 1	Brake fluid pressure detected by the primary pressure sensor is displayed.	V
Pressure sensor 2	Brake fluid pressure detected by the secondary pressure sensor is displayed.	V
Longitudinal G sensor	Longitudinal G sensor is not equipped on vehicles after '00MY. But longitudinal G sensor will remain on monitor and 0 V will be displayed.	V
ABS CM power voltage	Voltage supplied to VDCCM is displayed.	V
Torque driver requires	Engine torque requested by the driver is displayed.	N·m
Current torque	Current engine torque is displayed.	N·m
Valve relay signal	Drive condition of the valve relay is displayed.	ON or OFF
Motor relay signal	Drive condition of the motor relay is displayed.	ON or OFF
VDC OFF lamp	ON operation of the VDC OFF indicator lamp is displayed.	ON or OFF
Motor relay monitor	Operating condition of the motor relay is displayed.	High or Low
PW signal	Accelerator position signal is displayed.	1 or 0
AET signal	Engine control start signal is displayed.	OPEN or GND
AEB signal	Engine control signal is displayed.	OPEN or GND
AEC signal	Engine control signal is displayed.	OPEN or GND
EAM signal	Engine control command signal is displayed.	1 or 0

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select {2. Each System Check} and press the «YES» key.
2) On the «System Select Menu» display screen, select {Brake System} and press the «YES» key.
3) Press the «YES» key after the engine type is displayed.
4) On the «Brake Control Diagnosis» display screen, select {Clear Memory} and press the «YES» key.
5) When `Done' and `turn ignition switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. FUNCTION CHECK

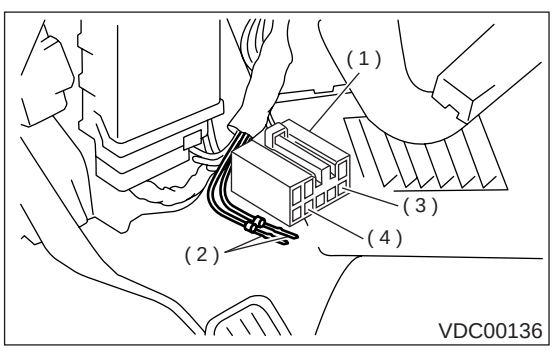
Display screen	Contents to be monitored	Index No.
ABS sequence control mode	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to VDC-16, ABS Sequence Control.>
VDC check mode	Perform VDC sequence control by operating valve and pump motor sequentially.	<Ref. to VDC-19, VDC Sequence Control.>
Set mode St. r. A. Sen. N & Lat. G Sen. Op	Set both the neutral position of the steering angle sensor and the zero “0” point of the lateral G sensor.	<Ref. to VDC-26, Steering Angle Sensor.>

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

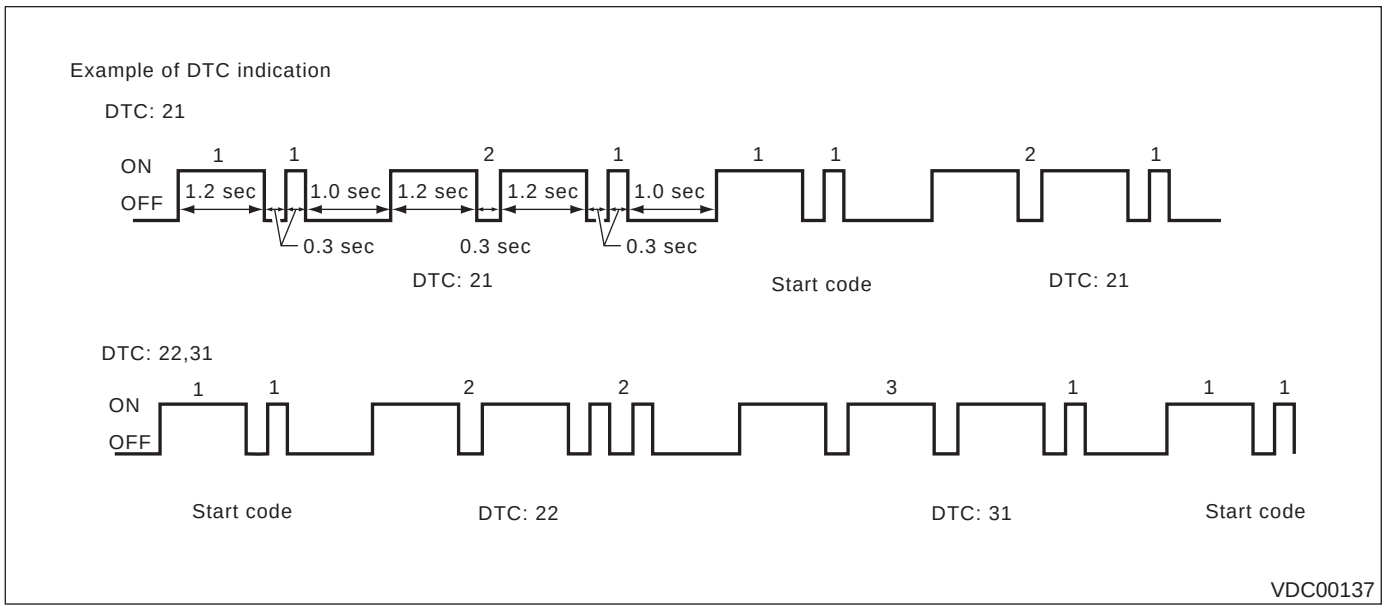
1) Take out diagnosis connector from side of driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Turn ignition switch OFF.
3) Connect diagnosis connector terminal 8 to diagnosis terminal.
4) Turn ignition switch ON.
5) ABS warning light is set in the diagnostic mode and blinks to identify diagnostic trouble code (DTC).
6) After the start code (11) is shown, the diagnostic trouble codes (DTCs) will be shown in order of the last information first.
These repeat for a maximum of 5 minutes.

NOTE:
• When there are no diagnostic trouble codes (DTCs) in memory, only the start code (11) is shown.
• When on-board diagnosis of the VDC control module detects a problem, the information (up to a maximum of three) will be stored in the EEP ROM as a diagnostic trouble code (DTC). When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand diagnostic trouble codes (DTCs). <Ref. to VDC-<Ref. to VDC-20, Subaru Select Monitor.>, Subaru Select Monitor.>

9. Inspection Mode

A: OPERATION

Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at least ten minutes.

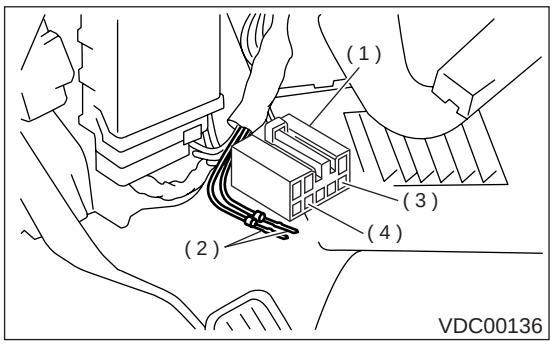
NOTE:
Make sure vehicle does not pull to one side during normal driving.

10.Clear Memory Mode

A: OPERATION

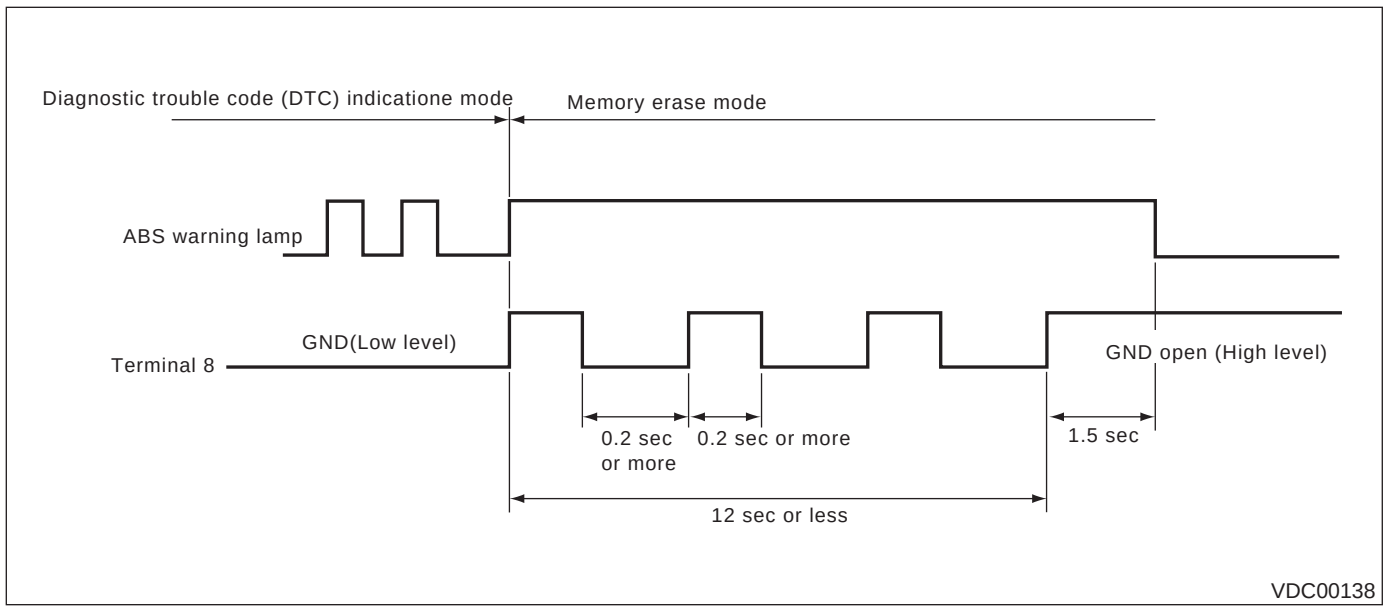
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a diagnostic trouble code (DTC), disconnect diagnosis connector terminal 8 from diagnosis terminal.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 8 and diagnosis terminal for at least 0.2 seconds each time.



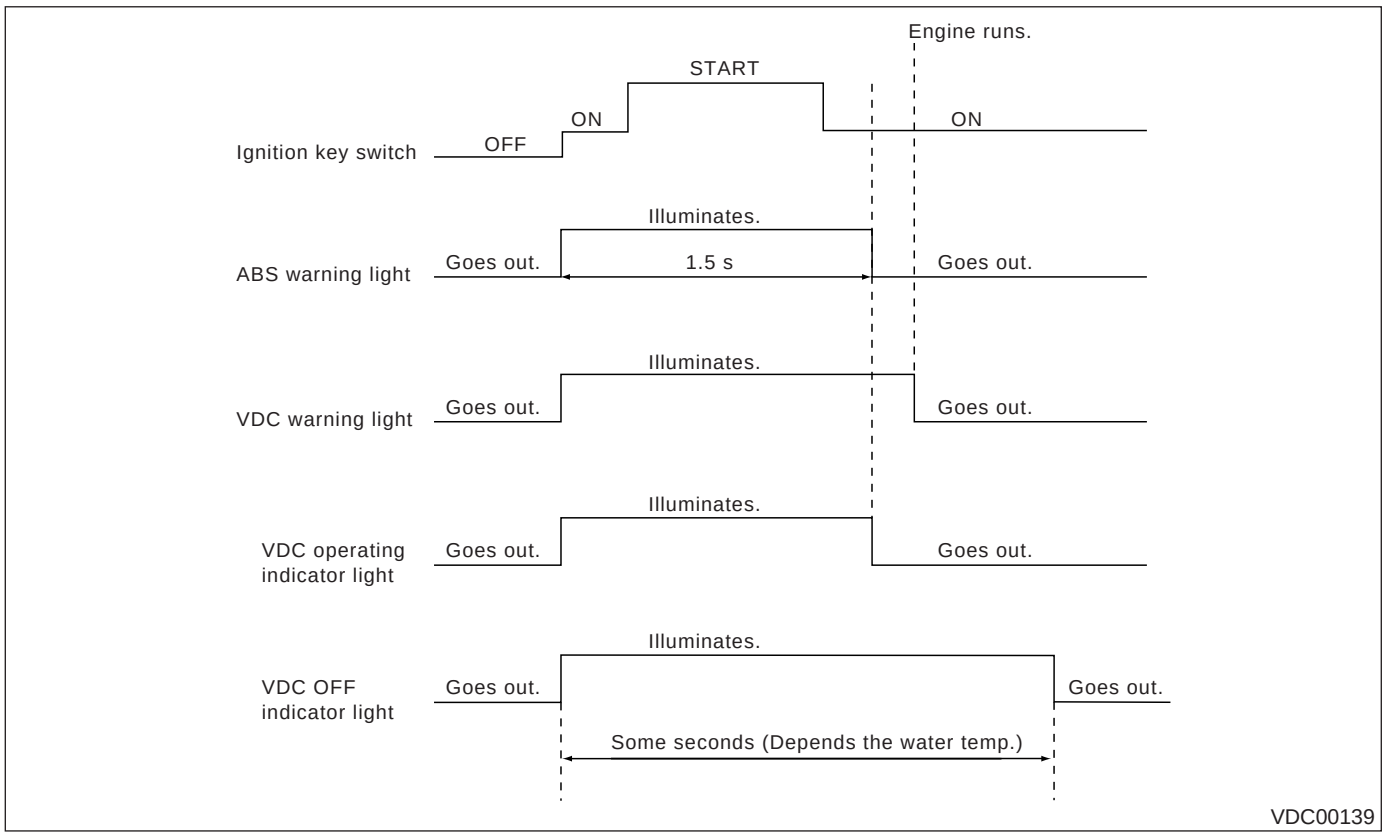
NOTE:
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear diagnostic trouble codes (DTCs). <Ref. to VDC-20, Subaru Select Monitor.>

11.Warning Light Illumination Pattern

A: INSPECTION



1) When the warning and/or indicator lights do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the warning and/or indicator lights remain constantly OFF, repair the warning and/or indicator lights circuit or diagnosis circuit. <Ref. to VDC-33, ABS WARNING LIGHT, VDC WARNING LIGHT, VDC OPERATING INDICATOR LIGHT OR VDC OFF INDICATOR LIGHT DOES NOT COME ON., Diagnostics Chart with Diagnosis Connector.>

NOTE:
• Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the VDC system operates normally when the warning light goes out while driving at approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the ABS warning light is illuminated.
• It may take a few minutes for the VDC OFF indicator light to go out when the vehicle is exposed for some time in a low temperature area. This is not a problem because of low engine coolant temperatures.
• If a vehicle wheel is stuck or free-spinning for approximately 1 minute, power transfer fluctuation to the remaining wheels will occur. Power transfer conditions will differ from those occurring during normal vehicle operation. The ABS sensor will detect this condition. The ABS and VDC warning lights will illuminate. If the vehicle is operated with the four wheels lifted off the ground or with the four wheels placed on rollers, the VDCCM will detect a problem with the speed sensor and the ABS and VDC warning lights may illuminate. In this case, there is no abnormality. Clear the diagnostic code from memory.
• When the engine is started and vehicle movement begins, the VDCH/U motor pump and solenoid valve will operate for a few seconds. This permits checking of VDC function. Normal motor pump and solenoid valve operational noise will be heard. Normal brake pedal kick back will be felt when the brake pedal is depressed. In this case, there is no abnormality.

12.List of Diagnostic Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC No.	Contents of diagnosis		Index No.
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor	<Ref. to VDC-48, DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
23		Front left ABS sensor	<Ref. to VDC-48, DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
25		Rear right ABS sensor	<Ref. to VDC-48, DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
27		Rear left ABS sensor	<Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor	<Ref. to VDC-54, DTC 22 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
24		Front left ABS sensor	<Ref. to VDC-54, DTC 24 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
26		Rear right ABS sensor	<Ref. to VDC-54, DTC 26 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
28		Rear left ABS sensor	<Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>
29		Any one of four	<Ref. to VDC-60, DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR), Diagnostics Chart with Diagnosis Connector.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Contents of diagnosis		Index No.
31	Abnormal solenoid valve circuit(s)	Front right inlet valve	<Ref. to VDC-63, DTC 31 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT RH INLET), Diagnostics Chart with Diagnosis Connector.>
32		Front right outlet valve	<Ref. to VDC-68, DTC 32 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT RH OUTLET), Diagnostics Chart with Diagnosis Connector.>
33		Front left inlet valve	<Ref. to VDC-63, DTC 33 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT LH INLET), Diagnostics Chart with Diagnosis Connector.>
34		Front left outlet valve	<Ref. to VDC-68, DTC 34 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT LH OUTLET), Diagnostics Chart with Diagnosis Connector.>
35		Rear right inlet valve	<Ref. to VDC-63, DTC 35 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR RH INLET), Diagnostics Chart with Diagnosis Connector.>
36		Rear right outlet valve	<Ref. to VDC-68, DTC 36 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR RH OUTLET), Diagnostics Chart with Diagnosis Connector.>
37		Rear left inlet valve	<Ref. to VDC-63, DTC 37 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR LH INLET), Diagnostics Chart with Diagnosis Connector.>
38		Rear left outlet valve	<Ref. to VDC-68, DTC 38 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR LH OUTLET), Diagnostics Chart with Diagnosis Connector.>
61		Primary cut valve	<Ref. to VDC-63, DTC 61 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (PRIMARY CUT), Diagnostics Chart with Diagnosis Connector.>
62		Secondary cut valve	<Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>
63		Primary suction valve	<Ref. to VDC-68, DTC 63 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (PRIMARY SUCTION), Diagnostics Chart with Diagnosis Connector.>
64		Secondary suction valve	<Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>
41	Abnormal VDC control module		<Ref. to VDC-74, DTC 41 ABNORMAL VDC CONTROL MODULE, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.		<Ref. to VDC-76, DTC 42 SOURCE VOLTAGE IS ABNORMAL., Diagnostics Chart with Diagnosis Connector.>
43	Faulty VDCCM-ECM communication line		<Ref. to VDC-78, DTC 43 FAULTY VDCCM — ECM COMMUNICATION LINE, Diagnostics Chart with Diagnosis Connector.>
44	A communication with AT control abnormal		<Ref. to VDC-82, DTC 44 A COMMUNICATION WITH AT CONTROL ABNORMAL, Diagnostics Chart with Diagnosis Connector.>
45	Control module out of specification		<Ref. to VDC-84, DTC 45 CONTROL MODULE OUT OF SPECIFICATION, Diagnostics Chart with Diagnosis Connector.>
46	Abnormal voltage of 5 V power supply		<Ref. to VDC-86, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Diagnosis Connector.>
47	Faulty CAN communication line		<Ref. to VDC-90, DTC 47 FAULTY CAN COMMUNICATION LINE, Diagnostics Chart with Diagnosis Connector.>
48	Faulty ECM-VDCCM communication line		<Ref. to VDC-94, DTC 48 FAULTY ECM — VDCCM COMMUNICATION LINE, Diagnostics Chart with Diagnosis Connector.>
49	Abnormal engine speed signal		<Ref. to VDC-96, DTC 49 ABNORMAL ENGINE SPEED SIGNAL, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay		<Ref. to VDC-98, DTC 51 ABNORMAL VALVE RELAY, Diagnostics Chart with Diagnosis Connector.>

DTC No.	Contents of diagnosis	Index No.
52	Abnormal motor and/or motor relay	<Ref. to VDC-106, DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY, Diagnostics Chart with Diagnosis Connector.>
71	Abnormal steering angle sensor	<Ref. to VDC-112, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
72	Abnormal yaw rate sensor	<Ref. to VDC-116, DTC 72 ABNORMAL YAW RATE SENSOR, Diagnostics Chart with Diagnosis Connector.>
73	Abnormal lateral G sensor	<Ref. to VDC-120, DTC 73 ABNORMAL LATERAL G SENSOR, Diagnostics Chart with Diagnosis Connector.>
74	Abnormal pressure sensor	<Ref. to VDC-124, DTC 74 ABNORMAL PRESSURE SENSOR, Diagnostics Chart with Diagnosis Connector.>

If any of the following multiple diagnostic trouble codes (DTCs) are present in memory, check the area corresponding to the first diagnostic trouble code (DTC). If no problem is detected, check the areas corresponding to the other diagnostic trouble codes (DTCs) in order of their appearance.

Combination of DTC No.	Problem area	Index No.
46, 74	(F87) — No. 78, 68 or 69 lead circuit is shorted to ground or battery.	<Ref. to VDC-86, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Diagnosis Connector.>
44, 71	(F87) — No. 83 or 81 lead circuit is open.	<Ref. to VDC-112, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
51, 48, 71	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-112, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
71, 51, 44	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-112, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
72, 73	(F87) — No. 63 lead circuit is open.	<Ref. to VDC-120, DTC 73 ABNORMAL LATERAL G SENSOR, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

DTC No.	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Select monitor communication failure	<Ref. to VDC-128, COMMUNICATION FOR INITIALIZING IMPOSSIBLE (SELECT MONITOR COMMUNICATION FAILURE), Diagnostics Chart with Select Monitor.>
—	No trouble code	Although no diagnostic trouble code appears on the select monitor display, the ABS warning light and/or VDC warning light and/or VDC operating indicator light and/or VDC OFF indicator light remains on.	<Ref. to VDC-33, Diagnostics Chart with Diagnosis Connector.>
—	No trouble code	Although no diagnostic trouble code appears on the select monitor display, the ABS warning light and/or VDC warning light and/or VDC operating indicator light and/or VDC OFF indicator light remains off.	<Ref. to VDC-33, Diagnostics Chart with Diagnosis Connector.>
21	Front right ABS sensor circuit open or shorted battery	Open or short circuit in front right ABS sensor circuit	<Ref. to VDC-131, DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
22	Front right ABS sensor signal	Front right ABS sensor abnormal signal	<Ref. to VDC-137, DTC 22 FRONT RIGHT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Display screen	Contents of diagnosis	Index No.
23	Front left ABS sensor circuit open or shorted battery	Open or short circuit in front left ABS sensor circuit	<Ref. to VDC-131, DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
24	Front left ABS sensor signal	Front left ABS sensor abnormal signal	<Ref. to VDC-137, DTC 24 FRONT LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
25	Rear right ABS sensor circuit open or shorted battery	Open or short circuit in rear right ABS sensor circuit	<Ref. to VDC-131, DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
26	Rear right ABS sensor signal	Rear right ABS sensor abnormal signal	<Ref. to VDC-137, DTC 26 REAR RIGHT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
27	Rear left ABS sensor circuit open or shorted battery	Open or short circuit in rear left ABS sensor circuit	<Ref. to VDC-132, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
28	Rear left ABS sensor signal	Rear left ABS sensor abnormal signal	<Ref. to VDC-138, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
29	Any one of four ABS sensor signal	Abnormal ABS sensor signal on any one of four sensor	<Ref. to VDC-144, DTC 29 ANY ONE OF FOUR ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
31	FR hold valve malfunction	Front right inlet solenoid valve	<Ref. to VDC-147, DTC 31 FR HOLD VALVE MALFUNCTION (FRONT RIGHT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
32	FR pressure reducing valve malfunction	Front right outlet solenoid valve malfunction	<Ref. to VDC-152, DTC 32 FR PRESSURE REDUCING VALVE MALFUNCTION (FRONT RIGHT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
33	FL hold valve malfunction	Front left inlet solenoid valve malfunction	<Ref. to VDC-147, DTC 33 FL HOLD VALVE MALFUNCTION (FRONT LEFT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
34	FL pressure reducing valve malfunction	Front left outlet solenoid valve	<Ref. to VDC-152, DTC 34 FL PRESSURE REDUCING VALVE MALFUNCTION (FRONT LEFT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
35	RR hold valve malfunction	Rear right inlet solenoid valve malfunction	<Ref. to VDC-147, DTC 35 RR HOLD VALVE MALFUNCTION (REAR RIGHT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
36	RR pressure reducing valve malfunction	Rear right outlet solenoid valve	<Ref. to VDC-152, DTC 36 RR PRESSURE REDUCING VALVE MALFUNCTION (REAR RIGHT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
37	RL hold valve malfunction	Rear left inlet solenoid valve malfunction	<Ref. to VDC-147, DTC 37 RL HOLD VALVE MALFUNCTION (REAR LEFT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
38	RL pressure reducing valve malfunction	Rear left outlet solenoid valve	<Ref. to VDC-152, DTC 38 RL PRESSURE REDUCING VALVE MALFUNCTION (REAR LEFT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
41	Electrical control module	VDC control module malfunction	<Ref. to VDC-158, DTC 41 ELECTRICAL CONTROL MODULE (VDC CONTROL MODULE MALFUNCTION), Diagnostics Chart with Select Monitor.>
42	Power supply voltage low	Power supply voltage too low	<Ref. to VDC-160, DTC 42 POWER SUPPLY VOLTAGE LOW, Diagnostics Chart with Select Monitor.>
43	AET communication line malfunction	AET communication line malfunction	<Ref. to VDC-162, DTC 43 AET COMMUNICATION LINE MALFUNCTION, Diagnostics Chart with Select Monitor.>
43	AEB communication line malfunction	AEB communication line malfunction	<Ref. to VDC-166, DTC 43 AEB COMMUNICATION LINE MALFUNCTION, Diagnostics Chart with Select Monitor.>
43	AEC communication line malfunction	AEC communication line malfunction	<Ref. to VDC-170, DTC 43 AEC COMMUNICATION LINE MALFUNCTION, Diagnostics Chart with Select Monitor.>
44	TCM communication circuit	TCM communication line malfunction	<Ref. to VDC-174, DTC 44 TCM COMMUNICATION CIRCUIT, Diagnostics Chart with Select Monitor.>
45	Incorrect VDC control module	Incorrect VDC control module	<Ref. to VDC-176, DTC 45 INCORRECT VDC CONTROL MODULE, Diagnostics Chart with Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Display screen	Contents of diagnosis	Index No.
45	TCM malfunction specifications	TCM malfunction specifications	<Ref. to VDC-177, DTC 45 TCM MALFUNCTION SPECIFICATIONS, Diagnostics Chart with Select Monitor.>
46	Abnormal voltage of 5 V power supply	Abnormal voltage of 5 V power supply	<Ref. to VDC-178, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Select Monitor.>
47	Improper CAN communication	CAN communication line malfunction	<Ref. to VDC-182, DTC 47 IMPROPER CAN COMMUNICATION, Diagnostics Chart with Select Monitor.>
48	Improper EAC communication	EAC communication line malfunction	<Ref. to VDC-186, DTC 48 IMPROPER EAC COMMUNICATION, Diagnostics Chart with Select Monitor.>
48	EAS communication line grounding shorted	EAS communication line grounding	<Ref. to VDC-188, DTC 48 EAS COMMUNICATION LINE GROUNDING SHORTED, Diagnostics Chart with Select Monitor.>
48	Erroneous communication from EGI to VDC	Faulty ECM-VDCCM communication line	<Ref. to VDC-190, DTC 48 ERRONEOUS COMMUNICATION FROM EGI TO VDC, Diagnostics Chart with Select Monitor.>
49	Abnormal engine speed signal	Abnormal engine speed signal	<Ref. to VDC-192, DTC 49 ABNORMAL ENGINE SPEED SIGNAL, Diagnostics Chart with Select Monitor.>
51	Valve relay	Valve relay malfunction	<Ref. to VDC-194, DTC 51 VALVE RELAY, Diagnostics Chart with Select Monitor.>
51	Valve relay ON failure	Valve relay ON failure	<Ref. to VDC-200, DTC 51 VALVE RELAY ON FAILURE, Diagnostics Chart with Select Monitor.>
52	Motor and motor relay OFF failure	Motor and motor relay OFF failure	<Ref. to VDC-206, DTC 52 MOTOR AND MOTOR RELAY OFF FAILURE, Diagnostics Chart with Select Monitor.>
52	Motor and motor relay ON failure	Motor and motor relay ON failure	<Ref. to VDC-210, DTC 52 MOTOR AND MOTOR RELAY ON FAILURE, Diagnostics Chart with Select Monitor.>
52	Motor malfunction	Motor malfunction	<Ref. to VDC-216, DTC 52 MOTOR MALFUNCTION, Diagnostics Chart with Select Monitor.>
61	Normal opening valve 2 malfunction	Primary cut valve malfunction	<Ref. to VDC-147, DTC 61 NORMAL OPENING VALVE 2 MALFUNCTION (PRIMARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
62	Normal opening valve 1 malfunction	Secondary cut valve malfunction	<Ref. to VDC-148, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
63	Normal closing valve 2 malfunction	Primary suction valve malfunction	<Ref. to VDC-152, DTC 63 NORMAL CLOSING VALVE 2 MALFUNCTION (PRIMARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
64	Normal closing valve 1 malfunction	Secondary suction valve malfunction	<Ref. to VDC-154, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
71	Steering angle sensor offset is too big.	Steering angle sensor offset is too big.	<Ref. to VDC-220, DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG., Diagnostics Chart with Select Monitor.>
71	Change range of steering angle sensor is too big.	Change range of steering angle sensor is too big.	<Ref. to VDC-222, DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG., Diagnostics Chart with Select Monitor.>
71	Steering angle sensor malfunction	Steering angle sensor malfunction	<Ref. to VDC-224, DTC 71 STEERING ANGLE SENSOR MALFUNCTION, Diagnostics Chart with Select Monitor.>
71	No signal from steering angle sensor	No signal from steering angle sensor	<Ref. to VDC-226, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
72	Abnormal yaw rate sensor output	Abnormal yaw rate sensor output	<Ref. to VDC-230, DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT, Diagnostics Chart with Select Monitor.>
72	Voltage inputted to yaw rate sensor exceeds specification.	Voltage inputted to yaw rate sensor exceeds specification.	<Ref. to VDC-234, DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION., Diagnostics Chart with Select Monitor.>
72	Abnormal yaw rate sensor reference voltage	Abnormal yaw rate sensor reference voltage	<Ref. to VDC-238, DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE, Diagnostics Chart with Select Monitor.>
72	Change range of yaw rate sensor signal is too big.	Change range of yaw rate sensor signal is too big.	<Ref. to VDC-242, DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG., Diagnostics Chart with Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Display screen	Contents of diagnosis	Index No.
73	Lateral G sensor offset is too big.	Lateral G sensor offset is too big.	<Ref. to VDC-246, DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG., Diagnostics Chart with Select Monitor.>
73	Abnormal lateral G sensor output	Abnormal lateral G sensor output	<Ref. to VDC-246, DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostics Chart with Select Monitor.>
73	Change range of lateral G sensor is too big.	Change range of lateral G sensor is too big.	<Ref. to VDC-246, DTC 73 CHANGE RANGE OF LATERAL G SENSOR IS TOO BIG., Diagnostics Chart with Select Monitor.>
73	Excessive lateral G sensor signal	Excessive lateral G sensor signal	<Ref. to VDC-248, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
73	Voltage inputted to lateral G sensor exceeds specification.	Voltage inputted to lateral G sensor exceeds specification.	<Ref. to VDC-250, DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION., Diagnostics Chart with Select Monitor.>
74	Voltage inputted to pressure sensor 1 exceeds specification.	Voltage inputted to primary pressure sensor exceeds specification.	<Ref. to VDC-254, DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 1 EXCEEDS SPECIFICATION. (PRIMARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Voltage inputted to pressure sensor 2 exceeds specification.	Voltage inputted to secondary pressure sensor exceeds specification.	<Ref. to VDC-258, DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 2 EXCEEDS SPECIFICATION. (SECONDARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Pressure sensor 1 offset is too big.	Primary pressure sensor offset is too big.	<Ref. to VDC-261, DTC 74 PRESSURE SENSOR 1 OFFSET IS TOO BIG. (PRIMARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Pressure sensor 2 offset is too big.	Secondary pressure sensor offset is too big.	<Ref. to VDC-262, DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG. (SECONDARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Differential pressure of pressure sensor is too big.	Differential pressure of pressure sensor is too big.	<Ref. to VDC-264, DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG., Diagnostics Chart with Select Monitor.>

If any of the following multiple diagnostic trouble codes (DTCs) are present in memory, check the area corresponding to the first diagnostic trouble code (DTC). If no problem is detected, check the areas corresponding to the other diagnostic trouble codes (DTCs) in order of their appearance.

Combination of DTC No.	Problem area	Index No.
46 Abnormal voltage of 5 V power supply 74 Voltage inputted to pressure sensor 2 exceeds specification.	(F87) — No. 78, 68 or 69 lead circuit is shorted to ground or battery.	<Ref. to VDC-178, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Select Monitor.>
44 TCM communication circuit 71 No signal from steering angle sensor	(F87) — No. 83 or 81 lead circuit is open.	<Ref. to VDC-226, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
51 Valve relay 48 Improper EAC communication 71 No signal from steering angle sensor	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-226, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
71 No signal from steering angle sensor 51 Valve relay 44 TCM communication circuit	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-226, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
73 Voltage inputted to lateral G sensor exceeds specification. 72 Voltage inputted to yaw rate sensor exceeds specifications.	(F87) — No. 23 lead circuit is open.	<Ref. to VDC-248, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

13.Diagnostics Chart with Diagnosis Connector

A: ABS WARNING LIGHT, VDC WARNING LIGHT, VDC OPERATING INDICATOR LIGHT OR VDC OFF INDICATOR LIGHT DOES NOT COME ON.

DIAGNOSIS:

- ABS warning light circuit is open or shorted.
- VDC warning light circuit is open or shorted.
- VDC operating indicator light circuit is open or shorted.
- VDC OFF indicator light circuit is open or shorted.

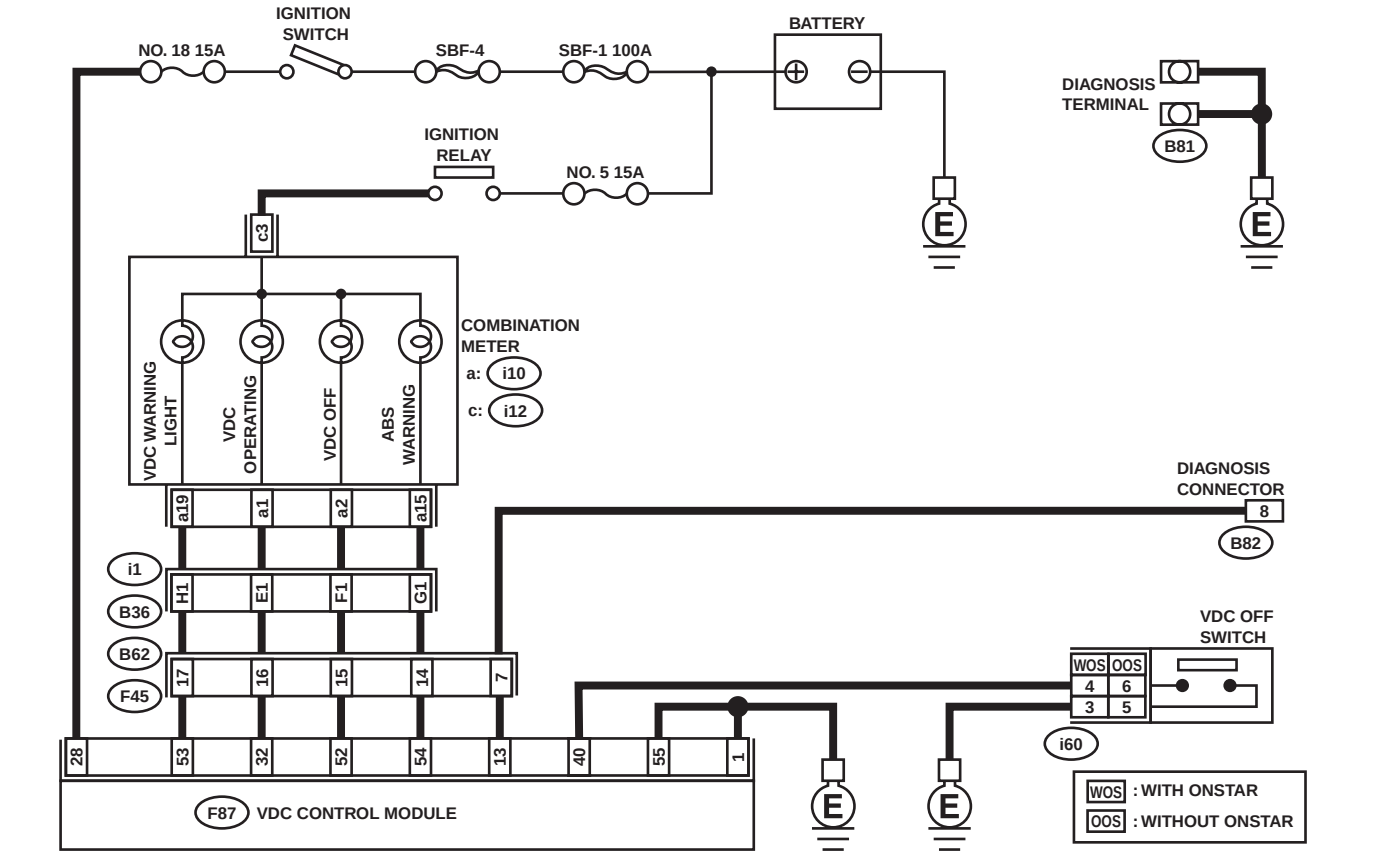
TROUBLE SYMPTOM:

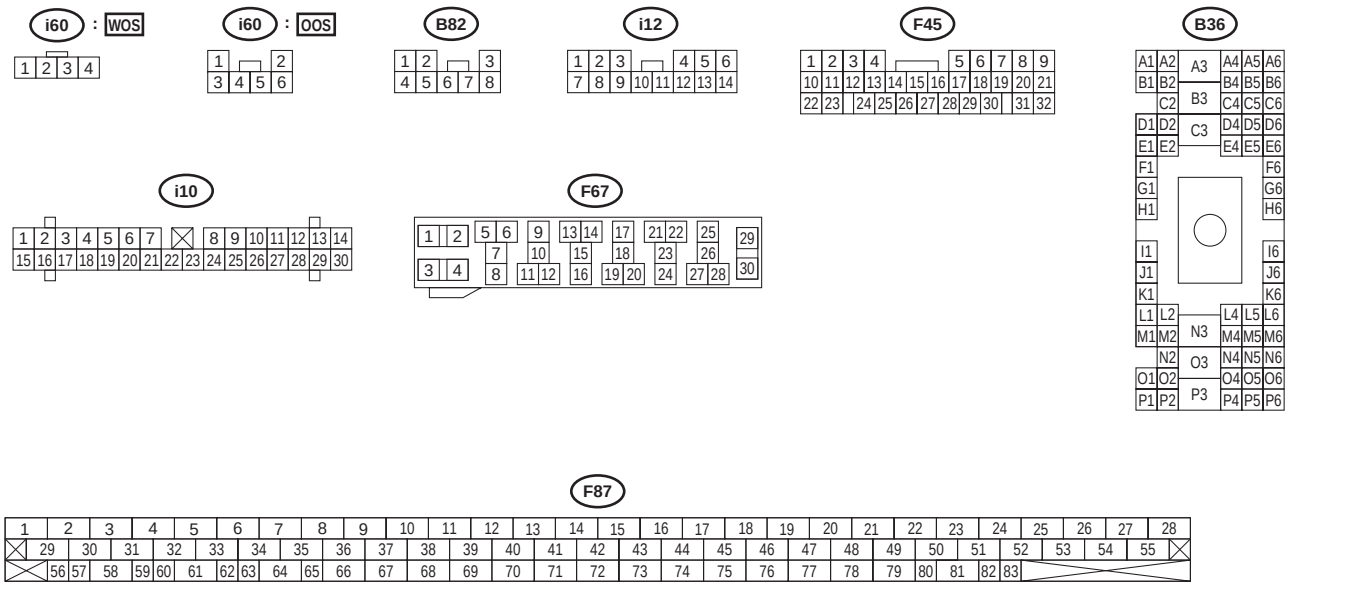
- When ignition switch is turned ON (engine OFF), ABS warning light, VDC warning light, VDC operating indicator light or VDC OFF indicator light does not come on.

NOTE:
When pushing the VDC OFF switch for 10 seconds or more while revving the engine, the VDC OFF indicator light goes off and operations cannot be continued. Turn ignition switch from OFF to ON again to recover the previous condition.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

WIRING DIAGRAM:





VDC00140

Vehicle-id:

SIE-id::A: ABS Warning Light, VDC Warning Light, VDC Operating Indicator Light or VDC OFF Indicator Light Does Not Come On.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK IF OTHER WARNING LIGHTS TURN ON.** Turn ignition switch to ON (engine OFF). Do other warning lights turn on?	Warning lights turn on.	Go to step **2.**	Repair combination meter. <Ref. to IDI-12, Combination Meter Assembly.>
2	**CHECK LIGHT BULB.** 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove ABS warning light bulb, VDC warning light bulb, VDC operating indicator light bulb or VDC OFF indicator light bulb from combination meter. Is light bulb OK?	OK.	Go to step **3.**	Replace faulty light bulb. <Ref. to IDI-12, DISASSEMBLY, Combination Meter Assembly.>
3	**CHECK BATTERY SHORT OF LIGHT HARNESS.** 1) Disconnect VDCCM connector from VDCCM. 2) Place a sheet of thick paper [thickness 1.5 mm (0.059 in)] in switch area of VDCCM connector. 3) Turn ignition switch to ON. 4) Measure voltage between VDC connector and chassis ground. ***Connector & terminal*** ***ABS warning light*** ***(F87) No. 54 (+) — Chassis ground (–):*** ***VDC warning light*** ***(F87) No. 53 (+) — Chassis ground (–):*** ***VDC operating indicator light*** ***(F87) No. 32 (+) — Chassis ground (–):*** ***VDC OFF indicator light*** ***(F87) No. 52 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	3 V	Go to step **4.**	Repair light harness.
4	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Install ABS warning light bulb from combination meter. 3) Install combination meter. 4) Place a sheet of thick paper [thickness 1.5 mm (0.059 in)] in switch area of VDCCM connector. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***ABS warning light*** ***(F87) No. 54 (+) — Chassis ground (–):*** ***VDC warning light*** ***(F87) No. 53 (+) — Chassis ground (–):*** ***VDC operating indicator light*** ***(F87) No. 32 (+) — Chassis ground (–):*** ***VDC OFF indicator light*** ***(F87) No. 52 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **5.**	Repair wiring harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connectors between combination meter and VDCCM?	There is poor contact.	Repair connector.	Go to step **6.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

Step		Value	Yes	No
6	**CHECK WARNING AND INDICATOR LIGHTS.** 1) Connect connector to VDCCM. 2) Turn ignition switch to ON. Do ABS warning light, VDC warning light, VDC operating indicator light and VDC OFF indicator light turn on?	Turn(s) on.	A temporary poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Vehicle-id:
SIE-id::A: ABS Warning Light, VDC Warning Light, VDC Operating Indicator Light or VDC OFF Indicator Light Does Not Come On.

MEMO:

Vehicle-id:
SIE-id::A: ABS Warning Light, VDC Warning Light, VDC Operating Indicator Light or VDC OFF Indicator Light Does Not Come On.

B: ABS AND VDC WARNING LIGHTS DO NOT GO OFF.

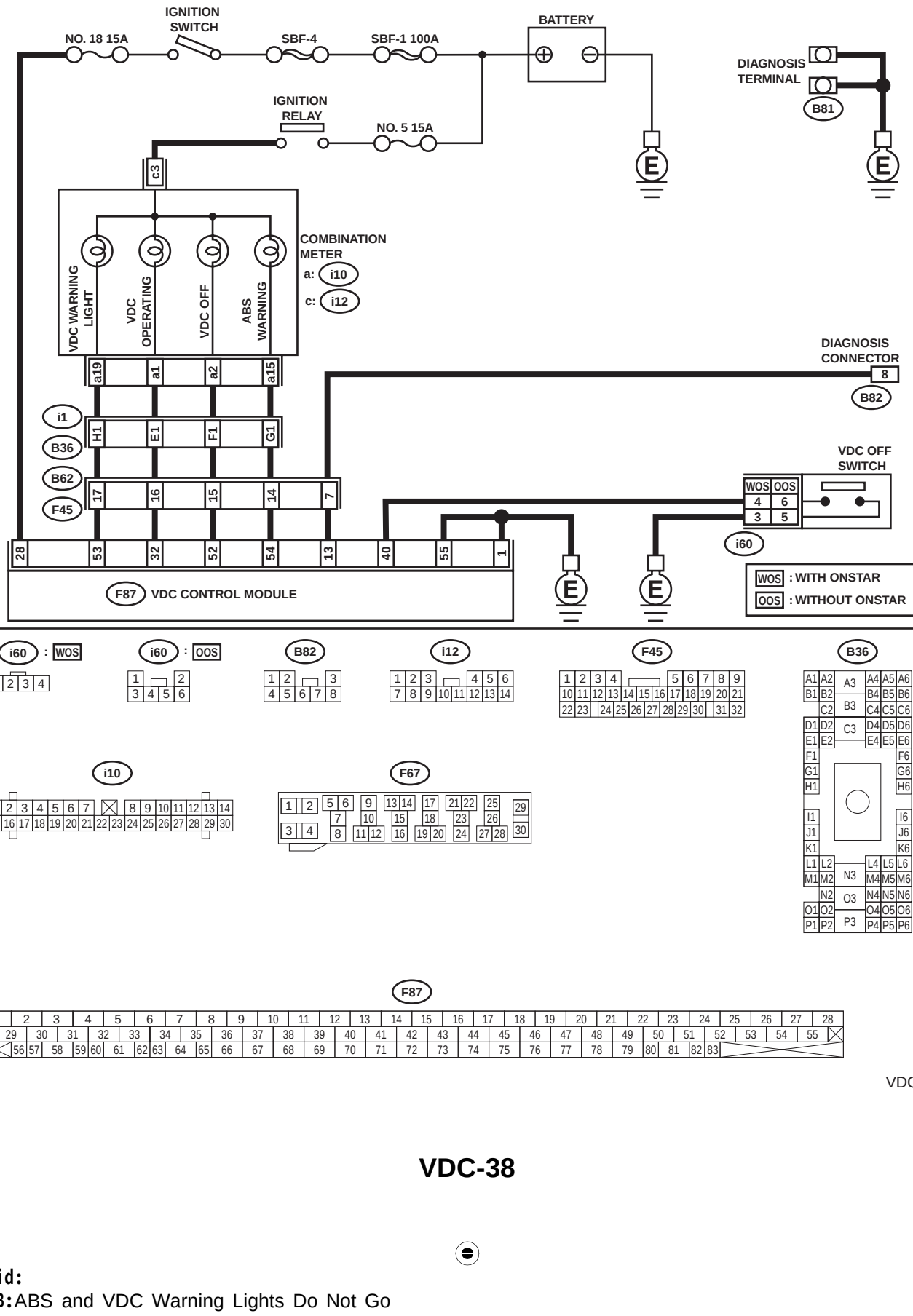
DIAGNOSIS:

- ABS warning light circuit is open or shorted.
- VDC warning light circuit is open or shorted.
- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- When starting the engine and while ABS and/or VDC warning light is kept ON.

WIRING DIAGRAM:



VDC00140

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK INSTALLATION OF VDCCM CONNECTOR.** Turn ignition switch to OFF. Is VDCCM connector inserted into VDCCM until the clamp locks onto it?	VDCCM connector is connected and the clamp is locked.	Go to step **2.**	Insert VDCCM connector into VDCCM until the clamp locks onto it.
2	**CHECK DIAGNOSIS TERMINAL.** Measure resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair diagnosis terminal harness.
3	**CHECK DIAGNOSIS LINE.** 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from VDCCM. 4) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 13 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **4.**	Repair harness connector between VDCCM and diagnosis connector.
4	**CHECK WIRING HARNESS.** 1) Place a sheet of thick paper [thickness 1.5 mm (0.059 in)] in switch area of VDCCM connector. 2) Turn ignition switch to ON. Do the ABS warning light and VDC warning light remain off?	Warning lights remain off.	Go to step **5.**	Repair front wiring harness.
5	**CHECK VDCCM TERMINAL.** 1) Turn ignition switch to OFF. 2) Check, if there is any faulty condition of VDCCM terminal. Is there any faulty condition of VDCCM terminal?	There is no problem.	Go to step **6.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	**CHECK POWER SUPPLY OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Start engine. 3) Idle the engine. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 28 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **7.**	Repair VDCCM power supply circuit.
7	**CHECK POOR CONTACT IN VDCCM CONNECTOR.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

C: VDC OPERATING INDICATOR LIGHT DOES NOT GO OFF.

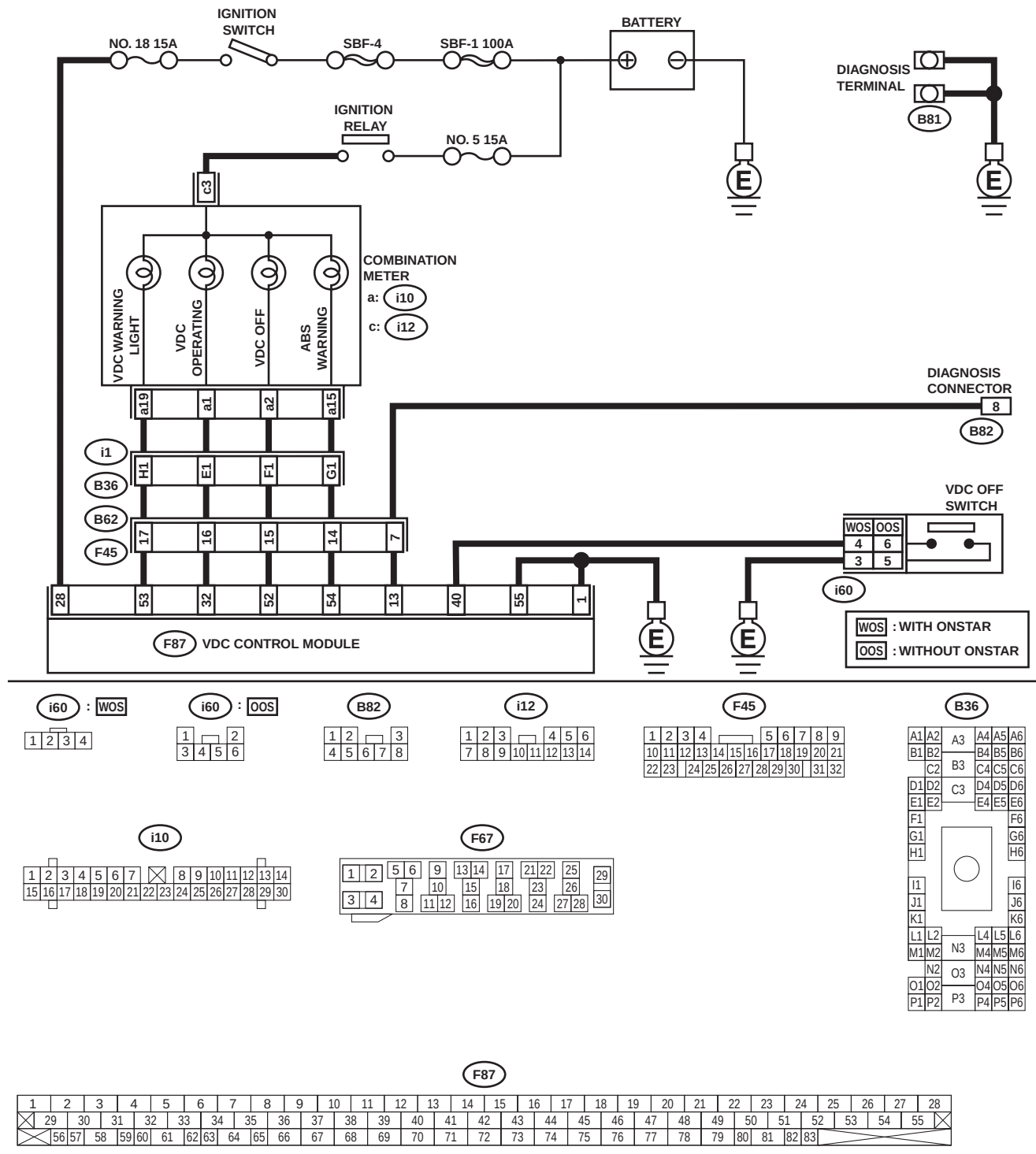
DIAGNOSIS:

- VDC operating indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while VDC operating indicator light is kept ON.

WIRING DIAGRAM:



VDC00140

Vehicle-id:
SIE-id::C:VDC Operating Indicator Light Does Not Go Off.
~

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

Step		Value	Yes	No
1	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VDCCM connector from VDCCM. 3) Turn ignition switch to ON. Does the VDC operating indicator light remain off?	Indicator light remains off.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair wiring harness.

Vehicle-id:
SIE-id::C:VDC Operating Indicator Light Does Not Go Off.
~

D: VDC OFF INDICATOR LIGHT DOES NOT GO OFF.

DIAGNOSIS:

- VDC OFF indicator light circuit is open or shorted.
- VDC OFF switch is shorted.

TROUBLE SYMPTOM:

- When starting the engine and while VDC OFF indicator light is kept ON.

NOTE:
When pushing the VDC OFF switch for 10 seconds or more while revving the engine, the VDC OFF indicator light goes off and operations cannot be continued. Turn ignition switch from OFF to ON again to recover the previous condition.

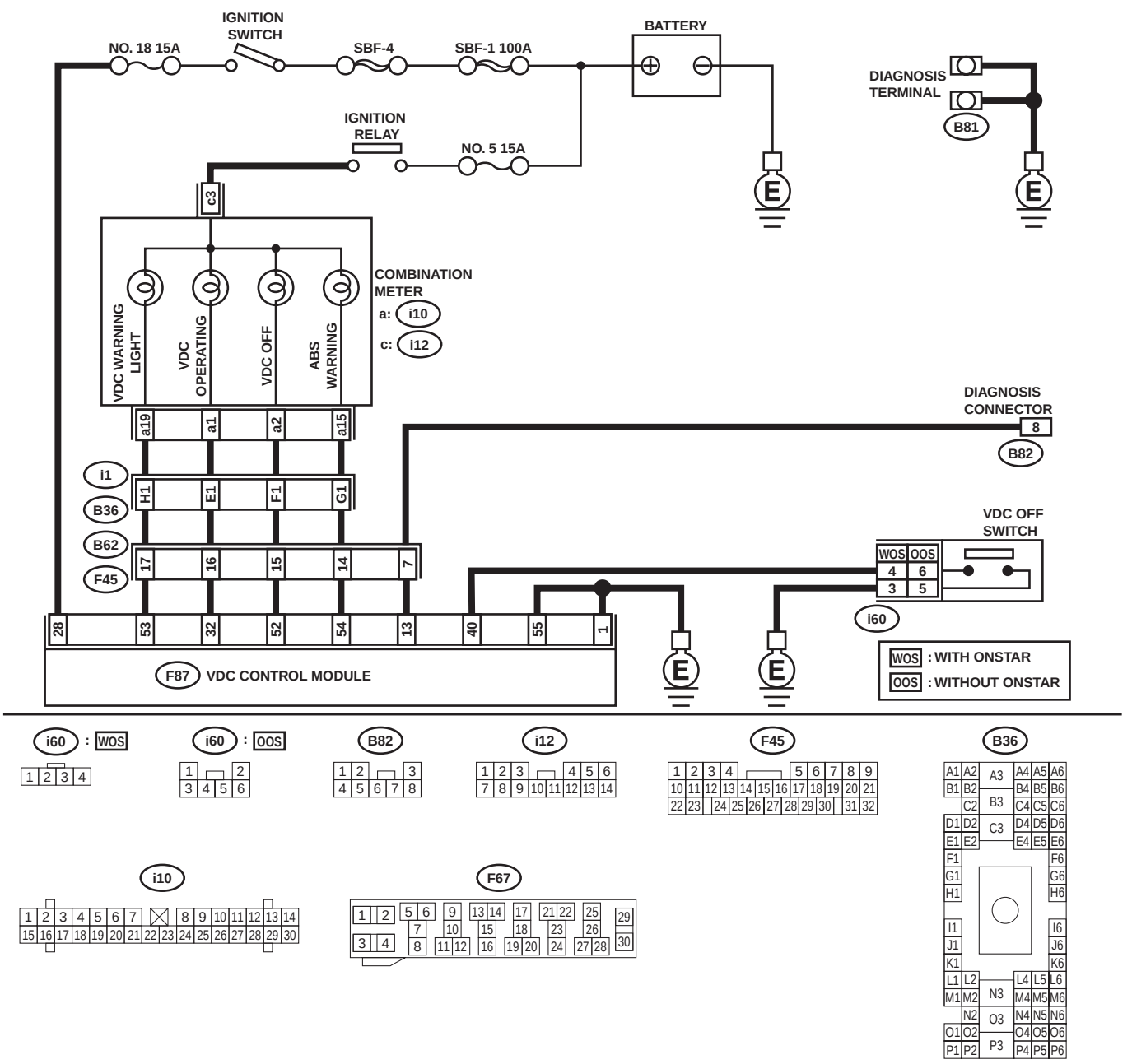
Vehicle-id:
SIE-id::D:VDC OFF Indicator Light Does Not Go Off.
~

MEMO:

Vehicle-id:
SIE-id::D:VDC OFF Indicator Light Does Not Go Off.
～

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

WIRING DIAGRAM:



VDC00140

Vehicle-id:
SIE-id::D: VDC OFF Indicator Light Does Not Go Off.
～

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**OPERATE VDC OFF SWITCH.** 1) Operate VDC OFF switch. 2) Turn ignition switch OFF, then turn ignition switch ON. Is VDC OFF indicator light off?	Indicator lights off.	The VDC is normal.	Go to step **2.**
2	**CHECK ENGINE COOLANT TEMPERATURE.** Does VDC OFF indicator light come on when engine coolant temperature is too low? Does it go out after engine has warmed up?	Indicator lights on, when engine coolant temperature is too low and goes out after warmed up.	The VDC is normal.	Go to step **3.**
3	**CHECK VDC OFF SWITCH.** Remove and check VDC OFF switch. <Ref. to VDC-32, VDC Off Switch.> Is VDC OFF switch OK?	OK.	Go to step **4.**	Replace VDC OFF switch.
4	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VDCCM connector from VDCCM. 3) Turn ignition switch to ON. Does the VDC OFF indicator light remain off?	Indicator lights off.	Go to step **5.**	Repair wiring harness.
5	**CHECK VDC OFF SWITCH LINE.** 1) Disconnect fuse from VDC OFF switch. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 40 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair VDC OFF switch circuit.

Vehicle-id:
SIE-id::D:VDC OFF Indicator Light Does Not Go Off.
～

E: DIAGNOSTIC TROUBLE CODE (DTC) DOES NOT APPEAR.

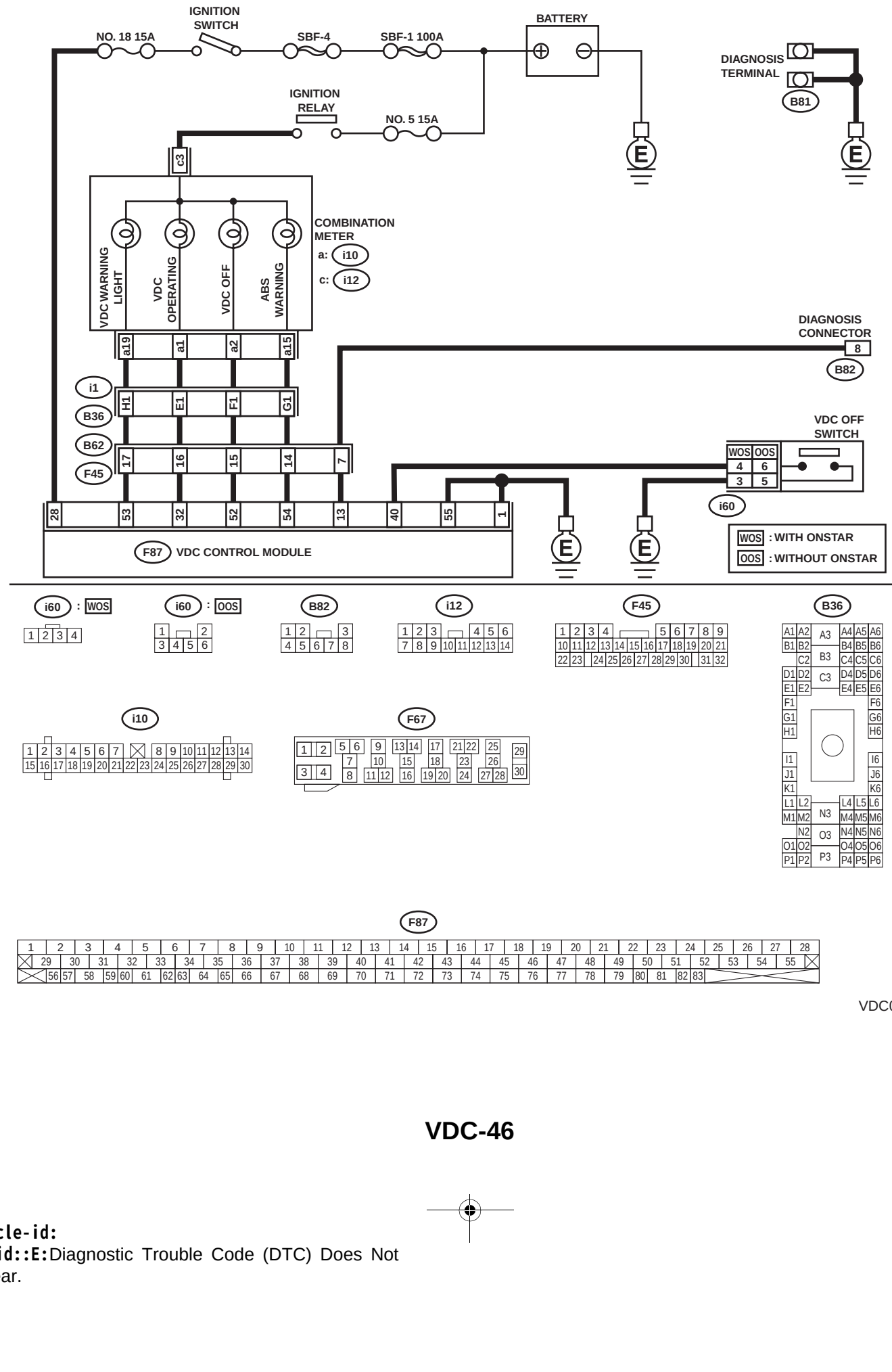
DIAGNOSIS:

- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

WIRING DIAGRAM:



VDC00140

Vehicle-id:
SIE-id::E: Diagnostic Trouble Code (DTC) Does Not Appear.
~

	Step	Value	Yes	No
1	**CHECK DIAGNOSIS TERMINAL.** Measure resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair diagnosis terminal harness.
2	**CHECK DIAGNOSIS LINE.** 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from VDCCM. 4) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 13 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair harness connector between VDCCM and diagnosis connector.
3	**CHECK POOR CONTACT IN VDCCM CONNECTOR.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

F: DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH)

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

G: DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH)

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

H: DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH)

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

Vehicle-id:
SIE-id::F:DTC 21 Abnormal ABS Sensor (Open Circuit or Input Voltage Too High) (Front RH)
~

MEMO:

Vehicle-id:
SIE-id::H:DTC 25 Abnormal ABS Sensor (Open Circuit or Input Voltage Too High) (Rear RH)
～

I: DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH)

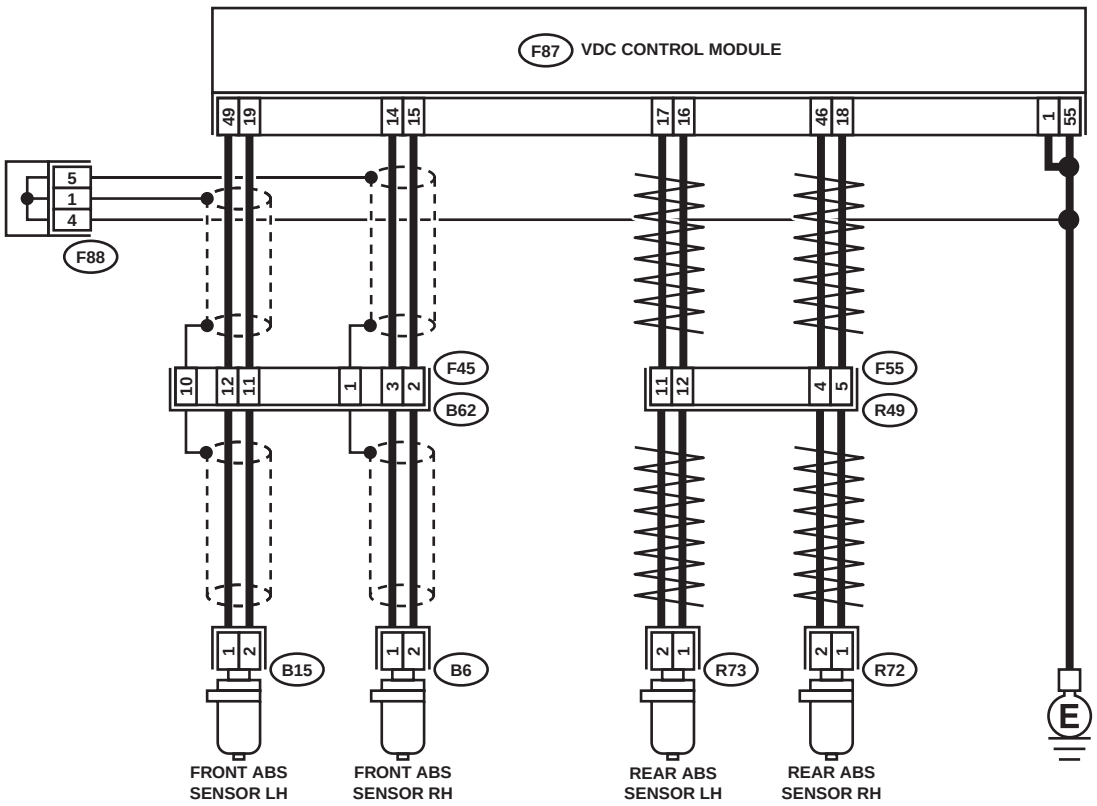
DIAGNOSIS:

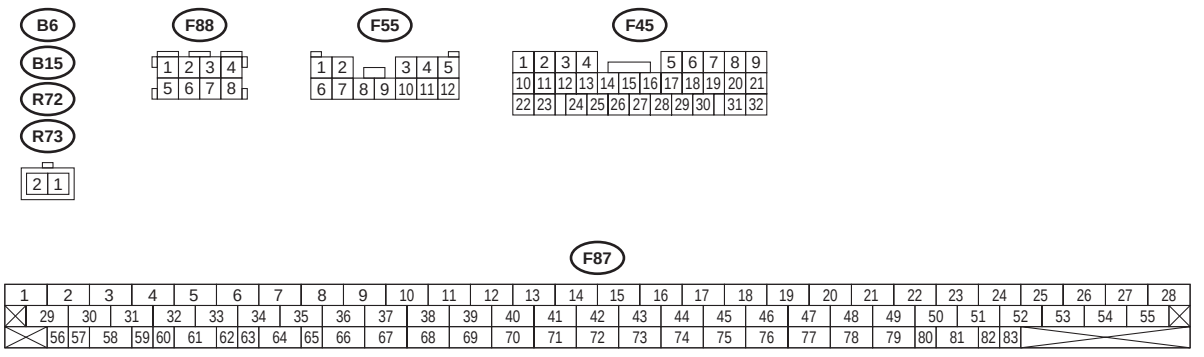
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00141

Vehicle-id:
SIE-id::I:DTC 27 Abnormal ABS Sensor (Open Circuit or Input Voltage Too High) (Rear LH)
～

	Step	Value	Yes	No
1	**CHECK ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within the specified range?	1.0 — 1.5 kΩ	Go to step **2.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
2	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **3.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
3	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **4.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
4	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 — No. 15:*** ***DTC 23 / (F87) No. 49 — No. 19:*** ***DTC 25 / (F87) No. 18 — No. 46:*** ***DTC 27 / (F87) No. 16 — No. 17:*** Is the measured value within the specified range?	1.0 — 1.5 kΩ	Go to step **5.**	Repair harness/ connector between VDCCM and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
5	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 (+) — Chassis ground (–):*** ***DTC 23 / (F87) No. 49 (+) — Chassis ground (–):*** ***DTC 25 / (F87) No. 18 (+) — Chassis ground (–):*** ***DTC 27 / (F87) No. 16 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **6.**	Repair harness between VDCCM and ABS sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 (+) — Chassis ground (–):*** ***DTC 23 / (F87) No. 49 (+) — Chassis ground (–):*** ***DTC 25 / (F87) No. 18 (+) — Chassis ground (–):*** ***DTC 27 / (F87) No. 16 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **7.**	Repair harness between VDCCM and ABS sensor.
7	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)*** Are the ABS sensor installation bolts tightened securely?	Tightened securely.	Go to step **8.**	Tighten ABS sensor installation bolts securely.
8	**CHECK ABS SENSOR GAP.** Measure tone wheel-to-pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **9.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
9	**CHECK HUB AND TONE WHEEL RUNOUT.** Measure hub and tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **10.**	Repair hub and tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
10	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step **11.**

Step		Value	Yes	No
11	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **12.**
12	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between VDCCM and ABS sensor.

J: DTC 22 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH)

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

K: DTC 24 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH)

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

L: DTC 26 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH)

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

Vehicle-id:
SIE-id::J:DTC 22 Abnormal ABS Sensor (Abnormal ABS Sensor Signal) (Front RH)
～

MEMO:

Vehicle-id:
SIE-id::L:DTC 26 Abnormal ABS Sensor (Abnormal ABS Sensor Signal) (Rear RH)
～

M: DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH)

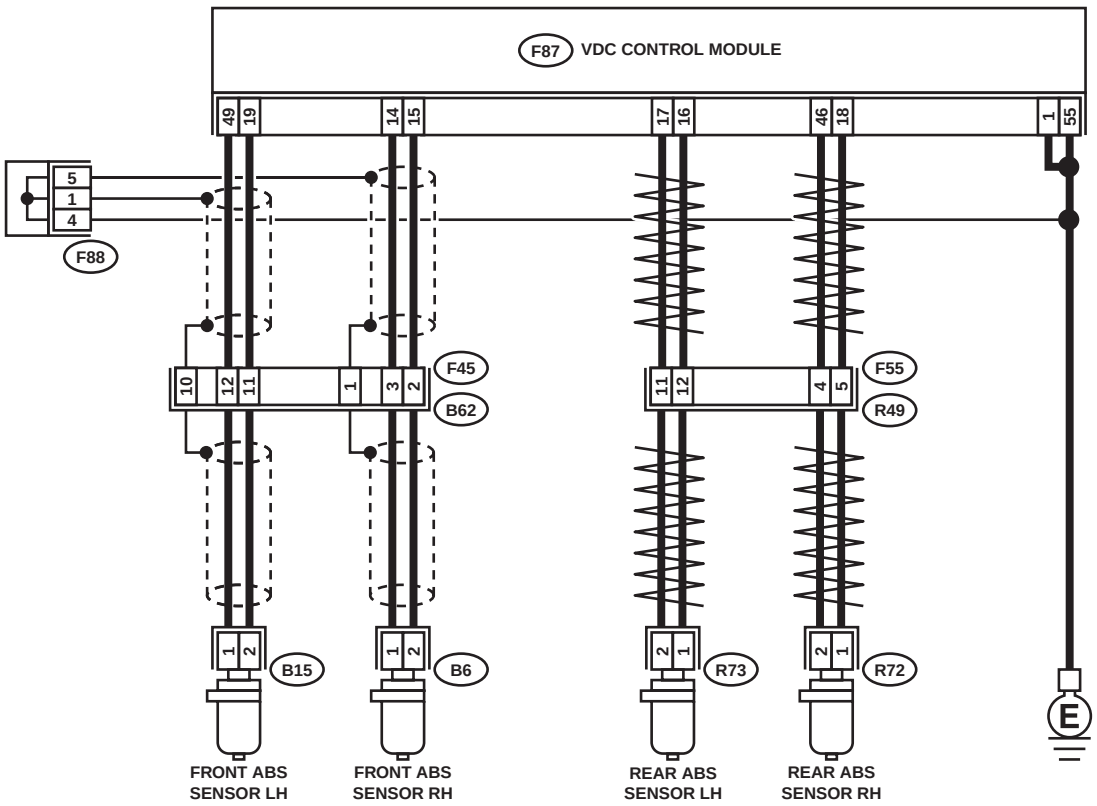
DIAGNOSIS:

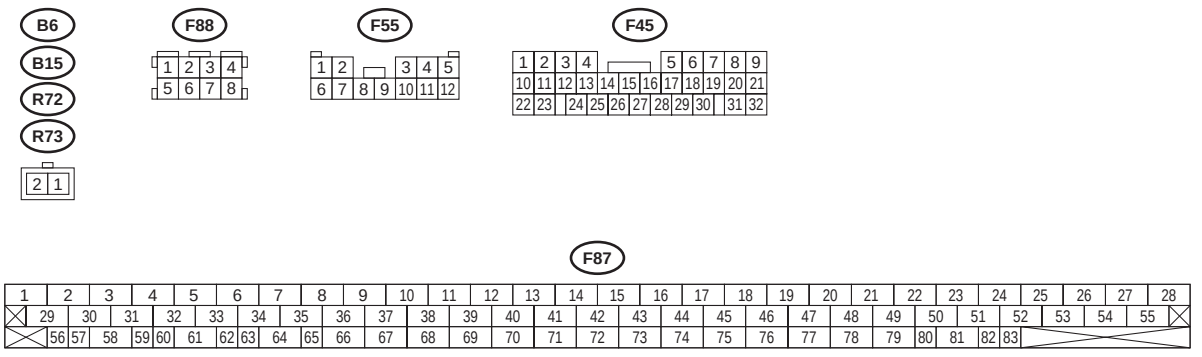
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00141

	Step	Value	Yes	No
1	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)*** Are the ABS sensor installation bolts tightened securely?	Tightened securely.	Go to step **2.**	Tighten ABS sensor installation bolts securely.
2	**CHECK ABS SENSOR GAP.** Measure tone wheel to pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **3.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
3	**CHECK OSCILLOSCOPE.** Is an oscilloscope available?	Available.	Go to step **4.**	Go to step **5.**
4	**CHECK ABS SENSOR SIGNAL.** 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 (+) — No. 15 (–):*** ***DTC 24 / (F87) No. 49 (+) — No. 19 (–):*** ***DTC 26 / (F87) No. 18 (+) — No. 46 (–):*** ***DTC 28 / (F87) No. 16 (+) — No. 17 (–):*** Is oscilloscope pattern smooth, as shown in figure?	Smooth pattern.	Go to step **8.**	Go to step **5.**
5	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub in accordance with diagnostic trouble code. Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Dirt or foreign matter found.	Thoroughly remove dirt or other foreign matter.	Go to step **6.**
6	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged in the ABS sensor pole piece or the tone wheel?	Broken or damaged.	Replace ABS sensor or tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> and <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-29, Rear ABS Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **7.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **8.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>
8	**CHECK RESISTANCE OF ABS SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within the specified range?	1.0 — 1.5 kΩ	Go to step **9.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
9	**CHECK GROUND SHORT OF ABS SENSOR.** Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **10.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
10	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR.** 1) Connect connector to ABS sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance at VDCCM connector terminals. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 — No. 15:*** ***DTC 24 / (F87) No. 49 — No. 19:*** ***DTC 26 / (F87) No. 18 — No. 46:*** ***DTC 28 / (F87) No. 16 — No. 17:*** Is the measured value within the specified range?	1.0 — 1.5 kΩ	Go to step **11.**	Repair harness/ connector between VDCCM and ABS sensor.
11	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 — Chassis ground:*** ***DTC 24 / (F87) No. 49 — Chassis ground:*** ***DTC 26 / (F87) No. 18 — Chassis ground:*** ***DTC 28 / (F87) No. 16 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **12.**	Repair harness/ connector between VDCCM and ABS sensor.

	Step	Value	Yes	No
12	**CHECK GROUND CIRCUIT OF VDCCM.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **13.**	Repair VDCCM ground harness.
13	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step **14.**
14	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step **15.**	Properly install the car telephone or the wireless transmitter.
15	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Installed properly.	Install the noise sources apart from the sensor harness.	Go to step **16.**
16	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F45) No. 1 — Chassis ground:*** ***DTC 24 / (F45) No. 10 — Chassis ground:*** Is the measured value less than the specified value? NOTE: For the DTC 26 and 28, Go to step **17.**	0.5 Ω	Go to step **17.**	Repair shield harness.
17	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **18.**
18	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.

N: DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR)

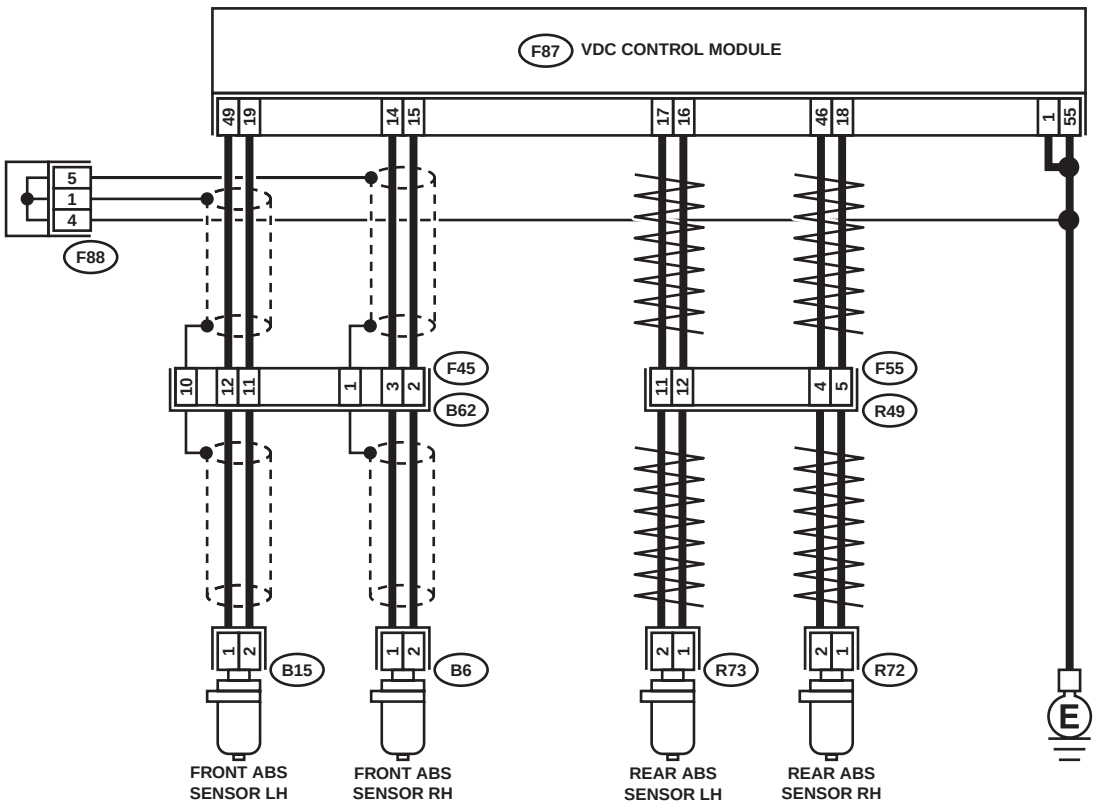
DIAGNOSIS:

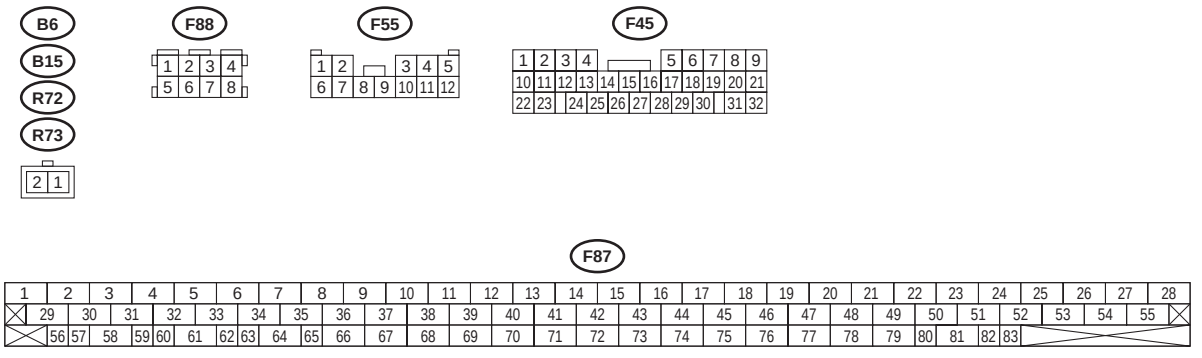
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00141

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY.** Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Turned freely over 1 minutes.	The VDC is normal. Erase the diagnostic trouble code. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Are the tire specifications correct?	Correct specification.	Go to step **3.**	Replace tire.
3	**CHECK WEAR OF TIRE.** Is the tire worn excessively?	Worn excesiblely.	Replace tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.** Is the tire pressure correct?	Correct tire pressure.	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)*** Are the ABS sensor installation bolts tightened securely?	Tightened securely.	Go to step **6.**	Tighten ABS sensor installation bolts securely.
6	**CHECK ABS SENSOR GAP.** Measure tone wheel to pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7	**CHECK OSCILLOSCOPE.** Is an oscilloscope available?	Available.	Go to step **8.**	Go to step **9.**
8	**CHECK ABS SENSOR SIGNAL.** 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***(F87) No. 14 (+) — No. 15 (–) (Front RH):*** ***(F87) No. 49 (+) — No. 19 (–) (Front LH):*** ***(F87) No. 18 (+) — No. 46 (–) (Rear RH):*** ***(F87) No. 16 (+) — No. 17 (–) (Rear LH):*** Is oscilloscope pattern smooth, as shown in figure?	Smooth pattern.	Go to step **12.**	Go to step **9.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub. Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Dirt or foreign matter found.	Thoroughly remove dirt or other foreign matter.	Go to step **10.**
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?	Broken or damaged.	Replace ABS sensor or tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> and <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-29, Rear ABS Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **12.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>
12	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the diagnostic same trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

O: DTC 31 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT RH INLET)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

P: DTC 33 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT LH INLET)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

Q: DTC 35 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR RH INLET)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

R: DTC 37 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR LH INLET)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

S: DTC 61 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (PRIMARY CUT)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

T: DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT)

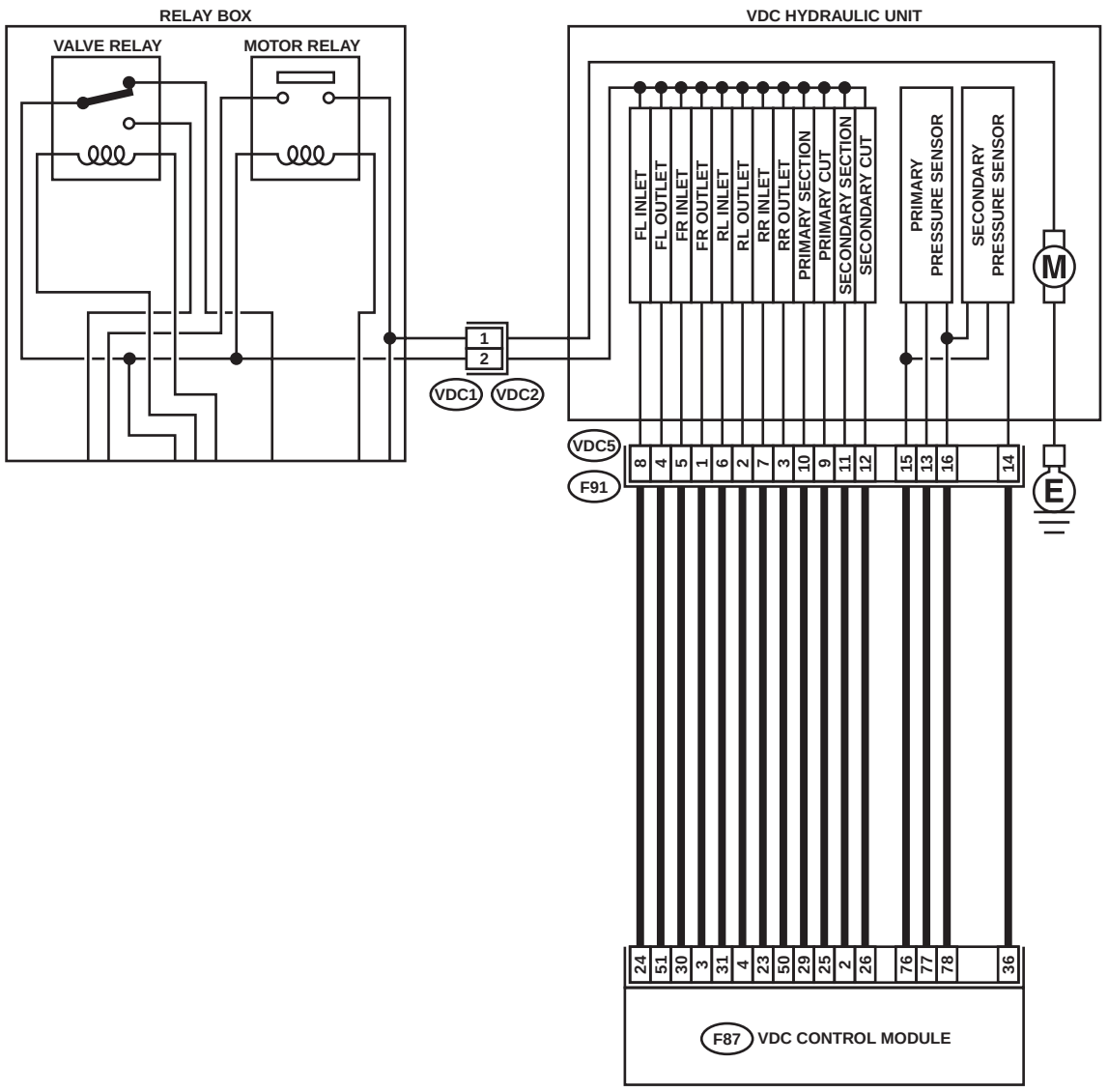
DIAGNOSIS:

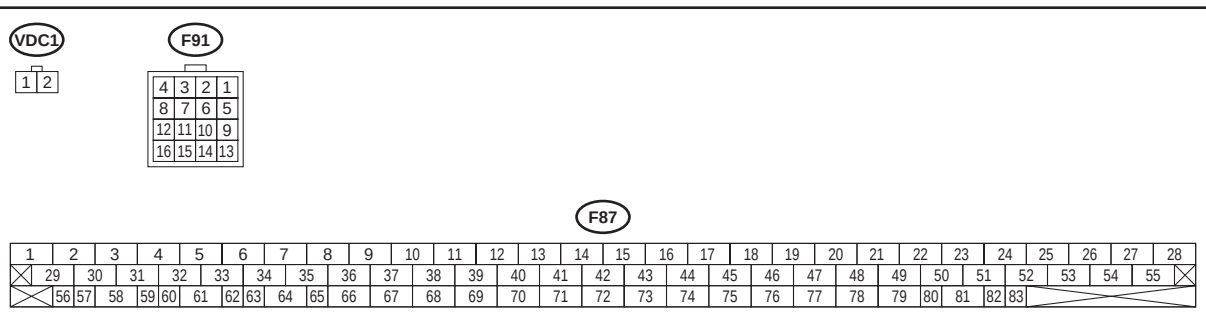
- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00142

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 — (VDC2) No. 2:*** ***DTC 33/(VDC5) No. 8 — (VDC2) No. 2:*** ***DTC 35/(VDC5) No. 7 — (VDC2) No. 2:*** ***DTC 37/(VDC5) No. 6 — (VDC2) No. 2:*** ***DTC 61/(VDC5) No. 9 — (VDC2) No. 2:*** ***DTC 62/(VDC5) No. 12 — (VDC2) No. 2:*** Is the measured value within the specified range?	8.04 — 9.04 Ω	Go to step **2.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 — Chassis ground:*** ***DTC 33/(VDC5) No. 8 — Chassis ground:*** ***DTC 35/(VDC5) No. 7 — Chassis ground:*** ***DTC 37/(VDC5) No. 6 — Chassis ground:*** ***DTC 61/(VDC5) No. 9 — Chassis ground:*** ***DTC 62/(VDC5) No. 12 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 (+) — Chassis ground (–):*** ***DTC 33/(VDC5) No. 8 (+) — Chassis ground (–):*** ***DTC 35/(VDC5) No. 7 (+) — Chassis ground (–):*** ***DTC 37/(VDC5) No. 6 (+) — Chassis ground (–):*** ***DTC 61/(VDC5) No. 9 (+) — Chassis ground (–):*** ***DTC 62/(VDC5) No. 12 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **4.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Vehicle-id:
SIE-id::T:DTC 62 Abnormal Inlet and Cut Solenoid Valve Circuit(s) (Secondary Cut)
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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 (+) — Chassis ground (–):*** ***DTC 33/(VDC5) No. 8 (+) — Chassis ground (–):*** ***DTC 35/(VDC5) No. 7 (+) — Chassis ground (–):*** ***DTC 37/(VDC5) No. 6 (+) — Chassis ground (–):*** ***DTC 61/(VDC5) No. 9 (+) — Chassis ground (–):*** ***DTC 62/(VDC5) No. 12 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 (+) — Chassis ground (–):*** ***DTC 33/(F87) No. 24 (+) — Chassis ground (–):*** ***DTC 35/(F87) No. 23 (+) — Chassis ground (–):*** ***DTC 37/(F87) No. 31 (+) — Chassis ground (–):*** ***DTC 61/(F87) No. 25 (+) — Chassis ground (–):*** ***DTC 62/(F87) No. 26 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **6.**	Repair harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 (+) — Chassis ground (–):*** ***DTC 33/(F87) No. 24 (+) — Chassis ground (–):*** ***DTC 35/(F87) No. 23 (+) — Chassis ground (–):*** ***DTC 37/(F87) No. 31 (+) — Chassis ground (–):*** ***DTC 61/(F87) No. 25 (+) — Chassis ground (–):*** ***DTC 62/(F87) No. 26 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **7.**	Repair harness between VDCCM and VDCH/U.

	Step	Value	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 — Chassis ground:*** ***DTC 33/(F87) No. 24 — Chassis ground:*** ***DTC 35/(F87) No. 23 — Chassis ground:*** ***DTC 37/(F87) No. 31 — Chassis ground:*** ***DTC 61/(F87) No. 25 — Chassis ground:*** ***DTC 62/(F87) No. 26 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair harness between VDCCM and VDCH/U.
8	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 31/(F87) No. 30 — (VDC2) No. 2:*** ***DTC 33/(F87) No. 24 — (VDC2) No. 2:*** ***DTC 35/(F87) No. 23 — (VDC2) No. 2:*** ***DTC 37/(F87) No. 31— (VDC2) No. 2:*** ***DTC 61/(F87) No. 25 — (VDC2) No. 2:*** ***DTC 62/(F87) No. 26 — (VDC2) No. 2:*** Is the measured value within the specified range?	7 — 10 Ω	Go to step **9.**	Repair harness/ connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and VDCH/U?	There is poor contact.	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Repair VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

U: DTC 32 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT RH OUTLET)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

V: DTC 34 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT LH OUTLET)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

W: DTC 36 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR RH OUTLET)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

X: DTC 38 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR LH OUTLET)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

Y: DTC 63 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (PRIMARY SUCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

MEMO:

Vehicle-id:
SIE-id::Y:DTC 63 Abnormal Outlet and Suction Solenoid Valve Circuit(s) (Primary Suction)
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Z: DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION)

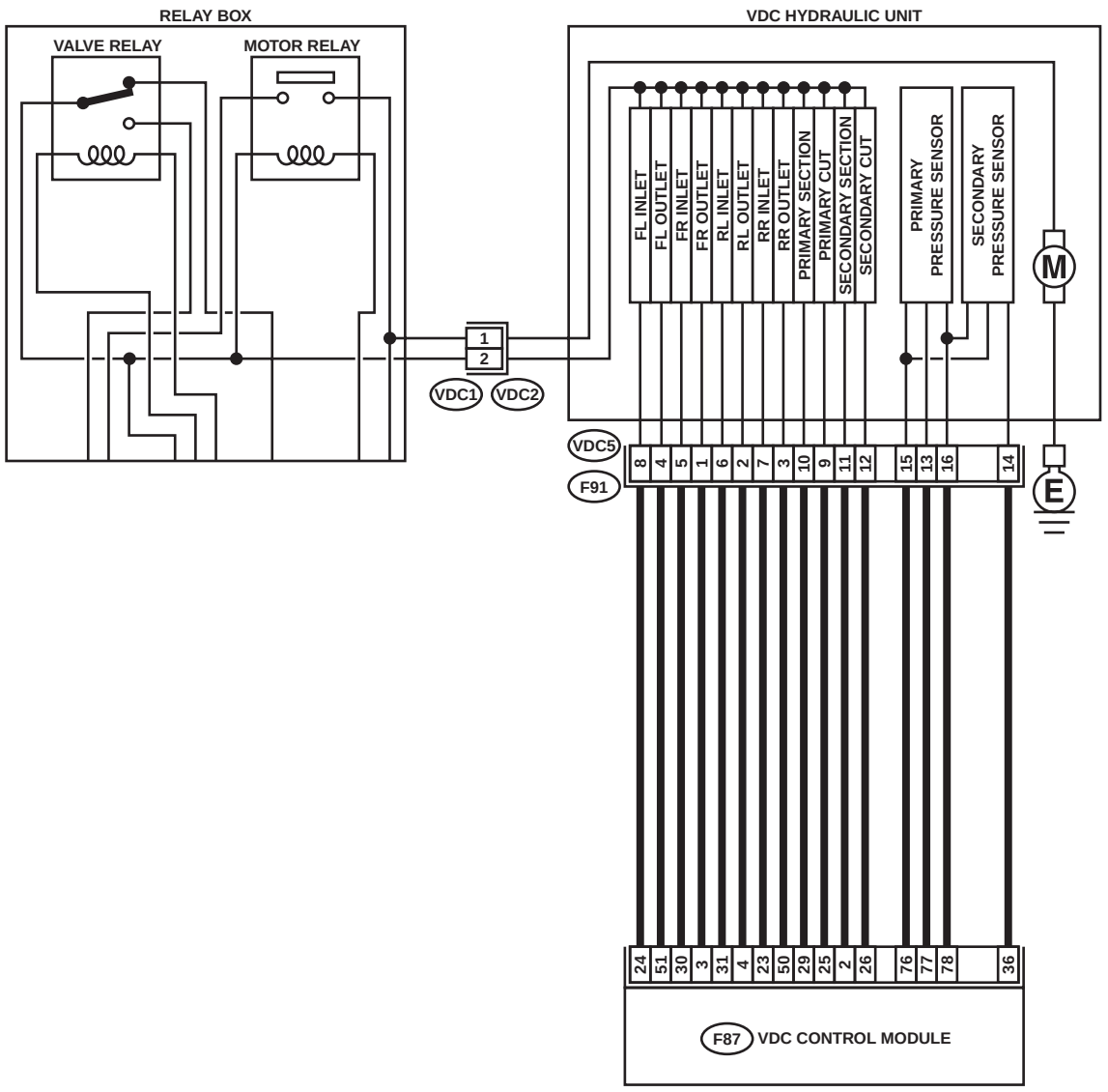
DIAGNOSIS:

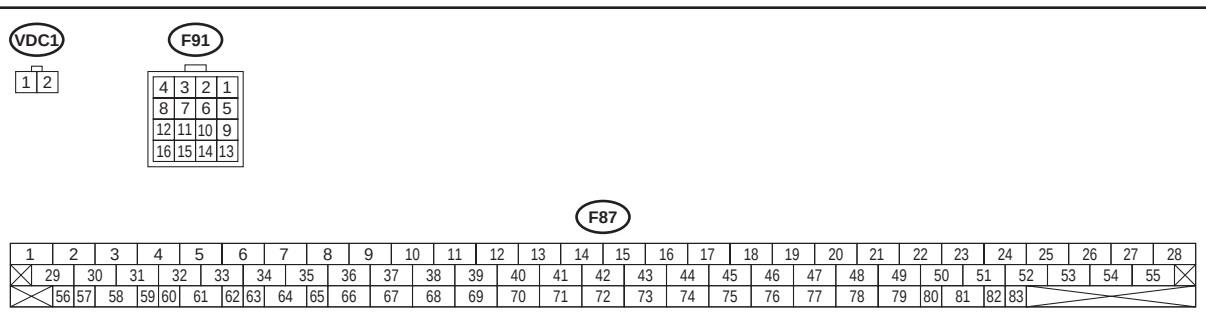
- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00142

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 — (VDC2) No. 2:*** ***DTC 34/(VDC5) No. 4 — (VDC2) No. 2:*** ***DTC 36/(VDC5) No. 3 — (VDC2) No. 2:*** ***DTC 38/(VDC5) No. 2 — (VDC2) No. 2:*** ***DTC 63/(VDC5) No. 10 — (VDC2) No. 2:*** ***DTC 64/(VDC5) No. 11 — (VDC2) No. 2:*** Is the measured value within the specified range?	3.8 — 4.8 Ω	Go to step **2.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 — Chassis ground:*** ***DTC 34/(VDC5) No. 4 — Chassis ground:*** ***DTC 36/(VDC5) No. 3 — Chassis ground:*** ***DTC 38/(VDC5) No. 2 — Chassis ground:*** ***DTC 63/(VDC5) No. 10 — Chassis ground:*** ***DTC 64/(VDC5) No. 11 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34/(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36/(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38/(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63/(VDC5) No. 10 (+) — Chassis ground (–):*** ***DTC 64/(VDC5) No. 11 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **4.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Vehicle-id:
SIE-id::Z:DTC 64 Abnormal Outlet and Suction Solenoid Valve Circuit(s) (Secondary Suction)
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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34/(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36/(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38/(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63/(VDC5) No. 10 (+) — Chassis ground (–):*** ***DTC 64/(VDC5) No. 11 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 (+) — Chassis ground (–):*** ***DTC 34/(F87) No. 51 (+) — Chassis ground (–):*** ***DTC 36/(F87) No. 50 (+) — Chassis ground (–):*** ***DTC 38/(F87) No. 4 (+) — Chassis ground (–):*** ***DTC 63/(F87) No. 29 (+) — Chassis ground (–):*** ***DTC 64/(F87) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **6.**	Repair harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 (+) — Chassis ground (–):*** ***DTC 34/(F87) No. 51 (+) — Chassis ground (–):*** ***DTC 36/(F87) No. 50 (+) — Chassis ground (–):*** ***DTC 38/(F87) No. 4 (+) — Chassis ground (–):*** ***DTC 63/(F87) No. 29 (+) — Chassis ground (–):*** ***DTC 64/(F87) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **7.**	Repair harness between VDCCM and VDCH/U.

Vehicle-id:
SIE-id::Z:DTC 64 Abnormal Outlet and Suction Solenoid Valve Circuit(s) (Secondary Suction)
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	Step	Value	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 — Chassis ground:*** ***DTC 34/(F87) No. 51 — Chassis ground:*** ***DTC 36/(F87) No. 50 — Chassis ground:*** ***DTC 38/(F87) No. 4 — Chassis ground:*** ***DTC 63/(F87) No. 29 — Chassis ground:*** ***DTC 64/(F87) No. 2 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair harness between VDCCM and VDCH/U.
8	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 32/(F87) No. 3 — (VDC2) No. 1:*** ***DTC 34/(F87) No. 51 — (VDC2) No. 1:*** ***DTC 36/(F87) No. 50 — (VDC2) No. 1:*** ***DTC 38/(F87) No. 4 — (VDC2) No. 1:*** ***DTC 63/(F87) No. 29 — (VDC2) No. 1:*** ***DTC 64/(F87) No. 2 — (VDC2) No. 1:*** Is the measured value within the specified range?	3 — 6 Ω	Go to step **9.**	Repair harness/ connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and VDCH/U?	There is poor contact.	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AA:DTC 41 ABNORMAL VDC CONTROL MODULE

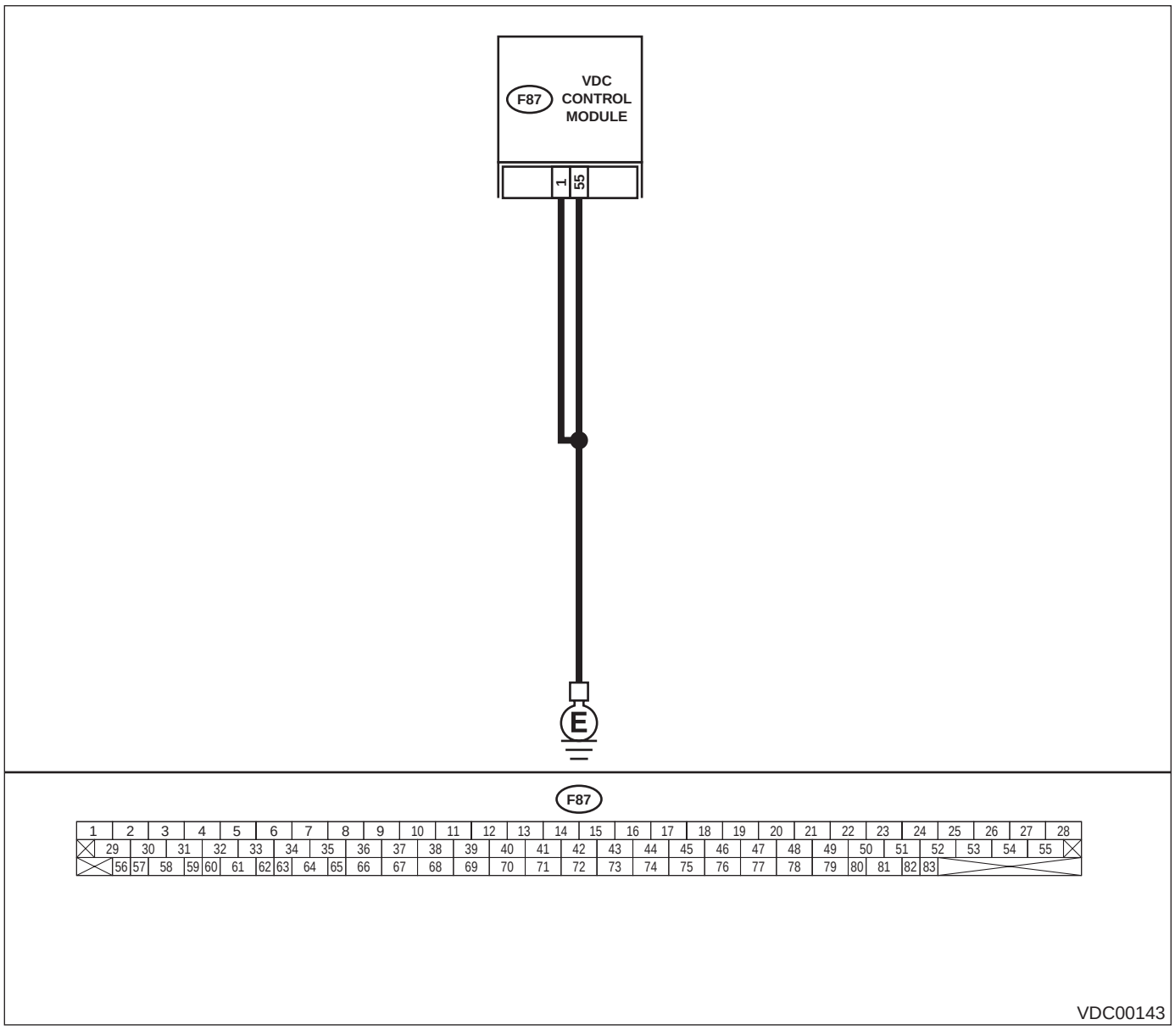
DIAGNOSIS:

- Faulty VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair VDCCM ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between battery, ignition switch and VDCCM?	There is poor contact.	Repair connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Tightened securely.	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Installed properly.	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AB:DTC 42 SOURCE VOLTAGE IS ABNORMAL.

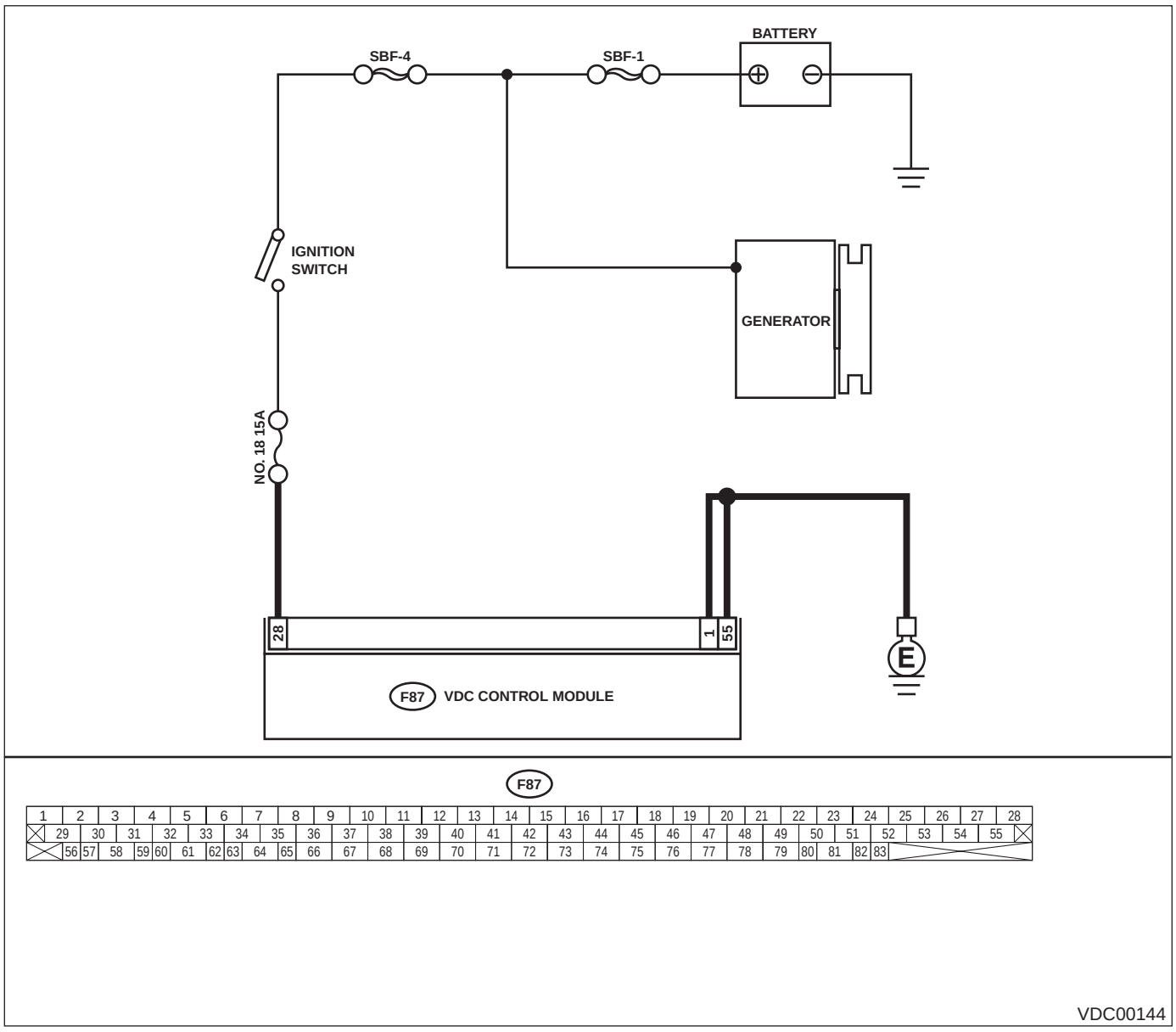
DIAGNOSIS:

- Power source voltage of the VDCCM is low.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



Vehicle-id:
SIE-id::AB:DTC 42 Source Voltage Is Abnormal.
~

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Go to step **2.**	Repair generator.
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Clamped securely.	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Run the engine at idle. 3) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 28 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **4.**	Repair harness connector between battery, ignition switch and VDCCM.
4	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair VDCCM ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and VDCCM?	There is poor contact.	Repair connector.	Go to step **6.**
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Vehicle-id:
SIE-id::AB:DTC 42 Source Voltage Is Abnormal.
~

AC:DTC 43 FAULTY VDCCM — ECM COMMUNICATION LINE

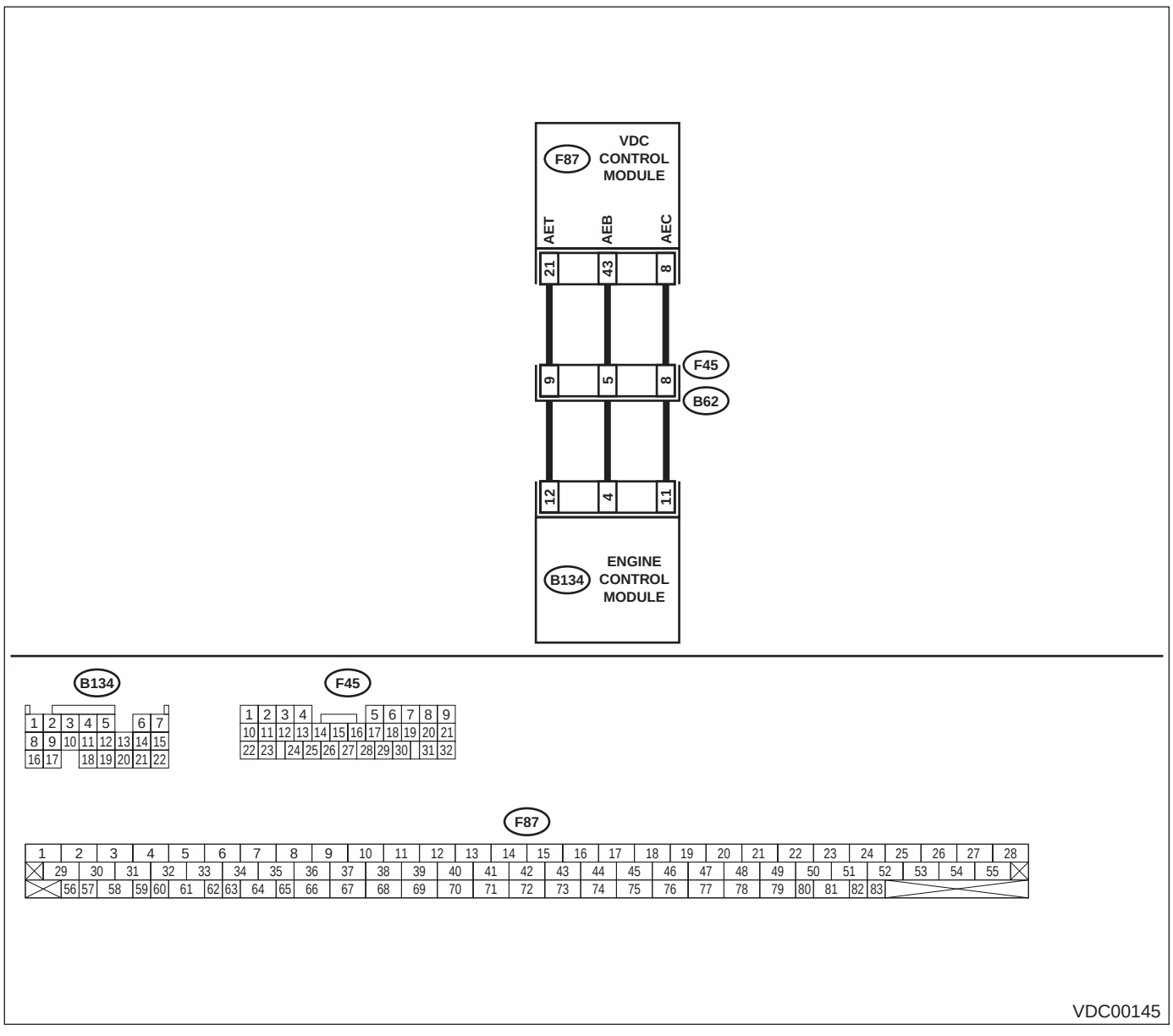
DIAGNOSIS:

- AET communication line is broken or short circuited.
- AEB communication line is broken or short circuited.
- AEC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00145

	Step	Value	Yes	No
1	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 21 — (B134) No. 12:*** ***(F87) No. 43 — (B134) No. 4:*** ***(F87) No. 8 — (B134) No. 11:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair harness/ connector between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 — Chassis ground:*** ***(F87) No. 43 — Chassis ground:*** ***(F87) No. 8 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair harness/ connector between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 (+) — Chassis ground (–):*** ***(F87) No. 43 (+) — Chassis ground (–):*** ***(F87) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **4.**	Repair harness/ connector between VDCCM and ECM.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 (+) — Chassis ground (–):*** ***(F87) No. 43 (+) — Chassis ground (–):*** ***(F87) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Repair harness/ connector between VDCCM and ECM.
5	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 (+) — Chassis ground (–):*** ***(F87) No. 43 (+) — Chassis ground (–):*** ***(F87) No. 8 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Go to step **9.**
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ECM and VDCCM?	There is poor contact.	Repair connector.	Go to step **7.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9	**CHECK ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):*** ***(B134) No. 4 (+) — Chassis ground (–):*** ***(B134) No. 11 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Repair harness/ connector between ECM and VDCCM.	Go to step **10.**
10	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector ECM?	There is poor contact.	Repair connector.	Go to step **11.**
11	**CHECK ENGINE.** Is the engine functioning normally?	Operates properly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

MEMO:

Vehicle-id:
SIE-id::AC:DTC 43 Faulty VDCCM — ECM Communication Line
~

AD:DTC 44 A COMMUNICATION WITH AT CONTROL ABNORMAL

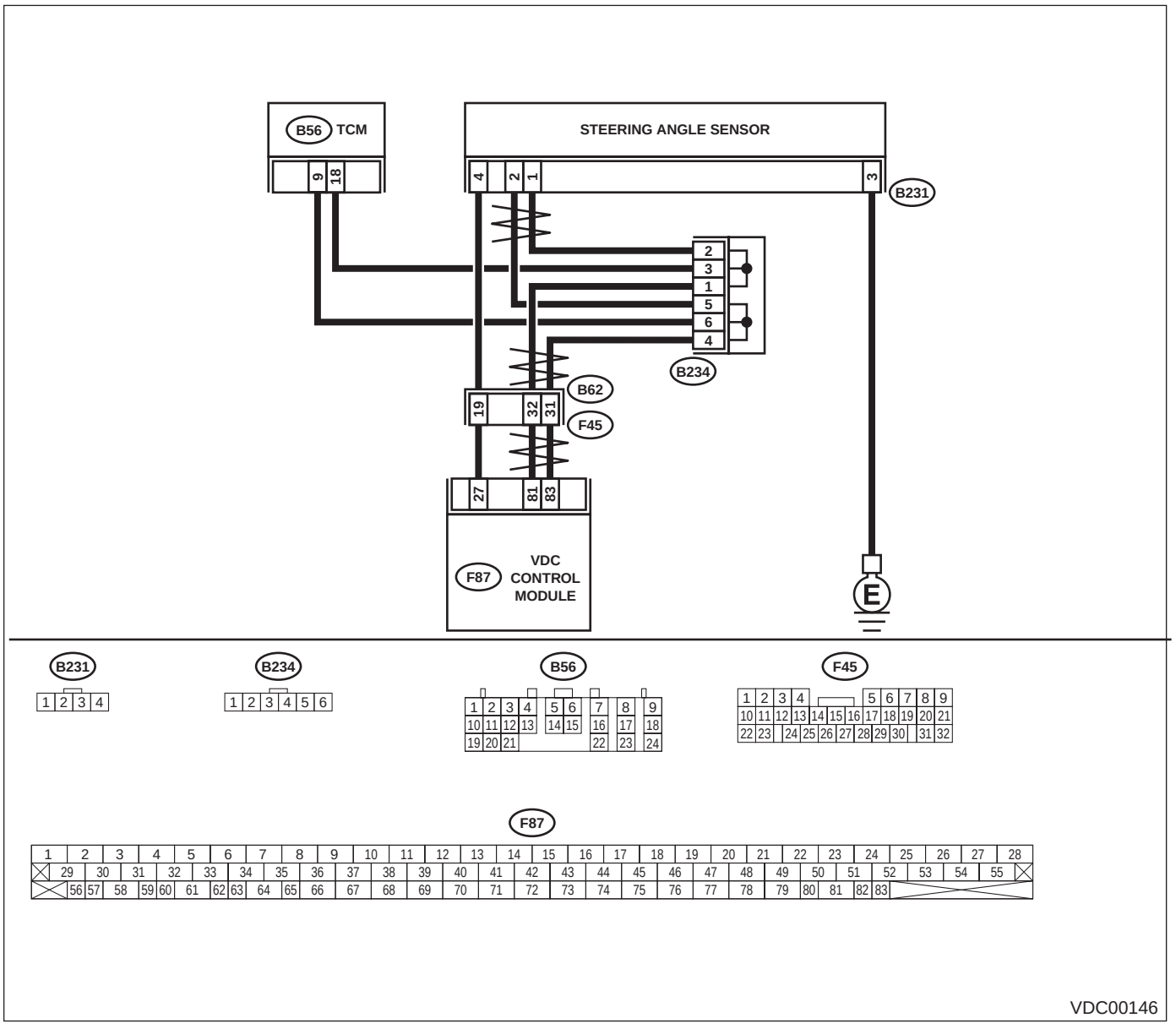
DIAGNOSIS:

- Communication with AT control faults

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00146

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Measure resistance between TCM connector terminals. ***Connector & terminal*** ***(B56) No. 9 — No. 18:*** Is the measured value within the specified range?	57 — 63 Ω	Go to step **2.**	Repair harness between TCM and VDCCM.
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in TCM connectors?	There is poor contact.	Repair connector.	Go to step **3.**
3	**CHECK TCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AE:DTC 45 CONTROL MODULE OUT OF SPECIFICATION

DIAGNOSIS:

- Control module out of specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Value	Yes	No
1	**CHECK TCM.** Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **2.**	Proceed with the diagnosis corresponding to the diagnostic trouble code.
2	**CHECK VDCCM SPECIFICATIONS.** Check the VDCCM identification mark. ***VDCCM identification mark*** ***P*** Does the VDCCM identification mark agree with the vehicle specifications?	Agree.	Go to step **3.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK TCM SPECIFICATIONS.** Check the TCM identification mark. ***TCM identification mark*** ***ZV*** Does the TCM identification mark agree with the vehicle specifications?	Agree.	Go to step **4.**	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>
4	**CHECK TCM.** 1) Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).> 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **5.**	The original TCM has been faulty.
5	**CHECK VDCCM.** 1) Install original TCM. 2) Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).> 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **6.**	The original VDCCM has been faulty.
6	**CHECK VDCCM.** Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>	Proceed with the diagnosis corresponding to the diagnostic trouble code.

MEMO:

Vehicle-id:
SIE-id::AE:DTC 45 Control Module out of Specification
～

AF:DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY

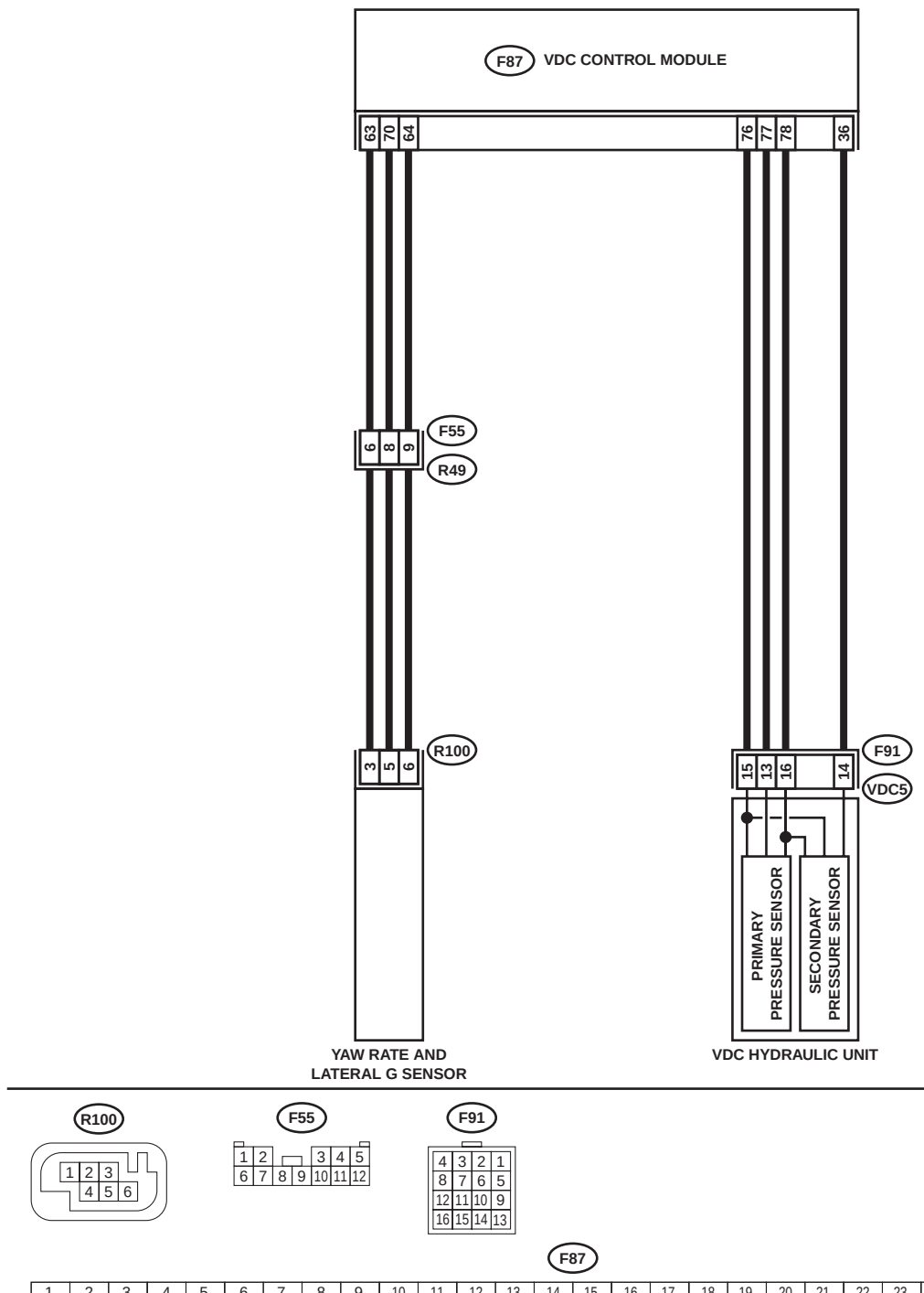
DIAGNOSIS:

- 5 volt power supply is abnormal.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00147

	Step	Value	Yes	No
1	**CHECK GROUND SHORT OF SENSOR AND HARNESS.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground (Lateral G sensor):*** ***(F87) No. 78 — Chassis ground (Pressure sensor):*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Go to step **2.**
2	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect connector from faulty sensors. 2) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground (Lateral G sensor):*** ***(F87) No. 78 — Chassis ground (Pressure sensor):*** Does the measured value exceed the specified value?	1 MΩ	Replace faulty sensors.	Repair or replace harness connector between VDCCM and faulty sensor.
3	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):*** Is the measured value less than the specified value?	0.5 V	Go to step **4.**	Go to step **5.**
4	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):*** Is the measured value less than the specified value?	0.5 V	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from faulty sensors. 3) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):*** Is the measured value less than the specified value?	0.5 V	Go to step **6.**	Repair or replace harness connector between VDCCM and faulty sensor.

	Step	Value	Yes	No
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):*** Is the measured value less than the specified value?	0.5 V	Replace faulty sensor.	Repair or replace harness connector between VDCCM and faulty sensor.

MEMO:

Vehicle-id:
SIE-id::AF:DTC 46 Abnormal Voltage of 5 V Power Supply
～

AG:DTC 47 FAULTY CAN COMMUNICATION LINE

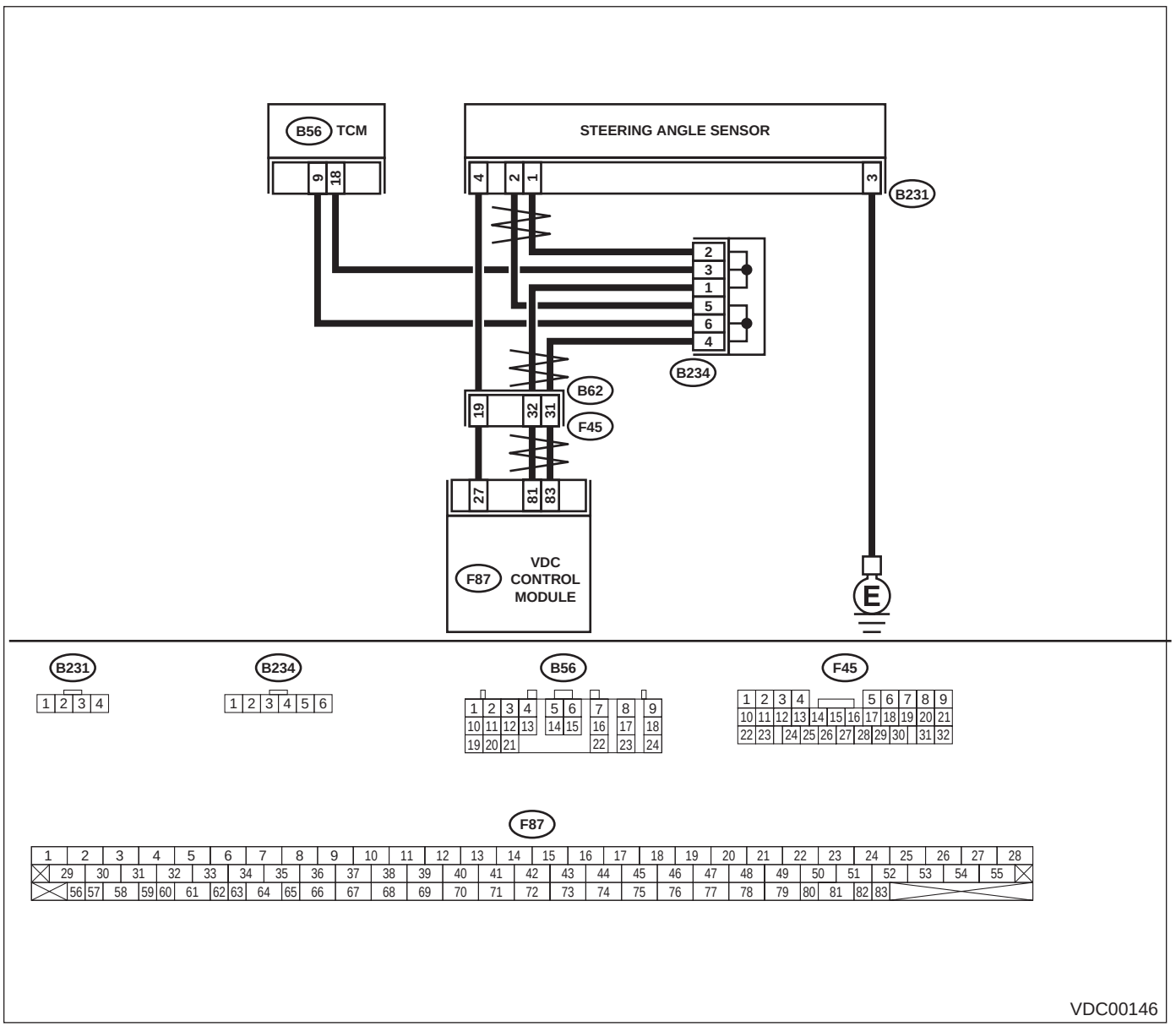
DIAGNOSIS:

- CAN communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN VDCCM, STEERING ANGLE SENSOR AND TCM.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM, TCM and steering angle sensor. 3) Measure resistance between VDCCM, TCM and steering angle sensor. ***Connector & terminal*** ***(F87) No. 83 — (B56) No. 9:*** ***(F87) No. 81 — (B56) No. 18:*** ***(F87) No. 83 — (B231) No. 2:*** ***(F87) No. 81 — (B231) No. 1:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Go to step **2.**
2	**CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND TCM.** Measure resistance between TCM and steering angle sensor. ***Connector & terminal*** ***(B56) No. 9 — (B231) No. 2:*** ***(B56) No. 18 — (B231) No. 1:*** Is the measured value less than the specified value?	0.5 Ω	Repair or replace harness connector between VDCCM and steering angle sensor.	Repair or replace harness connector between TCM and steering angle sensor.
3	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
4	**CHECK BATTERY SHORT OF SENSOR.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:*** Is the measured value less than the specified value?	0.5 V	Go to step **5.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
5	**CHECK BATTERY SHORT OF SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:*** Is the measured value less than the specified value?	0.5 V	Go to step **6.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
6	**CHECK STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to steering angle sensor. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 83 — No. 81:*** Is the measured value within the specified range?	114 — 126 Ω	Go to step **8.**	Go to step **7.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in steering angle sensor?	There is poor contact.	Replace steering angle sensor.	Repair or replace steering angle sensor connector.
8	**CHECK VDCCM.** 1) Connect connector to VDCCM. 2) Disconnect connector from steering angle sensor. 3) Measure resistance between steering angle sensor connector terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:*** Is the measured value within the specified range?	114 — 126 Ω	Go to step **10.**	Go to step **9.**
9	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in steering angle sensor?	There is poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair or replace VDCCM connector.
10	**CHECK TCM.** 1) Connect connector to TCM. 2) Disconnect connector from VDCCM. 3) Measure resistance between steering angle sensor terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **12.**	Go to step **11.**
11	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in steering angle sensor?	There is poor contact.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>	Repair or replace TCM connector.
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Are other diagnostic trouble codes being output?	Other DTC indicated.	Go to step **13.**	A temporary poor contact.
13	**CHECK DIAGNOSTIC TROUBLE CODE.** Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **14.**	Proceed with the diagnosis corresponding to the diagnostic trouble code.
14	**CHECK AT SYSTEM DIAGNOSTIC TROUBLE CODE.** Is the AT system diagnostic trouble code is same as the specification?	DTC 86	Replace steering angle sensor.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

MEMO:

Vehicle-id:
SIE-id::AG:DTC 47 Faulty CAN Communication Line
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AH:DTC 48 FAULTY ECM — VDCCM COMMUNICATION LINE

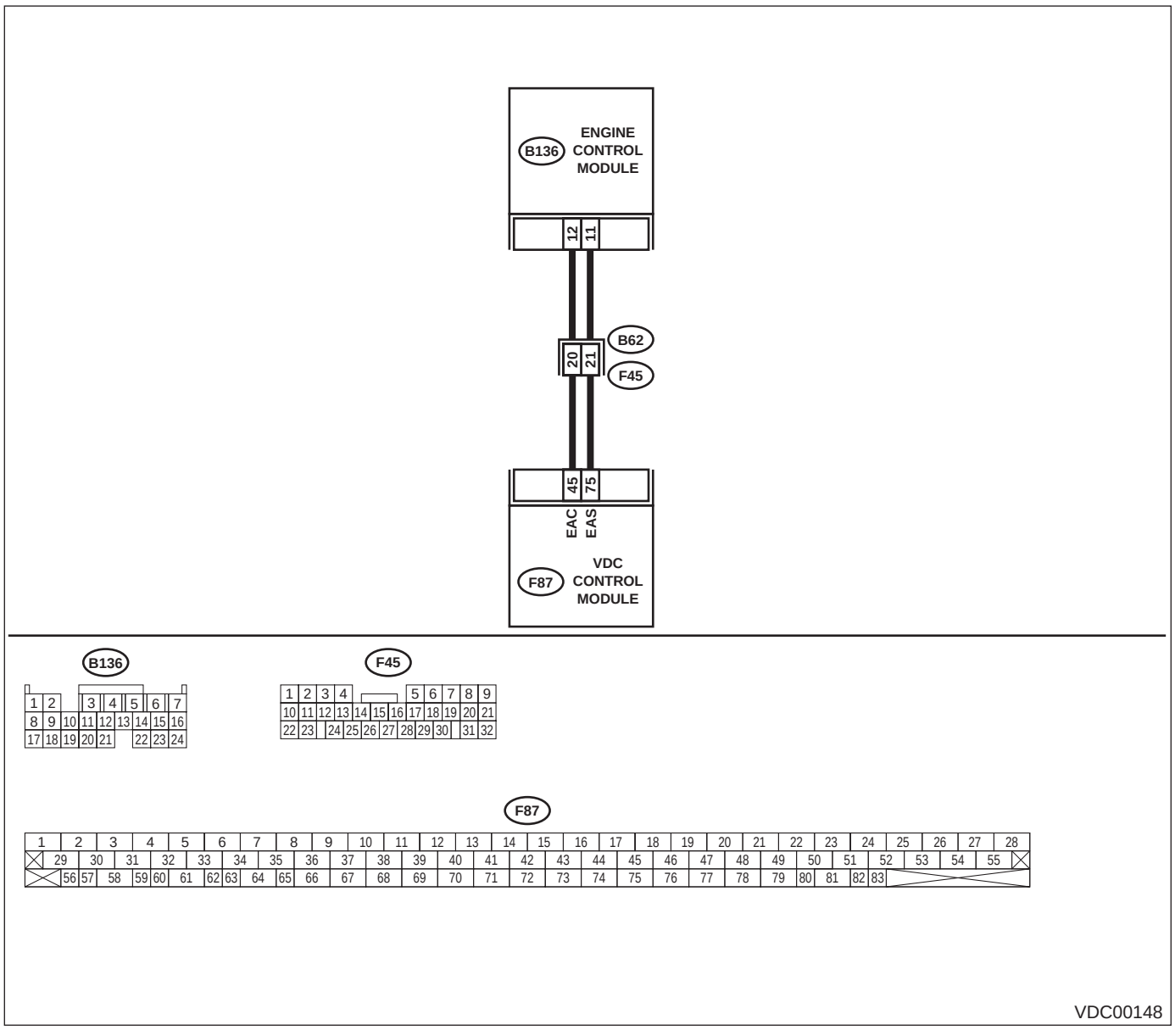
DIAGNOSIS:

- EAS communication line is broken or short circuited.
- EAC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00148

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 75 — (B136) No. 11:*** ***(F87) No. 45 — (B136) No. 12:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair or replace open circuit between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 75 — Chassis ground:*** ***(F87) No. 45 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair or replace ground short circuit between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 75 — Chassis ground:*** ***(F87) No. 45 — Chassis ground:*** Is the measured value less than the specified value?	0.5 V	Go to step **4.**	Repair or replace battery short circuit between VDCCM and ECM.
4	**CHECK INPUT VOLTAGE TO ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):*** ***(B136) No. 12 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Go to step **5.**
5	**CHECK POOR CONTACT IN ECM CONNECTORS.** Is there poor contact in ECM connector?	There is poor contact.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
6	**ERASE MEMORY.** 1) Connect all connectors. 2) Erase the memory. Can the memory be erased?	Can be erased.	Go to step **7.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK DIAGNOSTIC TROUBLE CODE.** 1) Perform inspection mode. 2) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

AI: DTC 49 ABNORMAL ENGINE SPEED SIGNAL

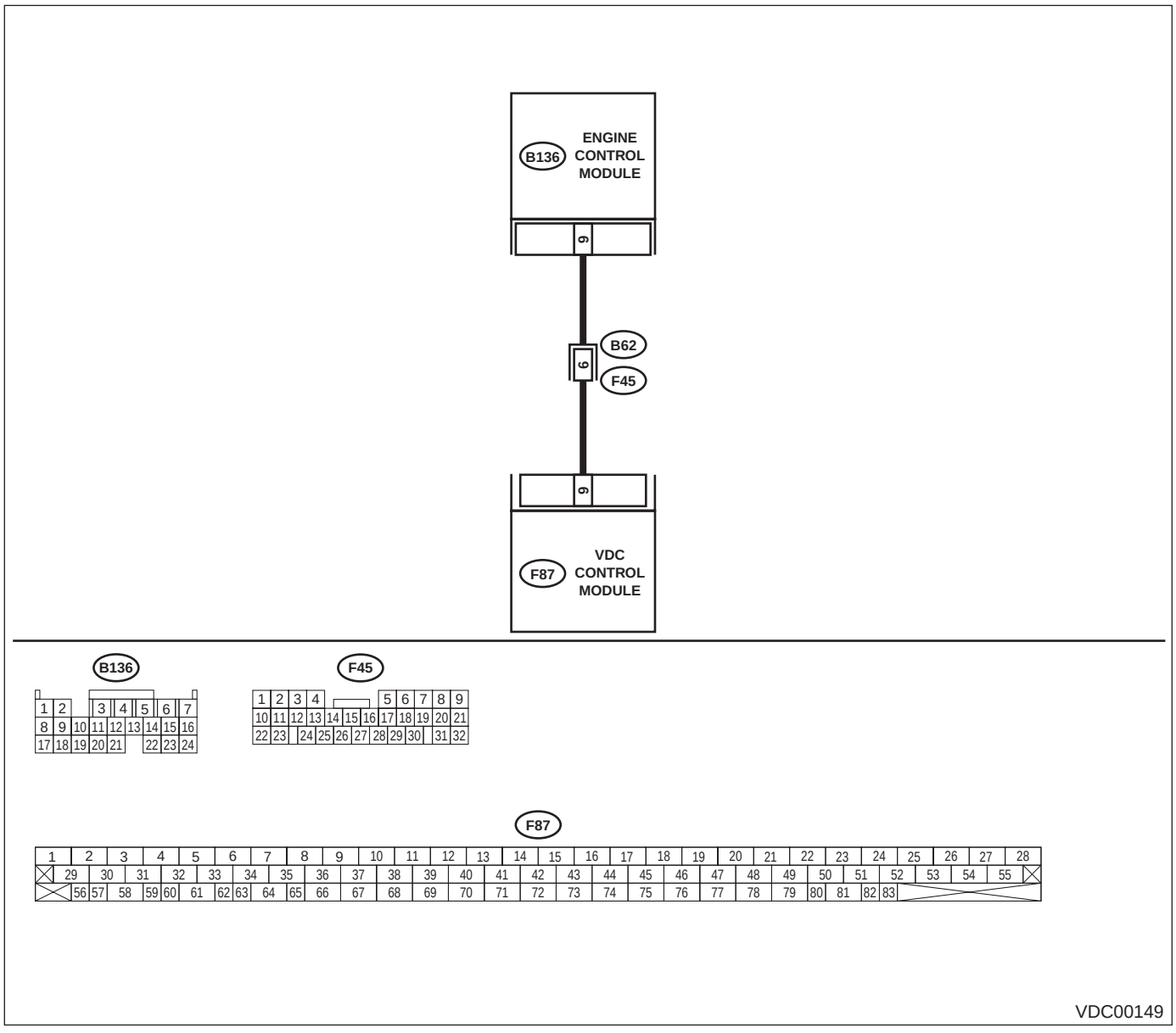
DIAGNOSIS:

- Engine speed signal line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00149

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK TACHOMETER OPERATION IN COMBINATION METER.** Does tachometer operate normally?	Operates properly.	Go to step **2.**	Repair tachometer.
2	**CHECK HARNESS BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 9 — (B136) No. 9:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair harness connector between VDCCM and ECM.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and ECM?	There is poor contact.	Repair connector.	Go to step **4.**
4	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AJ:DTC 51 ABNORMAL VALVE RELAY

DIAGNOSIS:

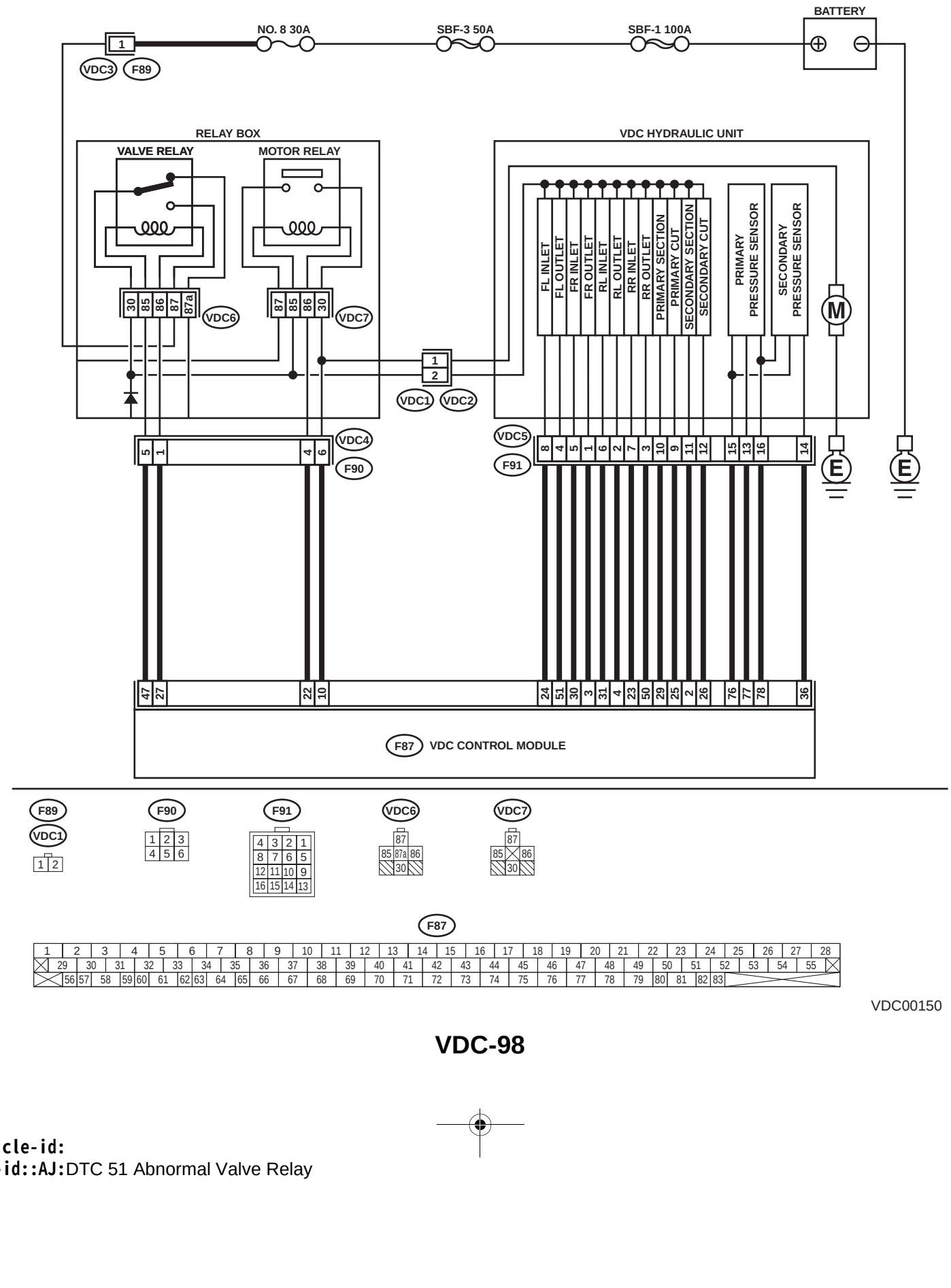
- Faulty valve relay

NOTE:
When DTC 74 ABNORMAL PRESSURE SENSOR procedure 4 is carried out, DTC 51 is memorized.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00150

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Remove valve relay from relay box. 3) Measure resistance between valve relay terminals. ***Terminals*** ***No. 85 — No. 86:*** Is the measured value within the specified range?	93 — 113 Ω	Go to step **2.**	Replace valve relay.
2	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Connect battery to valve relay terminals No. 85 and No. 86. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Replace valve relay.
3	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Replace valve relay.
4	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Disconnect battery from valve relay terminals. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **5.**	Replace valve relay.
5	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **6.**	Replace valve relay.
6	**CHECK SHORT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 86 — No. 87:*** ***No. 86 — No. 87a:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **7.**	Replace valve relay.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK POWER SUPPLY FOR VALVE RELAY.** 1) Disconnect connector (F89) from relay box. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **8.**	Repair harness between battery and relay box connector. Check fuse No. 8.
8	**CHECK OPEN CIRCUIT AND GROUND SHORT IN POWER SUPPLY CIRCUIT OF RELAY BOX.** 1) Disconnect connector (VDC1) from VDCH/U. 2) Connect connector (F89) to relay box. 3) Measure voltage of relay box. ***Connector & terminal*** ***(VDC6) No. 87 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **9.**	Replace relay box and check fuse No. 8.
9	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F90) from relay box. 3) Measure resistance between relay box connector and valve relay installing point. ***Connector & terminal*** ***(VDC4) No. 5 — (VDC6) No. 85:*** ***(VDC4) No. 1 — (VDC6) No. 86:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **10.**	Replace relay box.
10	**CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 — Chassis ground:*** ***(VDC4) No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **11.**	Replace relay box and check fuse No. 8.
11	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **12.**	Replace relay box. Check fuse No. 8.

	Step	Value	Yes	No
12	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **13.**	Replace relay box. Check fuse No. 8.
13	**CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(F87) No. 47 — (F90) No. 5:*** ***(F87) No. 27 — (F90) No. 1:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **14.**	Repair harness between VDCCM and relay box.
14	**CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 47 — Chassis ground:*** ***(F87) No. 27 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **15.**	Repair harness between VDCCM and relay box and check all fuses.
15	**CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 27 (+) — Chassis ground (–):*** ***(F87) No. 47 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **16.**	Repair harness between VDCCM and relay box.
16	**CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 27 (+) — Chassis ground (–):*** ***(F87) No. 47 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **17.**	Repair harness between VDCCM and relay box.
17	**CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between VDCH/U connector and valve relay installing point. ***Connector & terminal*** ***(VDC1) No. 2 — (VDC6) No. 30:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **18.**	Replace relay box.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
18	**CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **19.**	Replace relay box and check fuse No. 8.
19	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **20.**	Replace relay box. Check fuse No. 8.
20	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **21.**	Replace relay box. Check fuse No. 8.
21	**CHECK RESISTANCE OF INLET AND CUT SOLENOID VALVES.** 1) Disconnect connector from VDCH/U. 2) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 8 — (VDC2) No. 2:*** ***(VDC5) No. 5 — (VDC2) No. 2:*** ***(VDC5) No. 6 — (VDC2) No. 2:*** ***(VDC5) No. 7 — (VDC2) No. 2:*** ***(VDC5) No. 9 — (VDC2) No. 2:*** ***(VDC5) No. 12 — (VDC2) No. 2:*** Is the measured value within the specified range?	8.04 — 9.04 Ω	Go to step **22.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
22	**CHECK RESISTANCE OF OUTLET SOLENOID VALVE.** Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 4 — (VDC2) No. 2:*** ***(VDC5) No. 1 — (VDC2) No. 2:*** ***(VDC5) No. 2 — (VDC2) No. 2:*** ***(VDC5) No. 3 — (VDC2) No. 2:*** ***(VDC5) No. 10 — (VDC2) No. 2:*** ***(VDC5) No. 11 — (VDC2) No. 2:*** Is the measured value within the specified range?	4.04 — 4.54 Ω	Go to step **23.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
23	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **24.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
24	**CHECK BATTERY SHORT OF SOLENOID VALVE.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **25.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
25	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **26.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
26	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 (+) — Chassis ground (–):*** ***(F87) No. 24 (+) — Chassis ground (–):*** ***(F87) No. 23 (+) — Chassis ground (–):*** ***(F87) No. 31 (+) — Chassis ground (–):*** ***(F87) No. 26 (+) — Chassis ground (–):*** ***(F87) No. 25 (+) — Chassis ground (–):*** ***(F87) No. 3 (+) — Chassis ground (–):*** ***(F87) No. 51 (+) — Chassis ground (–):*** ***(F87) No. 50 (+) — Chassis ground (–):*** ***(F87) No. 4 (+) — Chassis ground (–):*** ***(F87) No. 2 (+) — Chassis ground (–):*** ***(F87) No. 29 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **27.**	Repair harness between VDCH/U and VDCCM and check all fuses.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
27	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 (+) — Chassis ground (–):*** ***(F87) No. 24 (+) — Chassis ground (–):*** ***(F87) No. 23 (+) — Chassis ground (–):*** ***(F87) No. 31 (+) — Chassis ground (–):*** ***(F87) No. 26 (+) — Chassis ground (–):*** ***(F87) No. 25 (+) — Chassis ground (–):*** ***(F87) No. 3 (+) — Chassis ground (–):*** ***(F87) No. 51 (+) — Chassis ground (–):*** ***(F87) No. 50 (+) — Chassis ground (–):*** ***(F87) No. 4 (+) — Chassis ground (–):*** ***(F87) No. 2 (+) — Chassis ground (–):*** ***(F87) No. 29 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **28.**	Repair harness between VDCH/U and VDCCM and check all fuses.
28	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 — Chassis ground:*** ***(F87) No. 24 — Chassis ground:*** ***(F87) No. 23 — Chassis ground:*** ***(F87) No. 31 — Chassis ground:*** ***(F87) No. 26 — Chassis ground:*** ***(F87) No. 25 — Chassis ground:*** ***(F87) No. 3 — Chassis ground:*** ***(F87) No. 51 — Chassis ground:*** ***(F87) No. 50 — Chassis ground:*** ***(F87) No. 4 — Chassis ground:*** ***(F87) No. 2 — Chassis ground:*** ***(F87) No. 29 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **29.**	Repair harness between VDCH/U and VDCCM.
29	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***(F87) No. 30 — (VDC2) No. 2:*** ***(F87) No. 24 — (VDC2) No. 2:*** ***(F87) No. 23 — (VDC2) No. 2:*** ***(F87) No. 31 — (VDC2) No. 2:*** ***(F87) No. 26 — (VDC2) No. 2:*** ***(F87) No. 25 — (VDC2) No. 2:*** Is the measured value within the specified range?	8.0 — 10.0 Ω	Go to step **30.**	Repair harness/ connector between VDCH/U and VDCCM.

	Step	Value	Yes	No
30	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***(F87) No. 3 — (VDC2) No. 2:*** ***(F87) No. 51 — (VDC2) No. 2:*** ***(F87) No. 50 — (VDC2) No. 2:*** ***(F87) No. 4 — (VDC2) No. 2:*** ***(F87) No. 2 — (VDC2) No. 2:*** ***(F87) No. 29 — (VDC2) No. 2:*** Is the measured value within the specified range?	4.0 — 6.0 Ω	Go to step **31.**	Repair harness/ connector between VDCH/U and VDCCM.
31	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between VDCCM and VDCH/U?	There is poor contact.	Repair connector.	Go to step **32.**
32	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **33.**
33	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

AK:DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY

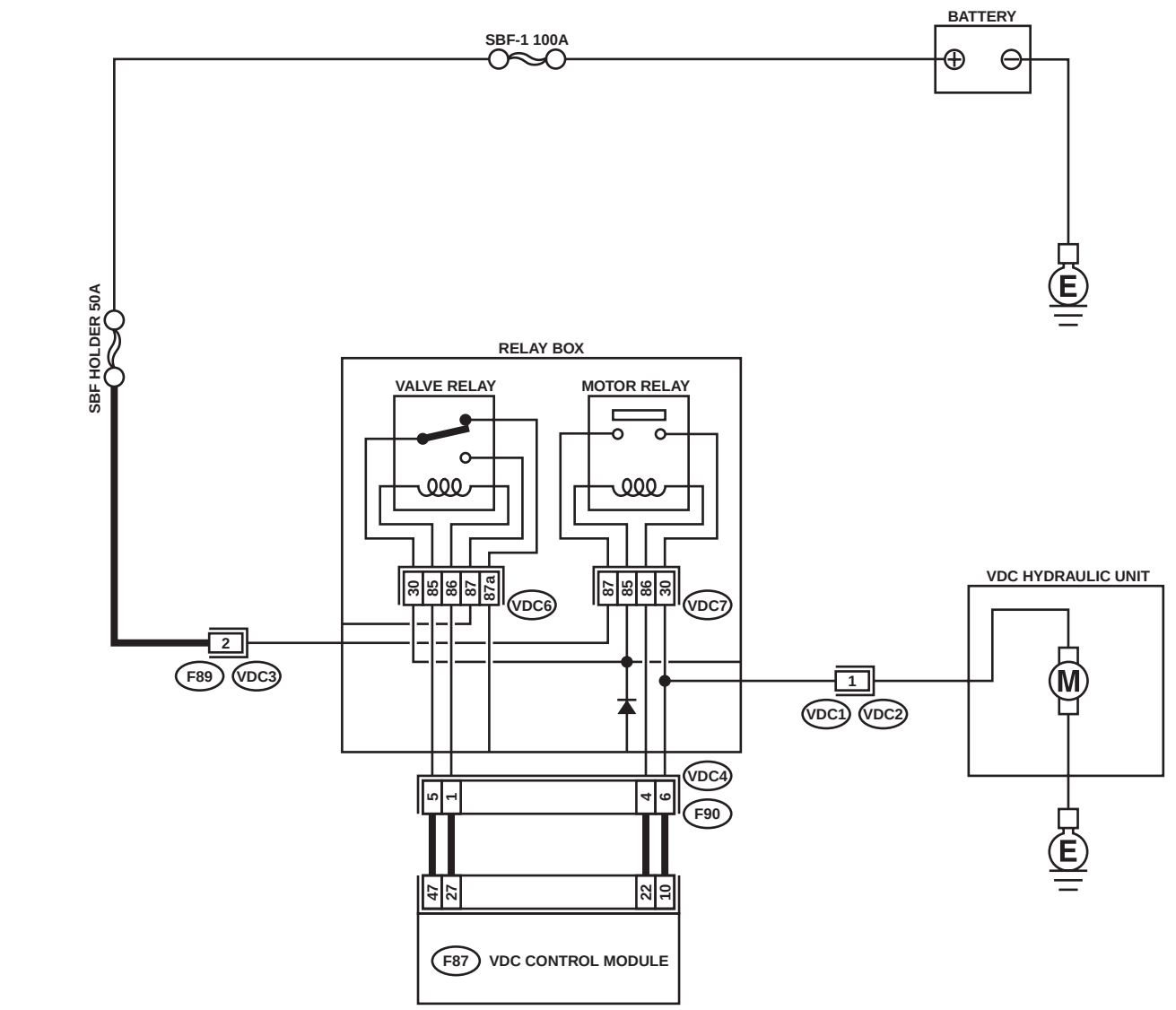
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00155

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 86:*** Is the measured value within the specified range?	70 — 90 Ω	Go to step **2.**	Replace motor relay.
2	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Connect battery to motor relay terminals No. 85 and No. 86. 2) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Replace motor relay.
3	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Disconnect battery from motor relay terminals. 2) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Replace motor relay.
4	**CHECK SHORT OF MOTOR RELAY.** Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 30:*** ***No. 85 — No. 87:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **5.**	Replace motor relay.
5	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect connector (F89) from relay box. 2) Disconnect connector from VDCCM. 3) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 2 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Repair harness/ connector between battery and relay box, and check fuse SBF holder.
6	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Connect connector (F89) to relay box. 2) Measure voltage between relay box and chassis ground. ***Connector & terminal*** ***(VDC7) No. 87 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **7.**	Replace relay box.

	Step	Value	Yes	No
7	**CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to OFF. 2) Disconnect connectors (VDC2, F90) from relay box. 3) Measure resistance between relay box connector unit and motor relay installing portion. ***Connector & terminal*** ***(VDC1) No. 1 — (VDC7) No. 30:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **8.**	Replace relay box.
8	**CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and motor relay installing point. ***Connector & terminal*** ***(VDC4) No. 6 — (VDC7) No. 30:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **9.**	Replace relay box.
9	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** Measure resistance between motor relay installing point and relay box connector. ***Connector & terminal*** ***(VDC4) No. 4 — (VDC7) No. 86:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **10.**	Replace relay box.
10	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** 1) Remove valve relay from relay box. 2) Measure resistance between motor relay installing point and valve relay installing point. ***Connector & terminal*** ***(VDC7) No. 85 — (VDC6) No. 30:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **11.**	Replace relay box.
11	**CHECK GROUND SHORT IN CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector unit and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:*** ***(VDC4) No. 6 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **12.**	Replace relay box.
12	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 (+) — Chassis ground (–):*** ***(VDC4) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **13.**	Replace relay box.

	Step	Value	Yes	No
13	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 (+) — Chassis ground (–):*** ***(VDC4) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **14.**	Replace relay box.
14	**CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(F87) No. 22 — (F90) No. 4:*** ***(F87) No. 10 — (F90) No. 6:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **15.**	Repair harness connector between VDCCM and relay box.
15	**CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 — Chassis ground:*** ***(F87) No. 10 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **16.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
16	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 (+) — Chassis ground (–):*** ***(F87) No. 10 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **17.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
17	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 (+) — Chassis ground (–):*** ***(F87) No. 10 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **18.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
18	**CHECK CONDITION OF MOTOR GROUND.** ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)*** Is the motor ground terminal tightly clamped?	Clamped securely.	Go to step **19.**	Tighten the clamp of motor ground terminal.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
19	**CHECK VDCCM MOTOR DRIVE TERMINAL.** 1) Turn ignition switch OFF. 2) Remove VDC connector cover. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect all connectors. 4) Install motor relay and valve relay to relay box. 5) Operate the ABS check sequence. <Ref. to VDC-16, ABS Sequence Control.> 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 22 (+) — No. 1 (–):*** Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?	Drop from 10 — 13 V to less than 1.5 V, and rise to 10 — 13 V again when carrying out the check sequence.	Go to step **20.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
20	**CHECK MOTOR OPERATION.** Operate the check sequence. <Ref. to VDC-19, VDC Sequence Control.> Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Noise heard	Go to step **21.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
21	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between VDCH/U, relay box and VDCCM?	There is poor contact.	Repair connector.	Go to step **22.**
22	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **23.**
23	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

MEMO:

Vehicle-id:
SIE-id::AK:DTC 52 Abnormal Motor and/or Motor Relay
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AL:DTC 71 ABNORMAL STEERING ANGLE SENSOR

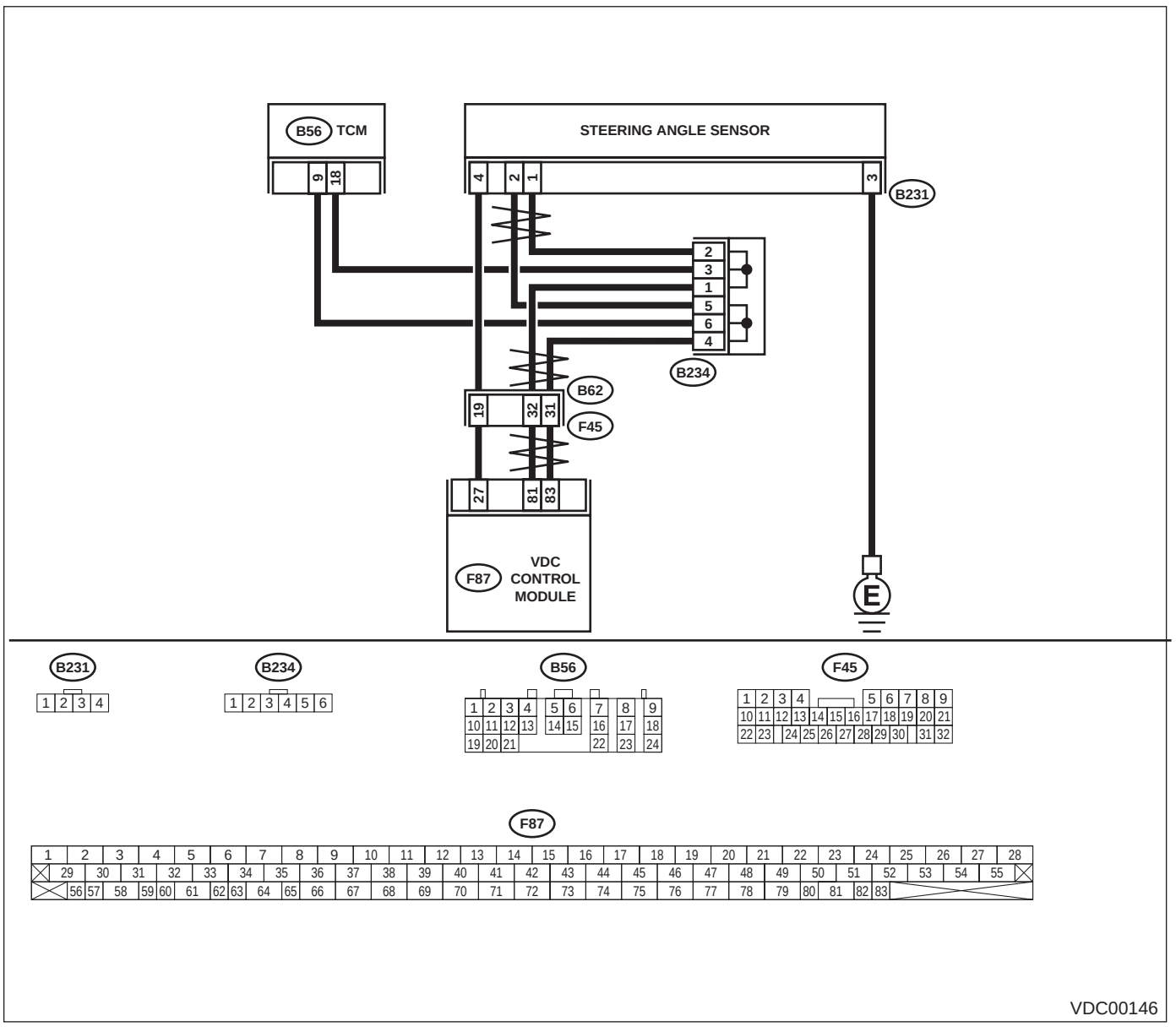
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Value	Yes	No
1	**CHECK THE STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel. Is the measured value less than the specified value?	5°	Go to step **2.**	Perform centering alignment of steering.
2	**CHECK RUNNING FIELD.** Check if the vehicle was driven on banked road surfaces or sandy surfaces (not dirt road surfaces). Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces)?	Driven	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) sometimes results in a VDCCM memory trouble code.	Go to step **3.**
3	**CHECK POWER SUPPLY OF STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from steering angle sensor. 3) Turn ignition switch to ON. 4) Measure voltage between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 27 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Repair harness between yaw rate sensor and VDCCM.	Go to step **5.**
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in yaw rate sensor connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	**CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.** Measure resistance between steering sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **7.**	Repair steering angle sensor ground harness.

	Step	Value	Yes	No
7	**CHECK HARNESS OF STEERING ANGLE SENSOR.** 1) Connect connector to steering angle sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 81 — No. 83:*** Is the measured value within the specified range?	114 — 126 Ω	Repair harness between steering angle sensor and VDCCM.	Go to step **8.**
8	**CHECK STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **10.**	Go to step **9.**
9	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
10	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Replace steering angle sensor. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	The original steering angle sensor has been faulty.

MEMO:

Vehicle-id:
SIE-id::AL:DTC 71 Abnormal Steering Angle Sensor
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AM:DTC 72 ABNORMAL YAW RATE SENSOR

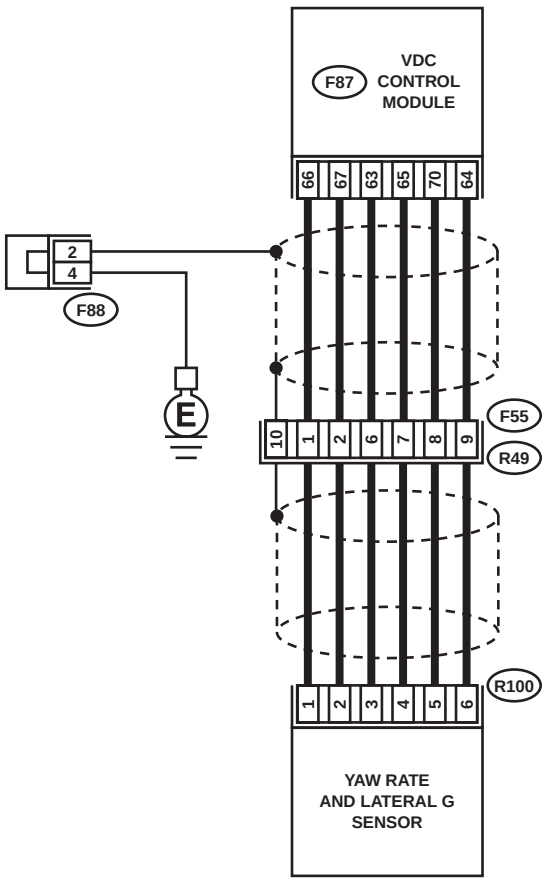
DIAGNOSIS:

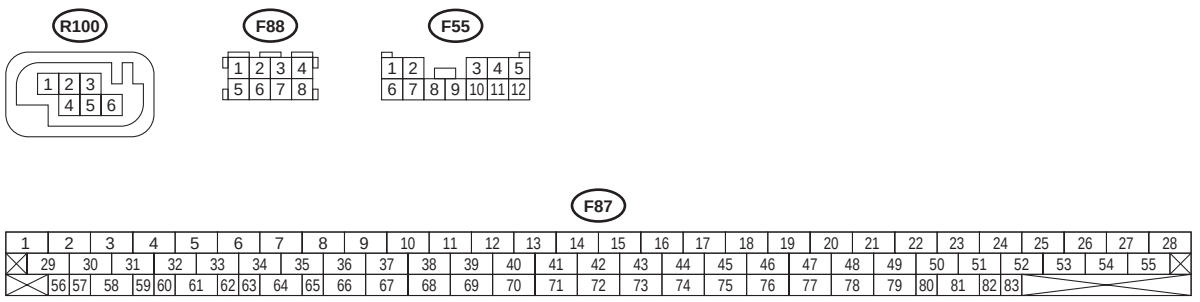
- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00151

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK THE STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel. Is the measured value less than the specified value?	5°	Go to step **2.**	Perform centering alignment of steering.
2	**CHECK RUNNING FIELD.** Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces) or surfaces with holes or bumps at high speeds?	Driven	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) or surfaces with holes or bumps at high speeds, sometimes results in a VDCCM memory trouble code.	Go to step **3.**
3	**CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR.** Check installation of yaw rate and lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?	Fixed securely.	Go to step **4.**	Install yaw rate and lateral G sensor securely.
4	**CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 3 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in yaw rate and lateral G sensor connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK GROUND CIRCUIT OF YAW RATE AND LATERAL G SENSOR.** Measure resistance between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 6 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **10.**	Go to step **8.**
8	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 64 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **9.**
9	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
10	**CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure resistance between VDCCM and yaw rate and lateral G sensor. ***Connector & terminal*** ***(F87) No. 65 — (R100) No. 4:*** ***(F87) No. 66 — (R100) No. 1:*** ***(F87) No. 67 — (R100) No. 2:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **11.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
11	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 65 — Chassis ground:*** ***(F87) No. 66 — Chassis ground:*** ***(F87) No. 67 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **12.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):*** ***(F87) No. 66 (+) — Chassis ground (–):*** ***(F87) No. 67 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **13.**	Repair harness between yaw rate and lateral G sensor and VDCCM.

	Step	Value	Yes	No
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):*** ***(F87) No. 66 (+) — Chassis ground (–):*** ***(F87) No. 67 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **14.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
14	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Install yaw rate and lateral G sensor to body. 3) Connect all connectors. 4) Turn ignition switch to ON. 5) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 66 (+) — No. 64 (–):*** Is the measured value within the specified range?	2.1 — 2.9 V	Go to step **15.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
15	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to ON. 2) Check oscilloscope signal pattern between VDCCM connector terminals.<Ref. to VDC-18, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> ***Connector & terminal*** ***(F87) No. 67 (+) — No. 64 (–):*** Is the oscilloscope pattern the same as shown in the figure?	Same pattern.	Go to step **16.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
16	**CHECK YAW RATE SENSOR.** Check oscilloscope pattern between yaw rate and lateral G sensor terminals.<Ref. to VDC-18, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> ***Connector & terminal*** ***(F87) No. 65 (+) — No. 64 (–):*** Is the oscilloscope pattern the same as shown in the figure?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace yaw rate and lateral G sensor. <Ref. to VDC-8, VDC Control Module (VDCCM).>

AN:DTC 73 ABNORMAL LATERAL G SENSOR

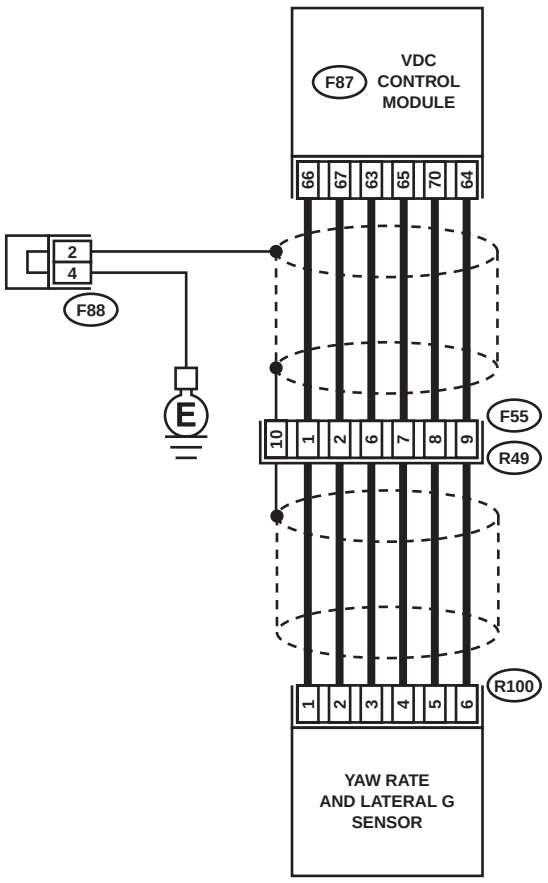
DIAGNOSIS:

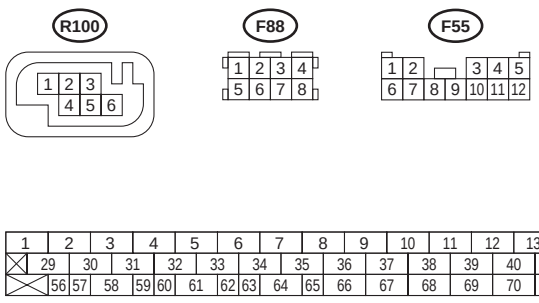
- Faulty lateral G sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00151

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK INSTALLATION OF LATERAL G SENSOR.** Check installation of lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?	Fixed securely.	Go to step **2.**	Install yaw rate and lateral G sensor securely.
2	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect connector from yaw rate and lateral G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 3 (+) — No. 6 (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **3.**	Repair harness/ connector between yaw rate and lateral G sensor and VDCCM.
3	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between yaw rate and lateral G sensor terminals. ***Terminals*** ***No. 3 — No. 5:*** Is the measured value within the specified range?	4.3 — 4.9 kΩ	Go to step **4.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
4	**CHECK OPEN CIRCUIT IN YAW RATE AND LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Connect connector to yaw rate and lateral G sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 63 — No. 70:*** Is the measured value within the specified range?	4.3 — 4.9 kΩ	Go to step **5.**	Repair harness/ connector between yaw rate and lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT IN YAW RATE AND LATERAL G SENSOR HARNESS.** 1) Disconnect connector from yaw rate and lateral G sensor. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:*** ***(F87) No. 70 — Chassis ground:*** ***(F87) No. 64 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **6.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–):*** ***(F87) No. 70 (+) — Chassis ground (–):*** ***(F87) No. 64 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **7.**	Repair harness between yaw rate and lateral G sensor and VDCCM.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–):*** ***(F87) No. 70 (+) — Chassis ground (–):*** ***(F87) No. 64 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **8.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
8	**CHECK LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove yaw rate and lateral G sensor from vehicle. 3) Connect connector to yaw rate and lateral G sensor. 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):*** Is the measured value within the specified range when yaw rate and lateral G sensor is horizontal?	2.3 — 2.7 V	Go to step **9.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
9	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):*** Is the measured value within the specified range when yaw rate and lateral G sensor is inclined 90° to left?	3.3 — 3.7 V	Go to step **10.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
10	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):*** Is the measured value within the specified range when yaw rate and lateral G sensor is inclined 90° to right?	1.3 — 1.7 V	Go to step **11.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
11	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	There is poor contact.	Repair connector.	Go to step **12.**
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

MEMO:

Vehicle-id:
SIE-id::AN:DTC 73 Abnormal Lateral G Sensor
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AO:DTC 74 ABNORMAL PRESSURE SENSOR

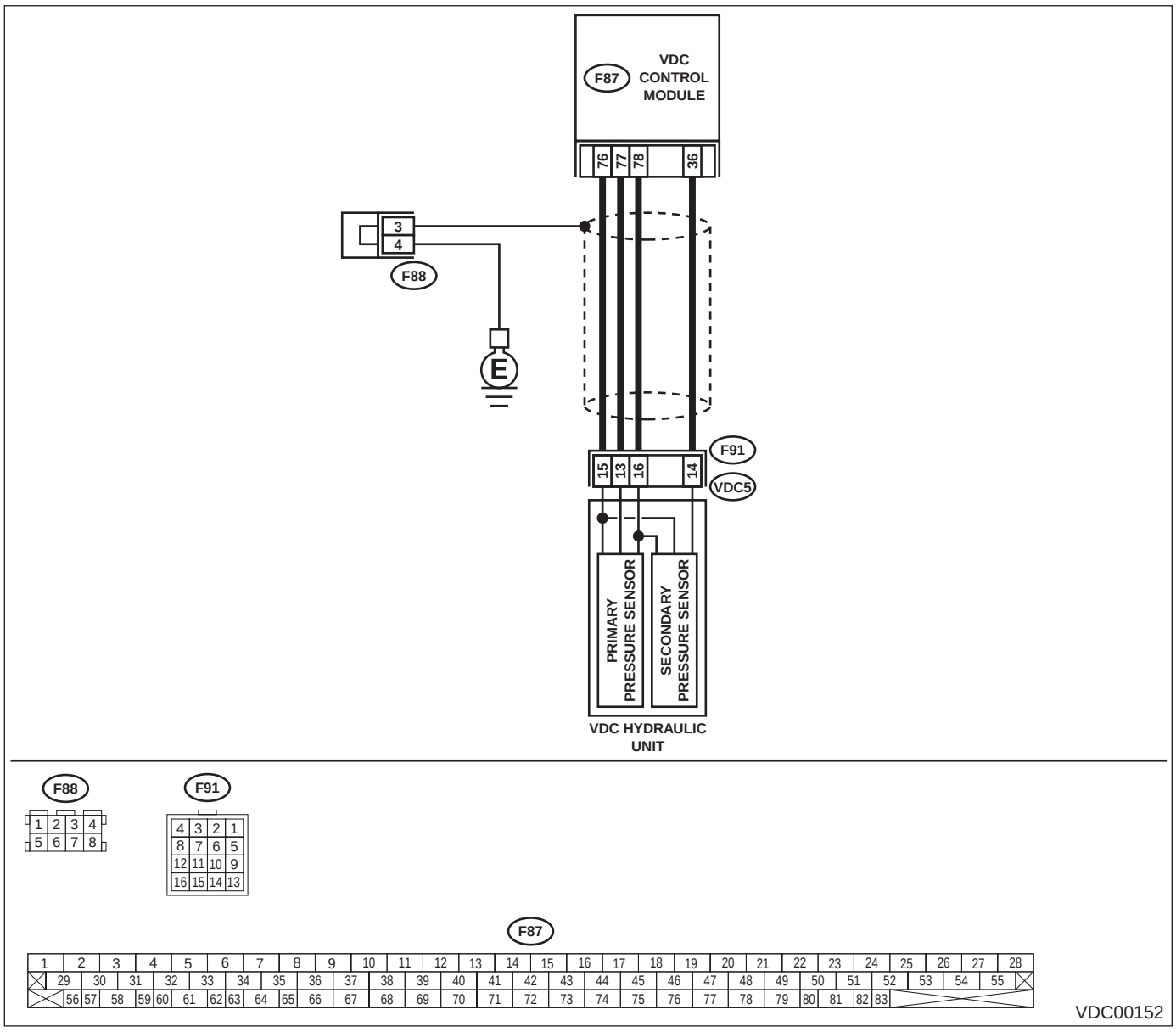
DIAGNOSIS:

- Faulty pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F91) from VDCH/U. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 15 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **4.**	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 76 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Replace harness between VDCH/U and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY OF PRESSURE SENSOR.** NOTE: When this inspection is carried out, DTC 51 ABNORMAL VALVE RELAY is memorized, but this does not indicate valve relay malfunction. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(F91) No. 16 (+) — No. 15 (–):*** Is the measured value within the specified range?	4.75 — 5.25 V	Go to step **7.**	Go to step **5.**
5	**CHECK POWER SUPPLY OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 78 (+) — No. 76 (–):*** Is the measured value within the specified range?	4.75 — 5.25 V	Repair harness between VDCH/U and VDCCM.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 — Chassis ground:*** ***(F91) No. 14 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair harness between VDCH/U and VDCCM.
8	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **9.**	Repair harness between VDCH/U and VDCCM.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **10.**	Repair harness between VDCH/U and VDCCM.
10	**CHECK OUTPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 77 (+) — No. 76 (–):*** ***(F87) No. 36 (+) — No. 76 (–):*** Is the measured value within the specified range?	0.48 — 0.72 V	Go to step **11.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
11	**CHECK BRAKE FLUID LEAKAGE.** Inspect fluid leakage between brake master cylinder and VDCH/U. Does brake fluid leak?	Fluid leaks.	Retighten or replace.	Go to step **12.**
12	**CHECK BRAKE MASTER CYLINDER.** Inspect brake master cylinder hydraulic pressure. <Ref. to BR-29, OPERATION CHECK (WITH GAUGES), INSPECTION, Brake Booster.> Is hydraulic pressure normal?	Normal.	Go to step **13.**	Replace master cylinder.

	Step	Value	Yes	No
13	**CHECK BRAKE PEDAL STROKE.** Measure the stroke between non-forced pedal position and forced pedal position with 50 kg (110 lb). Is the measured value less than the specified value?	95 mm (3.74 in)	Go to step **14.**	Perform bleeding.
14	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Depress the brake pedal with 50 kg (110 lb). 2) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***A (F87) No. 77 (+) — No. 76 (–):*** ***B (F87) No. 36 (+) — No. 76 (–):*** Does the voltage difference between A and B exceed the specified value?	0.2 V	Go to step **15.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
15	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between VDCCM and pressure sensor?	There is poor contact.	Repair connector.	Go to step **16.**
16	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **17.**
17	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

14.Diagnostics Chart with Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE (SELECT MONITOR COMMUNICATION FAILURE)

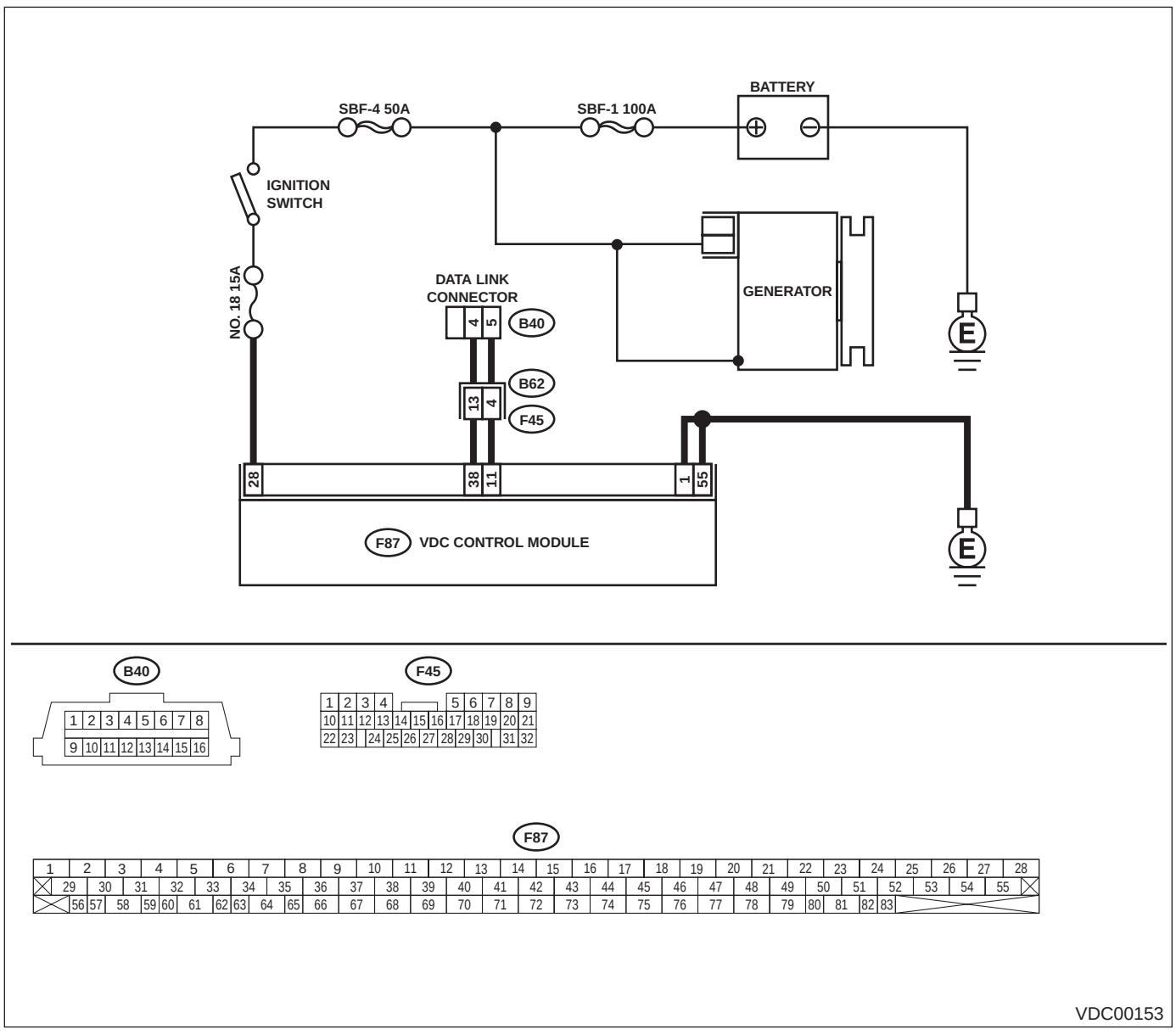
DIAGNOSIS:

- Faulty harness connector

TROUBLE SYMPTOM:

- ABS warning light remains on.

WIRING DIAGRAM:



VDC00153

Vehicle-id:
SIE-id::A: Communication for Initializing Impossible (Select Monitor Communication Failure)
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DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK IGNITION SWITCH.**	Is ignition switch to ON?	Go to step **2.**	Turn ignition switch to ON, and select VDCCM mode using the select monitor.
2	**CHECK BATTERY.** 1) Turn ignition switch to OFF. 2) Measure battery voltage. Does the measured value exceed the specified value?	11 V	Go to step **3.**	Charge or replace battery.
3	**CHECK BATTERY TERMINAL.** Is there poor contact at battery terminal?	There is poor contact.	Repair or tighten battery terminal.	Go to step **4.**
4	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to ON. 2) Using the select monitor, check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor?	Displayed.	Go to step **9.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to OFF. 2) Disconnect VDCCM connector. 3) Check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor?	Displayed.	Go to step **10.**	Go to step **6.**
6	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to OFF. 2) Connect VDCCM module connector. 3) Disconnect cruise control module connector. 4) Check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor? NOTE: If the vehicle is not equipped with cruise control: Go to step **7.**	Displayed.	Inspect cruise control module.	Go to step **7.**
7	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect VDCCM, and cruise control module connectors. 3) Measure resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair harness and connector between each control module and data link connector.

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
8	**CHECK OUTPUT SIGNAL FOR VDCCM.** 1) Turn ignition switch to ON. 2) Measure voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — Chassis ground:*** Is the measured value less than the specified value?	1 V	Repair harness and connector between each control module and data link connector.	Go to step **9.**
9	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND DATA LINK CONNECTOR.** Measure resistance between VDCCM connector and data link connector. ***Connector & terminal*** ***(F87) No. 11 — (B40) No. 5:*** ***(F87) No. 38 — (B40) No. 4:*** Does the measured value exceed the specified value?	0.5 Ω	Repair harness and connector between VDCCM and data link connector.	Go to step **10.**
10	**CHECK INSTALLATION OF VDCCM CONNECTOR.** Turn ignition switch to OFF. Is VDCCM connector inserted into VDCCM until the clamp locks onto it?	VDCCM connector is connected and the clamp is locked.	Go to step **11.**	Insert VDCCM connector into VDCCM until the clamp locks onto it.
11	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn ignition switch to ON (engine OFF). 2) Measure ignition power supply voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 28 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	10 V	Go to step **12.**	Repair open circuit in harness between VDCCM and battery.
12	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and transmission. 3) Measure resistance of harness between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:*** Is the measured value less than the specified value? Does the measured value exceed the specified value?	1 Ω	Go to step **13.**	Repair open circuit in harness between VDCCM and inhibitor side connector, and poor contact in coupling connector.
13	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in control module power supply, ground line and data link connector?	There is poor contact.	Repair connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

B: DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-132, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>

C: DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-132, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>

D: DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-132, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>

Vehicle-id:
SIE-id::B:DTC 21 Front Right ABS Sensor Circuit Open or Shorted Battery
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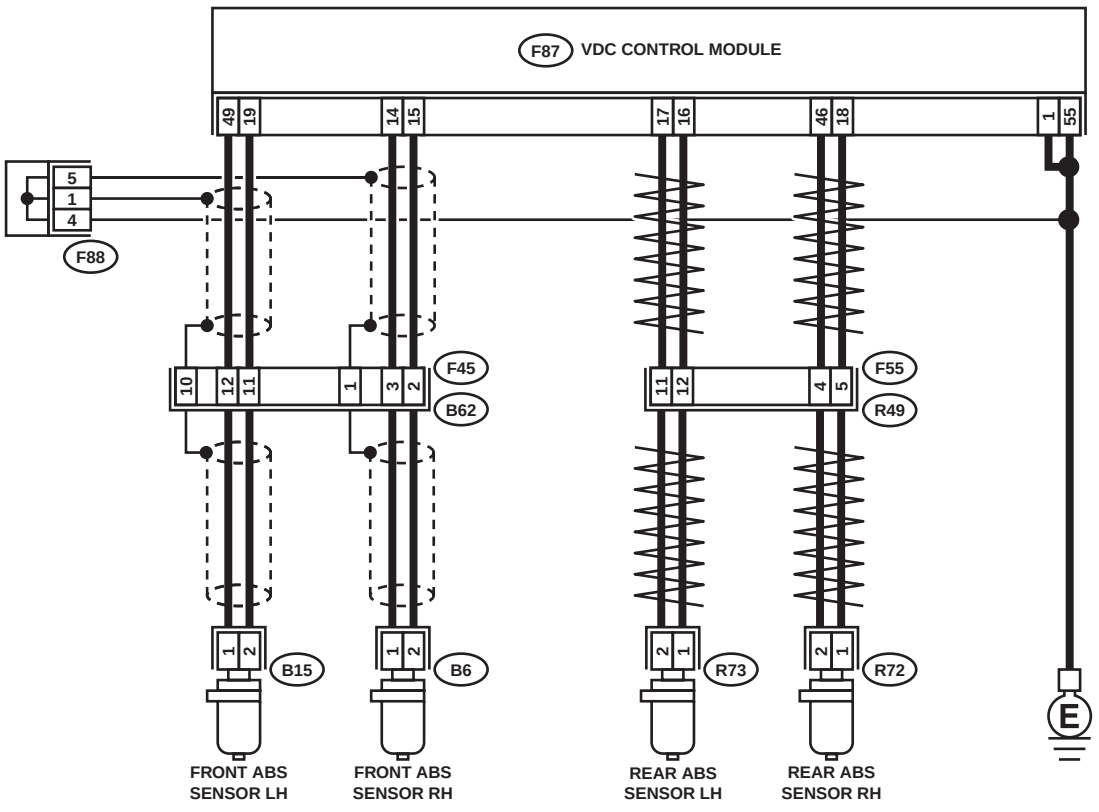
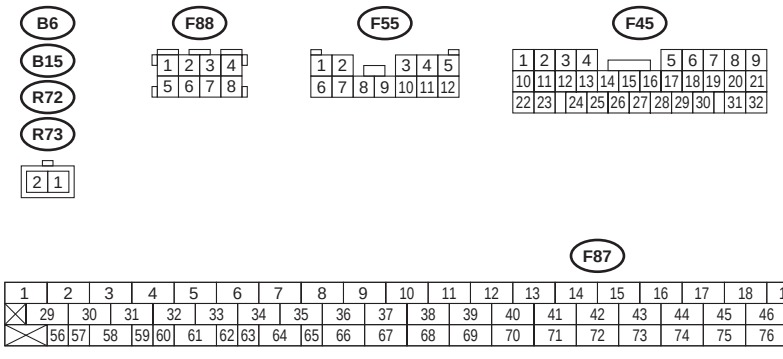
E: DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

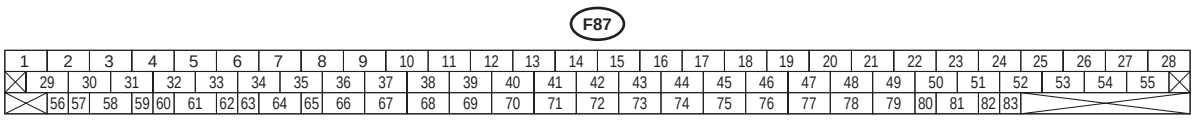
DIAGNOSIS:
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:







VDC00141

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode. Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Change	Go to step **2.**	Go to step **9.**
2	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened securely? ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)***	Tightened securely.	Go to step **3.**	Tighten ABS sensor installation bolts securely.
3	**CHECK ABS SENSOR GAP.** Measure tone wheel-to-pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **4.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **5.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step **6.**
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between VDCCM and ABS sensor.

	Step	Value	Yes	No
8	**CHECK ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within the specified range?	1.0 — 1.5 kΩ	Go to step **9.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
9	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **10.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
10	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **11.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
11	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 — No. 15:*** ***DTC 23 / (F87) No. 49 — No. 19:*** ***DTC 25 / (F87) No. 18 — No. 46:*** ***DTC 27 / (F87) No. 16 — No. 17:*** Is the measured value within the specified range?	1.0 — 1.5 kΩ	Go to step **12.**	Repair harness/ connector between VDCCM and ABS sensor.

	Step	Value	Yes	No
12	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 (+) — Chassis ground (–):*** ***DTC 23 / (F87) No. 49 (+) — Chassis ground (–):*** ***DTC 25 / (F87) No. 18 (+) — Chassis ground (–):*** ***DTC 27 / (F87) No. 16 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **13.**	Repair harness between VDCCM and ABS sensor.
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 (+) — Chassis ground (–):*** ***DTC 23 / (F87) No. 49 (+) — Chassis ground (–):*** ***DTC 25 / (F87) No. 18 (+) — Chassis ground (–):*** ***DTC 27 / (F87) No. 16 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **14.**	Repair harness between VDCCM and ABS sensor.
14	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened securely? ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)***	Tightened securely.	Go to step **15.**	Tighten ABS sensor installation bolts securely.
15	**CHECK ABS SENSOR GAP.** Measure tone wheel-to-pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
16	**CHECK HUB AND TONE WHEEL RUNOUT.** Measure hub and tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **17.**	Repair hub and tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
17	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step **18.**

DIAGNOSTICS CHART WITH SELECT MONITOR

Step		Value	Yes	No
18	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **19.**
19	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between VDCCM and ABS sensor.

F: DTC 22 FRONT RIGHT ABS SENSOR SIGNAL

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-138, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

G: DTC 24 FRONT LEFT ABS SENSOR SIGNAL

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-138, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

H: DTC 26 REAR RIGHT ABS SENSOR SIGNAL

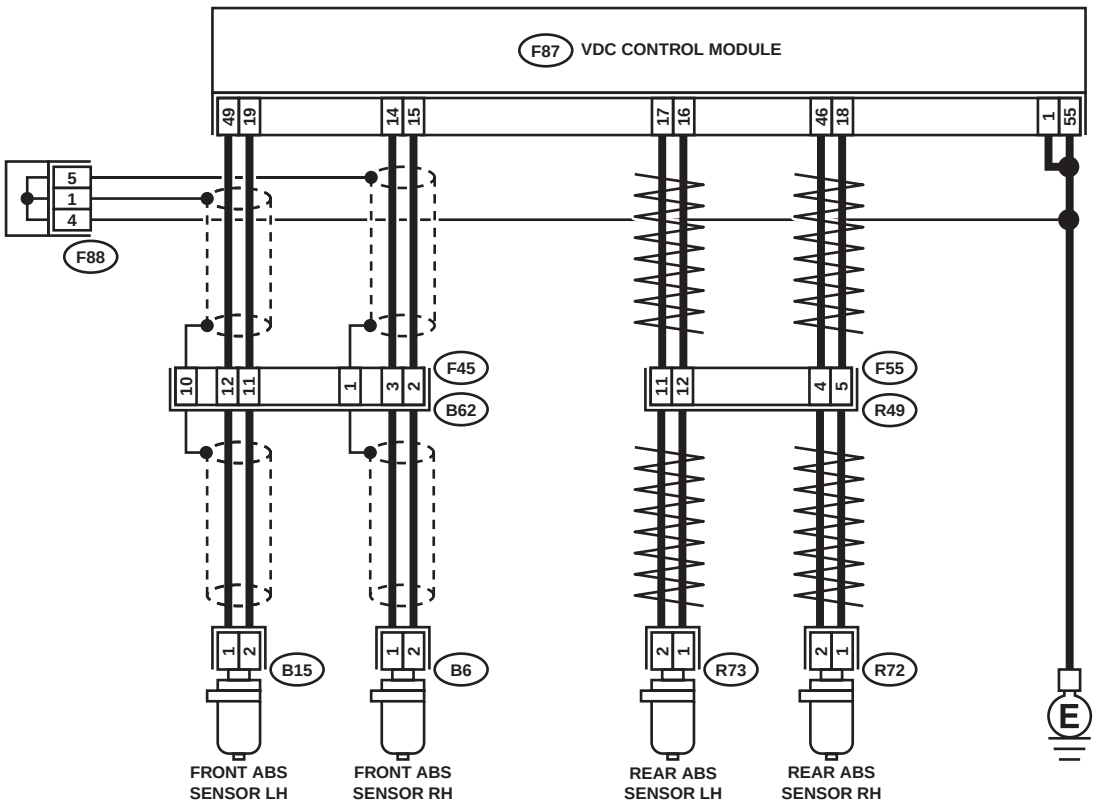
NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-138, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

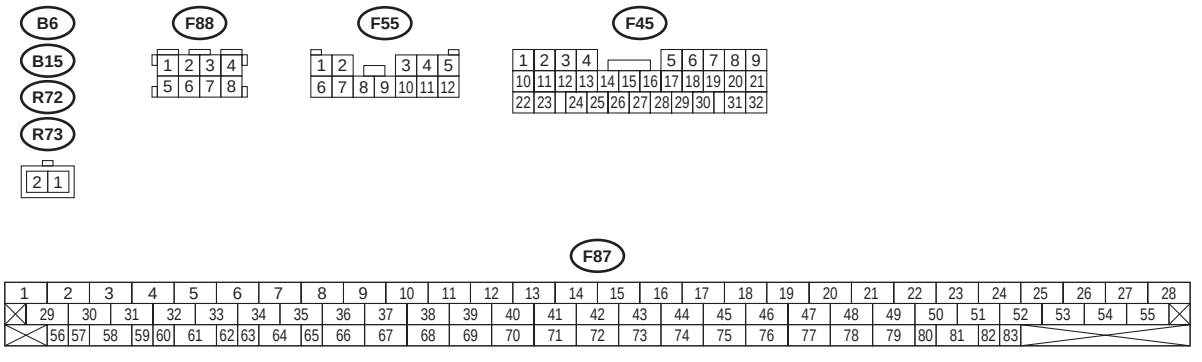
I: DTC 28 REAR LEFT ABS SENSOR SIGNAL

DIAGNOSIS:
- Faulty ABS sensor signal (noise, irregular signal)
- Faulty harness/connector

TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





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DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode. Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Change	Go to step **2.**	Go to step **8.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Installed	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK SHIELD CIRCUIT.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F45) No. 1 — Chassis ground:*** ***DTC 24 / (F45) No. 10 — Chassis ground:*** Is the measured value less than the specified value? NOTE: For the DTC 26 and 28, Go to step **6.**	0.5 Ω	Go to step **6.**	Repair shield harness.
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.
8	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)*** Are the ABS sensor installation bolts tightened securely?	Tightened securely.	Go to step **9.**	Tighten ABS sensor installation bolts securely.

	Step	Value	Yes	No
9	**CHECK ABS SENSOR GAP.** Measure tone wheel to pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **10.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
10	**CHECK OSCILLOSCOPE.** Is an oscilloscope available?	Available	Go to step **11.**	Go to step **12.**
11	**CHECK ABS SENSOR SIGNAL.** 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 (+) — No. 15 (–):*** ***DTC 24 / (F87) No. 49 (+) — No. 19 (–):*** ***DTC 26 / (F87) No. 18 (+) — No. 46 (–):*** ***DTC 28 / (F87) No. 16 (+) — No. 17 (–):*** Is oscilloscope pattern smooth, as shown in figure?	Smooth pattern.	Go to step **15.**	Go to step **12.**
12	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub in accordance with diagnostic trouble code. Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Dirt or foreign matter found.	Thoroughly remove dirt or other foreign matter.	Go to step **13.**
13	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged in the ABS sensor pole piece or the tone wheel?	Broken or damaged.	Replace ABS sensor or tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> and <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-29, Rear ABS Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **14.**
14	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **15.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>

	Step	Value	Yes	No
15	**CHECK RESISTANCE OF ABS SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within the specified range?	1.0 — 1.5 kΩ	Go to step **16.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
16	**CHECK GROUND SHORT OF ABS SENSOR.** Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **17.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
17	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR.** 1) Connect connector to ABS sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance at VDCCM connector terminals. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 — No. 15:*** ***DTC 24 / (F87) No. 49 — No. 19:*** ***DTC 26 / (F87) No. 18 — No. 46:*** ***DTC 28 / (F87) No. 16 — No. 17:*** Is the measured value within the specified range?	1.0 — 1.5 kΩ	Go to step **18.**	Repair harness/ connector between VDCCM and ABS sensor.
18	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 — Chassis ground:*** ***DTC 24 / (F87) No. 49 — Chassis ground:*** ***DTC 26 / (F87) No. 18 — Chassis ground:*** ***DTC 28 / (F87) No. 16 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **19.**	Repair harness/ connector between VDCCM and ABS sensor.
19	**CHECK GROUND CIRCUIT OF VDCCM.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **20.**	Repair VDCCM ground harness.

	Step	Value	Yes	No
20	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step **21.**
21	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step **22.**	Properly install the car telephone or the wireless transmitter.
22	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Installed.	Install the noise sources apart from the sensor harness.	Go to step **23.**
23	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F45) No. 1 — Chassis ground:*** ***DTC 24 / (F45) No. 10 — Chassis ground:*** Is the measured value less than the specified value? NOTE: For the DTC 26 and 28, Go to step **25.**	0.5 Ω	Go to step **24.**	Repair shield harness.
24	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **25.**
25	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.

MEMO:

Vehicle-id:
SIE-id::I:DTC 28 Rear Left ABS Sensor Signal
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J: DTC 29 ANY ONE OF FOUR ABS SENSOR SIGNAL

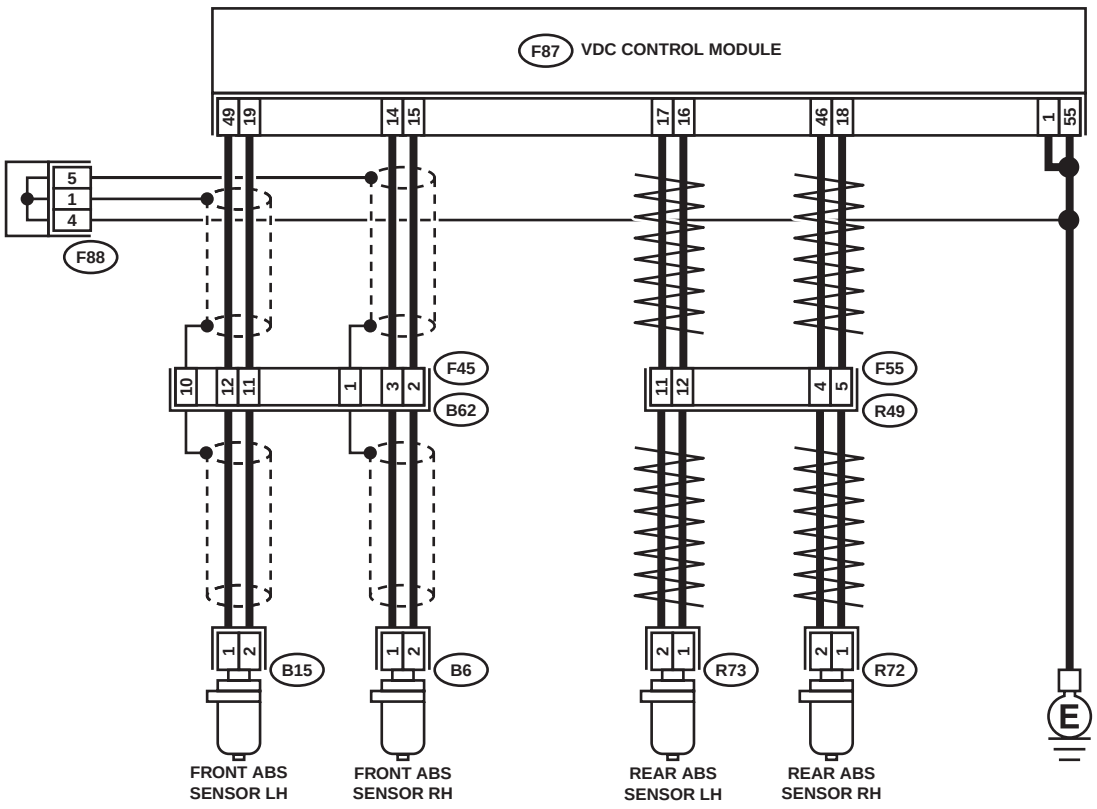
DIAGNOSIS:

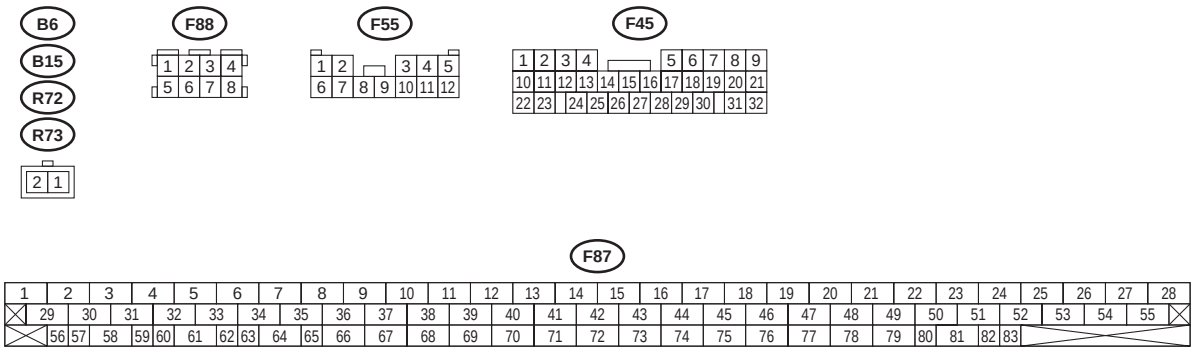
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





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DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY.** Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Turned freely over 1 minutes.	The VDC is normal. Erase the diagnostic trouble code. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or under full-lock cornering locked in full, this trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Are the tire specifications correct?	Turned freely over 1 minutes.	Go to step **3.**	Replace tire.
3	**CHECK WEAR OF TIRE.** Is the tire worn excessively?	Worn excesiblely.	Replace tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.** Is the tire pressure correct?	Correct tire pressure.	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)*** Are the ABS sensor installation bolts tightened securely?	Tightened securely.	Go to step **6.**	Tighten ABS sensor installation bolts securely.
6	**CHECK ABS SENSOR GAP.** Measure tone wheel to pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7	**CHECK OSCILLOSCOPE.** Is an oscilloscope available?	Available	Go to step **8.**	Go to step **9.**
8	**CHECK ABS SENSOR SIGNAL.** 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***(F49) No. 14 (+) — No. 15 (–) (Front RH):*** ***(F49) No. 49 (+) — No. 19 (–) (Front LH):*** ***(F49) No. 18 (+) — No. 46 (–) (Rear RH):*** ***(F49) No. 16 (+) — No. 17 (–) (Rear LH):*** Is oscilloscope pattern smooth, as shown in figure?	Smooth pattern.	Go to step **12.**	Go to step **9.**

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub. Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Dirt or foreign matter found.	Thoroughly remove dirt or other foreign matter.	Go to step **10.**
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?	Broken or damaged.	Replace ABS sensor or tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> and <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-29, Rear ABS Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step **12.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>
12	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

K: DTC 31 FR HOLD VALVE MALFUNCTION (FRONT RIGHT INLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-148, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

L: DTC 33 FL HOLD VALVE MALFUNCTION (FRONT LEFT INLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-148, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

M: DTC 35 RR HOLD VALVE MALFUNCTION (REAR RIGHT INLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-148, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

N: DTC 37 RL HOLD VALVE MALFUNCTION (REAR LEFT INLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-148, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

O: DTC 61 NORMAL OPENING VALVE 2 MALFUNCTION (PRIMARY CUT VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-148, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

P: DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION)

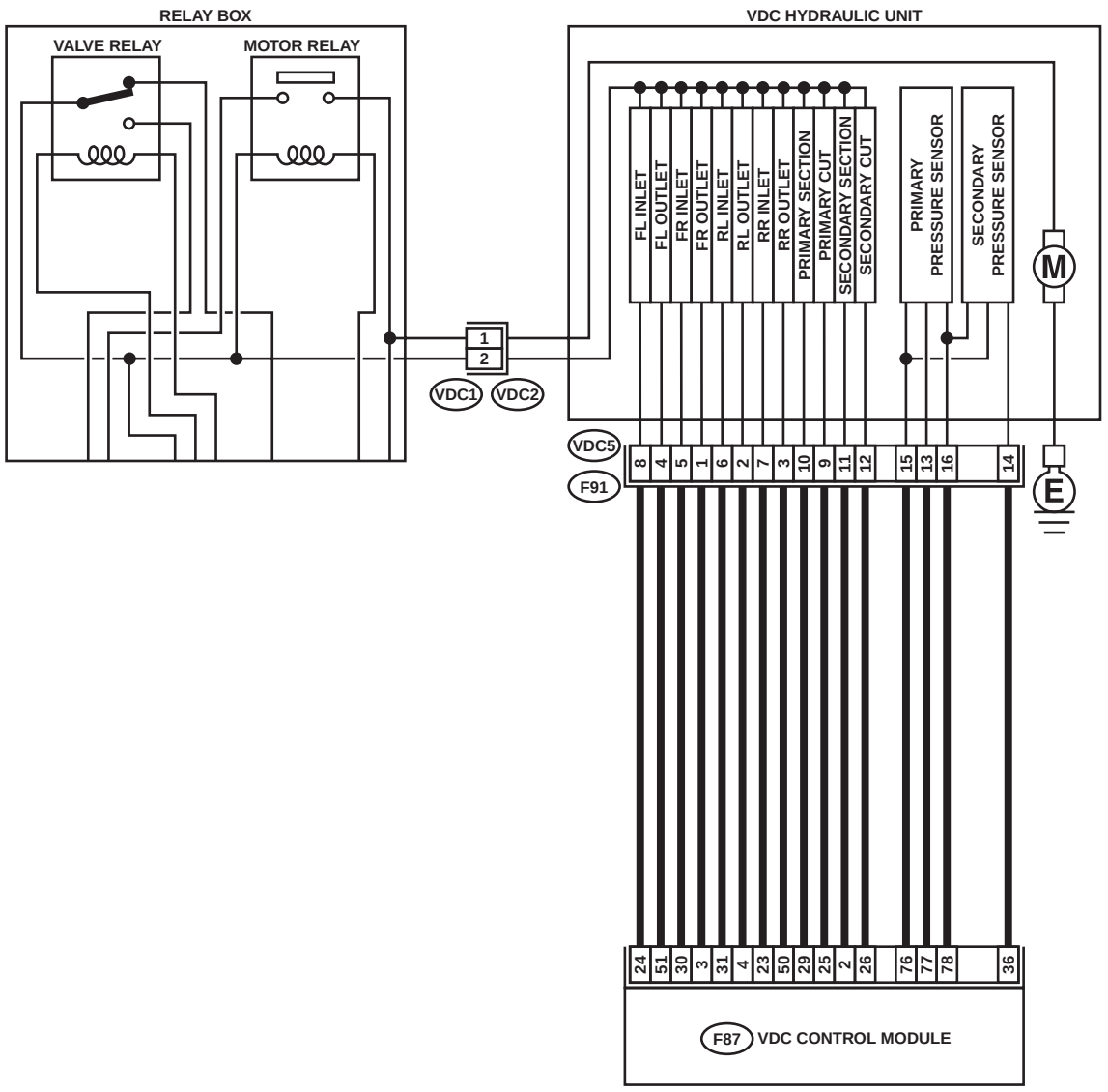
DIAGNOSIS:

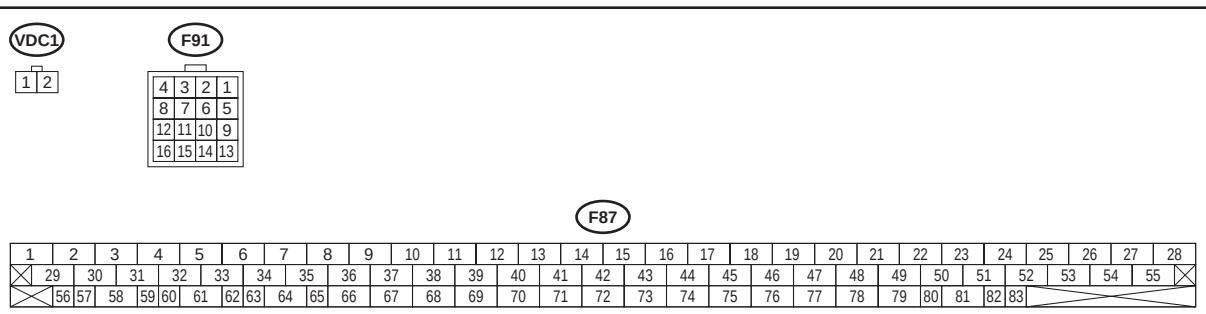
- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00142

Vehicle-id:
SIE-id::P:DTC 62 Normal Opening Valve 1 Malfunction (Secondary Cut Valve Malfunction)
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DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 — (VDC2) No. 2:*** ***DTC 33/(VDC5) No. 8 — (VDC2) No. 2:*** ***DTC 35/(VDC5) No. 7 — (VDC2) No. 2:*** ***DTC 37/(VDC5) No. 6 — (VDC2) No. 2:*** ***DTC 61/(VDC5) No. 9 — (VDC2) No. 2:*** ***DTC 62/(VDC5) No. 12 — (VDC2) No. 2:*** Is the measured value within the specified range?	8.04 — 9.04 Ω	Go to step **2.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 — Chassis ground:*** ***DTC 33/(VDC5) No. 8 — Chassis ground:*** ***DTC 35/(VDC5) No. 7 — Chassis ground:*** ***DTC 37/(VDC5) No. 6 — Chassis ground:*** ***DTC 61/(VDC5) No. 9 — Chassis ground:*** ***DTC 62/(VDC5) No. 12 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 (+) — Chassis ground (–):*** ***DTC 33/(VDC5) No. 8 (+) — Chassis ground (–):*** ***DTC 35/(VDC5) No. 7 (+) — Chassis ground (–):*** ***DTC 37/(VDC5) No. 6 (+) — Chassis ground (–):*** ***DTC 61/(VDC5) No. 9 (+) — Chassis ground (–):*** ***DTC 62/(VDC5) No. 12 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **4.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Vehicle-id:
SIE-id::P:DTC 62 Normal Opening Valve 1 Malfunction (Secondary Cut Valve Malfunction)
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	Step	Value	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 (+) — Chassis ground (–):*** ***DTC 33/(VDC5) No. 8 (+) — Chassis ground (–):*** ***DTC 35/(VDC5) No. 7 (+) — Chassis ground (–):*** ***DTC 37/(VDC5) No. 6 (+) — Chassis ground (–):*** ***DTC 61/(VDC5) No. 9 (+) — Chassis ground (–):*** ***DTC 62/(VDC5) No. 12 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 (+) — Chassis ground (–):*** ***DTC 33/(F87) No. 24 (+) — Chassis ground (–):*** ***DTC 35/(F87) No. 23 (+) — Chassis ground (–):*** ***DTC 37/(F87) No. 31 (+) — Chassis ground (–):*** ***DTC 61/(F87) No. 25 (+) — Chassis ground (–):*** ***DTC 62/(F87) No. 26 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **6.**	Repair harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 (+) — Chassis ground (–):*** ***DTC 33/(F87) No. 24 (+) — Chassis ground (–):*** ***DTC 35/(F87) No. 23 (+) — Chassis ground (–):*** ***DTC 37/(F87) No. 31 (+) — Chassis ground (–):*** ***DTC 61/(F87) No. 25 (+) — Chassis ground (–):*** ***DTC 62/(F87) No. 26 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **7.**	Repair harness between VDCCM and VDCH/U.

Vehicle-id:
SIE-id::P:DTC 62 Normal Opening Valve 1 Malfunction (Secondary Cut Valve Malfunction)
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	Step	Value	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 — Chassis ground:*** ***DTC 33/(F87) No. 24 — Chassis ground:*** ***DTC 35/(F87) No. 23 — Chassis ground:*** ***DTC 37/(F87) No. 31 — Chassis ground:*** ***DTC 61/(F87) No. 25 — Chassis ground:*** ***DTC 62/(F87) No. 26 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair harness between VDCCM and VDCH/U.
8	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 31/(F87) No. 30 — (VDC2) No. 2:*** ***DTC 33/(F87) No. 24 — (VDC2) No. 2:*** ***DTC 35/(F87) No. 23 — (VDC2) No. 2:*** ***DTC 37/(F87) No. 31 — (VDC2) No. 2:*** ***DTC 61/(F87) No. 25 — (VDC2) No. 2:*** ***DTC 62/(F87) No. 26 — (VDC2) No. 2:*** Is the measured value within the specified range?	7 — 10 Ω	Go to step **9.**	Repair harness/ connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and VDCH/U?	There is poor contact.	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Repair VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Q: DTC 32 FR PRESSURE REDUCING VALVE MALFUNCTION (FRONT RIGHT OUTLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-154, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

R: DTC 34 FL PRESSURE REDUCING VALVE MALFUNCTION (FRONT LEFT OUTLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-154, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

S: DTC 36 RR PRESSURE REDUCING VALVE MALFUNCTION (REAR RIGHT OUTLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-154, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

T: DTC 38 RL PRESSURE REDUCING VALVE MALFUNCTION (REAR LEFT OUTLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-154, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

U: DTC 63 NORMAL CLOSING VALVE 2 MALFUNCTION (PRIMARY SUCTION VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-154, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

Vehicle-id:
SIE-id::Q:DTC 32 FR Pressure Reducing Valve Malfunction (Front Right Outlet Valve Malfunction)
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DIAGNOSTICS CHART WITH SELECT MONITOR

MEMO:

Vehicle-id:
SIE-id::U:DTC 63 Normal Closing Valve 2 Malfunction (Primary Suction Valve Malfunction)
～

V: DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION)

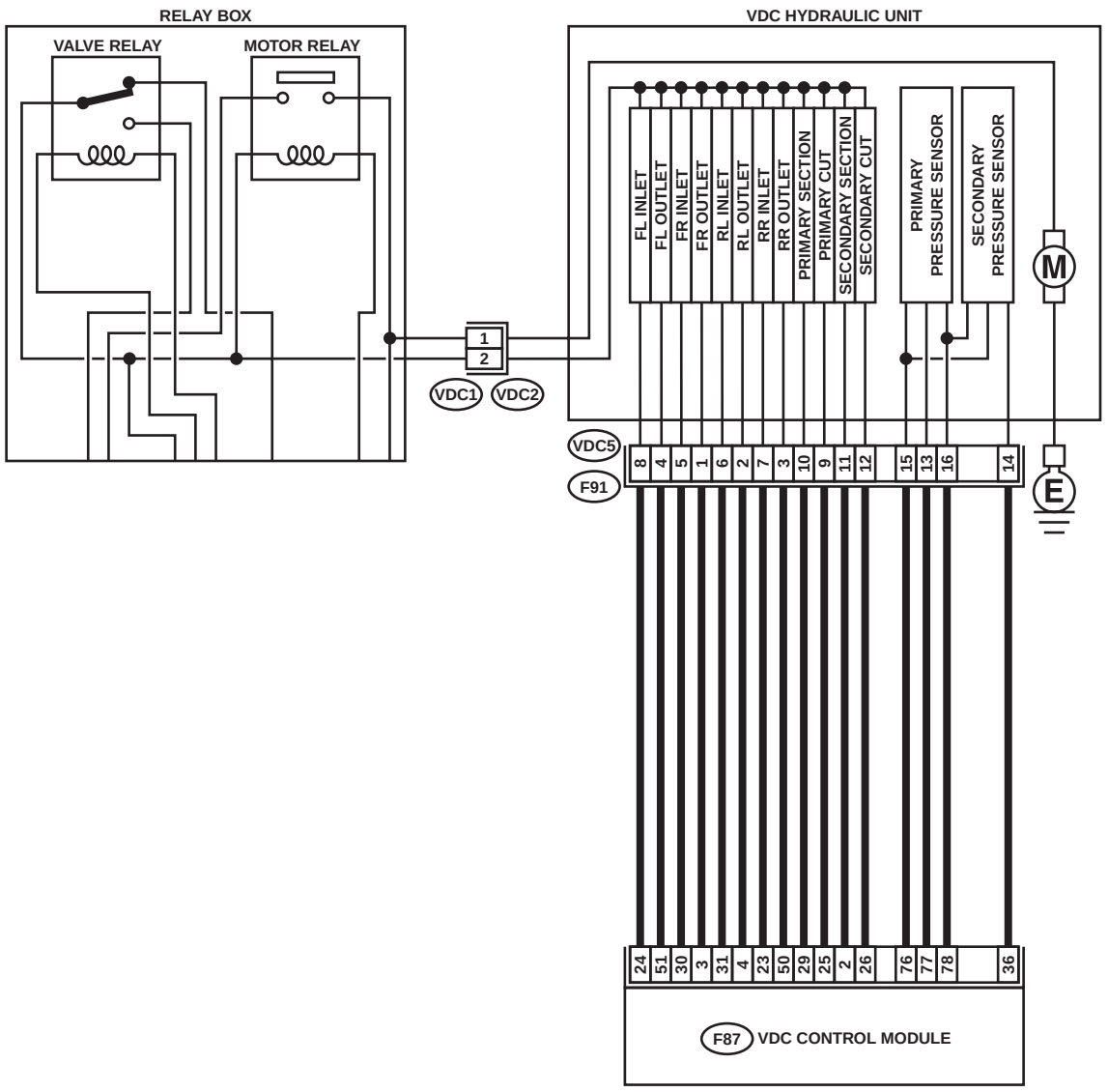
DIAGNOSIS:

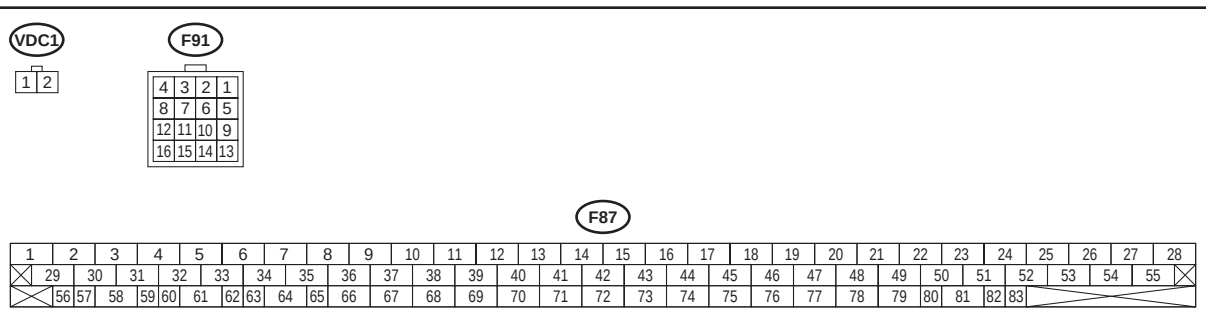
- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00142

Vehicle-id:
SIE-id::V: DTC 64 Normal Closing Valve 1 Malfunction (Secondary Suction Valve Malfunction)
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DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 — (VDC2) No. 2:*** ***DTC 34/(VDC5) No. 4 — (VDC2) No. 2:*** ***DTC 36/(VDC5) No. 3 — (VDC2) No. 2:*** ***DTC 38/(VDC5) No. 2 — (VDC2) No. 2:*** ***DTC 63/(VDC5) No. 10 — (VDC2) No. 2:*** ***DTC 64/(VDC5) No. 11 — (VDC2) No. 2:*** Is the measured value within the specified range?	3.8 — 4.8 Ω	Go to step **2.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 — Chassis ground:*** ***DTC 34/(VDC5) No. 4 — Chassis ground:*** ***DTC 36/(VDC5) No. 3 — Chassis ground:*** ***DTC 38/(VDC5) No. 2 — Chassis ground:*** ***DTC 63/(VDC5) No. 10 — Chassis ground:*** ***DTC 64/(VDC5) No. 11 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34/(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36/(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38/(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63/(VDC5) No. 10 (+) — Chassis ground (–):*** ***DTC 64/(VDC5) No. 11 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **4.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Vehicle-id:
SIE-id::V:DTC 64 Normal Closing Valve 1 Malfunction (Secondary Suction Valve Malfunction)
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	Step	Value	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34/(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36/(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38/(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63/(VDC5) No. 10 (+) — Chassis ground (–):*** ***DTC 64/(VDC5) No. 11 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 (+) — Chassis ground (–):*** ***DTC 34/(F87) No. 51 (+) — Chassis ground (–):*** ***DTC 36/(F87) No. 50 (+) — Chassis ground (–):*** ***DTC 38/(F87) No. 4 (+) — Chassis ground (–):*** ***DTC 63/(F87) No. 29 (+) — Chassis ground (–):*** ***DTC 64/(F87) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **6.**	Repair harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 (+) — Chassis ground (–):*** ***DTC 34/(F87) No. 51 (+) — Chassis ground (–):*** ***DTC 36/(F87) No. 50 (+) — Chassis ground (–):*** ***DTC 38/(F87) No. 4 (+) — Chassis ground (–):*** ***DTC 63/(F87) No. 29 (+) — Chassis ground (–):*** ***DTC 64/(F87) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **7.**	Repair harness between VDCCM and VDCH/U.

	Step	Value	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 — Chassis ground:*** ***DTC 34/(F87) No. 51 — Chassis ground:*** ***DTC 36/(F87) No. 50 — Chassis ground:*** ***DTC 38/(F87) No. 4 — Chassis ground:*** ***DTC 63/(F87) No. 29 — Chassis ground:*** ***DTC 64/(F87) No. 2 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair harness between VDCCM and VDCH/U.
8	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 32/(F87) No. 3 — (VDC2) No. 1:*** ***DTC 34/(F87) No. 51 — (VDC2) No. 1:*** ***DTC 36/(F87) No. 50 — (VDC2) No. 1:*** ***DTC 38/(F87) No. 4 — (VDC2) No. 1:*** ***DTC 63/(F87) No. 29 — (VDC2) No. 1:*** ***DTC 64/(F87) No. 2 — (VDC2) No. 1:*** Is the measured value within the specified range?	3 — 6 Ω	Go to step **9.**	Repair harness/ connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and VDCH/U?	Tightened securely.	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	There is poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Same DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

W: DTC 41 ELECTRICAL CONTROL MODULE (VDC CONTROL MODULE MALFUNCTION)

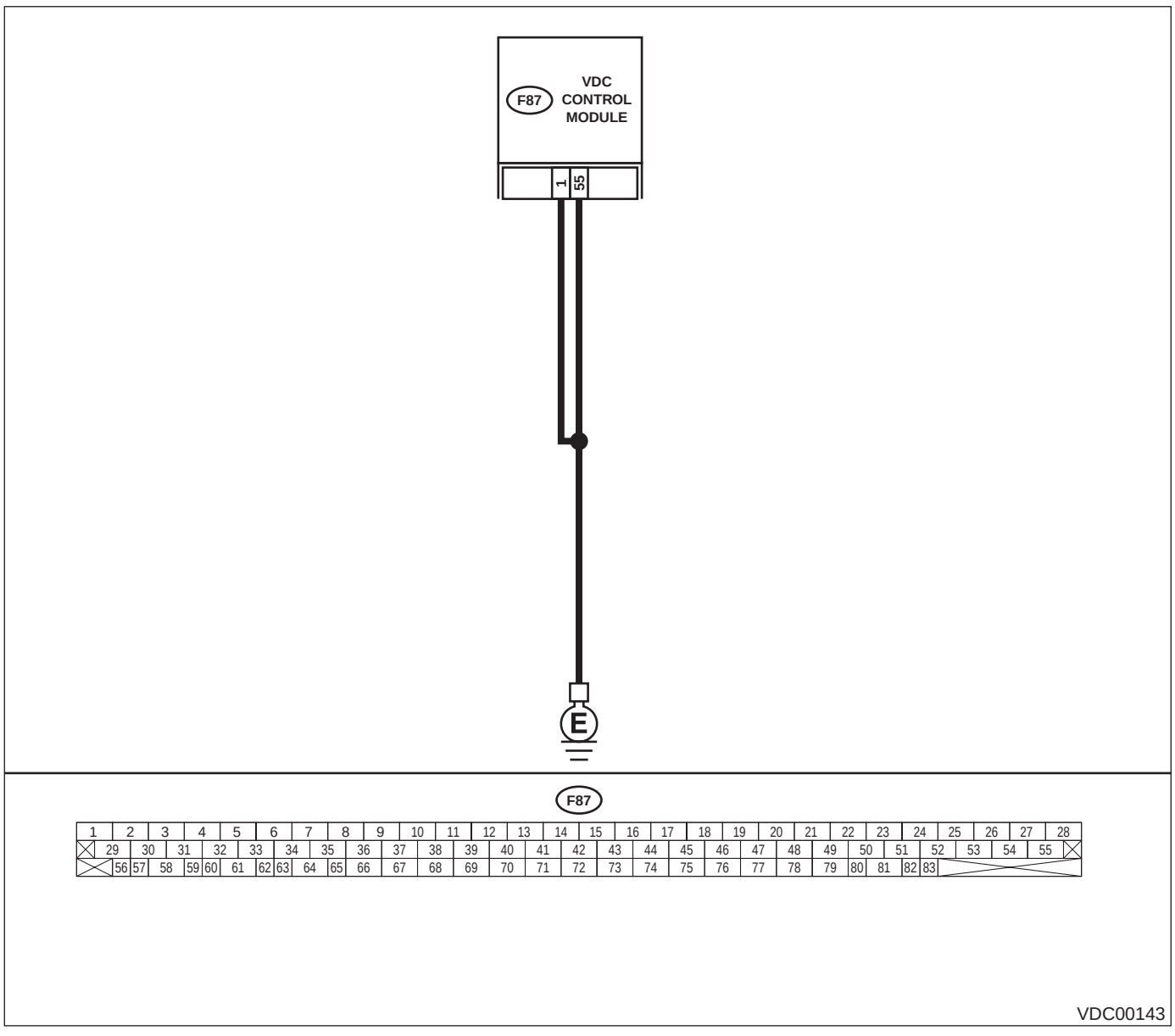
DIAGNOSIS:

- Faulty VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



Vehicle-id:
SIE-id::W:DTC 41 Electrical Control Module (VDC Control Module Malfunction)
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DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair VDCCM ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between battery, ignition switch and VDCCM?	There is poor contact.	Repair connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Tightened securely.	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Installed properly.	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

X: DTC 42 POWER SUPPLY VOLTAGE LOW

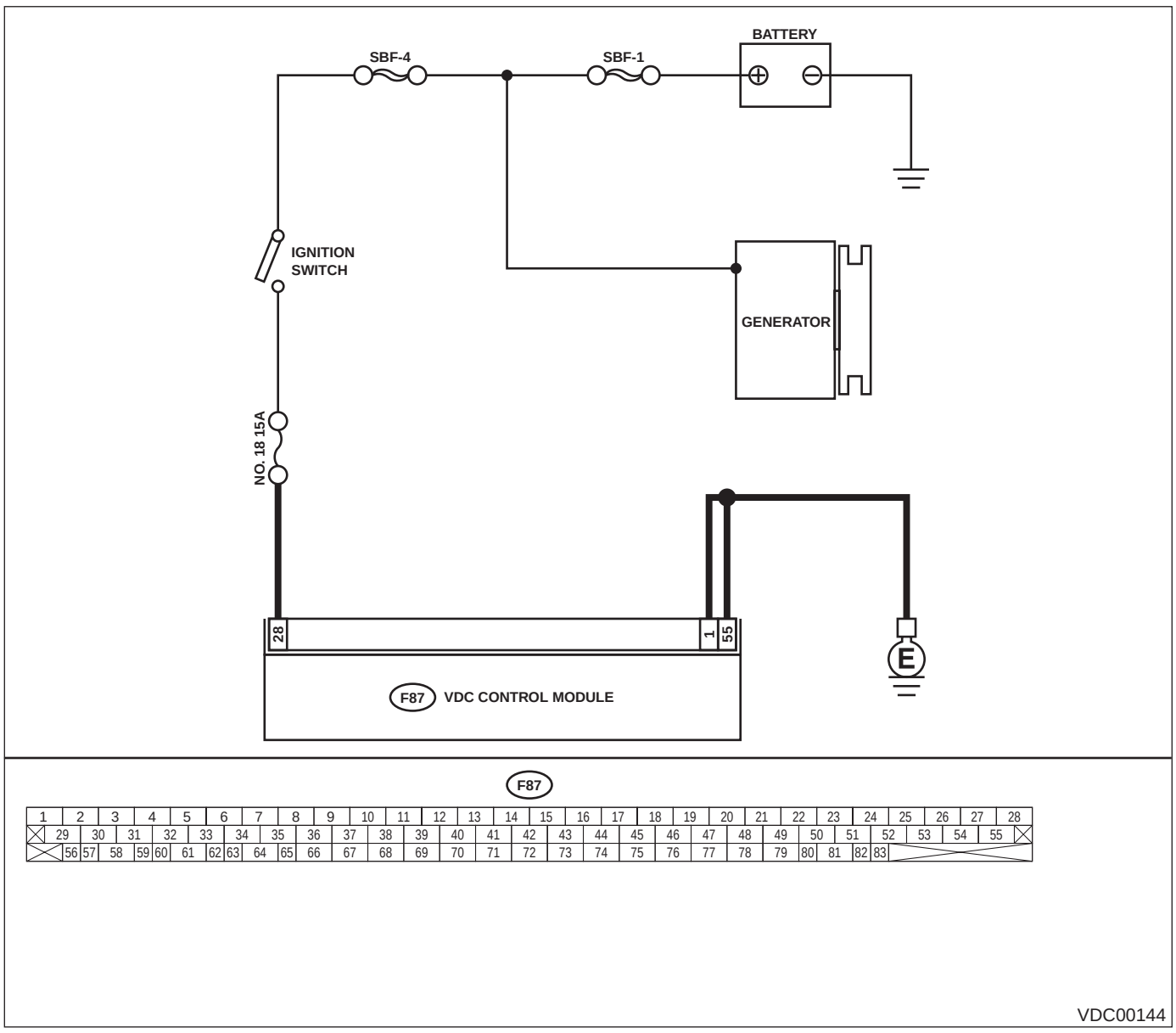
DIAGNOSIS:

- Power source voltage of the VDCCM is low.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Go to step **2.**	Repair generator.
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Clamped securely.	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Run the engine at idle. 3) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 28 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **4.**	Repair harness connector between battery, ignition switch and VDCCM.
4	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair VDCCM ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and VDCCM?	There is poor contact.	Repair connector.	Go to step **6.**
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Y: DTC 43 AET COMMUNICATION LINE MALFUNCTION

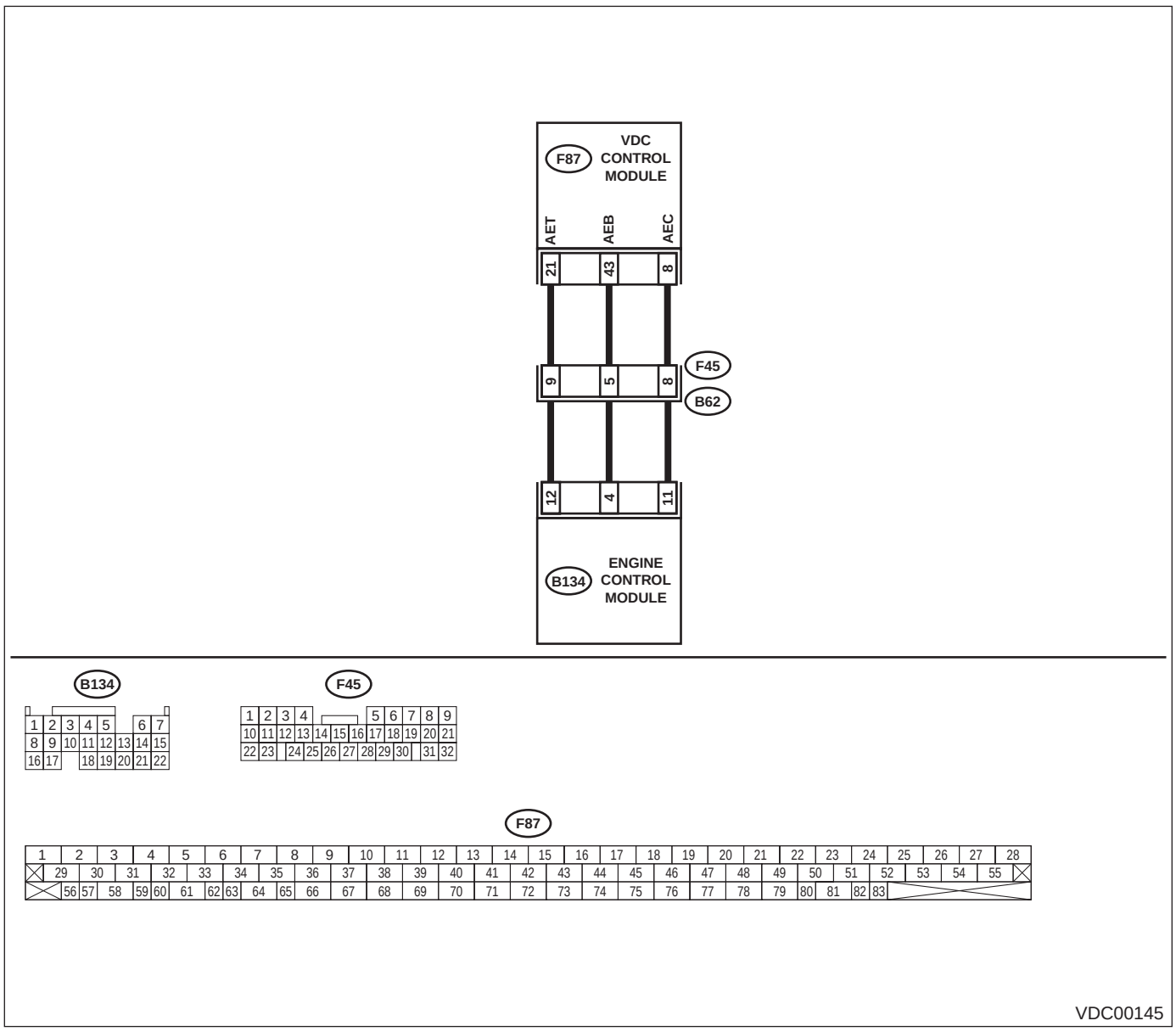
DIAGNOSIS:

- AET communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00145

Vehicle-id:
SIE-id::Y:DTC 43 AET Communication Line Malfunction
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DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 21 — (B134) No. 12:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair harness/ connector between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair harness/ connector between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Terminal*** ***(F87) No. 21 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **4.**	Repair harness/ connector between VDCCM and ECM.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Terminal*** ***(F87) No. 21 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Repair harness/ connector between VDCCM and ECM.
5	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Go to step **9.**
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ECM and VDCCM?	Tightened securely.	Repair connector.	Go to step **7.**
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	There is por contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Same DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9	**CHECK ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Repair harness/ connector between ECM and VDCCM.	Go to step **10.**
10	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector ECM?	There is poor contact.	Repair connector.	Go to step **11.**
11	**CHECK ENGINE.** Is the engine functioning normally?	Operates properly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

MEMO:

Vehicle-id:
SIE-id::Y:DTC 43 AET Communication Line Malfunction
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Z: DTC 43 AEB COMMUNICATION LINE MALFUNCTION

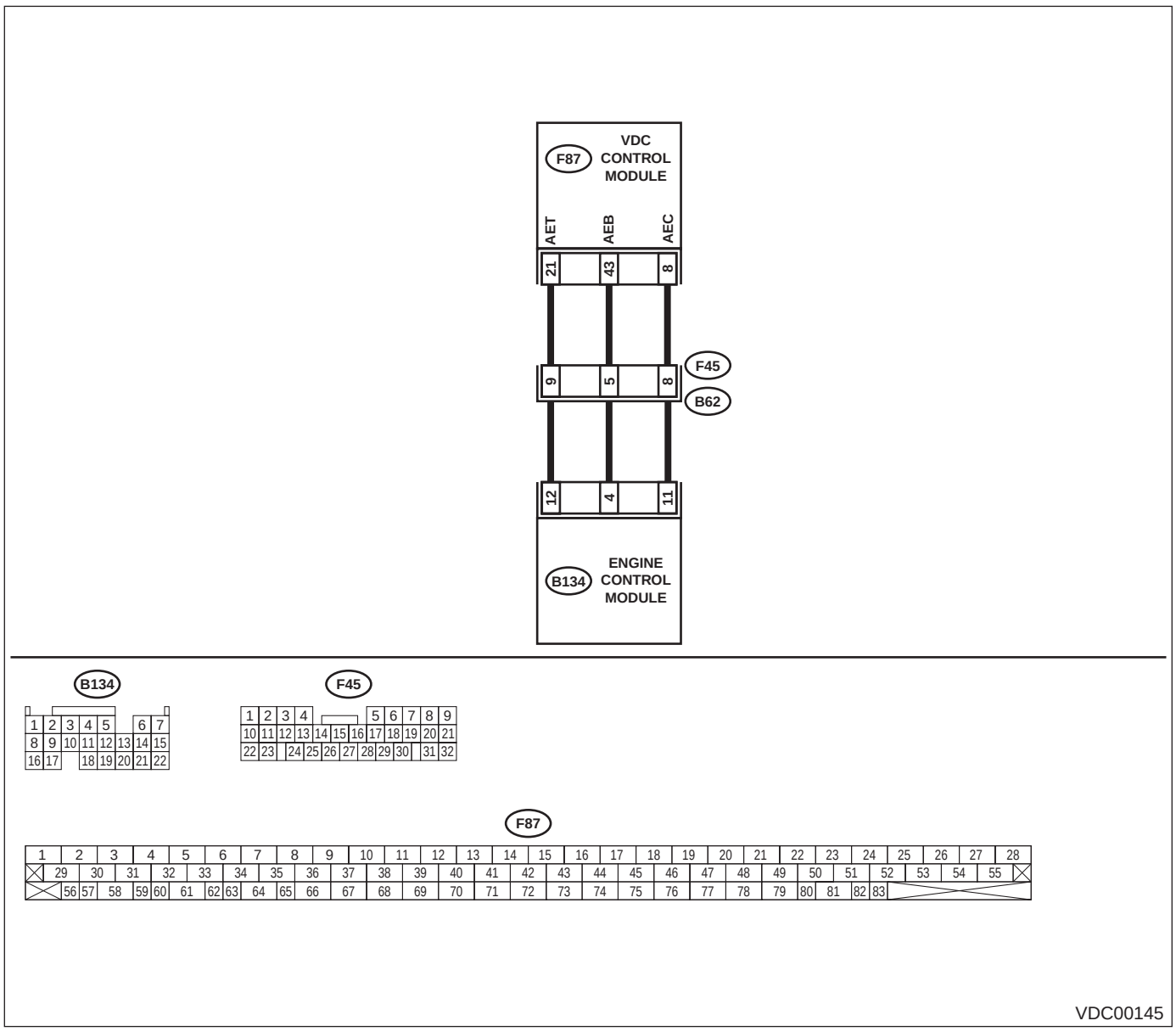
DIAGNOSIS:

- AEB communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00145

Vehicle-id:
SIE-id::Z:DTC 43 AEB Communication Line Malfunction
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	Step	Value	Yes	No
1	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 43 — (B134) No. 4:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair harness/ connector between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 43 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair harness/ connector between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 43 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **4.**	Repair harness/ connector between VDCCM and ECM.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 43 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Repair harness/ connector between VDCCM and ECM.
5	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 43 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Go to step **9.**
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ECM and VDCCM?	Tightened securely.	Repair connector.	Go to step **7.**
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	There is poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Same DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9	**CHECK ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Repair harness/ connector between ECM and VDCCM.	Go to step **10.**
10	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector ECM?	There is poor contact.	Repair connector.	Go to step **11.**
11	**CHECK ENGINE.** Is the engine functioning normally?	Operates properly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

MEMO:

Vehicle-id:
SIE-id::Z:DTC 43 AEB Communication Line Malfunction
～

AA:DTC 43 AEC COMMUNICATION LINE MALFUNCTION

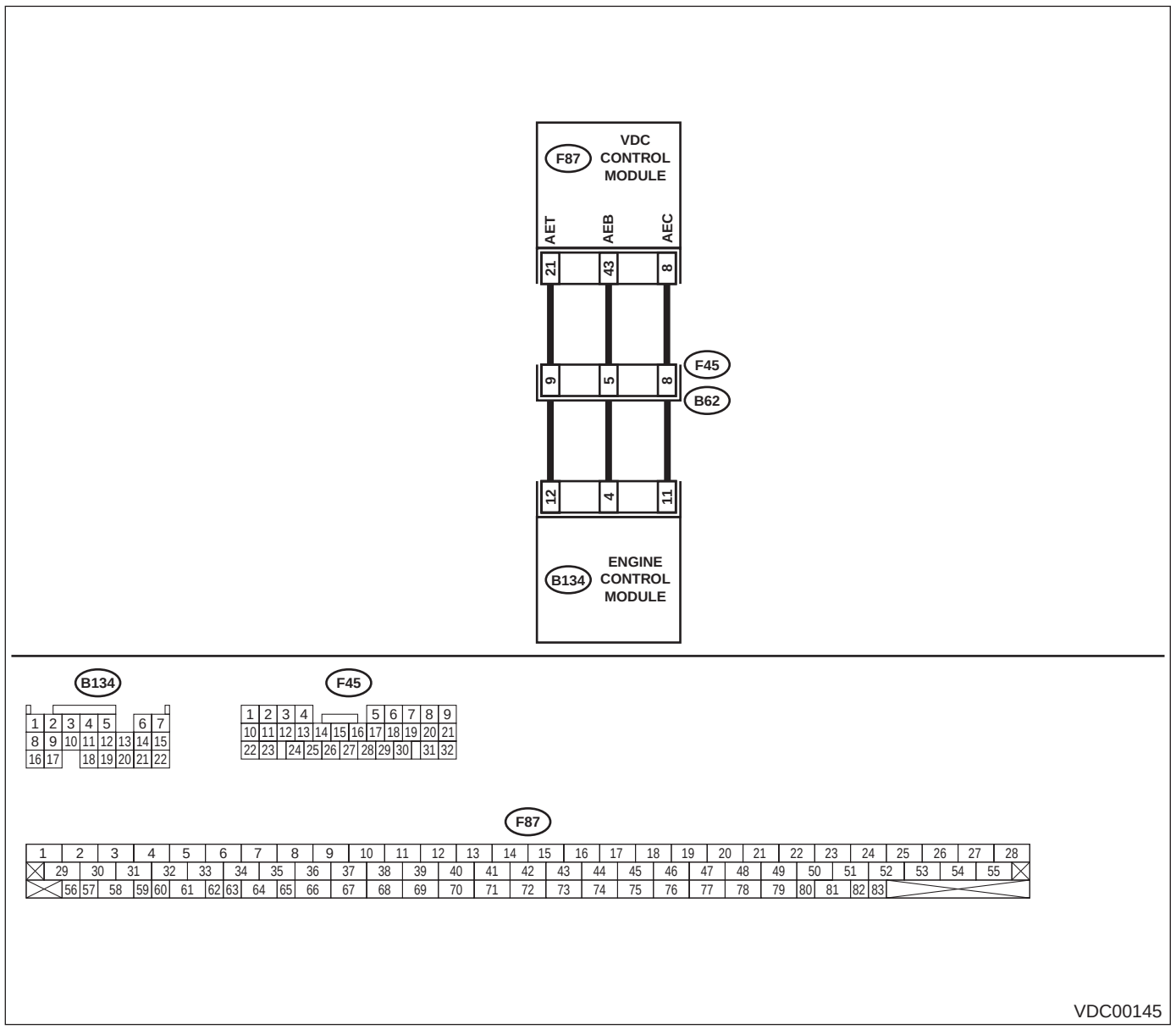
DIAGNOSIS:

- AEC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



Vehicle-id:
SIE-id::AA:DTC 43 AEC Communication Line Malfunction
～

	Step	Value	Yes	No
1	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 8 — (B134) No. 11:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair harness/ connector between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 8 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair harness/ connector between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **4.**	Repair harness/ connector between VDCCM and ECM.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Repair harness/ connector between VDCCM and ECM.
5	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 8 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Go to step **9.**
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ECM and VDCCM?	Tightened securely.	Repair connector.	Go to step **7.**
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	There is poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Same DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9	**CHECK ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B134) No. 11 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Repair harness/ connector between ECM and VDCCM.	Go to step **10.**
10	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector ECM?	There is poor contact.	Repair connector.	Go to step **11.**
11	**CHECK ENGINE.** Is the engine functioning normally?	Operates properly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

MEMO:

Vehicle-id:
SIE-id::AA:DTC 43 AEC Communication Line Malfunction
~

AB:DTC 44 TCM COMMUNICATION CIRCUIT

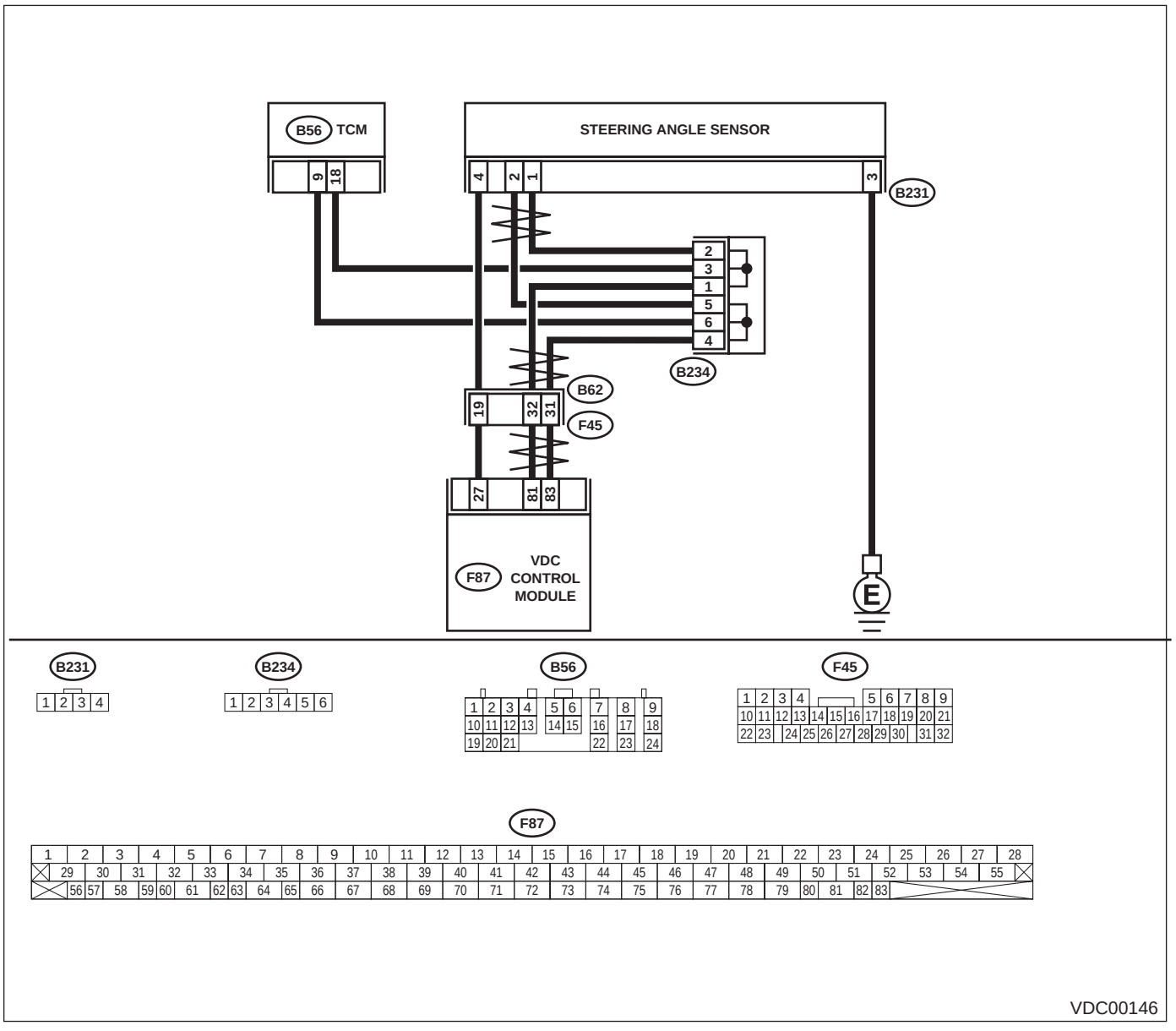
DIAGNOSIS:

- Communication with AT control faults

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00146

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Measure resistance between TCM connector terminals. ***Connector & terminal*** ***(B56) No. 9 — No. 18:*** Is the measured value within the specified range?	57 — 63 Ω	Go to step **2.**	Repair harness between TCM and VDCCM.
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in TCM connectors?	There is poor contact.	Repair connector.	Go to step **3.**
3	**CHECK TCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AC:DTC 45 INCORRECT VDC CONTROL MODULE

DIAGNOSIS:

- Control module out of specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Value	Yes	No
1	**CHECK VDCCM SPECIFICATIONS.** Check the VDCCM identification mark. ***VDCCM identification mark*** ***P*** Does the VDCCM identification mark agree with the vehicle specifications?	Agree.	Go to step **2.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK TCM SPECIFICATIONS.** Check the TCM identification mark. ***TCM identification mark*** ***ZV*** Does the TCM identification mark agree with the vehicle specifications?	Agree.	Go to step **3.**	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>
3	**CHECK TCM.** 1) Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).> 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **4.**	The original TCM has been faulty.
4	**CHECK TCM.**	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **5.**	Proceed with the diagnosis corresponding to the diagnostic trouble code.
5	**CHECK VDCCM.** 1) Install original TCM. 2) Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).> 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **6.**	The original VDCCM has been faulty.
6	**CHECK VDCCM.** Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>	Proceed with the diagnosis corresponding to the diagnostic trouble code.

AD:DTC 45 TCM MALFUNCTION SPECIFICATIONS

DIAGNOSIS:

- Control module out of specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step		Value	Yes	No
1	**CHECK AT SYSTEM.** 1) Start the engine. 2) Check AT system diagnostic trouble code. Is the AT system diagnostic trouble code is same with the specification?	Indicated.	Repair AT system.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

AE:DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY

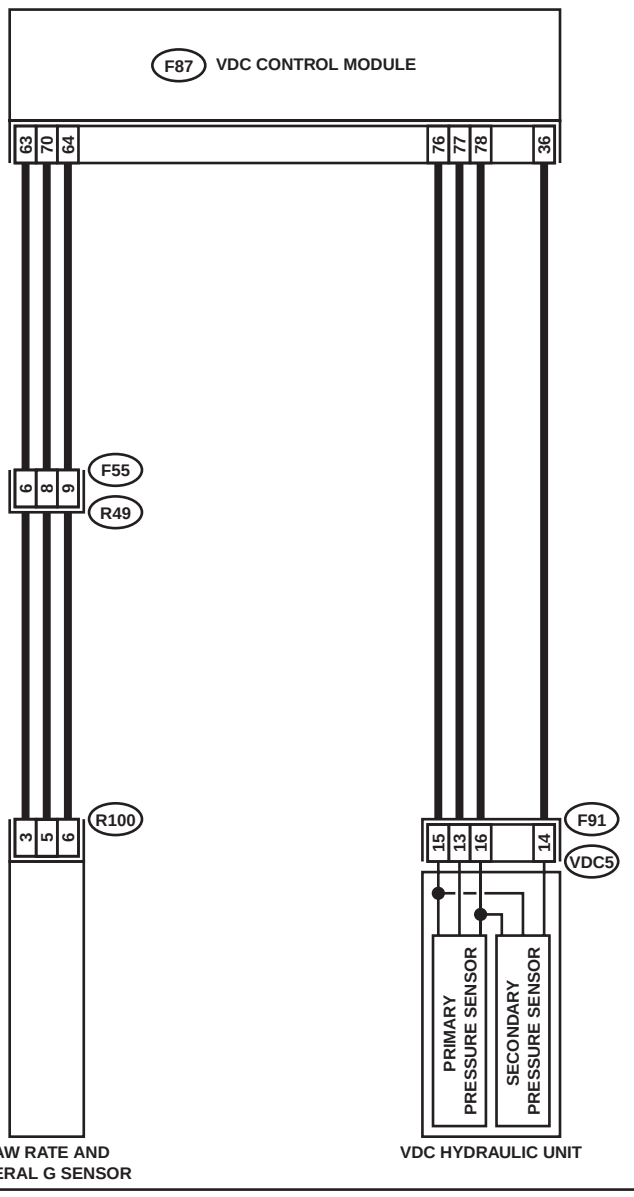
DIAGNOSIS:

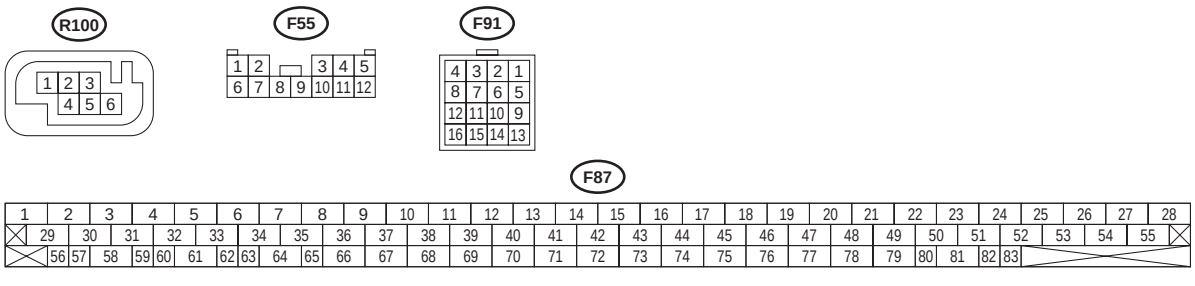
- 5 volt power supply is abnormal.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00147

	Step	Value	Yes	No
1	**CHECK GROUND SHORT OF SENSOR AND HARNESS.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground (Lateral G sensor):*** ***(F87) No. 78 — Chassis ground (Pressure sensor):*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Go to step **2.**
2	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect connector from faulty sensors. 2) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground (Lateral G sensor):*** ***(F87) No. 78 — Chassis ground (Pressure sensor):*** Does the measured value exceed the specified value?	1 MΩ	Replace faulty sensors.	Repair or replace harness connector between VDCCM and faulty sensor.
3	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):*** Is the measured value less than the specified value?	0.5 V	Go to step **4.**	Go to step **5.**
4	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):*** Is the measured value less than the specified value?	0.5 V	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from faulty sensors. 3) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):*** Is the measured value less than the specified value?	0.5 V	Go to step **6.**	Repair or replace harness connector between VDCCM and faulty sensor.

DIAGNOSTICS CHART WITH SELECT MONITOR

Step		Value	Yes	No
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):*** Is the measured value less than the specified value?	0.5 V	Replace faulty sensor.	Repair or replace harness connector between VDCCM and faulty sensor.

Vehicle-id:
SIE-id::AE:DTC 46 Abnormal Voltage of 5 V Power Supply
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MEMO:

Vehicle-id:
SIE-id::AE:DTC 46 Abnormal Voltage of 5 V Power Supply
～

AF:DTC 47 IMPROPER CAN COMMUNICATION

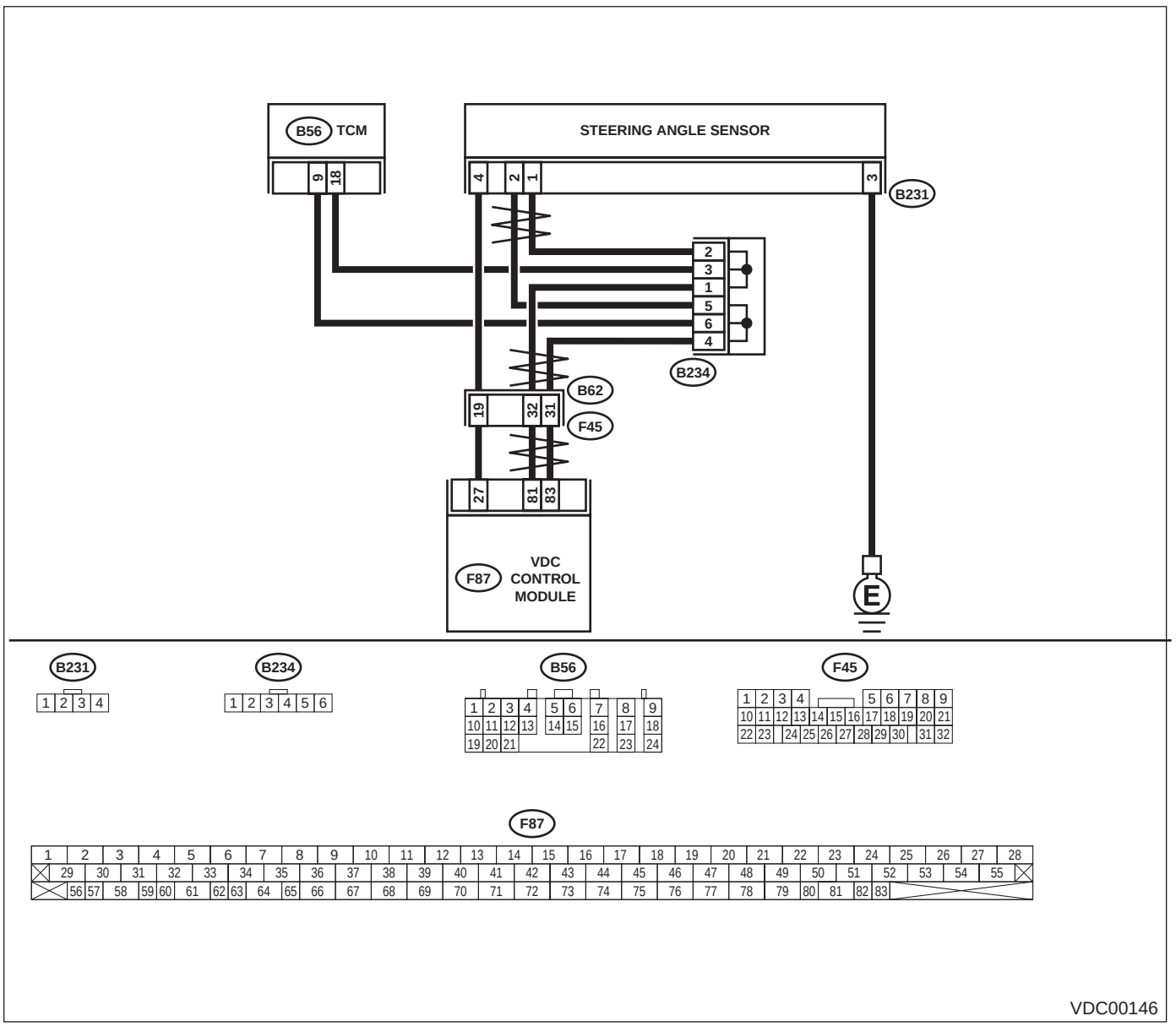
DIAGNOSIS:

- CAN communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN VDCCM, STEERING ANGLE SENSOR AND TCM.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM, TCM and steering angle sensor. 3) Measure resistance between VDCCM, TCM and steering angle sensor. ***Connector & terminal*** ***(F87) No. 83 — (B56) No. 9:*** ***(F87) No. 81 — (B56) No. 18:*** ***(F87) No. 83 — (B231) No. 2:*** ***(F87) No. 81 — (B231) No. 1:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Go to step **2.**
2	**CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND TCM.** Measure resistance between TCM and steering angle sensor. ***Connector & terminal*** ***(B56) No. 9 — (B231) No. 2:*** ***(B56) No. 18 — (B231) No. 1:*** Is the measured value less than the specified value?	0.5 Ω	Repair or replace harness connector between VDCCM and steering angle sensor.	Repair or replace harness connector between TCM and steering angle sensor.
3	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
4	**CHECK BATTERY SHORT OF SENSOR.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:*** Is the measured value less than the specified value?	0.5 V	Go to step **5.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
5	**CHECK BATTERY SHORT OF SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:*** Is the measured value less than the specified value?	0.5 V	Go to step **6.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
6	**CHECK STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to steering angle sensor. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 83 — No. 81:*** Is the measured value within the specified range?	114 — 126 Ω	Go to step **8.**	Go to step **7.**

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
7	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in steering angle sensor?	There is poor contact.	Replace steering angle sensor.	Repair or replace steering angle sensor connector.
8	**CHECK VDCCM.** 1) Connect connector to VDCCM. 2) Disconnect connector from steering angle sensor. 3) Measure resistance between steering angle sensor connector terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:*** Is the measured value within the specified range?	114 — 126 Ω	Go to step **10.**	Go to step **9.**
9	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in steering angle sensor?	There is poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair or replace VDCCM connector.
10	**CHECK TCM.** 1) Connect connector to TCM. 2) Disconnect connector from VDCCM. 3) Measure resistance between steering angle sensor terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **12.**	Go to step **11.**
11	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in steering angle sensor?	There is poor contact.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>	Repair or replace TCM connector.
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Are other diagnostic trouble codes being output?	Other DTC indicated.	Go to step **13.**	A temporary poor contact.
13	**CHECK DIAGNOSTIC TROUBLE CODE.** Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **14.**	Proceed with the diagnosis corresponding to the diagnostic trouble code.
14	**CHECK AT SYSTEM DIAGNOSTIC TROUBLE CODE.** Is the AT system diagnostic trouble code is same with the specification?	DTC 86	Replace steering angle sensor.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

MEMO:

Vehicle-id:
SIE-id::AF:DTC 47 Improper CAN Communication
～

AG:DTC 48 IMPROPER EAC COMMUNICATION

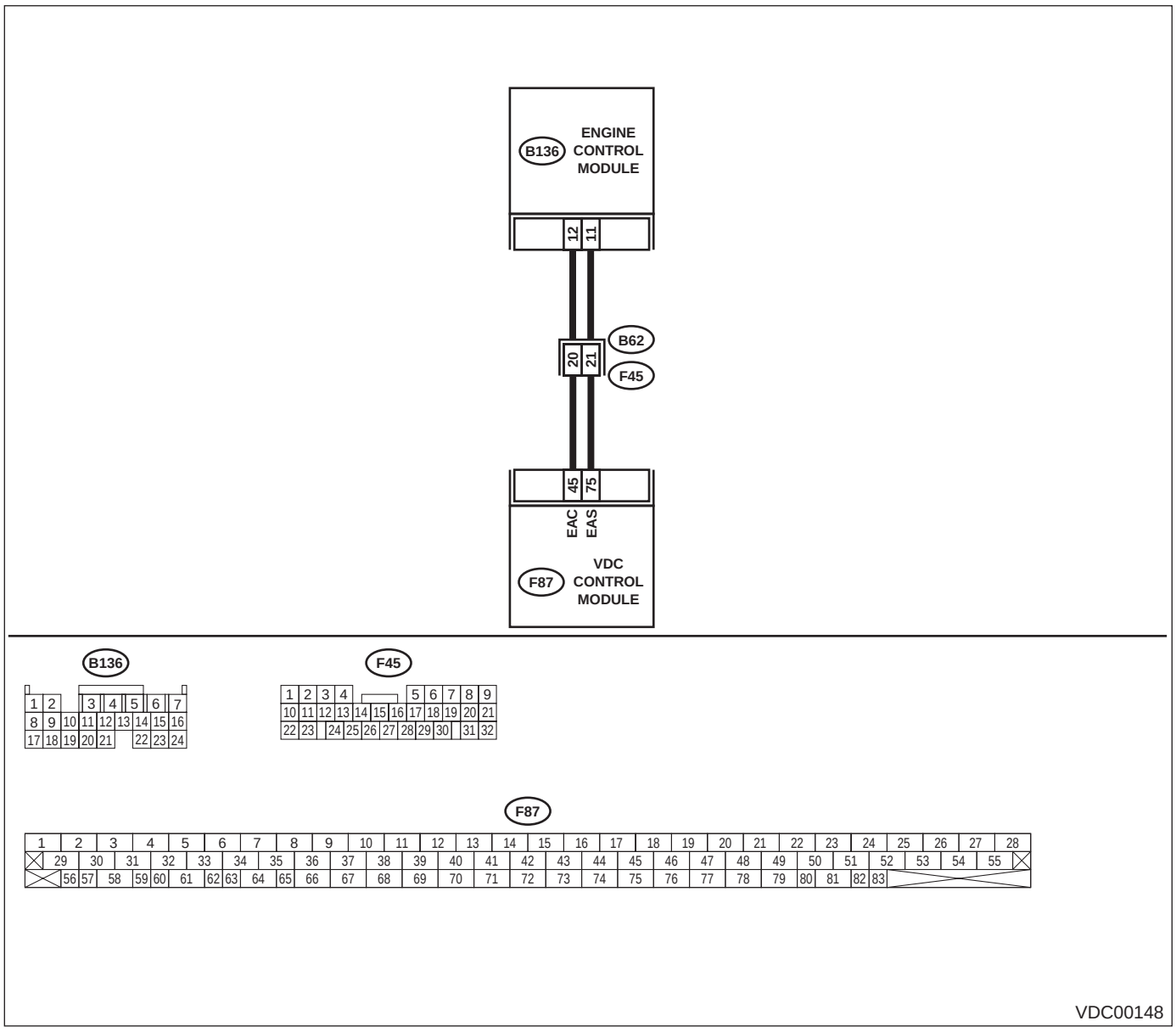
DIAGNOSIS:

- EAC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00148

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 45 — (B136) No. 12:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair or replace open circuit between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 45 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair or replace ground short circuit between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 45 — Chassis ground:*** Is the measured value less than the specified value?	0.5 V	Go to step **4.**	Repair or replace battery short circuit between VDCCM and ECM.
4	**CHECK INPUT VOLTAGE FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 12 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Go to step **5.**
5	**CHECK POOR CONTACT IN ECM CONNECTORS.** Is there poor contact in ECM connector?	There is poor contact.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
6	**ERASE MEMORY.** 1) Connect all connectors. 2) Erase the memory. Can the memory be erased?	Can be erased.	Go to step **7.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK DIAGNOSTIC TROUBLE CODE.** 1) Perform inspection mode. 2) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

AH:DTC 48 EAS COMMUNICATION LINE GROUNDING SHORTED

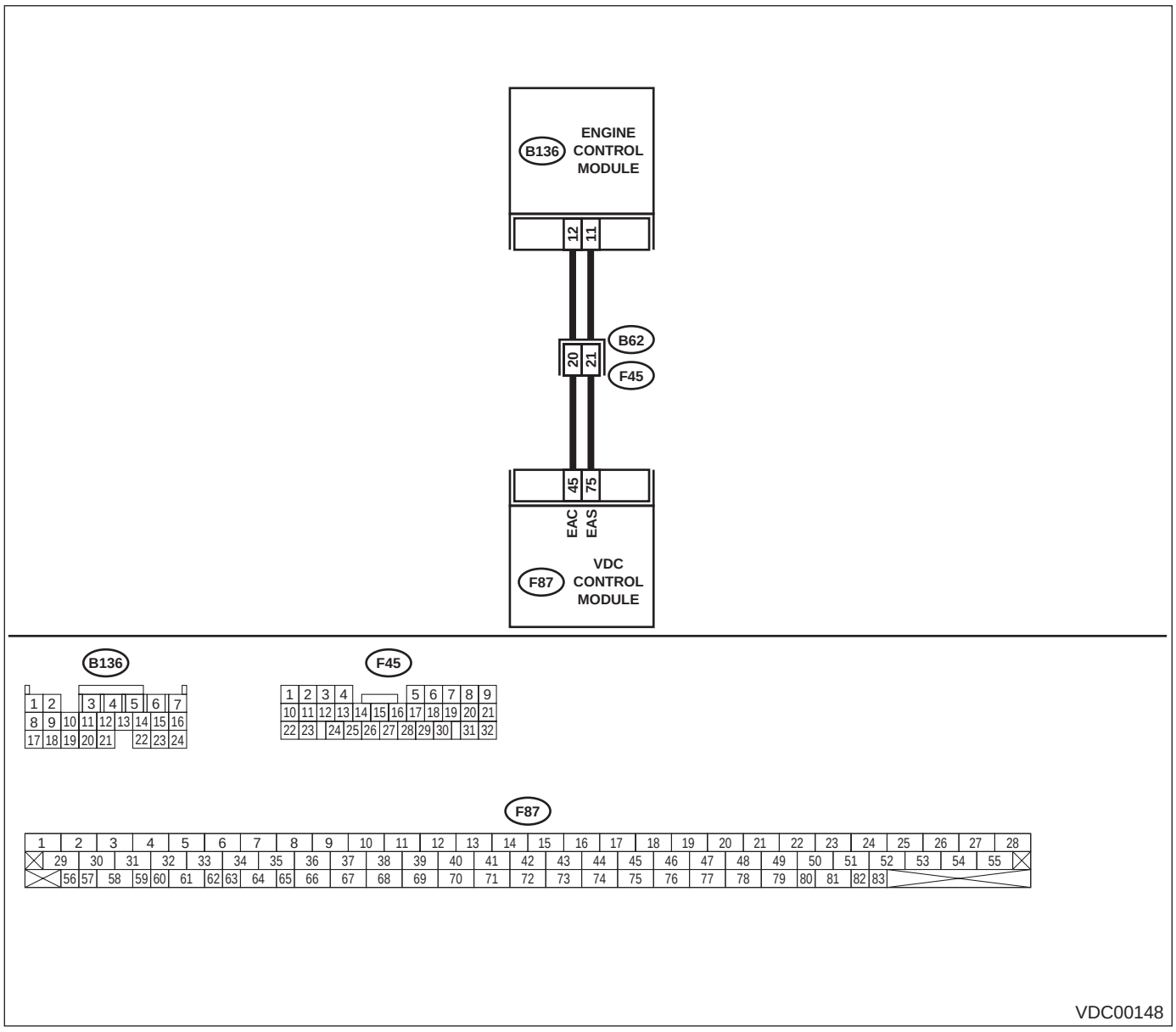
DIAGNOSIS:

- EAS communication line is short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



Vehicle-id:
SIE-id::AH:DTC 48 EAS Communication Line Grounding Shorted
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DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 75 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **2.**	Repair or replace ground short circuit between VDCCM and ECM.
2	**CHECK INPUT VOLTAGE FROM ECM.** 1) Connect connector to VDCCM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT IN ECM CONNECTORS.** Is there poor contact in ECM connector?	There is poor contact.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
4	**ERASE MEMORY.** 1) Connect all connectors. 2) Erase the memory. Can the memory be erased?	Can be erased.	Go to step **5.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK DIAGNOSTIC TROUBLE CODE.** 1) Perform inspection mode. 2) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

AI: DTC 48 ERRONEOUS COMMUNICATION FROM EGI TO VDC

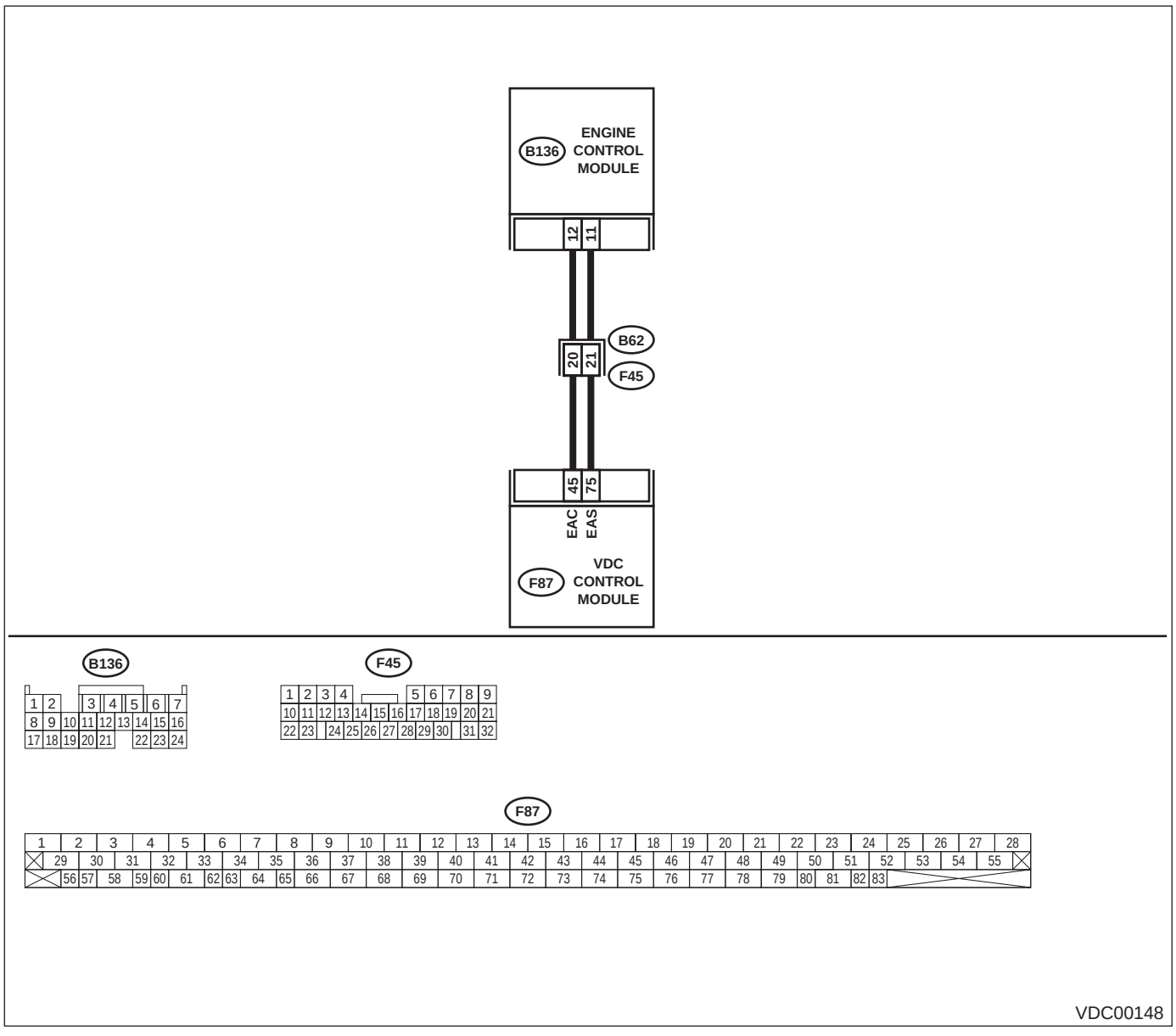
DIAGNOSIS:

- EAS communication line is broken or short circuited.
- EAC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00148

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 75 — (B136) No. 11:*** ***(F87) No. 45 — (B136) No. 12:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Repair or replace open circuit between VDCCM and ECM.
2	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 75 — Chassis ground:*** ***(F87) No. 45 — Chassis ground:*** Is the measured value less than the specified value?	0.5 V	Go to step **3.**	Repair or replace battery short circuit between VDCCM and ECM.
3	**CHECK INPUT VOLTAGE FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):*** ***(B136) No. 12 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **5.**	Go to step **4.**
4	**CHECK POOR CONTACT IN ECM CONNECTORS.** Is there poor contact in ECM connector?	There is poor contact.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
5	**ERASE MEMORY.** 1) Connect all connectors. 2) Erase the memory. Can the memory be erased?	Can be erased.	Go to step **6.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	**CHECK DIAGNOSTIC TROUBLE CODE.** 1) Perform inspection mode. 2) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

AJ:DTC 49 ABNORMAL ENGINE SPEED SIGNAL

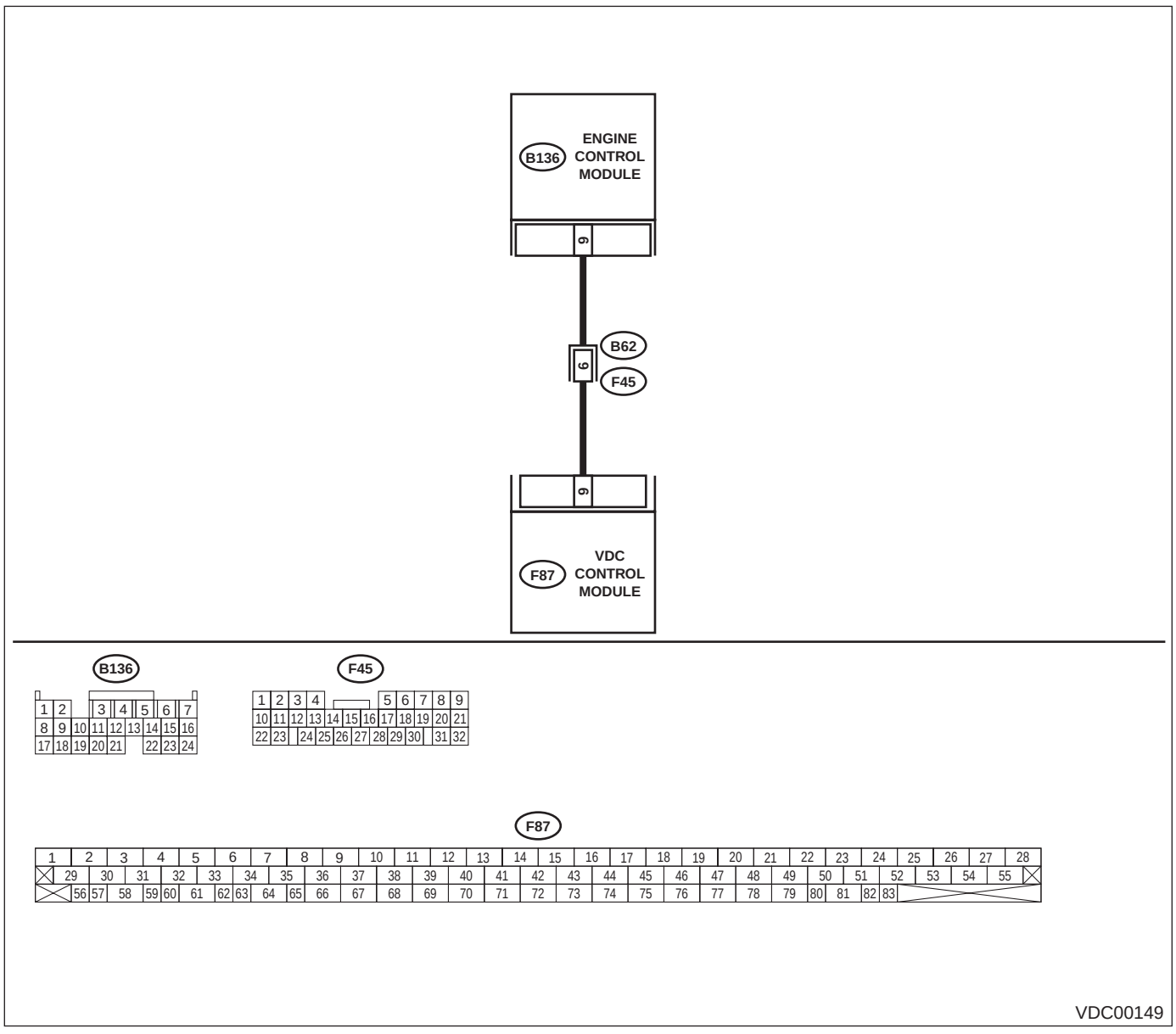
DIAGNOSIS:

- Engine speed signal line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00149

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK TACHOMETER OPERATION IN COMBINATION METER.** Does tachometer operate normally?	Operates properly.	Go to step **2.**	Repair tachometer.
2	**CHECK HARNESS BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 9 — (B136) No. 9:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Repair harness connector between VDCCM and ECM.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between VDCCM and ECM?	There is poor contact.	Repair connector.	Go to step **4.**
4	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AK:DTC 51 VALVE RELAY

DIAGNOSIS:

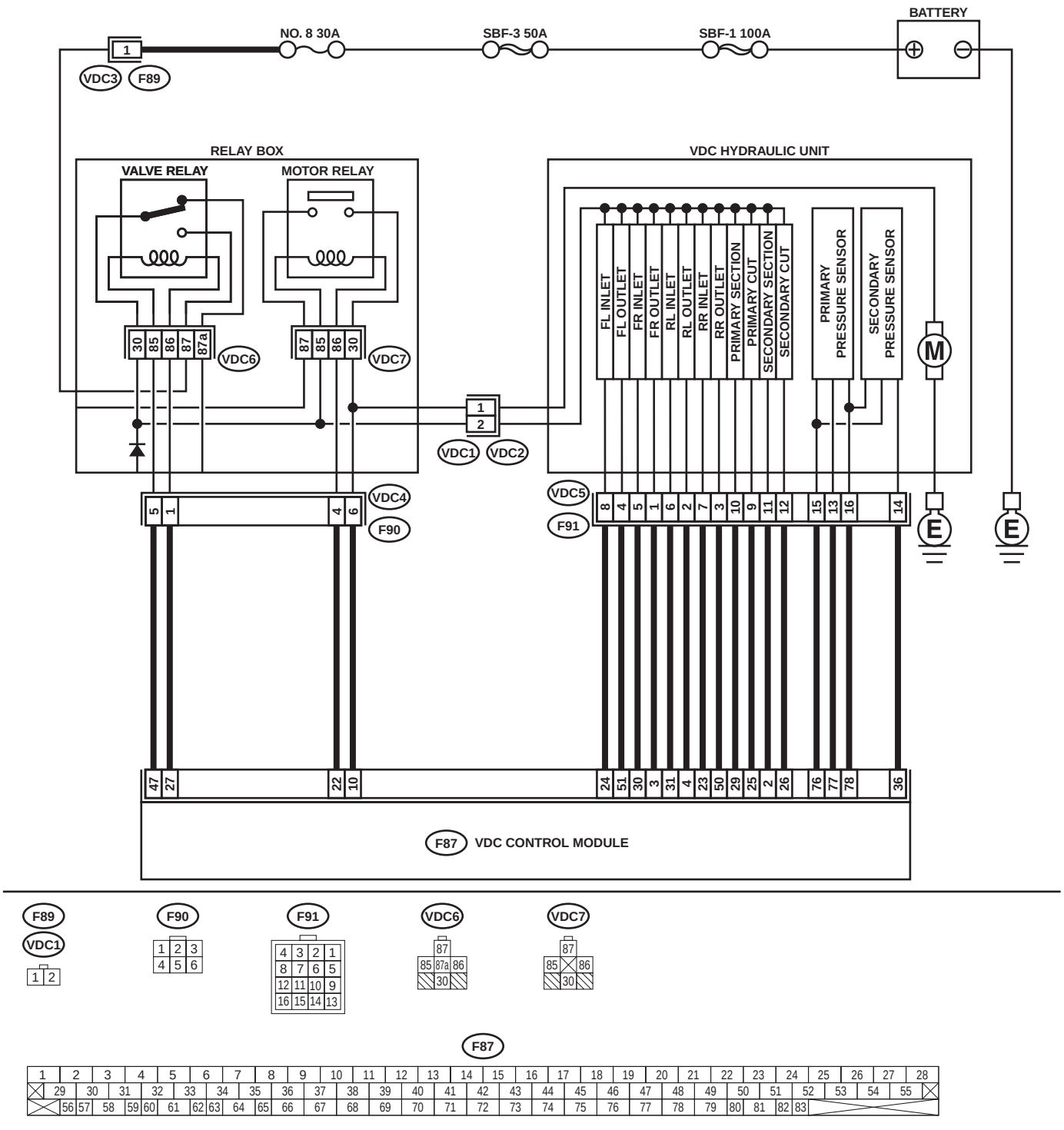
- Faulty valve relay

NOTE:
When DTC 74 inspection is carried out, DTC 51 is memorized.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00150

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Remove valve relay from relay box. 3) Measure resistance between valve relay terminals. ***Terminals*** ***No. 85 — No. 86:*** Is the measured value within the specified range?	93 — 113 Ω	Go to step **2.**	Replace valve relay.
2	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Connect battery to valve relay terminals No. 85 and No. 86. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Replace valve relay.
3	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Replace valve relay.
4	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Disconnect battery from valve relay terminals. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **5.**	Replace valve relay.
5	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **6.**	Replace valve relay.
6	**CHECK SHORT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 86 — No. 87:*** ***No. 86 — No. 87a:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **7.**	Replace valve relay.

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
7	**CHECK POWER SUPPLY FOR VALVE RELAY.** 1) Disconnect connector (F89) from relay box. 2) Turn ignition switch to ON. 3) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 1 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **8.**	Repair harness between battery and relay box connector. Check fuse No. 8.
8	**CHECK OPEN CIRCUIT AND GROUND SHORT IN POWER SUPPLY CIRCUIT OF RELAY BOX.** 1) Disconnect connector (VDC1) from VDCH/U. 2) Connect connector (F89) to relay box. 3) Turn ignition switch to ON. 4) Measure voltage of relay box. ***Connector & terminal*** ***(VDC6) No. 87 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Go to step **9.**	Replace relay box and check fuse No. 8.
9	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F90) from relay box. 3) Measure resistance between relay box connector and valve relay installing point. ***Connector & terminal*** ***(VDC4) No. 5 — (VDC6) No. 85:*** ***(VDC4) No. 1 — (VDC6) No. 86:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **10.**	Replace relay box.
10	**CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 — Chassis ground:*** ***(VDC4) No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **11.**	Replace relay box and check fuse SBF6.
11	**CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(F87) No. 47 — (F90) No. 5:*** ***(F87) No. 27 — (F90) No. 1:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **12.**	Repair harness between VDCCM and relay box.

	Step	Value	Yes	No
12	**CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 47 — Chassis ground:*** ***(F87) No. 27 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **13.**	Repair harness between VDCCM and relay box.
13	**CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between VDCH/U connector and valve relay installing point. ***Connector & terminal*** ***(VDC1) No. 2 — (VDC6) No. 30:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **14.**	Replace relay box.
14	**CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **15.**	Replace relay box and check fuse No. 8.
15	**CHECK RESISTANCE OF INLET AND CUT SOLENOID VALVES.** 1) Disconnect connector from VDCH/U. 2) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 8 — (VDC2) No. 2:*** ***(VDC5) No. 5 — (VDC2) No. 2:*** ***(VDC5) No. 6 — (VDC2) No. 2:*** ***(VDC5) No. 7 — (VDC2) No. 2:*** ***(VDC5) No. 9 — (VDC2) No. 2:*** ***(VDC5) No. 12 — (VDC2) No. 2:*** Is the measured value within the specified range?	8.04 — 9.04 Ω	Go to step **16.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
16	**CHECK RESISTANCE OF OUTLET SOLENOID VALVE.** Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 4 — (VDC2) No. 2:*** ***(VDC5) No. 1 — (VDC2) No. 2:*** ***(VDC5) No. 2 — (VDC2) No. 2:*** ***(VDC5) No. 3 — (VDC2) No. 2:*** ***(VDC5) No. 10 — (VDC2) No. 2:*** ***(VDC5) No. 11 — (VDC2) No. 2:*** Is the measured value within the specified range?	4.04 — 4.54 Ω	Go to step **17.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
17	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **18.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
18	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 — Chassis ground:*** ***(F87) No. 24 — Chassis ground:*** ***(F87) No. 23 — Chassis ground:*** ***(F87) No. 31 — Chassis ground:*** ***(F87) No. 26 — Chassis ground:*** ***(F87) No. 25 — Chassis ground:*** ***(F87) No. 3 — Chassis ground:*** ***(F87) No. 51 — Chassis ground:*** ***(F87) No. 50 — Chassis ground:*** ***(F87) No. 4 — Chassis ground:*** ***(F87) No. 2 — Chassis ground:*** ***(F87) No. 29 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **19.**	Repair harness between VDCH/U and VDCCM.
19	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U ***Connector & terminal*** ***(F87) No. 30 — (VDC2) No. 2:*** ***(F87) No. 24 — (VDC2) No. 2:*** ***(F87) No. 23 — (VDC2) No. 2:*** ***(F87) No. 31 — (VDC2) No. 2:*** ***(F87) No. 26 — (VDC2) No. 2:*** ***(F87) No. 25 — (VDC2) No. 2:*** Is the measured value within the specified range?	8.0 — 10.0 Ω	Go to step **20.**	Repair harness/ connector between VDCH/U and VDCCM.
20	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 3 — (VDC2) No. 2:*** ***(F87) No. 51 — (VDC2) No. 2:*** ***(F87) No. 50 — (VDC2) No. 2:*** ***(F87) No. 4 — (VDC2) No. 2:*** ***(F87) No. 2 — (VDC2) No. 2:*** ***(F87) No. 29 — (VDC2) No. 2:*** Is the measured value within the specified range?	4.0 — 6.0 Ω	Go to step **21.**	Repair harness/ connector between VDCH/U and VDCCM.
21	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between VDCCM and VDCH/U?	There is poor contact.	Repair connector.	Go to step **22.**

Step		Value	Yes	No
22	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **23.**
23	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AL:DTC 51 VALVE RELAY ON FAILURE

DIAGNOSIS:

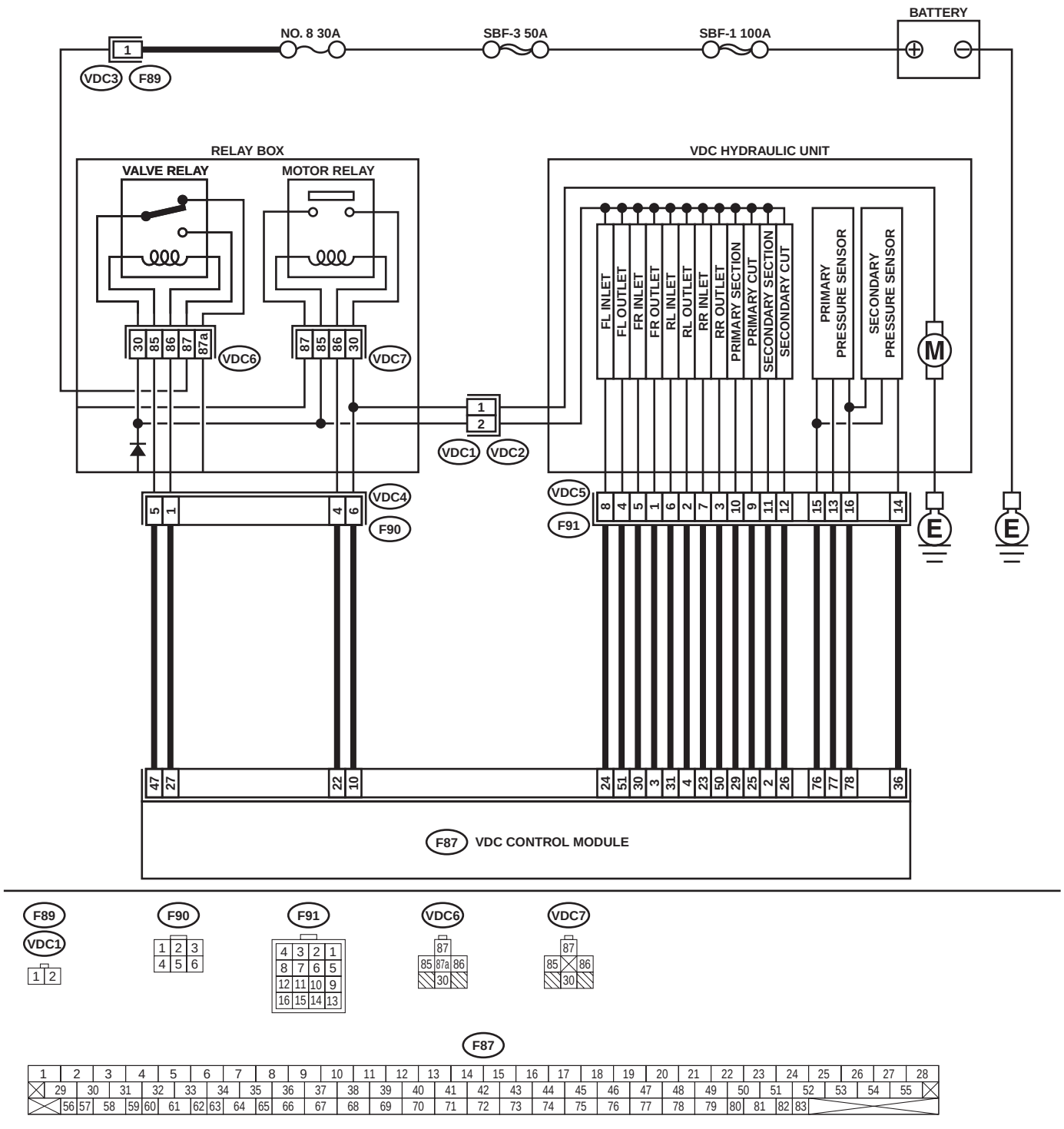
- Faulty valve relay

NOTE:
When DTC 74 inspection is carried out, DTC 51 is memorized.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00150

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Remove valve relay from relay box. 3) Connect battery to valve relay terminals No. 85 and No. 86. 4) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Replace valve relay.
2	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Replace valve relay.
3	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Disconnect battery from valve relay terminals. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Replace valve relay.
4	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Replace valve relay.
5	**CHECK SHORT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 86 — No. 87:*** ***No. 86 — No. 87a:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **6.**	Replace valve relay.
6	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Disconnect connector (F90) from relay box. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **7.**	Replace relay box. Check fuse No. 8 and SBF3.

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
7	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **8.**	Replace relay box. Check fuse No. 8 and SBF3.
8	**CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from VDCH/U. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 27 (+) — Chassis ground (–):*** ***(F87) No. 47 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **9.**	Repair harness between VDCCM and relay box and check all fuses.
9	**CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 27 (+) — Chassis ground (–):*** ***(F87) No. 47 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **10.**	Repair harness between VDCCM and relay box and check all fuses.
10	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Disconnect connector VDC1 from relay box. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **11.**	Replace relay box.
11	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **12.**	Replace relay box.

	Step	Value	Yes	No
12	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **13.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
13	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **14.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
14	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 (+) — Chassis ground (–):*** ***(F87) No. 24 (+) — Chassis ground (–):*** ***(F87) No. 23 (+) — Chassis ground (–):*** ***(F87) No. 31 (+) — Chassis ground (–):*** ***(F87) No. 26 (+) — Chassis ground (–):*** ***(F87) No. 25 (+) — Chassis ground (–):*** ***(F87) No. 3 (+) — Chassis ground (–):*** ***(F87) No. 51 (+) — Chassis ground (–):*** ***(F87) No. 50 (+) — Chassis ground (–):*** ***(F87) No. 4 (+) — Chassis ground (–):*** ***(F87) No. 2 (+) — Chassis ground (–):*** ***(F87) No. 29 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **15.**	Repair harness between VDCH/U and VDCCM and check all fuses.
15	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 (+) — Chassis ground (–):*** ***(F87) No. 24 (+) — Chassis ground (–):*** ***(F87) No. 23 (+) — Chassis ground (–):*** ***(F87) No. 31 (+) — Chassis ground (–):*** ***(F87) No. 26 (+) — Chassis ground (–):*** ***(F87) No. 25 (+) — Chassis ground (–):*** ***(F87) No. 3 (+) — Chassis ground (–):*** ***(F87) No. 51 (+) — Chassis ground (–):*** ***(F87) No. 50 (+) — Chassis ground (–):*** ***(F87) No. 4 (+) — Chassis ground (–):*** ***(F87) No. 2 (+) — Chassis ground (–):*** ***(F87) No. 29 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **16.**	Repair harness between VDCH/U and VDCCM and check all fuses.

DIAGNOSTICS CHART WITH SELECT MONITOR

Step		Value	Yes	No
16	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between VDCCM and VDCH/U?	There is poor contact.	Repair connector.	Go to step **17.**
17	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **18.**
18	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

MEMO:

Vehicle-id:
SIE-id::AL:DTC 51 Valve Relay on Failure
～

AM:DTC 52 MOTOR AND MOTOR RELAY OFF FAILURE

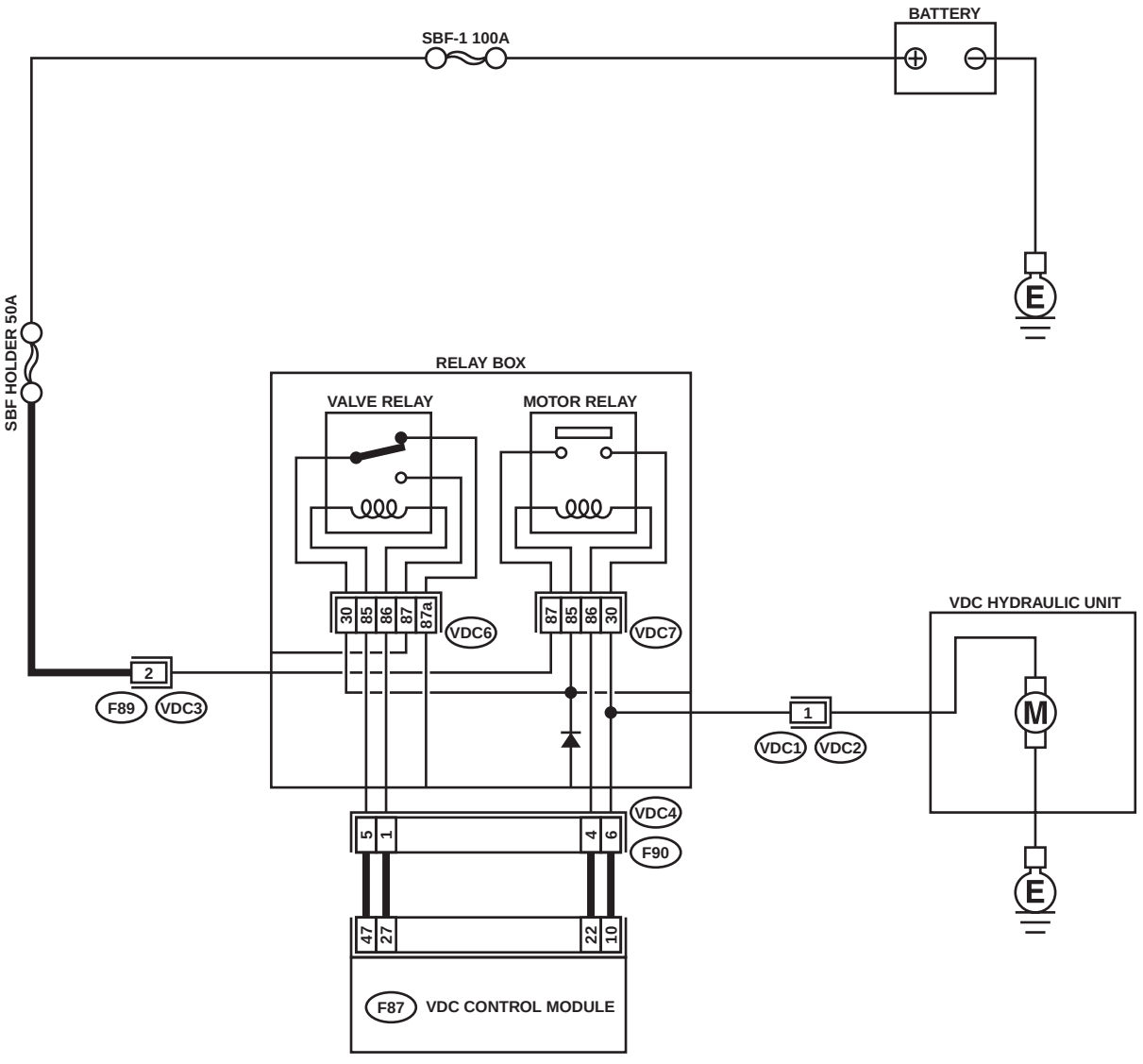
DIAGNOSIS:

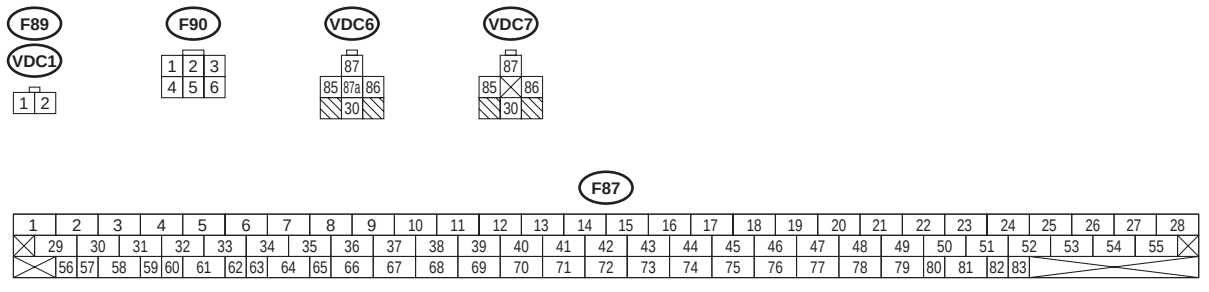
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00155

	Step	Value	Yes	No
1	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **2.**	Replace motor relay.
2	**CHECK SHORT OF MOTOR RELAY.** Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 30:*** ***No. 85 — No. 87:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Replace motor relay.
3	**CHECK GROUND SHORT IN CIRCUIT OF RELAY BOX.** 1) Disconnect connector (F90) from relay box. 2) Measure resistance between relay box connector unit and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Replace relay box.
4	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **5.**	Replace relay box.
5	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **6.**	Replace relay box.
6	**CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 — Chassis ground:*** Is the measured value less than the specified value?	1 MΩ	Go to step **7.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
7	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 10 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **8.**	Repair harness between VDCCM and relay box.
8	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 10 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **9.**	Repair harness between VDCCM and relay box.
9	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between VDCH/U, relay box and VDCCM?	There is poor contact.	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

MEMO:

Vehicle-id:
SIE-id::AM:DTC 52 Motor and Motor Relay off Failure
～

AN:DTC 52 MOTOR AND MOTOR RELAY ON FAILURE

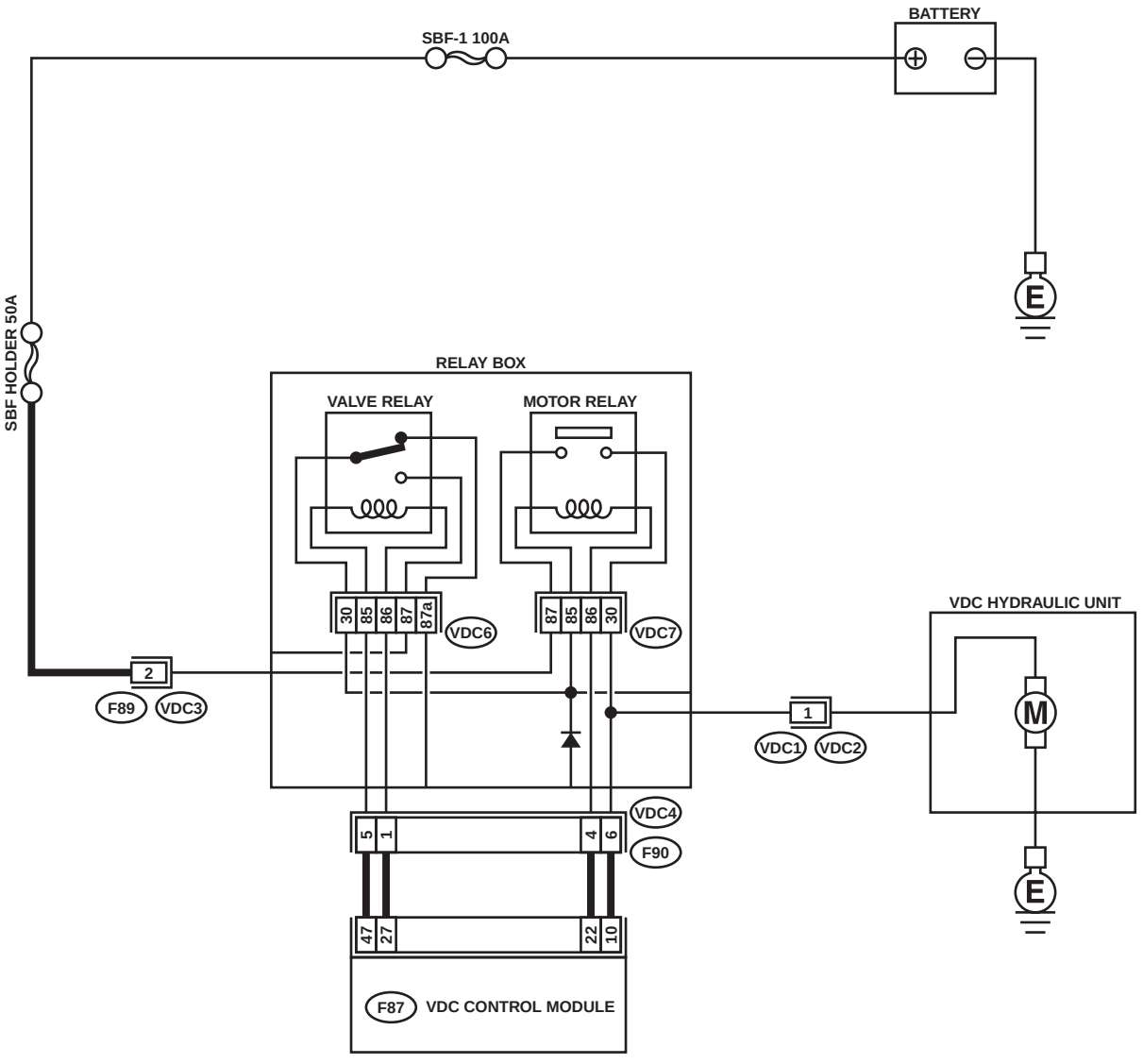
DIAGNOSIS:

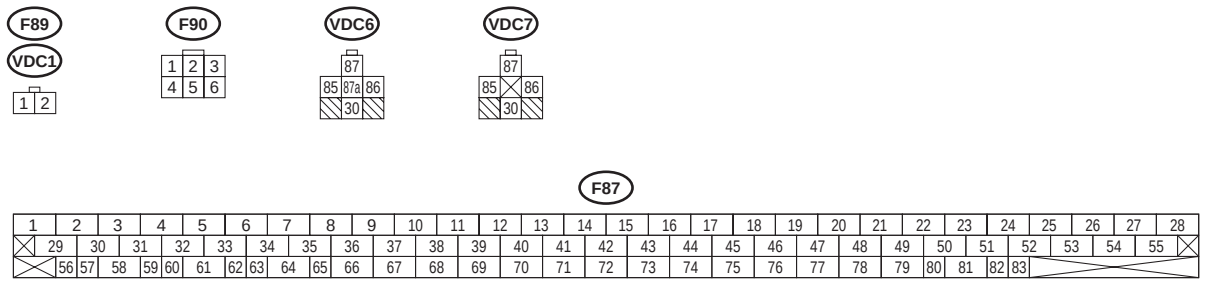
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00155

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK RESISTANCE OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 86:*** Is the measured value within the specified range?	70 — 90 Ω	Go to step **2.**	Replace motor relay.
2	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Connect battery to motor relay terminals No. 85 and No. 86. 2) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **3.**	Replace motor relay.
3	**CHECK SHORT OF MOTOR RELAY.** Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 30:*** ***No. 85 — No. 87:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Replace motor relay.
4	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect connector (F89) from relay box. 2) Disconnect connector from VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 2 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **5.**	Repair harness/ connector between battery and relay box, and check fuse SBF holder.
5	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Connect connector (F89) to relay box. 3) Turn ignition switch to ON. 4) Measure voltage between relay box and chassis ground. ***Connector & terminal*** ***(VDC7) No. 87 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Replace relay box.

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
6	**CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to OFF. 2) Disconnect connectors (VDC2, F90) from relay box. 3) Measure resistance between relay box connector unit and motor relay installing portion. ***Connector & terminal*** ***(VDC1) No. 1 — (VDC7) No. 30:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **7.**	Replace relay box.
7	**CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and motor relay installing point. ***Connector & terminal*** ***(VDC4) No. 6 — (VDC7) No. 30:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **8.**	Replace relay box.
8	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** Measure resistance between motor relay installing point and relay box connector. ***Connector & terminal*** ***(VDC4) No. 4 — (VDC7) No. 86:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **9.**	Replace relay box.
9	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** 1) Remove valve relay from relay box. 2) Measure resistance between motor relay installing point and valve relay installing point. ***Connector & terminal*** ***(VDC7) No. 85 — (VDC6) No. 30:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **10.**	Replace relay box.
10	**CHECK GROUND SHORT IN CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:*** ***(VDC4) No. 6 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **11.**	Replace relay box.
11	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **12.**	Replace relay box.

	Step	Value	Yes	No
12	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **13.**	Replace relay box.
13	**CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS.** Measure resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(F87) No. 22 — (F90) No. 4:*** ***(F87) No. 10 — (F90) No. 6:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **14.**	Repair harness connector between VDCCM and relay box.
14	**CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 — Chassis ground:*** ***(F87) No. 10 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **15.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
15	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 10 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **16.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
16	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 10 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **17.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
17	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between VDCH/U, relay box and VDCCM?	There is poor contact.	Repair connector.	Go to step **18.**
18	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **19.**

DIAGNOSTICS CHART WITH SELECT MONITOR

Step		Value	Yes	No
19	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

MEMO:

Vehicle-id:
SIE-id::AN:DTC 52 Motor and Motor Relay on Failure
～

DIAGNOSTICS CHART WITH SELECT MONITOR

AO:DTC 52 MOTOR MALFUNCTION

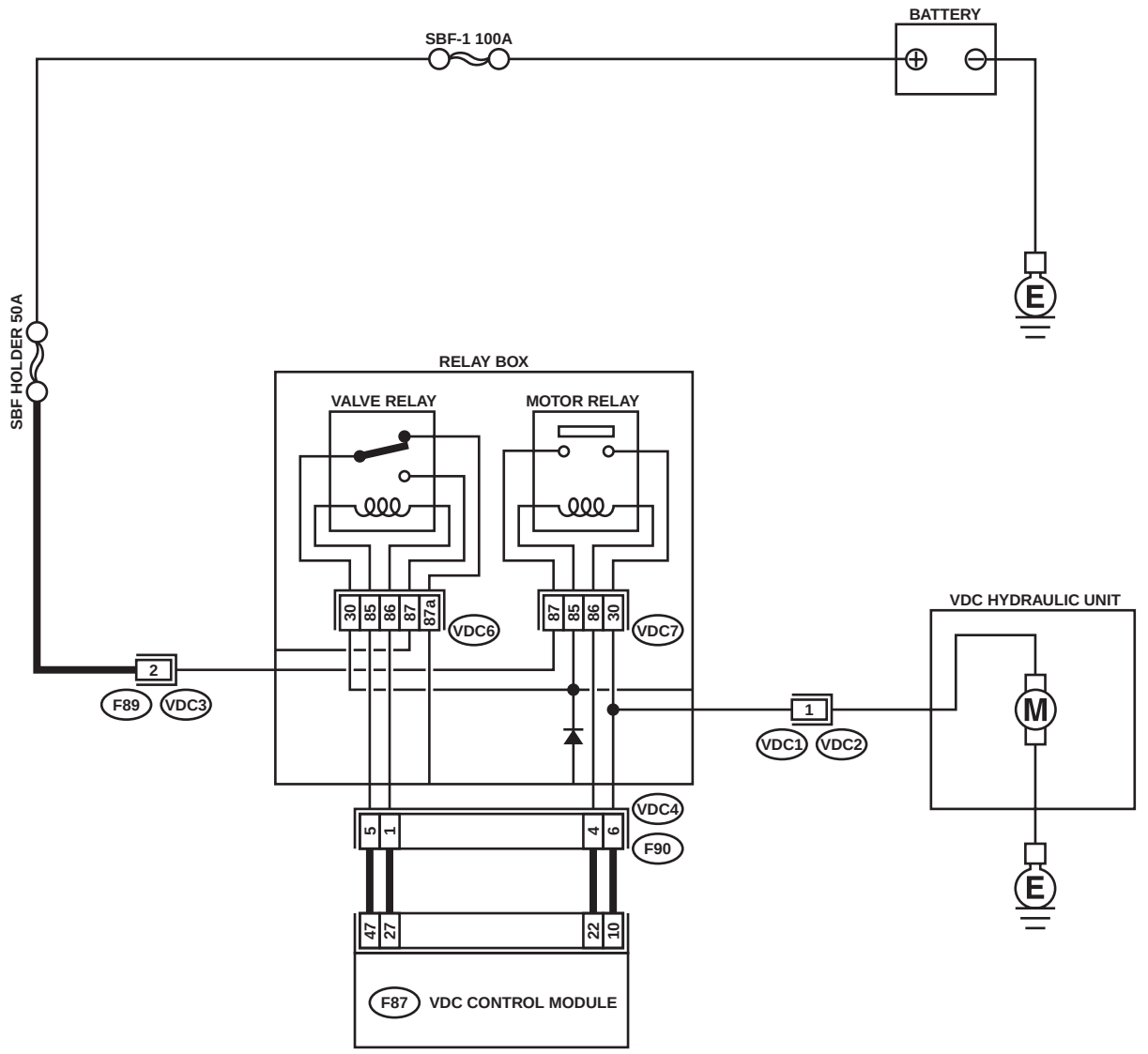
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00155

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Connect battery to motor relay terminals No. 85 and No. 86. 4) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **2.**	Replace motor relay.
2	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Disconnect battery from motor relay terminals. 2) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Replace motor relay.
3	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect connector (F89) from relay box. 2) Disconnect connector from VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 2 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **4.**	Repair harness/ connector between battery and relay box, and check fuse SBF holder.
4	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Connect connector (F89) to relay box. 3) Turn ignition switch to ON. 4) Measure voltage between relay box and chassis ground. ***Connector & terminal*** ***(VDC7) No. 87 (+) — Chassis ground (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **5.**	Replace relay box.
5	**CHECK CONDITION OF MOTOR GROUND.** ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)*** Is the motor ground terminal tightly clamped?	Clamped securely.	Go to step **6.**	Tighten the clamp of motor ground terminal.

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
6	**CHECK VDCCM MOTOR DRIVE TERMINAL.** 1) Turn ignition switch OFF. 2) Remove VDC connector cover. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect all connectors. 4) Install motor relay. 5) Operate the ABS check sequence. <Ref. to VDC-16, ABS Sequence Control.> 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal (F87) No. 22 (+) — No. 1 (–):*** Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?	Drop from 10 — 13 V to less than 1.5 V, and rise to 10 — 13 V again when carrying out the check sequence.	Go to step **7.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK MOTOR OPERATION.** Operate the check sequence. <Ref. to VDC-19, VDC Sequence Control.> Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Noise heard	Go to step **8.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
8	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between VDCH/U, relay box and VDCCM?	There is poor contact.	Repair connector.	Go to step **9.**
9	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **10.**
10	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

MEMO:

Vehicle-id:
SIE-id::A0:DTC 52 Motor Malfunction
～

AP:DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG.

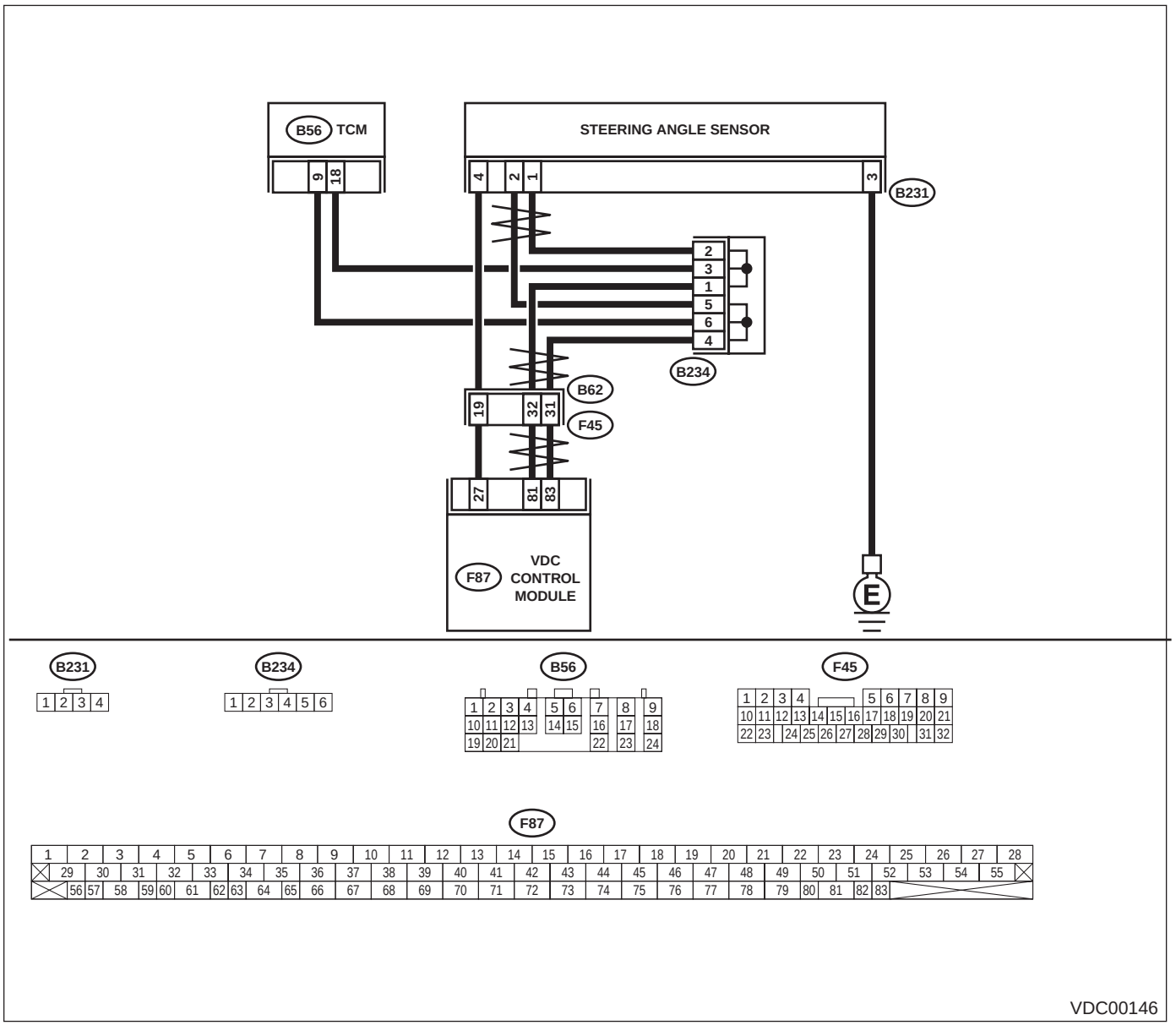
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00146

Vehicle-id:
SIE-id::AP:DTC 71 Steering Angle Sensor Offset is too Big.
～

DIAGNOSTICS CHART WITH SELECT MONITOR

Step		Value	Yes	No
1	**CHECK THE STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel. Is the measured value less than the specified value?	5°	Go to step **2.**	Perform centering alignment of steering wheel.
2	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **3.**
3	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Vehicle-id:
SIE-id::AP:DTC 71 Steering Angle Sensor Offset is too Big.
～

AQ:DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG.

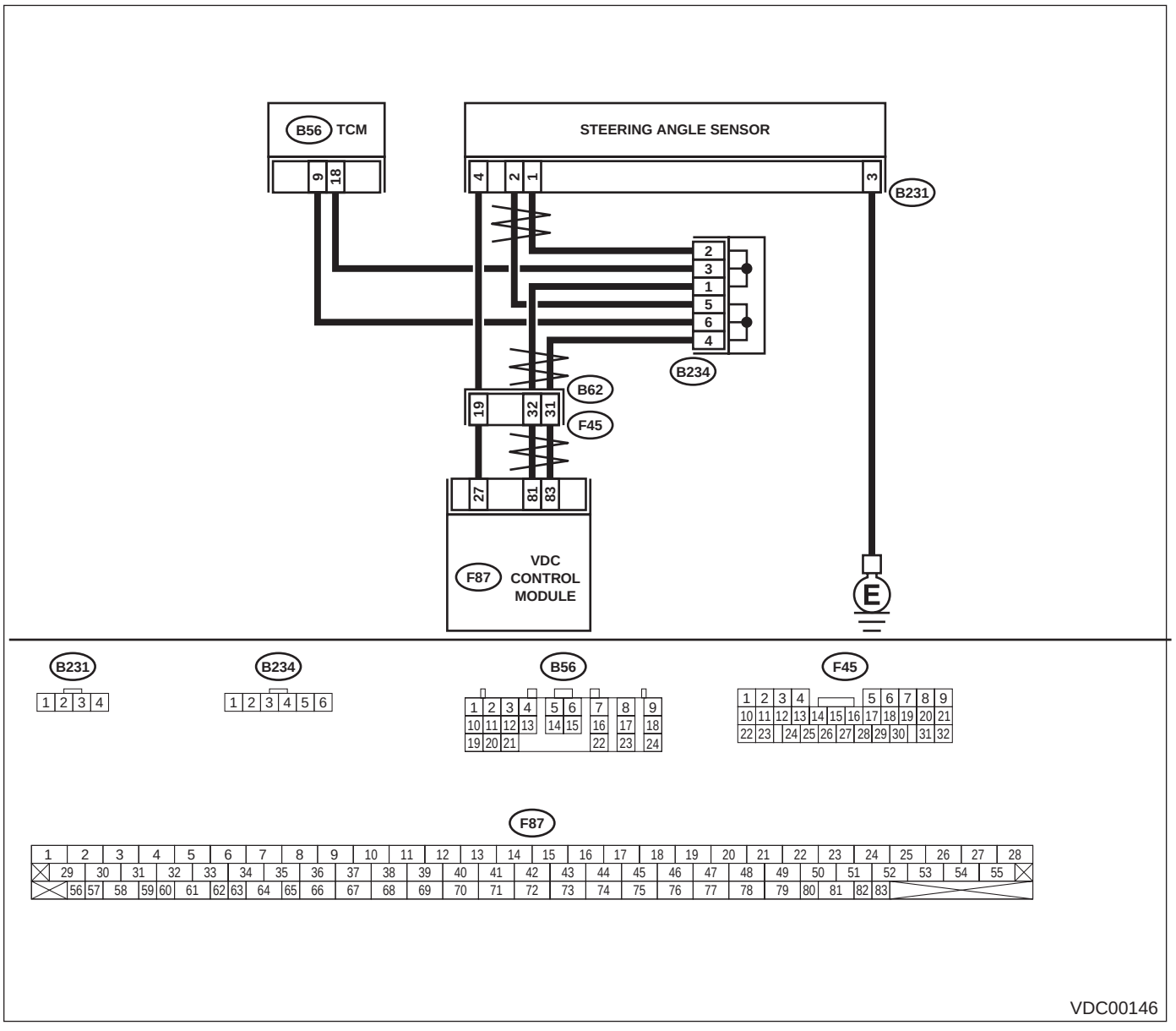
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00146

Vehicle-id:
SIE-id::AQ:DTC 71 Change Range of Steering Angle Sensor is too Big.
～

DIAGNOSTICS CHART WITH SELECT MONITOR

Step		Value	Yes	No
1	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **2.**
2	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AR:DTC 71 STEERING ANGLE SENSOR MALFUNCTION

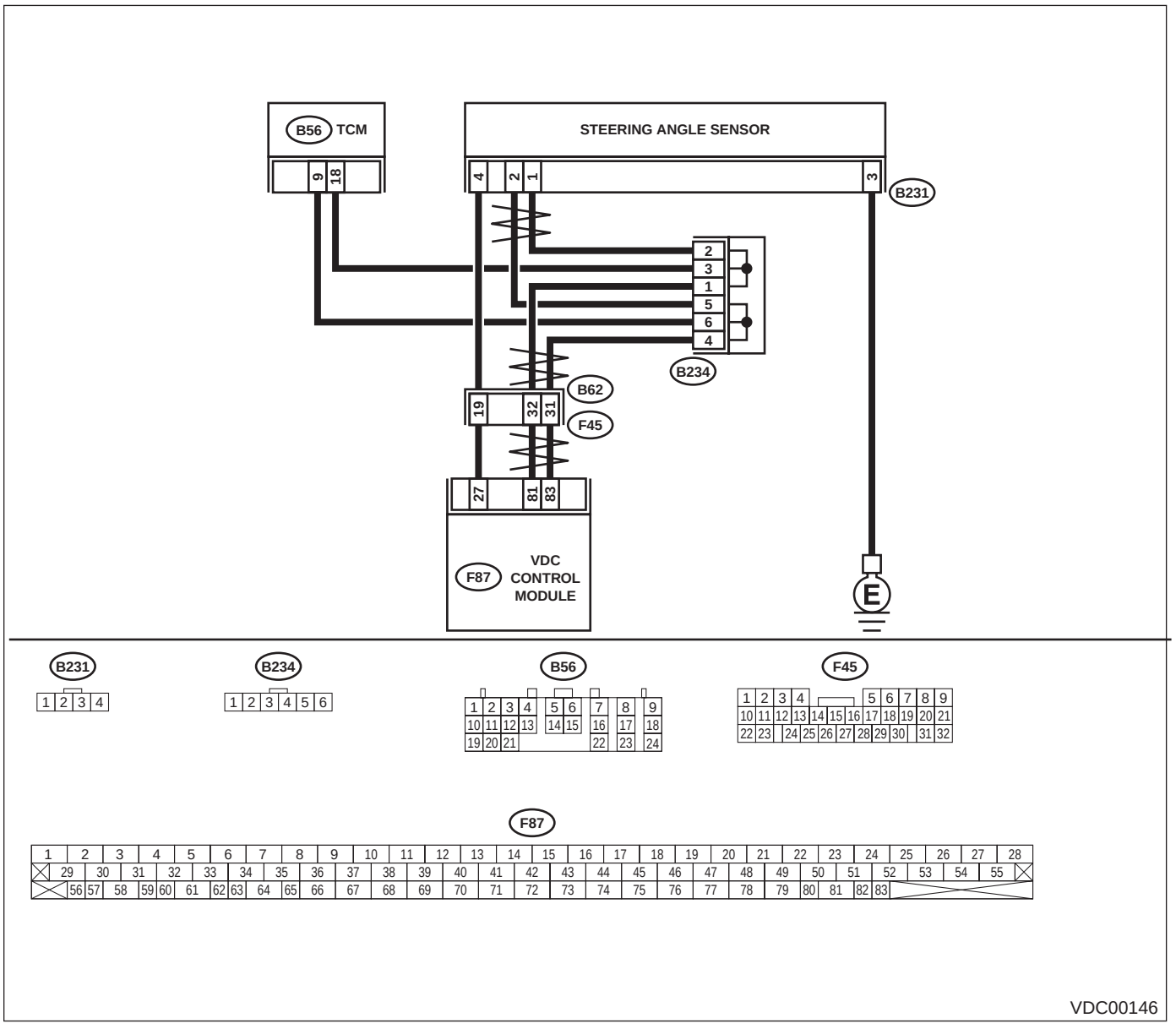
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00146

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK THE STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel. Is the measured value less than the specified value?	5°	Go to step **2.**	Perform centering alignment of steering.
2	**CHECK OUTPUT OF STEERING ANGLE SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read steering angle sensor output on the select monitor display. Does the steering angle sensor output (value) change on the monitor display when the steering wheel is turned in either direction?	Change	Go to step **3.**	Replace steering angle sensor.
3	**CHECK RUNNING FIELD.** Check if the vehicle was driven on banked road surfaces or sandy surfaces (not dirt road surfaces). Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces)?	Driven.	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) sometimes results in a VDCCM memory trouble code.	Go to step **4.**
4	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AS:DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR

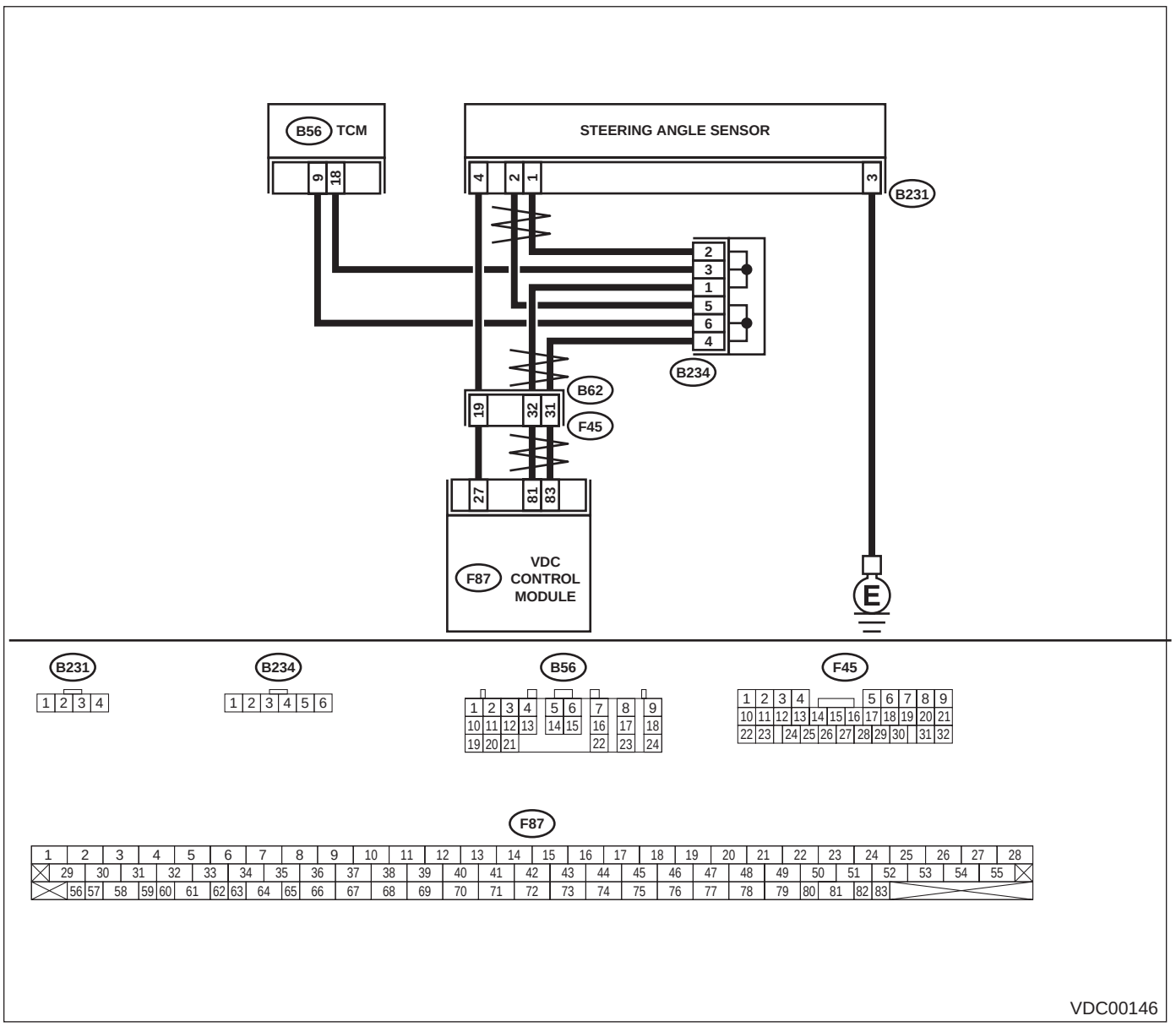
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00146

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY OF STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from steering angle sensor. 3) Turn ignition switch to ON. 4) Measure voltage between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, VDC Sequence Control.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 27 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Repair harness between yaw rate sensor and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in yaw rate sensor connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.** Measure resistance between steering sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair steering angle sensor ground harness.
5	**CHECK HARNESS OF STEERING ANGLE SENSOR.** 1) Connect connector to steering angle sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 81 — No. 83:*** Is the measured value within the specified range?	114 — 126 Ω	Repair harness between steering angle sensor and VDCCM.	Go to step **6.**
6	**CHECK STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **8.**	Go to step **7.**

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
8	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Replace steering angle sensor. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **9.**
9	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	The original steering angle sensor has been faulty.

Vehicle-id:
SIE-id::AS:DTC 71 No Signal from Steering Angle Sensor
~

MEMO:

Vehicle-id:
SIE-id::AS:DTC 71 No Signal from Steering Angle Sensor
~

AT:DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT

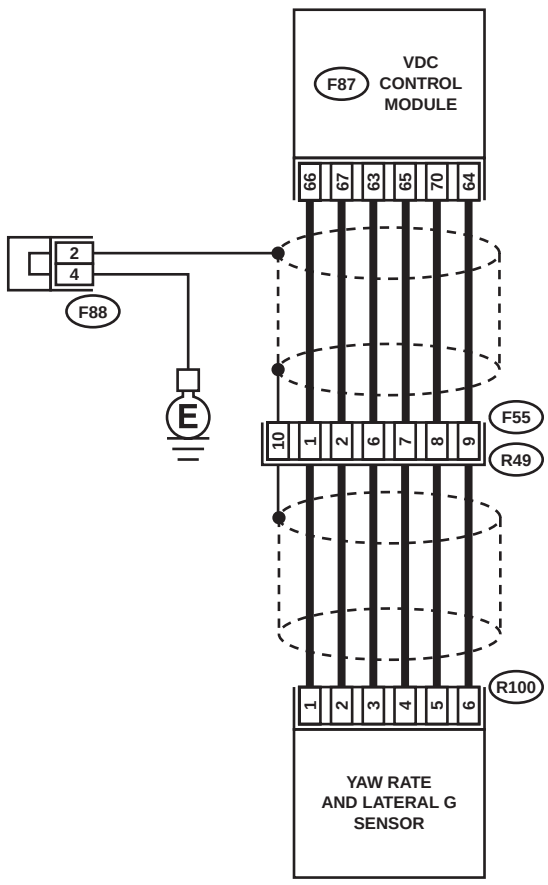
DIAGNOSIS:

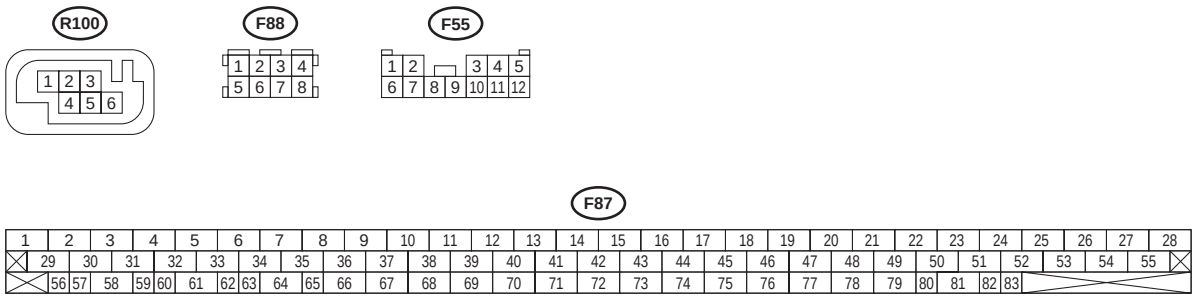
- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:





VDC00151

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK RUNNING FIELD.** Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces)?	Driven.	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) sometimes results in a VDCCM memory diagnostic trouble code.	Go to step **2.**
2	**CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR.** Check installation of yaw rate and lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?	Fixed securely.	Go to step **3.**	Install yaw rate and lateral G sensor securely.
3	**CHECK OUTPUT OF YAW RATE AND LATERAL G SENSOR USING SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Select “Current data display & Save” on the select monitor. 4) Read yaw rate and lateral G sensor output on the select monitor display. Is the measured value within the specified range?	0±5.25 deg/s	Go to step **4.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
4	**CHECK OUTPUT OF STEERING ANGLE SENSOR USING SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Select “Current data display & Save” on the select monitor. 4) Read steering angle sensor output on the select monitor display. Is the measured value within the specified range?	0±2.5 deg	Go to step **5.**	Perform centering alignment of steering wheel.
5	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step **6.**	Go to step **7.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Replace yaw rate and lateral G sensor. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**

DIAGNOSTICS CHART WITH SELECT MONITOR

Step		Value	Yes	No
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	The original yaw rate and lateral G sensor has been faulty.

Vehicle-id:
SIE-id::AT:DTC 72 Abnormal Yaw Rate Sensor Output
～

DIAGNOSTICS CHART WITH SELECT MONITOR

MEMO:

Vehicle-id:
SIE-id::AT:DTC 72 Abnormal Yaw Rate Sensor Output
～

DIAGNOSTICS CHART WITH SELECT MONITOR

AU:DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION.

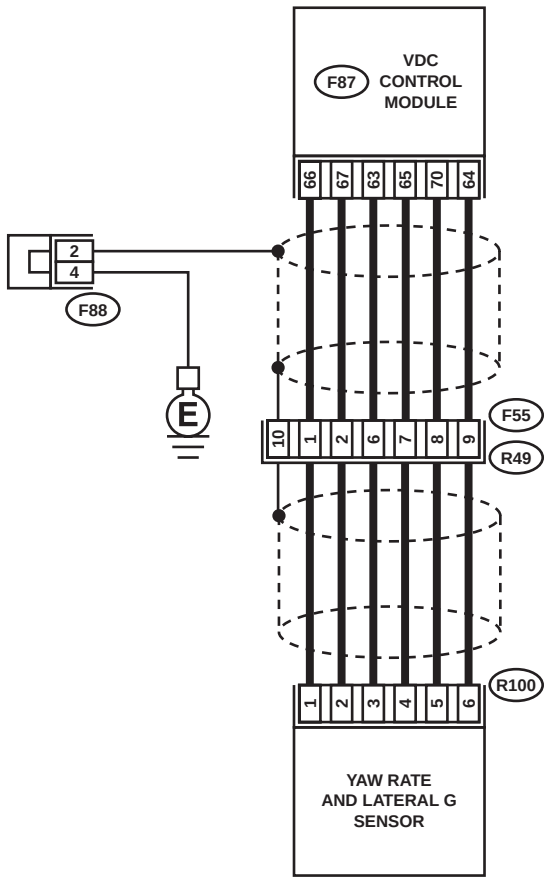
DIAGNOSIS:

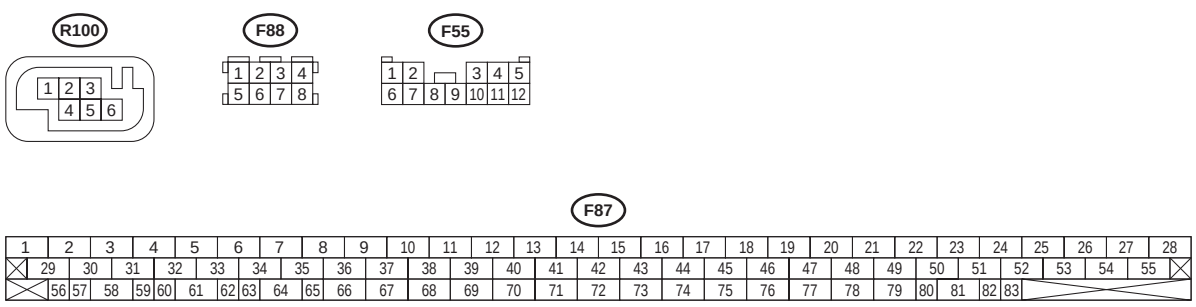
- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:





VDC00151

Vehicle-id:
SIE-id::AU:DTC 72 Voltage Inputted to Yaw Rate Sensor Exceeds Specification.
~

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 3 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in yaw rate and lateral G sensor connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM and yaw rate and lateral G sensor. ***Connector & terminal*** ***(F87) No. 65 — (R100) No. 4:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **6.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **7.**	Repair harness between yaw rate and lateral G sensor and VDCCM.

Vehicle-id:
SIE-id::AU:DTC 72 Voltage Inputted to Yaw Rate Sensor Exceeds Specification.
~

Step		Value	Yes	No
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>	Repair harness between yaw rate and lateral G sensor and VDCCM.

MEMO:

Vehicle-id:
SIE-id::AU:DTC 72 Voltage Inputted to Yaw Rate Sensor Exceeds Specification.
～

AV:DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE

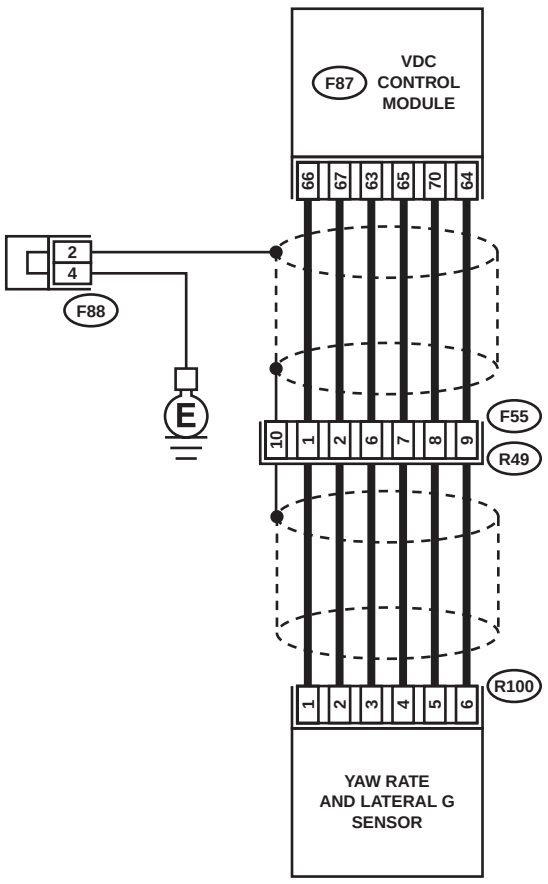
DIAGNOSIS:

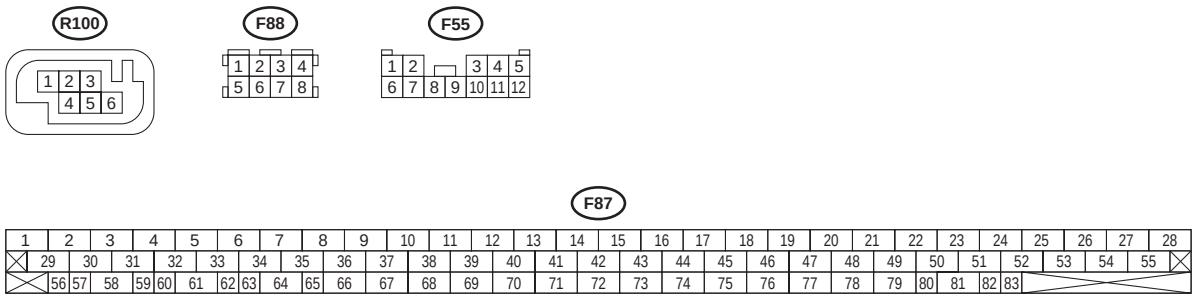
- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:





VDC00151

Vehicle-id:
SIE-id::AV:DTC 72 Abnormal Yaw Rate Sensor Reference Voltage
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	Step	Value	Yes	No
1	**CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 3 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in yaw rate and lateral G sensor connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure resistance between VDCCM and yaw rate and lateral G sensor. ***Connector & terminal*** ***(F87) No. 66 — (R100) No. 1:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **5.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminalDoes the measured value exceed the specified value?*** ***(F87) No. 66 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **6.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 66 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **7.**	Repair harness between yaw rate and lateral G sensor and VDCCM.

	Step	Value	Yes	No
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 66 — Chassis ground:*** Is the measured value less than the specified value?	0.5 V	Go to step **8.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
8	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Install yaw rate and lateral G sensor to body. 3) Remove VDCCM connector cover. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect all connectors. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 66 (+) — No. 64 (–):*** Is the measured value within the specified range?	2.1 — 2.9 V	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

MEMO:

Vehicle-id:
SIE-id::AV:DTC 72 Abnormal Yaw Rate Sensor Reference Voltage
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AW:DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG.

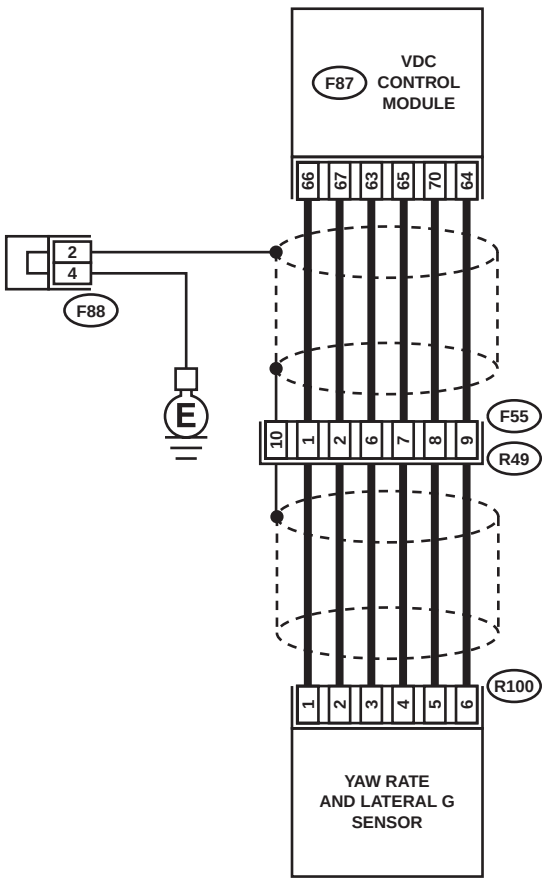
DIAGNOSIS:

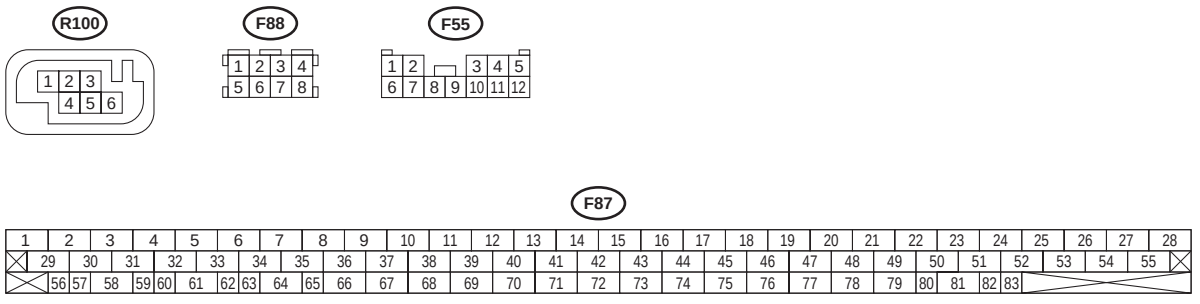
- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:





VDC00151

Vehicle-id:
SIE-id::AW:DTC 72 Change Range of Yaw Rate Sensor Signal is too Big.
~

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK RUNNING FIELD.** Was the vehicle driven on surfaces with holes or bumps at high speeds?	Driven.	When driving on surfaces with holes or bumps at high speeds, VDCCM sometimes records trouble codes in memory.	Go to step **2.**
2	**CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR.** Check installation of yaw rate and lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?	Fixed securely.	Go to step **3.**	Install yaw rate and lateral G sensor securely.
3	**CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 3 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:*** Is the measured value within the specified range?	10 — 15 V	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **5.**
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in yaw rate and lateral G sensor connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	**CHECK GROUND CIRCUIT OF YAW RATE AND LATERAL G SENSOR.** Measure resistance between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 6 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **9.**	Go to step **7.**

Vehicle-id:
SIE-id::AW:DTC 72 Change Range of Yaw Rate Sensor Signal is too Big.
~

	Step	Value	Yes	No
7	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM connector. <Ref. to VDC-19, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 64 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **8.**
8	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
9	**CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure resistance between VDCCM and yaw rate and lateral G sensor. ***Connector & terminal*** ***(F87) No. 65 — (R100) No. 4:*** ***(F87) No. 66 — (R100) No. 1:*** ***(F87) No. 67 — (R100) No. 2:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **10.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
10	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 — Chassis ground:*** ***(F87) No. 66 — Chassis ground:*** ***(F87) No. 67 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **11.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
11	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):*** ***(F87) No. 66 (+) — Chassis ground (–):*** ***(F87) No. 67 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **12.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 — Chassis ground:*** ***(F87) No. 66 — Chassis ground:*** ***(F87) No. 67 — Chassis ground:*** Is the measured value less than the specified value?	0.5 V	Go to step **13.**	Repair harness between yaw rate and lateral G sensor and VDCCM.

Step		Value	Yes	No
13	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Install yaw rate and lateral G sensor to body. 3) Connect all connectors. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(F87) No. 66 (+) — No. 64 (–):*** Is the measured value within the specified range?	2.1 — 2.9 V	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

Vehicle-id:
SIE-id::AW:DTC 72 Change Range of Yaw Rate Sensor Signal is too Big.
~

AX:DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG.

NOTE:
For diagnostic procedure, refer to DTC 73. <Ref. to VDC-248, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

AY:DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT

NOTE:
For diagnostic procedure, refer to DTC 73. <Ref. to VDC-248, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

AZ:DTC 73 CHANGE RANGE OF LATERAL G SENSOR IS TOO BIG.

NOTE:
For diagnostic procedure, refer to DTC 73. <Ref. to VDC-248, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

Vehicle-id:
SIE-id::AX:DTC 73 Lateral G Sensor Offset is too Big.
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MEMO:

Vehicle-id:
SIE-id::AZ:DTC 73 Change Range of Lateral G Sensor is too Big.
～

BA:DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL

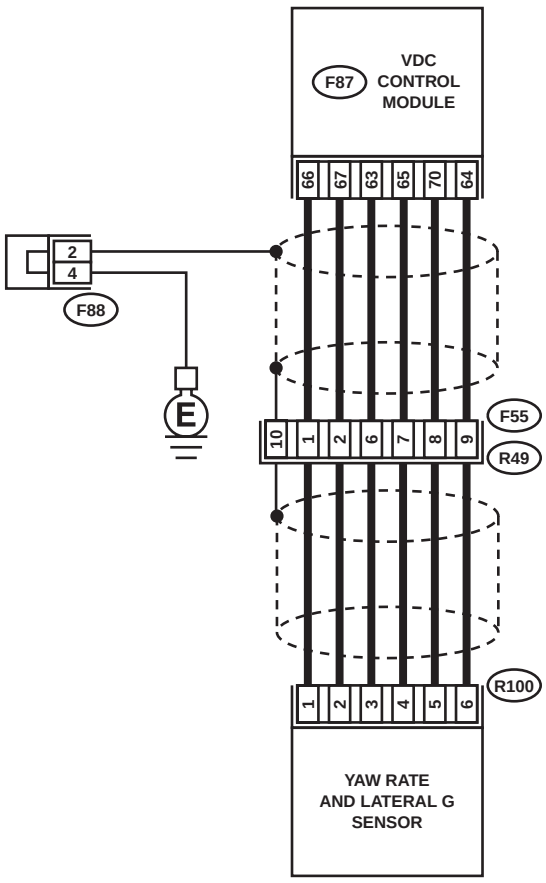
DIAGNOSIS:

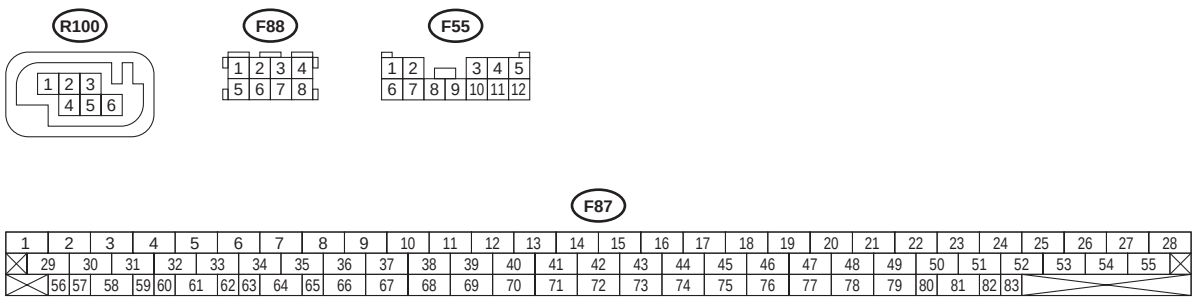
- Faulty lateral G sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00151

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR.** Check installation of yaw rate and lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?	Fixed securely.	Go to step **2.**	Install yaw rate and lateral G sensor securely.
2	**CHECK OUTPUT OF LATERAL G SENSOR USING SELECT MONITOR.** 1) Stop the vehicle on a flat road. 2) Select “Current data display & Save” on the select monitor. 3) Read yaw rate and lateral G sensor output on the select monitor display. Is the measured value within the specified range?	2.3 — 2.7 V	Go to step **3.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
3	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	There is poor contact.	Repair connector.	Go to step **4.**
4	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Vehicle-id:
SIE-id::BA:DTC 73 Excessive Lateral G Sensor Signal
~

BB:DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION.

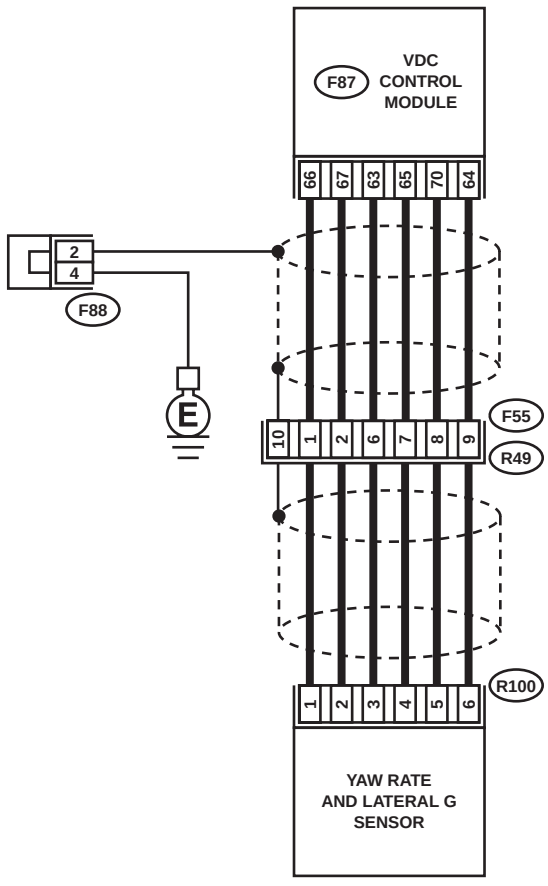
DIAGNOSIS:

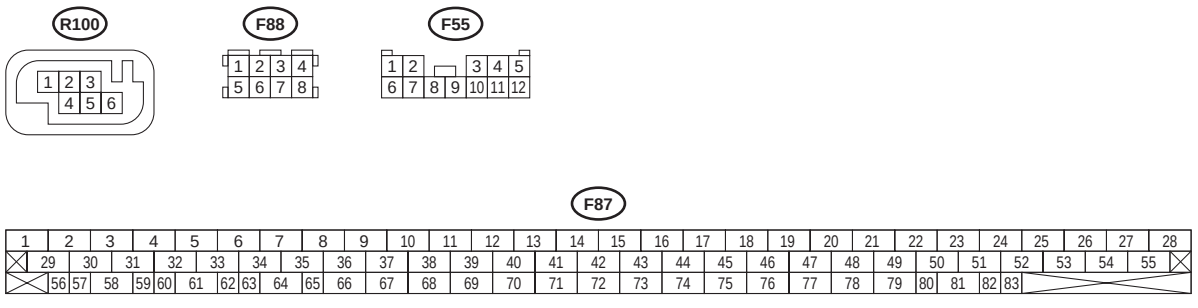
- Faulty lateral G sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00151

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF YAW RATE AND LATERAL G SENSOR USING SELECT MONITOR.** 1) Stop the vehicle on a flat road. 2) Select “Current data display & Save” on the select monitor. 3) Read yaw rate and lateral G sensor output on the select monitor display. Is the measured value within the specified range?	2.3 — 2.7 V	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	There is poor contact.	Repair connector.	Go to step **3.**
3	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
5	**CHECK INPUT VOLTAGE OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect connector from yaw rate and lateral G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 3 (+) — No. 6 (–):*** Is the measured value within the specified range?	10 — 15 V	Go to step **6.**	Repair harness/ connector between yaw rate and lateral G sensor and VDCCM.
6	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between yaw rate and lateral G sensor terminals. ***Terminals*** ***No. 3 — No. 5:*** Is the measured value within the specified range?	4.3 — 4.9 kΩ	Go to step **7.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

Vehicle-id:
SIE-id::BB:DTC 73 Voltage Inputted to Lateral G Sensor Exceeds Specification.
~

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
7	**CHECK OPEN CIRCUIT IN YAW RATE AND LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Connect connector to yaw rate and lateral G sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 70 — No. 64:*** Is the measured value within the specified range?	4.3 — 4.9 kΩ	Go to step **8.**	Repair harness/ connector between yaw rate and lateral G sensor and VDCCM.
8	**CHECK GROUND SHORT IN YAW RATE AND LATERAL G SENSOR HARNESS.** 1) Disconnect connector from yaw rate and lateral G sensor. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:*** ***(F87) No. 70 — Chassis ground:*** ***(F87) No. 64 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **9.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
9	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove yaw rate and lateral G sensor from vehicle. 3) Connect connector to yaw rate and lateral G sensor. 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):*** Is the measured value within the specified range when yaw rate and lateral G sensor is horizontal?	2.3 — 2.7 V	Go to step **10.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
10	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):*** Is the measured value within the specified range when yaw rate and lateral G sensor is inclined 90× to left?	3.3 — 3.7 V	Go to step **11.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
11	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):*** Is the measured value within the specified range when yaw rate and lateral G sensor is inclined 90× to right?	1.3 — 1.7 V	Go to step **12.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

Vehicle-id:
SIE-id::BB:DTC 73 Voltage Inputted to Lateral G Sensor Exceeds Specification.
～

Step		Value	Yes	No
12	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	There is poor contact.	Repair connector.	Go to step **13.**
13	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **14.**
14	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Vehicle-id:
SIE-id::BB:DTC 73 Voltage Inputted to Lateral G Sensor Exceeds Specification.
～

BC:DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 1 EXCEEDS SPECIFICATION. (PRIMARY PRESSURE SENSOR)

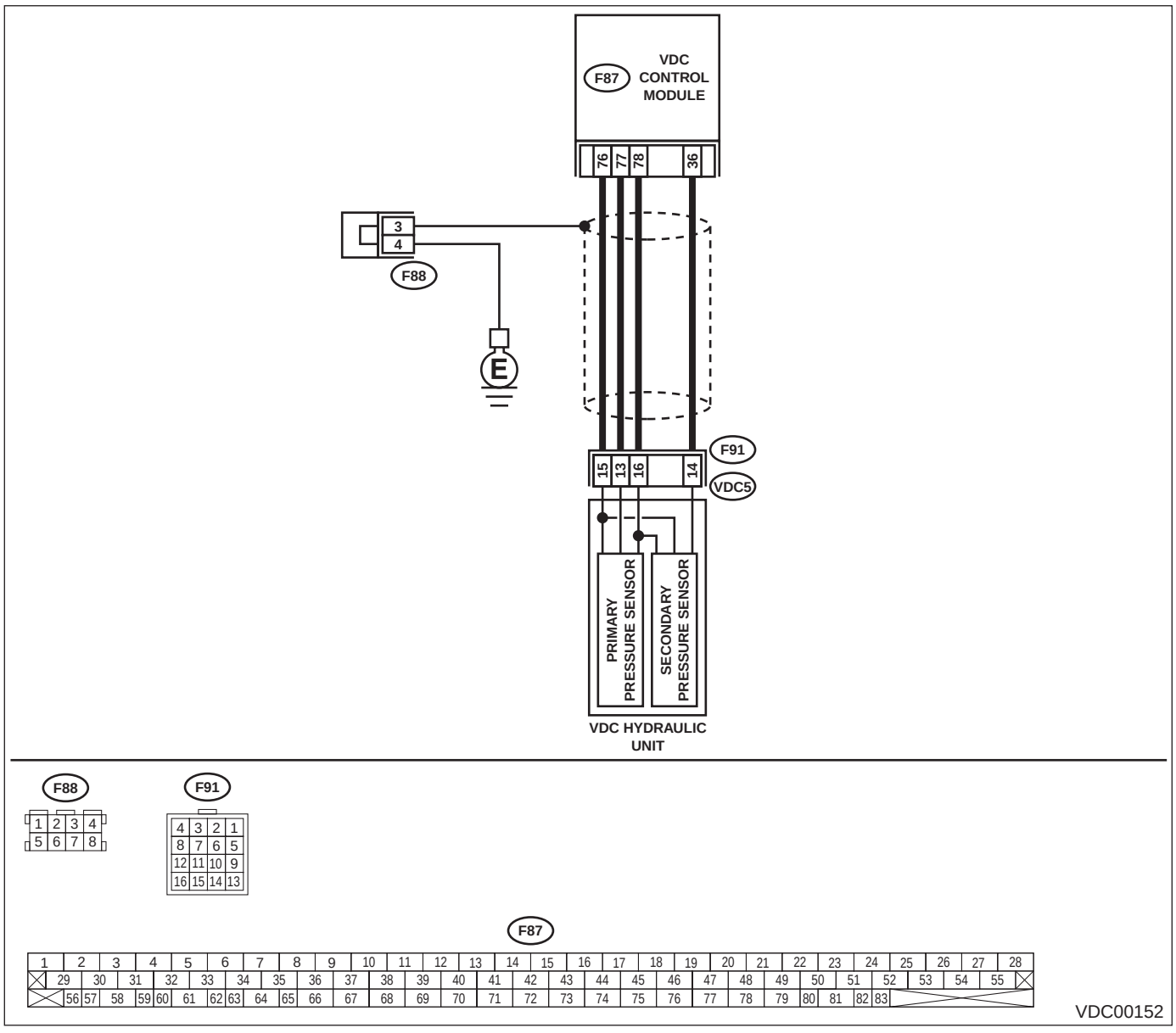
DIAGNOSIS:

- Faulty primary pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F91) from VDCH/U. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 15 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **4.**	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM. <Ref. to VDC-19, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 76 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Replace harness between VDCH/U and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY OF PRESSURE SENSOR.** NOTE: When this inspection is carried out, DTC 51 ABNORMAL VALVE RELAY is memorized, but this does not indicate valve relay malfunction. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(F91) No. 16 (+) — No. 15 (–):*** Is the measured value within the specified range?	4.75 — 5.25 V	Go to step **7.**	Go to step **5.**
5	**CHECK POWER SUPPLY OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 78 (+) — No. 76 (–):*** Is the measured value within the specified range?	4.75 — 5.25 V	Repair harness between VDCH/U and VDCCM.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair harness between VDCH/U and VDCCM.
8	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **9.**	Repair harness between VDCH/U and VDCCM.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **10.**	Repair harness between VDCH/U and VDCCM.
10	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 77 (+) — No. 76 (–):*** Is the measured value within the specified range?	0.48 — 0.72 V	Go to step **11.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
11	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between VDCCM and pressure sensor?	There is poor contact.	Repair connector.	Go to step **12.**
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Vehicle-id:
SIE-id::BC:DTC 74 Voltage Inputted to Pressure Sensor 1 Exceeds Specification. (Primary Pressure Sensor)
～

MEMO:

Vehicle-id:
SIE-id::BC:DTC 74 Voltage Inputted to Pressure Sensor 1 Exceeds Specification. (Primary Pressure Sensor)

BD:DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 2 EXCEEDS SPECIFICATION. (SECONDARY PRESSURE SENSOR)

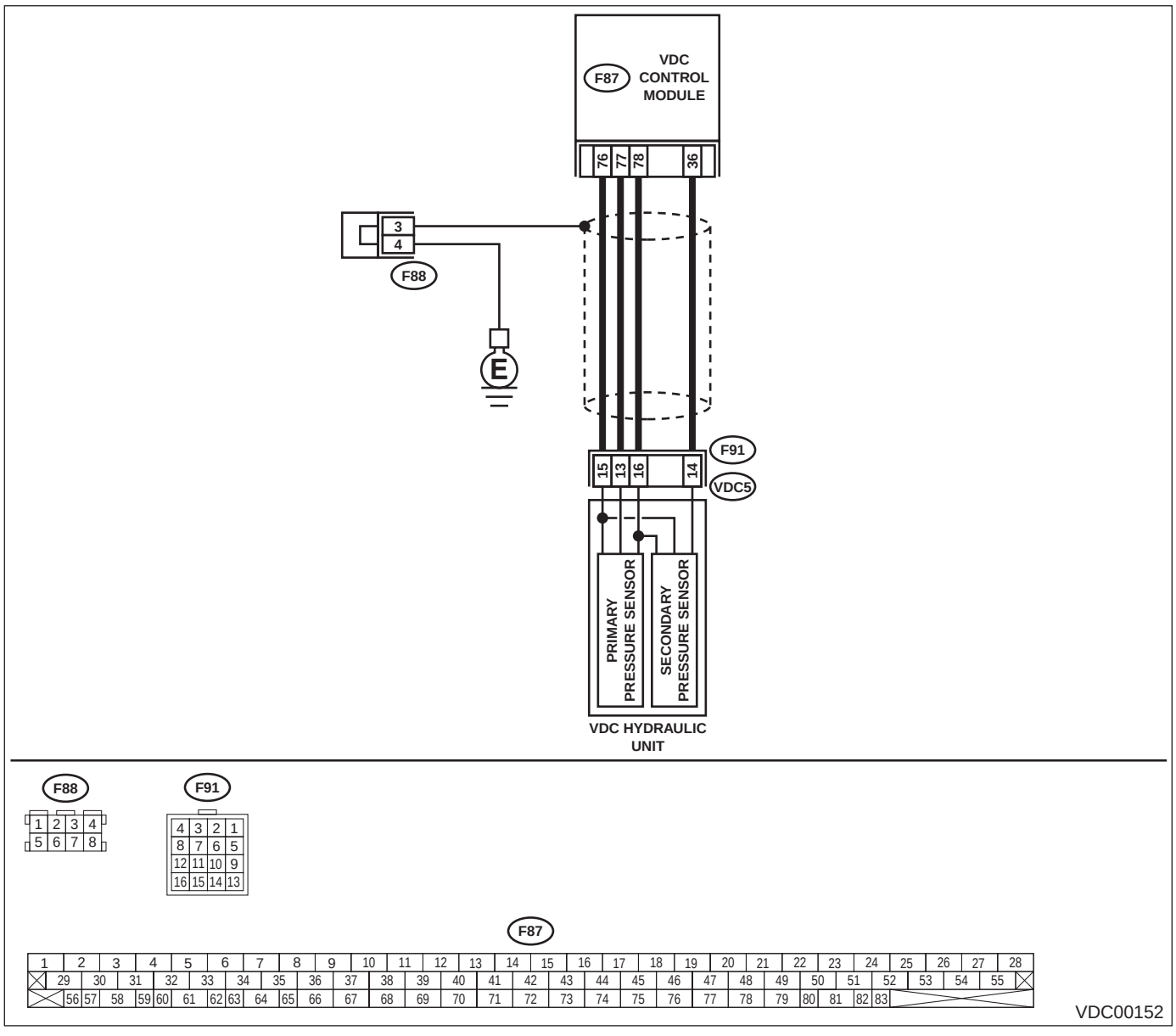
DIAGNOSIS:

- Faulty secondary pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F91) from VDCH/U. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 15 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Go to step **4.**	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 76 — Chassis ground:*** Is the measured value less than the specified value?	0.5 Ω	Replace harness between VDCH/U and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY OF PRESSURE SENSOR.** NOTE: When this inspection is carried out, DTC 51 ABNORMAL VALVE RELAY is memorized, but this does not indicate valve relay malfunction. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(F91) No. 16 (+) — No. 15 (–):*** Is the measured value within the specified range?	4.75 — 5.25 V	Go to step **7.**	Go to step **5.**
5	**CHECK POWER SUPPLY OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 78 (+) — No. 76 (–):*** Is the measured value within the specified range?	4.75 — 5.25 V	Repair harness between VDCH/U and VDCCM.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in VDCCM connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 14 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair harness between VDCH/U and VDCCM.
8	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 14 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **9.**	Repair harness between VDCH/U and VDCCM.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **10.**	Repair harness between VDCH/U and VDCCM.
10	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 36 (+) — No. 76 (–):*** Is the measured value within the specified range?	0.48 — 0.72 V	Go to step **11.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
11	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between VDCCM and pressure sensor?	There is poor contact.	Repair connector.	Go to step **12.**
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

BE:DTC 74 PRESSURE SENSOR 1 OFFSET IS TOO BIG. (PRIMARY PRESSURE SENSOR)

NOTE:
For diagnostic procedure, refer to DTC 74. <Ref. to VDC-262, DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG. (SECONDARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>

Vehicle-id:
SIE-id::BE:DTC 74 Pressure Sensor 1 Offset is too Big. (Primary Pressure Sensor)
～

BF:DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG. (SECONDARY PRESSURE SENSOR)

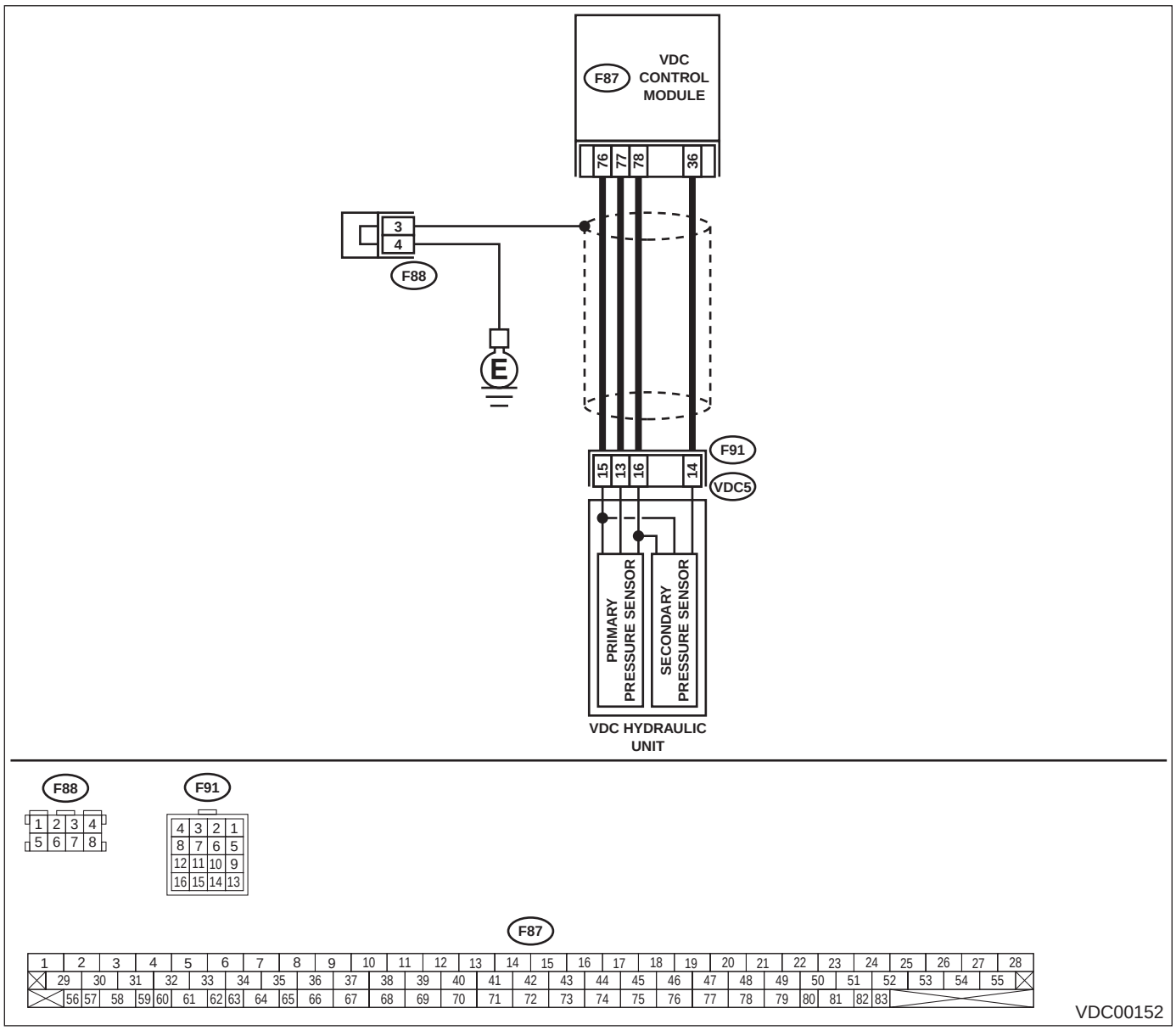
DIAGNOSIS:

- Faulty pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



Vehicle-id:
SIE-id::BF:DTC 74 Pressure Sensor 2 Offset is too Big. (Secondary Pressure Sensor)
～

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK DRIVING TECHNIC.** Check the driver's technic. Are the accelerator and brake pedals depressed simultaneously while driving?	Depressed.	The VDC is normal. Erase the diagnostic trouble code. NOTE: Driving the vehicle with both the accelerator pedal and brake pedal depressed may store a diagnostic trouble code in the memory.	Go to step **2.**
2	**CHECK OUTPUT OF PRESSURE SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read pressure sensor output on the select monitor display. Is the measured value within the specified range when brake pedal is depressed?	0.48 — 0.72 V	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

BG:DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG.

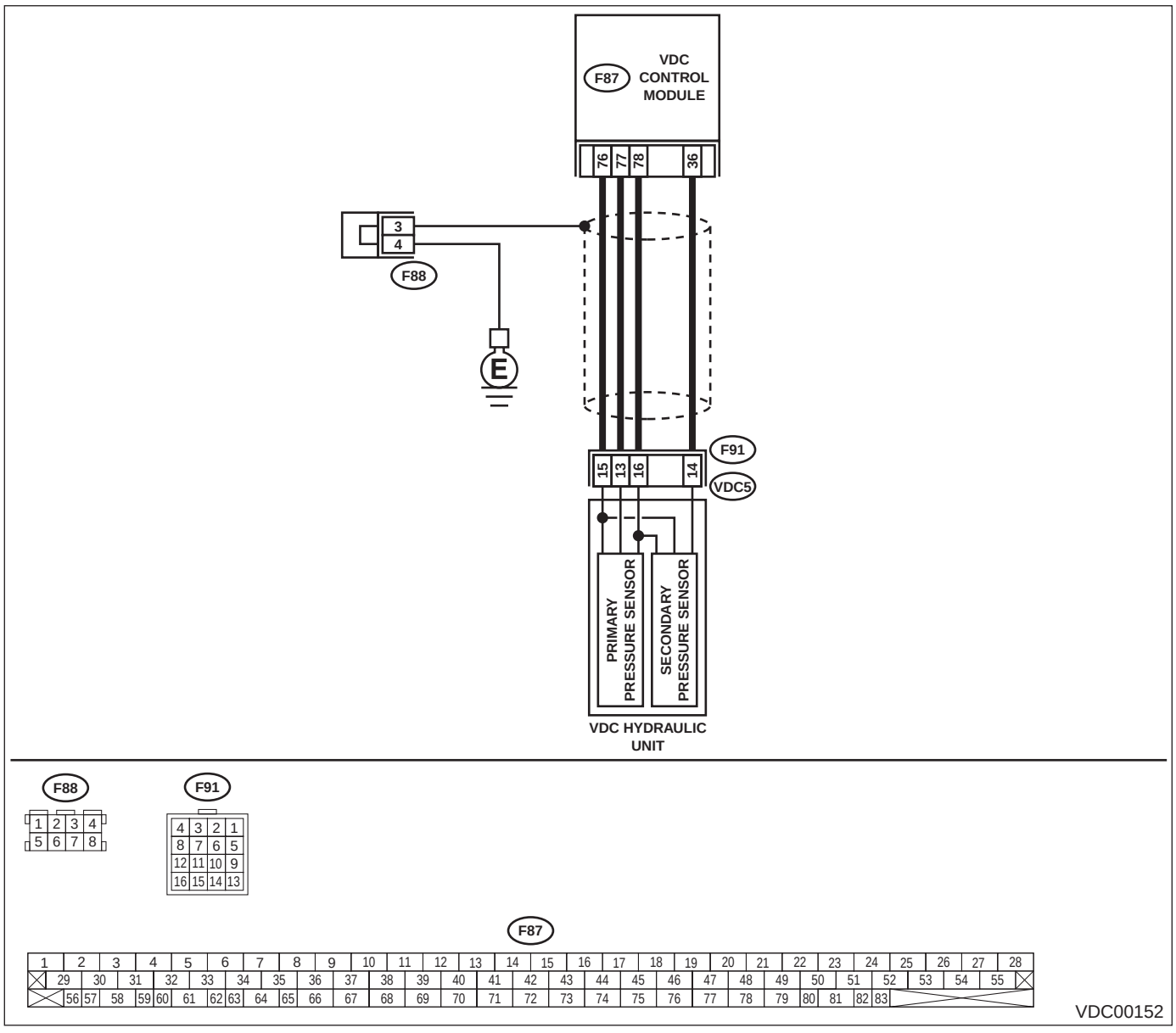
DIAGNOSIS:

- Faulty pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



Vehicle-id:
SIE-id::BG:DTC 74 Differential Pressure of Pressure Sensor is too Big.
~

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector (F91) from VDCH/U. 4) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 — Chassis ground:*** ***(F91) No. 14 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **2.**	Repair harness between VDCH/U and VDCCM.
2	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **3.**	Repair harness between VDCH/U and VDCCM.
3	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.5 V	Go to step **4.**	Repair harness between VDCH/U and VDCCM.
4	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 77 (+) — No. 76 (–):*** ***(F87) No. 36 (+) — No. 76 (–):*** Is the measured value within the specified range?	0.48 — 0.72 V	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BRAKE FLUID LEAKAGE.** Inspect fluid leakage between brake master cylinder and VDCH/U. Does brake fluid leak?	Fluid leaks.	Retighten or replace.	Go to step **6.**
6	**CHECK BRAKE MASTER CYLINDER.** Inspect brake master cylinder hydraulic pressure. <Ref. to BR-29, OPERATION CHECK (WITH GAUGES), INSPECTION, Brake Booster.> Is hydraulic pressure normal?	Normal.	Go to step **7.**	Replace master cylinder.

Vehicle-id:
SIE-id::BG:DTC 74 Differential Pressure of Pressure Sensor is too Big.
~

DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Value	Yes	No
7	**CHECK BRAKE PEDAL STROKE.** Measure the stroke between non-forced pedal position and forced pedal position with 50 kg (110 lb). Is the measured value less than the specified value?	95 mm (3.74 in)	Go to step **8.**	Perform bleeding from brake system.
8	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Depress the brake pedal with 50 kg (110 lb). 2) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***A (F87) No. 77 (+) — No. 76 (–):*** ***B (F87) No. 36 (+) — No. 76 (–):*** Does the voltage difference between A and B exceed the specified value?	0.2 V	Go to step **9.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
9	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between VDCCM and pressure sensor?	There is poor contact.	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.** Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

15.General Diagnostic Table

A: INSPECTION

Symptom		Primary probable cause	Secondary probable cause
Poor braking effectiveness	Long braking distance	VDCH/U VDCCM Brake pads Air in brake line Tire specifications, wear and pressures Incorrect wiring or piping	Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Proportioning valve Master cylinder Brake caliper Disc rotor Brake pipe Brake booster
	Wheel locks	VDCH/U VDCCM Faulty ABS sensor or sensor gap Incorrect wiring or piping	Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Proportioning valve Brake caliper Brake pipe
	Brake dragging	VDCH/U VDCCM Faulty ABS sensor or sensor gap Master cylinder Brake caliper Parking brake Axle & wheels Brake pedal play	Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake pads Brake pipe
	Long brake pedal stroke	Air in brake line Brake pedal play	VDCH/U Proportioning valve Master cylinder Brake caliper Brake pads Brake pipe Brake booster
	Vehicle pitching	VDCH/U VDCCM Uneven road Suspension play or fatigue (reduced damping) Incorrect wiring or piping	Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation
	Unstable or uneven braking	VDCH/U VDCCM Faulty ABS sensor or sensor gap Brake caliper Brake pads Uneven road Tire specifications, wear and pressures Incorrect wiring or piping	Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Master cylinder Disc rotor Brake pipe Axle & wheels Crowned road or banked road Suspension play or fatigue (reduced damping)

GENERAL DIAGNOSTIC TABLE

Symptom		Primary probable cause	Secondary probable cause
Vibration and/or noise • During abrupt braking • During rapid acceleration • During slippery road driving	Excessive brake pedal vibration	Uneven road Incorrect wiring or piping	VDCH/U Proportioning valve Brake booster Suspension play or fatigue (reduced damping)
	Noise from VDCH/U	VDCH/U (mount bushing) Faulty ABS sensor or sensor gap Brake pipe	VDCCM Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation
	Noise from front of vehicle	VDCH/U (mount bushing) Faulty ABS sensor or sensor gap Master cylinder Brake caliper Brake pads Disc rotor Brake pipe Brake booster Suspension play or fatigue (reduced damping)	Axle & wheels Tire specifications, wear and pressures
	Noise inside passenger compartment		VDCCM Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation
	Noise from rear of vehicle	Faulty ABS sensor or sensor gap Brake caliper Brake pads Disc rotor Parking brake Brake pipe Suspension play or fatigue (reduced damping)	Axle & wheels Tire specifications, wear and pressures
Engine does not accelerate or engine stalls during rapid acceleration or on slippery roads.		VDCH/U VDCCM Faulty ABS sensor or sensor gap Master cylinder Brake caliper Parking brake Incorrect wiring or piping	Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake pads Brake pipe

GENERAL DIAGNOSTIC TABLE

Symptom		Primary probable cause	Secondary probable cause
Poor TCS's directional operation stability	Deviation in either left or right direction	VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake caliper Brake pads Wheel alignment Uneven road Crowned road or banked road Tire specifications, wear and pressures Incorrect wiring or piping	Proportioning valve Disc rotor Brake pipe Axle & wheels Suspension play or fatigue (reduced damping)
	Vehicle spin	VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake pads Tire specifications, wear and pressures Incorrect wiring or piping	Proportioning valve Brake caliper Brake pipe
Steering wheel drags during operation.		VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Incorrect wiring or piping connections Power steering system	Brake caliper Brake pads Disc rotor Wheel alignment Uneven road Crowned road or banked road Suspension play or fatigue (reduced damping) Tire specifications, wear and pressures
VDC activates during ordinary driving.		VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Wheel alignment Uneven road Crowned road or banked road Suspension play or fatigue (reduced damping) Tire specifications, wear and pressures Incorrect wiring or piping Power steering system	
VDC OFF indicator light does not illuminate when VDC OFF switch is pushed. NOTE: When pushing the VDC OFF switch for 10 seconds or more while revving the engine, the VDC OFF indicator light goes off and operations cannot be continued. Turn ignition switch from OFF to ON again to recover the previous condition.		Harness Indicator light bulb VDC OFF switch	

GENERAL DIAGNOSTIC TABLE

MEMO:

1. General Description

A: SPECIFICATIONS

Front disc brake	Size	15 inch type	16 inch type
	Type	Disc (Floating type, ventilated)	
	Effective disc diameter	228 mm (8.98 in)	244 mm (9.76 in)
	Disc thickness × Outer diameter	24 × 277 mm (0.94 × 10.91 in)	24 × 294 mm (0.94 × 11.57 in)
	Effective cylinder diameter	42.8 mm (1.685 in) × 2	
	Pad dimensions (length × width × thickness)	105.0 × 50.5 × 11.0 mm (4.134 × 1.99 × 0.433 in)	
	Clearance adjustment	Automatic adjustment	
Rear disc brake	Type	Disc (Floating type)	
	Effective disc diameter	254 mm (10.0 in)	
	Disc thickness × Outer diameter	10 × 290 mm (0.39 × 11.42 in)	
	Effective cylinder diameter	38.1 mm (1.500 in)	
	Pad dimensions (length × width × thickness)	82.4 × 33.7 × 9.0 mm (3.244 × 1.327 × 0.354 in)	
	Clearance adjustment	Automatic adjustment	
Master cylinder	Type	Tandem	
	Effective diameter	26.99 mm (1-1/16 in)	
	Reservoir type	Sealed type	
	Brake fluid reservoir capacity	205 cm^3 (12.51 cu in)	
Brake booster	Type	Vacuum suspended	
	Effective diameter	205 + 230 mm (8.07 + 9.06 in)	
Proportioning valve	Split point	2,942 kPa (30 kg/cm^2, 427 psi)	3,678 kPa (without VDC) (37.5 kg/cm^2, 533 psi) 2,942 kPa (without VDC) (30 kg/cm^2, 427 psi)
	Reducing ratio	0.3	
Brake line		Dual circuit system	
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading.** **• When brake fluid is supplemented, be careful not to allow any dust into the reservoir.** **• Use fresh DOT3 or 4 brake fluid when replacing or refilling the fluid.**		FMVSS No. 116, DOT3 or DOT4	

NOTE:
Refer to “PB section” for parking brake SPECIFICATIONS.

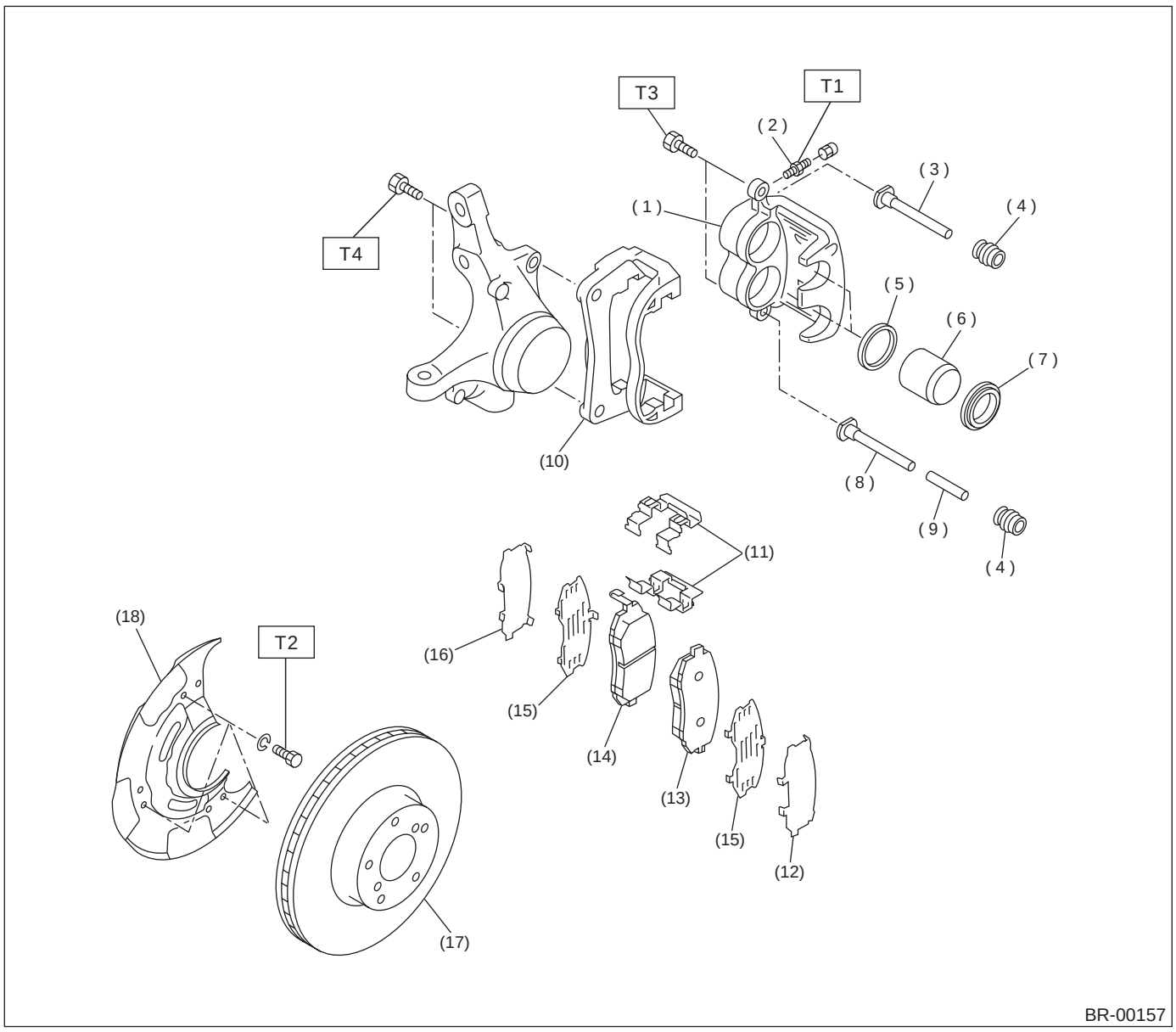
ITEM		STANDARD	SERVICE LIMIT
Front brake	Pad thickness (including back metal)	17 mm (0.67 in)	7.5 mm (0.295 in)
	Disc thickness	24 mm (0.94 in)	22 mm (0.87 in)
	Disc runout	—	0.075 mm (0.0030 in)
Rear brake	Pad thickness (including back metal)	14 mm (0.55 in)	6.5 mm (0.256 in)
	Disc thickness	10 mm (0.39 in)	8.5 mm (0.335 in)
	Disc runout	—	0.070 mm (0.0028 in)
Parking brake	Inside diameter	170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness	3.2 mm (0.126 in)	1.5 mm (0.059 in)
	Lever stroke	7 to 8 notches/196 N (20 kgf, 44 lb)	

		Brake pedal force	Fluid pressure	
			15 inch type	16 inch type
Brake booster	Brake fluid pressure without engine running	147 N (15 kgf, 33 lb)	588 kPa (6 kg/cm^2, 85 psi)	
		294 N (30 kgf, 66 lb)	1,569 kPa (16 kg/cm^2, 228 psi)	
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lb)	6,178 kPa (63 kg/cm^2, 896 psi)	
		294 N (30 kgf, 66 lb)	9,709 kPa (99 kg/cm^2, 1,408 psi)	

Brake pedal	Free play	1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]

B: COMPONENT

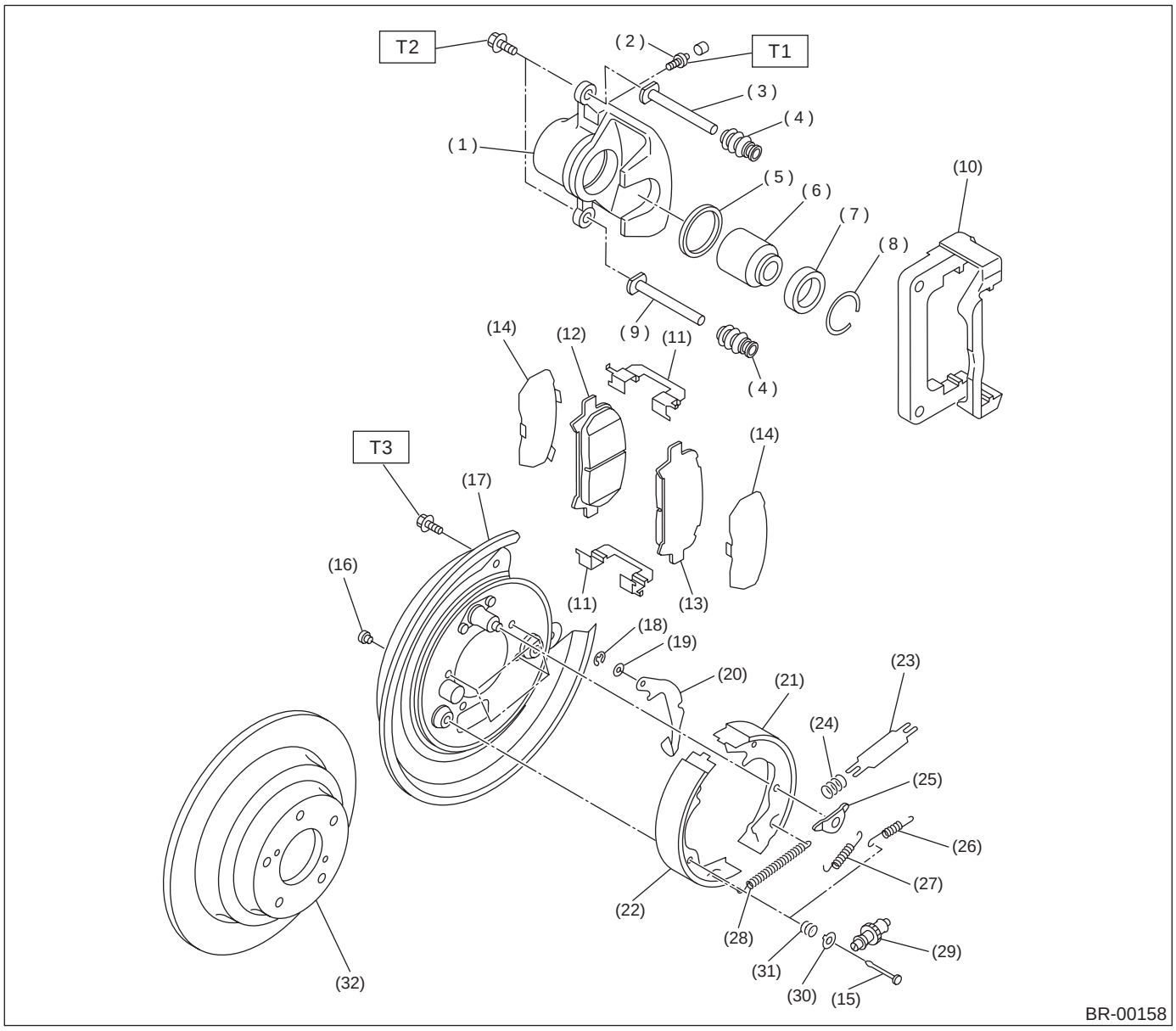
1. FRONT DISC BRAKE



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Bushing
(10) Support
(11) Pad clip
(12) Outer shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Rubber coated shim
(16) Inner shim
(17) Disc rotor
(18) Disc cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 37 (3.8, 27.5)
T4: 80 (8.2, 59)

2. REAR DISC BRAKE

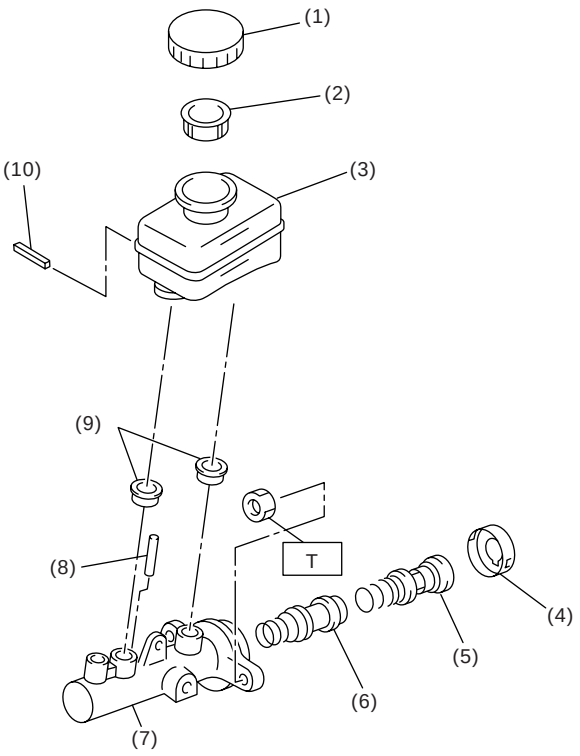


(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Boot ring
(9) Lock pin (Yellow)
(10) Support
(11) Pad clip
(12) Inner pad
(13) Outer pad
(14) Shim
(15) Shoe hold-down pin
(16) Cover
(17) Back plate
(18) Retainer
(19) Spring washer
(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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 39 (4.0, 28.9)
T3: 52 (5.3, 38.3)

3. MASTER CYLINDER

• Models without VDC

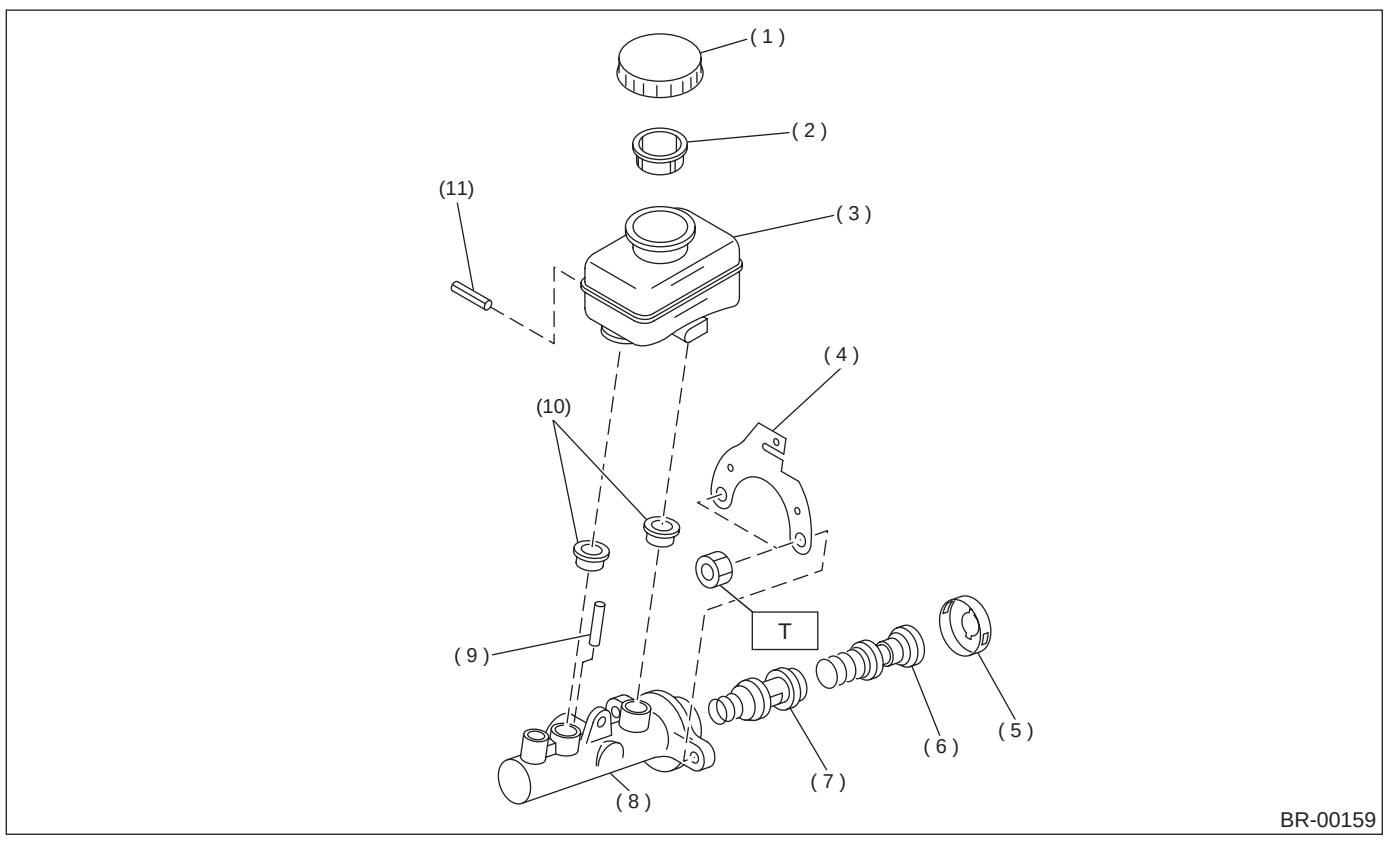


BR-00153

(1) Cap
(2) Filter
(3) Reservoir tank
(4) Piston retainer
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin (With ABS)
(9) Seal
(10) Pin

Tightening torque: N·m (kgf-m, ft-lb)
T: 14 (1.4, 10.1)

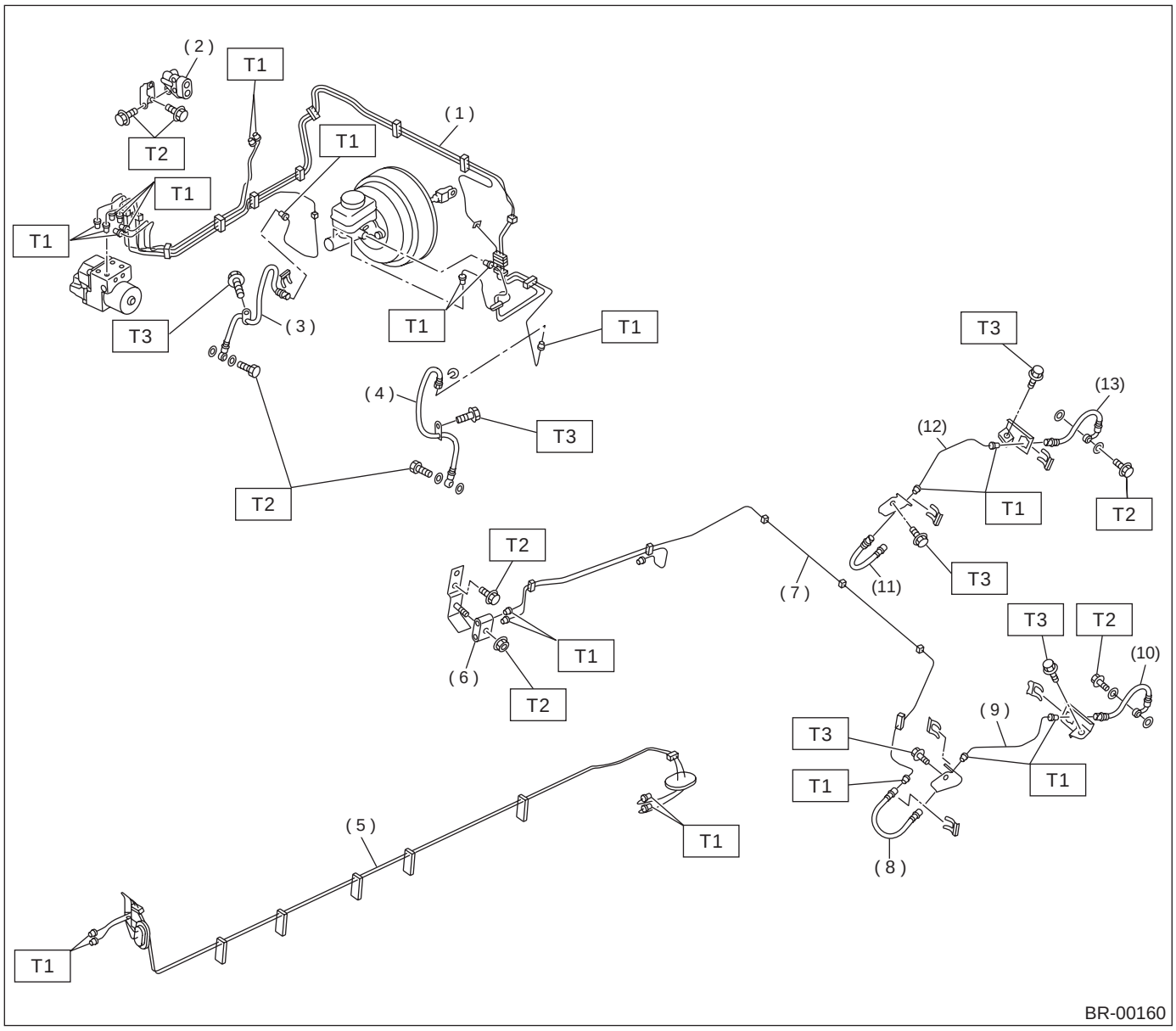
• Model with VDC



(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

Tightening torque: N·m (kgf-m, ft-lb)
T: 14 (1.4, 10.1)

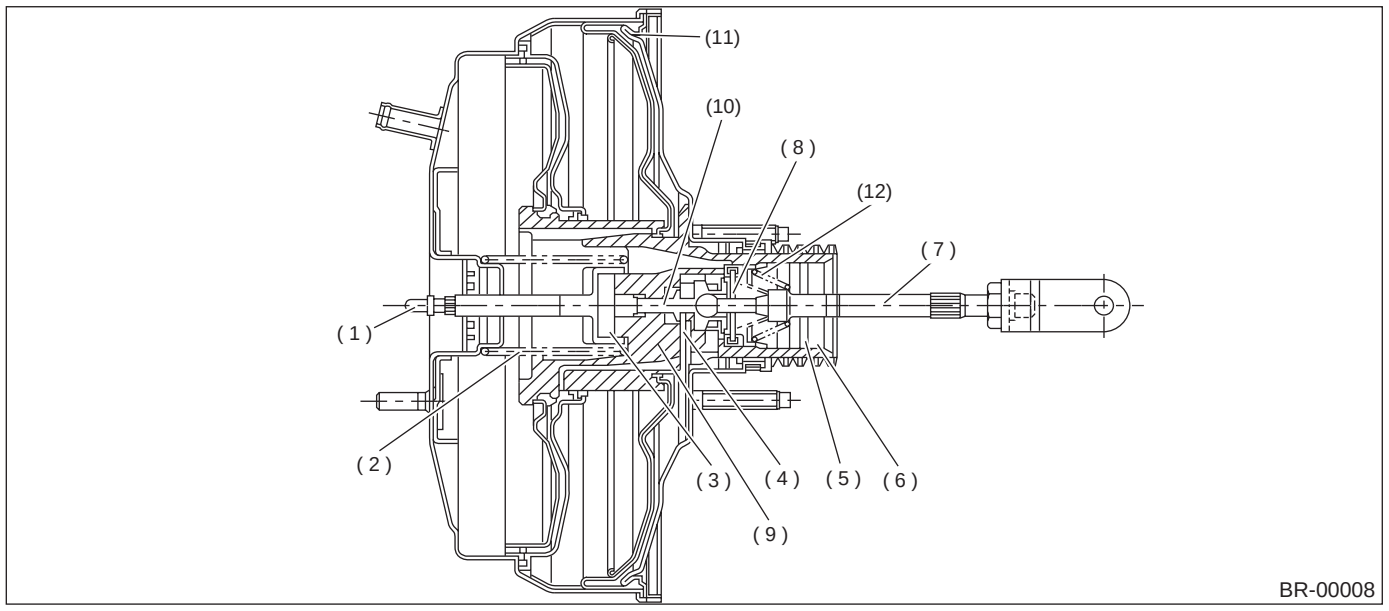
4. BRAKE PIPES AND HOSE



(1) Front brake pipe assembly
(2) Proportioning valve
(3) Front brake hose RH
(4) Front brake hose LH
(5) Center brake pipe assembly
(6) Two-way connector
(7) Rear brake pipe assembly
(8) Rear brake hose LH
(9) Rear brake pipe LH
(10) Rear brake hose rear LH
(11) Rear brake hose RH
(12) Rear brake pipe RH
(13) Rear brake hose rear RH

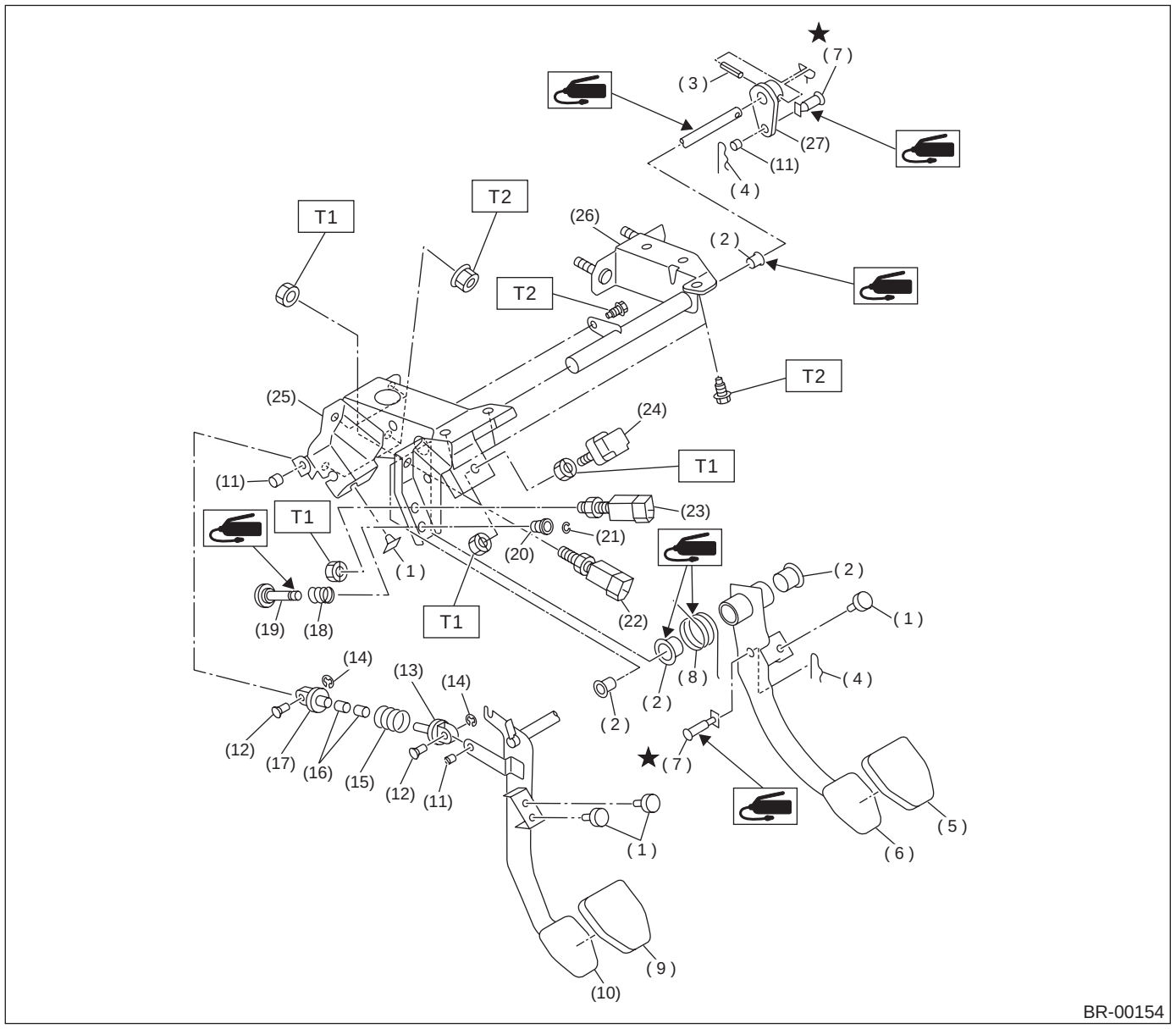
Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 33 (3.3, 23.8)

5. BRAKE BOOSTER



(1) Push rod
(2) Return spring
(3) Reaction disc
(4) Key
(5) Filter
(6) Silencer
(7) Operating rod
(8) Poppet valve
(9) Valve body
(10) Plunger valve
(11) Diaphragm plate
(12) Valve return spring

6. BRAKE PEDAL FOR MT MODEL

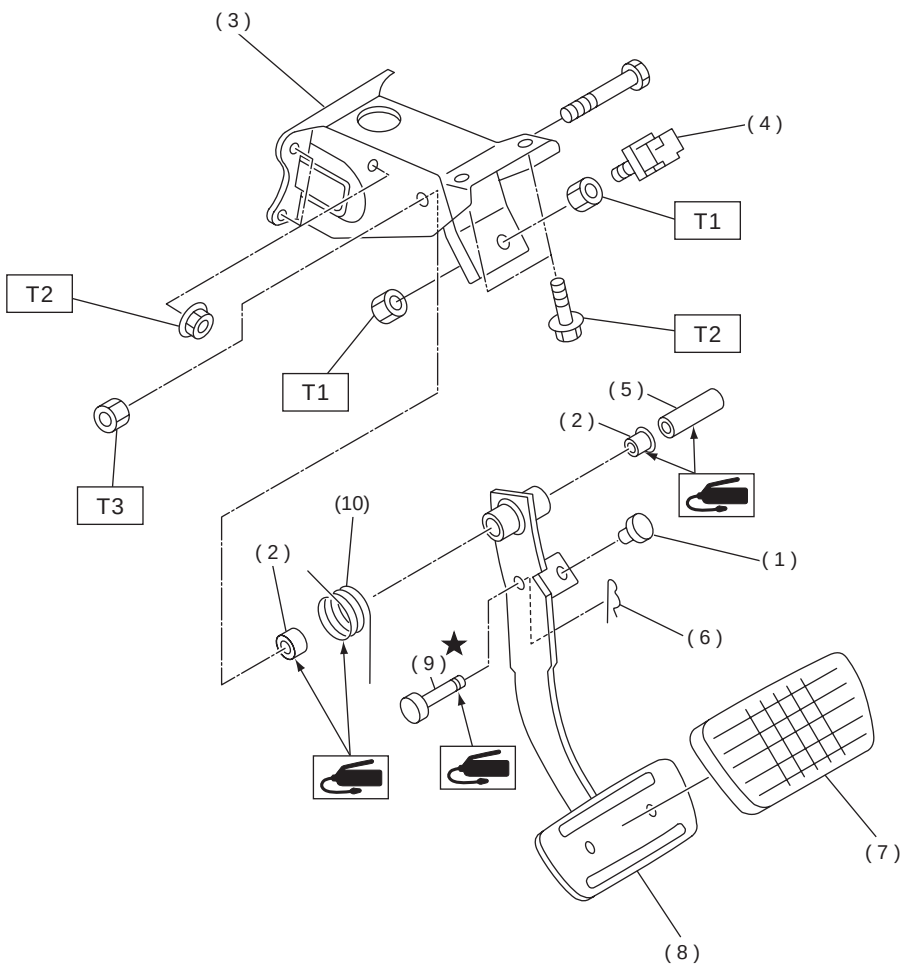


BR-00154

(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring S
(19) Rod S
(20) Bushing S
(21) Clip
(22) Clutch switch (Starter interlock)
(23) Clutch switch (With cruise control)
(24) Stop light switch
(25) Pedal bracket
(26) Clutch master cylinder bracket
(27) Lever

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)

7. BRAKE PEDAL FOR AT MODEL



BR-00162

(1) Stopper
(2) Bushing
(3) Pedal bracket
(4) Stop light switch
(5) Spacer
(6) Snap pin
(7) Brake pedal pad
(8) Brake pedal
(9) Clevis pin
(10) Brake pedal spring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 29 (3.0, 21.7)

C: CAUTION

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

D: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Snap Ring Pliers	Used for removing and installing snap ring.

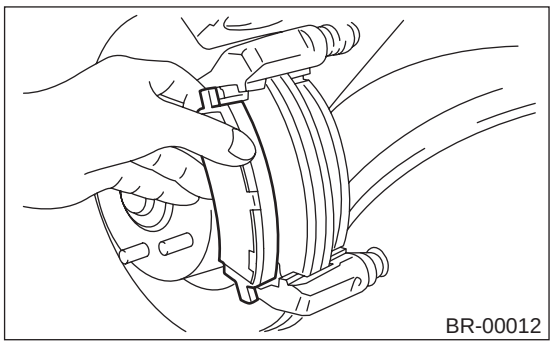
2. Front Brake Pad

A: REMOVAL

1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Remove bottom bolt.
3) Raise caliper body and suspend it securely.

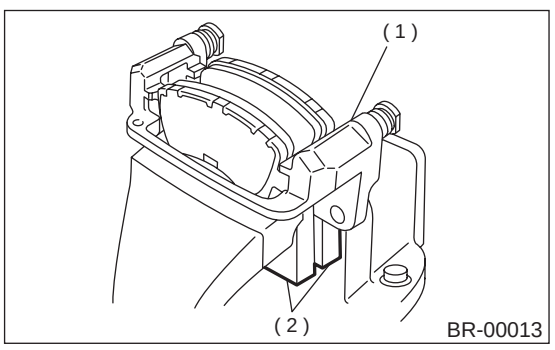
NOTE:
Do not disconnect brake hose from caliper body.

4) Remove pad.


BR-00012

NOTE:
If brake pad is difficult to remove, proceed as follows:

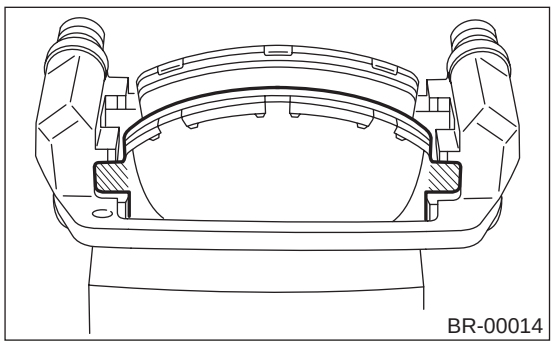
(1) Remove caliper body and fasten it provisionally to coil spring.
(2) Remove support.
(3) Place a support in a vise between wooden blocks.



BR-00013

(1) Support
(2) Wooden blocks

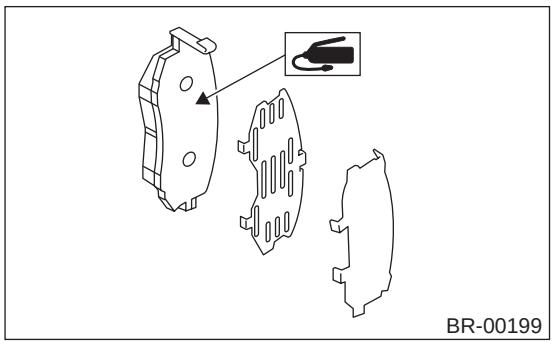
(4) Attach a rod of less than 12 mm (0.47 in) dia. to the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.


BR-00014

B: INSTALLATION

1) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.
2) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad inner shim.

CAUTION:
Do not allow oil or grease to adhere to the sliding surface of pad and disc rotor.


BR-00199

3) Check disc rotor thickness and runout.
<Ref. to BR-15, INSPECTION, Front Disc Rotor.>
4) Install pads on support.
5) Install caliper body on support.

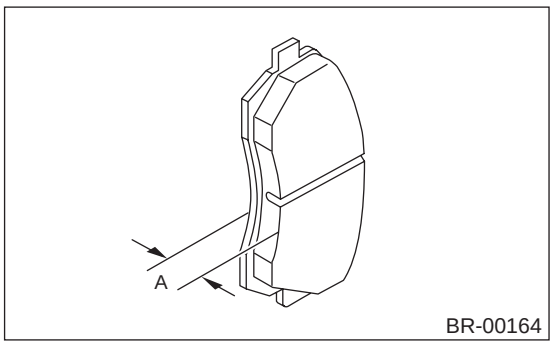
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.

6) Depress brake pedal several times.
7) Check that brake fluid level is at max. line.

C: INSPECTION

Check pad thickness A.



Pad thickness (including back metal)	Standard value	17 mm (0.67 in)
	Wear limit	7.5 mm (0.295 in)

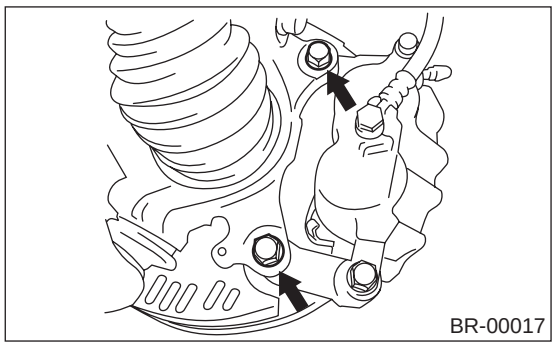
CAUTION:

- **Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.**
- **A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.**
- **Replace pad if there is oil or grease on it.**

3. Front Disc Rotor

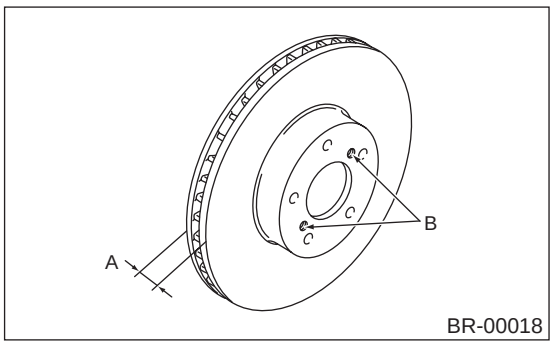
A: REMOVAL

1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Remove caliper body from housing, and suspend it from strut using a wire.


BR-00017

3) Remove the disc rotor.

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



BR-00018

4) Clean mud and foreign particles from caliper body assembly and support.

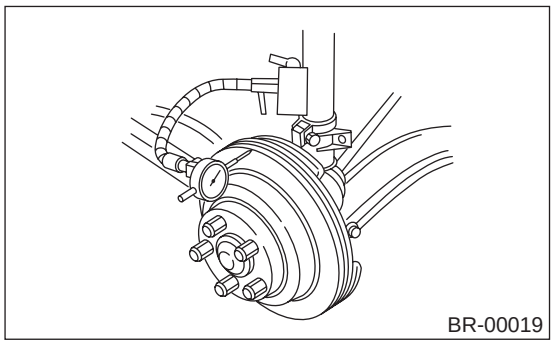
B: INSTALLATION

1) Install the disc rotor.
2) Install the caliper body to housing.

Tightening torque:
78 N·m (8 kgf-m, 58 ft-lb)

C: INSPECTION

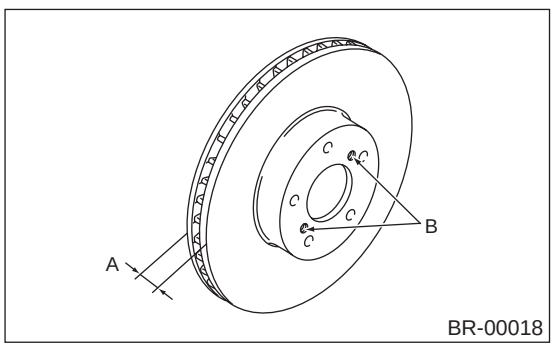
1) Secure disc rotor by tightening the five wheel nuts.
2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.


BR-00019

NOTE:
• Make sure that dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.
• If disc rotor runout is above standard value, inspect play of hub bearing axial direction and runout of axle hub.
<Ref. to DS-22, INSPECTION, Front Axle.>
If bearing and hub are normal, replace disc rotor.

Disc rotor runout limit:
0.075 mm (0.0030 in)

3) Measure disc rotor thickness.
If thickness of disc rotor is outside the standard value, replace disc rotor.



BR-00018

NOTE:
Make sure that micrometer is set 5 mm (0.20 in) inward of rotor outer perimeter.

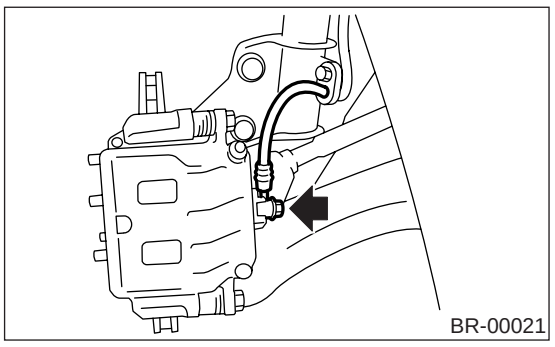
		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	15″	24.0 mm (0.945 in)	22.0 mm (0.866 in)	277 mm (10.91 in)
	16″	24.0 mm (0.945 in)	22.0 mm (0.866 in)	294 mm (11.57 in)

4. Front Disc Brake Assembly

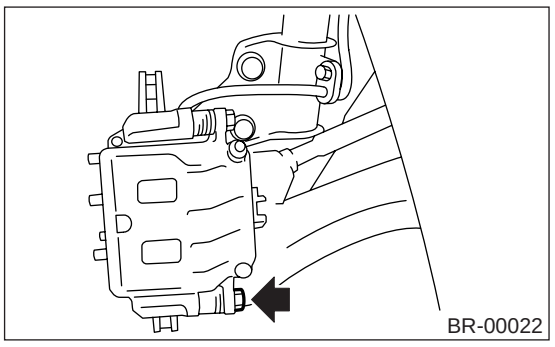
A: REMOVAL

1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Remove union bolt and disconnect brake hose from caliper body assembly.

CAUTION:
Do not spill brake fluid on painted surface. Wash it off immediately.

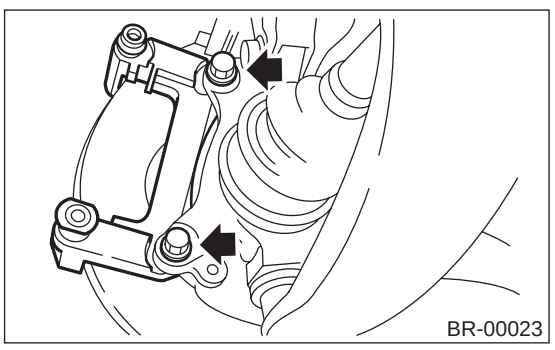

BR-00021

3) Remove bolt securing lock pin to caliper body.


BR-00022

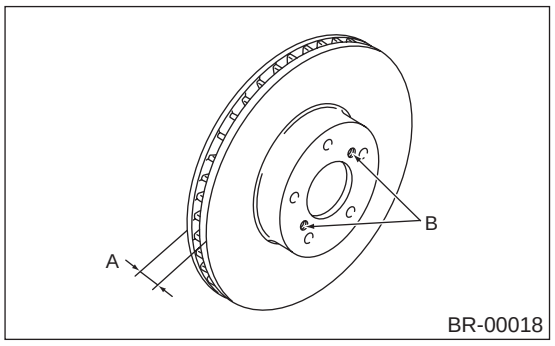
4) Raise caliper body and move it toward vehicle center to separate it from support.
5) Remove support from housing.

NOTE:
Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.


BR-00023

6) Remove disc rotor from hub.

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



BR-00018

7) Clean mud and foreign particles from caliper body assembly and support.

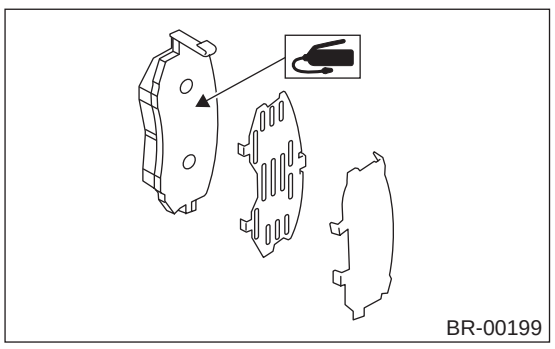
B: INSTALLATION

1) Install disc rotor on hub.
2) Install support on housing.

Tightening torque:
78 N·m (8 kgf-m, 58 ft-lb)

CAUTION:
• Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• When replacing the pads, replace pads of the right and left wheels at the same time.

3) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.
4) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and inner shim.


BR-00199

5) Install pads on support.

6) Install caliper body on support.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

7) Connect brake hose.

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

CAUTION:
Replace brake hose gaskets with new ones.

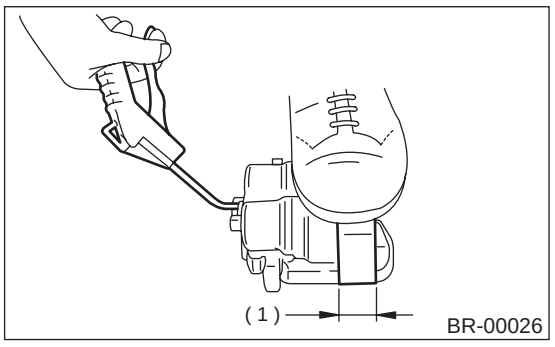
8) Bleed air from brake system.

C: DISASSEMBLY

1) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

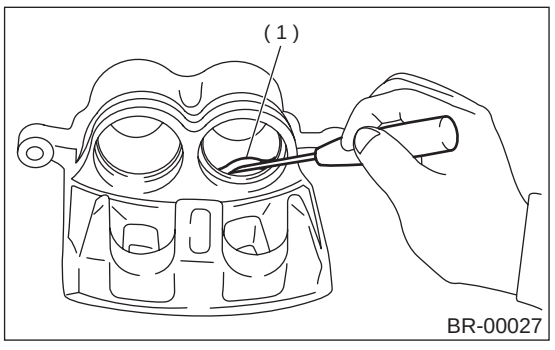
2) Remove the boot from piston end.
3) Place a wooden block as shown in the figure to prevent damage to the piston. Gradually supply compressed air via inlet of the brake hose to force piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Be careful not to scratch the inner surface of cylinder and piston seal groove.



(1) Piston seal

5) Remove the lock pin boot and guide pin boot.

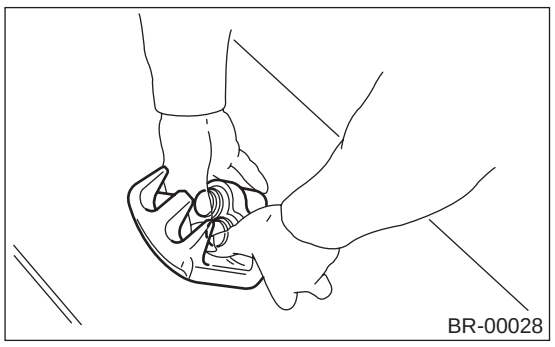
D: ASSEMBLY

1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

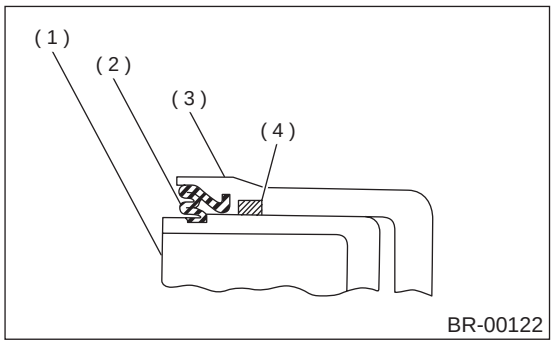
Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



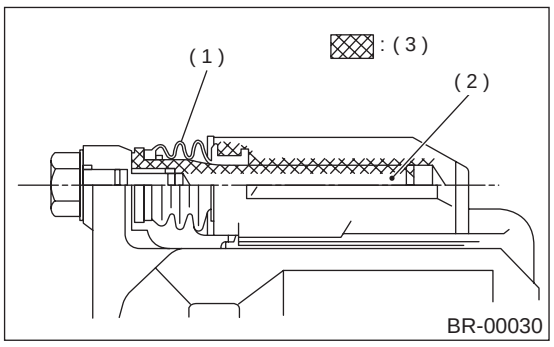
6) Position the boot in grooves on cylinder and piston.



(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply a coat of specified grease to the lock pin and guide pin, outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

8) Install the lock pin boot and guide pin boot on support.

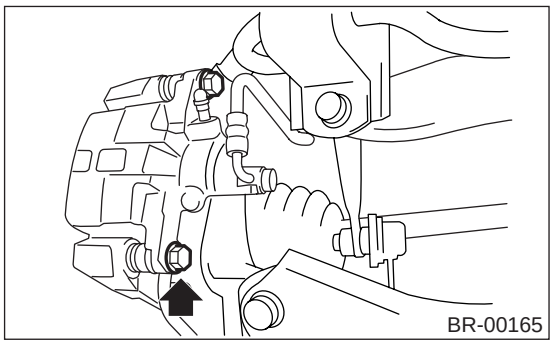
E: INSPECTION

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) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Remove bottom bolt.

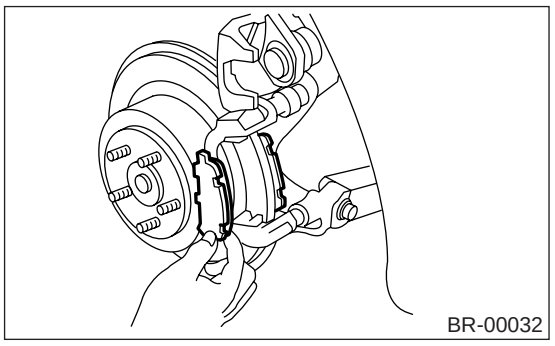

BR-00165

3) Raise caliper body and suspend it securely.

NOTE:
Do not disconnect brake hose from caliper body.

4) Remove pad from support.

NOTE:
If brake pad is difficult to remove, use the same procedure as for front disc brake pad.
<Ref. to BR-13, REMOVAL, Front Brake Pad.>


BR-00032

B: INSTALLATION

1) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.

CAUTION:
Do not allow oil or grease to adhere to the sliding surface of pad and disc rotor.

2) Check disc rotor thickness and runout.
<Ref. to BR-20, INSPECTION, Rear Disc Rotor.>
3) Install pad on support.
4) Install caliper body on support.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

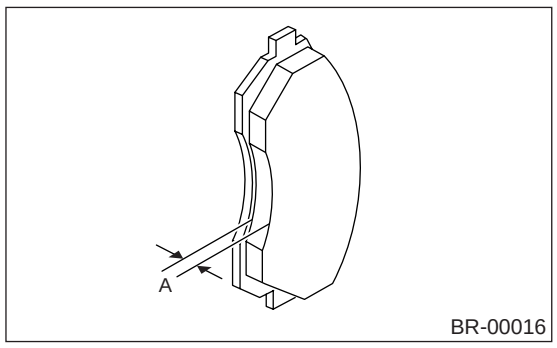
NOTE:
If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.

5) Depress brake pedal several times.
6) Check that brake fluid level is at max. line.

C: INSPECTION

Check pad thickness (including back metal).

Pad thickness: A
Standard value
14.0 mm (0.551 in)
Wear limit
6.5 mm (0.256 in)



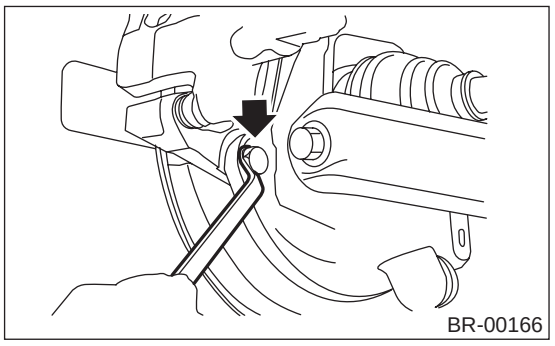
BR-00016

CAUTION:
• Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

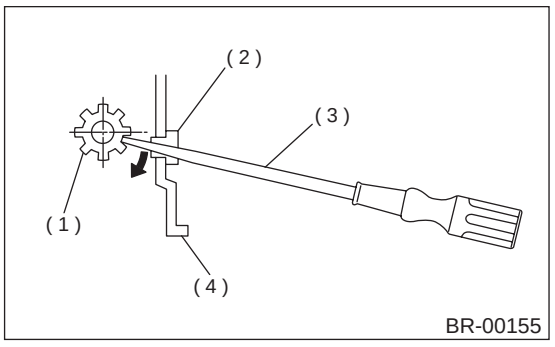
1) Lift-up vehicle and remove wheels.
2) Remove the two mounting bolts and remove the disc brake assembly.


BR-00166

3) Suspend the disc brake assembly so that the hose is not stretched.
4) Pull down and release parking brake.
5) Remove the disc rotor.

NOTE:
If the disc rotor is difficult to remove try the following two methods in order.

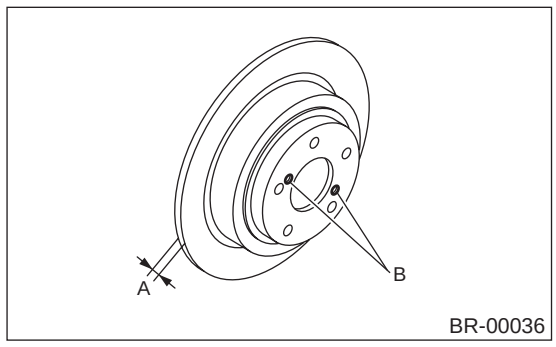
(1) Turn adjusting screw using a slot-type screwdriver until brake shoe gets away enough from the disc rotor.



BR-00155

(1) Adjusting screw
(2) Cover
(3) Slot-type screwdriver
(4) Back plate

(2) If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.



BR-00036

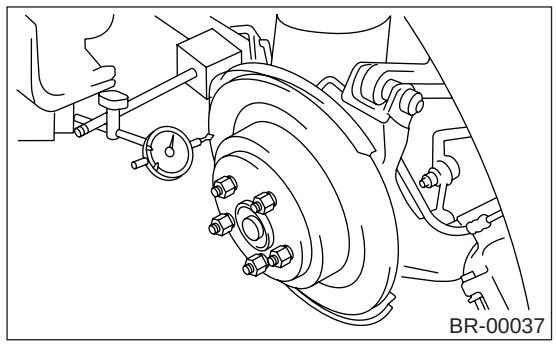
B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust parking brake. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly.>

C: INSPECTION

1) Secure disc rotor by tightening the five wheel nuts.
2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.

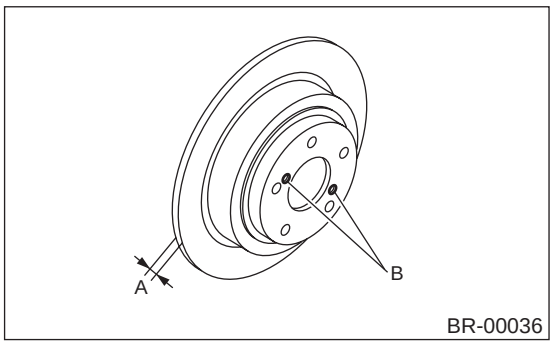
CAUTION:
Securely fix disc rotor to hub.


BR-00037

NOTE:
• Make sure that dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.
• If disc rotor runout is above standard value, inspect play of hub bearing axial direction and runout of axle hub.
<Ref. to DS-27, INSPECTION, Hub Unit Bearing.>

Disc rotor runout limit:
0.075 mm (0.0030 in)

3) Measure disc rotor thickness.



NOTE:
Make sure that micrometer is set 5 mm (0.20 in) inward of rotor outer perimeter.

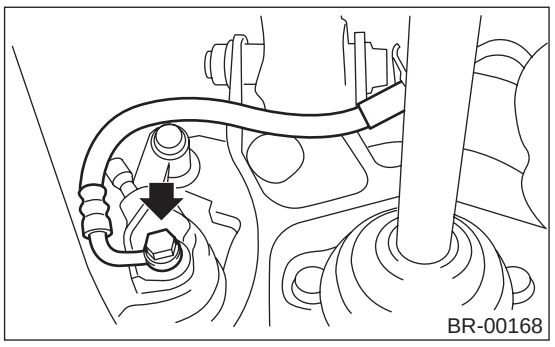
Disc rotor thickness: A
Standard value
10 mm (0.39 in)
Service limit
8.5 mm (0.335 in)

7. Rear Disc Brake Assembly

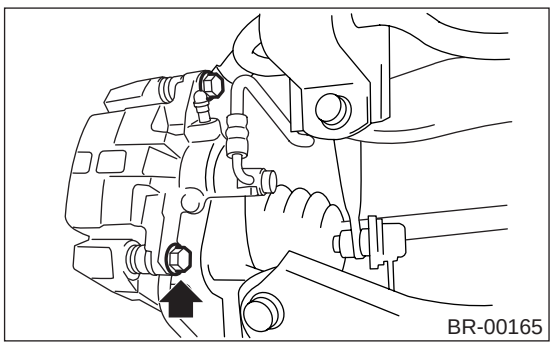
A: REMOVAL

1) Lift-up vehicle and remove wheels.
2) Disconnect brake hose from caliper body assembly.

CAUTION:
Do not spill brake fluid on painted surface. Wash it off immediately.



3) Remove bolt securing lock pin to caliper body.



4) Raise caliper body and move it toward vehicle center to separate it from support.
5) Remove support from back plate.

NOTE:
Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.

6) Clean mud and foreign particles from caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

B: INSTALLATION

1) Install disc rotor on hub.
2) Install support on back plate.

Tightening torque:
78 N·m (8.0 kgf-m, 58 ft-lb)

CAUTION:
• Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace pads if there is oil or grease on them.

3) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.

CAUTION:
Do not allow oil or grease to adhere to the sliding surface of pad and disc rotor.

4) Install pads on support.
5) Install caliper body on support.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

6) Connect brake hose.

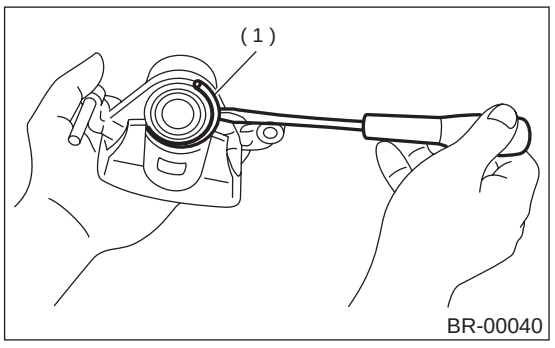
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:
• The brake hose must be connected without any twist.
• Replace brake hose gaskets with new ones.

7) Bleed air from brake system.
<Ref. to BR-34, Air Bleeding.>

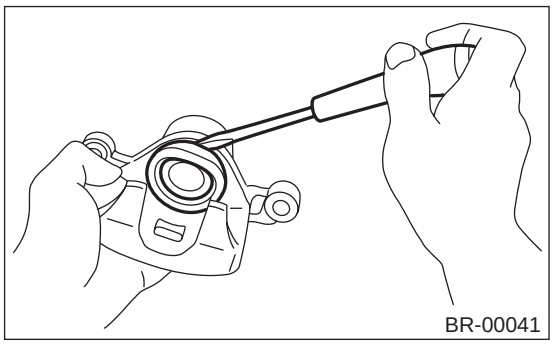
C: DISASSEMBLY

1) Remove the boot ring.



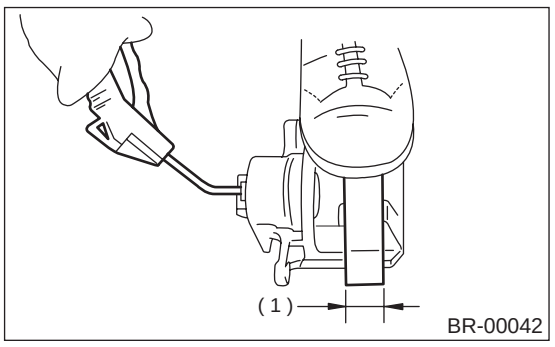
(1) Boot ring

2) Remove the piston boot.



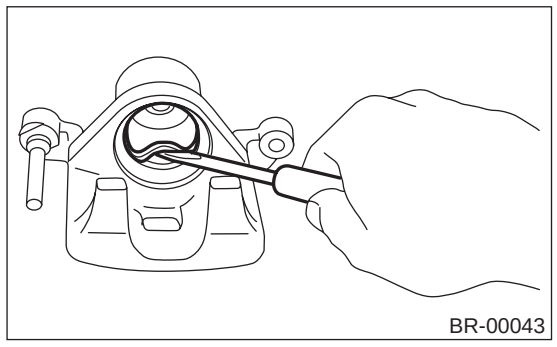
3) Gradually supply compressed air via inlet of caliper body to force piston out.

CAUTION:
• Place a wooden block as shown in Figure to prevent damage to piston.
• Do not apply excessively high-pressure.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove piston seal from caliper body cylinder.



5) Remove lock pin sleeve and boot from caliper body.
6) Remove guide pin boot.

D: ASSEMBLY

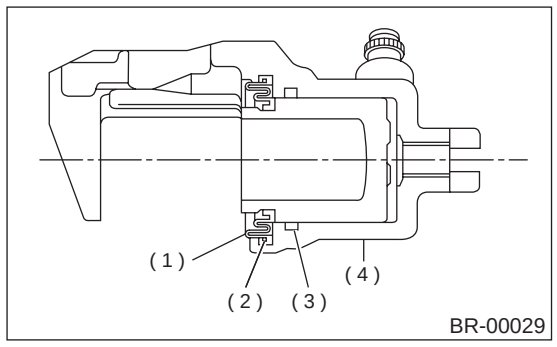
1) Clean caliper body interior using brake fluid.
2) Apply a coat of brake fluid to piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Insert piston into cylinder.

CAUTION:
Do not force piston into cylinder.

5) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and piston.

Grease:
NIGLUBE RX-2 (Part No. 003606000)

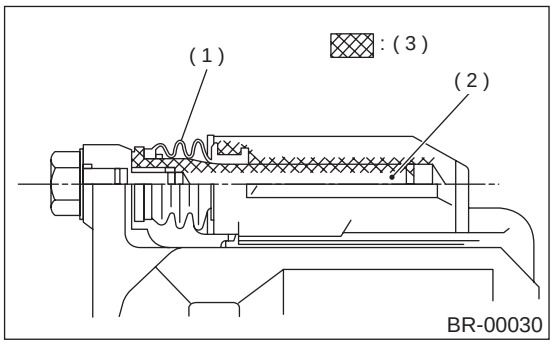
6) Install the piston boot to the caliper body, and attach boot ring.



(1) Piston boot
(2) Piston
(3) Piston seal
(4) Caliper body

7) Apply a coat of specified grease to guide pin, outer surface, sleeve outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. 003606000)



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

8) Install guide pin boot on caliper body.
9) Install lock pin boot on caliper body and insert lock pin sleeve into place.

E: INSPECTION

1) Repair or replace faulty parts.
2) Check caliper body and piston for uneven wear, damage or rust.
3) Check rubber parts for damage or deterioration.

8. Master Cylinder

A: REMOVAL

1) Thoroughly drain brake fluid from reservoir tank.
2) Disconnect fluid level indicator harness connector.
3) Remove brake pipes from master cylinder.
4) Remove master cylinder mounting nuts, and take out master cylinder from brake booster.

CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wash it off quickly if spilt.

B: INSTALLATION

To install the master cylinder to the body, reverse the sequence of removal procedure.

Tightening torque:
Master cylinder mounting nut
14 N·m (1.4 kgf-m, 10.1 ft-lb)
Piping flare nut
15 N·m (1.5 kgf-m, 10.8 ft-lb)

CAUTION:
Be sure to use recommended brake fluid.

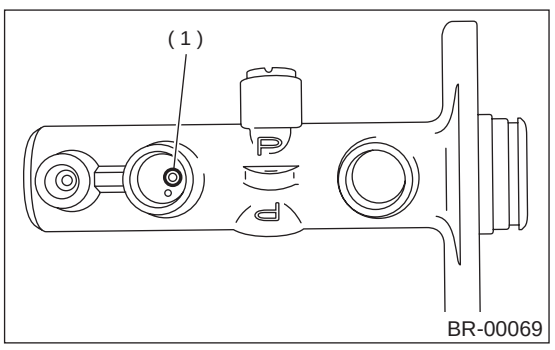
C: DISASSEMBLY

1. PRECAUTIONS FOR DISASSEMBLING

1) Remove mud and dirt from the surface of brake master cylinder.
2) Prepare tools necessary for disassembly operation, and arrange them neatly on work bench.
3) Clean work bench.

2. DISASSEMBLING PROCEDURE

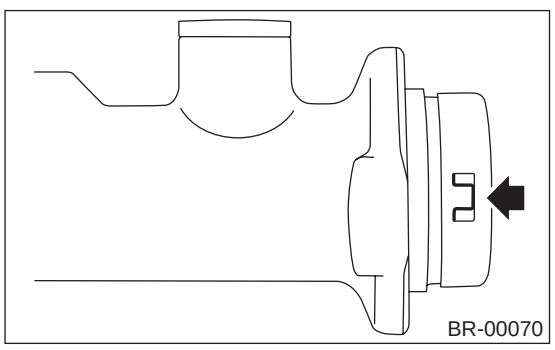
1) Remove pin with drift pin which secures reserve tank to master cylinder.
2) Remove cylinder pin with magnetic pick-up tool while pushing in primary piston.



(1) Cylinder pin

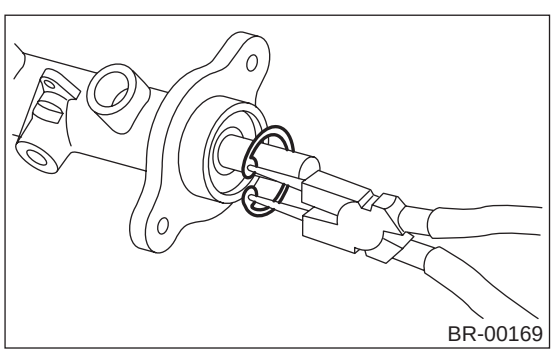
3) Pry up the pawl and remove the piston retainer. (Without VDC)

NOTE:
Piston may jump out from master cylinder.



4) Using pliers, remove C-ring. (With VDC)

NOTE:
Piston may jump out from master cylinder.



5) Extract primary piston assembly and secondary piston assembly.

CAUTION:
• Do not disassemble the piston assembly; otherwise, the spring set value may be changed.
• Use brake fluid or methanol to wash inside wall of cylinder, pistons and piston cups. Be careful not to damage parts when washing. If methanol is used for washing, do not dip rubber parts, such as piston cups, in it for more than 30 seconds; otherwise, they may become swelled.

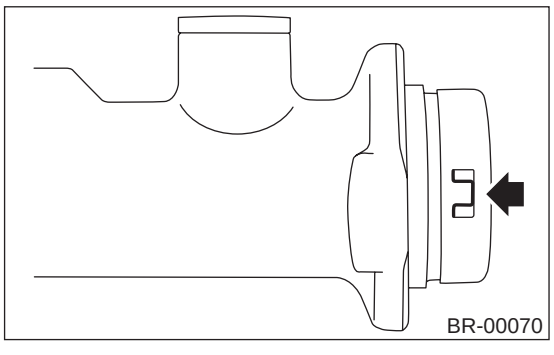
D: ASSEMBLY

1. PRECAUTIONS FOR ASSEMBLING

1) When assembling, be sure to use recommended brake fluid.
2) Ensure that the inside wall of cylinder, pistons, and piston cups are free from dirt when assembling.
3) Be extremely careful not to damage, scratch, or dent cylinder inside wall, pistons, and piston cups.
4) Do not drop parts. Never attempt to use any part that has been dropped accidentally.

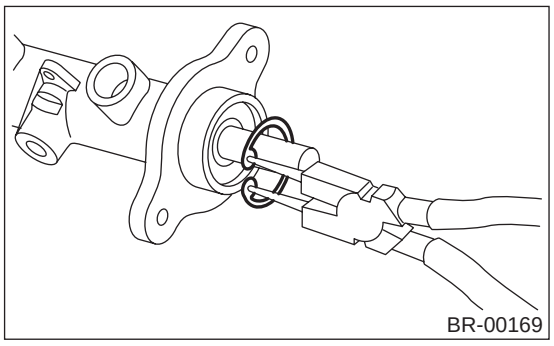
2. ASSEMBLING PROCEDURE

1) Assembling piston assembly:
Apply recommended brake fluid to inside wall of cylinder, and to outer surface of piston assembly, and install piston assemblies carefully into cylinder.
2) Assembling cylinder pin:
3) Press the pawl and install the piston retainer into the master cylinder. (Without VDC)

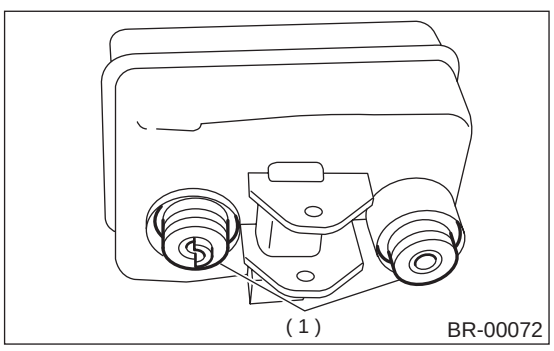


4) Using pliers, install C-ring in its groove. (With VDC)

CAUTION:
Make sure to install it firmly to groove.



5) Install seal to reservoir tank.



(1) Seal

6) Install pin with drift pins which secures reservoir tank to master cylinder.

E: INSPECTION

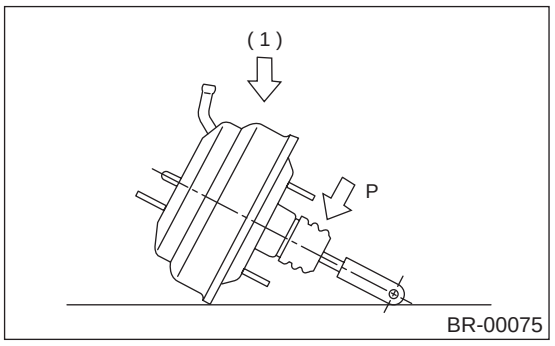
If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly, secondary piston assembly, supply valve stopper, or gasket, replace the faulty part.

CAUTION:
• The primary and secondary pistons must be replaced as complete assemblies.
• The service limit of the clearance between each piston and the master cylinder inner dia. is 0.11 mm (0.0043 in).
• When handling parts, be extremely careful not to damage or scratch the parts, or let any foreign matter get on them.

9. Brake Booster

A: REMOVAL

CAUTION:
If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by “P”, may be damaged.

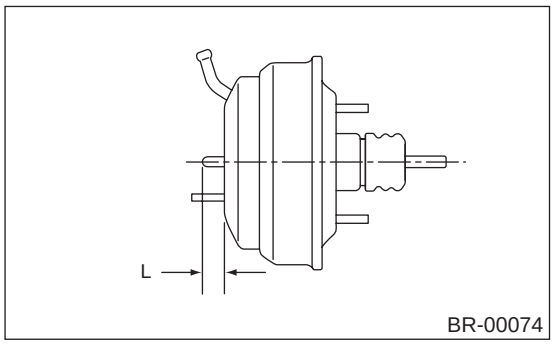


(1) Force

1) Pull up parking brake lever, and block tires.
2) Disconnect battery ground cable.
3) Remove or disconnect the following parts at engine compartment.
   (1) Disconnect connector for brake fluid level indicator.
   (2) Remove brake pipes from master cylinder.
   (3) Remove master cylinder installing nuts.
   (4) Disconnect vacuum hose from brake booster.
4) Remove the following parts from the pedal bracket.
   (1) Snap pin and clevis pin
   (2) Four brake booster installing nuts
5) Remove brake booster while shunning brake pipes.

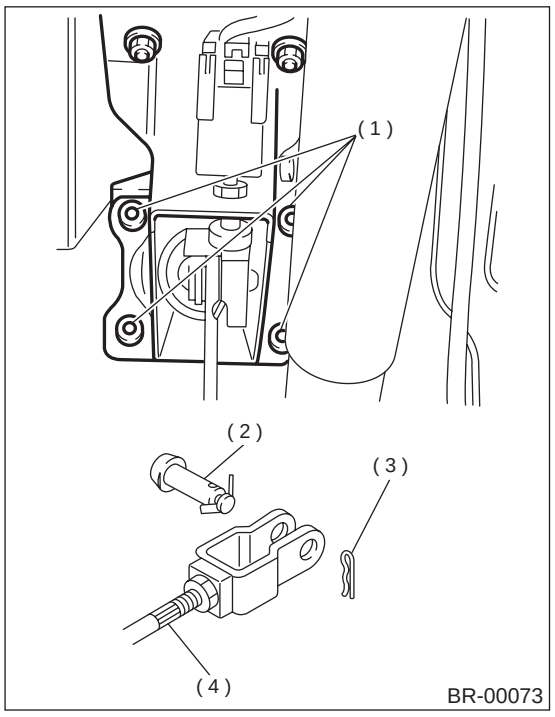
NOTE:
• Be careful not to drop brake booster. Brake booster should be discarded if it has been dropped.
• Use special care when handling operating rod.
If excessive force is applied to operating rod, sufficient to cause a change in the angle in excess of ±3°, it may result in damage to the power piston cylinder.
• Use care when placing brake booster on the floor.
• Do not change the push rod length. If it has been changed, reset the projected length “L” to the standard length.

Standard:
Without VDC
L = 10 mm (0.39 in)
With VDC
L = 1.8 mm (0.071 in)



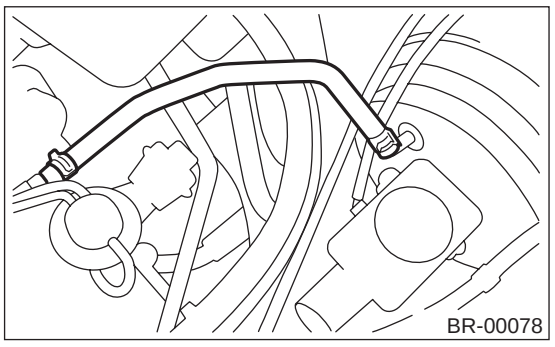
B: INSTALLATION

1) Mount brake booster in position.
2) Connect operating rod to brake pedal with clevis pin and snap pin.



(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

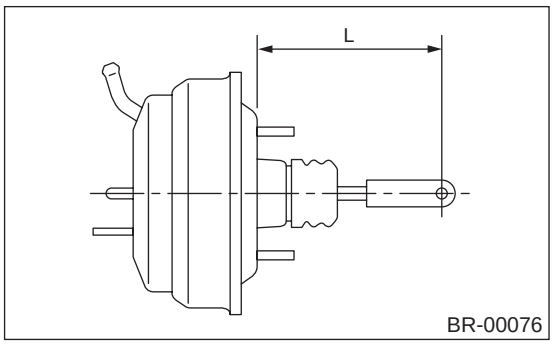
3) Connect vacuum hose to brake booster.


BR-00078

4) Mount master cylinder onto brake booster.
5) Connect brake pipes to master cylinder.
6) Connect electric connector for brake fluid level indicator.
7) Adjust operating rod of brake booster.

Standard: L
145.3 mm (5.72 in)

If it is not in specified value, adjust it by adjusting brake booster operating rod.

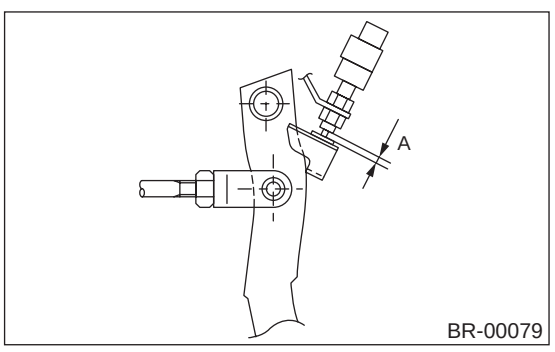


BR-00076

8) Measure the clearance between threaded end of stop light switch and stopper.
If it is not in specified value, adjust it by adjusting position of stop light switch.

CAUTION:
Be careful not to rotate stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



BR-00079

9) Apply grease to operating rod connecting pin to prevent it from wearing.

10) Bleed air from brake system.

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

11) Conduct road tests to ensure brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

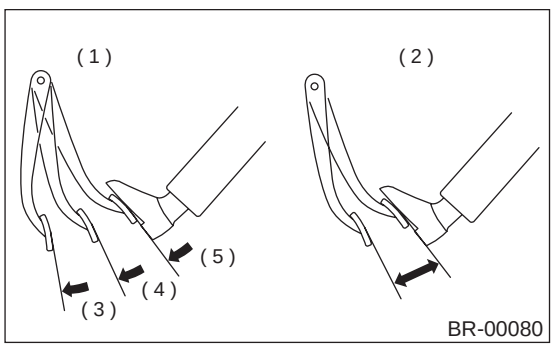
CAUTION:
When checking operation, be sure to securely apply the hand brake.

• Checking without gauges

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of the failure if checking is conducted in accordance with the following procedures.

• Air tightness check

Start engine, and run it for 1 to 2 minutes, then turn it off. Depress brake pedal several times applying the same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on the 1st depression, and it should become smaller with each successive depression. If no change occurs in the pedal height while in a depressed state, brake booster is faulty.



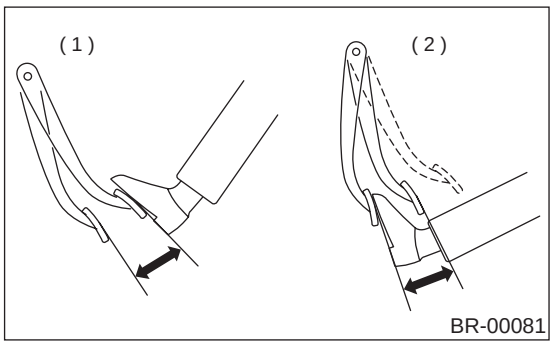
BR-00080

(1) OK
(2) NOT OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In the event of defective operation, inspect the condition of the check valve and vacuum hose.
• Replace them if faulty and conduct the test again.
• If no improvement is observed, check precisely with gauges.

• Operation check

1) With engine off, depress brake pedal several times applying the same pedal force and make sure that the pedal height does not vary with each depression of the pedal.



(1) When engine is stopped
(2) When engine is started

2) With brake pedal depressed, start engine.
3) As engine starts, brake pedal should move slightly toward the floor. If no change occurs in the pedal height, brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

• Loaded air tightness check

Depress brake pedal while engine is running, and turn off engine while the pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, brake booster is functioning normally; if the pedal height increases, it is faulty.

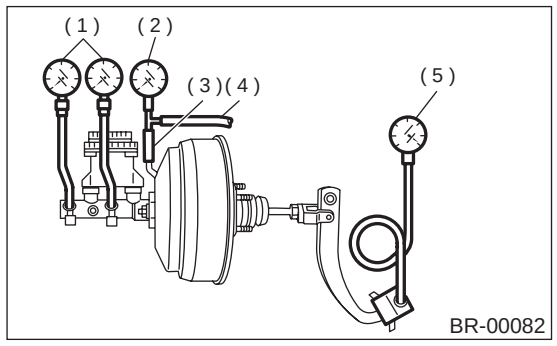
NOTE:
If faulty, check precisely with gauges.

2. OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to securely apply the hand brake.

• Checking with gauges

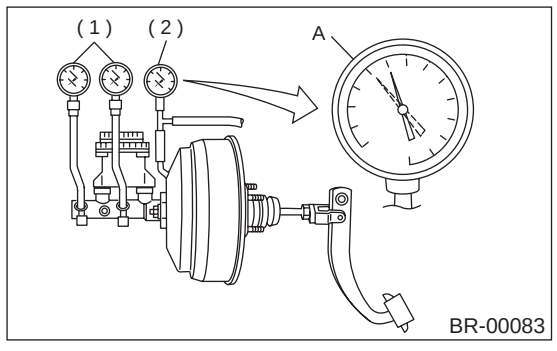
Connect gauges as shown in Figure. After bleeding air from pressure gauges, proceed to each check.



(1) Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

• Air tightness check

1) Start engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress brake pedal.



(1) Pressure gauge
(2) Vacuum gauge

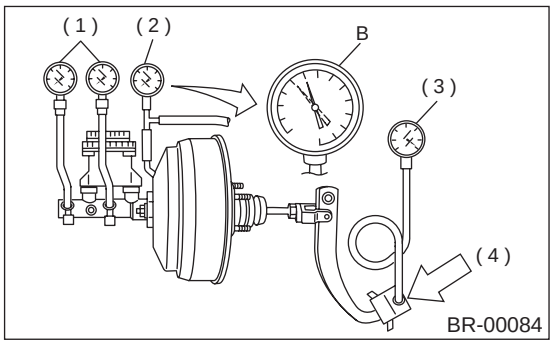
2) Stop engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.
If defective, the cause may be one of those listed below.

- Check valve malfunction
- Leak from vacuum hose
- Leak from the shell jointed portion or stud bolt welded portion

- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion

• Loaded air tightness check

1) Start engine and depress brake pedal with pedal force of 196 N (20 kgf, 44 lb). Keep engine running until a vacuum of 66.7 kPa (500 mmHg, 19.69 in-Hg) = point B is indicated on vacuum gauge while the pedal is still depressed.



(1) Pressure gauge
(2) Vacuum gauge
(3) Pedal force gauge
(4) Depress

2) Stop engine and watch vacuum gauge.
If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.
If defective, refer to “AIR TIGHTNESS CHECK”.
<Ref. to BR-28, INSPECTION, Brake Booster.>

• Lack of boosting action check

Turn off engine, and set the vacuum gauge reading at “0”. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Brake pedal force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	588 kPa (6 kg/cm^2, 85 psi)	1,569 kPa (16 kg/cm^2, 228 psi)

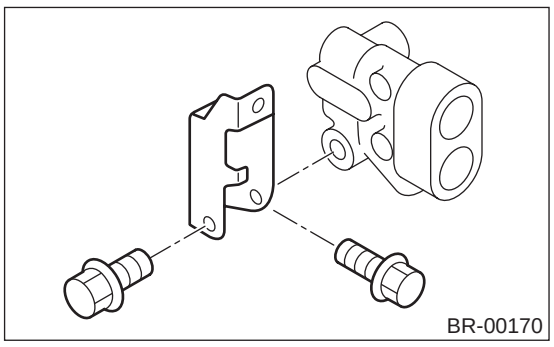
• Boosting action check

Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Brake pedal force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	6,178 kPa (63 kg/cm^2, 896 psi)	9,709 kPa (99 kg/cm^2, 1,408 psi)

10.Proportioning Valve

A: REMOVAL



1) Pull up parking brake lever, and block the tires.
2) Remove brake pipe from proportioning valve at four places.
3) Remove proportioning valve from its bracket.

CAUTION:
Do not disassemble or adjust the proportioning valve. (The proportioning valve must be replaced as an assembly.)

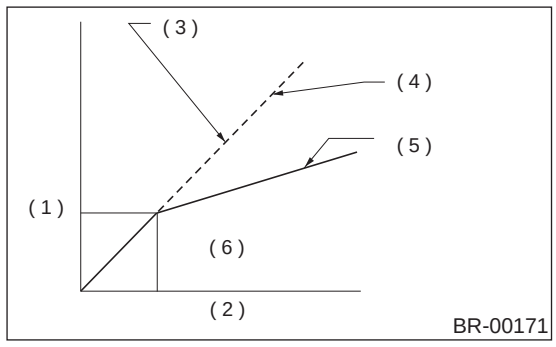
B: INSTALLATION

1) Install proportioning valve to bracket.
2) Connect brake pipes correctly to proportioning valve.
3) Bleed air, then check each joint of brake pipe for oil leaks.

Tightening torque:
Proportioning valve to brake pipe flare nut:
15 N·m (1.5 kgf-m, 10.8 ft-lb)
Proportioning valve to bracket:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: INSPECTION

1) Install oil pressure gauges to measure the master cylinder fluid pressure (front wheel brake fluid pressure) and rear wheel cylinder fluid pressure.
2) Bleed air from oil pressure gauges.
3) Check the master cylinder fluid pressure and rear wheel cylinder fluid pressure.
The standard values are shown in Figure.



(1) Rear wheel cylinder fluid pressure: P3
(2) Master cylinder fluid pressure: P2
(3) In case of failure in one circuit
(4) Without ABS model
(5) With ABS model
(6) When both circuits are normal

4) For the oil pressure in case of split point, refer to “SPECIFICATIONS”.
<Ref. to BR-2, SPECIFICATIONS, General Description.>

11.Brake Fluid

A: INSPECTION

1) Check that brake fluid level remains between “MIN” and “MAX”. If out of the specified range, refill or drain fluid. If fluid level becomes close to “MIN”, refill fluid.
2) Check fluid for discoloration. If fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

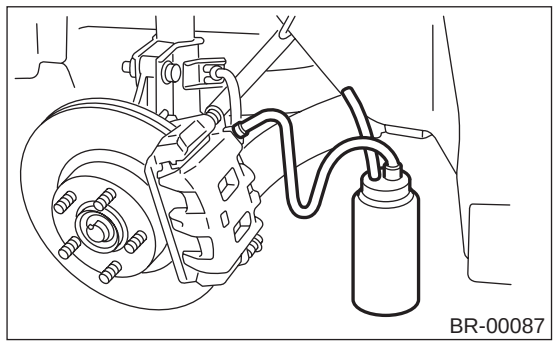
CAUTION:
• Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wash it off quickly if spilt.
• To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• Brake pedal operation must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approximately 500 m ℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

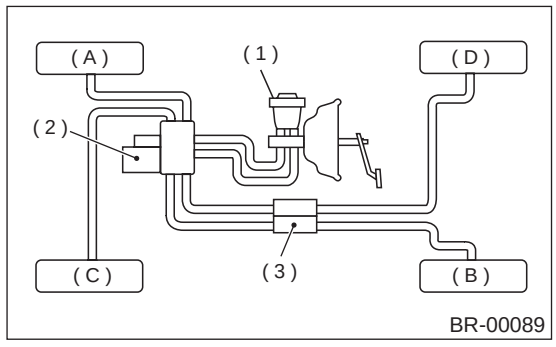
1) Either jack-up vehicle and place a safety stand under it, or lift up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

5) Install one end of a vinyl tube onto the air bleeder and insert the other end into a container to collect the brake fluid.


BR-00087

CAUTION:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



BR-00089

(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen bleeder screw approximately 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten screw.
8) Repeat steps 6) and 7) above until there are no air bubbles in drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

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

10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 7) above.

11) Depress brake pedal with a force of approximately 294 N (30 kgf, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it shows any unusual movement.
Visually inspect bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install wheels, and drive vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

12. Air Bleeding

A: PROCEDURE

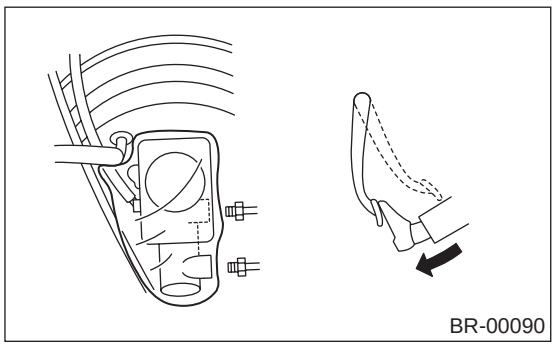
CAUTION:
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover bleeder with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.
• Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wash it off quickly if spilt.

NOTE:
• Start with the brakes (wheels) connected to the secondary chamber of the master cylinder.
• The time interval between two brake pedal operations (from the time when the pedal is released to the time when it is depressed another time) should be approximately 3 seconds.
• The air bleeder on each brake should be released for 1 to 2 seconds.

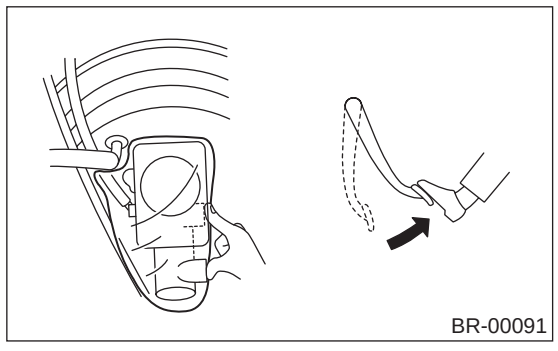
1. MASTER CYLINDER

NOTE:
• If master cylinder is disassembled or reservoir tank is empty, bleed master cylinder.
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• Brake pedal operation must be very slow.
• For convenience and safety, two people should do the work.

1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Disconnect brake line at primary and secondary sides.
3) Put plastic bag cover on the master cylinder.
4) Carefully depress and hold brake pedal.


BR-00090

5) Close outlet plug with your finger, and release brake pedal.


BR-00091

6) Repeat above steps 4) and 5) until master cylinder is completely bled.
7) Install brake pipes to master cylinder.

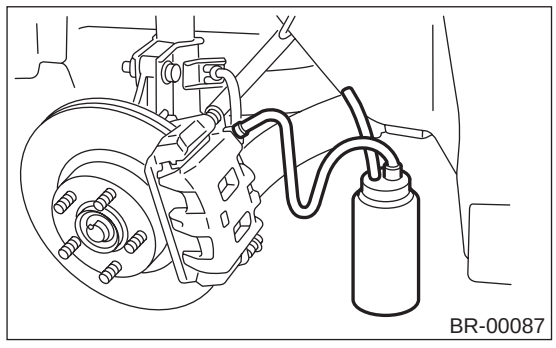
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

8) Cleanly wash away brake fluid spilt on master cylinder etc.
9) Bleed air from brake system. <Ref. to BR-34, BRAKE LINE, PROCEDURE, Air Bleeding.>

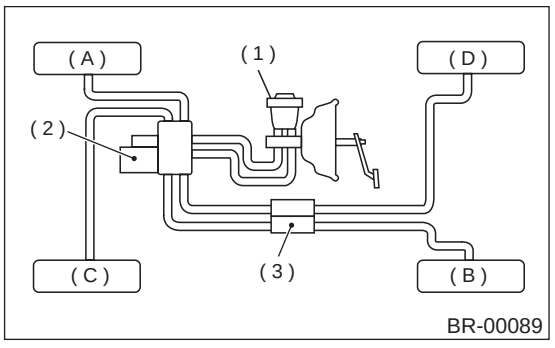
2. BRAKE LINE

NOTE:
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• Brake pedal operation must be very slow.
• For convenience and safety, two people should do the work.

1) Make sure that there is no leak from joints and connections of the brake system.
2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.


BR-00087

CAUTION:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.
Release air bleeder for 1 to 2 seconds.
Next, with the bleeder closed, slowly release the brake pedal.
Repeat these steps until there are no more air bubbles in the vinyl tube.
Allow 3 to 4 seconds between two brake pedal operations.

CAUTION:
Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

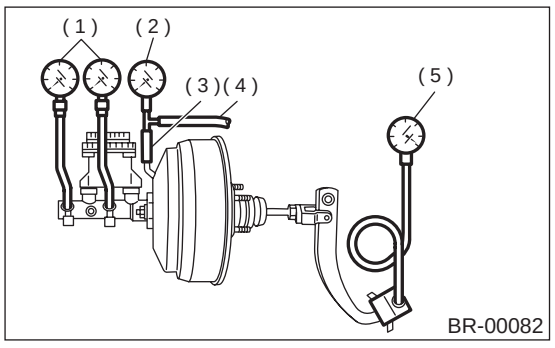
NOTE:
Brake pedal operating must be very slow.

4) Tighten air bleeder securely when no air bubbles are visible.

Air bleeder tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

5) Perform these steps for the brakes connecting to the secondary chamber of master cylinder, first, and then for the ones connecting to primary chamber. With all procedures completed, fully depress the brake pedal and keep it in that position for approximately 20 seconds to make sure that there is no leak evident in the entire system.

6) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between the brake pedal and steering wheel. With the brake pedal released, measure the distance between the pedal and steering wheel again. The difference between the two measurements must be more than specified.



(1) Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

Specified pedal stroke:
95 mm (3.74 in)
When depressing brake pedal with a 490 N (50 kgf, 110 lb) load.

7) If the distance is more than specifications, there is a possibility that air is in the brake line. Bleed brake line until pedal stroke meets the specification.
8) Operate hydraulic control unit in the sequence control mode.
With ABS: <Ref. to ABS-9, ABS Sequence Control.>
With VDC: <Ref. to VDC-19, VDC Sequence Control.>
9) Recheck the brake stroke.
10) If the distance is more than specifications, there is a possibility air is in the inside of the hydraulic unit. Repeat above steps 2) to 9) above until pedal stroke meets the specification.
11) Add brake fluid to the required level (MAX. level) of reservoir tank.
12) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

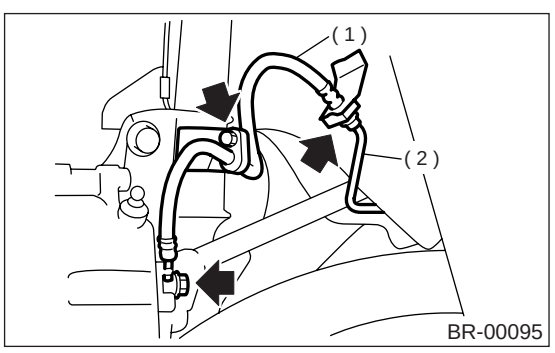
13.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

1) Separate brake pipe from brake hose.

NOTE:
Always use flare nut wrench and be careful not to deform flare nut.



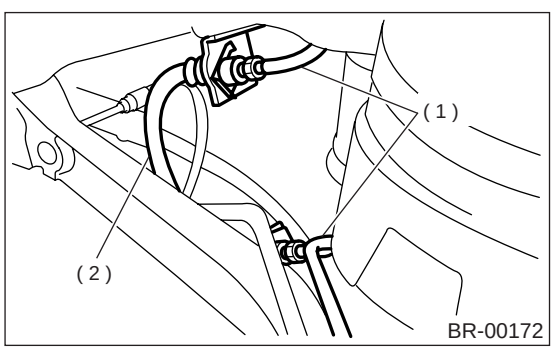
(1) Brake hose
(2) Brake pipe

2) Pull out clamp to remove brake hose.
3) Remove bolt at strut and union bolt.

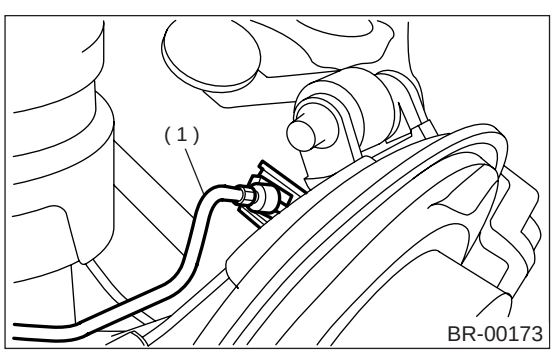
2. REAR BRAKE HOSE

1) Separate brake pipe from brake hose.

NOTE:
Always use flare nut wrench and be careful not to deform flare nut.



(1) Brake pipe
(2) Brake hose



(1) Brake pipe

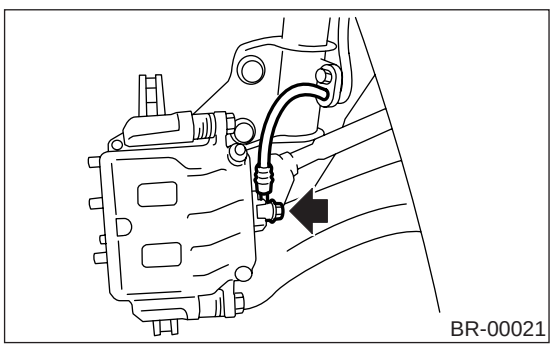
2) Pull out clamp to remove brake hose.

B: INSTALLATION

1. FRONT BRAKE HOSE

1) Route end of brake hose (on caliper side) through hole in brake hose bracket at strut location.
2) Tighten end of brake hose at caliper using a union bolt.

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



3) Secure middle fitting of brake hose to bracket at strut location using a clamp.
4) Position disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

CAUTION:
Be sure brake hose is not twisted.

5) Temporarily tighten flare nut to connect brake pipe and hose.
6) Fix brake hose with clamp at wheel apron bracket.
7) While holding hexagonal part of brake hose fitting with a wrench, tighten flare nut to the specified torque.

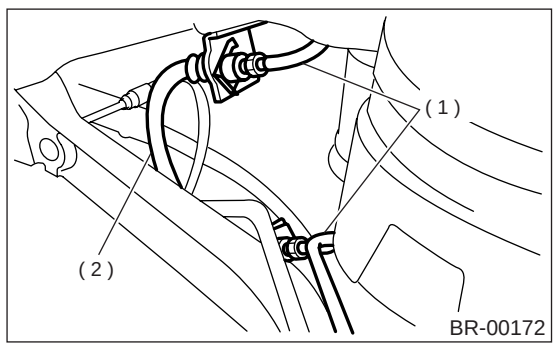
Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

8) Bleed air from the brake system.

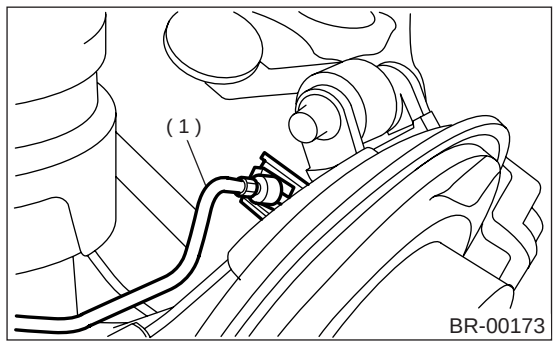
2. REAR BRAKE HOSE

1) Pass brake hose through the hole of bracket, and lightly tighten flare nut to connect brake pipe.
2) Insert clamp upward to fix brake hose.
3) While holding hexagonal part of brake hose fitting with a wrench, tighten flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Brake pipe
(2) Brake hose



(1) Brake pipe

4) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage, or damage on hoses. Check joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace hose.

14.Brake Pipe

A: REMOVAL

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage airbag system wiring harness when servicing the center brake pipe.
• When removing the brake pipe, make sure that it is not bent.

B: INSTALLATION

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage airbag system wiring harness when servicing the center brake pipe.
• When installing the brake pipe, make sure that it is not bent.
• After installing the brake pipe and hose, bleed the air.
• After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

Brake pipe tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace pipe.

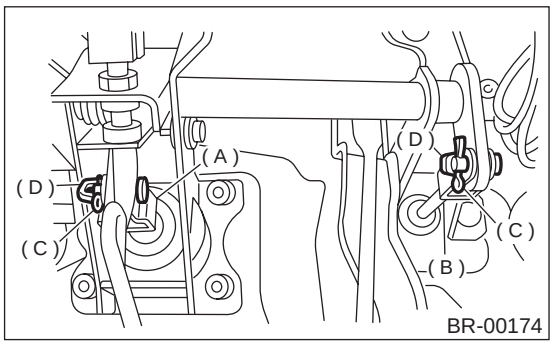
NOTE:
Use a mirror when inspecting low-visible part or back side.

15.Brake Pedal

A: REMOVAL

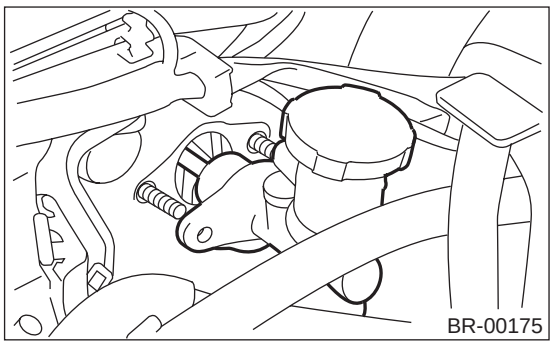
1. MT MODEL

1) Pull up parking brake lever and block tires.
2) Disconnect battery ground cable.
3) Remove steering column.
<Ref. to PS-21, REMOVAL, Tilt Steering Column.>
4) Disconnect connectors from stop light and clutch switches.
5) Remove snap pins which secure lever to push rod and operating rod.
6) Remove clevis pins which secure lever to push rod and operating rod.



(A) Operating rod
(B) Push rod
(C) Snap pin
(D) Clevis pin

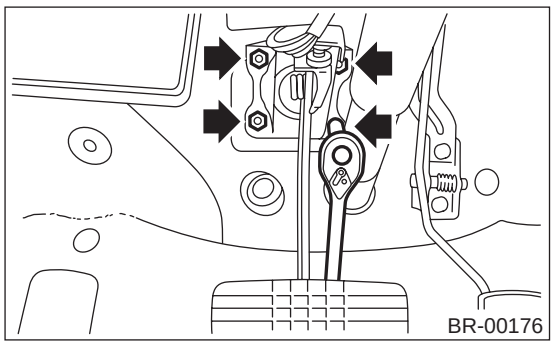
7) Remove nut which secures clutch master cylinder.



8) Remove bolts and nuts which secure brake and clutch pedals, and remove pedal assembly.

2. AT MODEL

1) Pull up parking brake lever.
2) Disconnect ground cable from battery.
3) Remove instrument panel lower cover from instrument panel.
4) Remove clevis pin which secures brake pedal to brake booster operating rod. Also disconnect stop light switch connector.
5) Remove AT unit from brake panel (2 nuts).
6) Remove two bolts and four nuts which secure brake pedal to pedal.



B: INSTALLATION

1) Install in the reverse order of removal.

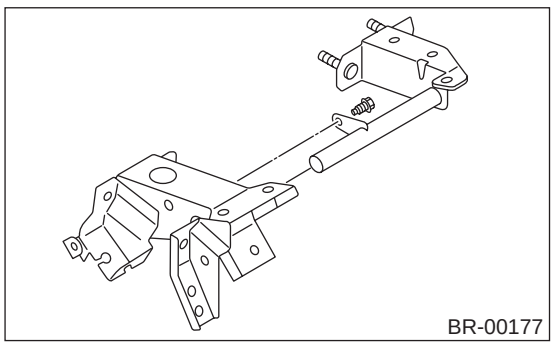
CAUTION:
• If cable clamp is damaged, replace it with a new one.
• Never fail to cover outer cable end with boot.
• Be careful not to kink accelerator cable.
• Always use new clevis pins.

2) Adjustment of clutch pedal <Ref. to BR-40, ASSEMBLY, Brake Pedal.>
3) Inspect after pedal installation <Ref. to BR-41, INSPECTION, Brake Pedal.>

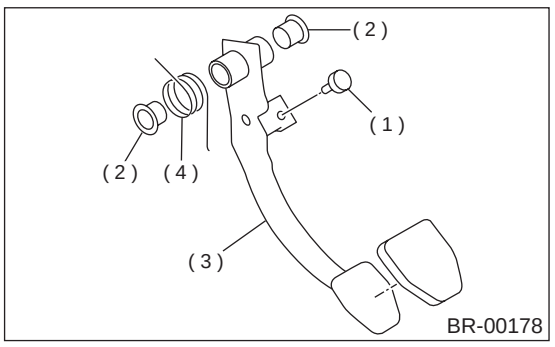
C: DISASSEMBLY

1. MT MODEL

1) Remove the brake switch.
<Ref. to BR-42, REMOVAL, Stop Light Switch.>
2) Remove the clutch pedal.
<Ref. to CL-21, DISASSEMBLY, Clutch Pedal.>
3) Remove the clutch master cylinder bracket.



4) Remove bushing, spring and stopper.

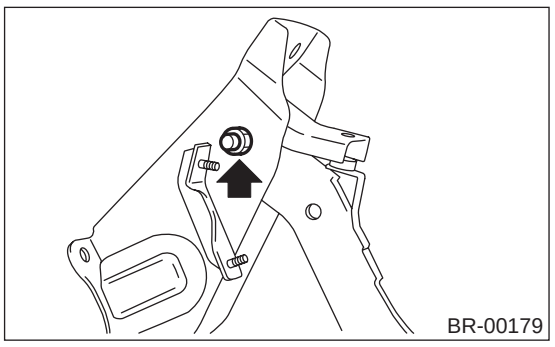


(1) Stopper
(2) Bushing
(3) Brake pedal
(4) Brake pedal spring

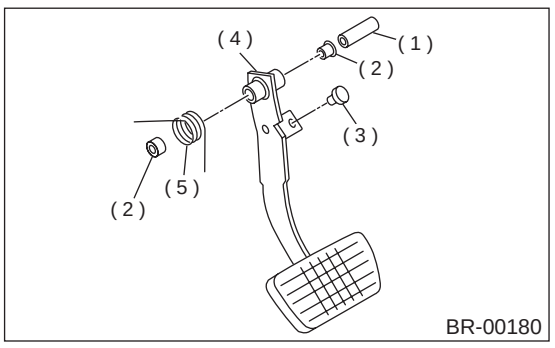
5) Remove the brake pedal pad.

2. AT MODEL

1) Remove the brake switch.
2) Unbolt, and then remove the brake pedal.



3) Remove bushing, spacer and spring.



(1) Spacer
(2) Bushing
(3) Stopper
(4) Brake pedal
(5) Brake pedal spring

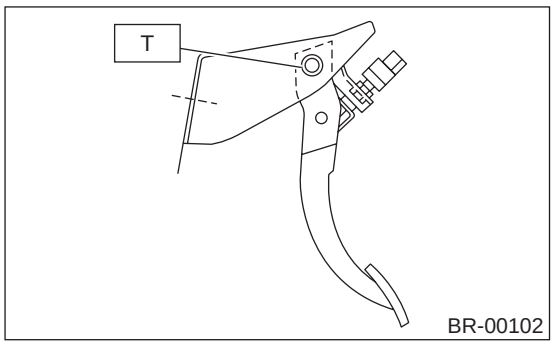
4) Remove the brake pedal pad.

D: ASSEMBLY

1) Attach stop light switch, etc. to pedal bracket temporarily.
2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.
3) Align bores of pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring and clutch pedal effort reducing spring (vehicle with hill holder), and then install pedal bolt.

NOTE:
Clean up inside of bushings and apply grease before installing spacer.

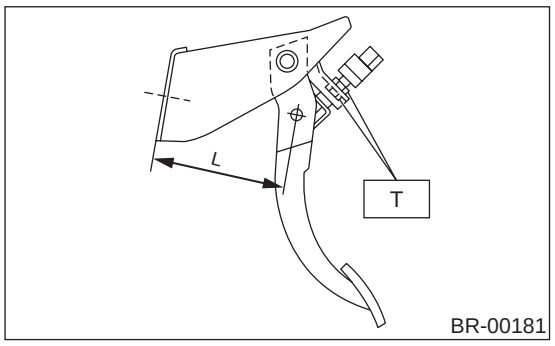
Tightening torque:
T: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



4) Set brake pedal position by adjusting position of stop light switch.

Pedal position: L
126.4 mm (4.98 in)

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

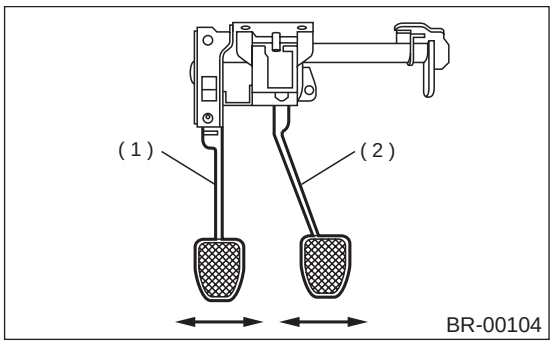


E: INSPECTION

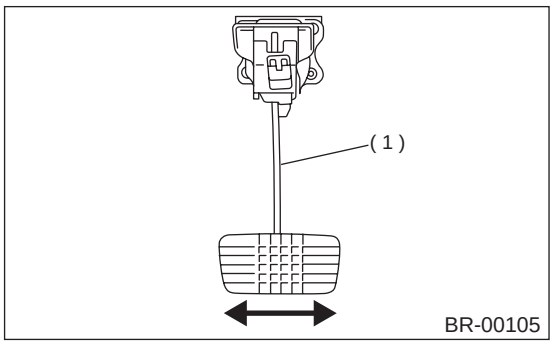
1) Move brake and clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace bushings with new ones.

Deflection of brake and clutch pedal:
Service limit
5.0 mm (0.197 in) or less



(1) Clutch pedal
(2) Brake pedal

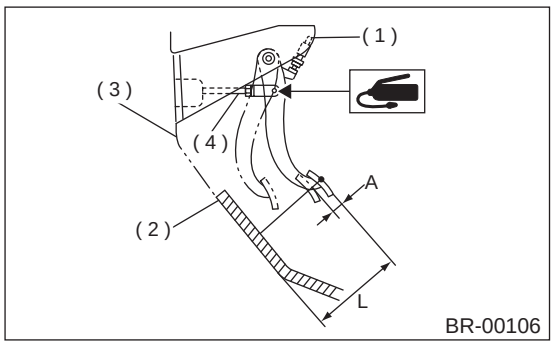


(1) Brake pedal

2) Check position of pedal pad.

Pedal height: L
AT: 158 mm (6.22 in)
MT: 153 mm (6.02 in)

Brake pedal free play: A
1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]



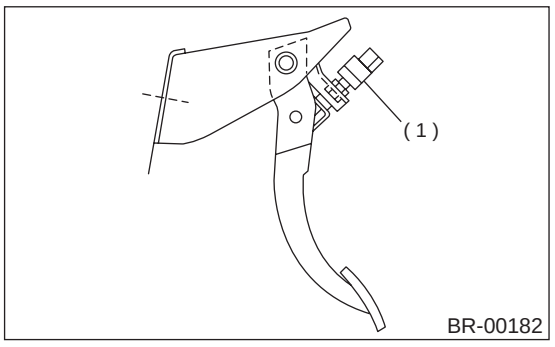
(1) Stop light switch
(2) Mat
(3) Toe board
(4) Brake booster operating rod

3) If it is not in specified value, adjust it by adjusting brake booster operating rod length.

16.Stop Light Switch

A: REMOVAL

1) Disconnect battery ground cable.
2) Disconnect stop light switch connector.
3) Loosen nuts, and unscrew stop light switch to remove.

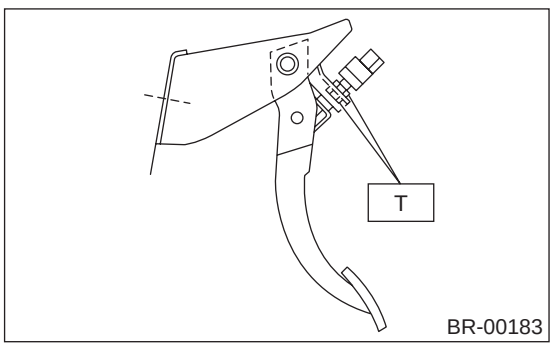


(1) Stop light switch

B: INSTALLATION

1) Screw the stop light switch onto a bracket and secure it temporarily with a nut.
2) Adjust stop light switch position, and then tighten the nut.
<Ref. to BR-43, ADJUSTMENT, Stop Light Switch.>

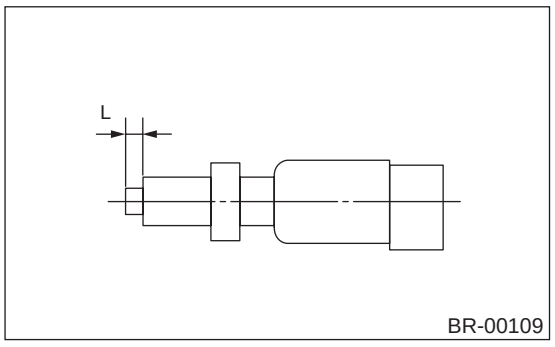
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



C: INSPECTION

1) If stop light switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

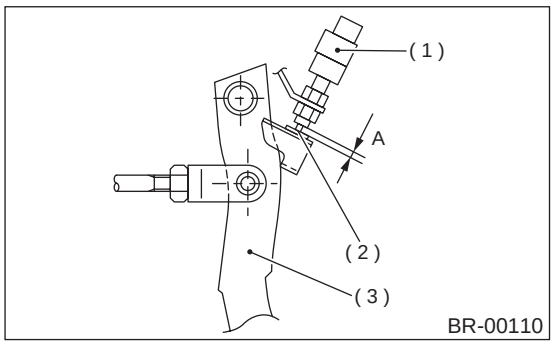
Specified position: L
$2^{+1.5}_{0}$ mm ($0.079^{+0.059}_{0}$ in)



2) Measure the clearance between threaded end of stop light switch and stopper.

CAUTION:
Be careful not to rotate stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



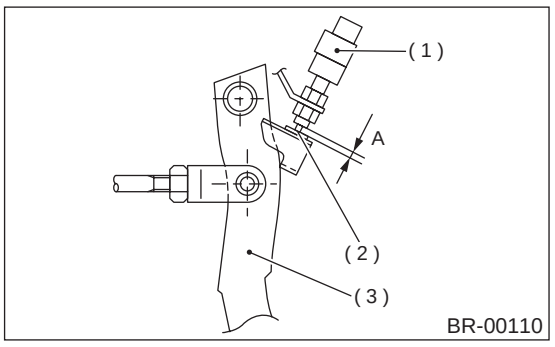
(1) Stop light switch
(2) Stopper
(3) Brake pedal

3) If it is not in specified value, adjust it by adjusting position of stop light switch.

CAUTION:
Be careful not to rotate stop light switch.

D: ADJUSTMENT

Loosen the lock nut, and adjust stop light switch position until the clearance (A) between threaded end of the stop light switch and the stopper becomes 0.3 mm (0.012 in). Then, tighten the lock nut.



(1) Stop light switch
(2) Stopper
(3) Brake pedal

17.General Diagnostics

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(2) Entry of air into the hydraulic mechanism	Bleed the air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining or rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Rotor eccentricity	Correct or replace the rotor.
	(3) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(4) Deformed back plate	Correct or replace.
	(5) Improper tire inflation	Inflate to correct pressure.
	(6) Disordered wheel alignment	Adjust alignment.
	(7) Loosened back plate or the support installing bolts	Retighten.
	(8) Loosened wheel bearing	Retighten to normal tightening torque or replace.
	(9) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
	(10) Uneven effect of the parking brake	Check, adjust, or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed the air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(4) Improperly adjusted shoe clearance	Adjust.
	(5) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Correct or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Improper adjusted wheel bearing	Adjust or replace.
5. Brake noise (1) (creak sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loosened back plate or the support installing bolts	Retighten.
	(4) Loose wheel bearing	Retighten to normal tightening torque.
	(5) Dirty rotor	Clean the rotor, or clean and replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improper installed shoe or pad	Correct or replace the shoe assembly or pad.
	(3) Loose or bent rotor	Retighten or replace.
7. Brake noise (3) (click sound)	(1) Excessively worn pad or the support	Replace the pad or the support.
	(2) Excessively worn shoe ridge	Replace the back plate.
	(3) Lack of oil on the shoe ridge surface and anchor	Add more grease.

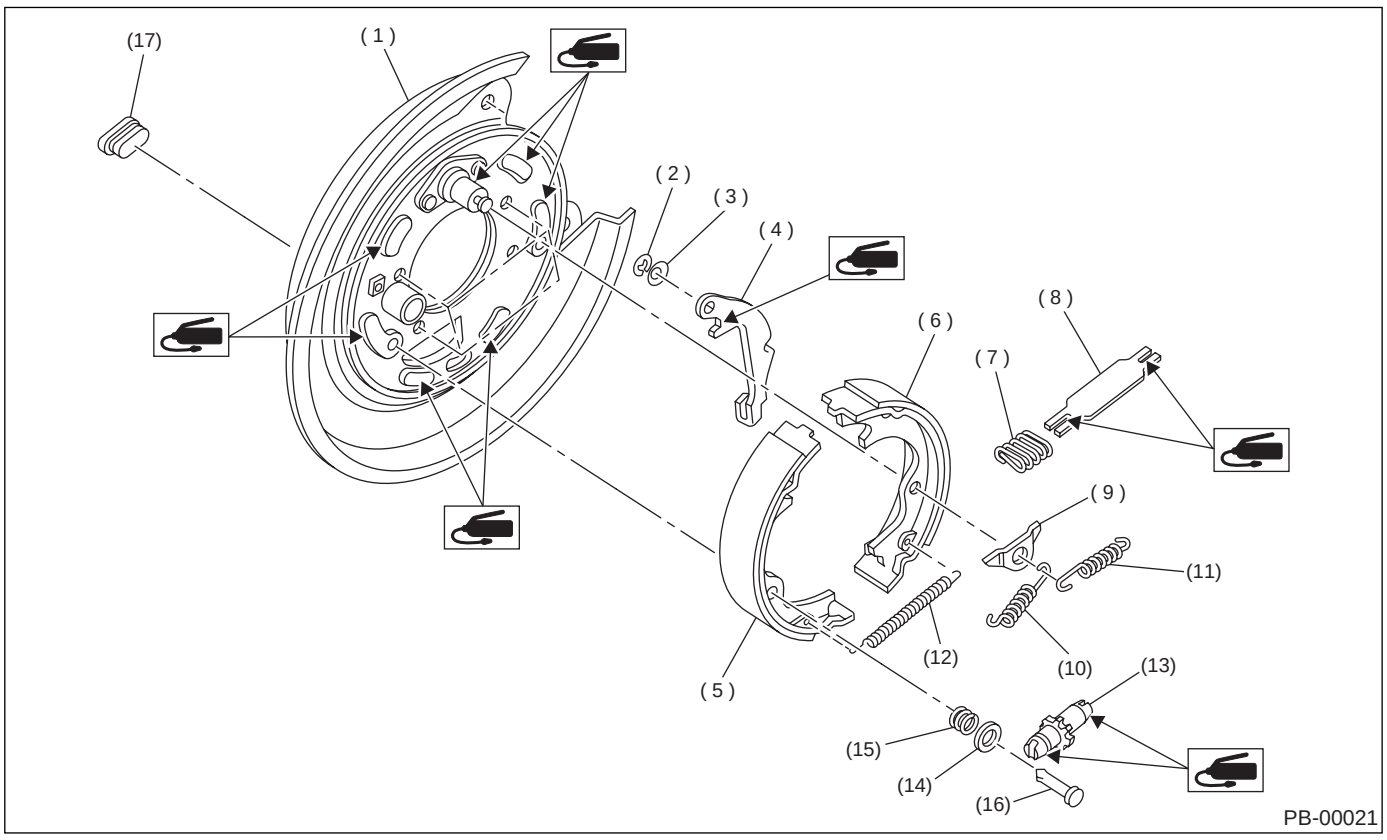
1. General Description

A: SPECIFICATIONS

Type		Mechanical on rear brakes, drum in disc
Effective drum diameter	mm (in)	170 (6.69)
Lining dimensions (length × width × thickness)	mm (in)	162.6 × 30.0 × 3.2 (6.40 × 1.181 × 0.126)
Clearance adjustment		Manual adjustment
Lever stroke	notches/N (kgf, lb)	7 to 8/196 (20, 44)

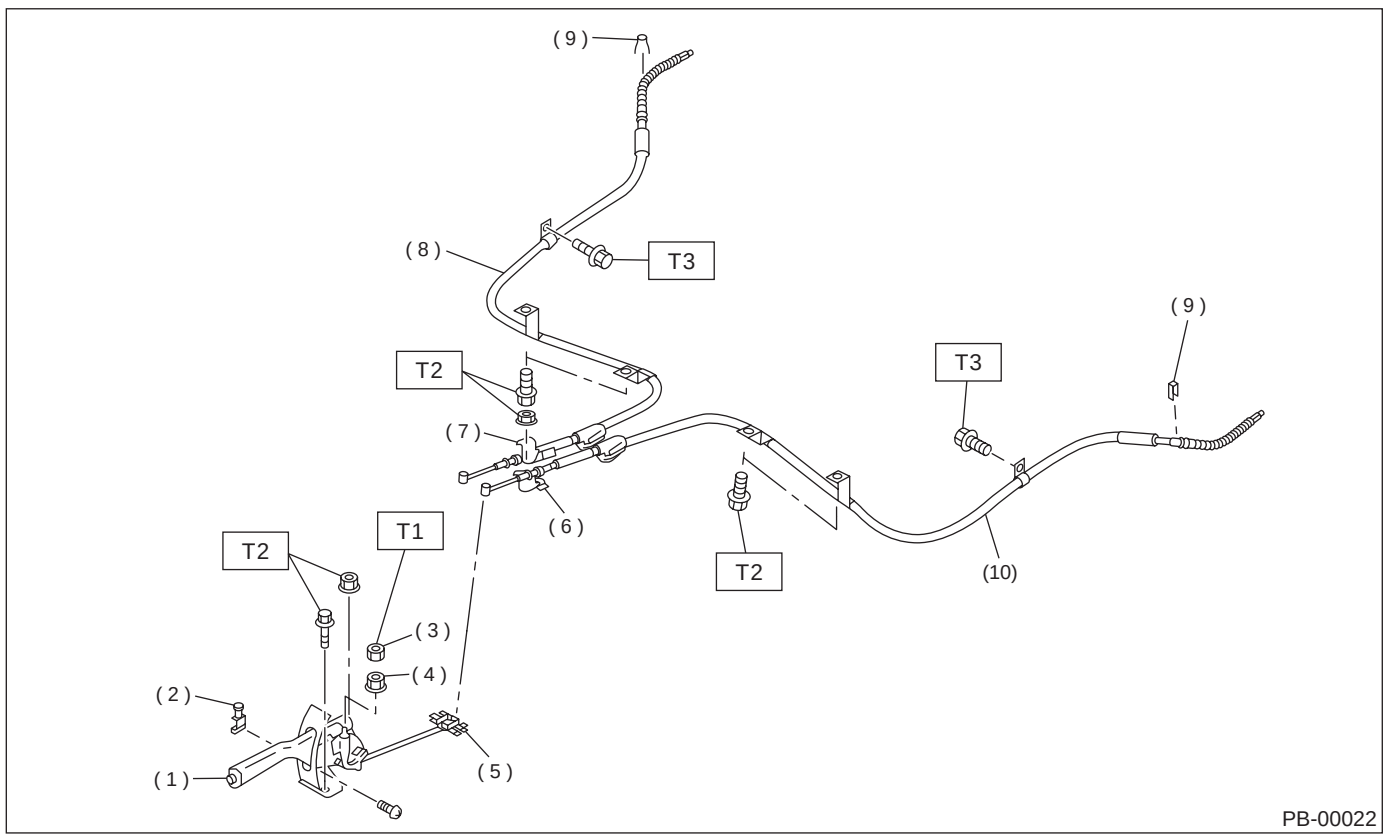
B: COMPONENT

1. PARKING BRAKE



(1) Back plate
(2) Retainer
(3) Spring washer
(4) Lever
(5) Parking brake shoe (Primary)
(6) Parking brake show (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
(13) Adjuster

2. PARKING BRAKE CABLE



(1) Parking brake lever
(2) Parking brake switch
(3) Lock nut
(4) Adjusting nut
(5) Equalizer
(6) Bracket
(7) Clamp
(8) Parking brake cable RH
(9) Clamp (Rear disc brake model only)
(10) Parking brake cable LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5.9 (0.60, 4.3)
T2: 18 (1.8, 13.0)
T3: 32 (3.3, 24)

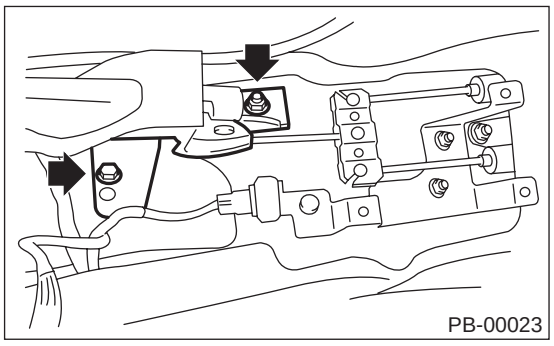
C: CAUTION

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

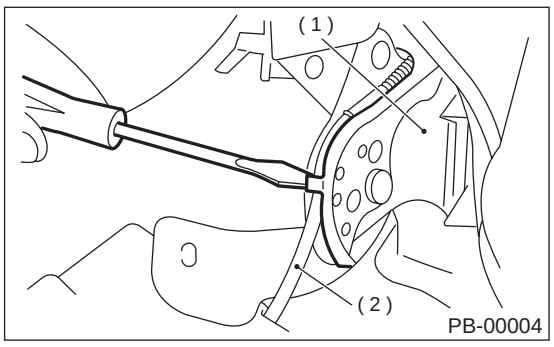
2. Parking Brake Lever

A: REMOVAL

1) Lift-up the vehicle.
2) Remove rear tire and wheel.
3) Remove console box. <Ref. to EI-36, REMOVAL, Console Box.>
4) Loosen parking cable adjusting nut and console bracket.
5) Remove parking brake lever.



6) Unbend parking brake lever pawls and remove cable.



(1) Parking brake lever
(2) Cable

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Parking brake lever;
18 N·m (1.8 kgf-m, 13.0 ft-lb)
Adjusting nut;
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

NOTE:
• Be sure to pass cable through guide inside the tunnel.
• Be sure to adjust the lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

While pulling parking brake lever upward, count the notches.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

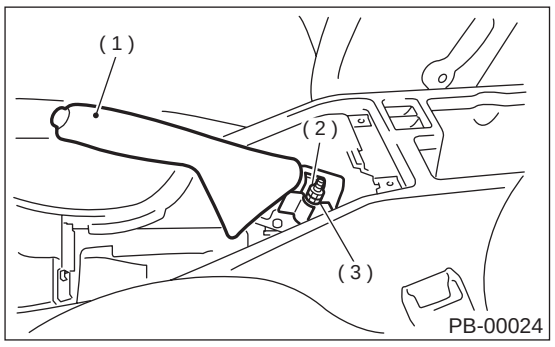
Incorrect, adjust the parking brake. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly.>

D: ADJUSTMENT

1) Remove console cover.
2) Forcibly pull parking brake lever 3 to 5 times.
3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).
4) Tighten lock nut.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Lock nut):
5.9 N·m (0.60 kgf-m, 4.3 ft-lb)



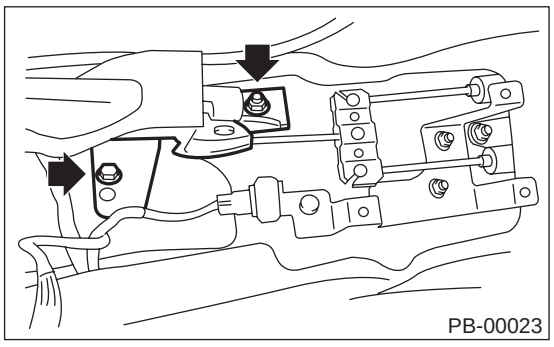
(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

5) Install console cover.

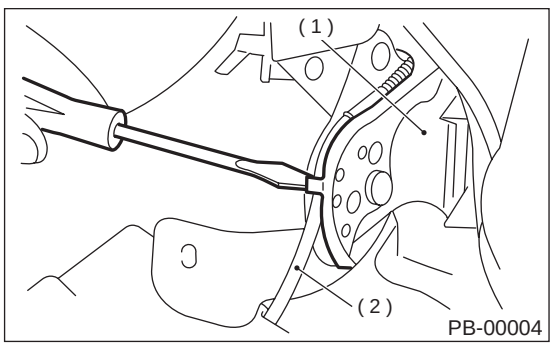
3. Parking Brake Cable

A: REMOVAL

1) Lift-up vehicle.
2) Remove rear tires and wheels.
3) Remove rear seat cushion. <Ref. to SE-17, Rear Seat.>
4) Remove console box. <Ref. to EI-36, REMOVAL, Console Box.>
5) Loosen parking cable adjusting nut and console bracket.
6) Remove parking brake lever.

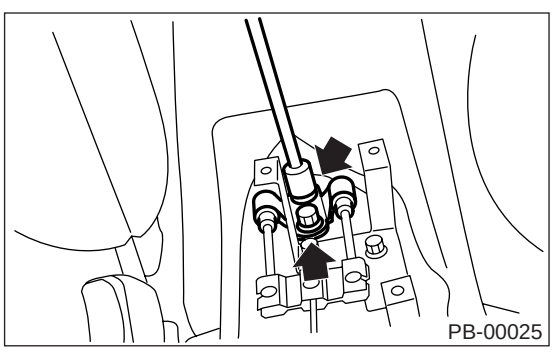


7) Unbend parking brake lever pawls and remove cable.

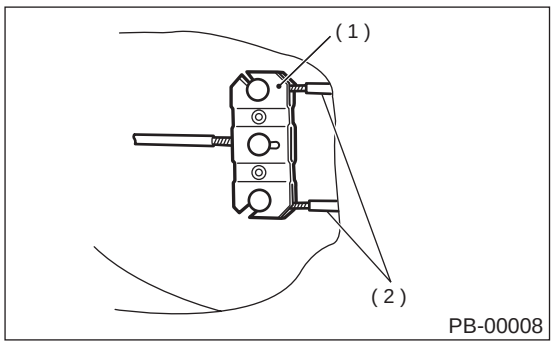


(1) Parking brake lever
(2) Cable

8) Roll up floor mat and remove clamps.

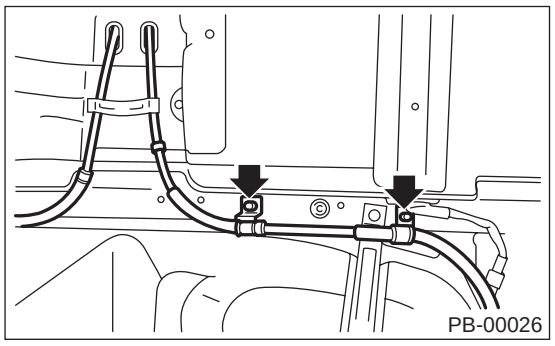


9) Remove equalizer cover.
10) Remove inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

11) Pull out parking brake cable from rear brake. <Ref. to PB-8, REMOVAL, Parking Brake Assembly.>
12) Pull out clamp from rear brake.
13) Remove bolt and bracket from trailing link bracket.
14) Remove bolt and clamp from rear floor.



15) Detach grommet from rear floor.
16) Remove cable assembly from cabin by forcibly pulling it backward.
17) Detach parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

Install (new) parking brake assembly in the reverse order of removal.

NOTE:
• Be sure to pass cable through cable guide inside the tunnel.
• Be sure to adjust the lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

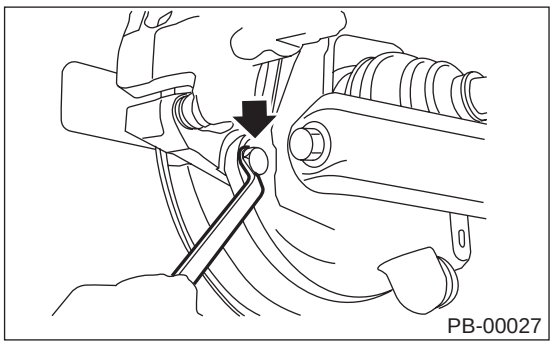
C: INSPECTION

Check the removed cable and replace if damaged, rusty, or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends, and cracks.
4) Check the boot for damage, cracks, and deterioration.

4. Parking Brake Assembly

A: REMOVAL

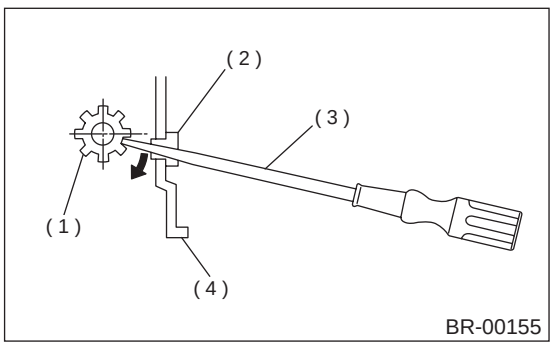
1) Remove the two mounting bolts and remove the disc brake assembly.


PB-00027

2) Suspend the disc brake assembly so that the hose is not stretched.
3) Pull down and release parking brake.
4) Remove the disc rotor.

NOTE:
If the disc rotor is difficult to remove, try the following two methods in order.

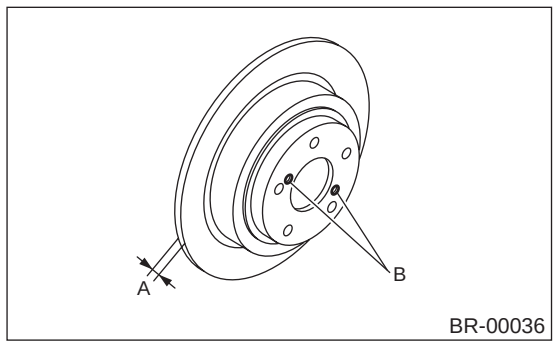
(1) Turn adjusting screw using a slot-type screwdriver until brake shoe gets away enough from the disc rotor.



BR-00155

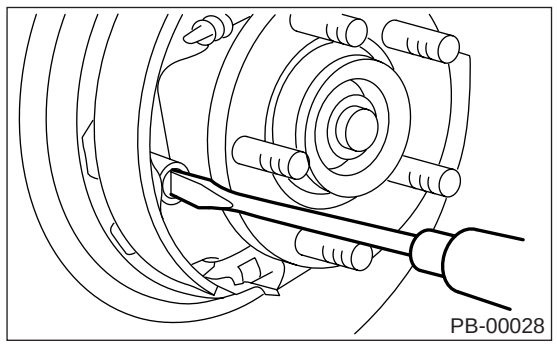
(1) Adjusting screw
(2) Cover (rubber)
(3) Slot-type screwdriver
(4) Back plate

(2) If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.

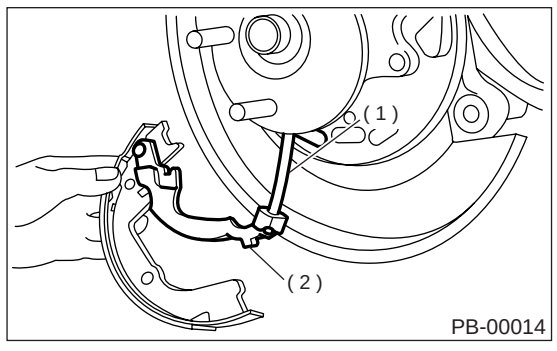


BR-00036

5) Remove shoe return spring from parking brake assembly.
6) Using a standard screwdriver, remove front shoe hold-down spring and pin.


PB-00028

7) Remove strut and strut spring.
8) Remove adjuster assembly from parking brake assembly.
9) Using a standard screwdriver, remove rear shoe hold-down spring and pin.
10) Remove brake shoe.
11) Remove parking cable from parking lever.



PB-00014

(1) Parking brake cable
(2) Parking brake lever

12) Using a standard screwdriver, raise retainer. Remove parking lever and washer from brake shoe.

B: INSTALLATION

CAUTION:
Be sure lining surface is free from oil contamination.

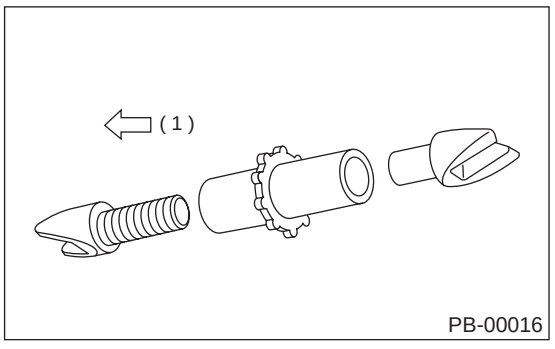
Brake grease:
Dow Corning Molykote No. 7439 (Part No. 725191460)

1) Apply brake grease to the following places.
- Six contact surfaces of shoe rim and back plate packing
- Contact surface of shoe wave and anchor pin
- Contact surface of lever and strut
- Contact surface of shoe wave and adjuster assembly
- Contact surface of shoe wave and strut
- Contact surface of lever and shoe wave

2) Install in reverse order of removal.

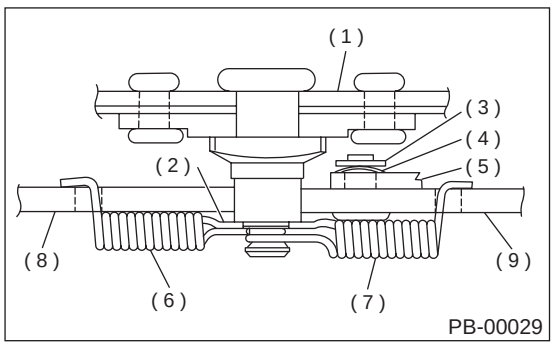
CAUTION:
- **Use new retainers and clinch them when installing brake shoes to levers.**
- **Ensure that parking lever moves smoothly.**
- **Do not confuse left parking lever with right one.**
- **Do not confuse left strut with right one.**

NOTE:
Ensure that adjuster assembly is securely installed with screw in the left side, facing vehicle front.



(1) LEFT

NOTE:
Ensure that shoe return spring is installed as shown in Figure.



(1) Back plate
(2) Shoe guide plate
(3) Retainer
(4) Spring washer
(5) Lever
(6) Primary shoe return spring (Blue)
(7) Secondary shoe return spring (Yellow)
(8) Parking brake shoe (Primary)
(9) Parking brake shoe (Secondary)

3) Adjust parking brakes. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly.>

CAUTION:
After replacing parking brake lining, be sure to drive vehicle for “break-in” purposes.
(1) Drive the vehicle about 35 km/h (22 MPH).
(2) With the parking brake release button pushed in, pull the parking brake lever gently.
(3) Drive the vehicle for about 200 meter (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
(5) After breaking-in, re-adjust parking brakes.

C: INSPECTION

1) Measure brake disc inside diameter. If the disc is scored or worn, replace the brake disc.

Disc 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.

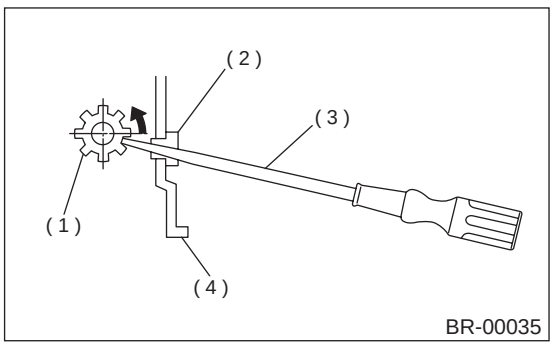
Lining thickness:
Standard
3.2 mm (0.126 in)
Service limit
1.5 mm (0.059 in)

CAUTION:
Replace the brake shoes on the right and left brake assembly at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove adjusting hole cover from back plate.
2) Turn adjusting screw using a slot-type screwdriver until brake shoe is in close contact with disc rotor.

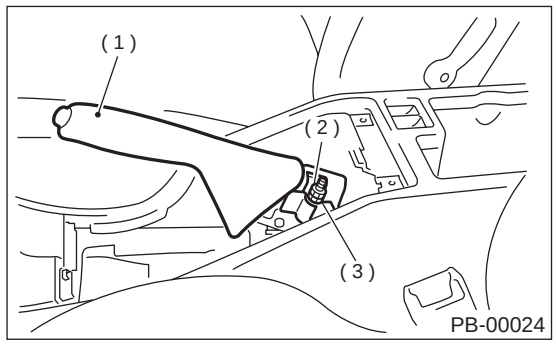


(1) Adjusting screw
(2) Cover (rubber)
(3) Slot-type screwdriver
(4) Back plate

3) Turn back (downward) adjusting screw 3 or 4 notches.
4) Install adjusting hole cover to back plate.

2. LEVER STROKE

1) Remove console box cover.
2) Forcibly pull parking brake lever 3 to 5 times.
3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 6 notches with operating force of 196 N (20 kgf, 44 lb).



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

4) Tighten lock nut.
5) Install console box cover.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Adjuster lock nut):
5.9 N·m (0.60 kgf-m, 4.3 ft-lb)

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Brake drag	• Parking brake lever is maladjusted.	• Adjustment.
	• Parking brake cable does not move.	• Repair or replace.
	• Parking brake shoe clearance is maladjusted.	• Adjustment.
	• Return spring is faulty.	• Replace.
Noise from brake	• Return spring is faulty.	• Replace.
	• Shoe hold-down spring is faulty.	• Replace.

GENERAL DIAGNOSTIC TABLE

PARKING BRAKE

MEMO:

1. General Description

A: SPECIFICATIONS

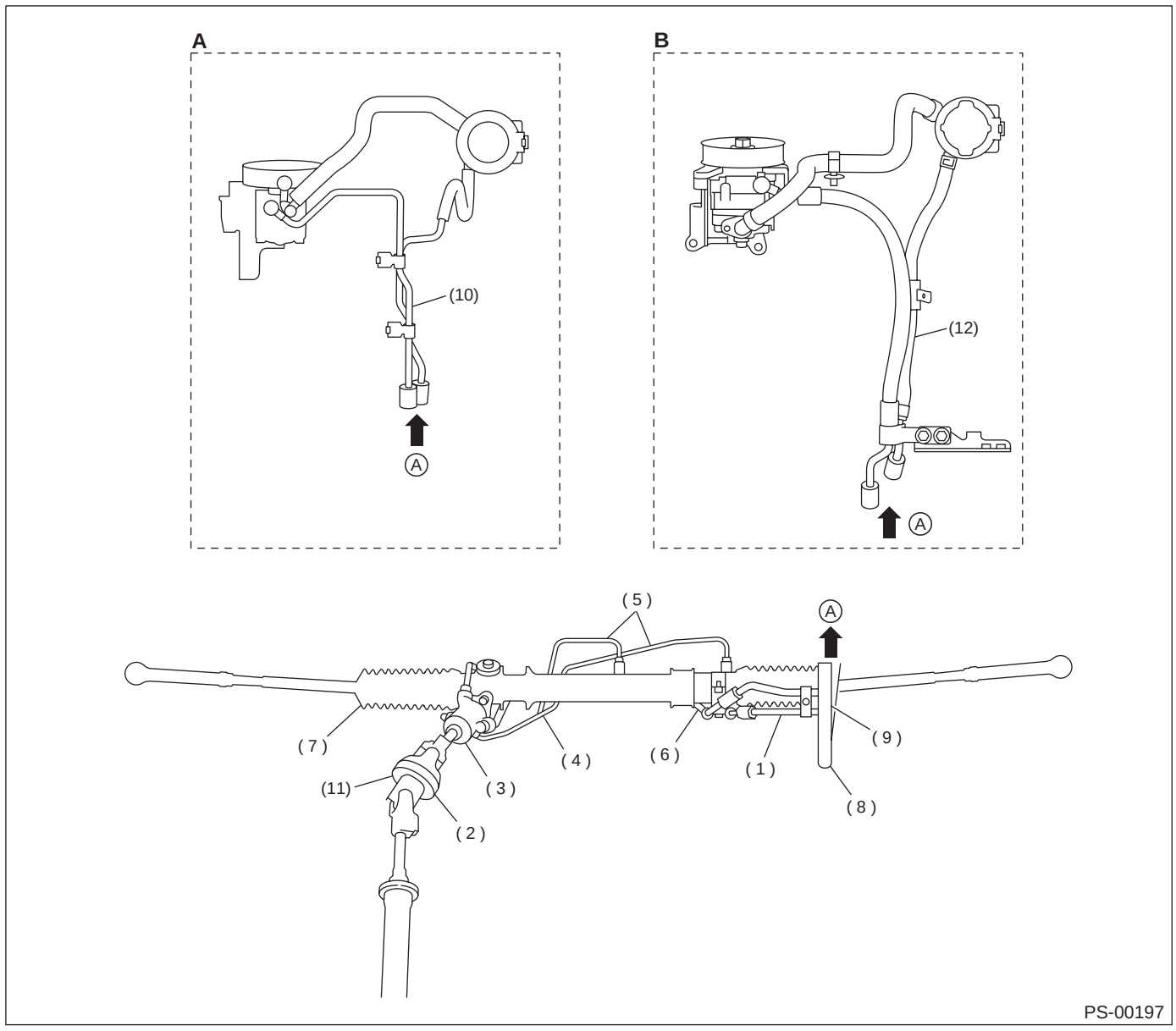
Model				Except OUTBACK	OUTBACK	
					2.5 L model	3.0 L model
Whole system	Minimum turning radius		m (ft)	5.4±0.5 (17.7±1.6)	5.6±0.5 (18.4±1.6)	
	Steering angle (Inside-Outside)			36.3°±1.5° — 31.6°±1.5°	34.5°±1.5° — 30.3°±1.5°	
	Steering wheel diameter		mm (in)	385 (15.16)		
	Overall gear ratio (Turns, lock to lock)			16.5 (3.2)	19.0 (3.4)	
Gearbox	Type			Rack and pinion, Integral		
	Backlash			0 (Automatically adjustable)		
	Valve (Power steering system)			Rotary valve		
Pump (Power steering system)	Type			Vane pump		
	Oil tank			Installed on body		
	Output		cm^3 (cu in)/rev.	7.2 — 0.6 (0.439 — 0.037)		9.6 — 0.65 (0.586 — 0.040)
	Relief pressure		kPa (kg/cm^2, psi)	9,807 (100, 1,422)		7,846 (80, 1,138)
	Hydraulic fluid control			Dropping in response to increased engine revolutions		
	Hydraulic fluid		ℓ (US qt, Imp qt)	1,000 rpm: 6 (6.3, 5.3) 3,000 rpm: 5 (5.3, 4.4)		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)
	Range of revolution		rpm	500 — 9,000		500 — 8,000
	Revolving direction			Clockwise		
Working fluid (Power steering system)	Name			ATF DEXRON IIE or III		
	Capacity	Oil tank	ℓ (US qt, Imp qt)	0.3 (0.3, 0.3)		
		Total	ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)		

Steering wheel	Free play		mm (in)	17 (0.67)
Turning angle	Inner tire & wheel	Except OUTBACK model		36.3°±1.5°
		OUTBACK model		34.5°±1.5°
	Outer tire & wheel	Except OUTBACK model		31.6°±1.5°
		OUTBACK model		30.3°±1.5°
Steering shaft	Clearance between steering wheel and column cover		mm (in)	3.0 (0.118)
Steering gearbox (Power steering system)	Sliding resistance		N (kgf, lb)	304.0 (31.0, 68.4) or less
	Rack shaft play in radial direction	Right-turn steering	mm (in)	0.15 (0.0059) or less
		Left-turn steering	mm (in)	Horizontal movement: 0.3 (0.012) or less Vertical movement: 0.15 (0.0059) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less
		In axial direction	mm (in)	0.1 (0.004) or less
	Turning resistance		N (kgf, lb)	Within 30 mm (1.18 in) from rack center in straight ahead position: Less than 11.18 (1.14, 2.51) Maximum allowable value: 12.7 (1.3, 2.9)
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less
		Axial play	mm (in)	0.6 (0.024) or less
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less
		Resistance to rotation	N (kgf, lb)	9.22 (0.94, 2.07) or less
	Regular pressure		kPa (kg/cm^2, psi)	981 (10, 142) or less
	Relief pressure		kPa (kg/cm^2, psi)	9,807 (100, 1,422)
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road		N (kgf, lb)	29.4 (3.0, 6.6) or less
	At standstill with engine stalled on a concrete road		N (kgf, lb)	294.2 (30, 66.2) or less

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

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

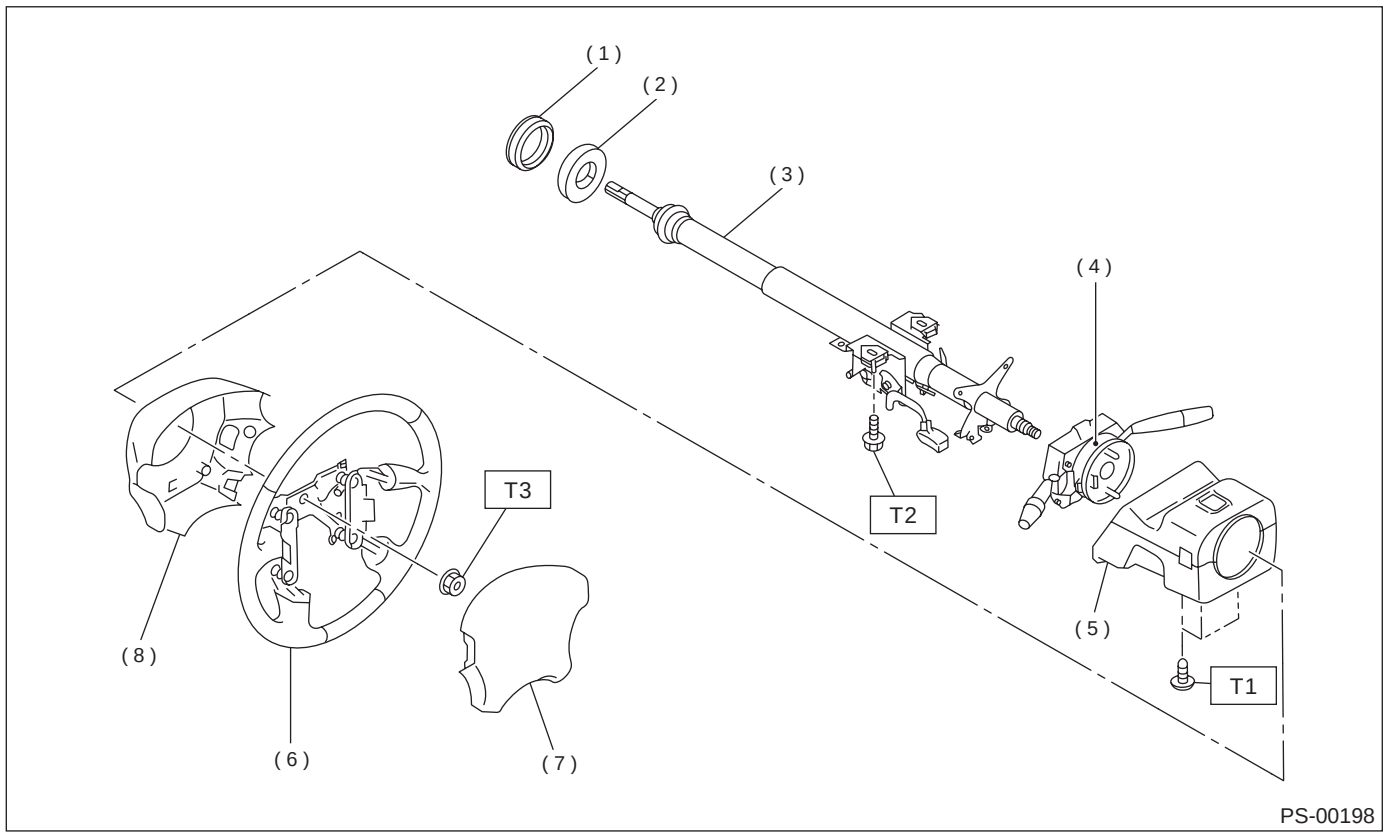
Location	Minimum allowance	
	2.5 L model	3.0 L model
(1) Crossmember — Pipe	5 mm (0.20 in)	
(2) DOJ — Shaft or joint	14 mm (0.55 in)	
(3) DOJ — Valve housing	11 mm (0.43 in)	
(4) Pipe — Pipe	2 mm (0.08 in)	
(5) Stabilizer — Pipe	5 mm (0.20 in)	
(6) Exhaust pipe — Pipe	15 mm (0.59 in)	
(7) Exhaust pipe — Gearbox boot	15 mm (0.59 in)	
(8) Side frame — Hose A and B	15 mm (0.59 in)	
(9) Cruise control pump — Hose A and B	15 mm (0.59 in)	
(10) Pipe portion of hose A — Pipe portion of hose B	1.5 mm (0.059 in)	—
(11) AT cooling hose — Joint	20 mm (0.79 in)	—
(12) Pressure hose — Return hose	—	3.0 mm (0.12 in)



(A) 2.5 L model (B) 3.0 L model

B: COMPONENT

1. STEERING WHEEL AND COLUMN

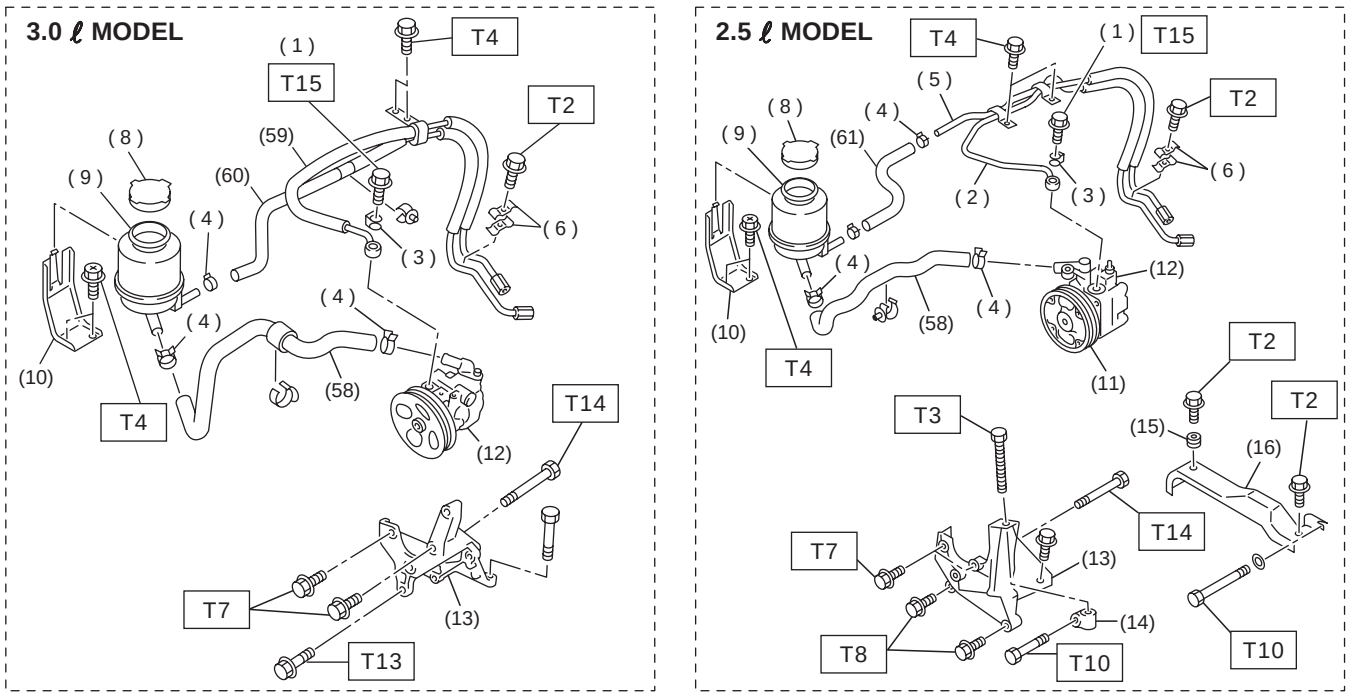


(1) Bushing
(2) Seal
(3) Steering shaft
(4) Steering roll connector
(5) Column cover
(6) Steering wheel
(7) Airbag module
(8) Lower steering wheel cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.2 (0.12, 0.9)
T2: 25 (2.5, 18.1)
T3: 44 (4.5, 32.5)

MEMO:

2. POWER ASSISTED SYSTEM



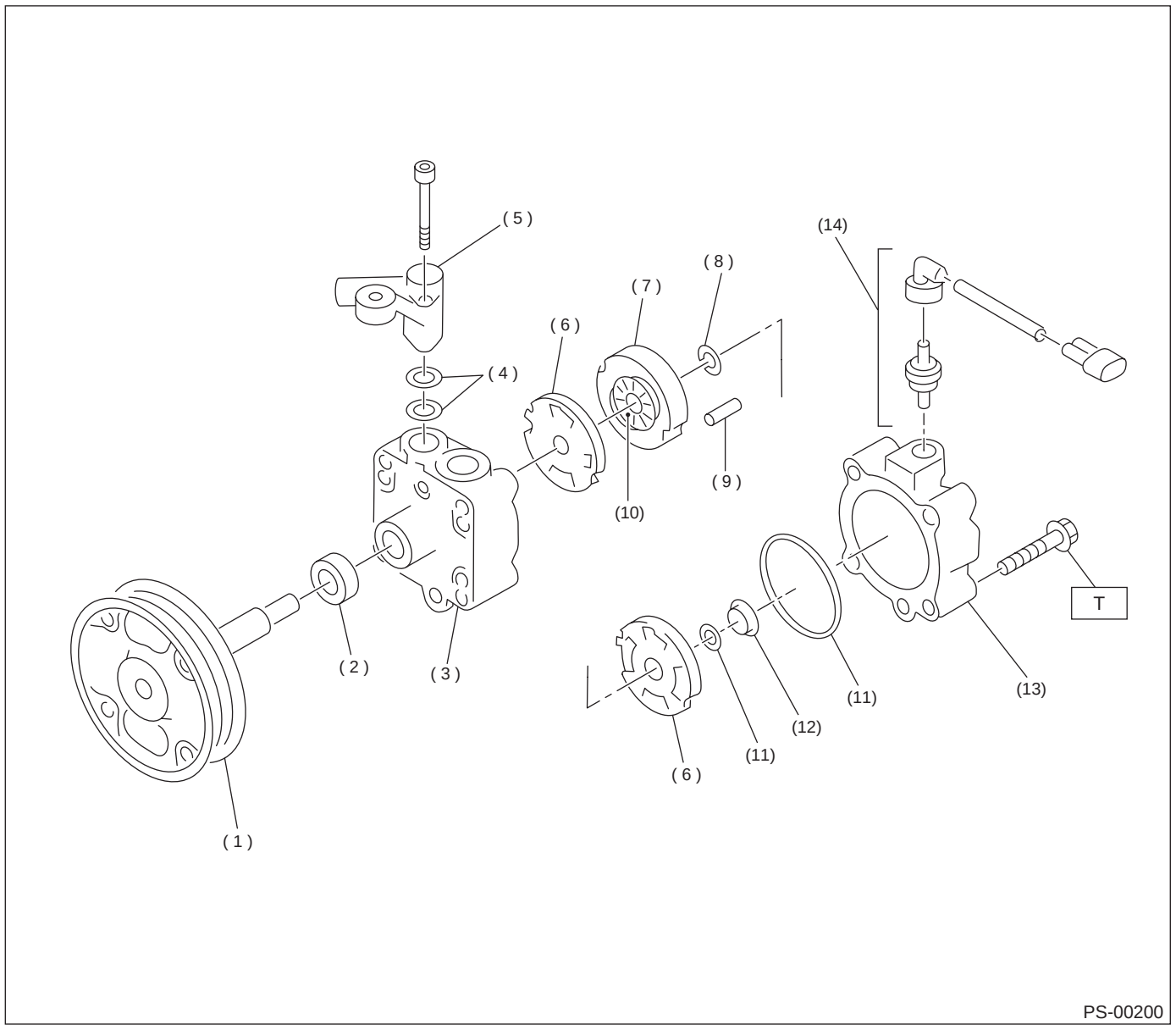
(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bushing
(16) Belt cover
(17) Pipe E
(18) Pipe F
(19) Clamp plate
(20) Universal joint
(21) Dust seal
(22) C-ring
(23) Oil seal
(24) Valve housing
(25) Gasket
(26) Seal ring
(27) Pinion and valve ASSY
(28) Oil seal
(29) Back-up washer
(30) Ball bearing
(31) Snap ring
(32) Lock nut
(33) Adjusting screw
(34) Spring
(35) Sleeve
(36) Adapter
(37) Clamp
(38) Cotter pin
(39) Castle nut
(40) Dust cover
(41) Clip
(42) Tie-rod end
(43) Clip
(44) Boot
(45) Band
(46) Tie-rod
(47) Lock washer
(48) Pipe B
(49) Pipe A
(50) Steering body
(51) Oil seal
(52) Piston ring
(53) Rack
(54) Rack bushing
(55) Rack stopper
(56) Circlip
(57) Spacer
(58) Suction hose
(59) Pressure hose ASSY
(60) Return hose ASSY
(61) Return hose
(62) Hose

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***6 (0.6, 4.3)***
T2:	***7.4 (0.75, 5.4)***
T3:	***8 (0.8, 5.8)***
T4:	***13 (1.3, 9.4)***
T5:	***15 (1.5, 10.8)***
T6:	***15 (1.5, 10.8)***
T7:	***15.7 (1.6, 11.6)***
T8:	***22 (2.2, 15.9)***
T9:	***24 (2.4, 17.4)***
T10:	***24.5 (2.5, 18.1)***
T11:	***25 (2.5, 18.1)***
T12:	***27 (2.75, 19.9)***
T13:	***33 (3.4, 25)***
T14:	***37.3 (3.8, 27.5)***
T15:	***39 (4.0, 28.9)***
T16:	***59 (6.0, 43)***
T17:	***78 (8.0, 58)***
T18:	***83 (8.5, 61.5)***
T19:	***25 (2.5, 18.1)***

3. OIL PUMP

NOTE:
The illustration for 2.5 L model is shown below. (Not shown for 3.0 L model because it cannot be disassembled.)



(1) Pulley
(2) Oil seal
(3) Front casing
(4) O-ring
(5) Socket
(6) Pressure plate
(7) Cam ring
(8) Circlip
(9) Straight pin
(10) Rotor
(11) O-ring
(12) Seal ring
(13) Rear body
(14) Connector

Tightening torque: N·m (kgf-m, ft-lb)
T: 27.5 (2.8, 20.3)

C: CAUTION

• This section includes Airbag related repair works. For those corresponding to the repair procedures, read carefully CAUTION items in AB section before working and be sure to follow the instructions.
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine steering fluid, grease etc. or the equivalent. Do not mix steering fluid, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply steering fluid onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of steering fluid to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

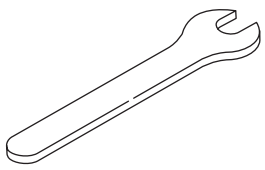
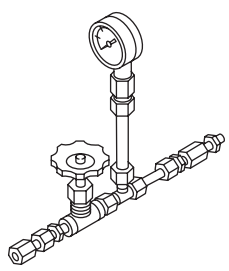
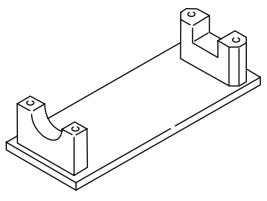
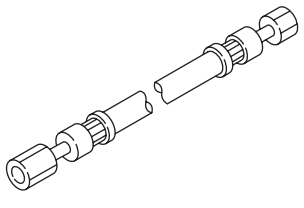
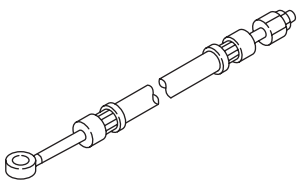
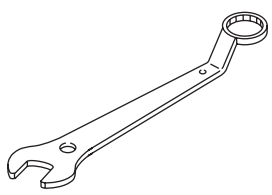
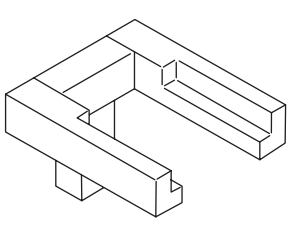
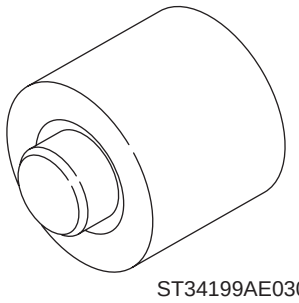
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925700000	925700000	WRENCH	• Used for removing and installing tie-rod. • Apply this tool to rack.
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 ST-926230000	926230000	SPANNER	• For the lock nut when adjusting backlash of gearbox. • Measurement of rotating resistance of gearbox assembly.
 ST34199AE020	34199AE020	MOUNT	Used for disassembling oil pump.
 ST34199AE030	34199AE030	INSTALLER	Used for installing oil seal into oil pump.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

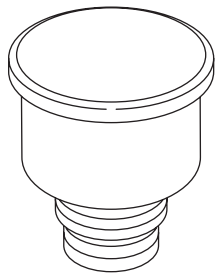
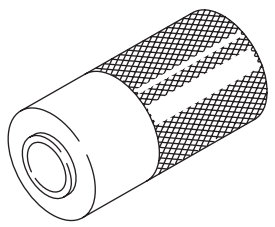
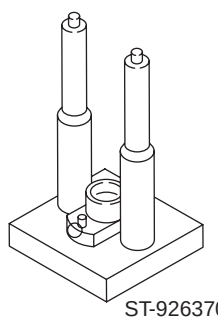
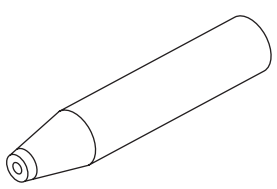
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering oil.
 ST-927640000	927640000	INSTALLER B	Used for installing ball bearing into housing.
 ST-926370000	926370000	INSTALLER A	• Used for installing valve assembly into valve housing assembly. • Used with STAND BASE (927630000).
 ST-926390001	926390001	COVER & REMOVER ASSY	Used for assembling rack assembly.

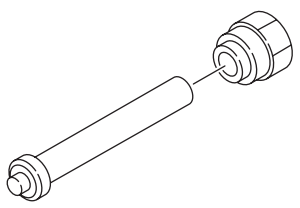
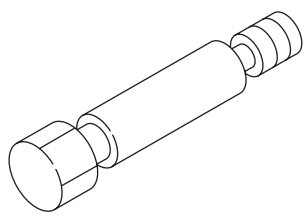
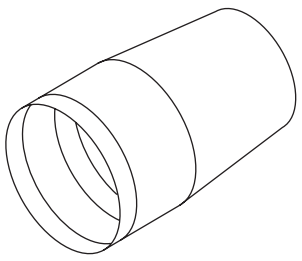
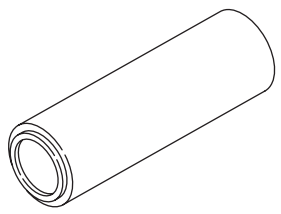
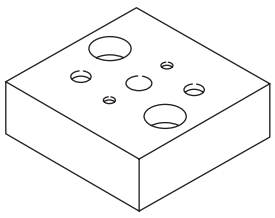
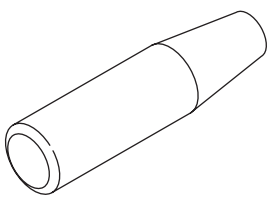
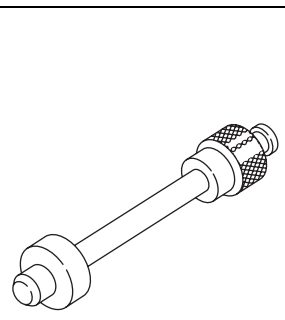
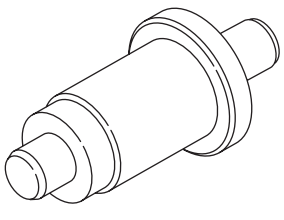
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926420000	926420000	PLUG	When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.
 ST-926400000	926400000	GUIDE	• Right side of rack when installing rack bushing. • Used with GUIDE (927660000).
 ST-927660000	927660000	GUIDE	• Right side of rack when installing rack bushing. • Used with GUIDE (926400000).
 ST-927620000	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927630000	927630000	STAND BASE	Used for assembling power steering gearbox.
 ST-926360000	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000).
 ST34199AE060	34199AE060	INSTALLER	Used for installing oil seal.
 ST-927610000	927610000	INSTALLER & REMOVER SEAL	Used for installing valve housing oil seal.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Spring scale	Used for measuring tightening torque.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring steering gearbox.

2. Steering Wheel

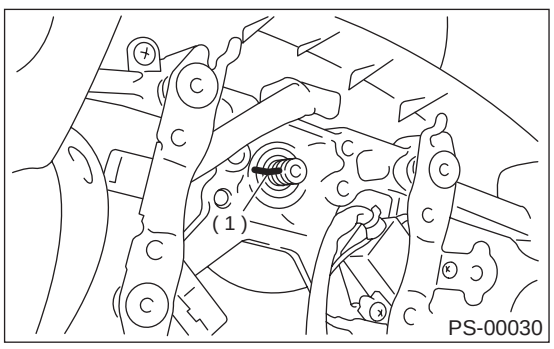
A: REMOVAL

1) Disconnect ground cable from battery.
2) Set tires to straight-ahead position.
3) Remove airbag module. <Ref. to AB-13, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped). <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

4) Remove steering wheel nut, and then draw out steering wheel from shaft using steering puller.

NOTE:
Make matching marks on steering wheel and steering column in advance.



(1) Matching mark

B: INSTALLATION

1) Align center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align matching marks on steering wheel and steering column.

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

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped). <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

C: INSPECTION

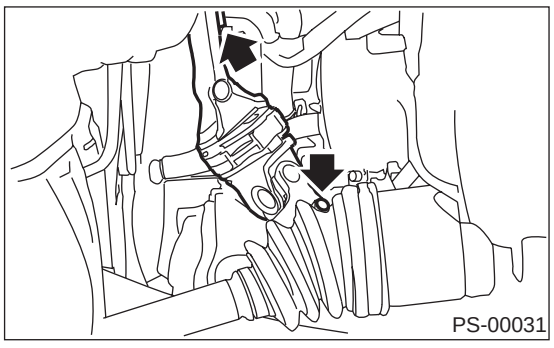
1) Check steering wheel for deformation. If the deformation is excessive, replace steering wheel.
2) Check splines on steering wheel for damage. If the damage is excessive, replace steering wheel.

3. Universal Joint

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
3) Lift-up the vehicle.
4) Remove universal joint bolts and then remove universal joint.

CAUTION:
Scribe alignment marks on universal joint so that it can be reassembled at the original serration.



B: INSTALLATION

1) Install universal joint.
   (1) Align bolts hole on the long yoke side of universal joint with the cutout at the serrated section of shaft end, and insert universal joint.
   (2) Align bolt hole on the short yoke side of universal joint with the cutout at the serrated section of gearbox assembly. Lower universal joint completely.
   (3) Temporarily tighten bolt on the short yoke side. Raise universal joint to make sure the bolt is properly passing through the cutout at the serrated section.
   (4) Tighten bolt on the long yoke, then that on the short yoke side.

Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
• Make sure that universal joint bolt is tightened through notch in shaft serration.
• Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 15 mm (0.59 in)

2) Lower the vehicle.
3) Align center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

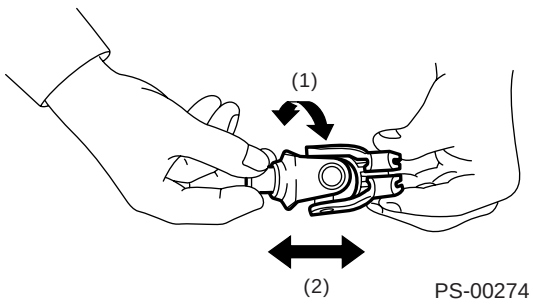
CAUTION:
Ensure that front wheel are set straight forward direction.

4) Install steering wheel and airbag module. <Ref. to PS-18, INSTALLATION, Steering Wheel.>

WARNING:
Always refer to “Airbag System” before performing airbag module service (if so equipped). <Ref. to AB-13, INSPECTION, Driver's Airbag Module.> and <Ref. to AB-13, INSTALLATION, Driver's Airbag Module.>

C: INSPECTION

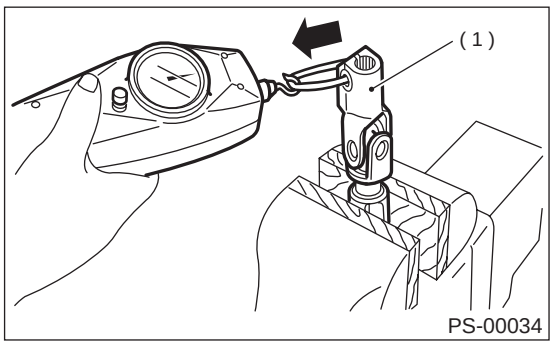
Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

Inspection	Corrective action
(1) Free play (2) Swinging torque Yawing torque Looseness  PS-00274 **Standard value of universal joint free play: 0 mm (0 in)** **Max. value of universal joint swinging torque: 0.3** N·m **(0.03 kgf-m, 0.2 ft-lb)**	Replace if faulty.

Measurement of folding torque of universal joint is as shown in the figures.

Service limit:

Maximum load; 5.49 N (0.56 kgf, 1.23 lb) or less

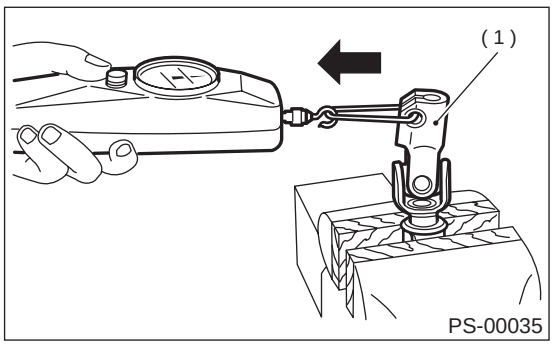


PS-00034

(1) Long yoke

Service limit:

Maximum load; 5.49 N (0.56 kgf, 1.23 lb) or less

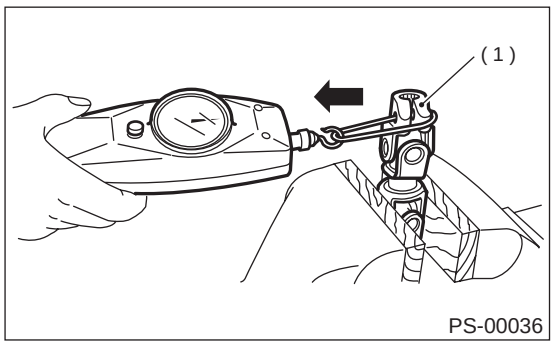


PS-00035

(1) Long yoke

Service limit:

Maximum load; 8.43 N (0.86 kgf, 1.90 lb) or less

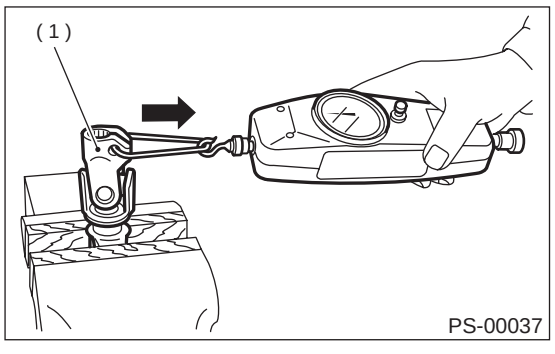


PS-00036

(1) Short yoke

Service limit:

Maximum load; 8.43 N (0.86 kgf, 1.90 lb) or less

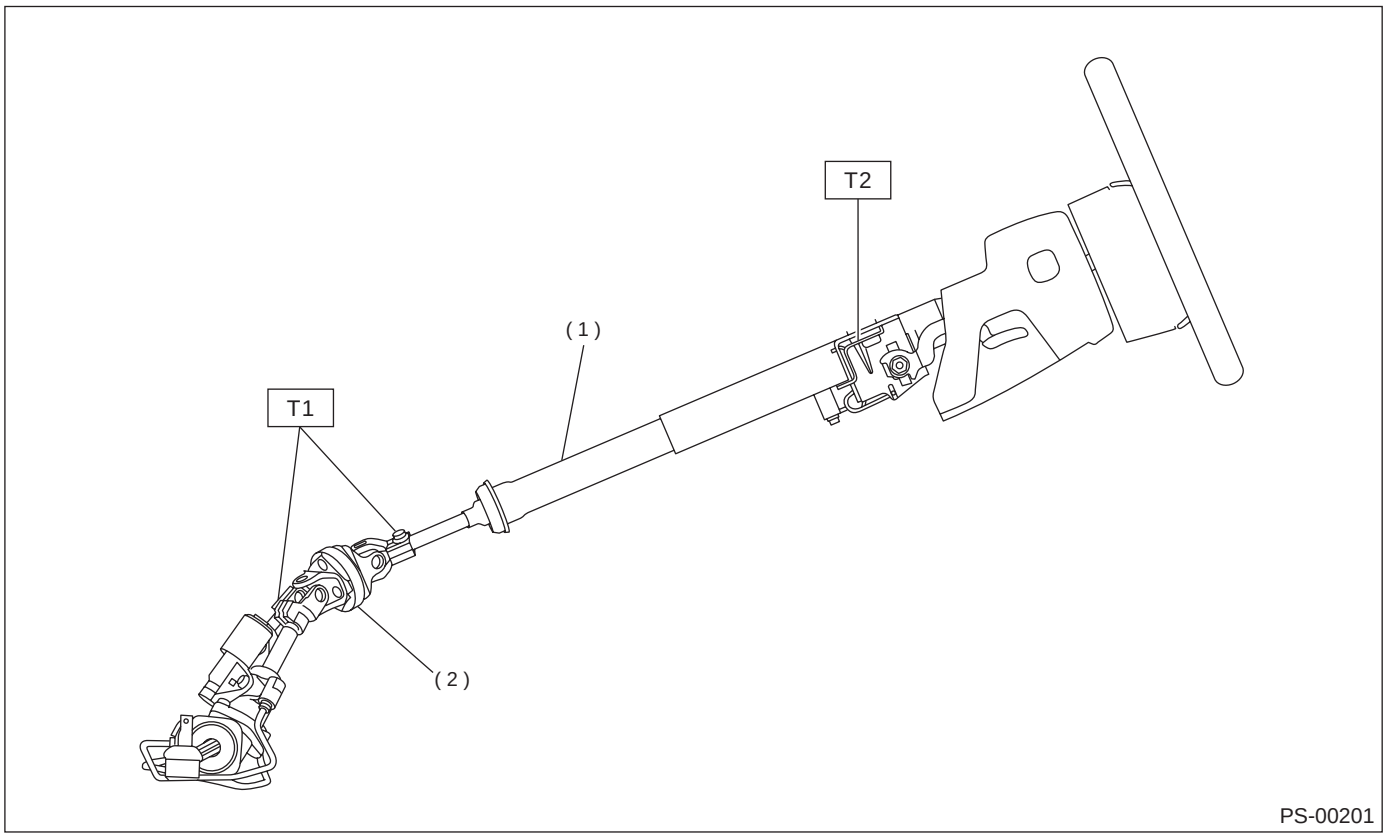


PS-00037

(1) Short yoke

4. Tilt Steering Column

A: REMOVAL



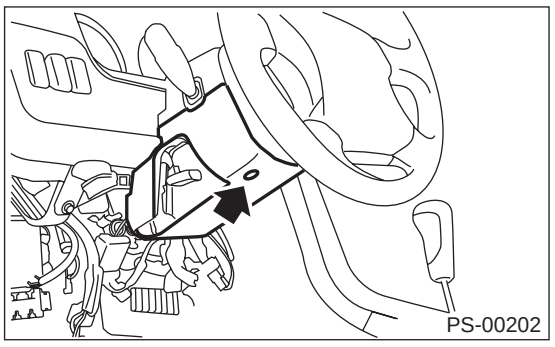
(1) Tilt steering column
(2) Universal joint

Tightening torque: N·m (kgf-m, ft-lb)
T1: 24 (2.4, 17.4)
T2: 25 (2.5, 18.1)

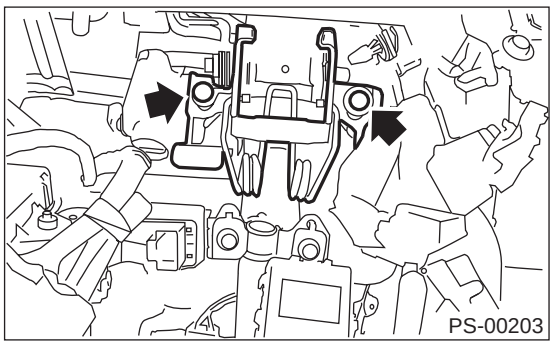
1) Set the vehicle on the lift.
2) Disconnect battery minus ground cable.
3) Remove airbag module. <Ref. to AB-13, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to “Airbag System” before performing airbag module service (if so equipped). <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

4) Remove steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
5) Lift-up the vehicle.
6) Remove universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
7) Lower the vehicle.
8) Remove trim panel under instrument panel.
9) Remove the screw securing lower steering column cover.


PS-00202

10) Remove all connectors from steering column.
11) Remove the two bolts under instrument panel securing steering column.

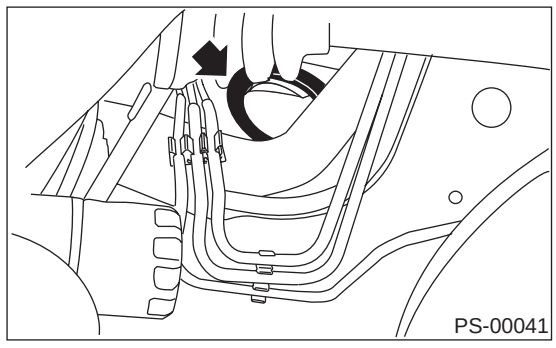

PS-00203

12) Pull out steering shaft assembly from hole on toe board.

CAUTION:
Be sure to remove universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing of other parts.

B: INSTALLATION

1) Set grommet to toe board.


PS-00041

2) Insert end of steering shaft into toe board grommet.
3) Tighten steering shaft mounting bolts under instrument panel.

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

4) Connect all connectors under instrument panel.
5) Connect airbag system connector at harness spool.

NOTE:
Make sure to apply double lock.

6) Install lower column cover with tilt lever held in the lowered position.
7) Install universal joint. <Ref. to PS-19, INSTALLATION, Universal Joint.>
8) Align center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

CAUTION:
Ensure that front wheels are set in straight forward direction.

9) Install steering wheel. <Ref. to PS-18, INSTALLATION, Steering Wheel.>
Set steering wheel to neutral and install it onto steering shaft.

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

10) Install airbag module to steering wheel.

WARNING:
Always refer to “Airbag System” before performing the service operation. <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and the two screws securing combination switch, then remove related parts.

D: ASSEMBLY

1) Insert combination switch to upper column shaft, and install upper column cover. Then route ignition key harness and combination switch harness between column cover mounting bosses.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

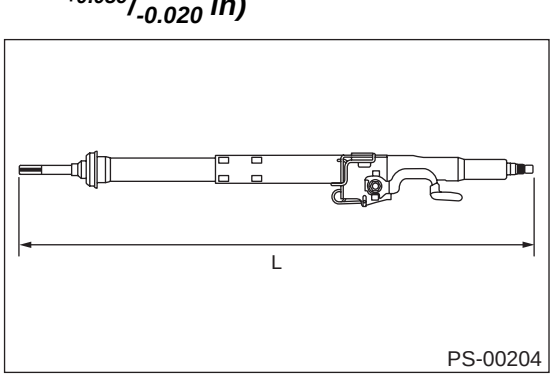
CAUTION:
Don't overtorque screw.

E: INSPECTION

1. BASIC INSPECTION

Measure overall length of steering column and if it is out of standard value, replace it.

Standard value:
Overall length (L)
Except OUTBACK model: $849^{+1.5}_{-0.5}$ mm ($33.425^{+0.059}_{-0.020}$ in)
OUTBACK model: $817^{+1.5}_{-0.5}$ mm ($32.197^{+0.059}_{-0.020}$ in)



2. AIRBAG MODEL INSPECTION

WARNING:
For airbag model inspection procedures, refer to “Airbag System”. <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

5. Steering Gearbox

A: REMOVAL

1) Disconnect battery ground cable.
2) Loosen front wheel nut.
3) Lift vehicle and remove front wheels.
4) Remove front exhaust pipe assembly.

2.5 L model

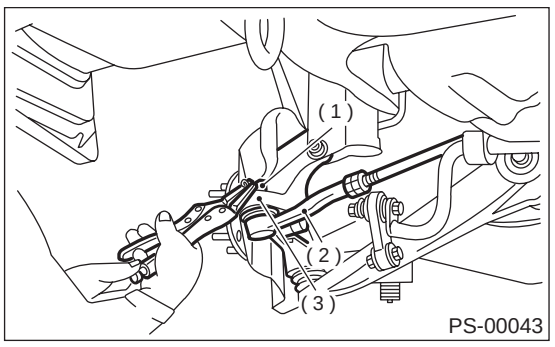
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>

3.0 L model

<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>

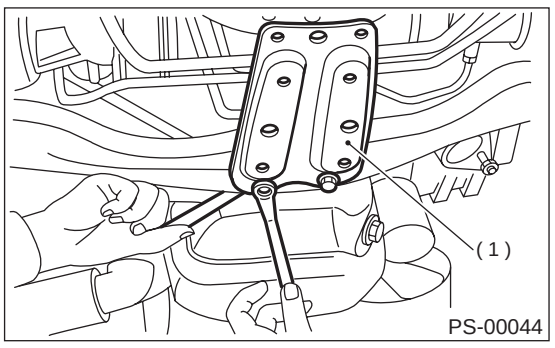
WARNING:
Be careful, exhaust pipe is hot.

5) Using a puller, remove tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



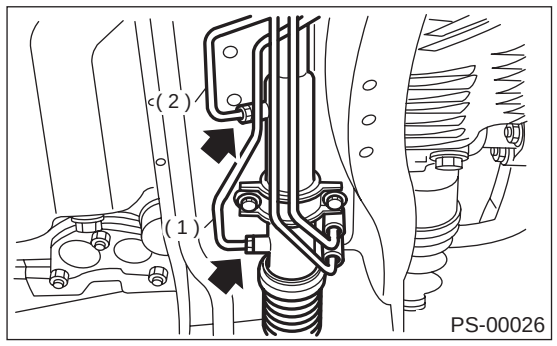
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

6) Remove jack-up plate and front stabilizer. <Ref. to FS-23, REMOVAL, Front Stabilizer.>



(1) Jack-up plate

7) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

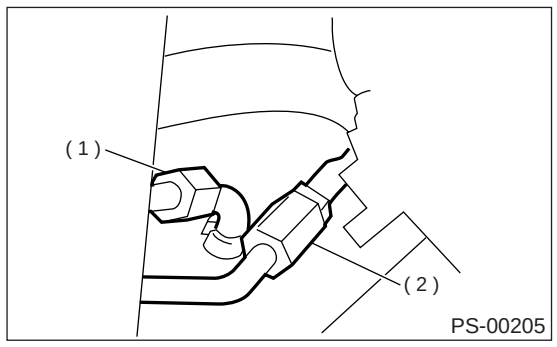


(1) Pipe A
(2) Pipe B

8) Remove universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
9) Disconnect pipes C (Pressure pipe assembly) and D (Return pipe assembly) from pipe of gearbox.

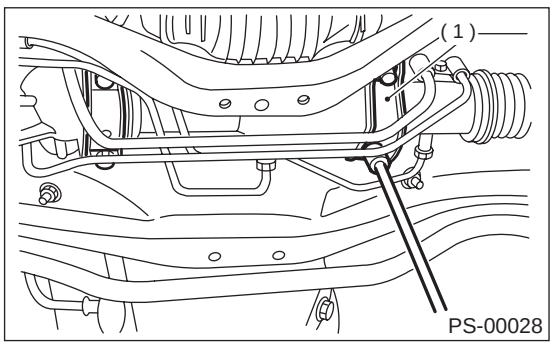
CAUTION:
Be careful not to damage these pipes.

NOTE:
Disconnect upper pipe D (Return hose assembly) first, and lower pipe C (Pressure hose assembly) second.



(1) Pipe C
(2) Pipe D

10) Remove clamp bolts securing gearbox to crossmember, and remove gearbox.

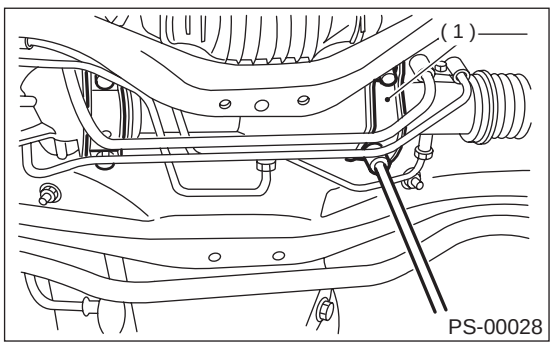


(1) Clamp

B: INSTALLATION

1) Insert gearbox into crossmember, being careful not to damage gearbox boot.
2) Tighten gearbox to crossmember bracket via clamp with bolt to the specified torque.

Tightening torque:
59 N·m (6.0 kgf-m, 43 ft-lb)

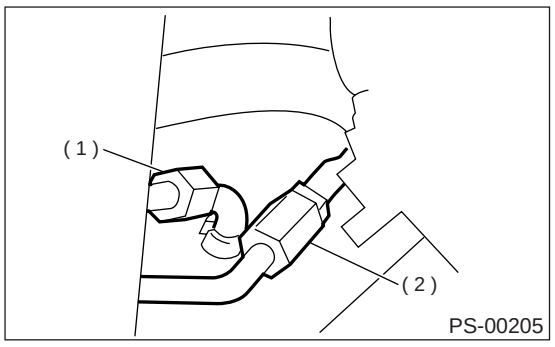


(1) Clamp

3) Connect pipes C and D to pipe of gearbox.

NOTE:
Connect lower pipe C first, and upper pipe D second.

CAUTION:
Be careful not to damage these pipes.

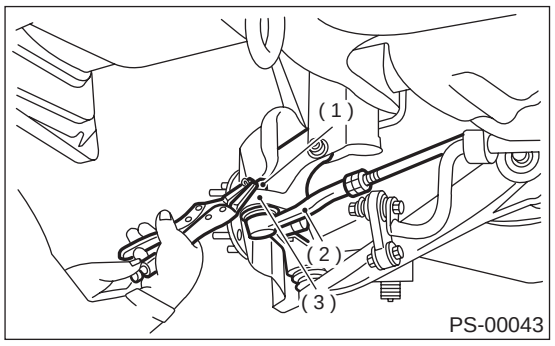


(1) Pipe C
(2) Pipe D

4) Install universal joint. <Ref. to PS-19, INSTALLATION, Universal Joint.>
5) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

Castle nut tightening torque:
Tighten to 27.0 N·m (2.75 kgf-m, 19.9 ft-lb), and tighten further within 60° until cotter pin hole is aligned with a slot in the nut.

CAUTION:
When connecting, do not hit cap at the bottom of tie-rod end with hammer.



(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

6) Install front stabilizer to vehicle. <Ref. to FS-23, INSTALLATION, Front Stabilizer.>

7) Install front exhaust pipe assembly. <Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

2.5 L model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

3.0 L model
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>

8) Install tires.
9) Tighten wheel nuts to the specified torque.

Tightening torque:
88 N·m (9.0 kgf-m, 65 ft-lb)

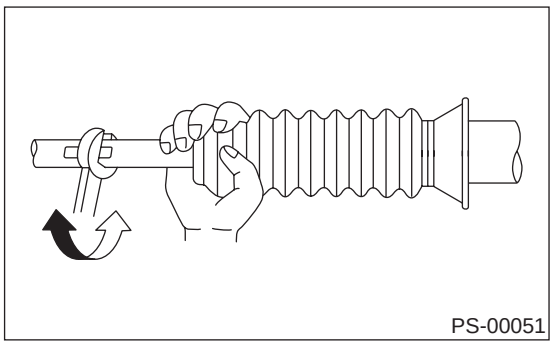
10) Connect battery ground cable.
11) Pour fluid into oil tank, and bleed air.
<Ref. to PS-63, Power Steering Fluid.>
12) Check for fluid leaks. <Ref. to PS-41, OIL LEAKING, INSPECTION, Steering Gearbox.>
13) Install jack-up plate.

WARNING:
Be careful, exhaust manifold is hot.

14) Lower vehicle.
15) Check fluid level in oil tank.
16) After adjusting toe-in and steering angle, tighten lock nut on tie-rod end.

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

CAUTION:
When adjusting toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.

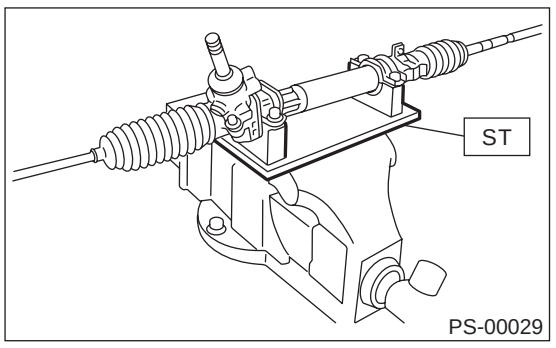

PS-00051

C: DISASSEMBLY

1. RACK HOUSING ASSEMBLY

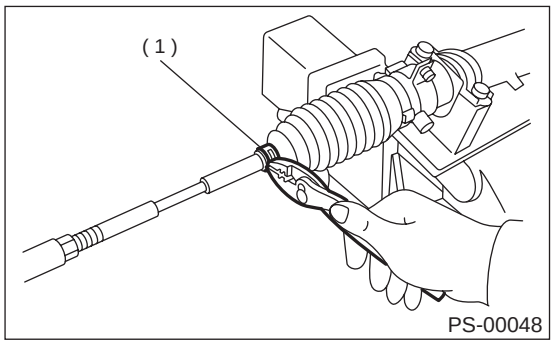
1) Disconnect four pipes from gearbox.
2) Secure gearbox removed from vehicle in vise using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox in a vise using the ST as shown. Do not attempt to secure it without this ST.



PS-00029

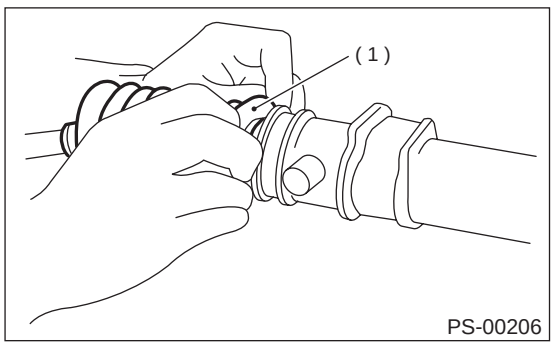
3) Remove tie-rod end and lock nut from gearbox.
4) Remove small clip from boot using pliers, and move boot to tie-rod end side.



PS-00048

(1) Clip

5) Remove boot with large clips.

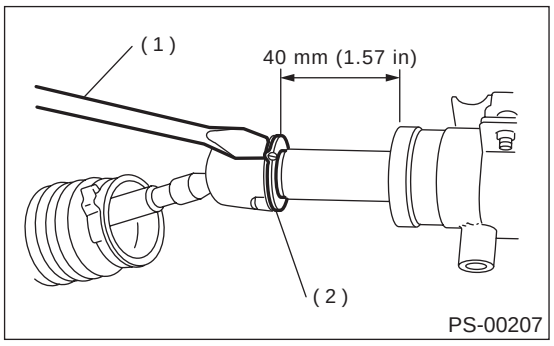


PS-00206

(1) Boot

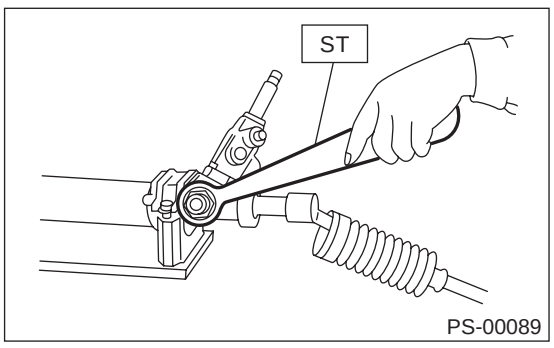
6) Extend rack approximately 40 mm (1.57 in) out. Unlock lock wire at lock washer on each side of tie-rod end using a standard screwdriver.

CAUTION:
Be careful not to scratch rack surface as oil leaks may result.

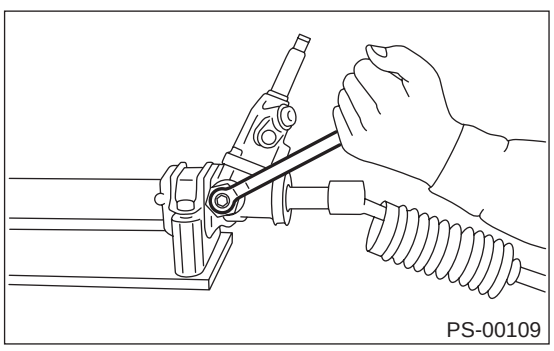


(1) Standard screwdriver
(2) Lock washer

7) Using ST, loosen lock nut.
ST 926230000 SPANNER

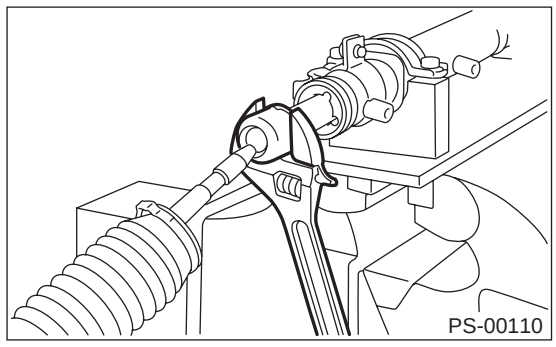


8) Tighten adjusting screw until it no longer tightens.



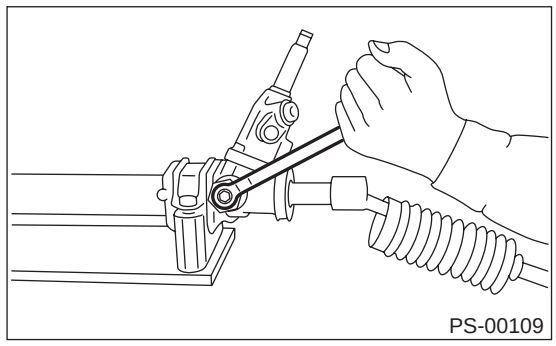
9) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove tie-rod.

CAUTION:
• Check ball joint for free play, and tie-rod for bends. Replace if necessary.
• Check dust seals used with tie-rod end ball joint for damage or deterioration. Replace if necessary.

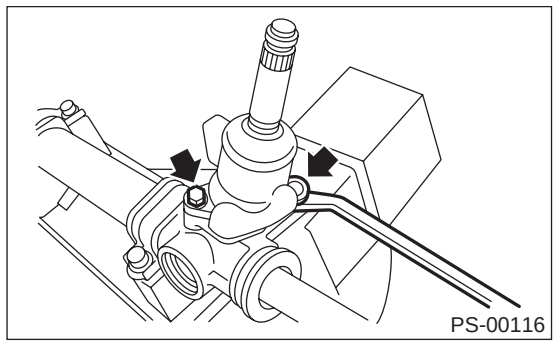


10) Loosen adjusting screw and remove spring and sleeve.

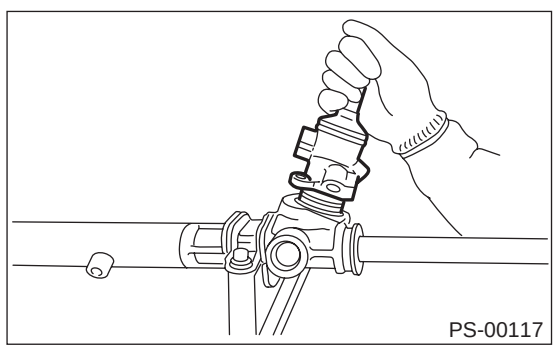
CAUTION:
Replace spring and/or sleeve if damaged.



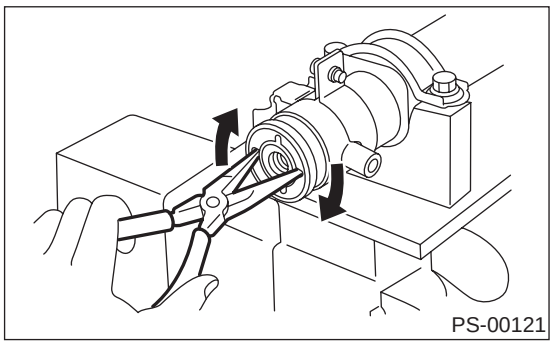
11) Remove two bolts securing valve assembly.



12) Carefully draw out input shaft and remove valve assembly.

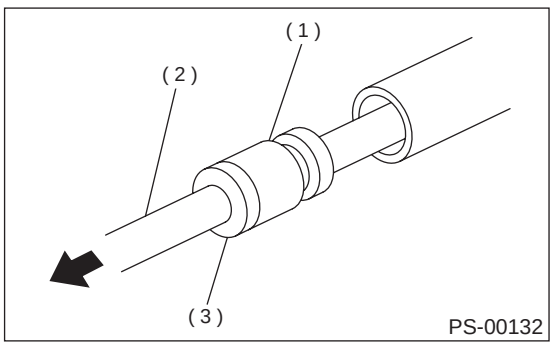


13) Using a sharp pointed pliers, rotate the rack stopper in the direction of the arrow until the end of the circlip comes out of the stopper. Rotate the circlip in the opposite direction and pull it out.



14) Pull rack assembly from cylinder side, and draw out rack bushing and rack stopper together with rack assembly.

CAUTION:
Be careful not to contact rack to inner wall of cylinder when drawing out. Any scratch on cylinder inner wall will cause oil leakage.

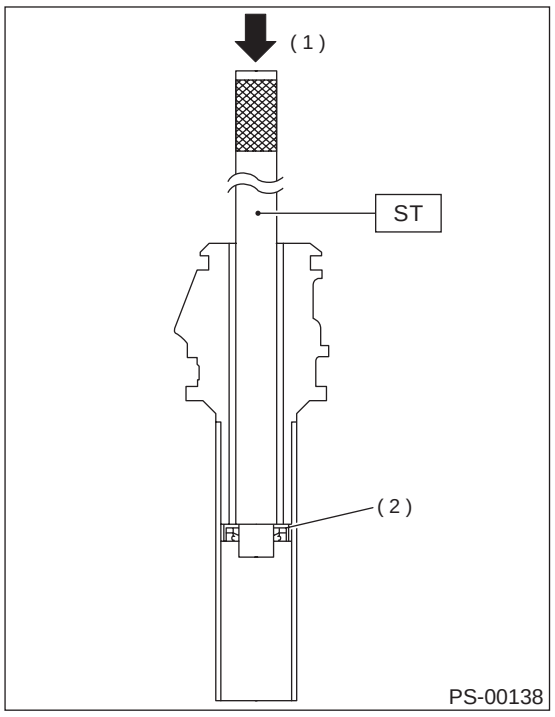


(1) Rack bushing
(2) Rack ASSY
(3) Rack stopper

15) Remove rack bushing and rack stopper from rack assembly.

CAUTION:
Do not reuse removed rack bushing and circlip.

16) Insert ST from pinion housing side and remove oil seal using a press.
ST 34199AE050 OIL SEAL REMOVER



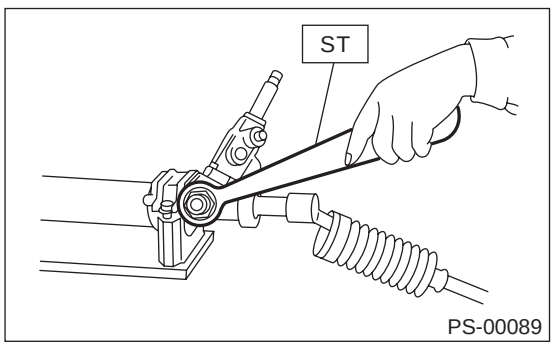
(1) Press
(2) Oil seal

NOTE:
Discard removed oil seal.

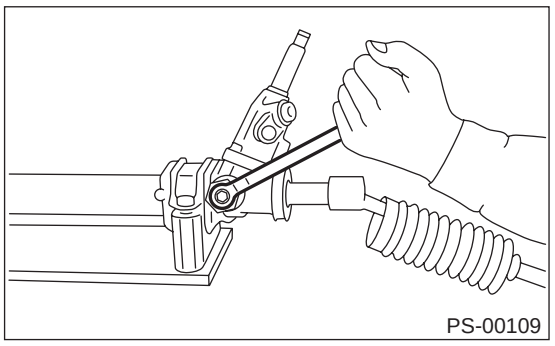
2. CONTROL VALVE ASSEMBLY

NOTE:
Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

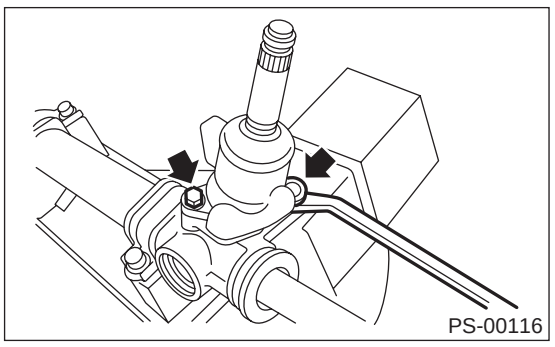
1) Using ST, loosen lock nut.
ST 926230000 SPANNER



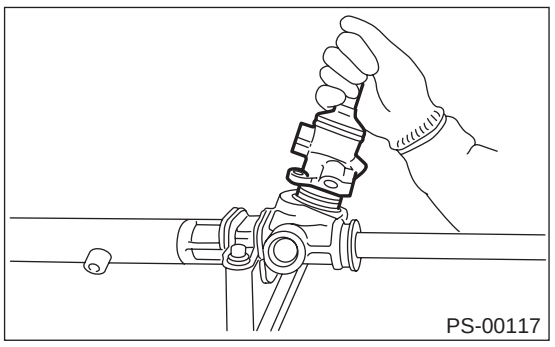
2) Tighten adjusting screw until it no longer tightens.


PS-00109

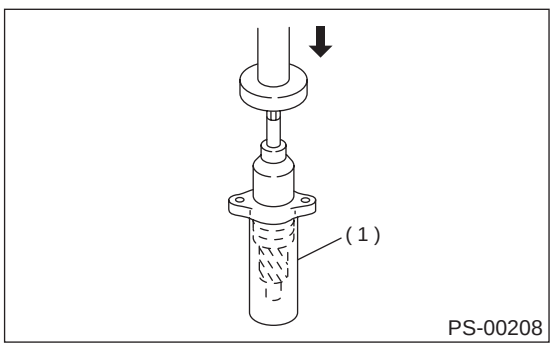
3) Remove two bolts securing valve assembly.


PS-00116

4) Carefully draw out input shaft and remove valve assembly.


PS-00117

5) Draw out pinion and valve assembly from valve housing, using pipe of I.D. 44 to 46 mm (1.73 to 1.81 in) and a press.

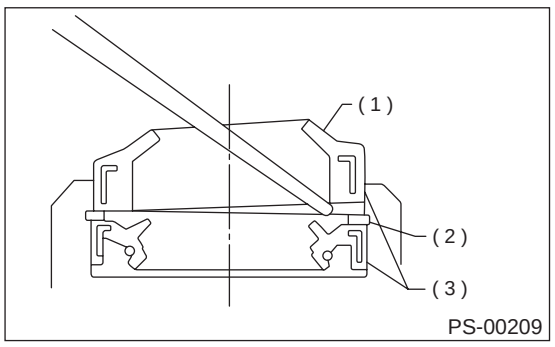


PS-00208

(1) Pipe

6) Pry off dust seal using screwdriver.

7) Remove snap ring using snap ring pliers.

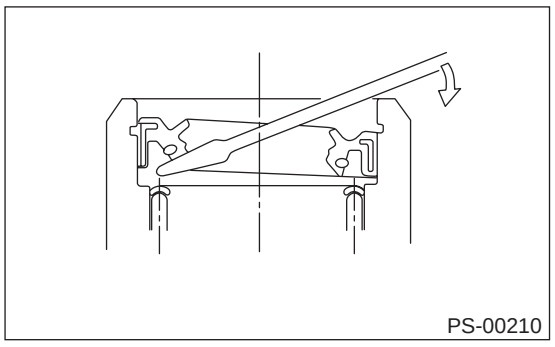


PS-00209

(1) Dust seal
(2) Snap ring
(3) Oil seal

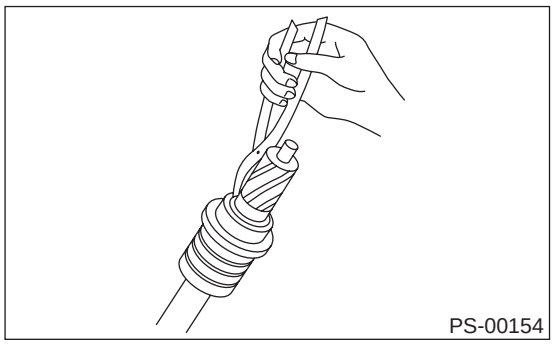
8) Pry off oil seal using screwdriver.

CAUTION:
After removing, check inside surface of valve housing for damage. If oil seal contacting surface is damaged, replace valve housing with a new one.


PS-00210

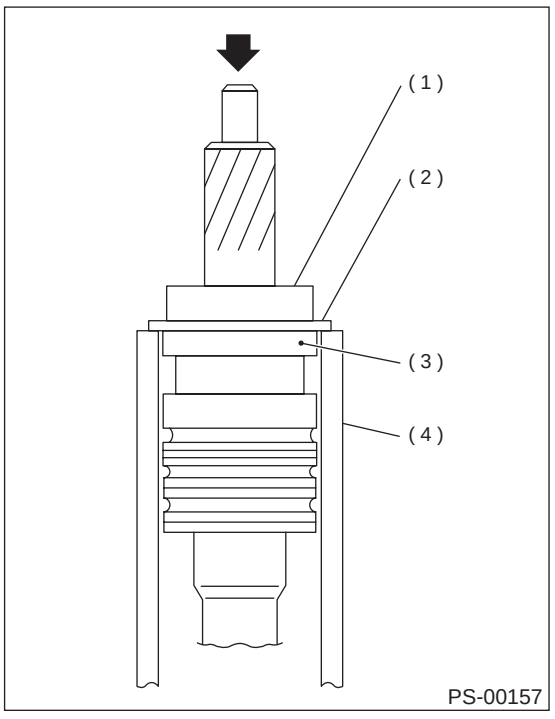
9) Remove snap ring using snap ring pliers.

CAUTION:
- **Do not reuse removed snap ring.**
- **Be careful not to scratch pinion and valve assembly.**


PS-00154

10) Press out bearing together with backing washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.

CAUTION:
Do not reuse removed bearing.



(1) Bearing
(2) Backing washer
(3) Oil seal
(4) Pipe

11) Remove oil seal.

CAUTION:
Do not reuse removed oil seal.

D: ASSEMBLY

1. RACK HOUSING ASSEMBLY

CAUTION:
Use only SUBARU genuine grease for gearbox.

Grease:
VALIANT GREASE M2
[Part No. 003608001, net 0.5 kg (1.1 lb)]

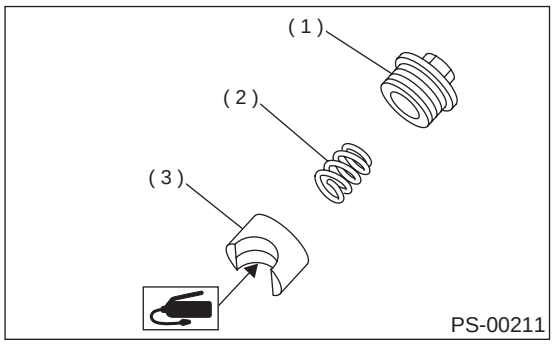
1) Clean all parts and tools before reassembling.
2) Apply grease to teeth of rack so that grease applied is about as high as teeth, and also apply a thin film of grease to sliding portion of rack shaft.

CAUTION:
• When moving rack to stroke end without tie-rod attached, prevent shocks from being applied at the end.
• Do not apply grease to threaded portion at end of rack shaft.
• Move rack shaft to stroke end two (2) or three (3) times to squeeze grease which accumulates on both ends. Remove grease to prevent it from choking air passage hole.

3) Apply grease to sleeve insertion hole.
4) Apply grease to dust seal insertion hole.

CAUTION:
Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

5) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.

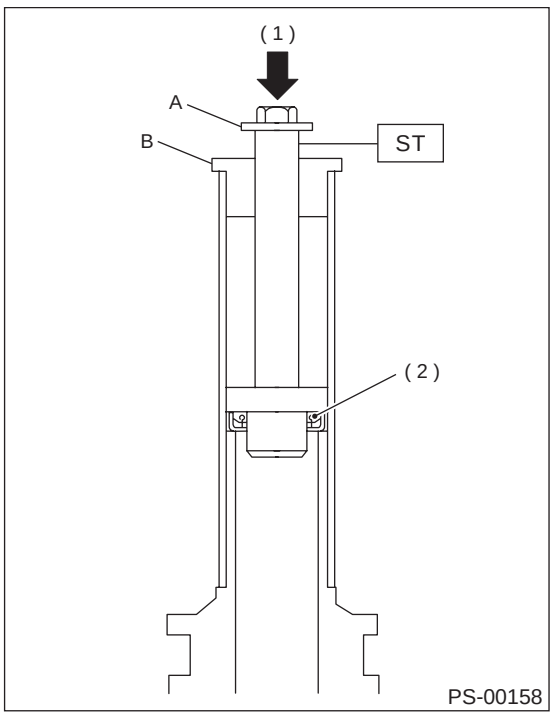


(1) Adjusting screw
(2) Spring
(3) Sleeve

6) Force-fit oil seal using ST.
ST 34199AE060 INSTALLER

CAUTION:
Be careful not to damage or scratch cylinder inner wall.

NOTE:
• Apply specified power steering fluid to oil seal.
• Pay special attention not to install oil seal in wrong direction.
• Push oil seal until the stepped portion of A contacts end face of B.

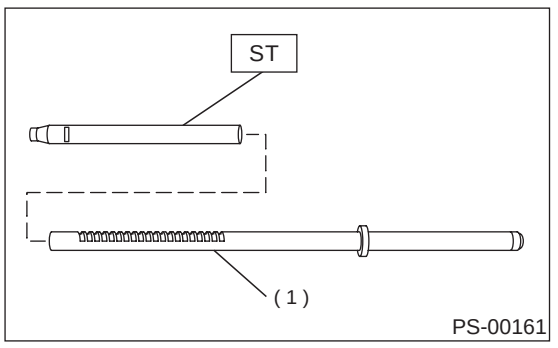


(1) Press
(2) Oil seal

7) Fixing rack housing
Fix rack housing in vise using ST.
ST 926200000 STAND

CAUTION:
• When fixing rack housing in vise, be sure to use this special tool. Do not fix rack housing in vise using pad such as aluminum plates, etc.
• When using old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

8) Fit ST over toothed portion of rack assembly, and check for binding or unsmooth insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.
ST 926390001 COVER & REMOVER



(1) Rack ASSY

9) Apply genuine grease to teeth of thoroughly washed rack assembly, and fit ST over the toothed portion.

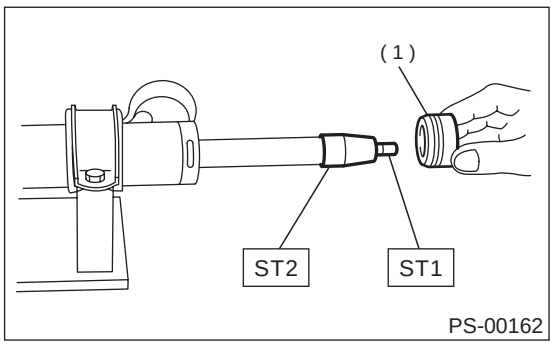
CAUTION:
• Be careful not to block air passage hole with grease. Remove excessive grease.
• After fitting cover, check air passage hole for clogging. If clogged, open by removing grease from the hole.
• Check rack shaft for damage.
• Apply specified power steering fluid to this ST and surface of piston ring to prevent seal from being damaged.

10) Insert rack assembly into rack housing from cylinder side, and remove ST after it has passed completely through oil seal.

NOTE:
Before inserting rack assembly, apply a coat of specified power steering fluid to surfaces of ST and rack piston.
ST 926390001 COVER & REMOVER

11) Fit ST1 and ST2 over the end of rack, and install rack bushing.
ST1 926400000 GUIDE
ST2 927660000 GUIDE

CAUTION:
• If burrs, or nicks are found on this guide and rack shaft portion, remove by filing.
• Dip rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.

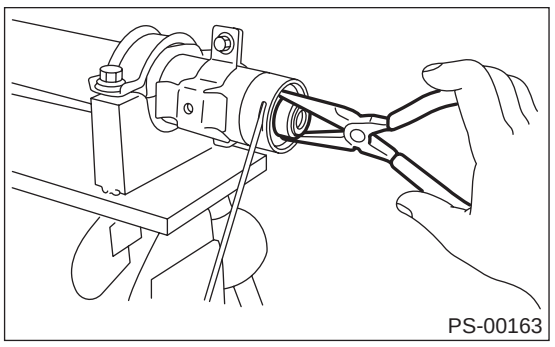


(1) Rack bushing ASSY

12) Insert rack stopper into cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn rack stopper with ST so that rack stopper hole is seen through cylinder slits.
13) Insert rack stopper into rack housing, and wrap circlip using a sharp pointed pliers to secure rack stopper in position.

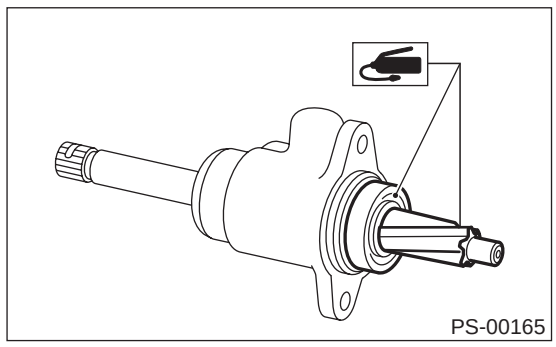
CAUTION:
Be careful not to scratch rack while winding circlip.

NOTE:
Rotate wrench another 90 to 180° after the end of circlip has been wrapped in.



14) Fit mounting rubber onto rack housing.

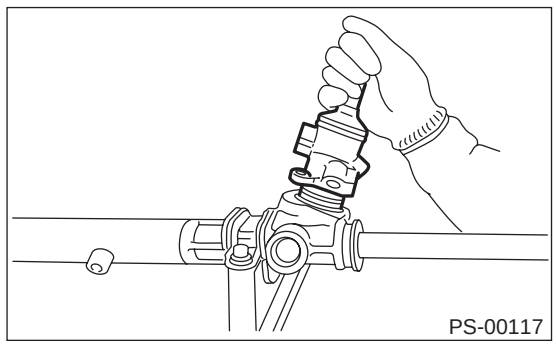
15) Apply genuine grease to pinion gear and bearing of valve assembly.



16) Install gasket on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

CAUTION:
Be sure to use a new gasket.

NOTE:
Do not allow packing to be caught when installing valve assembly.



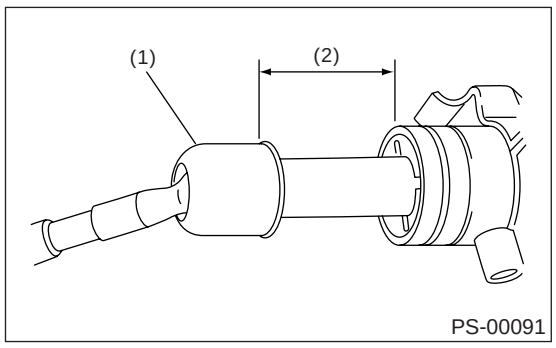
17) Tighten bolts alternately to secure valve assembly.

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

CAUTION:
Be sure to alternately tighten bolts.

18) Install lock washers and tighten left and right tie-rods into rack ends.

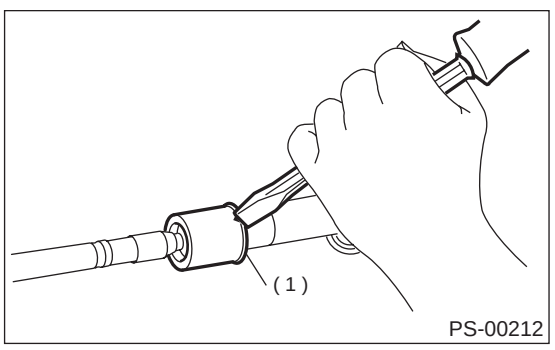
Tightening torque:
78 N·m (8.0 kgf-m, 58 ft-lb)



(1) Tie-rod
(2) Approx. 40 mm (1.57 in)

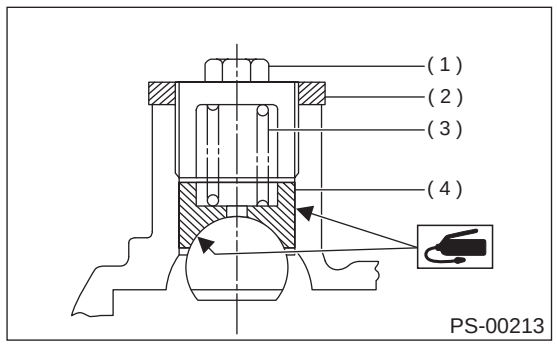
19) Bend lock washer, using chisel.

CAUTION:
Be careful not to scratch rack when bending lock washer.



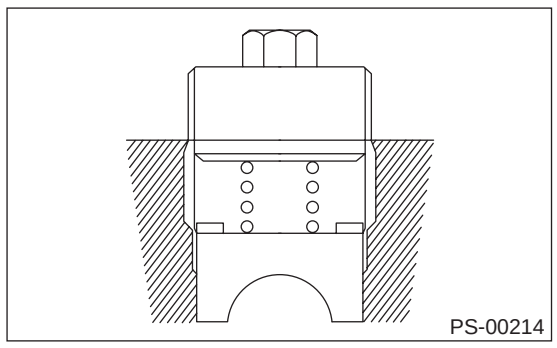
(1) Lock washer

20) Rack and pinion backlash adjustment
(1) Loosen adjusting screw.
(2) Rotate input shaft so that rack is in the straight ahead direction.
(3) Apply grease to sleeve.



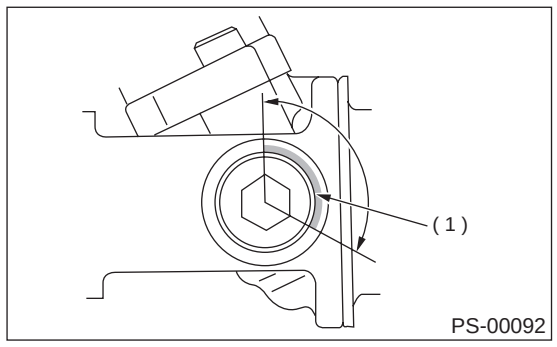
(1) Adjusting screw
(2) Lock nut
(3) Spring
(4) Sleeve

(4) Tighten adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



(1) Apply liquid packing to at least 1/3 of entire perimeter.

(6) Tighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.
(7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

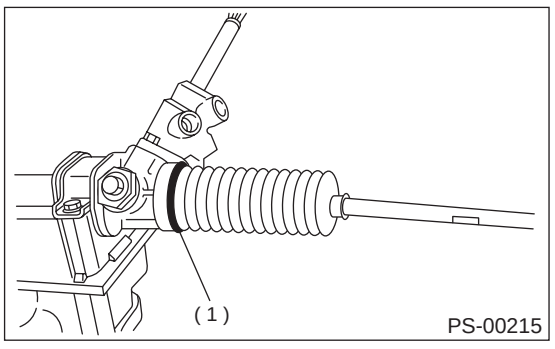
Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

NOTE:
• Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.
• Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

21) Inspect for service limit as per article of “Service limit”. <Ref. to PS-39, SERVICE LIMIT, INSPECTION, Steering Gearbox.> Make replacement and adjustment if necessary.
22) Install boot to housing.

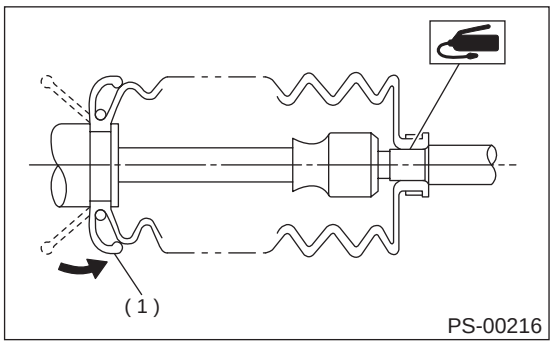
NOTE:
• Before installing boot, be sure to apply grease to the groove of tie-rod.
• Install fitting portions of boots to the following portions in both sides of assembled steering gearbox.
The groove on gearbox
The groove on the rod
• Make sure that boot is installed without unusual inflation or deflation.

23) Fit clip (large) to boot, and then install boot to gearbox while holding boot flange. After installing boot, fold back boot flange to the extent that large clip cannot be seen.



(1) Clip (large)

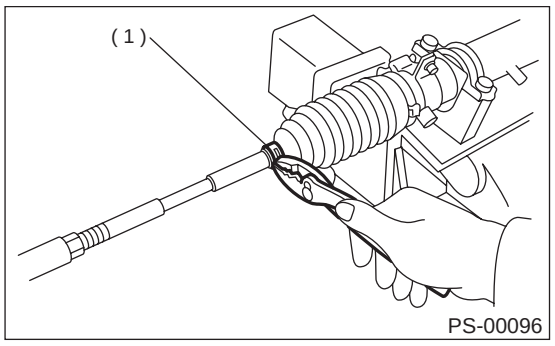
24) Turn boot until it seats well on gearbox and rubber mounting, then bend boot flange back.



(1) Reverse after installing

25) Fix boot end with clip (small).

CAUTION:
After installing, check boot end is positioned into groove on tie-rod.

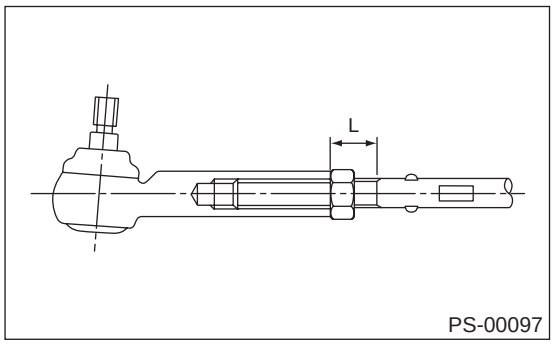


(1) Clip

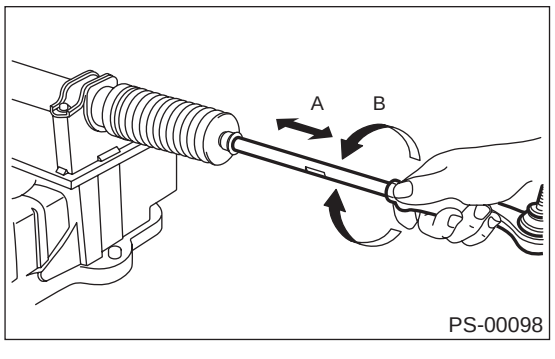
26) If tie-rod end was removed, screw in lock nut and tie-rod end to screwed portion of tie-rod, and tighten lock nut temporarily in a position as shown in figure.

Installed tie-rod length: L
15 mm (0.59 in)

NOTE:
Pay attention to difference between right and left tie-rod ends.



27) Inspect gearbox as follows:
“A” Holding tie-rod end, repeat lock to lock two or three times as quickly as possible.
“B” Holding tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that boot is installed in the specified position without deflation.

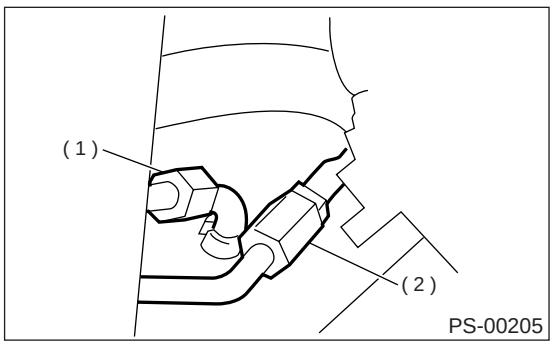


28) Remove gearbox from ST.
ST 926200000 STAND
29) Install four pipes on gearbox.
(1) Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect pipes C and D to gearbox.
Connect lower pipe C first, and upper pipe D second.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



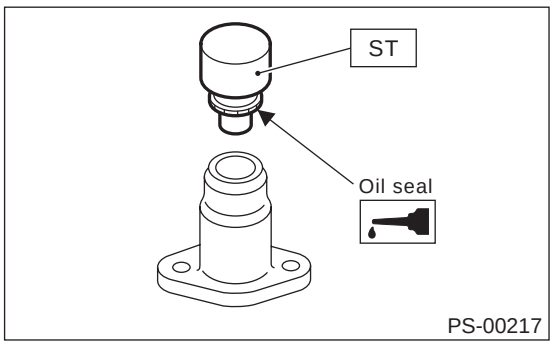
(1) Pipe C
(2) Pipe D

2. CONTROL VALVE ASSEMBLY

Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

1) Clean all parts and tools before reassembling.
2) Press-fit oil seal into valve housing using ST and press.
ST 927610000 INSTALLER

NOTE:
Before fitting, coat oil seal fully with ATF DEXRON ATF DEXRON III or equivalent.



3) Fit snap ring in snap ring groove using snap ring pliers.

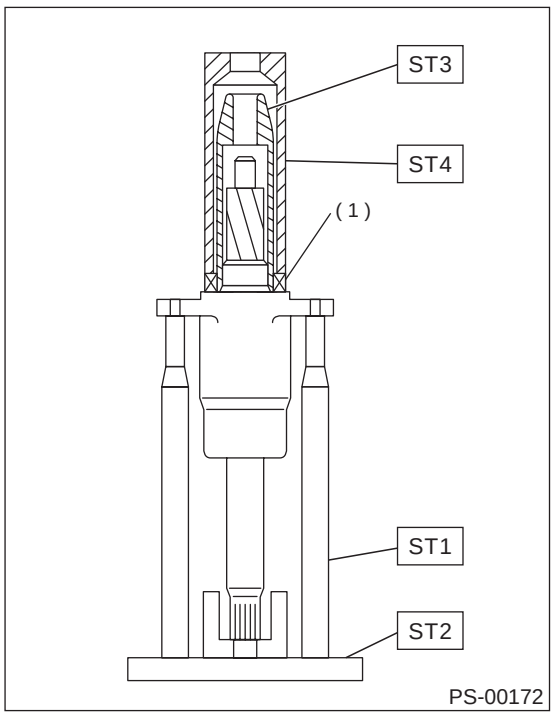
CAUTION:
Be careful not to scratch oil seal with snap ring pliers.

NOTE:
Rotate snap ring to check for proper installation.

4) Put vinyl tape around pinion shaft splines to protect oil seal from damage.
5) Fit pinion and valve assembly into valve housing.

NOTE:
Apply specified power steering fluid to outer diameter surface of input shaft and outer surface of valve body seal ring, and pay special attention not to damage seal when inserting pinion and valve assembly.

6) Secure valve assembly to ST1 and ST2.
7) Put ST3 over pinion, and insert oil seal, then force-fit oil seal into housing using ST4.
ST1 926370000 INSTALLER A
ST2 927630000 STAND BASE
ST3 926360000 INSTALLER A
ST4 927620000 INSTALLER B

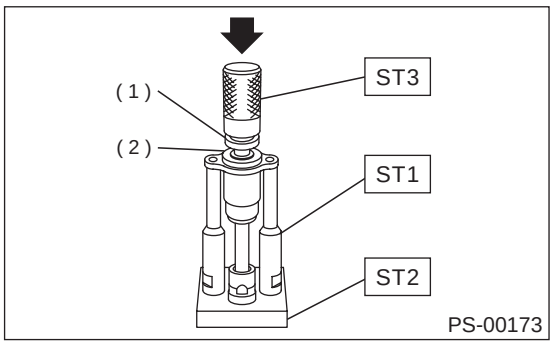


(1) Oil seal

NOTE:
• Apply specified power steering fluid to oil seal and ST3, being careful not to damage oil seal lip.
• Push oil seal until ST3 contacts housing end face.

8) Remove ST3, and fit backing washer.

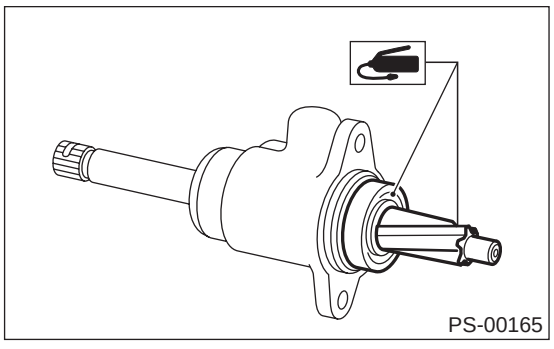
9) Force-fit ball bearing using ST3.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 927640000 INSTALLER B



(1) Ball bearing
(2) Backing washer

NOTE:
Be careful not to tilt ball bearing during installation.

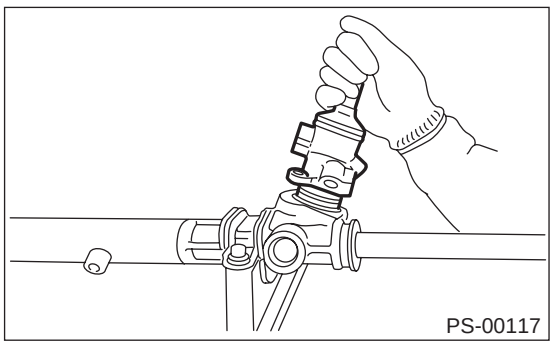
10) Apply genuine grease to pinion gear and bearing of valve assembly.



11) Install gasket on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

CAUTION:
Be sure to use a new gasket.

NOTE:
Do not allow packing to be caught when installing valve assembly.



12) Tighten bolts alternately to secure valve assembly.

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

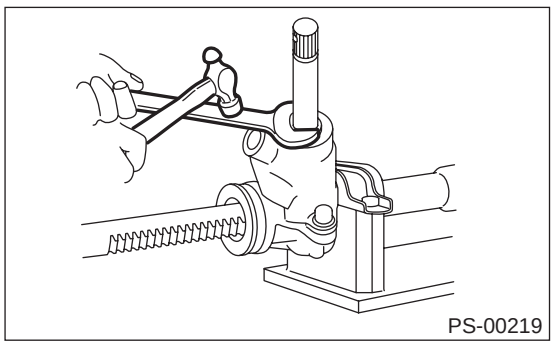
CAUTION:
Be sure to alternately tighten bolts.

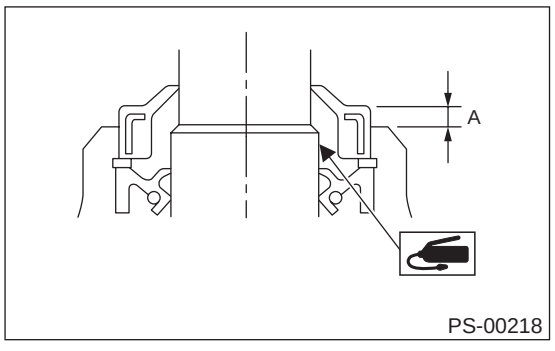
13) Apply grease to sleeve insertion hole.
14) Apply grease to dust seal insertion hole.

CAUTION:
Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

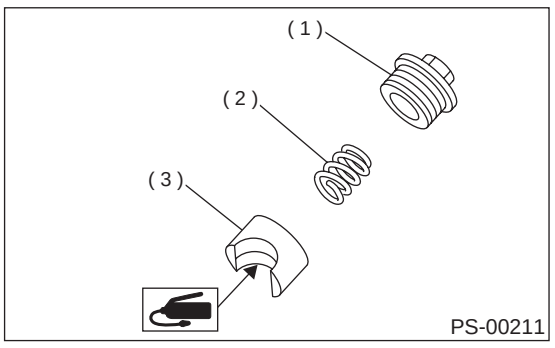
15) Press-fit dust seal into gearbox housing while tapping it via a spanner or the like so that stepping between gearbox and dust seal is normally 2 mm (0.08 in).

Depth: A
2 mm (0.08 in)



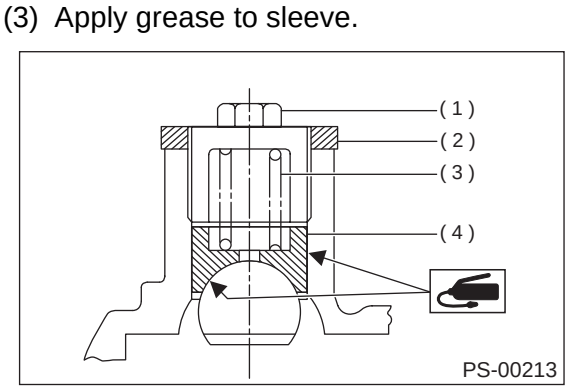


16) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.



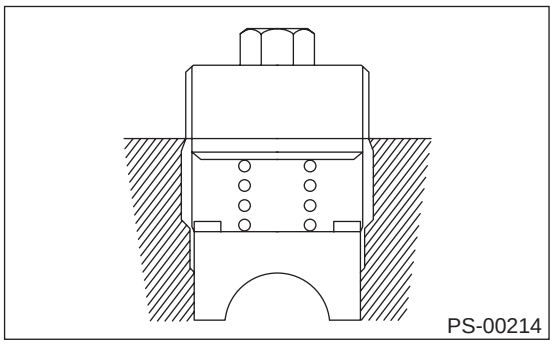
(1) Adjusting screw
(2) Spring
(3) Sleeve

17) Rack and pinion backlash adjustment
(1) Loosen adjusting screw.
(2) Rotate input shaft so that rack is in the straight ahead direction.
(3) Apply grease to sleeve.



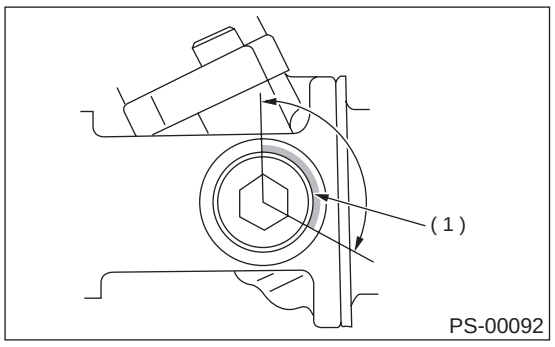
(1) Adjusting screw
(2) Lock nut
(3) Spring
(4) Sleeve

(4) Tighten adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



(1) Apply liquid packing to at least 1/3 of entire perimeter.

(6) Tighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.
(7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

NOTE:
• Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.
• Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

18) Check for service limit as per article of “Service limit”. <Ref. to PS-39, SERVICE LIMIT, INSPECTION, Steering Gearbox.> Make replacement and adjustment if necessary.

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check inside of gearbox for water. If any water is found, carefully check boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If bend or damage is excessive, replace entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If outer wall slips, lip is worn out or damage is found, replace it with new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust backlash properly. By measuring turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace gearbox with new one.
		(4) Wear or damage on rack bush	If free play of rack shaft in radial direction is out of the specified range, replace gearbox with new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If free plays of input shaft in radial and axial directions are out of the specified ranges, replace gearbox with new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT

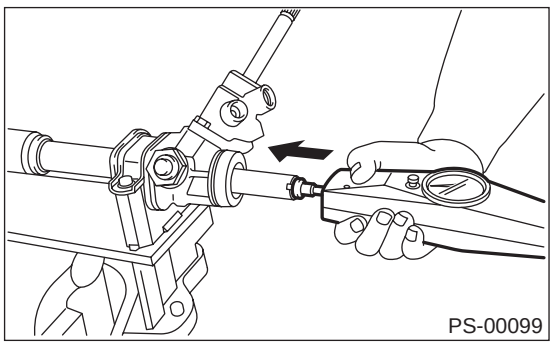
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

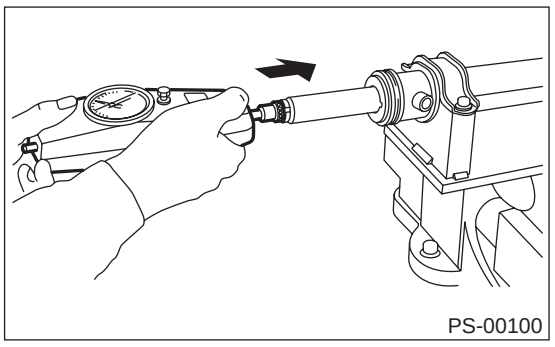
NOTE:
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
304 N (31 kgf, 68 lb) or less



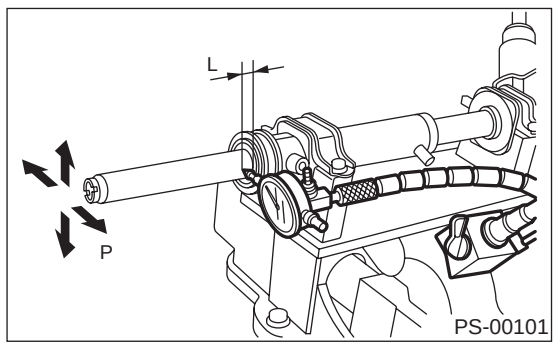


3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

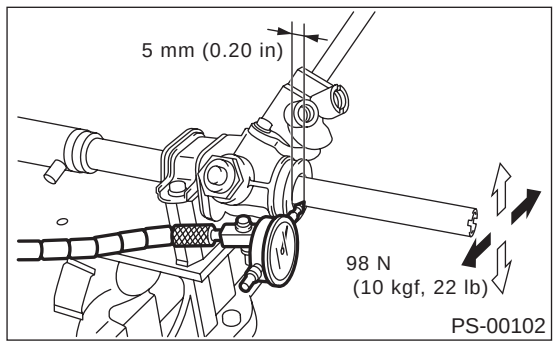
Service limit
0.19 mm (0.0075 in) or less

On condition
L: 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lb)



Left-turn steering:

Service limit
Direction ⇔
0.3 mm (0.012 in) or less
Direction ⇔
0.15 mm (0.0059 in) or less

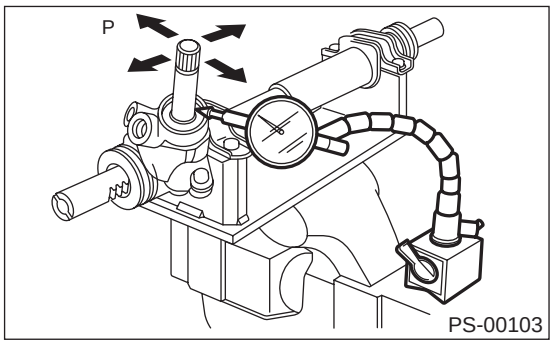


4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

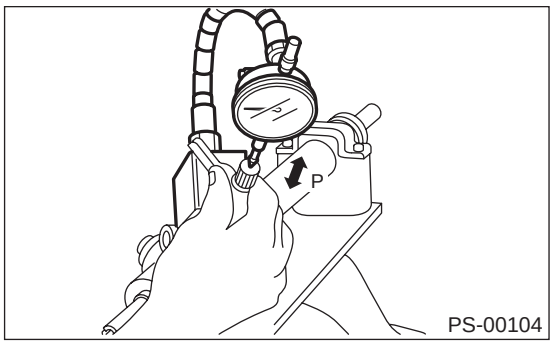
On condition
P: 98 N (10 kgf, 22 lb)



In axial direction:

Service limit
0.5 mm (0.020 in) or less

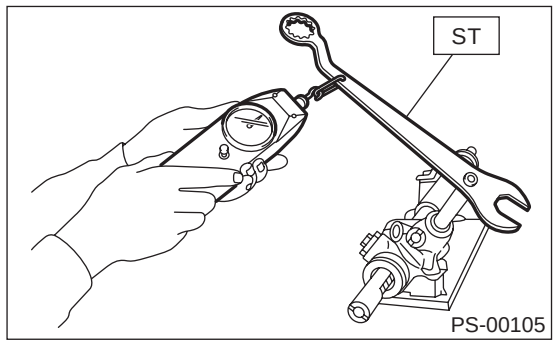
On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



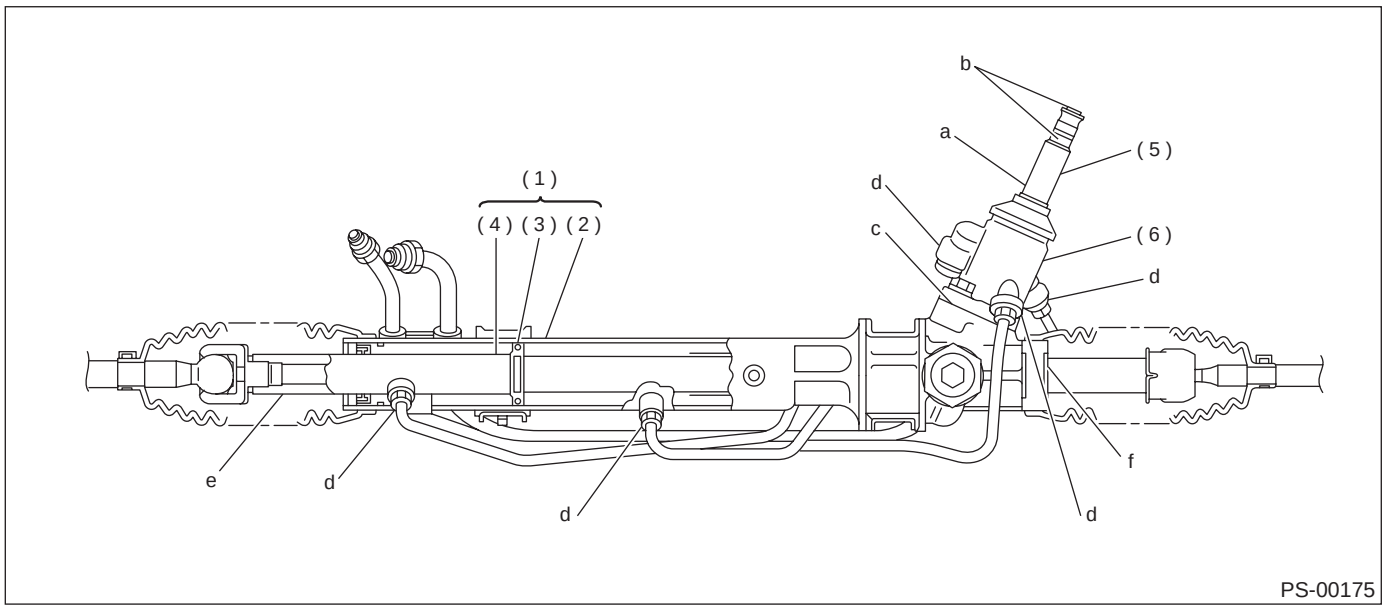
5. TURNING RESISTANCE OF GEARBOX

Using ST, measure gearbox turning resistance.
ST 926230000 SPANNER

Service limit:
Straight-ahead position within 30 mm (1.18 in) from rack center
Less than 11.18 N (1.14 kgf, 2.51 lb)
Maximum allowable resistance
12.7 N (1.3 kgf, 2.9 lb)



6. OIL LEAKING



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

• Oil leaking points

1) If leak point is other than a, b, c, or d, perform the 5th step in “Oil leak check procedure and replacement parts” before dismounting gearbox from vehicle. <Ref. to “Oil leak check procedure and replacement parts”.> If gearbox is dismounted without confirming where the leak is, it must be mounted again to locate the leak point.
2) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the oil from the suspected portion and turn the steering wheel from lock to lock about 30 to 40 times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.
3) Before starting oil leak repair work, be sure to clean the gearbox, hoses, pipes, and surrounding parts. After completing repair work, clean these areas again.

• Oil leak check procedure and replacement parts

NOTE:
Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

1) Leakage from “a”
The oil seal is damaged. Replace valve assembly with a new one.
2) Leakage from “b”
The torsion bar O-ring is damaged. Replace valve assembly with a new one.
3) Leakage from “c”
The oil seal is damaged. Replace valve assembly or oil seal with a new one.
4) Leakage from “d”
The pipe is damaged. Replace the faulty pipe or O-ring.

5) If leak is other than a, b, c, or d, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove oil from the surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.

(1) Leakage from “e”

The cylinder seal is damaged. Replace rack bush with a new one.

(2) Leakage from “f”

There are two possible causes. Take following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.

CAUTION:

• If leakage from “f” is noted again:

The oil seal of pinion and valve assembly is damaged. Replace pinion and valve assembly with a new one. Or replace the oil seal and the parts that are damaged during disassembly with new ones.

• If oil stops leaking from “f”:

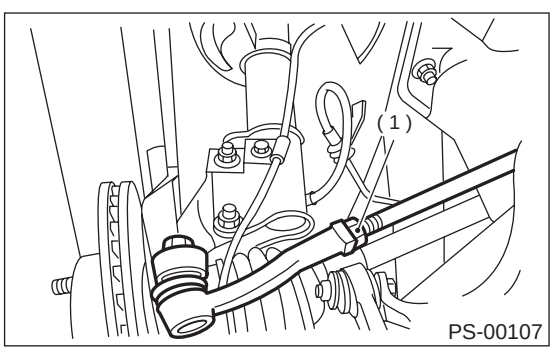
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust front toe.

Standard of front toe:

IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



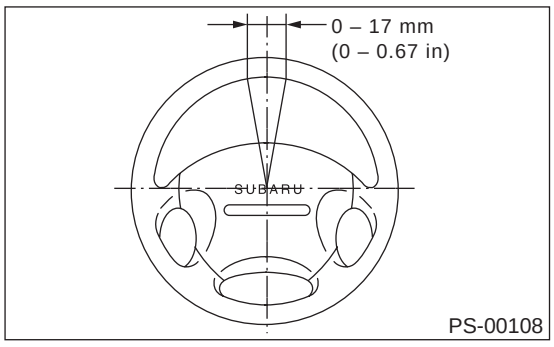
(1) Lock nut

2) Adjust steering angle of wheels.

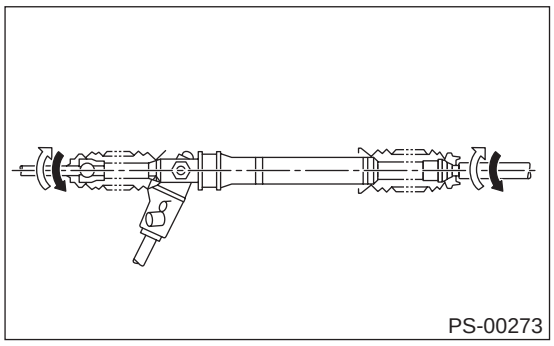
Standard of steering angle:

Model	*Except OUTBACK*	*OUTBACK*
Inner wheel	*36.3°±1.5°*	*34.5°±1.5°*
Outer wheel	*31.6°±1.5°*	*30.3°±1.5°*

3) If steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



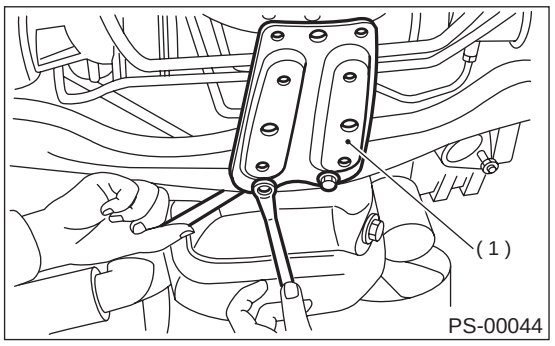
4) If steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the same direction by the same turns.



6. Pipe Assembly

A: REMOVAL

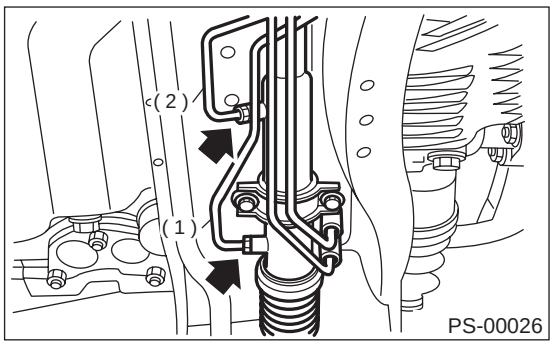
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.
3) Lift vehicle and remove jack-up plate.



(1) Jack-up plate

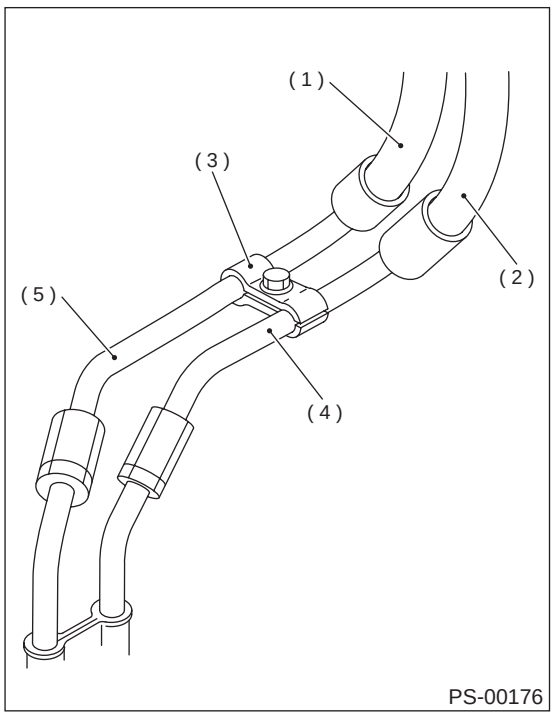
4) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

CAUTION:
Improper removal and installation of parts often causes fluid leak trouble. To prevent this, clean the surrounding portions before disassembly and reassembly, and pay special attention to keep dirt and other foreign matter from mating surfaces.



(1) Pipe A
(2) Pipe B

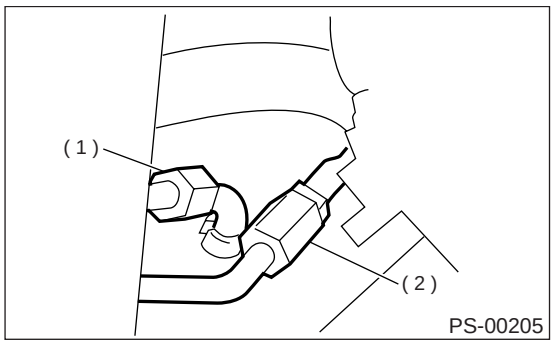
5) Remove clamp E from pipes.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

6) Disconnect pipe C·D.
Disconnect pipe C·D from pipe (on the gearbox side).

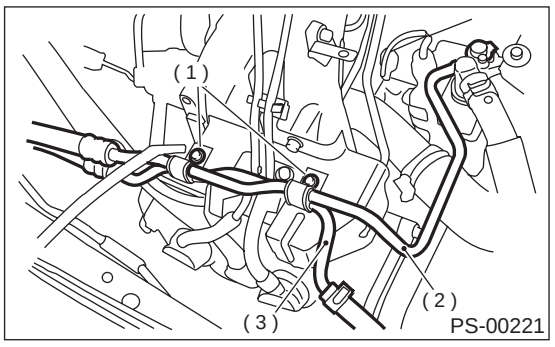
CAUTION:
• When disconnecting pipe C·D, use two wrenches to prevent deformities.
• Be careful to keep pipe connections free from foreign matter.



(1) Pipe C
(2) Pipe D

2.5 L model
Disconnect pipe C from oil pump. Disconnect pipe D from return hose.

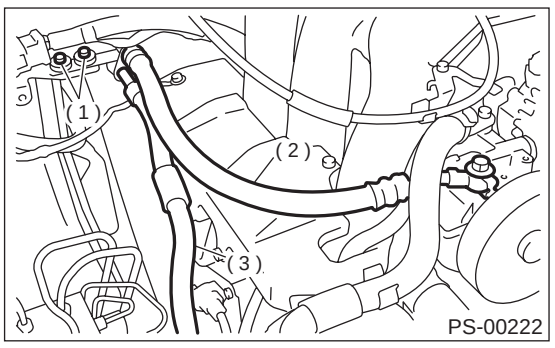
CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



(1) Bolt A
(2) Pipe C
(3) Pipe D

3.0 L model
Disconnect pressure hose from oil pump. Disconnect return hose from reservoir tank.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



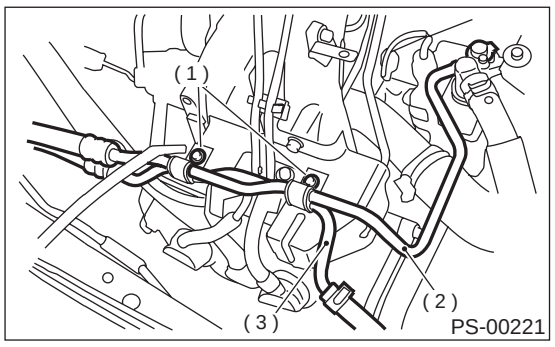
(1) Bolt A
(2) Pressure hose
(3) Return hose

B: INSTALLATION

1) Tighten bolt A.

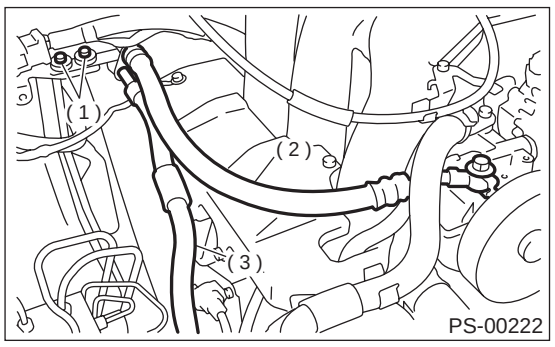
CAUTION:
Visually check that hose between tank and pipe D is free from bending or twisting.

2.5 L model



(1) Bolt A
(2) Pipe C
(3) Pipe D

3.0 L model



(1) Bolt A
(2) Pressure hose
(3) Return hose

(1) Connect pipe D or return hose to oil tank.
(2) Connect pipe C or pressure hose to oil pump.

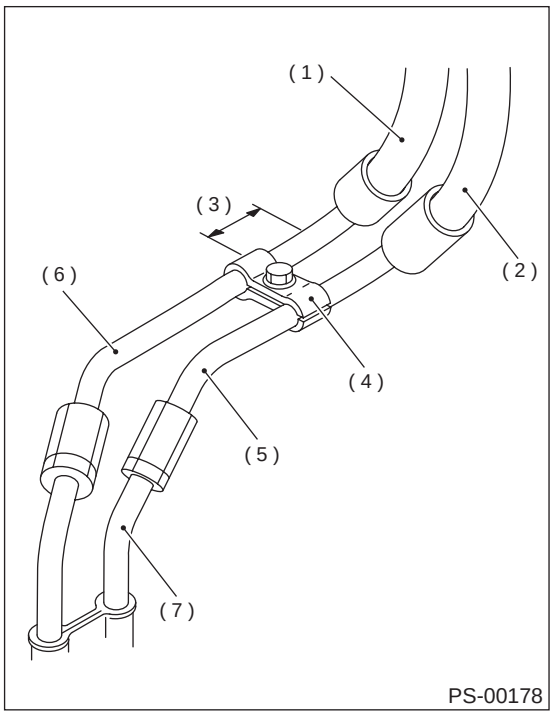
CAUTION:
Use anew gasket.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten bolt A.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Temporarily connect pipes C and D.

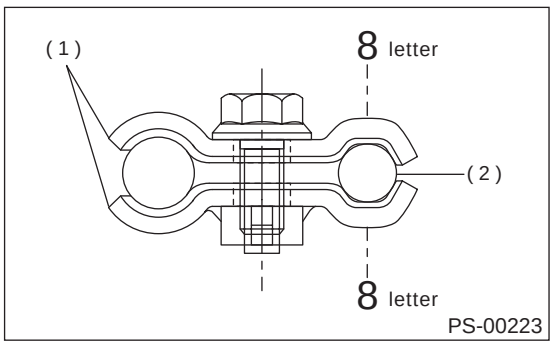


(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E
(5) Pipe C
(6) Pipe
(7) Pipe (on gearbox side)

3) Temporarily install clamp E on pipes C and D, and tighten clamp E firmly.

CAUTION:
Ensure that the letter “8” on each clamp are diagonally opposite each other as shown in figure.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



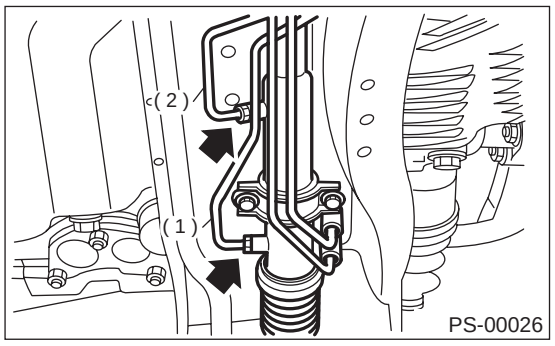
(1) Clamp E
(2) Pipe C

4) Tighten joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

5) Connect pipe A and B.
Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A second.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

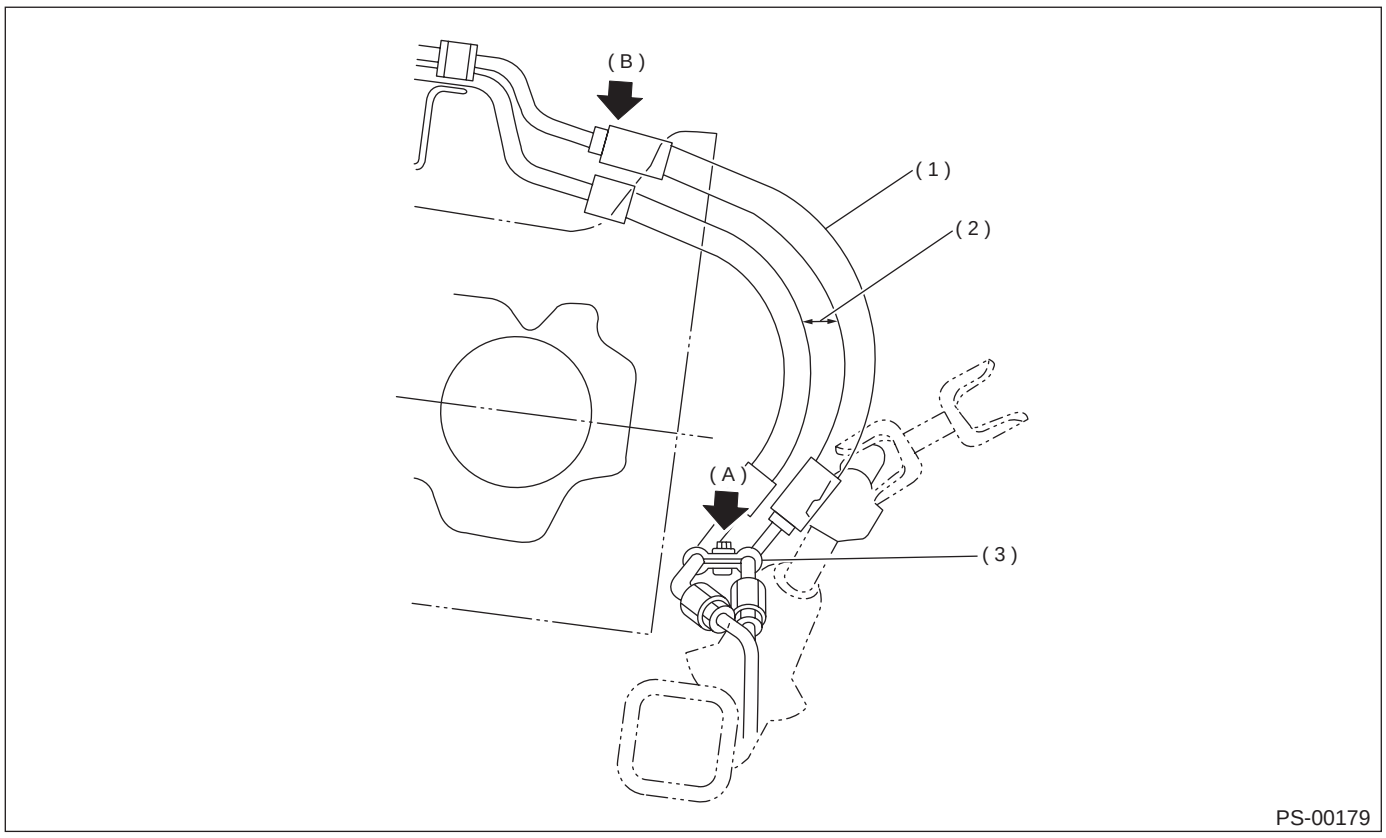


(1) Pipe A
(2) Pipe B

6) Install jack-up plate.
7) Connect battery ground cable.
8) Feed the specified fluid.

PIPE ASSEMBLY

NOTE:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.



(1) High-pressure hose
(2) No interference is allowed between hoses.
(3) Clearance between crossmember and pipe: 3 - 8 (0.12 - 0.31)

9) Finally check clearance between pipes and/or hoses, as shown above.
If clearance between cruise control pump and power steering hose is less than 10 mm (0.39 in), proceed as follows:

(1) Move clamped section (A) (refer to figure above.) down to a point where pipe is close to crossmember.

Pipe-to-crossmember clearance:
10 mm (0.39 in), min.

(2) Check that clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend section (B) down until a clearance of at least 10 mm (0.39 in) is obtained.

C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

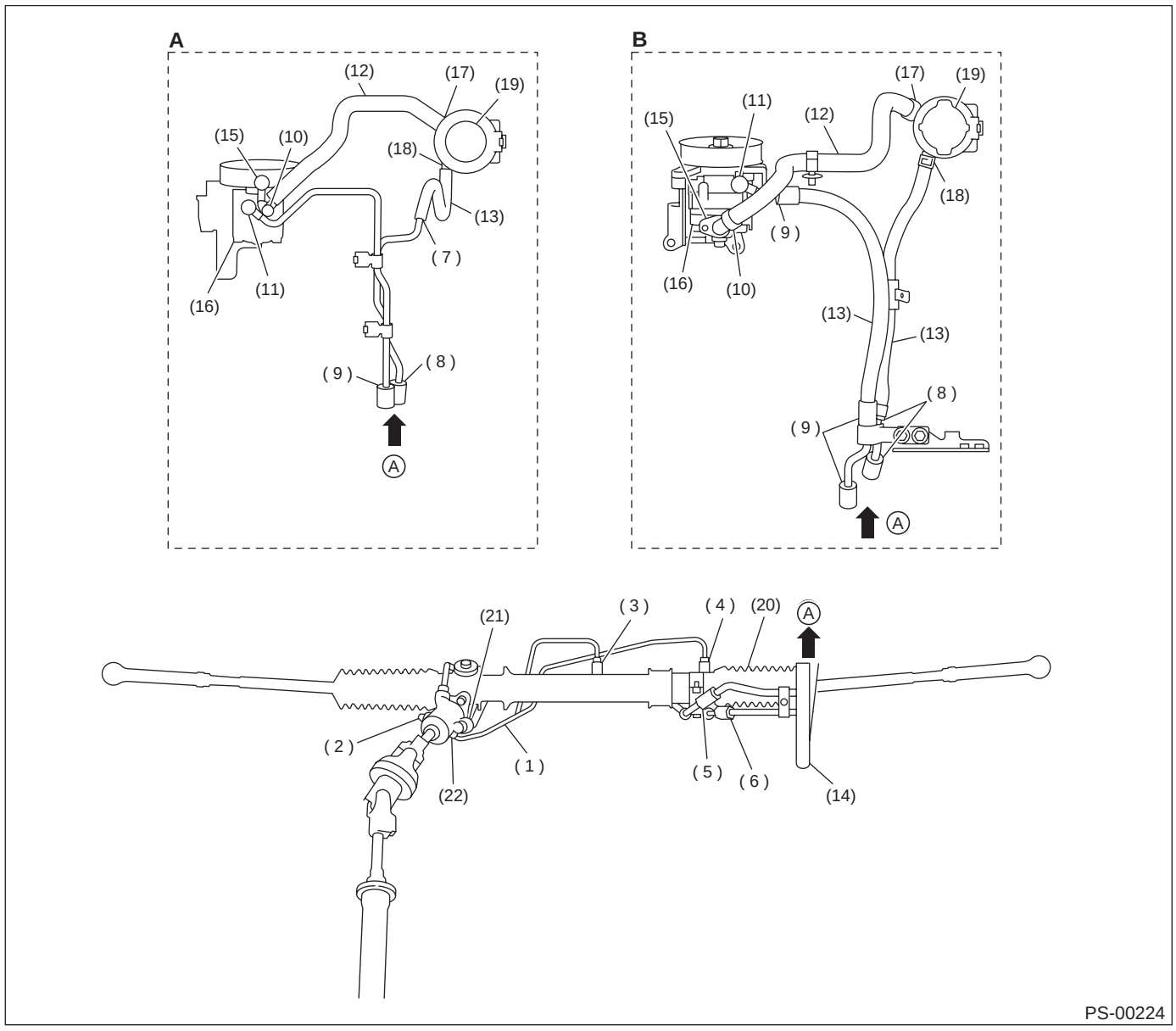
Part name	Inspection	Remedy
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with new one.
Clamp	• Clamps for weak clamping force	Replace with new one.
Hose	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with new one.

CAUTION:
Although surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since 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 area and/or a driving condition in which many steering operations are required in short time.
Particularly continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.
So, avoid to keep this kind of condition when servicing as well as driving.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace defective parts.
	Improper stop position of pitching stopper	Replace defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct customers.

PIPE ASSEMBLY

CAUTION:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



(A) 2.5 L model (B) 3.0 L model

Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (11) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace clamp.
	Damaged O-ring or gasket	Replace O-ring or gasket pipe or hose with new one, if ineffective, replace gear-box also.
Leakage from hose (12), (13) and (14) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (15) and (16) in figure	Damaged O-ring	Replace oil pump.
	Damaged gasket	Replace oil pump.
Leakage from oil tank (17) and (18) in figure	Crack in oil tank	Replace oil tank.
Leakage from filler neck (19)	Damaged cap packing	Replace cap.
	Crack in root of filler neck	Replace oil tank.
	High fluid level *1	Adjust fluid level.
Leakage from surrounding of power cylinder of gearbox (20) in figure	Damaged oil seal	Replace oil seal.
Leakage from control valve of gear-box (21) and (22) in figure	Damaged packing or oil seal	Replace problem parts.
	Damage in control valve	Replace control valve.

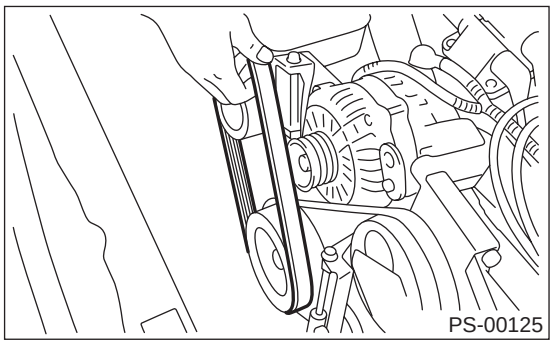
NOTE:
Fluid level is specified at optimum position (range) for ordinary use. Accordingly, if the vehicle is used often under hard conditions such as on very rough roads or in mountainous areas, fluid may bleed out from cap air vent hole. This is not a problem. If a customer complains strongly and is not likely to be satisfied with the leakage, lower the fluid level to the extent that fluid will not bleed out under the conditions described, and have the customer check the fluid level and its quality more frequency than usual.

7. Oil Pump

A: REMOVAL

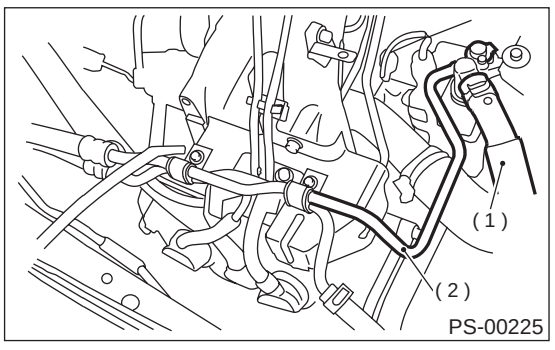
1. 2.5 L MODEL

1) Remove ground cable from battery.
2) Remove pulley belt cover bracket.
3) Loosen lock bolt and slider bolt and remove power steering pump drive V-belt.



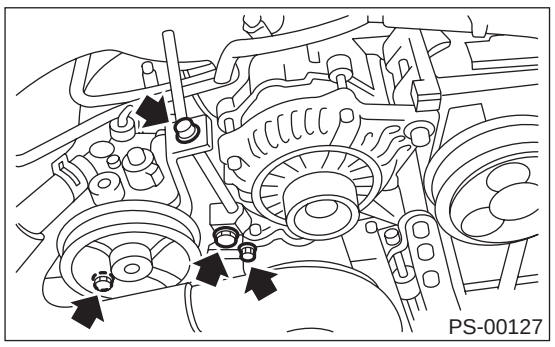
4) Disconnect connector from power steering pump switch.
5) Disconnect pipe C and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



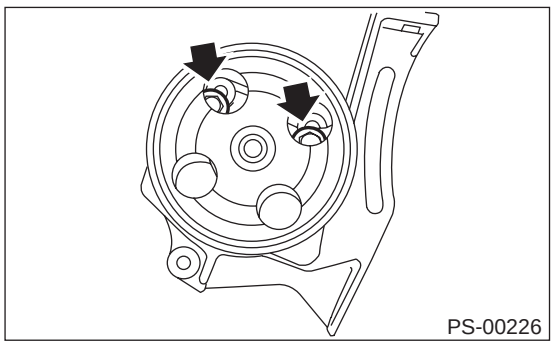
(1) Suction hose
(2) Pipe C

6) Remove bolts which install power steering pump bracket.

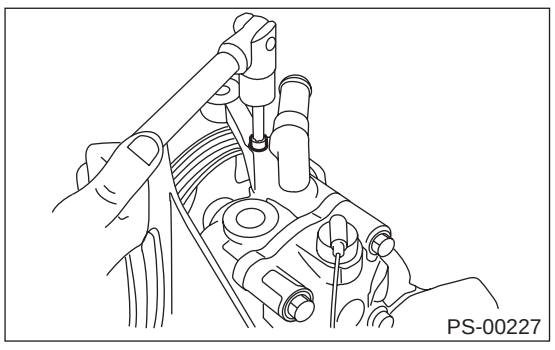


7) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

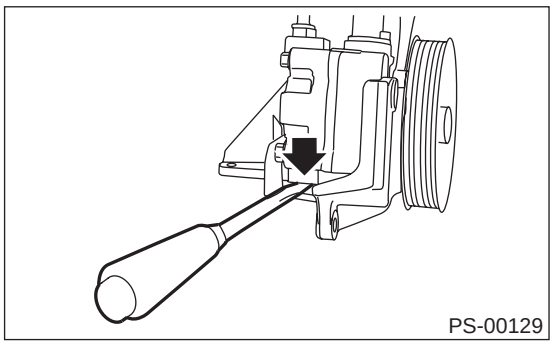


8) Remove socket from oil pump.



9) Remove bolt from the rear side of oil pump.

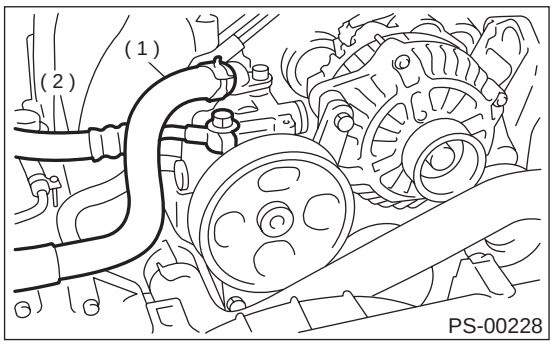
10) Disassemble oil pump and bracket by inserting a screwdriver as shown in the figure.


PS-00129

2. 3.0 L MODEL

1) Remove ground cable from battery.
2) Remove pulley belt cover.
3) Remove V-belt.
4) Disconnect connector from power steering pressure switch.
5) Remove tensioner adjuster.
6) Disconnect pressure hose and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



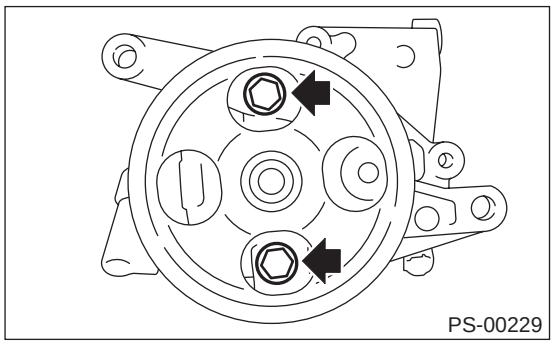
PS-00228

(1) Pressure hose
(2) Suction hose

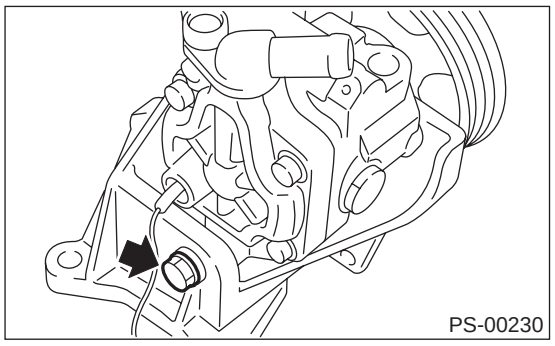
7) Remove bolts, which install power steering pump bracket.

8) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.


PS-00229

9) Remove bolt from the rear side of oil pump.


PS-00230

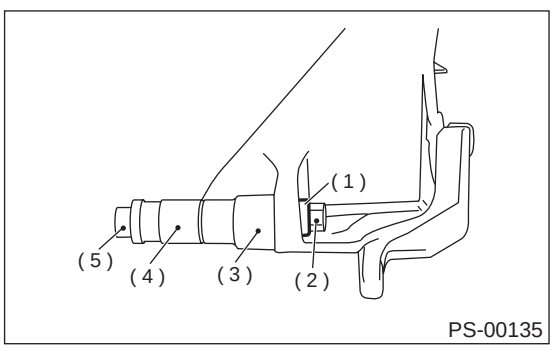
10) Remove oil pump from bracket.

B: INSTALLATION

1. 2.5 L MODEL

1) Install oil pump to bracket.
(1) Place oil pump bracket in a vise. Tighten bushing using a 12.7 mm (1/2″) type 14- and 21-mm box wrench until it is in contact with oil pump mounting surface.

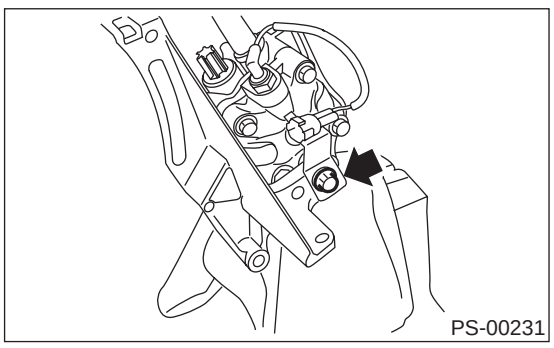
CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



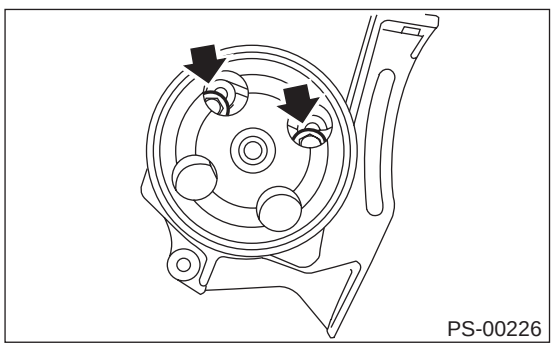
(1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten bolt which installs oil pump and switch bracket to bracket.

Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)

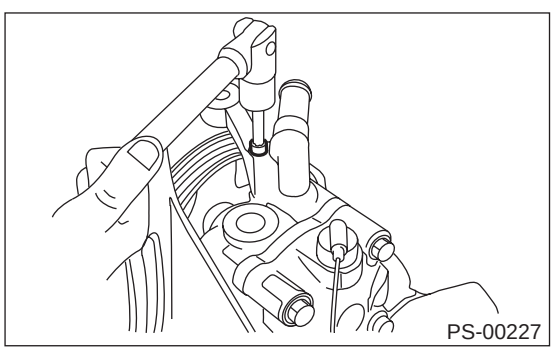


Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



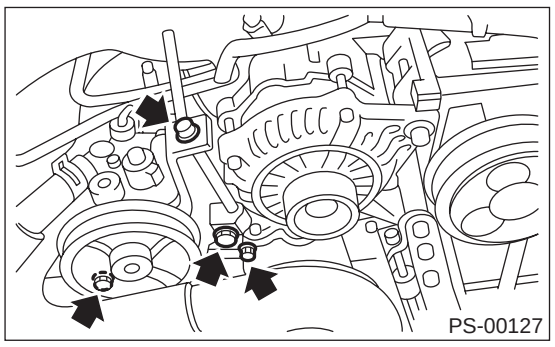
2) Install socket to oil pump.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



3) Tighten bolts which install power steering pump bracket.

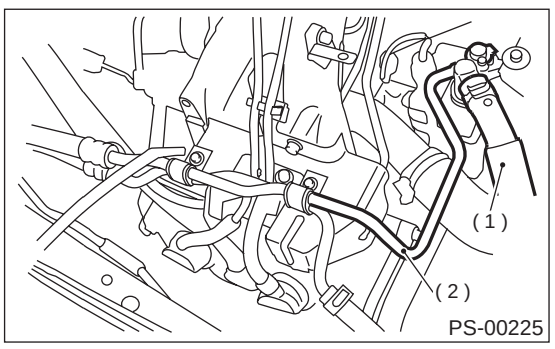
Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



4) Interconnect pipes C and suction hose.

Tightening torque:
Joint nut
39.2 N·m (4 kgf-m, 28.9 ft-lb)

CAUTION:
If a hose is twisted at this step, the hose may come into contact with some other parts.



(1) Suction hose
(2) Pipe C

5) Connect connector to power steering oil pressure switch.
6) Install pulley belt to oil pump.
7) Check pulley belt tension. <Ref. to ME(H4SO)-42, V-belt.> and <Ref. to ME(H6DO)-28, V-belt.>
8) Tighten lock bolt.

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

9) Tighten bolt belt tension.

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

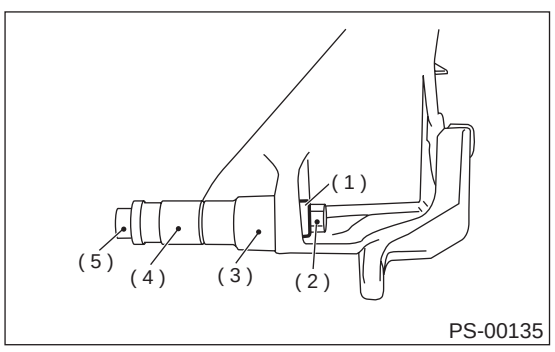
10) Install pulley belt cover bracket.
11) Connect ground terminal of battery.
12) Feed the specified power steering fluid <Ref. to PS-63, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

2. 3.0 L MODEL

1) Install oil pump to bracket.
(1) Place oil pump bracket in a vise. Tighten bushing using a 12.7 mm (1/2″) type 14 and 21-mm box wrench until it is in contact with oil pump mounting surface.

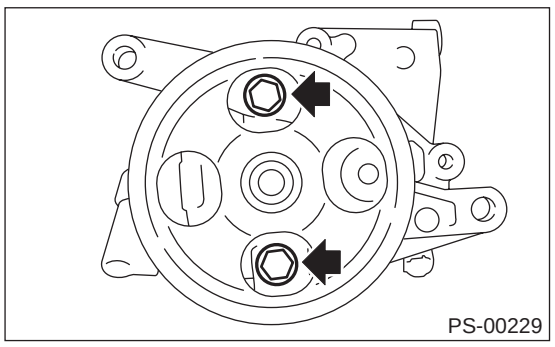
CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



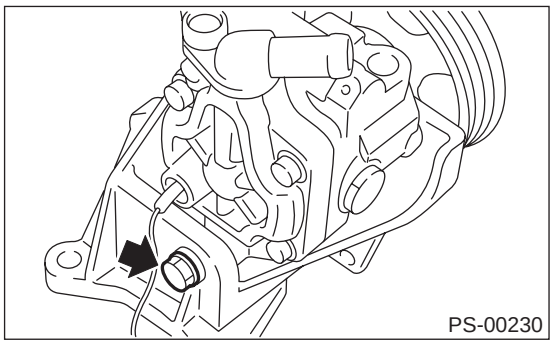
(1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten bolt which installs oil pump to bracket.

Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

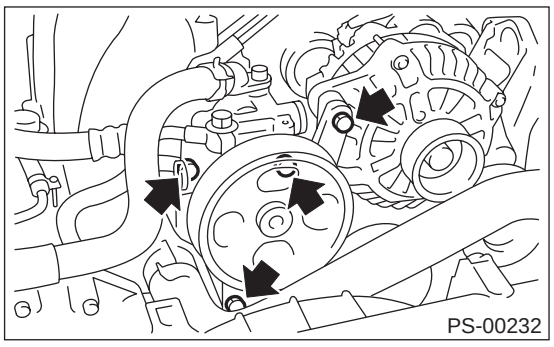


Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)


PS-00230

2) Tighten bolts which install power steering pump bracket.

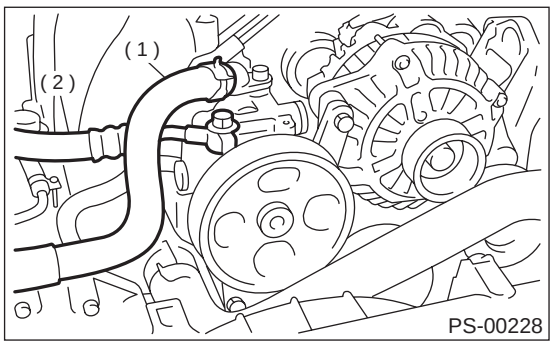
Tightening torque:
33.3 N·m (3.4 kgf-m, 24.5 ft-lb)


PS-00232

3) Interconnect pressure hose and suction hose.

Tightening torque:
Eye bolt
39.2 N·m (4 kgf-m, 28.9 ft-lb)

CAUTION:
If a hose is twisted at this step, the hose may come into contact with some other parts.



PS-00228

(1) Suction hose
(2) Pressure hose

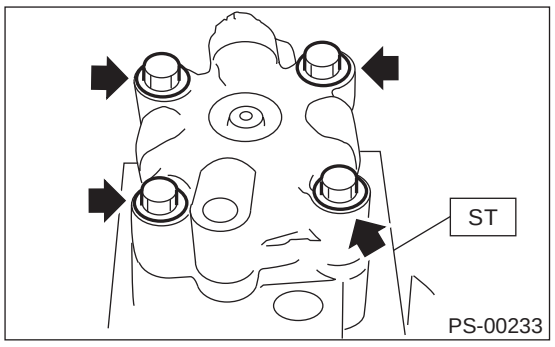
4) Connect connector to power steering oil pressure switch.
5) Install tensioner adjuster.
6) Install V-belt.
7) Install pulley belt cover.
8) Connect ground terminal of battery.
9) Feed the specified power steering fluid. <Ref. to PS-63, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

C: DISASSEMBLY

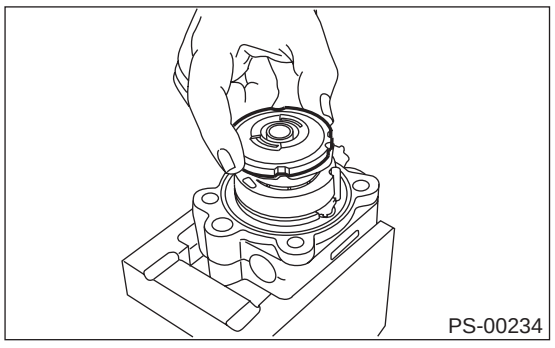
NOTE:
Oil pump for 3.0 L model cannot be disassembled. If the oil pump is malfunctioning, replace the oil pump as an assembly.

1) Using ST, place oil pump in a vise and remove four bolts which secure rear cover.
ST 34199AE020 ATTACHMENT



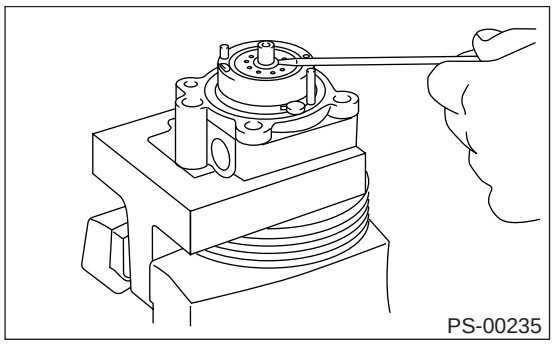
PS-00233

2) Remove pressure plate.


PS-00234

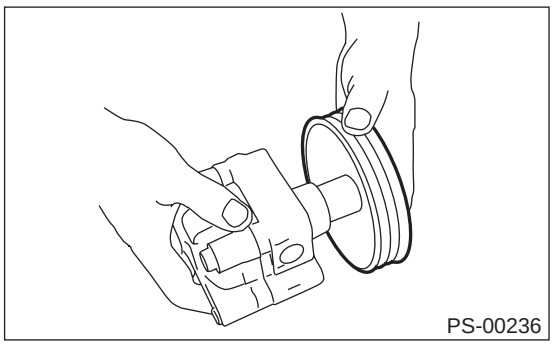
3) Using a screwdriver, pry retaining ring off.

CAUTION:
Do not remove cam ring, rotor, etc.


PS-00235

4) Install pressure plate.

5) Temporarily install rear cover to front casing.
6) Remove oil pump pulley.

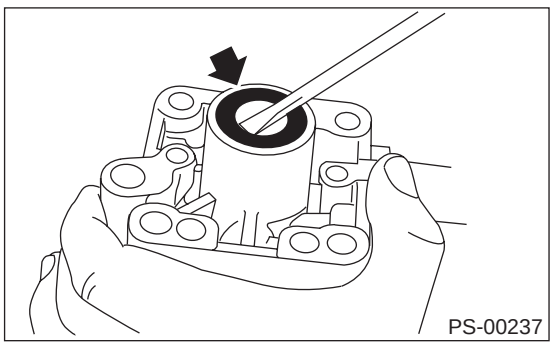

PS-00236

7) Place oil pump in a vise.

CAUTION:
Do not place oil pump directly in the vise, use soft pads and hold oil pump lightly to protect the pump.

8) Pry oil seal off using a screwdriver.

CAUTION:
Be careful not to scratch inner surface of casing.

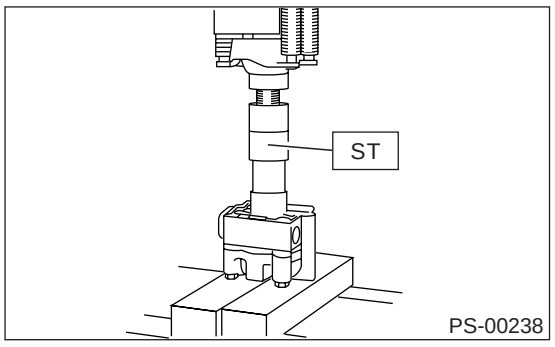

PS-00237

D: ASSEMBLY

1) Reassembly precautions
   (1) Whenever O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.
   (2) Thoroughly wash parts and allow to dry. They must be kept free from cleaning oil and dust.
   (3) Reassembly procedure must be performed in clean place. Ensure that parts are kept away from waste threads or other dust particles.
   (4) Cleaning oil tends to stay inside the front casing. Remove it completely by blowing compressed air.
   (5) Ensure that parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)
   (6) Reverse the sequence of disassembly procedures.
2) Apply grease to oil seal and inner surface of front casing (at bearing location).

CAUTION:
Make sure that the front body internal surfaces are free from damage.

3) Temporarily install rear cover to front body.
4) Attach ST to front body. Using a press, install oil seal.
ST 34199AE030 INSTALLER

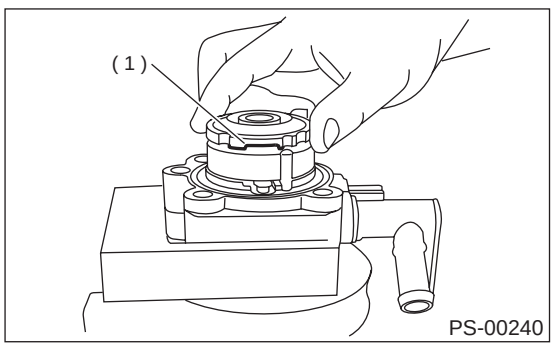


PS-00238

5) Install pump pulley to front body.
6) Using ST, place oil pump in a vise.
ST 34199AE020 ATTACHMENT
7) Remove rear cover.
8) Using 10-mm box wrench, tap retaining ring into shaft groove.

PS-00239

9) Install pressure plate as shown in the figure.



PS-00240

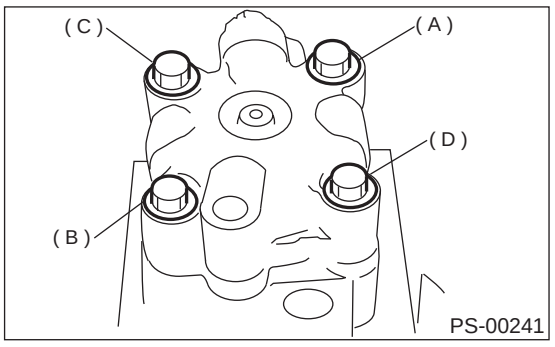
(1) Groove

10) Apply specified hydraulic oil to O-rings and fit them into front casing and pressure plate.
11) Install seal ring to pressure plate.

12) With knock pin positions aligned, install rear cover.

Tightening torque:
27.5 N·m (2.8 kgf-m, 20.3 ft-lb)

CAUTION:
Loosely tighten bolts in the sequence (A), (B), (C), and (D) shown in figure. Then, tighten in the same sequence.



13) When reassembly procedures have been completed, turn shaft by hand to ensure it turns smoothly. If it binds or other unusual conditions are evident, disassemble again and check for foreign matter trapped on sliding surfaces and improper installation. Eliminate the cause of trouble.
14) Check followings by referring to “CHECK” article.
- Excessive play in pulley shaft
- Ditch deflection of pulley
- Resistance to rotation of pulley
- Measurement of generated oil pressure

E: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

Part name	Description	Remedy
1. Front casing	1) Damage on body surfaces 2) Excessive wear on hole, into which spool valve is inserted. 3) Wear and damage on cartridge assembly mounting surface 4) Wear and damage on surfaces in contact with shaft and oil seal	Replace with a new one together with spool valve as selective fit is made.
2. Rear cover	1) Damage on body surfaces 2) Wear and damage on sliding surfaces	Replace with a new one.
3. Shaft	1) Shaft bend 2) Wear and damage on surfaces in contact with bushing and oil seal 3) Wear and damage on rotor mounting surfaces 4) Bearing damage	Replace with a new one.
4. Pressure plate	Wear and damage on sliding surfaces	Replace with a new one.
5. Cam ring	Ridge wear on sliding surfaces	If damage is serious, replace with a new cartridge assembly.
6. Vane	Excessive wear on nose radius and side surfaces	
7. Rotor	1) Wear and damage on sliding surfaces 2) Ridge wear on vane sliding grooves (If light leaks with vane in slit against light source)	
	3) Damage resulting from snap ring removal	Correct with oil stone. If damage is serious, replace with a new cartridge assembly.
8. Connector	Damage on threads	Replace with a new one.
9. Spring	Damage	Replace with a new one.
10. Bolts and nuts	Damage on threads	Replace with a new one.

• In accordance with the following table, check all removed parts for wear and damage, and make repair or replacement if necessary.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace oil pump with a new one.
		(2) Play of pulley shaft	Measure radial play and axial play. If any of these exceeds the service limit, replace oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure V ditch deflection. If it exceeds the service limit, replace pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check resistance to rotation of pulley. If it is past the service limit, replace oil pump with a new one.
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace oil pump with a new one.
4	O-ring	Crack or deterioration	Replace it with a new one.
5	Bracket	Crack	Replace it with a new one.

2. SERVICE LIMIT

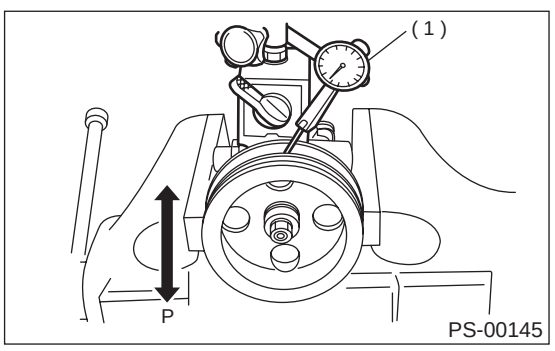
Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:
• Fix oil pump on a vise to make a measurement. At this time, hold oil pump with the least possible force between two wood pieces.
• Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

1) Play of pulley shaft

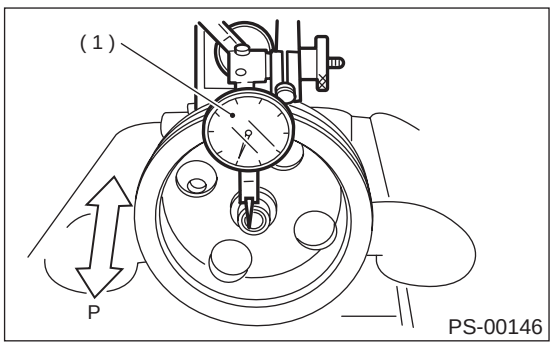
On condition:
P: 9.8 N (1.0 kgf, 2.2 lb)

Service limit:
Radial play (Direction ⟷)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction ⟺)
0.6 mm (0.024 in) or less

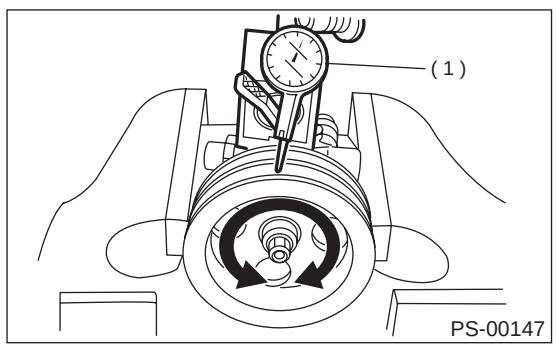


(1) Dial indicator

2) Ditch deflection of pulley

Service limit:
1.0 mm (0.039 in) or less

NOTE:
Read the value for one surface of V ditch, and then the value for another off the dial.

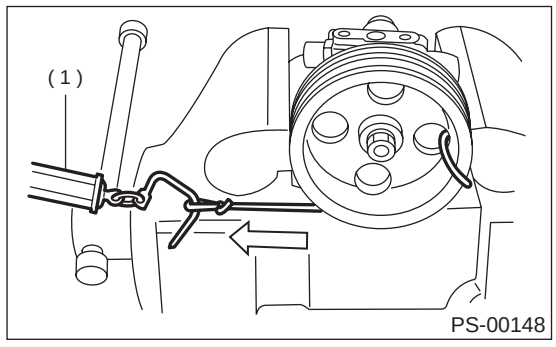


(1) Dial indicator

3) Resistance to rotation of pulley

Service limit:
Maximum load; 9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:
• A rather higher value may be indicated when pulley starts turning.
• Measure the load during rotation and make a judgment.



(1) Spring balance

3. HYDRAULIC PRESSURE

CAUTION:
• Be sure to complete all items aforementioned in “INSPECTION”, prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-65, INSPECTION, General Diagnostic Table.>
• Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
• Put cotton cloth waste at a place where fluid drops before pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

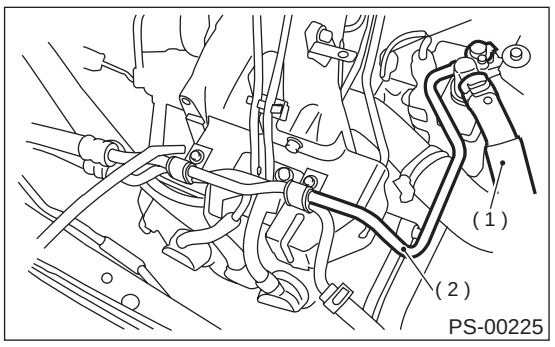
NOTE:
Keep engine idling during the measurement.

1) REGULAR PRESSURE MEASUREMENT
(1) Connect ST1, ST2 and ST3.

ST1 92511000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

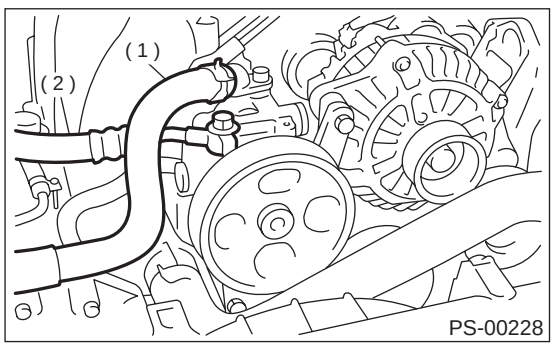
(2) Disconnect pressure hose from the pump.
(3) Using gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), instal ST2 to the pump instead of pressure hose.

2.5 L model:



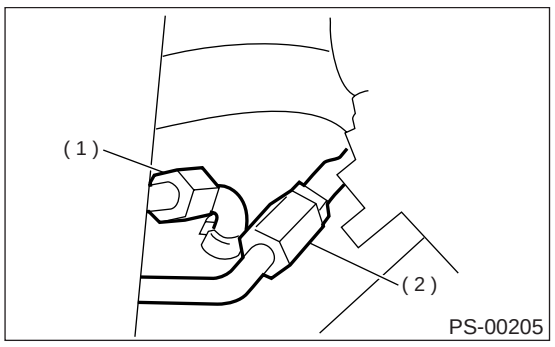
(1) Suction hose
(2) Pressure hose

3.0 L model:



(1) Suction hose
(2) Pressure hose

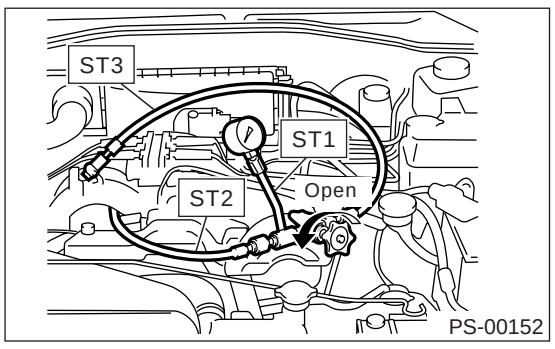
(4) Disconnect pipe C form pipe (on gearbox side).
(5) Install ST3 to pipe C.



(1) Pipe C
(2) Pipe D

(6) Replenish power steering fluid up to specified level.
(7) Open valve, and start the engine.
(8) Measure regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

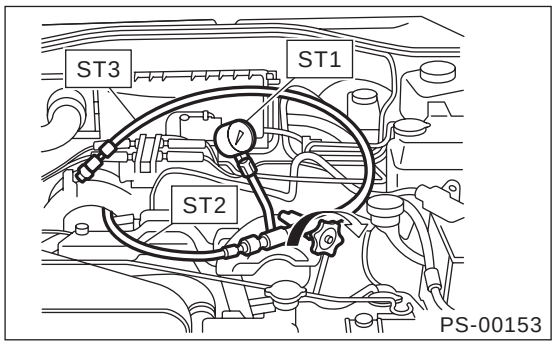


Service limit:
981 kPa (10 kg/cm^2, 142 psi) or less

(9) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

2) Measure relief pressure.
(1) Using STs, measure relief pressure.
(2) Close valve.
(3) Measure relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

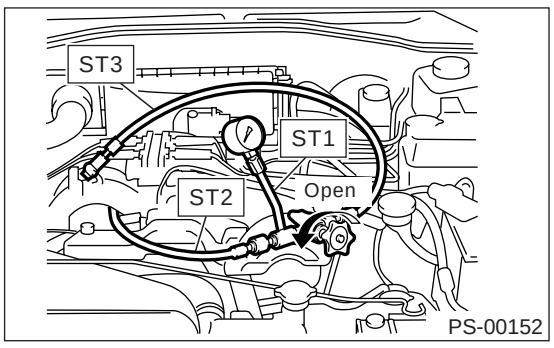


Service limit:
2.5 L model
9,611 — 10,199 kPa (98 — 104 kg/cm^2, 1,394 — 1,479 psi)
3.0 L model
7,650 — 8,340 kPa (78.03 — 88.13 kg/cm^2, 1,109 — 1,209 psi)

(4) If it is not within the specified value, replace the oil pump.

3) Measure working pressure.
(1) Using STs, measure working pressure.
(2) Open valve.
(3) Measure working pressure of control valve by turning wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:
2.5 L model
9,611 — 10,199 kPa (98 — 104 kg/cm^2, 1,394 — 1,479 psi)
3.0 L model
7,650 — 8,340 kPa (78.03 — 88.13 kg/cm^2, 1,109 — 1,209 psi)

(4) If it is within the specified value, measure steering effort. <Ref. to PS-68, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace control valve itself or control valve and pinion as a single unit with new ones.

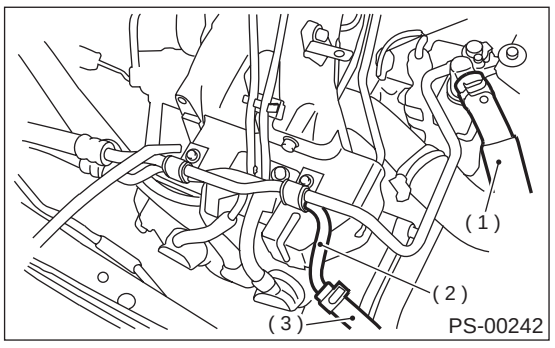
8. Reservoir Tank

A: REMOVAL

1. 2.5 L MODEL

1) Drain fluid from the reservoir tank.
2) Disconnect pipe D from return hose and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



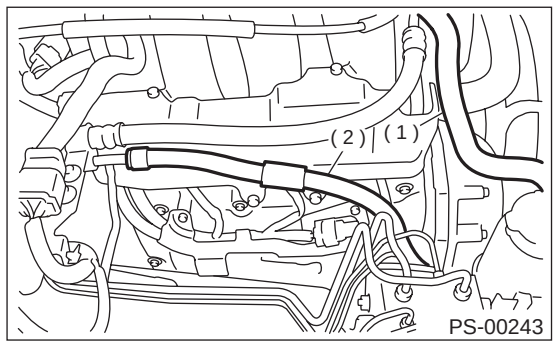
(1) Suction hose
(2) Pipe D
(3) Return hose

3) Remove reservoir tank from bracket by pulling it upwards.

2. 3.0 L MODEL

1) Drain fluid from the reservoir tank.
2) Disconnect return hose and suction hose from reservoir tank.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



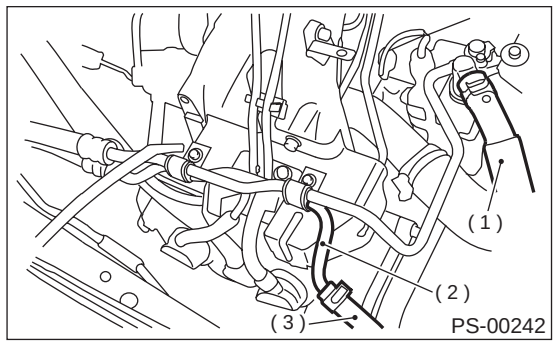
(1) Suction hose
(2) Return hose

3) Remove reservoir tank from bracket by pulling it upwards.

B: INSTALLATION

1. 2.5 L MODEL

1) Install reservoir tank to bracket.
2) Connect pipes D to return hose and suction hose to oil pump.

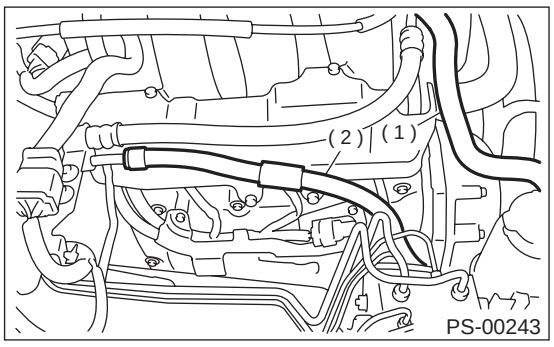


(1) Suction hose
(2) Pipe D
(3) Return hose

3) Feed the specified power steering fluid. <Ref. to PS-63, Power Steering Fluid.>

2. 3.0 L MODEL

1) Install reservoir tank to bracket.
2) Connect return hose and suction hose to reservoir tank.



(1) Suction hose
(2) Return hose

3) Feed the specified power steering fluid. <Ref. to PS-63, Power Steering Fluid.>

C: INSPECTION

Check reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace reservoir tank.

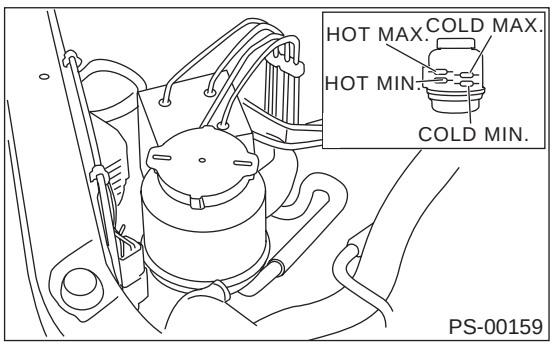
9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid	Manufacturer
DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

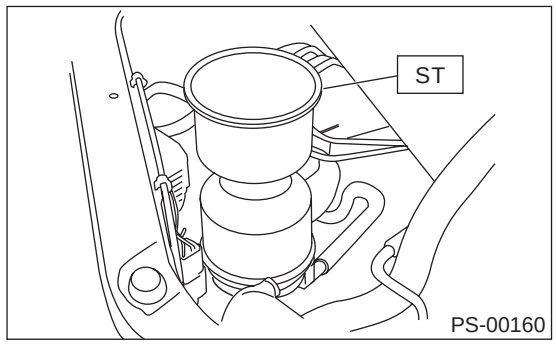
B: INSPECTION

1) Check power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.
2) Check joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.
3) Inspect fluid level on flat and level surface with engine “OFF” by indicator of reservoir tank.
If the level is at lower point or below, add fluid to keep the level in the specified range of the indicator. If at upper point or above, drain fluid by using a syringe or the like.
(1) Check at temperature 20°C (68°F) on reservoir surface of oil pump; read the fluid level on the “COLD” side.
(2) Check at temperature 80°C (176°F) on reservoir surface of oil pump; read the fluid level on the “HOT” side.



C: INSTALLATION

1) Set ST on top of reservoir tank and fill it about half way with the specified fluid.
ST 34199AE040 OIL CHARGE GUIDE



2) Jack-up vehicle and support it with safety stands, then turn steering wheel with engine stopped.
3) Continue to turn steering wheel slowly from lock to lock until bubbles stop appearing in the tank while keeping the fluid at that level.
4) In case air is absorbed to deliver bubbles into piping because the fluid level is lower, leave it about half an hour and then do the step 2) all over again.
5) Start and idle the engine.
6) Continue to turn steering wheel slowly from lock to lock again until bubbles stop appearing in the tank while keeping the fluid at that level.
It is normal that bubbles stop appearing after three times turning of steering wheel.
7) In case bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 5) all over again.
8) Stop the engine, and take out safety stands after jacking up vehicle again.
Then lower the vehicle, and idle the engine.
9) Continue to turn steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
10) In case the following happens, leave it about half an hour and then do step 8) again.
(1) The fluid level changes over 3 mm (0.12 in).
(2) Bubbles remain on the upper surface of the fluid.
(3) Grinding noise is generated from oil pump.

11) Check the fluid leakage at flare nuts after turning steering wheel from lock to lock with engine running.

CAUTION:
• Before checking, wipe off any fluid on flare nuts and piping.
• In case the fluid leaks from flare nut, it is caused by dust (or the like) and/or damage between flare and tapered seat in piping.
• Remove the flare nut and tighten again it to the specified torque after cleaning flare and tapered seat. If flare or tapered seat is damaged, replace with a new one.

10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning.	1. Pulley belt • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys except oil pump pulley • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and rim • Improper tires out of specification • Improper rims out of specification • Tires not properly inflated*1	Replace or reinflate.
	3. Fluid • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idling speed • Lower idling speed • Excessive drop of idling speed at start or at turning steering wheel *3	Adjust or instruct customer.
	5. Measure hydraulic pressure.<Ref. to PS-57, INSPECTION, Oil Pump.>	Replace problem parts.
	6. Measure steering effort.<Ref. to PS-65, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other. • Poor return of steering wheel to center • Steering wheel surges when turning.	1. Fluid line • Folded hose • Flattened pipe	Reform or replace.
	2. Tire and rim • Flat tire • Mix use of different tires • Mix use of different rims • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure	Fix or replace.
	3. Front alignment • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • One-sided weight	Replace, adjust or instruct customer.
	5. Measure steering effort.<Ref. to PS-65, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or rims are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.
*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.
*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

1. NOISE AND VIBRATION

CAUTION:
Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:

- Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
- Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
- When stopping with service brake and/or parking brake applied, power steering can be operated easily due to its light steering effort. If doing so, the disk rotates slightly and makes creaking noise. The noise is generated by creaking between the disk and pads. If the noise goes off when the brake is released, there is no abnormal function in the system.
- There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts are properly adjusted and have no defects.
  Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
  This phenomena does not indicate there is some abnormal function in the system.
  The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in “D” range for automatic transmission vehicle.

GENERAL DIAGNOSTIC TABLE

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	Defective Replace oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check clearance. Correct if necessary. <Ref. to PS-47, INSPECTION, Pipe Assembly.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace bad parts of the gearbox or oil pump.
Knocking When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Loosened tightening or play of tie-rod, tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace oil pump.
	Pulley bearing seizing of oil pump	Replace oil pump.
	Folded hose, flat pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix wrong part causing aeration. Replace fluid and vent air.
	Damaged pipe of gearbox	Replace pipe.
	Abnormal inside of hose or pipe Flat hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace bad parts of gearbox or hose.
Whine or growl (continuous or intermittent) While engine is running with/ without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace bad parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Too low engine speed at start	Adjust and instruct customers.
	Vane pump aeration	Fix wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace oil pump, bad parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

2. MEASUREMENT OF STEERING EFFORT

	Step	Value	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on a concrete road. 2) Start the engine. 3) Idle the engine. 4) Install spring scale on the steering wheel. 5) Pull spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort. Is the steering effort less than the specified value? NOTE: When turning steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem.	29.4 N (3.0 kgf, 6.6 lb)	Go to step **2.**	Adjustment backlash.
2	**CHECK STEERING EFFORT.** 1) Stop the engine. 2) Pull spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort. Is the steering effort less than the specified value?	29.4 N (3.0 kgf, 6.6 lb)	Go to step **3.**	Adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove universal joint. 2) Measure steering wheel effort. Is the maximum force steering wheel effort less than the specified value?	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 steering wheel effort. Is the fluctuation width less than the specified value?	1.08 N (0.11 kgf, 0.24 lb)	Go to step **5.**	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure folding torque of the joint (short yoke). <Ref. to PS-20, INSPECTION, Universal Joint.> Is the fluctuation width less than the specified value?	8.43 N (0.86 kgf, 1.90 lb)	Go to step **6.**	Replace with new one.
6	**CHECK UNIVERSAL JOINT.** Measure folding torque of the joint (long yoke). <Ref. to PS-20, INSPECTION, Universal Joint.> Is the folding torque less than the specified value?	5.49 N (0.56 kgf, 1.23 lb)	Go to step **7.**	Replace with new one.
7	**CHECK FRONT WHEEL.** Is there any trouble indicated in "Value" column?	Unsteady revolution or rattling of front wheels. Dragging of brake.	Inspect, readjust and replace if necessary.	Go to step **8.**
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends. Is there any trouble indicated in "Value" column?	Unsteady revolution or rattling of tie-rod ends of suspension.	Inspect and replace if necessary.	Go to step **9.**
9	**CHECK BALL JOINT.** Is there any trouble indicated in "Value" column?	Unsteady revolution or rattling of ball joints of suspension.	Inspect and replace if necessary.	Go to step **10.**

GENERAL DIAGNOSTIC TABLE

Step		Value	Yes	No
10	**CHECK GEARBOX.** Measure rotating of gearbox. <Ref. to PS-40, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.> Is the measured rotating resistance same with the specified value?	11.18 N (1.14 kgf, 2.51 lb) or less around center position and 15.79 N (1.61 kgf, 3.55 lb) or less in all positions within 20% difference between clockwise and counterclockwise?	Go to step **11.**	Readjust backlash, and if ineffective, replace bad parts.
11	**CHECK GEARBOX.** Measure sliding of gearbox. <Ref. to PS-39, SERVICE LIMIT, INSPECTION, Steering Gearbox.> Is the measured rotating resistance within the specified range?	304 N (31 kgf, 68 lb) or less with 20% difference between left and right direction?	Steering effort is normal.	Readjust backlash, and if ineffective, replace bad parts.

GENERAL DIAGNOSTIC TABLE

MEMO: