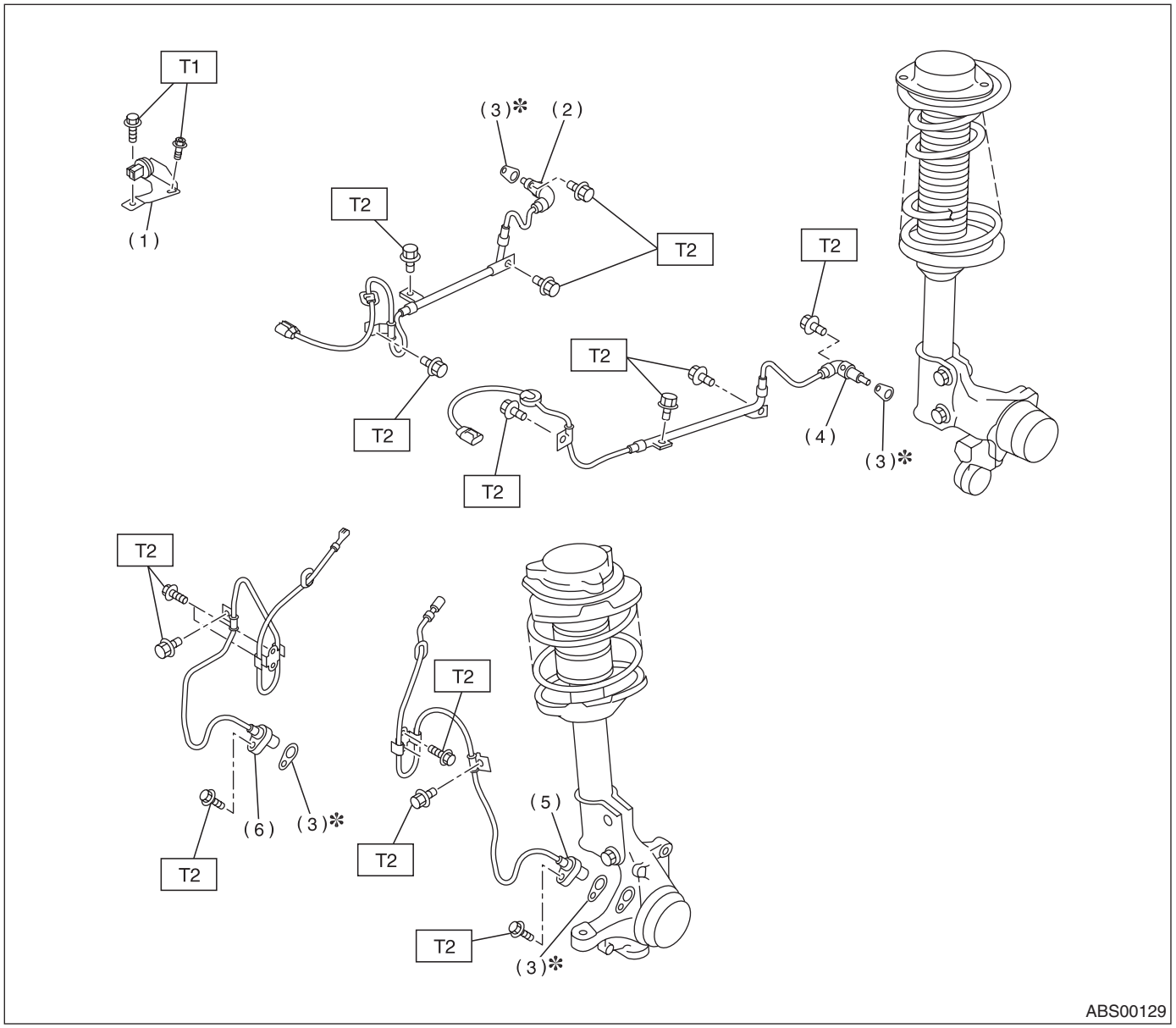
1. General Description

A: SPECIFICATION

Item				Specification
ABS wheel speed sensor	ABS wheel speed sensor gap		Front	0.3 — 0.8 mm (0.012 — 0.031 in)
			Rear	0.7 — 1.2 mm (0.028 — 0.047 in)
	ABS wheel speed sensor resistance		Front	1.25±0.25 kΩ
			Rear	1.15±0.115 kΩ
	Identifications of harness (Colors)	Front	RH	Yellow green
			LH	Pink
		Rear	RH	White
			LH	Yellow
G sensor	G sensor voltage			2.3±0.2 V
ABSCM&H/U identification			AT	L6
			MT	L7

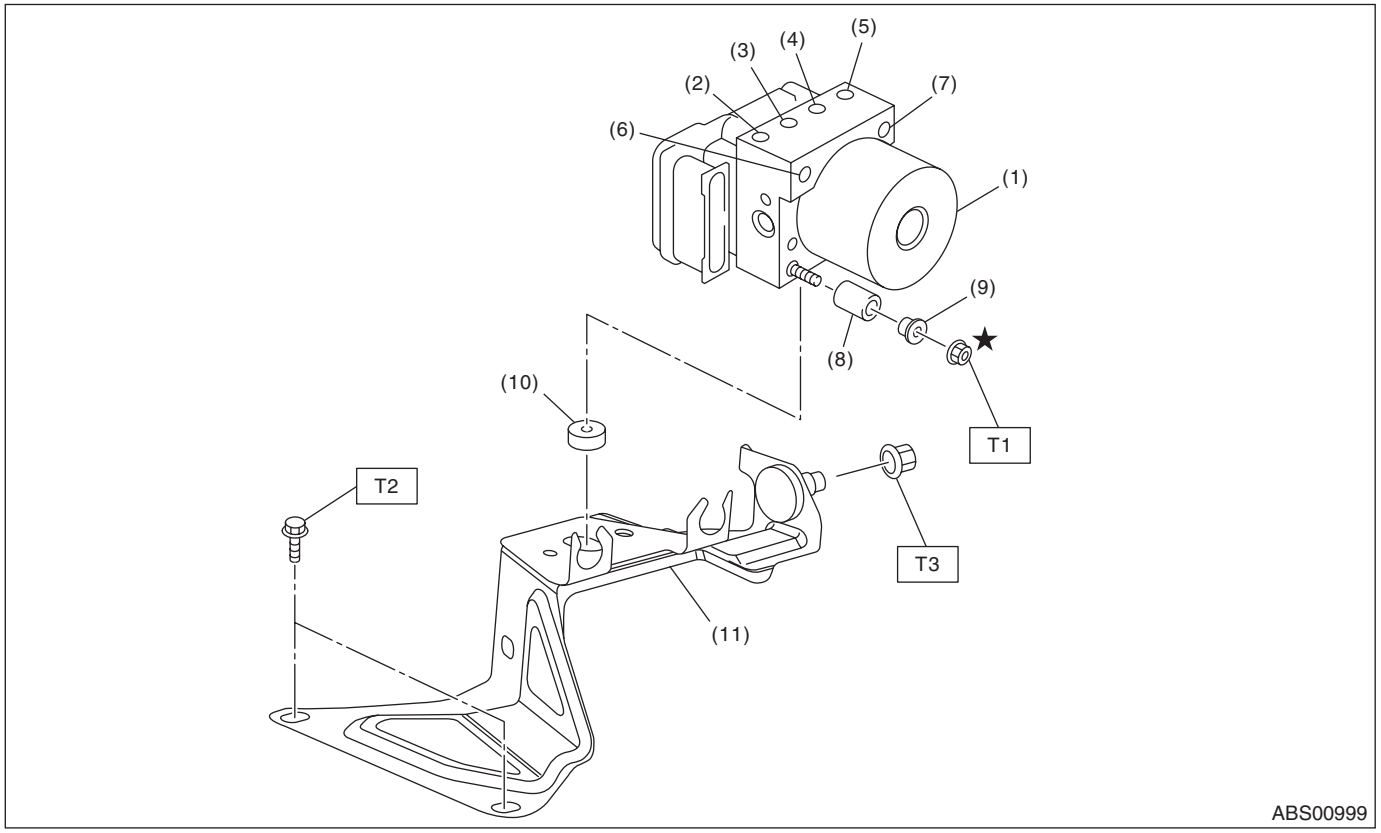
B: COMPONENT

1. SENSOR



(1)	G sensor	(4)	Rear ABS wheel speed sensor LH	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Rear ABS wheel speed sensor RH	(5)	Front ABS wheel speed sensor LH	***T1: 18 (1.8, 13.0)***
(3)	Adjusting spacer	(6)	Front ABS wheel speed sensor RH	***T2: 33 (3.4, 24.6)***

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



(1)	ABS control module and hydraulic control unit (ABSCM&H/U)	(6)	Primary inlet
		(7)	Secondary inlet
(2)	Front outlet RH	(8)	Damper
(3)	Rear outlet LH	(9)	Spacer
(4)	Rear outlet RH	(10)	Damper
(5)	Front outlet LH	(11)	Bracket

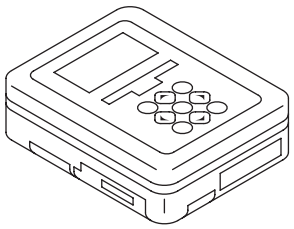
Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 24.6)
T3: 38 (3.8, 27.5)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B021XU0	1B021XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring the sensor.
TORX® bit E5	Used for replacing ABSCM.

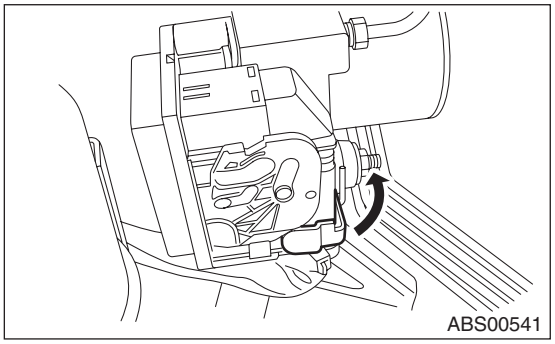
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the air cleaner case to make it easier to remove the ABSCM&H/U. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
3) Use an air gun to blow off any water around the ABSCM&H/U.

NOTE:
A contact fault may occur if the terminal is wet.
4) Lift the lock lever and disconnect the ABSCM&H/U connector.

CAUTION:
Do not pull on the harness when disconnecting the connector.

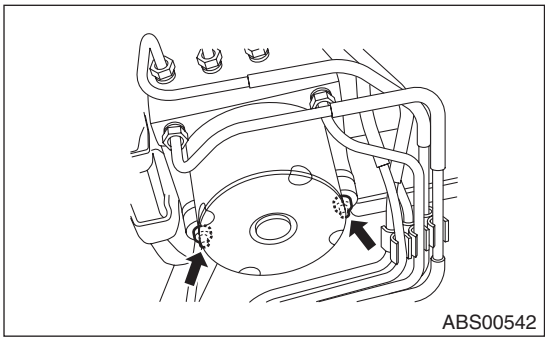

ABS00541

5) Remove the harness clip.
6) Disconnect the brake pipes from the ABSCM&H/U.
7) Wrap the brake pipe with a vinyl bag so as not to spill the brake fluid on the vehicle body.

CAUTION:
If brake fluid is spilled on the vehicle body, wash it off immediately with water and wipe clean.

8) Remove the nuts and remove the ABSCM&H/U.

CAUTION:
- **Do not drop or bump the ABSCM&H/U.**
- **Do not turn the ABSCM&H/U upside down or place it sideways for storage.**
- **Be careful not to let foreign matter enter into ABSCM&H/U.**
- **Be careful that no water enters the connectors.**


ABS00542

9) Remove the ABSCM&H/U bracket.

B: INSTALLATION

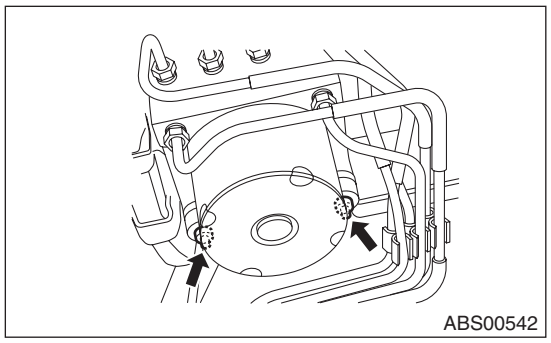
1) Install the ABSCM&H/U bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

2) Install the ABSCM&H/U using new nuts (Part No. 023506000) by aligning the damper groove of the ABSCM&H/U to the bracket side claw.

NOTE:
Check the identification marks of the ABSCM&H/U.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



3) Connect the brake pipes to their correct positions on the ABSCM&H/U.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

4) Using cable clip, secure the ABSCM&H/U harness to the bracket.
5) Connect the connector to the ABSCM&H/U.

NOTE:
• Be sure to remove all foreign matter from inside the connector before connecting.
• Make sure that the ABSCM&H/U connector is securely locked.

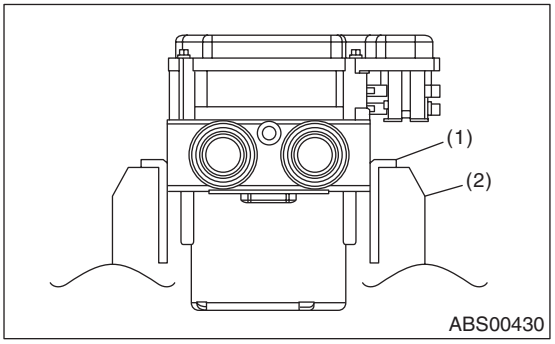
6) Connect the grounding wire of the ABSCM&H/U and apply rust-prevention wax.
7) Install the air cleaner case. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>
8) Bleed air from the brake system.

C: REPLACEMENT

CAUTION:
• Because the seal of the ABSCM cannot be replaced, do not pull or peel it by lifting it up.
• Because the screw of the H/U will become slightly worn in every replacement procedure, 5 times is the maximum number of times for replacement. If a problem is found such as not being able to torque the screw to specifications even before 5 replacement operations are performed, replace the H/U body.
• When installing the ABSCM, always use new screws.
• When the sealing surface of the ABSCM or H/U is dirty or damaged and it cannot be removed or repaired, replace with a new part.

1) Remove the ABSCM&H/U. <Ref. to ABS-6, REMOVAL, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2) To prevent entry of foreign objects and brake fluid leakage, plug the oil pressure port of the ABSCM&H/U using a screw plug, etc.
3) Set the pump motor section of the removed ABSCM&H/U face down on a vise.

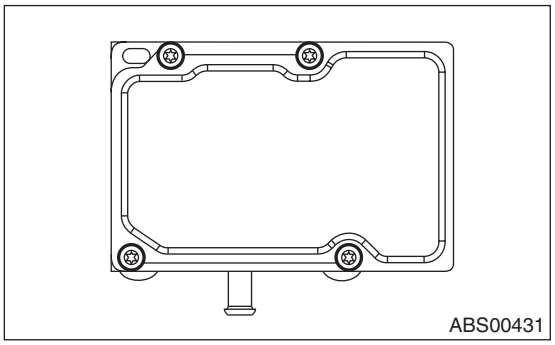
NOTE:
Before securing a part on a vise, set cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.



(1) Aluminum plate, etc.
(2) Vise

4) Using TORX® bit E5, remove the four screws of ABSCM.

NOTE:
These screws cannot be reused.


ABS00431

5) Slowly pull out the ABSCM upward from the H/U.

NOTE:
To prevent damaging the coil section, remove the ABSCM straight up from H/U without twisting.

6) Make sure there is no dirt or damage on the sealing surface of the H/U.

CAUTION:
• Do not clean the ABSCM & H/U by applying compressed air.
• Even if damage is found on the H/U seal, do not attempt repair by filing or with a metal scraper. To remove the seal residue, always use a plastic scraper. Do not use chemical such as paint thinner, etc., to clean.

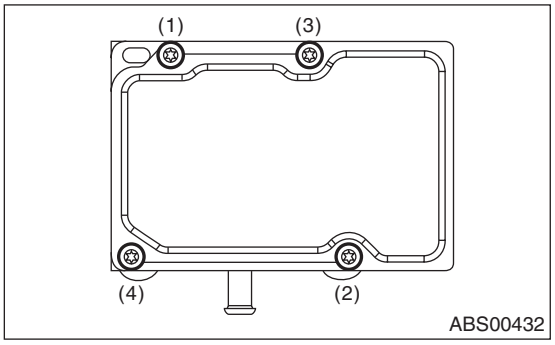
7) Position the coil of the new ABSCM to align with the H/U valve.

8) To prevent deformation of the ABSCM housing cover, hold the corner of ABSCM and install it to the H/U without tilting.

9) Using a TORX® bit E5, attach/tighten new screws in the order of (1) through (4).

CAUTION:
Always use new screws.

Tightening torque:
1.5 N·m (0.15 kgf-m, 1.1 ft-lb)



ABS00432

10) Check that there is no foreign matter in mating surface between the ABSCM & H/U.

11) Using a TORX® bit E5, tighten the screws in the order of (1) through (4) again.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

12) Check that there is no gap in the mating surface between ABSCM and H/U.

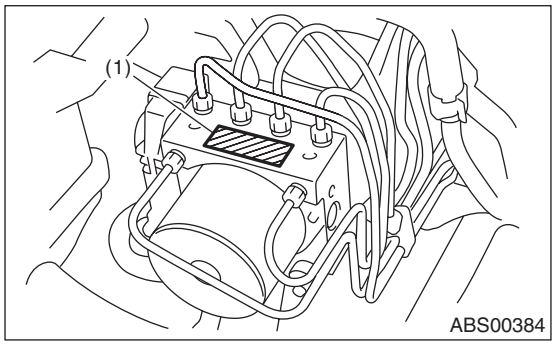
13) Install the ABSCM&H/U to the vehicle. <Ref. to ABS-7, INSTALLATION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: INSPECTION

1) Check the connection and seating of the connector.

2) Check the mark used for ABSCM&H/U identification.

Identification mark	Model
L6	AT
L7	MT



ABS00384

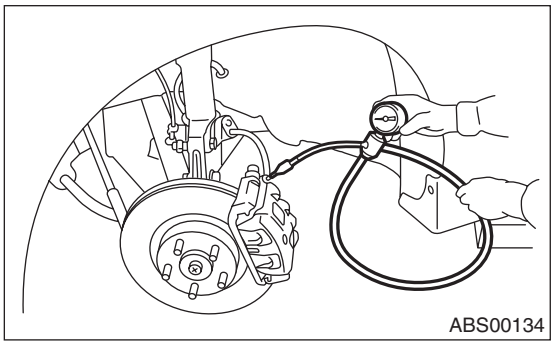
(1) Identification mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift up the vehicle, and remove the wheels.
2) Remove the air bleeder screws from FL and FR caliper bodies.
3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:
• Use a pressure gauge used exclusively for brake fluid measurement.
• Do not use a pressure gauge used previously for measurement of transmission oil pressure, as the piston seal may expand and deform.

NOTE:
Wrap sealing tape around the pressure gauge.



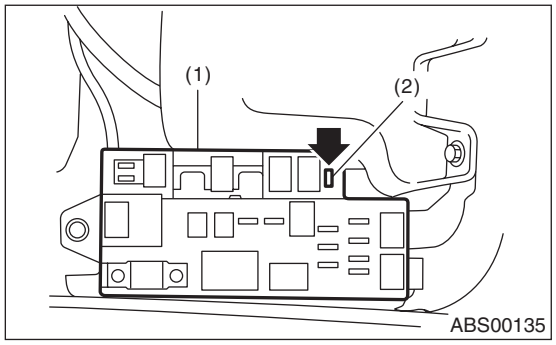
4) Bleed air from the pressure gauge.
5) Perform ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>
6) When the hydraulic unit begins to work, first the FL side performs decompression, hold and compression, and then the FR side performs decompression, hold and compression.
7) Read the values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check whether any irregular tightness of the brake pedal can be felt.

	Front wheel	Rear wheel
Initial value	3,500 kPa (35 kgf/cm^2, 498 psi)	3,500 kPa (35 kgf/cm^2, 498 psi)
When depressurized	500 kPa (5 kgf/cm^2, 71 psi) or less	500 kPa (5 kgf/cm^2, 71 psi) or less
When pressurized	3,500 kPa (35 kgf/cm^2, 498 psi) or more	3,500 kPa (35 kgf/cm^2, 498 psi) or more

8) Disconnect the pressure gauges from FL and FR caliper bodies.
9) Remove the air bleeder screws from RL and RR caliper bodies.
10) Install the air bleeder screws of FL and FR caliper bodies.
11) Connect two pressure gauges to RL and RR caliper bodies.
12) Bleed the air of the FL and FR caliper bodies.
13) Perform ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>
14) When the hydraulic unit begins to work, first the RR side performs decompression, hold and compression, and then the RL side performs decompression, hold and compression.
15) Read the values indicated on the pressure gauges and check if it is within specification.
16) After checking, remove the pressure gauges from the caliper bodies.
17) Install the air bleeder screws of RL and RR caliper bodies.
18) Bleed air from the brake system.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER

1) In the case of AWD AT models, install a spare fuse to the FWD connector in the main fuse box to simulate FWD vehicles.

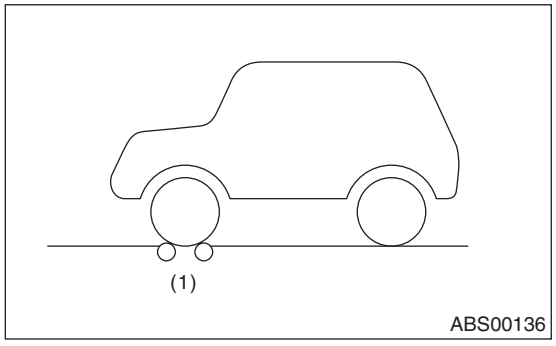


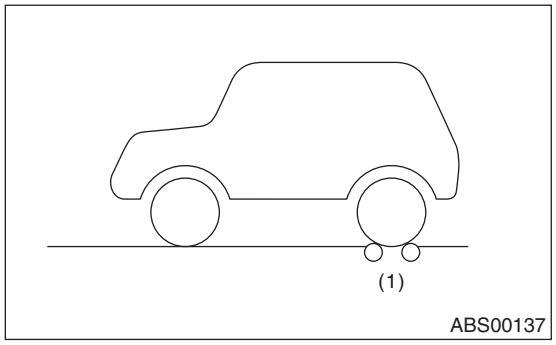
(1) Main fuse box
(2) FWD connector

NOTE:
Since a viscous coupling is used in the center differential on MT models, AWD circuit cut-off cannot be performed.

2) Prepare for the ABS sequence control operation. <Ref. to ABS-11, ABS Sequence Control.>

3) Set the front wheels or rear wheels on the brake tester and set the select lever position to the “N” range.





(1) Brake tester

4) Operate the brake tester.

5) Perform ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>

6) When the hydraulic unit begins to work, check the following work sequence.
   (1) The FL side performs decompression, hold and compression in sequence, and subsequently the FR side repeats the cycle.
   (2) The RR side performs decompression, hold and compression in sequence, and the RL side repeats the same cycle next.

7) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets the standard values.

	Front wheel	Rear wheel
Initial value	1,000 N (100 kgf, 221 lb)	1,000 N (100 kgf, 221 lb)
When depressurized	500 N (50 kgf, 110 lb) or less	500 N (50 kgf, 110 lb) or less
When pressurized	1,000 N (100 kgf, 221 lb) or more	1,000 N (100 kgf, 221 lb) or more

8) After checking, press the brake pedal and check whether any irregular tightness of the brake pedal can be felt.

3. ABS Sequence Control

A: OPERATION

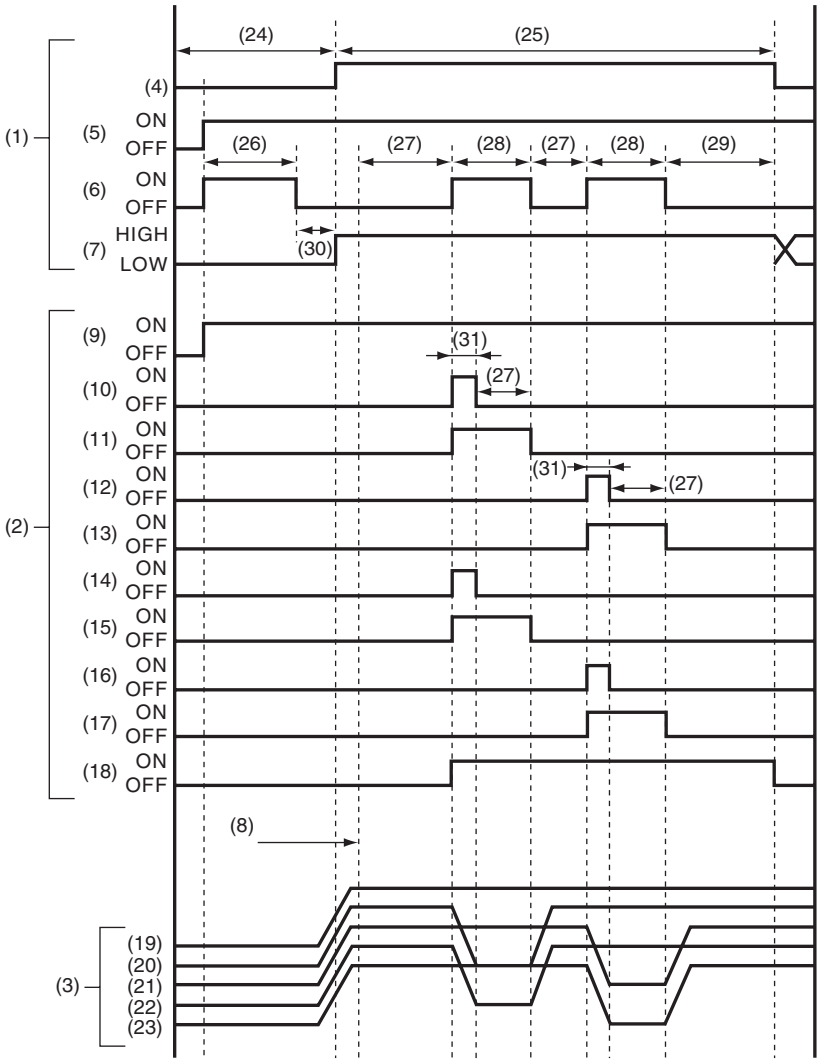
1) While the ABS sequence control is being performed, the operation of the hydraulic unit can be checked using the brake tester or pressure gauge after the hydraulic unit solenoid valve operation.
2) ABS sequence control can be started by diagnosis connector or Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:
If a problem occurs, sequence control will not operate. In this case, diagnose the failure. <Ref. to ABS(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
1) Connect the Subaru Select Monitor to data link connector under the driver's side instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Run the Subaru Select Monitor.
4) Set the Subaru Select Monitor to "BRAKE CONTROL" mode.
5) When the "Function check sequence" is selected, the "ABS sequence control" will start.
6) Execute the following operations when the message "Press the brake pedal so that the brake pedal force is between 100 and 150 kgf" is displayed.
   (1) When using a brake tester, press the brake pedal pad with a force of 981 N (100 kgf, 221 lb).
   (2) When using a pressure gauge, press the brake pedal so that the pressure gauge indicates 3,432 kPa (35 kg/cm^2, 498 psi).

CAUTION:
On models with the hill holder feature, do not step on the clutch pedal.
7) "Press the [YES] key" will be displayed. Press the YES key.
8) The brake system being operated is displayed on the Subaru Select Monitor.

2. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00781

(1) Operation guide line of the sequence control
(2) Operation pattern of sequence control
(3) Operating pressure of sequence control
(4) All wheel speed
(5) Ignition key
(6) ABS warning light
(7) Stop light switch
(8) A point
(9) Valve relay
(10) FL decompression valve
(11) FL compression valve
(12) FR decompression valve
(13) FR compression valve
(14) RR decompression valve
(15) RR compression valve
(16) RL decompression valve
(17) RL compression valve
(18) Pump motor
(19) Master cylinder pressure
(20) FL wheel cylinder pressure
(21) FR wheel cylinder pressure
(22) RR wheel cylinder pressure
(23) RL wheel cylinder pressure
(24) 4 km/h (2 MPH) or less
(25) 10 km/h (6 MPH) or less
(26) 1.5 sec.
(27) 1.0 sec.
(28) 1.4 sec.
(29) 0.6 sec.
(30) Within 0.5 sec.
(31) 0.4 sec.

NOTE:
- The control operation starts from point A.
- HIGH indicates high voltage.
- LOW indicates low voltage.

B: SPECIFICATION

1. ABS SEQUENCE CONTROL COMPLETE CONDITION

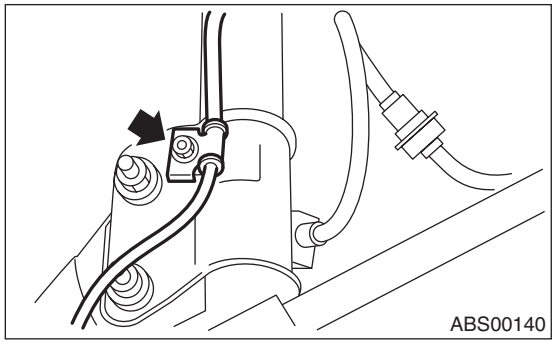
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is released during sequence control and the stop light switch is becomes OFF.
3) After completion of the sequence control.
4) When a malfunction is detected.

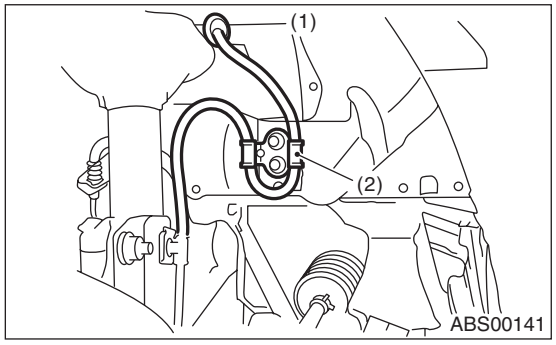
4. Front ABS Wheel Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Disconnect the ABS wheel speed sensor connector located next to the front strut mounting house in the engine compartment.
3) Remove the bolts which secure the sensor harness to the strut.



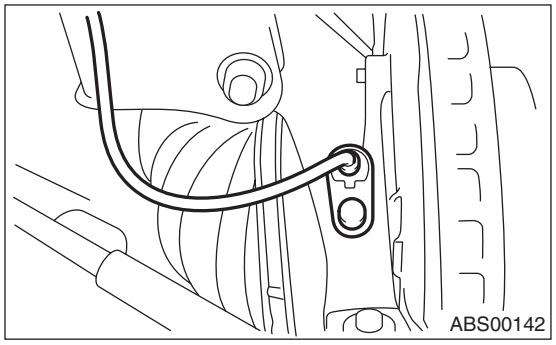
4) Remove the bolts which secure the sensor harness to the body.



(1) To the front ABS wheel speed sensor connector
(2) Bracket

5) Remove the bolts which secure front ABS wheel speed sensor to the housing, and remove the front ABS wheel speed sensor.

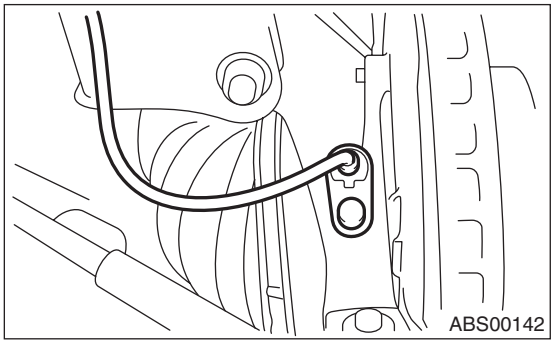
CAUTION:
• Be careful not to damage the pole piece and the face of the teeth located at tip of the sensor during removal.
• Do not pull on the sensor harness during removal.



B: INSTALLATION

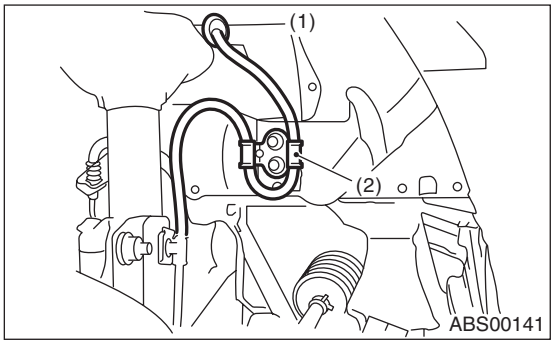
1) Temporarily install the front ABS wheel speed sensor on the housing.

CAUTION:
Be careful not to hit the ABS wheel speed sensor pole piece and tone wheel against adjacent metal parts during installation.



2) Install the front ABS wheel speed sensor on the strut and the wheel apron bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

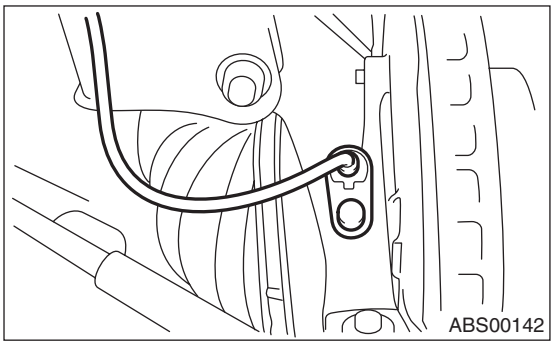


(1) To the front ABS wheel speed sensor connector
(2) Bracket

3) Check the clearance of the sensor. <Ref. to ABS-16, SENSOR GAP, INSPECTION, Front ABS Wheel Speed Sensor.>
If clearance is outside of the standard value, readjust by using the spacer (Part No. 26755AA000).

ABS wheel speed sensor gap standard value:
0.3 — 0.8 mm (0.012 — 0.031 in)

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

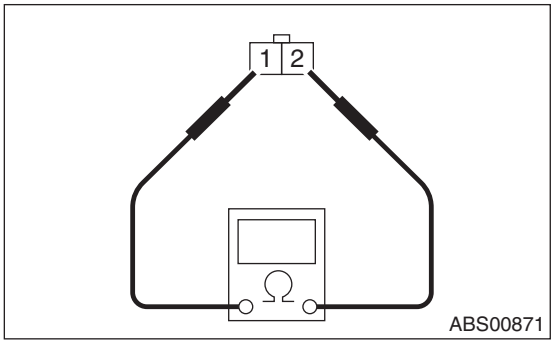


NOTE:
Check the identification (mark) on the harness to make sure there is no warpage. (RH: Yellow green, LH: Pink)
4) After confirmation of the ABS wheel speed sensor clearance, connect the connector to the ABS wheel speed sensor.
5) Connect the ground cable to the battery.

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of the ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace the ABS wheel speed sensor.
2) Measure the ABS wheel speed sensor resistance.
If resistance is outside the standard value, replace with a new ABS wheel speed sensor.

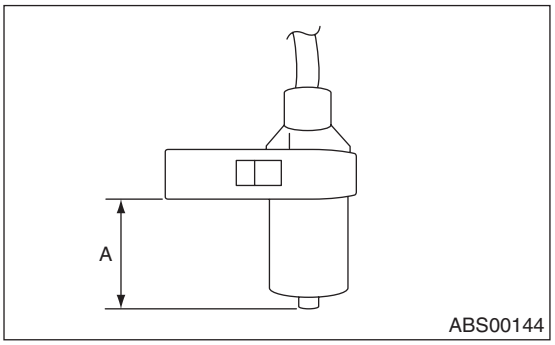


Terminal No.	Specification
1 and 2	1.25±0.25 kΩ

NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new part.

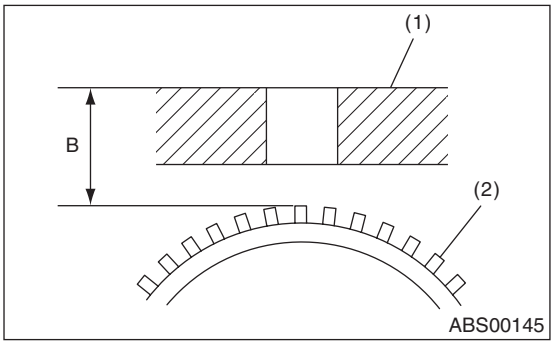
2. SENSOR GAP

1) Measure the distance “A” between the ABS wheel speed sensor surface and sensor pole face.



2) Measure the distance “B” between the surface where the front axle housing meets the ABS wheel speed sensor, and the tone wheel.

NOTE:
Measure so that the gauge touches the apex of the tone wheel teeth.



(1) Axle housing
(2) Tone wheel

3) Find the gap between the ABS wheel speed sensor pole face and the surface of the tone wheel teeth by entering and calculating the measured values in the formula below.
ABS wheel speed sensor gap = B – A

ABS wheel speed sensor gap standard value:
0.3 — 0.8 mm (0.012 — 0.031 in)

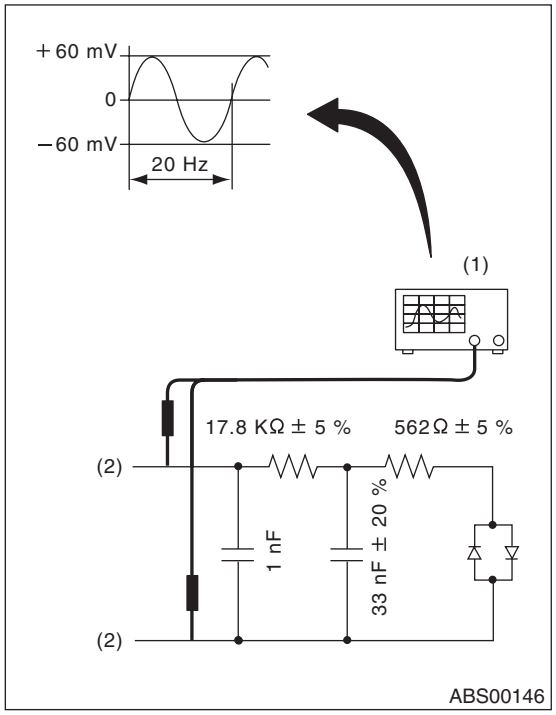
NOTE:
If clearance is outside of the standard value, readjust by using the spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install a resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Standard value of output voltage:
0.12 — 1 V (at 20 Hz)

NOTE:
Regarding terminal numbers, refer to 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-16, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>



(1) Oscilloscope
(2) Terminals

D: ADJUSTMENT

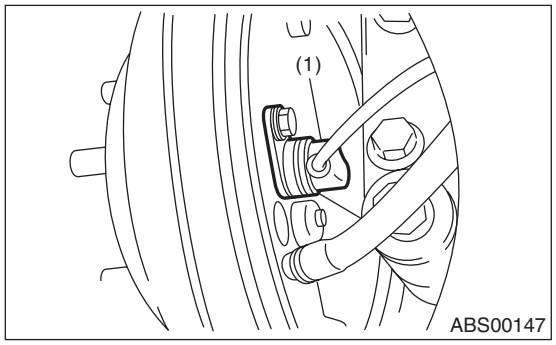
Adjust the gap using spacers (Part No. 26755AA000).

5. Rear ABS Wheel Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Lift up the vehicle.
3) Remove the rear seat and disconnect the rear ABS wheel speed sensor connector.
4) Remove the rear sensor harness bracket from the rear trailing link and bracket.
5) Remove the rear ABS wheel speed sensor from the back plate.

CAUTION:
• Be careful not to damage the pole piece and the face of the teeth located at tip of the sensor during removal.
• Do not pull on the sensor harness during removal.



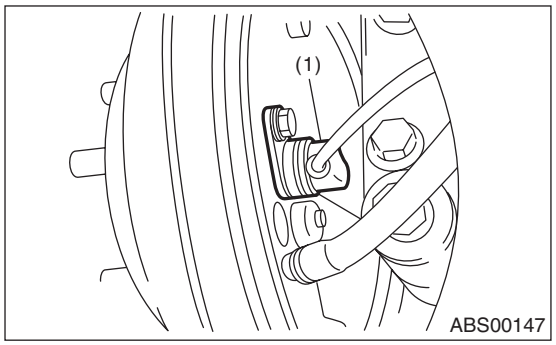
(1) Rear ABS wheel speed sensor

6) Remove the rear tone wheel when removing the hub from the housing and hub assembly. <Ref. to DS-22, REMOVAL, Rear Axle.>

B: INSTALLATION

1) Attach the hub to the rear tone wheel and attach the rear housing. <Ref. to DS-28, ASSEMBLY, Rear Axle.>
2) Temporarily attach the rear ABS wheel speed sensor to the back plate.

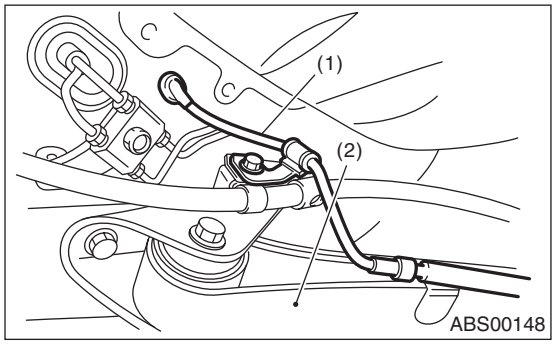
CAUTION:
Be careful not to hit the ABS wheel speed sensor pole piece and tone wheel against adjacent metal parts during installation.



(1) Rear ABS wheel speed sensor

3) Install the rear drive shaft to the rear housing and rear differential spindle. <Ref. to DS-25, INSTALLATION, Rear Axle.>
4) Install the rear sensor harness on the rear trailing link.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



(1) Rear sensor harness
(2) Trailing link

5) Check the clearance of the sensor. <Ref. to ABS-19, SENSOR GAP, INSPECTION, Rear ABS Wheel Speed Sensor.>When the clearance is within standard values, tighten the ABS wheel speed sensor to the back plate at the specified torque.
If clearance is outside of the standard value, readjust by using the spacer (Part No. 26755AA000).

ABS wheel speed sensor gap standard value:
0.7 — 1.2 mm (0.028 — 0.047 in)

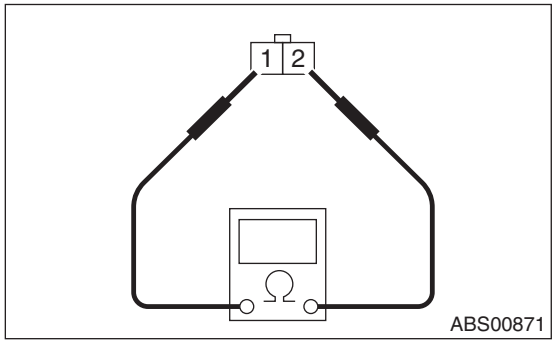
Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

NOTE:
Check the identification (mark) on the harness to make sure there is no warpage. (RH: White, LH: Yellow)
6) After confirmation of the ABS wheel speed sensor clearance, connect the connector to the ABS wheel speed sensor.
7) Connect the ground cable to the battery.

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of the ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace the ABS wheel speed sensor.
2) Measure the ABS wheel speed sensor resistance. If resistance is outside the standard value, replace with a new ABS wheel speed sensor.



Terminal No.	Specification
1 and 2	1.15±0.115 kΩ

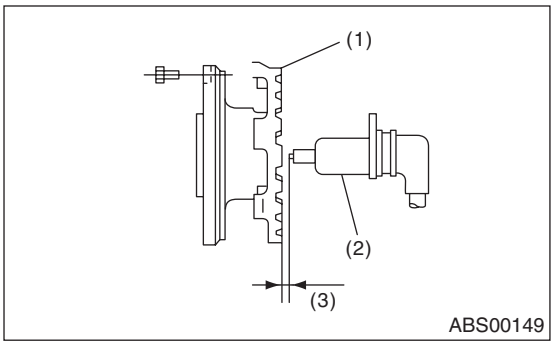
NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new part.

2. SENSOR GAP

Check the gap between the tone wheel and the ABS wheel speed sensor around the entire circumference.

NOTE:
If clearance is narrow, adjust by using the spacer (Part No. 26755AA000).
If clearance is wide, check the output voltage and replace the ABS wheel speed sensor or tone wheel if the output voltage is outside the specification.

ABS wheel speed sensor gap standard value:
0.7 — 1.2 mm (0.028 — 0.047 in)



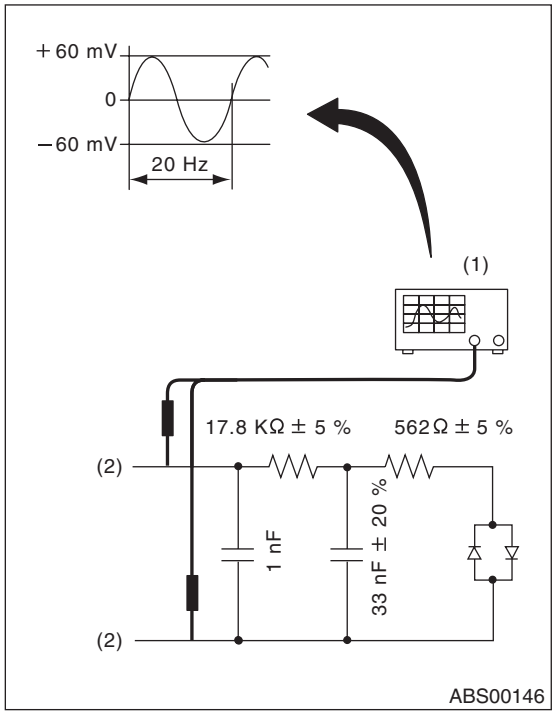
(1) Tone wheel
(2) ABS wheel speed sensor
(3) Sensor gap

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install a resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Standard value of output voltage:
0.12 — 1 V at (20 Hz)

NOTE:
Regarding terminal numbers, refer to 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-19, ABS WHEEL SPEED SENSOR, INSPECTION, Rear ABS Wheel Speed Sensor.>



(1) Oscilloscope
(2) Terminals

D: ADJUSTMENT

Adjust the gap using spacers (Part No. 26755AA000).

6. Front Tone Wheel

A: REMOVAL

The front tone wheel is integrated with the front drive shaft. Refer to the section on Front Drive Shaft.
<Ref. to DS-30, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

The front tone wheel is integrated with the front drive shaft. Refer to the section on Front Drive Shaft.
<Ref. to DS-31, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace with a new tone wheel.

NOTE:
Replace the AC assembly with a new part if there is any defect found on the tone wheel, since it is unitized with the AC assembly of the drive shaft.

7. Rear Tone Wheel

A: REMOVAL

The rear tone wheel is attached to the rear hub. Refer to Rear Axle.
<Ref. to DS-22, REMOVAL, Rear Axle.>

B: INSTALLATION

The rear tone wheel is attached to the rear hub. Refer to Rear Axle.
<Ref. to DS-25, INSTALLATION, Rear Axle.>

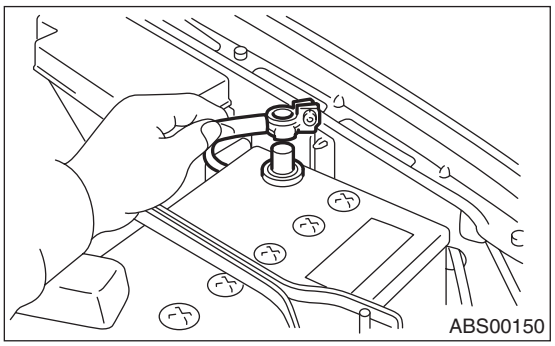
C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace with a new tone wheel.

8. G Sensor

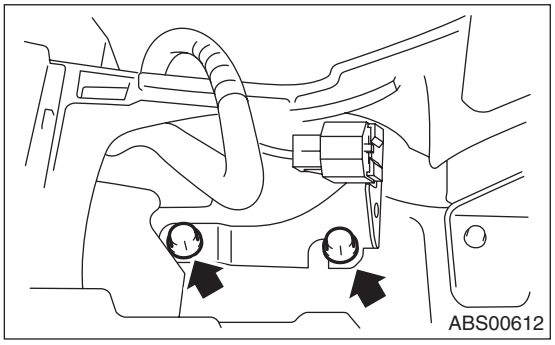
A: REMOVAL

1) Disconnect the ground cable from the battery.



2) Remove the console cover.
<Ref. to EI-37, REMOVAL, Console Box.>
3) Disconnect the connector from the G sensor.
4) Remove the G sensor from the body.

CAUTION:
- **Do not drop or bump the G sensor.**
- **The G sensor integrated with the bracket. Do not disassemble.**



B: INSTALLATION

Install in the reverse order of removal.

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

CAUTION:
Do not drop or bump the G sensor.

C: INSPECTION

Step		Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Is a Subaru Select Monitor available?	Go to step **5**.	Go to step **2**.
2	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the G sensor from vehicle. 3) Connect the connector to the G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 2.3±0.2 V when G sensor is in a horizontal position?	Go to step **3**.	Replace the G sensor.
3	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage between 3.9±0.2 V when G sensor is inclined forward 90°?	Go to step **4**.	Replace the G sensor.
4	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal:*** ***(B292) No. 2 (+) — No. 3 (–)***	Is the voltage 0.7±0.2 V when the G sensor is inclined backward 90°?	G sensor is normal.	Replace the G sensor.
5	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to the data link connector. 3) Set the Subaru Select Monitor to the “BRAKE CONTROL” mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the Subaru Select Monitor display.	Is the indicated reading on the monitor display 0±0.1 m/s ^{2}?	Go to step **6**.	Replace the G sensor.
6	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the G sensor from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display.	Is the numerical value 9.8± 0.1 m/s^2 when G sensor is inclined forward 90°?	Go to step **7**.	Replace the G sensor.
7	**CHECK G SENSOR.** Read the Subaru Select Monitor display.	Is the numerical value –9.8± 0.1 m/s^2 when G sensor is inclined back 90°?	G sensor is normal.	Replace the G sensor.

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
Remove foreign matter (dust, water, oil etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check harness for broken wires or short circuits, shake the suspected trouble spot or connector.
- Refer to “Check List for Interview”. <Ref. to ABS(diag)-4, Check List for Interview.>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to ABS(diag)-4, Check List for Interview.> 2) Before performing diagnostics, check the components which might affect ABS problems. <Ref. to ABS(diag)-8, INSPECTION, General Description.>	Are components which might affect the ABS problem operating correctly?	Go to step **2**.	Repair or replace each component.
2	**CHECK INDICATION OF DTC ON SCREEN.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to the data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 4) Read the DTC. <Ref. to ABS(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Record all DTCs and freeze frame data.	Is DTC displayed?	Go to step **4**.	Go to step **3**.
3	**PERFORM GENERAL DIAGNOSTICS.** 1) Perform the inspection using “General Diagnostic Table”. <Ref. to ABS(diag)-70, General Diagnostic Table.> 2) Perform the Clear Memory Mode. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the Inspection Mode. <Ref. to ABS(diag)-25, Inspection Mode.> 4) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.> Check that there is no DTC displayed.	Does the ABS warning light go off after turning the ignition switch ON?	Finish the diagnosis.	Check using “ABS Diagnostic Procedure”. <Ref. to ABS(diag)-22, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

Step		Check	Yes	No
4	**PERFORM DIAGNOSIS.** 1) Refer to “List of Diagnostic Trouble Code (DTC).” <Ref. to ABS(diag)-35, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the cause of trouble. 3) Perform the Clear Memory Mode. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the Inspection Mode. <Ref. to ABS(diag)-25, Inspection Mode.> 5) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Repeat step 1 to 4 until DTC does not appear.	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Check the following items regarding condition of the vehicle.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When and for how long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (Before starting engine) ❑ START ❑ ON (After starting engine, while engine is running) ❑ ON (After starting engine, engine is stopped)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When other electrical parts are operating		
	• Parts name: • Operating condition:		

2. STATE OF BRAKE WARNING LIGHT

Brake warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on ❑ When pulling the parking brake lever ❑ When releasing the parking brake lever • When and for how long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (Before starting engine) ❑ START ❑ ON (After starting engine, while engine is running) ❑ ON (After starting engine, engine is stopped)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When other electrical parts are operating		
	• Parts name: • Operating condition:		

3. SYMPTOMS

ABS operating condition	❑ Does not operate.		
	❑ Operates only when applying the brakes suddenly.	Vehicle speed:	km/h MPH
	• Procedures for stepping on the brake pedal:		
	a) Operating time:		Sec.
	b) Operating noise: ❑ Occurs. / ❑ Does not occur.		
	• What kind of noise?	❑ Knocking ❑ Gong gong ❑ Thump ❑ Buzz ❑ Gong gong buzz ❑ Others :	
	c) Reaction force of brake pedal		
		❑ Sticks ❑ Weak pedal resistance ❑ Strong pedal resistance ❑ Others :	
Condition of vehicle	a) Directional stability cannot be obtained or the steering does not respond when applying brakes: ❑ Yes / ❑ No		
	• When:	❑ When turning to the right ❑ When turning to the left ❑ When spinning out ❑ Others :	
	b) Directional stability cannot be obtained or the steering does not respond when accelerating: ❑ Yes / ❑ No		
	• When:	❑ When turning to the right ❑ When turning to the left ❑ When spinning out ❑ Others :	
	c) Poor brake performance:❑ Yes / ❑ No		
	• What kind:	❑ Braking distance is long. ❑ Brakes lock or drag. ❑ Pedal stroke is long. ❑ Pedal sticks. ❑ Others :	
	d) Poor acceleration: ❑ Yes / ❑ No		
	• What kind:	❑ Fails to accelerate. ❑ Engine stalls. ❑ Others :	
	e) Occurrence of vibration:❑ Yes / ❑ No		
	• Where • What kind:		
	f) Occurrence of noise: ❑ Yes / ❑ No		
	• Where • What kind:		
	g) Other troubles occurred: ❑ Yes / ❑ No		
	• What kind:		

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others :
	b) Ambient temperature	°C (°F)
	c) Road	❑ Inner city ❑ Suburbs ❑ Highway ❑ Local street ❑ Uphill ❑ Downhill ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Others :
	d) Road surface	❑ Dry ❑ Wet ❑ Covered with fresh snow ❑ Covered with hardened snow ❑ Frozen slope ❑ Others :
Condition	a) Brakes	Deceleration: G ❑ Intermittent / ❑ Temporary
	b) Accelerator	Acceleration: G ❑ Intermittent / ❑ Temporary
	c) Vehicle speed	km/h | MPH ❑ Advancing ❑ When accelerating ❑ When decelerating ❑ At low speed ❑ When turning ❑ Others:
	d) Tire inflation pressure	Front RH tire: kPa Front LH tire: kPa Rear RH tire: kPa Rear LH tire: kPa
	e) Degree of wear	Front RH tire: Front LH tire: Rear RH tire: Rear LH tire:
	f) Genuine parts are used: ❑ Yes / ❑ No	
	g) Tire chain is attached: ❑ Yes / ❑ No	
	h) T-type tire is used: ❑ Yes / ❑ No	
	i) Condition of suspension alignment:	
	j) Loaded state:	
	k) Repair parts are used: ❑ Yes / ❑ No	
	• Contents:	
	l) Others:	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor and ABSCM&H/U.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor and ABSCM&H/U.

B: INSPECTION

Before performing diagnosis, check the following item which might affect ABS problems.

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage:
12 V or more

Specific gravity:
1.260 or more

2. GROUND

Check the tightness of ABS ground (GB-4) bolt.

3. BRAKE FLUID

1) Check the brake fluid level.
2) Check the brake fluid for leaks.

4. HYDRAULIC UNIT

Check the hydraulic unit.
• When using the brake tester <Ref. to ABS-10, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
• When not using the brake tester <Ref. to ABS-9, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

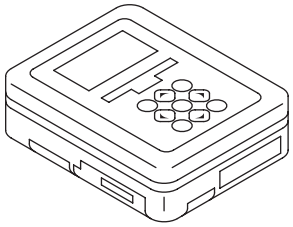
Check the brake pad and rotor.
• Front <Ref. to BR-16, INSPECTION, Front Brake Pad.> <Ref. to BR-17, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-22, INSPECTION, Rear Brake Pad.> <Ref. to BR-24, INSPECTION, Rear Disc Rotor.>

7. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOL

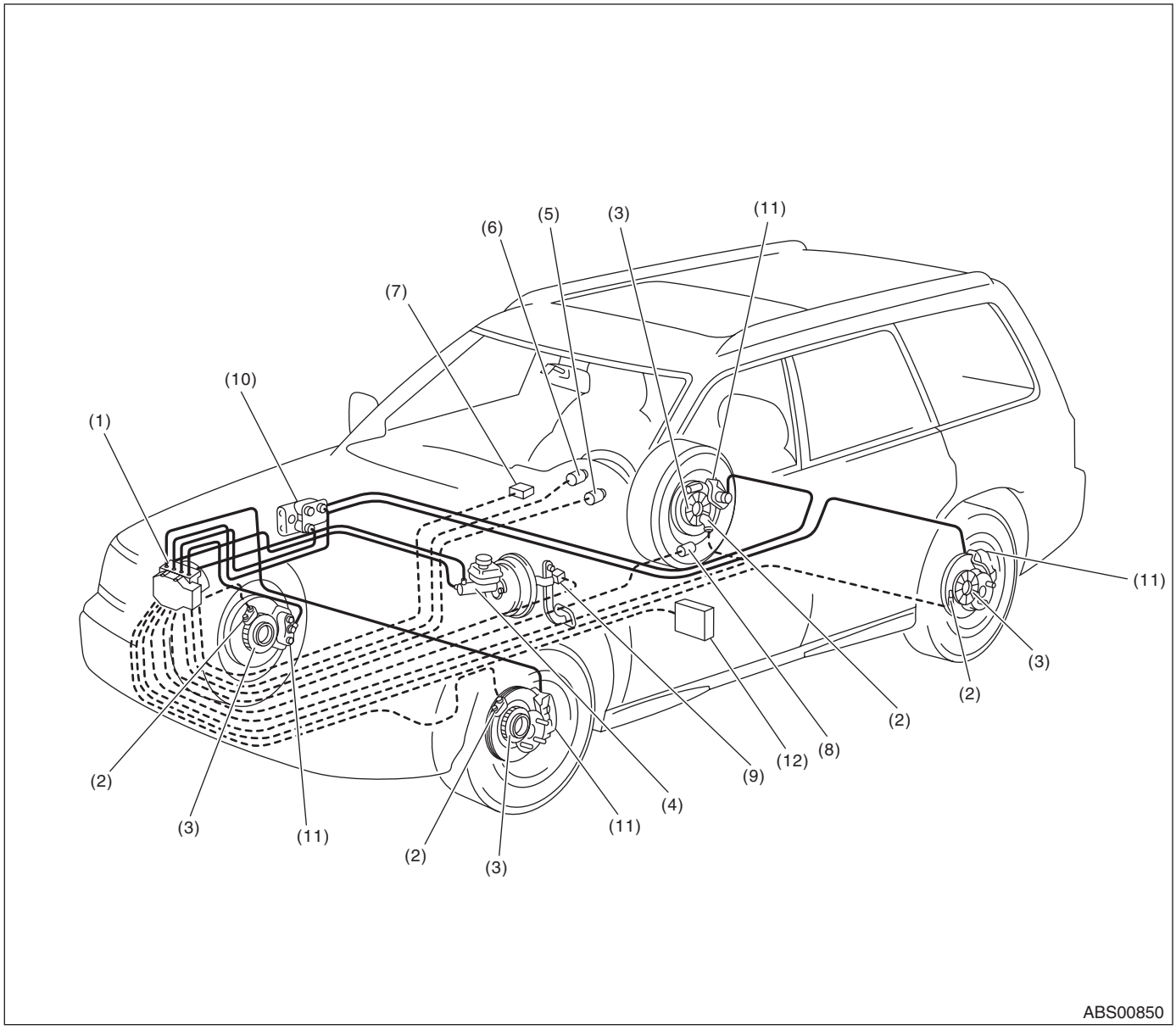
ILLUSTRATION	TOOL NUMBER	Description	REMARKS
 ST1B021XU0	1B021XU0	SUBARU SELECT MONITOR III KIT	Used for diagnosing the electrical system.

2. GENERAL TOOL

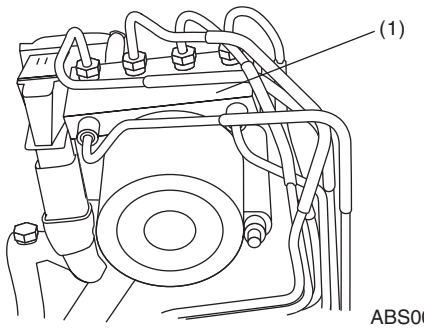
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

4. Electrical Component Location

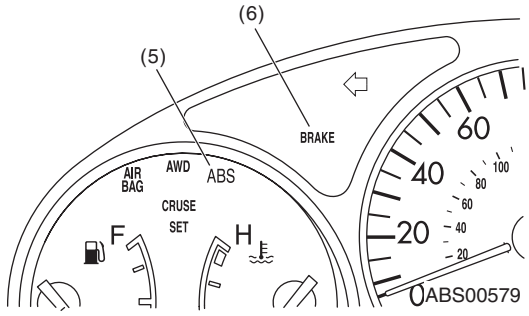
A: LOCATION



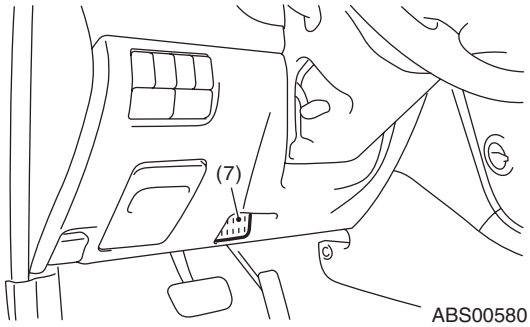
(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) ABS wheel speed sensor
(3) Tone wheel
(4) Master cylinder
(5) ABS warning light
(6) Brake warning light (EBD warning light)
(7) Data link connector
(8) G sensor
(9) Stop light switch
(10) Proportioning valve type connector
(11) Caliper body
(12) Transmission control module (for AT model only)



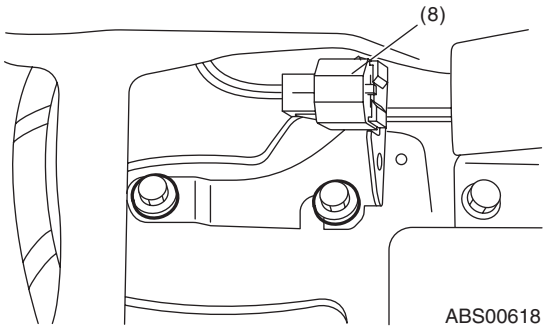
ABS00551



ABS00579

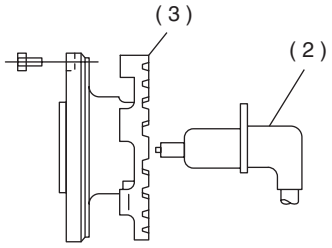


ABS00580



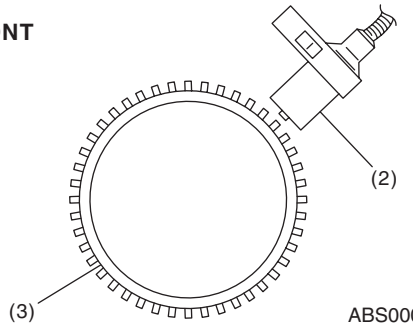
ABS00618

REAR



ABS00019

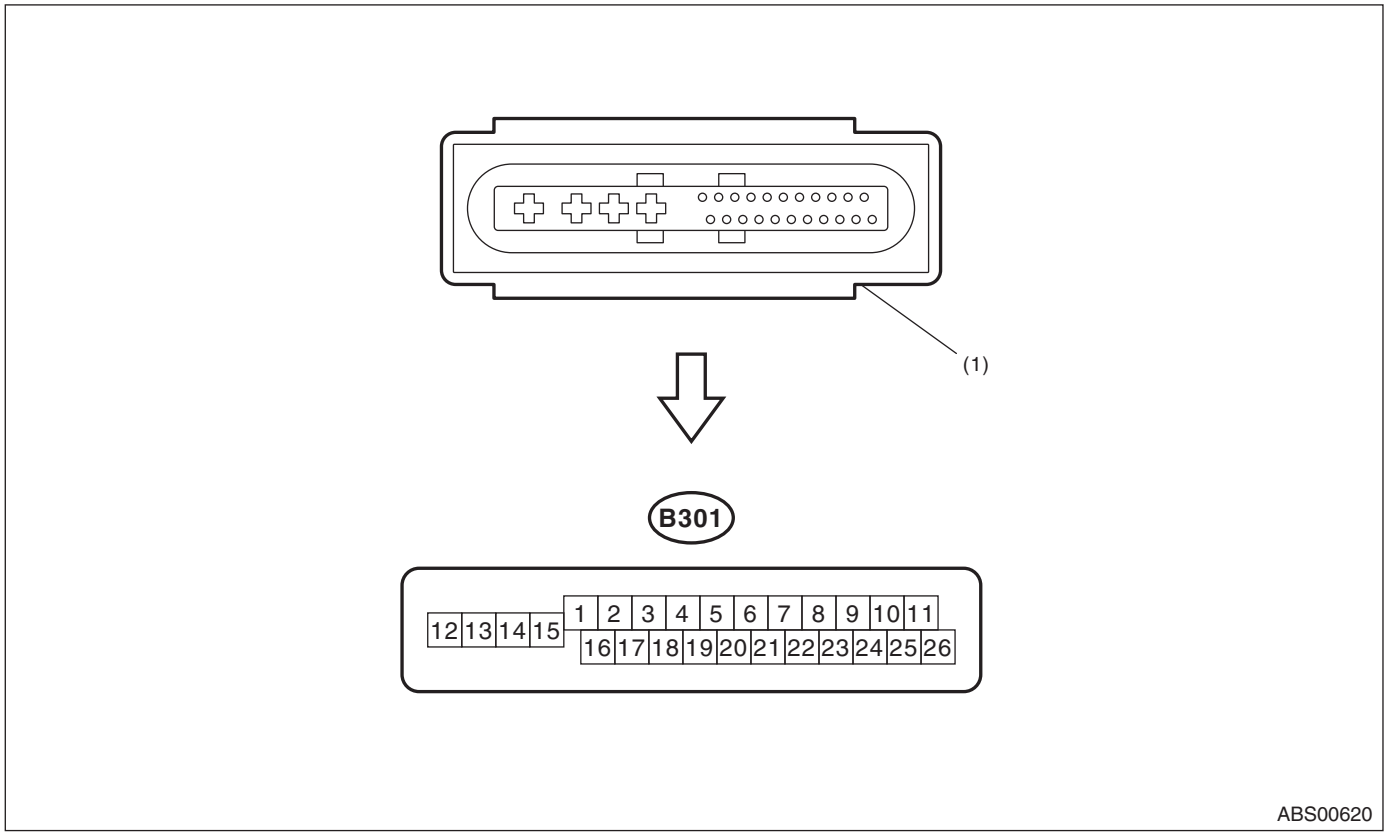
FRONT



ABS00028

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



(1) ABS control module and hydraulic control unit (ABSCM&H/U) connector

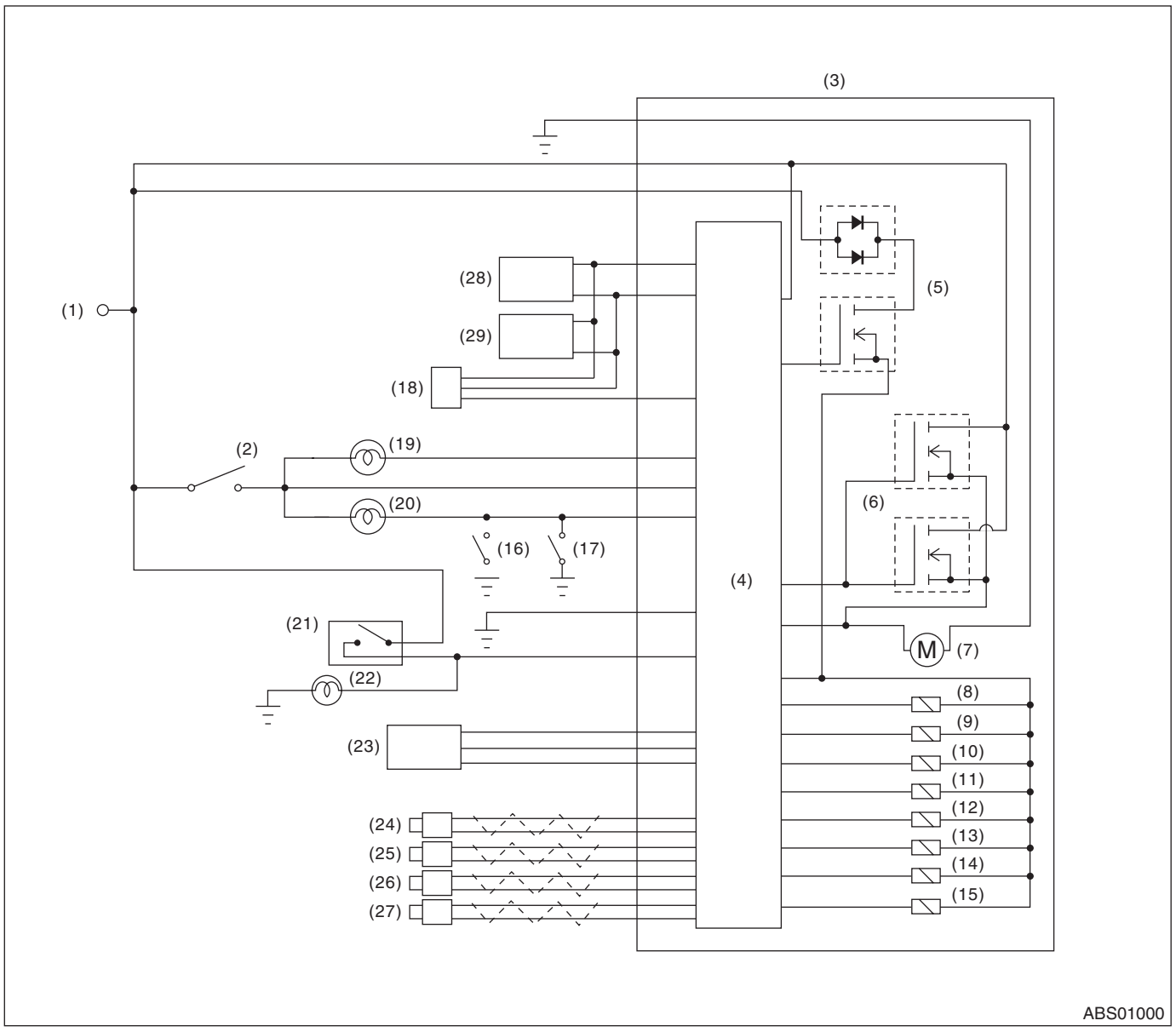
NOTE:
- Terminal numbers in ABSCM&H/U connector are shown in the figure.
- ABS warning light illuminates when the connector is removed from ABSCM&H/U.

Control Module I/O Signal

Description		Terminal No. (+) — (–)	Input/Output signal
ABS wheel speed sensor (Wheel speed sensor)	Front LH wheel	1 — 16	0.12 — 1 V (at 20 Hz)
	Front RH wheel	6 — 5	
	Rear LH wheel	3 — 2	
	Rear RH wheel	19 — 4	
CAN communication circuit (+) (for AT models only)		26	2.5 — 1.5 V pulse signal
CAN communication circuit (–) (for AT models only)		11	3.5 — 2.5 V pulse signal
Valve relay power supply *1		14 — 15	10 — 15 V
Motor relay power supply *1		13 — 15	10 — 15 V
G Sensor	Power supply	24 — 10	4.75 — 5.25 V
	Ground	10	—
	Output	21 — 10	2.1 — 2.5 V when the vehicle is on level surface
Stop light switch *1		20 — 15	Less than 1.5 V when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.
ABS warning light		22 — 15	After turning the ignition switch ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Brake warning light (EBD warning light)		8 — 15	After turning the ignition switch ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Subaru Select Monitor		7 — 15	Less than 1.5 V when no data is received. 0 ←→ 12 V pulse (in communication)
Power supply *1		18 — 15	10 — 15 V when the ignition switch is ON.
Grounding line		15	—

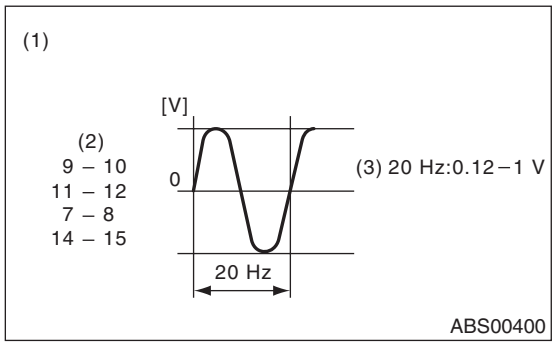
*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.

B: WIRING DIAGRAM



(1) Battery
(2) Ignition switch
(3) ABS control module and hydraulic control unit (ABSCM&H/U)
(4) ABS control module
(5) Valve relay
(6) Motor relay
(7) Motor
(8) Front inlet solenoid valve LH
(9) Front outlet solenoid valve LH
(10) Front inlet solenoid valve RH
(11) Front outlet solenoid valve RH
(12) Rear inlet solenoid valve LH
(13) Rear outlet solenoid valve LH
(14) Rear inlet solenoid valve RH
(15) Rear outlet solenoid valve RH
(16) Parking brake switch
(17) Brake fluid level switch
(18) Data link connector
(19) ABS warning light
(20) Brake warning light
(21) Stop light switch
(22) Stop light
(23) G Sensor
(24) Front ABS wheel speed sensor LH
(25) Front ABS wheel speed sensor RH
(26) Rear ABS wheel speed sensor LH
(27) Rear ABS wheel speed sensor RH
(28) Transmission control module (AT models)
(29) Engine control module

C: WAVEFORM



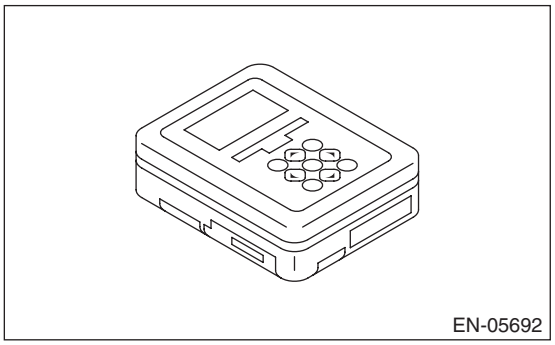
(1) ABS wheel speed sensor
(2) Terminal No.
(3) Standard output voltage

6. Subaru Select Monitor

A: OPERATION

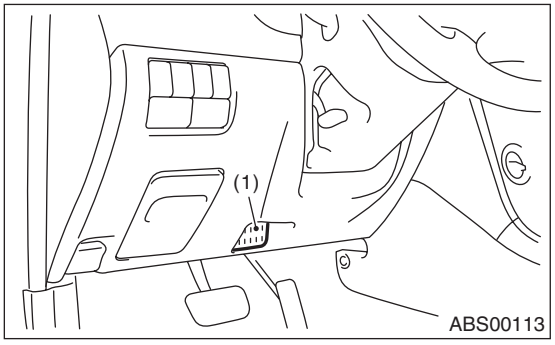
1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare the Subaru Select Monitor kit. <Ref. to ABS(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>



2) Prepare the PC to which Subaru Select Monitor has been installed.
3) Connect the USB cable to the SDI (Subaru Diagnostic Interface) and the USB port of PC (port for Subaru Select Monitor).

NOTE:
The port for Subaru Select Monitor is the USB port which has been used in installing the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect SDI to the data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect the scan tools other than the Subaru Select Monitor.
6) Start up PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
8) On the «Main Menu» display screen, select {Each System Check}.
9) On the «System Selection Menu» display screen, select {Brake Control}.
10) Press [OK] after {ABS} is displayed.
11) On the «Brake Control Diagnosis» display screen, select {DTC Display}.
12) Record DTCs and data.

NOTE:
• For details concerning operation procedure, refer to the "PC APPLICATION HELP FOR SUBARU SELECT MONITOR".
• For details concerning DTCs, refer to List of Diagnostic Trouble Code (DTC). <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>
• Up to 3 DTCs are displayed in the order of detection.
• If a particular DTC is not stored in memory properly at the occurrence of problem (due to a drop in ABSCM&H/U power supply etc.), the DTC suffixed with a question mark "?" is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.
13) If communication is not possible between the ABS and the Subaru Select Monitor, check the communication circuit. <Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>
14) When DTC is not displayed, check the meter circuit and the CAN communication circuit. <Ref. to ABS(diag)-22, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

Display	Contents to be monitored
Current	The current DTC is displayed on Subaru Select Monitor display screen.
Old	The latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.
Second previous	The second latest DTC from the history of previous problems is displayed on the Subaru Select Monitor display screen.
Third previous	The third latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Brake Control}.
3) Press [OK] button after {ABS} is displayed.
4) On the “Brake Control Diagnosis” display screen, select {Current Data Display & Save}.
5) On the «Display Menu» screen, select the data display method.
6) Using the scroll key, scroll the display screen up or down until necessary data is shown.

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

Display	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h or MPH
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h or MPH
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h or MPH
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h or MPH
BLS Signal	Brake ON/OFF is displayed.	ON or OFF
G Sensor	Vehicle acceleration detected by analog G sensor is displayed.	m/s (m/s^2)
Valve Relay Signal	Valve relay operation signal is displayed.	ON or OFF
ABS Warning Light	ON operation of the ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of the EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Motor relay monitor voltage is displayed.	V
IG power supply voltage	Voltage supplied to ABSCM&H/U is displayed.	V
ABS Control Flag	ABS control condition is displayed.	ON or OFF
ABS OK B Signal	ABS system normal/abnormal is displayed.	OK or NG

NOTE:
For details concerning operation procedure, refer to the “PC APPLICATION HELP FOR SUBARU SELECT MONITOR”.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Brake Control}.
3) Press [OK] after {ABS} is displayed.
4) On the «Brake Control Diagnosis» display screen, select {Clear Memory}.
5) When the “Clear Memory?” is shown on the screen, press [YES] button.
6) When Done and Turn ignition switch to OFF is shown on the display screen, turn the ignition switch to OFF.

NOTE:
For details concerning operation procedure, refer to the “PC APPLICATION HELP FOR SUBARU SELECT MONITOR”.

4. ABS SEQUENCE CONTROL

Display	Contents to be monitored	Index No.
ABS sequence control	Operate the valve and pump motor continuously to perform the ABS sequence control.	<Ref. to ABS-11, ABS Sequence Control.>

5. FREEZE FRAME DATA

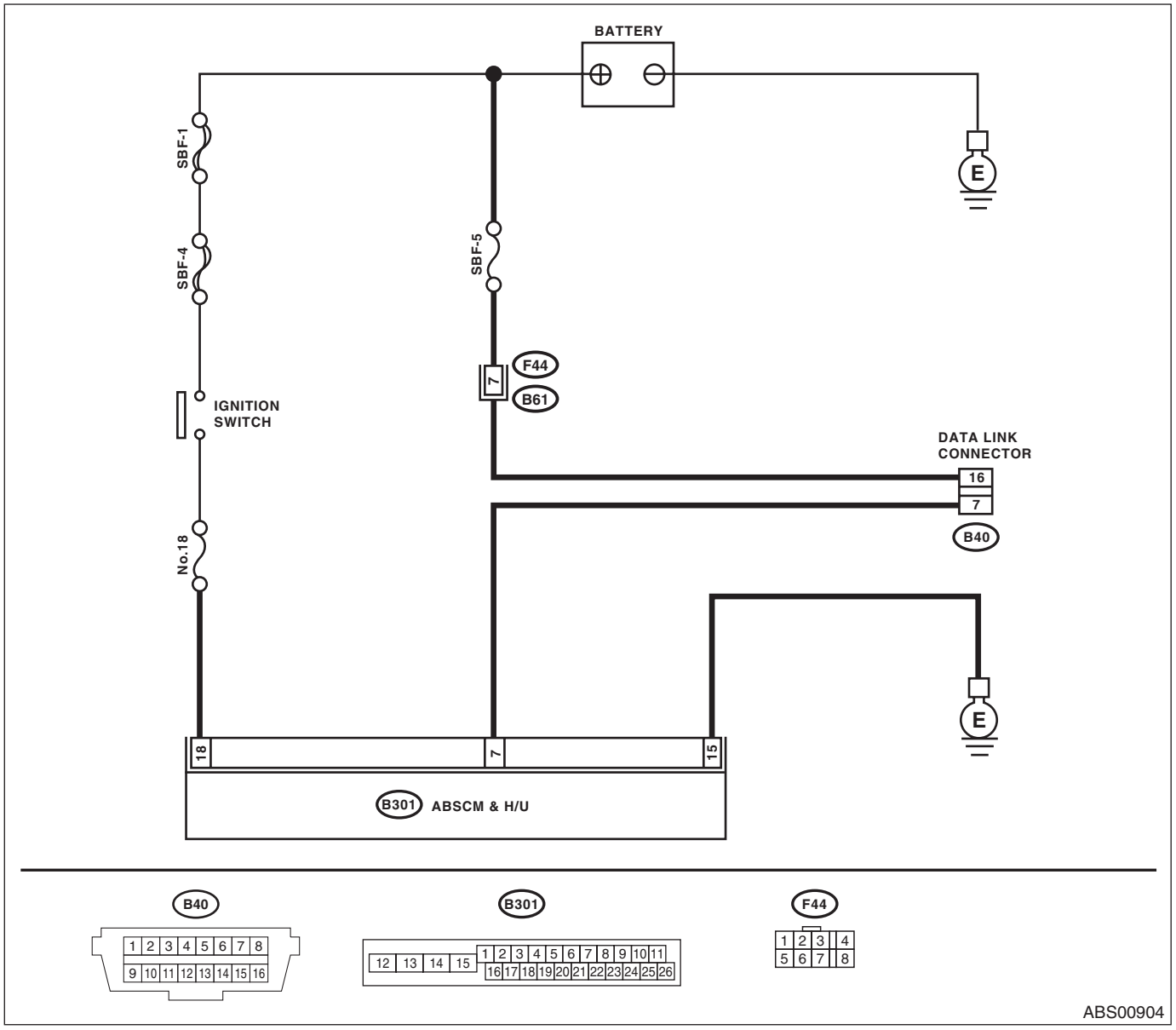
NOTE:
• Data stored at the time of trouble occurrence is shown on the display.
• Each time a trouble occurs, the latest information is stored in the freeze frame data in memory.
• Up to 3 freeze frame data will be stored.
• If freeze frame data is not stored in memory properly (due to a drop in ABS control module power supply etc.), a DTC suffixed with a question mark “?” is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.

Display	Contents to be monitored
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed in km/h or MPH.
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed in km/h or MPH.
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed in km/h or MPH.
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed in km/h or MPH.
IG power supply voltage	Voltage supplied (V) to ABSCM&H/U is displayed.
G Sensor	Vehicle acceleration detected by analog G sensor is displayed.
Motor Relay Monitor	Motor relay condition is displayed.
BLS Signal	Brake ON/OFF is displayed.
Vehicle speed	Vehicle speed calculated by ABS control module is displayed.
ABS Control Flag	ABS control condition is displayed.
Power Supply Failure	Whether abnormal voltage occurred or not is displayed during malfunction.

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Communication is impossible between ABS and Subaru Select Monitor.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch ON?	Go to step **2**.	Turn the ignition switch to ON, and select ABS mode using Subaru Select Monitor.
2	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage 11 V or more?	Go to step **3**.	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at the battery terminal?	Repair or tighten the battery terminal.	Go to step **4**.
4	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Go to step **8**.	Go to step **5**.
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6**.
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U, ECM and TCM. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR ABSCM&H/U.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8**.	Repair the harness and connector between each control module and data link connector.
8	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR.** Measure the resistance between ABSCM&H/U connector and data link connector. ***Connector & terminal*** ***(B301) No. 7 — (B40) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **9**.	Repair harness and connector between ABSCM&H/U and data link connector.
9	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn the ignition switch to OFF.	Is the ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it?	Go to step **10**.	Insert ABSCM&H/U connector into ABSCM&H/U.
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **11**.	Repair open circuit of harness between ABSCM&H/U and battery.

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance of the harness between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12**.	Repair the open circuit of the harness between ABSCM&H/U and inhibitor side connector, and poor contact of coupling connector.
12	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2. WITHOUT DTC

DETECTING CONDITION:

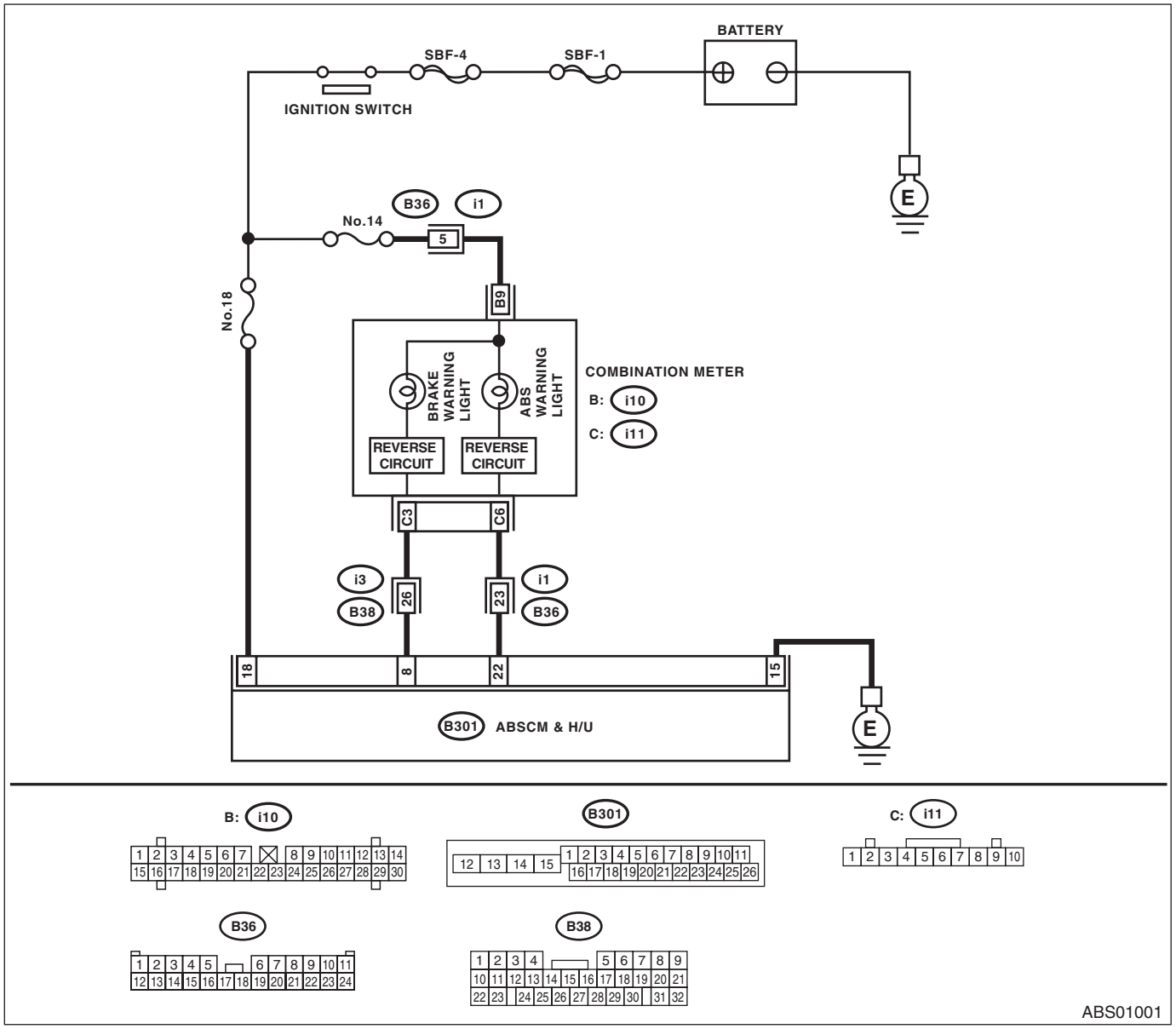
- Defective combination meter
- Open circuit of harness

TROUBLE SYMPTOM:

- ABS warning light does not go off.
- “NO TROUBLE CODE” will be displayed on the Subaru Select Monitor.

NOTE:
When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in normal condition.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR DATA.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the condition of “ABS warning light.”	Is “ON” indicated?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **2**.
2	**CHECK WIRING HARNESS.** Measure the resistance between ABSCM connector and combination meter connector. ***Connector & terminal*** ***(i11) No. 6 — (B301) No. 22:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair harness and connector between ABSCM&H/U and combination meter.
3	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in ABSCM connector and combination meter connector?	Repair the connector.	Check the combination meter.

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details about reading of DTCs, refer to “Subaru Select Monitor”. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as much as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

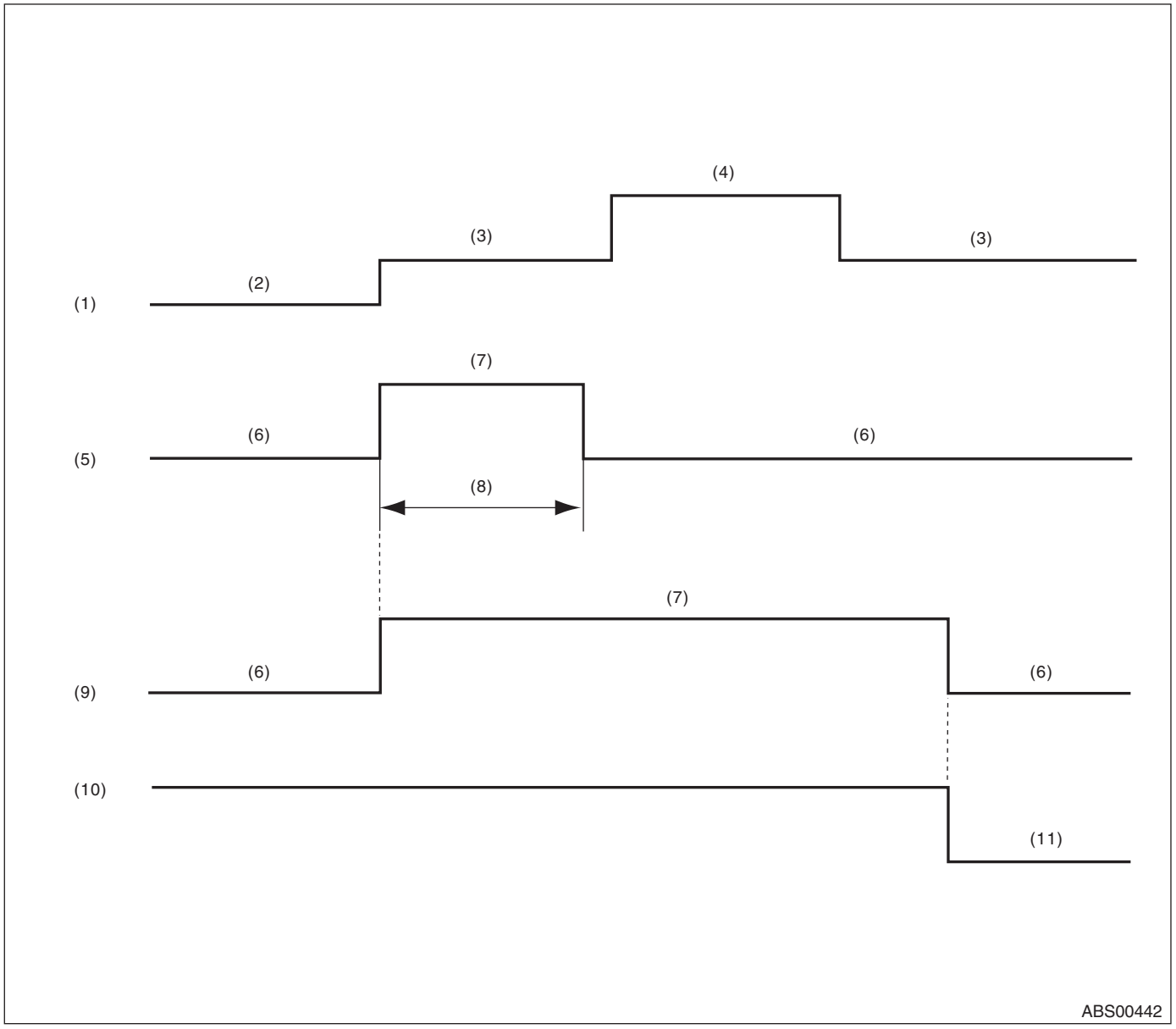
9. Clear Memory Mode

A: OPERATION

For details concerning DTC clear operation, refer to “Subaru Select Monitor”. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

10.ABS Warning Light / Brake Warning Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Start
(5) ABS warning light
(6) Light OFF
(7) Light ON
(8) Approx. 2 sec.
(9) Brake warning light (EBD warning light)
(10) Parking brake
(11) Released

ABS Warning Light / Brake Warning Light Illumination Pattern

1) When the ABS warning light and brake warning light do not illuminate in accordance with this illumination pattern, it can be thought that there is an electrical problem.
2) When the ABS warning light remains constantly OFF, check the combination meter circuit. <Ref. to ABS(diag)-29, ABS WARNING LIGHT DOES NOT COME ON, ABS Warning Light / Brake Warning Light Illumination Pattern.>
3) When the ABS warning light does not go off, check the combination meter circuit. <Ref. to ABS(diag)-31, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>
4) When the brake warning light does not go off, check the brake warning circuit and the combination meter circuit. <Ref. to ABS(diag)-33, BRAKE WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>

NOTE:
Even though the ABS warning light does not go off after approximately 2 seconds from ABS warning light illumination, the ABS function operates normally when the warning light goes off while driving at approximately 12 km/h (7 MPH). However, the ABS system does not work while the ABS warning light is illuminated.

B: ABS WARNING LIGHT DOES NOT COME ON

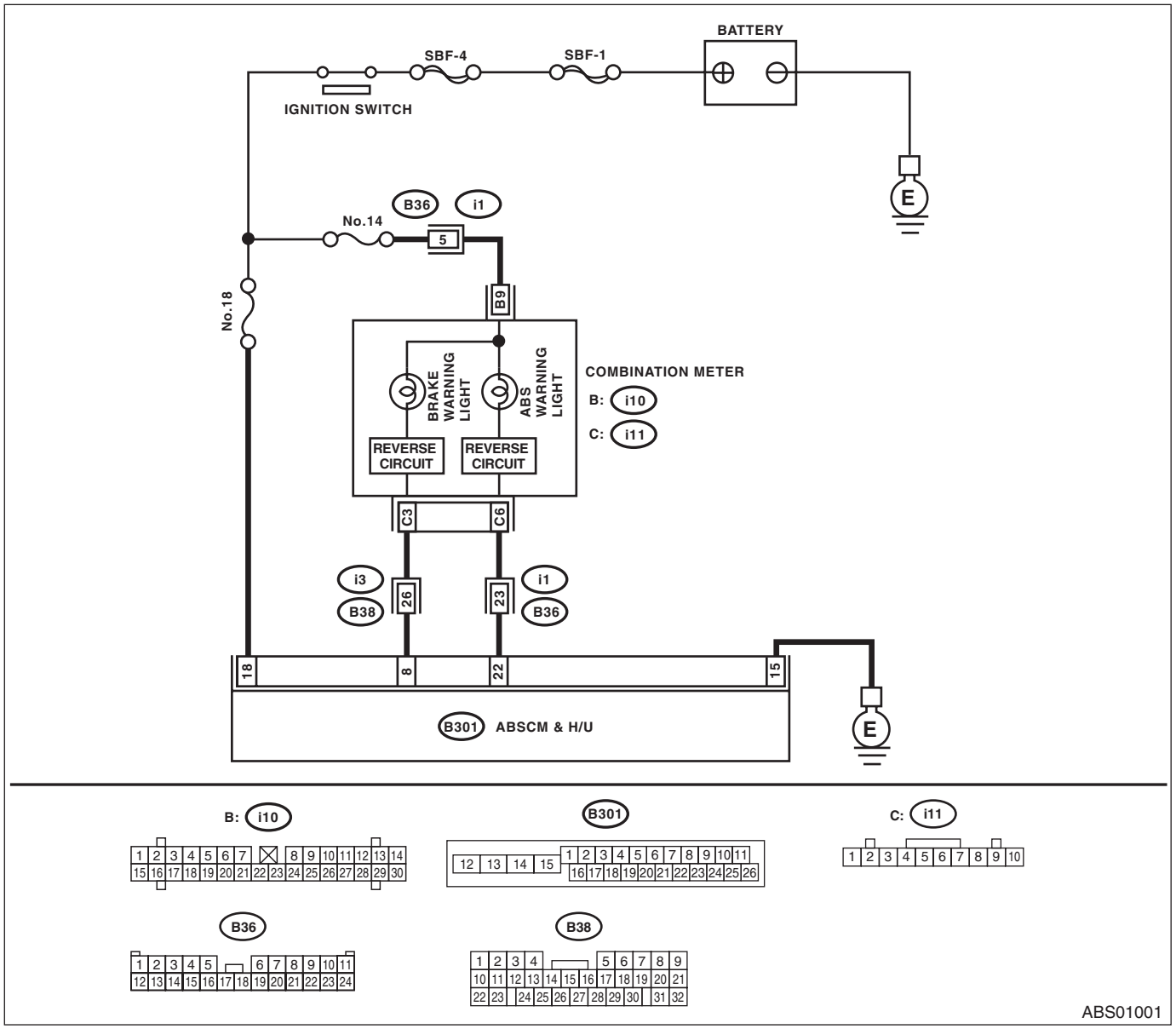
DETECTING CONDITION:

- Defective combination meter
- Defective harness

TROUBLE SYMPTOM:

When the ignition switch is turned ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:



ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**CHECK ILLUMINATION OF OTHER LIGHTS.** Turn the ignition switch to ON. (Engine OFF)	Do other warning lights illuminate?	Go to step **2**.	Check the combination meter.
2	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3**.
3	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition OFF. 2) Disconnect the connector (B301) from the ABSCM&H/U. 3) Disconnect the connector (i11) from combination meter. 4) Measure the resistance between ABSCM connector and chassis ground. ***Connector & terminal*** ***(B301) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair harness and connector between ABSCM&H/U and combination meter.
4	**CHECK ABSCM.** 1) Connect the connector (B301) to the ABSCM&H/U. 2) Turn the ignition ON. 3) Immediately after turning ignition switch ON (within approximately 2 seconds), measure the resistance of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

C: ABS WARNING LIGHT DOES NOT GO OFF

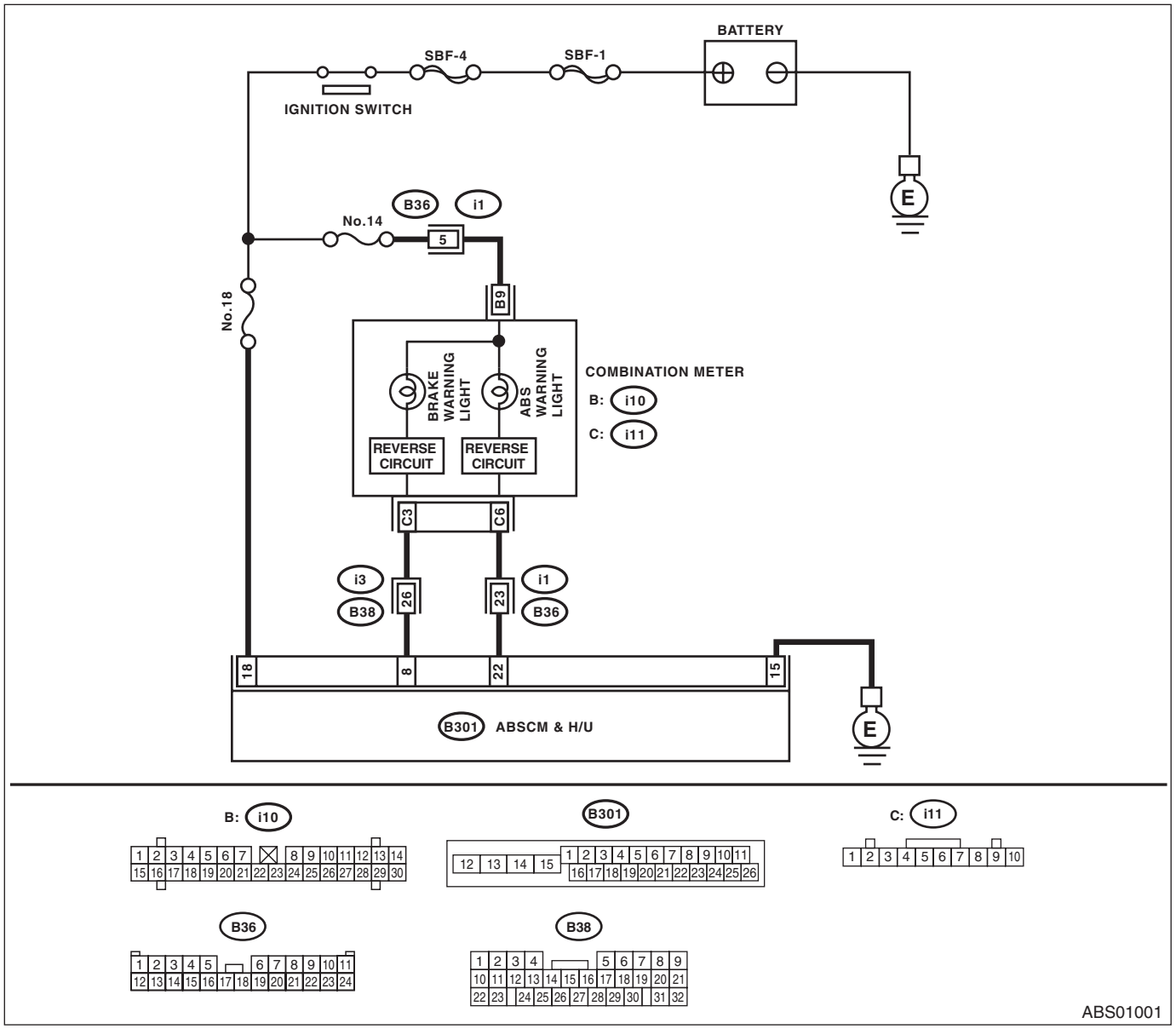
DETECTING CONDITION:

- Defective combination meter
- Open circuit of harness

TROUBLE SYMPTOM:

When starting the engine, the ABS warning light is kept on.

WIRING DIAGRAM:



ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK WIRING HARNESS.** 1) Turn the ignition OFF. 2) Disconnect the connector (B301) from the ABSCM&H/U. 3) Disconnect the connector (i11) from combination meter. 4) Measure the resistance between ABSCM connector and combination meter connector. ***Connector & terminal*** ***(B301) No. 22 — (i11) No. 6:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the harness connector between ABSCM&H/U and combination meter.
3	**CHECK POOR CONTACT OF CONNECTOR.** Check for poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **4**.
4	**CHECK ABSCM.** 1) Connect the connector (B301) to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: BRAKE WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Brake warning light circuit is shorted.
- Defective sensor/connector

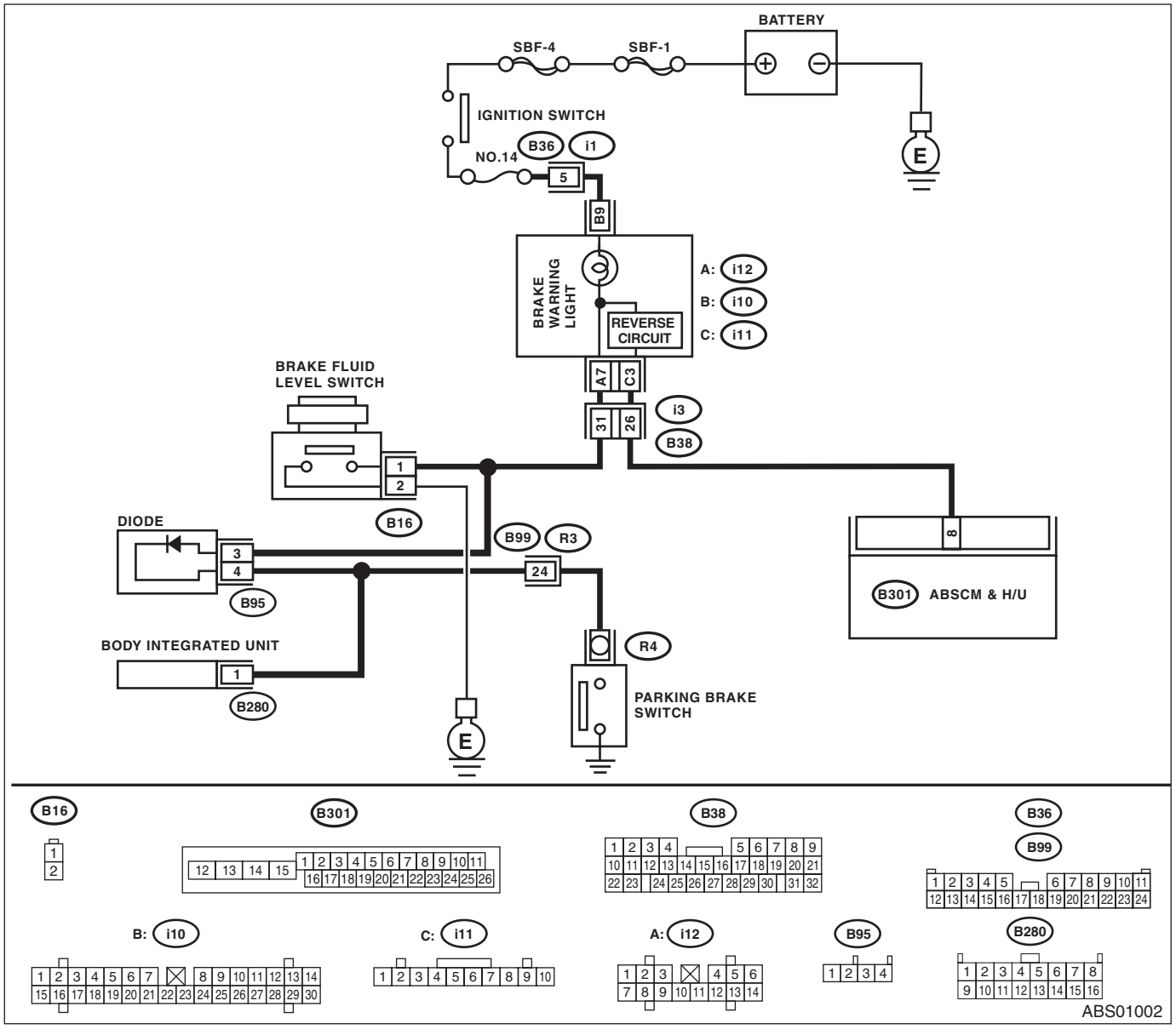
TROUBLE SYMPTOM:

After starting the engine, the brake warning light remains lit though the parking lever is released.

NOTE:

If the ABS warning light is lit, perform the diagnosis of “ABS WARNING LIGHT DOES NOT GO OFF”, then the diagnosis of “BRAKE WARNING LIGHT DOES NOT GO OFF” after repairing it. <Ref. to ABS(diag)-31, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>

WIRING DIAGRAM:



ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Check that the ABSCM&H/U connector is inserted to ABSCM&H/U until the clamp locks onto it.	Is the connector firmly inserted?	Go to step **2**.	Insert the ABSCM&H/U connector until the clamp locks completely.
2	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3**.
3	**CHECK BRAKE FLUID AMOUNT.** Check the amount of brake fluid in the reservoir tank of the master cylinder.	Is the amount of brake fluid between the lines of “MAX” and “MIN”?	Go to step **4**.	Replenish brake fluid to the specified value.
4	**CHECK BRAKE FLUID LEVEL SWITCH.** 1) Disconnect the level switch connector (B16) from master cylinder. 2) Measure the resistance of master cylinder terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the master cylinder.
5	**CHECK PARKING BRAKE SWITCH.** 1) Disconnect the connector (R4) from parking brake switch. 2) Release the parking brake. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the parking brake switch.
6	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connector (i12) from combination meter. 2) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the harness connector between combination meter and parking brake switch.
7	**CHECK HARNESS.** 1) Disconnect the connector (B301) from the ABSCM&H/U. 2) Disconnect the connector (i11) from combination meter. 3) Measure the resistance between the ABSCM&H/U connector and combination meter connector. ***Connector & terminal*** ***(B301) No. 8 — (i11) No. 3:***	Is the resistance less than 0.5 Ω?	Go to step **8**.	Repair the harness between the ABSCM&H/U and the combination meter.
8	**CHECK POOR CONTACT OF CONNECTOR.** Check for poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **9**.
9	**CHECK ABSCM.** 1) Connect the connector to ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 3 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Content of diagnosis		Display	Reference target
21	ABS wheel speed sensor malfunction (Broken wire, short)	Front ABS wheel speed sensor RH	Front Right ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-37, DTC 21 ABS WHEEL SPEED SENSOR FR MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of front ABS wheel speed sensor RH	Front Right ABS Sensor Signal	<Ref. to ABS(diag)-42, DTC 22 ABS WHEEL SPEED SENSOR FR MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	ABS wheel speed sensor malfunction (Broken wire, short)	Front ABS wheel speed sensor LH	Front Left ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-37, DTC 23 ABS WHEEL SPEED SENSOR FL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of front ABS wheel speed sensor LH	Front Left ABS Sensor Signal	<Ref. to ABS(diag)-42, DTC 24 ABS WHEEL SPEED SENSOR FL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	ABS wheel speed sensor malfunction (Broken wire, short)	Rear ABS wheel speed sensor RH	Rear Right ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-37, DTC 25 ABS WHEEL SPEED SENSOR RR MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of rear ABS wheel speed sensor RH	Rear Right ABS Sensor Signal	<Ref. to ABS(diag)-42, DTC 26 ABS WHEEL SPEED SENSOR RR MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ABS wheel speed sensor malfunction (Broken wire, short)	Rear ABS wheel speed sensor LH	Rear Left ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-38, DTC 27 ABS WHEEL SPEED SENSOR RL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of rear ABS wheel speed sensor LH	Rear Left ABS Sensor Signal	<Ref. to ABS(diag)-43, DTC 28 ABS WHEEL SPEED SENSOR RL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
29		Abnormal ABS wheel speed sensor on any one of four sensors	Any One of Four ABS Sensors Signal	<Ref. to ABS(diag)-48, DTC 29 ANY OF WHEEL SENSORS SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Inlet valve malfunction in hydraulic unit	Front inlet valve RH	FR Hold Valve malfunction	<Ref. to ABS(diag)-51, DTC 31 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Outlet valve malfunction in hydraulic unit	Front outlet valve RH	FR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-51, DTC 32 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Content of diagnosis		Display	Reference target
33	Inlet valve malfunction in hydraulic unit	Front inlet valve LH	FL Hold Valve malfunction	<Ref. to ABS(diag)-51, DTC 33 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	Outlet valve malfunction in hydraulic unit	Front outlet valve LH	FL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-51, DTC 34 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	Inlet valve malfunction in hydraulic unit	Rear inlet valve RH	RR Hold Valve malfunction	<Ref. to ABS(diag)-51, DTC 35 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Outlet valve malfunction in hydraulic unit	Rear outlet valve RH	RR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-51, DTC 36 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	Inlet valve malfunction in hydraulic unit	Rear inlet valve LH	RL Hold Valve malfunction	<Ref. to ABS(diag)-51, DTC 37 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Outlet valve malfunction in hydraulic unit	Rear outlet valve LH	RL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
41	ABS control module malfunction		ECM	<Ref. to ABS(diag)-54, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	Power voltage malfunction		Power Supply Voltage Failure	<Ref. to ABS(diag)-56, DTC 42 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
47	Defective CAN communication line		CAN communication link	<Ref. to ABS(diag)-58, DTC 47 IMPROPER CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Defective valve relay		Valve Relay	<Ref. to ABS(diag)-60, DTC 51 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	Motor/motor relay on failure		Motor and Motor Relay	<Ref. to ABS(diag)-62, DTC 52 MOTOR/MOTOR RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	Stop light switch circuit malfunction		Brake Light Switch	<Ref. to ABS(diag)-65, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
56	Faulty G sensor output voltage or output signal error		G Sensor Failure	<Ref. to ABS(diag)-67, DTC 56 G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 21 ABS WHEEL SPEED SENSOR FR MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
Refer to DTC 27 for diagnostic procedure. <Ref. to ABS(diag)-38, DTC 27 ABS WHEEL SPEED SENSOR RL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC 23 ABS WHEEL SPEED SENSOR FL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
Refer to DTC 27 for diagnostic procedure. <Ref. to ABS(diag)-38, DTC 27 ABS WHEEL SPEED SENSOR RL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC 25 ABS WHEEL SPEED SENSOR RR MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
Refer to DTC 27 for diagnostic procedure. <Ref. to ABS(diag)-38, DTC 27 ABS WHEEL SPEED SENSOR RL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC 27 ABS WHEEL SPEED SENSOR RL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

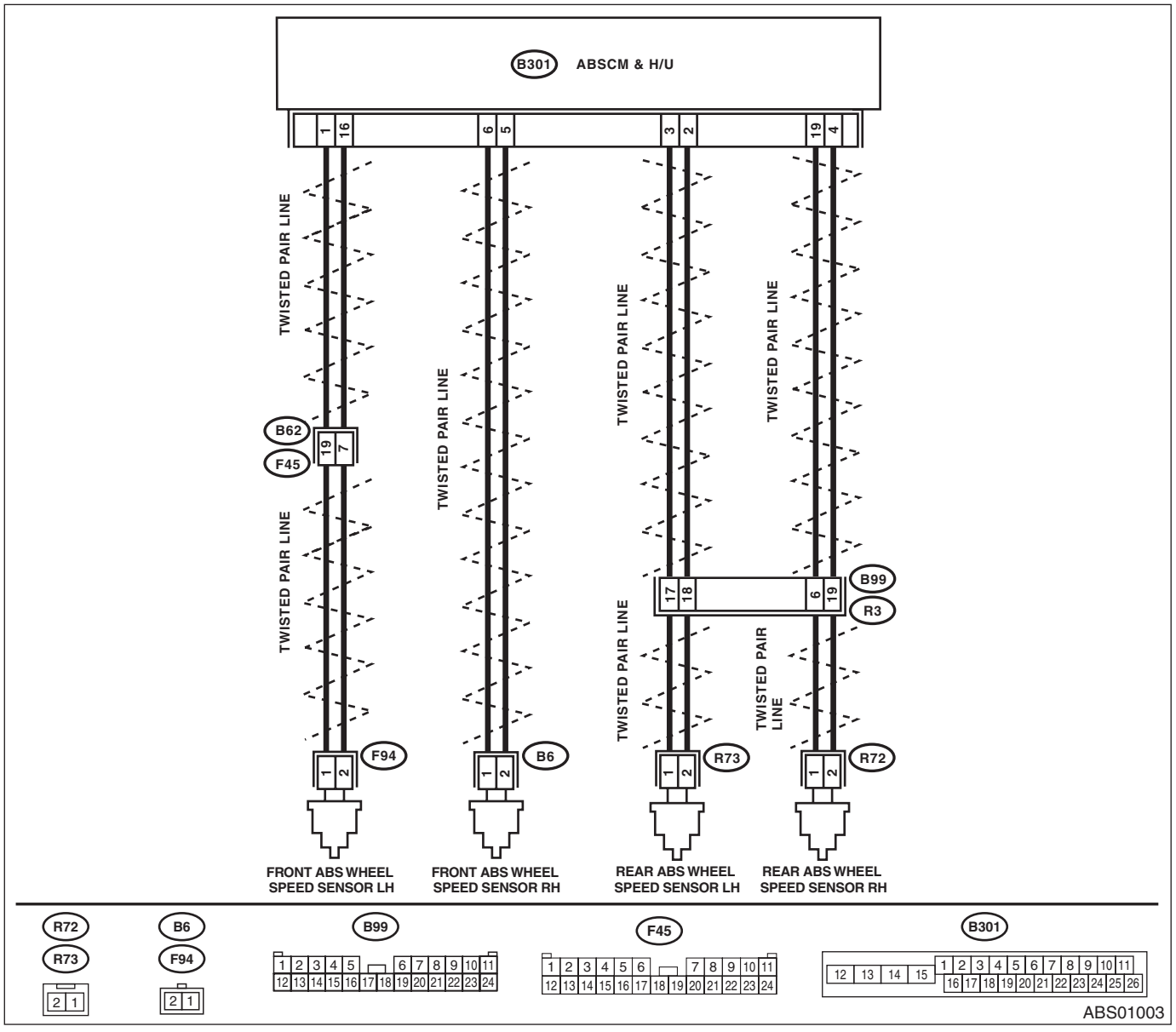
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the output of the faulty ABS wheel speed sensor.	Does the speed indicated on the display change in response to the speedometer reading during acceleration or deceleration when the steering wheel is in the straight-ahead position?	Go to step **2**.	Go to step **8**.

	Step	Check	Yes	No
2	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened to 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **3**.	Tighten the ABS wheel speed sensor installation bolts.
3	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the gap between the ABS wheel speed sensor protrusion and tone wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **4**.	Adjust the clearance. NOTE: Adjust the clearance using spacers (Part No. 26755AA000). If spacers cannot correct the clearance, replace the worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **5**.	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.>Rear: <Ref. to ABS-22, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **6**.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC still output?	Replace the ABSCM only. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is there any other DTC detected?	Perform the diagnosis according to DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between ABSCM&H/U and ABS wheel speed sensor.
8	**CHECK ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance of ABS wheel speed sensor terminals while shaking the harness lightly. ***Terminals*** ***Front RH*** ***No. 1 — No. 2:*** ***Front LH*** ***No. 1 — No. 2:*** ***Rear RH*** ***No. 1 — No. 2:*** ***Rear LH*** ***No. 1 — No. 2:***	Is the resistance within the following? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **9**.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.>Rear: <Ref. to ABS-18, Rear ABS Wheel Speed Sensor.>

	Step	Check	Yes	No
9	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Disconnect the ABSCM&H/U connectors. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH*** ***No. 1 (+) — Chassis ground (–):*** ***Front LH*** ***No. 1 (+) — Chassis ground (–):*** ***Rear RH*** ***No. 1 (+) — Chassis ground (–):*** ***Rear LH*** ***No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **10**.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.>Rear: <Ref. to ABS-18, Rear ABS Wheel Speed Sensor.>
10	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH*** ***No. 1 (+) — Chassis ground (–):*** ***Front LH*** ***No. 1 (+) — Chassis ground (–):*** ***Rear RH*** ***No. 1 (+) — Chassis ground (–):*** ***Rear LH*** ***No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11**.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.>Rear: <Ref. to ABS-18, Rear ABS Wheel Speed Sensor.>
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to the ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21; (B301) No. 6 — No. 5:*** ***DTC 23; (B301) No. 1 — No. 16:*** ***DTC 25; (B301) No. 19 — No. 4:*** ***DTC 27; (B301) No. 3 — No. 2:***	Is the resistance within the following? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **12**.	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21; (B301) No. 6 (+) — Chassis ground (–):*** ***DTC 23; (B301) No. 1 (+) — Chassis ground (–):*** ***DTC 25; (B301) No. 19 (+) — Chassis ground (–):*** ***DTC 27; (B301) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **13**.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.

	Step	Check	Yes	No
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21; (B301) No. 6 (+) — Chassis ground (–):*** ***DTC 23; (B301) No. 1 (+) — Chassis ground (–):*** ***DTC 25; (B301) No. 19 (+) — Chassis ground (–):*** ***DTC 27; (B301) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **14**.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
14	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened to 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **15**.	Tighten the ABS wheel speed sensor installation bolts.
15	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the gap between the ABS wheel speed sensor protrusion and tone wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **16**.	Adjust the clearance. NOTE: Adjust the clearance using spacers (Part No. 26755AA000). If spacers cannot correct the clearance, replace the worn sensor or worn tone wheel.
16	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **17**.	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.>Rear: <Ref. to ABS-22, Rear Tone Wheel.>
17	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH*** ***No. 1 — Chassis ground:*** ***Front LH*** ***No. 1 — Chassis ground:*** ***Rear RH*** ***No. 1 — Chassis ground:*** ***Rear LH*** ***No. 1 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **18**.	Replace the ABSCM&H/U and ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.>Rear: <Ref. to ABS-18, Rear ABS Wheel Speed Sensor.>and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Connect the connector to the ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connectors and chassis ground. ***Connector & terminal*** ***DTC 21; (B301) No. 6 — Chassis ground:*** ***DTC 23; (B301) No. 1 — Chassis ground:*** ***DTC 25; (B301) No. 19 — Chassis ground:*** ***DTC 27; (B301) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **19**.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

	Step	Check	Yes	No
19	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **20**.
20	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC still output?	Replace the ABSCM only.	Go to step **21**.
21	**CHECK OTHER DTC DETECTION.**	Is there any other DTC detected?	Perform the diagnosis according to DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between ABSCM&H/U and ABS wheel speed sensor.

E: DTC 22 ABS WHEEL SPEED SENSOR FR MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
Refer to DTC 28 for diagnostic procedure. <Ref. to ABS(diag)-43, DTC 28 ABS WHEEL SPEED SENSOR RL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 24 ABS WHEEL SPEED SENSOR FL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
Refer to DTC 28 for diagnostic procedure. <Ref. to ABS(diag)-43, DTC 28 ABS WHEEL SPEED SENSOR RL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 26 ABS WHEEL SPEED SENSOR RR MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
Refer to DTC 28 for diagnostic procedure. <Ref. to ABS(diag)-43, DTC 28 ABS WHEEL SPEED SENSOR RL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC 28 ABS WHEEL SPEED SENSOR RL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

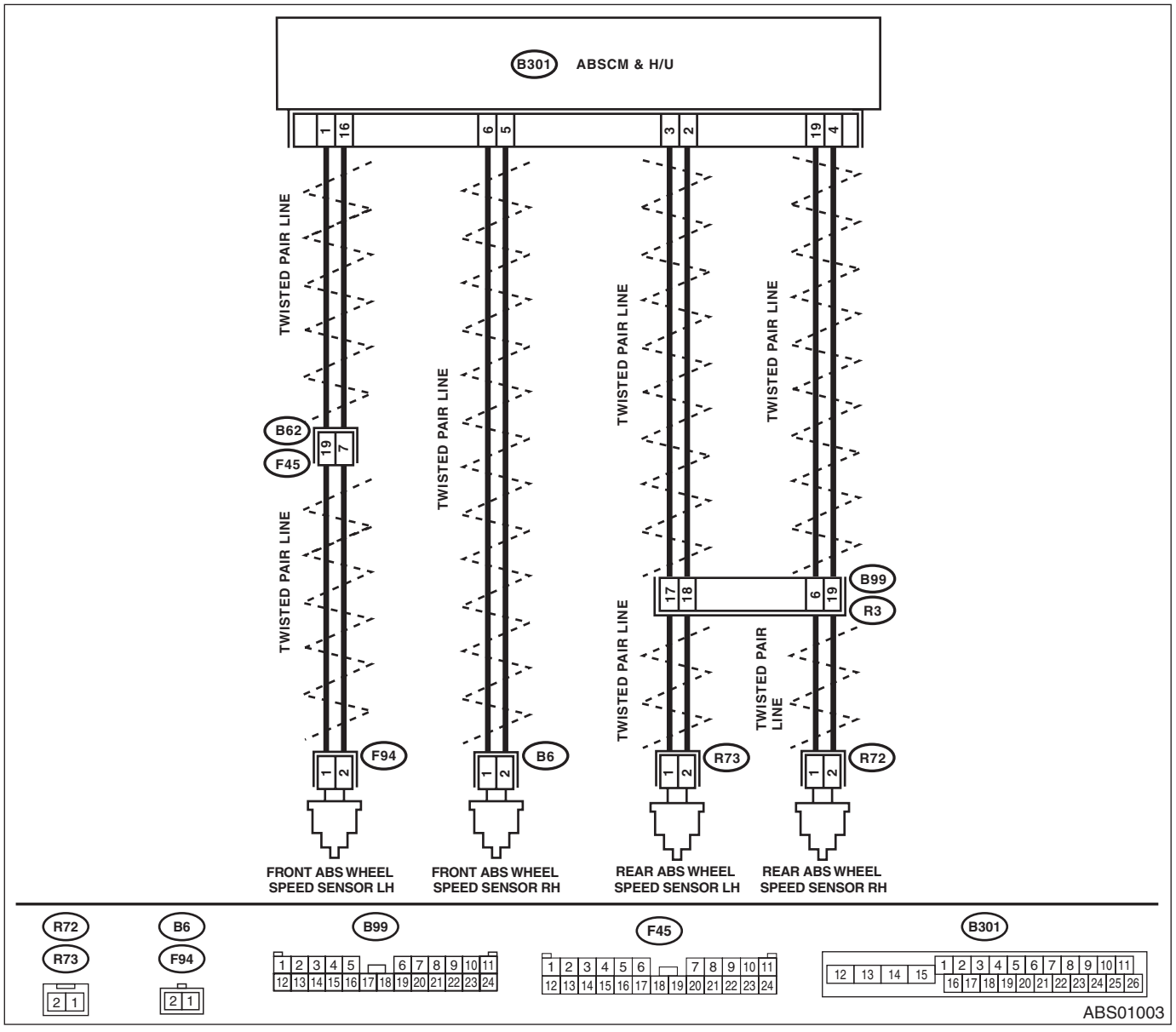
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the output of the faulty ABS wheel speed sensor.	Does the speed indicated on the display change in response to the speedometer reading during acceleration or deceleration when the steering wheel is in the straight-ahead position?	Go to step **2**.	Go to step **7**.
2	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.** Make sure the radio wave devices and electronic components are installed correctly.	Are the car telephone or radio wave devices and electronic components installed correctly?	Go to step **4**.	Install the radio wave devices and electronic components properly.
4	**CHECK CAUSE OF SIGNAL NOISE.**	Is there a noise source (such as an antenna) installed near the sensor harness?	Install the noise source apart from the sensor harness.	Go to step **5**.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC still output?	Replace the ABSCM only. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6**.
6	**CHECK OTHER DTC DETECTION.**	Is there any other DTC detected?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.
7	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened to 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **8**.	Tighten the ABS wheel speed sensor installation bolts.
8	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the gap between the ABS wheel speed sensor protrusion and tone wheel.	Is the gap within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **9**.	Adjust the clearance. NOTE: Adjust the clearance using spacers (Part No. 26755AA000). If spacers cannot correct the clearance, replace the worn sensor or worn tone wheel.
9	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **10**.	Go to step **11**.

	Step	Check	Yes	No
10	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Lift up the vehicle. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Start the wheel, and measure the voltage at the specified frequency. <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM&H/U may record DTC 29 or DTC 56. ***Connector & terminal*** ***DTC 22; (B6) No. 1 (+) — No. 2 (–):*** ***DTC 24; (F94) No. 1 (+) — No. 2 (–):*** ***DTC 26; (B99) No. 6 (+) — No. 19 (–):*** ***DTC 28; (B99) No. 18 (+) — No. 17 (–):***	Is the oscilloscope pattern the same voltage as shown in the table? <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Go to step **14**.	Go to step **11**.
11	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from the hub according to the DTC.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **12**.
12	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Is there damage in the protrusion of the ABS wheel speed sensor or the tone wheel?	Go to step **13**.	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.>Rear: <Ref. to ABS-18, Rear ABS Wheel Speed Sensor.>and Front: <Ref. to ABS-21, Front Tone Wheel.>Rear: <Ref. to ABS-22, Rear Tone Wheel.>
13	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **14**.	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.>Rear: <Ref. to ABS-22, Rear Tone Wheel.>
14	**CHECK RESISTANCE OF THE ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance of the ABS wheel speed sensor connector terminals by shaking the harness lightly. ***Connector & terminal*** ***Front RH*** ***No. 1 — No. 2:*** ***Front LH*** ***No. 1 — No. 2:*** ***Rear RH*** ***No. 1 — No. 2:*** ***Rear LH*** ***No. 1 — No. 2:***	Is the resistance within the following? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **15**.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.>Rear: <Ref. to ABS-18, Rear ABS Wheel Speed Sensor.>

	Step	Check	Yes	No
15	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** Measure the resistance between ABS wheel speed sensor and chassis ground. ***Connector & terminal*** ***Front RH*** ***No. 1 — Chassis ground:*** ***Front LH*** ***No. 1 — Chassis ground:*** ***Rear RH*** ***No. 1 — Chassis ground:*** ***Rear LH*** ***No. 1 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **16**.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.>Rear: <Ref. to ABS-18, Rear ABS Wheel Speed Sensor.>
16	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Connect the connector to the ABS wheel speed sensor. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22; (B301) No. 6 — No. 5:*** ***DTC 24; (B301) No. 1 — No. 16:*** ***DTC 26; (B301) No. 19 — No. 4:*** ***DTC 28; (B301) No. 3 — No. 2:***	Is the resistance within the following? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **17**.	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
17	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22; (B301) No. 6 — Chassis ground:*** ***DTC 24; (B301) No. 1 — Chassis ground:*** ***DTC 26; (B301) No. 19 — Chassis ground:*** ***DTC 28; (B301) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **18**.	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
18	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** Measure the resistance between the ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **19**.	Repair the ABSCM&H/U ground harness.
19	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **20**.
20	**CHECK CAUSE OF SIGNAL NOISE.** Make sure the radio wave devices and electronic components are installed correctly.	Are the car telephone or radio wave devices and electronic components installed correctly?	Go to step **21**.	Install the radio wave devices and electronic components properly.
21	**CHECK CAUSE OF SIGNAL NOISE.**	Is there a noise source (such as an antenna) installed near the sensor harness?	Install the noise source apart from the sensor harness.	Go to step **22**.
22	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC still output?	Replace the ABSCM only. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **23**.

Step		Check	Yes	No
23	CHECK OTHER DTC DETECTION.	Is there any other DTC detected?	Perform the diagnosis according to DTC.	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at more than 12 km/h (7.46 MPH) in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

I: DTC 29 ANY OF WHEEL SENSORS SIGNAL

DTC DETECTING CONDITION:

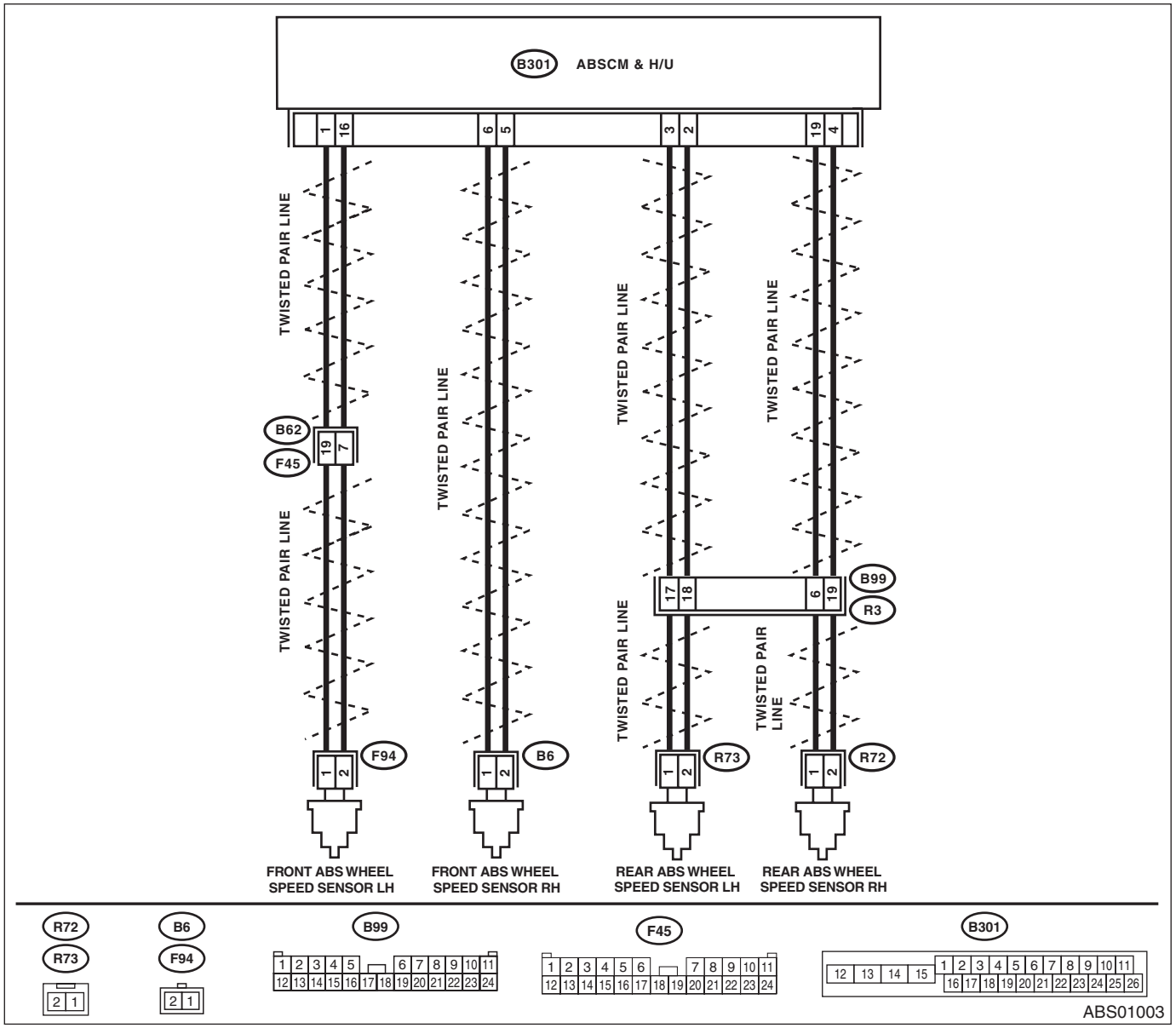
- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective magnetic encoder
- When a wheel is turned freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light comes on as well as the ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.**	Did the wheels turn freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface?	ABS is normal. Erase the memory. NOTE: This diagnostic trouble code may sometimes occur if the wheels turn freely for a long time, for example when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way.	Go to step **2**.
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3**.	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4**.
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5**.	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened to 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **6**.	Tighten the ABS wheel speed sensor installation bolts.
6	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the gap between the ABS wheel speed sensor protrusion and tone wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **7**.	Adjust the clearance. NOTE: Adjust the clearance using spacers (Part No. 26755AA000). If spacers cannot correct the clearance, replace the worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8**.	Go to step **9**.
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Lift up the vehicle. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope according to the DTC. 4) Turn the ignition switch to ON. 5) Start the wheel, and measure the voltage at the specified frequency. <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM&H/U may record DTC 29. ***Connector & terminal*** ***Front RH*** ***(B6) No. 1 (+) — No. 2 (–):*** ***Front LH*** ***(F94) No. 1 (+) — No. 2 (–):*** ***Rear RH*** ***(B99) No. 6 (+) — No. 19 (–):*** ***Rear LH*** ***(B99) No. 17 (+) — No. 18 (–):***	Is the oscilloscope pattern the same voltage as shown in the table? <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Go to step **12**.	Go to step **9**.

	Step	Check	Yes	No
9	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from the hub.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10**.
10	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there cracked or damaged teeth in the protrusion of the ABS wheel speed sensor or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.>Rear: <Ref. to ABS-18, Rear ABS Wheel Speed Sensor.>and Front: <Ref. to ABS-21, Front Tone Wheel.>Rear: <Ref. to ABS-22, Rear Tone Wheel.>	Go to step **11**.
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12**.	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.>Rear: <Ref. to ABS-22, Rear Tone Wheel.>
12	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC still output?	Replace the ABSCM only. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13**.
13	**CHECK OTHER DTC DETECTION.**	Is there any other DTC detected?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

J: DTC 31 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 32 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 33 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC 34 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC 35 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 36 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 37 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

DTC DETECTING CONDITION:

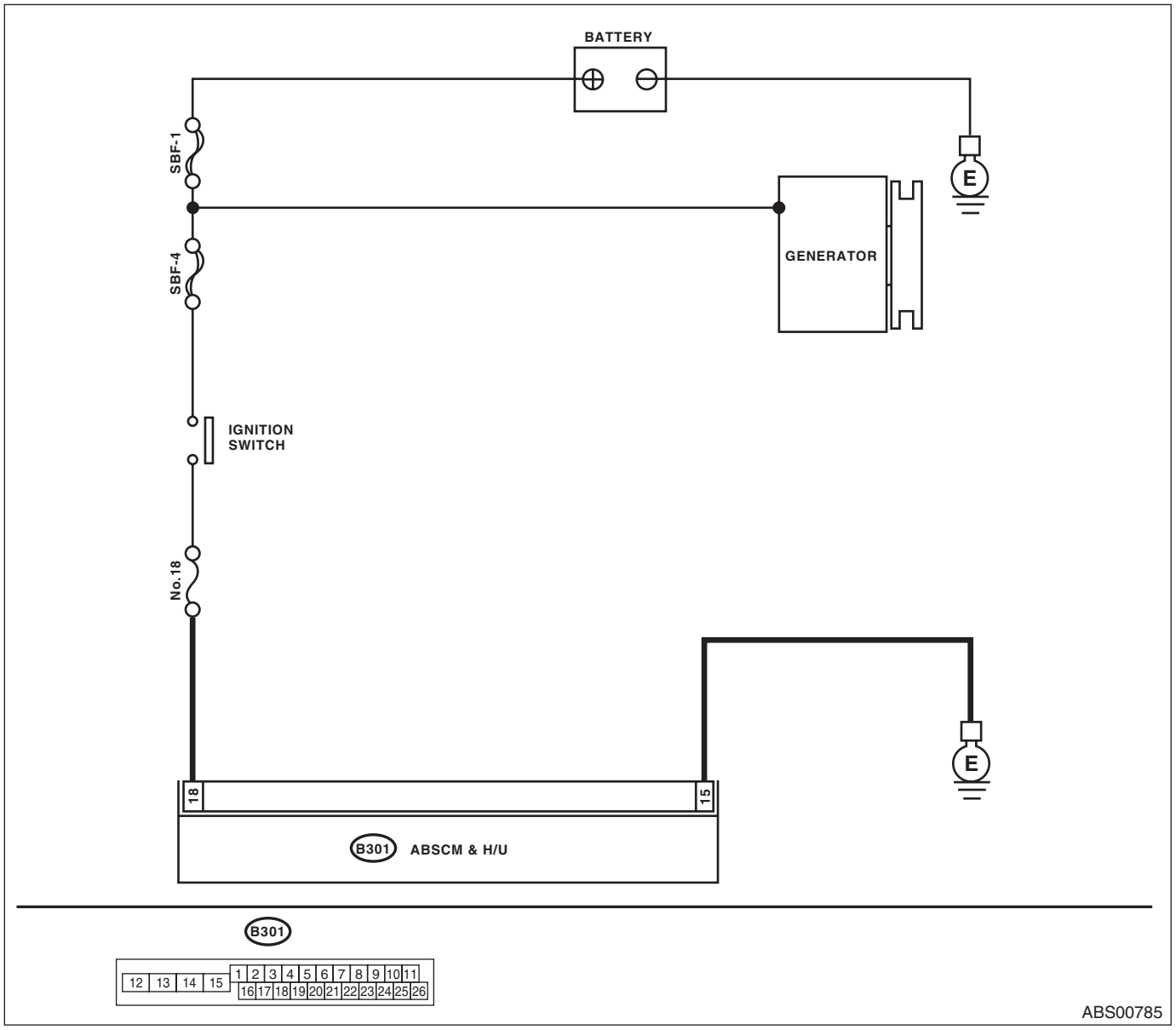
- Defective harness connector
- Defective inlet solenoid valve or outlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light comes on as well as the ABS warning light.

WIRING DIAGRAM:

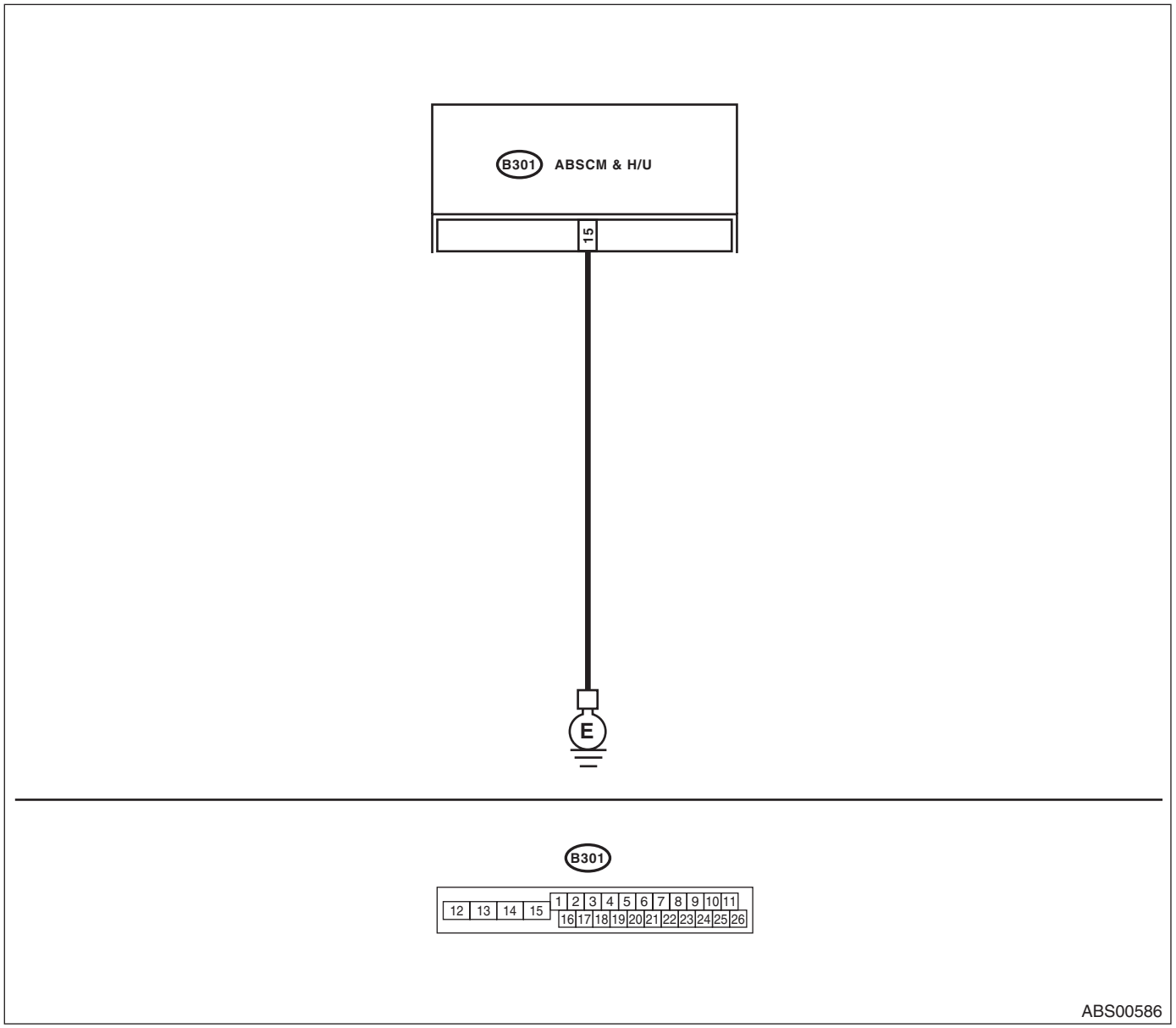


	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the ABSCM&H/U power circuit.
2	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4**.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5**.
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

R: DTC 41 ABS CONTROL MODULE MALFUNCTION

DTC DETECTING CONDITION:
Defective ABSCM&H/U
TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light comes on as well as the ABS warning light.
WIRING DIAGRAM:

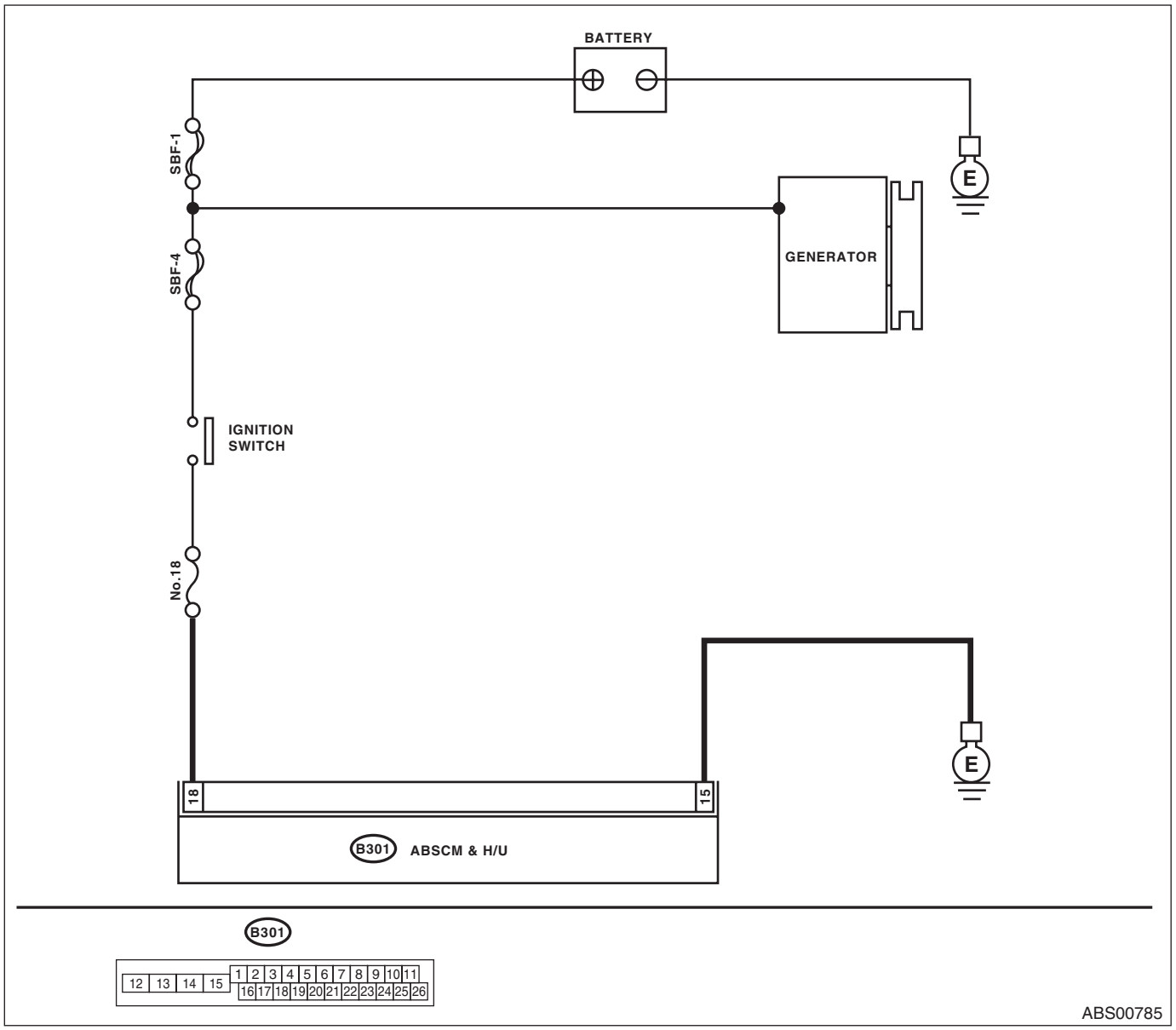


	Step	Check	Yes	No
1	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between the ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2**.	Repair the ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact of the connector between the battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.** Make sure the radio wave devices and electronic components are installed correctly.	Are the car telephone or radio wave devices and electronic components installed correctly?	Go to step **4**.	Install the radio wave devices and electronic components properly.
4	**CHECK CAUSE OF SIGNAL NOISE.**	Is there a noise source (such as an antenna) installed near the sensor harness?	Install the noise source apart from the sensor harness.	Go to step **5**.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6**.
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

S: DTC 42 POWER VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:
Power supply voltage of the ABSCM&H/U is too low or too high.
TROUBLE SYMPTOM:
- ABS does not operate.
- EBD may not operate.

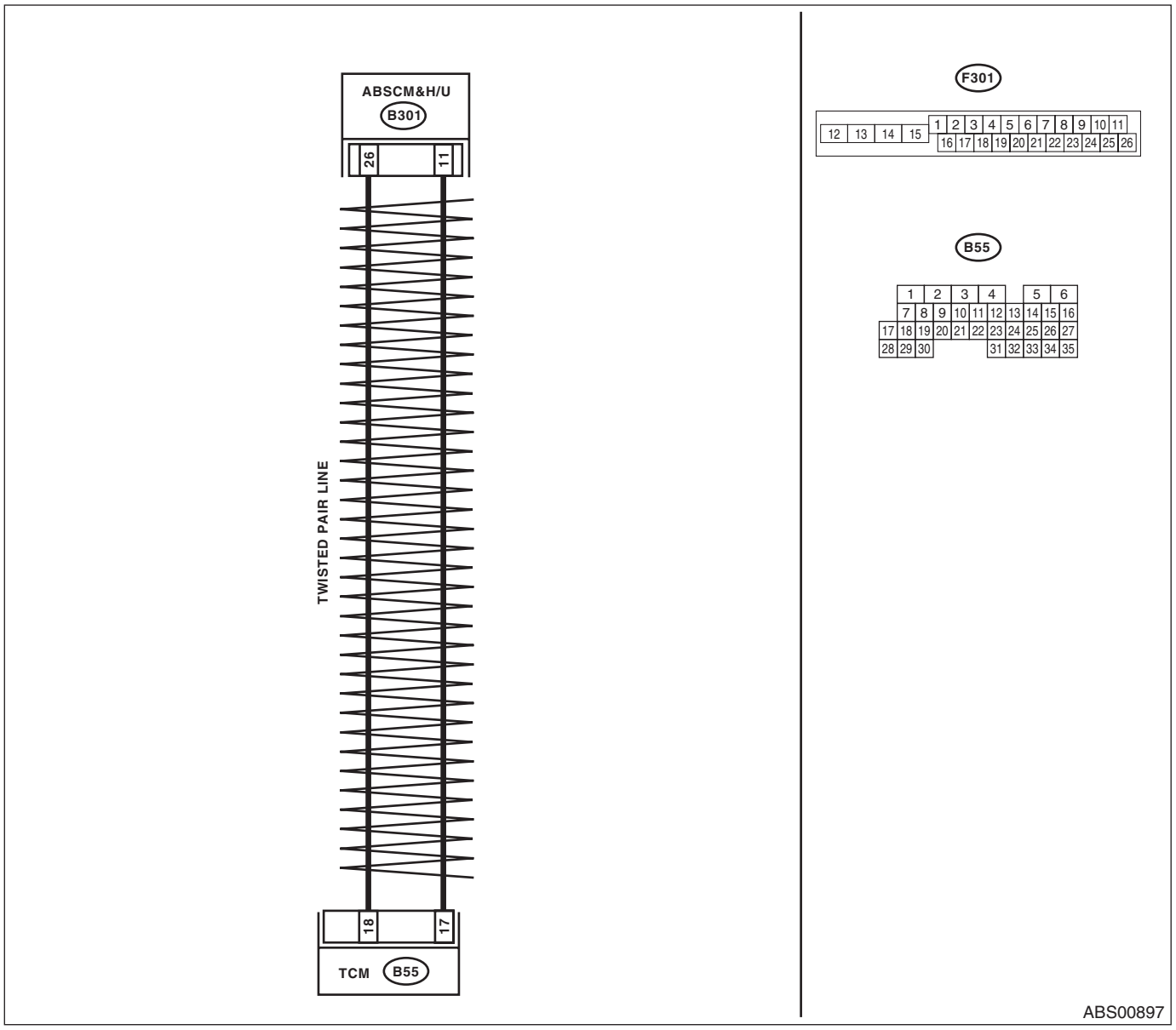
NOTE:
If EBD does not operate, the brake warning light illuminates in addition to ABS warning light. Both warning lights go off if voltage returns.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator terminal B and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the generator.
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightened securely?	Go to step **3**.	Tighten the terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect the ABSCM&H/U connectors. 2) Run the engine at idle. 3) Operate devices such as headlights, air conditioner, defogger, etc. which produce an electrical load. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Repair the ABSCM&H/U power circuit.
4	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5**.	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6**.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7**.
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

T: DTC 47 IMPROPER CAN COMMUNICATION

DTC DETECTING CONDITION:
CAN communication line is damaged or circuit is shorted.
TROUBLE SYMPTOM:
Tight corner braking phenomenon occurs.
WIRING DIAGRAM:



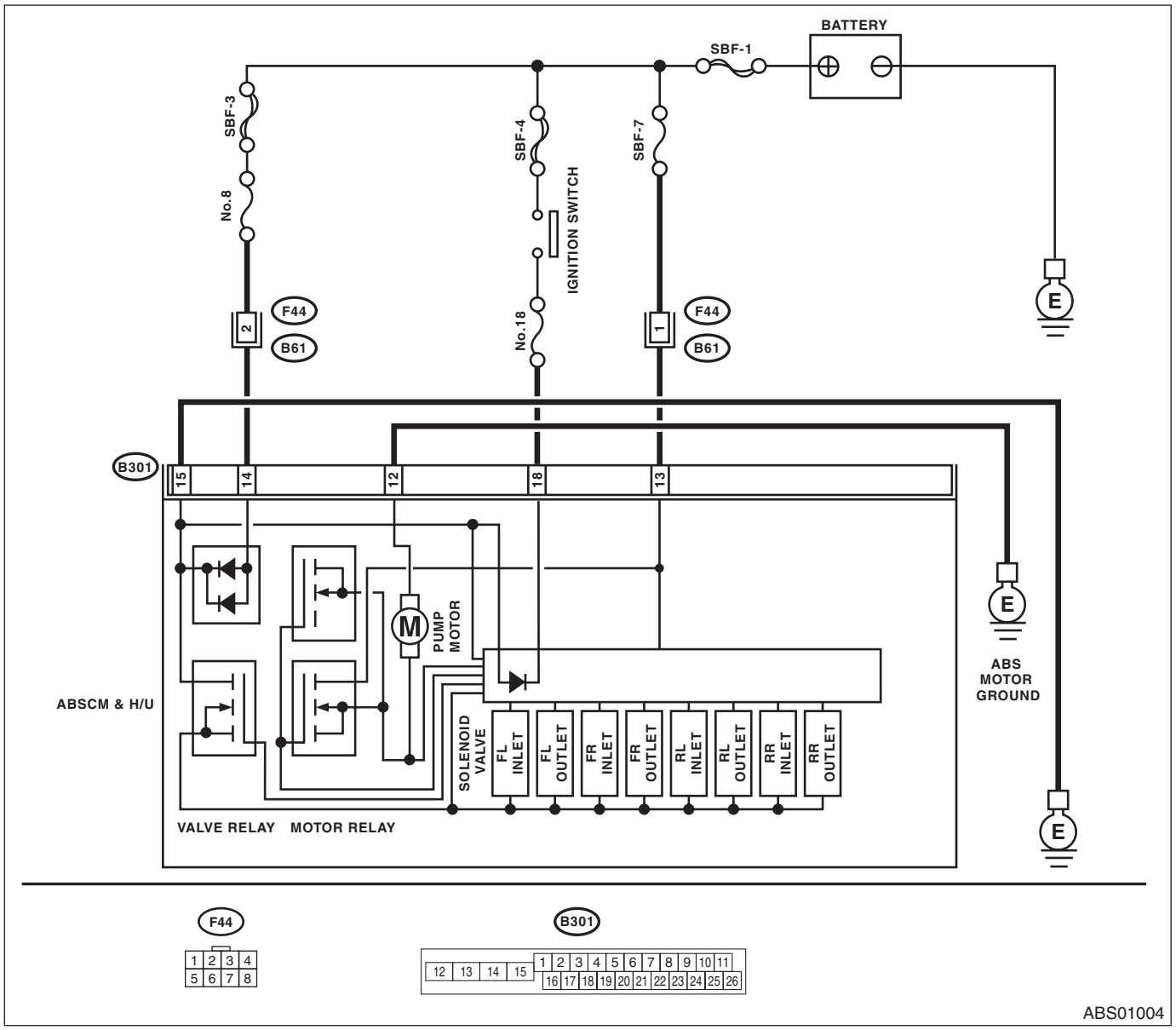
Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND TCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U and TCM. 3) Measure the resistance of the harness connector between ABSCM&H/U and TCM. ***Connector & terminal*** ***(B301) No. 26 — (B55) No. 18:*** ***(B301) No. 11 — (B55) No. 17:***	Is the resistance less than 0.5 Ω?	Go to step **2**.	Repair or replace the harness connector between ABSCM&H/U and TCM.

	Step	Check	Yes	No
2	**CHECK GROUND SHORT OF HARNESS CONNECTOR BETWEEN ABSCM&H/U AND TCM.** 1) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 26 — Chassis ground:*** ***(B301) No. 11 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair or replace the harness connector between ABSCM&H/U and TCM.
3	**CHECK BATTERY SHORT OF HARNESS CONNECTOR BETWEEN ABSCM&H/U AND TCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 26 (+) — Chassis ground (–):*** ***(B301) No. 11 (+) — Chassis ground (–):***	Is the voltage less than 1.0 V?	Go to step **4**.	Repair or replace the harness connector between ABSCM&H/U and TCM.
4	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABSCM&H/U. 3) Measure the resistance between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 17 — (B55) No. 18:***	Is the resistance 120±6 Ω?	Go to step **6**.	Go to step **5**.
5	**CHECK POOR CONTACT OF ABSCM&H/U.**	Is there poor contact?	Repair the poor contact of ABSCM&H/U connector.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK TCM.** 1) Connect the connector to TCM. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between the ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 11 — (B301) No. 26:***	Is the resistance 120±6 Ω?	Go to step **8**.	Go to step **7**.
7	**CHECK POOR CONTACT OF TCM CONNECTORS.**	Is there poor contact?	Repair the poor contact of TCM connector.	Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>
8	**CHECK DTC DETECTION.**	Is DTC 47 output?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **9**.
9	**CHECK IF DTC P1718 FOR TCM SYSTEM IS OUTPUT.**	Is DTC P1718 output?	Replace the TCM. <Ref. to 4AT-64, REMOVAL, Transmission Control Module (TCM).>	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

U: DTC 51 VALVE RELAY MALFUNCTION

DTC DETECTING CONDITION:
Defective valve relay
TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate depending on the trouble contents.

NOTE:
Brake warning light comes on as well as ABS warning light when EBD does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):*** ***(B301) No. 14 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the harness connector between battery and ABSCM&H/U.
2	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the ABSCM&H/U ground harness.
3	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure the resistance between the ABSCM&H/U terminals. ***Terminals*** ***No. 14 — No. 15:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **5**.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6**.
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

V: DTC 52 MOTOR/MOTOR RELAY MALFUNCTION

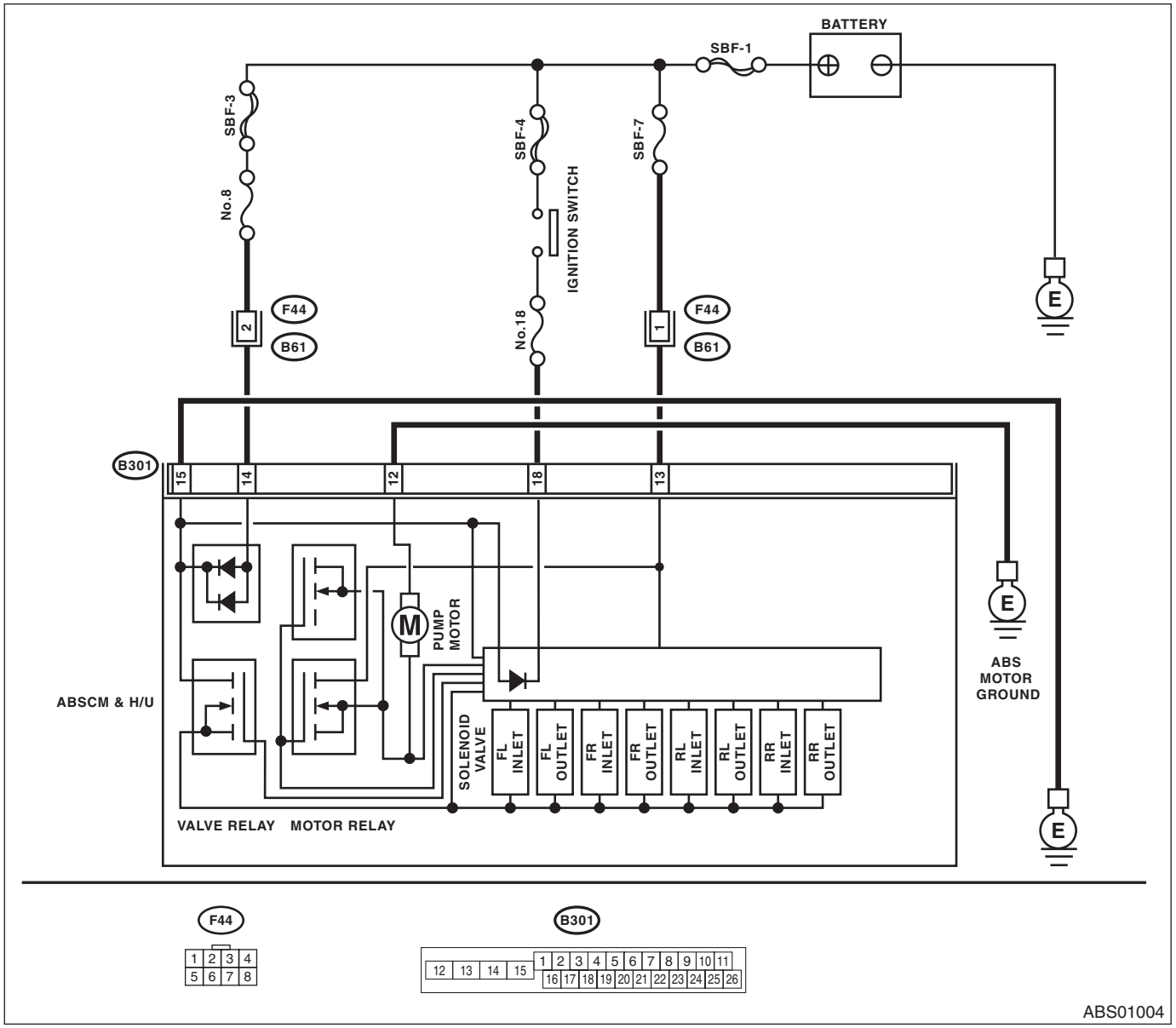
DTC DETECTING CONDITION:

- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR LOOSENED GROUND BOLT.** Check for looseness in the ABSCM&H/U motor ground bolt (GAB-2).	Is ground bolt loosened?	Tighten the bolt to 13 N·m (1.3 kgf-m, 9.4 ft-lb) torque.	Go to step **2**.
2	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **3**.	Repair the harness connector between battery and ABSCM&H/U.
3	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 12 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Repair the ABSCM&H/U ground harness.
4	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **5**.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
5	**CHECK THE ABSCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **6**.	Repair the ABSCM&H/U ground harness.
6	**CHECK MOTOR OPERATION.** Perform the sequence control. <Ref. to ABS-11, ABS Sequence Control.> NOTE: Perform the sequence control using Subaru Select Monitor.	Can the motor revolution noise (buzz sound) be heard when performing the sequence control?	Go to step **7**.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **8**.
8	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **9**.

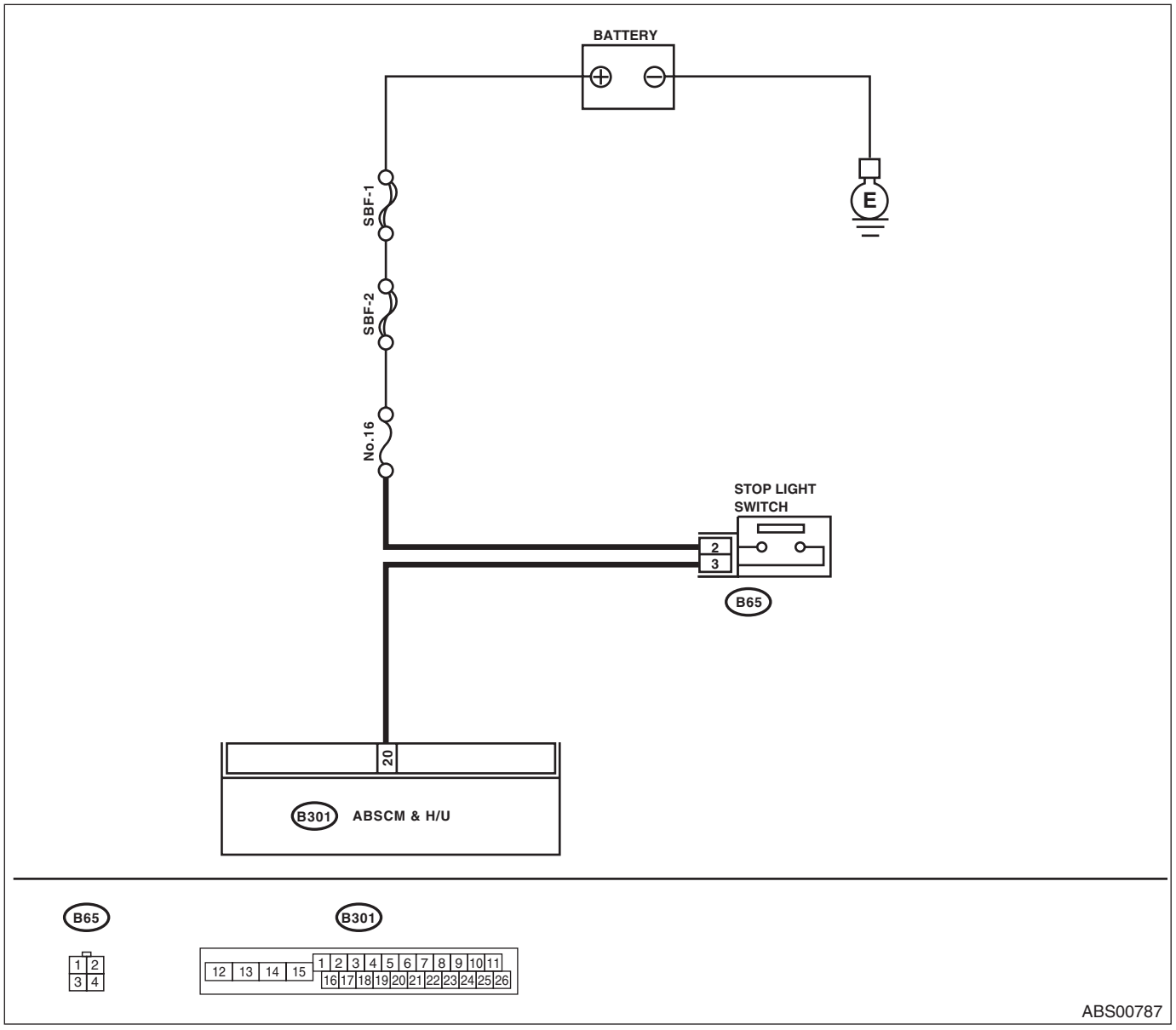
Step		Check	Yes	No
9	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

W: DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

Defective stop light switch

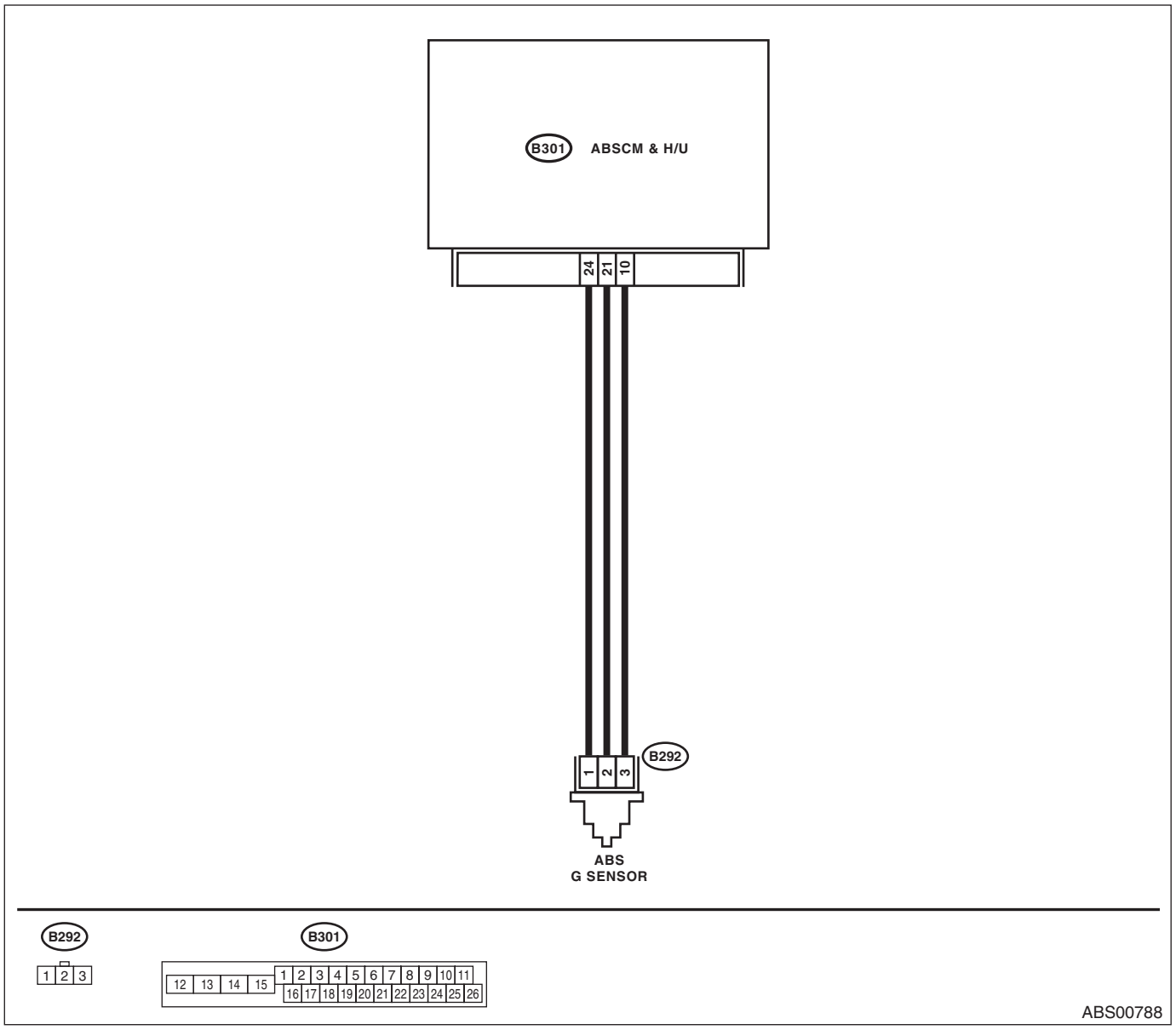
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch signal in Subaru Select Monitor.	Is "OFF" displayed on the screen?	Go to step **2**.	Go to step **3**.
2	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor.	Is "ON" displayed on the screen?	Go to step **5**.	Go to step **3**.
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal.	Does the stop light illuminate?	Go to step **4**.	Repair the stop light circuit.
4	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Depress the brake pedal. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 20 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **5**.	Repair the harness between stop light switch and ABSCM&H/U connector.
5	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the connector between stop light switch and ABSCM&H/U?	Repair the connector.	Go to step **6**.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7**.
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

X: DTC 56 G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION

DTC DETECTING CONDITION:
Defective G sensor
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.**	Have the wheels spun free of load when the vehicle is lifted up, or during driving on a rough road?	ABS is normal. Erase the memory.	Go to step **2**.
2	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the G sensor output on Subaru Select Monitor.	Is the reading indicated on display –1.2 — 1.2 m/s when the G sensor is horizontal?	Go to step **3**.	Go to step **6**.
3	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connectors between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **4**.
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5**.
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
6	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 1 (+) — No. 3 (–):***	Is the voltage 4.75 — 5.25 V?	Go to step **7**.	Repair the harness connector between the G sensor and ABSCM&H/U.
7	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 21 — No. 10:***	Is the resistance between 1.8 and 2.4 kΩ?	Go to step **8**.	Repair the harness connector between the G sensor and ABSCM&H/U.
8	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from the G sensor. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 21 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **9**.	Repair the harness between the G sensor and ABSCM&H/U.

	Step	Check	Yes	No
9	**CHECK G SENSOR.** 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **10**.	Replace G sensor. <Ref. to ABS-23, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.6 — 4.1 V when the G sensor is inclined forward to 90°?	Go to step **11**.	Replace G sensor. <Ref. to ABS-23, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 1.0 V when G sensor is inclined back 90°?	Go to step **12**.	Replace G sensor. <Ref. to ABS-23, G Sensor.>
12	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **13**.
13	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14**.
14	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

13.General Diagnostic Table

A: INSPECTION

Symptoms		Problem parts
Vehicle instability during braking	Vehicle is pulled to either right or left side.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pad) • Wheel alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (pad) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor brake performance	Long braking/stopping distance	• ABSCM&H/U (solenoid valve) • Brake (pad) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	• ABSCM&H/U (solenoid valve, motor) • ABS wheel speed sensor • Incorrect wiring or piping connections
	Brake drag	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Master cylinder • Brake (caliper and piston) • Parking brake • Axle and wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle vertical pitching	• Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pad) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Excessive pedal vibration	• Incorrect wiring or piping connections • Road surface (uneven)
	Noise from the ABSCM&H/U	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Brake line
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Master cylinder • Brake (caliper, piston, pad and rotor) • Brake line • Brake booster and check valve • Suspension play or fatigue
	Noise from rear of vehicle	• ABS wheel speed sensor • Brake (caliper, piston, pad and rotor) • Parking brake • Brake line • Suspension play or fatigue

1. General Description

A: SPECIFICATION

Model		2.5 X	2.5 XS, 2.5 XT, L.L.Bean
Front disc brake	Type	Disc (Floating type, ventilated)	
	Effective disc diameter	244 mm (9.61 in)	
	Disc thickness × Diameter	24 × 294 mm (0.94 × 11.57 in)	
	Effective cylinder diameter	42.8 mm (1.685 in) × 2	
	Pad dimensions (Length × Width × Thickness)	117.8 × 50.5 × 11.0 mm (4.638 × 1.988 × 0.433 in)	
	Clearance adjustment	Automatic adjustment	
Rear disc brake	Type	—	Disc (Floating type)
	Effective disc diameter	—	230 mm (9.06 in)
	Disc thickness × Diameter	—	10 × 266 mm (0.39 × 10.47 in)
	Effective cylinder diameter	—	38.1 mm (1.500 in)
	Pad dimensions (Length × Width × Thickness)	—	89.4 × 33.7 × 9.0 mm (3.520 × 1.327 × 0.354 in)
	Clearance adjustment	—	Automatic adjustment
Rear drum brake	Type	Drum (Leading-Trailing type)	—
	Effective drum diameter	228.6 mm (9 in)	—
	Effective cylinder diameter	19 mm (0.75 in)	—
	Lining dimensions (Length × Width × Thickness)	219.4 × 35.0 × 4.1 mm (8.64 × 1.378 × 0.161 in)	—
	Clearance adjustment	Automatic adjustment	—
Master cylinder	Type	Tandem	
	Effective diameter	25.4 mm (1 in)	
	Reservoir type	Sealed type	
	Brake fluid reservoir capacity	205 cm^3 (12.51 cu in)	
Brake booster	Type	Vacuum suspended	
	Effective diameter	“8 + 9” tandem type	
Brake line		Dual circuit system	
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.** **• When filling brake fluid, be careful not to allow any dust into the reservoir.** **• Use new DOT3 or 4 brake fluid when replacing or refilling fluid.**		FMVSS No. 116, DOT3 or DOT4	

NOTE:
Refer to the “PB section” for parking brake specifications. <Ref. to PB-2, SPECIFICATION, General Description.>

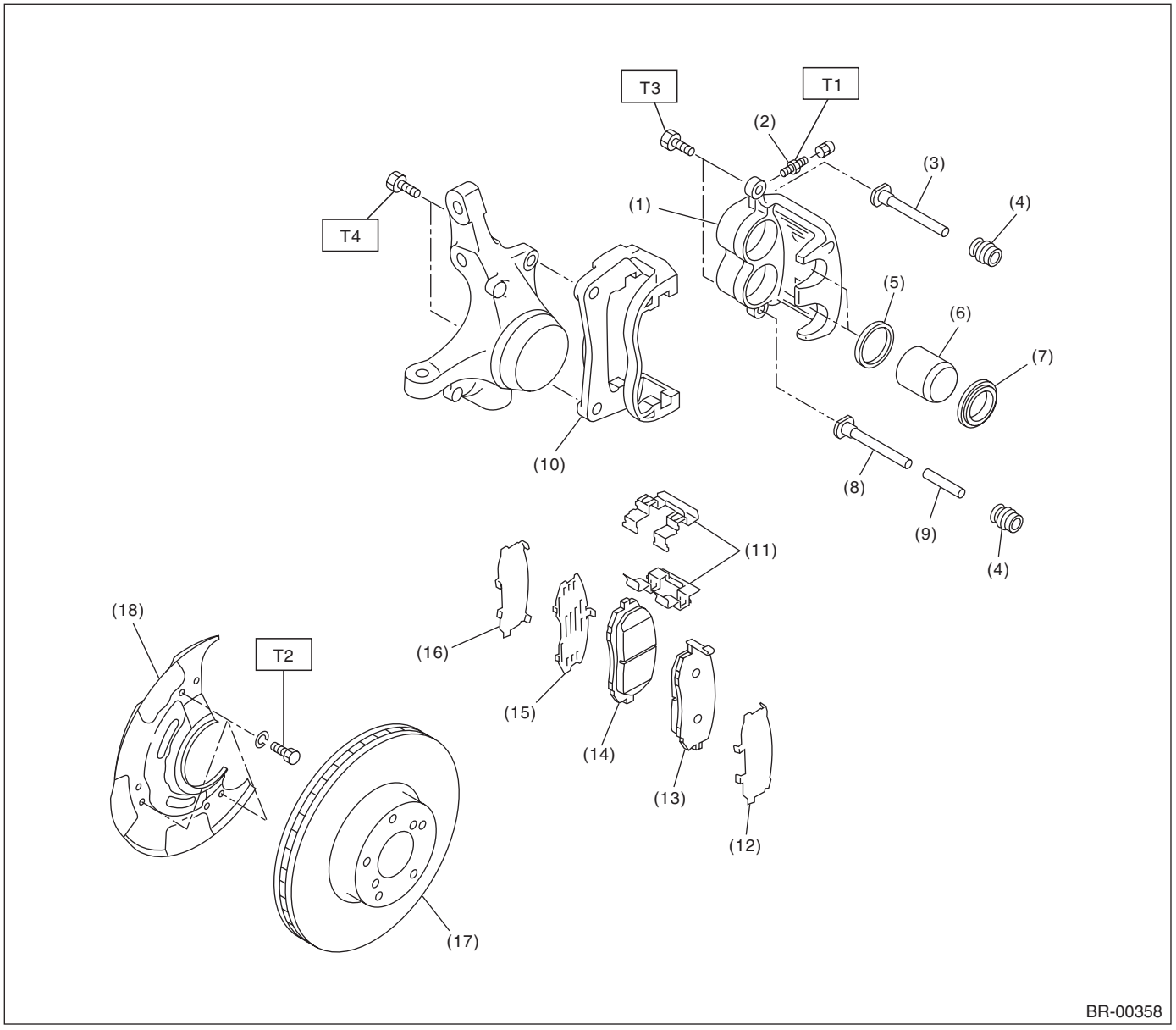
Item		Standard	Limit
Front brake	Pad thickness	11 mm (0.43 in)	1.5 mm (0.059 in)
	Disc thickness	24 mm (0.94 in)	22 mm (0.87 in)
	Disc runout	—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness	9 mm (0.35 in)	1.5 mm (0.059 in)
	Disc thickness	10 mm (0.39 in)	8.5 mm (0.335 in)
	Disc runout	—	0.07 mm (0.0028 in)
Rear brake (Drum type)	Inside diameter	228.6 mm (9 in)	230.6 mm (9.08 in)
	Lining thickness	4.1 mm (0.161 in)	1.5 mm (0.059 in)
Rear brake (Disc type parking)	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)
Parking brake	Lever stroke	7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)	

		Brake pedal operation force	Fluid pressure
Brake booster	Brake fluid pressure with engine stopped	147 N (15 kgf, 33 lb)	686 kPa (7 kg/cm^2, 100 psi)
		294 N (30 kgf, 66 lb)	1,765 kPa (18 kg/cm^2, 256 psi)
	Brake fluid pressure and vacuum pressure with engine running at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lb)	6,468 kPa (65 kg/cm^2, 938 psi)
		294 N (30 kgf, 66 lb)	10,297 kPa (105 kg/cm^2, 1,493 psi)

Brake pedal	Free play	0.5 — 2.0 mm (0.02 — 0.08 in) [Depress brake pedal with a force of less than 10 N (1 kgf, 2 lb).]

B: COMPONENT

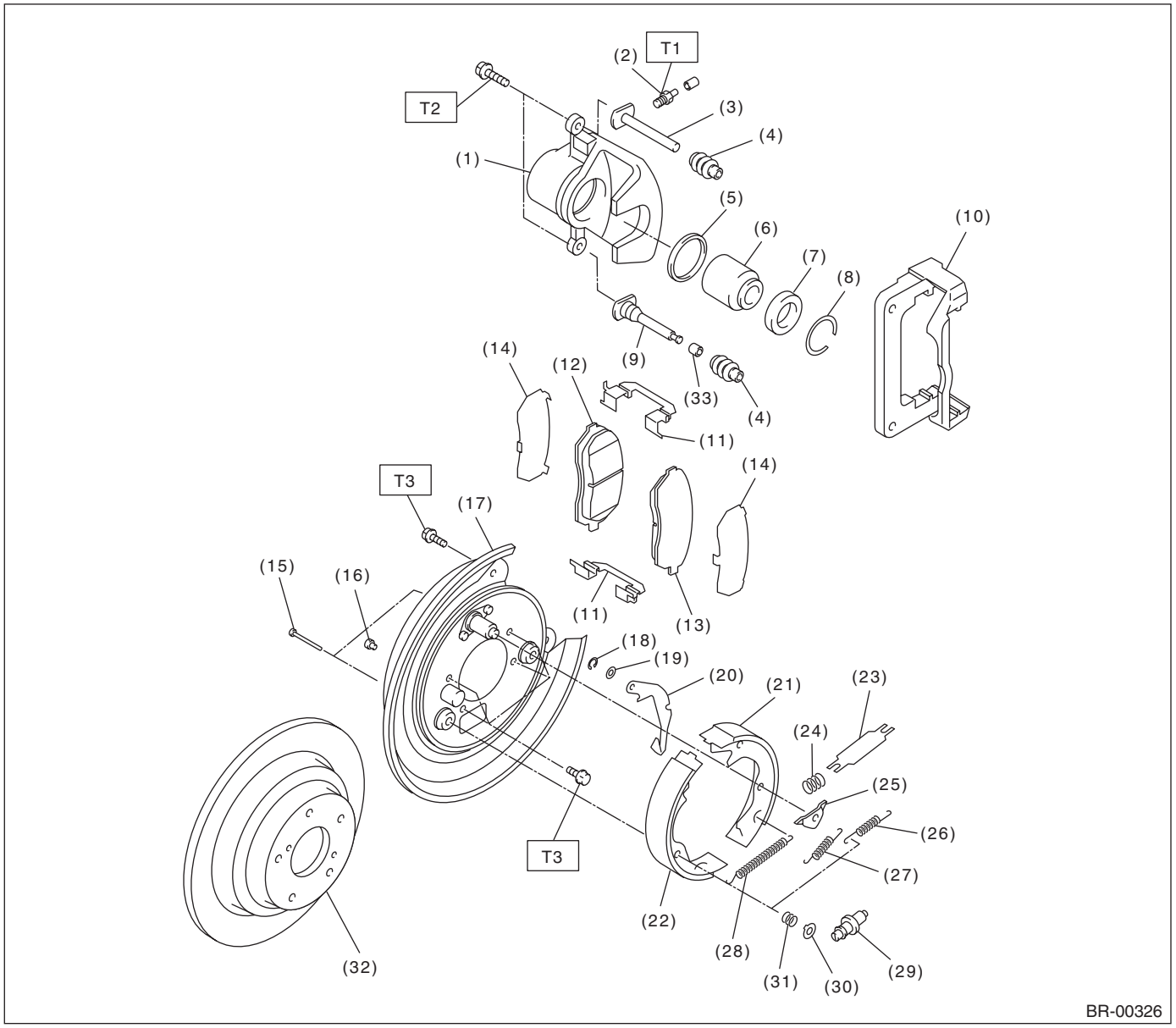
1. FRONT DISC BRAKE



(1)	Caliper body	(9)	Bushing	(17)	Disc rotor
(2)	Air bleeder screw	(10)	Support	(18)	Disc cover
(3)	Guide pin (Green)	(11)	Pad clip		
(4)	Pin boot	(12)	Outer shim		
(5)	Piston seal	(13)	Outer pad		
(6)	Piston	(14)	Inner pad		
(7)	Piston boot	(15)	Rubber coat shim		
(8)	Lock pin (Yellow)	(16)	Inner shim		

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 26 (2.7, 19.2)
T4: 80 (8.2, 59)

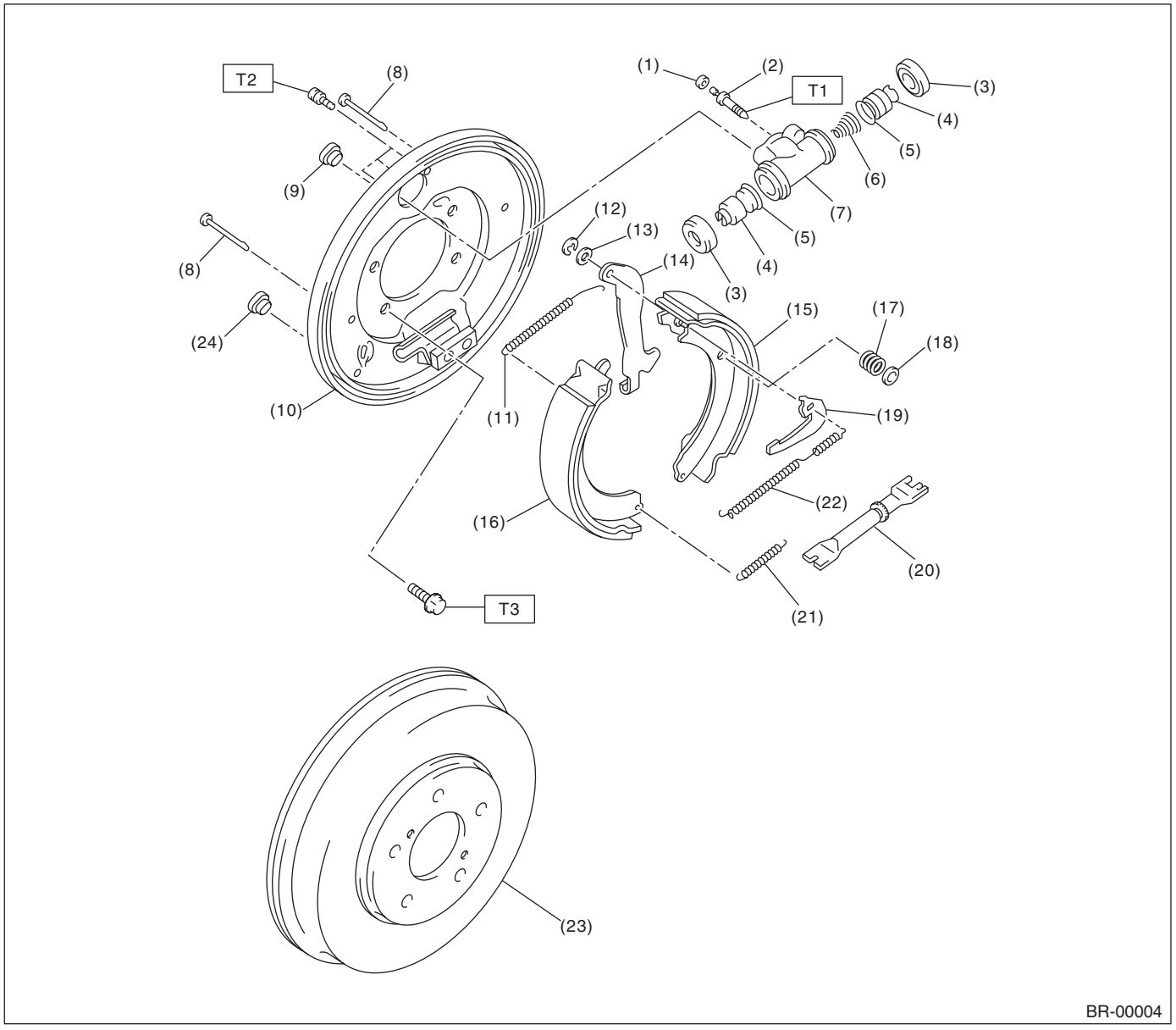
2. REAR DISC BRAKE



(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
(33) Bushing

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 37 (3.8, 27.5)
T3: 52 (5.3, 38.3)

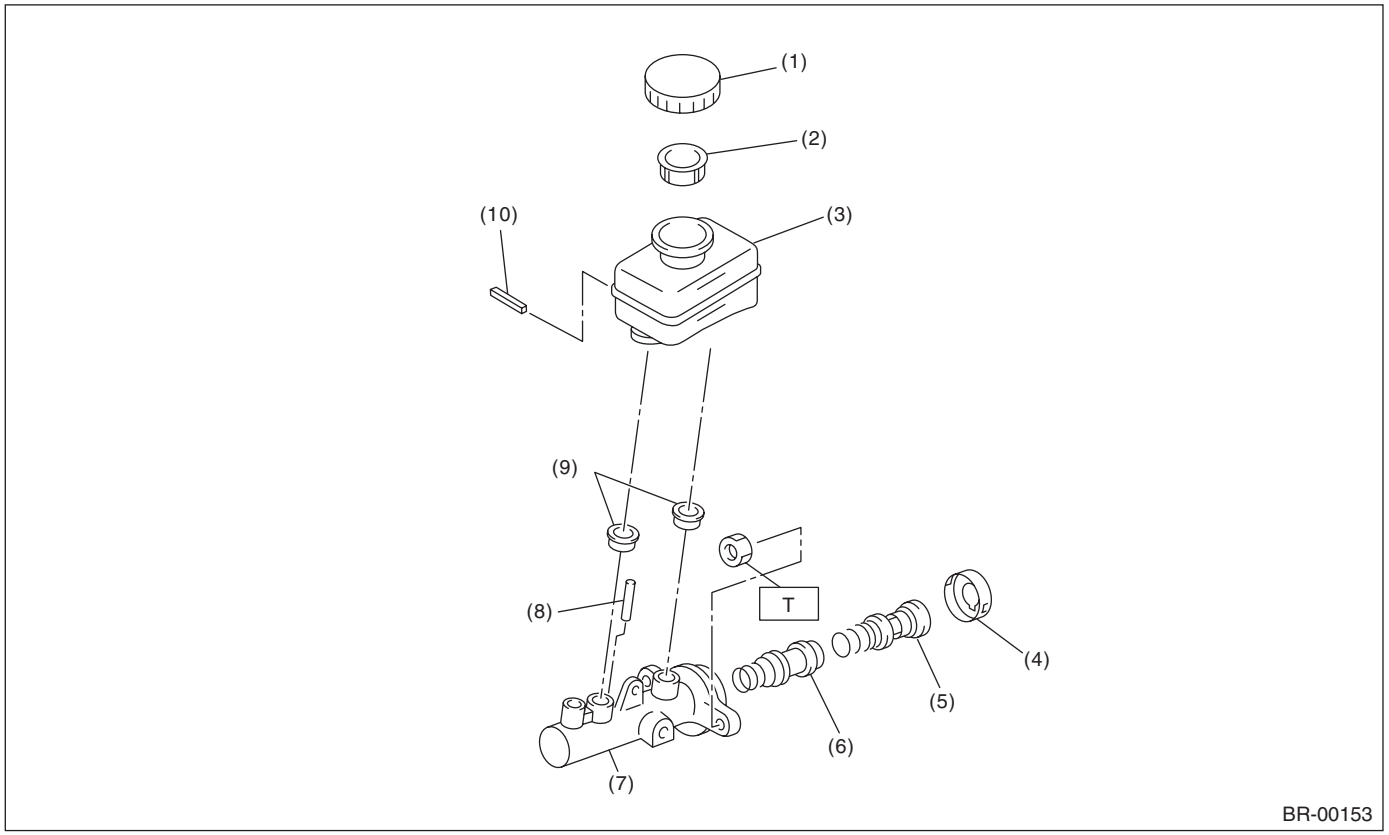
3. REAR DRUM BRAKE



(1) Air bleeder cap
(2) Air bleeder screw
(3) Dust boots
(4) Piston
(5) Cup
(6) Spring
(7) Wheel cylinder body
(8) Hold-down pin
(9) Plug
(10) Back plate
(11) Upper shoe return spring
(12) Retainer
(13) Washer
(14) Parking brake lever
(15) Brake shoe (Trailing)
(16) Brake shoe (Leading)
(17) Shoe hold-down spring
(18) Hold-down cup
(19) Adjusting lever
(20) Adjuster ASSY
(21) Lower shoe return spring
(22) Adjusting spring
(23) Brake drum
(24) Plug

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 10 (1.0, 7.2)
T3: 52 (5.3, 38.3)

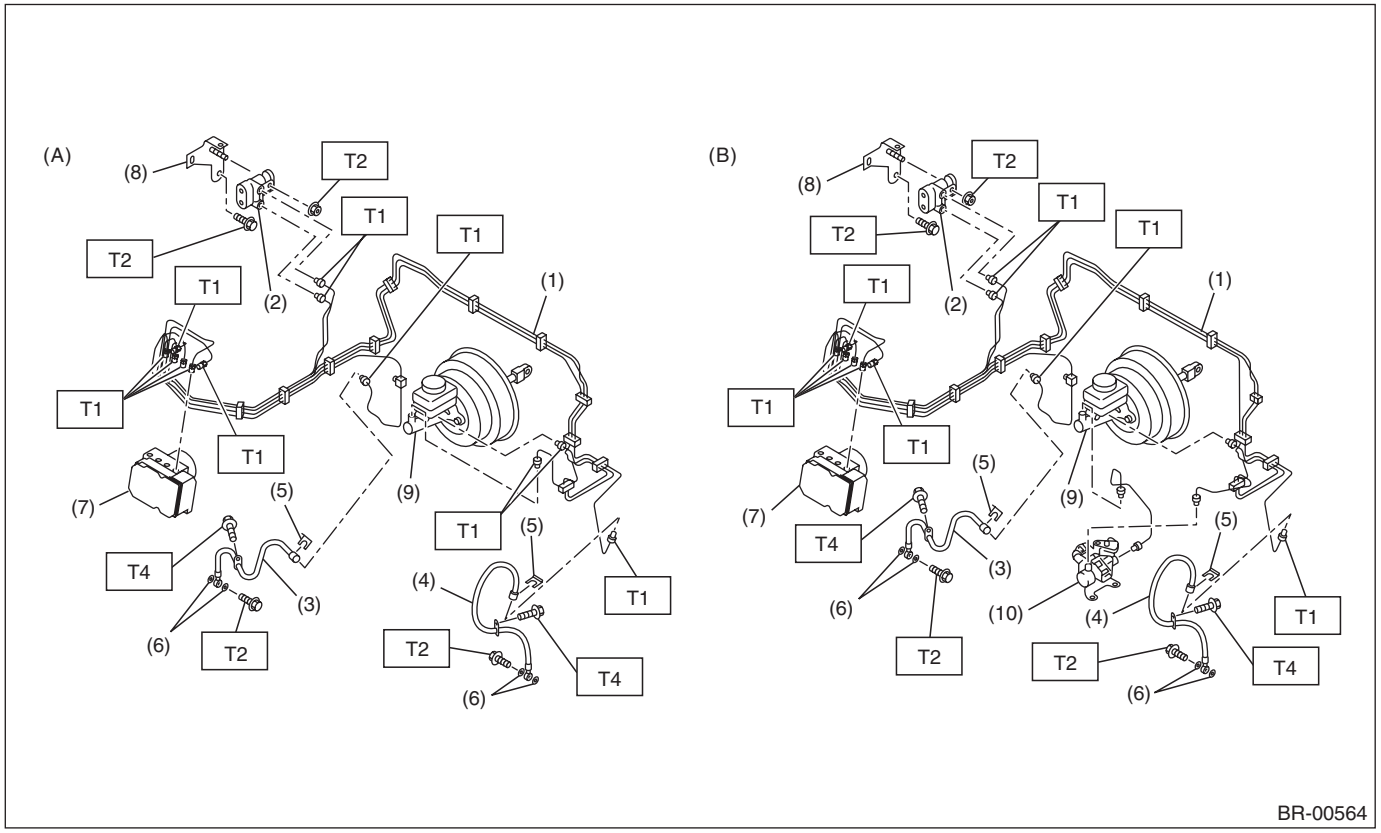
4. MASTER CYLINDER



(1) Cap
(2) Filter
(3) Reservoir tank
(4) Piston retainer
(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)

5. FRONT BRAKE PIPES AND HOSES

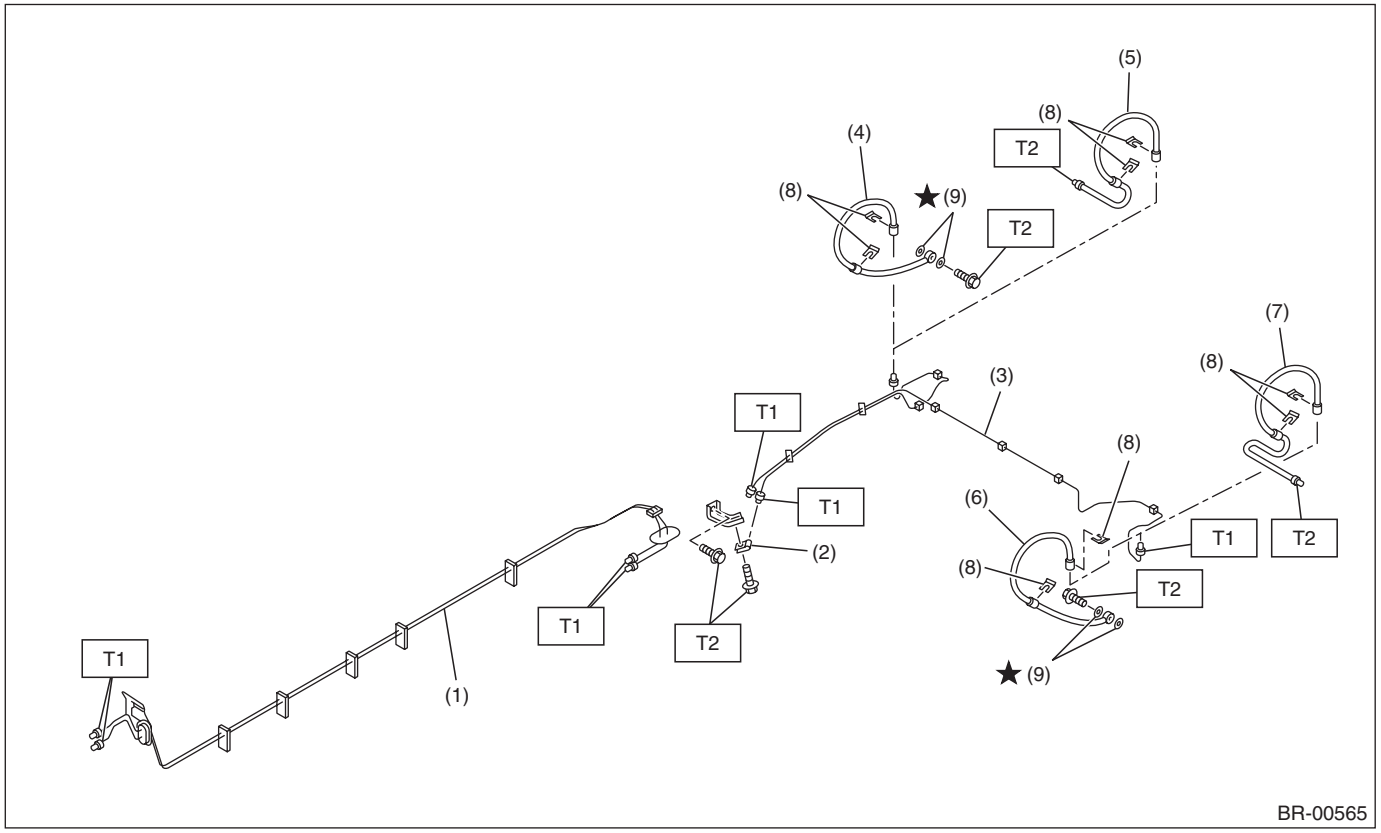


(A) AT model
(B) MT model

(1) Front brake pipe ASSY
(2) Two-way connector
(3) Front brake hose RH
(4) Front brake hose LH
(5) Clamp
(6) Gasket
(7) ABS control module and hydraulic control unit (ABSCM&H/U)
(8) Bracket
(9) Master cylinder
(10) Hill holder

Tightening torque:N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 19 (1.9, 13.7)
T4: 33 (3.4, 24.3)

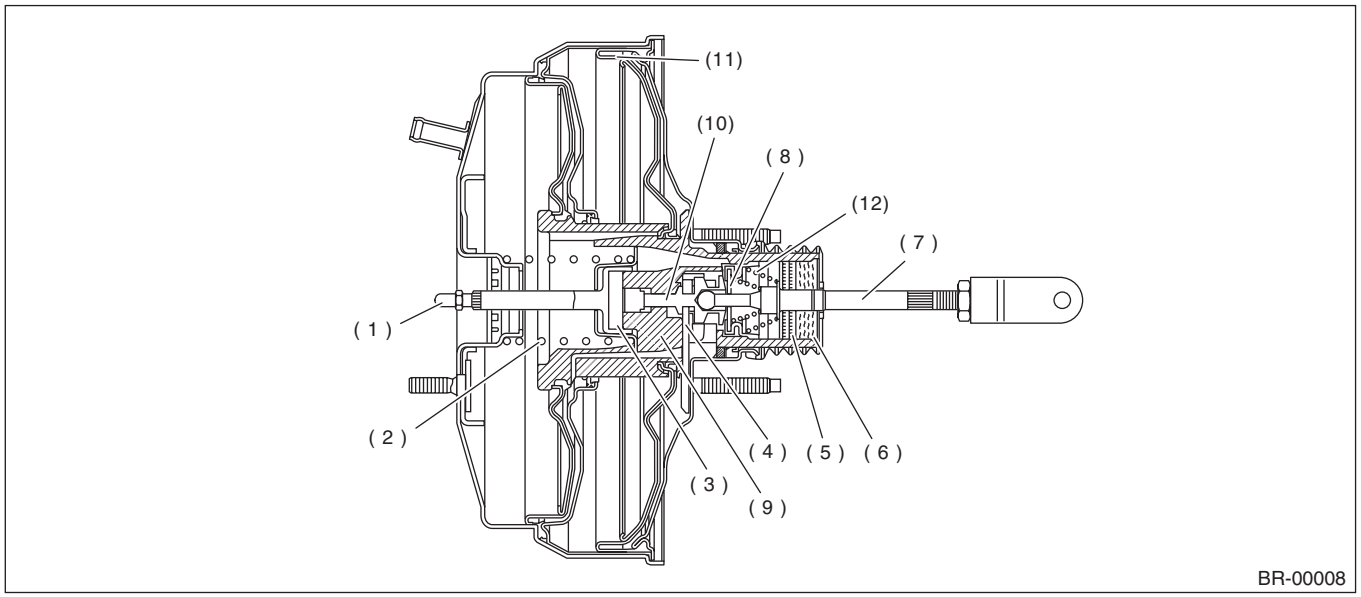
6. CENTER AND REAR BRAKE PIPES AND HOSES



(1) Center brake pipe ASSY
(2) Two-way connector
(3) Rear brake pipe ASSY
(4) Rear brake hose RH (Disc brake model)
(5) Rear brake hose RH (Drum brake model)
(6) Rear brake hose LH (Disc brake model)
(7) Rear brake hose LH (Drum brake model)
(8) Brake hose clamp
(9) Gasket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)

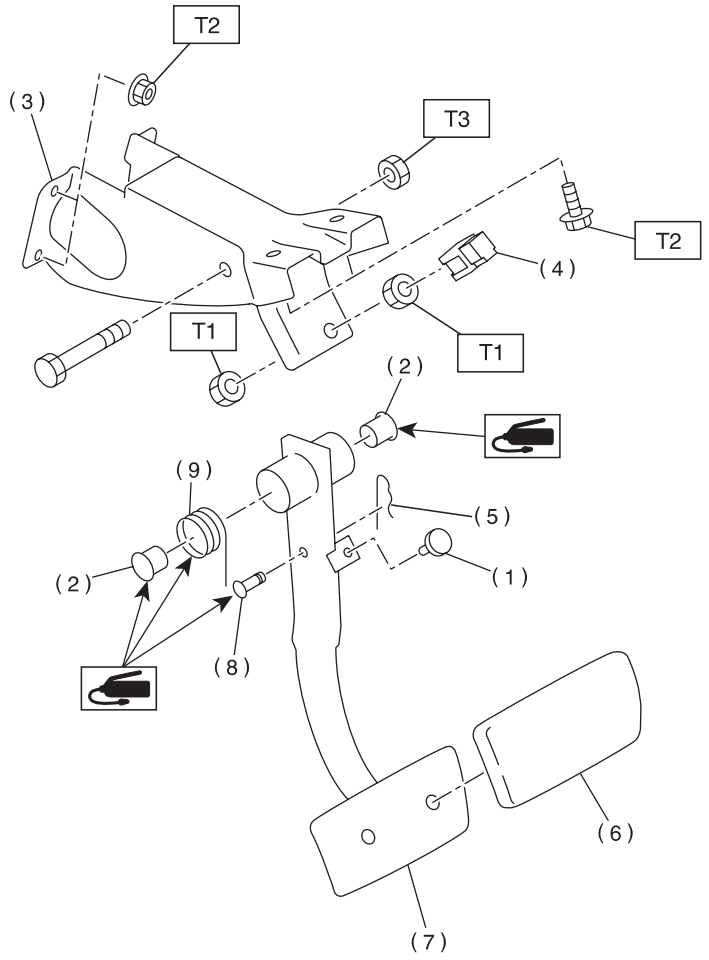
7. BRAKE BOOSTER



(1) Push rod
(2) Return spring
(3) Reaction disc
(4) Key
(5) Filter
(6) Silencer
(7) Operating rod
(8) Poppet valve ASSY
(9) Valve body
(10) Plunger valve
(11) Diaphragm plate
(12) Valve return spring

8. BRAKE PEDAL

- AT model

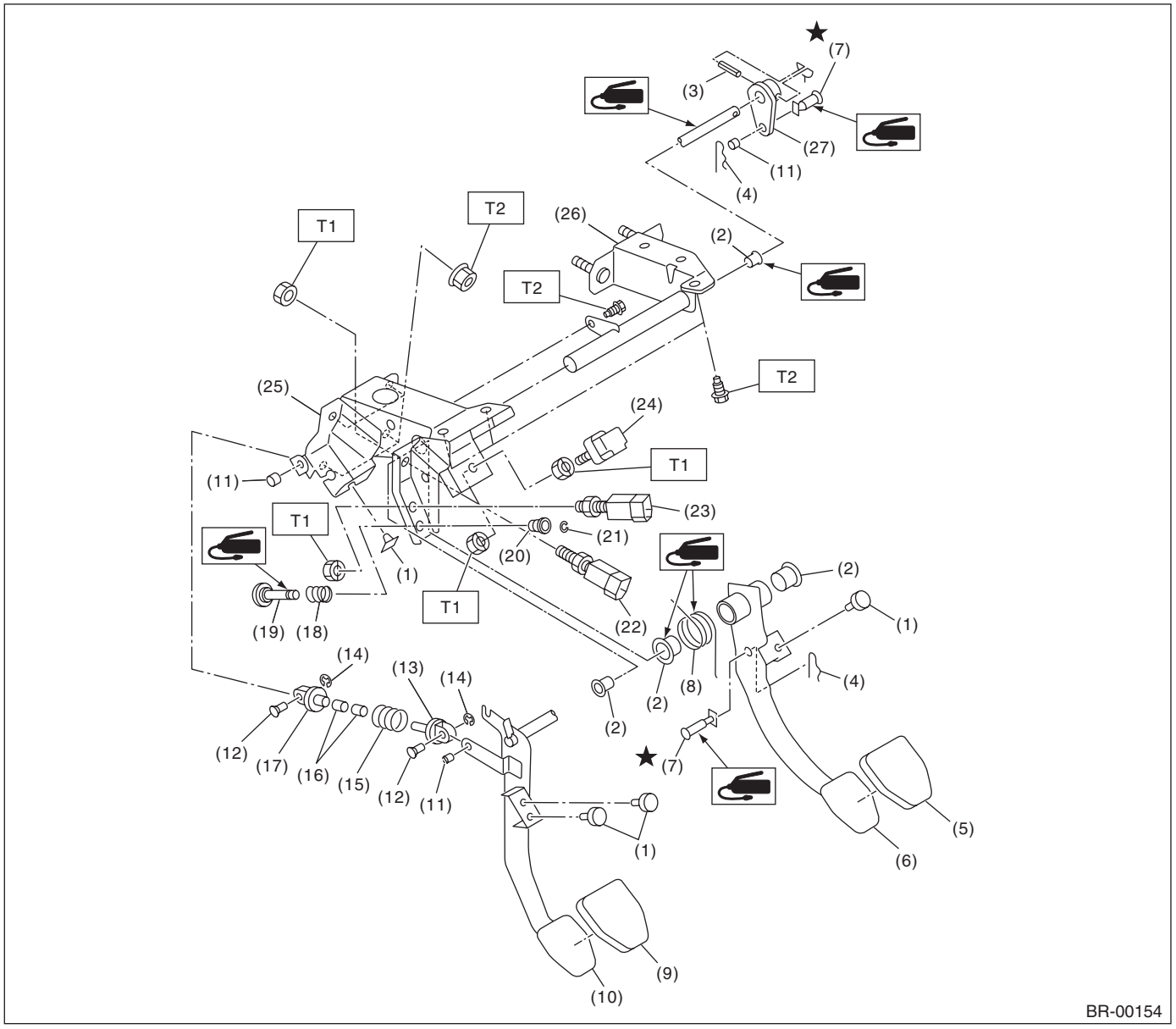


BR-00139

(1) Stopper
(2) Bushing
(3) Pedal bracket
(4) Stop light switch
(5) Snap pin
(6) Brake pedal pad
(7) Brake pedal
(8) Clevis pin
(9) Brake pedal spring

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 29 (3.0, 21.7)

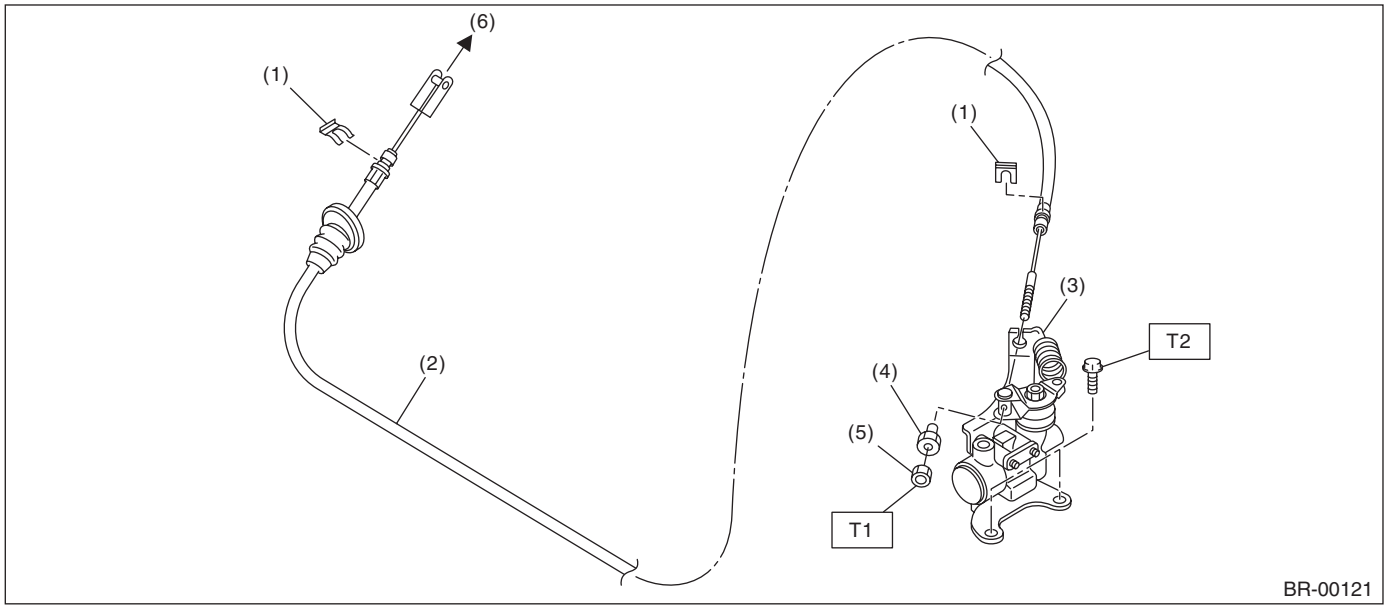
- MT model



(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 (Model 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)

9. HILL HOLDER



(1)	Clamp	(4)	Adjusting nut
(2)	PHV cable	(5)	Lock nut
(3)	PHV (Pressure hold valve)	(6)	To clutch pedal

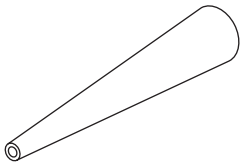
Tightening torque:N·m (kgf-m, ft-lb)
T1: 3.5 (0.36, 2.6)
T2: 18 (1.8, 13.0)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine fluid, grease etc. or equivalent. Do not mix fluid, grease, etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolving surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
- Before securing a part on a vise, set cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep fluids away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926460000	926460000	WHEEL CYLINDER 3/4″ADAPTER	Used for installing the cup to the wheel cylinder piston. (Size 3/4 in)

2. GENERAL TOOL

TOOL NAME	REMARKS
Snap ring pliers	Used for removing and installing snap rings.
Brake pipe wrench	Used for removing and installing brake pipes.

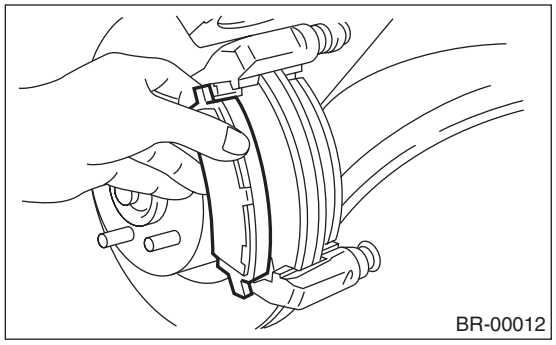
2. Front Brake Pad

A: REMOVAL

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift up the vehicle, and remove the front wheels.
4) Remove the lower caliper bolts.
5) Raise the caliper body and support it.

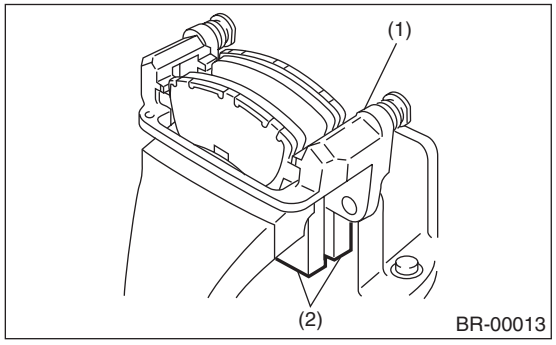
NOTE:
The brake hose must not be disconnected from the caliper body.

6) Remove the pad.



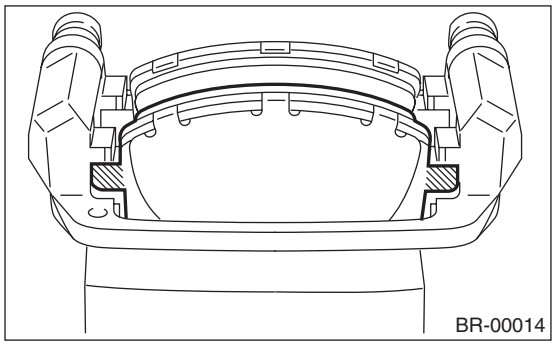
NOTE:
If the brake pad is difficult to remove, proceed as follows:

(1) Remove the caliper body from support.
(2) Remove the support.
(3) Place the support between wooden blocks in the vise.



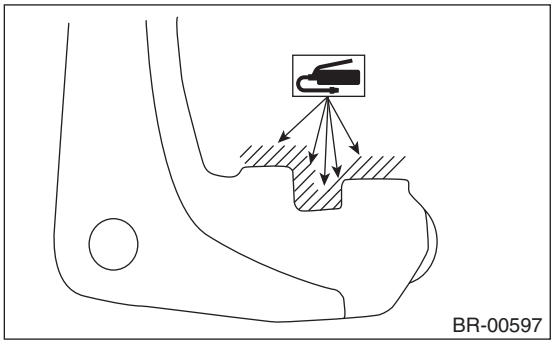
(1) Support
(2) Wooden block

(4) Apply a rod with less than 12 mm (0.47 in) diameter to the shaded area of brake pad, and strike the rod with a hammer to remove brake pad.

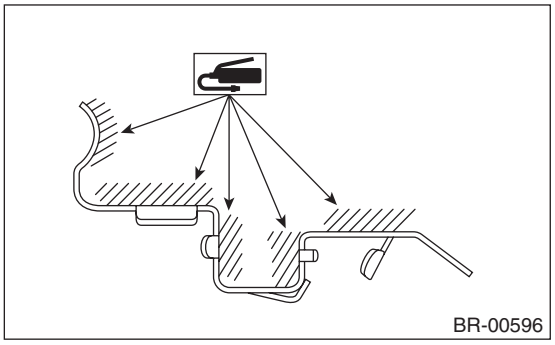


B: INSTALLATION

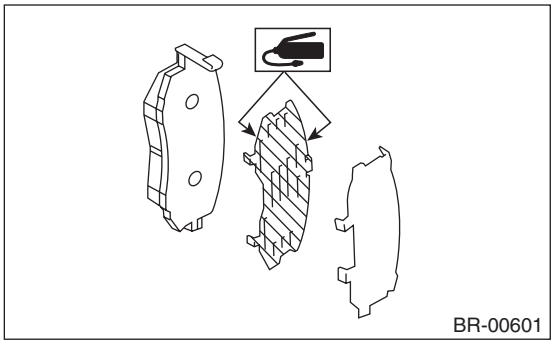
1) Apply a thin coat of Molykote M7439 (Part No. 003602001) to the support.



2) Apply a thin coat of Molykote M7439 (Part No. 003602001) to the contact surface between pad and pad clip.



3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between pad and pad clip.



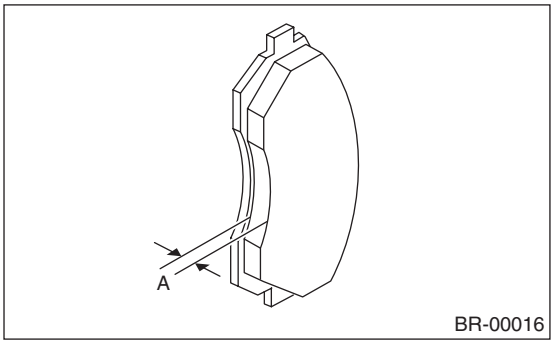
4) Install the pad to support.
5) Install the caliper body to the support.

Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen the air bleeder to facilitate work.

C: INSPECTION

Check the thickness A of pad.



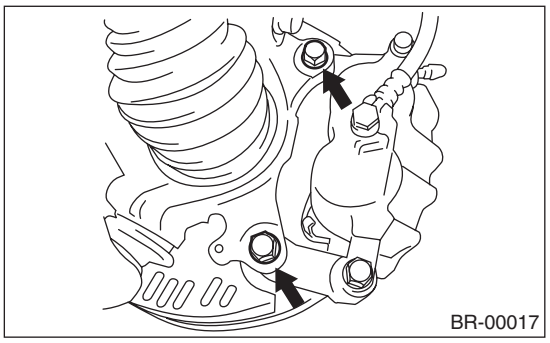
Pad thickness	Standard	11 mm (0.43 in)
	Wear limit	1.5 mm (0.06 in)

NOTE:
- Always replace the pads of both sides as a set.
- Replace pad clips if they are twisted or worn.
- A wear indicator is installed on inner pad. If the pad is worn to the limit, the end of wear indicator contacts disc rotor, and a squeaking sound is heard as the wheel rotates. If the sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

3. Front Disc Rotor

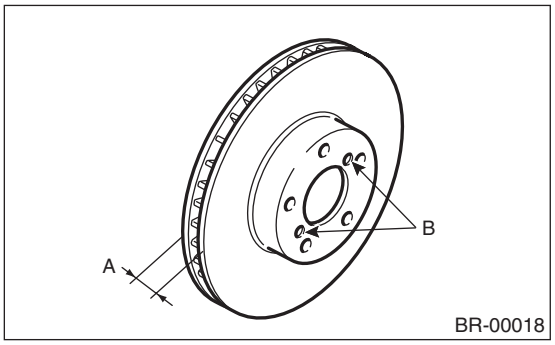
A: REMOVAL

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift up the vehicle, and remove the front wheels.
4) Remove caliper body and support from the housing, and suspend it from the strut using a wire.



5) Remove the disc rotor.

NOTE:
If it is difficult to remove the disc rotor from hub, drive an 8 mm bolt into the threads B of the rotor, then remove the rotor.



6) Remove mud and foreign matter from caliper body assembly and support.

B: INSTALLATION

1) Install the disc rotor.
2) Install the caliper body and the support to housing.

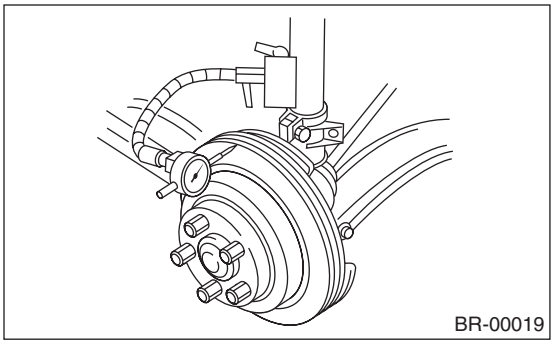
Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

3) Install the wheel.

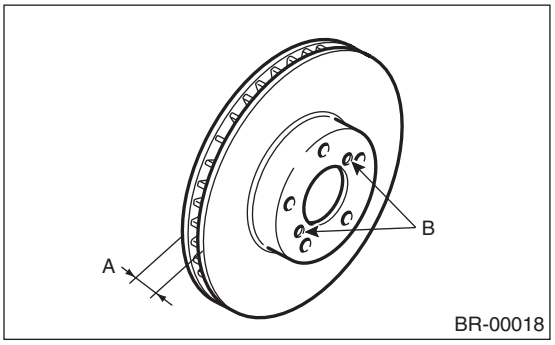
C: INSPECTION

1) Check the front wheel bearing play and axle hub runout before the inspection of disc rotor runout limit. <Ref. to DS-21, INSPECTION, Front Axle.>
2) Secure the disc rotor by tightening the five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward from the disc rotor outer circumference. Rotate the disc rotor to check runout. If the disc rotor runout exceeds the limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4).

Disc rotor runout limit:
0.075 mm (0.0030 in)



4) Set a micrometer in 10 mm (0.39 in) inward from disc rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



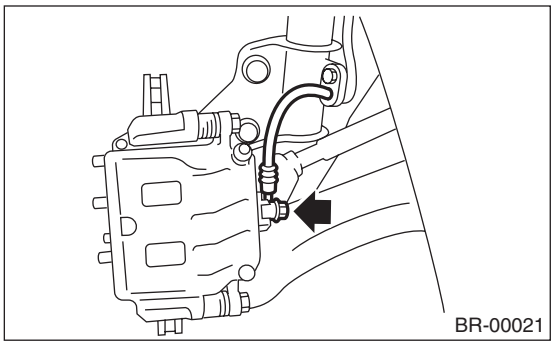
	Standard	Limit	Disc rotor outer dia.
Disc rotor thickness A	24 mm (0.94 in)	22 mm (0.87 in)	294 mm (11.57 in)

4. Front Disc Brake Assembly

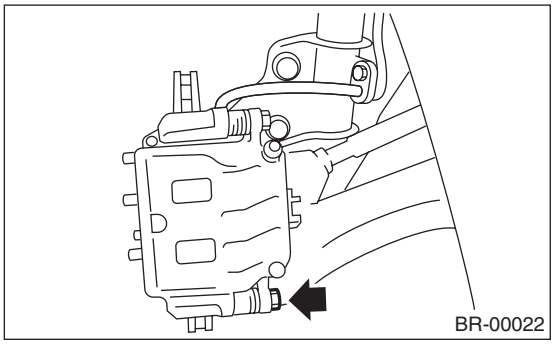
A: REMOVAL

CAUTION:
Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift up the vehicle, and remove the front wheels.
4) Remove the union bolt, and disconnect the brake hose from the caliper body assembly.

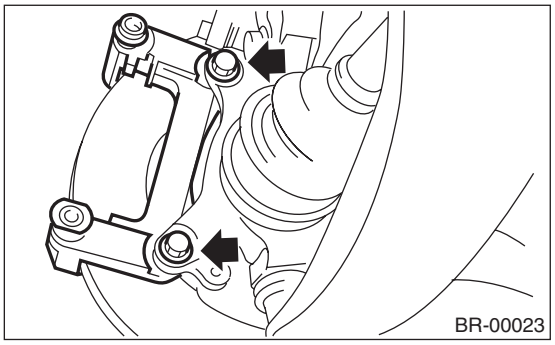


5) Remove the bolt securing lock pin (Yellow) to caliper body assembly.



6) Raise the caliper body assembly, and then move it toward vehicle center to separate it from the support.
7) Remove the support from housing.

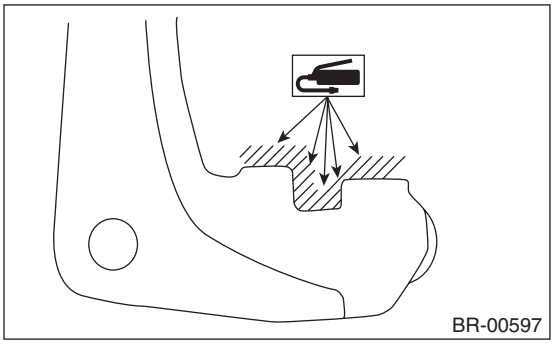
NOTE:
Remove the support only when replacing the rotor or support. It need not be removed when servicing the caliper body assembly.



8) Remove mud and foreign matter from caliper body assembly and support.

B: INSTALLATION

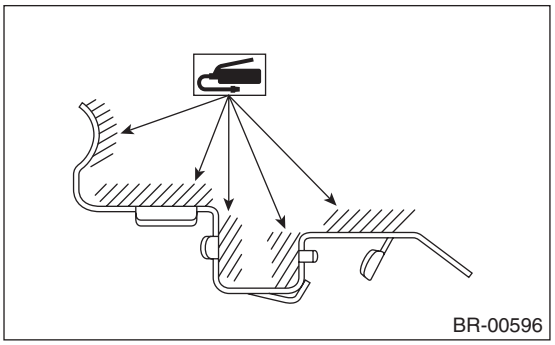
1) Apply a thin coat of Molykote M7439 (Part No. 003602001) to the support.



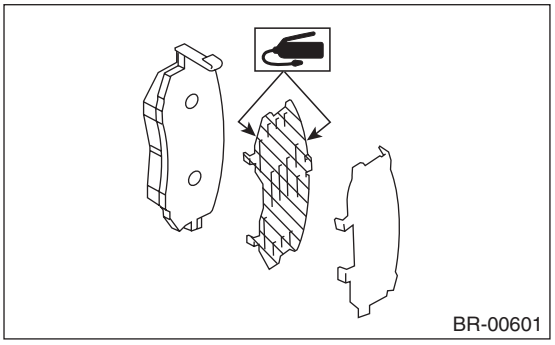
2) Install the support to the housing.

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

3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the pad clip.



4) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the both side of the inner shim.



5) Install the pad to support.
6) Install the caliper body to the support.

Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)

7) Connect the brake hose using the new gaskets.

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

CAUTION:
When connecting the brake hose, do not twist it.

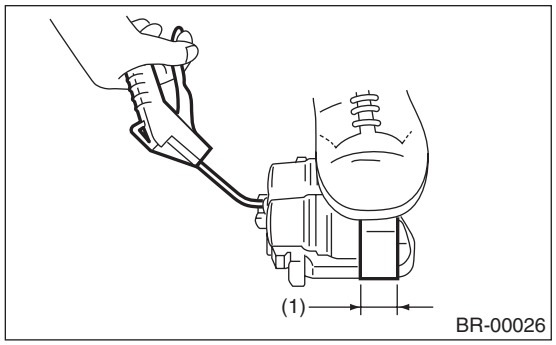
8) Bleed air from the brake system. <Ref. to BR-43, Air Bleeding.>

C: DISASSEMBLY

1) Remove mud and foreign matter from caliper body assembly and support.

CAUTION:
Be careful not to allow foreign matter to enter the brake hose connector.

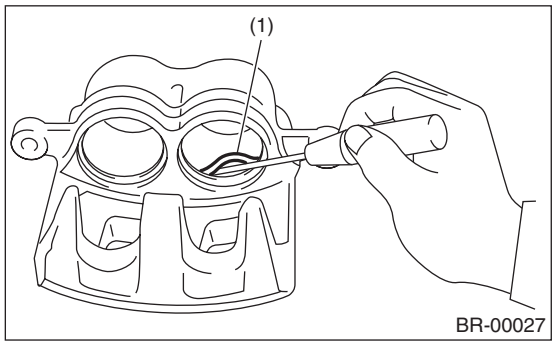
2) Using a standard screwdriver, remove the boot ring from piston.
3) Remove the piston boot from piston end.
4) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and being damaged, then gradually apply compressed air via installation hole of brake hose to push piston out.



(1) Place a wood block with 30 mm (1.18 in) wide.

5) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the caliper body cylinder and piston seal groove.



(1) Piston seal

6) Remove the pin boot, then remove the lock pin (yellow) and the guide pin (green).

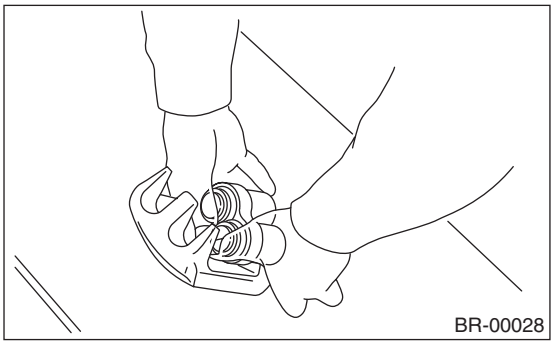
D: ASSEMBLY

1) Clean the inside of the caliper body using brake fluid.
2) Apply a coat of brake fluid to piston seal and install piston seal in the groove on caliper body.
3) Apply a coat of brake fluid to the inner surface of the caliper body cylinder and entire outer surface of the piston.
4) Apply a coat of specified grease to the piston boot and install it into the groove on tip of caliper body cylinder.

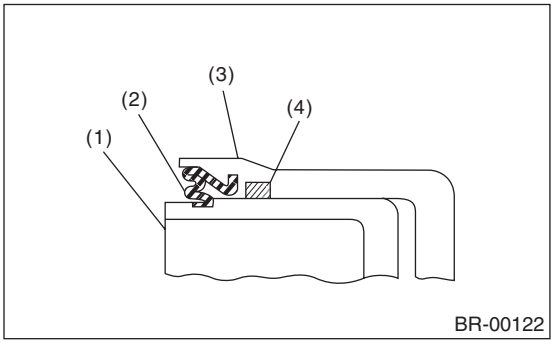
Grease:
NIGLUBE RX-2 (Part No. 000041000)

5) Insert the piston into caliper body cylinder.

CAUTION:
Do not force the piston into caliper body cylinder.



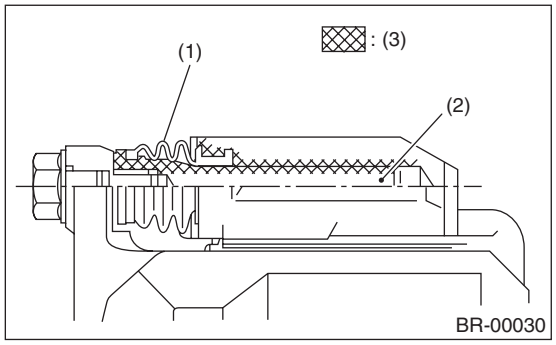
6) Position the piston boot in the grooves on caliper body cylinder and piston.



(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply a coat of the specified grease to the outer surface of lock pin (yellow) and guide pin (green), cylinder inner surface, and pin boot grooves.

Grease:
NIGLUBE RX-2 (Part No. 000041000)



(1) Pin boot
(2) Lock pin (yellow) or guide pin (green)
(3) Grease applied area

8) Insert the lock pin (yellow) and guide pin (green) and each pin boots into the support.

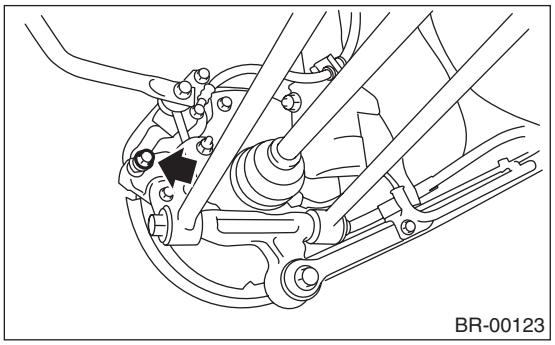
E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

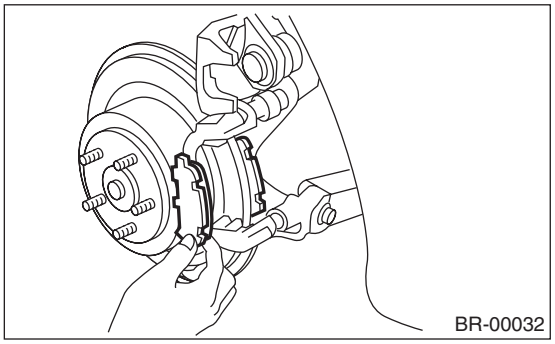
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift up the vehicle, and then remove the rear wheels.
4) Remove the lower caliper bolts.



5) Raise the caliper body and support it.

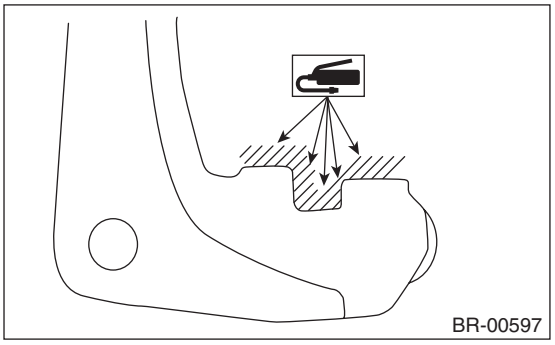
NOTE:
The brake hose must not be disconnected from the caliper body.
6) Remove the pad.

NOTE:
If it is difficult to remove the brake pad, use the same procedure as front disc brake pad.
<Ref. to BR-15, REMOVAL, Front Brake Pad.>

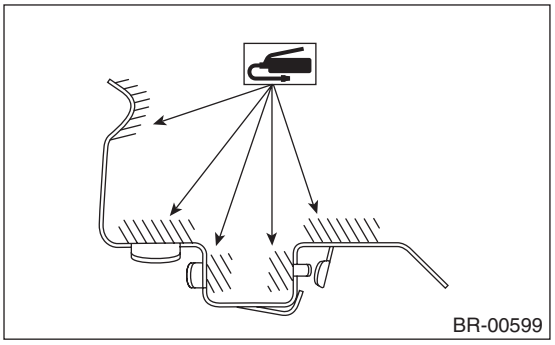


B: INSTALLATION

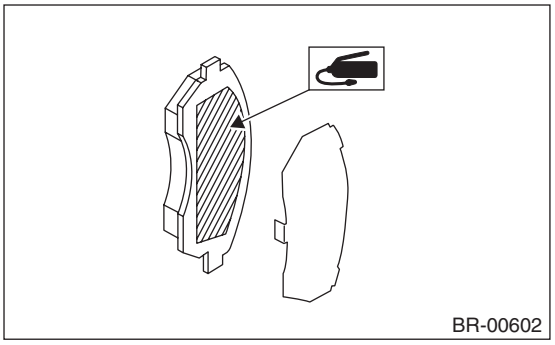
1) Apply a thin coat of Molykote M7439 (Part No. 003602001) to the support.



2) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between pad and pad clip.



3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between pad and pad clip.



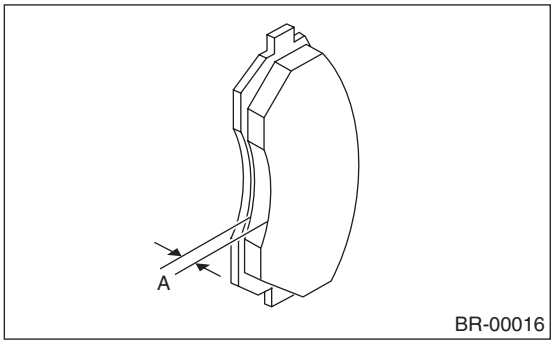
4) Install the pad to support.
5) Install the caliper body to the support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen the air bleeder to facilitate work.

C: INSPECTION

Check the thickness A of pad.



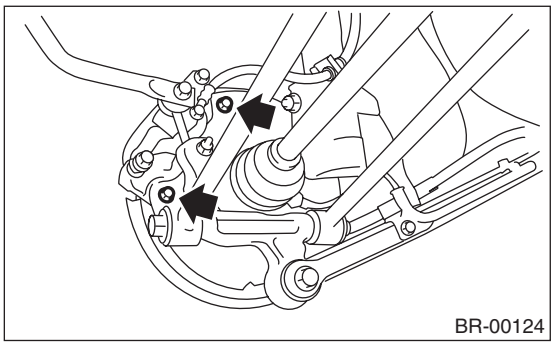
Pad thickness	Standard	9 mm (0.354 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:
- Always replace the pads of both sides as a set.
- Replace pad clips if they are twisted or worn.
- A wear indicator is installed on inner pad. If the pad is worn to the limit, the end of wear indicator contacts disc rotor, and a squeaking sound is heard as the wheel rotates. If the sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

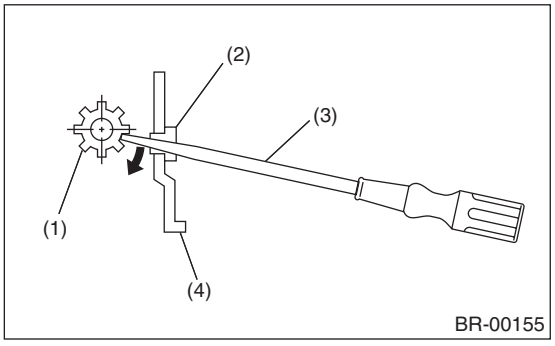
1) Lift up the vehicle, and then remove the rear wheels.
2) Pull down and release the parking brake.
3) Remove the two mounting bolts and remove the disc brake assembly.


BR-00124

4) Suspend the disc brake assembly so that the hose is not stretched.
5) Remove the disc rotor.

NOTE:
If it is difficult to remove the disc rotor, perform the following two methods in order.

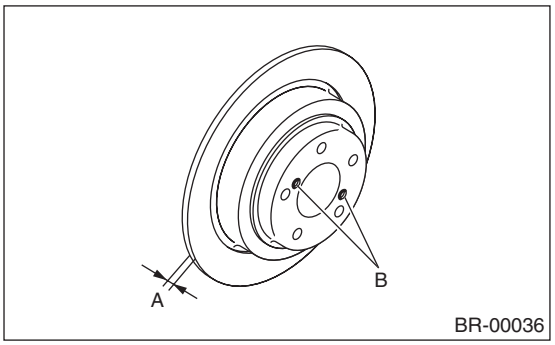
(1) Using a flat tip screwdriver, turn the adjuster until the parking brake shoe is apart enough from disc rotor.



BR-00155

(1) Adjuster
(2) Cover
(3) Flat tip screwdriver
(4) Back plate

(2) If it is difficult to remove the disc rotor from hub, drive an 8 mm bolt into the threads B of the rotor, then remove the rotor.



BR-00036

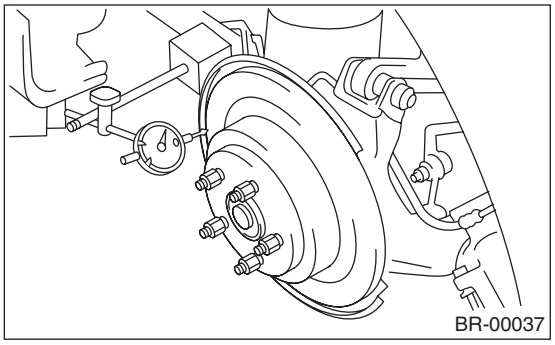
B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

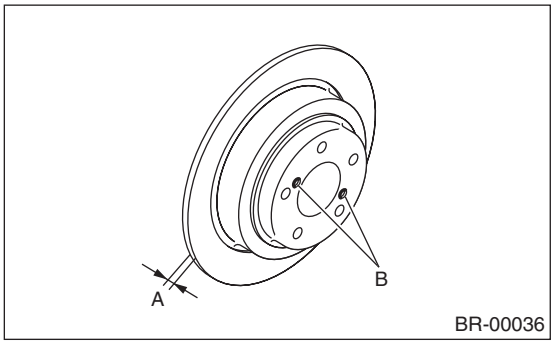
C: INSPECTION

1) Check the rear wheel bearing play and axle hub runout before the inspection of disc rotor runout. <Ref. to DS-29, INSPECTION, Rear Axle.>
2) Secure the disc rotor by tightening the five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward from the disc rotor outer circumference. Rotate the disc rotor to check runout. If the disc rotor runout exceeds the limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4).

Disc rotor runout limit:
0.070 mm (0.0027 in)



4) Set a micrometer in 10 mm (0.39 in) inward from disc rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



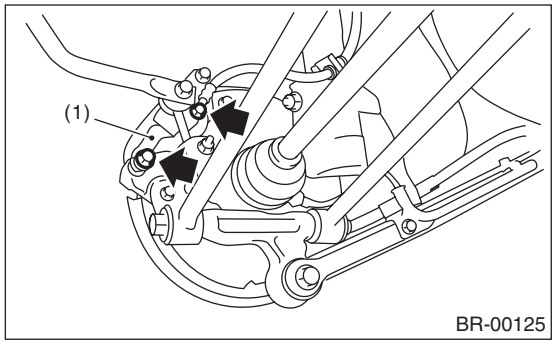
	Standard	Limit	Disc rotor outer dia.
Disc rotor thickness A	10 mm (0.39 in)	8.5 mm (0.335 in)	266 mm (10.47 in)

7. Rear Disc Brake Assembly

A: REMOVAL

CAUTION:
Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift up the vehicle, and then remove the rear wheels.
4) Disconnect the brake hose from caliper body assembly.
5) Remove the bolt securing lock pin (Yellow) to caliper body assembly.



(1) Caliper body

6) Raise the caliper body, and then move it toward vehicle center to separate it from the support.
7) Remove the support from housing.

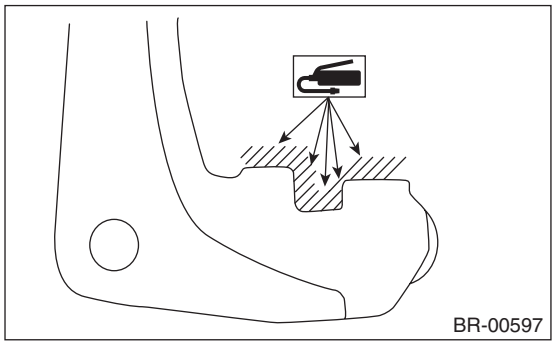
NOTE:
Remove the support only when replacing the rotor or support. It need not be removed when servicing the caliper body assembly.

8) Remove mud and foreign matter from caliper body assembly and support.

CAUTION:
Be careful not to allow foreign matter to enter the brake hose connector.

B: INSTALLATION

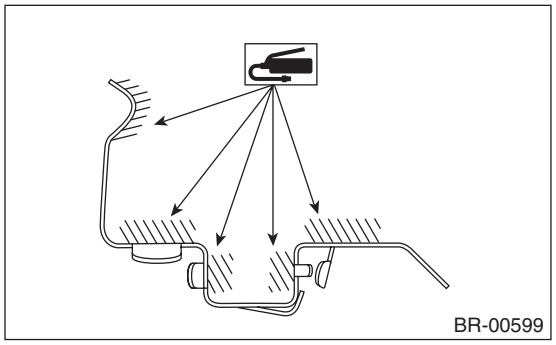
1) Apply a thin coat of Molykote M7439 (Part No. 003602001) to the support.



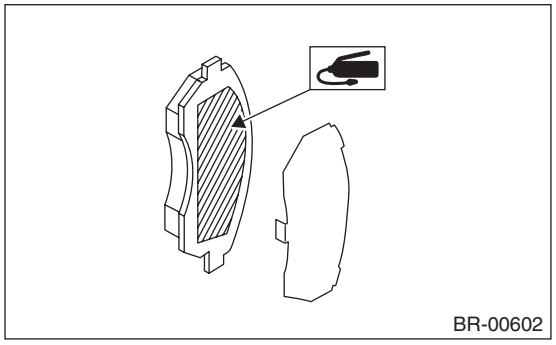
2) Install the support to the housing.

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

3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between pad and pad clip.



4) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between pad and pad inner shim.



5) Install the pad to support.
6) Install the caliper body to the support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

7) Connect the brake hose using the new gaskets.

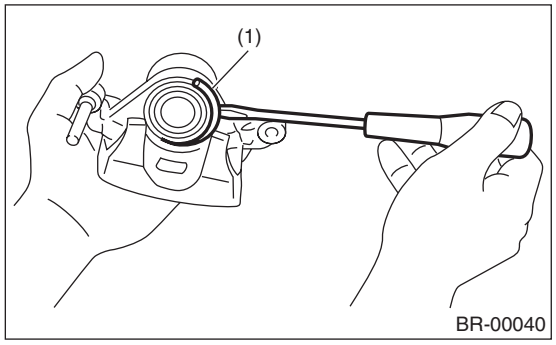
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:
When connecting the brake hose, do not twist it.

8) Bleed air from the brake system. <Ref. to BR-43, Air Bleeding.>

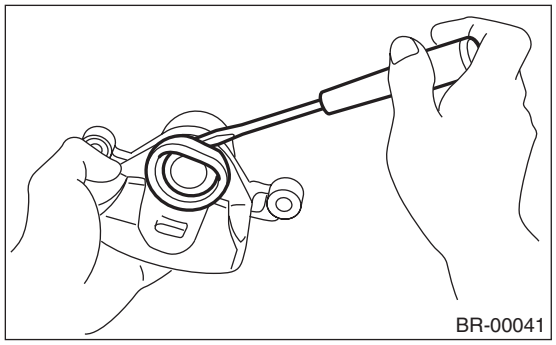
C: DISASSEMBLY

1) Remove the boot ring.

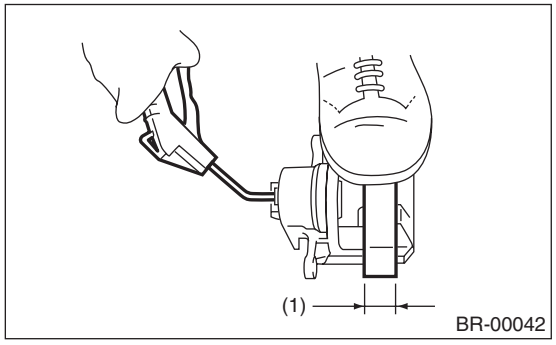


(1) Boot ring

2) Remove the piston boot.



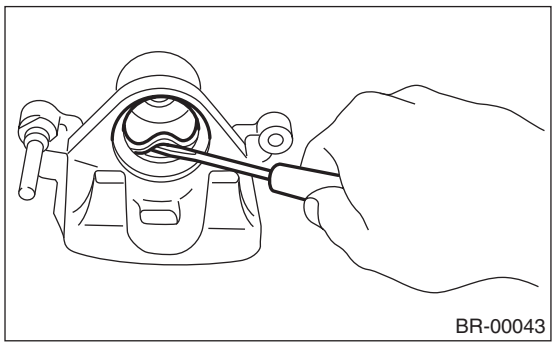
3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and being damaged, then gradually apply compressed air via installation hole of brake hose to push piston out.



(1) Place a wood block with 30 mm (1.18 in) wide.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the caliper body cylinder and piston seal groove.



5) Remove the lock pin sleeve and pin boot from caliper body.
6) Remove the guide pin (green) and pin boot.

D: ASSEMBLY

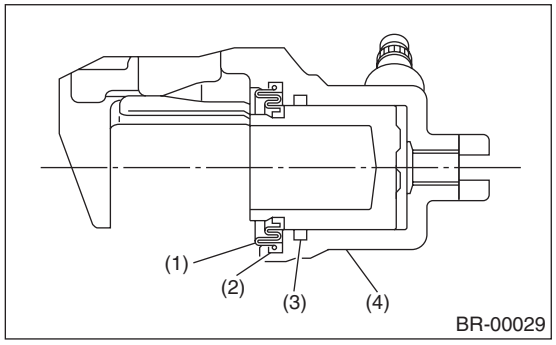
1) Clean the inside of the caliper body using brake fluid.
2) Apply a coat of brake fluid to piston seal and install piston seal in the groove on caliper body.
3) Apply a coat of brake fluid to the inner surface of caliper body cylinder and entire outer surface of piston.
4) Apply a coat of specified grease to the piston boot and install it into the groove on tip of caliper body cylinder.

Grease:
NIGLUBE RX-2 (Part No. 000041000)

5) Insert the piston into caliper body cylinder.

CAUTION:
Do not force the piston into caliper body cylinder.

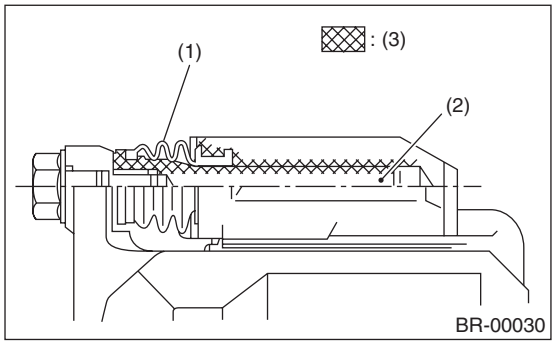
6) Position the piston boot in the grooves on caliper body cylinder and piston, then install the boot ring.



(1) Piston boot
(2) Boot ring
(3) Piston seal
(4) Caliper body

7) Apply a coat of the specified grease to the outer surface of lock pin (yellow) and guide pin (green), outer surface of the lock pin sleeve, cylinder inner surface, and pin boot grooves.

Grease:
NIGLUBE RX-2 (Part No. 000041000)



(1) Pin boot
(2) Lock pin (yellow) or guide pin (green)
(3) Grease applied area

8) Insert the guide pin boot to the support.
9) Install the lock pin boot to the support, and then insert the lock pin sleeve into the specified position.

E: INSPECTION

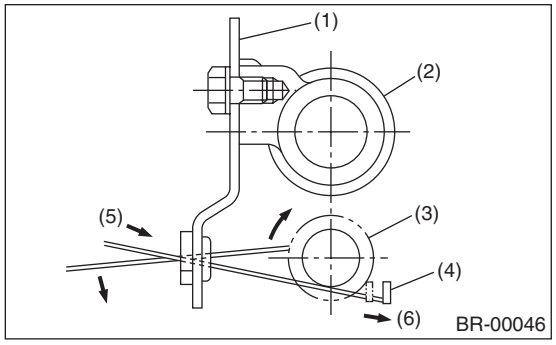
1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check rubber parts for damage or deterioration.

8. Rear Drum Brake Shoe

A: REMOVAL

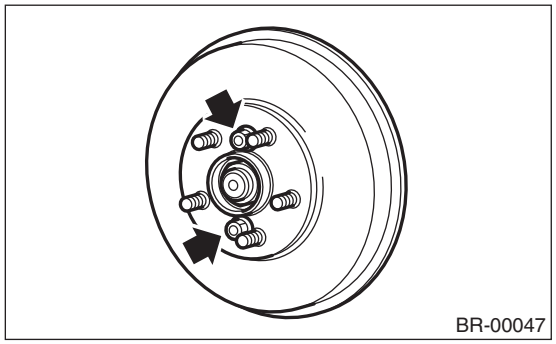
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift up the vehicle, and then remove the rear wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly.

NOTE:
• If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, then turn the adjuster assembly claws using a flat tip screwdriver until the brake shoe separates from the drum.

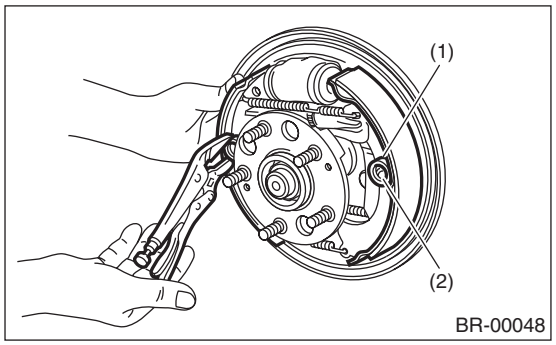


(1) Back plate
(2) Wheel cylinder ASSY
(3) Adjuster ASSY claws
(4) Adjusting lever
(5) Tightening direction
(6) Push direction

• If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.

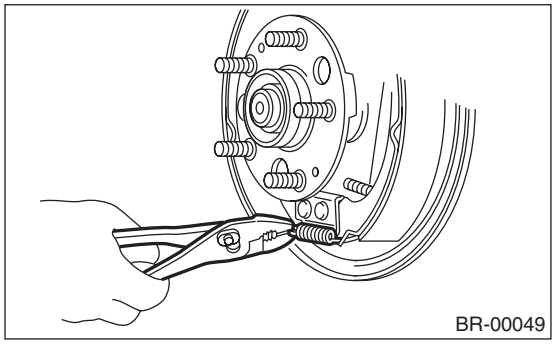


6) Hold the hold-down pin by securing rear of back plate with your hand.



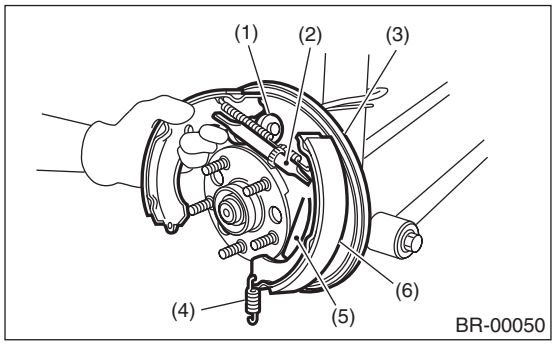
(1) Hold-down cup
(2) Hold-down pin

7) Rotate the hold down cup and remove from the hold down pin.
8) Disconnect the lower shoe return spring from the brake shoe.



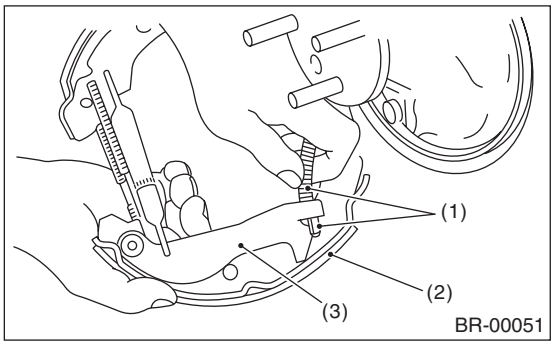
9) Remove each brake shoe along with the adjuster from the back plate.

CAUTION:
Be careful not to excessively bend the parking brake cable when removing the brake shoes.



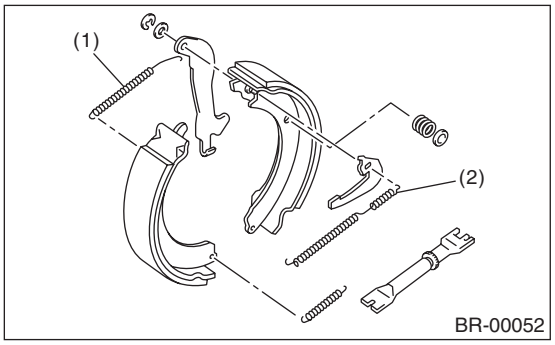
(1) Wheel cylinder ASSY
(2) Adjuster ASSY
(3) Back plate
(4) Lower shoe return spring
(5) Parking lever
(6) Brake shoe (Trailing)

10) Disconnect the parking brake cable from the parking brake lever.



(1) Parking brake cable
(2) Brake shoe (Trailing)
(3) Parking brake lever

11) Remove the upper shoe return spring and adjusting spring from the brake shoe.

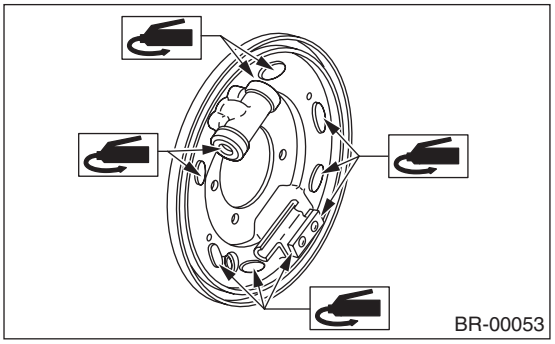


(1) Upper shoe return spring
(2) Adjusting spring

B: INSTALLATION

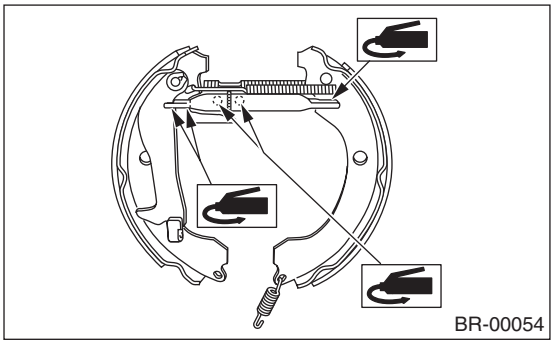
1) Clean the back plate and wheel cylinder assembly.
2) Apply grease to the portions indicated by arrows in the figure.

Brake grease:
Dow Corning Molykote M 7439 (Part No. 003602001)

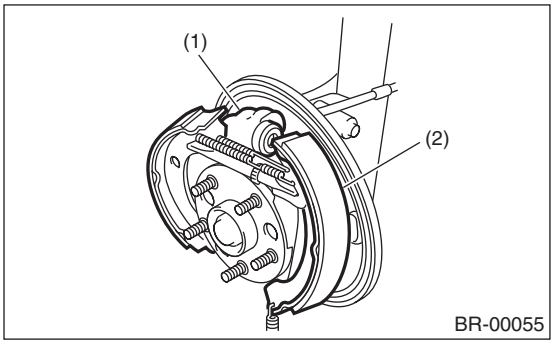


3) Apply grease to the adjusting screw and both ends of adjuster.

Brake grease:
Dow Corning Molykote M 7439 (Part No. 003602001)



4) Attach the upper shoe return spring to the brake shoe.
5) Connect the parking brake cable to the parking lever.
6) While positioning the brake shoe (one at a time) in the groove of the wheel cylinder, secure the brake shoe in place.



(1) Wheel cylinder ASSY
(2) Brake shoe (Trailing)

7) Fix the shoes in place by connecting the hold-down cup to the hold-down pin.
8) Install the lower shoe return spring.
9) Set the outside diameter of brake shoes 0.5 to 0.8 mm (0.020 to 0.031 in) smaller in comparison with the inside diameter of the brake drum.

C: INSPECTION

1) Measure the lining thickness. If it exceeds the service limit, replace the brake shoe with a new part.

Lining thickness
Standard:
4.1 mm (0.161 in)
Service limit:
1.5 mm (0.059 in)

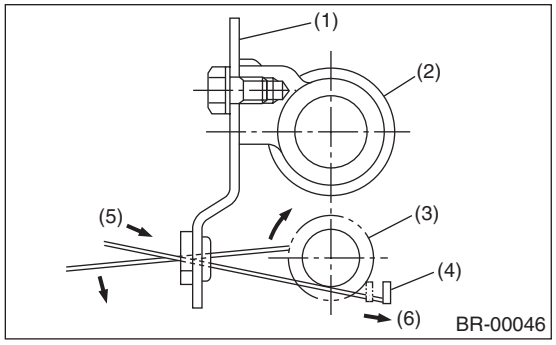
2) If the deformation or wear of back plate, shoe, etc. are severe, replace them.
3) If the tension of the shoe return spring is very low, replace it. Be careful not to confuse the upper and lower shoe return springs.

9. Rear Drum Brake Drum

A: REMOVAL

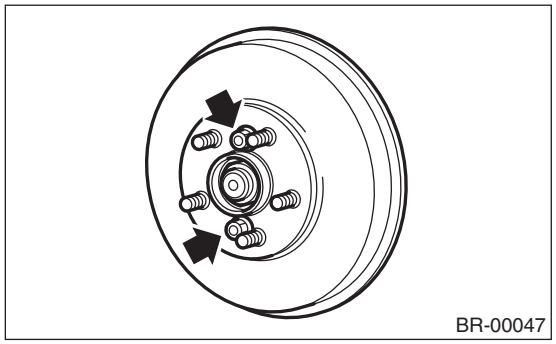
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift up the vehicle, and then remove the rear wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly.

NOTE:
• If it is difficult to remove the brake drum, remove the adjusting hole cover from the back plate, then turn the adjuster assembly claws using a flat tip screwdriver until the brake shoe separates from the drum.



(1) Back plate
(2) Wheel cylinder ASSY
(3) Adjuster ASSY claws
(4) Adjusting lever
(5) Tightening direction
(6) Push direction

• If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.



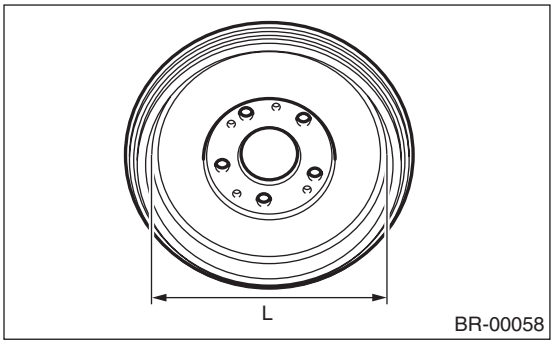
B: INSTALLATION

Set the outside diameter of brake shoes 0.5 to 0.8 mm (0.020 to 0.031 in) smaller in comparison with the inside diameter of the brake drum.

C: INSPECTION

1) If the inside surface of the brake drum has scratches, perform inspection. And, if it is unevenly worn, has narrow streaks on the surface, or the outside surface of brake drum is damaged, correct or replace it.
2) Measure the brake drum inside diameter. If it exceeds service limits, replace with a new brake drum.

Drum inner diameter: "L"
Standard:
228.6 mm (9 in)
Service limit:
230.6 mm (9.08 in)

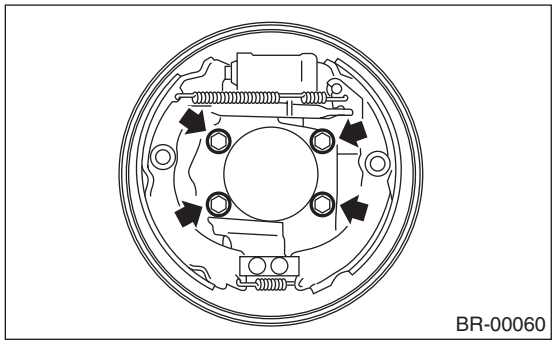


10.Rear Drum Brake Assembly

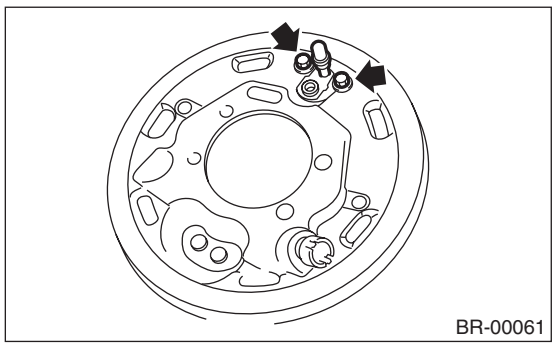
A: REMOVAL

CAUTION:
Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift up the vehicle, and then remove the rear wheels.
4) Release the parking brake.
5) Remove the brake drum from the brake assembly. <Ref. to BR-31, REMOVAL, Rear Drum Brake Drum.>
6) Remove the brake shoe. <Ref. to BR-28, REMOVAL, Rear Drum Brake Shoe.>
7) Disconnect the brake hose. <Ref. to BR-45, REAR BRAKE HOSE (DRUM BRAKE), REMOVAL, Brake Hose.>
8) Remove the hub.
<Ref. to DS-22, REMOVAL, Rear Axle.>
9) Disconnect the ABS wheel speed sensor from the back plate.
10) Remove the rear drum brake assembly.


BR-00060

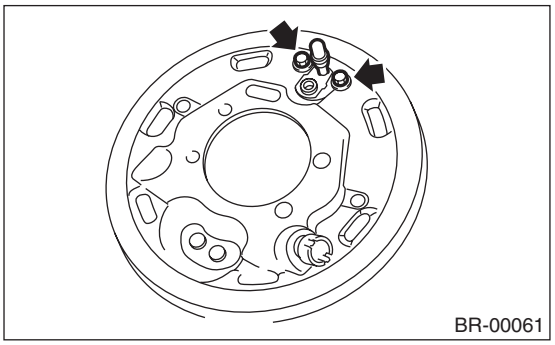
11) Remove the bolts holding the wheel cylinder assembly on the back plate, and remove the wheel cylinder assembly.


BR-00061

B: INSTALLATION

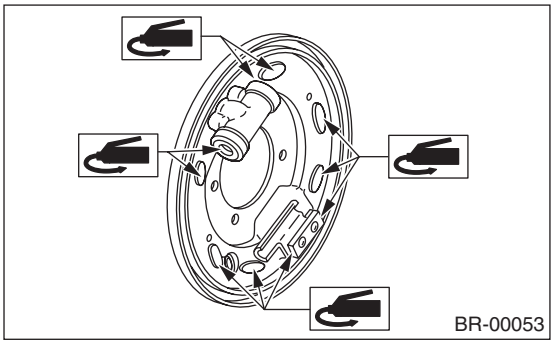
1) Clean the back plate and wheel cylinder assembly.
2) Install the wheel cylinder assembly on the back plate, and tighten bolts.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


BR-00061

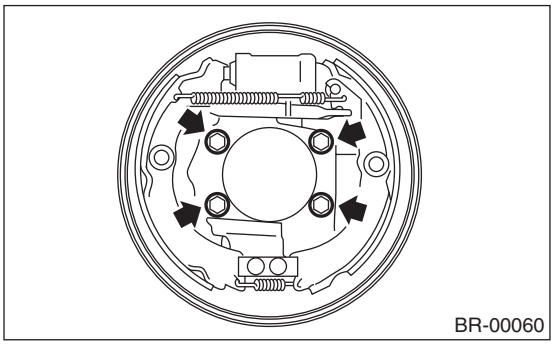
3) Apply grease to the portions indicated by arrows in the figure.

Brake grease:
Dow Corning Molykote M 7439 (Part No. 003602001)


BR-00053

4) Install the brake assembly on housing, and tighten the bolts to install back plate.

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


BR-00060

5) Install the hub. <Ref. to DS-25, INSTALLATION, Rear Axle.>

6) Connect the brake hose, and tighten the brake hose flange nut.

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

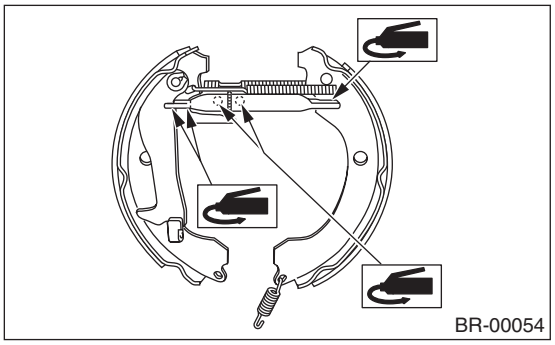
CAUTION:
When connecting the brake hose, do not twist it.

7) Install the ABS wheel speed sensor on the back plate.

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

8) Apply grease to the adjusting screw and both ends of adjuster.

Brake grease:
Dow Corning Molykote M 7439 (Part No. 003602001)



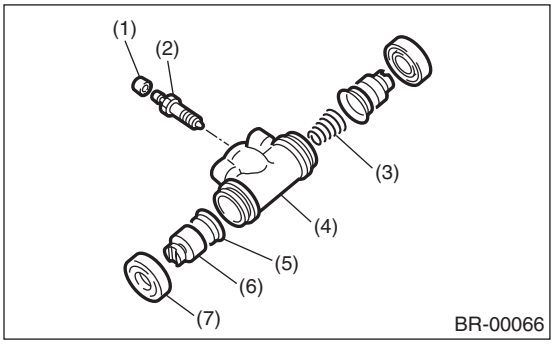
9) Install the brake shoe. <Ref. to BR-29, INSTALLATION, Rear Drum Brake Shoe.>

10) Install the brake drum. <Ref. to BR-31, INSTALLATION, Rear Drum Brake Drum.>

11) After installing the rear drum brake assembly, bleed air from the brake line. <Ref. to BR-43, Air Bleeding.>

C: DISASSEMBLY

1) Remove the right and left dust boots from the wheel cylinder.



(1) Air bleeder cap
(2) Air bleeder screw
(3) Spring
(4) Wheel cylinder body
(5) Cup
(6) Piston
(7) Dust boots

2) Remove the piston, cup, spring and air bleeder screw and cap.

D: ASSEMBLY

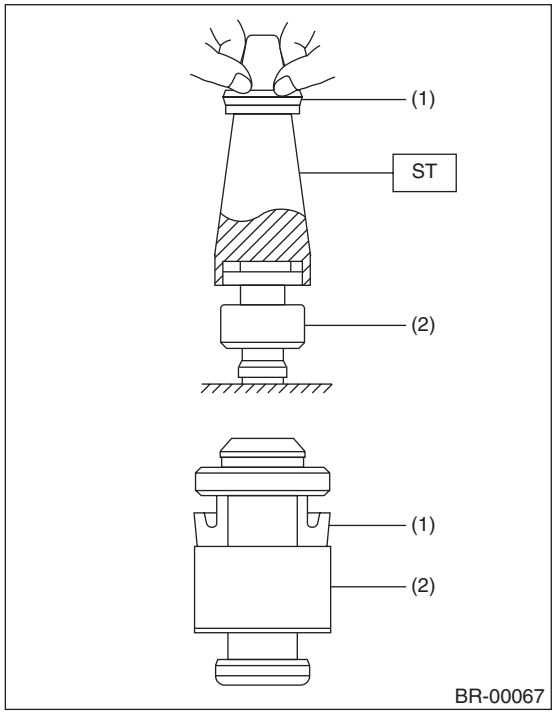
1) Clean all parts with brake fluid. Check and replace faulty parts.
- Cup and boot damage or fatigue
- Wheel cylinder body, piston and spring damage or rust

2) Assemble in the reverse order of disassembly.
   (1) When attaching the cup, use the ST and apply brake fluid to the sliding surfaces to make installation smoother. Be careful of the direction of the cup at this time.
   (2) The ST is available in different sizes.

CAUTION:
When replacing with the repair kit, make sure that the sizes of wheel cylinder body and cup are the same as those being replaced.

ST: ADAPTER	
Size	Part No.
19 mm (3/4 in)	926460000

CAUTION:
When assembling, be careful that the wheel cylinder does not become scratched, and that no dust enters.

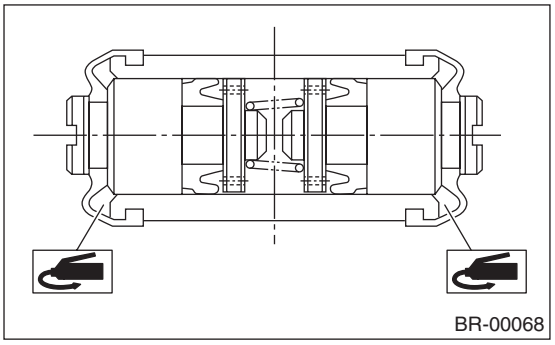


(1) Cup
(2) Piston

3) Apply rubber grease to the boot inside as shown in figure.

CAUTION:
Never use brake grease.

Grease:
NIGLUBE RX-2 (Part No. 000041000)



E: INSPECTION

If the deformation or wear of back plate, shoe, etc. are severe, replace them.

11.Master Cylinder

A: REMOVAL

CAUTION:
Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.
1) Drain brake fluid from reservoir tank completely.
2) Disconnect the harness connector of the fluid level gauge.
3) Remove the brake pipes from master cylinder.
4) Remove the master cylinder mounting nuts, and remove the master cylinder from the brake booster.

B: INSTALLATION

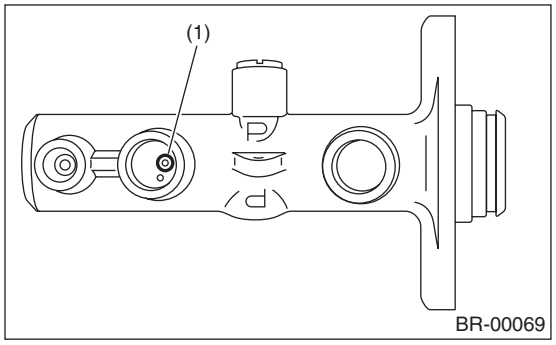
1) Install in the reverse order of removal.

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.
2) Bleed air from the brake system. <Ref. to BR-43, PROCEDURE, Air Bleeding.>

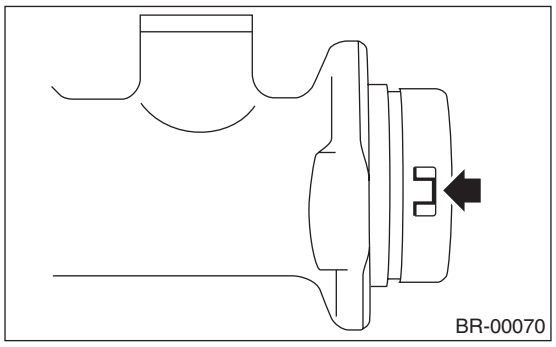
C: REPLACEMENT

1) Remove mud and dirt from the surface of brake master cylinder.
2) Secure the master cylinder in a vise.
3) Remove the pin which secures the reservoir tank to master cylinder, and then remove the reservoir tank and grommet.
4) Remove the cylinder pin with magnetic pick-up tool while pushing in the primary piston by screwdriver which is wrapped with tape.



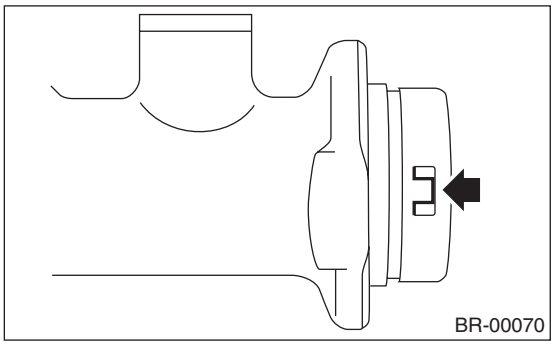
(1) Cylinder pin (straight pin)

5) Raise the claw and remove the piston retainer. Hold the piston retainer while working, because the piston may fly out with force.

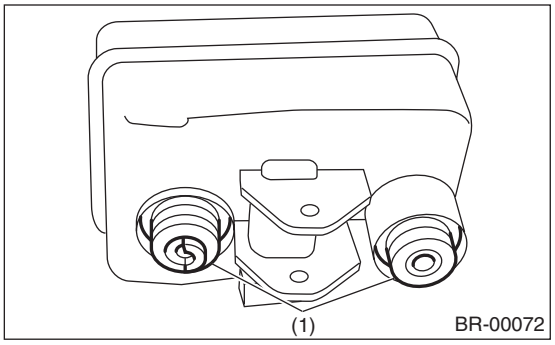


6) Extract the primary piston assembly and secondary piston assembly straight out while taking care not to scratch the inner surface of the cylinder.
7) Use brake fluid to wash the inside wall of master cylinder and the piston assembly. Check for any damage, deformation, wear or rust. Replace the master cylinder assembly as a unit if faulty.
8) Apply brake fluid to the inner surface of master cylinder and piston assembly.
9) Make sure that the inner surface of master cylinder and the piston assembly are free of foreign matter. Install the primary piston assembly and the secondary piston assembly to master cylinder, while taking care not to scratch the master cylinder inner surface.
10) Install the cylinder pin while pushing in the primary piston by the screwdriver which is wrapped with tape.

11) Install the piston retainer and secure it with the claw.



12) Install the seal to reservoir tank.



(1) Seal

13) Install the reservoir tank to the master cylinder, and secure with pin.

D: INSPECTION

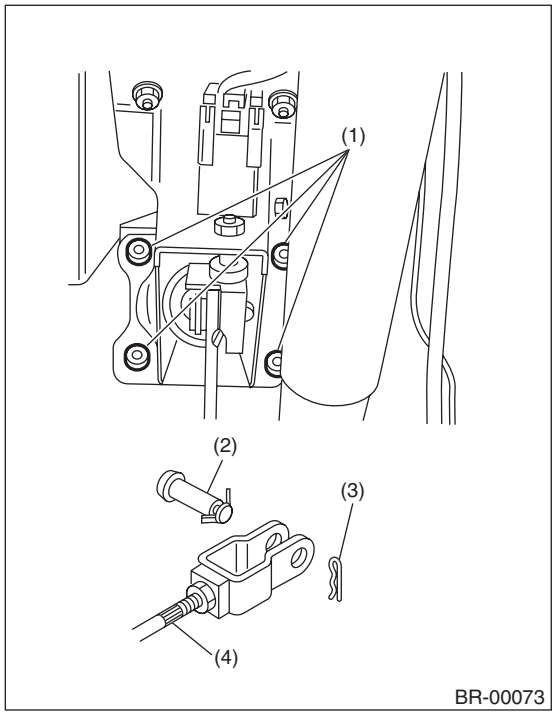
Check the master cylinder for oil leakage.

NOTE:
After replacing the piston kit, if an oil leakage is found even though there is no damage or scratches on the inside of the cylinder, the master cylinder inner wall may be worn. In this case, replace the master cylinder as an assembly.

12.Brake Booster

A: REMOVAL

1) Remove or disconnect the following parts of engine compartment.
   (1) Disconnect the connector of brake fluid level gauge.
   (2) Remove the brake pipes from master cylinder.
   (3) Remove the master cylinder installation nut.
   (4) Disconnect the vacuum hose from brake booster.
2) Remove the following parts from the pedal bracket.
   (1) Snap pin and clevis pin
   (2) Four brake booster installation nuts

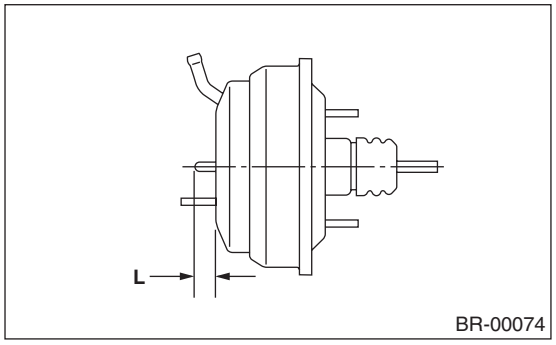


(1) Nut
(2) Clevis pin
(3) Snap pin
(4) Operating rod

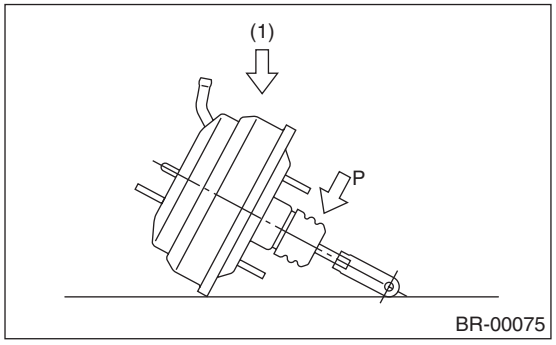
3) Remove the brake booster while avoiding the brake pipe.

NOTE:
• Be careful not to drop the brake booster. If the booster is dropped, replace it.
• Use special care when handling the operating rod.
• If excessive force is applied to operating rod, angle may cause change in excess of ±3°, and it may result in damage to the master cylinder.
• Be careful when placing the brake booster on floor.
• Do not change the push rod length. If it has been changed, reset the projected length “L” to the standard length.

Standard:
Model with ABS
L = 10.05 mm (0.396 in)



CAUTION:
• Do not disassemble the brake booster.
• If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by “P” may be damaged, so be careful how it is placed.



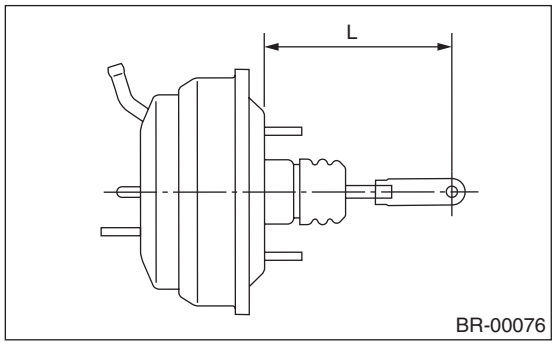
(1) Force

B: INSTALLATION

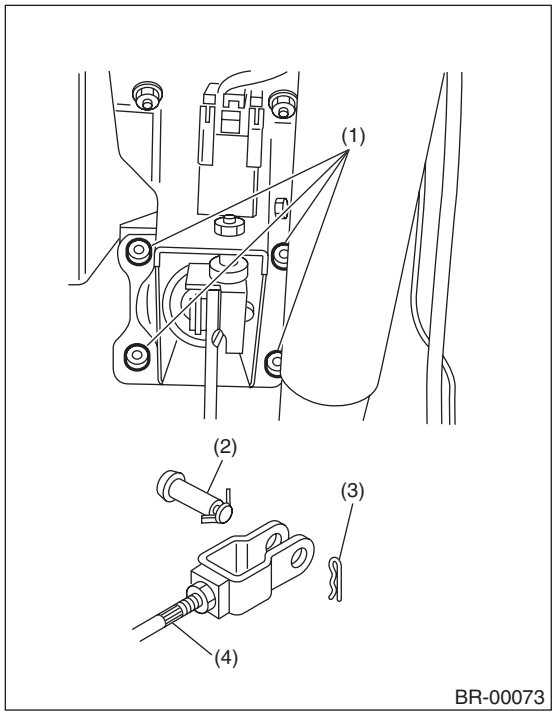
1) Check and adjust the operating rod of the brake booster.

Standard: L
144.6 mm (5.69 in)

If it is out of specification, adjust it with the brake booster operating rod.

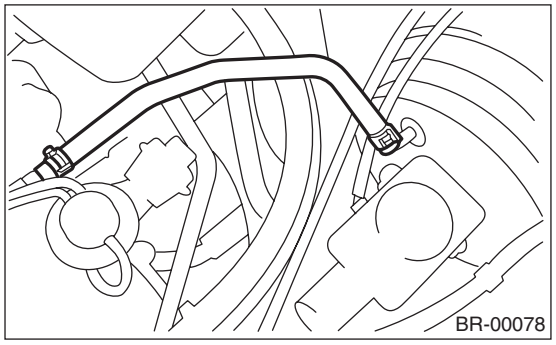


2) Mount the brake booster in position.
3) Connect the operating rod to brake pedal with a clevis pin and snap pin.



(1) Nut
(2) Clevis pin
(3) Snap pin
(4) Operating rod

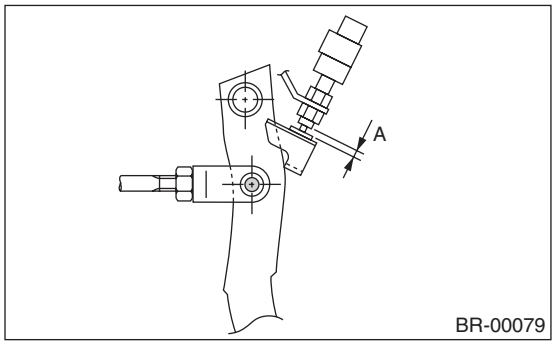
4) Connect the vacuum hose to brake booster.



5) Mount the master cylinder onto the brake booster.
6) Connect the brake pipes to the master cylinder.
7) Connect the connector of the brake fluid level gauge.
8) Measure the clearance between the threaded end of stop light switch and the stopper.
If it is not within the specification, adjust it by adjusting the position of the stop light switch. <Ref. to BR-53, ADJUSTMENT, Stop Light Switch.>

CAUTION:
Do not rotate the stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



9) Apply grease to the operating rod connecting pin to prevent it from wear.
10) Bleed air from the brake system. <Ref. to BR-43, Air Bleeding.>

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

11) Perform a road test to make sure the brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

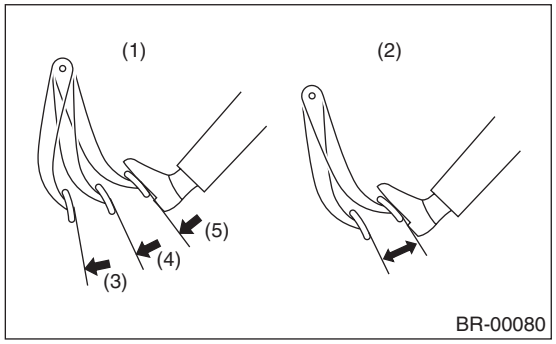
CAUTION:
When checking operation, be sure to apply the parking brake securely.

CHECK WITHOUT GAUGES

This method can not determine which portion is defective exactly. But it is possible to identify the outline of the defect by performing the check according to the following procedures.

AIR TIGHTNESS CHECK

Start the engine, and idle it for 1 to 2 minutes, then turn it OFF. Depress the brake pedal several times applying the normal pedal force. The pedal stroke should be the longest at the 1st depression, and it should become shorter at each successive depression. If the depressed pedal height is not changed, the brake booster is faulty.

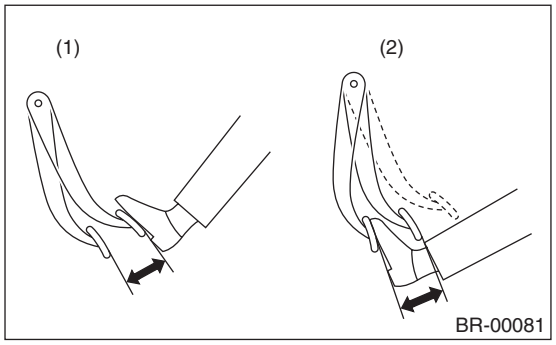


(1) Normal
(2) Not OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In case of defective operation, inspect the condition of the check valve and vacuum hose as well.
• Replace them if faulty, and perform the test again.
• If a defect is not improved, check correctly using a gauge.

OPERATION CHECK

1) While the engine is OFF, depress the brake pedal several times applying the same pedal force, to check for a change in pedal height.



(1) When engine is stopped
(2) When engine is started

2) With brake pedal depressed, start the engine.
3) As the engine starts, the brake pedal should move slowly toward floor. If the pedal height is not changed, the brake booster is faulty.

NOTE:
If faulty, check correctly with gauge.

LOADED AIR TIGHTNESS CHECK

Depress the brake pedal while the engine is running, and turn the engine OFF with the pedal depressed. Keep the pedal depressed for 30 seconds. If the pedal height does not change, the function of brake booster is normal. If the pedal height increases, it is faulty.

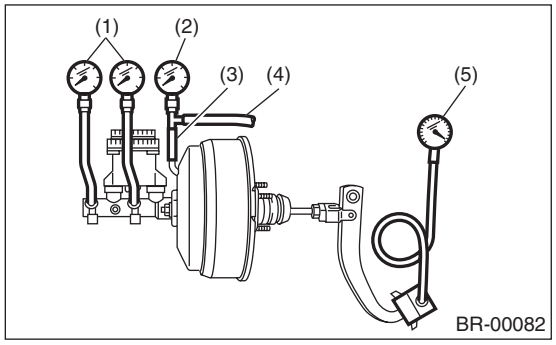
NOTE:
If faulty, check correctly with gauge.

2. OPERATION CHECK (WITH GAUGE)

CAUTION:
When checking operation, be sure to apply the parking brake securely.

CHECK WITH GAUGE

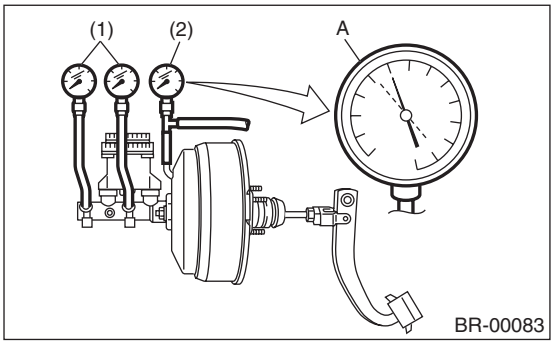
Connect the gauge as shown in the figure. After bleeding air from pressure gauge, perform each check.



(1) Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

AIR TIGHTNESS CHECK

1) Start the engine and keep it running until vacuum pressure indicates A point of vacuum gauge = 66.7 kPa (500 mmHg, 19.69 inHg). Do not depress the brake pedal at this time.



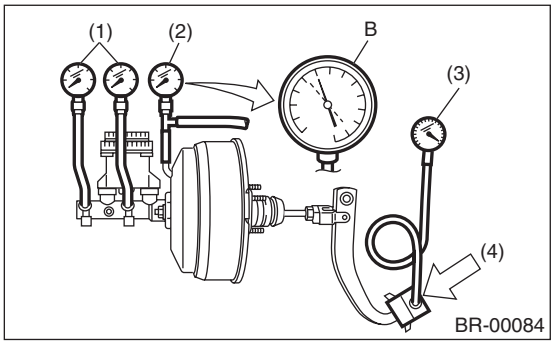
(1) Pressure gauge
(2) Vacuum gauge

2) Stop the engine and check the gauge. If the vacuum pressure drop within 15 seconds after stopping the engine is less than 3.3 kPa (25 mmHg, 0.98 inHg), the function of brake booster is normal. If faulty, the cause may be one of the following.

- Check valve malfunction
- Leak from vacuum hose
- Leak from shell joint section or stud bolt welded section
- Damaged diaphragm plate
- Leak from valve body seal and bearing section
- Leak from plate and seal assembly section
- Leak from poppet valve assembly section

LOADED AIR TIGHTNESS CHECK

1) Start the engine and depress the brake pedal with a pedal force of 196 N (20 kgf, 44 lb). Keep the engine idling until vacuum pressure indicates B point of gauge = 66.7 kPa (500 mmHg, 19.69 inHg) with the pedal depressed.



(1) Pressure gauge
(2) Vacuum gauge
(3) Pedal force gauge
(4) Depressed

2) Stop the engine and check the vacuum gauge. If the vacuum pressure drop within 15 seconds after stopping the engine is less than 3.3 kPa (25 mmHg, 0.98 inHg), the function of brake booster is normal.
If defective, refer to “AIR TIGHTNESS CHECK”.
<Ref. to BR-39, INSPECTION, Brake Booster.>
3) If the brake booster is faulty, replace it with a new part.

LACK OF BOOSTING ACTION CHECK

Turn the engine OFF, and set the value of the vacuum gauge to “0”. Then, check the fluid pressure when the brake pedal is depressed. The pressure must be greater than the specification listed.

Brake pedal operation force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	686 kPa (7 kg/cm^2, 100 psi)	17,65 kPa (18 kg/cm^2, 256 psi)

BOOSTING ACTION CHECK

Set the vacuum gauge reading to 66.7 kPa (500 mmHg, 19.69 inHg) with the engine running. Then, check the fluid pressure when the brake pedal is depressed. The pressure must be greater than the specification listed.

Brake pedal operation force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	6,468 kPa (66 kg/cm^2, 938 psi)	10,297 kPa (105 kg/cm^2, 1,493 psi)

13.Brake Fluid

A: INSPECTION

1) Check that the brake fluid level remains between MIN and MAX. If out of the specified range, refill or drain fluid. If the fluid level becomes close to MIN, check the brake pad for wear and refill fluid.
2) Check the fluid for discoloration. If the fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

CAUTION:
• Do not let brake fluid come into contact with the painted surface of the vehicle body. Wash away with water immediately and wipe off if it is spilled by accident.
• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.
• Be careful not to allow dirt or dust to enter into reservoir tank.

NOTE:
• While working, keep the reservoir tank filled with brake fluid to eliminate entry of air.
• Operate the brake pedal slowly.
• For convenience and safety, perform work with 2 people.
• The required amount of brake fluid is approximately 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for entire brake system.
1) Lift up the vehicle and set rigid racks at the specified locations, or keep the vehicle lifted.
2) Remove both the front and rear wheels.
3) Drain the brake fluid from the reservoir tank.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
Refer to SPECIFICATION of General Description. <Ref. to BR-2, SPECIFICATION, General Description.>
Repeat the same procedure as for bleeding air from the brake line, until new brake fluid comes out from vinyl tube. <Ref. to BR-43, PROCEDURE, Air Bleeding.>

NOTE:
Perform the brake fluid replacement starting from the wheel cylinder farthest from the master cylinder.

14.Air Bleeding

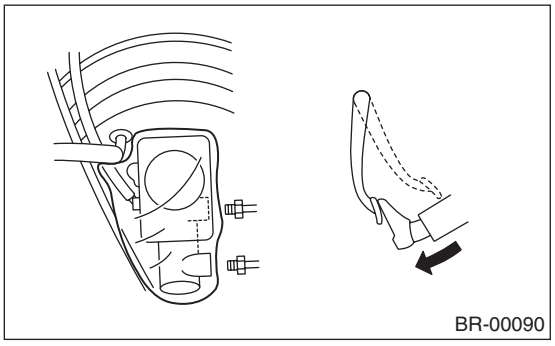
A: PROCEDURE

CAUTION:
• Do not let brake fluid come into contact with the painted surface of the vehicle body. Wash away with water immediately and wipe off if it is spilled by accident.
• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.
• Be careful not to allow dirt or dust to enter into reservoir tank.

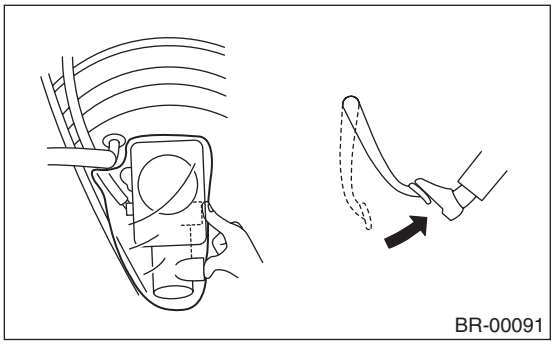
1. MASTER CYLINDER

NOTE:
• When the master cylinder is disassembled or when the reservoir tank is empty, bleed the master cylinder.
• If bleeding of the master cylinder is not necessary, omit the following procedures, and perform bleeding of the brake line. <Ref. to BR-43, BRAKE LINE, PROCEDURE, Air Bleeding.>
1) Fill the master cylinder reservoir tank with brake fluid.

NOTE:
During air bleeding, keep the reservoir tank filled with brake fluid to prevent entry of air.
2) Disconnect the brake line at primary and secondary sides.
3) Wrap the master cylinder with a plastic bag.
4) Slowly depress the brake pedal and keep it depressed.


BR-00090

5) Close the outlet plug with your finger, and release the brake pedal.


BR-00091

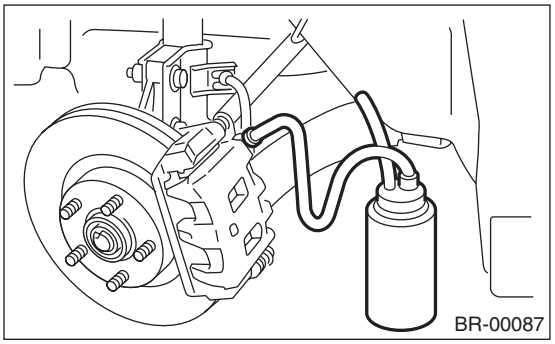
6) Repeat steps 4) and 5) several times.
7) Remove the plastic bag.
8) Install the brake pipe to the master cylinder.

Tightening torque:
Model with ABS
15 N·m (1.5 kgf-m, 10.8 ft-lb)
9) Bleed air from the brake line. <Ref. to BR-43, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

1) When the master cylinder is disassembled or when the reservoir tank is empty, bleed the master cylinder before bleeding the brake line. <Ref. to BR-43, MASTER CYLINDER, PROCEDURE, Air Bleeding.>
2) Fill the master cylinder reservoir tank with brake fluid.

NOTE:
While bleeding air, keep the reservoir tank filled with brake fluid to prevent entry of air.
3) Attach one end of the vinyl tube to the air bleeder and the other end to the brake fluid container.

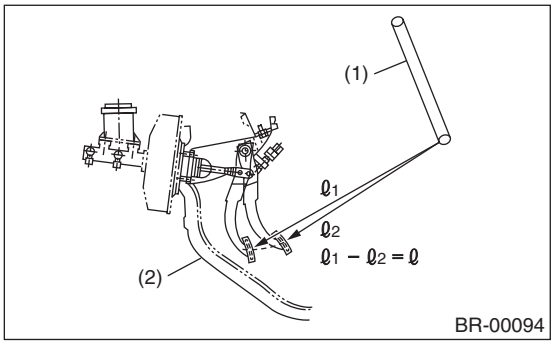

BR-00087

4) Depress the brake pedal several times and keep it depressed.
5) Loosen the air bleeder screw to drain brake fluid. Tighten the air bleeder quickly, and release the brake pedal.
6) Repeat the steps 4) to 5) until there are no more air bubbles in the vinyl tube.
7) Repeat the steps from 2) to 6) above to bleed air from each wheel.

NOTE:
Perform the air bleeding operation starting from the wheel cylinder farthest to the master cylinder.
8) Securely tighten the air bleeder screws.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)
9) Check the entire system for brake fluid leaks.

10) Check the pedal stroke.
Idle the engine after warm-up, depress the brake pedal with a force of 500 N (51 kgf, 112 lbf), and measure the distance between the brake pedal and steering wheel. Release the pedal, and measure the distance between pedal and steering wheel again.



(1) Steering wheel
(2) Toe board

Specification of pedal stroke:
When depressing the pedal with a force of 500 N (51 kgf, 112 lbf)
105 mm (4.13 in) or less

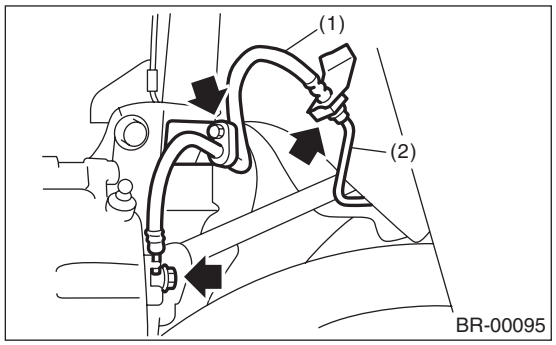
11) If the distance is more than specified, there is a possibility that air is in the brake line. Bleed the brake line of all air until the pedal stroke meets the specification.
12) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-11, ABS Sequence Control.>
13) Check the pedal stroke again.
14) If the distance is more than specified, there is a possibility that air is in the hydraulic unit. Repeat above steps 2) to 9) until pedal stroke meets the specification.
15) Fill brake fluid up to the “MAX” level of reservoir tank.
16) Test run the vehicle and ensure that the brakes operate normally.

15.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

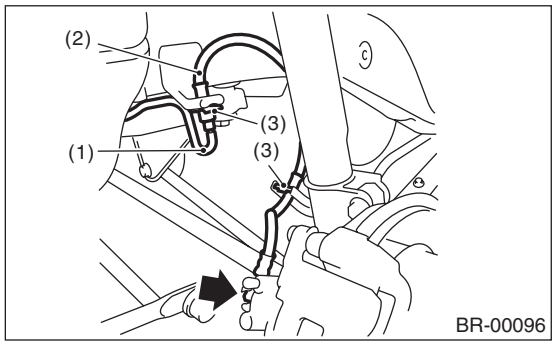
1) Separate the brake pipe from the brake hose using a flare nut wrench.
2) Remove the clamp, strut mount bolts and union bolt.



(1) Brake hose
(2) Brake pipe

2. REAR BRAKE HOSE (DISC BRAKE)

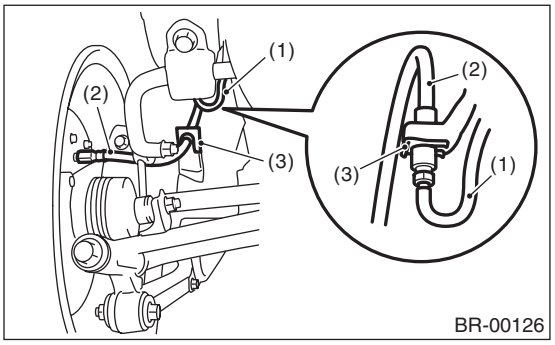
1) Separate the brake pipe from the brake hose using a flare nut wrench.
2) Remove the clamp and union bolt.



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

3. REAR BRAKE HOSE (DRUM BRAKE)

1) Separate the brake pipe from the brake hose using a flare nut wrench.
2) Remove the two clamps.
3) Disconnect the brake hose from the wheel cylinder.



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

B: INSTALLATION

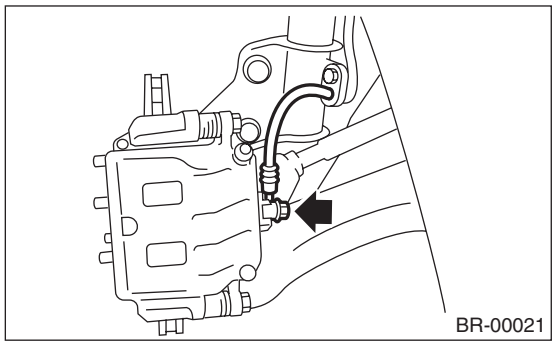
1. FRONT BRAKE HOSE

1) Secure the brake hose to strut mount.

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

2) Install the brake hose to the caliper using new gasket.

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



3) Position the disc in straight position and route the brake hose through the hole in the bracket on the wheel apron side.

CAUTION:
Do not twist the brake hose.

4) Temporarily tighten the flare nut which connects brake pipe and hose.
5) Secure the brake hose to wheel apron bracket with clamp.
6) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Bleed air from brake system.

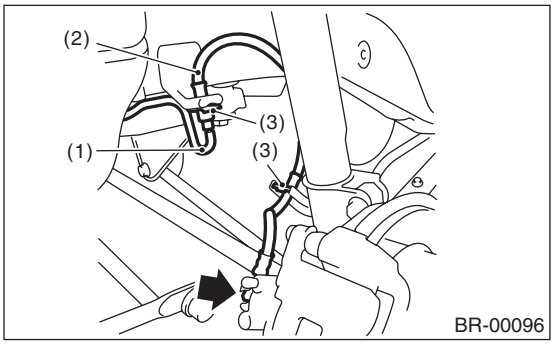
2. REAR BRAKE HOSE (DISC BRAKE)

1) Route the brake hose through the hole of bracket, and lightly tighten the flare nut to connect brake pipe.
2) Insert the clamp to secure brake hose.
3) Install the brake hose to caliper using new gasket.

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

4) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

5) Bleed air from the brake system.

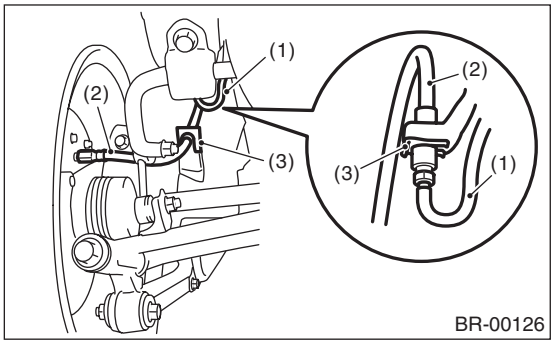
3. REAR BRAKE HOSE (DRUM BRAKE)

1) Attach the brake hose to the wheel cylinder.

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

2) Attach the brake hose to the bracket of the strut using the clamp.
3) Route the brake hose through the bracket hole in the vehicle body, and connect to the brake pipe.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

4) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage, or damage on hoses. Check the joint for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the hose.

NOTE:
Check locations that are hard to see and reverse side of parts using a mirror.

16.Brake Pipe

A: REMOVAL

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When removing brake pipes, use a brake pipe wrench.
• When removing the brake pipe, do not bend.

B: INSTALLATION

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When installing brake pipes, use a brake pipe wrench.
• When installing the brake pipe, do not bend.
• After installing the brake pipe and hose, bleed air.
• After installing the brake hoses, make sure that they do not contact the tires 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 the joint for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the pipe.

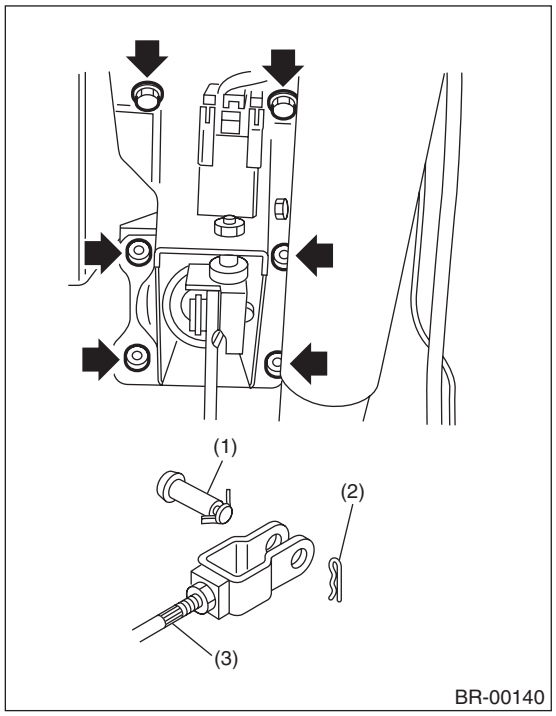
NOTE:
Check the part, which is difficult to see such as the backside using a mirror.

17.Brake Pedal

A: REMOVAL

1. AT MODEL

1) Disconnect the ground cable from the battery.
2) Remove the instrument panel lower cover from instrument panel.
3) Remove the clevis pins which secure the brake pedal to the brake booster operating rod. Also disconnect the stop light switch connector.
4) Remove the two bolts and four nuts which secure brake pedal to pedal.

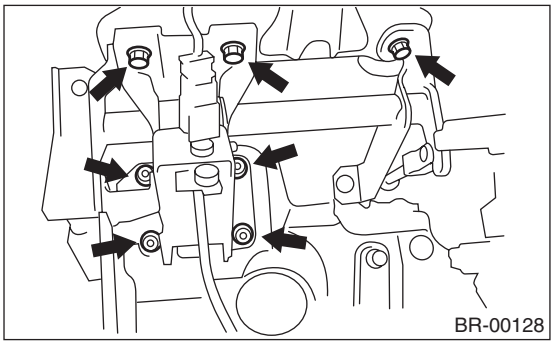


(1) Clevis pin
(2) Snap pin
(3) Operating rod

2. MT MODEL

1) Remove the steering bolt.
2) Raise the vehicle on a lift and remove the two bolts which secure the steering unit to the underside of the body.
3) Lower the vehicle.
4) Remove the instrument panel lower cover from instrument panel.
5) Disconnect the following parts from pedal bracket.
- Operating rod of brake booster
- Connector (stop light switch, etc.)

6) Remove the clevis pin which secures the lever and push rod.
7) Remove the nut which secures the clutch master cylinder.
8) Remove the steering assembly.
9) Remove the accelerator pedal.
10) Remove the bolts and nuts which secure the pedal bracket.



B: INSTALLATION

1) Install in the reverse order of removal.

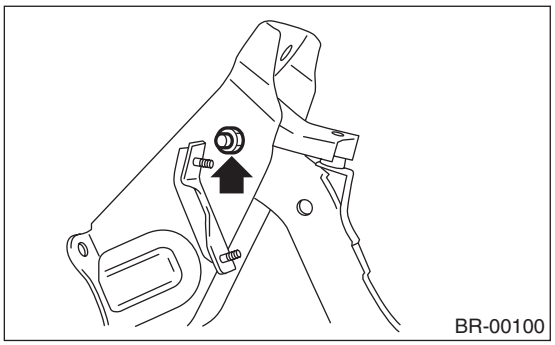
CAUTION:
- **If the cable clamp is damaged, replace it with a new part.**
- **Never fail to cover outer cable end with boot.**
- **Be careful not to twist the accelerator cable.**
- **Always use a new clevis pin.**

2) Adjust the clutch pedal. <Ref. to CL-27, ADJUSTMENT, Clutch Pedal.>
3) Check the brake pedal after installation. <Ref. to BR-51, INSPECTION, Brake Pedal.>

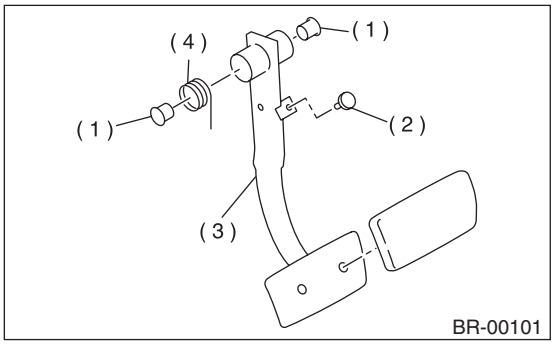
C: DISASSEMBLY

1. AT MODEL

1) Remove the brake switch. <Ref. to BR-52, REMOVAL, Stop Light Switch.>
2) Unbolt, and then remove the brake pedal.



3) Remove the bushing, stopper and spring.

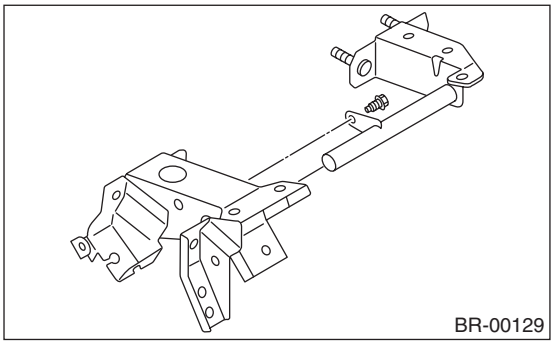


(1) Bushing
(2) Stopper
(3) Brake pedal
(4) Brake pedal spring

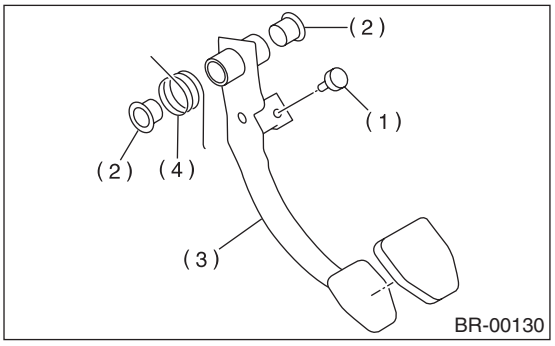
4) Remove the brake pedal pad.

2. MT MODEL

1) Remove the brake switch. <Ref. to BR-52, REMOVAL, Stop Light Switch.>
2) Remove the clutch pedal. <Ref. to CL-26, DISASSEMBLY, Clutch Pedal.>
3) Remove the clutch master cylinder bracket.



4) Remove the bushing, spring and stopper.



(1) Stopper
(2) Bushing
(3) Brake pedal
(4) Brake pedal spring

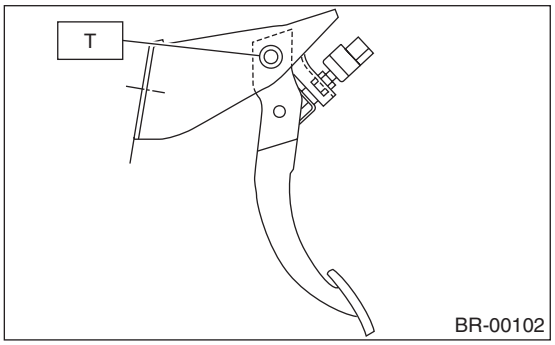
5) Remove the brake pedal pad.

D: ASSEMBLY

1) Position the stop light switch, etc. to the brake pedal.
2) Clean the inside of bores of the clutch pedal and brake pedal, apply grease, and set bushings into the bores.
3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring and clutch pedal effort reduction spring (vehicles equipped with hill holder), then install the pedal bolt.

NOTE:
Clean up the inside of bushings and apply a thin coat of grease before installing the spacer.

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



4) After attaching the brake pedal to the vehicle, adjust the position of the stop light switch. <Ref. to BR-53, ADJUSTMENT, Stop Light Switch.>

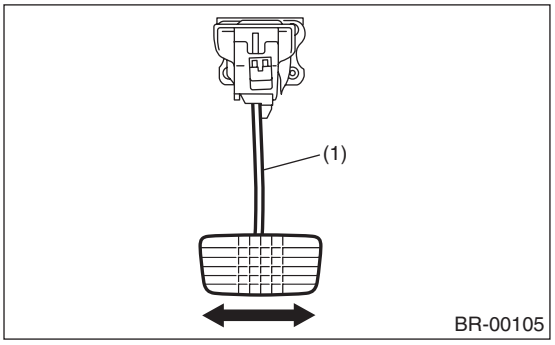
E: INSPECTION

1) Move the brake and clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lb), and check the pedal deflection is in the range of specifications.

CAUTION:
If excessive deflection is found, replace the bushing with new part.

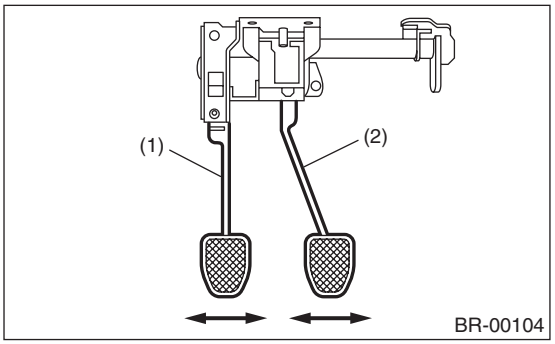
Deflection of the brake and clutch pedal:
Service limit:
5.0 mm (0.197 in) or less

- AT model



(1) Brake pedal

- MT model

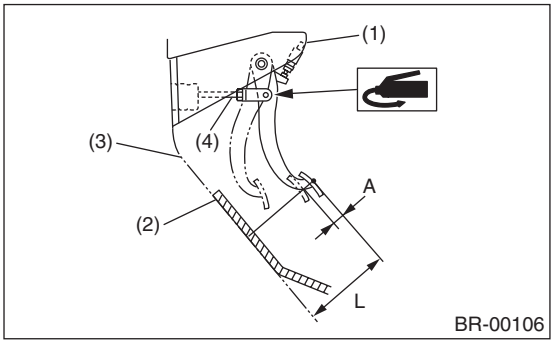


(1) Clutch pedal
(2) Brake pedal

2) Check the position of pedal pad.

Pedal height: L
148 mm (5.83 in)

Brake pedal free play: A
1 — 3 mm (0.04 — 0.12 in)
[Depress brake pedal with a force of less than 10 N (1 kgf, 2 lb).]]



(1) Stop light switch
(2) Mat
(3) Toe board
(4) Operating rod

3) If it is not within the specification, adjust it by adjusting the brake booster operating rod length.

18.Stop Light Switch

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Disconnect the stop light switch connector.
3) Loosen the nuts, unscrew the stop light switch, and remove stop light switch.

B: INSTALLATION

1) Install the stop light switch onto the bracket with screws and position it with the nut.
2) Adjust the stop light switch position, and then tighten the nut.
<Ref. to BR-53, ADJUSTMENT, Stop Light Switch.>

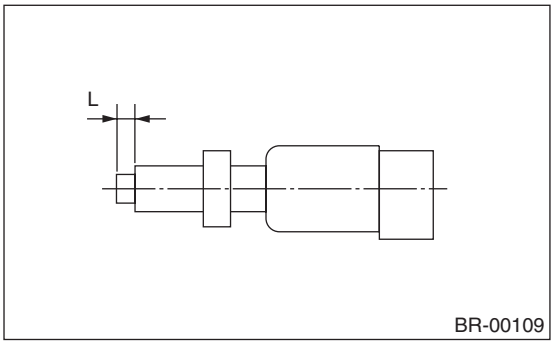
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

C: INSPECTION

1. INSPECT THE SPECIFIED POSITION

1) If the stop light switch does not operate properly (or if it is not secured at the specified position), replace with a new part.

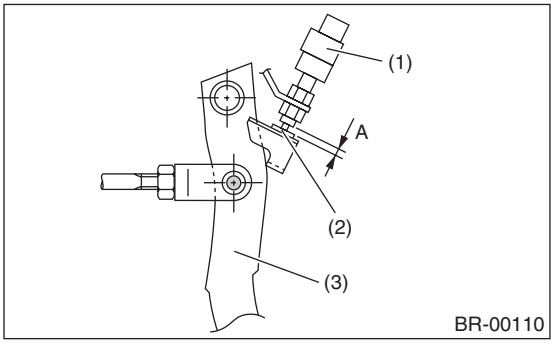
Specified position: L
2 mm (0.079 in)



2) Measure the clearance between the threaded end of stop light switch and the stopper.

CAUTION:
Do not rotate the stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



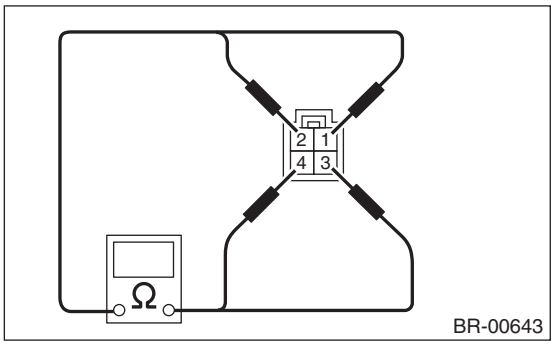
(1) Stop light switch
(2) Stopper
(3) Brake pedal

3) If it is not within the specification, adjust it by adjusting the position of the stop light switch.

CAUTION:
Do not rotate the stop light switch.

2. INSPECT THE RESISTANCE

1) If the stop light switch does not operate properly, replace with a new part.
2) Measure the resistance of stop light switch.

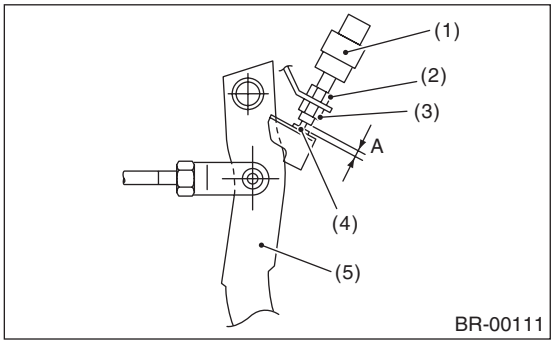


Pedal	Terminal No.	Standard value
Released	1 and 4	Less than 1 Ω
	2 and 3	1 MΩ or more
Depression	1 and 4	1 MΩ or more
	2 and 3	Less than 1 Ω

D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance A between the threaded end of the stop light switch and stopper becomes 0.3 mm (0.012 in). Then, tighten the lock nut.

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



(1) Stop light switch
(2) Lock nut A
(3) Lock nut B
(4) Stopper
(5) Brake pedal

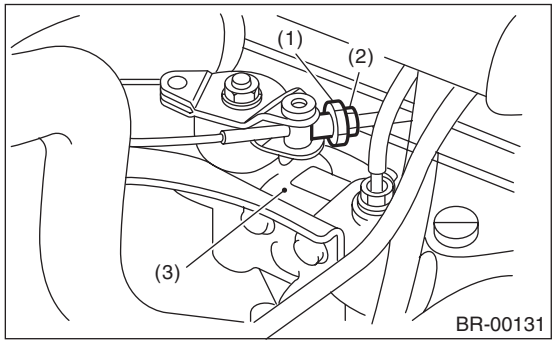
NOTE:
Tighten lock nut B until the threaded end of switch contacts with stopper. Hold the switch so that it does not rotate, then loosen the lock nut B approx. 60°. The clearance will become approximately 0.3 mm (0.012 in).

19.Hill Holder

A: REMOVAL

1. PHV (PRESSURE HOLD VALVE)

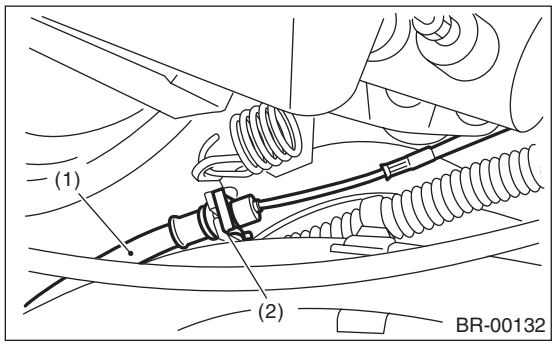
1) Drain brake fluid from the master cylinder reservoir tank.
2) Remove the adjusting nut and lock nut.



(1) Adjusting nut
(2) Lock nut
(3) PHV

3) Remove the cable clamp, and disconnect the PHV cable from the PHV.

CAUTION:
When disconnecting the PHV cable, protect it carefully so as not to damage the boot and inner cable.



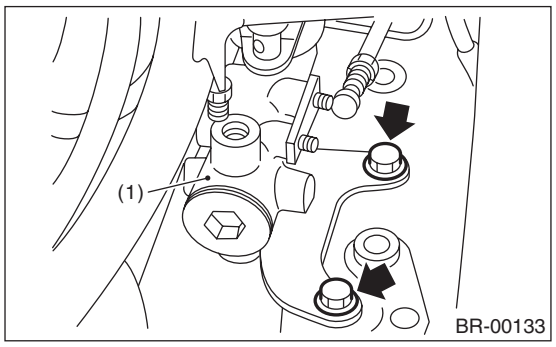
(1) PHV cable
(2) Clamp

4) Disconnect the brake pipes from the PHV.

CAUTION:
• Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.
• Use a pipe wrench so that the hex head of the flare nut is not damaged.

5) Separate the PHV from the side frame, along with the support.

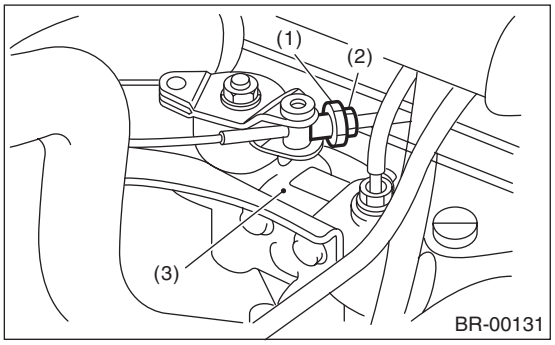
CAUTION:
When removing the PHV, take great care that no foreign objects enter inside.



(1) PHV

2. PHV CABLE

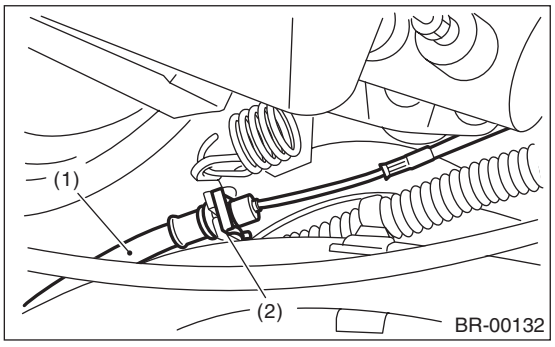
1) Remove the adjusting nut and lock nut.



(1) Adjusting nut
(2) Lock nut
(3) PHV

2) Remove the cable clamp, and disconnect the PHV cable from the PHV.

CAUTION:
When disconnecting the PHV cable, protect it carefully so as not to damage the boot and inner cable.



(1) PHV cable
(2) Clamp

3) Remove the cable clamp from the clutch pedal bracket.
4) Remove the PHV cable.

B: INSPECTION

Inspect the following items for the removed parts, and replace those that apply.
1) If the PHV cable boot is damaged or deteriorated, or if the inner cable is damaged or rusted.
2) Check for weak return springs, damage, and rust.
3) Check that the rotation of the ball can be heard when the PHV is tilted and the lever is moved smoothly.

CAUTION:
The PHV cannot be disassembled. If it requires replacement, replace the entire PHV assembly.

C: INSTALLATION

1. PHV (PRESSURE HOLD VALVE)

1) Attach the PHV to the side frame.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)
2) Connect the brake pipe to the PHV.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

CAUTION:
Check that there is no deformation or damage on the brake pipe. If necessary, replace with a new part.
3) Attach the PHV cable to the PHV.

CAUTION:
• If the cable clamp (and clip) is damaged, replace it with a new part.
• Do not bend the PHV cable sharply to avoid damage.
4) Connect the PHV cable with a clip.
5) Apply grease to the following points.
• Return spring hook position
• Lever cable end portion.

Grease:
KOPR-KOTE (Part No. 003603001)
6) Bleed air from the brake system. <Ref. to BR-43, Air Bleeding.>
7) Adjust the PHV cable. <Ref. to BR-56, PHV CABLE, INSTALLATION, Hill Holder.>

CAUTION:
After replacing with a new PHV cable, operate the clutch pedal approximately 30 times to break it in, then perform adjustment.

2. PHV CABLE

1) The installation of the PHV cable is performed in the reverse order of removal.

CAUTION:
• If the cable clamp is damaged, replace it with a new part.
• Do not bend the PHV cable sharply to avoid damage.

2) Apply grease to the following points.
• Return spring hook position
• Lever cable end portion.

Grease:
KOPR-KOTE (Part No. 003603001)

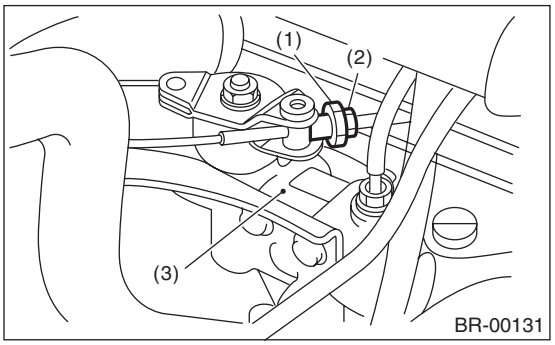
3) Adjust the PHV cable. <Ref. to BR-56, ADJUSTMENT, Hill Holder.>

CAUTION:
After replacing with a new PHV cable, operate the clutch pedal approximately 30 times to break it in, then perform adjustment.

D: ADJUSTMENT

Perform inspection of stop, start performance on a hill with an incline of 3° or more.
1) If the vehicle will not stop:
Tighten the adjusting nut of the PHV cable.
2) If the vehicle does not advance properly:
• Case A — If the hill holder is released after the clutch is connected (engine stalls easily):
Loosen the adjusting nut gradually until a smooth start is possible.
• Case B — If the hill holder is released before the clutch is connected (vehicle moves backward):
Tighten the adjusting nut so that the hill holder releases after connecting the clutch pedal. (Case A) then perform the same adjustment as for Case A.

CAUTION:
When turning the adjusting nut, always make sure that the PHV cable does not turn.



(1) Adjusting nut
(2) Lock nut
(3) PHV

3) Tighten the lock nut.

Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)

20.General Diagnostic Table

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(2) Entry of air into the hydraulic mechanism	Bleed air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, water or fluid on lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining, drum or rotor	Correct the cause of fluid leakage, and clean or replace.
	(2) Drum or rotor problem	Repair or replace the drum or rotor.
	(3) Worn brake drum, or damage to the drum caused by entry of sand	Repair by grinding, or replace.
	(4) Improper lining contact, deteriorated surface, deteriorated or wear lining material	Repair by grinding, or replace.
	(5) Deformed back plate	Correct or replace.
	(6) Overinflation of tires	Adjust air pressure.
	(7) Defective wheel alignment	Adjust alignment.
	(8) Loose back plate or the support installation bolt	Tighten to the specified torque.
	(9) Loose wheel bearing	Replace.
	(10) Defective hydraulic system	Replace the cylinder, brake pipe or hose.
	(11) Unstable effect of parking brake	Check, adjust or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(4) 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 mechanism	Replace.
	(4) Improper return or adjustment of parking brake	Repair or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Faulty wheel bearing	Replace.
5. Brake noise (1) (creaking sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loose back plate or the support installation bolt	Tighten to the specified torque.
	(4) Loose wheel bearing	Tighten to the specified torque.
	(5) Dirty drum or rotor	Clean the drum or rotor, or clean/replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improperly installed brake shoe or pad	Repair or replace the shoe assembly or pad.
	(3) Loose or bent drum or rotor	Retighten or replace.

	Trouble and possible cause	Corrective action
7. Brake noise (3) (click sound)	In the case of the disc brake:	
	(1) Excessively worn pad or the support	Replace the pad or the support.
	In the case of the drum brake:	
	(1) Excessively worn shoe ridge	Replace the back plate.
	(2) Lack of oil on the shoe ridge surface and anchor	Supply grease.

1. General Description

A: SPECIFICATION

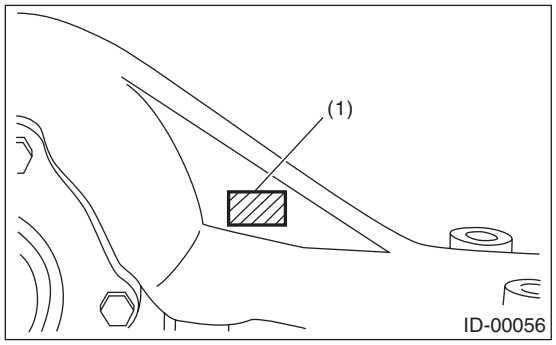
When replacing a rear differential assembly, select the correct assembly according to the following table.

NOTE:
Using a different rear differential assembly will cause the drive train and tires to drag or emit abnormal noise.

Model	Non-turbo, rear drum brake		Non-turbo, rear disc brake		Turbo	
	MT	AT	MT	AT	MT	AT
Rear differential type	T type (Model without LSD)		T type (Model with LSD)			
LSD type	—		Viscous coupling			
Identification	T2	TP	JP	CF	CF	JP
Type of gear	Hypoid gear					
Gear ratio (Number of gear teeth)	4.111 (37/9)	4.444 (40/9)	4.111 (37/9)	4.444 (40/9)	4.444 (40/9)	4.111 (37/9)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)					
Rear differential gear oil	GL-5					

- **Identification**

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

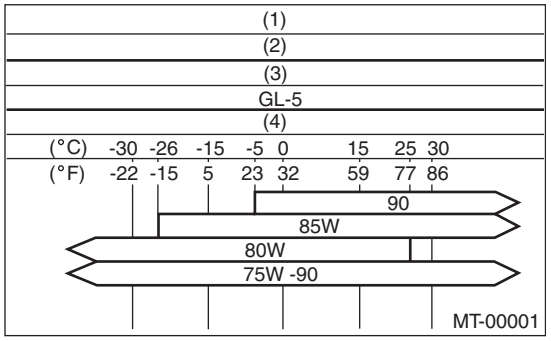


(1) Identification

- **Rear differential gear oil**

Recommended oil

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



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

1. SERVICE DATA

Drive pinion bearing preload (for new bearing)	Measure with spring measurement (Measured from the companion flange bolt hole) N (kgf, lbf)	17.7 — 38.8 (1.8 — 4.0, 4.0 — 8.7)
	Measure with torque wrench N·m (kgf-m, ft-lb)	0.67 — 1.47 (0.07 — 0.15, 0.49 — 1.08)
Side gear backlash	mm (in)	0.10 — 0.20 (0.004 — 0.008)
Side bearing standard width	mm (in)	20.00 (0.7874)
Hypoid driven gear to drive pinion backlash	mm (in)	0.10 — 0.20 (0.004 — 0.008)
Hypoid driven gear runout on its back surface	mm (in)	0.05 (0.002) or less

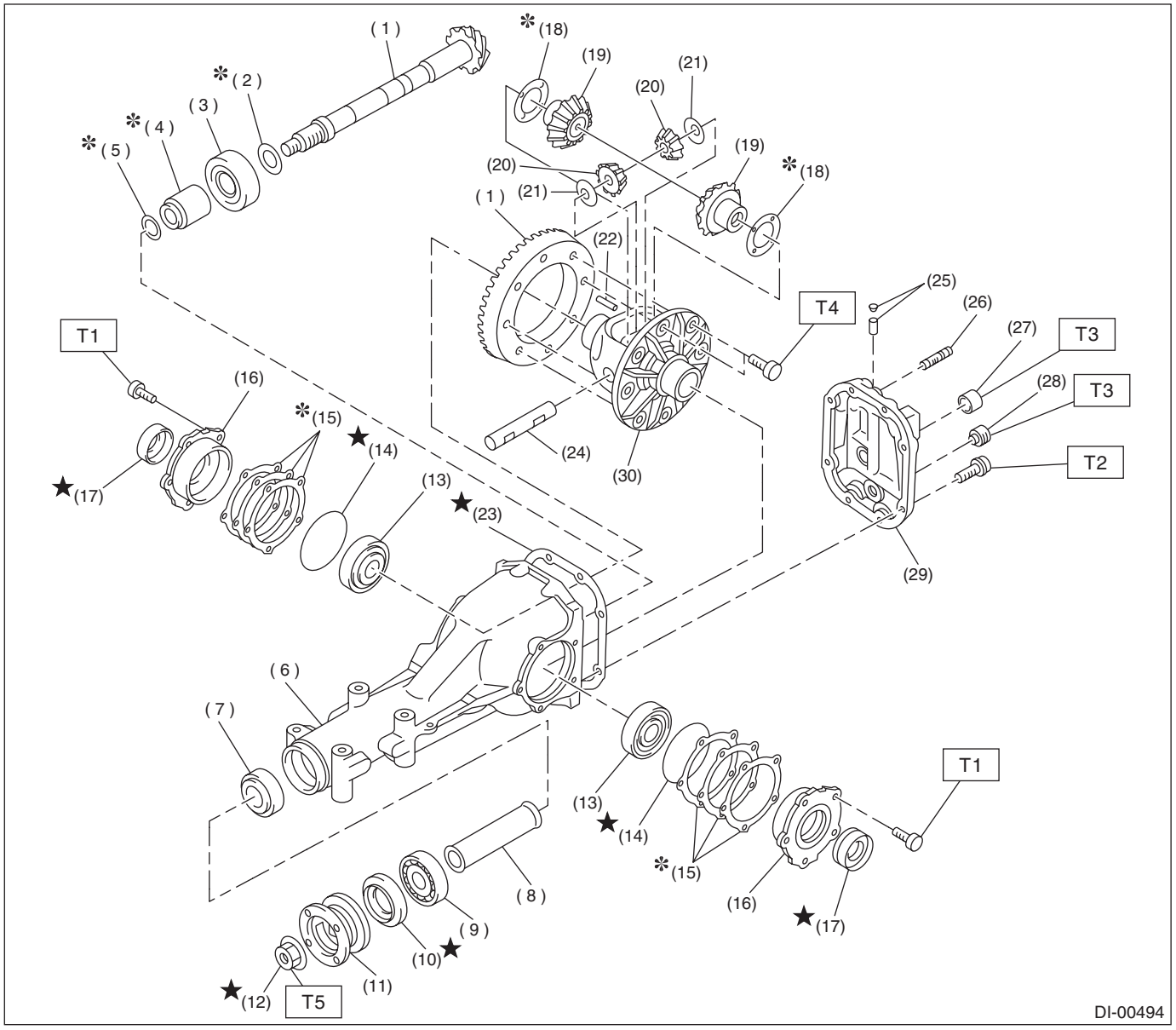
2. ADJUSTING PARTS

Drive pinion bearing preload (for new bearing)	Measure with spring measurement (Measured from the companion flange bolt hole) N (kgf, lbf)	17.7 — 38.8 (1.8 — 4.0, 4.0 — 8.7)
	Measure with torque wrench N·m (kgf-m, ft-lb)	0.67 — 1.47 (0.07 — 0.15, 0.49 — 1.08)
Preload adjusting collar	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)
Preload adjusting washer	Part No.	Thickness mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
Pinion height adjusting washer	Part No.	Thickness mm (in)
	383495200	3.09 (0.1217)
	383505200	3.12 (0.1228)
	383515200	3.15 (0.1240)
	383525200	3.18 (0.1252)
	383535200	3.21 (0.1264)
	383545200	3.24 (0.1276)
	383555200	3.27 (0.1287)
	383565200	3.30 (0.1299)
	383575200	3.33 (0.1311)
	383585200	3.36 (0.1323)
	383595200	3.39 (0.1335)
	383605200	3.42 (0.1346)
	383615200	3.45 (0.1358)
	383625200	3.48 (0.1370)
	383635200	3.51 (0.1382)
	383645200	3.54 (0.1394)
	383655200	3.57 (0.1406)
	383665200	3.60 (0.1417)
	383675200	3.63 (0.1429)
	383685200	3.66 (0.1441)
Side gear backlash mm (in)	0.10 — 0.20 (0.004 — 0.008)	

Side gear thrust washer (Model without LSD)	Part No.	Thickness mm (in)
	383445201	0.75 — 0.80 (0.0295 — 0.0315)
	383445202	0.80 — 0.85 (0.0315 — 0.0335)
	383445203	0.85 — 0.90 (0.0335 — 0.0354)
Side bearing standard width mm (in)	—	20.00 (0.7874)
Side bearing retainer shim	Part No.	Thickness mm (in)
	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)
Hypoid driven gear to drive pinion backlash	Allowable limit mm (in)	0.10 — 0.20 (0.004 — 0.008)
Hypoid driven gear runout on its back surface		0.05 (0.002)

B: COMPONENT

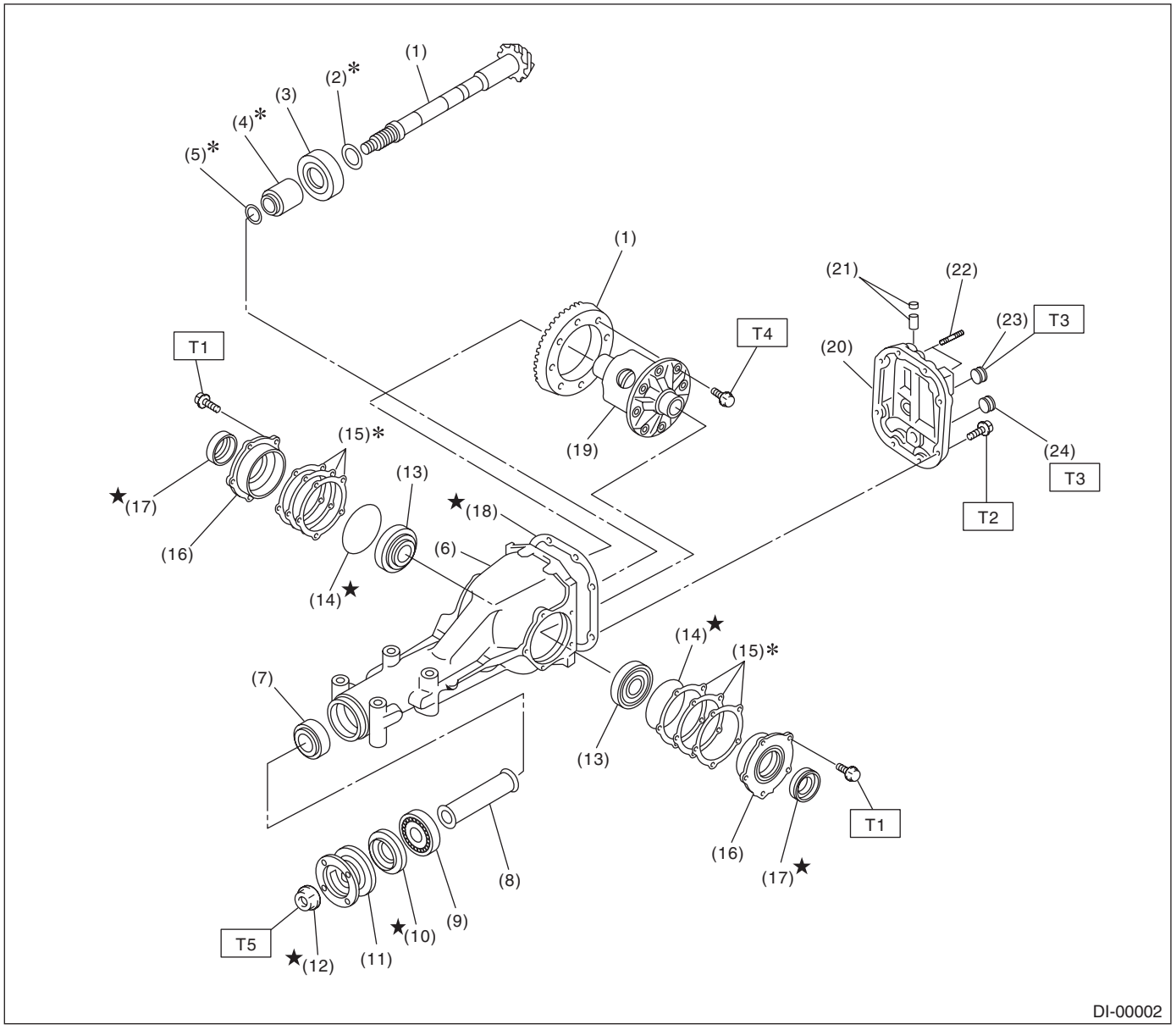
1. REAR DIFFERENTIAL WITHOUT LSD



(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting collar
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Side gear thrust washer
(19) Side gear
(20) Pinion mate gear
(21) Pinion mate gear washer
(22) Pinion shaft lock pin
(23) Gasket
(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

Tightening torque:N·m (kgf-m, ft-lb)
T1: 10.5 (1.1, 7.7)
T2: 29.5 (3.0, 21.8)
T3: 49 (5.0, 36.2)
T4: 103 (10.5, 76.0)
T5: 181.5 (18.5, 134.0)

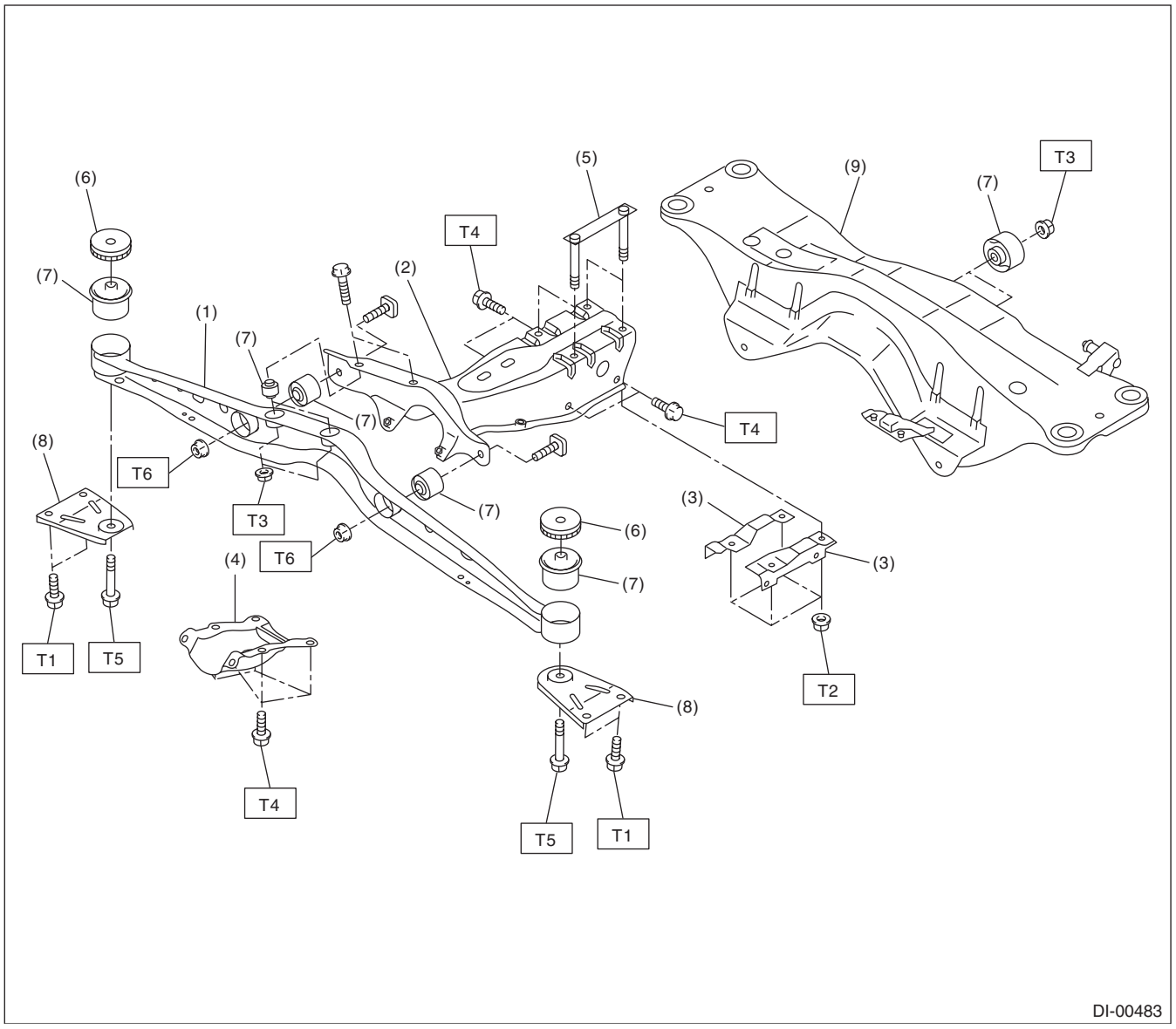
2. REAR DIFFERENTIAL WITH LSD



(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting collar
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Spacer
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Gasket
(19) Differential case ASSY (Viscous coupling type)
(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 (1.1, 7.7)
T2: 29.5 (3.0, 21.8)
T3: 49 (5.0, 36.2)
T4: 103 (10.5, 76.0)
T5: 181.5 (18.5, 134.0)

3. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Front differential member
(2) Differential bracket
(3) Differential mount lower bracket
(4) Differential mount front cover
(5) Plate
(6) Stopper
(7) Bushing
(8) Differential mount bracket
(9) Crossmember

Tightening torque:N·m (kgf-m, ft-lb)
T1: 33 (3.4, 24.3)
T2: 50 (5.1, 36.9)
T3: 70 (7.1, 51.6)
T4: 90 (9.2, 66.4)
T5: 100 (10.2, 73.8)
T6: 128 (13.1, 94.4)

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOL

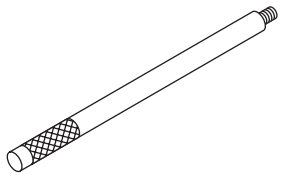
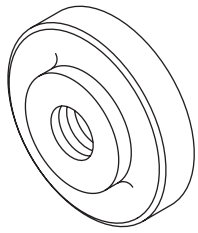
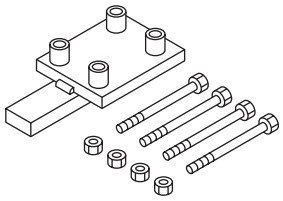
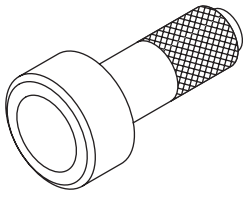
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing the front and rear bearing cones.
 ST-398477702	398477702	DRIFT	Used for press-fitting the bearing cone of differential carrier (front).
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier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

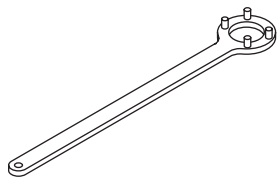
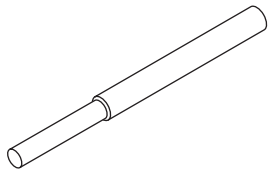
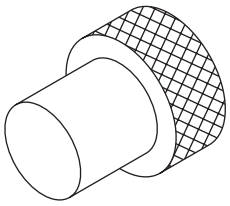
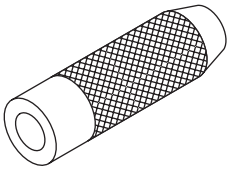
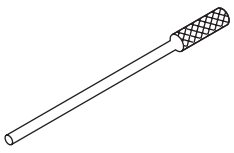
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498427200	498427200	FLANGE WRENCH	Used for preventing rotation of companion flange when loosening and tightening self-lock nut.
 ST-398467700	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 ST-399780104	399780104	WEIGHT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

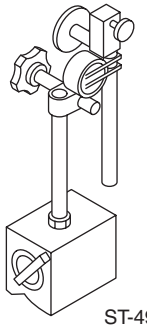
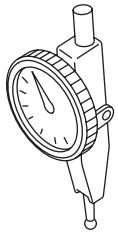
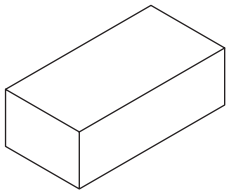
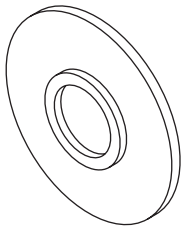
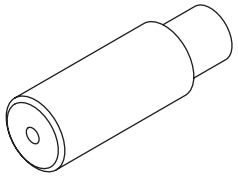
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid driven gear. • Used together with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion,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

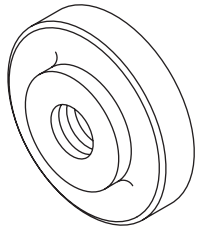
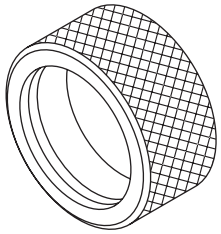
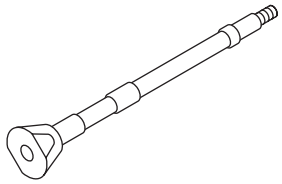
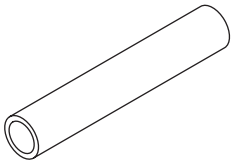
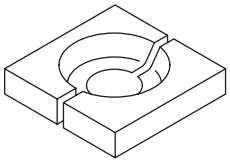
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477703	398477703	DRIFT 2	Used for press-fitting bearing race (rear) of differential carrier.
 ST-398437700	398437700	DRIFT	Used for installing the side oil seal.
 ST-398507702	398507702	DUMMY SHAFT	Used for adjusting pinion height and preload.
 ST-398507703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

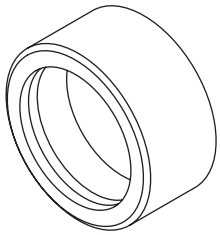
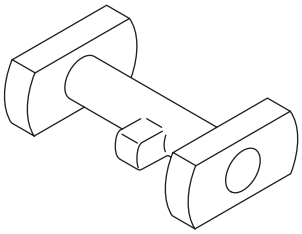
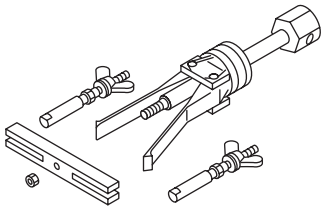
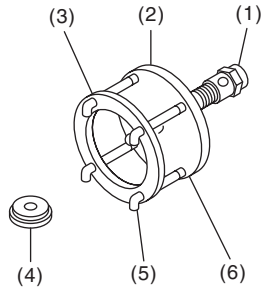
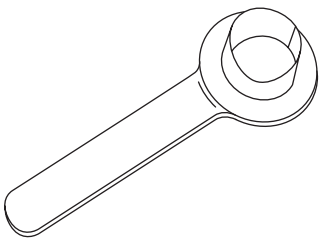
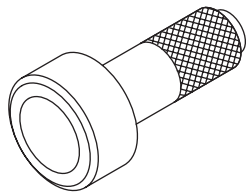
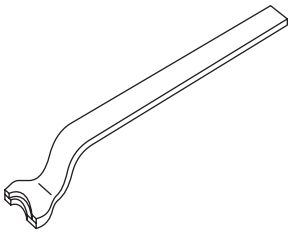
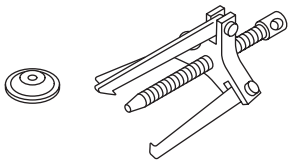
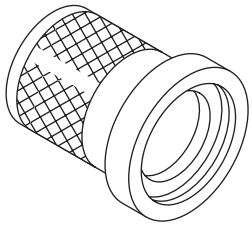
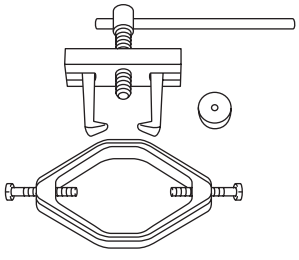
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398487700	398487700	DRIFT	Used for press-fitting side bearing cone.
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	Used for adjusting pinion height.
 ST-398527700	398527700	PULLER ASSY	• Used for removing front oil seal. • Used for removing side bearing cup.
 ST-399527700	399527700	PULLER SET	Used for taking out the side bearing cone. (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000)
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to the rear differential. • For oil seal protection

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398417700	398417700	DRIFT PUNCH	Used for installing side bearing.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing the rear drive shaft from rear differential.
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-899874100	899874100	INSTALLER	Used for installing the companion flange.
 ST18759AA000	18759AA000	PULLER ASSY	Used for removing the differential side bearing cone.

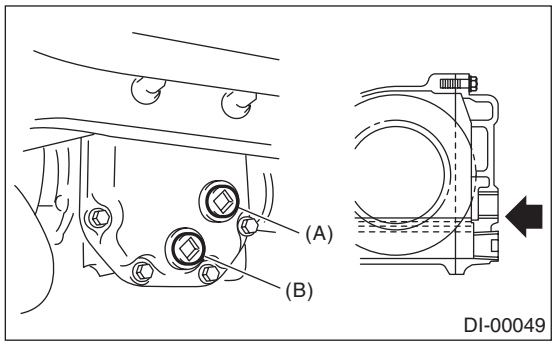
2. GENERAL TOOL

TOOL NAME	REMARKS
Transmission jack	Used for removing and installing the rear differential.
Puller	Used for removing the side bearing retainer.
Thickness gauge	Used for measuring clearance.
Tire lever	Used for removing the rear drive shaft.

2. Differential Gear Oil

A: INSPECTION

1) Remove the filler plug, and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. <Ref. to DI-16, REPLACEMENT, Differential Gear Oil.>
2) Check that the gear oil level is up to the bottom of filler plug hole. If the level is low, check that there is no oil leakage and fill the oil up to the bottom of filler plug.



(A) Filler plug
(B) Drain plug

3) When checking is completed, tighten the filler plug.

NOTE:
Apply liquid gasket to the drain plug.

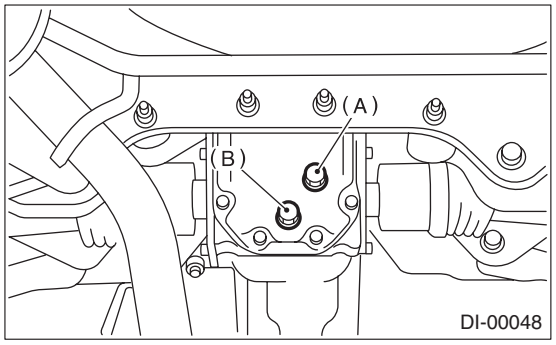
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

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

B: REPLACEMENT

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

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



(A) Filler plug
(B) Drain plug

3) Tighten the oil drain plug.

NOTE:
Apply liquid gasket to the drain plug.

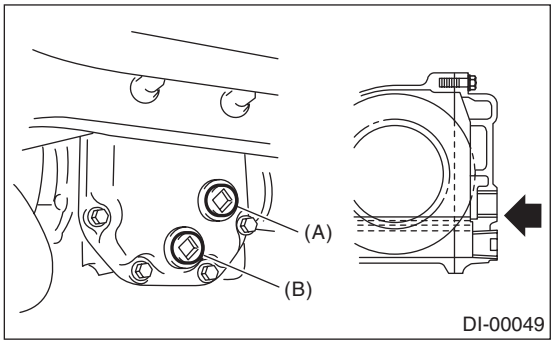
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

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

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

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

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



(A) Filler plug
(B) Drain plug

5) Install the filler plug.

NOTE:
Apply liquid gasket to the filler plug.

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

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

3. Front Differential Assembly

A: NOTE

1. AT MODEL

For front differential of automatic transmission, refer to the “AT” section. <Ref. to 4AT-103, Front Differential Assembly.>

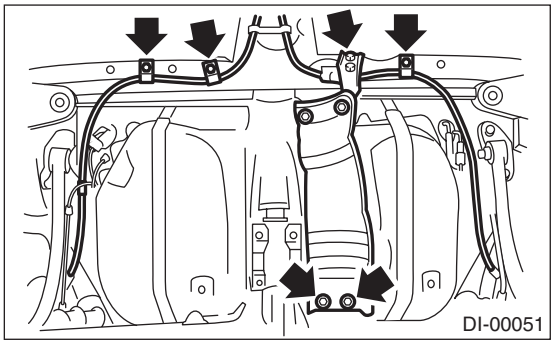
2. MT MODEL

For front differential of manual transmission, refer to “MT” section. <Ref. to 5MT-70, Front Differential Assembly.>

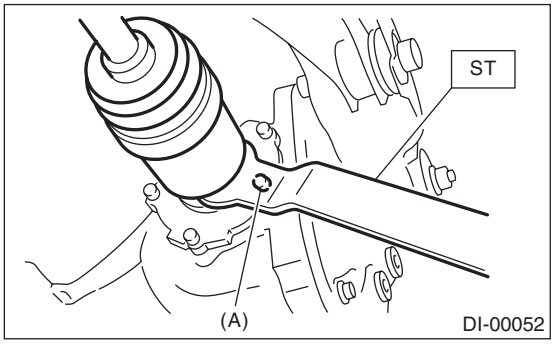
4. Rear Differential

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Shift the select lever or gear shift lever to neutral.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Lift up the vehicle.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler.
• Non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
• Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
9) Remove the propeller shaft. <Ref. to DS-13, REMOVAL, Propeller Shaft.>
10) Remove the clamps and bracket of parking brake cable.


DI-00051

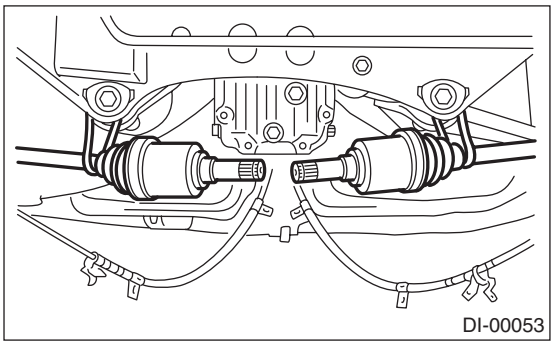
11) Remove the DOJ of rear drive shaft from rear differential using ST. <Ref. to DI-39, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA100 DRIVE SHAFT REMOVER



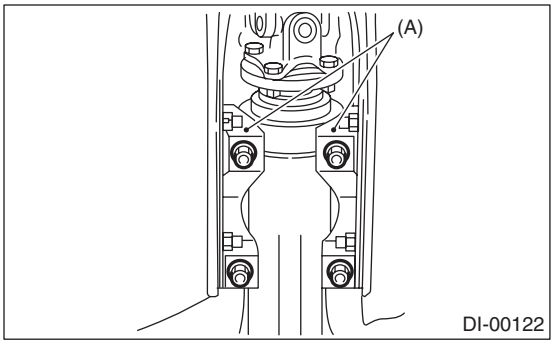
DI-00052

(A) Bolt

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


DI-00053

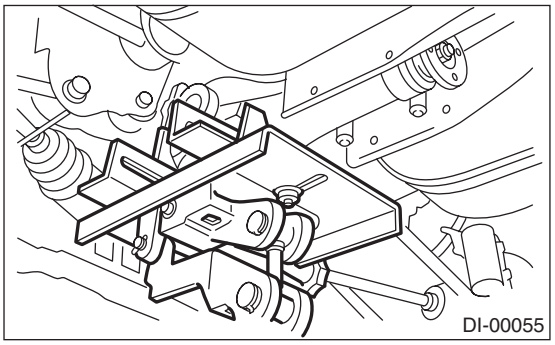
13) Remove the lower bracket.



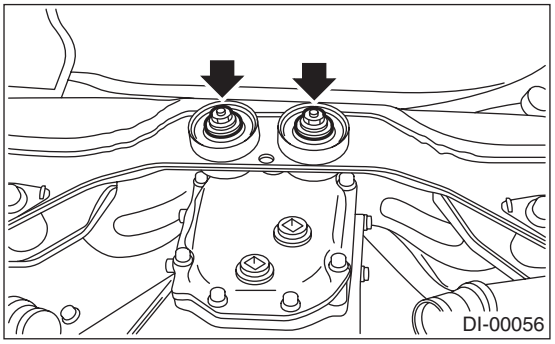
DI-00122

(A) Lower bracket

14) Support the rear differential with the transmission jack.

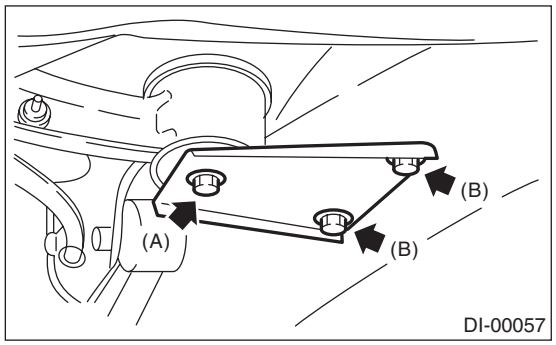

DI-00055

15) Remove the self-locking nuts and bolts.


DI-00056

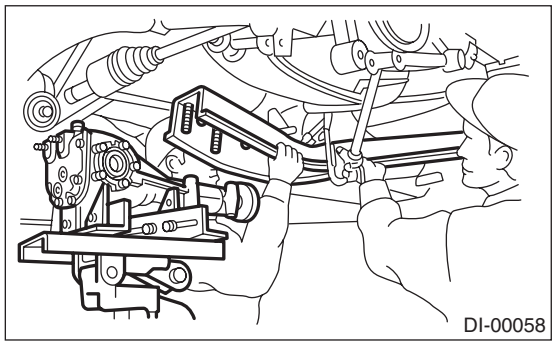
16) Remove the bolts which secure the front differential member to the vehicle.
Loosen the bolt A first, then remove the bolt B.

NOTE:
Instruct your co-worker to hold the front differential member so that it will not fall.

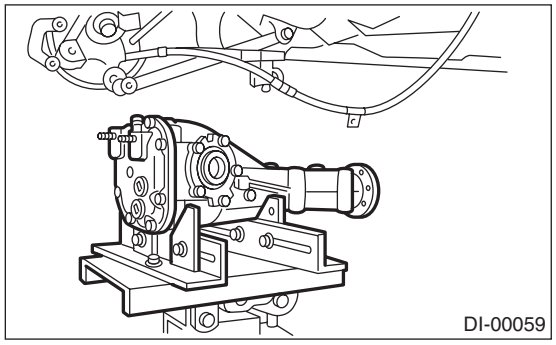


(A) Bolt A
(B) Bolt B

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



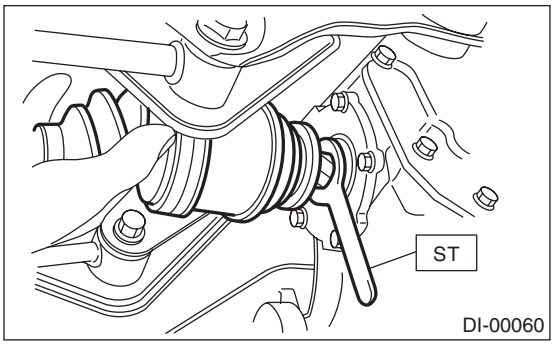
19) Remove the rear differential from the front differential member.



B: INSTALLATION

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

NOTE:
When installing the front differential member, be careful of the order for installation of the upper and lower stoppers.
2) Install the DOJ of the drive shaft into the rear differential. <Ref. to DI-39, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA090 OIL SEAL PROTECTOR

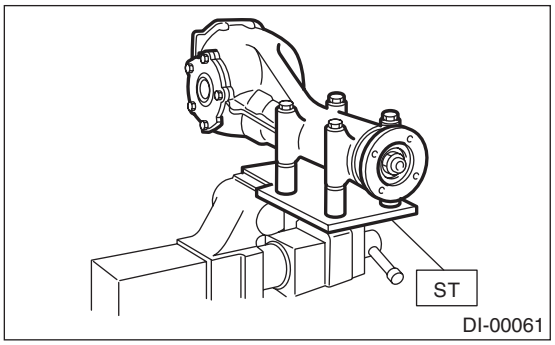


3) Installing procedure hereafter is in the reverse order of removal.
4) After installing, fill the differential carrier with gear oil up to the bottom of the filler plug hole. <Ref. to DI-16, Differential Gear Oil.>

C: DISASSEMBLY

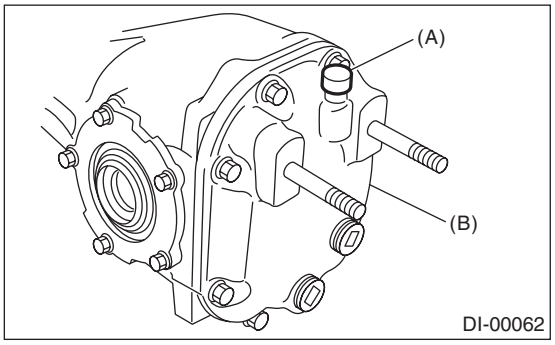
To detect the real cause of trouble, inspect the following items before disassembling.
- Tooth contact of hypoid driven gear and drive pinion, and backlash
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

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



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

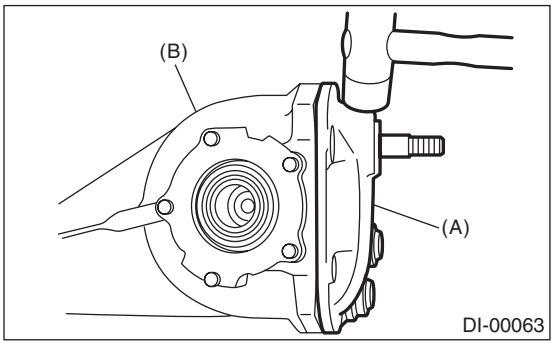
NOTE:
- Do not attempt to replace the air breather cap unless necessary.
- Replace the air breather cap with a new part when removing.



(A) Air breather cap
(B) Rear cover

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

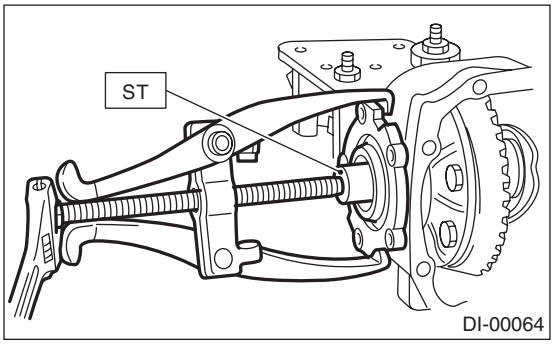
NOTE:
Remove by lightly tapping with a plastic hammer.



(A) Rear cover
(B) Differential carrier

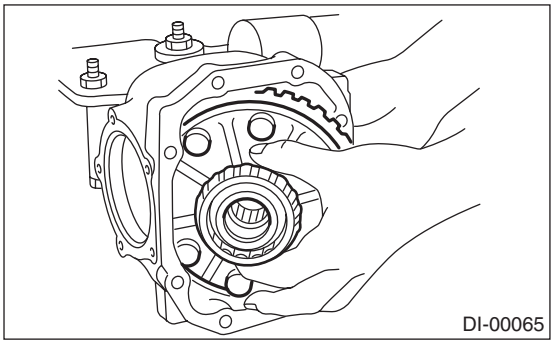
5) Keep the side bearing retainers RH and LH separately for easier reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract the side bearing retainers RH and LH with a puller.

NOTE:
Each shim, which is installed to adjusted the side bearing preload, should be kept together with its mating retainer.
ST 398457700 ATTACHMENT



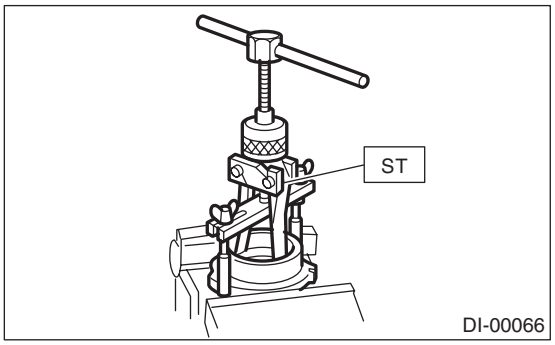
6) Pull out the differential case assembly from differential carrier.

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



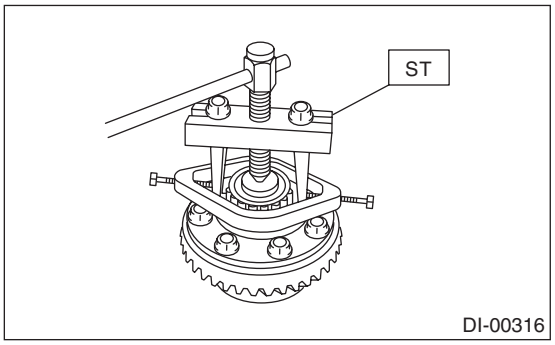
7) Remove the O-ring from side bearing retainer.

8) Remove the oil seal from the side bearing retainer. <Ref. to DI-39, REPLACEMENT, Rear Differential Side Oil Seal.>
9) When replacing the side bearing, remove the bearing cup from the side bearing retainer using ST.
ST 398527700 PULLER ASSY

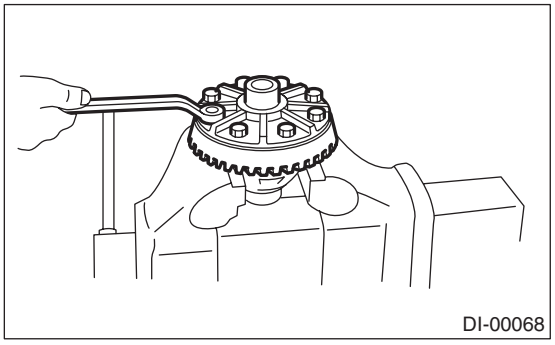


10) Remove the bearing cone with ST.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of the bearing cone.
• Never mix up the RH and LH bearing races and cones.
ST 18759AA000 PULLER ASSY

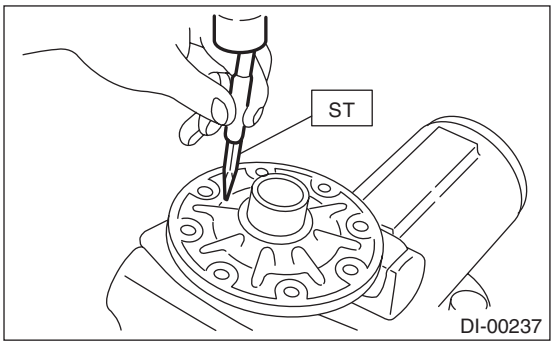


11) Remove the hypoid driven gear by loosening the hypoid driven gear bolts.



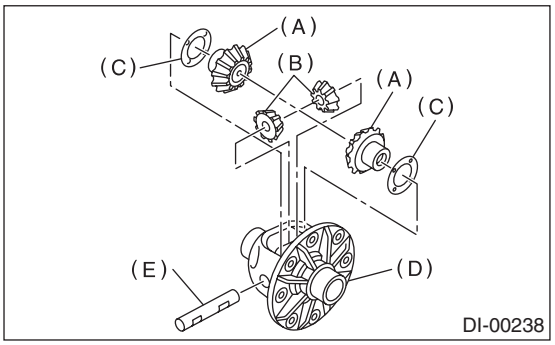
12) Drive out the pinion shaft lock pin from hypoid driven gear side. (Model without LSD)

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



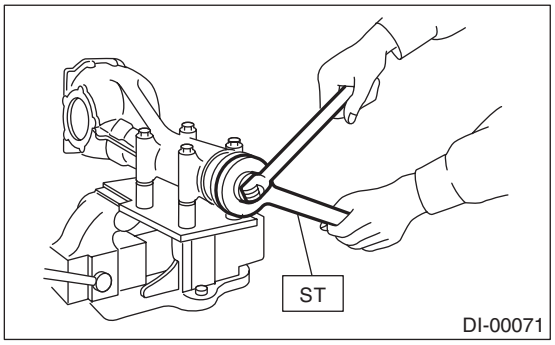
13) Draw out the pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Model without LSD)

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

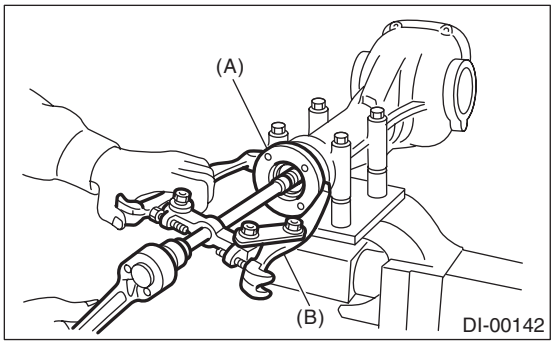


(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

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



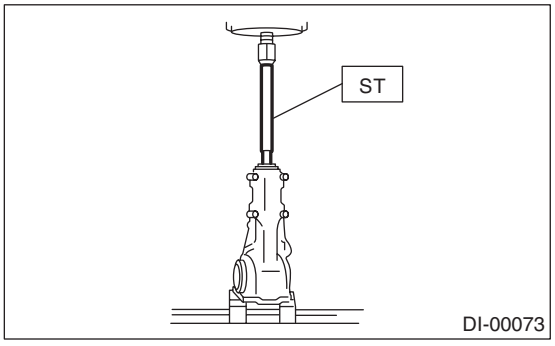
15) Extract the companion flange with a puller.



(A) Companion flange
(B) Puller

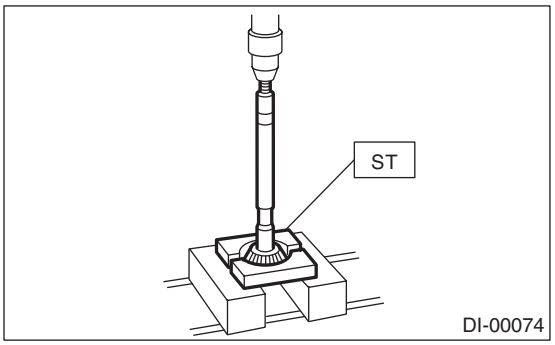
16) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjusting washer and washer.

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

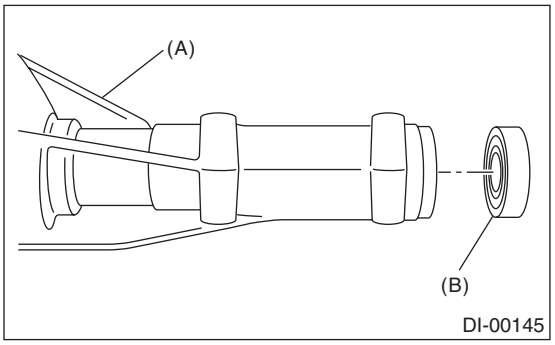


17) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

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

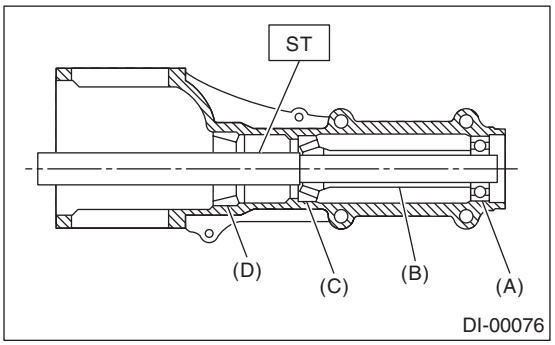


18) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



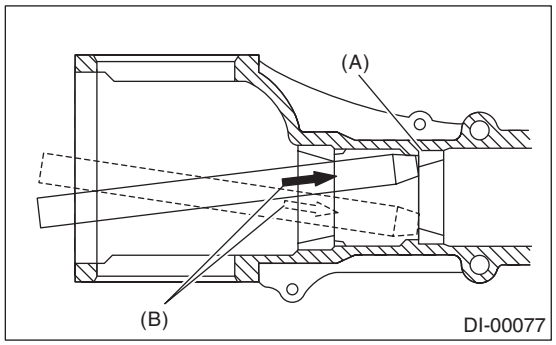
(A) Differential carrier
(B) Front oil seal

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



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

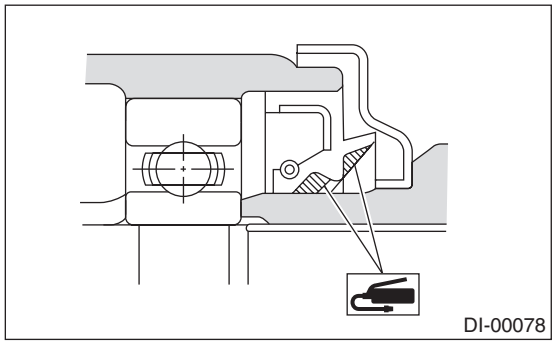
20) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order using a brass bar.



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

D: ASSEMBLY

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

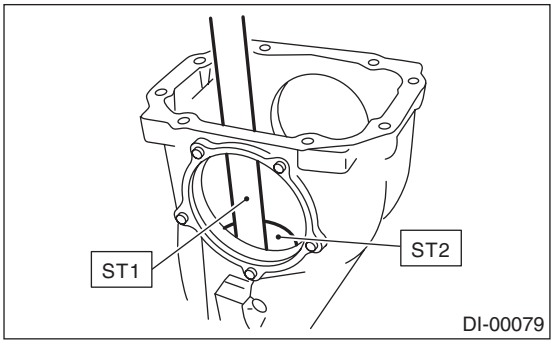


1) Adjusting preload for front and rear bearings

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

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

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



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

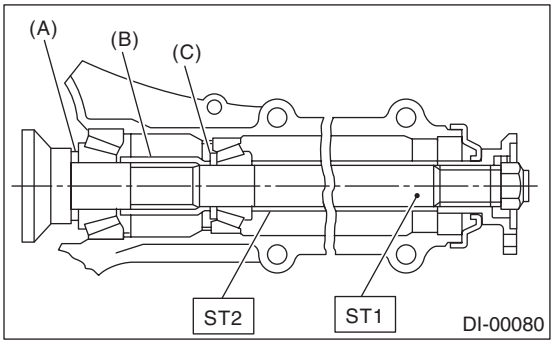
ST1 398477701 HANDLE
ST2 398477702 DRIFT

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

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

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

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



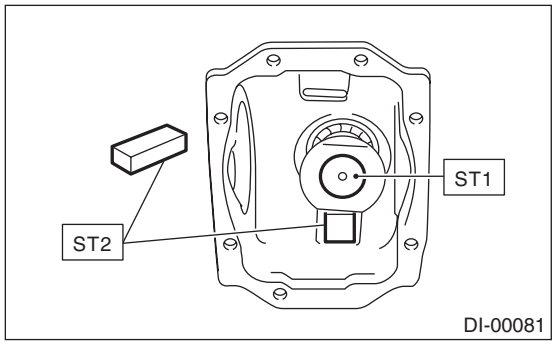
(A) Pinion height adjusting washer
(B) Preload adjusting collar
(C) Preload adjusting washer

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

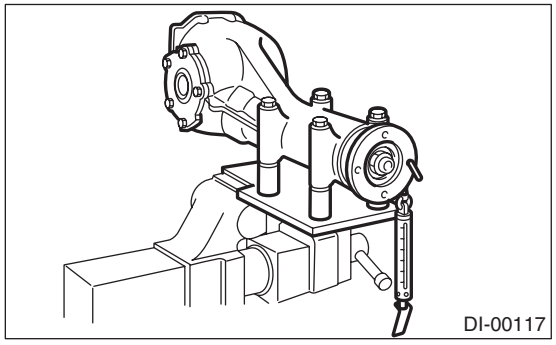
NOTE:
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.

ST1 398507702 DUMMY SHAFT
ST2 398507704 BLOCK

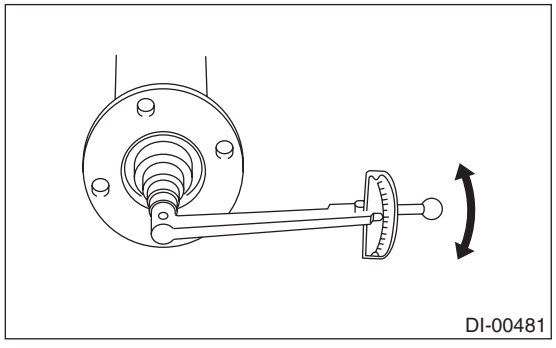
Tightening torque:
181.5 N·m (18.5 kgf-m, 134.0 ft-lb)



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



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

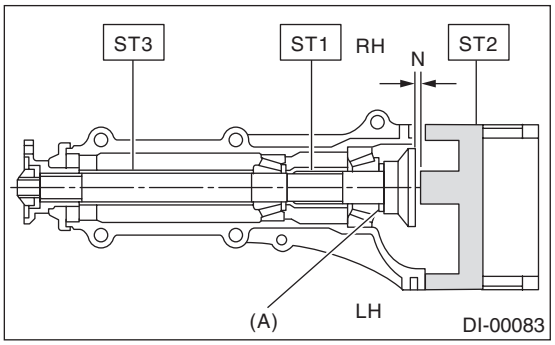


	Part No.	Thickness mm (in)
Preload adjusting washer	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)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

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

(1) Attach ST2.

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

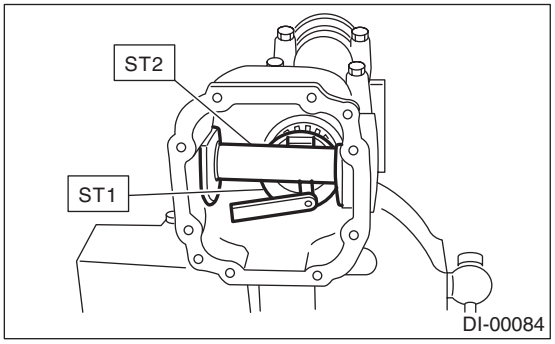


(A) Pinion height adjusting washer

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

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

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.
T = To + N – (H × 0.01) – 0.20 mm (0.0079 in)

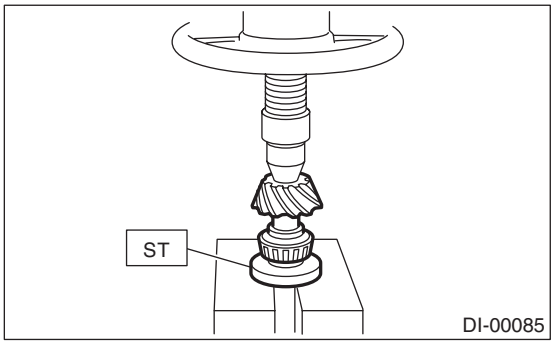
NOTE:
Use copies of this page.

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

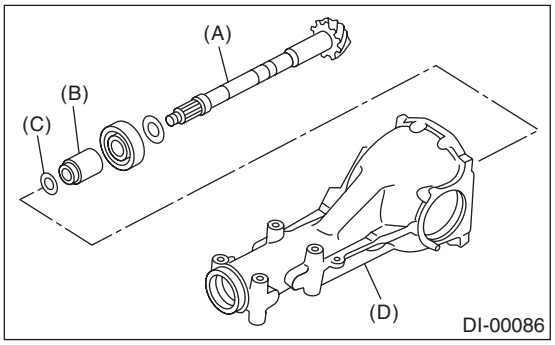
(Example of calculation)
To = 2.20 + 1.20 = 3.40 mm
N = 0.23 mm
H = +1
T = 3.40 + 0.23 – 0.01 – 0.20 = 3.42
Result: Thickness = 3.42 mm
Therefore use the washer 383605200.

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

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

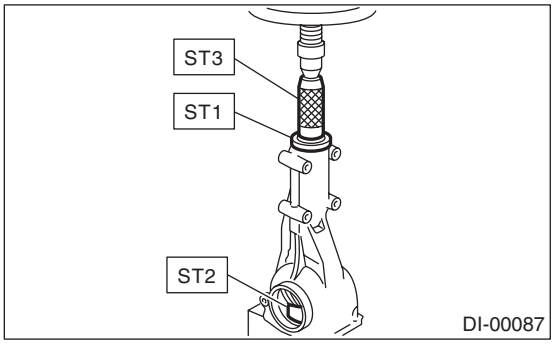


4) Insert the drive pinion into the differential carrier, and install the selected bearing preload adjusting collar and washer.

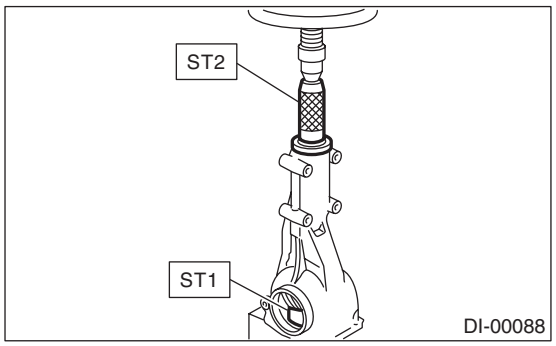


(A) Drive pinion
(B) Bearing preload adjusting collar
(C) Bearing preload adjusting washer
(D) Differential carrier

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

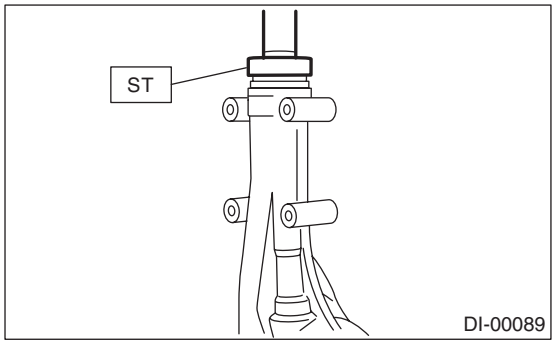


6) Insert the collar, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



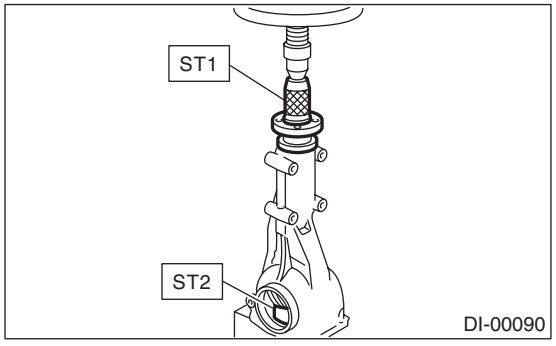
7) Fit a new oil seal with ST.

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



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

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

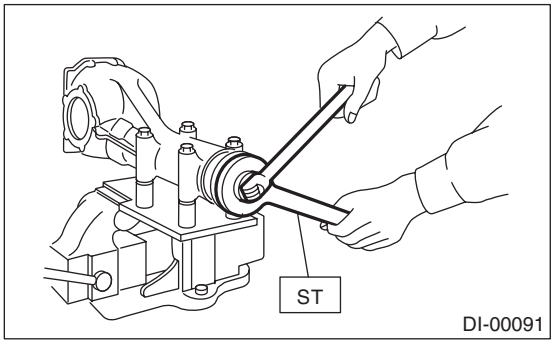


9) Apply seal material on the drive pinion shaft thread and new self-locking nut seat.

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

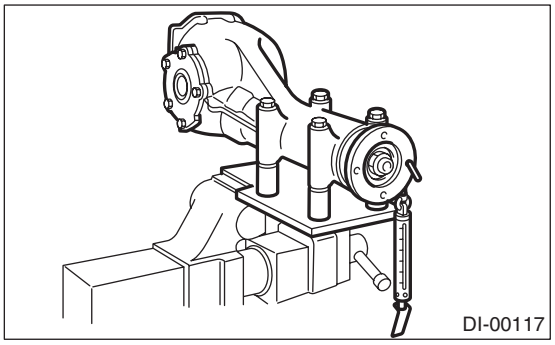
10) Attach a new self-locking nut and tighten using the ST.
ST 498427200 FLANGE WRENCH

Tightening torque:
181.5 N·m (18.5 kgf-m, 134.0 ft-lb)

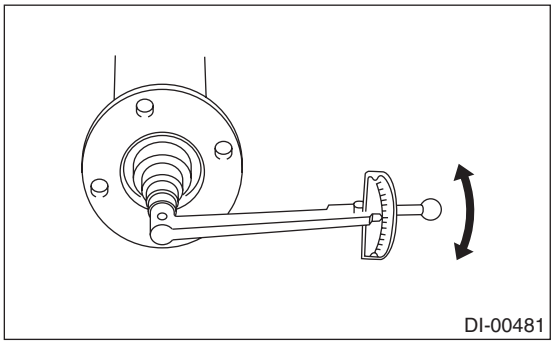


11) Measure the initial torque or the initial load.

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

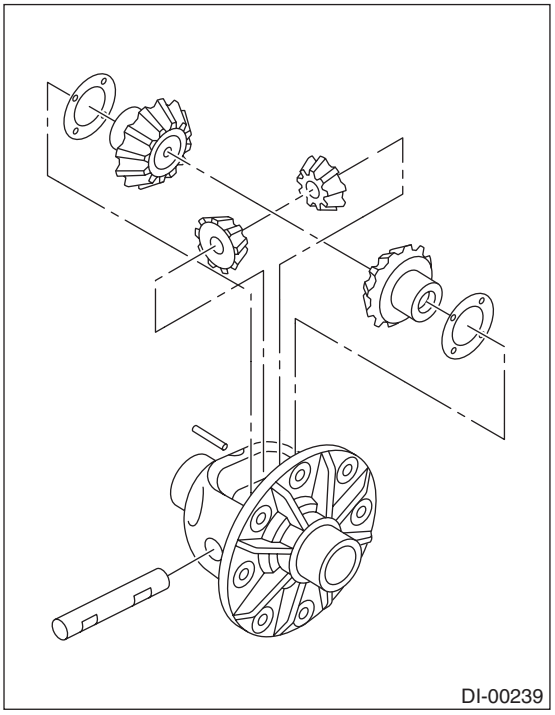


Initial torque:
0.67 — 1.47 N·m
(0.07 — 0.15 kgf-m, 0.49 — 1.08 ft-lb)



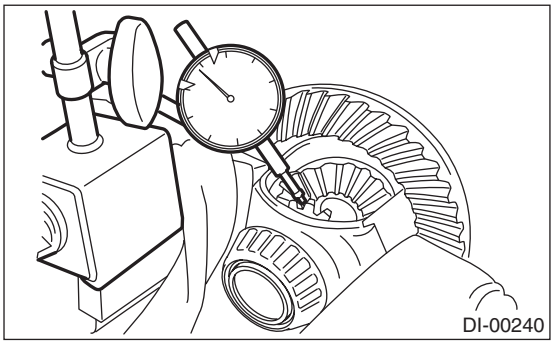
12) Assembling differential case
Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into the differential case. (Model without LSD)

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



(1) Measure the side gear backlash.

Side gear backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)



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

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

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

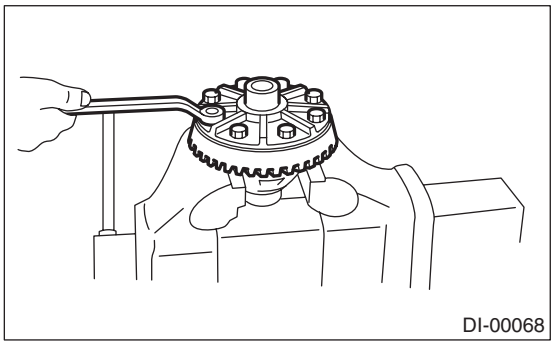
13) Install the hypoid driven gear to the differential case.

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

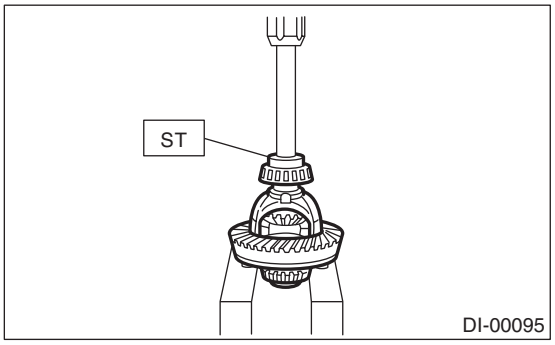
Seal material:
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:
Tighten diagonally while gently tapping the bolt heads.

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


DI-00068

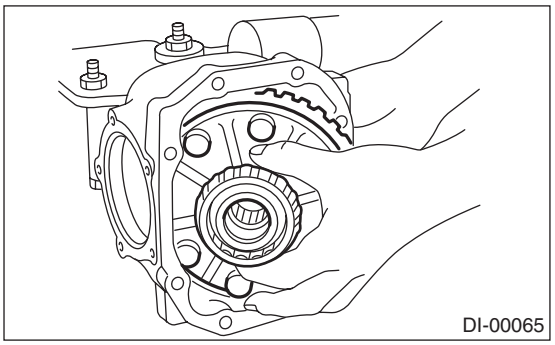
14) Press the side bearing into differential case using ST.
ST 398487700 DRIFT



DI-00095

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

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


DI-00065

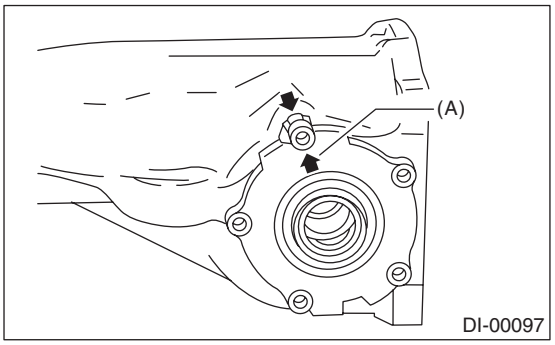
(3) Install the side bearing retainer shims to retainers RH and LH from which they were installed.

NOTE:
Replace the broken or corroded side retainer shim and O-ring with new parts of same thickness.

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

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

NOTE:
- Replace the O-ring with a new part.
- Be careful that the bearing roller does not damage the side bearing race.

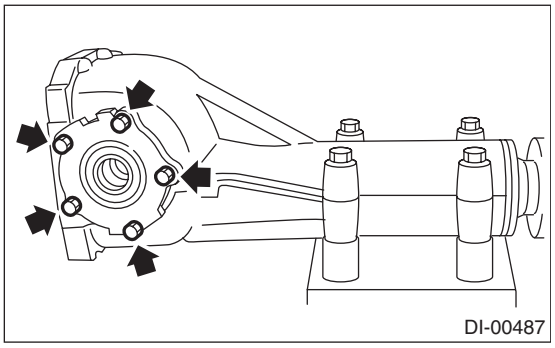


DI-00097

(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

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

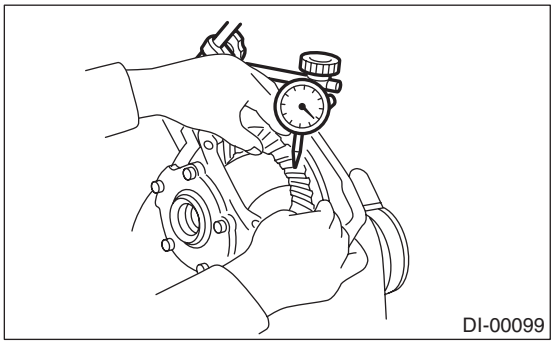


(6) Measure the backlash between hypoid driven gear and drive pinion. Set the magnet base on differential carrier. Align the contact point of dial gauge with the tooth surface of hypoid driven gear, and move the hypoid driven gear while securing the drive pinion. Read the value indicated on dial gauge. If the backlash is not within the range of specifications, adjust the side bearing retainer shim using the following procedures.

•When backlash exceeds 0.2 mm (0.008 in):
Reduce the hypoid driven gear back surface shim thickness and increase the hypoid driven gear tooth surface side shim thickness.

•When backlash is less than 0.1 mm (0.004 in):
Increase the hypoid driven gear back surface shim thickness and reduce the tooth surface side shim thickness.

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

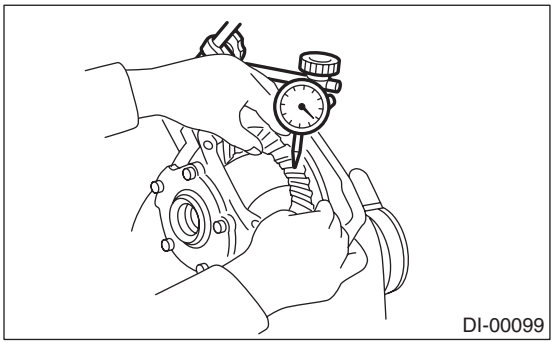


(7) At the same time, measure the total preload of the drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side bearing retainer shims, increasing/reducing both shims by an even amount at a time.

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

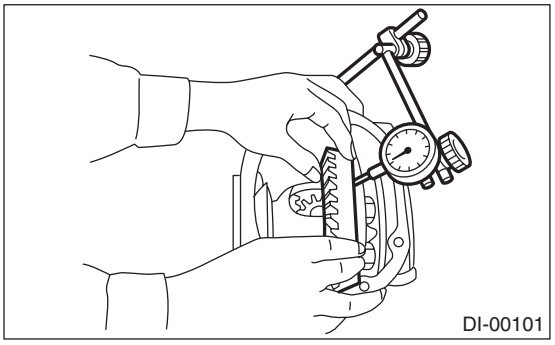
17) Recheck the backlash between hypoid driven gear and pinion.

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



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

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

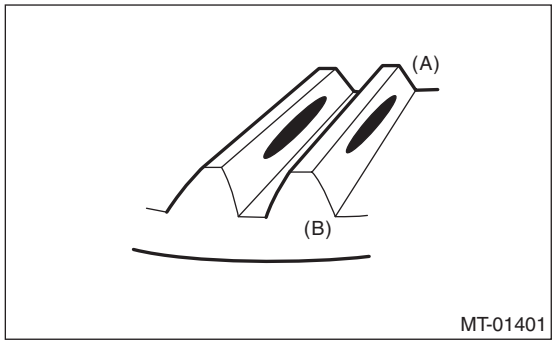


19) Checking and adjusting the tooth contact of hypoid driven gear
(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.
(2) When the contact pattern is not correct, readjust.

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

- Correct tooth contact

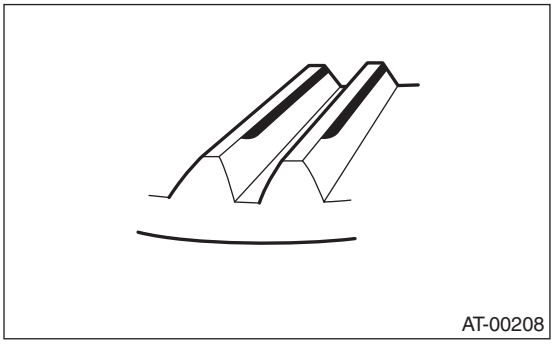
Check item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. (When driving, it moves towards the heel side.)



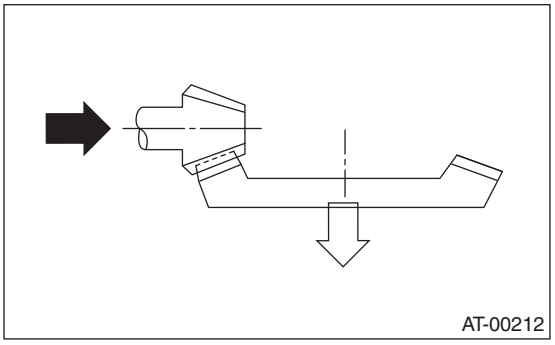
(A) Toe side
(B) Heel side

- Face contact

Check item: Backlash is too large.
Contact pattern



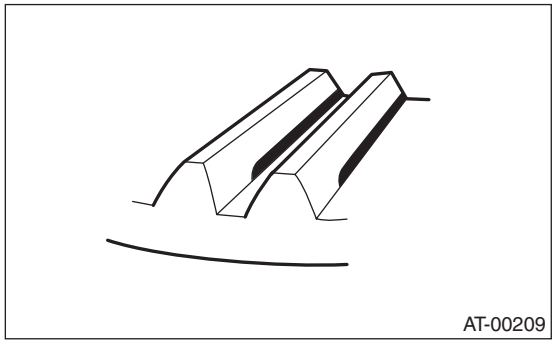
Corrective action: Increase the thickness of pinion height adjusting washer according to the procedure for bringing the drive pinion closer to the hypoid driven gear.



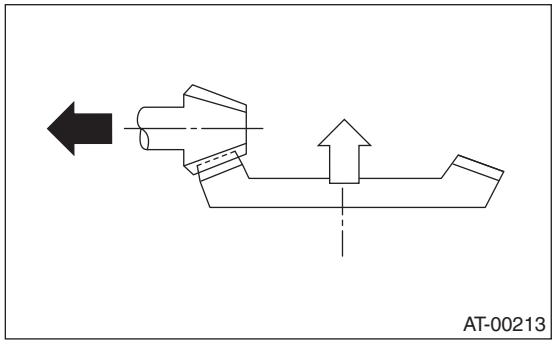
- Flank contact

Check item: Backlash is too small.

Contact pattern



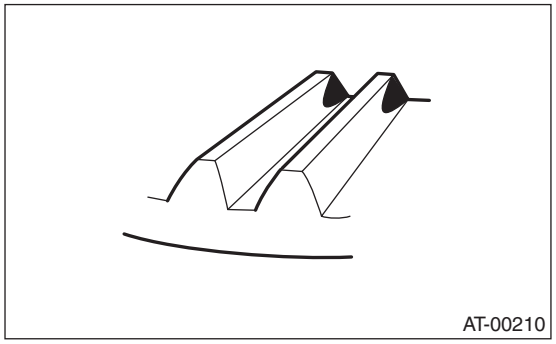
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for moving the drive pinion away from hypoid driven gear.



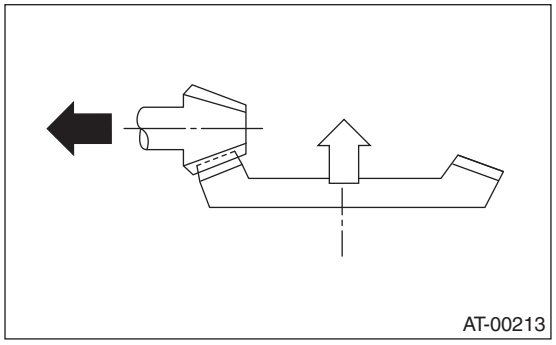
- Toe contact (inside contact)

Check item: Contact area is too small.

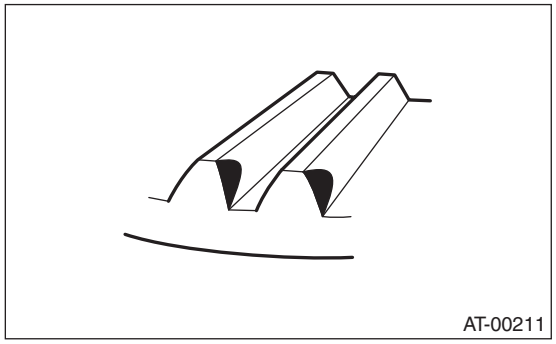
Contact pattern



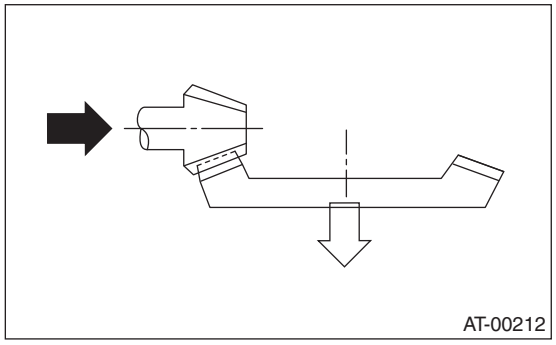
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for moving the drive pinion away from hypoid driven gear.



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

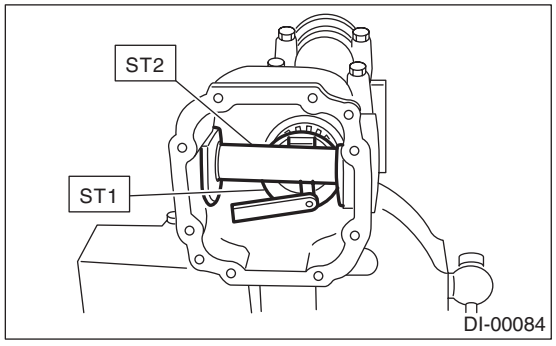


Corrective action: Increase the thickness of pinion height adjusting washer according to the procedure for bringing the drive pinion close to the hypoid driven gear.



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

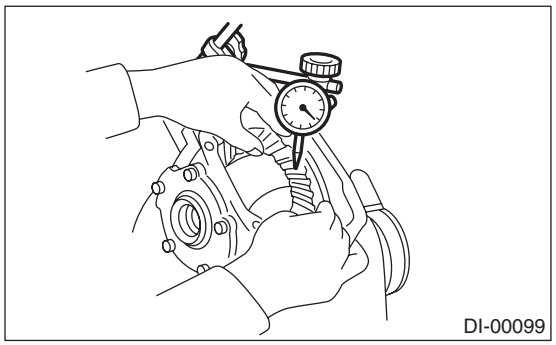
ST1	398507702	DUMMY SHAFT
ST2	398507701	DIFFERENTIAL CARRIER GAUGE



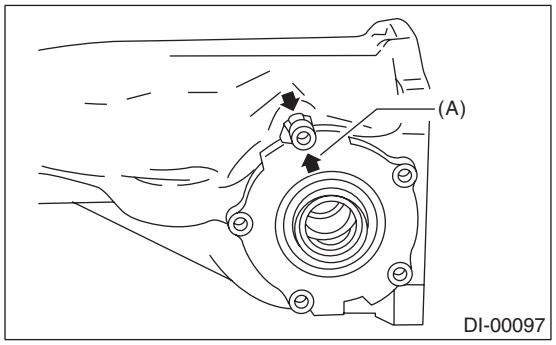
T = To + N – (H × 0.01) – 0.20 (mm)
Place:
T = Thickness of the pinion height adjusting washer (mm)
To = Thickness of the washer temporarily assembled (mm)
N = Clearance measured by thickness gauge (mm)
H = Figure marked on drive pinion head

(2) Hypoid gear backlash

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



21) Remove the RH and LH side bearing retainer.
22) Install the O-rings and the side bearing retainer shims to both the left and right side bearing retainers.
23) Install the oil seals to the left and right side bearing retainers. <Ref. to DI-39, REPLACEMENT, Rear Differential Side Oil Seal.>
24) Align the arrow mark on differential carrier with the mark on side retainer during installation.

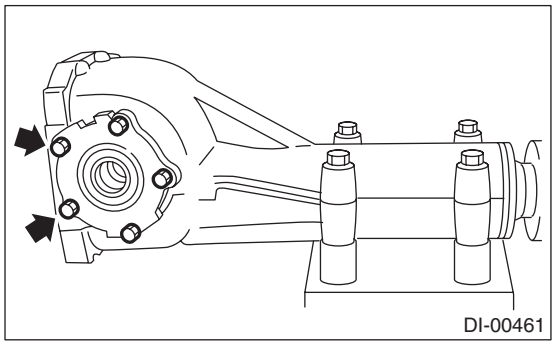


(A) Arrow mark

25) Apply liquid gasket to the bolts indicated by arrow marks, and install the side bearing retainer.

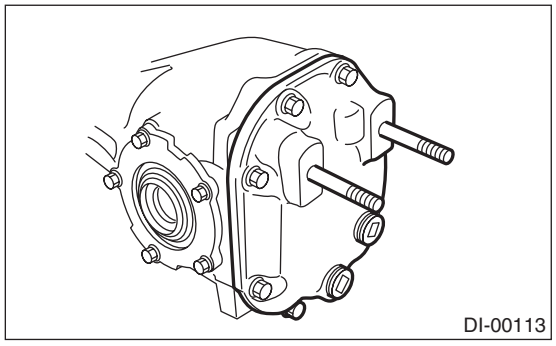
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

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

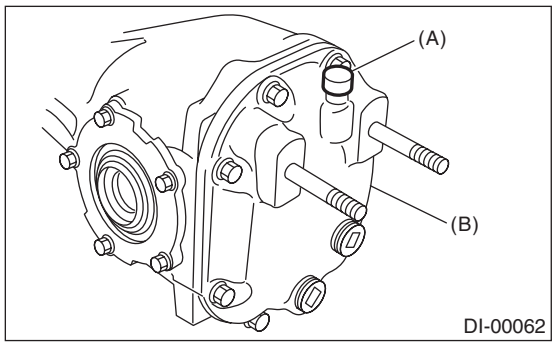


26) Install the new gasket and rear cover and tighten the bolts to specified torque.

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



27) Install the new air breather cap.



(A) Air breather cap
(B) Rear cover

28) Install the oil drain plug and filler plug.

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

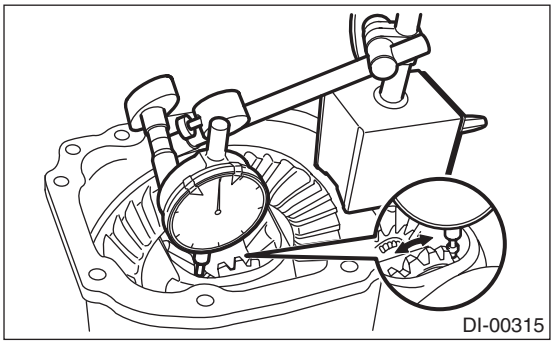
E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage and other defects. Repair or replace the defective parts as necessary.
1) Hypoid driven gear and drive pinion
• If there is evidently an abnormal tooth contact, find out the cause and adjust until the teeth contact correctly. Replace the gear if there is an excessive worn or an incapable adjustment.
• If crack, cutout or seizure is found, replace the parts as a set. Slight damage of some teeth can be corrected by oil stone or the like.
2) Bearing
Replace if seizure, peeling, wear, rust, dragging during rotation, noise or other defect is evident.
3) Oil seal
Replace if deformed or damaged, and at every disassembling.
4) Differential carrier
Replace if the bearing bores are worn or damaged.
5) Differential case
Replace if its sliding surfaces are worn or cracked.
6) Companion flange
Replace if the oil seal lip contacting surface has flaws.

1. SIDE GEAR BACKLASH

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

Side gear backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)
If the side gear backlash is not within the specification, select the side gear thrust washer and adjust the side gear backlash as specified.

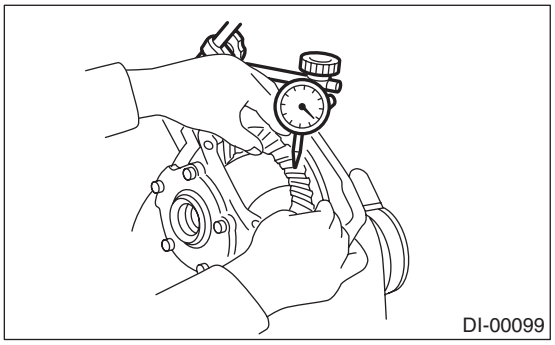


2. HYPOID DRIVEN GEAR BACKLASH

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

Hypoid driven gear backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)

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

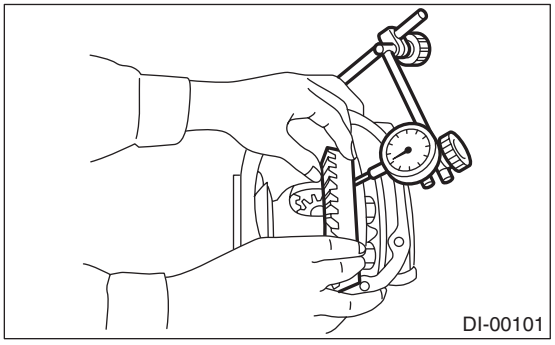


3. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

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

Hypoid driven gear rear face runout limit:
0.05 mm (0.002 in) or less

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



4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

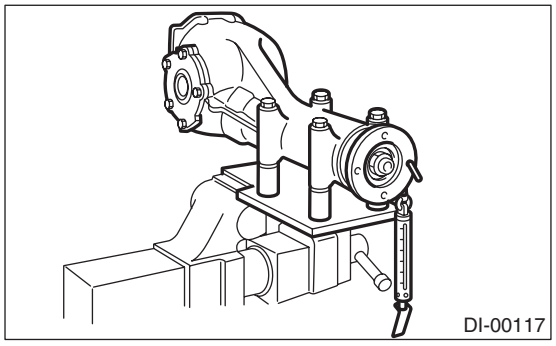
Inspect the tooth contact between hypoid driven gear and drive pinion. <Ref. to DI-24, ASSEMBLY, Rear Differential.>

5. TOTAL PRELOAD

Using a spring scale, check the total preload.

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

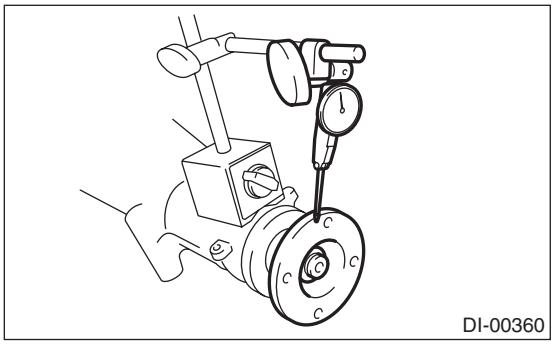
If the total preload is not within the specification, adjust the side bearing retainer shims.



6. COMPANION FLANGE

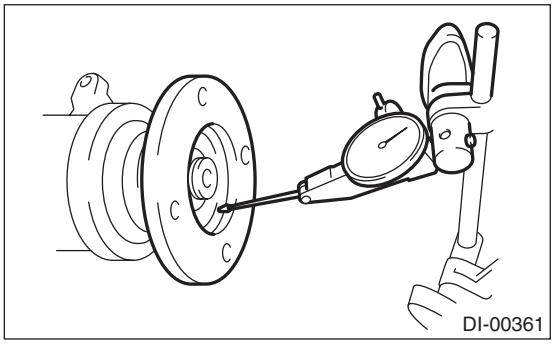
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.003 in)



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

Limit of runout:
0.08 mm (0.003 in)



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

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash.
<Ref. to DI-24, ASSEMBLY, Rear Differential.>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust the hypoid driven gear backlash.
<Ref. to DI-24, ASSEMBLY, Rear Differential.>

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear.
<Ref. to DI-24, ASSEMBLY, Rear Differential.>

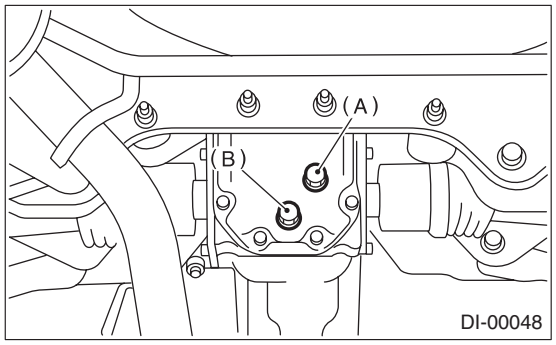
4. TOTAL PRELOAD

Adjust the side bearing shim.
<Ref. to DI-24, ASSEMBLY, Rear Differential.>

5. Rear Differential Front Oil Seal

A: REPLACEMENT

1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Shift the select lever or gear shift lever to neutral.
4) Release the parking brake.
5) Remove the oil drain plug, and drain gear oil.



(A) Filler plug
(B) Drain plug

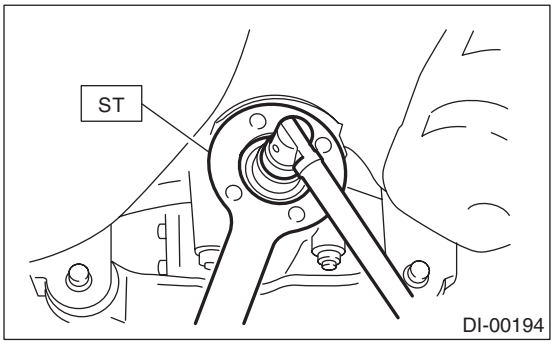
6) Install the oil drain plug.

NOTE:
Apply liquid gasket to the drain plug.

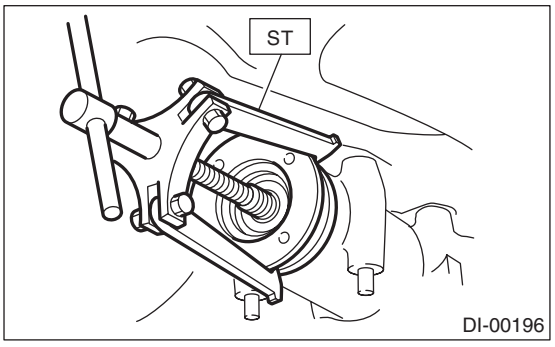
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

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

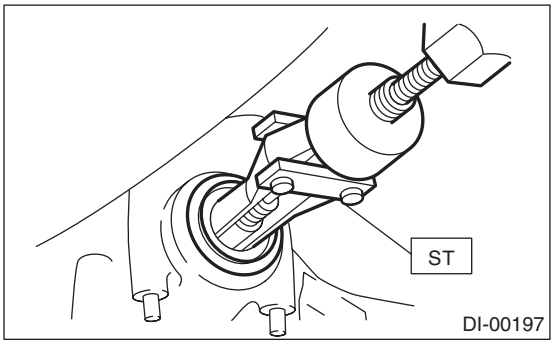
7) Lift up the vehicle.
8) Remove the rear exhaust pipe and muffler.
• Non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
• Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
9) Remove the propeller shaft. <Ref. to DS-13, REMOVAL, Propeller Shaft.>
10) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



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

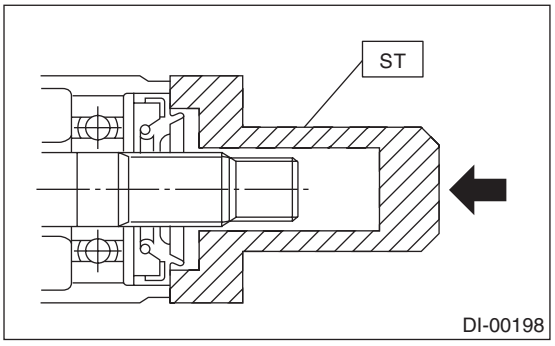


12) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY



13) Install a new oil seal using ST.

NOTE:
Apply oil to the outer circumference of the oil seal.
ST 498447120 INSTALLER



14) Install the companion flange.

NOTE:
Use a plastic hammer to install companion flange.

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

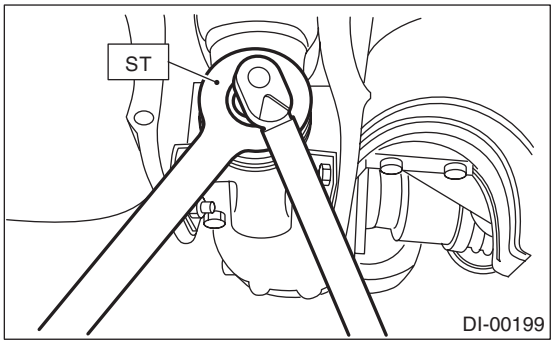
Seal material:
THREE BOND 1324 (Part No. 004403042) or equivalent

16) Tighten the self-locking nut to the specified torque so that the companion flange preload becomes the same value as that before replacing the oil seal.

ST 498427200 FLANGE WRENCH

NOTE:
Use a new self-locking nut.

Tightening torque:
181.5 N·m (18.5 kgf-m, 134.0 ft-lb)



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

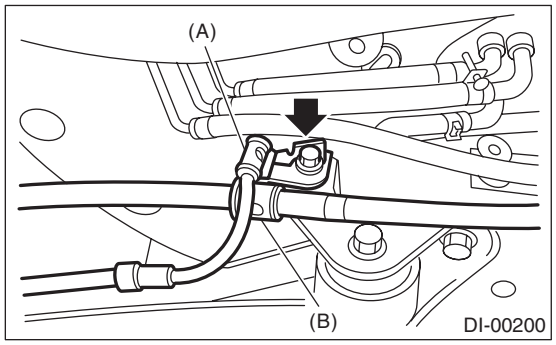
6. Rear Differential Side Oil Seal

A: INSPECTION

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

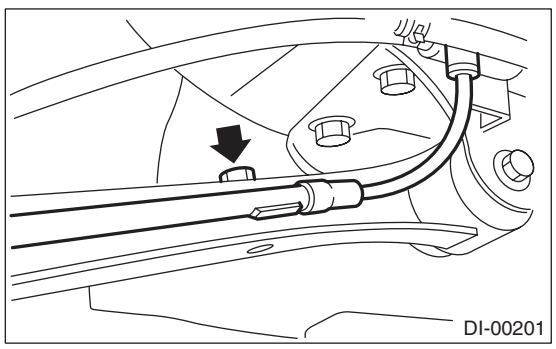
B: REPLACEMENT

1) Disconnect the ground cable from the battery.
2) Shift the select lever or gear shift lever to neutral.
3) Release the parking brake.
4) Loosen the wheel nuts on both sides.
5) Lift up the vehicle.
6) Remove the wheels.
7) Remove the rear exhaust pipe and muffler.
• Non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
• Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
8) Remove the DOJ of rear drive shaft from rear differential.
(1) Remove the ABS wheel speed sensor cable clamp and the parking brake cable clamp from bracket.

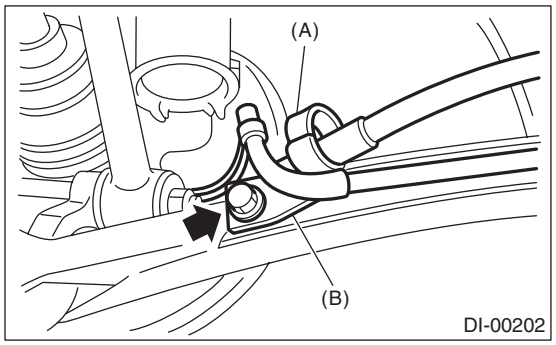


(A) ABS wheel speed sensor cable clamp
(B) Parking brake cable clamp

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

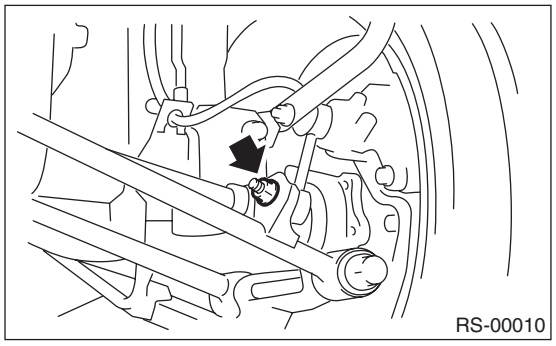


(3) Remove the ABS wheel speed sensor cable clamp and the parking brake cable guide from the trailing link.

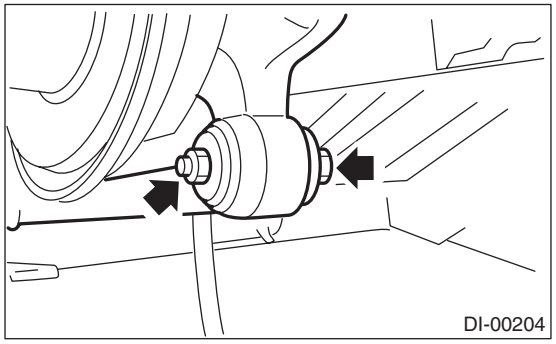


(A) Parking brake cable guide
(B) ABS wheel speed sensor cable clamp

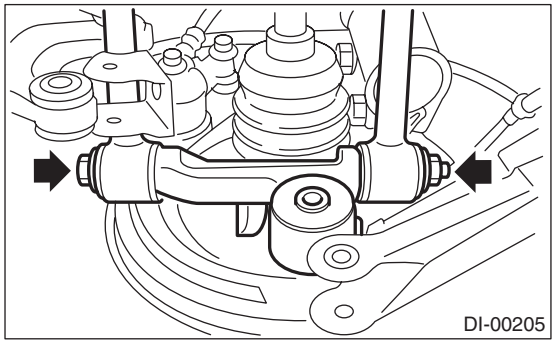
(4) Remove the rear stabilizer link.



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

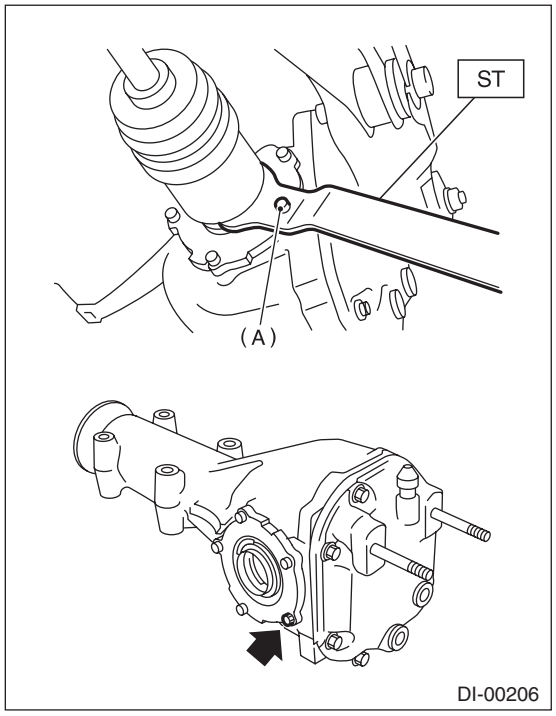


(6) Remove the bolts which secure the front and rear lateral links to the rear housing.



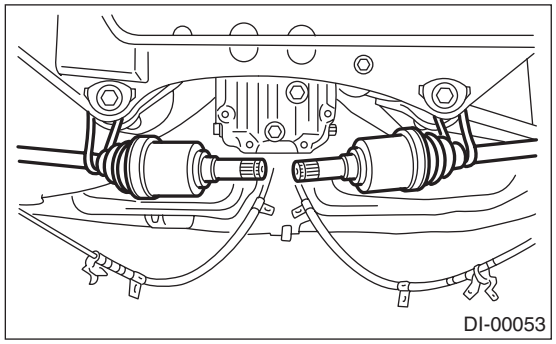
(7) Remove the DOJ from the rear differential by using ST.

NOTE:
When removing the DOJ from the rear differential, fit the ST to the bolts (A) as shown in figure so as not to damage the side bearing retainer.
ST 28099PA100 DRIVE SHAFT REMOVER

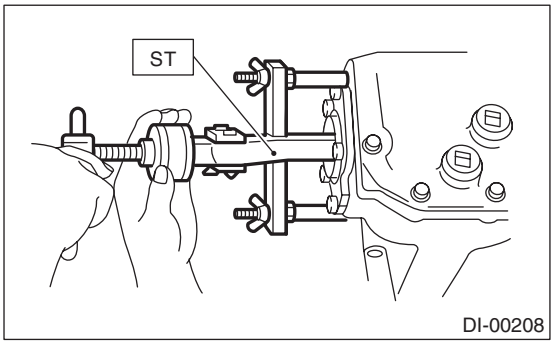


(A) Bolt

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

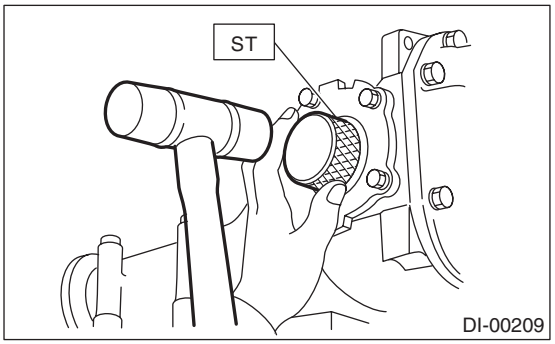


10) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY

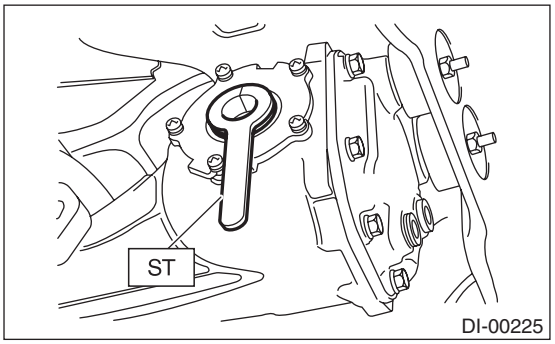


11) Install a new side oil seal using the ST.

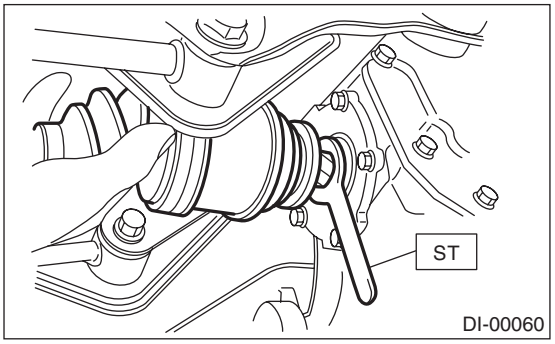
NOTE:
Apply chassis grease to the oil seal lips.
ST 398437700 DRIFT



12) Insert the DOJ into rear differential.
(1) Attach the ST to rear differential.
ST 28099PA090 OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal using ST.
ST 28099PA090 OIL SEAL PROTECTOR



(3) Remove the ST.

ST 28099PA090 OIL SEAL PROTECTOR

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

7. Rear Differential Member

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Lift up the vehicle.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler.
- Non-turbo model

<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>

- Turbo model

<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>

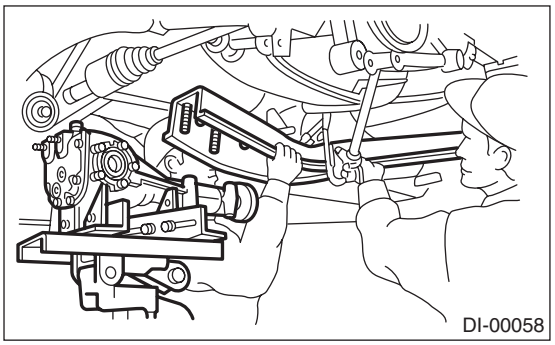
9) Remove the front differential member.

NOTE:
When removing the front differential member, work the removal procedure as rear differential.
<Ref. to DI-19, REMOVAL, Rear Differential.>
10) Remove the rear differential member.

B: INSTALLATION

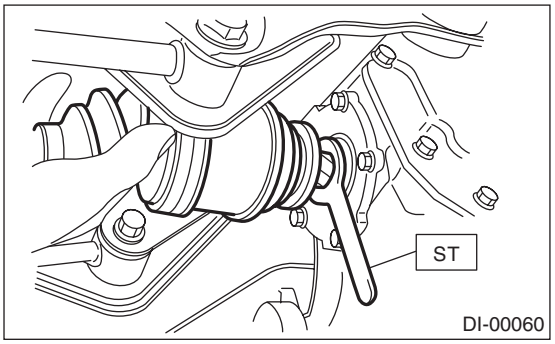
Install in the reverse order of removal.
1) Position the front differential member with the vehicle by passing the member under the parking brake cable and securing it to rear differential.

NOTE:
When installing the front differential member, be careful of the order for installation of the stoppers.



2) Insert the DOJ of the rear drive shaft into the rear differential.

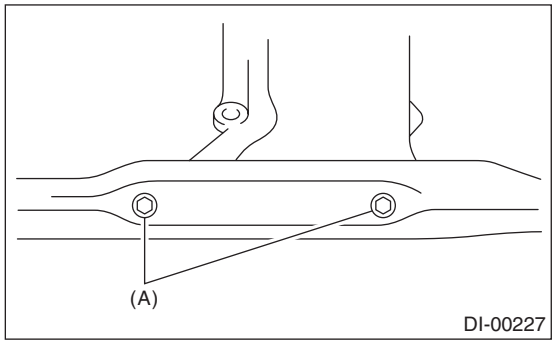
NOTE:
Before inserting, replace the side oil seal with a new part.
ST 28099PA090 OIL SEAL PROTECTOR

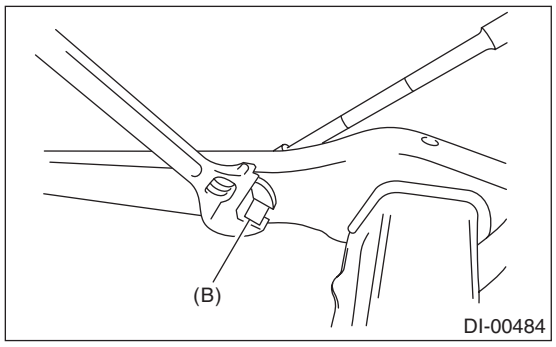


3) Hereafter, install in the reverse order of removal.

C: DISASSEMBLY

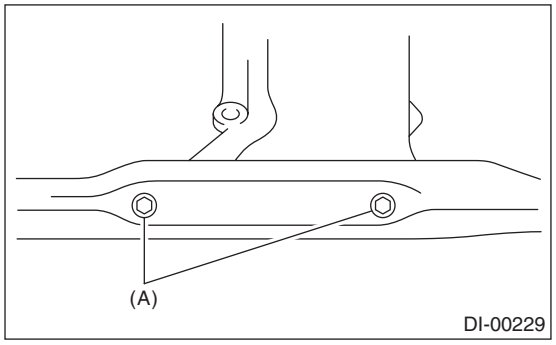
NOTE:
Clean the rear differential member before working.
1) Remove the bolts (A) and (B) which secure the front differential member and the differential bracket.





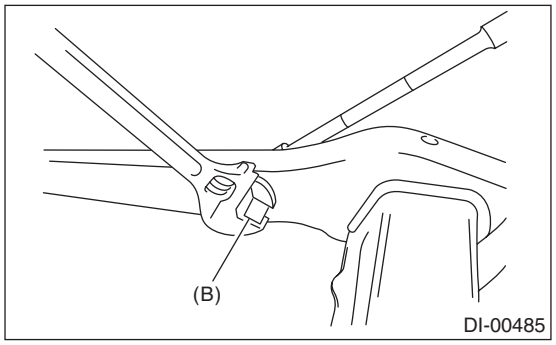
D: ASSEMBLY

1) Temporarily tighten bolts (A) that secure the front differential member and differential bracket.



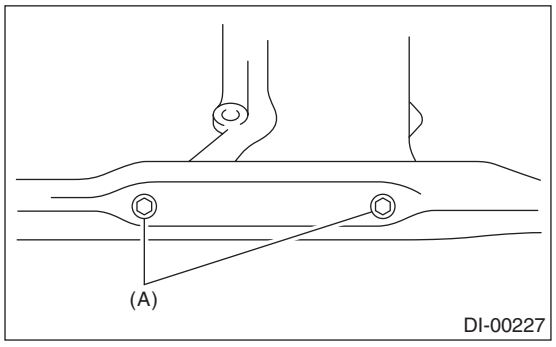
2) Tighten the nut of mounting bolt (B).

Tightening torque:
128 N·m (13.1 kgf-m, 94.4 ft-lb)



3) Tighten the nut of mounting bolt (A).

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



E: INSPECTION

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

8. General Diagnostic Table

A: INSPECTION

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

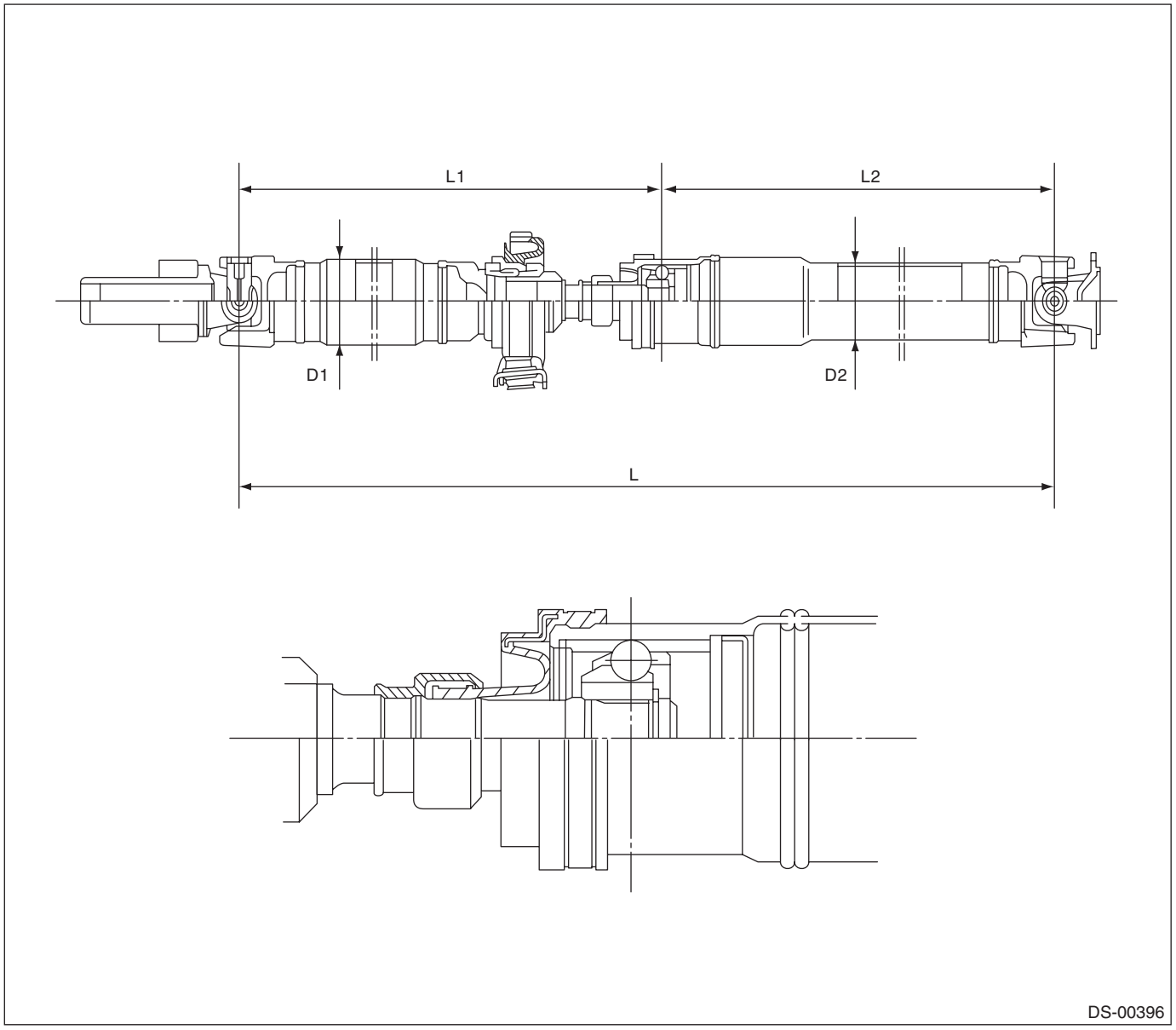
Symptom or trouble	Possible cause	Remedy
6. Gear Noise NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting,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

1. General Description

A: SPECIFICATION

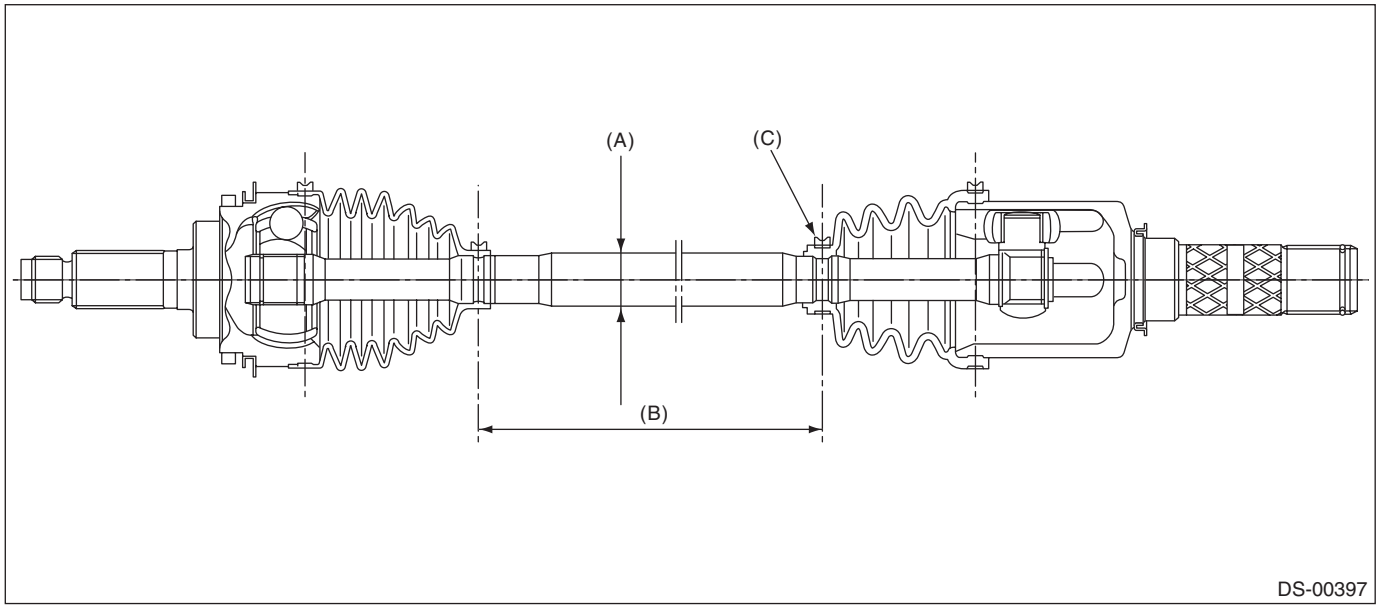
1. PROPELLER SHAFT

Model			AT	MT
Propeller shaft type			EDJ	
Propeller shaft length: L		mm (in)	1292 (50.87)	1352 (53.23)
Front propeller shaft joint-to-joint length: L_1		mm (in)	608 (23.93)	668 (26.30)
Rear propeller shaft joint-to-joint length: L_2		mm (in)	684 (26.93)	
Outer diameter of tube:	mm (in)	D_1	63.5 (2.50)	
		D_2	57.5 (2.26)	



2. FRONT DRIVE SHAFT ASSEMBLY

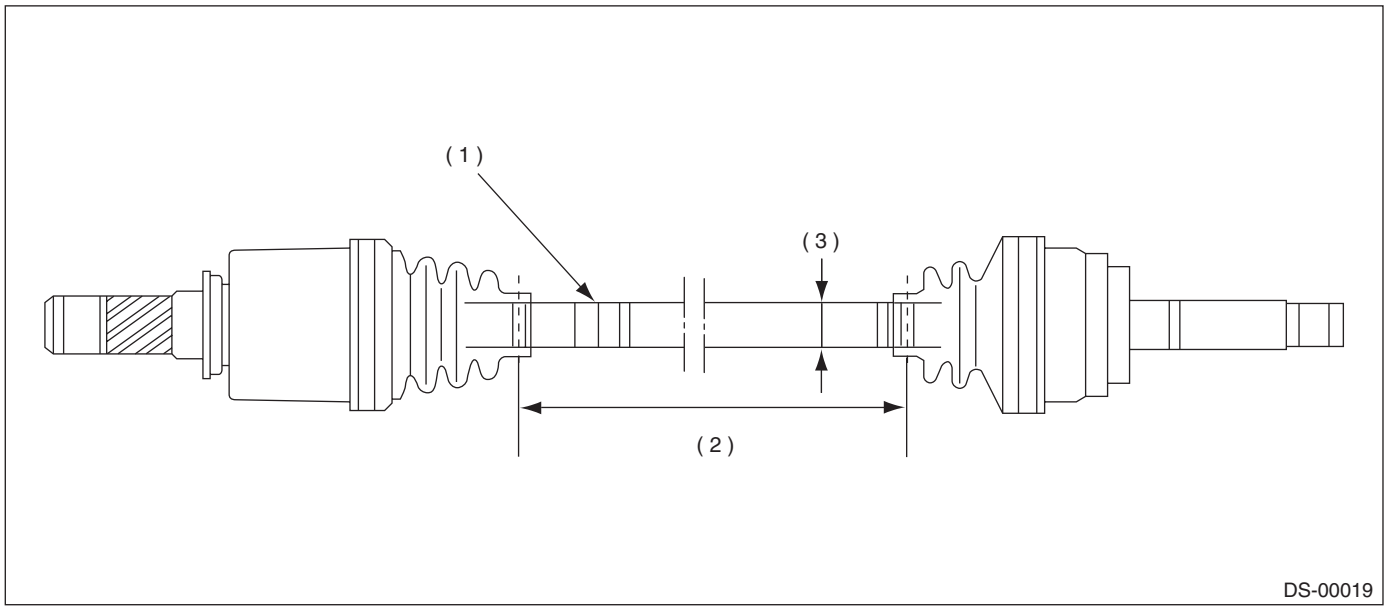
Specification	Model	Boot band identification color	L1 mm (in)	ϕ D mm (in)
AC + AARi	Non-turbo, Turbo AT	Blue	323.9 (12.75)	24.9 (0.98)
	Turbo MT	—	324.2 (12.76)	24.9 (0.98)



(A) ϕ D mm (in) (B) L1 mm (in) (C) Boot band

3. REAR DRIVE SHAFT ASSEMBLY

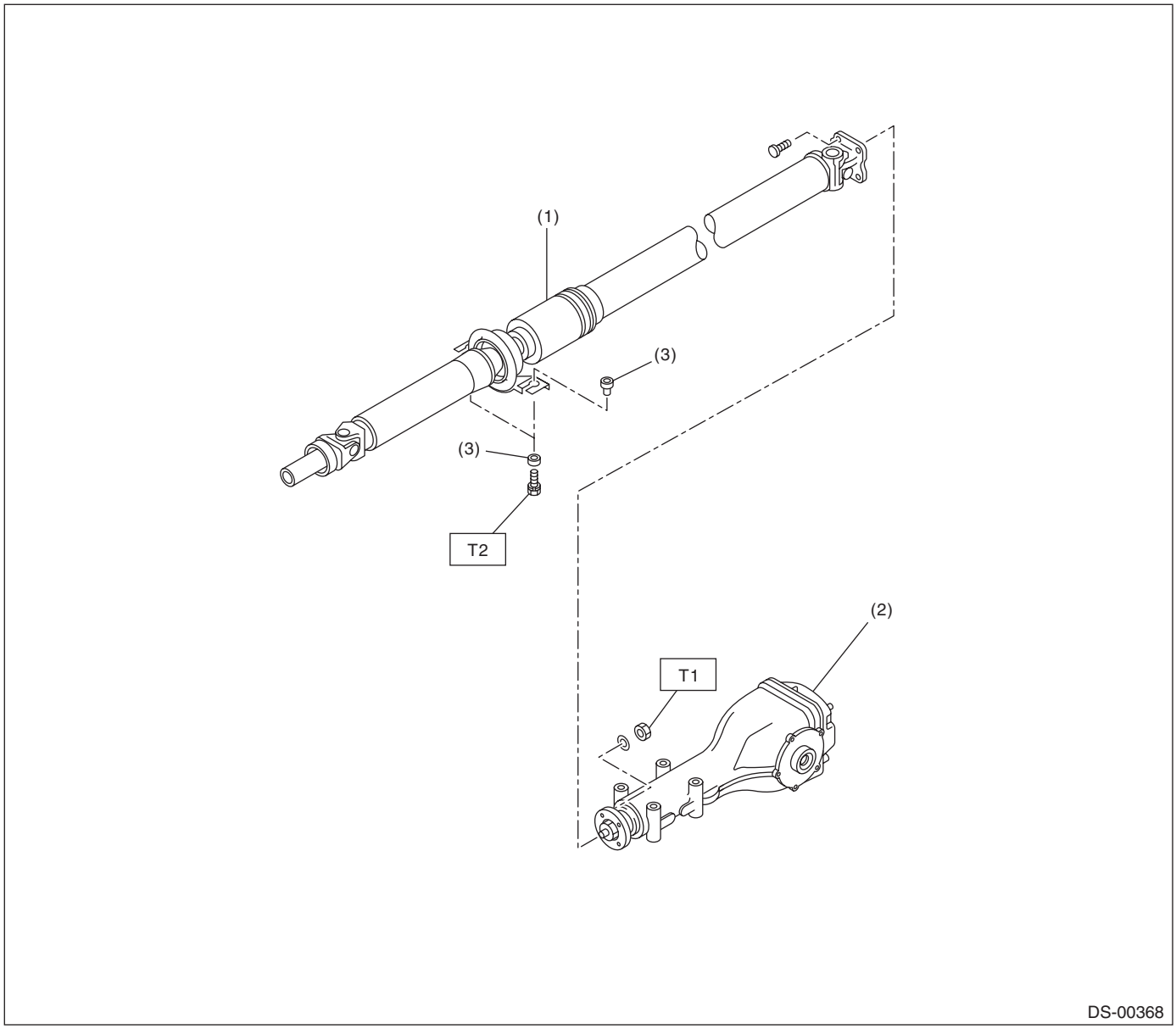
Specification	Model	No. of shaft identification groove	L1 mm (in)	ϕ D mm (in)
EBJ + DOJ RH	All models	1	367.4 (14.5)	24 (0.9)
EBJ + DOJ LH		0	357.4 (14.1)	24 (0.9)



(1) Identification groove (2) L1 mm (in) (3) ϕ D mm (in)

B: COMPONENT

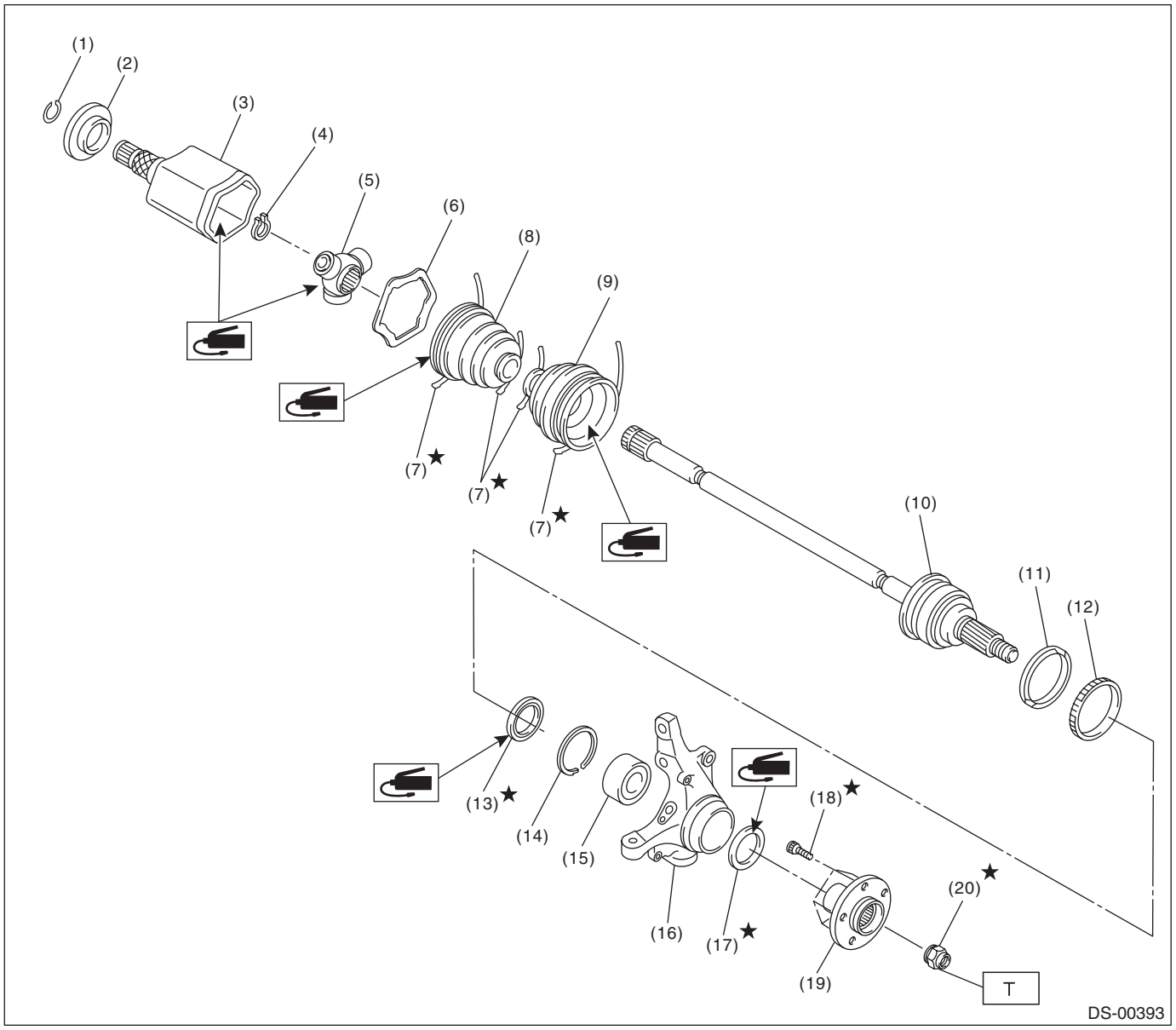
1. PROPELLER SHAFT



(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)

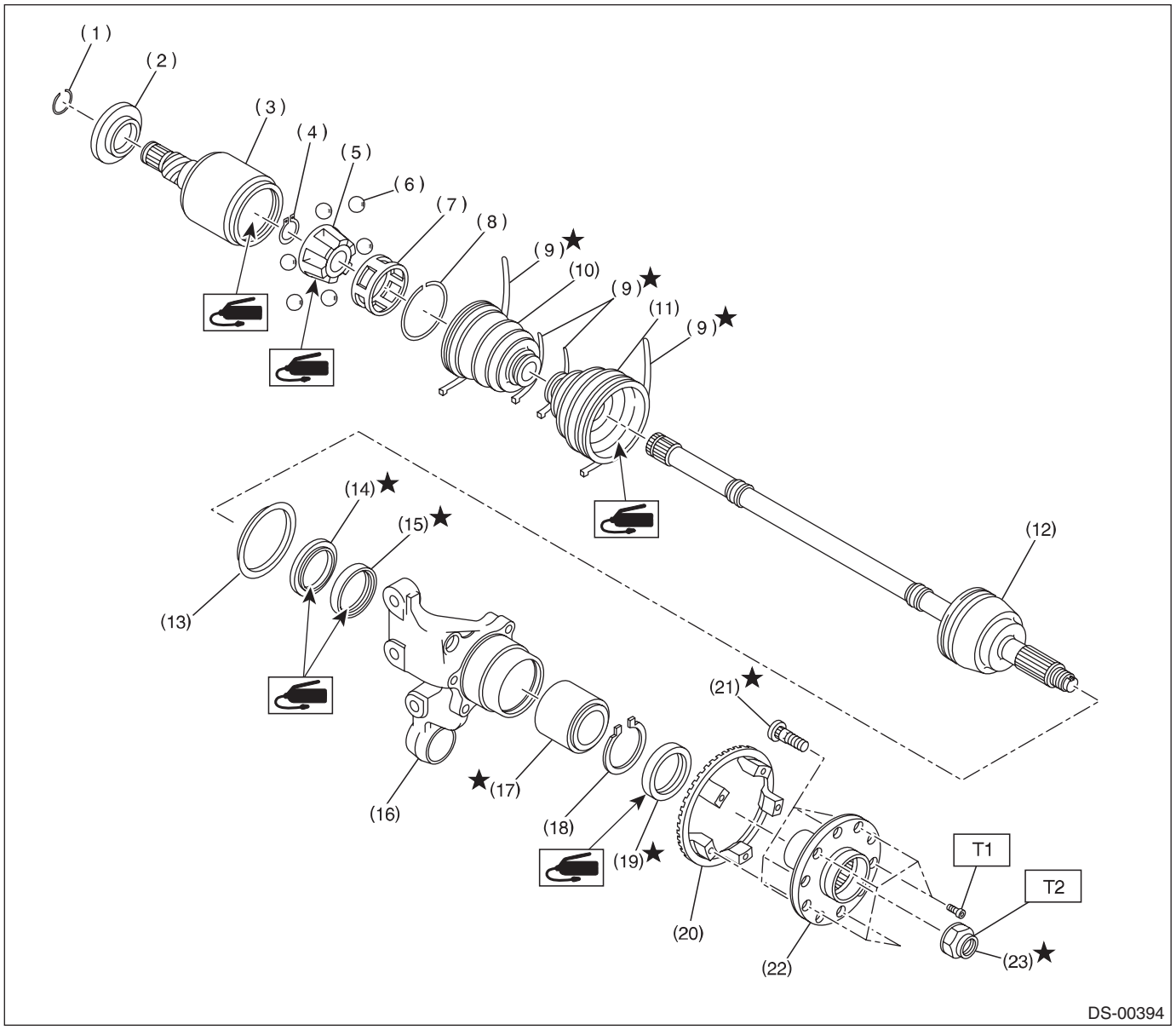
2. FRONT AXLE



(1) Circlip
(2) Baffle plate (AARi)
(3) Outer race (AARi)
(4) Snap ring
(5) Trunnion
(6) Retainer
(7) Boot band
(8) Boot (AARi)
(9) Boot (AC)
(10) AC ASSY
(11) Baffle plate
(12) Tone wheel
(13) Inner oil seal
(14) Snap ring
(15) Bearing
(16) Housing
(17) Outer oil seal
(18) Hub bolt
(19) Hub
(20) Axle nut

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

3. REAR AXLE



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

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

C: CAUTION

• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
• Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. of different grades or manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply grease onto sliding or revolving surfaces before installation.
• Before installing snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

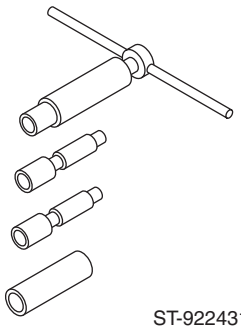
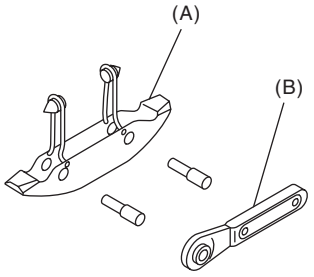
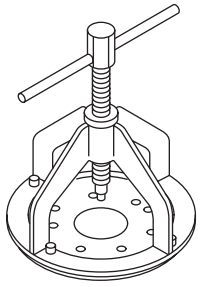
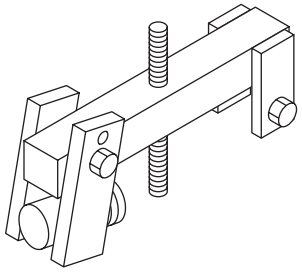
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-922431000	922431000	AXLE SHAFT INSTALLER	• Used for installing the axle shaft into housing. • Used together with ADAPTER (927390000).
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening the boot band. (A) Jig for the band (B) Ratchet wrench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

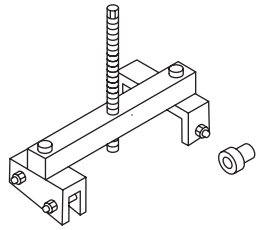
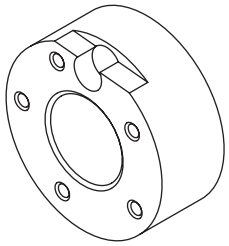
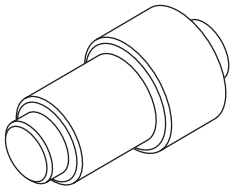
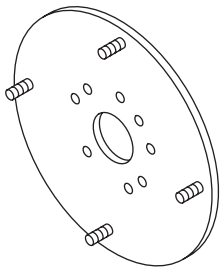
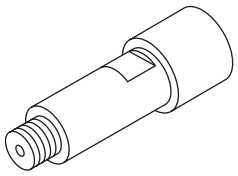
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927420000	927420000	HUB REMOVER	• Used for removing rear hub. • Used together with HUB STAND (927080000).
 ST-927080000	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.
 ST-927100000	927100000	BEARING PULLER	• Used for disassembling and assembling the front housing bearing. • Used together 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).

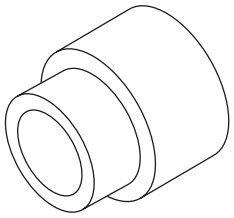
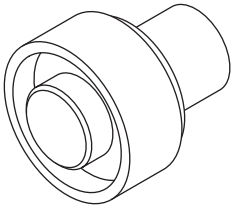
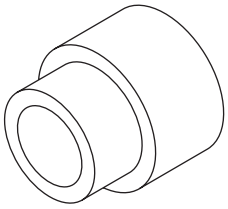
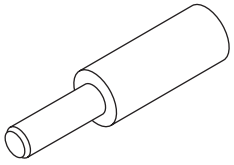
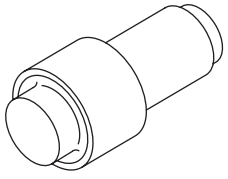
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927400000	927400000	HOUSING STAND	• Used for disassembling and assembling the front housing bearing. • Used together with BEARING PULLER (927100000).
 ST-927410000	927410000	OIL SEAL INSTALLER	• Used for installing oil seal into front housing. • Used together with HOUSING STAND (927400000).
 ST-927430000	927430000	HOUSING STAND	• Used for disassembling and assembling rear housing bearing. • Used together with BEARING PULLER (927440000).
 ST-927120000	927120000	HUB INSTALLER	Used for installing hub.
 ST-927440000	927440000	BEARING REMOVER	• Used for disassembling and assembling the rear wheel bearing. • Used together with HOUSING STAND (927430000).

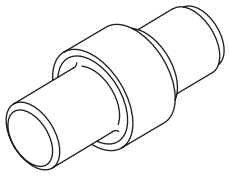
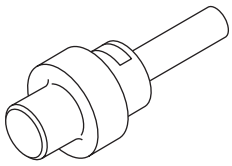
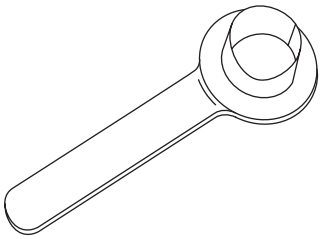
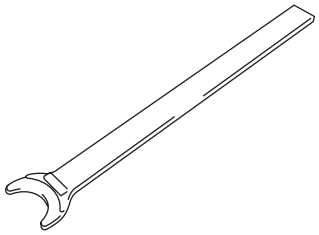
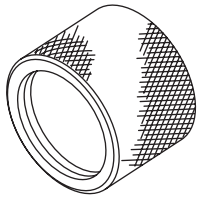
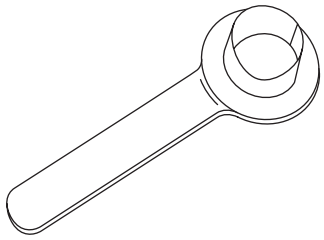
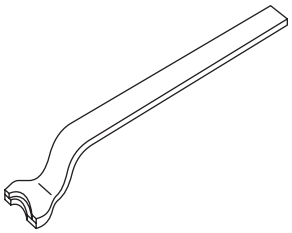
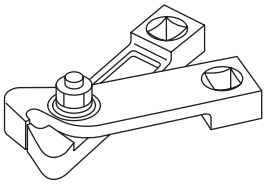
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927460000	927460000	OIL SEAL INSTALLER	• Used for installing the outer oil seal. • Used together with HOUSING STAND (927430000).
 ST-927450000	927450000	HUB INSTALLER	• Used for pressing in the hub bearing into the hub. • Used together with HUB STAND (927080000).
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	• Used for installing front drive shaft into front differential. • For protecting the oil seal.
 ST28399SA000	28399SA000	DRIVE SHAFT REMOVER	Used for removing the front drive shaft from the front differential.
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to the rear differential. • For protecting the oil seal.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing the rear drive shaft from the rear differential.
 ST28099AC000	28099AC000	BOOT BAND PLIER	Used for tightening front AC boot band.

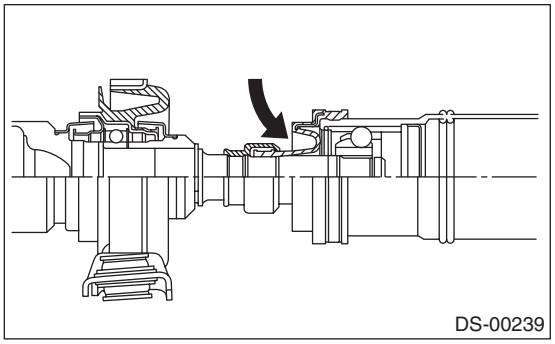
2. GENERAL TOOL

TOOL NAME	REMARKS
Puller	Used for removing the ball joint from knuckle arm.
Dial gauge	Used for inspecting the propeller shaft run-out.
Snap ring pliers	Used for installing and removing the snap ring.
Extension cap	When removing the propeller shaft, used to prevent gear oil or ATF fluid from leaking.

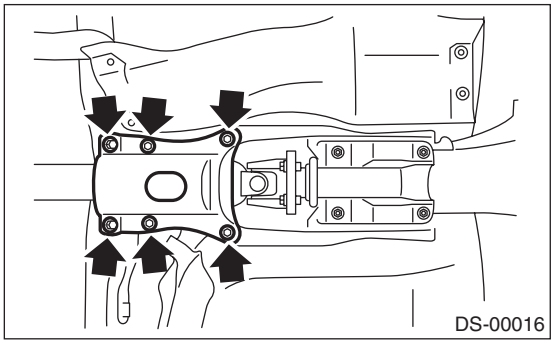
2. Propeller Shaft

A: REMOVAL

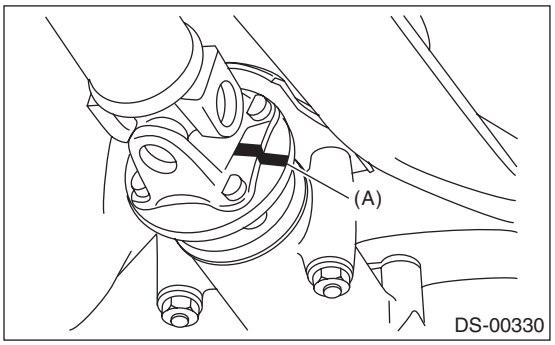
NOTE:
• Before removing propeller shaft, wrap metal parts with a cloth or rubber material.
• In case of a EDJ type, wrap the metal parts at the rubber boot of EDJ with a cloth or rubber material before removing propeller shaft, as shown in the figure. Rubber boot may be damaged due to interference with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


DS-00239

1) Disconnect the ground cable from the battery.
2) Move the select lever or the gear shift lever to “N”.
3) Release the parking brake.
4) Jack-up the vehicle and support it with rigid racks.
5) Remove the center exhaust pipe.
Non-turbo model
<Ref. to EX(H4SO)-7, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
6) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
7) Remove the differential mount front cover.


DS-00016

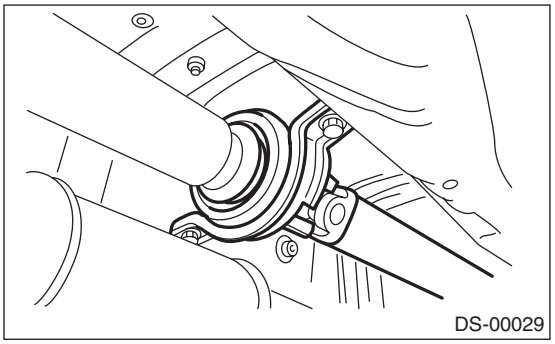
8) Apply alignment marks on appropriate parts before removal.



DS-00330

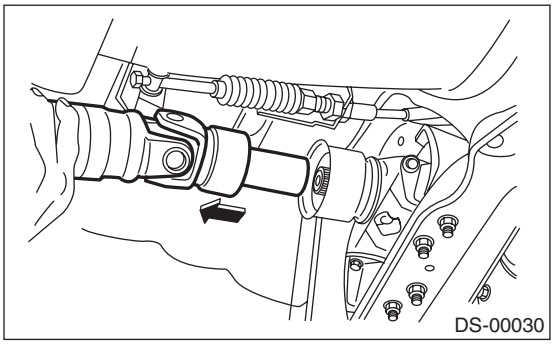
(A) Alignment mark

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


DS-00029

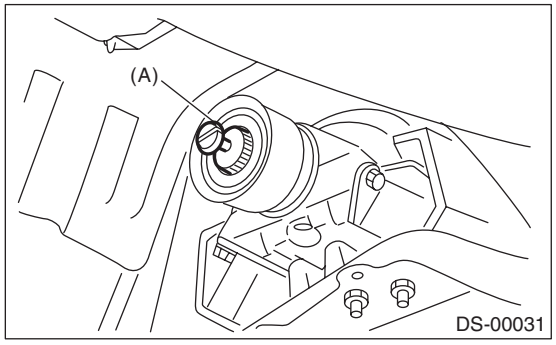
12) Remove the propeller shaft from transmission.

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


DS-00030

13) Install an extension cap to the transmission.

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

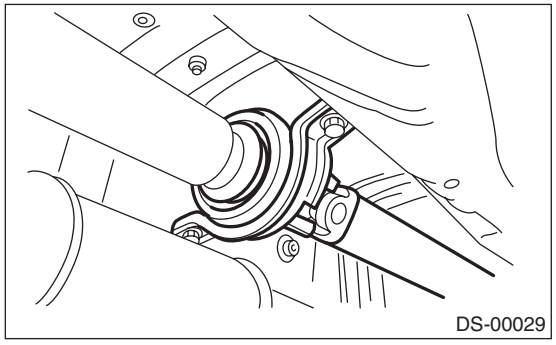


(A) Extension cap

B: INSTALLATION

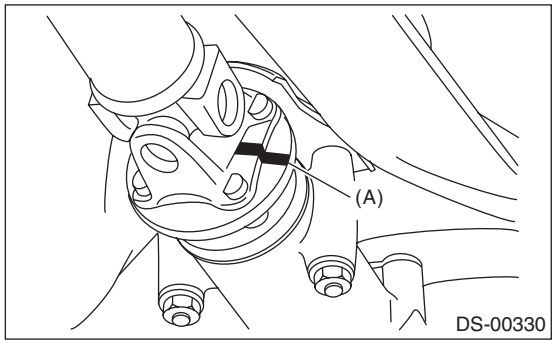
1) Insert the sleeve yoke into the transmission and attach the center bearing to the body.

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



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

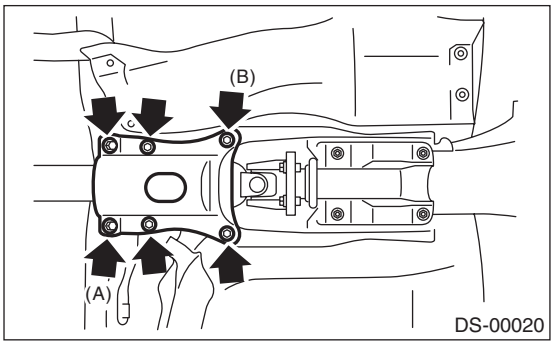
Tightening torque:
31 N·m (3.2 kgf-m, 23.1 ft-lb)



(A) Alignment mark

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

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



4) Install the center exhaust pipe.
Non-turbo model
<Ref. to EX(H4SO)-7, INSTALLATION, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
5) Install the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>

C: INSPECTION

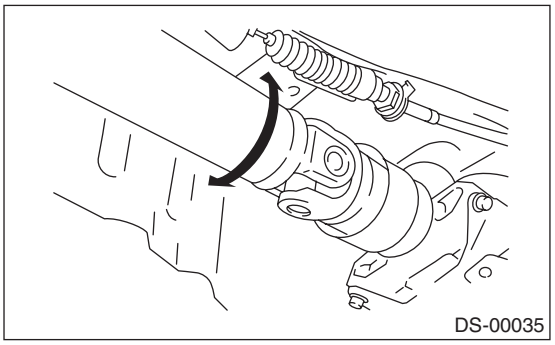
NOTE:
Do not disassemble the propeller shaft. Check the following items and replace if necessary.
1) Dents or cracks on the tube surface
2) Deformation or uneven wear on the splines
3) Unsmooth joint operation or abnormal noise
4) Center bearing free play, noise or unsmooth operation.
5) Uneven wear or damaged oil seal
6) Damaged center bearing
Check the following points with the propeller shaft installed in the vehicle.

1. JOINTS AND CONNECTORS

1) Remove the center exhaust pipe.
Non-turbo model
<Ref. to EX(H4SO)-7, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Remove the heat shield cover. (If equipped)
3) Check for any looseness of the yoke flange mounting bolts which connect to the rear differential and center bearing bracket mounting bolts.

2. SPLINES AND BEARING LOCATIONS

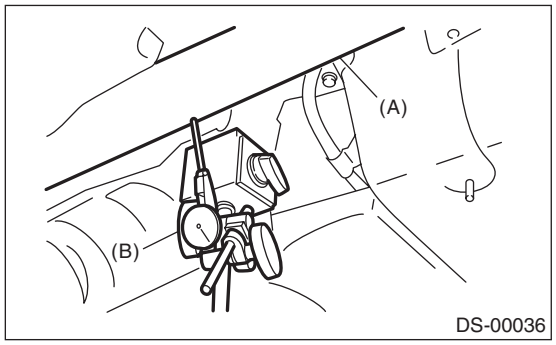
1) Remove the center exhaust pipe.
Non-turbo model
<Ref. to EX(H4SO)-7, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
3) Remove the heat shield cover. (If equipped)
4) Turn the propeller shaft by hand to see if there is any excessive free play in the splines. Also move the yoke to see if there is any excessive free play at the spiders or bearings.



3. RUNOUT OF PROPELLER SHAFT

1) Remove the center exhaust pipe.
Non-turbo model
<Ref. to EX(H4SO)-7, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
3) Remove the heat shield cover. (If equipped)
4) Set the dial gauge with its indicator stem at the center of the propeller shaft tube.
5) Turn the propeller shaft slowly by hands to check for runout of the propeller shaft.

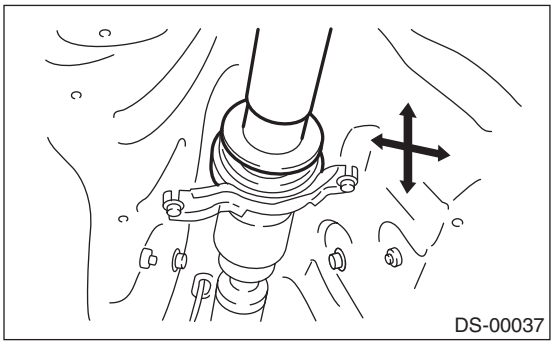
Runout:
Limit:
0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

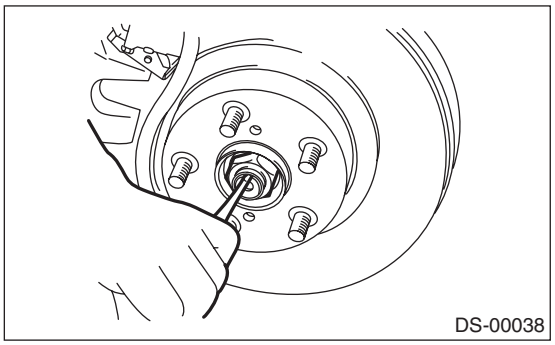
1) Remove the front and center exhaust pipes.
Non-turbo model
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4SO)-7, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC)-6, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
3) Remove the heat shield cover. (If equipped)
4) Move the propeller shaft near the center bearing up, down, left, right by hand, to check for any abnormal free play of the bearings.



3. Front Axle

A: REMOVAL

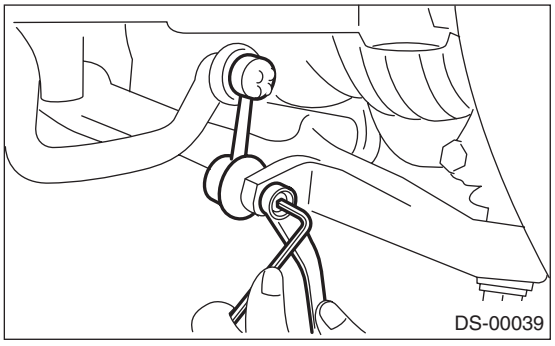
1) Lift up the vehicle, and remove the front wheels.
2) Lift the crimped section of axle nut.



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

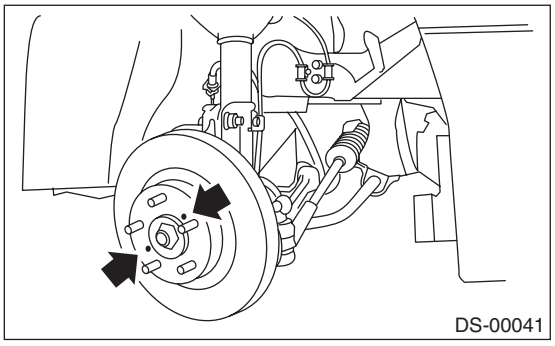
CAUTION:
Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.

4) Remove the stabilizer link.

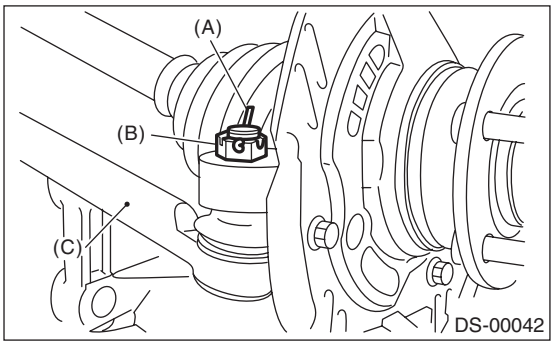


5) Remove the disc brake caliper from the housing, and suspend it from strut using a wire.
6) Remove the disc rotor from the hub.

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

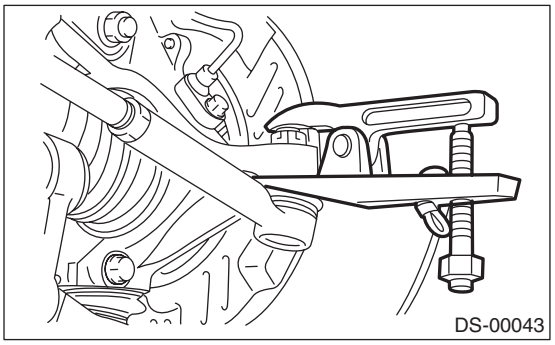


7) Remove the cotter pin and castle nut securing the tie-rod end to the housing knuckle arm.

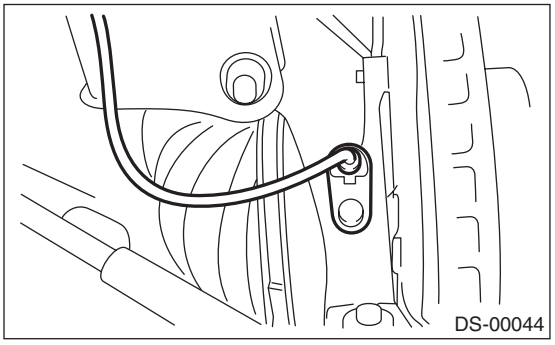


(A) Cotter pin
(B) Castle nut
(C) Tie-rod

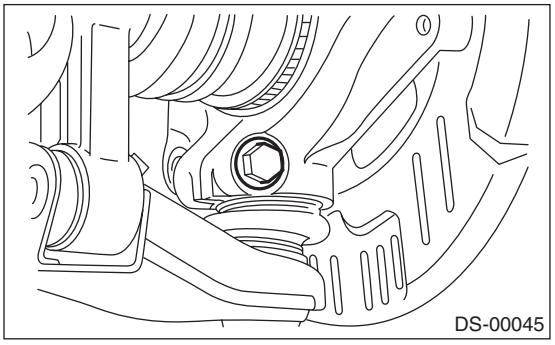
8) Using a puller, remove the tie-rod ball joint from knuckle arm.



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



10) Remove the transverse link ball joint from the housing.

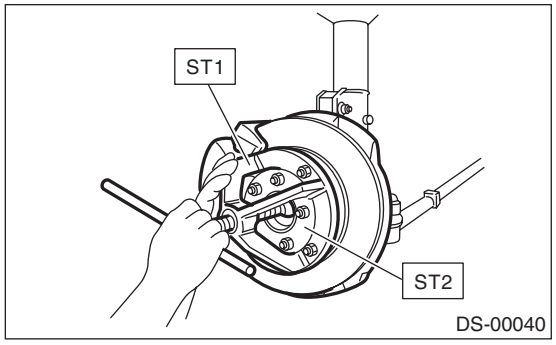


11) Remove the front drive shaft assembly from the hub. If it is hard to remove, use the STs.

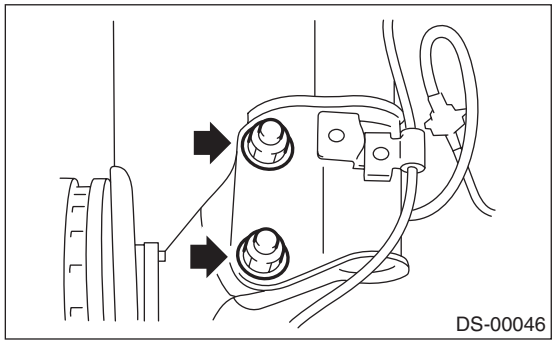
ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
Whenever the front drive shaft has been pulled out, always replace the differential side retainer oil seal on the transmission side with a new seal.

12) Hang the front drive shaft on the vehicle body using a wire.



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



B: INSTALLATION

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

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

5) Align the alignment mark on the camber adjusting bolt head, and tighten the housing and strut using a new self-locking nut.

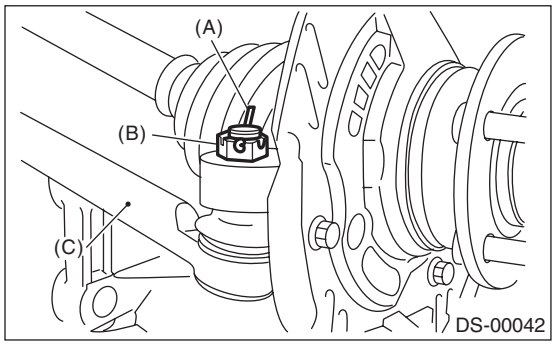
Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

6) Install the tie-rod end ball joint to the knuckle arm using the castle nut.

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

CAUTION:
When connecting the tie-rod, do not hit the cap at bottom of tie-rod end with a hammer.

7) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



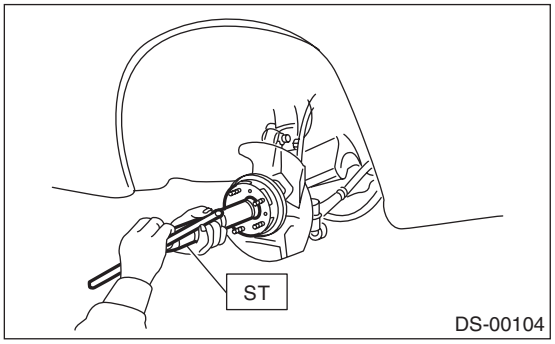
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

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

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

10) Connect the stabilizer link.

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

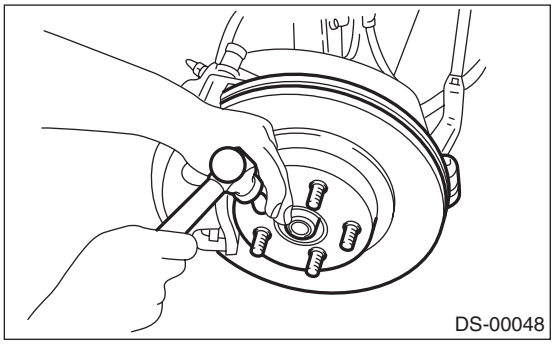


12) While pressing the brake pedal, tighten a new axle nut to the specified torque.

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

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

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



14) Install the ABS wheel speed sensor on the housing.

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

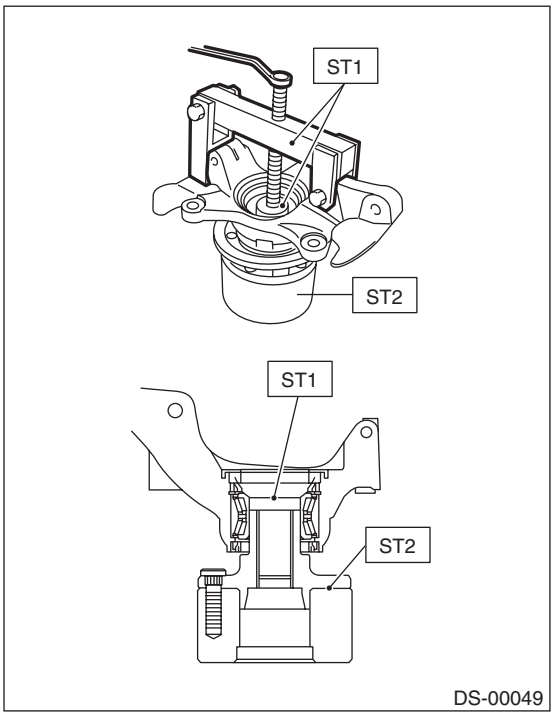
15) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

16) Inspect the wheel alignment and adjust if necessary.

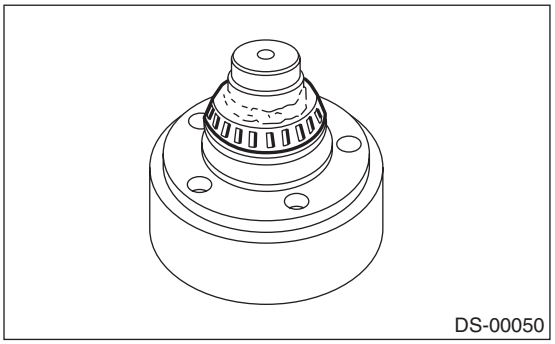
C: DISASSEMBLY

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

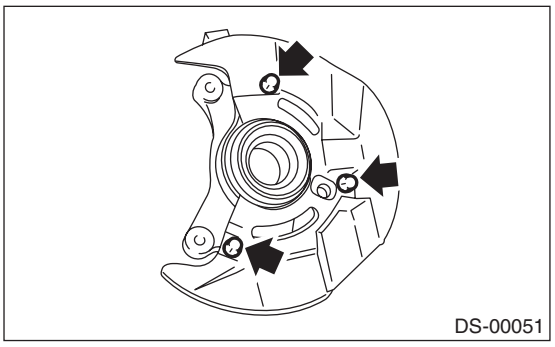


If inner bearing race remains in the hub, remove it with a suitable tool (commercially available tools).

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

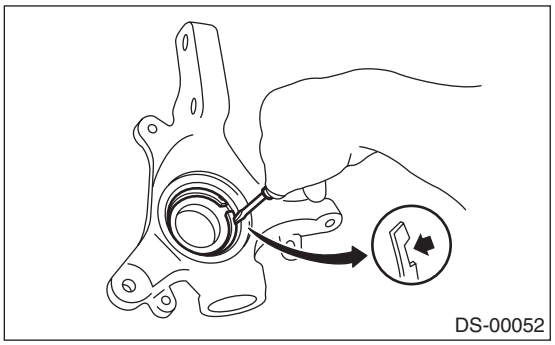


3) Remove the disc cover from housing.

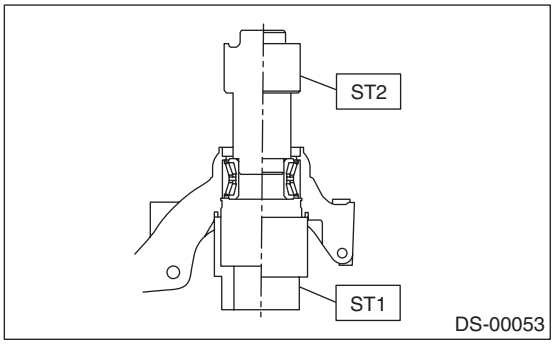


4) Remove the outer and inner oil seals using a flat tip screwdriver.
5) Remove the snap ring using a flat tip screwdriver.

CAUTION:
Be careful not to damage the housing during removal.

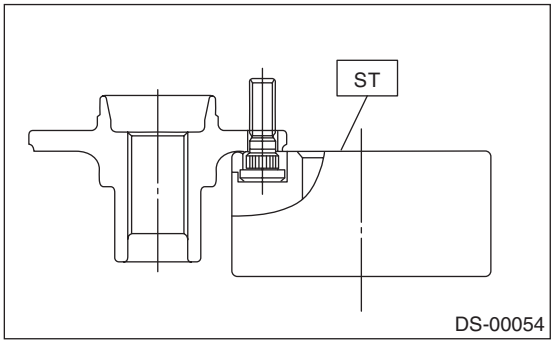

DS-00052

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



DS-00053

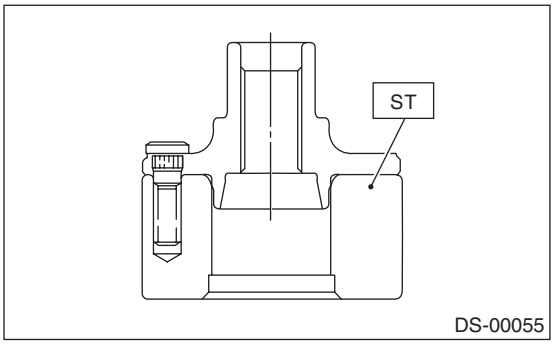
8) Using the ST and a hydraulic press, push out the hub bolts.
ST 927080000 HUB STAND



DS-00054

D: ASSEMBLY

NOTE:
When the hub is removed from housing, replace the bearing set and oil seal with new parts.
1) Attach the hub to the ST securely.
ST 927080000 HUB STAND

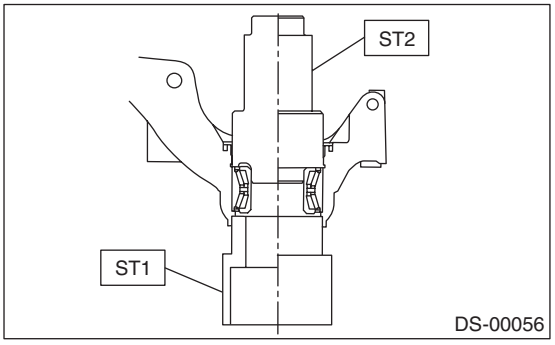


DS-00055

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

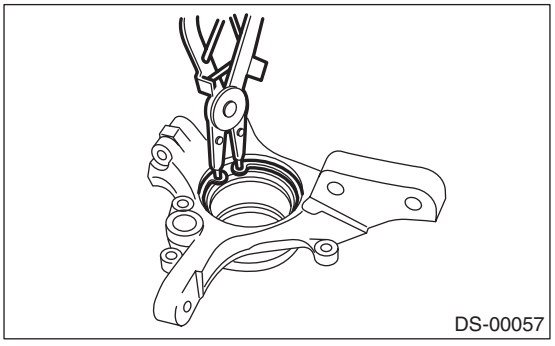
NOTE:
Use the 12 mm (0.47 in) dia. holes in the HUB STAND to prevent bolts from tilting.
3) Clean the dust or foreign particles from inside the housing.
4) Using ST1 and ST2, press a new bearing into place.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER

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

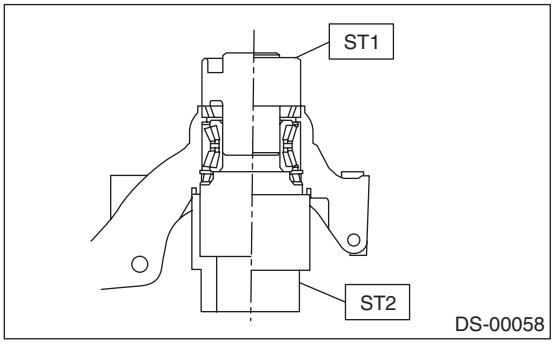


DS-00056

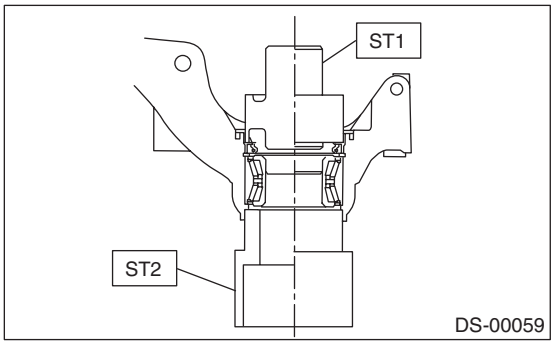
5) Using a pliers, securely install the snap ring.


DS-00057

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



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



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

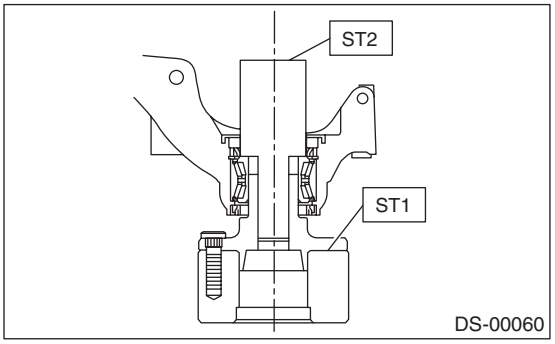
Grease:
SHELL 6459N

NOTE:
If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.

CAUTION:
Do not mix different types of grease.
10) Install the disc cover to housing with three bolts.

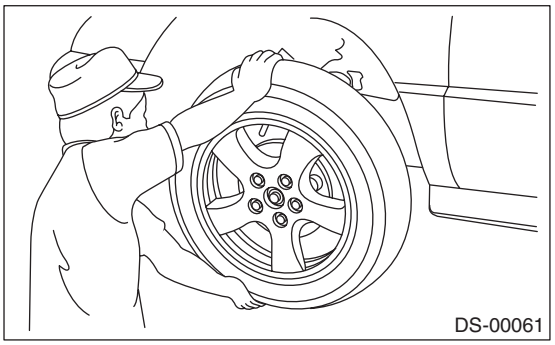
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)
11) Attach the hub to ST1 securely.
12) Clean dust and foreign particles from the polished surface of hub.

13) Place ST2 against the bearing inner race to press the bearing into the hub.
ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER



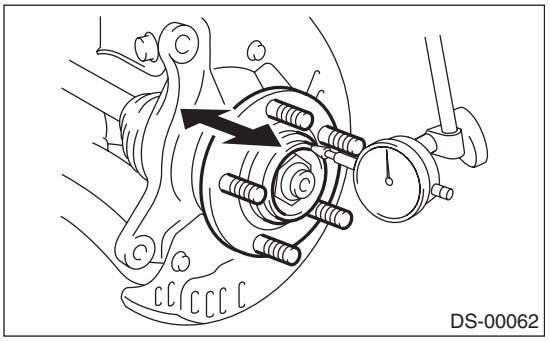
E: INSPECTION

1) While moving the front tire up and down by hand, check that there is no looseness in the bearing, and check that the wheel rotates smoothly.



2) Inspect the play in the axial direction using a dial gauge. Replace the hub bearing if the play exceeds the limit value.

Limit:
Max:
0.05 mm (0.0020 in)



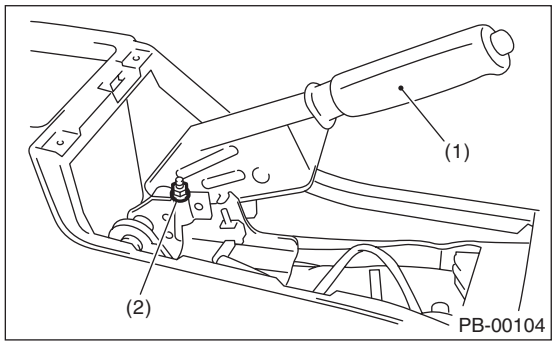
4. Rear Axle

A: REMOVAL

1. DISC BRAKE

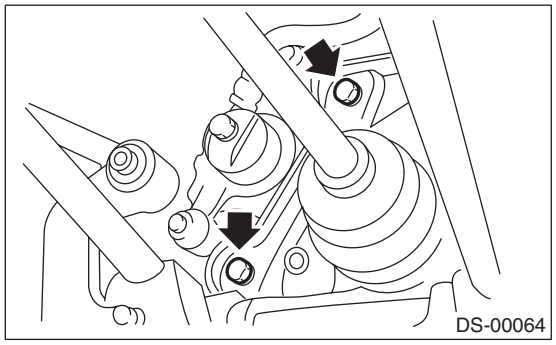
1) Disconnect the ground cable from the battery.
2) Lift up the vehicle, and then remove the rear wheels.
3) Lift the crimped section of axle nut.
4) While applying the parking brake, remove the axle nut using a socket wrench.

CAUTION:
Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.
5) Return the parking brake lever and loosen the self locking nut.



(1) Parking brake lever
(2) Self-locking nut

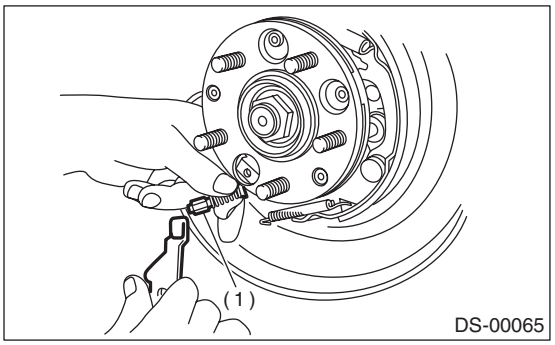
6) Remove the disc brake caliper from the back plate, and suspend it from strut using a piece of wire.



7) Remove the disc rotor from the hub.

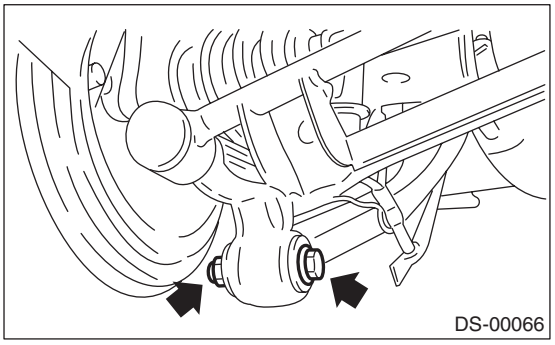
NOTE:
If the disc rotor seizes up within hub, drive disc rotor out by installing an 8 mm bolt in screw hole on the rotor.

8) Disconnect the parking brake cable end from the parking lever.

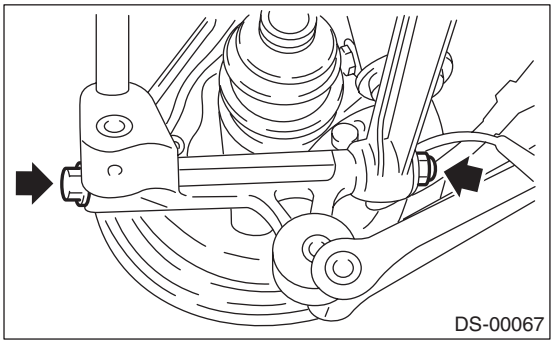


(1) Cable end

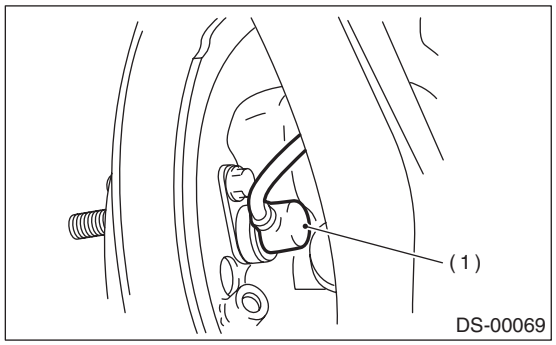
9) Disconnect the rear stabilizer from the rear lateral link.
10) Remove the bolts which secure the trailing link assembly to the rear housing.



11) Remove the bolts which secure the lateral assembly to the rear housing.



12) Remove the rear ABS wheel speed sensor from the back plate.

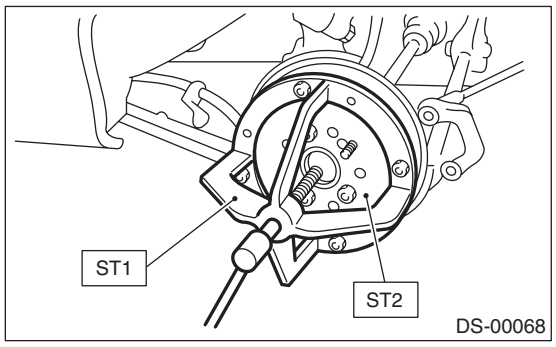


(1) ABS wheel speed sensor

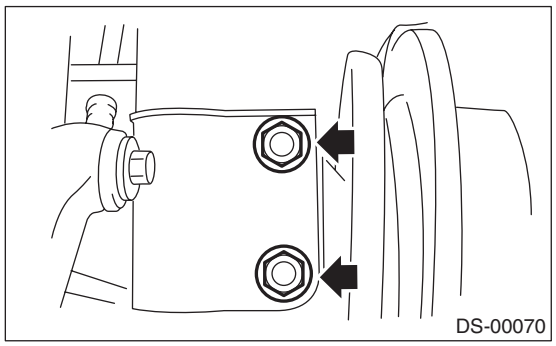
13) Disengage the BJ assembly from the hub splines, and remove the rear drive shaft assembly. If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
• Be careful not to damage the oil seal lip when removing the rear drive shaft.
• When rear drive shaft is to be replaced, also replace the inner oil seal with a new seal.



14) Remove the bolts which secure the rear housing to strut, and separate the two.

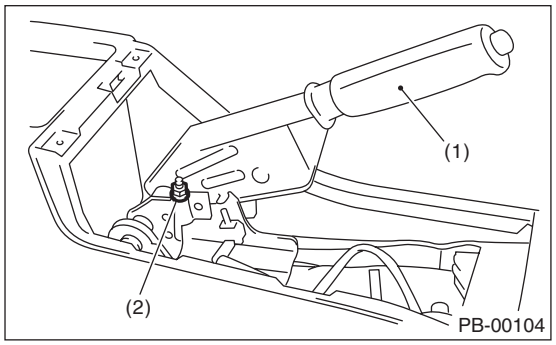


2. DRUM BRAKE

1) Disconnect the ground cable from the battery.
2) Lift up the vehicle, and then remove the rear wheels.
3) Lift the crimped section of axle nut.
4) While applying the parking brake, remove the axle nut using a socket wrench.

CAUTION:
Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.

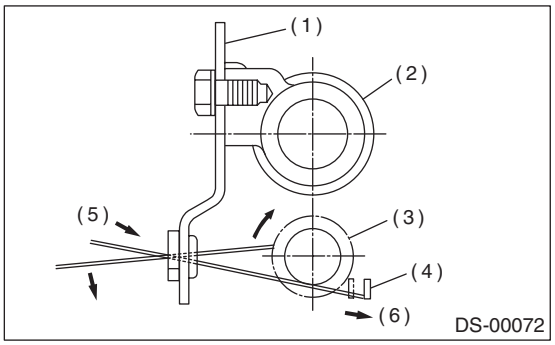
5) Return the parking brake lever and loosen the self locking nut.



(1) Parking brake lever
(2) Self-locking nut

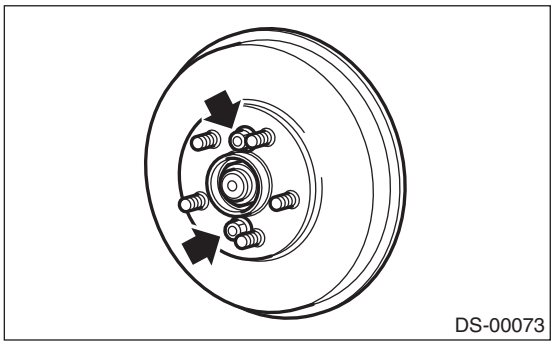
6) Remove the brake drum from hub.

7) If it is difficult to remove brake drum, remove the adjusting hole cover from the back plate, and then turn the adjusting screw using a slot-type screwdriver until the brake shoe separates from the drum.

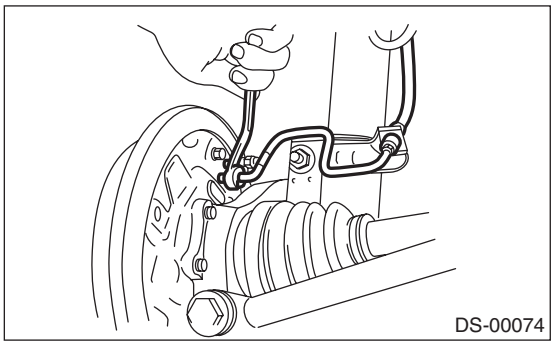


(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pole
(4) Adjusting lever
(5) Tightening direction
(6) Press

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

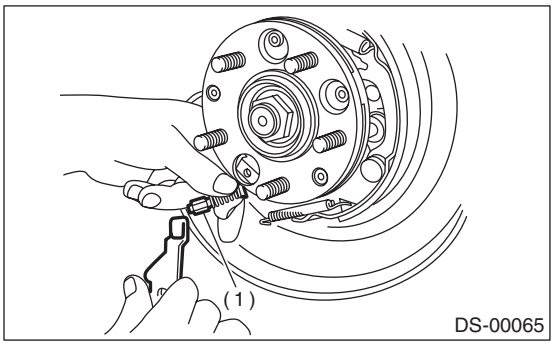


8) Using a flare-nut wrench, disconnect the brake pipe from the wheel cylinder. Place a cover on the brake pipe attachment hole of the wheel cylinder, to prevent entry of foreign particles.



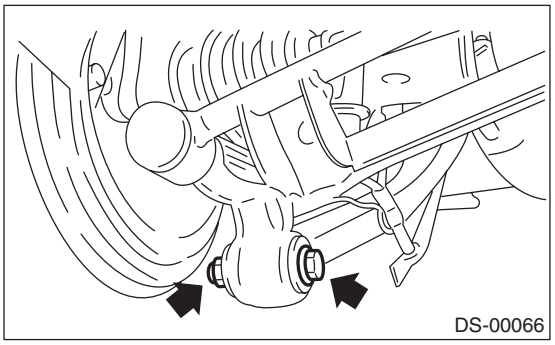
9) Cover the end of the brake pipe with a vinyl sheet or equivalent to prevent brake fluid from leaking out.

10) Disconnect the parking brake cable end from the parking brake lever.

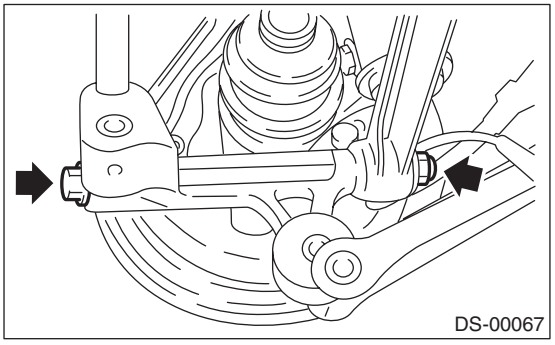


(1) Cable end

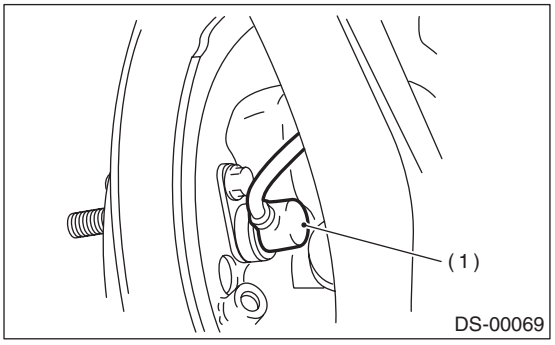
11) Disconnect the rear stabilizer from the rear lateral link. Remove the bolts which secure the trailing link assembly to the rear housing.



12) Remove the bolts which secure the lateral link assembly to the rear housing.



13) Remove the rear ABS wheel speed sensor from the back plate.



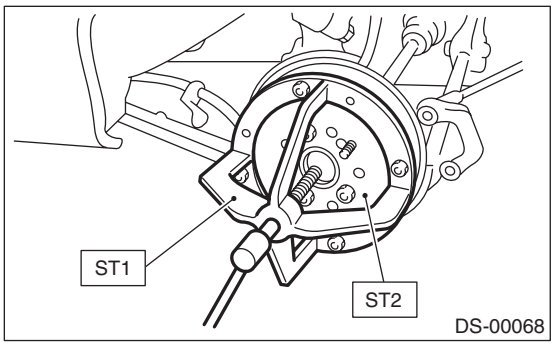
(1) ABS wheel speed sensor

14) Disengage the BJ assembly from the hub splines, and remove the rear drive shaft assembly.

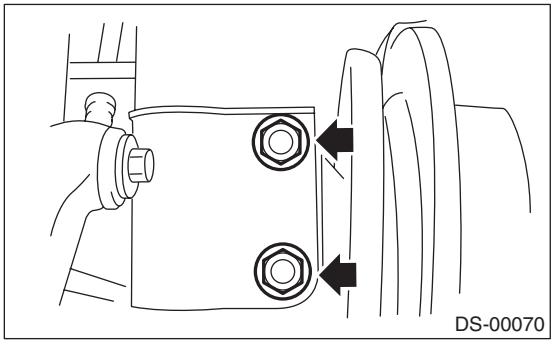
NOTE:
If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
• Be careful not to damage the oil seal lip when removing the rear drive shaft.
• When rear drive shaft is to be replaced, also replace the inner oil seal with a new seal.



15) Remove the bolts which secure the rear housing to strut, and separate the two.

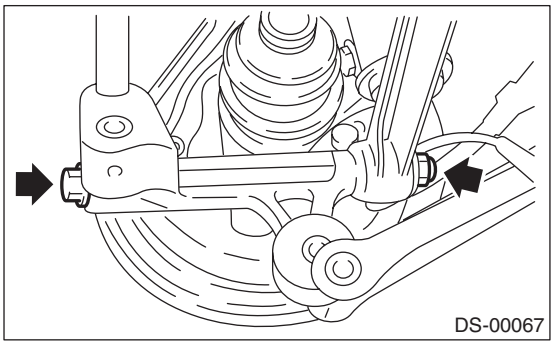


B: INSTALLATION

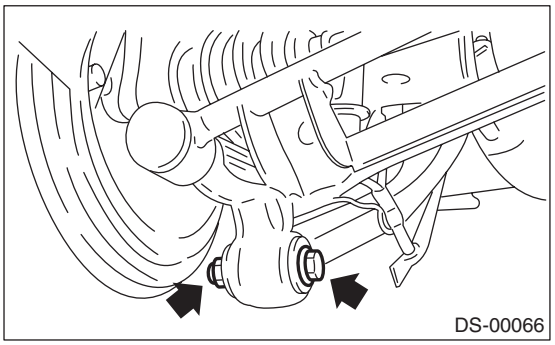
1. DISC BRAKE

1) Temporarily tighten the rear axle to the strut.
2) Insert the rear drive shaft into the rear axle.

CAUTION:
Be careful not to damage the inner oil seal lip.
3) Tighten the axle nut temporarily.
4) Using new self-locking nuts, temporarily attach the rear housing assembly and the rear lateral link assembly.



5) Using new self-locking nuts, temporarily attach the rear housing assembly and the trailing link assembly.



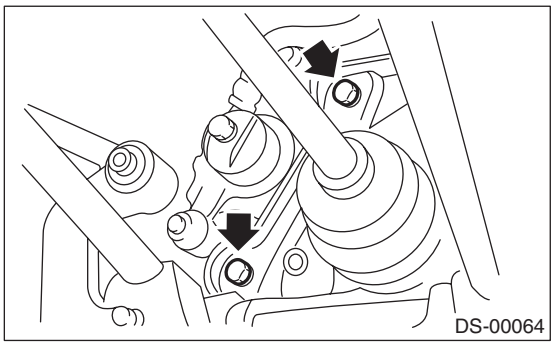
6) Using new self-locking nuts, secure the rear housing assembly and the strut assembly.

Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)
7) Using new self-locking nuts, install the rear stabilizer and rear lateral link.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)
8) Connect the parking brake cable to the parking brake lever.
9) Install the disc rotor on the rear housing assembly.

10) Install the disc brake caliper on the back plate.

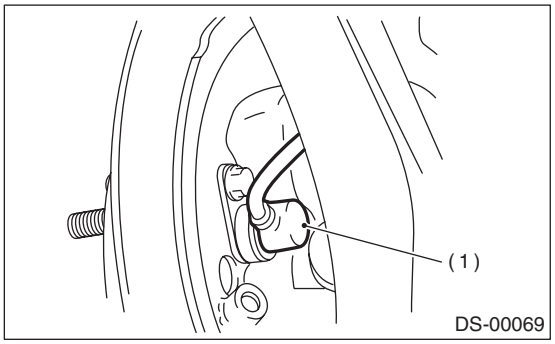
Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)



11) Adjust the parking brake lever stroke by turning the adjuster. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>
12) While applying the parking brake, tighten a new axle nut using the socket wrench. After tightening, crimp the axle nut.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
Do not overtighten it as this may damage the wheel bearing.
13) Install the rear ABS wheel speed sensor.



(1) ABS wheel speed sensor

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

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)
15) Make the tires completely touch the ground.

CAUTION:
Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.
16) Tighten the rear housing assembly and lateral link assembly installation bolts.

Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)

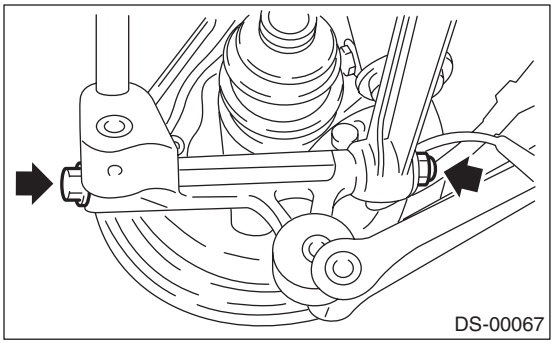
17) Tighten the rear housing assembly and trailing link assembly installation bolts.

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

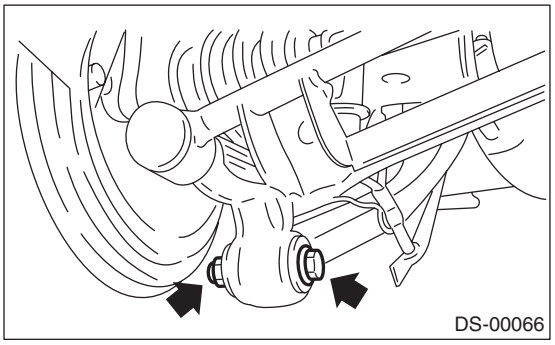
2. DRUM BRAKE

1) Temporarily tighten the rear axle to the strut.
2) Insert the rear drive shaft into the rear axle.

CAUTION:
Be careful not to damage the inner oil seal lip.
3) Tighten the axle nut temporarily.
4) Using new self-locking nuts, temporarily attach the rear housing assembly and the rear lateral link assembly.



5) Using new self-locking nuts, temporarily attach the rear housing assembly and the trailing link assembly.



6) Using new self-locking nuts, secure the rear housing assembly and the strut assembly.

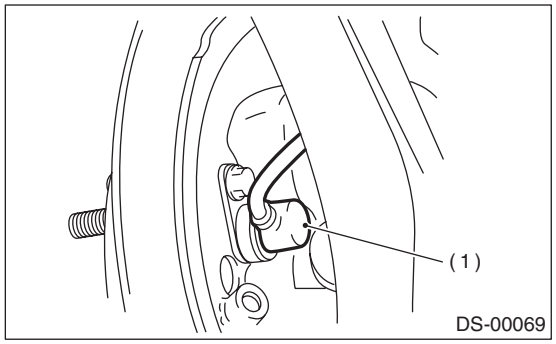
Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)
7) Using new self-locking nuts, install the rear stabilizer and rear lateral link.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)
8) Connect the parking brake cable to the parking brake lever.
9) Clean the brake pipe connection. Using a flare-nut wrench, connect the brake pipe to the wheel cylinder.
10) Connect the parking brake cable to the lever.
11) Install the brake drum on the rear housing assembly.

12) Bleed air from brake system. <Ref. to BR-42, REPLACEMENT, Brake Fluid.>
13) Adjust the parking brake lever stroke by turning the adjuster. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>
14) While applying the parking brake, remove the axle nut using a socket wrench. After tightening, crimp the axle nut.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
Do not overtighten it as this may damage the wheel bearing.
15) Attach the rear ABS wheel speed sensor to the back plate.



(1) ABS wheel speed sensor

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

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)
17) Make the tires completely touch the ground.

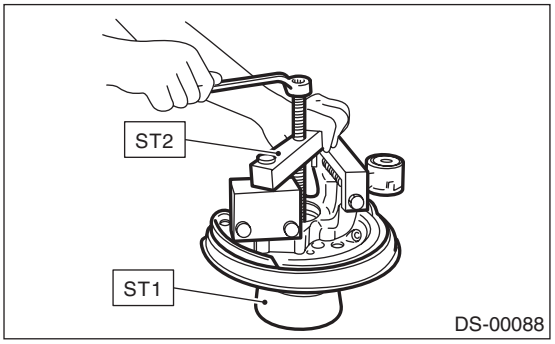
CAUTION:
Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.
18) Tighten the rear housing assembly and lateral link assembly installation bolts.

Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)
19) Tighten the rear housing assembly and trailing link assembly installation bolts.

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

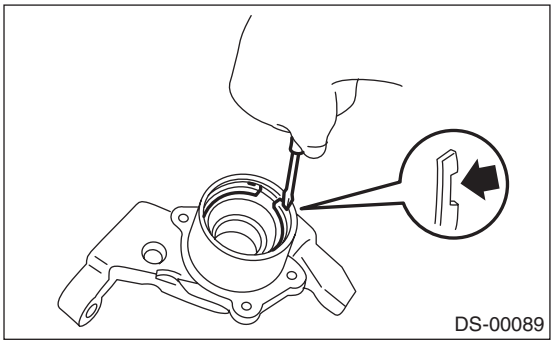
C: DISASSEMBLY

1) Using ST1 and ST2, remove the hub from the rear housing.
ST1 927080000 HUB STAND
ST2 927420000 HUB REMOVER

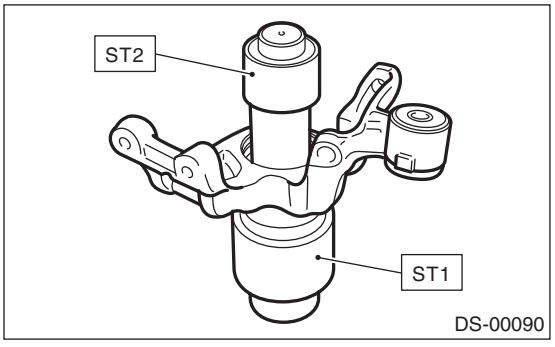


2) Remove the back plate from the rear housing.
3) Remove the outer and inner oil seals using a flat tip screwdriver.
4) Remove the snap ring using a flat tip screwdriver.

CAUTION:
Be careful not to damage housing during removal.



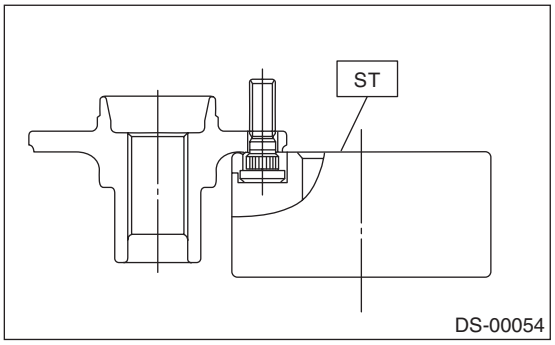
5) Using ST1 and ST2, remove the bearing by pressing the inner race.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER



6) Remove the tone wheel bolts and remove the tone wheel from the hub.

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

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

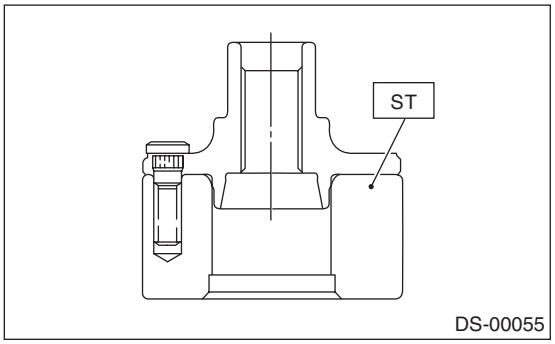


D: ASSEMBLY

NOTE:
When the hub is removed from the housing, replace the bearing set and oil seal.
1) Using the ST, press the new hub bolt into place.

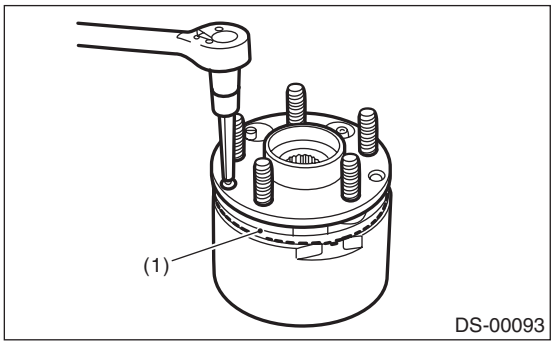
NOTE:
- Make sure the hub bolt contacts the hub.
- Use the 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

ST 927080000 HUB STAND



2) Remove the foreign particles (dust, rust, etc.) from the mating surfaces of hub tone wheel, and install the tone wheel to the hub.

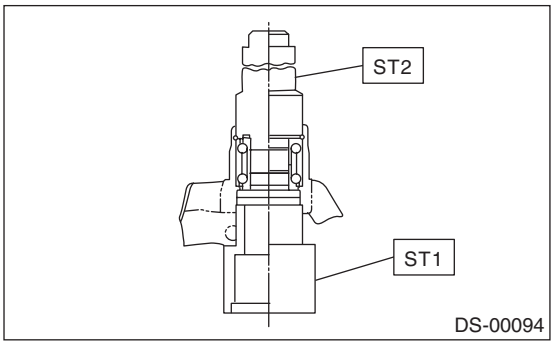
NOTE:
- Make sure the tone wheel contacts the hub.
- Be careful not to damage the tone wheel teeth.



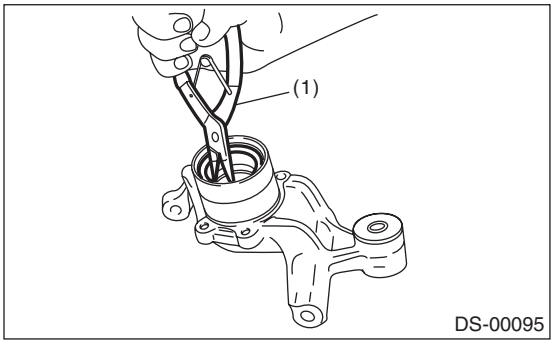
(1) Tone wheel

3) Clean the housing interior completely. Using ST1 and ST2, press the bearing into the housing.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:
- **Always press the outer race when installing bearings.**
- **Be careful not to remove the plastic lock from the inner race when installing the bearings.**

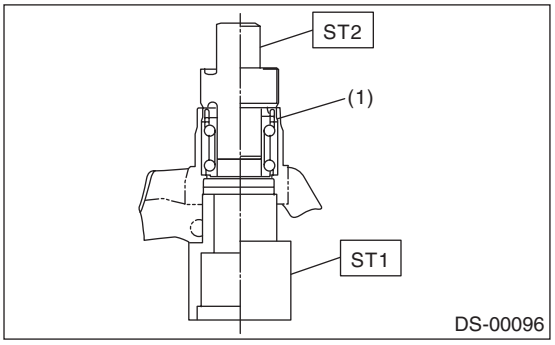


4) Using a pliers, securely install the snap ring.



(1) Pliers

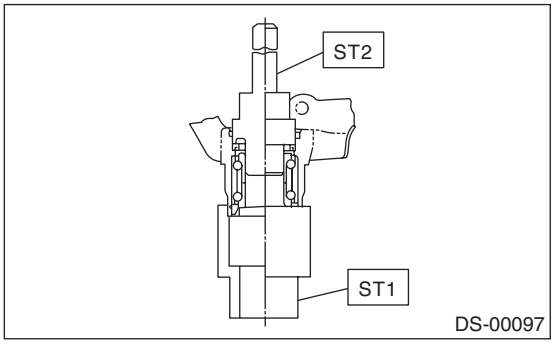
5) Using the ST1 and ST2, press the outer oil seal until it comes in contact with snap ring.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



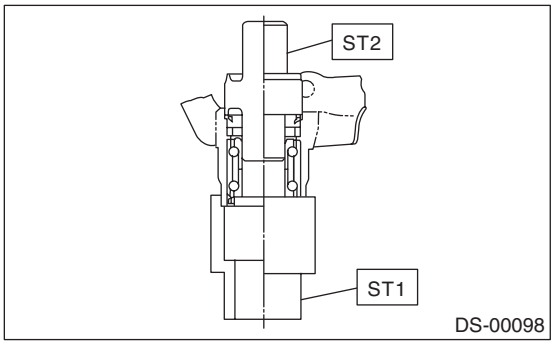
(1) Snap ring

6) Invert both ST1 and housing (up and down).

7) Using ST2, press the inner oil seal into the housing until it touches the bottom.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



8) Using ST1 and ST2, press the sub seal into place.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



9) Apply sufficient grease to the oil seal lip.

Grease:
SHELL 6459N

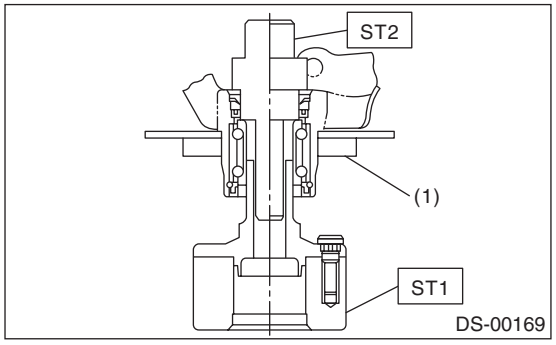
NOTE:
If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.

CAUTION:
Do not mix different types of grease.

10) Install the back plate to the rear housing.

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

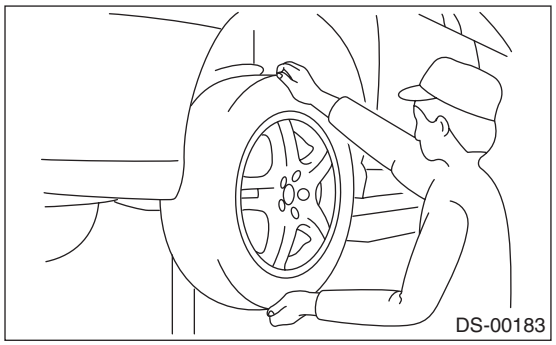
11) Using ST1 and ST2, press the bearing into the hub.
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER



(1) Back plate

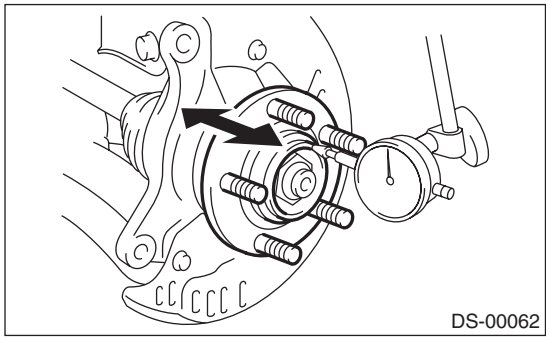
E: INSPECTION

1) While moving the rear tire up and down by hand, check that there is no looseness of the bearing, and check that the wheel rotates smoothly.



2) Inspect the play in the axial direction using a dial gauge. Replace the hub bearing if the play exceeds the limit value.

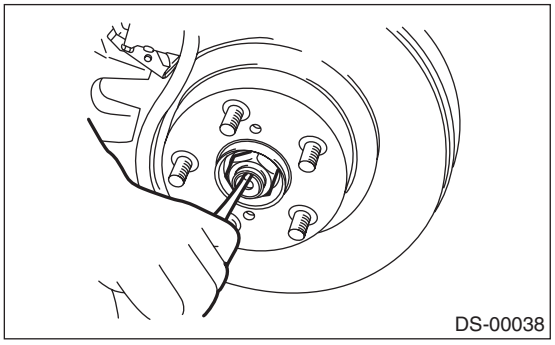
Limit:
Max:
0.05 mm (0.0020 in)



5. Front Drive Shaft

A: REMOVAL

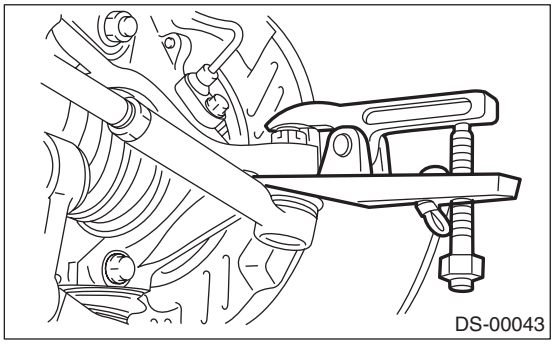
1) Lift up the vehicle, and remove the front wheels.
2) Drain the transmission gear oil. (MT model)
3) Drain the differential gear oil. (AT model)
4) Lift the crimped section of axle nut.



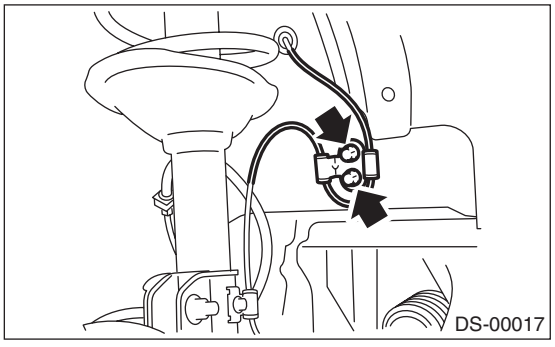
5) Depress the brake pedal and remove the axle nut using a socket wrench.

CAUTION:
Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.

6) Remove the cotter pin and castle nut. Using a puller, remove the tie-rod end.

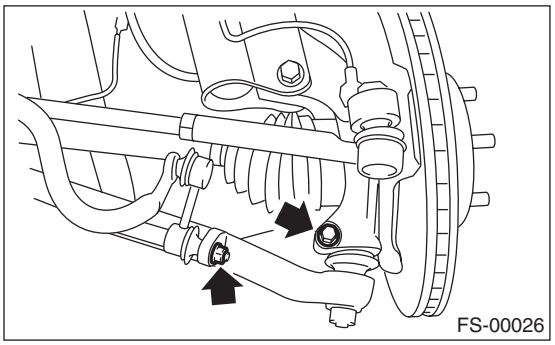


7) Remove the bracket of the ABS wheel speed sensor.



8) Remove the front stabilizer link from the transverse link.

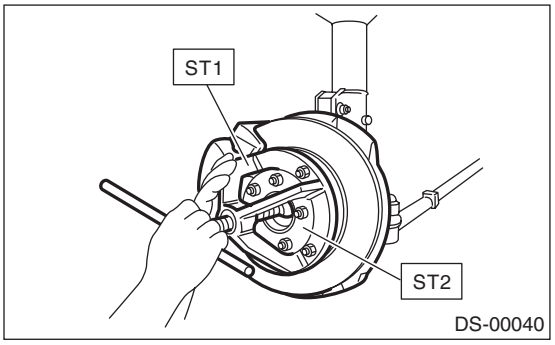
9) Remove the bolts which secure the ball joint. Remove the transverse link from the front housing.



10) Pull out the front drive shaft from the front axle. If it is hard to remove, use ST1 and ST2.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

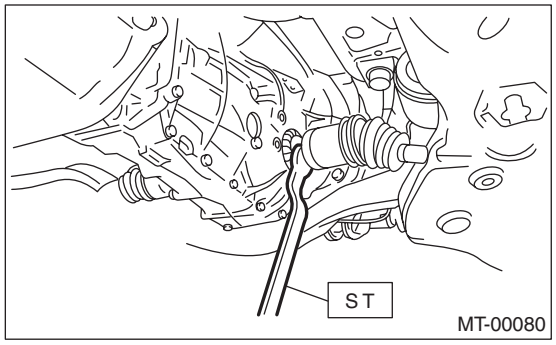
CAUTION:
- **When removing the drive shaft, do not hammer the shaft.**
- **Do not damage the oil seal and tone wheel.**
- **When replacing the front drive shaft, also replace the inner oil seal.**



11) Using the ST, remove the front drive shaft from the transmission.
ST 28399SA000 DRIVE SHAFT REMOVER

NOTE:
• The direction of the ST differs by type of the transmission to be installed.
• For AT model, use ST with the “AT” stamped side facing the transmission side. For MT model, use the ST with the “MT” stamped side facing the transmission side.

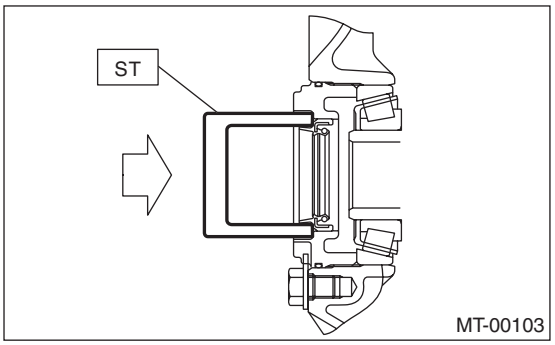
CAUTION:
Be careful not to allow the ST to contact the holder area.



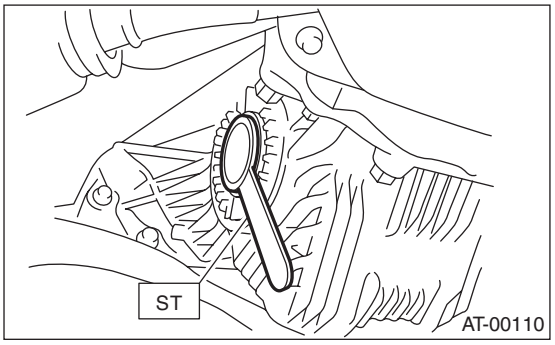
B: INSTALLATION

1) Using the ST, replace the differential side retainer oil seal with a new seal.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

CAUTION:
Always replace the differential side retainer oil seal with a new seal after removing the drive shaft.



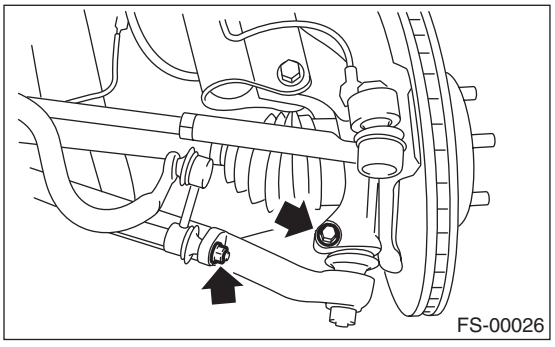
2) Insert the front drive shaft into the front axle.
3) Tighten the axle nut temporarily.
4) Using the ST, install the front drive shaft to the transmission while protecting the differential side retainer oil seal.
ST 28399SA010 OIL SEAL PROTECTOR



5) Install the ball joint to the front axle.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)
6) Install the stabilizer link.

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

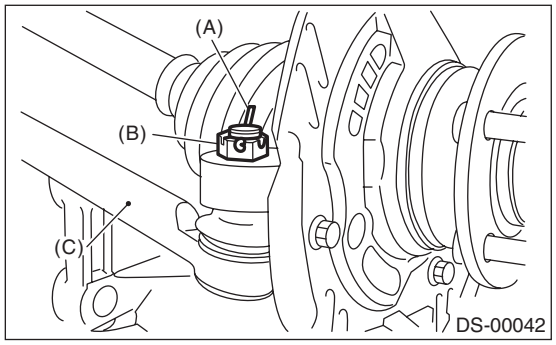


7) Install the tie-rod end.

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

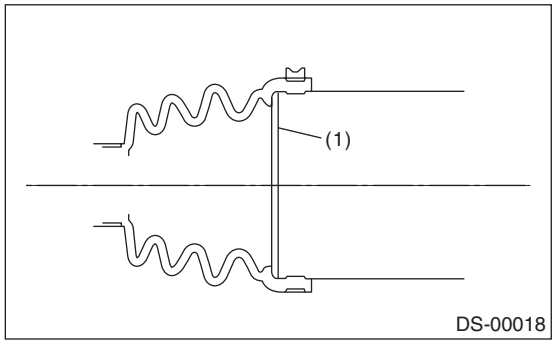
CAUTION:
When connecting the tie-rod, do not hit the cap at bottom of tie-rod end with a hammer.

8) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



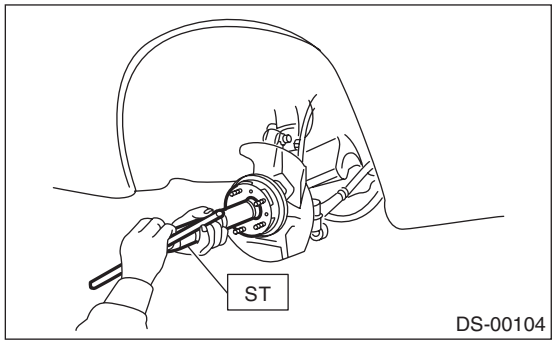
(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

9) Check whether or not the AARi retainer has moved from its prescribed position.



(1) Retainer

10) Using ST1 and ST2, pull the front drive shaft into the required position.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

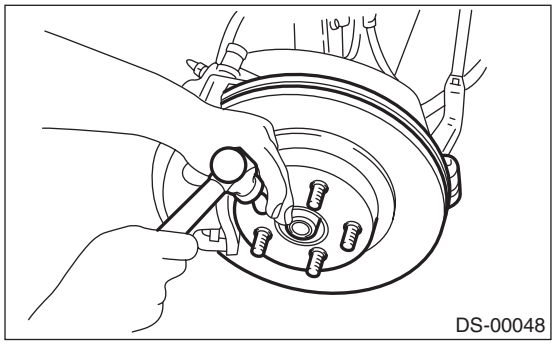


11) While pressing the brake pedal, tighten a new axle nut to the specified torque.

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

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

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



13) Install the ABS wheel speed sensor bracket.

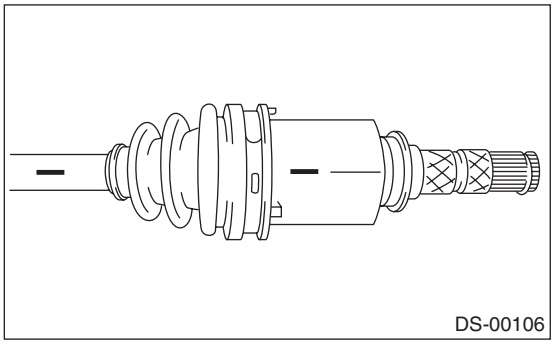
Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

14) Add the transmission gear oil. (MT model)
15) Add the differential gear oil. (AT model)
16) Install the wheel.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

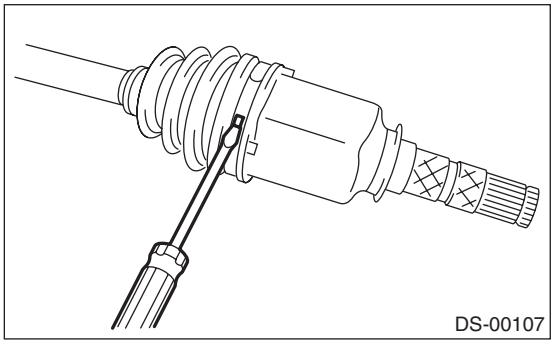
C: DISASSEMBLY

1) Place alignment marks on the shaft and outer race.



2) Remove the AARi boot band and boot.

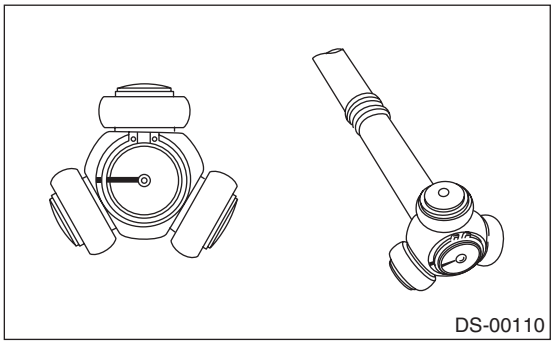
CAUTION:
Be careful not to damage the boot.



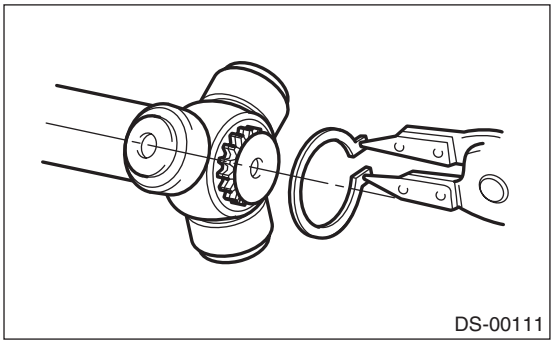
3) Remove the AARi outer race from the shaft assembly.
4) Wipe off grease.

CAUTION:
This grease is a special type of grease. Do not mix it with other grease.

5) Place alignment marks on the trunnion and shaft.



6) Remove the snap ring and trunnion.



7) Remove the AARi boot.

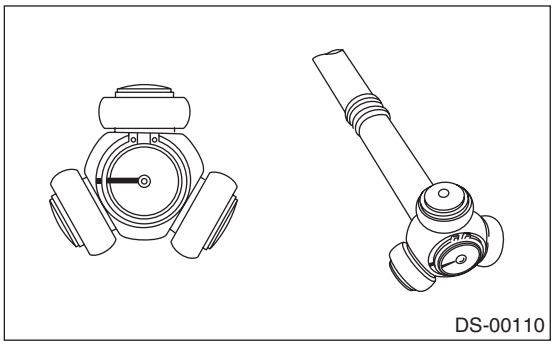
CAUTION:
Be sure to wrap shaft splines with vinyl tape to protect the boot from scratches.

D: ASSEMBLY

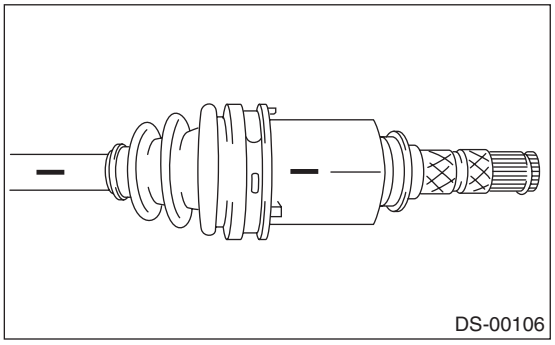
NOTE:
Use specified grease.

Grease:
AARi side:
ONE LOUVER C (Part No. 28395SA000)

1) Pass the AARi boot and the retainer through the shaft and place at the center.
2) Align the alignment marks and install the trunnion on the shaft.



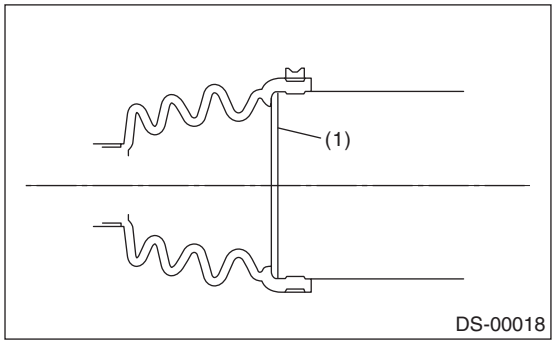
3) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of AARi outer race.
4) Apply a thin coat of specified grease to the free ring and trunnion.
5) Align the alignment marks of the shaft and outer race, and install the outer race.



6) 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.
7) Install the AARi boot taking care not to twist it.

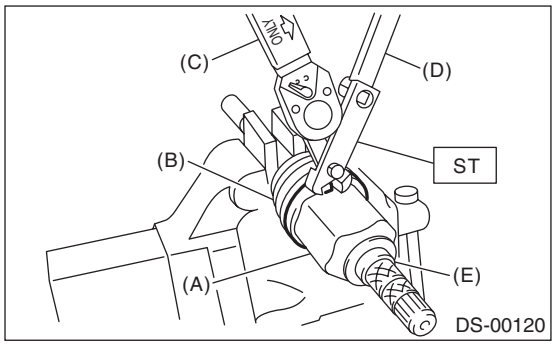
CAUTION:
• The inside of the larger end of the AARi boot and the boot groove is to be cleaned so as to be free of grease and other foreign substances.
• When installing the AARi boot, position the outer race of the AARi at the center of the stroke.

8) Check the position of the retainer.



(1) Retainer

9) Install the new large boot band and small boot band at the required positions.
10) Tighten the 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) AARi

Clearance at the crimped section of the boot band:
Large boot band
1 mm (0.04 in) or less
Small boot band
1 mm (0.04 in) or less

11) Extend and retract the AARi repeatedly to ensure an equal grease coating.

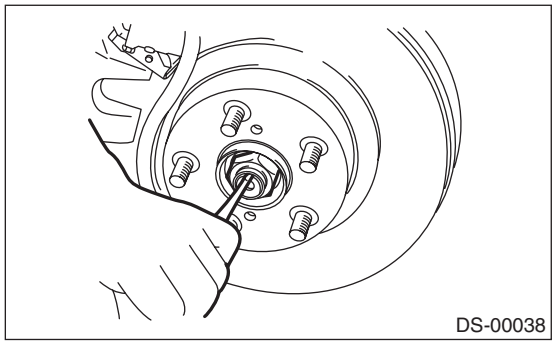
E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. Repair or replace if defective.
1) AARi
Check for seizure, corrosion, damage and excessive play.
2) Shaft
Check for excessive bending, twisting, damage and wear.
3) AC
Check for seizure, corrosion, damage and excessive play.
4) Boot
Check for wear, warping, breakage and scratches.
5) Grease
Check for discoloration and fluidity.

6. Rear Drive Shaft

A: REMOVAL

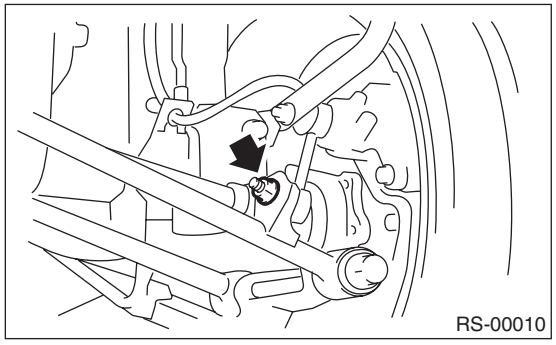
1) Disconnect the ground cable from the battery.
2) Lift up the vehicle, and then remove the rear wheels.
3) Lift the crimped section of the axle nut.



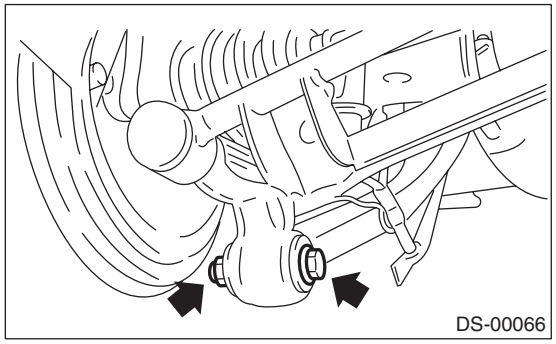
4) While applying the parking brake, remove the axle nut using a socket wrench.

CAUTION:
Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.

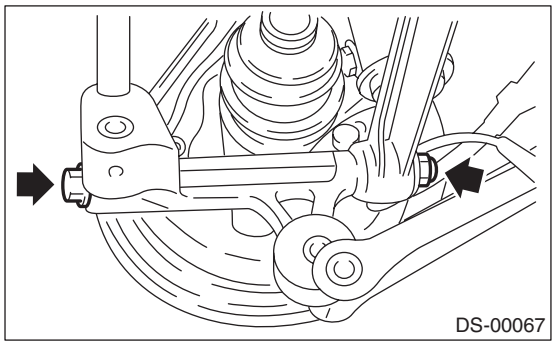
5) Remove the rear stabilizer link.



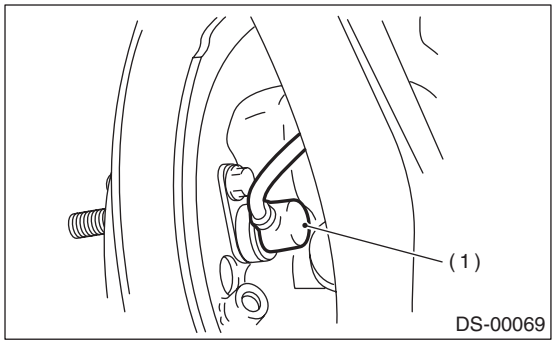
6) Remove the bolts which secure the trailing link to the housing.



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



8) Remove the rear ABS wheel speed sensor from the back plate.

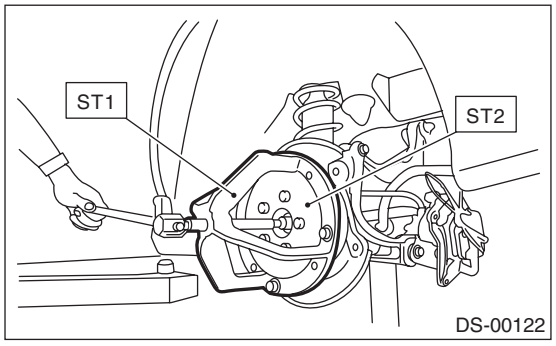


(1) ABS wheel speed sensor

9) Remove the rear drive shaft from the rear axle. If it is hard to remove, use ST1 and ST2 to remove the brake disc rotor.

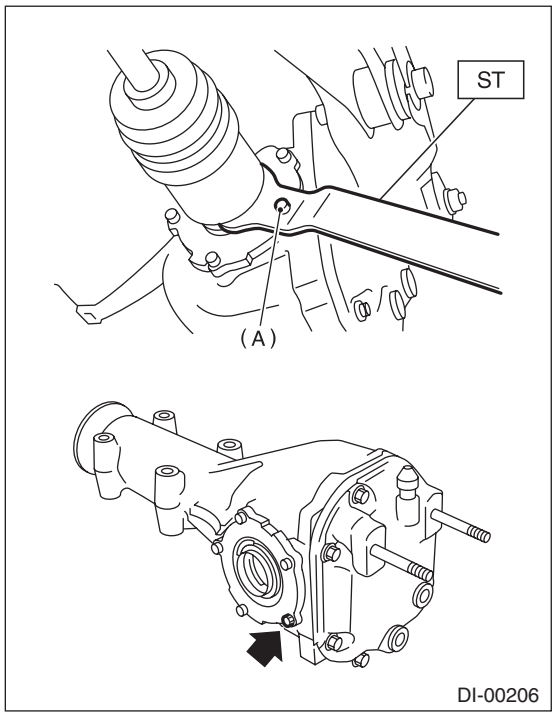
ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
- **Do not hammer the drive shaft when removing it.**
- **Do not damage the oil seal and tone wheel.**



10) Remove the rear drive shaft from the rear differential by using the ST.
ST 28099PA100 DRIVE SHAFT REMOVER

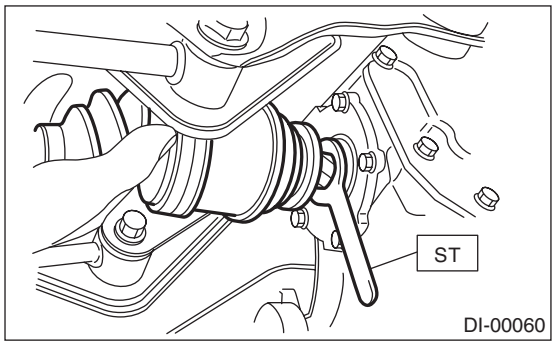
CAUTION:
As shown in the figure, set the ST to the bolt (A) without damaging the side bearing retainer.



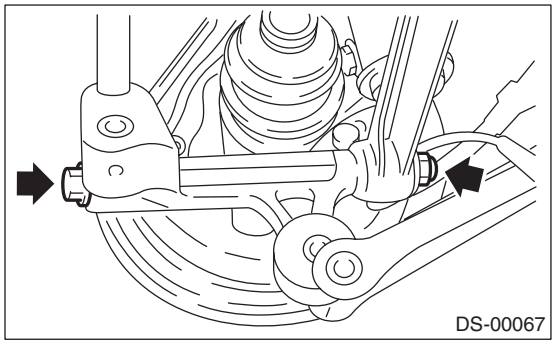
(A) Bolt

B: INSTALLATION

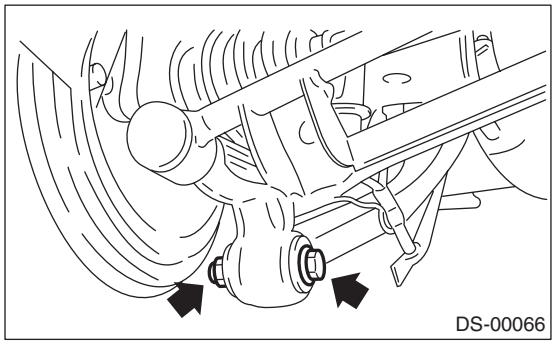
1) Insert the rear drive shaft into the rear axle.
2) Tighten the axle nut temporarily.
3) Using the ST, install the rear drive shaft to the rear differential while protecting the oil seal.
ST 28099PA090 OIL SEAL PROTECTOR



4) Using new self-locking nuts, temporarily tighten the front and rear lateral links to the housing.

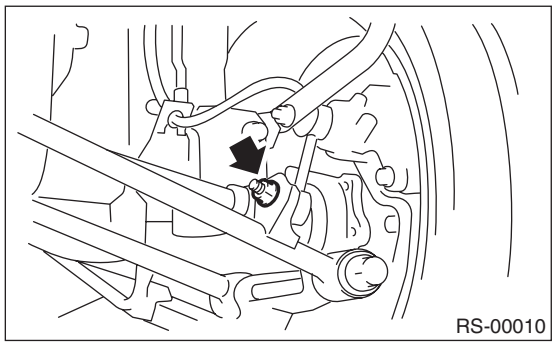


5) Using new self-locking nuts, temporarily attach the trailing link to the housing.



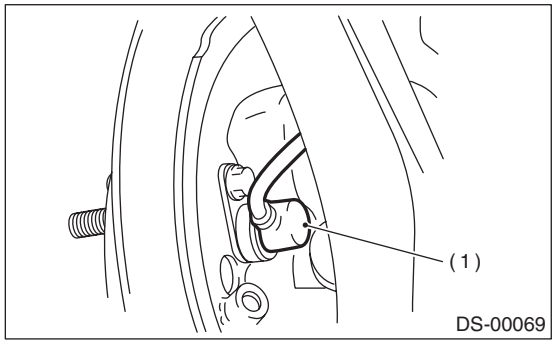
6) Install the stabilizer link.

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



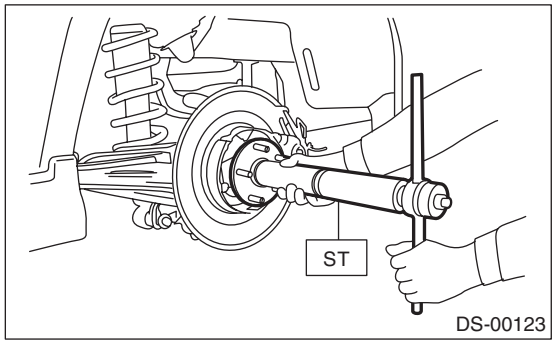
7) Install the ABS wheel speed sensor.

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



(1) ABS wheel speed sensor

8) Using ST1 and ST2, pull the rear drive shaft to the required location.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

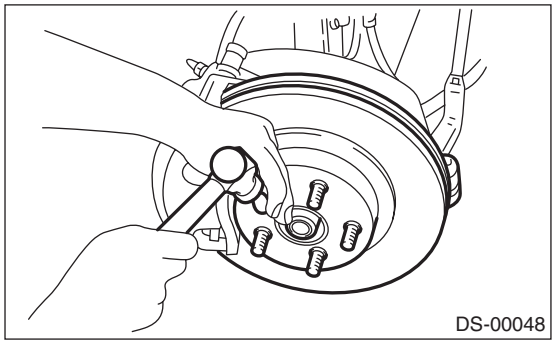


9) While applying the parking brake pedal, tighten the new axle nut to the specified torque.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

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

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



11) Install the wheel.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

12) Make the tires completely touch the ground.

CAUTION:
Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.

13) Tighten the rear housing assembly and lateral link assembly installation bolts.

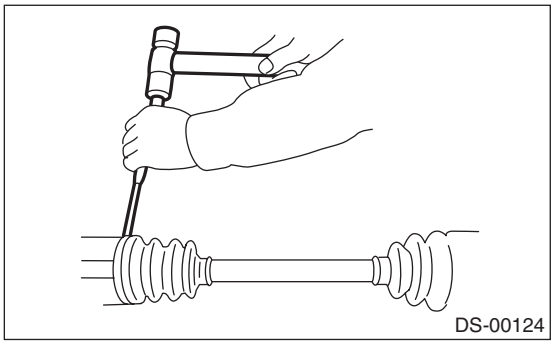
Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)

14) Tighten the rear housing assembly and trailing link assembly installation bolts.

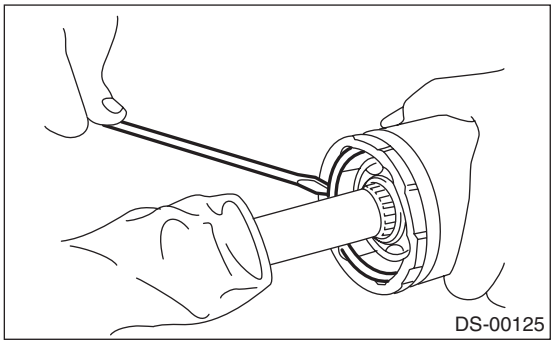
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

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

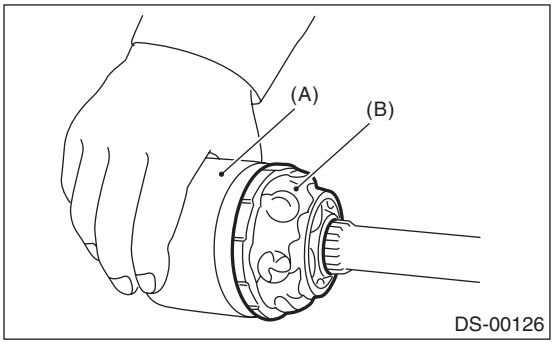

DS-00124

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


DS-00125

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

CAUTION:
• The grease is a special grease (grease for constant velocity joints). Do not mix with other greases.
• Disassemble while being careful not to lose ball bearings (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 move the cage.
9) Using pliers, remove the snap ring fixing the inner race to the shaft.
10) Take out the DOJ inner race.
11) Take off the DOJ cage from shaft and remove the DOJ boot.
12) Wrap vinyl tape around the spline part of shaft.
13) Remove the EBJ boot using the same procedures as for the DOJ boot.

NOTE:
The EBJ is a non-disassembly part, so the axle disassembly stops here.

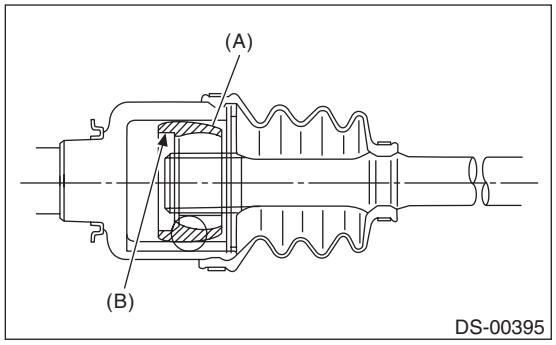
D: ASSEMBLY

NOTE:
Use specified grease.

Grease:
EBJ side
NKG106 (Part No. 28395TC000)
DOJ side:
NKG205 (Part No. 28495AG000)

1) Install the EBJ boot to the specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
2) Place the DOJ boot at the center of shaft.
3) Wrap vinyl tape around the spline part of shaft.
4) Insert the DOJ cage onto shaft.

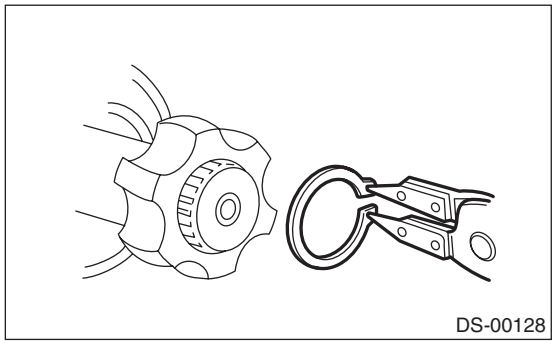
CAUTION:
The cage has a set orientation. Insert the cage with the cutout portion facing the shaft side.



(A) Cage
(B) Cutout portion

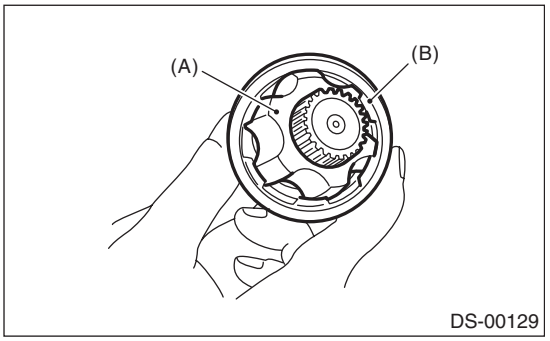
5) Install the DOJ inner race on shaft and fix the snap ring in place with pliers.

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



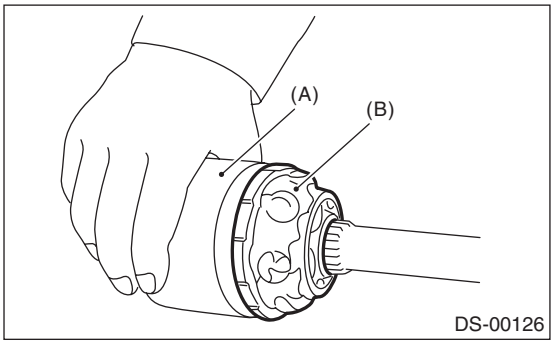
6) Install the removed cage, to the inner race fixed onto the shaft.

NOTE:
Fit the cage with the protruding section aligned with the track on the inner race, and turn by a half pitch.



(A) Inner race
(B) Cage

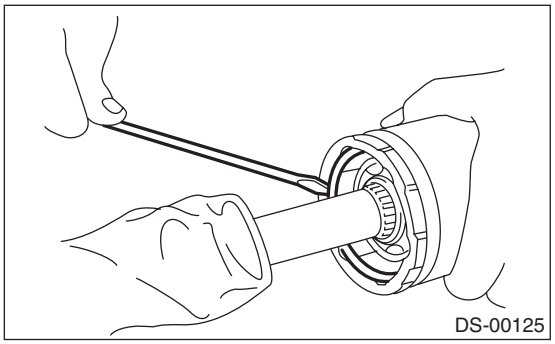
7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the inner side of the DOJ outer race.
8) Apply a thin coat of specified grease to the cage pocket and six ball bearings.
9) Insert the six ball bearings into the cage pocket.
10) Align the outer race track and ball positions, and place the shaft, inner race, cage and ball bearings in the original positions, then fix outer race in place.



(A) Outer race
(B) Grease

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

CAUTION:
• Make sure that the balls, cage and inner race are firmly fitted in the outer race of the DOJ.
• Take care not to place the matching position of the circlip in the ball groove of outer race.
• Pull the shaft lightly to make sure that the circlip is completely fitted in the groove.

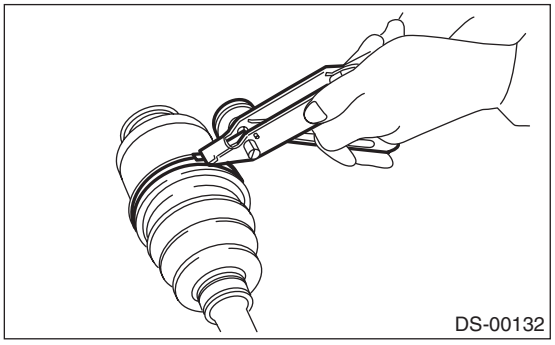

DS-00125

12) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to the shaft.
13) Install the DOJ boot taking care not to twist it.

NOTE:
• The inside of the larger end of DOJ boot and the boot groove is to be cleaned so as to be free from grease and other foreign substances.
• When installing the DOJ boot, position the outer race of DOJ at center of the stroke.
14) Put a new band through the clip and wind twice in the band groove of the boot.
15) Pinch the end of band with pliers. Hold the clip and tighten securely.

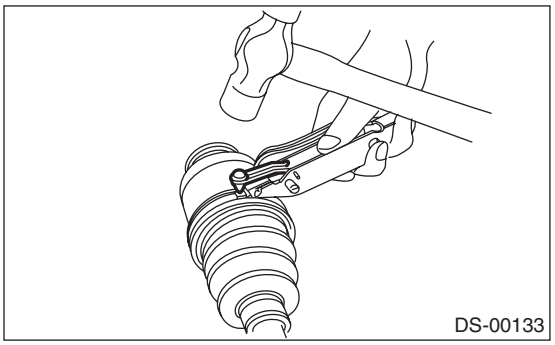
CAUTION:
When tightening the boot, exercise care so that the air within the boot is appropriate.
16) Tighten the band using the ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tighten the band until it cannot be moved by hand.


DS-00132

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

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


DS-00133

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

CAUTION:
Make sure that the end of the band is in close contact with clip.
19) Install EBJ boot in the same manner.
20) Extend and retract the DOJ repeatedly to provide an equal coating of grease.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. Repair or replace if defective.
1) DOJ (Double Offset Joint)
Check for seizure, corrosion, damage, wear and excessive play.
2) Shaft
Check for excessive bending, twisting, damage and wear.
3) EBJ
Check for seizure, corrosion, damage and excessive play.
4) Boot
Check for wear, warping, breakage and scratches.
5) Grease
Check for discoloration and 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.

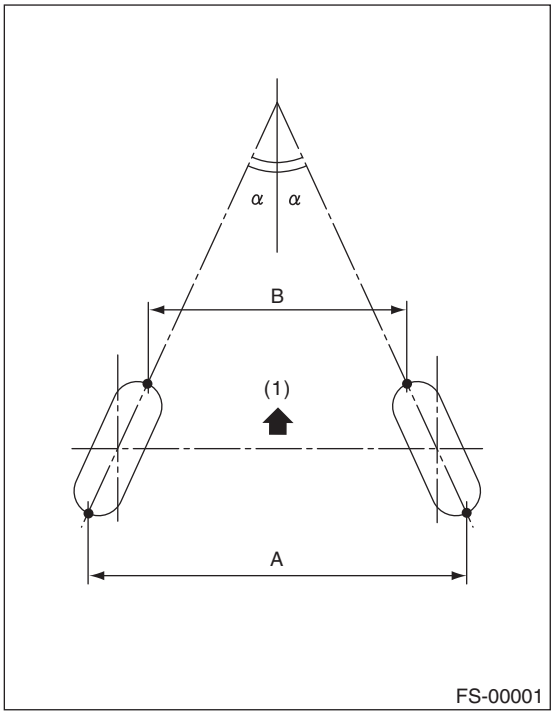
Symptom	Possible cause	Corrective action
Noise or vibration from propeller shaft	Center bearing	Check the center bearing. <Ref. to DS-16, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>
	Runout of propeller shaft	Check for deflection of the propeller shaft. <Ref. to DS-16, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>
	Loose or gap at connections	Check the joints and connectors. <Ref. to DS-15, JOINTS AND CONNECTORS, INSPECTION, Propeller Shaft.>
		Check the spline and bearing. <Ref. to DS-15, SPLINES AND BEARING LOCATIONS, INSPECTION, Propeller Shaft.>
Abnormal wheel vibration	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Wheel alignment	Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-13, INSPECTION, Rear Strut.>
	Front drive shaft	Check the front drive shaft. <Ref. to DS-35, INSPECTION, Front Drive Shaft.>
	Rear drive shaft	Check the rear drive shaft. <Ref. to DS-41, INSPECTION, Rear Drive Shaft.>
	Front axle	Check the wheel alignment. <Ref. to DS-21, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-29, INSPECTION, Rear Axle.>
Noise from the underbody	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Wheel alignment	Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-13, INSPECTION, Rear Strut.>

1. General Description

A: SPECIFICATION

Model		Non-turbo	Turbo
Front	Camber (Tolerance: ±0°45′Differences between RH and LH 45′ or less)	–0°25′	
	Caster (Reference)	3°03′	
	Toe-in	0±3 mm (0±0.12 in) Toe angle (sum of both wheels): 0°±0°15′	
	Kingpin angle (Reference)	13°12′	
	Wheel arch height (Tolerance: $^{+12}_{-24}$ mm ($^{+0.47}_{-0.94}$ in))	437 mm (17.20 in)	
Rear	Camber (Tolerance: ±0°45′Differences between RH and LH 45′ or less)	–0°50′	–0°55′
	Toe-in	2±3 mm (0.079±0.12 in) Toe angle (sum of both wheels): 0°10′±0°15′	
	Thrust angle	0°±30′	
	Wheel arch height (Tolerance: $^{+12}_{-24}$ mm ($^{+0.47}_{-0.94}$ in))	440 mm (17.32 in)	435 mm (17.13 in)

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

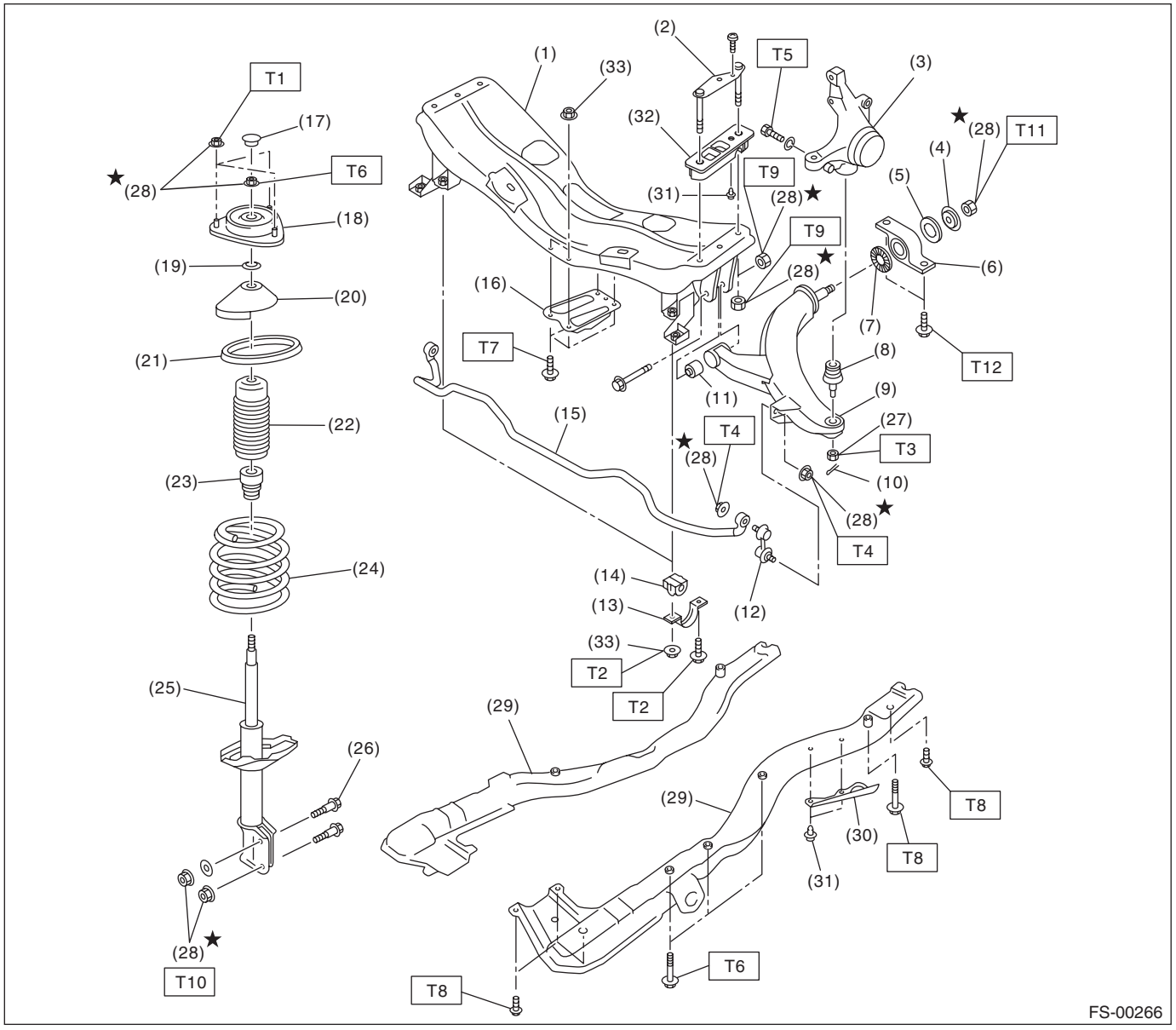


(1) Front

A – B = Positive: Toe-in, Negative: Toe-out

α = Individual toe angles

B: COMPONENT


T1
(17)
T6
(28)★
(18)
(19)
(20)
(21)
(22)
(23)
(24)
(25)
(26)
(28)★
T10
(2)
(1)
(33)
T5
(3)
(32)
(28)★
T11
(4)
(5)
T9
(31)
(28)★
T9
(28)★
(6)
(16)
(7)
T7
(8)
T12
(11)
(9)
(15)
(27)
T4
(28)★
T3
(10)
(28)★
T4
(14)
(12)
(13)
(33)
T2
T2
(29)
(29)
T8
(30)
T8
(31)
T6
T8
FS-00266

(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) Sub frame
(30) Cover
(31) Clip
(32) Spacer
(33) Flange nut

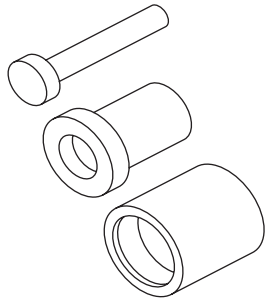
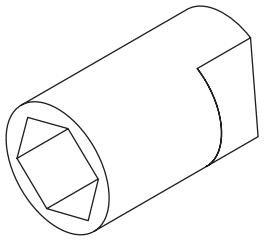
Tightening torque:N·m (kgf-m, ft-lb)	
T1:	*20 (2.0, 14.5)*
T2:	*25 (2.5, 18.1)*
T3:	*40 (4.1, 30) (Tighten an additional 60°)*
T4:	*45 (4.6, 33)*
T5:	*50 (5.1, 37)*
T6:	*55 (5.6, 41)*
T7:	*70 (7.1, 52)*
T8:	*71 (7.2, 52)*
T9:	*100 (10.2, 74)*
T10:	*175 (17.8, 129)*
T11:	*190 (19.4, 140)*
T12:	*250 (25.5, 184)*

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing the transverse link bushing.
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling the strut and shock mount.

2. GENERAL TOOL

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

2. Wheel Alignment

A: INSPECTION

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

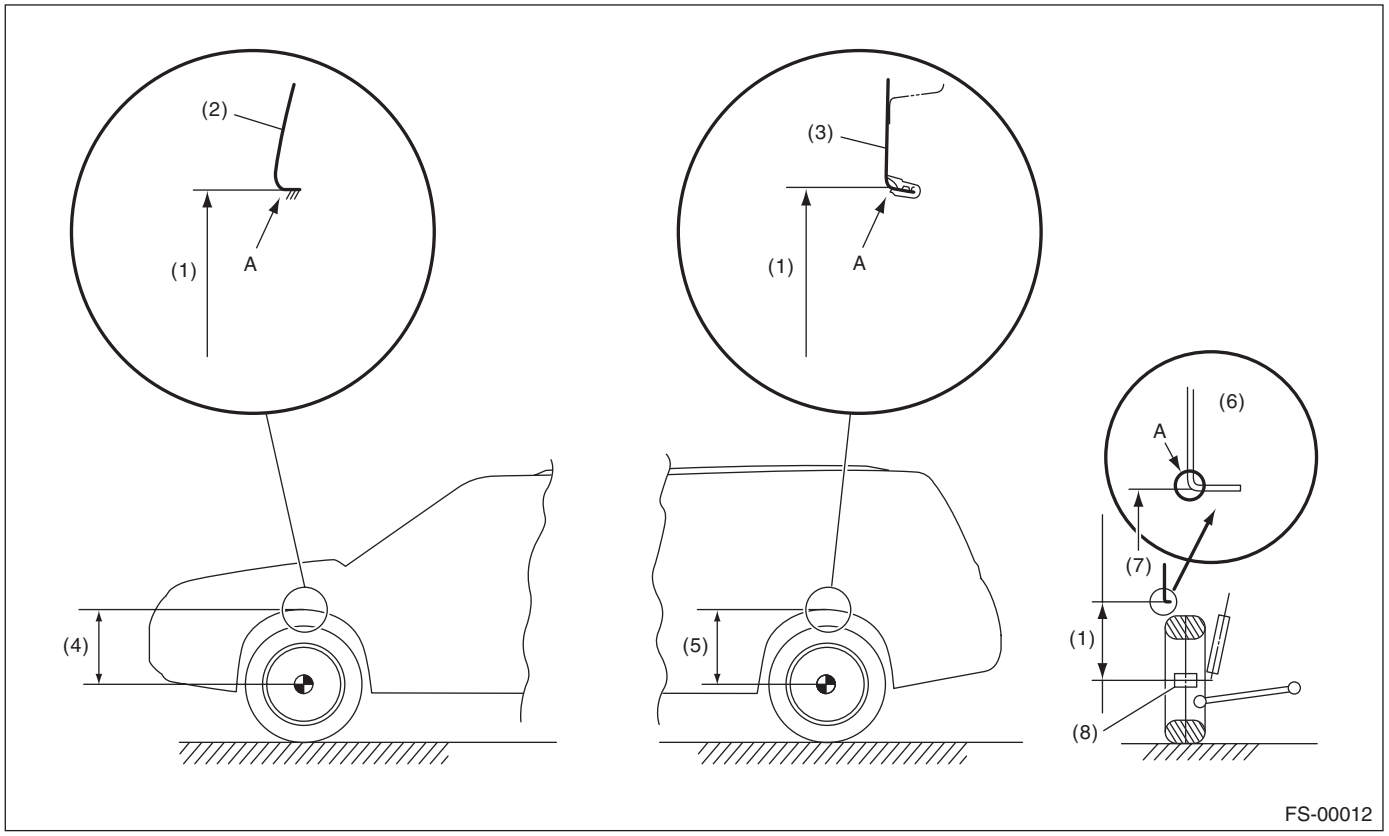
- Tire inflation pressure
- Uneven wear of RH and LH tires, or difference of sizes
- Tire runout
- Excessive play and wear of ball joint
- Excessive play and wear of tie rod end
- Excessive play of wheel bearing
- Right and left wheel base imbalance
- Deformation and excessive play of steering link
-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

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

Wheel arch height (front and rear wheels) <Ref. to FS-7, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (front and rear wheels) <Ref. to FS-8, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (front wheel) <Ref. to FS-10, CASTER, INSPECTION, Wheel Alignment.>
↓
Steering angle <Ref. to FS-10, STEERING ANGLE, INSPECTION, Wheel Alignment.>
↓
Front wheel toe-in <Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Rear wheel toe-in <Ref. to FS-11, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Thrust angle <Ref. to FS-13, THRUST ANGLE, INSPECTION, Wheel Alignment.>

1. WHEEL ARCH HEIGHT

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



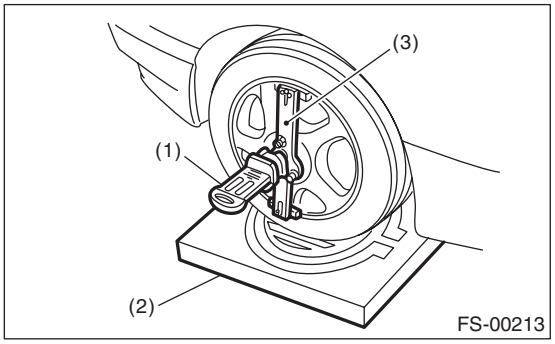
(1) Wheel arch height
(2) Front fender
(3) Rear quarter
(4) Front wheel arch height
(5) Rear wheel arch height
(6) Flange bend line
(7) Point of measurement
(8) End of spindle

Model	Specified wheel arch height	
	Front	Rear
Non-turbo	437^{+12}_{-24} mm ($17.20^{+0.47}_{-0.94}$ in)	440^{+12}_{-24} mm ($17.32^{+0.47}_{-0.94}$ in)
Turbo		435^{+12}_{-24} mm ($17.13^{+0.47}_{-0.94}$ in)

2. CAMBER

• INSPECTION

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



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

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

Model		Camber (Difference between RH and LH is 45′ or less)
Front	Non-turbo, Turbo	–0°25′±0°45′
Rear	Non-turbo	–0°50′±0°45′
	Turbo	–0°55′±0°45′

• FRONT CAMBER ADJUSTMENT

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

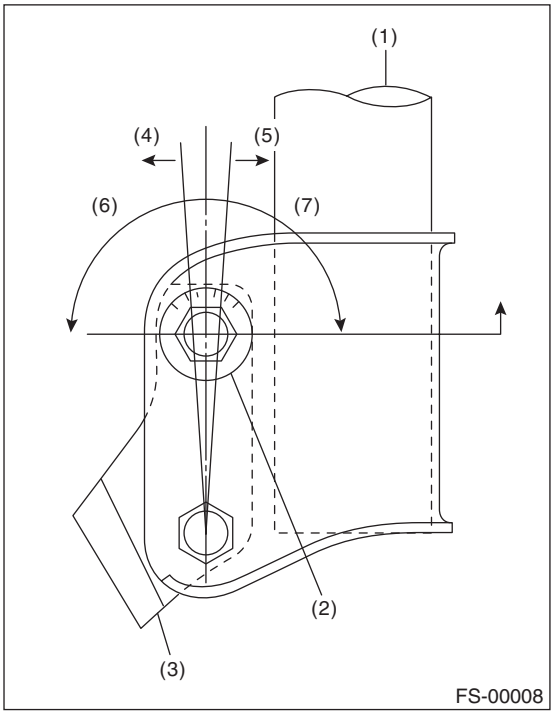
Model		Camber (Difference between RH and LH is 45′ or less)
Front	Non-turbo, Turbo	–0°25′±0°30′

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

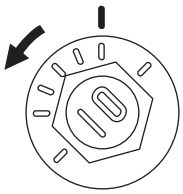
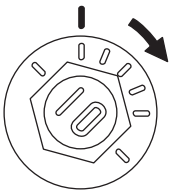
NOTE:
When the adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn the self-locking nut.

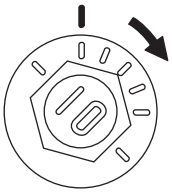
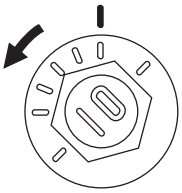
3) Turn the camber adjusting bolt so that the camber is set at specification.

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



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

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

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

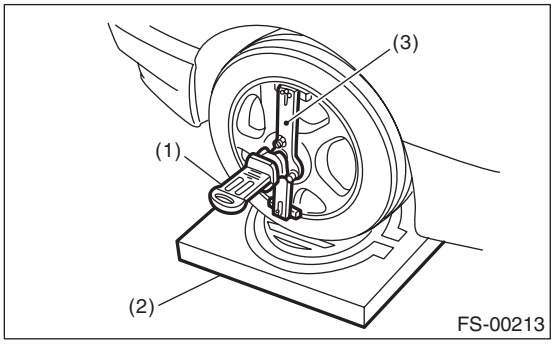
4) Tighten two new self-locking nuts.

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

3. CASTER

• INSPECTION

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



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

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

Model	Caster
Non-turbo, Turbo	3°03′

4. STEERING ANGLE

• INSPECTION

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

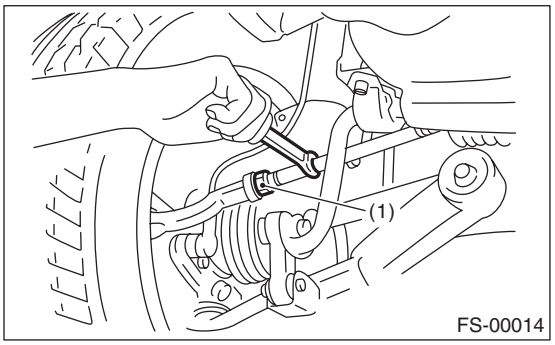
Steering angle:

Model	Non-turbo, Turbo
Inner wheel	35°00′±1°30′
Outer wheel	30°54′±1°30′

• ADJUSTMENT

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

NOTE:
Correct the boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• INSPECTION

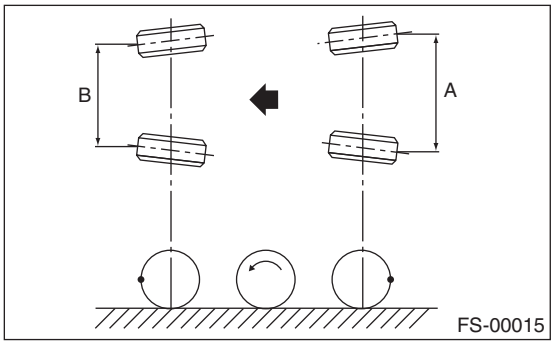
Toe-in (tolerance):
0±3 mm (0±0.12 in)

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

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

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

A – B = Toe-in

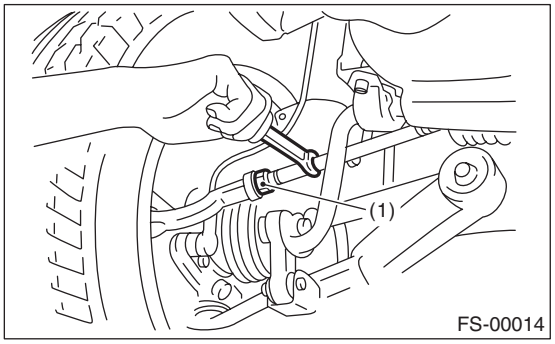


• ADJUSTMENT

Adjust the toe-in to be within the adjustment standard value if it exceeds the allowable value.

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

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



(1) Lock nut

4) Tighten the tie-rod lock nut.

Tightening torque:
85 N·m (8.7 kgf-m, 62.9 ft-lb)

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

6. REAR WHEEL TOE-IN

• INSPECTION

Toe-in (tolerance):
2±3 mm (0.08±0.12 in)

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

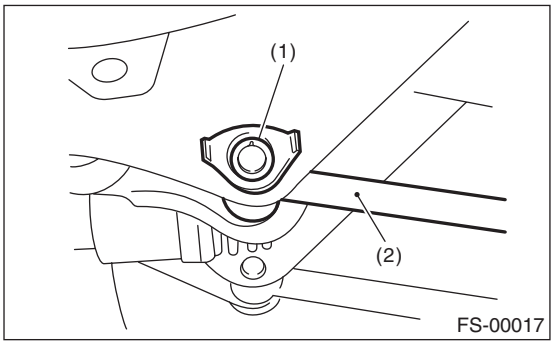
• ADJUSTMENT

Adjust the toe-in to be within the adjustment standard value if it exceeds the allowable value.

Toe-in (adjustment standard):
2±2 mm (0.08±0.08 in)

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

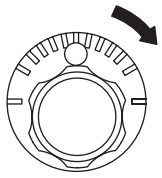
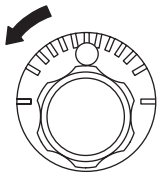
NOTE:
When loosening or tightening the adjusting bolt, hold the bolt head and turn the self-locking nut.

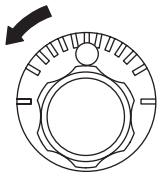
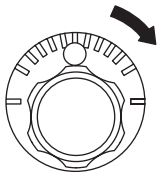


(1) Adjusting bolt
(2) Link rear

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

NOTE:
When the left and right wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.5 mm (0.6 in).

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

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

3) Replace with a new self-locking nut and tighten.

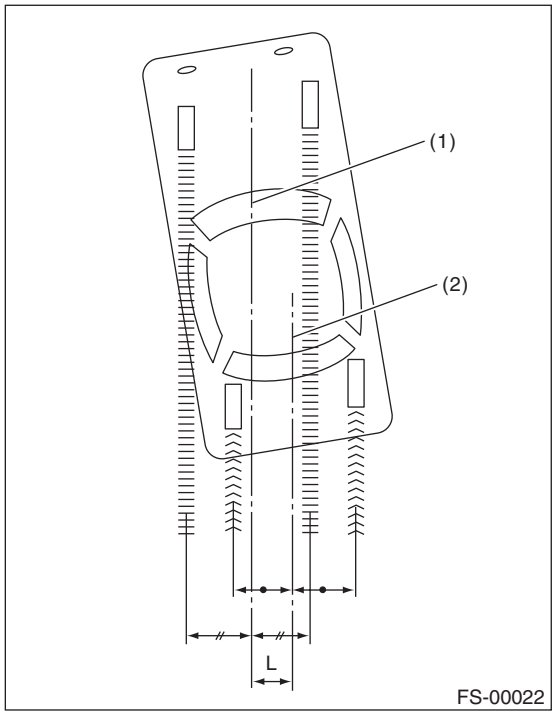
Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)

7. THRUST ANGLE

• INSPECTION

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

Thrust angle
Allowable value:
0°±30′ (When “L” is less than 23 mm (0.9 in), less than 30′.)



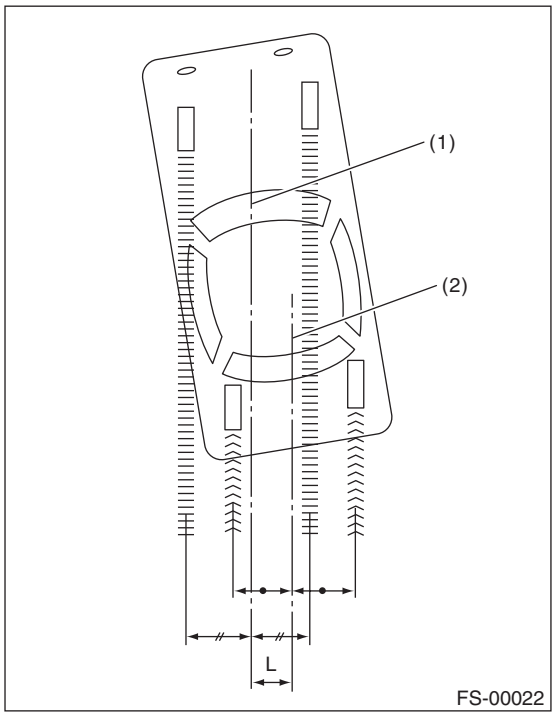
(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

• ADJUSTMENT

Adjust to be within the adjustment standard if it exceeds the allowed value.

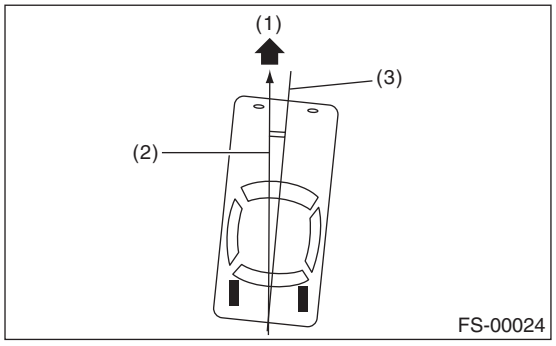
Thrust angle
Adjustment specifications:
0°±20′ (When “L” is less than 15 mm (0.6 in), under 20′.)

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



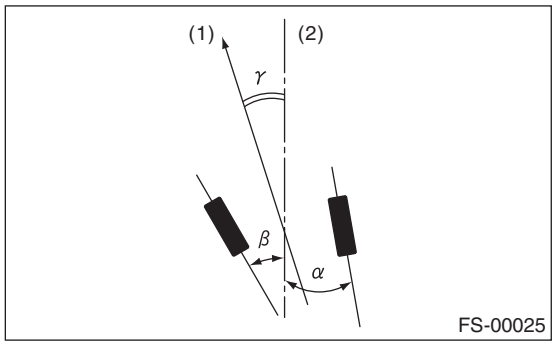
(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

NOTE:
The thrust angle is the average value of the right and left wheel toe angles with regard to the center line of the body. The vehicle will advance towards the thrust angle direction while swaying in a angle direction.



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

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

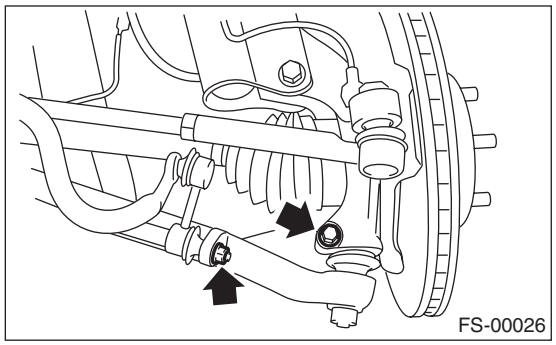


(1) Front
(2) Body center line

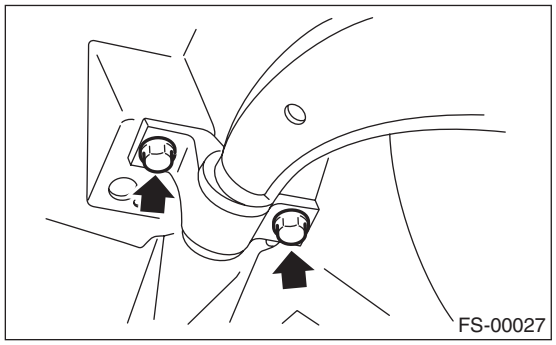
3. Front Transverse Link

A: REMOVAL

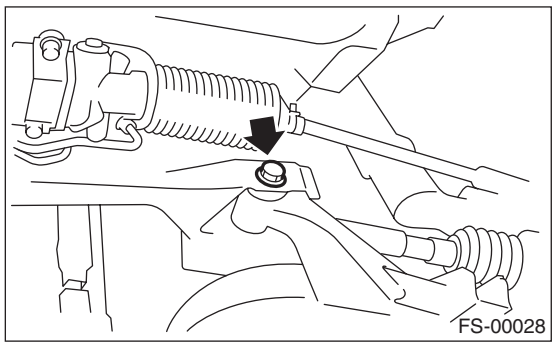
1) Set the vehicle on a lift.
2) Lift up the vehicle, and remove the wheels.
3) Remove the sub frame. <Ref. to FS-24, REMOVAL, Sub Frame.>
4) Remove the stabilizer link from the transverse link.
<Ref. to FS-22, REMOVAL, Front Stabilizer.>
5) Remove the bolt securing the ball joint of the transverse link to the housing.



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



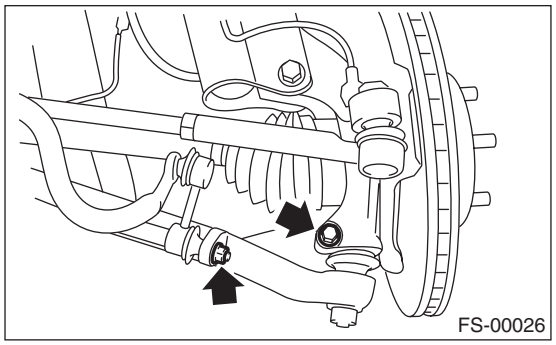
8) Extract the ball joint from housing.
9) Remove the bolt securing the transverse link to crossmember and extract the transverse link from the crossmember.



B: INSTALLATION

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

NOTE:
These bolts securing the bushings are tightened to a point where they can still move back and forth in the oblong shaped hole in the bracket.
2) Install the bolts which connect the transverse link to the crossmember, and temporarily tighten with a new self-locking nut.
3) Insert the ball joint into housing.
4) Connect the stabilizer link to the transverse link, and temporarily tighten the new self-locking nuts.



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

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)
(2) Between transverse link and crossmember

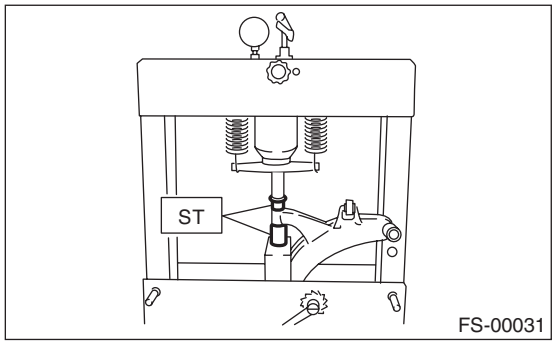
Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)
(3) Between transverse link rear bushing and body

Tightening torque:
250 N·m (25.5 kgf-m, 184 ft-lb)
6) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

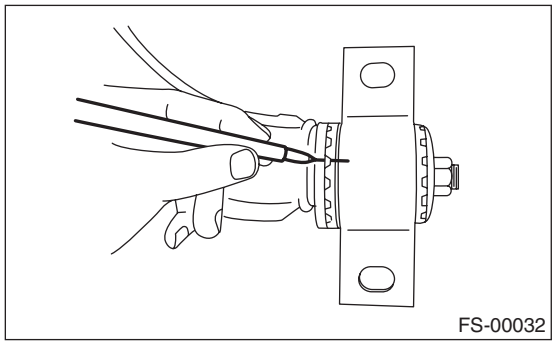
1. FRONT BUSHING

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



2. REAR BUSHING

1) Place alignment marks on the transverse link and rear bushing.
2) Loosen the nut and remove the rear bushing.

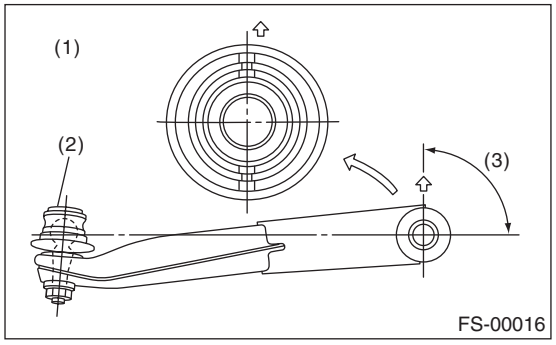


D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

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



(1) Face the bushing toward the center of ball joint.
(2) Ball joint
(3) 90°±3°

2. REAR BUSHING

1) Attach the rear bushing to the transverse link and align to the aligning marks.
2) Attach and tighten a new self-locking nut.

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

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

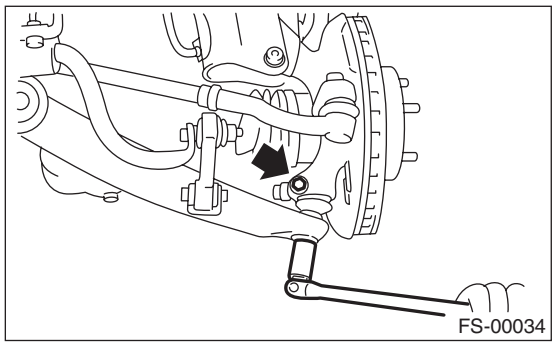
E: INSPECTION

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

4. Front Ball Joint

A: REMOVAL

1) Remove the wheels.
2) Pull out the cotter pin from the ball stud, remove the castle nut, and extract the ball stud from the transverse link.
3) Remove the bolts which secure the ball joint to the housing.



4) Extract the ball joint from housing.

B: INSTALLATION

1) Insert the ball joint into housing.

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

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

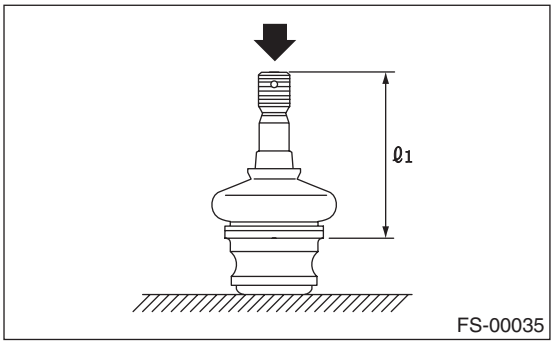
2) Connect the ball joint to transverse link.

Tightening torque (Castle nut):
40 N·m (4.1 kgf-m, 30 ft-lb)

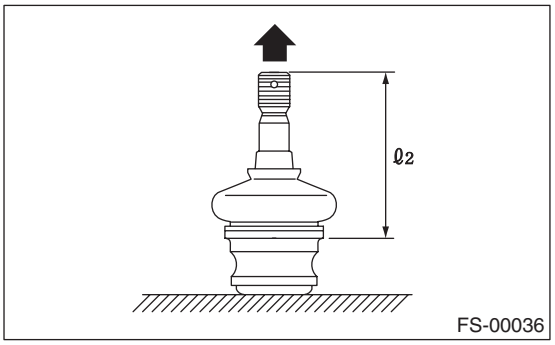
3) Tighten the castle nut further but within 60° until the hole in ball stud is aligned with a slot in castle nut. Then, insert a new cotter pin and bend it around the castle nut.
4) Install the front wheels.

C: INSPECTION

1) Measure the play of the ball joint using the following procedures. Replace with a new part if the play exceeds the specified value.
(1) While applying 686 N (70 kgf, 154 lb) of force in the direction shown in the figure, measure dimension ℓ_1.



(2) While applying 686 N (70 kgf, 154 lb) of force in the direction shown in the figure, measure dimension ℓ_2.



(3) Determine free play using the following formula.
$S = \ell_2 - \ell_1$
(4) Replace with a new part if the play exceeds the specified value.

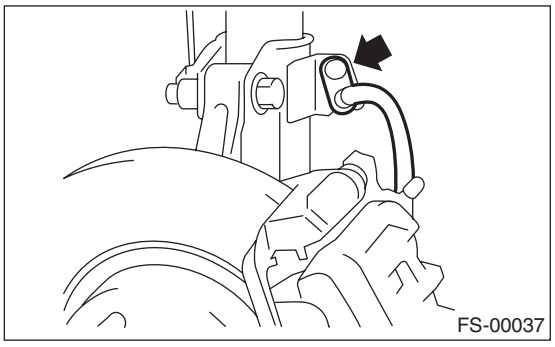
Front ball joint
Specification for replacement: S
Less than 0.3 mm (0.012 in)

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

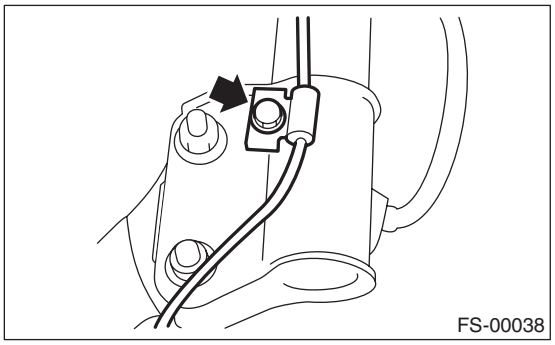
5. Front Strut

A: REMOVAL

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



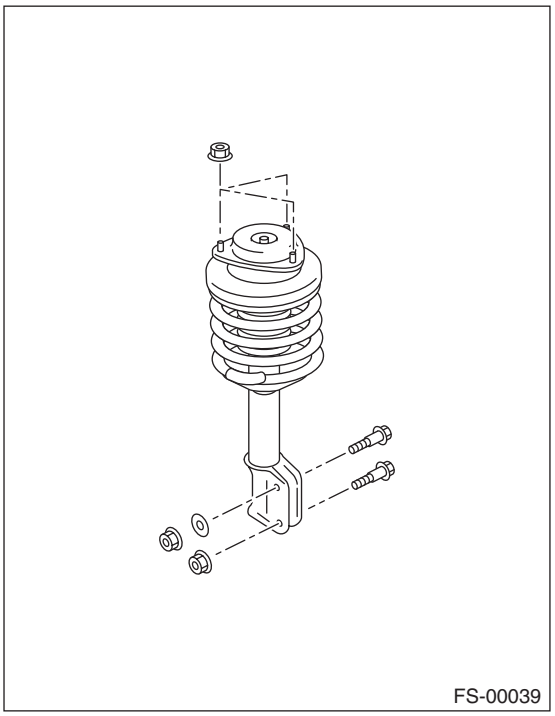
3) Scribe an alignment mark on the camber adjusting bolt that secures the strut to the housing.
4) Remove the bolt securing the ABS wheel speed sensor harness.



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

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

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



B: INSTALLATION

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

Tightening torque:
20 N·m (2.0 kgf-m, 14.8 ft-lb)

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

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

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

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

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

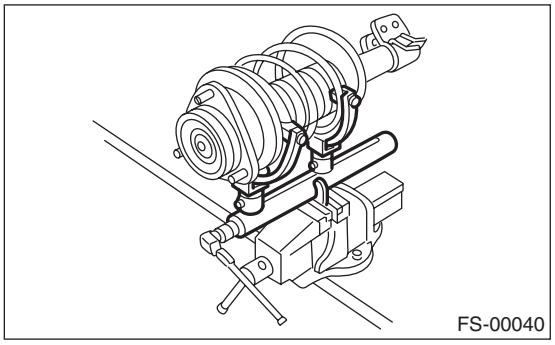
4) Install the bolts which secure the brake hose to the strut.

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

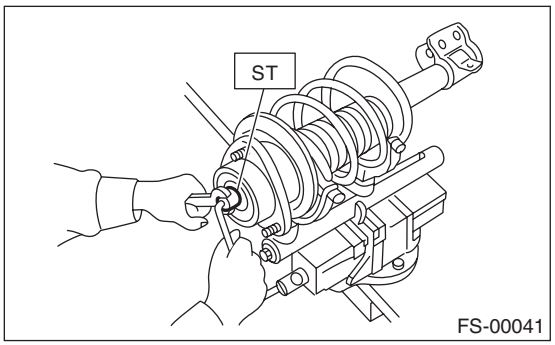
5) Install the wheel.
6) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

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



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



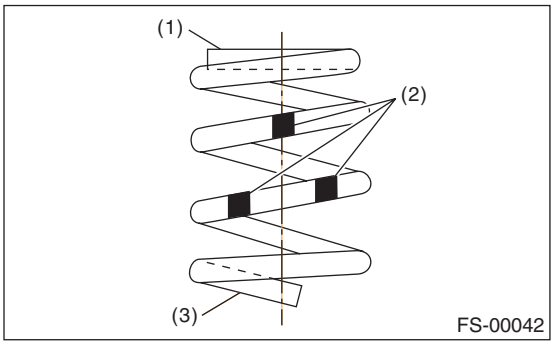
3) Remove the strut mount, upper spring seat and rubber seat from the strut.
4) Gradually decrease the compression force of compressor, and remove the coil spring.
5) Remove the dust cover and helper spring.

D: ASSEMBLY

1) Before installing the coil spring, strut mount, etc. on the strut, check the condition of air inside the strut damper mechanism to make sure that excessive air is not inhibiting the creation of appropriate damping force.
2) Checking for presence of air
   (1) Place the strut vertically with the piston rod facing up.
   (2) Move the piston rod to the center of its entire stroke.
   (3) While holding the piston rod end with fingers, move the rod up and down.
   (4) If the piston rod moves more than 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 retract the piston rod.
   (5) Repeat 3 or 4 times from the first step.

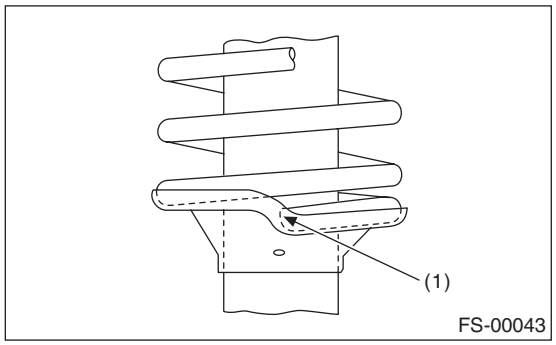
NOTE:
After purging air from the strut, be sure to place the strut with the piston rod facing up. If the strut is laid down for any reason, check for the entry of air in accordance with “Checking for presence of air”
4) Using a coil spring compressor, compress the coil spring.

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



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

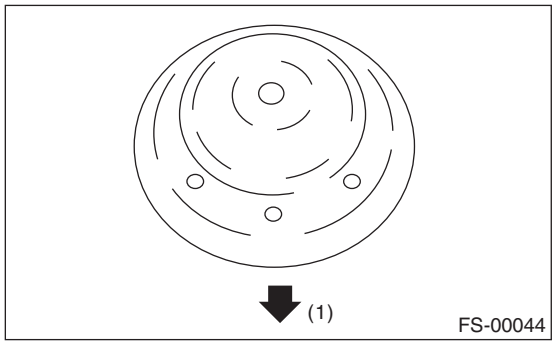
5) Set the coil spring correctly so that its end face seats well in the spring seat as shown in the figure.



(1) Coil spring end face

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

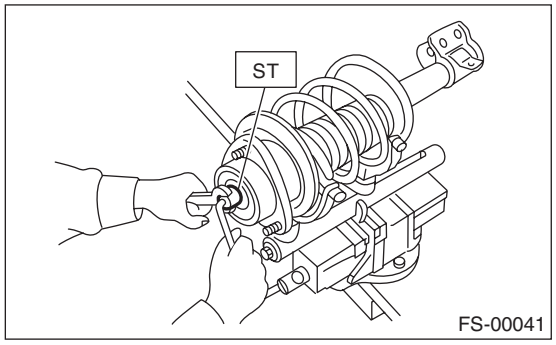
NOTE:
Position the upper spring seat as shown in the figure.



(1) Outside the vehicle

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

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



10) Loosen the coil spring carefully.

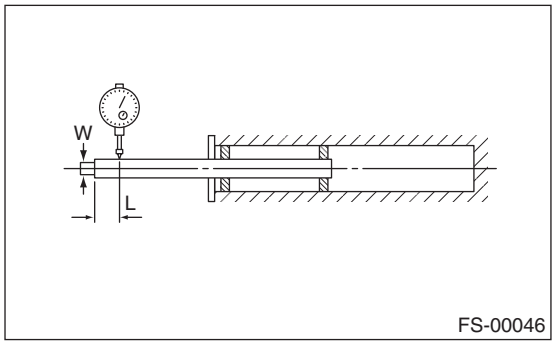
E: INSPECTION

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

1. DAMPER STRUT

1) Check for oil leaks.
2) Move the piston rod up and down to check that it operates smoothly.
3) Piston rod play
- Measure the play as follows:

Fix the outer shell in place and fully extend the rod. Set a dial gauge at the end of rod L [10 mm (0.39 in)], and then read the dial gauge indication P_1 while applying a force of W [20 N (2 kgf, 4 lb)] to the threaded portion. Apply a force of 20 N (2 kgf, 4 lb) from the opposite direction of “W”, and then read the dial gauge indication P_2.



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

If the play exceeds the limit, replace the strut.

2. STRUT MOUNT

Check the rubber part for abnormal deformation, cracks or deterioration. Replace it with a new part if defective.

3. DUST COVER

Replace with a new part if abnormally cracked or damaged.

4. COIL SPRING

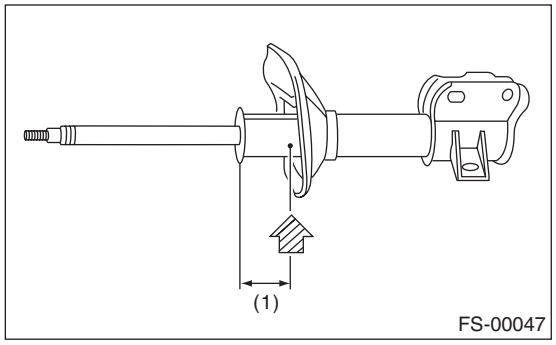
If a permanent strain is found, replaced it with a new part. Refer to the specifications to inspect the wheel arch height even if the vehicle is not inclined because of a flat tire or a biased load. If the tolerance is out of specifications, replace with a new part.

5. HELPER

Replace with a new part if abnormally cracked or damaged.

F: DISPOSAL

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

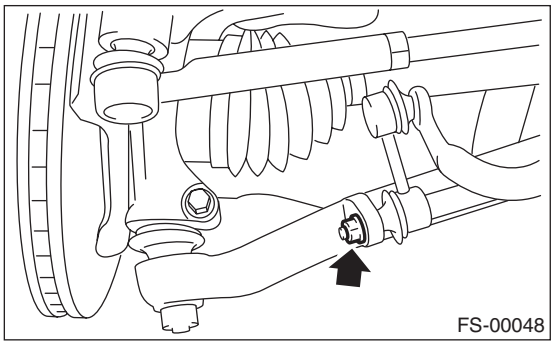


(1) 40 mm (1.57 in)

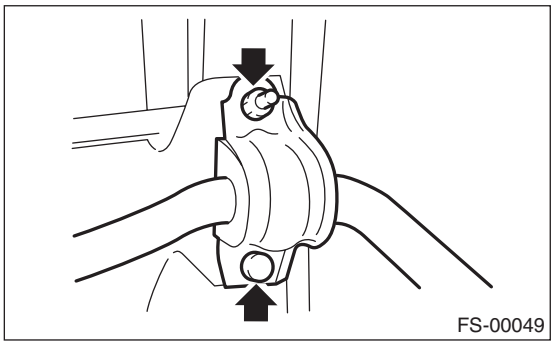
6. Front Stabilizer

A: REMOVAL

1) Jack-up the vehicle front end and support it with rigid racks.
2) Remove the jack-up plate from lower part of the crossmember.
3) Remove the sub frame. <Ref. to FS-24, REMOVAL, Sub Frame.>
4) Remove the nuts which secure the stabilizer link to front transverse link.



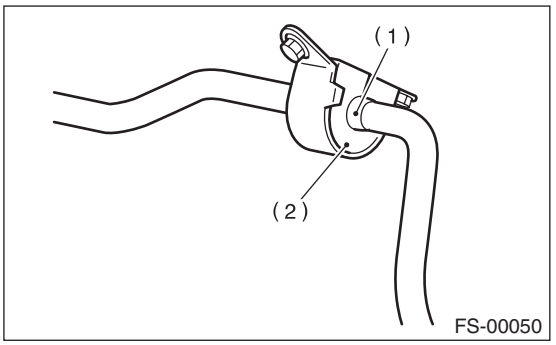
5) Remove the bolt and nut which secures the stabilizer to the crossmember.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
- Use a new self-locking nut.
- Install the bushing (on front crossmember side) while aligning it with the paint mark on the stabilizer.
- Make sure the bushing and stabilizer have the same identification colors when installing.



(1) Paint mark of the stabilizer
(2) Bushing identification color

2) Always tighten the rubber bushings with wheels in full contact with the ground and the vehicle at curb weight.

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

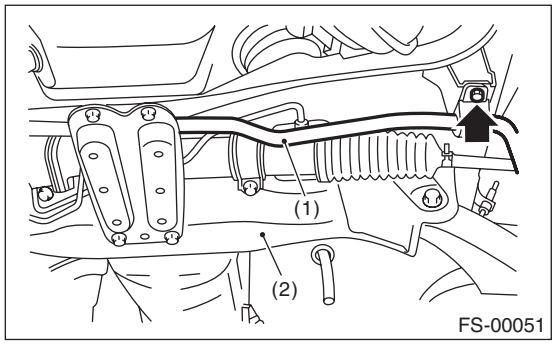
C: INSPECTION

1) Check the bushing for abnormal fatigue or damage.
2) Check that there is no deformation, cracks or damage on the stabilizer link.
3) Make sure that the bushing is not protruding from the hole in the stabilizer link.

7. Front Crossmember

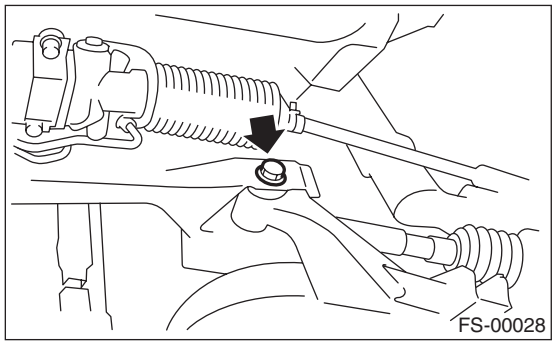
A: REMOVAL

1) Lift up the vehicle, and remove the front wheels.
2) Remove the sub frame.
3) Remove the stabilizer and jack-up plate.



(1) Front stabilizer
(2) Front crossmember

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



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

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

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Always tighten bushings with wheels in full contact with the ground and the vehicle 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 N·m (2.75 kgf-m, 19.9 ft-lb)
Front cushion rubber to crossmember:
85 N·m (8.7 kgf-m, 62.7 ft-lb)
Universal joint to pinion shaft:
24 N·m (2.4 kgf-m, 17.4 ft-lb)
Crossmember to body:
100 N·m (10.2 kgf-m, 74 ft-lb)

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

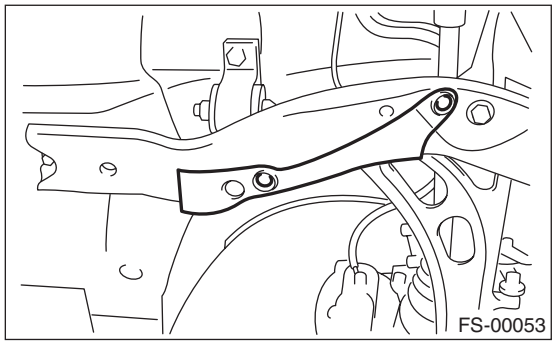
C: INSPECTION

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

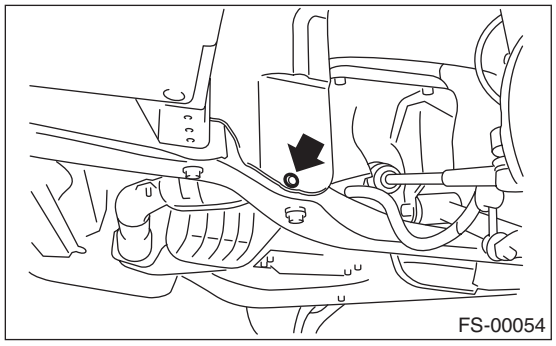
8. Sub Frame

A: REMOVAL

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

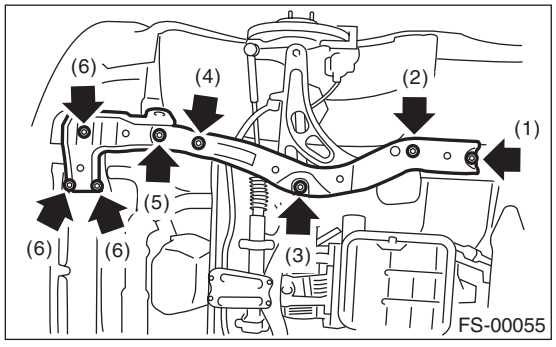


4) Remove the clip.



5) Remove the sub frame.

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

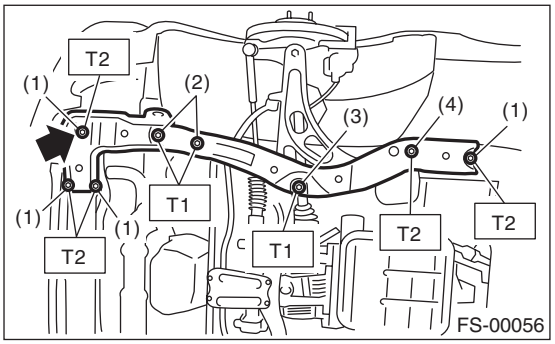


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace with a new M12 bolt.

Tightening torque:
T1: 55 N·m (5.6 kgf-m, 41 ft-lb)
T2: 71 N·m (7.2 kgf-m, 52 ft-lb)

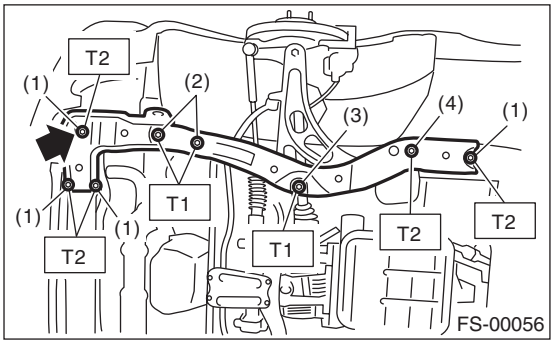


(1) M10 × 30 bolts
(2) M12 × 95 bolts (with wax)
(3) M12 × 77 bolts (with wax)
(4) M10 × 90 bolts

C: INSPECTION

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

Tightening torque:
T1: 55 N·m (5.6 kgf-m, 41 ft-lb)
T2: 71 N·m (7.2 kgf-m, 52 ft-lb)



(1) M10 × 30 bolts
(2) M12 × 95 bolts (with wax)
(3) M12 × 77 bolts (with wax)
(4) M10 × 90 bolts

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible cause	Corrective action
(1) Permanent distortion or damaged coil spring	Replace.
(2) Rough operation of damper strut or shock absorber	Replace.
(3) Installation of non-compatible strut or shock absorber	Replace with appropriate parts.
(4) Installation of non-compatible coil spring	Replace with appropriate parts.

2. POOR RIDE COMFORT

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

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

3. NOISE

Possible cause	Corrective action
(1) Worn or damaged damper strut	Replace.
(2) Wear or damage of shock absorber components	Replace.
(3) Loosening of the suspension link installing bolt	Tighten to the specified torque.
(4) Loss or abnormal deformation of bushing	Replace.
(5) Improper length (maximum or minimum) of damper strut or shock absorber	Replace with appropriate parts.
(6) Damaged coil spring	Replace.
(7) Wear or damage of the ball joint	Replace.
(8) Deformation of the stabilizer clamp	Replace.

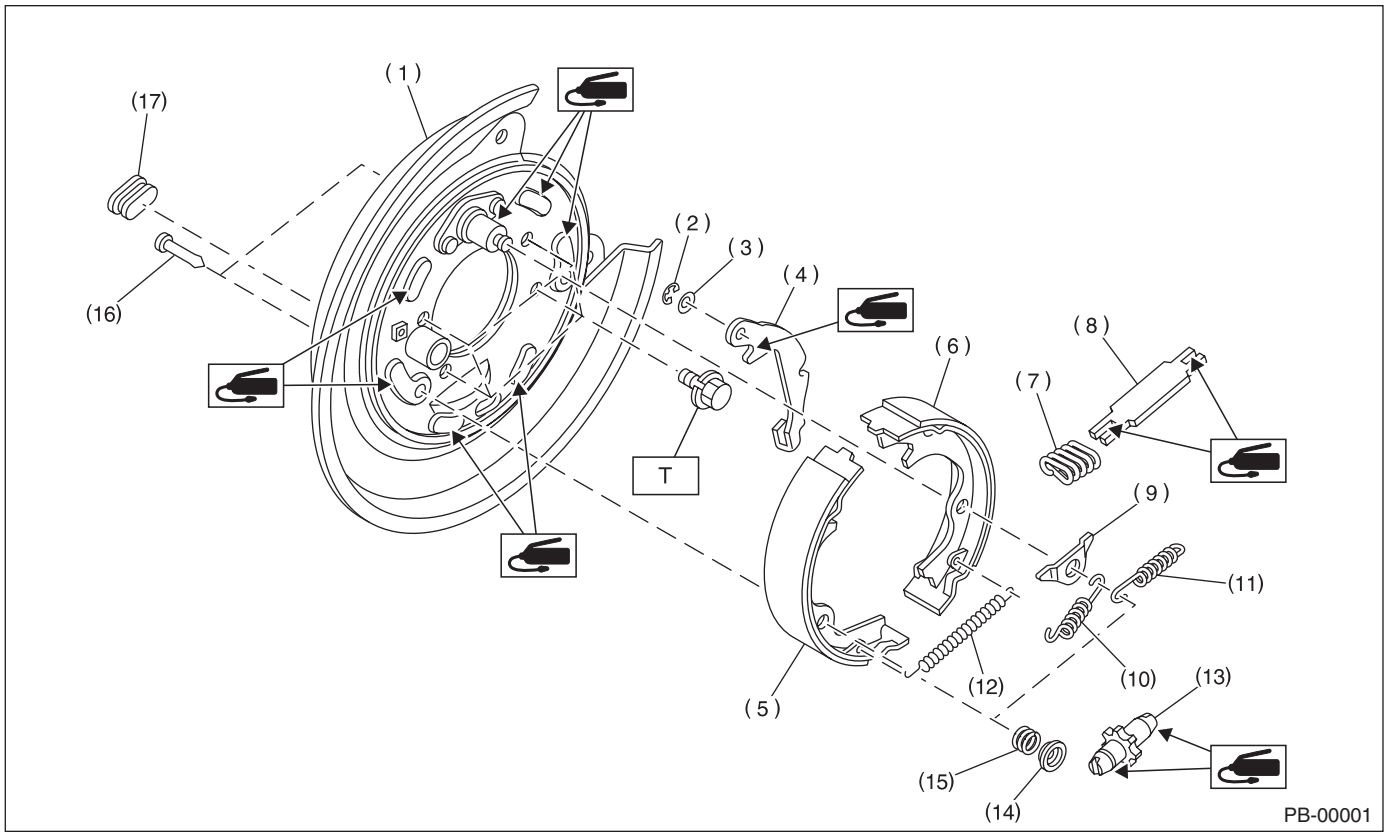
1. General Description

A: SPECIFICATION

Model		Rear drum brake	Rear disc brake
Type		Rear brake mechanical	Mechanical, drum in disc rear brakes
Effective drum diameter	mm (in)	228.6 (9)	170 (6.69)
Lining dimensions (Length × Width × Thickness)	mm (in)	219.4 × 35.0 × 4.1 (8.64 × 1.378 × 0.161)	163.1 × 30.0 × 3.2 (6.42 × 1.181 × 0.126)
Clearance adjustment		Automatic adjusting	Manual adjustment
Lever stroke	notches/N (kgf, lb)	7 — 8/196 (20, 44)	

B: COMPONENT

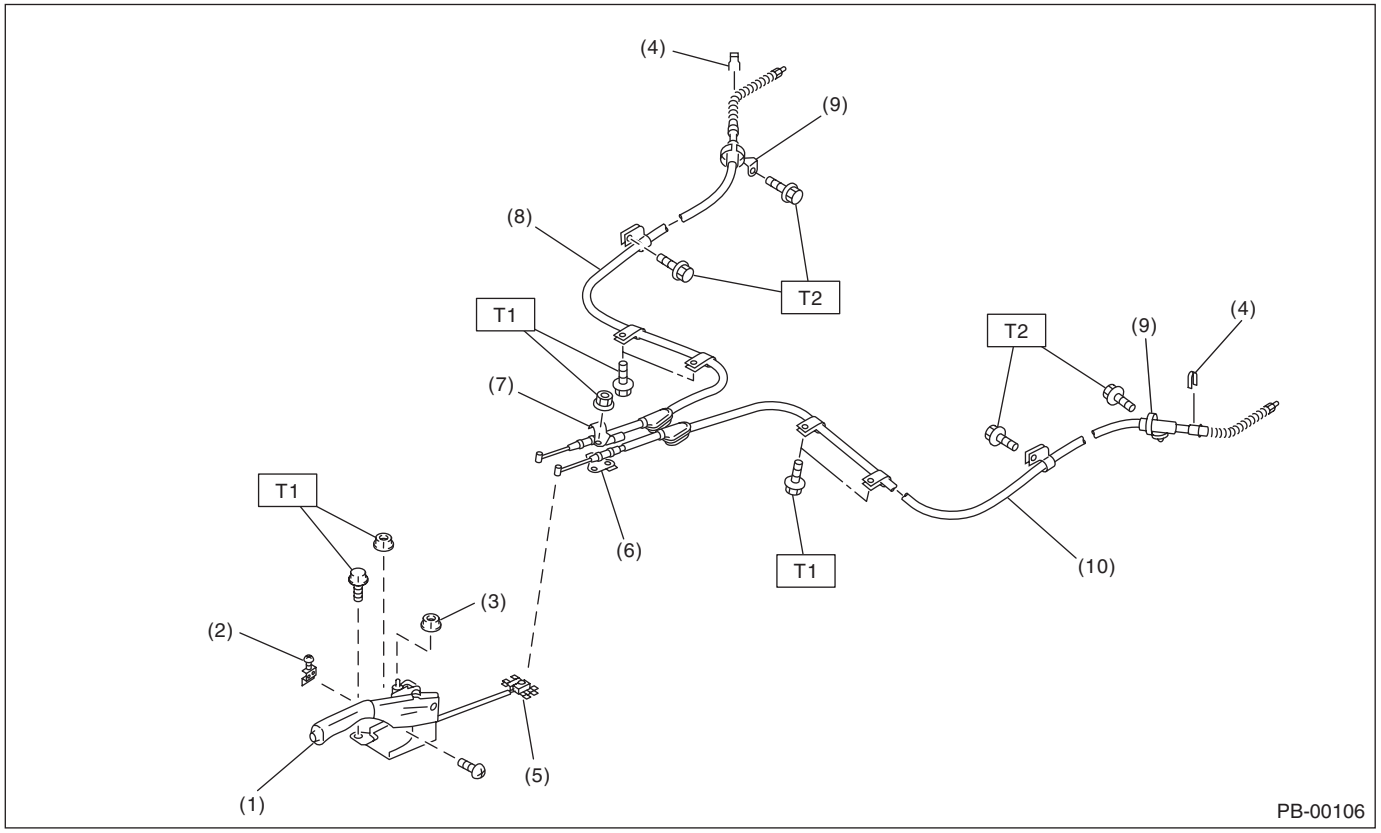
1. PARKING BRAKE (REAR DISC BRAKE)



(1) Back plate
(2) Retainer
(3) Spring washer
(4) Lever
(5) Parking brake shoe (Primary)
(6) Parking brake shoe (Secondary)
(7) Strut spring
(8) Strut
(9) Shoe guide plate
(10) Primary return spring
(11) Secondary return spring
(12) Adjusting spring
(13) Adjuster
(14) Shoe hold-down cup
(15) Shoe hold-down spring
(16) Shoe hold-down pin
(17) Adjusting hole cover

Tightening torque:N·m (kgf-m, ft-lb)
T: 53 (5.4, 39.1)

2. PARKING BRAKE CABLE



(1) Parking brake lever
(2) Parking brake switch
(3) Self-locking nut
(4) Clamp (Rear disc brake model only)
(5) Equalizer
(6) Bracket
(7) Clamp
(8) Parking brake cable RH
(9) Cable guide
(10) Parking brake cable LH

Tightening torque:N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 32 (3.3, 23.6)

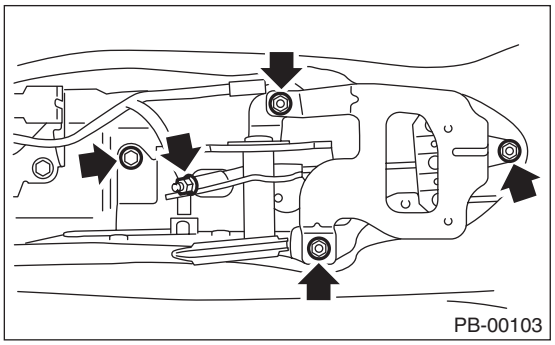
C: CAUTION

• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
• Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. of different grades or manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before securing a part in a vise, place cushioning material such as wood blocks, aluminum plate or cloth between the part and the vise.
• Make sure grease does not come into contact with the parking shoes.

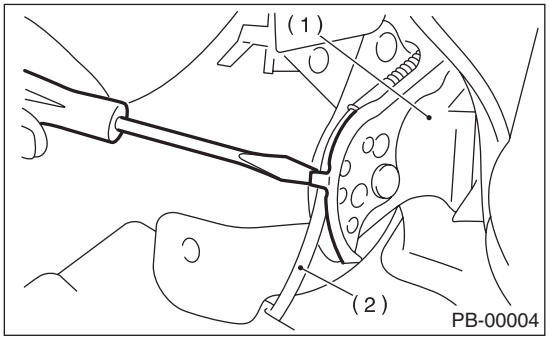
2. Parking Brake Lever

A: REMOVAL

1) Lift up the vehicle.
2) Remove the rear wheels.
3) Remove the rear seat cushion.
4) Remove the console box.
5) Loosen the parking cable self-locking nut and console bracket.
6) Disconnect the parking brake switch connector.
7) Remove the parking brake lever.



8) Straighten the tab on the parking brake lever and remove the cable.



(1) Parking brake lever
(2) Cable

B: INSTALLATION

1) Install in the reverse order of removal.

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

2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

While pulling the parking brake lever upward, count the notches.

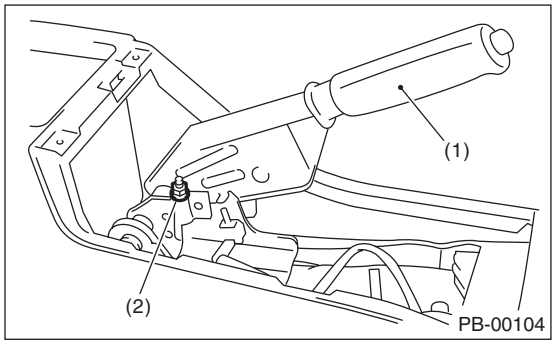
Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

If it is not within the specified value, adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

D: ADJUSTMENT

1) Remove the console cover. <Ref. to EI-37, REMOVAL, Console Box.>
2) Forcefully pull the parking brake lever 3 to 5 times.
3) Rotate to adjust the selflocking nut so that the lever stroke of the parking brake lever is 7 to 8 notches when applying the parking brake with force of 196 N (20 kgf, 44 lb).

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)



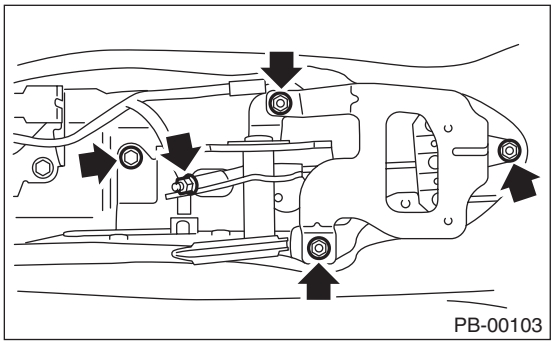
(1) Parking brake lever
(2) Self-locking nut

4) Install the console cover. <Ref. to EI-37, INSTALLATION, Console Box.>

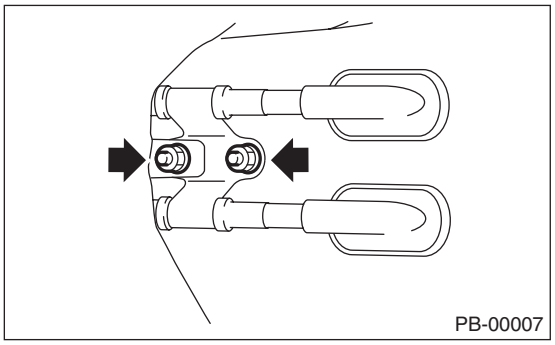
3. Parking Brake Cable

A: REMOVAL

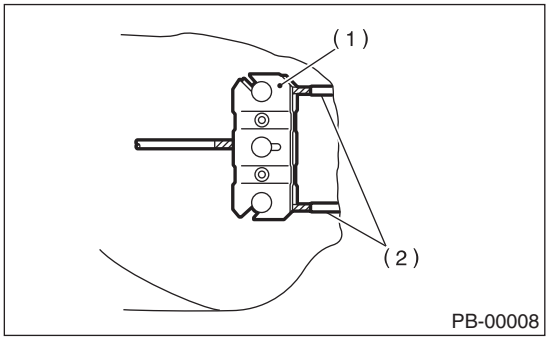
1) Lift up the vehicle.
2) Remove the rear wheels.
3) Remove the rear seat cushion.
4) Remove the console box. <Ref. to EI-37, REMOVAL, Console Box.>
5) Loosen the parking cable self-locking nut and console bracket.
6) Remove the parking brake lever.



7) Roll up the floor mat and remove the clamps.

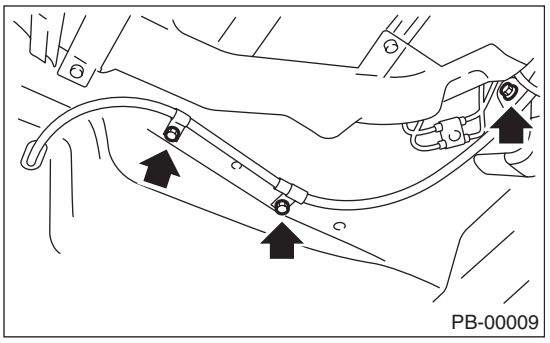


8) Remove the equalizer cover.
9) Remove the inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

10) Remove the parking brake cable from rear brake.
Disc brake
<Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
Drum brake
<Ref. to BR-32, Rear Drum Brake Assembly.>
11) Remove the clamp from the rear brake.
12) Remove the bolt and bracket from trailing link bracket.
13) Remove the bolt and clamp from rear floor.



14) Remove the grommet from the rear floor.
15) Remove the cable assembly from the cabin by pulling it forcefully rearward.
16) Detach the parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Be sure to pass the cable through the tunnel in the cable guide.
2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

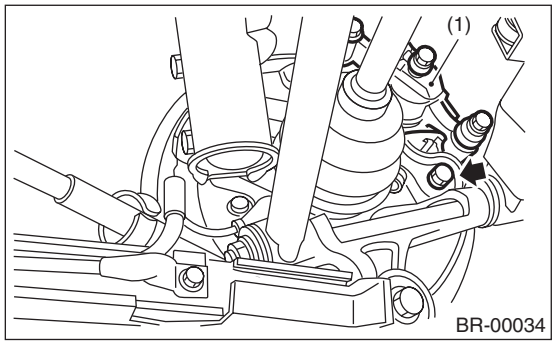
C: INSPECTION

Check the removed cable and replace if damaged, rusty or having problems.
1) Check the cable for smooth operation.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends and cracks.
4) Check the boot for damage, cracks, and corrosion.

4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

1) Release the parking brake.
2) Remove the two mounting bolts and remove the brake caliper assembly.

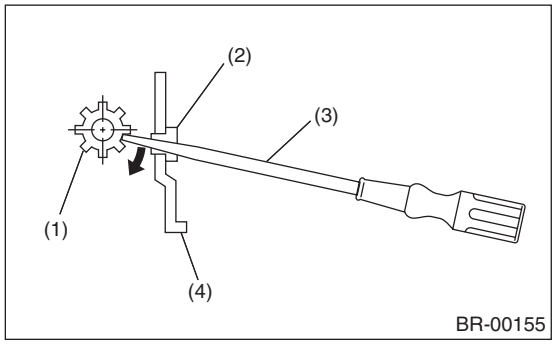


(1) Brake caliper ASSY

3) Suspend the brake caliper assembly so that the hose is not stretched.
4) Remove the disc rotor.

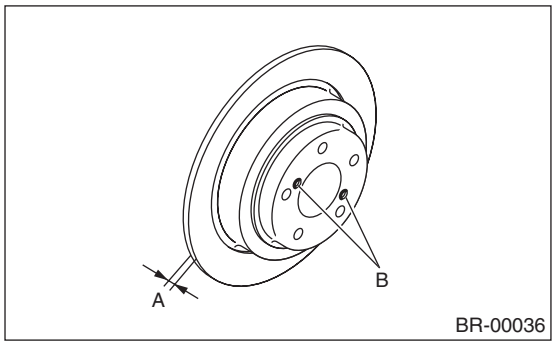
NOTE:
If the disc rotor is difficult to remove, try the following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until the brake shoe moves adequately away from the disc rotor.

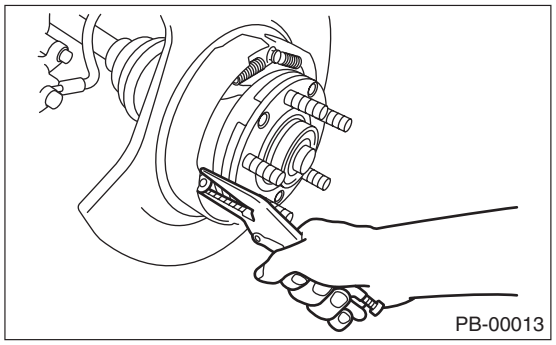


(1) Adjusting screw
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

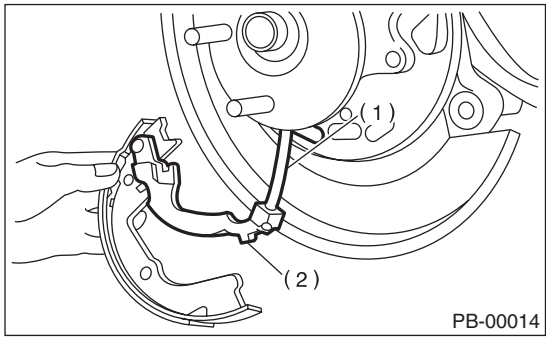
(2) If disc rotor is seized up on the hub, drive the disc rotor out by pushing two 8 mm bolts in holes B on the rotor.



5) Remove the shoe return spring from the parking brake assembly.
6) Remove the front shoe hold down spring and pin with pliers.



7) Remove the strut and strut spring.
8) Remove the adjuster assembly from the parking brake assembly.
9) Remove the brake shoe.
10) Remove the rear shoe hold down spring and pin with pliers.
11) Remove the parking brake cable from the parking brake lever.



(1) Parking brake cable
(2) Parking brake lever

12) Using a flat tip screwdriver, raise the retainer. Remove the parking lever and washer from brake shoe.

B: INSTALLATION

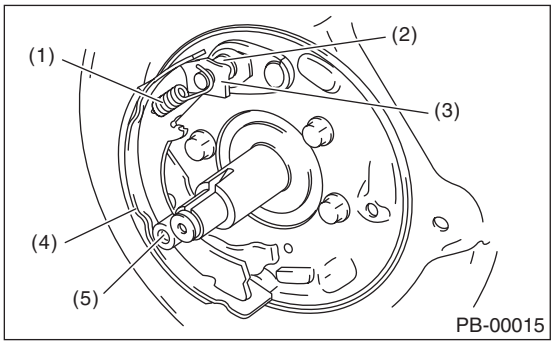
CAUTION:
Be sure the lining surface is free from oil and grease.

1) Apply brake grease to the following locations.

Brake grease:
Brake Grease (Part No. 003602002)

- Six contact surfaces of the shoe rim and the back plate packing
- Contact surface of the shoe wave and the anchor pin
- Contact surface of the lever and strut
- Contact surface of the shoe wave and the adjuster assembly
- Contact surface of the shoe wave and the strut
- Contact surface of the lever and the shoe wave

2) Insert the primary side brake shoe into the anchor pin groove.
3) Secure the brake shoe with the shoe hold-down pin and the cup.
4) Install the plate to the anchor pin, and then assemble the primary return spring to the anchor pin.

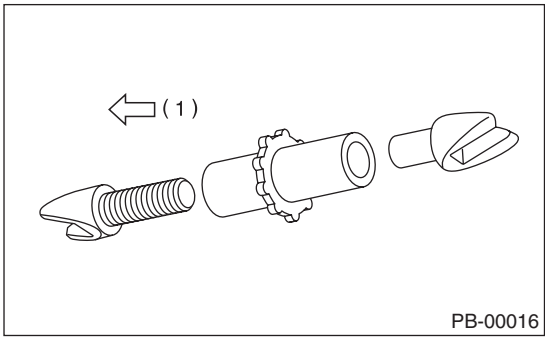


(1) Primary return spring
(2) Anchor pin
(3) Plate
(4) Primary shoe
(5) Shoe hold-down pin and cup

5) Install the parking brake cable to the parking brake lever.

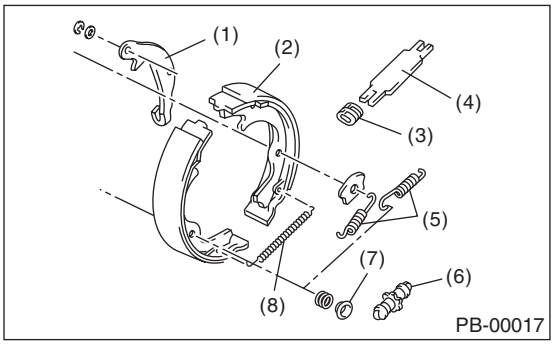
6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with the shoe hold-down pin and cup.

NOTE:
- Install the strut spring of both right and left wheels facing the front of the vehicle.
- Install the adjuster assembly with screw section on the left side from facing the brake front.



(1) LH

7) Install the secondary return spring and the adjusting spring.



(1) Lever
(2) Secondary brake shoe
(3) Strut spring
(4) Strut
(5) Secondary return spring
(6) Adjuster
(7) Hold-down cup
(8) Adjusting spring

8) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

9) Drive the vehicle to break-in the parking brake lining.
(1) Drive the vehicle at about 35 km/h (22 MPH).
(2) With the parking brake release button pushed in, pull the parking brake lever gently.
(3) Drive the vehicle for about 200 m (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
(5) After breaking-in, re-adjust the parking brakes.

C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

Disc rotor inside diameter:
Standard:
170 mm (6.69 in)
Service limit:
171 mm (6.73 in)

2) Measure the lining thickness. If it exceeds the limit, replace shoe assembly.

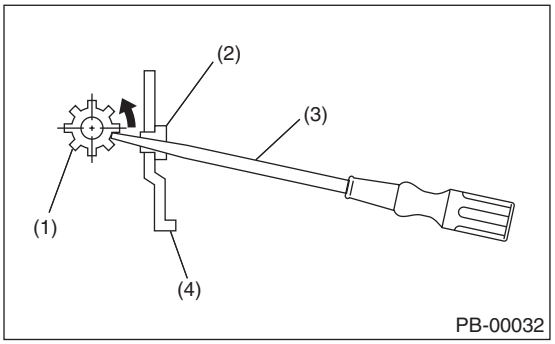
Lining thickness:
Standard:
3.2 mm (0.126 in)
Service limit:
1.5 mm (0.059 in)

NOTE:
Replace the right and left brake shoe as a set.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove the adjusting hole cover from the back plate.
2) Turn the adjusting screw using a flat tip screwdriver until the brake shoe is in close contact with the disc rotor.



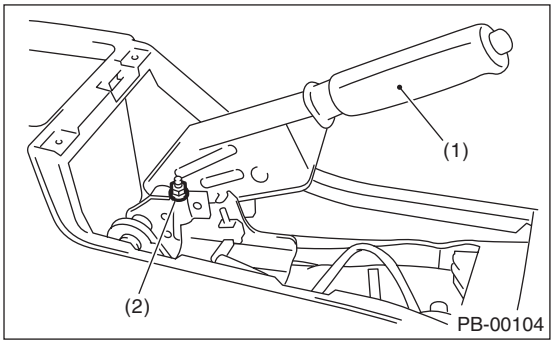
(1) Adjusting screw
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

3) Turn back (downward) the adjusting screw 3 to 4 notches.
4) Install the adjusting hole cover to the back plate.

2. LEVER STROKE

1) Remove the console box lid. <Ref. to EI-37, REMOVAL, Console Box.>
2) Forcefully pull the parking brake lever 3 to 5 times.
3) Rotate to adjust the selflocking nut so that the lever stroke of the parking brake lever is 7 to 8 notches when applying the parking brake with force of 196 N (20 kgf, 44 lb).

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)



(1) Parking brake lever
(2) Self-locking nut

4) Install the console box lid. <Ref. to EI-37, INSTALLATION, Console Box.>

5. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Brake drag	Parking brake lever misadjustment.	Adjust.
	Parking brake cable does not move.	Correct or replace.
	Parking brake shoe clearance is misadjusted.	Adjust.
	Return spring is faulty.	Replace.
Noise from brake	Return spring is faulty.	Replace.
	Shoe hold-down spring is faulty.	Replace.

1. General Description

A: SPECIFICATION

Model				Non-turbo model	Turbo model
Whole system	Minimum turning radius		m (ft)	5.4 (17.7)	
	Steering angle (Inside — Outside)			35° 00′ — 30° 54′	
	Steering wheel diameter		mm (in)	375 (14.8)	
	Maximum number of rotations			3.0	
Gearbox	Type			Integral Rack and Pinion	
	Backlash			0 (Automatic adjusting)	
	Valve (Power steering system)			Rotary valve	
Pump (Power steering system)	Type			Vane pump	
	Reservoir tank			Installed on body	
	Specific output		cm^3 (cu in)/rev.	7.2 (0.439)	
	Relief pressure		kPa (kg/cm^2, psi)	6,700 — 7,400 (68 — 75, 970 — 1,070)	7,650 — 8,340 (78 — 85, 1,110 — 1,210)
	Hydraulic fluid control			Engine speed sensitive	
	Adjusted flow		ℓ (US qt, Imp qt)/min.	1,000 rpm: 6.6 (7.0, 5.8) 3,000 rpm: 5.3 (5.6, 4.7)	1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)
	RPM range		rpm	670 — 9,869	595 — 8,925
	Direction of rotation			Clockwise (when observed from pulley side)	
Hydraulic oil (Power steering system)	Description			SUBARU ATF or ATF DEXRON III	
	Capacity ℓ (US qt, Imp qt)	Reservoir tank		0.3 (0.3, 0.3)	
		Whole system		0.7 (0.7, 0.6)	
Steering wheel	Free play		mm (in)	17 (0.67)	
Steering angle	Inner wheel			35°00′±1°30′	
	Outer wheel			30°54′±1°30′	
Steering shaft	Clearance between the steering wheel and column cover		mm (in)	3.0 (0.118)	
Steering gearbox (Power steering system)	Sliding resistance		N (kgf, lb)	400 (40.8, 89.9) or less	
	Rack shaft play in the radial direction	Right-turn steering	mm (in)	0.19 (0.0075) or less	
		Left-turn steering	mm (in)	Horizontal free play: 0.15 (0.0059) or less Vertical free play: 0.3 (0.012) or less	
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less	
		In axial direction	mm (in)	0.5 (0.020) or less	
	Rotation resistance		N (kgf, lb)	Maximum allowance: 9.33 (0.95, 2.10) or less Left and right Difference between right and left sliding resistance: 20% or less	

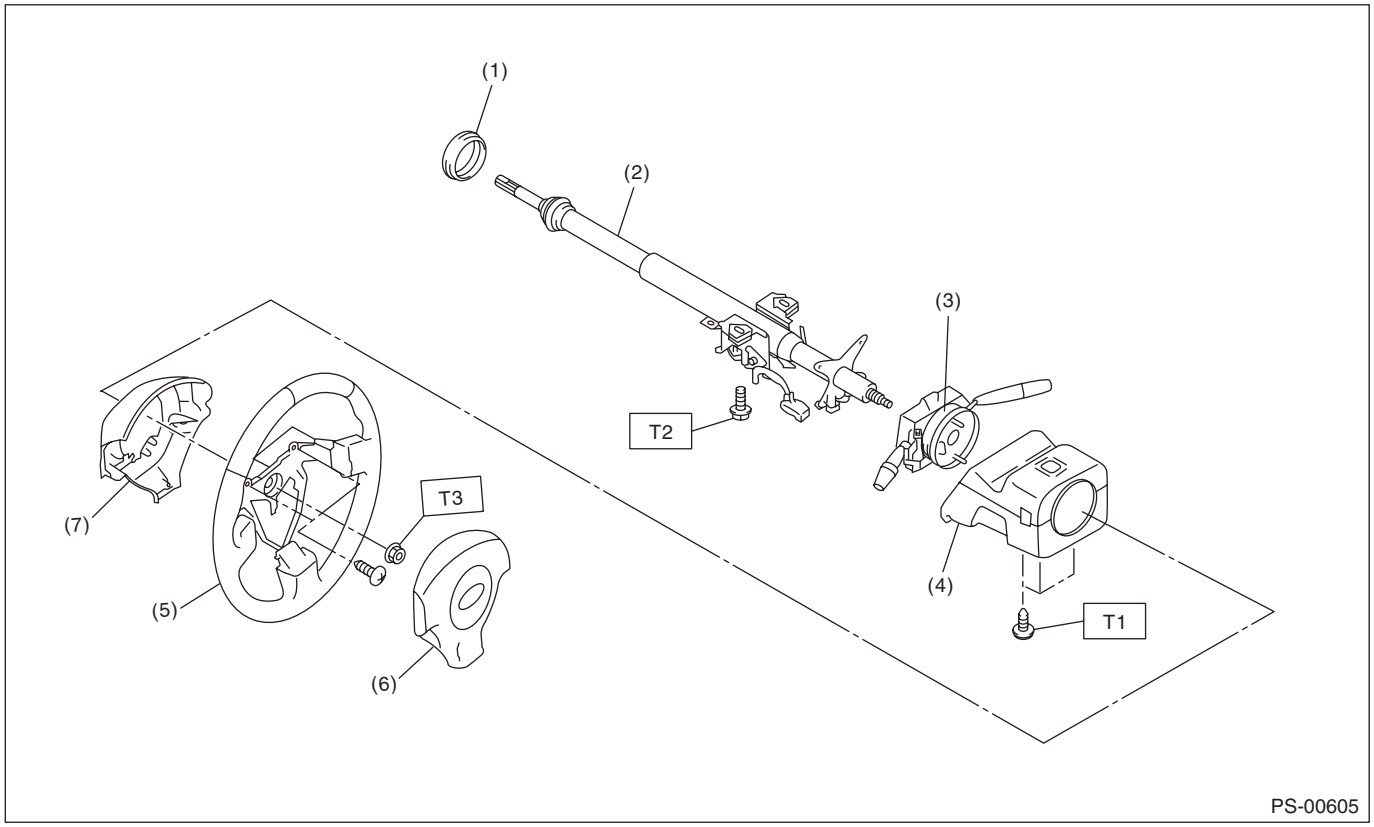
Oil pump (Power steering system)	Pulley shaft	Free play in the radial direction	mm (in)	0.4 (0.016) or less
		Free play in the axial direction	mm (in)	0.9 (0.035) or less
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less
		Rotation resistance	N (kgf, lb)	9.22 (0.94, 2.07) or less
	Regular pressure		kPa (kg/cm^2, psi)	981 (10, 142) or less
Steering wheel effort (Power steering system)	At standstill with engine idling on paved road		N (kgf, lb)	31.4 (3.2, 7.1) or less
	At standstill with engine stalled on paved road		N (kgf, lb)	294.2 (30, 66.2) or less

Recommended power steering fluid
SUBARU ATF or ATF DEXRON III

NOTE:
The table below lists various clearances that must be correctly adjusted to ensure the normal vehicle operation without interference noise, or any other faults. <Ref. to PS-56, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>

B: COMPONENT

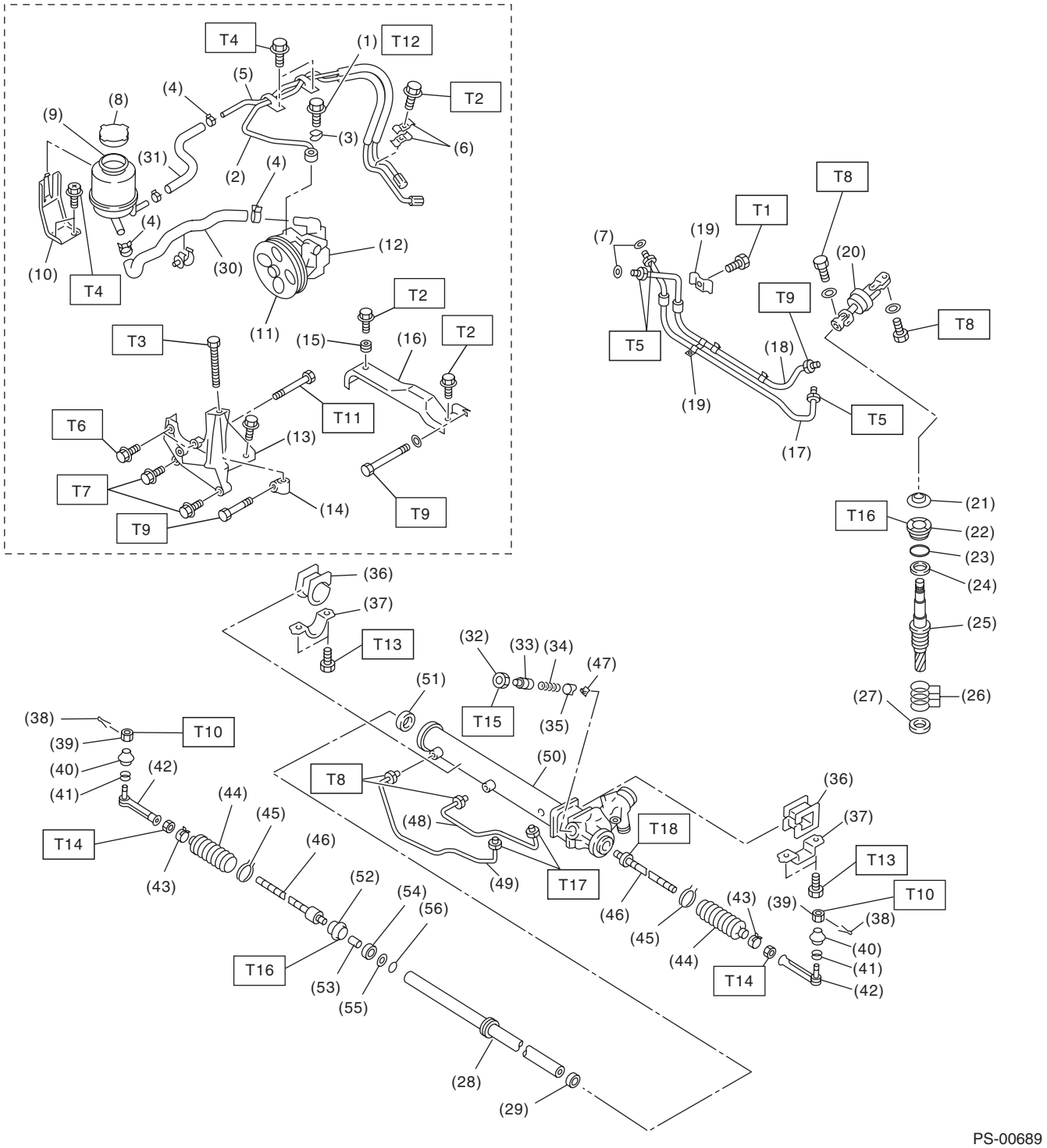
1. STEERING WHEEL AND COLUMN



(1)	Bushing	(5)	Steering wheel	
(2)	Steering shaft	(6)	Airbag module	
(3)	Steering roll connector	(7)	Steering wheel lower cover	
(4)	Column cover			

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.2 (0.12, 0.9)
T2: 25 (2.5, 18.1)
T3: 45 (4.6, 33.2)

2. POWER ASSISTED SYSTEM

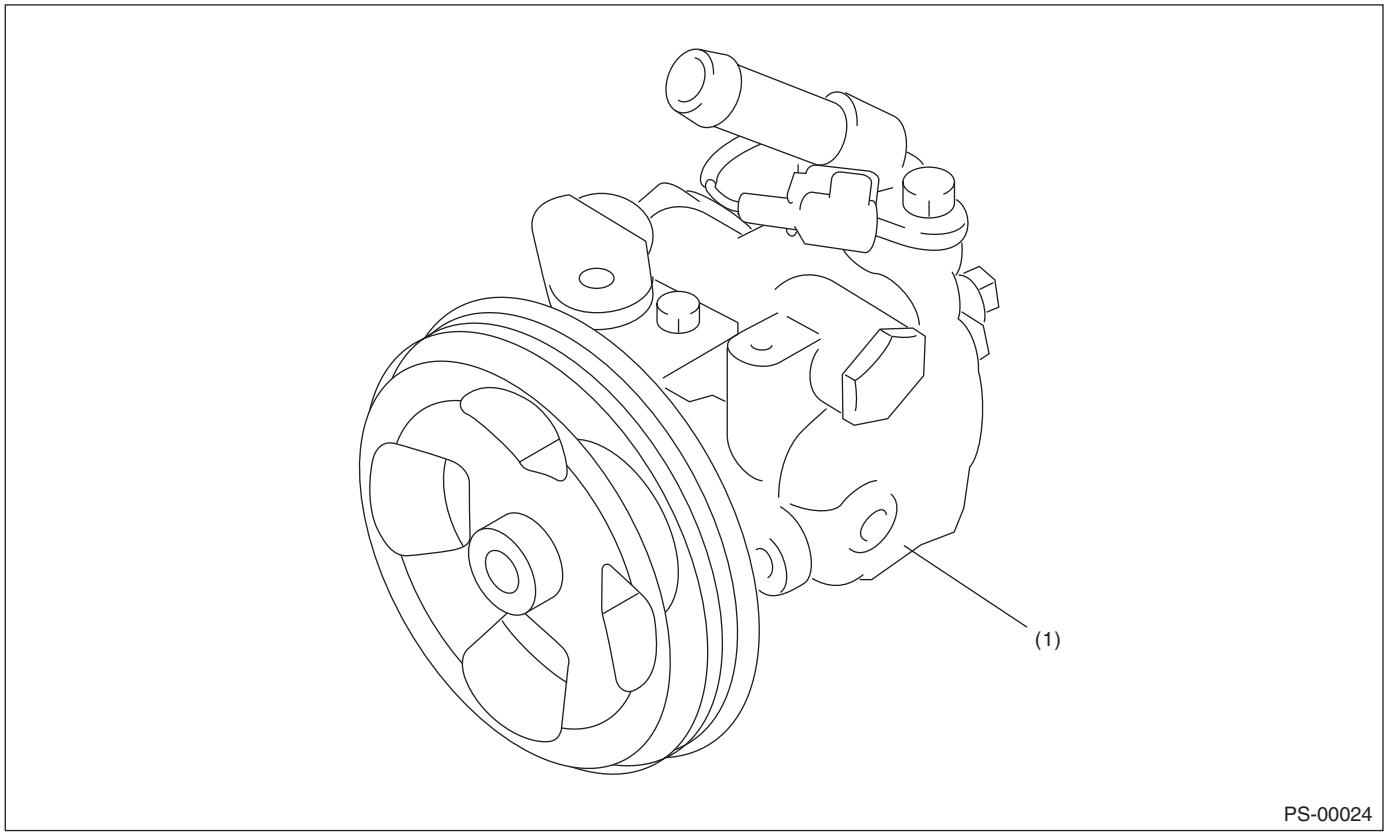


PS-00689

(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 cover
(22) Plug
(23) O-ring
(24) Oil seal
(25) Pinion and valve ASSY
(26) Seal ring
(27) Oil seal
(28) Rack
(29) Back-up washer
(30) Suction hose
(31) Return hose
(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) Boot band
(46) Tie-rod
(47) Sheet pad
(48) Pipe B
(49) Pipe A
(50) Steering body
(51) Oil seal
(52) Holder
(53) Bushing
(54) Oil seal
(55) Oil seal
(56) O-ring

Tightening torque:N·m (kgf-m, ft-lb)	
T1:	***6 (0.6, 4.3)***
T2:	***7.4 (0.75, 5.4)***
T3:	***8 (0.8, 5.8)***
T4:	***13 (1.3, 9.4)***
T5:	***15 (1.5, 10.8)***
T6:	***15.7 (1.6, 11.6)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.7)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***39 (4.0, 28.9)***
T13:	***60 (6.1, 44.1)***
T14:	***83 (8.5, 61.5)***
T15:	***39 (4.0, 28.9)***
T16:	***64 (6.5, 47.0)***
T17:	***20 (2.0, 14.5)***
T18:	***90 (9.0, 65.1)***

3. OIL PUMP



(1) Power steering oil pump ASSY

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine power steering fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply power steering fluid onto sliding or revolving surfaces before installation.
- Before installing the O-ring or snap ring, apply a sufficient amount of gear oil to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

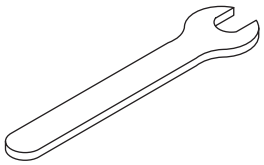
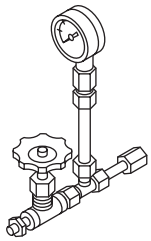
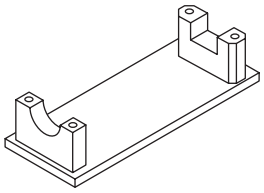
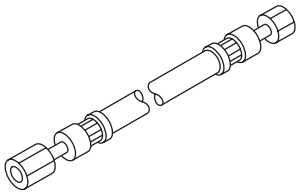
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925700000	925700000	WRENCH	• Used for removing and installing Tie-rod. • Apply this tool to rack.
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pressure.
 ST-926200000	926200000	STAND	Used when inspecting characteristics of the gearbox assembly and disassembly.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used together with PRESSURE GAUGE (925711000).

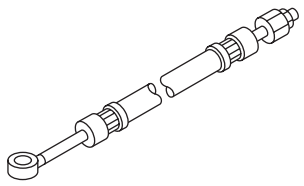
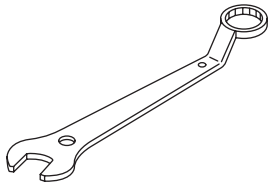
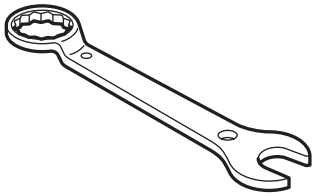
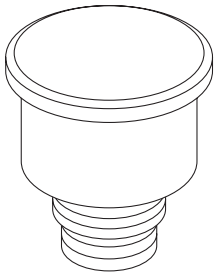
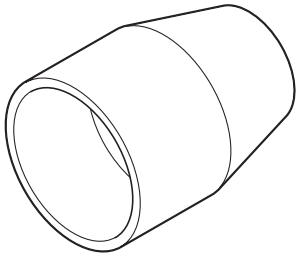
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used together with PRESSURE GAUGE (925711000).
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gearbox.
 ST34099PA100	34099PA100	SPANNER	Used when measuring the rotating resistance of gearbox assembly.
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering fluid.
 ST-926250000	926250000	GUIDE	Used for installing the holder assembly into the rack housing.

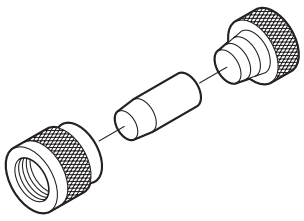
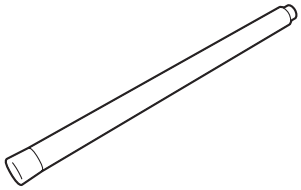
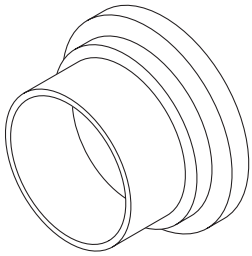
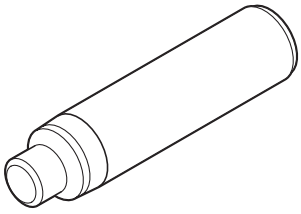
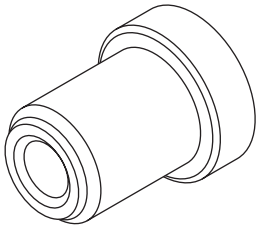
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927490000	927490000	INSTALLER A, B, C	Used for installing the oil seal to the rack assembly.
 ST-927580000	927580000	REMOVER	Used for removing the back-up ring and oil seal.
 ST34199AE000	34199AE000	GUIDE	Used for installing the rack and seal into housing assembly.
 ST34199FE000	34199FE000	INSTALLER & REMOVER	Used for removing and installing the rack oil seal (outer & inner).
 ST34199AE010	34199AE010	INSTALLER	Used for installing the rack oil seal (outer).

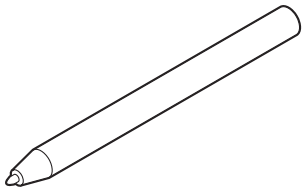
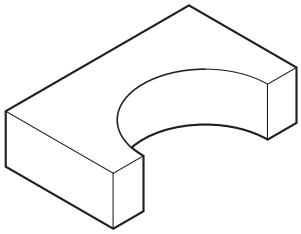
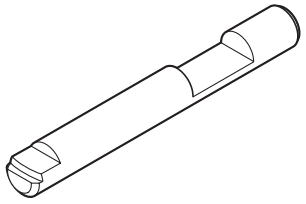
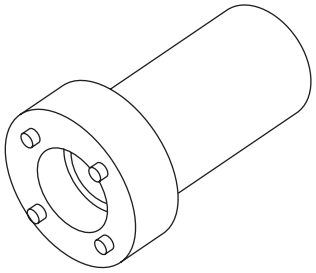
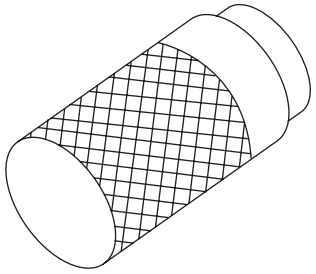
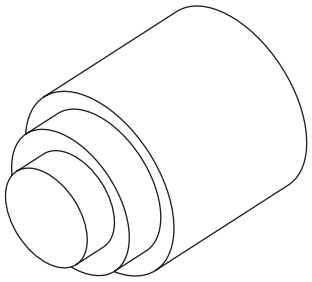
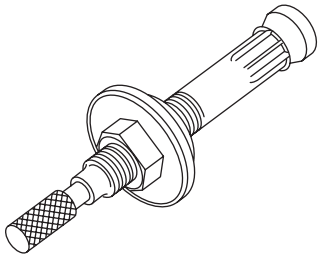
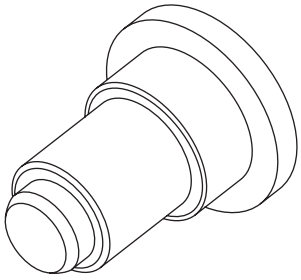
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA060	34099FA060	PUNCH HOLDER	Used for crimping.
 ST34099FA070	34099FA070	BASE	Used for the support housing assembly.
 ST34099FA080	34099FA080	PUNCH	Used for removing crimps.
 ST34199AE090	34199AE090	PLUG WRENCH	Used for removing the plug.
 ST34199AE100	34199AE100	OIL SEAL PLUG REMOVER	Used for removing the oil seal plug.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE110	34199AE110	OIL SEAL PLUG INSTALLER	Used for installing the oil seal plug.
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	Used for removing the gearbox oil seal.
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	Used for installing the gearbox oil seal.

2. GENERAL TOOL

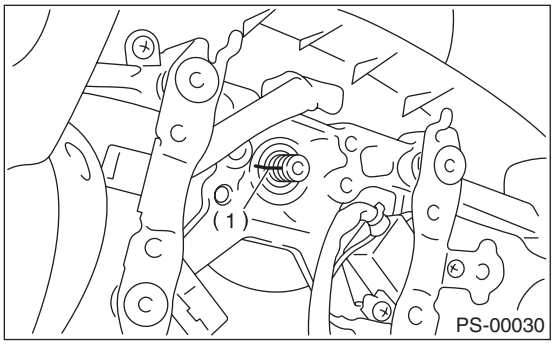
TOOL NAME	REMARKS
Spring scale	Used for measuring tightening torque.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring the steering gearbox.
Hand clamp pliers	Used for crimping the boot band.
Steering wheel puller	Used for removing the steering wheel.

2. Steering Wheel

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Set the tire to the straight-ahead position.
3) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>
4) Place alignment marks on the steering wheel and steering shaft.



(1) Alignment mark

5) Remove the steering wheel nut, and then draw out the steering wheel from the shaft using a steering puller.

B: INSTALLATION

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>
1) Align the center position of the roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align the alignment marks on the steering wheel and steering shaft.

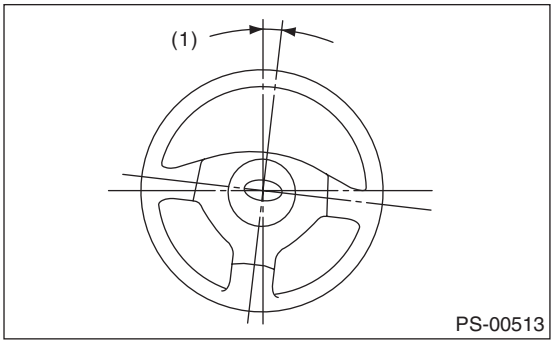
Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

Column cover to steering wheel clearance
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert the roll connector guide pin into the guide hole on the lower end of the steering wheel surface. Avoid damaging the pin.

C: INSPECTION

1) Check the steering wheel for deformation. If the deformation is excessive, replace the steering wheel.
2) Check the splines on the steering wheel for damage. If the damage is excessive, replace the steering wheel.
3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of the steering wheel, correctly reinstall the steering wheel.

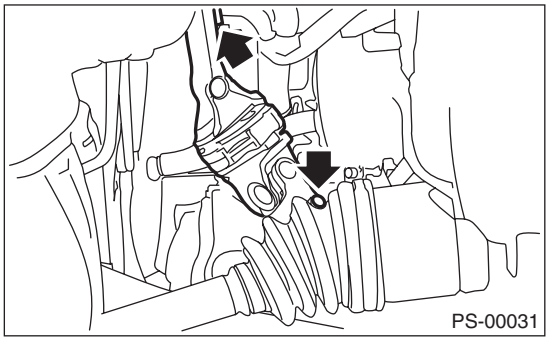


(1) Within 5°

3. Universal Joint

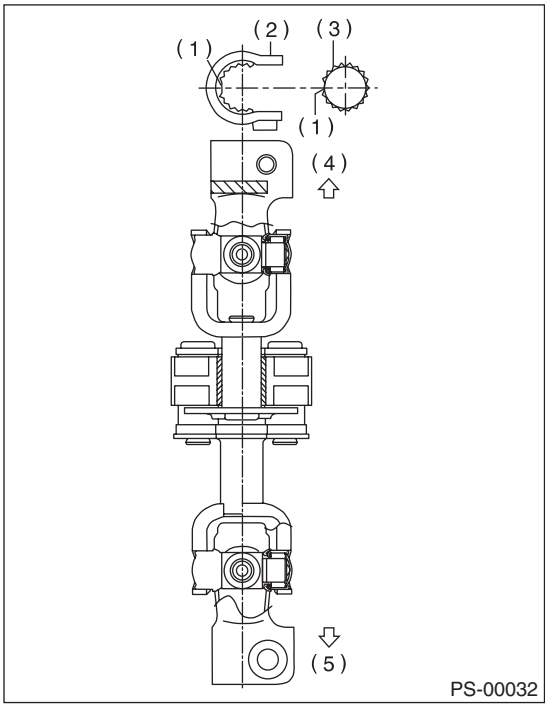
A: REMOVAL

1) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
2) Place alignment marks on universal joint.
3) Remove the universal joint bolt, and then remove the universal joint.



B: INSTALLATION

1) Align the cutout portion at the serrated section of the steering shaft and yoke, then insert the universal joint into the steering shaft.



(1) Cutout portion
(2) Yoke
(3) Steering shaft
(4) Steering shaft side
(5) Gearbox side

2) Match the alignment marks, and insert the universal joint into the serrations of gearbox assembly.
3) Tighten the bolt.

Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
Do not excessively tighten the torque on the universal joint bolts. Overtightening will make the steering wheel heavy.

Standard clearance between gearbox to DOJ:
14 mm (0.55 in) or more

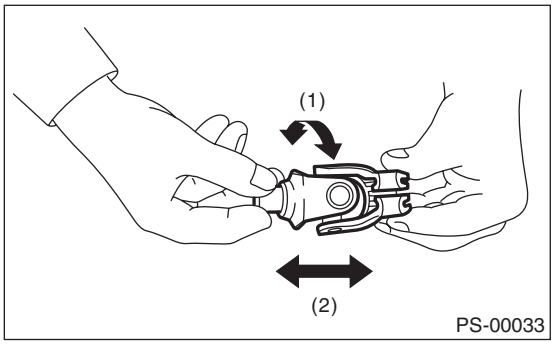
4) Align the center position of the roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
5) Install the steering wheel and airbag module. <Ref. to PS-13, INSTALLATION, Steering Wheel.>

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>

C: INSPECTION

Check for wear, damage or any other faults.
Replace as necessary.

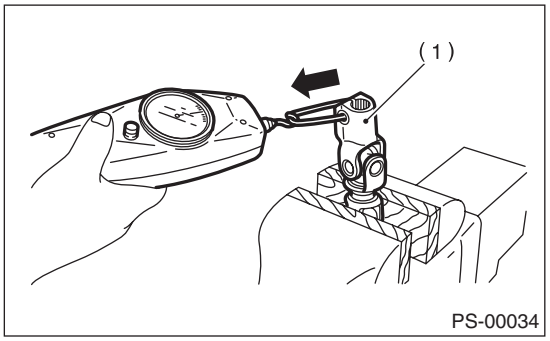
Service limit:
Free play of the universal joint:
0 mm (0 in)
Maximum value of swing torque:
0.3 N (0.03 kgf, 0.07 lb)



(1) Swing torque
(2) Play

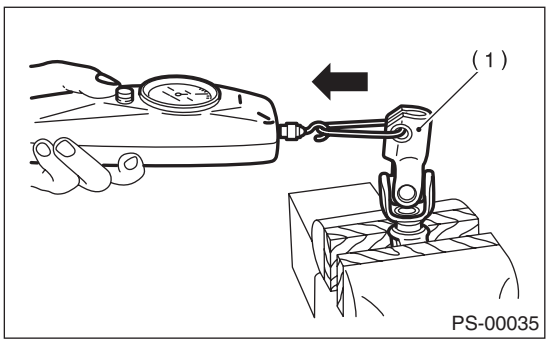
Measure the swing torque of universal joint.

Service limit:
Maximum load:
3.8 N (0.39 kgf, 0.86 lb) or less



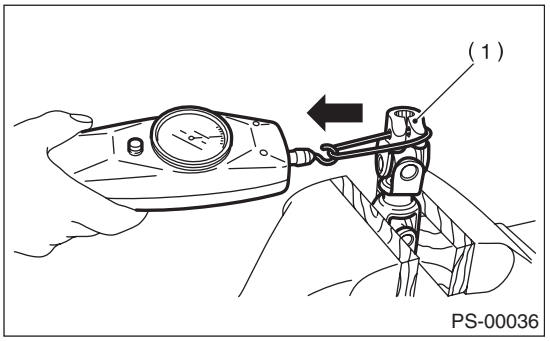
(1) Yoke (Gearbox side)

Service limit:
Maximum load:
3.8 N (0.39 kgf, 0.86 lb) or less



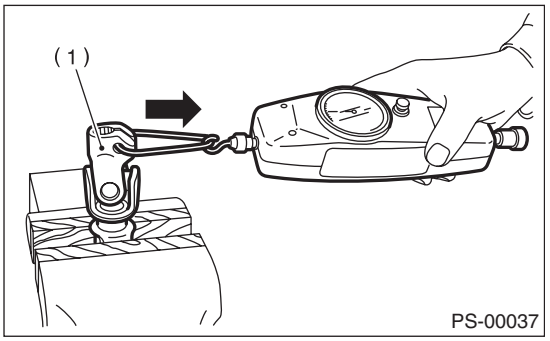
(1) Yoke (Gearbox side)

Service limit:
Maximum load:
7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

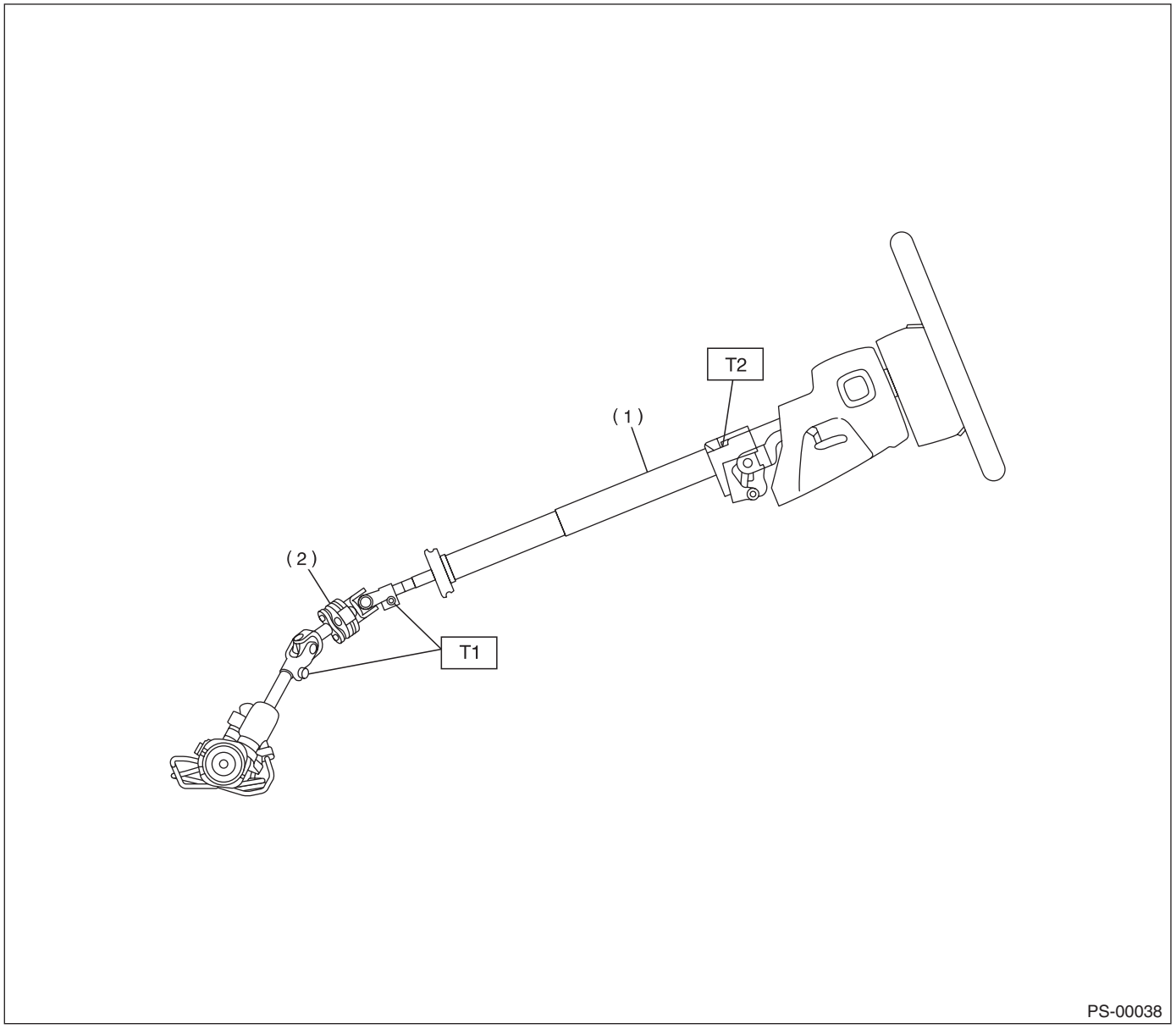
Service limit:
Maximum load:
7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

4. Tilt Steering Column

A: REMOVAL

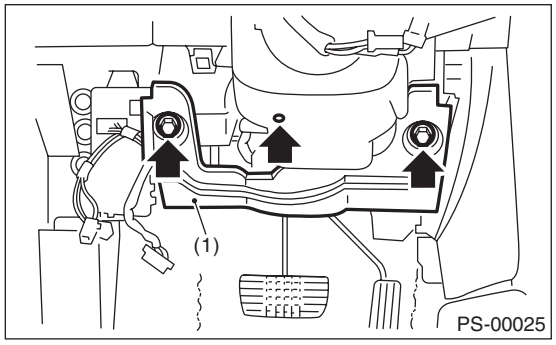


(1) Tilt steering column
(2) Universal joint

Tightening torque:N·m (kgf-m, ft-lb)
T1: 24 (2.4, 17.7)
T2: 25 (2.5, 18.1)

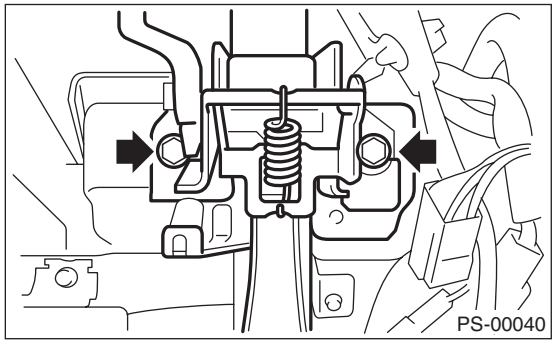
1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>
4) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
5) Remove the universal joint. <Ref. to PS-14, REMOVAL, Universal Joint.>
6) Remove the trim panel under instrument panel.
7) Knee guard panel and steering column lower cover.



(1) Knee guard panel

8) Remove all connectors from the steering column.
9) Remove the two bolts under instrument panel securing the steering column.

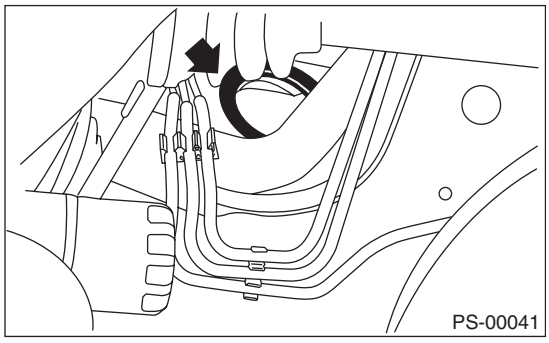


10) Pull out the steering shaft assembly from the hole on toe board.

CAUTION:
• Be sure to remove the universal joint before removing steering shaft assembly installing bolt, when removing the steering shaft assembly or when lowering it to service other parts.
• Do not loosen the tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

1) Set the grommet to the toe board.



2) Insert the end of the steering shaft into the toe board grommet.
3) Tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
4) Connect all the connectors under the instrument panel.
5) Connect the airbag system connector at the harness spool.

NOTE:
Make sure to apply double lock.
6) Install the lower column cover with tilt lever held in the lowered position.
7) Install the universal joint. <Ref. to PS-14, INSTALLATION, Universal Joint.>
8) Align the center position of the roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
9) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>

CAUTION:
Insert the roll connector guide pin into the guide hole on lower end of steering wheel surface to prevent damage.
10) Install the airbag module to the steering wheel.

WARNING:
Always refer to "Airbag System" before performing the service operation. <Ref. to AB-4, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing the upper steering column covers, and the two screws securing the combination switch, and then remove related parts.

D: ASSEMBLY

Insert the combination switch to the upper column shaft, and install the upper column cover. Then route the ignition key harness and combination switch harness between the column cover mounting bosses.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

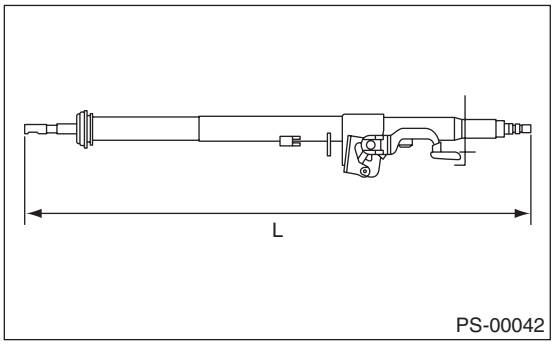
CAUTION:
Do not overtorque the screw.

E: INSPECTION

1. BASIC INSPECTION

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

Specification:
Overall length L
808.6±1.5 mm (31.83±0.059 in)



2. AIRBAG MODEL INSPECTION

Refer to “Airbag System” for airbag model inspection procedure. <Ref. to AB-14, INSPECTION, Driver’s Airbag Module.>

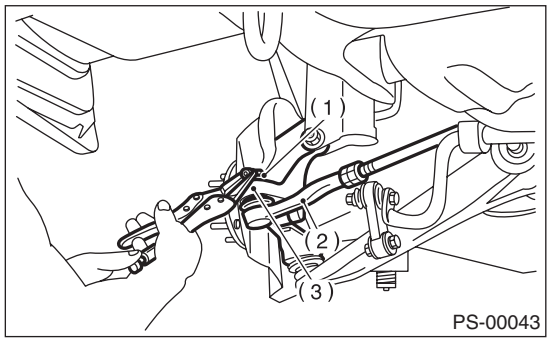
5. Steering Gearbox

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Loosen the front wheel nuts.
4) Lift up the vehicle, and remove the front wheels.
5) Remove the under cover.
6) Remove the sub frame. <Ref. to FS-24, REMOVAL, Sub Frame.>
7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

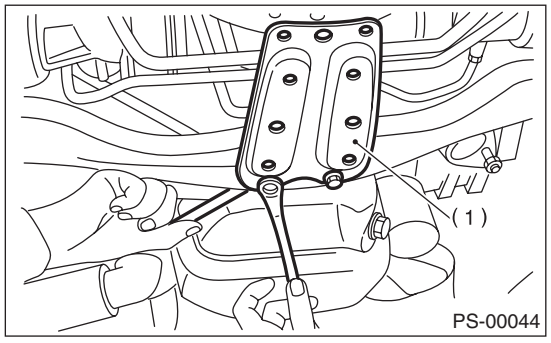
WARNING:
The exhaust pipe is extremely hot. Be careful not to burn your hand.

8) After pulling off the cotter pin and removing the castle nut, use a puller to remove the tie-rod end from the knuckle arm.



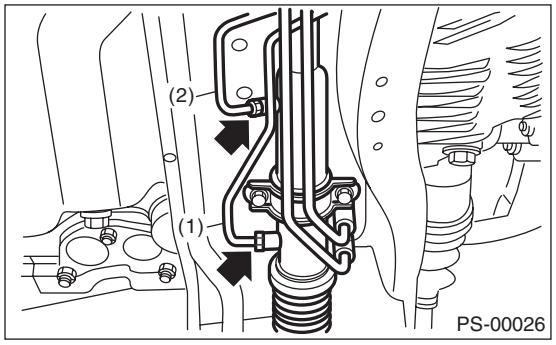
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

9) Remove the jack-up plate and front stabilizer.



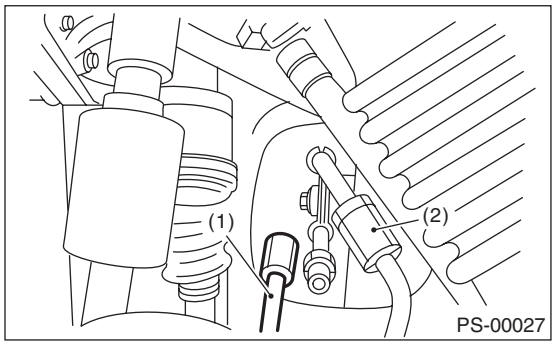
(1) Jack-up plate

10) Remove the one pipe joint at the center of gearbox assembly, and connect a vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



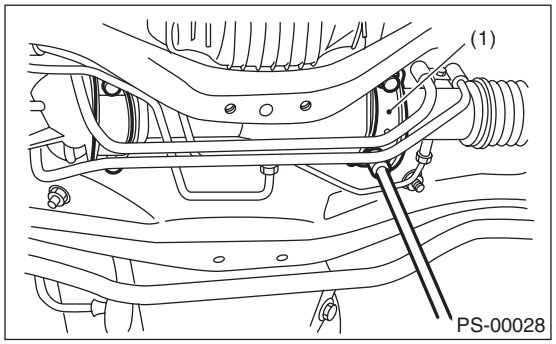
(1) Pipe A
(2) Pipe B

11) Remove the universal joint. <Ref. to PS-14, REMOVAL, Universal Joint.>
12) Disconnect the lower pipe C from gearbox assembly first, and upper pipe D second.



(1) Pipe C
(2) Pipe D

13) Remove the clamp bolts securing the gearbox assembly to the crossmember, and remove the gearbox.

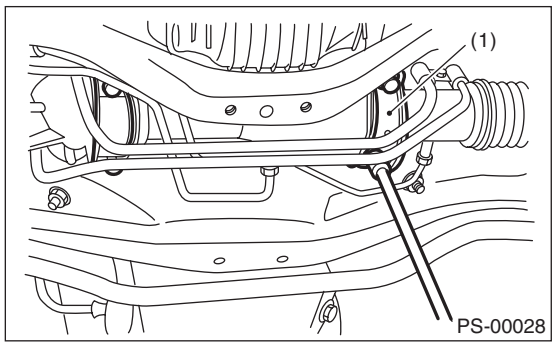


(1) Clamp

B: INSTALLATION

1) Insert the gearbox assembly into the crossmember, being careful not to damage the gearbox assembly boot.
2) Tighten the gearbox assembly to the crossmember bracket via clamp with bolt, and tighten to the specified torque.

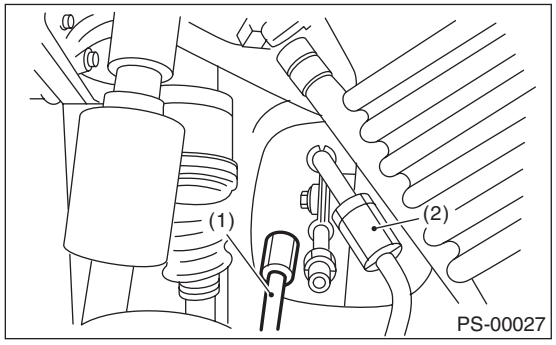
Tightening torque:
60 N·m (6.1 kgf-m, 44.1 ft-lb)



(1) Clamp

3) Connect the pipe D first to gearbox, then lower pipe C.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



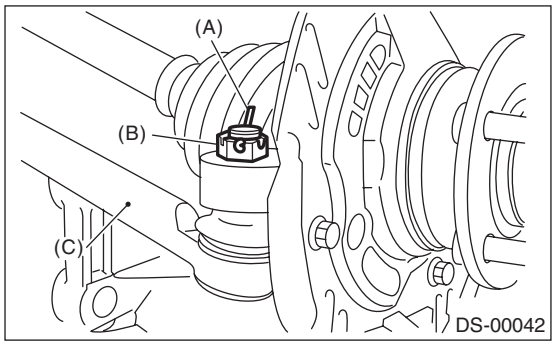
(1) Pipe C
(2) Pipe D

4) Install the universal joint. <Ref. to PS-14, INSTALLATION, Universal Joint.>
5) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

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

CAUTION:
When connecting, do not hit the cap at the bottom of tie-rod end with hammer.

6) After tightening the castle nut to the specified tightening torque, tighten it further within 60° until the cotter pin hole is aligned with slot in the nut. Fit the cotter pin into nut, and then bend the pin to lock.



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

7) Install the front stabilizer to vehicle. <Ref. to FS-22, INSTALLATION, Front Stabilizer.>
8) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
9) Install the sub frame. <Ref. to FS-24, INSTALLATION, Sub Frame.>
10) Install the under cover. <Ref. to EI-19, INSTALLATION, Front Under Cover.>
11) Align the center position of the roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
12) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>
13) Install the front wheels.
14) Tighten the wheel nuts to the specified torque.

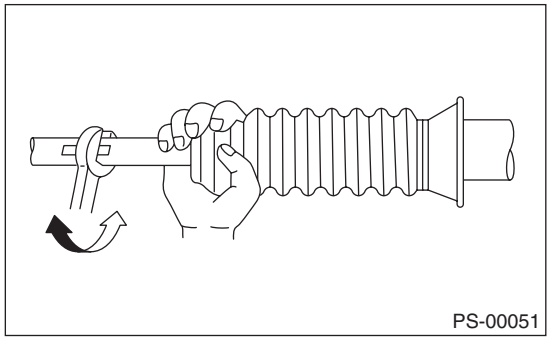
Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

15) Connect the ground cable to the battery.
16) Pour fluid into the reservoir, and bleed the air. <Ref. to PS-50, Power Steering Fluid.>
17) Check for fluid leaks.
18) Install the jack-up plate.
19) Lower the vehicle.
20) Check the fluid level in the reservoir tank.

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

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

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

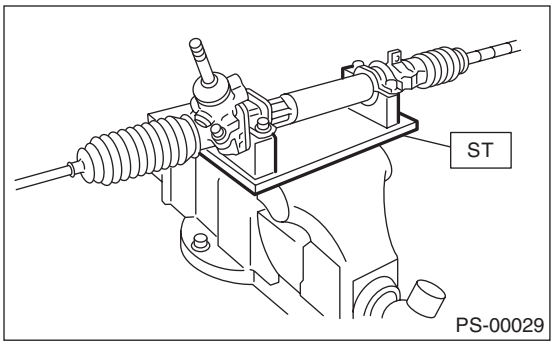


C: DISASSEMBLY

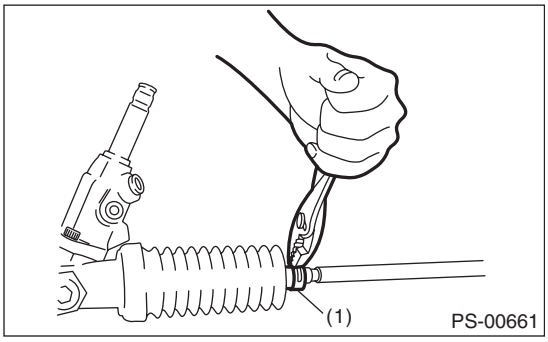
1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes E and F, which are fixed to the clamp plate, as a unit.
2) Secure the gearbox assembly removed from the vehicle in a vise using a ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox assembly in a vise using ST as shown. Do not affix the gearbox to the vice without this ST.



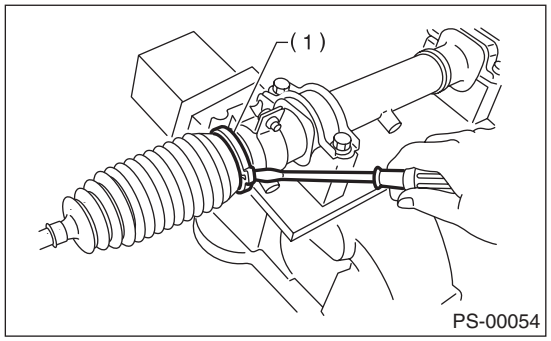
3) Remove the tie-rod end and lock nut from gearbox assembly.
4) Move the clip of the boot using the pliers, and then slide the boot to the tie-rod end side.



(1) Clip

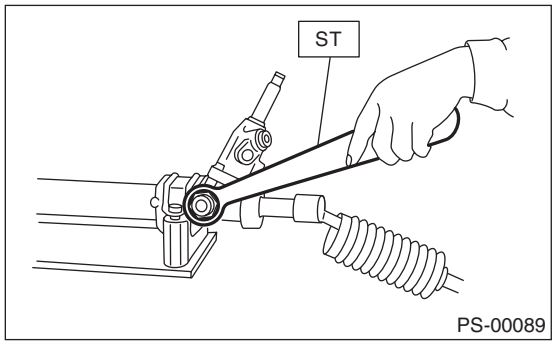
5) Using a flat tip screwdriver, remove the band from boot.

NOTE:
Replace the boot if there is damage, cracks or deterioration.

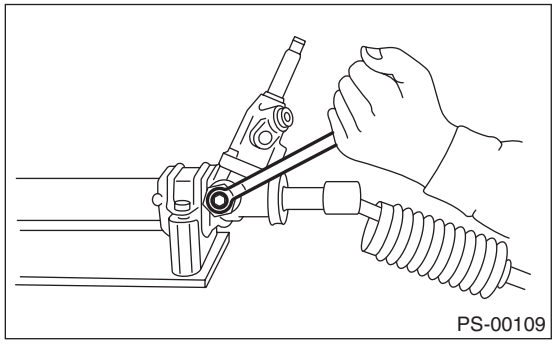


(1) Band

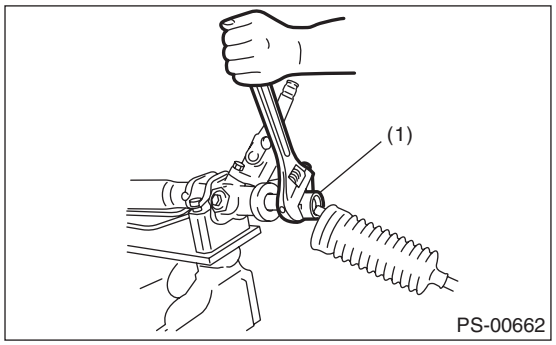
6) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



7) Tighten the adjusting screw until it can no longer be tightened.

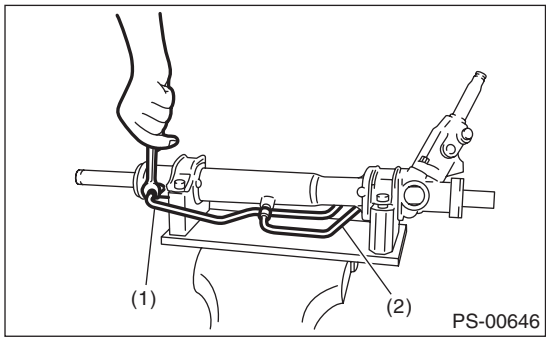


8) Remove the tie-rod using a 32 mm (1.26 in) wrench or adjustable wrench.



(1) Tie-rod

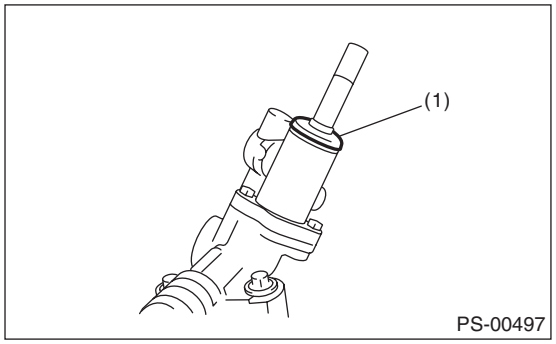
9) Loosen the adjusting screw, and remove the spring and sleeve.
10) Disconnect the pipes A and B from steering body and control valve housing.



(1) Pipe A
(2) Pipe B

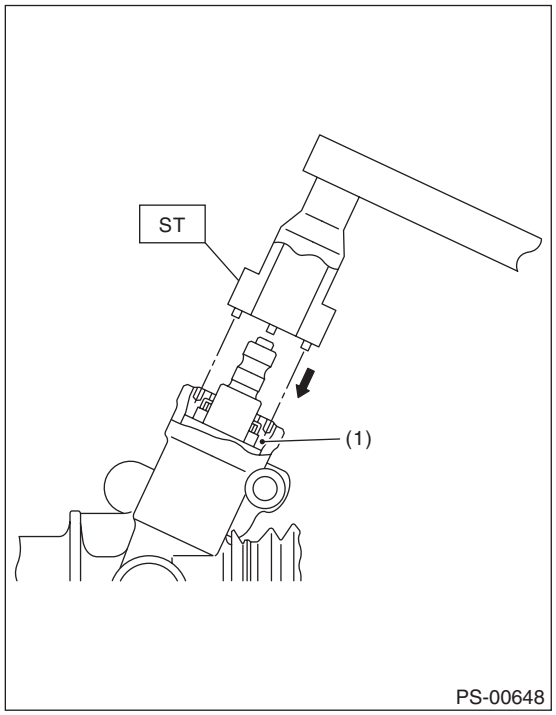
11) Clean any dirt adhered to the input shaft. Remove the dust cover, paying attention not to scratch the housing or input shaft and not to allow foreign matter to enter gear box interior.

CAUTION:
Wrap a tape around the input shaft spline in order not to damage the dust cover.



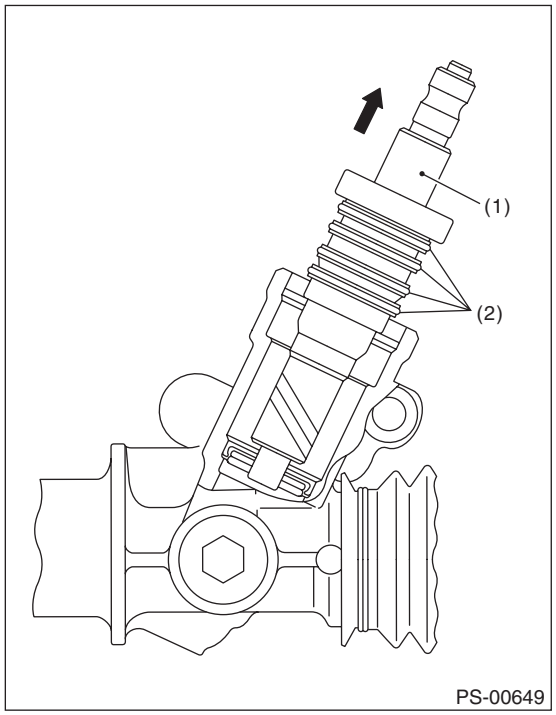
(1) Dust cover

12) Align the ST pin with plug hole to install. Rotate the ST counterclockwise to remove plug.
ST 34199AE090 PLUG WRENCH



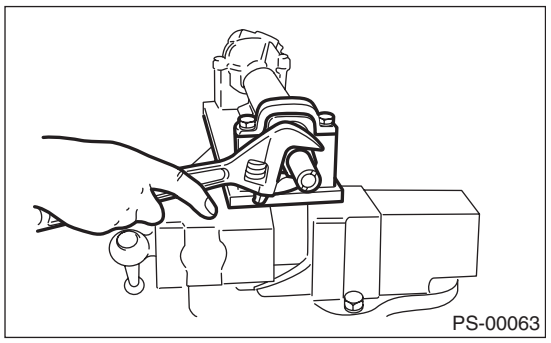
(1) Plug

13) Remove the valve assembly paying attention not to scratch the seal ring or valve housing inner surfaces.



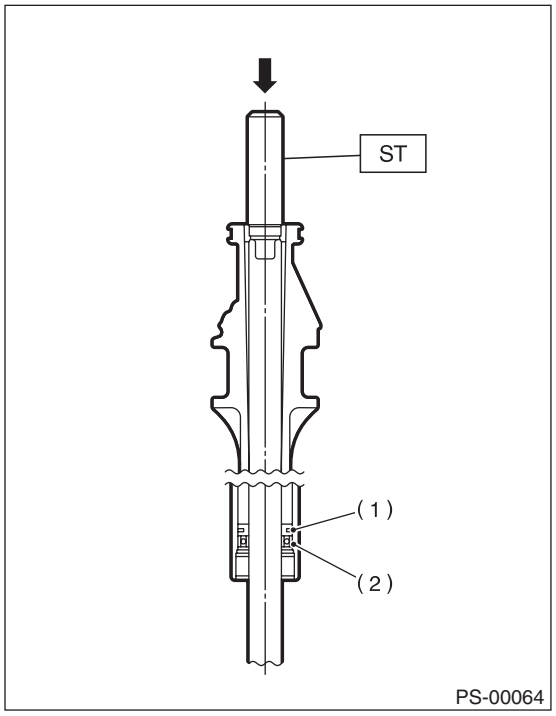
(1) Valve ASSY
(2) Seal ring

14) Remove the holder using a 32 mm (1.26 in) wrench or adjustable wrench.



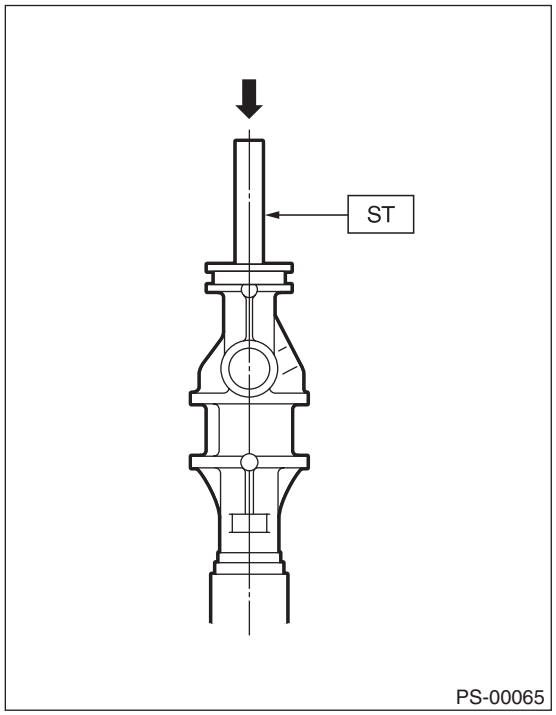
15) Attach the ST on the valve side of rack, and press out the outer side oil seal while taking care that the rack and the steering body inner surface do not come into contact with each other.
ST 34199FE000 INSTALLER & REMOVER

NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.

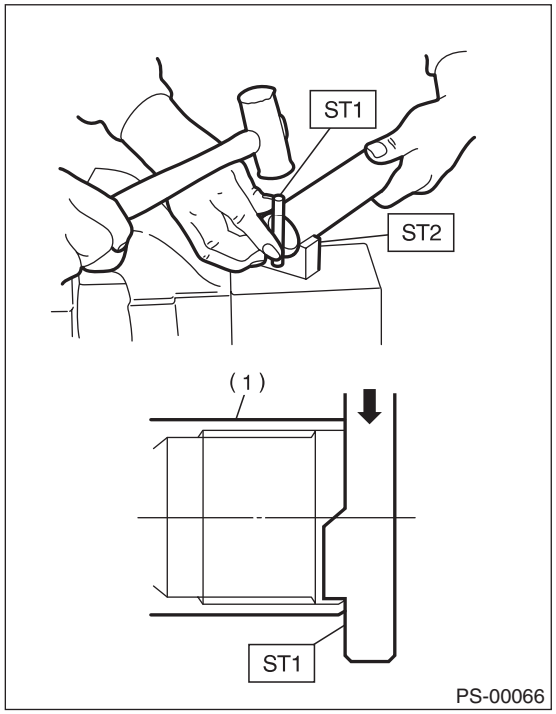


(1) Rack piston
(2) Outer side oil seal

16) Insert the ST from the valve side and press the back-up ring and oil seal out.
ST 927580000 REMOVER

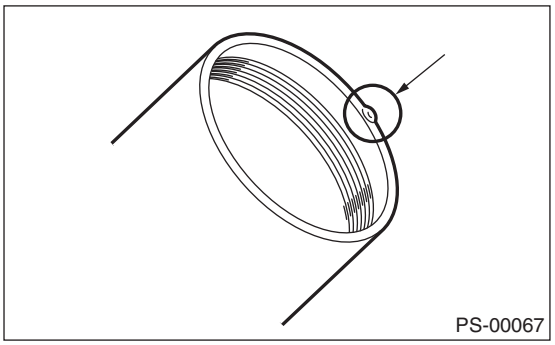


17) Using ST1 and ST2, repair the crimped portion of cylinder.
ST1 34099FA080 PUNCH
ST2 34099FA070 BASE



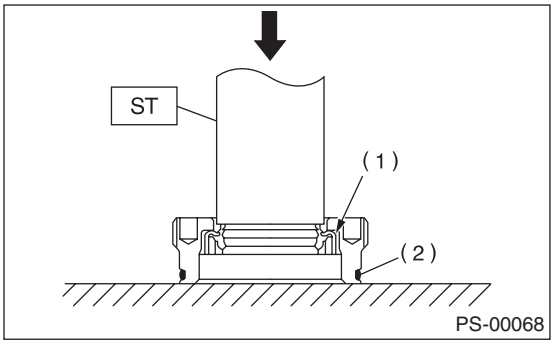
(1) Cylinder

18) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



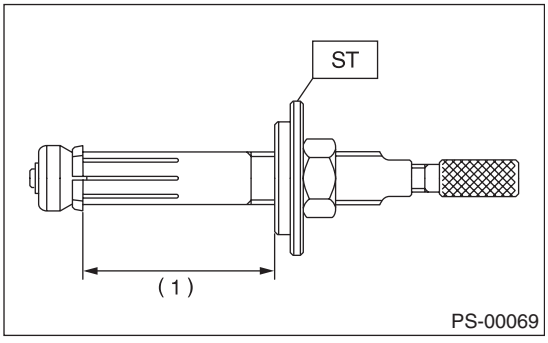
19) Remove the oil seal using ST and push out from the plug.
ST 34199AE100 OIL SEAL PLUG REMOVER

NOTE:
Do not apply force on the plug edge surface.



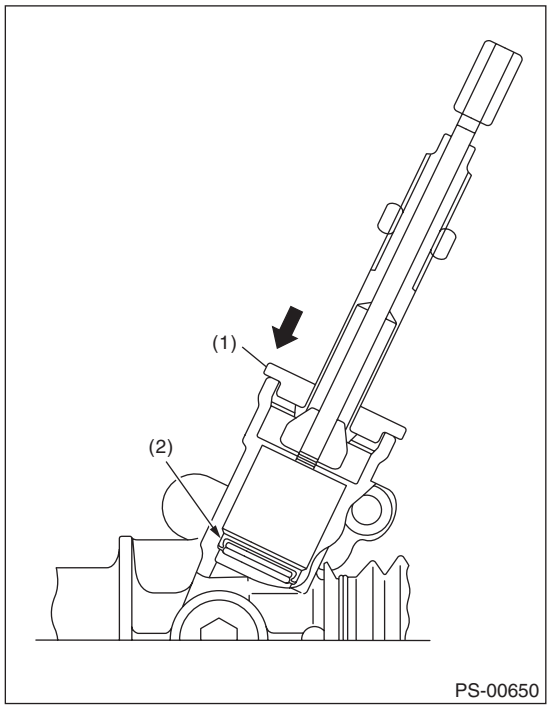
(1) Oil seal
(2) O-ring

20) Set the ST at a size shown in the figure.
ST 34199AE120 GEARBOX OIL SEAL REMOVER



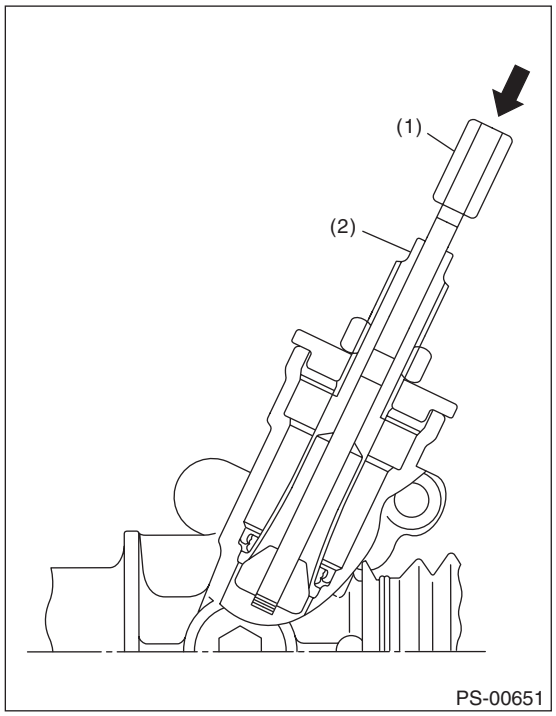
(1) 70 mm (2.76 in)

21) Set the stopper to gearbox, then insert the tip of the ST to the gearbox.



(1) Stopper
(2) Oil seal

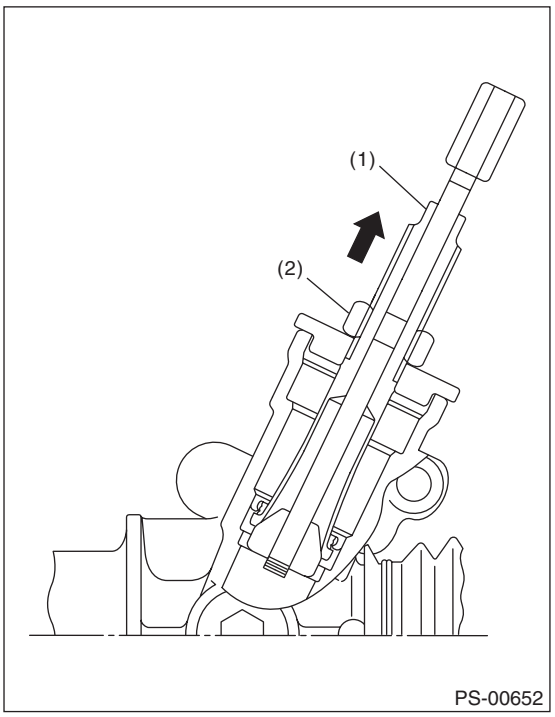
22) By fixing the 2-surface widths, press-in the rod while rotating it and catch the oil seal.



(1) Rod
(2) 2-surface widths

23) While fixing the 2-surface widths, pull out the oil seal by rotating nut.

CAUTION:
Take care not to scratch the gearbox inner surface.



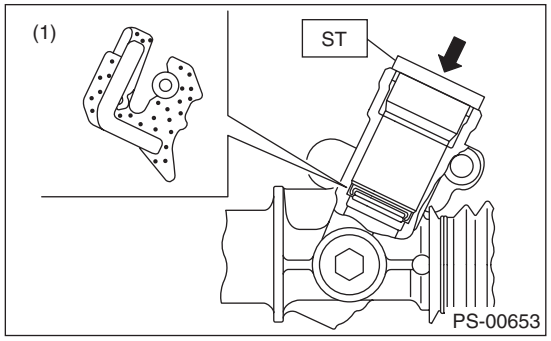
(1) 2-surface widths
(2) Nut

D: ASSEMBLY

1) Apply a coat of grease to the inside and outside of the new oil seal.

Steering grease:
ONE LUBER MO (Part No. 003608001)

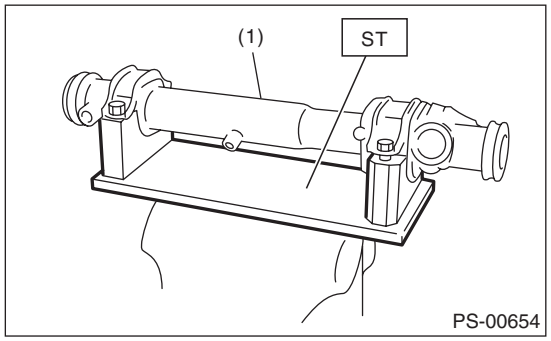
2) Verify the direction of the oil seal and installation position. Using the ST and a press, press-fit the oil seal into the gearbox.
ST 34199AE130 GEARBOX OIL SEAL INSTALLER



(1) Oil seal

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.
ST 926200000 STAND

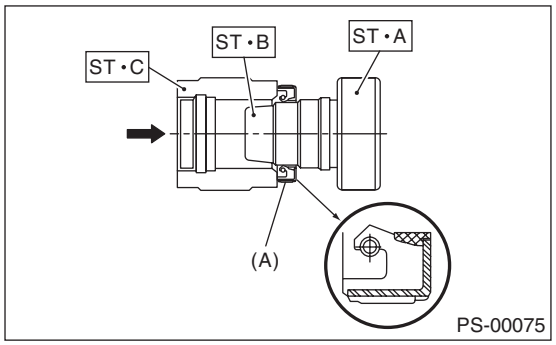
CAUTION:
Make sure the needle bearing is free from defects. If it is faulty, replace the steering body with a new part.



(1) Steering body

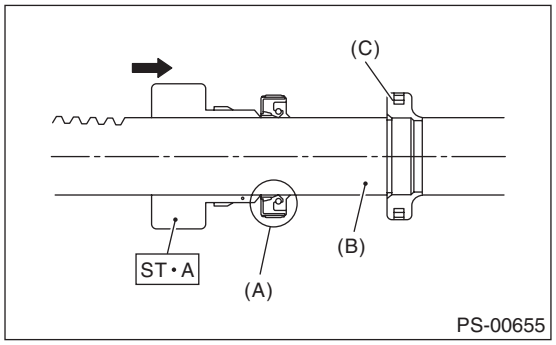
4) Using the ST B and ST C, attach the oil seal to ST A.
ST 927490000 INSTALLER A, B, C

NOTE:
Face the oil seal in the direction as shown in the figure.



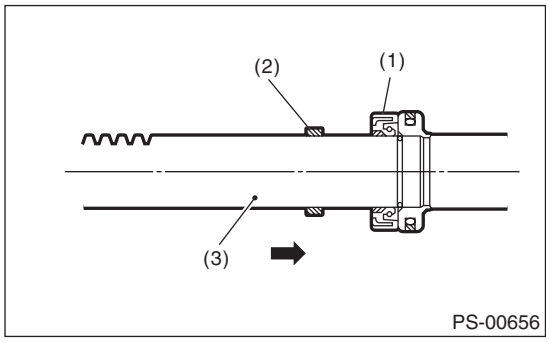
(A) Oil seal

5) Insert the ST A with oil seal assembled from the gear side of rack. Remove the oil seal from ST A near piston, and then remove the ST A from rack.



(A) Oil seal
(B) Rack
(C) Piston

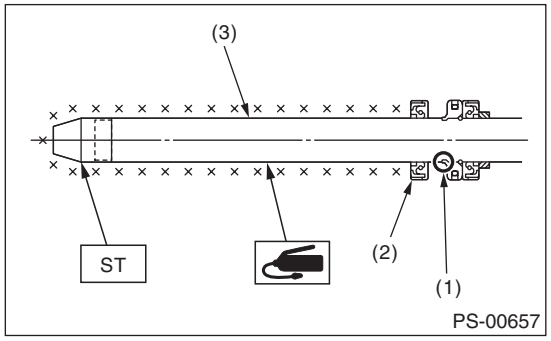
6) Install the back-up washer from the gear side of rack.



(1) Oil seal
(2) Back-up washer
(3) Rack

7) Attach the ST on rack, equally apply a thin coat of grease to the rack and ST, and then install the oil seal.
ST 926250000 GUIDE

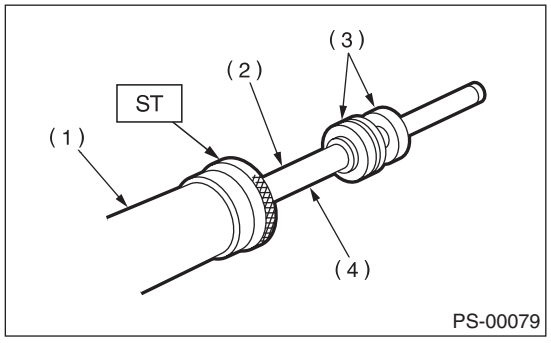
CAUTION:
Be careful not to scratch the oil seal lips with the inner ring section of piston.



(1) Rack piston inner ring
(2) Outer side oil seal
(3) Rack

8) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Attach the ST on the end of steering body cylinder. Then insert the rack into steering body from cylinder side.
ST 34199AE000 GUIDE (OIL SEAL)

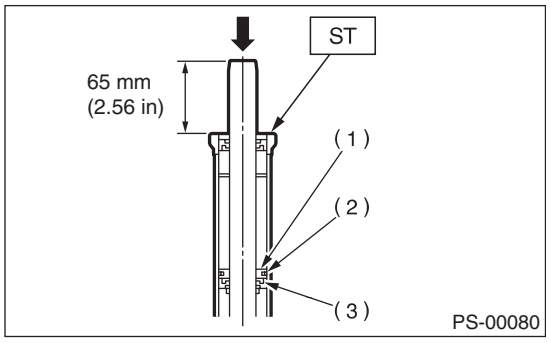
CAUTION:
Do not allow grease to block the air vent hole on rack.



(1) Cylinder side of steering body
(2) Air vent hole
(3) Oil seal
(4) Rack

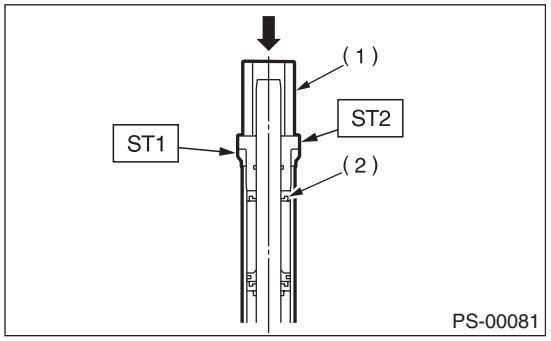
9) Slowly push the inner side oil seal using the press until the distance from the ST to the end of the rack is 65 mm (2.56 in).
ST 34199AE000 GUIDE (OIL SEAL)

CAUTION:
Make sure that there are no scratches on the inner wall of the ST. Otherwise there is a possibility of the oil seal being damaged when it is installed.



(1) Rack piston
(2) Inner side oil seal
(3) Back-up ring

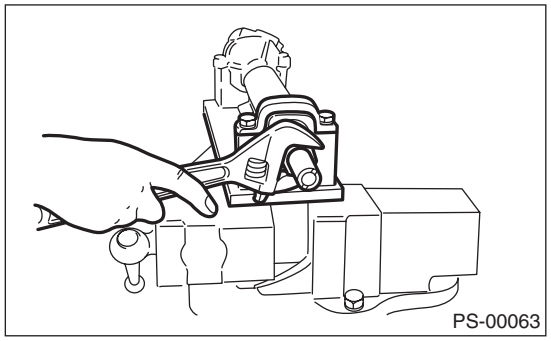
10) Make the ST2 and pipe pass through rack, and then press-in the ST1, ST 2 and the outer side oil seal using a press.
ST1 34199AE000 GUIDE (OIL SEAL)
ST2 34199AE010 INSTALLER (OIL SEAL)



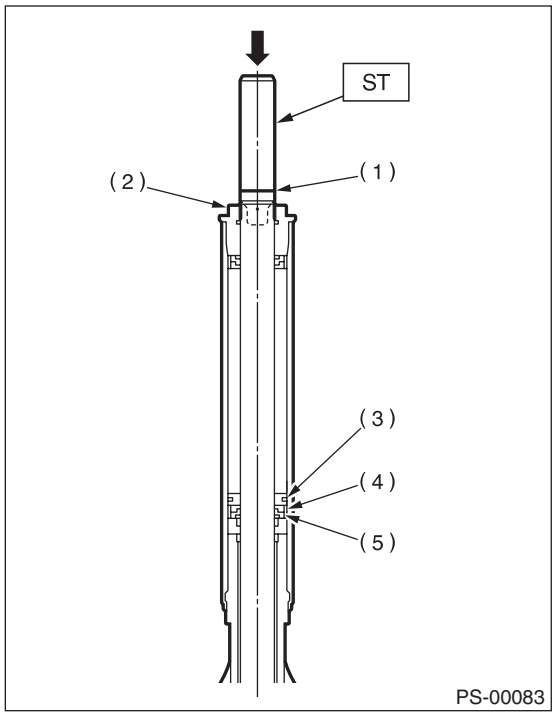
(1) Pipe
(2) Outer side oil seal

11) Install a new holder to the cylinder side of steering body.

Tightening torque:
64 N·m (6.5 kgf-m, 47.0 ft-lb)



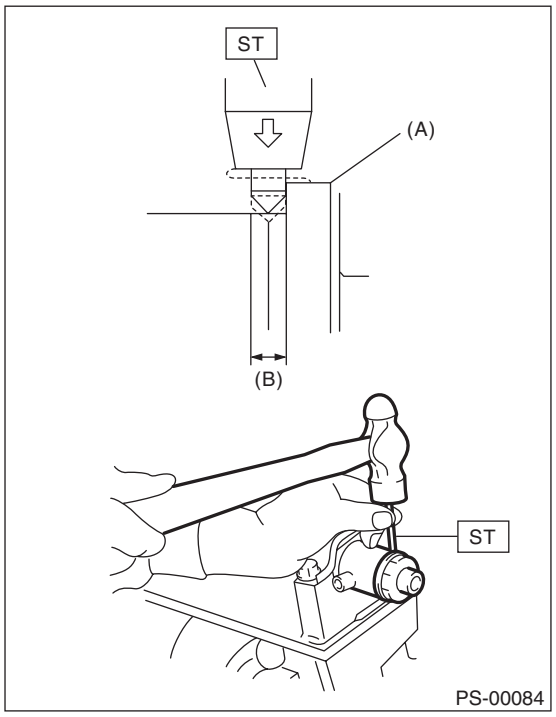
12) Attach the ST on rack cylinder. Using the press, press in the ST until the groove on the ST aligns with the edge of the holder.
ST 34199FE000 INSTALLER & REMOVER



(1) Groove
(2) Holder
(3) Rack piston
(4) Oil seal
(5) Back-up ring

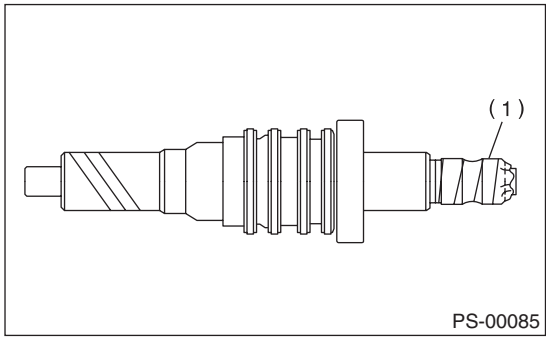
13) Using the ST, crimp the steering body at one point less than 3 mm (0.12 in) from holder.

CAUTION:
Be careful not to deform the holder.
ST 34099FA060 PUNCH HOLDER



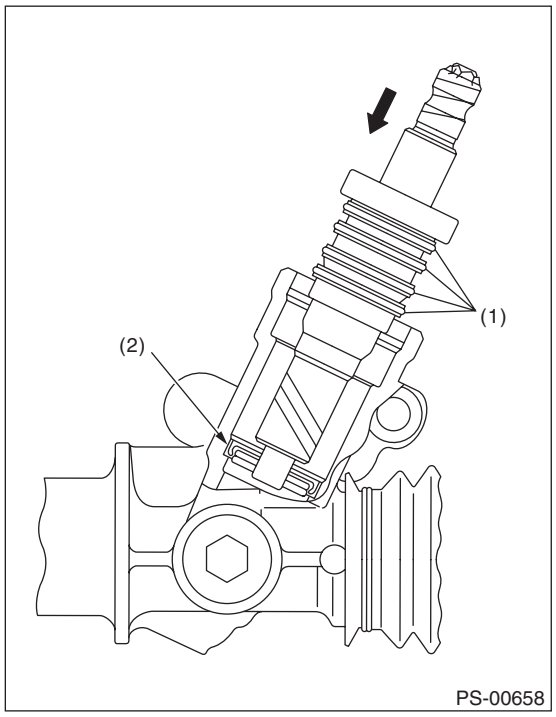
(A) Holder
(B) 3 mm (0.12 in)

14) Roll a vinyl tape on the serration portion of valve assembly, and then apply grease on the tape surface.



(1) Vinyl tape

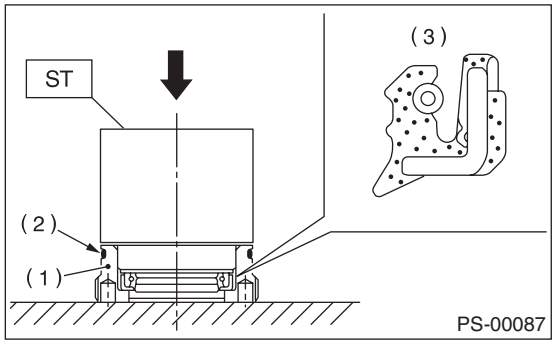
15) Apply a coat of grease on the gear teeth of the valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.



(1) Seal ring
(2) Oil seal

16) Apply grease on the oil seal circumference, and then press it into the plug using ST and a press. Replace the O-rings of plug circumference with new O-rings.
ST 34199AE110 OIL SEAL PLUG INSTALLER

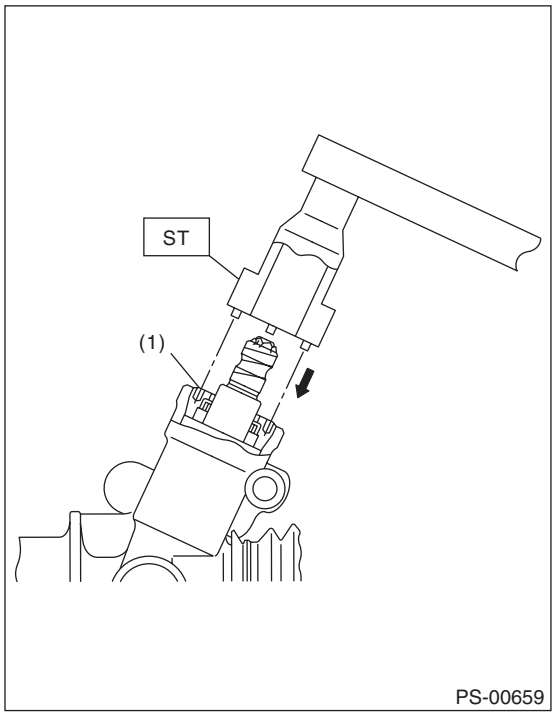
CAUTION:
Install the oil seal paying attention to correct direction.



(1) Plug
(2) O-ring
(3) Oil seal

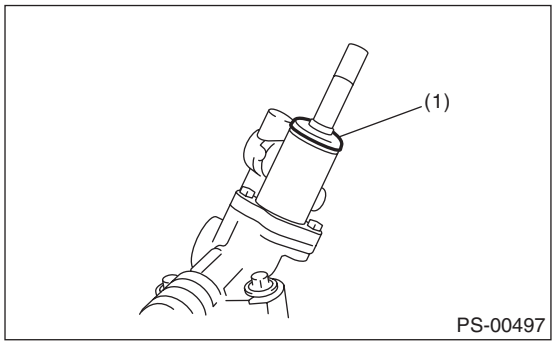
17) Attach the plug using ST.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf-m, 47.0 ft-lb)



(1) Plug

18) Install the dust cover and then remove the vinyl tape.

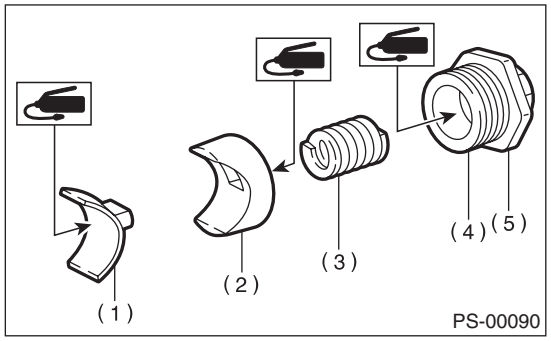


(1) Dust cover

19) Temporarily tighten the tie-rod to the rack end, and then operate the rack from lock to lock for two or three times to make it fit in. Remove any grease blocking the air vent hole.

CAUTION:
If operating the rack from lock to lock without installing tie-rods, it may damage the oil seal. Always install the tie-rods LH and RH.

20) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw. Then install on the steering body.



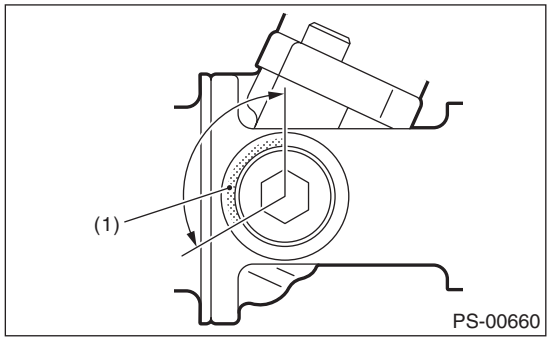
(1) Sheet pad
(2) Sleeve
(3) Spring
(4) Adjusting screw
(5) Lock nut

21) Tighten the adjusting screw to the specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

NOTE:
After tightening with the specified torque, loosen it by 25°.
22) Remove the tie-rod.
23) Check that the play, or looseness, is at the standard value. <Ref. to PS-33, SERVICE LIMIT, INSPECTION, Steering Gearbox.>
24) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

25) Tighten the adjusting screw.
(1) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)
(2) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)
(3) Tighten the adjusting screw to the specified torque, then loosen it 26°.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)
26) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.
ST 926230000 SPANNER

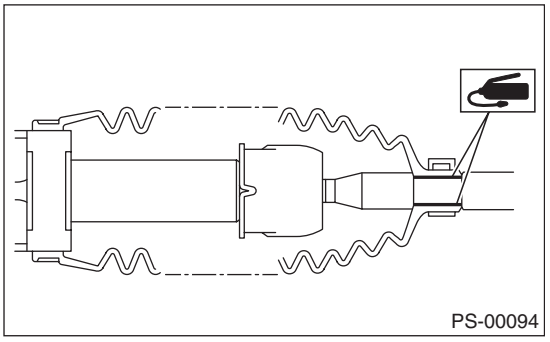
Tightening torque (lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening the lock nut.
27) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.0 kgf-m, 65.1 ft-lb)

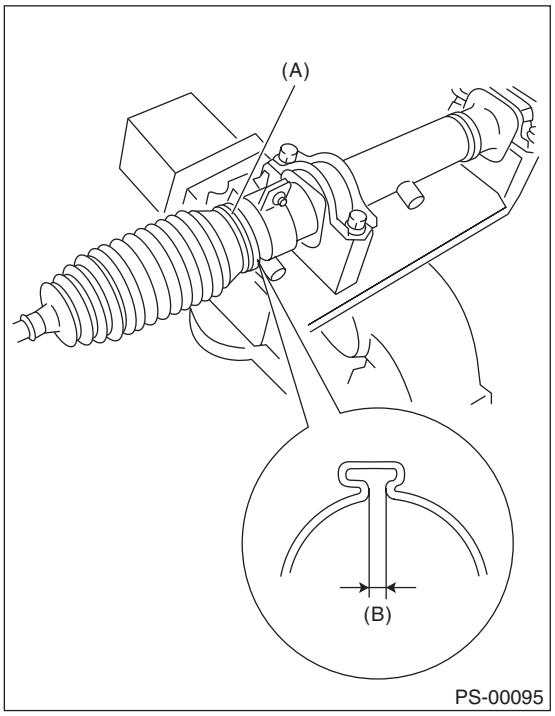
NOTE:
Check the mating face of rack and tie-rod for foreign matter such as dust etc.
28) Apply a coat of grease to the tie-rod groove, and then install the boot to the housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.



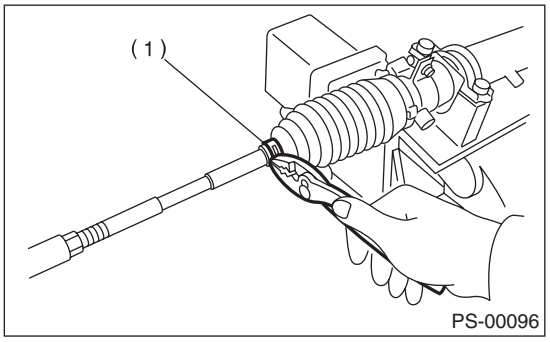
29) Crimp the boot so that the clearance of the boot band crimp portion becomes 2 mm (0.08 in) or less.

NOTE:
Use a new band.



(A) Boot band
(B) 2 mm (0.08 in) or less

30) Fix the boot end with small clip.

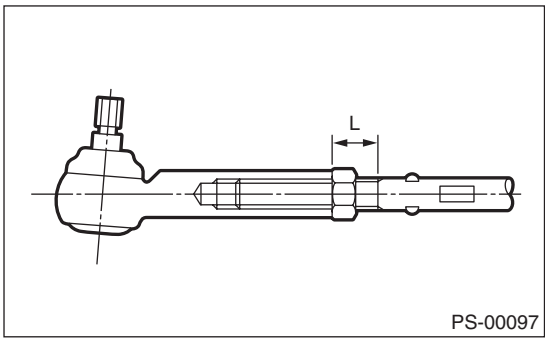


(1) Clip

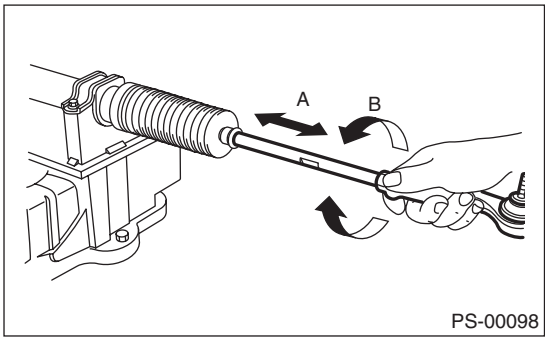
31) After installing, check that the boot end is installed to the groove of the tie-rod.

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

Installed tie-rod length: L
31.2 mm (1.23 in)



33) Inspect the gearbox as follows.
Holding the “A” tie-rod end, repeat movement from lock to lock two or three times as quickly as possible.
Holding the “B” tie-rod end, turn a few times as slowly as possible.
Finally, make sure that the boot is installed in the specified position without inflating.



34) Remove the gearbox from ST.
ST 926200000 STAND

E: INSPECTION

1. BASIC INSPECTION

1) Clean all the disassembled parts, and check for wear, damage or any other faults, then repair or replace as necessary.
2) When disassembling, check the inside of gearbox assembly for water. If any water is found, carefully check the boot for damage, and the input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

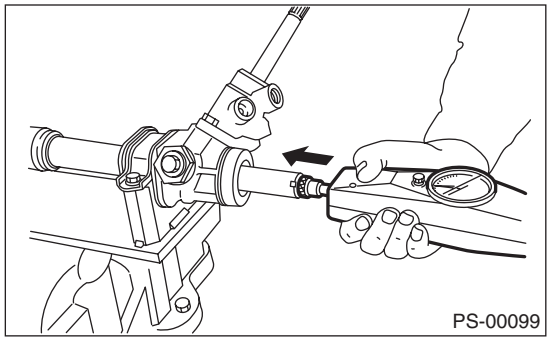
No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bent input shaft (2) Damage on serration	If there is excessive bend or damage, replace the entire gearbox assembly.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new dust seal.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of the gearbox and the sliding resistance of rack, check if the rack and pinion engages uniformly and smoothly with each other. (Refer to “SERVICE LIMIT”) (2) Pull out the entire rack to allow viewing of the teeth, and check for damage. If a problem of either (1) or (2) is found, replace the entire gearbox assembly.
4	Gearbox unit	(1) Bending of the rack shaft (2) Bending of the cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox assembly with a new part.
		(4) Wear or damage on rack bushing	If the free play of the rack shaft in the radial direction is out of the specified range, replace the gearbox assembly with a new part. (Refer to “SERVICE LIMIT”)
		(5) Wear on input shaft bearing	If the free play of the input shaft in the radial direction is out of the specified range, replace the gearbox assembly with a new part. (Refer to “SERVICE LIMIT”)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration of dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipe	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

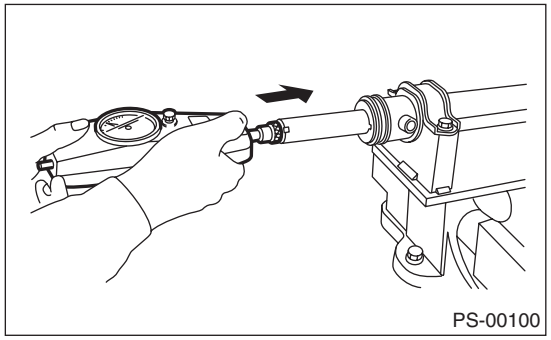
2. SERVICE LIMIT

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

NOTE:
When making a measurement, hold the gearbox assembly in a vise using the ST. Do not hold the gearbox in a vice by inserting aluminum plates etc. between the vise and gearbox assembly.
ST 926200000 STAND

Rack shaft sliding resistance:
Service limit:
400 N (41 kgf, 90 lb) or less


PS-00099

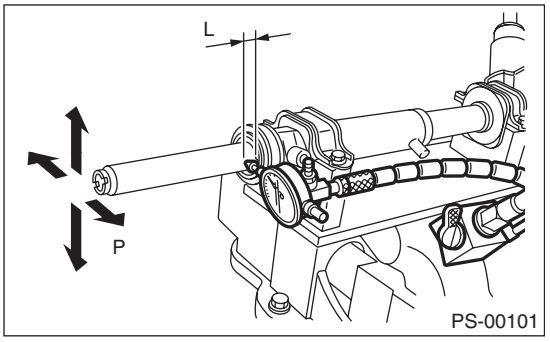

PS-00100

3. RACK SHAFT FREE PLAY IN THE RADIAL DIRECTION

Right-turn steering

Service limit:
0.19 mm (0.0075 in) or less

Condition
L = 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lb)

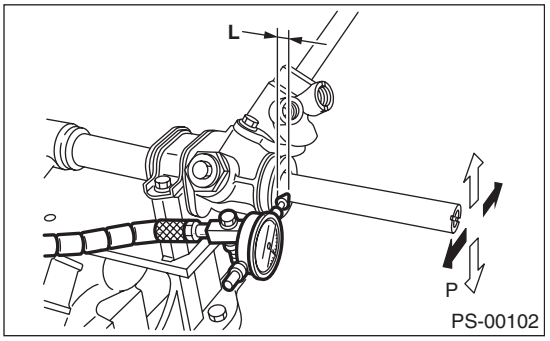


PS-00101

Left-turn steering

Service limit:
Direction ⇦ ⇨
0.3 mm (0.012 in) or less
Direction ⬅ ➡
0.15 mm (0.0059 in) or less

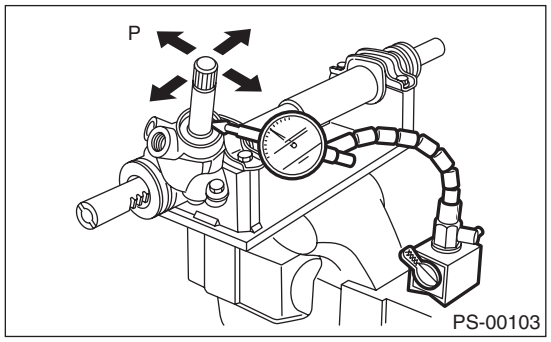
Condition
L = 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lb)



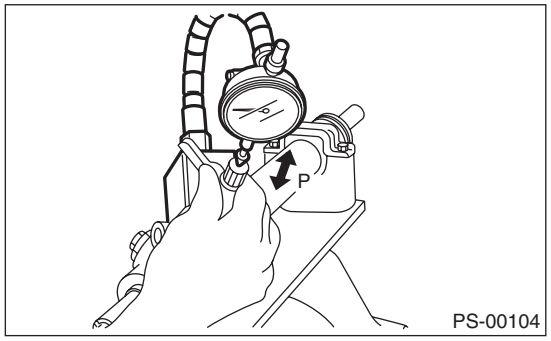
PS-00102

4. INPUT SHAFT PLAY

In radial direction
Service limit:
0.18 mm (0.0071 in) or less
Condition
P: 98 N (10 kgf, 22 lb)



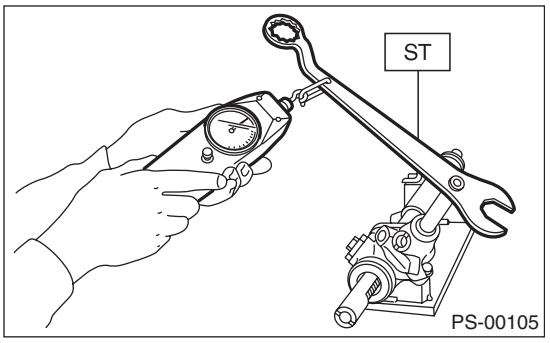
In axial direction
Service limit:
0.5 mm (0.020 in) or less
Condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



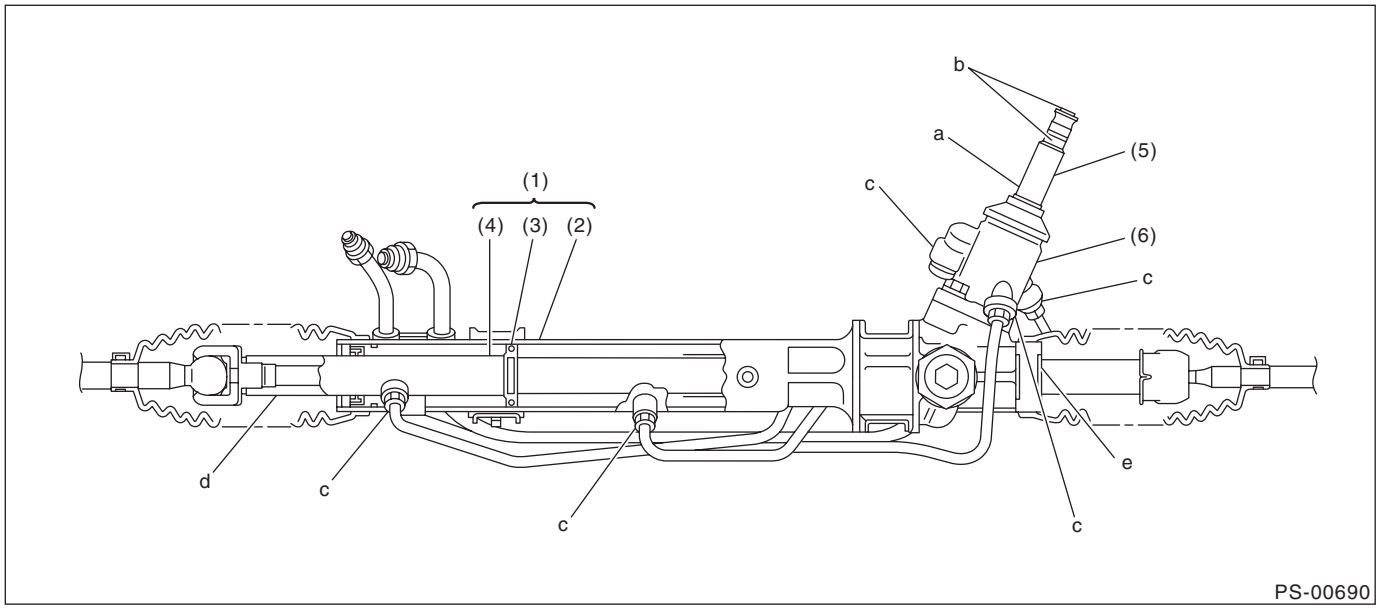
5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit:
Maximum allowable resistance:
9.33 N (0.95 kgf, 2.10 lb) or less
Difference between right and left turning resistance:
Less than 20 %



6. OIL LEAKAGE



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack
(5) Input shaft
(6) Valve housing

1) If a fluid leak is found, clean the fluid completely from the suspect area, and turn the steering wheel 30 to 40 times to the left and right from lock to lock, with the engine running, and check again for leaks immediately, and also after a few hours have passed
2) Cause and solution for oil leakage from “a”
The oil seal is damaged. Replace the valve assembly with a new part.
3) Cause and measure for oil leakage from “b”
The torsion bar O-ring is damaged. Replace the valve assembly with a new part.
4) Cause and measure for oil leakage from “c”
The pipe is damaged. Replace the faulty pipe or O-ring.
5) If the leak is other than a, b, c or if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from surrounding areas. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then reinspect the leaking area immediately after and several hours after this operation.
(1) Cause and solution for oil leakage from “d”
The cylinder seal is damaged. Replace the rack bushing with a new part.
(2) Cause and solution for oil leakage from “e”
There are two possible causes. Perform the following step first. Remove the pipe assembly B from the valve housing, and close the circuit using ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock 30 to 40 times with the engine running, then inspect the leaking section immediately after and several hours after this operation.

- If leakage from “e” is found again:

The oil seal of pinion and valve assembly is damaged. Replace the pinion and valve assembly with a new part. Or replace the oil seal and the parts that are damaged during disassembly with new parts.

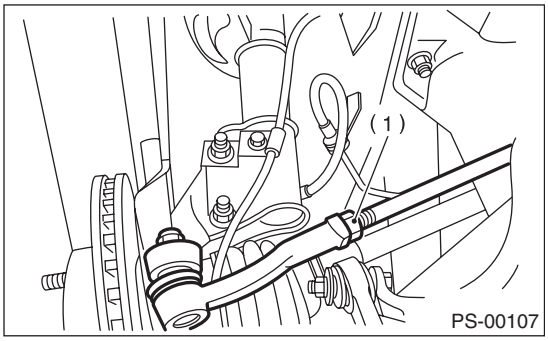
- If oil stops leaking from “e”:

The oil seal of rack housing is damaged. Replace the oil seal and parts that are damaged during disassembly with new parts.

F: ADJUSTMENT

1) Adjust the front toe. <Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



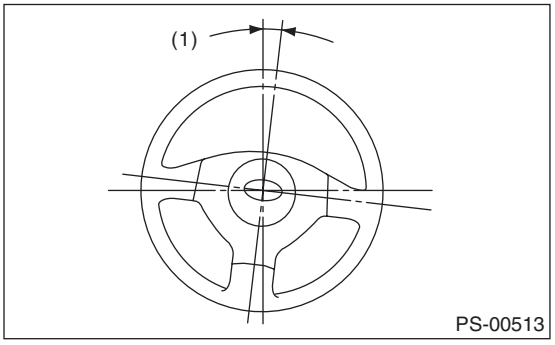
(1) Lock nut

2) Adjust the steering angle of the steering wheel.

Steering angle:

Model	Non-turbo, Turbo
Inner wheel	35°00′±1°30′
Outer wheel	30°54′±1°30′

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of the steering wheel, correctly reinstall the steering wheel.



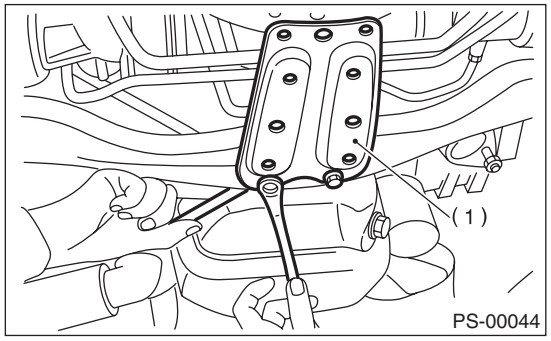
(1) Within 5°

4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction from each other by the same angle.

6. Pipe Assembly

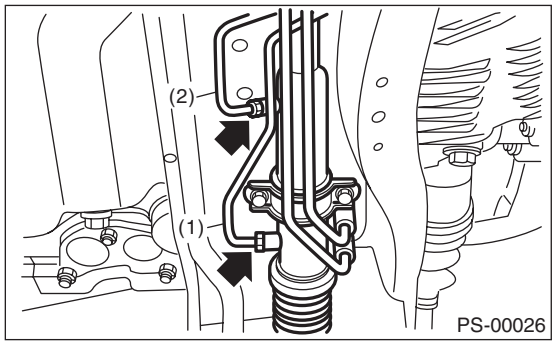
A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Lift up the vehicle and remove the jack-up plate.



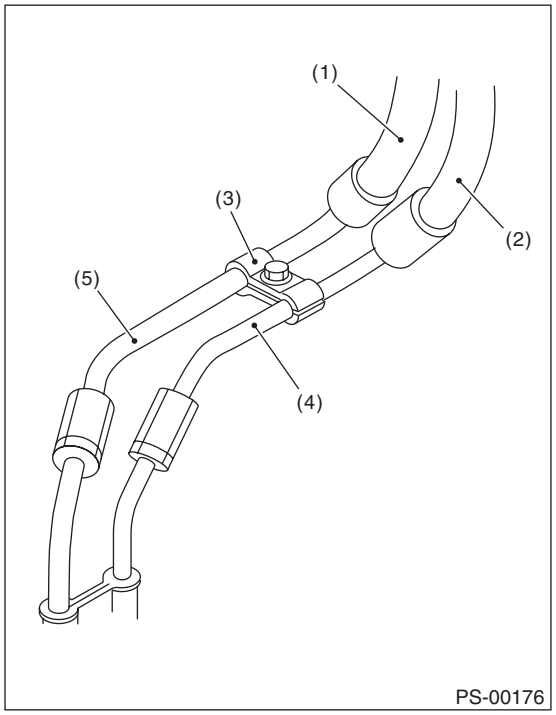
(1) Jack-up plate

3) Remove the one pipe joint at the center of gearbox assembly, and connect a vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



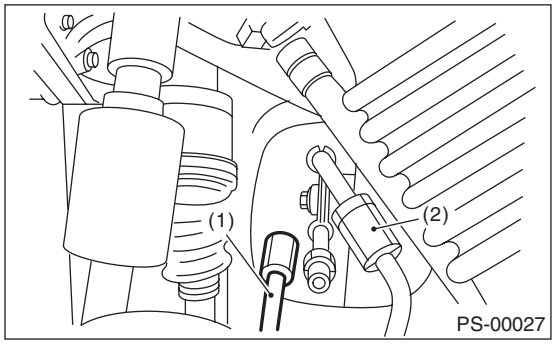
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from pipe C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

5) Disconnect the pipe C and D from the gearbox.

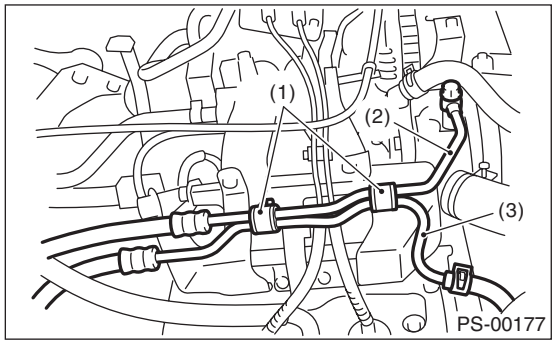


(1) Pipe C
(2) Pipe D

6) Remove the air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
7) Remove the bolt A.

8) Disconnect the pipe C from oil pump. Disconnect the pipe D from the 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 with clean cloth.

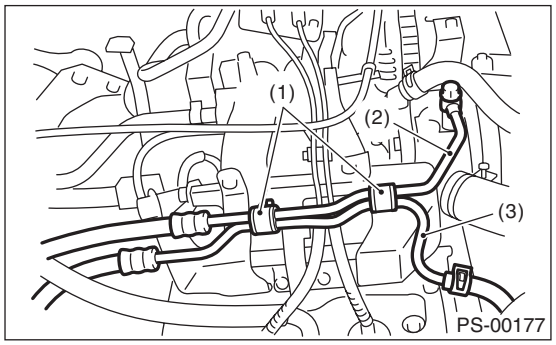


(1) Bolt A
(2) Pipe C
(3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts (bolts A) fixing pipe C and D in place.

NOTE:
Visually check that the hose between tank and pipe D is not bent or twisted.



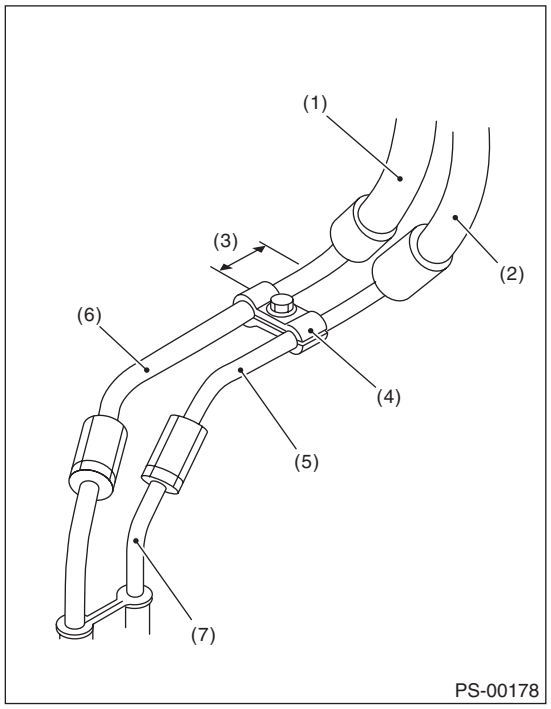
(1) Bolt A
(2) Pipe C
(3) Pipe D

(1) Connect pipe D to the reservoir tank.
(2) Install the pipe C to the oil pump using a new gasket.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)
(3) Tighten the two bolts (bolts A) fixing pipe C and D in place.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

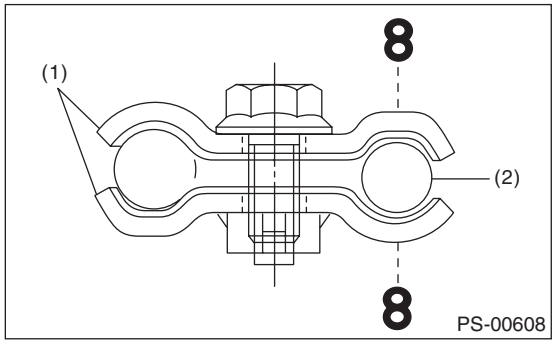
2) Temporarily connect the pipes C and D to the gearbox assembly.



(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E
(5) Pipe C
(6) Pipe D
(7) Pipe (on gearbox assembly side)

3) Temporarily install clamp E on pipes C and D.

NOTE:
Make sure that the character “8” on each clamp is positioned on the same side, as shown in the figure.



(1) Clamp E
(2) Pipe C

4) Tighten the clamp E.

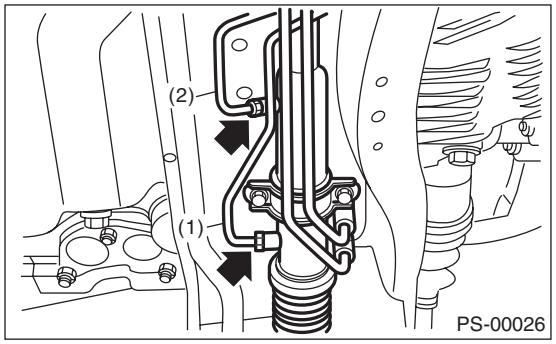
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

5) Tighten the joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

6) Connect pipe A and B to the four pipe joints of the gearbox assembly. Connect the upper pipe B first, and lower pipe A.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



(1) Pipe A
(2) Pipe B

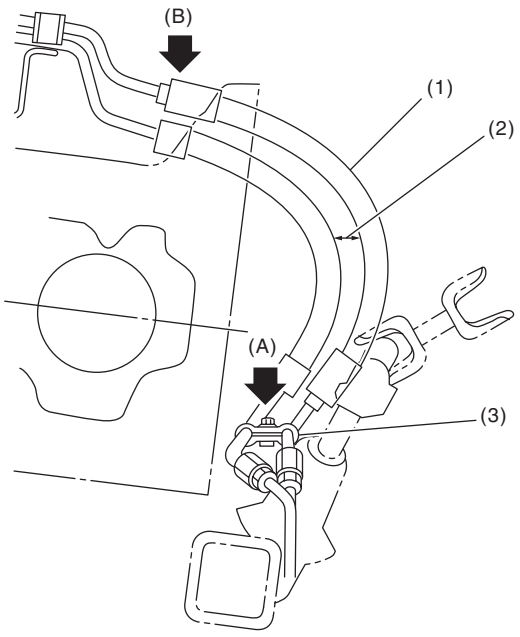
7) Install the jack-up plate.
8) Install the air intake duct, the air cleaner upper cover and the air intake boot. <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>
9) Connect the ground cable to the battery.
10) Fill with the specified fluid.

CAUTION:
Never start the engine before feeding the fluid otherwise the vane pump might be seize.

11) Finally, check clearance between pipes or hoses as shown in the figure.

Clearance:
10 mm (0.39 in) or more

If the cruise control actuator and power steering hose clearance is less than 10 mm (0.39 in), move section (A) held in place by the clamp, or bend (B) to adjust.



PS-00179

(1) High-pressure hose
(2) No interference is allowed between hoses.
(3) Clearance between crossmember and pipe: 3 — 8 mm (0.12 — 0.31 in)

C: INSPECTION

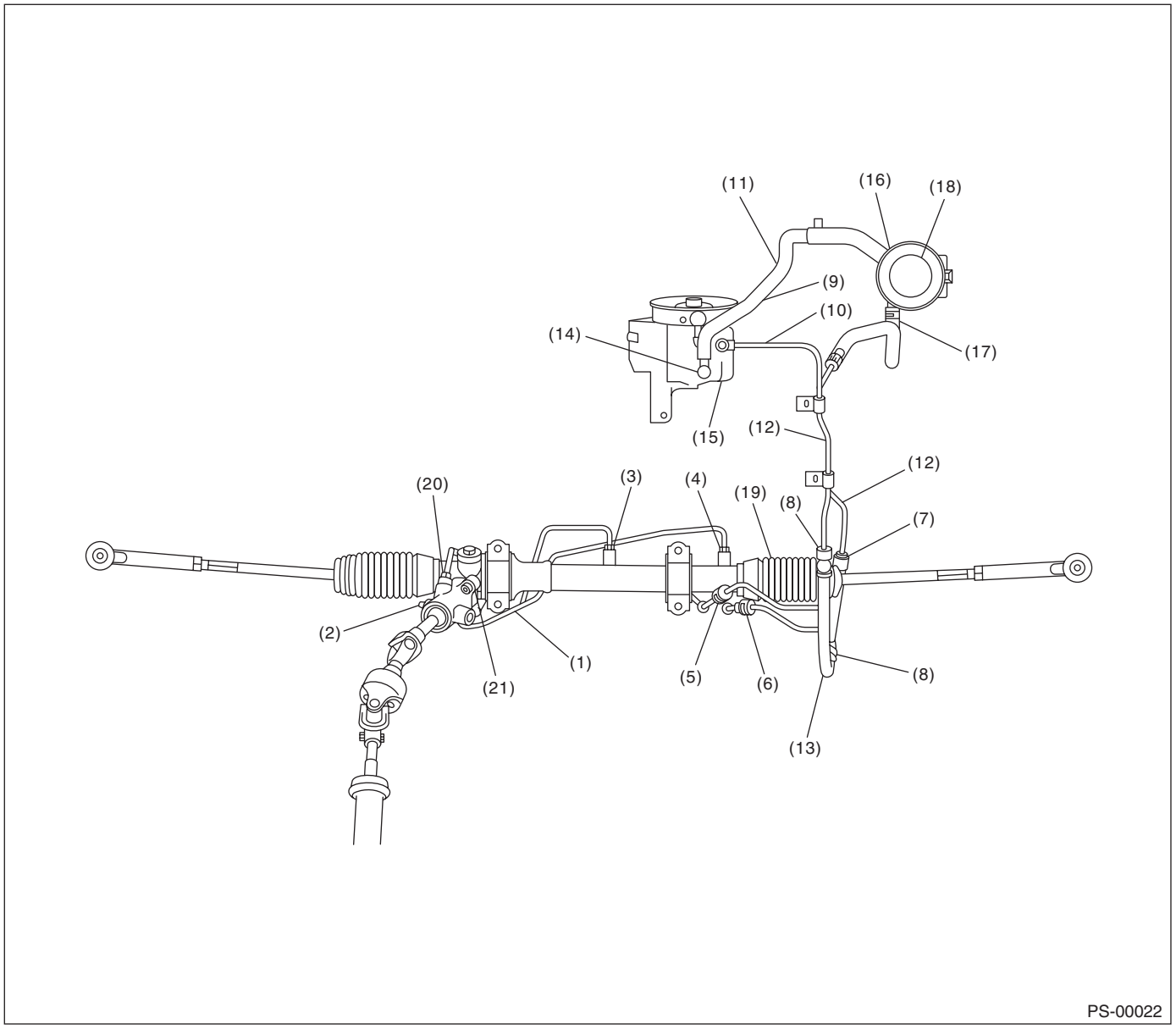
Check all disassembled parts for wear, damage or other problems. Repair or replace the defective parts as necessary.

Part	Inspection	Corrective action
Pipe	• O-ring fitting surface damage • Nut damage • Pipe damage	Replace with a new part.
Clamp	Loose clamps	Replace with a new part.
Hose	• Flare surface damage • Flare nut damage • Outer surface cracks • Outer surface wear • Clip damage • End coupling or adapter deformation	Replace with a new part.

CAUTION:
Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they will be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives will be very shortened. Wipe off hoses immediately if any of these come into contact with the hoses.
Since resistances for heat and low temperature brittleness gradually declines according to long periods of exposure to hot or cold conditions, and their service lives are shortening accordingly. It is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather areas and in frequent driving conditions where a lot of steering work is required.
Particularly when there is continuous operation of the relief valve for over 5 seconds, the life of the hoses, oil pump, and fluid will be shortened due to overheating.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Replace. Instruct customers.
	Malfunction of the relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Disconnection of the return hose	Improper connection	Correct.
	Loosening of the clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid slightly leaking out of hose	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the parts if defective.
	Improper stop position of pitching stopper	Replace the parts if defective.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace. Tighten to the specified torque.
	Power steering fluid, brake fluid, engine oil, or electrolyte coming into contact with the hose surface	Replace. Be careful during service work.
	Hard steering work in a short period of time during extreme cold weather.	Replace. Instruct customers.

NOTE:
There are conditions in which a fluid leak is diagnosed, but is not actually leaking. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.

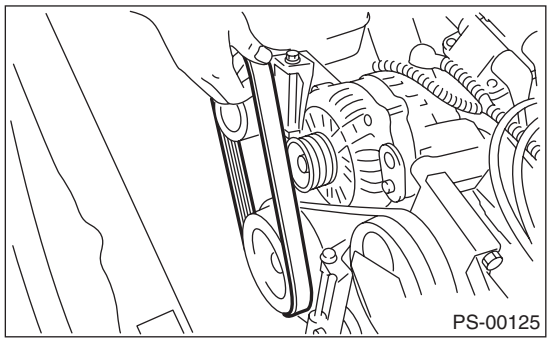


Fluid leaking area	Possible cause	Corrective action
Leakage from the connections of pipes and hoses, numbered with (1) through (10) in the figure	Insufficient tightening of flare nuts, dirt accumulation, damage to flare or flare nut or eye bolt	Loosen and retighten. Replace if ineffective.
	Improper installation of hoses or poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring, gasket pipe or hose with new parts. If there is still no improvement, replace the gearbox assembly.
Leakage from hose (11), (12) and (13) in the figure	Crack or damage in hose	Replace with a new part.
	Crack or damage in hose hardware	Replace with a new part.
Leakage from surrounding of cast iron portion of oil pump, (14) and (15) in the figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from reservoir (16) and (17) in the figure	Crack in the reservoir tank	Replace the reservoir tank.
Leakage from filler neck of (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the reservoir tank.
	Fluid level too high	Adjust the fluid level.
Leakage from power cylinder of gearbox area (19) in the figure	Damaged oil seal	Replace the oil seal.
Leakage from (20), (21) in the figure and control valve of gearbox	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

7. Oil Pump

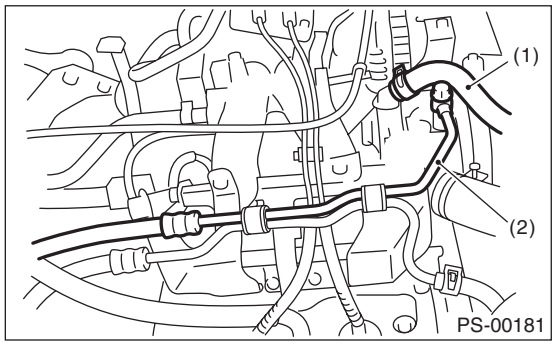
A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the pulley belt cover.
3) Loosen the lock bolt and slider bolt and remove the power steering pump drive V-belt.



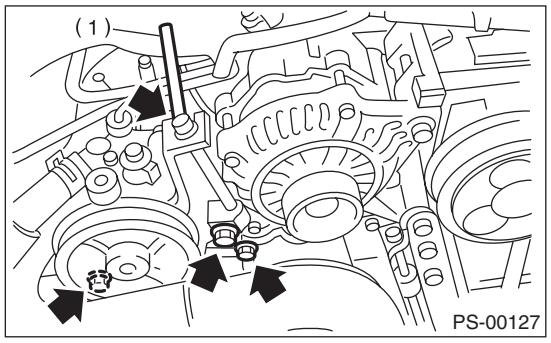
4) Disconnect the connector from power steering pump switch.
5) Disconnect pipe C and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose, cover the open ends with a clean cloth.



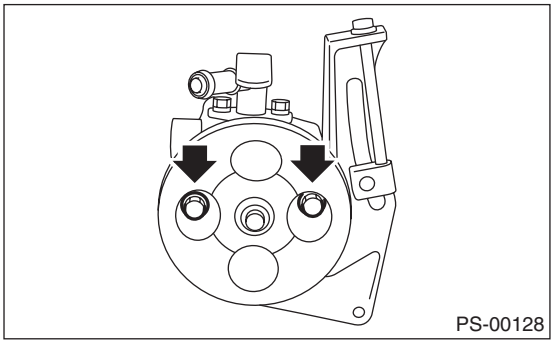
(1) Suction hose
(2) Pipe C

6) Remove the installation bolt of the power steering pump bracket.

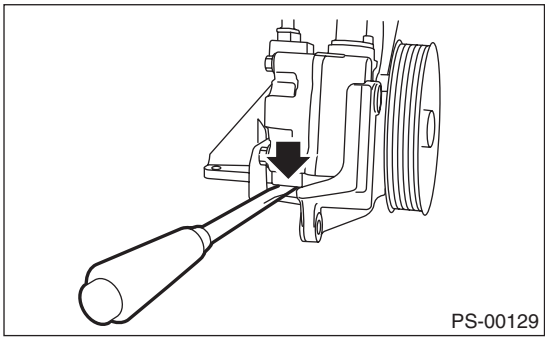


7) Place the oil pump bracket in a vise, and remove the two bolts from the front side of the oil pump.

CAUTION:
When securing the oil pump bracket in a vice, hold the oil pump bracket with the least possible force between two pieces of wood.



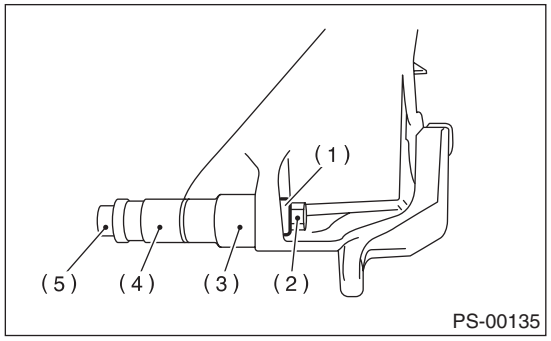
8) Remove the bolt from the rear side of oil pump.
9) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



B: INSTALLATION

1) Install the oil pump to bracket.
(1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2″) type 14- and 21-mm box wrench until it is in contact with the oil pump mounting surface.

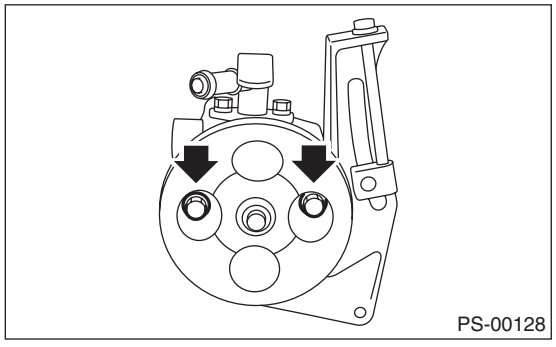
CAUTION:
When securing the oil pump bracket in a vice, hold the oil pump bracket with the least possible force between two pieces of wood.



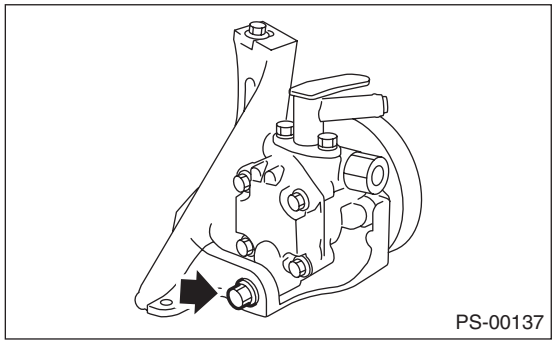
(1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Secure the oil pump to the bracket.

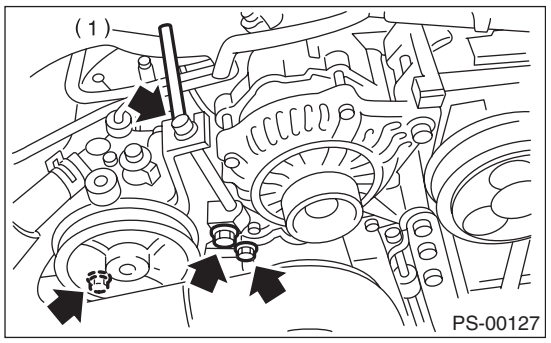
Tightening torque:
15.7 (1.6 kgf-m, 11.6 ft-lb)



Tightening torque:
37.3 (3.8 kgf-m, 27.5 ft-lb)



2) Attach the installation bolts of the power steering pump bracket.

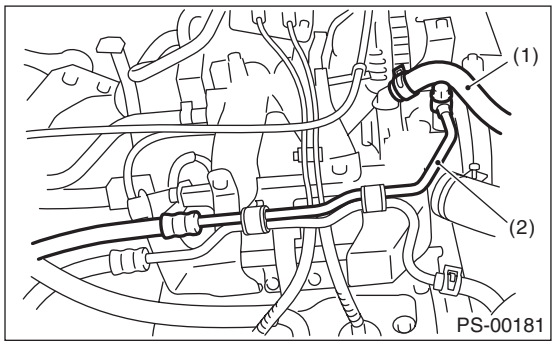


3) After installing the oil pump, pour the fluid while turning the pulley by hand, and bleed air in the oil pump.

CAUTION:
Always fill the oil pump with the fluid to prevent abnormal noise and seizure of the oil pump.
4) Install pipe C and the suction hose to the oil pump.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

CAUTION:
If the hose is twisted, there is a danger that it may contact other parts.



(1) Suction hose
(2) Pipe C

5) Connect the connector to the power steering pump switch.
6) Install the V-belts to the oil pump.
7) Check the tension of the V-belt. <Ref. to ME(H4SO)-42, INSPECTION, V-belt.>
8) Tighten the belt tension bolt.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)
9) Install the belt cover.
10) Connect the ground cable to the battery.
11) Fill with the specified power steering fluid. <Ref. to PS-50, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid otherwise the vane pump might be seize.

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and replace faulty parts.

No.	Part	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new part.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new part.
2	Pulley	(1) Damage	Replace with a new part.
		(2) Bend	Measure the V groove deflection. If it exceeds the service limit, replace the pulley with a new part.
3	Oil pump (Interior)	(1) Faulty or seized of vane pump	Check the rotating resistance of pulley. If it exceeds the service limit, replace the oil pump with new part.
		(2) Bend in the shaft or damage to bearing	If the a string is wrapped on the pulley and rotated, and the oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump, replace the oil pump with a new part.
4	O-ring	Cracking or deterioration	Replace with a new part.
5	Bracket	Cracking	Replace with a new part.

2. SERVICE LIMIT

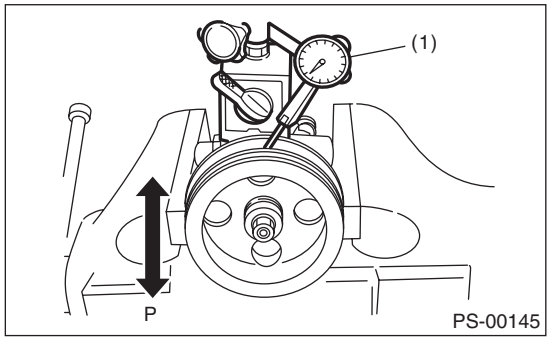
Make a measurements as follows. If it exceeds the service limit, replace with a new part.

CAUTION:
• When securing the oil pump on a vise, hold the oil pump with the least possible force between two pieces of wood.
• Do not set the outside of the flow control valve or the pulley section on a vise; doing so may deform the deform the exterior or the pulley. Select properly sized wood pieces.

1) Play of the pulley shaft

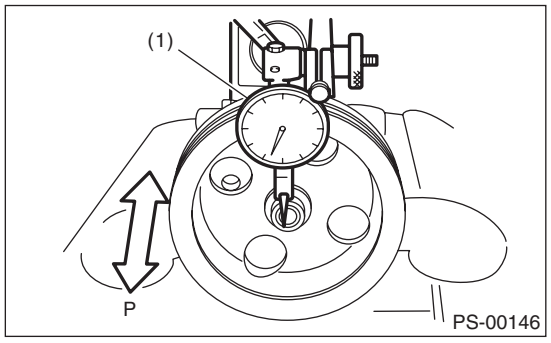
Condition:
P: When applying a force of 9.8 N (1.0 kgf, 2.2 lb)

Service limit:
Play in the radial direction (Direction ⬅ ➡)
0.4 mm (0.016 in) or less



(1) Dial gauge

Axial play (Direction ⇦ ⇨)
0.9 mm (0.035 in) or less

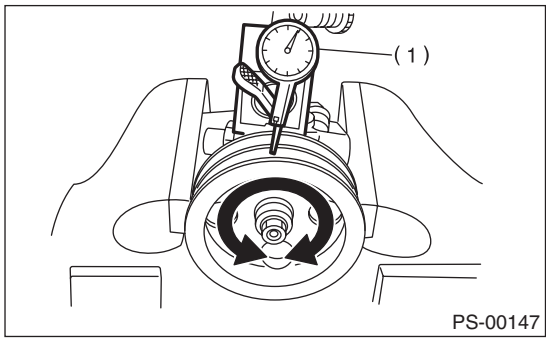


(1) Dial gauge

2) Deflection of the pulley groove

Service limit:
1.0 mm (0.039 in) or less

NOTE:
Read the value for one surface of V groove, and then set a dial on the other face and read the value.

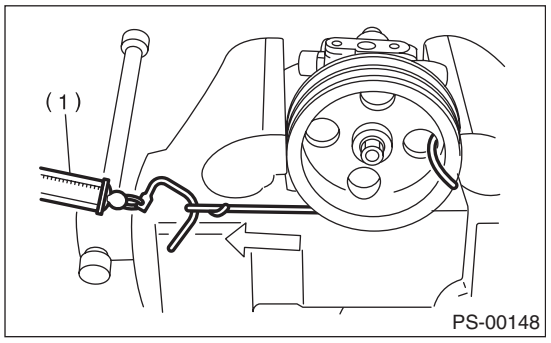


(1) Dial gauge

3) Rotating resistance of pulley

Service limit:
Maximum load:
9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:
• A rather higher value may be indicated when pulley starts turning.
• Measure the load during rotation to make a judgment.



(1) Spring scale

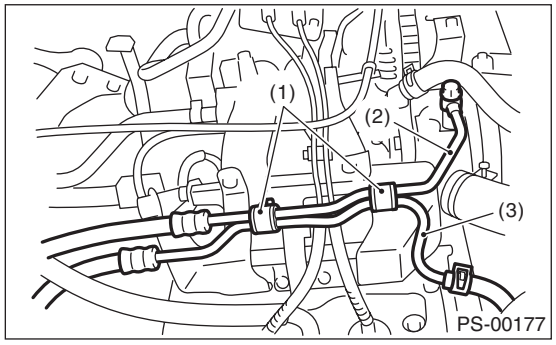
3. HYDRAULIC PRESSURE

NOTE:
• Be sure to complete all items aforementioned in "INSPECTION," prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-51, INSPECTION, General Diagnostic Table.>
• Do not leave the valve of pressure gauge closed or hold the steering wheel at lock for 5 seconds or more in any case, this can damage the oil pump.
• Before attaching a pressure gauge, place cloth at locations where fluid is expected to spill. Wipe off any spilt fluid completely after the measurement.

1) Regular pressure measurement
(1) Connect the ST1, ST2 and ST3.

ST1	925711000	PRESSURE GAUGE
ST2	34099AC020	ADAPTER HOSE B
ST3	34099AC010	ADAPTER HOSE A

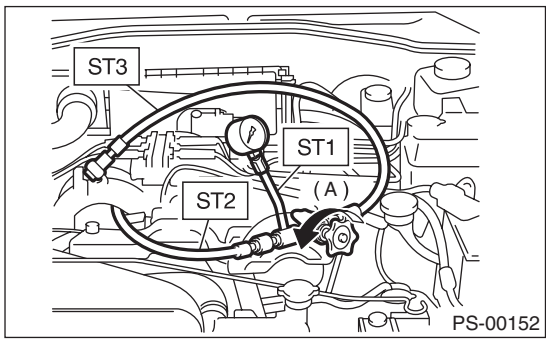
(2) Remove the air intake duct.
(3) Disconnect the pipe C from pump.
(4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to pump instead of pipe C.



(1) Bolt A
(2) Pipe C
(3) Pipe D

(5) Attach the ST3 to the end of pipe C which is removed from pump.
(6) Replenish power steering fluid up to the specified level.
(7) Open the valve, and start the engine.
(8) Measure the regular pressure.

ST1	925711000	PRESSURE GAUGE
ST2	34099AC020	ADAPTER HOSE B
ST3	34099AC010	ADAPTER HOSE A



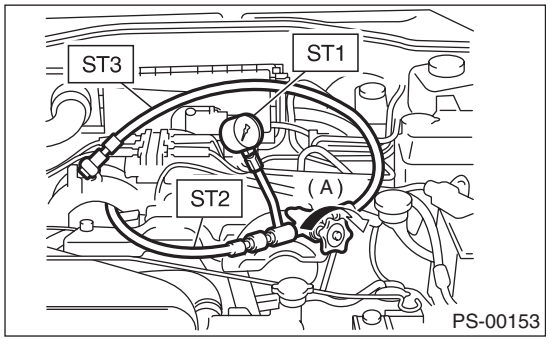
(A) Open

Service limit:
981 kPa (10 kg/cm^2, 142 psi) or less

(9) If it is not within the specification, replace the problem part for the following problems. (Pipe or hose clogged, leaks from fluid line, and mixture of foreign matter in fluid line)

2) Measure the relief pressure.
(1) Using the STs, measure the relief pressure.
(2) Close the valve.
(3) Measure the relief pressure.

ST1	925711000	PRESSURE GAUGE
ST2	34099AC020	ADAPTER HOSE B
ST3	34099AC010	ADAPTER HOSE A



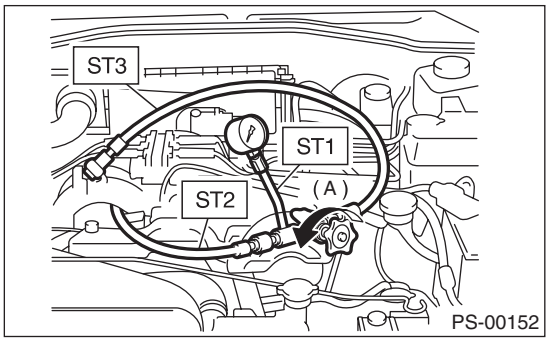
(A) Close

Service limit:
Turbo model
7,650 — 8,340 kPa (78 — 85 kg/cm^2, 1,110 — 1,210 psi)
Non-turbo model
6,700 — 7,400 kPa (68 — 75 kg/cm^2, 971 — 1,073 psi)

(4) If it is not within the specification, replace the oil pump.

3) Measure the working pressure.
(1) Using the ST, measure the working pressure.
(2) Open the valve.
(3) Measure the working pressure of control valve by turning steering wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



(A) Open

Service limit:
Turbo model
7,650 — 8,340 kPa (78 — 85 kg/cm^2, 1,110 — 1,210 psi)
Non-turbo model
6,700 — 7,400 kPa (68 — 75 kg/cm^2, 971 — 1,073 psi)

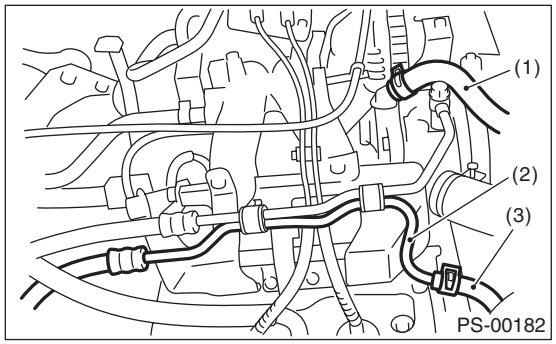
(4) If it is out of specification, measure the steering effort. <Ref. to PS-55, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>If it is not within specification, replace the control valve itself or control valve and pinion as a single unit, using new parts.

8. Reservoir Tank

A: REMOVAL

1) Remove the air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
2) Drain fluid from the reservoir tank.
3) Disconnect the pipe D from the return hose and suction hose from the 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 with clean cloth.

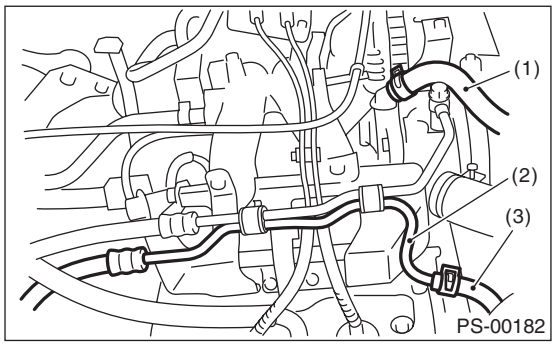


(1) Suction hose
(2) Pipe D
(3) Return hose

4) Remove the reservoir tank from the bracket by pulling it upwards.

B: INSTALLATION

1) Install the reservoir tank to the bracket.
2) Connect the pipes D to the return hose and suction hose to the oil pump.



(1) Suction hose
(2) Pipe D
(3) Return hose

3) Replenish the specified power steering fluid up to the specified level. <Ref. to PS-2, SPECIFICATION, General Description.>

C: INSPECTION

Check the reservoir tank for cracks, breakage or damage. If a failure is found, replace the reservoir tank.

9. Power Steering Fluid

A: SPECIFICATION

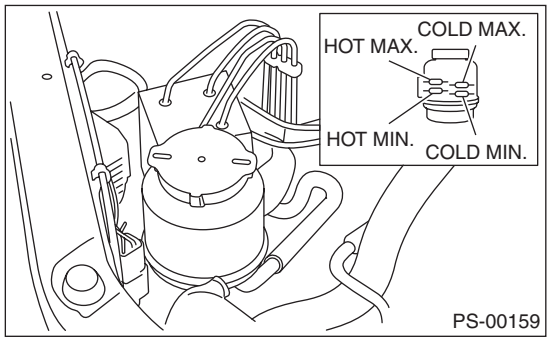
Recommended power steering fluid
SUBARU ATF or ATF DEXRON III

B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.
3) Inspect the fluid level of reservoir tank with vehicle on level surface and engine stopped.
If the level is at “MIN.” point or below, add fluid to keep the level in the specified range of the indicator. If at “MAX.” point or above, drain fluid by using a syringe or the like.

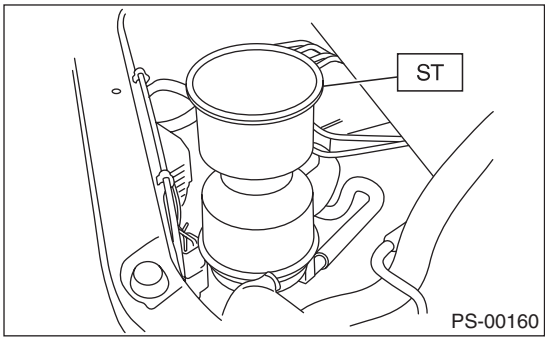
(1) If the power steering fluid temperature is 20°C (68°F) or less, read the fluid level on the “COLD” side.

(2) If the power steering fluid temperature is 80°C (176°F) or more, inspect the fluid level on the “HOT” side.



C: REPLACEMENT

1) Lift up the vehicle.
2) Remove the jack-up plate.
3) Remove the pipe joint in the center of gearbox assembly, and connect the vinyl hose to the pipe and joint. Turn the steering wheel to drain the fluid out.
4) Set ST on the top of reservoir tank and fill it about half way with the specified fluid.
ST 34199AE040 OIL CHARGE GUIDE



5) Maintaining the fluid level of Step 4), continue to turn the steering wheel slowly from lock to lock until the bubbles stop appearing on oil surface.
6) If the steering wheel is turned in a low fluid level condition, air will be sucked into the pipe. If air has entered, leave it for about half an hour and then repeat step 5) again.
7) Start the engine and let it idle.
8) Continue to turn the steering wheel slowly from lock to lock again until the bubbles stop appearing on oil surface, while keeping the fluid at the level in Step 4).
Normally bubbles will stop appearing after turning the steering wheel from lock to lock three times.
9) In case bubbles do not stop appearing in the tank, leave it for about half an hour and then repeat step 4) again.
10) Lower the vehicle, and then idle the engine.
11) Continue to turn the steering wheel from lock to lock until the bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.

(1) The fluid level changes over 3 mm (0.12 in).

(2) Bubbles remain on the upper surface of the fluid.

(3) Screeching noise is generated from oil pump.

13) Check for fluid leakage after turning steering wheel from lock to lock with the engine running.

10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Steering effort is heavy in all ranges. • Steering effort is heavy at stand still. • Steering wheel vibrates when turning.	1. Pulley belt • Unequal length of pulley belts • Contact with oil or grease • Looseness or damage of the pulley belt • Poor uniformity of the pulley belt cross section • Pulley belt is touching the pulley bottom. • Poor revolution of pulleys (except oil pump pulley) • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and wheel • Improper tires out of specifications • Improper wheels out of specification • Tires not properly inflated*1	Replace or reinflate.
	3. Fluid • Low fluid level • Air entry in fluid • Dust entry in fluid • Fluid deterioration • Inadequate warm-up of fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idle speed • Low idle speed • Excessive drop of idle speed at start or when turning the steering wheel *3	Adjust or instruct customer.
	5. Measure the hydraulic pressure. <Ref. to PS-47, HYDRAULIC PRESSURE, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure the steering wheel effort. <Ref. to PS-55, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other • Returning force of steering wheel to center is poor. • Steering wheel vibrates when turning.	1. Fluid line • Folded hose • Flattened pipe	Correct or replace.
	2. Tire and wheel • Flat tire • Mixed use of different tires • Mixed use of different wheels • Uneven tire wear • Unequal tread remaining • Unequal pressure of tire	Correct or replace.
	3. Front alignment • Improper or unequal caster • Improper or unequal toe-in • Loose suspension connections	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • Unbalanced weight	Replace, adjust or instruct customer.
	5. Measure the steering wheel effort. <Ref. to PS-55, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If the tires or wheels are wider than standard, the load to power steering system is increased. Accordingly, in a condition where the fluid has not yet warmed up, the relief valve may work before reaching the maximum turning angle. In this case, steering effort may be heavy. When the measured hydraulic pressure is normal, there is no problem.
*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn the steering wheel from stop to stop several times to warm-up the fluid. If steering effort reduces normally, the power steering is functioning normally.
*3 In cold weather or with insufficient warm-up of the engine, steering effort may be heavy due to excessive drop of idling when turning the steering wheel. In this case, it is recommended to start the vehicle by increasing engine speed a little higher than usual. If steering effort reduces normally, the power steering is functioning normally.

1. ABNORMAL NOISE & VIBRATION

CAUTION:
Do not keep the relief valve operating for over 5 seconds at a time or the inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• A screeching noise may be heard immediately after the engine start in extremely cold conditions. In this case, if the noise goes away when the vehicle warms up, the system is functioning normally. This is due to the fluid characteristics in extremely cold condition.
• The oil pump normally makes a small whining noise due to its mechanism. Even if a noise is heard when steering wheel is turned at stand still, there is no abnormal function in the system provided that the noise eliminates when the vehicle is driving.
• When turning the steering wheel with the brake applied when the vehicle is parked, a screeching noise may be generated by the brake disc and pads. This is not a fault in the steering system.
• There may be a small vibration around the steering devices when turning the steering wheel at standstill, even though the component parts are operating properly
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of the steering wheel, fluid temperature and braking conditions.
These conditions do not indicate a problem in the system.
Confirm vibration for an AT model, by applying the parking brake on a concrete surface, shifting into the “D” range, and turning the steering wheel repeatedly at from slow to rapid, step by step.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	The relief valve emits an operating sound when steering wheel is completely turned in either direction. (Do not keep this condition over 5 seconds.)	Normal
	Relief valve emits an operating sound when steering wheel is not turned. This means that the relief valve is defective.	Replace the oil pump.
Rattling noise (intermittent) when engine is running.	Interference with adjacent parts	Check the clearance. <Ref. to PS-56, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.> Correct if necessary. <Ref. to PS-40, INSPECTION, Pipe Assembly.>
	Loosened attachment of the oil pump, reservoir tank, pump bracket, gearbox or crossmember	Retighten.
	Loose oil pump pulley or other pulley(s)	Retighten.
	Looseness of the linkage, play in the steering, improper tightening (looseness) of suspension joints or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace faulty parts in the gearbox or oil pump.
Knocking When turning steering wheel in both directions with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Insufficient tightening or play in the tie-rod or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Air in vane pump	Inspect and retighten the fluid line connection. Refill the fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Oil pump pulley bearing seized	Replace the oil pump.
	Folded hose, flattened pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Improper adjustment of pulley belt Damaged or over tensioned pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Runout or dirty V-groove surface of oil pump pulley	Clean or replace.
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the faulty part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Faulty inside of hose or pipe Flattened hose or pipe	Repair or replace.
	Problem inside the reservoir tank	Replace.
	Missing reservoir tank cap	Install cap.
Whistle (continuous) While engine is running.	Faulty pipe of gearbox or faulty hose	Replace the faulty parts of the gearbox or the hose.
Whine or growl (intermittent or continuous) While engine is running. (with/without steering turned)	Looseness of oil pump, oil pump bracket attachment	Retighten.
	Fault inside of oil pump or hose	Replace the oil pump or hose, if the noise can be heard when vehicle is running as well as being stopped.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and check.
Grinding noise (continuous) While engine is running. (with steering turned)	Fault inside of gearbox	Replace the faulty parts of gearbox.
	Faulty steering shaft bearing	Apply grease or replace.
	Occurs when turning the steering wheel with brakes (service or parking) applied.	If the noise goes away when brake is released, it is normal.

Trouble	Possible cause	Corrective action
Vibration While engine is running. (with/without steering turned)	Engine speed is too low.	Adjust, and notify customer.
	Air in vane pump	Repair faulty part Vent air.
	Damaged valve in oil pump or gearbox	Replace the faulty parts in gearbox and oil pump.
	Excessive play in steering, looseness of suspension parts	Retighten.

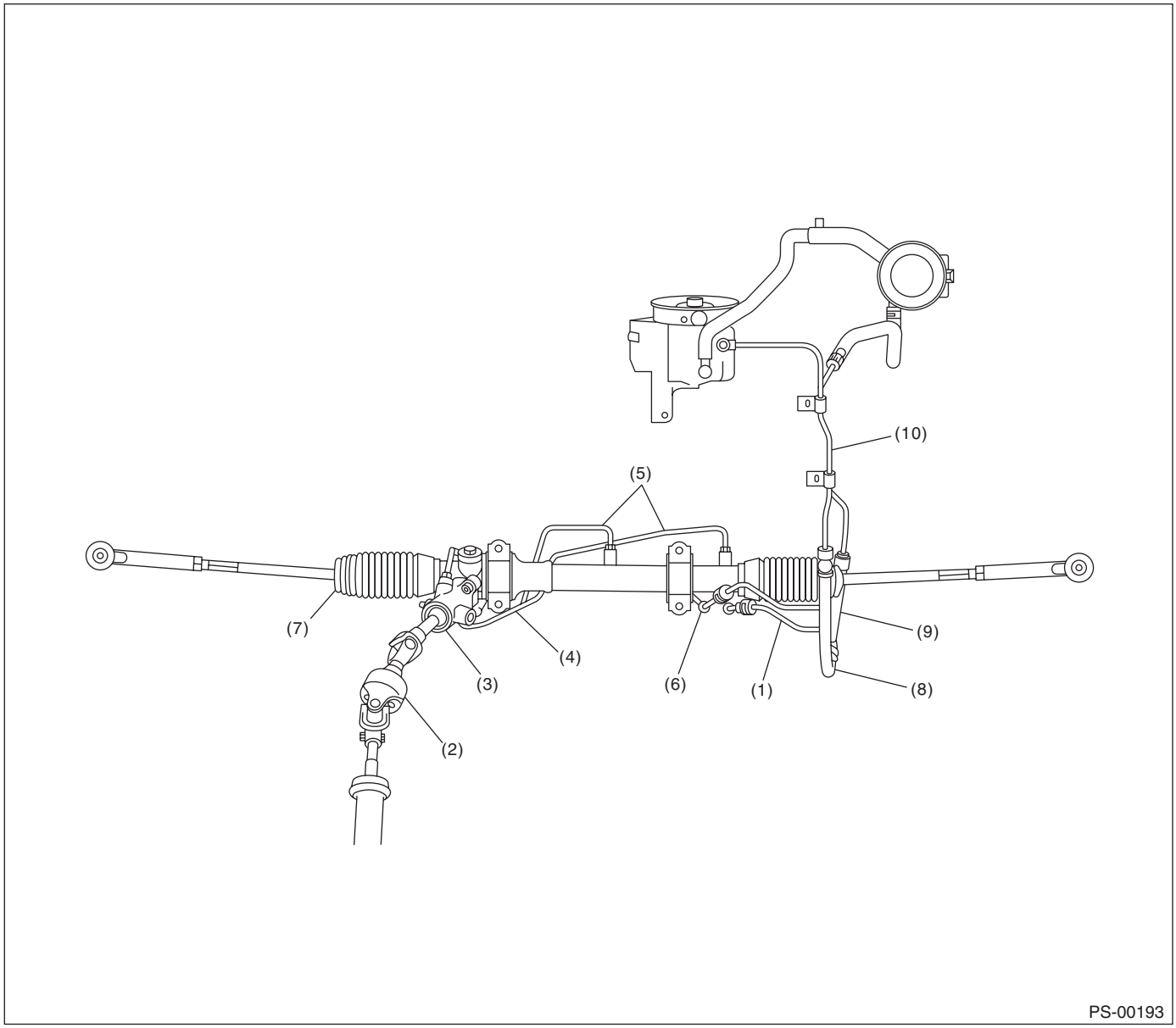
2. MEASUREMENT OF STEERING EFFORT

	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on paved road. 2) Start the engine. 3) Run the engine at idle. 4) Install a spring scale on the steering wheel. 5) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts. NOTE: When turning the steering more quickly than necessary from one direction to the other at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of the fluid in the oil pump and is not a defect.	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lb)?	Go to step **2**.	Adjust the backlash.
2	**CHECK STEERING EFFORT.** 1) Stop the engine. 2) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.	Is the steering effort less than 314 N (35 kgf, 77 lb)?	Go to step **3**.	Perform the adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is steering effort less than 2.26 N (0.23 kgf, 0.51 lb)?	Go to step **4**.	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure the steering wheel effort.	Is the steering effort difference in the left and right directions is less than 1.08 N (0.11 kgf, 0.24 lb)?	Go to step **5**.	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of steering column side). <Ref. to PS-15, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 7.3 N (0.74 kgf, 1.64 lb)?	Go to step **6**.	Replace with a new part.
6	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-15, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 7.3 N (0.74 kgf, 1.64 lb)?	Go to step **7**.	Replace with a new part.
7	**FRONT WHEEL CHECK.** Check the front wheels.	Does the front wheels have unsteady revolution or rattling, or does the brakes drag?	Inspect, readjust and replace if necessary.	Go to step **8**.
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends.	Is there any unsteady revolution or rattling of suspension tie-rod ends?	Inspect and replace if necessary.	Go to step **9**.
9	**BALL JOINT CHECK.** Remove the ball joint.	Is there any unsteady revolution or rattling of suspension ball joints?	Inspect and replace if necessary.	Go to step **10**.
10	**CHECK GEARBOX.** Measure the rotating resistance of the gearbox. <Ref. to PS-34, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the rotating resistance of steering gearbox less than 9.33 N (0.95 kgf, 2.09 lb)? Is the difference between right and left sides less than 20%?	Go to step **11**.	Readjust the backlash, and if ineffective, replace the faulty parts.
11	**CHECK GEARBOX.** Measure the sliding resistance of the gearbox. <Ref. to PS-33, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is the sliding resistance of steering gearbox less than 304 N (31 kgf, 68 lb)? Is the difference between the right and left sliding resistances less than 20%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

3. INSPECTION OF CLEARANCE

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

Install locations	Minimum allowance
(1) Crossmember to pipe	5 mm (0.20 in)
(2) DOJ to shaft or joint	14 mm (0.55 in)
(3) DOJ to valve housing	11 mm (0.43 in)
(4) Pipe to pipe	2 mm (0.08 in)
(5) Stabilizer to pipe	5 mm (0.20 in)
(6) Exhaust pipe to pipe	11 mm (0.43 in)
(7) Exhaust pipe to gear box bolt	15 mm (0.59 in)
(8) Side frame to hose A and B	10 mm (0.39 in)
(9) Cruise control pump to hose A and B	15 mm (0.59 in)
(10) Pipe portion of hose A to pipe portion of hose B	1.5 mm (0.059 in)



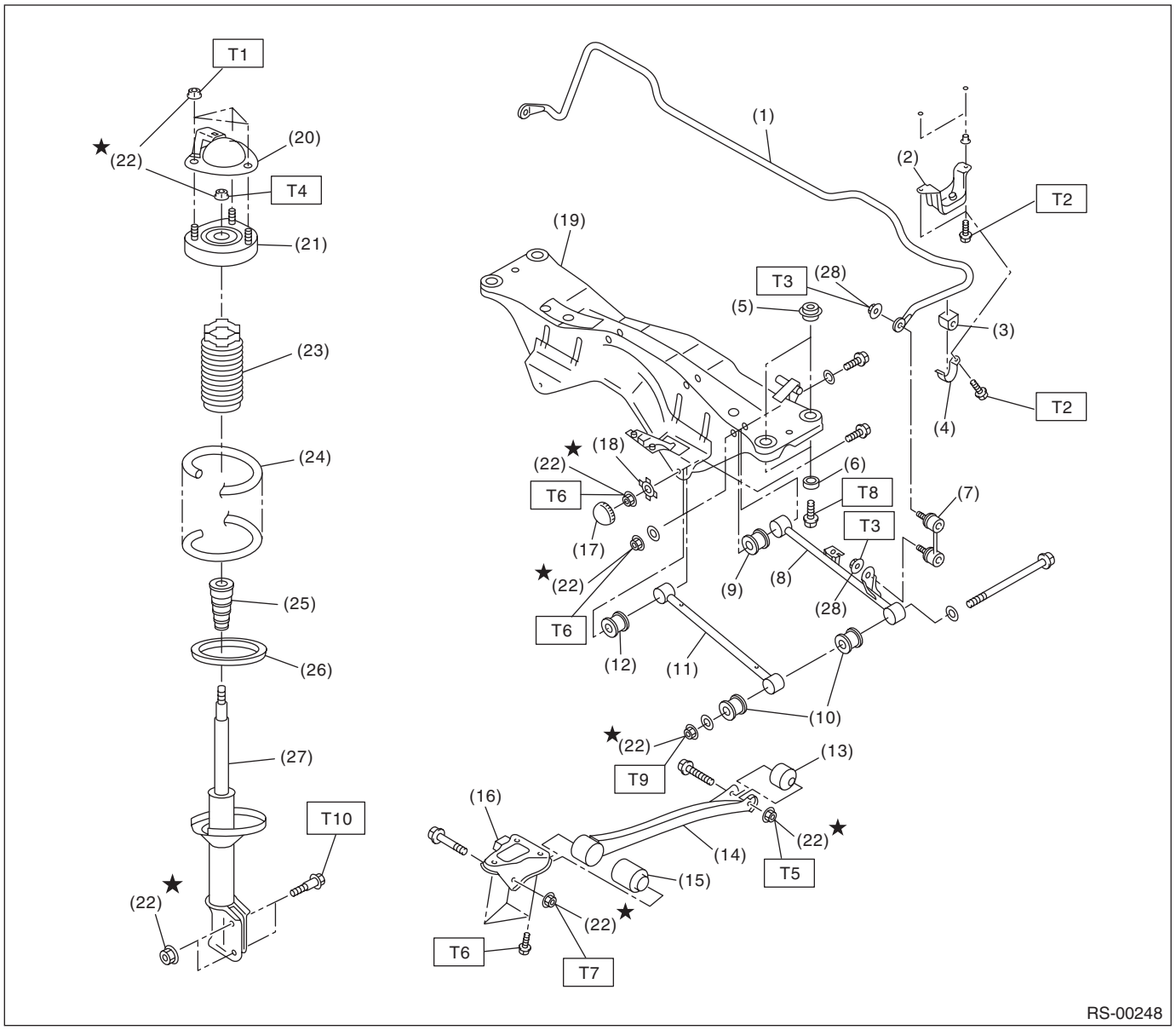
1. General Description

A: SPECIFICATION

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

B: COMPONENT

1. REAR SUSPENSION



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

Tightening torque:N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 25 (2.5, 18.1)
T3: 45 (4.6, 33.2)
T4: 60 (6.1, 44)
T5: 90 (9.2, 66)
T6: 100 (10.2, 74)
T7: 115 (11.7, 85)
T8: 130 (13.3, 96)
T9: 140 (14.3, 103)
T10: 200 (20.4, 148)

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOL

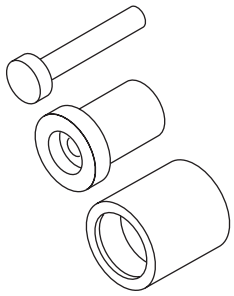
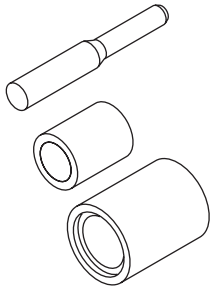
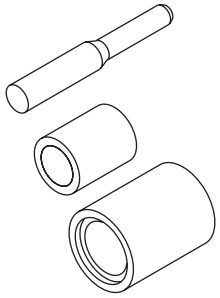
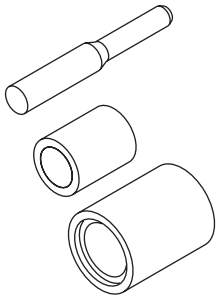
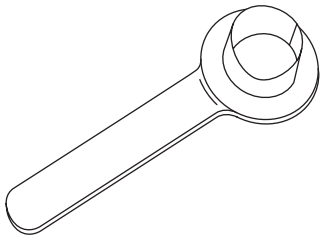
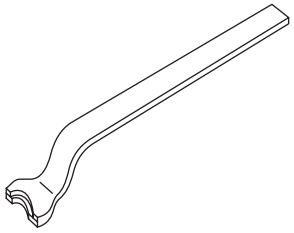
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927720000	927720000	INSTALLER & REMOVER	Used for replacing the front bushing.
 ST-927730000	927730000	INSTALLER & REMOVER	Used for replacing the rear bushing.
 ST-927700000	927700000	INSTALLER & REMOVER	Used for replacing the lateral link bushing.
 ST-927690000	927690000	INSTALLER & REMOVER	Used for replacing the lateral link bushing.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft into the rear differential. • For oil seal protection
 ST28099PA100	28099PA100	REMOVER	Used for removing the rear drive shaft from the rear differential.

2. GENERAL TOOL

TOOL NAME	REMARKS
Alignment gauge	Used for measuring wheel alignment.
Alignment gauge adapter	Used for measuring wheel alignment.
Turning radius gauge	Used for measuring wheel alignment.
Toe-in gauge	Used for toe-in measurement.
Transmission jack	Used for removing and installing the suspension.
Bearing puller	Used for removing bushings.
Coil spring compressor	Used for strut assembly/disassembly.

2. Wheel Alignment

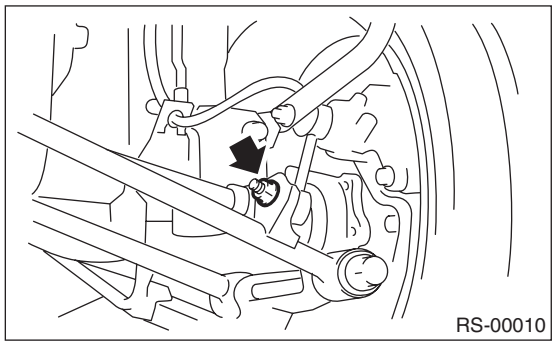
A: INSPECTION

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

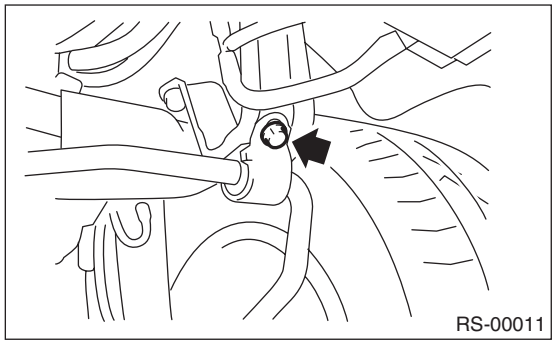
3. Rear Stabilizer

A: REMOVAL

1) Lift up the vehicle.
2) Remove the stabilizer link.



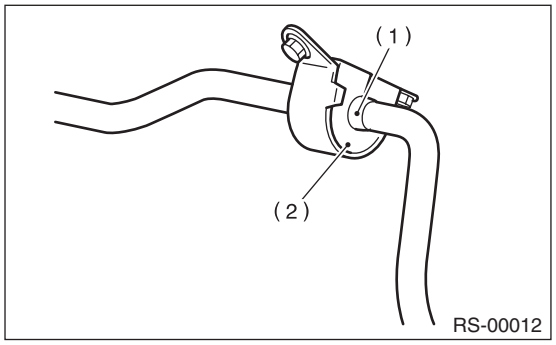
3) Remove the bolt which secures the stabilizer to the stabilizer bracket.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
- Use a new nut.
- Install the stabilizer bushing while aligning it with the paint mark on the stabilizer.
- Make sure the stabilizer bushing and stabilizer have the same identification colors (paint mark) when installing.



(1) Paint mark of the stabilizer
(2) Stabilizer bushing identification color

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

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

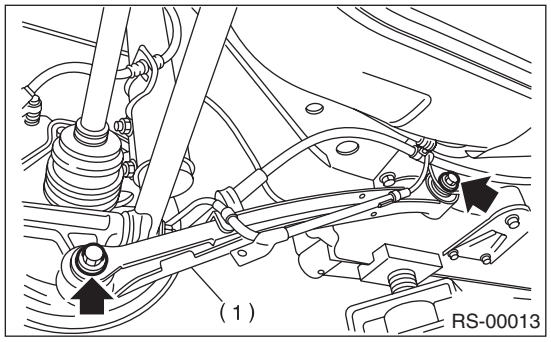
C: INSPECTION

1) Check the bushing for abnormal cracks, fatigue or damage.
2) Check that there is no deformation, cracks or damage on the stabilizer link.

4. Rear Trailing Link

A: REMOVAL

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



(1) Trailing link

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

B: INSTALLATION

NOTE:
Use a new self-locking nut.
1) Install in the reverse order of removal.

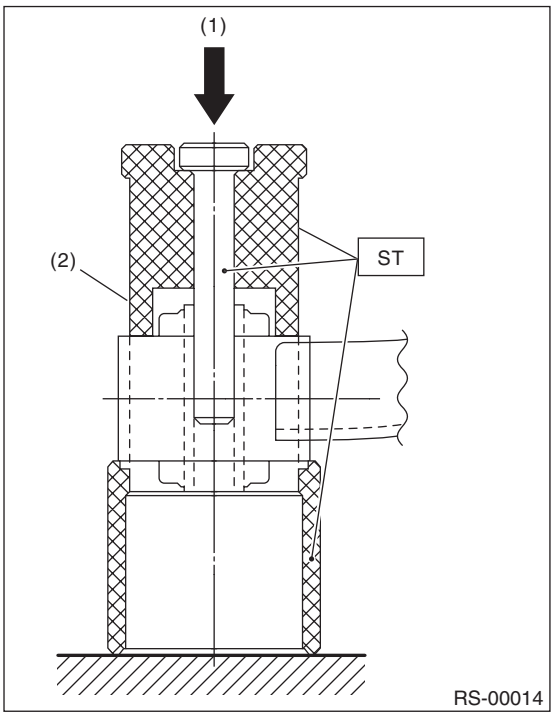
Tightening torque:
Refer to "COMPONENT" of "General Description" for tightening torque values. <Ref. to RS-3, COMPONENT, General Description.>

2) Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.
3) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

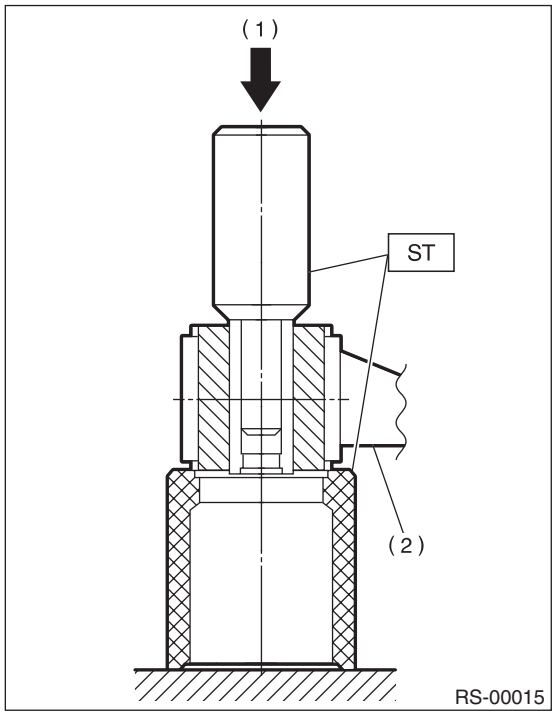
Using the ST, press the front bushing out of place.
ST 927720000 INSTALLER & REMOVER SET



(1) Press
(2) Trailing link

2. REAR BUSHING

1) Remove the housing. <Ref. to DS-22, REMOVAL, Rear Axle.>
2) Using the ST, press the rear bushing out.
ST 927730000 INSTALLER & REMOVER SET



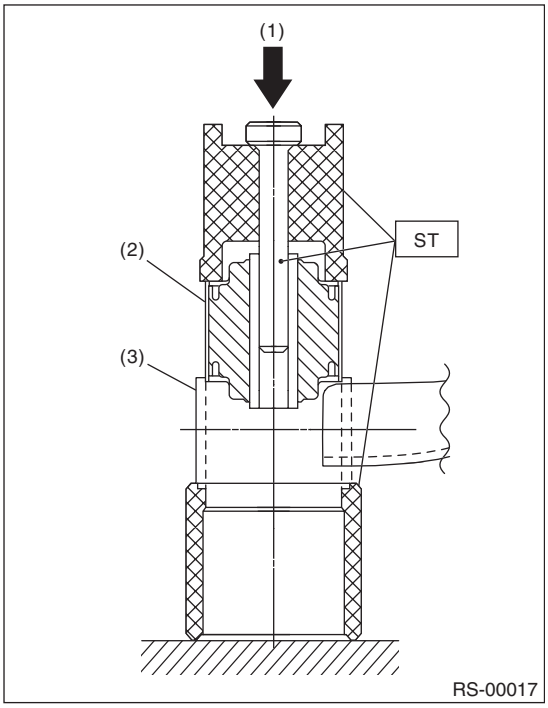
(1) Press
(2) Housing

D: ASSEMBLY

1. FRONT BUSHING

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

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



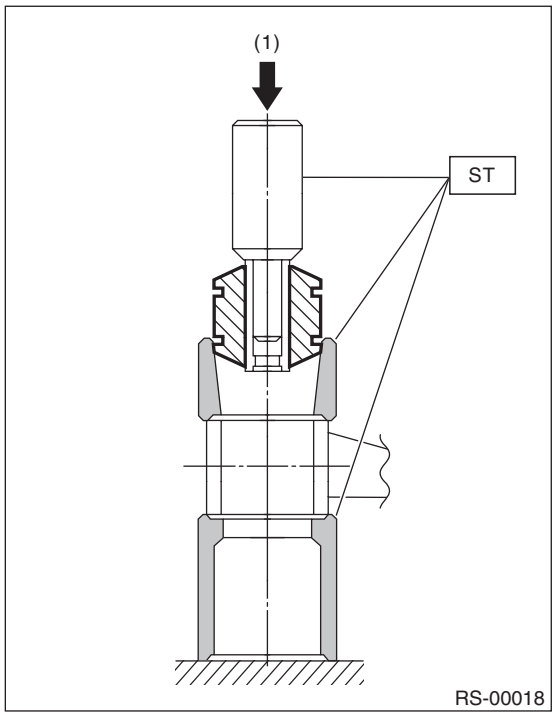
(1) Press
(2) Front bushing
(3) Trailing link

2. REAR BUSHING

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

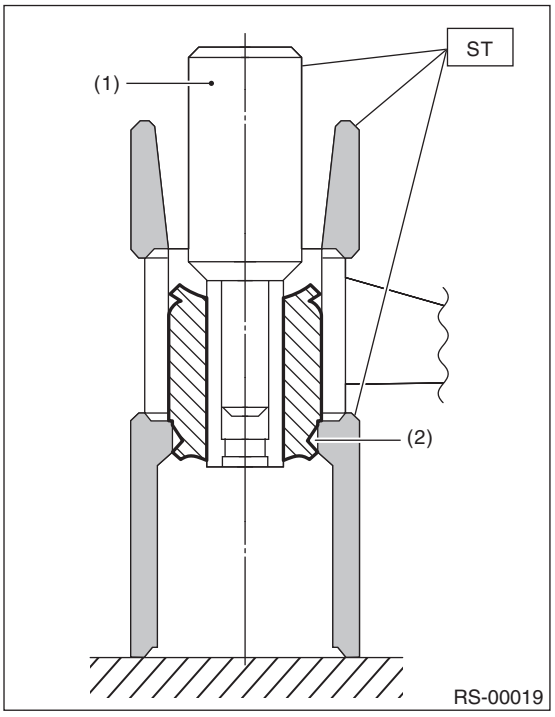
NOTE:
If it is difficult to press the bushing into the trailing link, dilute TIRE LUBE with water and apply it to the inner surface of ST as a lubricant.

Specified lubricant:
Tire lube: Water = 1:3



(1) Press

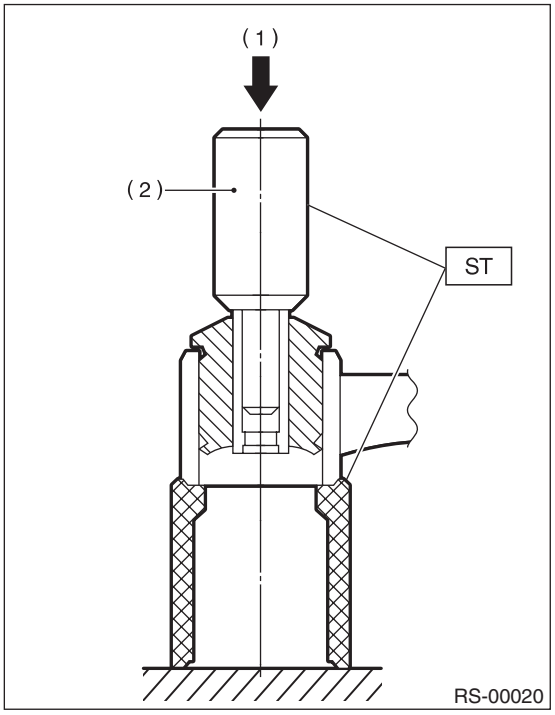
2) Press the ST plunger until bushing flange protrudes beyond the trailing link.
ST 927730000 INSTALLER & REMOVER SET



(1) Plunger
(2) Flange

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

ST 927730000 INSTALLER & REMOVER SET



(1) Press
(2) Plunger

4) Install the housing. <Ref. to DS-25, INSTALLATION, Rear Axle.>

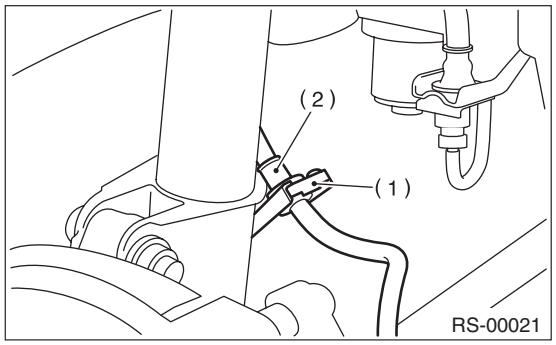
E: INSPECTION

Check the trailing link for bending, corrosion or damage.

5. Rear Strut

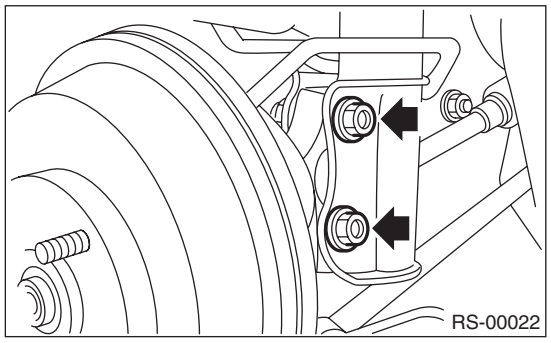
A: REMOVAL

1) Remove the strut cap of the quarter trim.
2) Loosen the rear wheel nuts.
3) Lift up the vehicle, and then remove the rear wheels.
4) Remove the brake hose clip and remove the brake hose from rear strut.

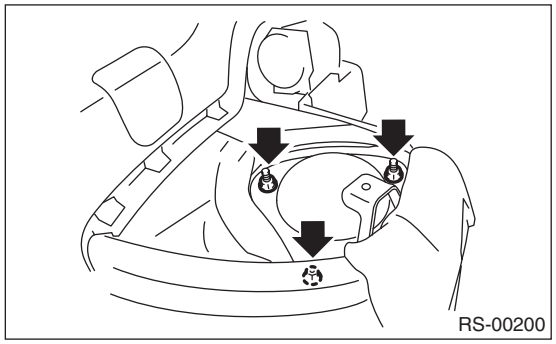


(1) Brake hose clip
(2) Brake hose

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



CAUTION:
Do not apply excessive tension to the brake hose and ABS wheel speed sensor harness.
6) Remove the nuts which secure the strut mount to the vehicle body.



B: INSTALLATION

1) Using new self-locking nuts, and attach the strut mount to the body.

Tightening torque:
20 N·m (2.0 kgf-m, 14.8 ft-lb)
2) Using new self-locking nuts, and attach the rear strut to housing.

Tightening torque:
200 N·m (20.4 kgf-m, 148 ft-lb)
3) Attach the brake hose to lower side of the strut, then insert brake hose clip.
4) Lower the vehicle and tighten wheel nut.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)
5) Attach the strut cap to the rear quarter trim.
6) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

Refer to the Front Strut for the procedures to disassemble the rear strut. <Ref. to FS-19, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut for assembly procedures. <Ref. to FS-19, ASSEMBLY, Front Strut.>

E: INSPECTION

Refer to Front Strut for inspection procedures. <Ref. to FS-20, INSPECTION, Front Strut.>

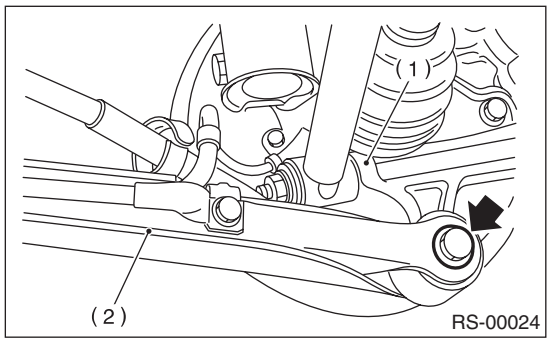
F: DISPOSAL

Refer to Front Strut for disposal procedures. <Ref. to FS-21, DISPOSAL, Front Strut.>

6. Lateral Link

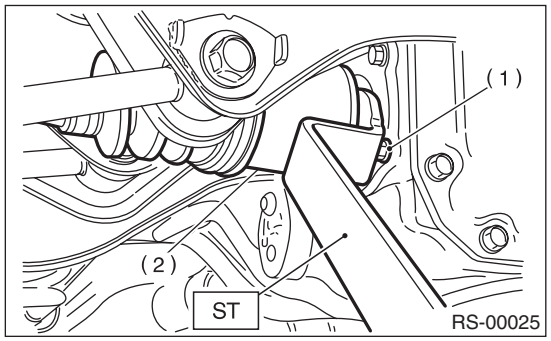
A: REMOVAL

1) Loosen the wheel nuts. Lift up the vehicle, and remove the wheels.
2) Remove the stabilizers.
3) Remove the ABS wheel speed sensor harness from the trailing link.
4) Remove the bolts which secure the trailing link to the housing.



(1) Rear housing
(2) Trailing link

5) Remove the bolts which secure the lateral link assembly to the rear housing.
6) Remove the DOJ from rear differential using the ST.
ST 28099PA100 REMOVER



(1) Bolt
(2) DOJ

CAUTION:
Be careful not to damage the side bearing retainer. Always use the bolt shown in figure, as supporting points for the ST during removal.
7) Scribe an alignment mark on the rear lateral link adjustment bolt and crossmember.
8) Remove the bolts securing the front and rear lateral links to the crossmember, and detach the lateral link.

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

B: INSTALLATION

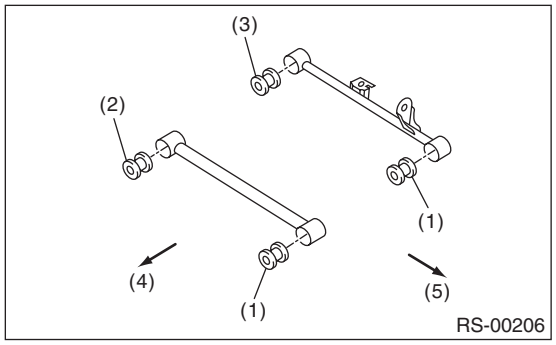
1) Install in the reverse order of removal. Observe the following instructions.
• Attaching the DOJ to the differential <Ref. to DS-37, INSTALLATION, Rear Drive Shaft.>.
• Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.
• Tighten the nut with the bolt head fixed in place when installing the adjusting bolt.

CAUTION:
• Always use a new self-locking nut and DOJ circlip.
• Always use the ST so that DOJ splines do not damage the side oil seal.
ST 28099PA090 OIL SEAL PROTECTOR
2) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

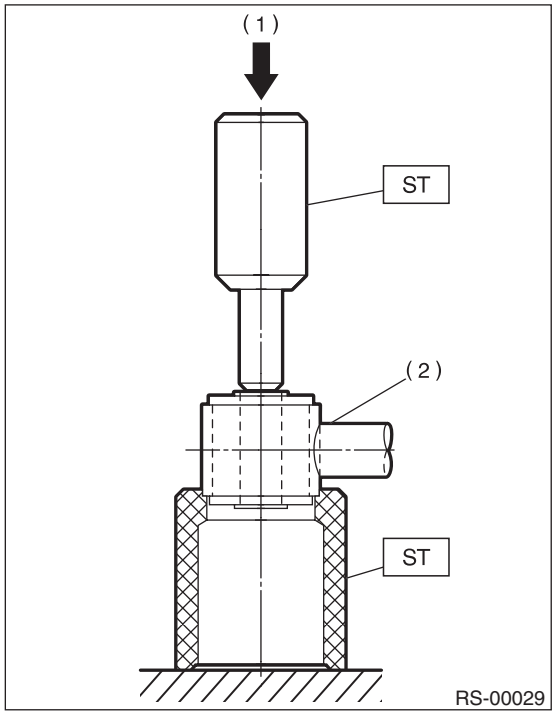
1) Check the bushing type by referring to the following table.
2) Select the ST according to the type of bushings used.

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



(1) Bushing A
(2) Bushing B
(3) Bushing C
(4) Front
(5) Outside of body

3) Using the ST, press the bushing out.



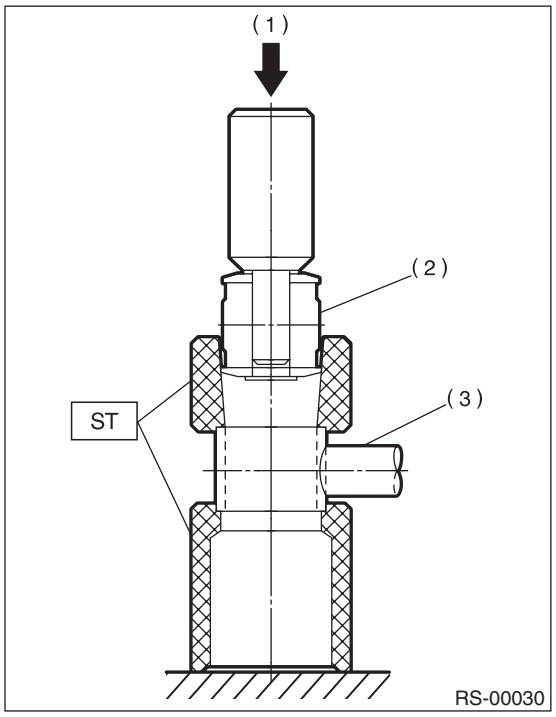
(1) Press
(2) Lateral link

D: ASSEMBLY

1) Use the same ST as the one used during disassembly.
2) If it is difficult to press the bushing into the lateral link, dilute TIRE LUBE with water and apply it to the inner surface of ST as a lubricant.

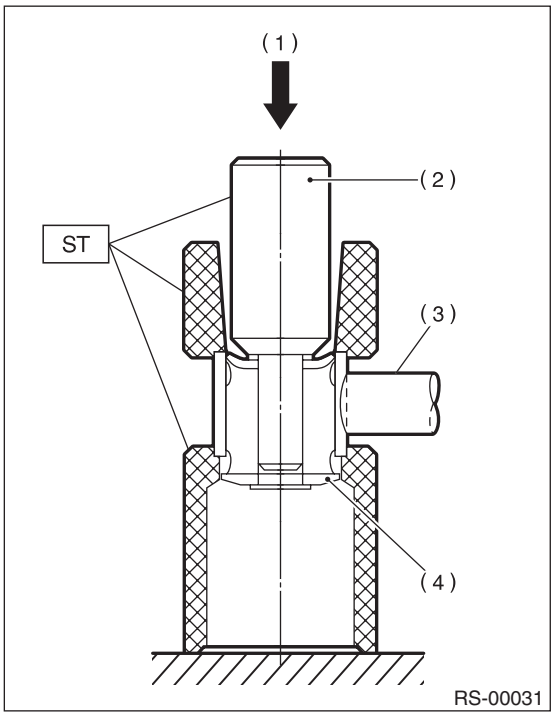
Specified lubricant:
Tire lube: Water = 1:3

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



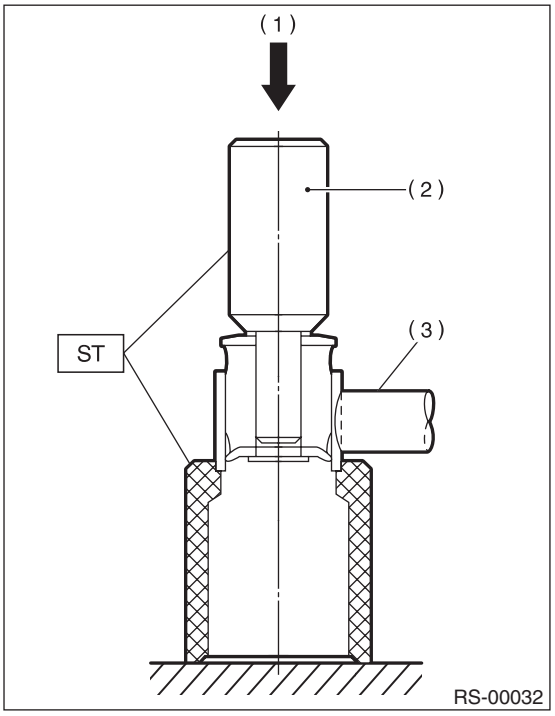
(1) Press
(2) Bushing
(3) Lateral link

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



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

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



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

E: INSPECTION

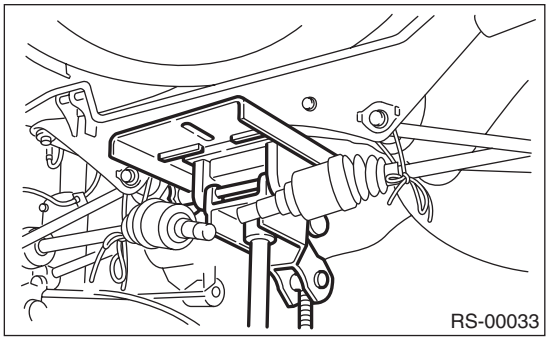
Visually check the lateral link for damage and deformation.

7. Rear Crossmember

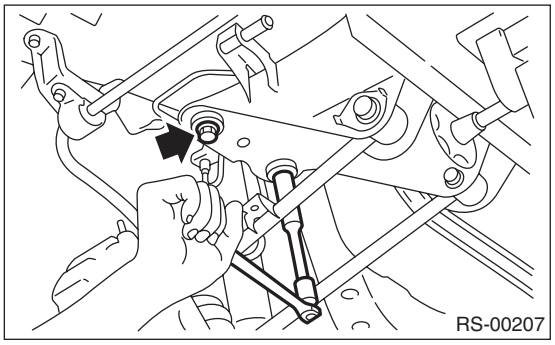
A: REMOVAL

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

1) Separate the front exhaust pipe from the rear exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the rear differential.
<Ref. to DI-19, REMOVAL, Rear Differential.>
4) Place a transmission jack under the rear crossmember.



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



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

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Discard the removed self-locking nut and replace it with a new part.
• Tighten the nut with the bolt head secured when installing the adjusting bolt.

2) Install the rear differential.
<Ref. to DI-20, INSTALLATION, Rear Differential.>
3) Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.
4) Inspect the wheel alignment and adjust if necessary.

C: INSPECTION

Inspect the removed parts for wear and damage. Repair or replace if defective.

8. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

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

2. POOR RIDE COMFORT

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

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

3. NOISE

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

1. Basic Diagnostic Procedure

A: PROCEDURE

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

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

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

2. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

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

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

2. TIRE PRESSURE MONITORING CONTROL MODULE

• In the state of new car, the registered ID position does not correspond to the tire position.
• If tire rotation or changes in install locations, or replacement of the transmitter is performed, ID registration for the transmitter is required. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.>
• When adjusting tire pressure indoors in winter, there is a big temperature difference between the indoor facilities and outside. Once the car is outside where the temperature is lower, the air pressure in the tires will drop, causing the tire pressure warning light to illuminate, even if the pressure in the tires was adjusted to standard values indoors. To avoid this, it is necessary to adjust the tire pressure to the high side in consideration of the difference in temperature between inside and outside according to the following table.
a. 215/55R17

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

b. 215/60R16

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

B: INSPECTION

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

1. TIRE

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

2. BATTERY

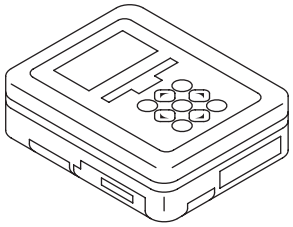
Check that amount of battery fluid, gravity and voltage are within the specifications.

Standard voltage: 12 V or more

Specific gravity: 1.260 or more

C: PREPARATION TOOL

1. SPECIAL TOOL

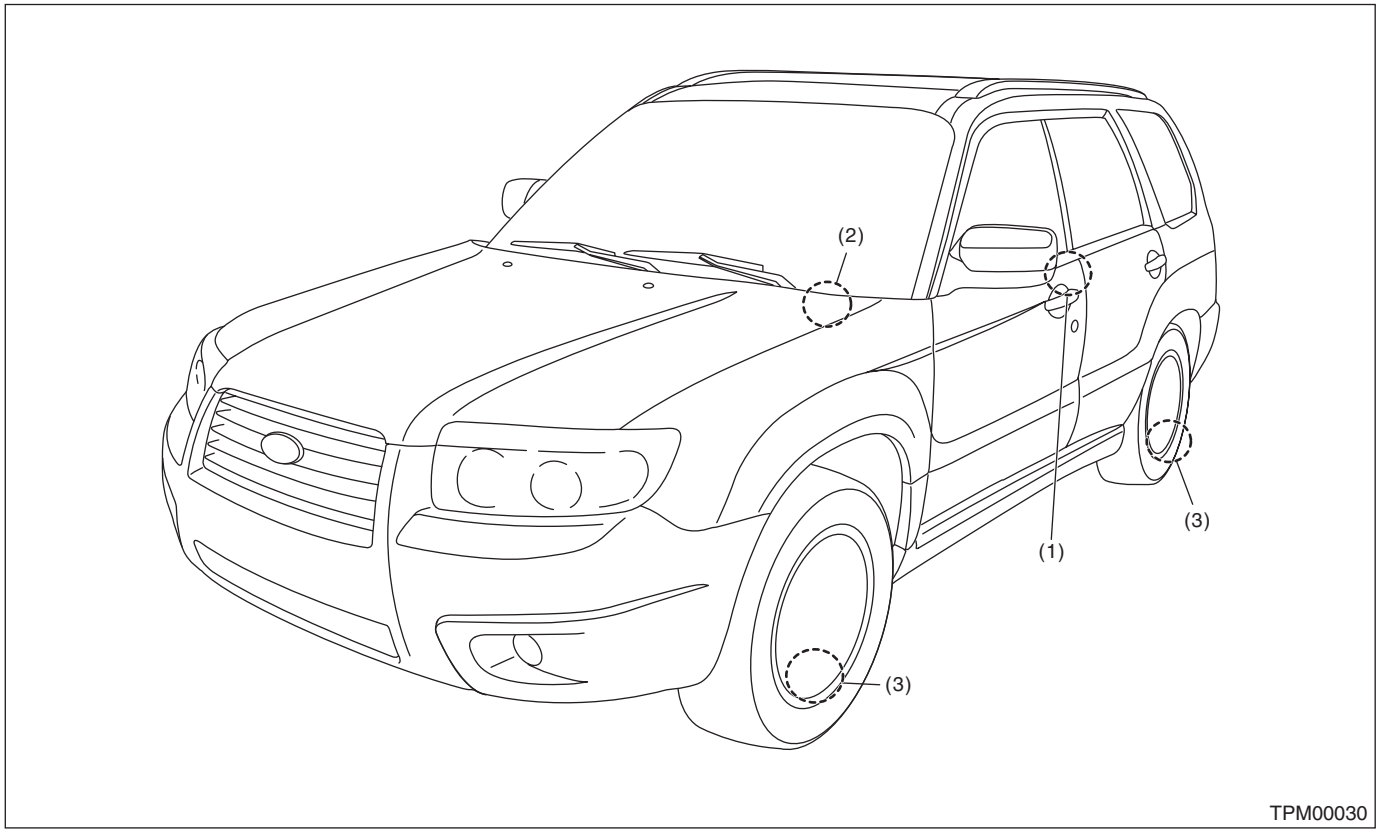
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B021XU0	1B021XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting for electrical system.

2. GENERAL TOOL

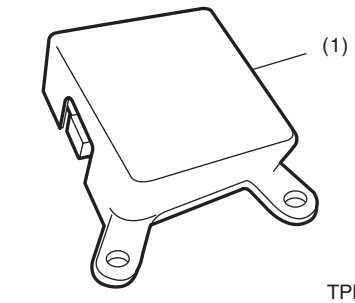
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Transmitter registration tool	Used to register the transmitter ID. Manufacturer: Kent-Moore Item number: J45295

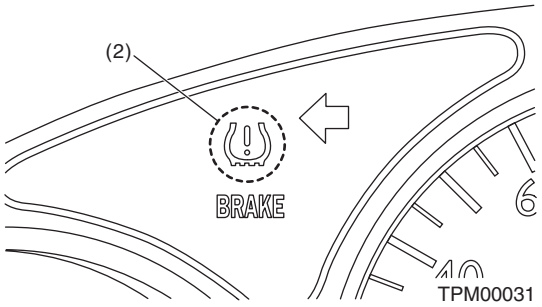
3. Electrical Component Location

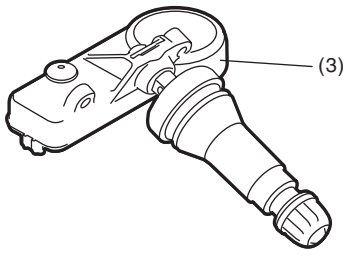
A: LOCATION



(1) Tire pressure monitoring control module
(2) Tire pressure warning light
(3) Transmitter 1 — 4





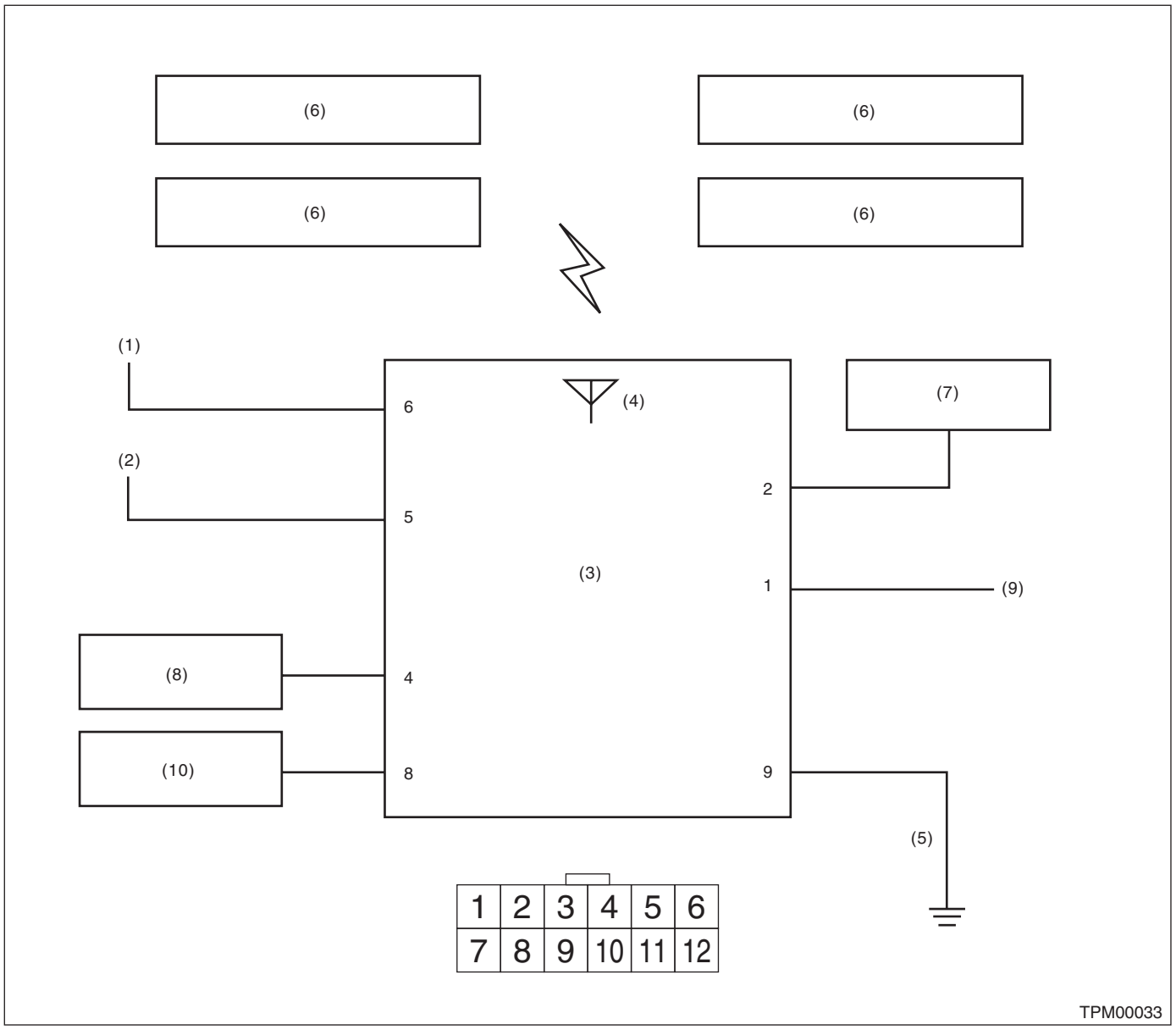


4. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

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

B: WIRING DIAGRAM



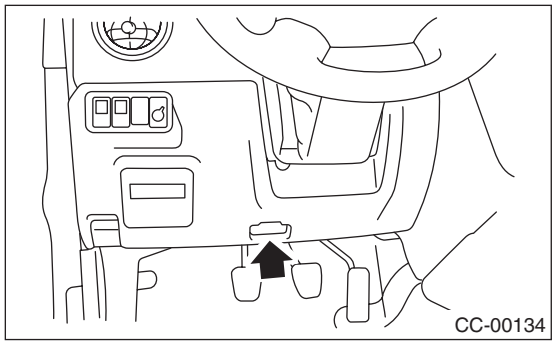
(1) Battery power supply
(2) Ignition power supply
(3) Tire pressure monitoring control module
(4) Antenna
(5) GND
(6) Transmitter
(7) Combination meter
(8) Vehicle speed signal
(9) Subaru Select Monitor
(10) Body integrated unit

5. Subaru Select Monitor

A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit. <Ref. to TPM(diag)-4, SPECIAL TOOL, PREPARATION TOOL, General Description.>
2) Connect the diagnosis cable to the Subaru Select Monitor.
3) Connect the Subaru Select Monitor to the data link connector.
(1) The data link connector is located in the lower portion of the instrument panel (on the driver's side).



(1) Data link connector

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

CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.
4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
5) On the «Main Menu» display screen, select {Each System Check}.
6) On the «System Selection Menu» display screen, select {Tire Pressure Monitor}.
7) Press [OK] after {Tire Pressure Monitor} is displayed.
8) On the «Tire Pressure Monitor Diagnosis» display screen, select {DTC Display}.

NOTE:
• For details concerning operation procedure, refer to the "PC APPLICATION HELP FOR SUBARU SELECT MONITOR".
• For details concerning DTCs, refer to List of Diagnostic Trouble Codes (DTC). <Ref. to TPM(diag)-26, List of Diagnostic Trouble Code (DTC).>
• All DTCs detected will be displayed.
• If a particular DTC is not properly stored in memory (due to a voltage drop of the tire air pressure monitor control module power supply, etc.) when a problem occurs, a DTC suffixed with a question mark will appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.
9) If communication is not possible between the tire pressure monitoring control module and the Subaru Select Monitor, check the communication circuit. <Ref. to TPM(diag)-11, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>
10) When DTC is not displayed, check the indicator circuit and communication circuit. <Ref. to TPM(diag)-14, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

2. DATA DISPLAY

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

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

1. Data monitor (Analog)

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

3. CLEAR MEMORY

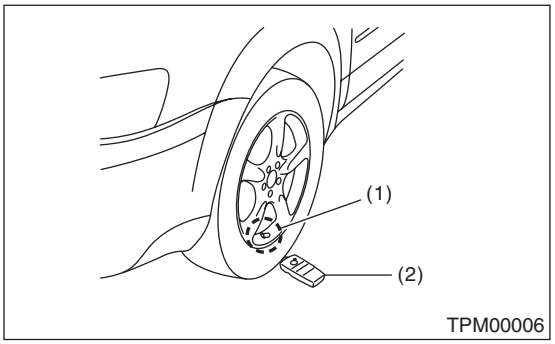
1) On the «Main Menu» display screen, select {2. Each System Check}.
2) On the «System Selection Menu» display screen, select {Tire Pressure Monitor}.
3) Press [OK] after {Tire Pressure Monitor} is displayed.
4) On the «Tire Pressure Monitor Diagnosis» display screen, select {Clear Memory}.
5) When “Done” and “Turn ignition switch OFF” is shown on the display screen, close the Subaru Select Monitor and turn the ignition switch OFF.

NOTE:
For details concerning operation procedure, refer to the “PC APPLICATION HELP FOR SUBARU SELECT MONITOR”.

4. REGISTER TRANSMITTER ID

Perform the procedures below to register the transmitter.
• Transmitter replaced.
• Switched the position of the transmitter (rotated tires)
• Replaced the tire pressure monitoring control module.

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



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

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

5. DISPLAY TRANSMITTER (ID)

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Tire Pressure Monitor}.
3) Press [OK] after {Tire Pressure Monitor} is displayed.
4) On the «Tire Pressure Monitor Diagnosis» display screen, select {Transmitter ID regist confirm}.
5) Select {Transmitter ID Data Monitor} and press [OK] to display the transmitter ID.

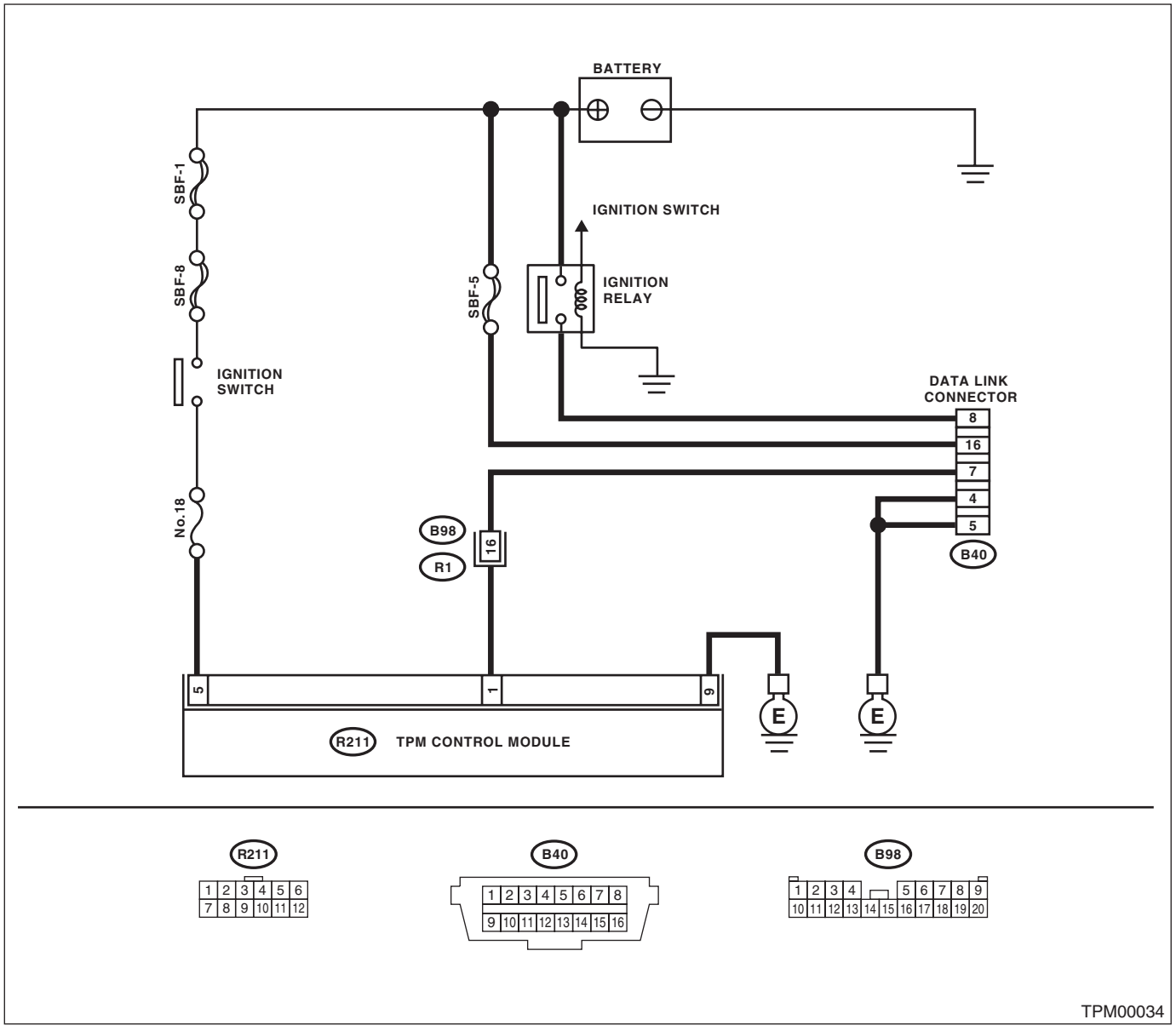
B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector

TROUBLE SYMPTOM:
Communication is impossible between the tire pressure monitoring control module and the Subaru Select Monitor.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch ON?	Go to step **2**.	Turn the ignition switch to ON, and select TPM mode using Subaru Select Monitor.
2	**CHECK BATTERY.**	Is the voltage 11 V or more?	Go to step **3**.	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **4**.
4	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be performed normally.	Are the system name displayed on Subaru Select Monitor?	Go to step **8**.	Go to step **5**.
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the tire pressure monitoring control module connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Are the system name displayed on Subaru Select Monitor?	Replace the tire pressure monitoring control module. <Ref. to WT-11, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	Go to step **6**.
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the tire pressure monitoring control module. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the harness and connector between each control module and data link connector.
7	**CHECK THE TIRE PRESSURE MONITORING CONTROL MODULE OUTPUT SIGNAL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tire pressure monitoring control module and chassis ground. ***Connector & terminal*** ***(B40) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8**.	Repair the harness and connector between each control module and data link connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TIRE PRESSURE MONITORING CONTROL MODULE AND DATA LINK CONNECTOR.** Measure the resistance between tire pressure monitoring control module and data link connector. ***Connector & terminal*** ***(R211) No. 1 — (B40) No. 7:***	Is resistance less than 0.5 Ω?	Go to step **9**.	Repair the harness and connector between tire pressure monitoring control module and data link connector.
9	**CHECK TIRE PRESSURE MONITORING CONTROL MODULE CONNECTOR.** Turn the ignition switch to OFF.	Is the tire pressure monitoring control module connector inserted in the tire pressure monitoring control module until it locks?	Go to step **10**.	Insert the tire pressure monitoring control module connector into the tire pressure monitoring control module.

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

2. WITHOUT DTC

DETECTING CONDITION:

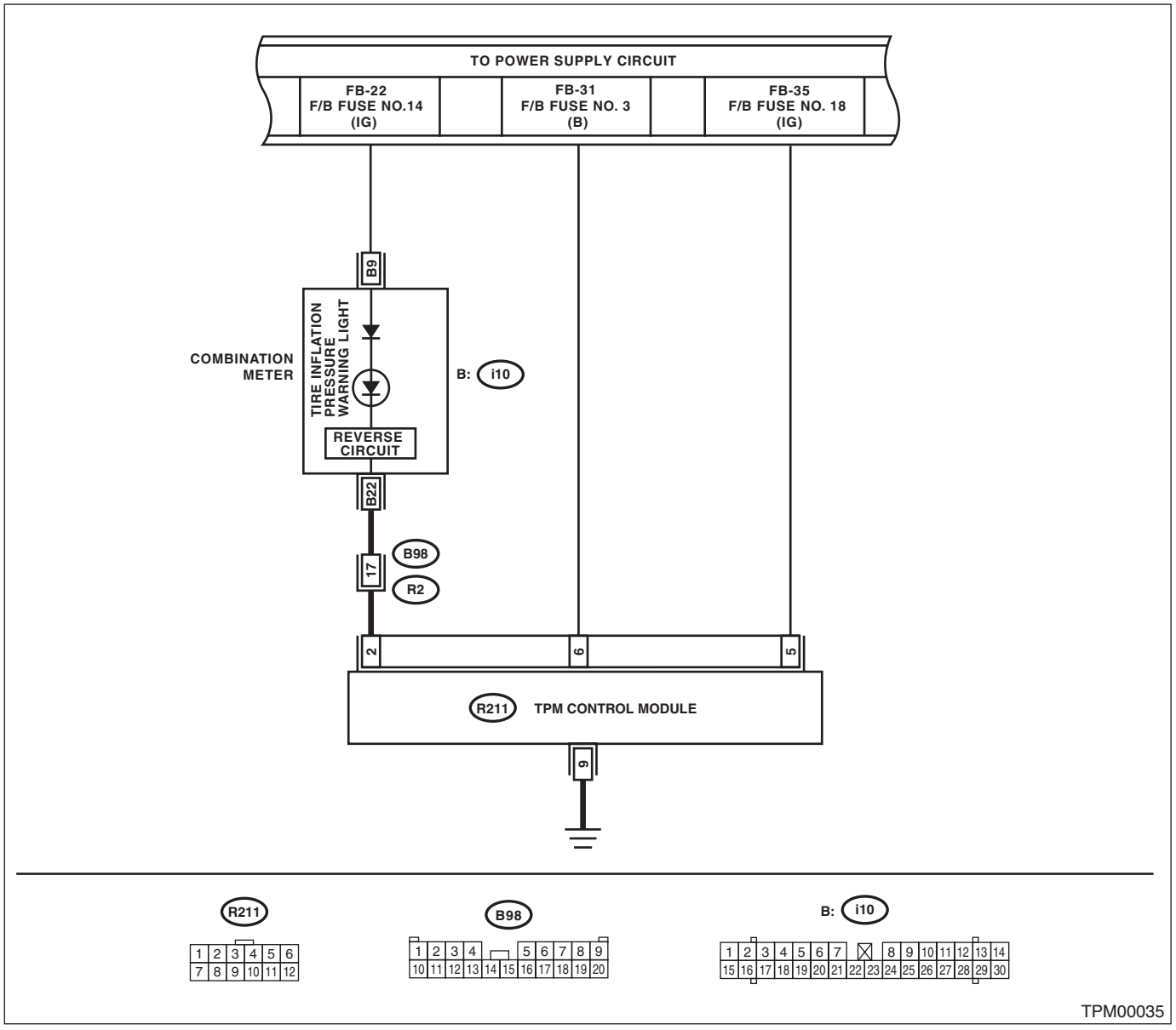
- Defective combination meter
- Defective harness

TROUBLE SYMPTOM:

- Tire pressure warning light does not go off.
- “NO TROUBLE CODE” will be displayed on the Subaru Select Monitor.

NOTE:
When the tire pressure warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in a normal condition.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR DATA.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the data of the "Tire pressure warning light".	Is "ON" indicated?	Replace the tire pressure monitoring control module. <Ref. to WT-11, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	Go to step **2**.
2	**CHECK WIRING HARNESS.** Measure the resistance between tire pressure monitoring control module and combination meter connector. ***Connector & terminal*** ***(i10) No. 22 — (R211) No. 2:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair the harness and connector between tire pressure monitoring control module and combination meter.
3	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the tire pressure monitoring control module connector and combination meter connector?	Repair the connector.	Check the combination meter.

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details regarding reading of DTCs, refer to “Subaru Select Monitor”. <Ref. to TPM(diag)-8, Subaru Select Monitor.>

7. Inspection Mode

A: PROCEDURE

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

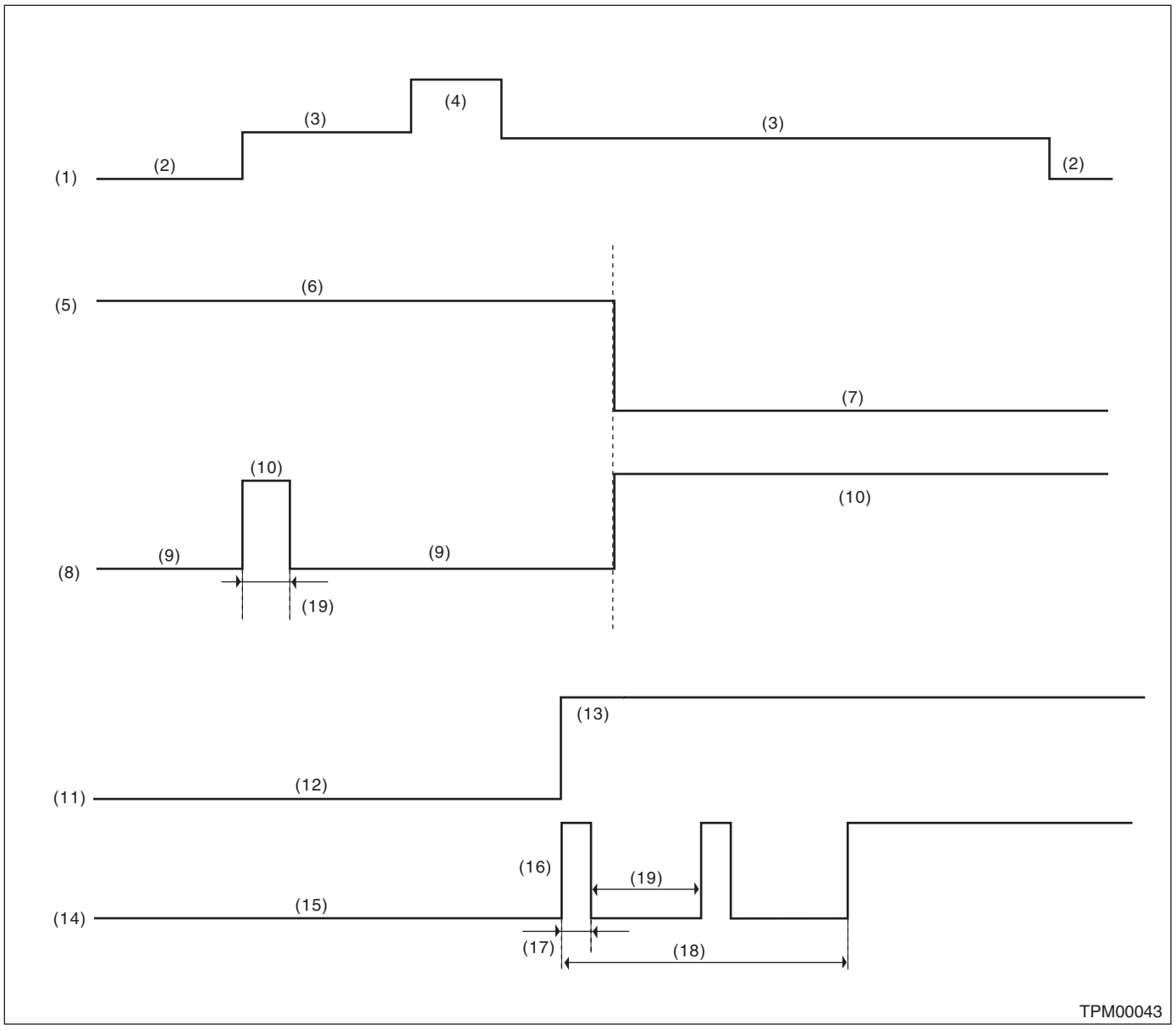
8. Clear Memory Mode

A: OPERATION

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

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

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Start
(5) Tire pressure
(6) Meet the specification
(7) 17 inch car: 180 kPa (1.8 kgf/cm^2, 26 psi), or less
16 inch car: 165 kPa (1.7 kgf/cm^2, 23.9 psi), or less
(8) Tire pressure warning light
(9) Light OFF
(10) Light ON
(11) System status
(12) Normal
(13) Malfunction
(14) Tire pressure warning light
(15) Light OFF
(16) Blink
(17) 1 second
(18) Blink 25 times
(19) 2 seconds

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

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

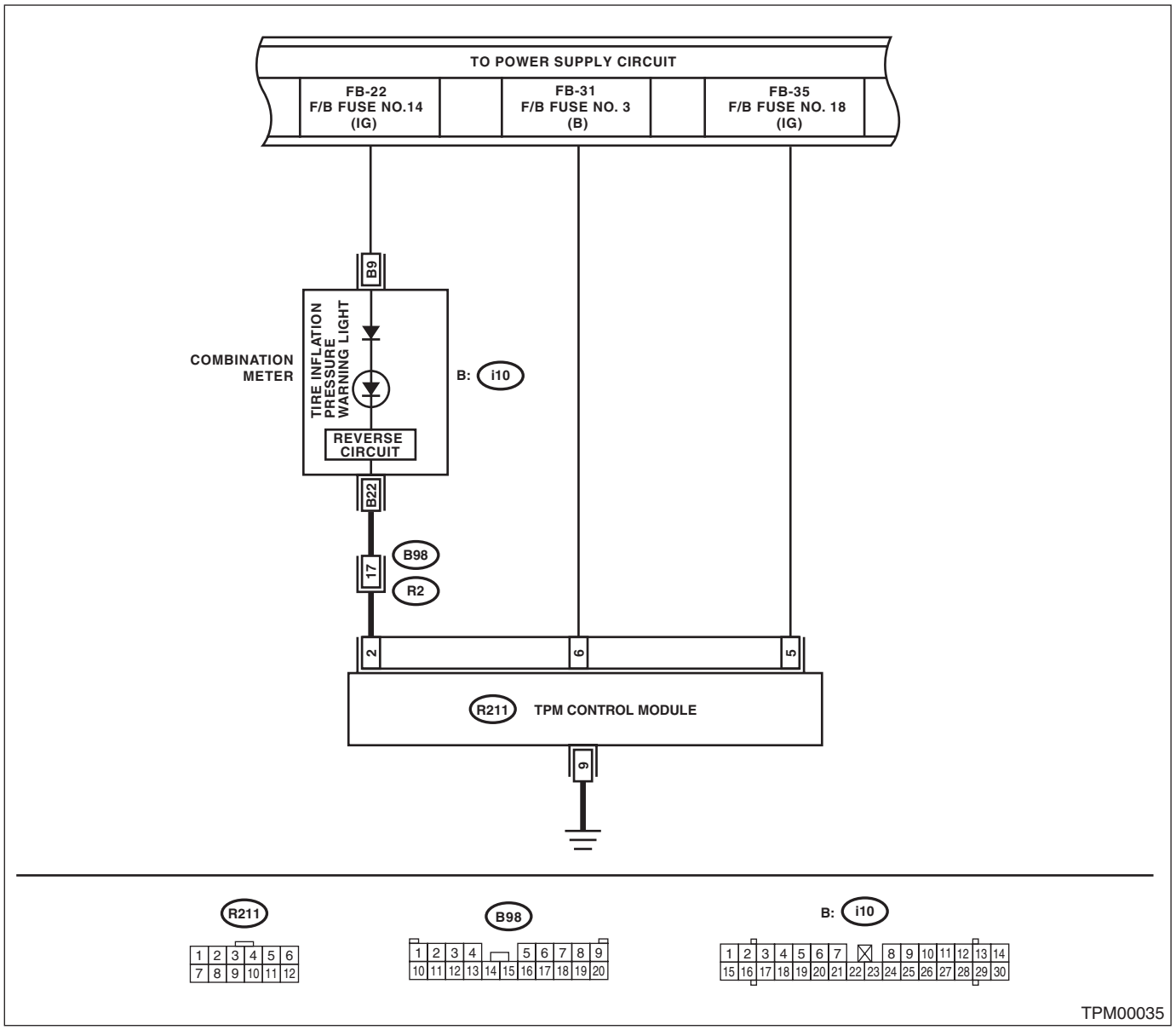
NOTE:
If the problem is fixed while driving at approximately 40 km/h (25 MPH) after the tire pressure warning light blinks/lights, the warning light goes out and the tire pressure monitor system operates normally. (If there is a decrease in tire pressure, or a malfunction of the system, the malfunction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

B: TIRE PRESSURE WARNING LIGHT DOES NOT COME ON

DETECTING CONDITION:
Defective combination meter

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

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** Connect the Subaru Select Monitor, and read the Diagnostic Trouble Code. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is diagnostics code (DTC) displayed?	Perform the diagnosis according to the DTC. <Ref. to TPM(diag)-26, List of Diagnostic Trouble Code (DTC).>	Replace the combination meter. <Ref. to IDI-10, REMOVAL, Combination Meter.>

C: TIRE PRESSURE WARNING LIGHT DOES NOT COME OFF

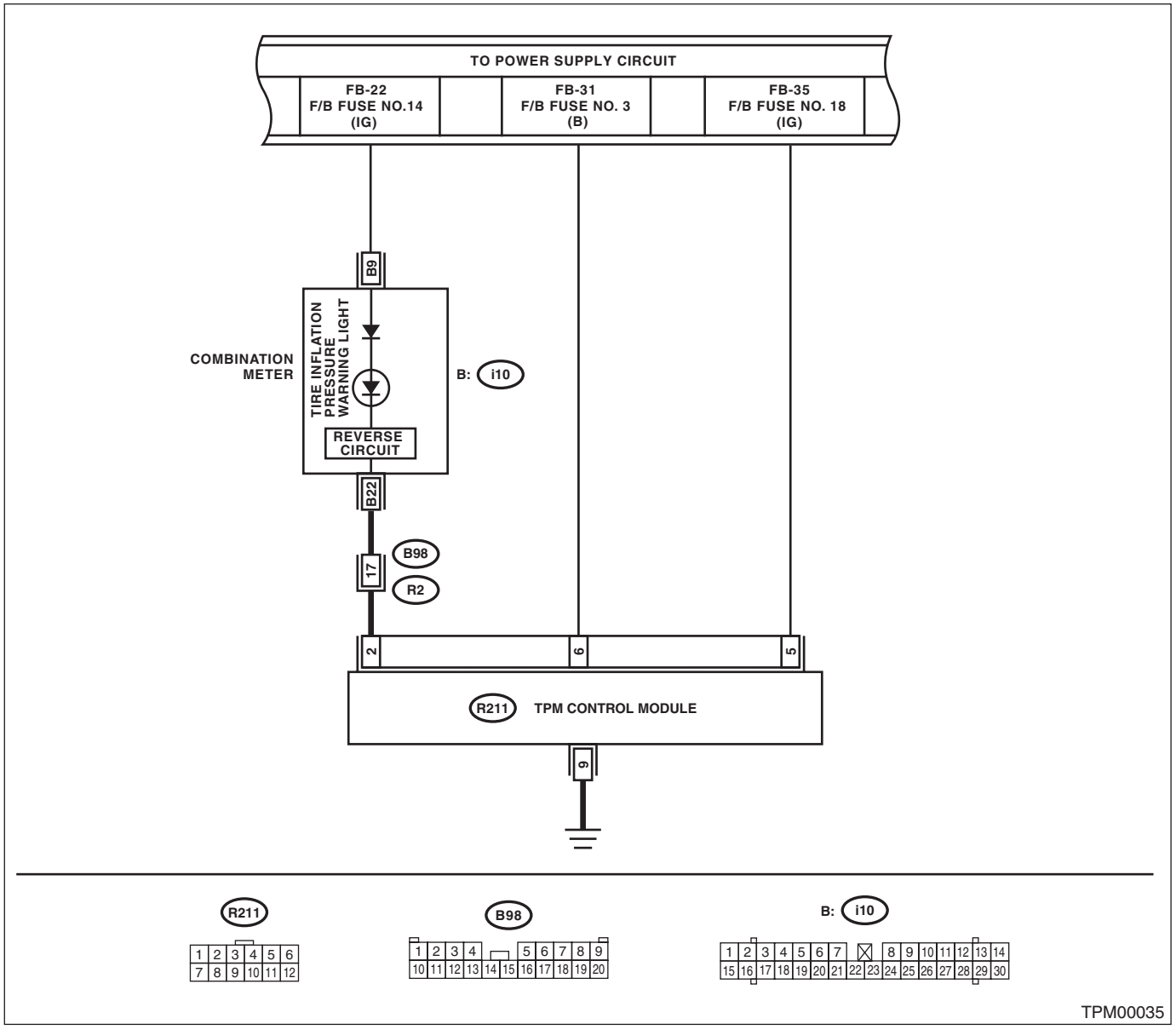
DETECTING CONDITION:

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

TROUBLE SYMPTOM:

Tire pressure warning light does not go off after engine starts.

WIRING DIAGRAM:



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

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

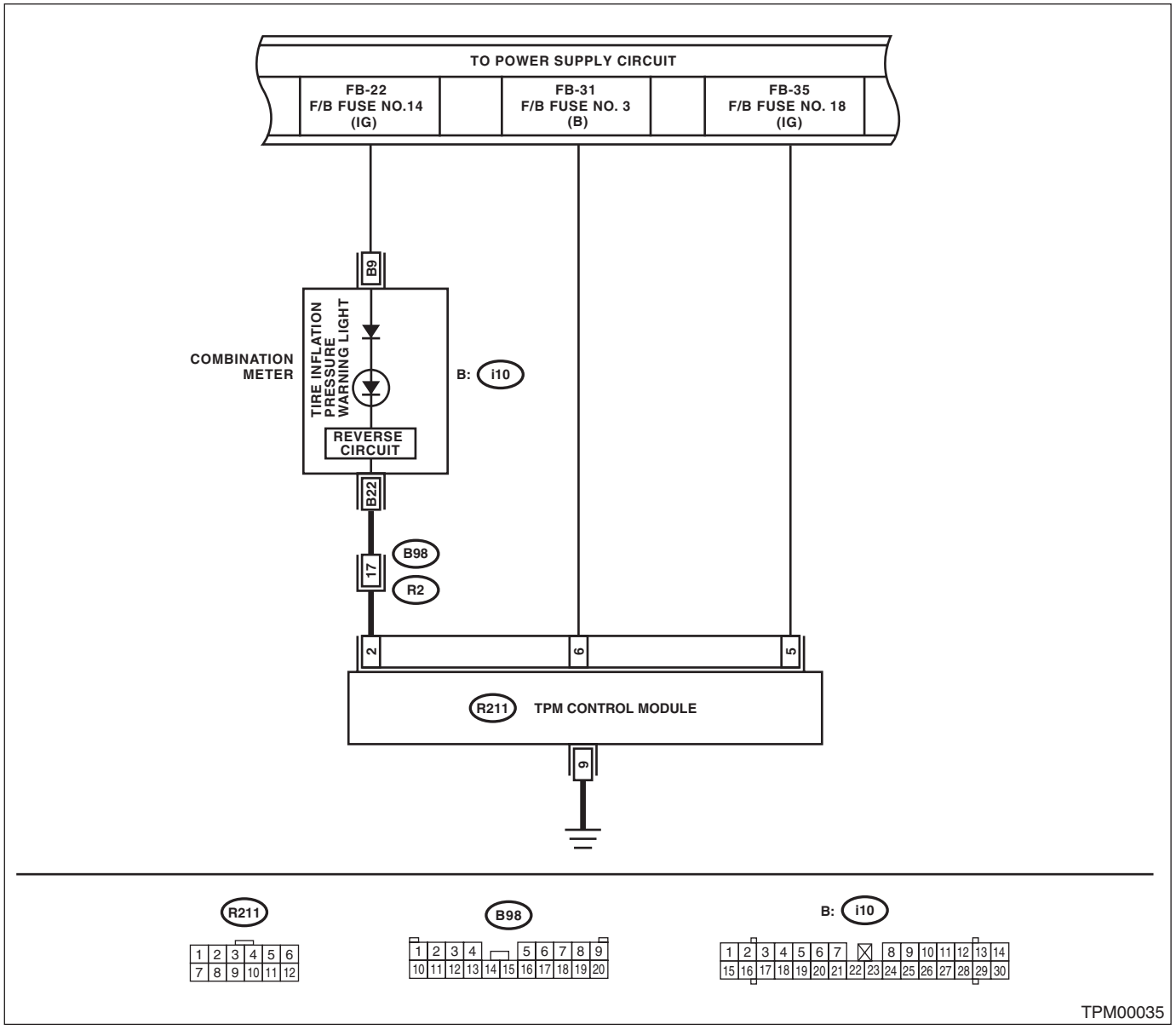
DETECTING CONDITION:

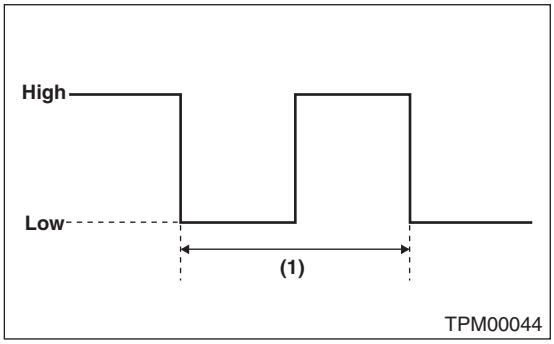
- Tire pressure monitoring control module is faulty.
- Defective harness
- Transmitter is faulty.

TROUBLE SYMPTOM:

Whenever starting the engine, tire pressure warning light blinks 25 times and is lit.

WIRING DIAGRAM:



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

10.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnosis	Remarks
11	Tire 1 Air Pressure Decrease	Tire 1 pressure is reduced.	<Ref. to TPM(diag)-28, DTC 11 TIRE 1 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Tire 2 Air Pressure Decrease	Tire 2 pressure is reduced.	<Ref. to TPM(diag)-28, DTC 12 TIRE 2 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
13	Tire 3 Air Pressure Decrease	Tire 3 pressure is reduced.	<Ref. to TPM(diag)-28, DTC 13 TIRE 3 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
14	Tire 4 Air Pressure Decrease	Tire 4 pressure is reduced.	<Ref. to TPM(diag)-29, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	Transmitter 1 No Data	Data cannot be received from transmitter 1.	<Ref. to TPM(diag)-29, DTC 21 TRANSMITTER 1 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Transmitter 2 No Data	Data cannot be received from transmitter 2.	<Ref. to TPM(diag)-29, DTC 22 TRANSMITTER 2 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Transmitter 3 No Data	Data cannot be received from transmitter 3.	<Ref. to TPM(diag)-29, DTC 23 TRANSMITTER 3 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Transmitter 4 No Data	Data cannot be received from transmitter 4.	<Ref. to TPM(diag)-30, DTC 24 TRANSMITTER 4 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Transmitter 1 Pressure Data Abnormal	Transmitter 1 data contents are abnormal.	<Ref. to TPM(diag)-31, DTC 31 TRANSMITTER 1 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Transmitter 2 Pressure Data Abnormal	Transmitter 2 data contents are abnormal.	<Ref. to TPM(diag)-31, DTC 32 TRANSMITTER 2 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Transmitter 3 Pressure Data Abnormal	Transmitter 3 data contents are abnormal.	<Ref. to TPM(diag)-31, DTC 33 TRANSMITTER 3 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Contents of diagnosis	Remarks
34	Transmitter 4 Pressure Data Abnormal	Transmitter 4 data contents are abnormal.	<Ref. to TPM(diag)-32, DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
41	Transmitter 1 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-33, DTC 41 TRANSMITTER 1 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	Transmitter 2 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-33, DTC 42 TRANSMITTER 2 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
43	Transmitter 3 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-33, DTC 43 TRANSMITTER 3 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
44	Transmitter 4 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-34, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Transmitter 1 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 51 TRANSMITTER 1 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	Transmitter 2 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 52 TRANSMITTER 2 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
53	Transmitter 3 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 53 TRANSMITTER 3 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	Transmitter 4 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
61	Vehicle Speed Is Abnormal	Vehicle speed signal is not input to the control module when the vehicle speed is 6 km/h (3.7 MPH) or more.	<Ref. to TPM(diag)-36, DTC 61 VEHICLE SPEED IS ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

11.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 TIRE 1 AIR PRESSURE DECREASE

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

B: DTC 12 TIRE 2 AIR PRESSURE DECREASE

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

C: DTC 13 TIRE 3 AIR PRESSURE DECREASE

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

D: DTC 14 TIRE 4 AIR PRESSURE DECREASE

DTC DETECTING CONDITION:
Inflation pressure of tires dropped under specifications (180 kPs (1.8 kgf/cm^2, 26.1 psi) or less).
TROUBLE SYMPTOM:
Tire pressure warning light illuminates.

	Step	Check	Yes	No
1	**CHECK THE TIRES.** Lift up the vehicle and check for damage in the tires.	Are there cracks or damage?	Replace the tire. <Ref. to WT-5, Tire.>	Go to step **2**.
2	**CHECK THE TIRES.** Check the tire air pressure.	Is the tire pressure in the specifications?	Go to step **3**.	Adjust the air pressure.
3	**CHECK TRANSMITTER.** Drive the vehicle at 40 km/h (25 MPH) or faster and compare the data from the transmitter on the four wheels.	Is there a transmitter with different data?	Replace the transmitter (tire pressure sensor). <Ref. to WT-11, Tire Pressure Monitoring System.>	Go to step **4**.
4	**PERFORM DRIVING TEST.** 1) Perform Clear Memory Mode. <Ref. to TPM(diag)-10, CLEAR MEMORY, OPERATION, Subaru Select Monitor.> 2) Perform a driving test. <Ref. to TPM(diag)-17, PROCEDURE, Inspection Mode.> 3) Read the DTC. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Inspect by referring to “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to TPM(diag)-28, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

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

E: DTC 21 TRANSMITTER 1 NO DATA

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

F: DTC 22 TRANSMITTER 2 NO DATA

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

G: DTC 23 TRANSMITTER 3 NO DATA

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

H: DTC 24 TRANSMITTER 4 NO DATA

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

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

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

I: DTC 31 TRANSMITTER 1 PRESSURE DATA ABNORMAL

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

J: DTC 32 TRANSMITTER 2 PRESSURE DATA ABNORMAL

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

K: DTC 33 TRANSMITTER 3 PRESSURE DATA ABNORMAL

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

L: DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL

DTC DETECTING CONDITION:

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

TROUBLE SYMPTOM:

The tire pressure warning light blinks 25 times and is lit.

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

M: DTC 41 TRANSMITTER 1 FUNCTION CODE ABNORMAL

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

N: DTC 42 TRANSMITTER 2 FUNCTION CODE ABNORMAL

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

O: DTC 43 TRANSMITTER 3 FUNCTION CODE ABNORMAL

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

P: DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL

DTC DETECTING CONDITION:
Unexpected function codes received from each transmitter.
TROUBLE SYMPTOM:
The tire pressure warning light blinks 25 times and is lit.

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

Q: DTC 51 TRANSMITTER 1 BATTERY VOLTAGE DECREASE

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

R: DTC 52 TRANSMITTER 2 BATTERY VOLTAGE DECREASE

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

S: DTC 53 TRANSMITTER 3 BATTERY VOLTAGE DECREASE

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

T: DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE

DTC DETECTING CONDITION:
Low battery signals received 20 times from each transmitter.
TROUBLE SYMPTOM:
The tire pressure warning light blinks 25 times and is lit.

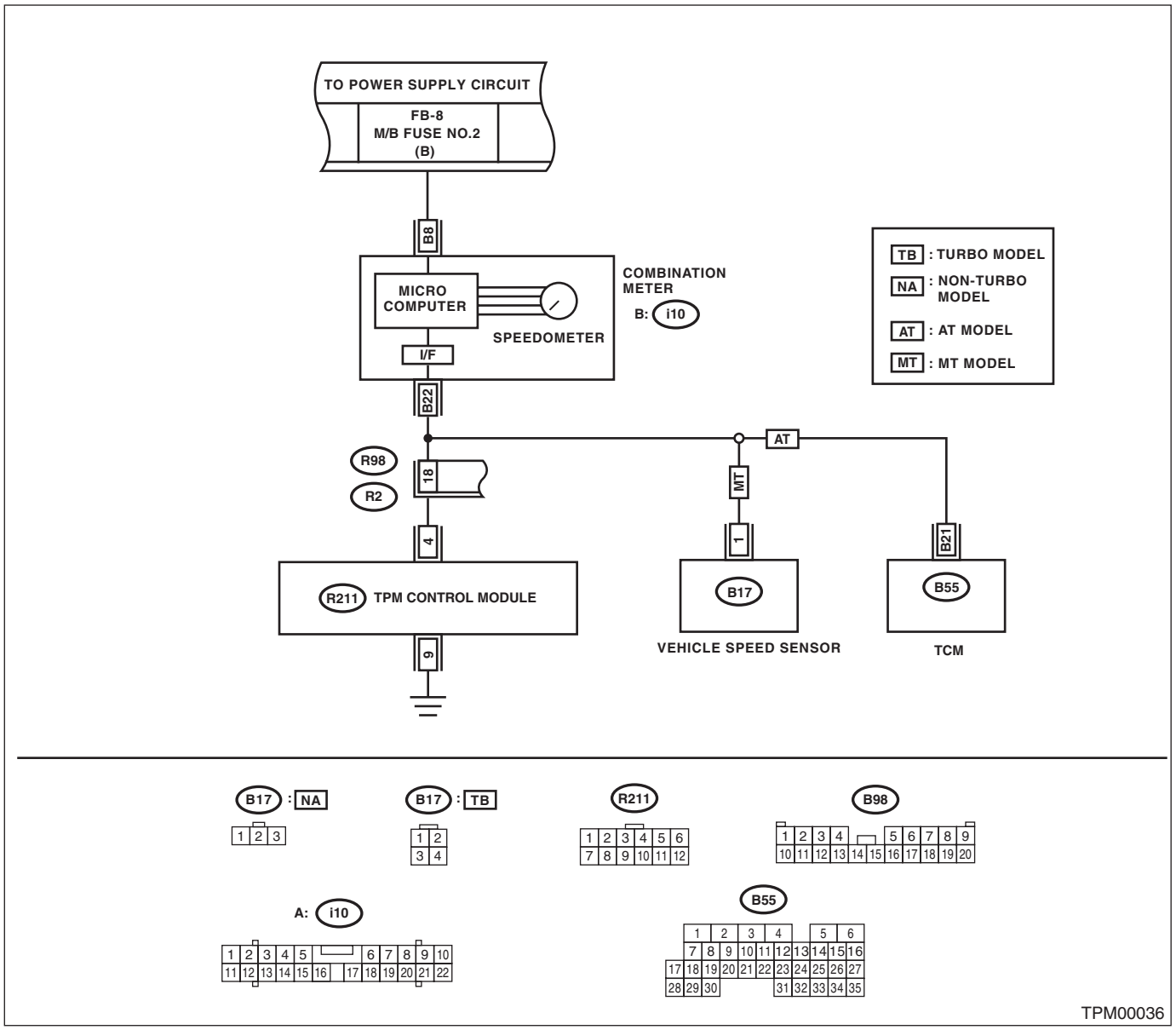
	Step	Check	Yes	No
1	**CHECK TRANSMITTER.** 1) Replace all transmitters and register their IDs. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.> 2) Perform the Clear Memory Mode, and perform driving test.	Is the fault eliminated?	Internal battery of the transmitter had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

U: DTC 61 VEHICLE SPEED IS ABNORMAL

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

TROUBLE SYMPTOM:
Tire pressure warning light blinks.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TIRE PRESSURE MONITORING CONTROL MODULE.** 1) Connect an oscilloscope to the terminal No. 4 of the tire pressure monitoring control module connector (R211). 2) Drive the vehicle at 40 km/h (25 MPH) and check the vehicle speed signal at that time.	Is the vehicle speed being input?	Replace the tire pressure monitoring control module. <Ref. to WT-11, REMOVAL, Tire Pressure Monitoring System.>	Go to step **2**.
2	**CHECK HARNESS.** 1) Disconnect the combination meter connector (i10). 2) Connect the tire pressure monitoring control module connector (R211) and combination meter connector (i10) and measure the resistance. ***Connector & terminal*** ***(R211) No. 4 — (i10) No. 22:***	Is the resistance less than 0.5 Ω?	Check the combination meter. <Ref. to IDI-10, REMOVAL, Combination Meter.>	Repair or replace the open circuit of the harness.

12.General Diagnostic Table

A: INSPECTION

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

1. General Description

A: NOTE

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

2. Transfer Case and Extension Case Assembly

A: NOTE

For removal, installation and inspection, refer to the “5MT” section. <Ref. to 5MT-40, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch

A: NOTE

For removal, installation and inspection, refer to the "4AT" section. <Ref. to 4AT-74, Transfer Clutch.>

4. Oil Seal

A: NOTE

For removal, installation and inspection, refer to the “4AT” or the “5MT” section.
AT model:
<Ref. to 4AT-45, Extension Case Oil Seal.>
MT model:
<Ref. to 5MT-34, Oil Seal.>

5. Transfer Drive Gear

A: NOTE

For removal, installation and inspection, refer to the “5MT” section. <Ref. to 5MT-44, Transfer Drive Gear.>

6. Transfer Driven Gear

A: NOTE

For removal, installation and inspection, refer to the “5MT” section. <Ref. to 5MT-46, Transfer Driven Gear.>

7. Reduction Drive Gear

A: NOTE

For removal, installation and inspection, refer to the “4AT” section. <Ref. to 4AT-84, Reduction Drive Gear.>

8. Reduction Driven Gear

A: NOTE

For removal, installation and inspection, refer to the “4AT” section. <Ref. to 4AT-82, Reduction Driven Gear.>

9. Center Differential

A: NOTE

For removal, installation and inspection, refer to the “5MT” section. <Ref. to 5MT-48, Center Differential.>

10. Transfer Clutch Pressure Test

A: NOTE

For inspection, refer to the “4AT” section.
<Ref. to 4AT-36, Transfer Clutch Pressure Test.>

1. Basic Diagnostic Procedure

A: PROCEDURE

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(diag)-3, Check List for Interview.>

	Step	Check	Yes	No
1	**PERFORM THE PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to VDC(diag)-3, Check List for Interview.> 2) Before performing diagnosis, inspect the unit which might influence the VDC problem. <Ref. to VDC(diag)-7, INSPECTION, General Description.>	Is the component that might influence the VDC problem working properly?	Go to step **2**.	Repair or replace each component.
2	**CHECK INDICATION OF DTC ON SCREEN.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to the data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. 4) Read the DTC. <Ref. to VDC(diag)-21, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Record all DTCs and freeze frame data.	Is DTC displayed?	Go to step **4**.	Go to step **3**.
3	**PERFORM GENERAL DIAGNOSTICS.** 1) Perform the inspection by referring to “General Diagnostic Table”. <Ref. to VDC(diag)-136, INSPECTION, General Diagnostic Table.> 2) Perform Clear Memory Mode. <Ref. to VDC(diag)-23, OPERATION, Clear Memory Mode.> 3) Perform Inspection Mode. <Ref. to VDC(diag)-22, OPERATION, Inspection Mode.> 4) Read the DTC. <Ref. to VDC(diag)-21, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Check the DTC is not displayed.	Is the warning light pattern normal? <Ref. to VDC(diag)-24, Warning Light Illumination Pattern.>	Finish the diagnosis.	Check the warning light. Refer to “List of Diagnostic Trouble Code (DTC)” for the contents of the diagnosis. <Ref. to VDC(diag)-26, List of Diagnostic Trouble Code (DTC).>
4	**PERFORM DIAGNOSIS.** 1) Inspect using the “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-32, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: Refer to “List of Diagnostic Trouble Code (DTC)” for the DTC list. <Ref. to VDC(diag)-26, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the cause of trouble. 3) Perform Clear Memory Mode. <Ref. to VDC(diag)-23, OPERATION, Clear Memory Mode.> 4) Perform Inspection Mode. <Ref. to VDC(diag)-22, OPERATION, Inspection Mode.> 5) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Inspect using the “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-32, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Inspect the following item about the vehicle's state.

1. STATE OF ABS/VDC WARNING LIGHT

ABS/VDC warning lights illuminate.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When and for how long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (Before starting engine) ❑ START ❑ ON after starting (Engine is running)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When other electrical parts are operating		
	• Parts name: • Operating condition:		

2. STATE OF VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT

VDC warning light/ VDC OFF indicator light illuminate.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When and for how long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (Before starting engine) ❑ START ❑ ON after starting (Engine is running) ❑ ON after starting (Engine is stopped)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When other electrical parts are operating		
	• Parts name: • Operating condition:		

3. STATE OF VDC OPERATION INDICATOR LIGHT

VDC operation indicator light illuminate.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When and for how long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (Before starting engine) ❑ START ❑ ON after starting (Engine is running) ❑ ON after starting (Engine is stopped)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When other electrical parts are operating		
	• Parts name: • Operating condition:		

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others:
	b) Ambient temperature	°C (°F)
	c) Road	❑ Inner city ❑ Suburbs ❑ Highway ❑ Local street ❑ Uphill ❑ Downhill ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Straight road ❑ Sharp curve ❑ Gentle curve ❑ S-curve ❑ Road with a slope on both sides ❑ Others:
	d) Road surface	❑ Dry ❑ Wet ❑ Covered with fresh snow ❑ Covered with hardened snow ❑ Frozen slope ❑ Others:
Condition	a) Brakes	Deceleration: G ❑ Intermittent / ❑ Temporary
	b) Accelerator	Acceleration: G ❑ Intermittent / ❑ Temporary
	c) Vehicle speed	km/h | MPH ❑ Advancing ❑ While accelerating ❑ While decelerating ❑ At low speed ❑ When turning ❑ Others:
	d) Tire inflation pressure	Front RH tire: kPa Front LH tire: kPa Rear RH tire: kPa Rear LH tire: kPa
	e) Degree of wear	Front RH tire: Front LH tire: Rear RH tire: Rear LH tire:
	f) Steering wheel	❑ Sharp turn ❑ Gentle turn ❑ Straight ❑ Slow return ❑ Fast return
	g) Tire/Wheel size	❑ Within specification ❑ Except specification ( )
	h) Tire type	❑ Summer tire ❑ Studless tire (Manufacture:)
	i) Chain is passed around tires: ❑ Yes / ❑ No	
	j) T-type tire is used. ❑ Yes / ❑ No	
	k) Condition of wheel alignment:	
	l) Loading state:	
	m) Repair parts are used: ❑ Yes / ❑ No	
	• Parts name:	
	n) Others:	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The airbag system wiring harness is routed near the ABS wheel speed sensor VDCCM and VDCH/U.

CAUTION:
• All airbag system wiring harnesses and connectors are yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor, VDCCM and VDCH/U.

B: INSPECTION

Before performing diagnosis, check the following items which might affect VDC problems.

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage:
12 V or more

Specific gravity:
1.260 or more

2. GROUND

Check the tightening of VDC ground bolt.

3. BRAKE FLUID

1) Check the brake fluid level. <Ref. to BR-42, INSPECTION, Brake Fluid.>
2) Check for brake fluid leaks. <Ref. to BR-42, INSPECTION, Brake Fluid.>

4. HYDRAULIC UNIT

Check the VDCH/U.
• With brake tester <Ref. to VDC-15, CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) VDC OPERATION BRAKE TESTER, INSPECTION, VDC Hydraulic Control Module (VDCH/M).>
• Without brake tester <Ref. to VDC-14, CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) VDC OPERATION BY PRESSURE GAUGE, INSPECTION, VDC Hydraulic Control Module (VDCH/M).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

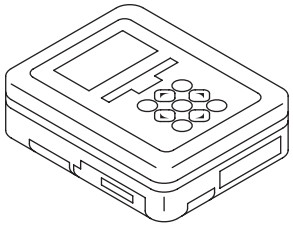
Check the brake pad and rotor.
• Front <Ref. to BR-16, INSPECTION, Front Brake Pad.>, <Ref. to BR-17, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-22, INSPECTION, Rear Brake Pad.>, <Ref. to BR-23, Rear Disc Rotor.>

7. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOL

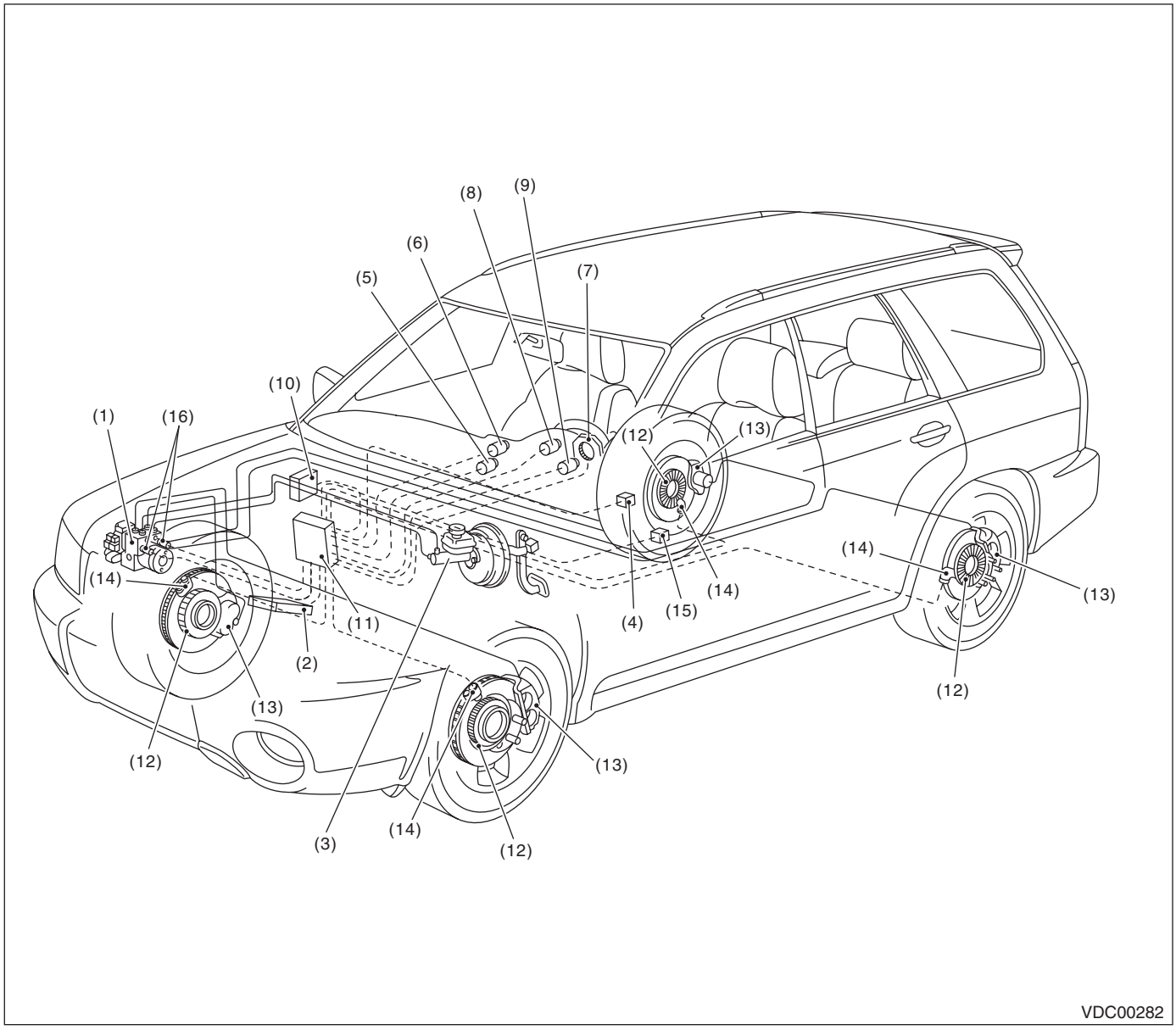
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B021XU0	1B021XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting for electrical system.

2. GENERAL TOOL

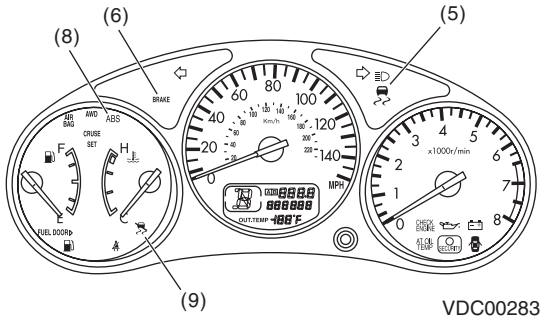
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

4. Electrical Component Location

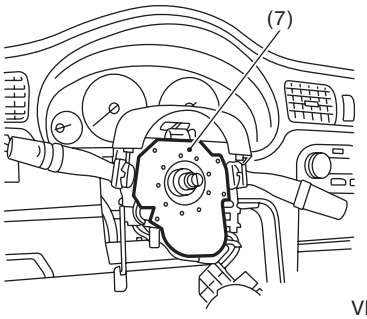
A: LOCATION



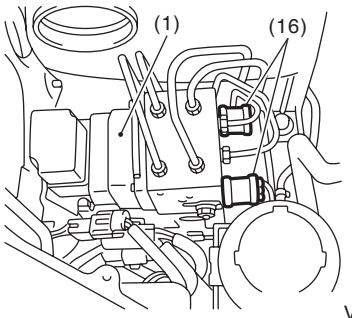
(1) VDC hydraulic control unit (VDCH/U)
(2) Engine control module (ECM)
(3) Master cylinder
(4) VDC OFF switch
(5) VDC indicator light
(6) Brake warning light (EBD warning light)
(7) Steering angle sensor
(8) ABS warning light
(9) VDC warning light/VDC OFF indicator light
(10) Transmission control module (TCM)
(11) VDC control module (VDCCM)
(12) Tone wheel
(13) Wheel cylinder
(14) ABS wheel speed sensor
(15) Yaw rate & lateral G sensor
(16) Pressure sensor



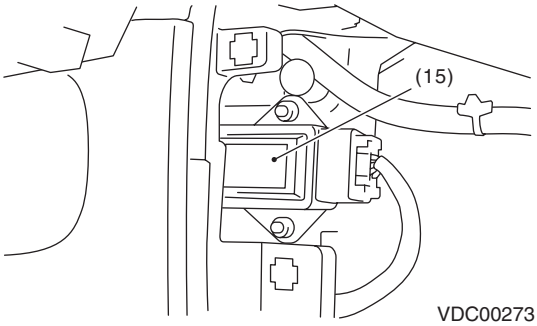
VDC00283



VDC00009

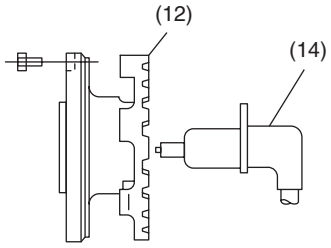


VDC00004



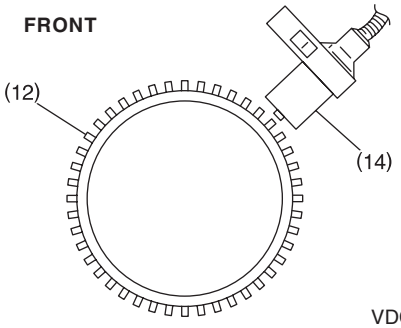
VDC00273

REAR



VDC00167

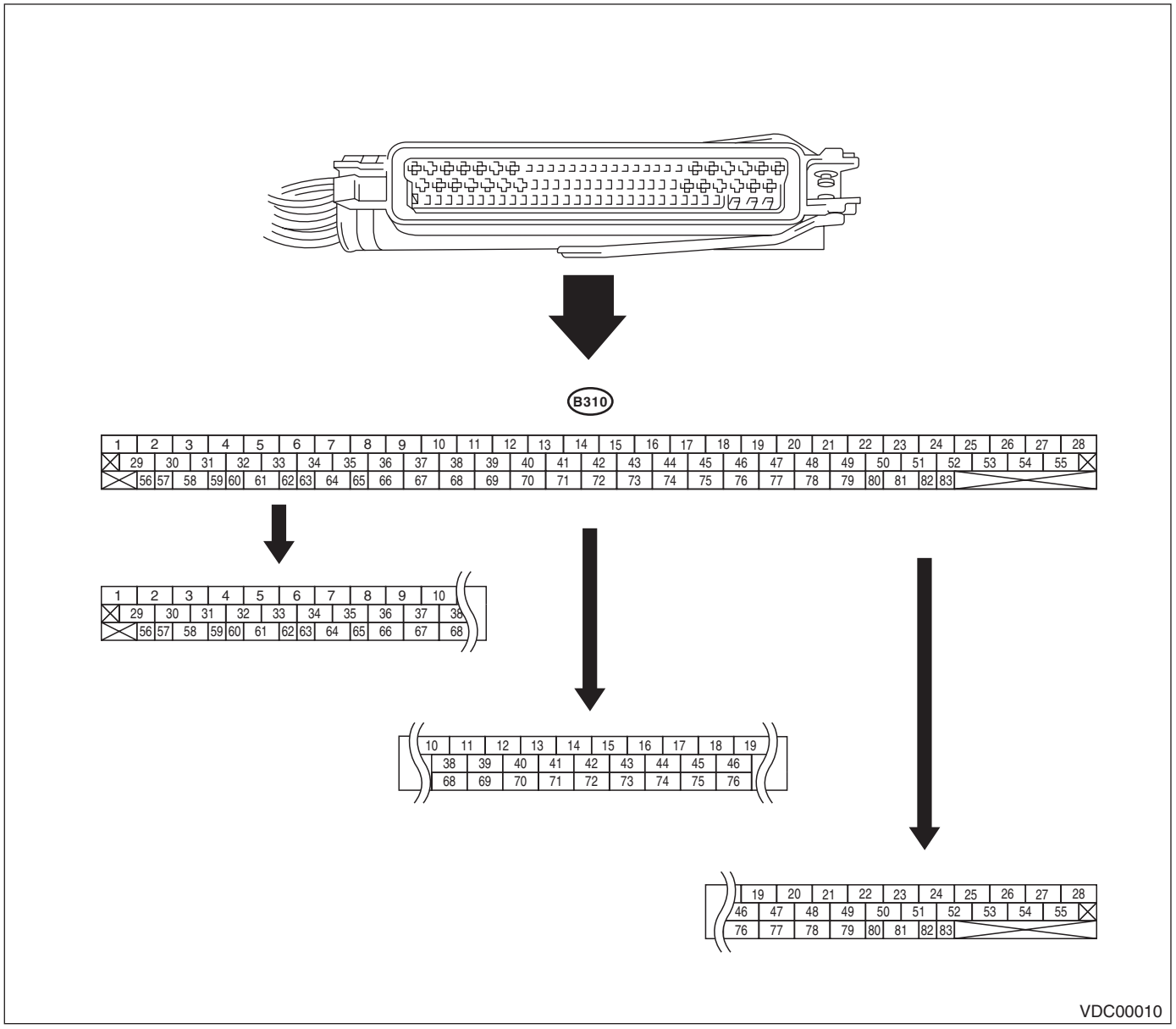
FRONT



VDC00008

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

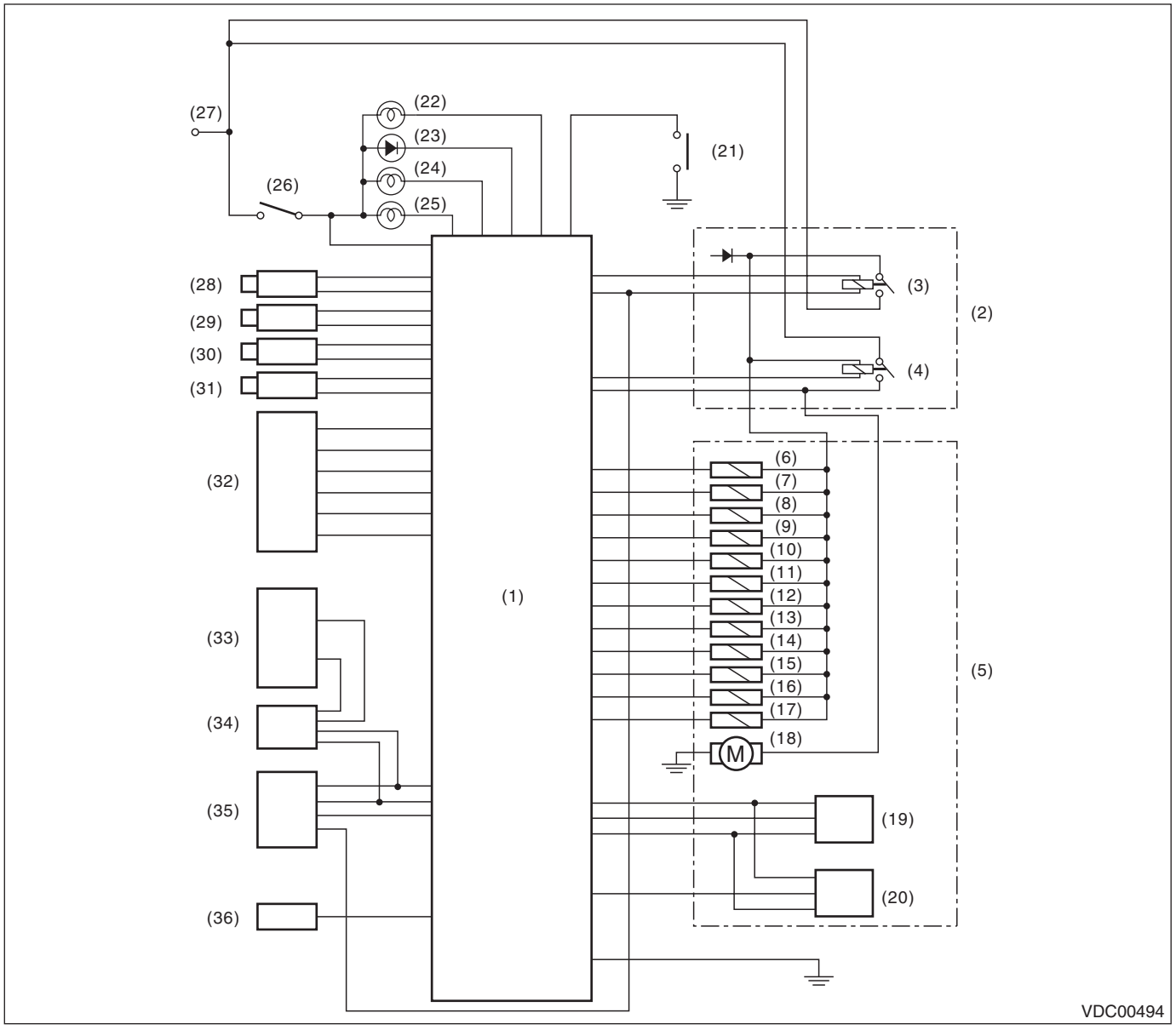


NOTE:
- Terminal numbers in the VDCCM connector are as shown in the figure.
- When the connector is removed from VDCCM, the connector switch closes the circuit between terminals No. 53 and 54. Then, ABS warning light and brake warning light (EBD warning light) illuminates.

Content		Terminal No. (+) — (–)	Input/Output signal Measured value and measuring conditions
Ignition switch		28 — 1	10 — 15 V when the ignition switch is ON.
ABS wheel speed sensor (Wheel speed sensor)	Front wheel LH	19 — 21	0.12 — 1 V (at 20 Hz)
	Front wheel RH	13 — 14	
	Rear wheel LH	15 — 16	
	Rear wheel RH	17 — 18	
Yaw rate & lateral G sensor	Output (Lateral G sensor)	11 — 64	2.2 — 2.8 V when the vehicle is on level surface
	Power supply	50 — 64	10 — 15 V when the ignition switch is ON.
	Output (Yaw rate sensor)	65 — 64	Waveform <Ref. to VDC(diag)-14, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Reference (Yaw rate sensor)	66 — 64	2.1 — 2.9 V
	Test	67 — 64	1 V — 5 cycles for a 40 ms pulse signal. <Ref. to VDC(diag)-14, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Ground	64	—
CAN communication line (+)		83 — 1	2.5 — 1.5 V pulse signal <Ref. to VDC(diag)-14, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
CAN communication line (–)		81 — 1	3.5 — 2.5 V pulse signal <Ref. to VDC(diag)-14, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
Relay box	Valve relay power supply	27 — 1	10 — 15 V when the ignition switch is ON.
	Valve relay drive	48 — 1	Less than 15 V when the ignition switch is ON.
	Motor relay drive	22 — 1	1.5 V or less (ABS/TCS/VDC Operation): 10 V or more (ABS/TCS/VDC not operated)
	Motor monitor	9 — 1	1.5 V or less (ABS/TCS/VDC Operation): 10 V or more (ABS/TCS/VDC not operated)
VDCH/U	Front inlet (hold) solenoid valve LH	24 — 1	When the valve turns OFF, 10 — 15 V. When the valve turns ON, less than 1.5 V.
	Front inlet (hold) solenoid valve RH	3 — 1	
	Rear inlet (hold) solenoid valve LH	31 — 1	
	Rear inlet (hold) solenoid valve RH	23 — 1	
	Front outlet (decompression) solenoid valve LH	26 — 1	
	Front outlet (decompression) solenoid valve RH	29 — 1	
	Rear outlet (decompression) solenoid valve LH	4 — 1	
	Rear outlet (decompression) solenoid valve RH	25 — 1	
	Primary cut solenoid valve	34 — 1	
	Secondary cut solenoid valve	35 — 1	
	Primary suction solenoid valve	32 — 1	
	Secondary suction solenoid valve	30 — 1	
Pressure sensor	Power supply	77 — 75	4.75 — 5.25 V when the ignition switch is ON.
	Primary output	76 — 75	0.48 — 0.72 V (when the brake pedal is released)
	Ground	75	—
	Secondary output	44 — 75	0.48 — 0.72 V (when the brake pedal is released)
VDC indicator light		72 — 1	After turning the ignition switch to ON, less than 1.5 V during 1.5 seconds and 10 — 15 V after 1.5 seconds passed.
VDC warning light/VDC OFF indicator light		61 — 1	After turning the ignition switch to ON, less than 1.5 V during 1.5 seconds and 10 — 15 V after 1.5 seconds passed.
ABS warning light		53 — 1	After turning the ignition switch to ON, less than 1.5 V during 2.6 seconds and 10 — 15 V after 1.5 seconds passed.
Subaru Select Monitor		38 — 1	0 — 12 V pulse signal (in communication)

Content	Terminal No. (+) — (–)	Input/Output signal
		Measured value and measuring conditions
VDC OFF switch	40 — 1	10 — 15 V when the ignition switch is ON. 0 V (While pressing the switch)
Ground	1	—
Ground	55	—
Brake warning light (EBD warning light)	54 — 1	After turning the ignition switch to ON, less than 3.6 V during 1.5 seconds and 10 — 15 V after 1.5 seconds passed.

B: WIRING DIAGRAM



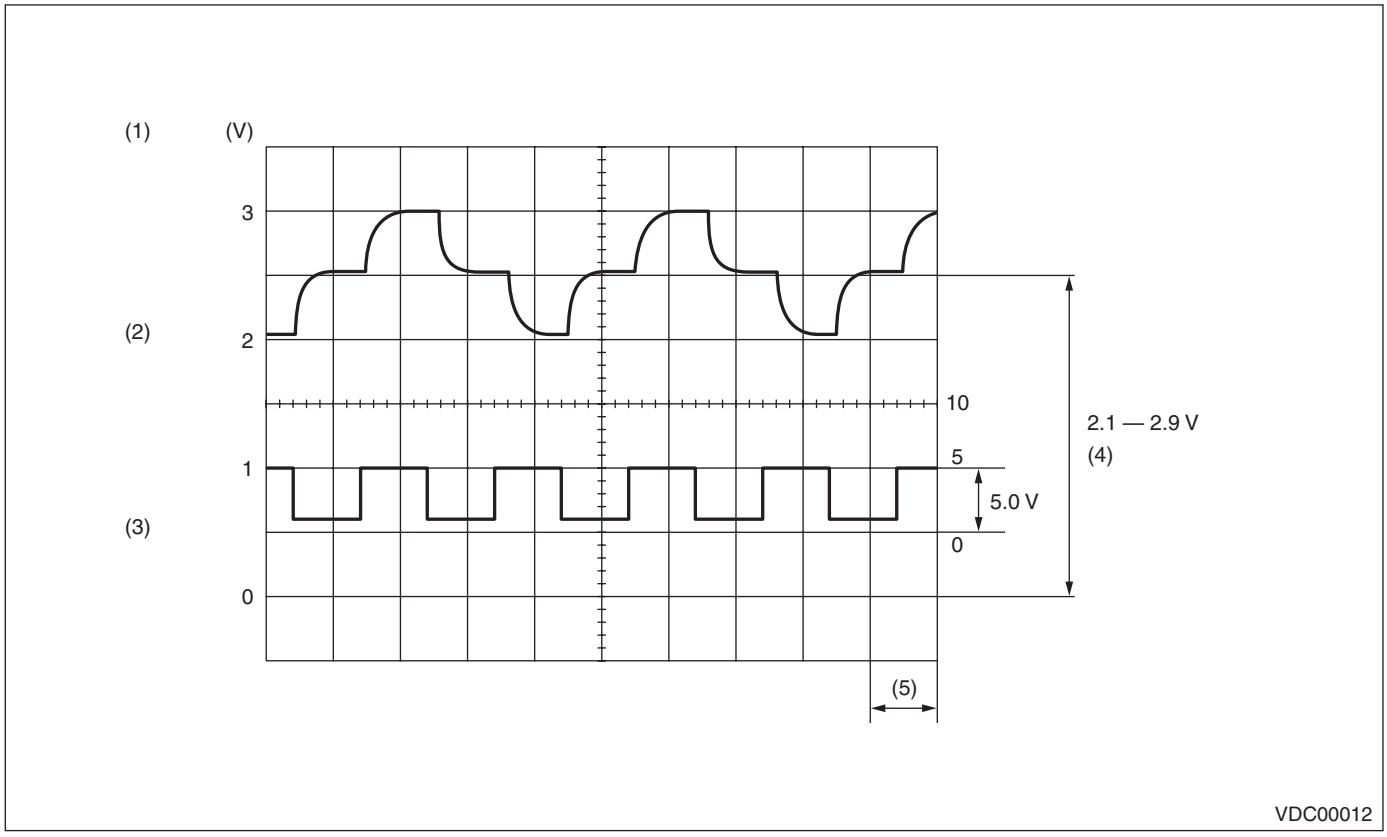
(1) VDC control module (VDCCM)
(2) Relay box
(3) Valve relay
(4) Motor relay
(5) VDC hydraulic control unit (VDCH/U)
(6) Front hold valve LH
(7) Front decompression valve LH
(8) Front hold valve RH
(9) Front decompression valve RH
(10) Rear hold valve LH
(11) Rear decompression valve LH
(12) Rear hold valve RH
(13) Rear decompression valve RH
(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/VDC OFF indicator light
(24) VDC indicator light
(25) Brake warning light (EBD warning light)
(26) Ignition relay
(27) Battery
(28) Front ABS wheel speed sensor LH
(29) Front ABS wheel speed sensor RH
(30) Rear ABS wheel speed sensor LH
(31) Rear ABS wheel speed sensor RH
(32) Yaw rate & lateral G sensor
(33) Engine control module (ECM)
(34) Transmission control module (TCM)
(35) Steering angle sensor
(36) Data link connector

C: MEASUREMENT

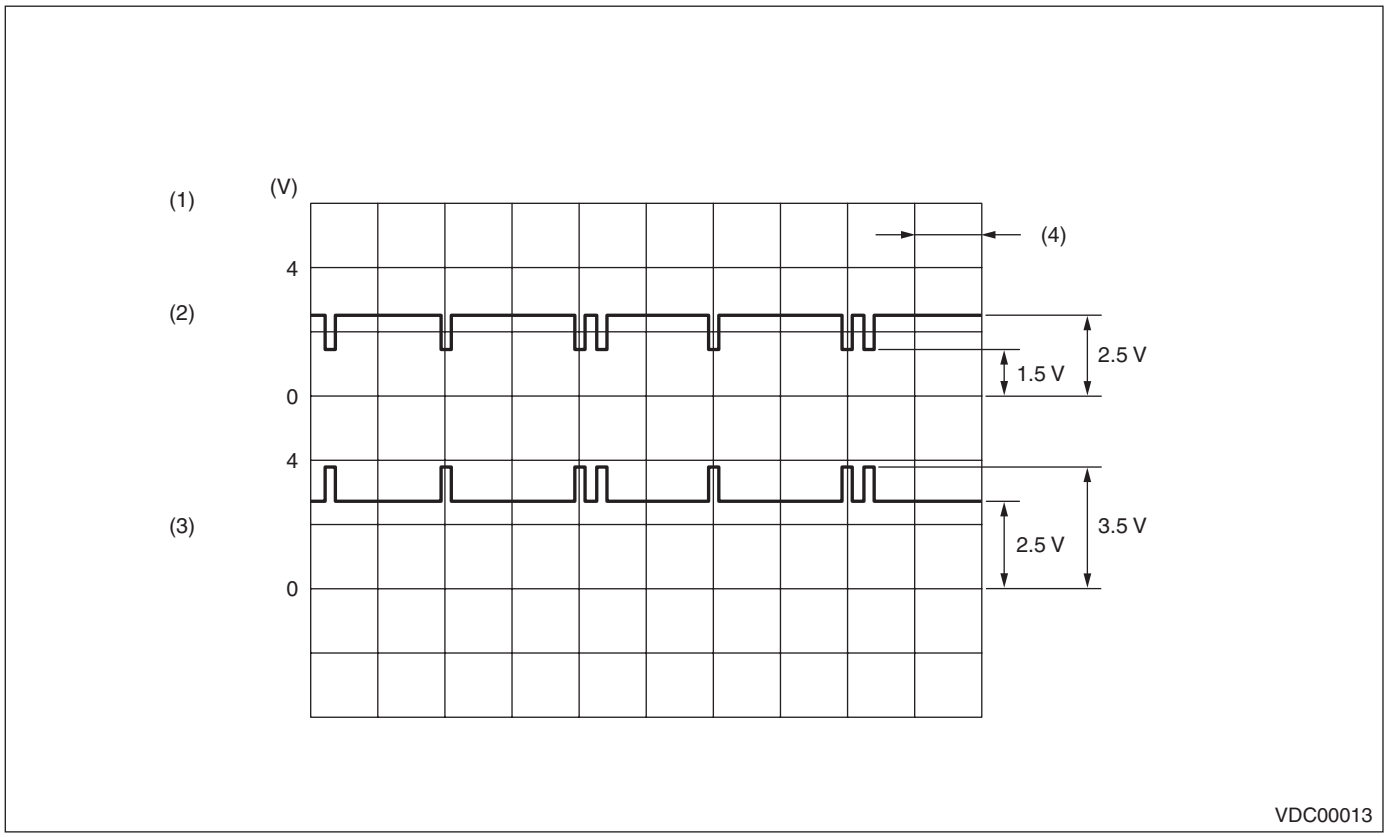
Measure the input and output signal voltages.

NOTE:
Measure while the VDCCM connector cover is removed. <Ref. to VDC(diag)-16, VDCCM Connector Cover.>

1. WAVEFORM



(1) Yaw rate sensor
(2) Terminals No. 65 — 64
(3) Terminals No. 67 — 64
(4) Vehicle is at a standstill.
(5) 20 ms

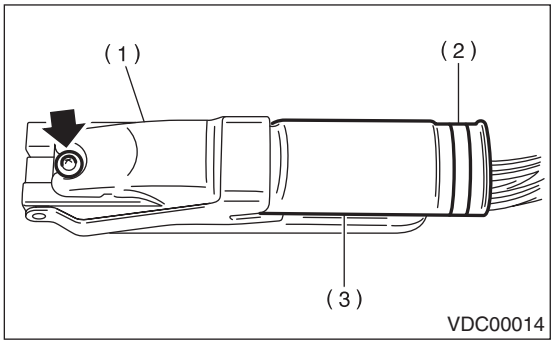


(1) CAN communication line
(2) Terminals No. 83 — 1
(3) Terminals No. 81 — 1
(4) 5 ms

6. VDCCM Connector Cover

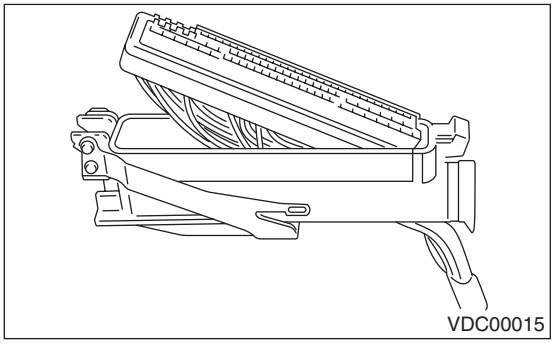
A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the connectors from VDCCM.
3) Remove the band.
4) Remove the cable clamp cover.
5) Remove the screw securing the connector cover.



(1) Connector cover
(2) Band
(3) Cable clamp cover

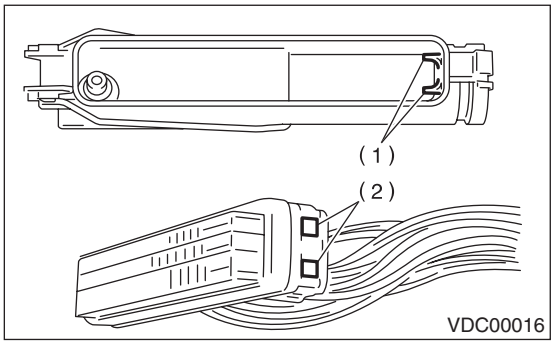
6) Remove the connector cover.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Align the rib on the connector cover with the connector hole before installation.



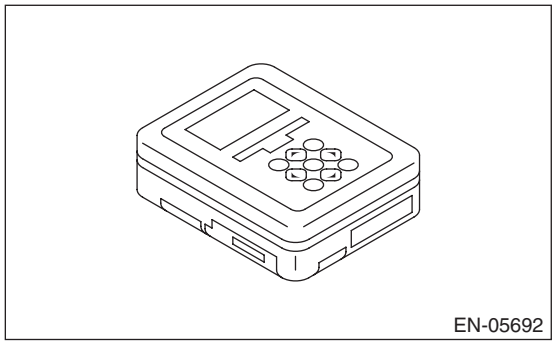
(1) Rib
(2) Hole

7. Subaru Select Monitor

A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

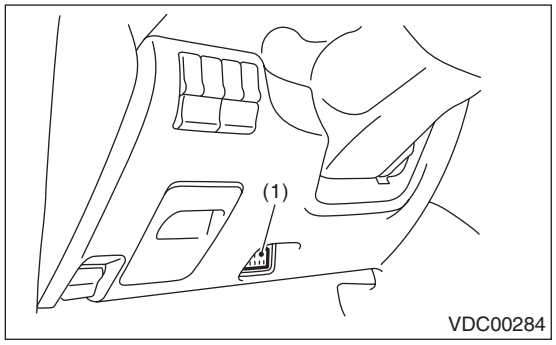
1) Prepare the Subaru Select Monitor kit. <Ref. to VDC(diag)-7, SPECIAL TOOL, PREPARATION TOOL, General Description.>



2) Prepare PC with Subaru Select Monitor installed.
3) Connect the SDI (Subaru Diagnostic Interface) to the PC USB port (exclusively for Subaru Selector Monitor) using a USB cable.

NOTE:
Port exclusively for Subaru Select Monitor refers to the USB port used when installing Subaru Select Monitor.

4) Connect the diagnosis cable to the SDI.
5) Connect the SDI to the data link connector located in the lower portion of the instrument panel (on the driver's side).



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

6) Start the PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
8) On the «Main Menu» display screen, select {Each System Check}.
9) On the «System Selection Menu» display screen, select {Brake Control}.
10) Click the [OK] button after the {VDC} is displayed.
11) On the «Brake Control Diagnosis» screen, select {DTC Display}.
12) Record the DTC and data.

NOTE:
• For detailed operation procedure, refer to the "help on PC application for Subaru Select Monitor".
• For details concerning DTCs, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to VDC(diag)-26, List of Diagnostic Trouble Code (DTC).>
• Up to 3 DTCs are displayed in the order of detection.
• If a particular DTC is not stored in memory properly at the occurrence of problem (due to a drop in VDCCM&H/U power supply etc.), the DTC suffixed with a question mark "?" is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.

13) If VDC and Subaru Select Monitor cannot communicate, check the communication circuit. <Ref. to VDC(diag)-32, COMMUNICATION FOR INITIALIZING IS IMPOSSIBLE (SUBARU SELECT MONITOR COMMUNICATION MALFUNCTION), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Display	Contents to be monitored
Current	The current DTC is displayed on Subaru Select Monitor display screen.
Old	The latest DTC in previous troubles is displayed on Subaru Select Monitor display screen.
Second previous	The second latest DTC in previous troubles is displayed on Subaru Select Monitor display screen.
Third previous	The third latest DTC in previous problems is displayed on Subaru Select Monitor display screen.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Brake Control}.
3) Click the [OK] button after the {VDC} is displayed.
4) On the «Brake Control Diagnosis» display screen, select {Current Data Display/Save}.
5) On the «Data Display Menu» screen, select {Data Display}.
6) Using the scroll key, scroll the display screen up or down until the desired data is shown on the screen.

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

Display	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h
Steering Angle Sensor	Steering wheel angle detected by steering angle sensor is displayed.	deg
Yaw Rate Sensor	Vehicle angular speed detected by yaw rate sensor is displayed.	deg (deg/s)
Pressure Sensor (P)	Brake fluid pressure detected by the primary pressure sensor is displayed.	bar
Pressure Sensor (S)	Brake fluid pressure detected by the secondary pressure sensor is displayed.	bar
Lateral G Sensor	Vehicle lateral direction acceleration detected by lateral G sensor is displayed.	m/s (m/s^2)
IG Power Supply Voltage	Voltage supplied to the VDCCM is displayed.	V
Valve Relay Signal	The valve relay operating condition is displayed.	ON or OFF
Motor Relay Signal	The motor relay operating condition is displayed.	ON or OFF
Motor Relay Monitor	The motor relay operating condition is displayed.	ON or OFF
VDC Operation Light	VDC operation condition is displayed.	ON or OFF
VDC Warning Light	ON/OFF condition of the VDC warning light/VDC OFF indicator light is displayed. (ON is displayed when there is a VDC failure.)	ON or OFF
ABS Warning Light	ON/OFF condition of the ABS warning light is displayed.	ON or OFF
VDC OFF Light	ON/OFF condition of the VDC warning light/VDC OFF indicator light is displayed. (ON/OFF is displayed by operating the VDC OFF switch and EAM signal.)	ON or OFF
EBD Warning Light	ON/OFF condition of the EBD warning light is displayed.	ON or OFF
EAM Signal	Engine control command signal is displayed.	1 or 0
PATA Signal	ON/OFF condition of the VDC OFF switch is displayed.	ON or OFF
Gear Position	Gear position is displayed by number. 0: N or P, 1:1st, 2:2nd, 3:3rd, 4:4th, 7:R	—
Engine Speed	Engine speed is displayed.	rpm
PW Signal	Acceleration opening is displayed.	%
Car Line	Vehicle type is displayed by number. Normally “1”	—

NOTE:
For details concerning the operation procedure, refer to the «help on PC application for Subaru Select Monitor».

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Brake Control}.
3) Click the [OK] button after the {VDC} is displayed.
4) On the «Brake Control Diagnosis» display screen, select {Clear Memory}.
5) When the “Clear Memory?” is shown on the screen, click the [YES] button.
6) When “Done” and “Turn ignition switch to OFF” are shown on the display screen, turn the ignition switch to OFF.

NOTE:
For details concerning the operation procedure, refer to the “help on PC application for Subaru Select Monitor”.

4. FUNCTION CHECK

Display	Contents of display	Index No.
ABS check mode	Operate the valve and pump motor by turns to perform the ABS sequence control.	<Ref. to ABS-11, ABS Sequence Control.>
VDC check mode	Operate the valve and pump motor by turns to perform the VDC sequence control.	<Ref. to VDC-19, VDC Sequence Control.>
Steering angle sensor neutral & lateral G sensor 0 pt mode	Set the steering angle sensor neutral position and the lateral G sensor “0” points.	<Ref. to VDC-25, Steering Angle Sensor.>

5. FREEZE FRAME DATA

NOTE:
- Data stored at the time of failure occurred is shown on display.
- Each time a failure occurs, the latest information is stored in the freeze frame data in memory.
- 1 freeze frame data is stored.
- If a freeze frame data is not properly stored in memory (due to a drop in VDCCM power supply, etc.), a DTC suffixed with a question mark "?" appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

FREEZE FRAME DATA LIST

Display	Contents to be monitored
FR Wheel Speed	Wheel speed detected by the front ABS wheel speed sensor RH is displayed in km/h.
FL Wheel Speed	Wheel speed detected by the front ABS wheel speed sensor LH is displayed in km/h.
RR Wheel Speed	Wheel speed detected by the rear ABS wheel speed sensor RH is displayed in km/h.
RL Wheel Speed	Wheel speed detected by the rear ABS wheel speed sensor LH is displayed in km/h.
Steering Angle Sensor	Steering wheel angle detected by steering angle sensor is displayed.
Yaw Rate Sensor	Vehicle angular speed detected by the yaw rate sensor is converted and displayed in volts.
Lateral G Sensor	Vehicle lateral direction acceleration detected by lateral G sensor is converted and displayed in volts.
Primary Pressure Sensor	Brake fluid pressure detected by the primary pressure sensor is converted and displayed in volts.
Secondary Pressure Sensor	Brake fluid pressure detected by the secondary pressure sensor is converted and displayed in volts.
Vehicle Speed	The vehicle speed is displayed.
Required Torque	Engine torque required by the driver is displayed.
Current Torque	Current engine torque is displayed.
Target Torque	The target torque is displayed.
Acceleration Opening Angle	Acceleration opening is displayed.
Engine Speed	Engine speed is displayed.
Gear Position	Gear position is displayed.
IG Power Supply Voltage	Voltage supplied to VDC control module is displayed.
ABS Warning Light	ON/OFF condition of the ABS warning light is displayed.
EBD Warning Light	ON/OFF condition of the EBD warning light is displayed.
VDC Warning Light	ON/OFF condition of the VDC warning light/VDC OFF indicator light is displayed. (ON is displayed when there is a VDC failure.)
VDC OFF Light	ON/OFF condition of the VDC warning light/VDC OFF indicator light is displayed. (ON/OFF is displayed by operating the VDC OFF switch and EAM signal.)
VDC Operation Light	ON/OFF condition of VDC indicator light is displayed.
Valve Relay Signal	The valve relay operating condition is displayed.
Motor Relay Driving Vibration	The motor relay operating condition is displayed.
Motor Relay Monitor	The motor relay operating condition is displayed.
Decreasing Required Torque	Engine torque decrease request is displayed.
EAM Signal	Engine control command signal is displayed.
VDC O Control Flag	VDC operation condition (over-steering) is displayed.
VDC U Control Flag	VDC operation condition (under-steering) is displayed.
ABS Control Flag	ABS operating condition is displayed.
VDC OK B Signal	VDC sensor normal flag

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details concerning DTC, refer to the “Subaru Select Monitor”. <Ref. to VDC(diag)-17, Subaru Select Monitor.>When doing so, read the detail code displayed under the DTC at the same time.

9. Inspection Mode

A: OPERATION

Reproduce the malfunction occurrence condition as much as possible.
Drive the vehicle for ten minutes or more.

NOTE:
While driving normally, check that the vehicle does not veer to the left or right from the straight-ahead direction.

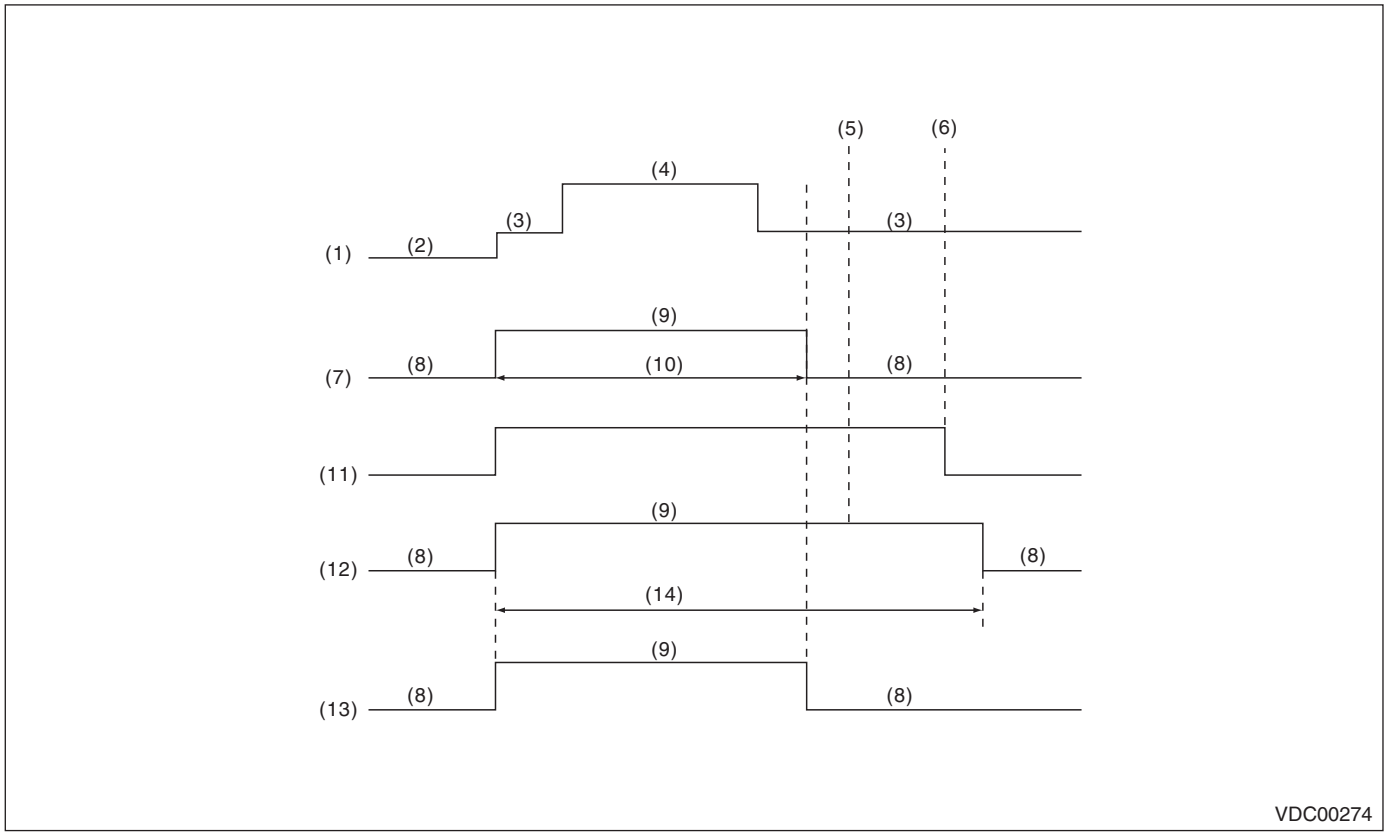
10.Clear Memory Mode

A: OPERATION

For details concerning DTC clear operation, refer to “Subaru Select Monitor”. <Ref. to VDC(diag)-17, Subaru Select Monitor.>

11.Warning Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Engine start
(5) Engine start
(6) Parking brake released
(7) ABS warning light
(8) Light OFF
(9) Light ON
(10) Approx. 2 sec.
(11) Brake warning light (EBD warning light)
(12) VDC warning light/VDC OFF indicator light
(13) VDC indicator light
(14) Few seconds (Depends on the coolant temperature)

1) When warning lights or indicator lights do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When warning lights or indicator lights remain constantly OFF, repair or diagnose the warning light or indicator light circuits. <Ref. to VDC(diag)-35, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT,BRAKE WARNING LIGHT (EBD WARNING LIGHT) OR VDC INDICATOR LIGHT DOES NOT COME ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-38, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-41, VDC INDICATOR LIGHT DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

NOTE:
• Even though the ABS warning light does not go out approx. after 2 seconds from ABS warning light illumination, the ABS system operates normally when the warning light goes out while driving at approximately 12 km/h (7.46 MPH). However, the ABS does not work while the ABS warning light is illuminated.
• If the vehicle has been standing for some time in a low temperature area, there are instances in which the VDC warning light/VDC OFF indicator light will take several minutes to turn off. This is due to the low engine coolant temperature, and is not a malfunction.
• If one wheel is locked, or turns freely, a change is generated in the drive transmission to the other wheels. The status of the change in drive differs from what occurs during normal operation. This status is detected by the ABS wheel speed sensor. The ABS and VDC warning lights will illuminate. When the vehicle is operated while all four wheels are lifted off the ground, or the four wheels are placed on rollers, the VDCCM sometimes detects a problem in the speed sensor, and the ABS and VDC warning lights illuminate. In this case, this is not a malfunction. Erase the DTC from the memory.

12.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Detail code No.	Display	Content of diagnosis	Reference target
—		Communication for initialization impossible	Subaru Select Monitor communication failure	<Ref. to VDC(diag)-32, COMMUNICATION FOR INITIALIZING IS IMPOSSIBLE (SUBARU SELECT MONITOR COMMUNICATION MALFUNCTION), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—		No DTC	Even when the DTC is not displayed on the Subaru Select Monitor display, the ABS warning light, VDC warning light/VDC OFF indicator light and VDC operation indicator light do not come on.	<Ref. to VDC(diag)-35, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT,BRAKE WARNING LIGHT (EBD WARNING LIGHT) OR VDC INDICATOR LIGHT DOES NOT COME ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—		No DTC	Even when the DTC is not displayed on the Subaru Select Monitor display, the ABS warning light, VDC warning light/VDC OFF indicator light and brake warning light (EBD warning light) do not come on.	<Ref. to VDC(diag)-38, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—		No DTC	Even when the DTC is not displayed on the Subaru Select Monitor display, the VDC indicator light does not extinguish.	<Ref. to VDC(diag)-41, VDC INDICATOR LIGHT DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	6A0XH	Front Right ABS Sensor Circuit Open or Shorted Battery	Open or Short Circuit in Front ABS Wheel Speed Sensor RH Circuit	<Ref. to VDC(diag)-42, DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	68CXH 68EXH 690XH 694XH	Front Right ABS Wheel Sensor Signal Malfunction	Front ABS wheel speed sensor RH signal error	<Ref. to VDC(diag)-47, DTC 22 FRONT RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	620XH	Front Left ABS Sensor Circuit Open or Shorted Battery	Open or Short Circuit in Front ABS Wheel Speed Sensor LH Circuit	<Ref. to VDC(diag)-42, DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	60CXH 60EXH 610XH 614XH	Front Left ABS Wheel Speed Sensor Signal Malfunction	Front ABS wheel speed sensor LH signal error	<Ref. to VDC(diag)-47, DTC 24 FRONT LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	660XH	Open/High Input of Rear ABS Wheel Speed Sensor RH	Open or Short Circuit in Rear ABS Wheel Speed Sensor RH Circuit	<Ref. to VDC(diag)-42, DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	64CXH 64EXH 650XH 654XH	Rear Right ABS Wheel Speed Sensor Signal Malfunction	Rear ABS wheel speed sensor RH signal error	<Ref. to VDC(diag)-47, DTC 26 REAR RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	6E0XH	Open/High Input of Rear ABS Wheel Speed Sensor LH	Open or Short Circuit in Rear ABS Wheel Speed Sensor LH Circuit	<Ref. to VDC(diag)-43, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	6CCXH 6CEXH 6D0XH 6D4XH	Rear Left ABS Wheel Speed Sensor Signal Malfunction	Rear ABS wheel speed sensor LH signal error	<Ref. to VDC(diag)-48, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detail code No.	Display	Content of diagnosis	Reference target
29	604XH 606XH 608XH 644XH 646XH 648XH 684XH 686XH 688XH 6C4XH 6C6XH 6C8XH 702XH 704XH 720XH 70CXH	Any One of Four ABS Sensors Signal	One sensor signal error of any of the four ABS wheel speed sensors	<Ref. to VDC(diag)-53, DTC 29 ANY OF WHEEL SENSORS SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	320XH	FR hold valve malfunction	Front inlet solenoid valve RH malfunction	<Ref. to VDC(diag)-56, DTC 31 FRONT SOLENOID RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	360XH	FR pressure reducing valve malfunction	Front outlet solenoid valve RH malfunction	<Ref. to VDC(diag)-62, DTC 32 FRONT RIGHT OUTLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	220XH	FL hold valve malfunction	Front inlet solenoid valve LH malfunction	<Ref. to VDC(diag)-56, DTC 33 FRONT LEFT INLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	260XH	FL pressure reducing valve malfunction	Front outlet solenoid valve LH malfunction	<Ref. to VDC(diag)-62, DTC 34 FRONT LEFT OUTLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	2A0XH	RR hold valve malfunction	Rear inlet solenoid valve RH malfunction	<Ref. to VDC(diag)-56, DTC 35 REAR RIGHT INLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	2E0XH	RR pressure reducing valve malfunction	Rear outlet solenoid valve RH malfunction	<Ref. to VDC(diag)-62, DTC 36 REAR RIGHT OUTLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	3A0XH	RL hold valve malfunction	Rear inlet solenoid valve LH malfunction	<Ref. to VDC(diag)-56, DTC 37 REAR LEFT INLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	3E0XH	RL pressure reducing valve malfunction	Rear outlet solenoid valve LH malfunction	<Ref. to VDC(diag)-62, DTC 38 REAR LEFT OUTLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detail code No.	Display	Content of diagnosis	Reference target
41	000XH 002XH 004XH 006XH 014XH 016XH 018XH 024XH 026XH 028XH 02CXH 02EXH 030XH 03AXH 03EXH 034XH 036XH 038XH 9D4XH 9E0XH	ECM	VDCCM malfunction	<Ref. to VDC(diag)-68, DTC 41 ECM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	7CEXH 7D0XH	Low power supply voltage	Power supply voltage malfunction	<Ref. to VDC(diag)-70, DTC 42 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
44	9A0XH	AT communication	TCM communication line malfunction	<Ref. to VDC(diag)-72, DTC 44 TCM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	970XH	Different control module specification	Incorrect VDCCM	<Ref. to VDC(diag)-74, DTC 45 INCORRECT VDC CONTROL MODULE SPECIFICATIONS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	972XH	AT ECM	TCM error specifications	<Ref. to VDC(diag)-74, DTC 45 TCM MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
46	9CEXH	5 V power supply	5 V power supply voltage error	<Ref. to VDC(diag)-75, DTC 46 ABNORMAL VOLTAGE OF 5V POWER SUPPLY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
47	788XH 78CXH 7A0XH 7A4XH	Improper CAN communication	Defective CAN communication line	<Ref. to VDC(diag)-78, DTC 47 IMPROPER CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	048XH	Valve relay OFF malfunction	Defective valve relay	<Ref. to VDC(diag)-81, DTC 51 VALVE RELAY OFF MALFUNCTION/ VALVE RELAY TEST MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	064XH	Valve relay ON malfunction		<Ref. to VDC(diag)-87, DTC 51 MOTOR AND MOTOR RELAY ON FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	06AXH	Valve relay test malfunction		<Ref. to VDC(diag)-81, DTC 51 VALVE RELAY OFF MALFUNCTION/ VALVE RELAY TEST MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detail code No.	Display	Content of diagnosis	Reference target
52	5A0XH	Motor/Motor relay OFF malfunction	Defective motor and motor relay OFF	<Ref. to VDC(diag)-91, DTC 52 MOTOR/MOTOR RELAY OFF MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	58EXH	Motor/Motor relay ON malfunction	Defective motor and motor relay ON	<Ref. to VDC(diag)-94, DTC 52 MOTOR/MOTOR RELAY ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	58CXH	Motor	Defective motor	<Ref. to VDC(diag)-98, DTC 52 MOTOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
57	820XH	EGI ECM signal	ECM communication failure	<Ref. to VDC(diag)-101, DTC 57 ECM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
61	4A0XH	VDC switching valve 1 (S)	Secondary cut valve malfunction	<Ref. to VDC(diag)-56, DTC 61 SECONDARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
62	4E0XH	VDC switching valve 1 (P)	Primary cut valve malfunction	<Ref. to VDC(diag)-57, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
63	520XH	VDC switching valve 2 (S)	Secondary suction valve malfunction	<Ref. to VDC(diag)-62, DTC 63 SECONDARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
64	560XH	VDC switching valve 2 (P)	Primary suction valve malfunction	<Ref. to VDC(diag)-63, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	148XH	Steering angle sensor offset is too big	The steering angle sensor offset is too large.	<Ref. to VDC(diag)-103, DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	14AXH	Change range of steering angle sensor is too big	The steering angle sensor change range is too large.	<Ref. to VDC(diag)-105, DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	142XH 144XH 146XH 158XH 15AXH 15CXH 15EXH	Steering angle sensor output	Defective steering angle sensor	<Ref. to VDC(diag)-107, DTC 71 STEERING ANGLE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	14CXH 14EXH 150XH 152XH 160XH	No signal from steering angle sensor	Signals from the steering angle sensor are not sent.	<Ref. to VDC(diag)-109, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detail code No.	Display	Content of diagnosis	Reference target
72	180XH 182XH 184XH 186XH 188XH 18BXH 18EXH 190XH 192XH 194XH 196XH 198XH 19AXH	Yaw rate sensor output	Yaw rate sensor output error	<Ref. to VDC(diag)-111, DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1A0XH	Yaw rate sensor power/output	Voltage input to the yaw rate sensor exceeds specifications.	<Ref. to VDC(diag)-113, DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	19CXH	Yaw rate sensor reference	Yaw rate sensor reference voltage malfunction	<Ref. to VDC(diag)-115, DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	18CXH	Excessive variation amount of yaw rate sensor output	The yaw rate sensor signal change range is too large.	<Ref. to VDC(diag)-117, DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	1C8XH 1CAXH	Excessive amount of lateral G sensor output offset	The lateral G sensor offset is too large.	<Ref. to VDC(diag)-119, DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1C0XH 1C6XH 1D8XH	Lateral G sensor output	Lateral G sensor output malfunction	<Ref. to VDC(diag)-119, DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1CCXH	Excessive variation amount of lateral G sensor output	The lateral G sensor change range is too large.	<Ref. to VDC(diag)-119, DTC 73 CHANGE RANGE OF LATERAL G SENSOR SIGNAL IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D2XH	Excessive lateral G sensor output	Excessive Lateral G Sensor Signal	<Ref. to VDC(diag)-120, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1E0XH	Lateral G sensor power/output	Voltage input to the lateral G sensor exceeds specifications.	<Ref. to VDC(diag)-122, DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detail code No.	Display	Content of diagnosis	Reference target
74	120XH	Primary pressure sensor power/output	Voltage input to the primary pressure sensor exceeds specifications.	<Ref. to VDC(diag)-125, DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 1 EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	122XH	Secondary pressure sensor power/output	Voltage input to the secondary pressure sensor exceeds specifications.	<Ref. to VDC(diag)-128, DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 2 EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	110XH	Primary pressure sensor offset is too big	The primary pressure sensor offset is too big.	<Ref. to VDC(diag)-130, DTC 74 PRESSURE SENSOR 1 OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	112XH	Secondary pressure sensor offset is too big	The secondary pressure sensor offset is too big.	<Ref. to VDC(diag)-131, DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	10AXH	Differential pressure of pressure sensor is too big	The differential pressure of the pressure sensor is too big.	<Ref. to VDC(diag)-133, DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

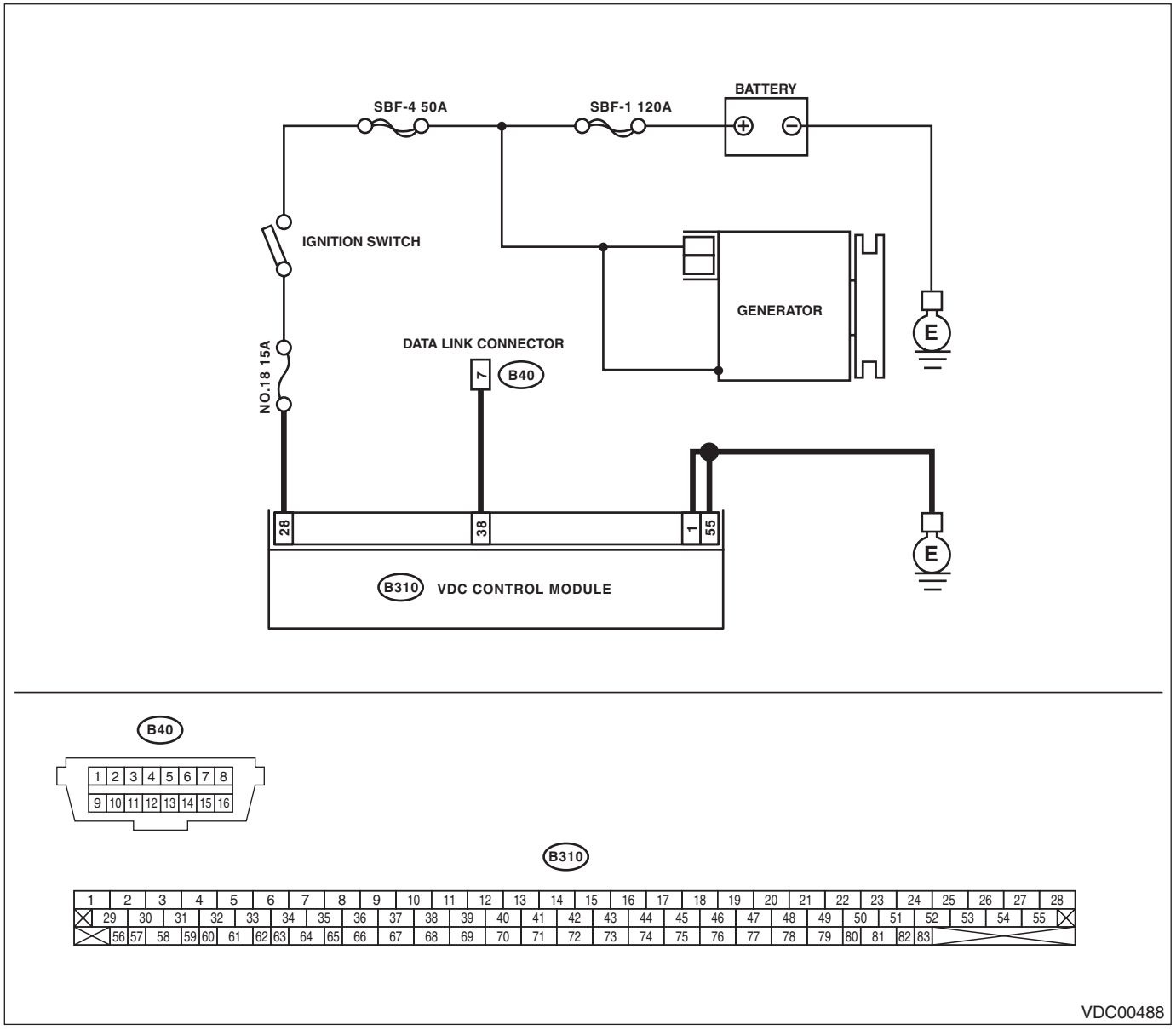
If either of the following multiple of DTC are in the memory, check the part that corresponds to the first DTC. If a problem is not detected, check the portions that correspond to the other DTC in the order that the codes appear.

Combination of DTC	Problem portions	Reference target
46 5 V power supply voltage error 74 Voltage input to the pressure sensor exceeds specifications.	(B310) — No. 77 lead circuit is shorted to the ground or battery.	<Ref. to VDC(diag)-75, DTC 46 ABNORMAL VOLTAGE OF 5V POWER SUPPLY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
44 TCM communication circuit 71 Signals from the steering angle sensor are not sent.	(B310) — No. 83 or 81 lead circuits are open.	<Ref. to VDC(diag)-109, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51 Valve relay 71 Signals from the steering angle sensor are not sent.	(B310) — No. 27 lead circuit is open.	<Ref. to VDC(diag)-109, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71 Signals from the steering angle sensor are not sent. 51 Valve relay 44 TCM communication circuit	(B310) — No. 27 lead circuit is open.	<Ref. to VDC(diag)-109, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73 Voltage input to the lateral G sensor exceeds specifications. 72 Voltage input to the yaw rate sensor exceeds specifications.	(B310) — No. 50 lead circuit is open.	<Ref. to VDC(diag)-120, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

13.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: COMMUNICATION FOR INITIALIZING IS IMPOSSIBLE (SUBARU SELECT MONITOR COMMUNICATION MALFUNCTION)

DTC DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
The ABS warning light is kept on.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch turned ON?	Go to step **2**.	Turn the ignition switch to ON, and select VDCCM mode using Subaru Select Monitor.
2	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage 11 V or more?	Go to step **3**.	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at the battery terminal?	Repair or tighten the battery terminal.	Go to step **4**.
4	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Are the system name and year displayed on Subaru Select Monitor?	Go to step **8**.	Go to step **5**.
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector. 3) Check whether communication to other systems can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Go to step **9**.	Go to step **6**.
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM, ECM and TCM connectors. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR VDCCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8**.	Repair the harness and connector between each control module and data link connector.
8	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND DATA LINK CONNECTOR.** Measure the resistance between VDCCM connector and data link connector. ***Connector & terminal*** ***(B310) No. 38 — (B40) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **9**.	Repair the harness and connector between VDCCM and data link connector.
9	**CHECK INSTALLATION OF VDCCM CONNECTOR.** Turn the ignition switch to OFF.	Is the VDCCM connector inserted into the VDCCM until the clamp is secured?	Go to step **10**.	Insert the VDCCM connector into the VDCCM until the clamp is secured.
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the ignition power supply voltage between the VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **11**.	Repair open circuit in harness between VDCCM and battery.

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance of the harness between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:*** ***(B310) No. 55 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **12**.	Repair the open circuit of VDCCM ground harness and poor contact of connector.
12	**CHECK THE POOR CONTACT OF CONNECTOR.**	Is there poor contact in control module power supply, ground line and in the data link connector?	Repair the connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

B: ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT,BRAKE WARNING LIGHT (EBD WARNING LIGHT) OR VDC INDICATOR LIGHT DOES NOT COME ON

DTC DETECTING CONDITION:

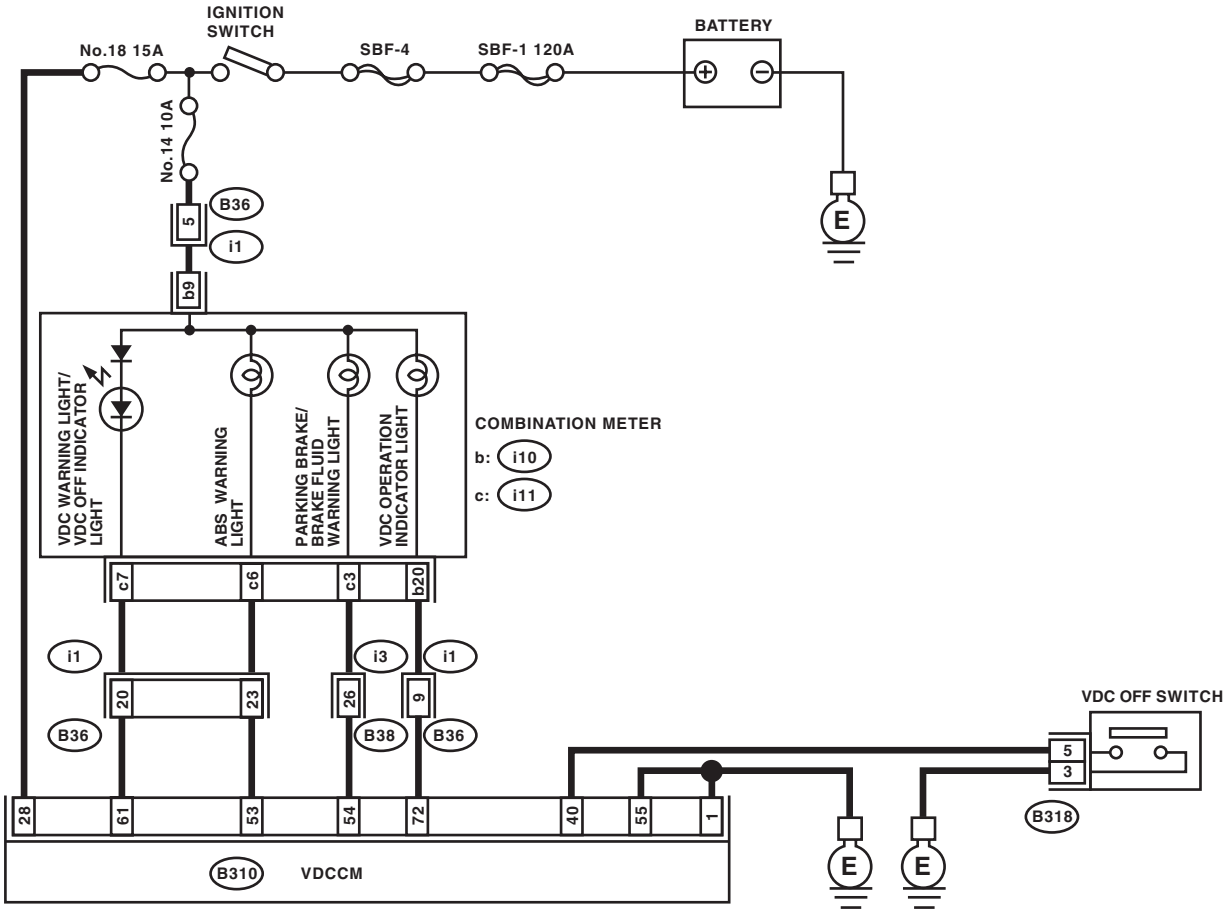
- ABS warning light circuit is open or shorted.
- VDC warning light/VDC OFF indicator light circuit is open or shorted.
- VDC indicator light circuit is open or shorted.
- Brake warning light (EBD warning light) circuit is open or shorted.

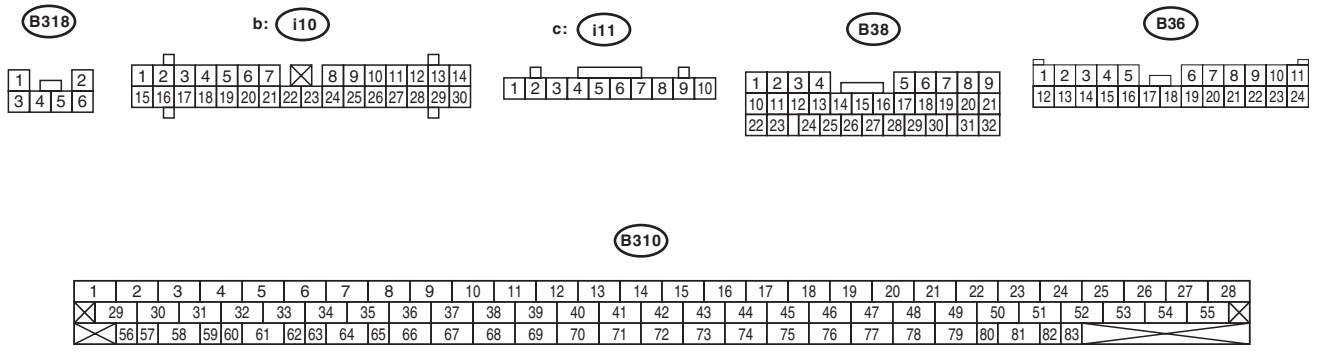
TROUBLE SYMPTOM:

When the ignition switch is ON (engine OFF), ABS warning light, VDC warning light/VDC OFF indicator light, VDC operation indicator light or brake warning light (EBD warning light) does not come on.

NOTE:
When the VDC OFF switch is held down for 10 seconds or more while the engine is running, the VDC warning light/VDC OFF indicator light will turn off and any following switch operations will be ignored. To recover VDC operation, turn the ignition switch from OFF to ON again.

WIRING DIAGRAM:





VDC00503

	Step	Check	Yes	No
1	**CHECK ILLUMINATION OF OTHER WARNING LIGHT.** Turn the ignition switch to ON (engine is OFF).	Do other warning lights illuminate?	Go to step **2**.	Repair the combination meter. <Ref. to IDI-10, Combination Meter.>
2	**CHECK BULBS.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the ABS warning light bulb, VDC operation indicator light bulb or the brake warning light bulb.	Is the bulb OK?	Go to step **3**.	Replace the defective bulbs. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>
3	**CHECK BATTERY SHORT OF LIGHT HARNESS.** 1) Disconnect the connectors from VDCCM. 2) Fit one sheet of paper (thickness 1.5 mm (0.059 in)) into the switch of the VDCCM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDC connector and chassis ground. ***Connector & terminal*** ***ABS warning light*** ***(B310) No. 53 (+) — Chassis ground (–):*** ***VDC warning light*** ***(B310) No. 61 (+) — Chassis ground (–):*** ***Brake warning light*** ***(B310) No. 54 (+) — Chassis ground (–):*** ***VDC indicator light*** ***(B310) No. 72 (+) — Chassis ground (–):***	Is the voltage less than 3 V?	Go to step **4**.	Repair the light harness.
4	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Install the ABS warning light bulb to the combination meter. 3) Install the combination meter. 4) Fit one sheet of paper (thickness 1.5 mm (0.059 in)) into the switch of the VDCCM connector. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***ABS warning light*** ***(B310) No. 53 (+) — Chassis ground (–):*** ***VDC warning light*** ***(B310) No. 61 (+) — Chassis ground (–):*** ***Brake warning light*** ***(B310) No. 54 (+) — Chassis ground (–):*** ***VDC indicator light*** ***(B310) No. 72 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **5**.	Repair the wiring harness.
5	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between combination meter and the VDCCM?	Repair the connector.	Go to step **6**.
6	**CHECK WARNING LIGHT AND INDICATOR LIGHT.** 1) Connect the connector to the VDCCM. 2) Turn the ignition switch to ON.	Do the ABS warning light, VDC warning light, brake warning light, VDC operation indicator light and VDC OFF indicator light illuminate?	Temporary poor contact occurs.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

C: ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) DOES NOT GO OFF

DTC DETECTING CONDITION:

- ABS warning light circuit is open or shorted.
- VDC control warning light/VDC OFF indicator light circuit is open or shorted.
- Brake warning light (EBD warning light) circuit is open or shorted.
- Diagnosis circuit is open.
- VDC OFF switch is shorted.

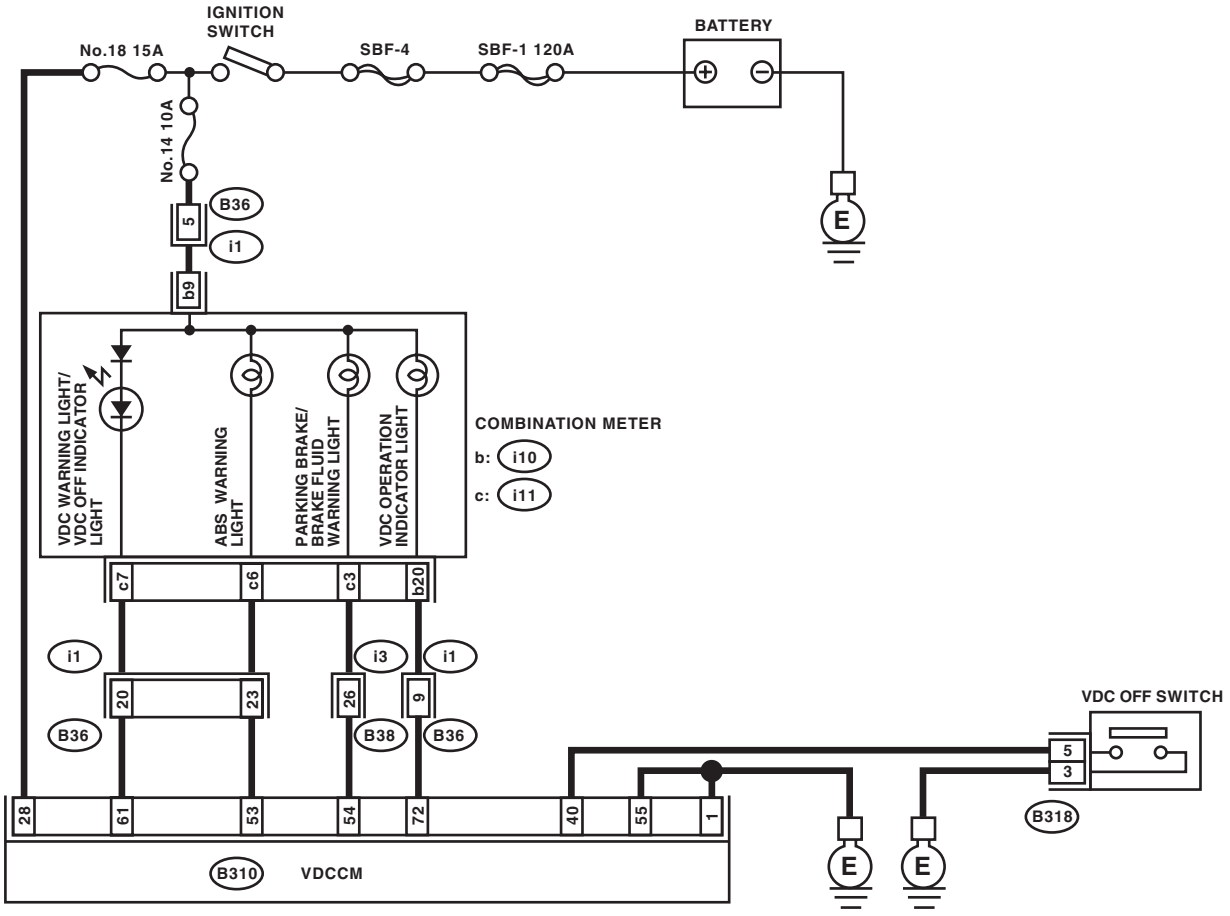
TROUBLE SYMPTOM:

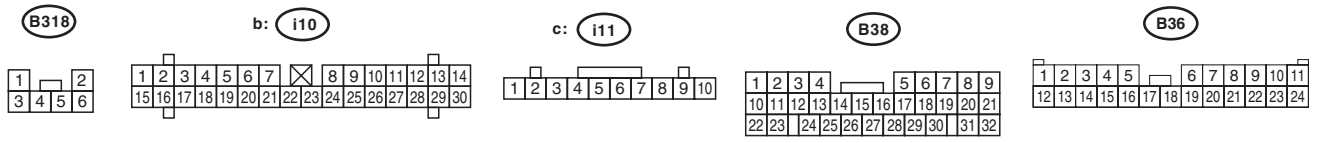
- When starting the engine, the ABS warning light and VDC warning light/VDC OFF indicator light are kept ON.
- After starting the engine, the brake warning light (EBD warning light) is kept on even though the parking brake is released.

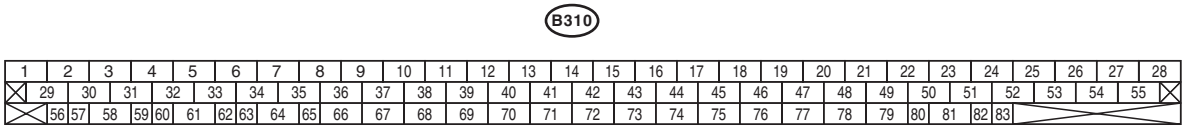
NOTE:

- When pressing the VDC OFF switch for 10 seconds or more while the engine is running, the VDC OFF indicator lights go off and the switch cannot be operated any more. To recover VDC operation, turn the ignition switch from OFF to ON again.
- When the engine coolant temperature is too low, the VDC OFF indicator light illuminates. The light will turn off when the engine is warmed up.

WIRING DIAGRAM:





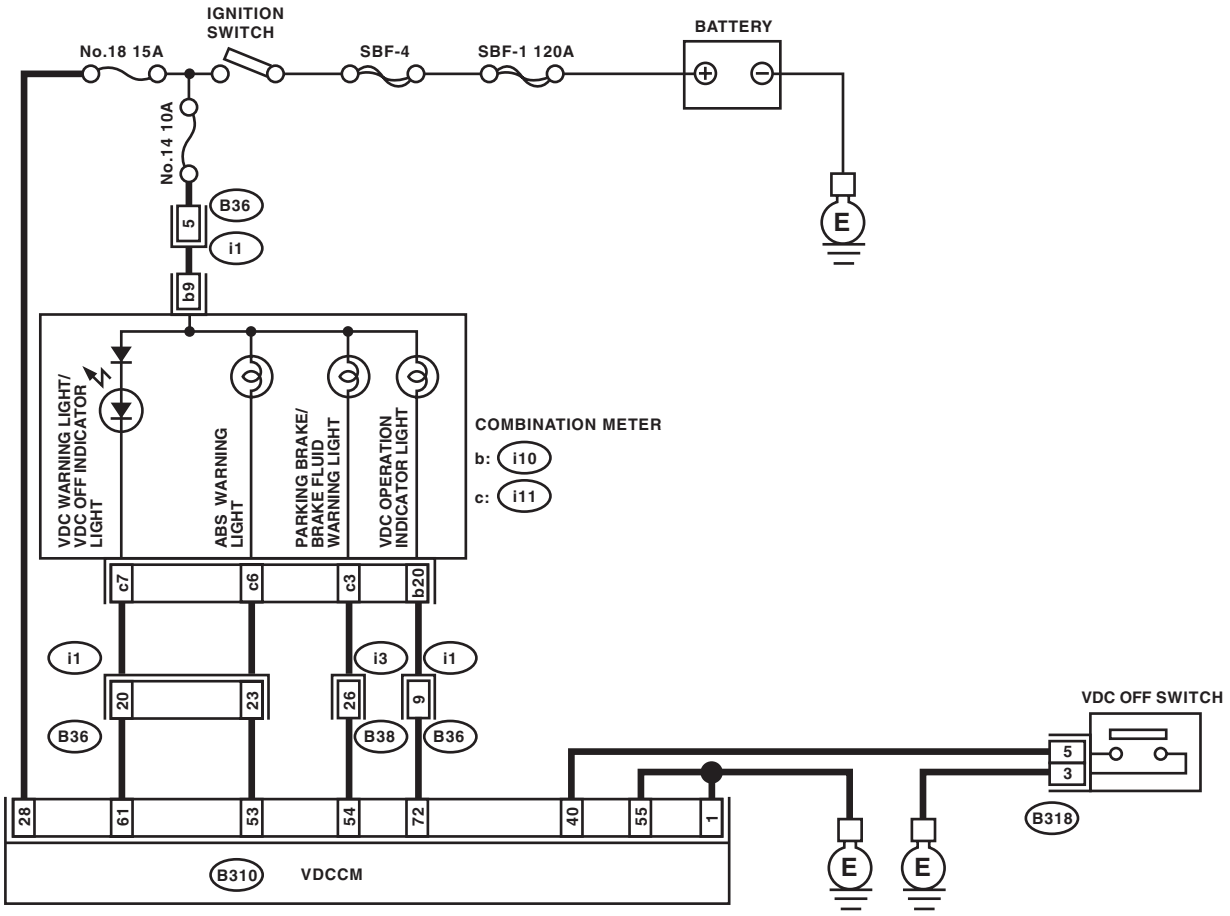


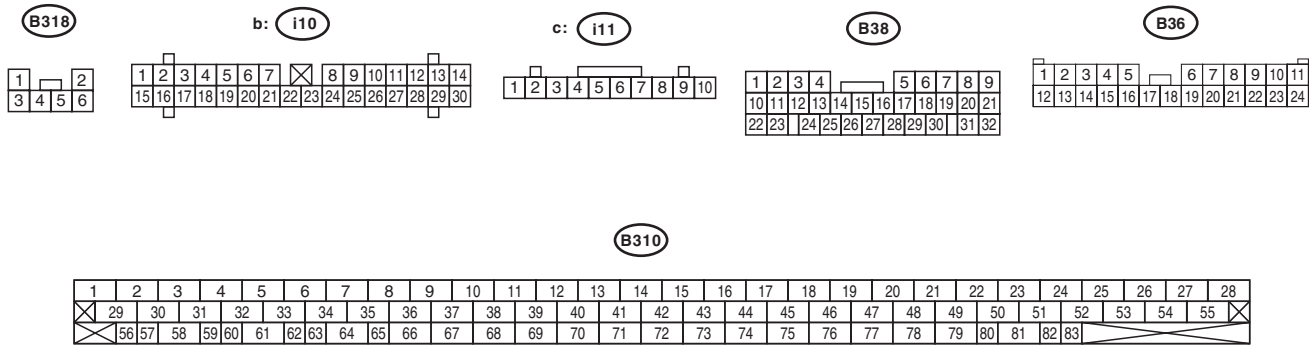
VDC00503

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF VDCCM CONNECTOR.** Turn the ignition switch to OFF.	Is the VDCCM connector inserted into the VDCCM until the clamp is secured?	Go to step **2**.	Insert the VDCCM connector into the VDCCM until the clamp is secured.
2	**CHECK THE FAILURE LIGHT.** Check the lights that do not extinguish.	Are the VDC warning light/VDC OFF indicator lights the ones that do not turn OFF?	Go to step **7**.	Go to step **3**.
3	**CHECK WIRING HARNESS.** 1) Fit one sheet of paper (thickness 1.5 mm (0.059 in)) into the switch of the VDCCM connector. 2) Turn the ignition switch to ON.	Are the ABS warning light and brake warning light (EBD warning light) still off?	Go to step **4**.	Repair the wiring harness.
4	**CHECK PROTRUSION OF THE VDCCM.** 1) Turn the ignition switch to OFF. 2) Check the damage to the VDCCM terminal protrusion.	Is the protrusion damaged?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5**.
5	**CHECK VDCCM POWER SUPPLY.** 1) Disconnect the connectors from VDCCM. 2) Start the engine. 3) Run the engine at idle. 4) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Repair the power supply circuit of the VDCCM.
6	**CHECK POOR CONTACT OF VDCCM CONNECTOR.**	Is there poor contact in the VDCCM connector?	Repair the connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**OPERATION OF VDC OFF SWITCH.** 1) Operate the VDC OFF switch. 2) Turn the ignition switch to OFF once and turn ON again.	Do the VDC warning light/VDC OFF indicator light extinguish?	VDC is normal.	Go to step **8**.
8	**CHECK ENGINE COOLANT TEMPERATURE.**	Warm up the engine. Is there a change in the VDC warning light/VDC OFF indicator light illumination conditions?	VDC is normal.	Go to step **9**.
9	**CHECK VDC OFF SWITCH.** Remove and check VDC OFF switch. <Ref. to VDC-32, VDC OFF Switch.>	Is the VDC OFF switch normal?	Go to step **10**.	Replace the VDC OFF switch.
10	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector from the VDCCM. 3) Turn the ignition switch to ON.	Do the VDC warning light/VDC OFF indicator light remain off?	Go to step **11**.	Repair the wiring harness.
11	**CHECK VDC OFF SWITCH HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector. 3) Measure the resistance between VDCCM connector terminals and chassis ground. ***Connector & terminal*** ***(B310) No. 40 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair the VDC OFF switch circuit.

D: VDC INDICATOR LIGHT DOES NOT GO OFF

DTC DETECTING CONDITION:
VDC indicator light circuit is open or shorted.
TROUBLE SYMPTOM:
When starting the engine, the VDC indicator light remains ON.
WIRING DIAGRAM:





VDC00503

	Step	Check	Yes	No
1	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector from the VDCCM. 3) Turn the ignition switch to ON.	Is the VDC operation indicator light off?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair the wiring harness.

E: DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:
Refer to DTC 27 for the diagnostic procedure. <Ref. to VDC(diag)-43, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:
Refer to DTC 27 for the diagnostic procedure. <Ref. to VDC(diag)-43, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:
Refer to DTC 27 for the diagnostic procedure. <Ref. to VDC(diag)-43, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

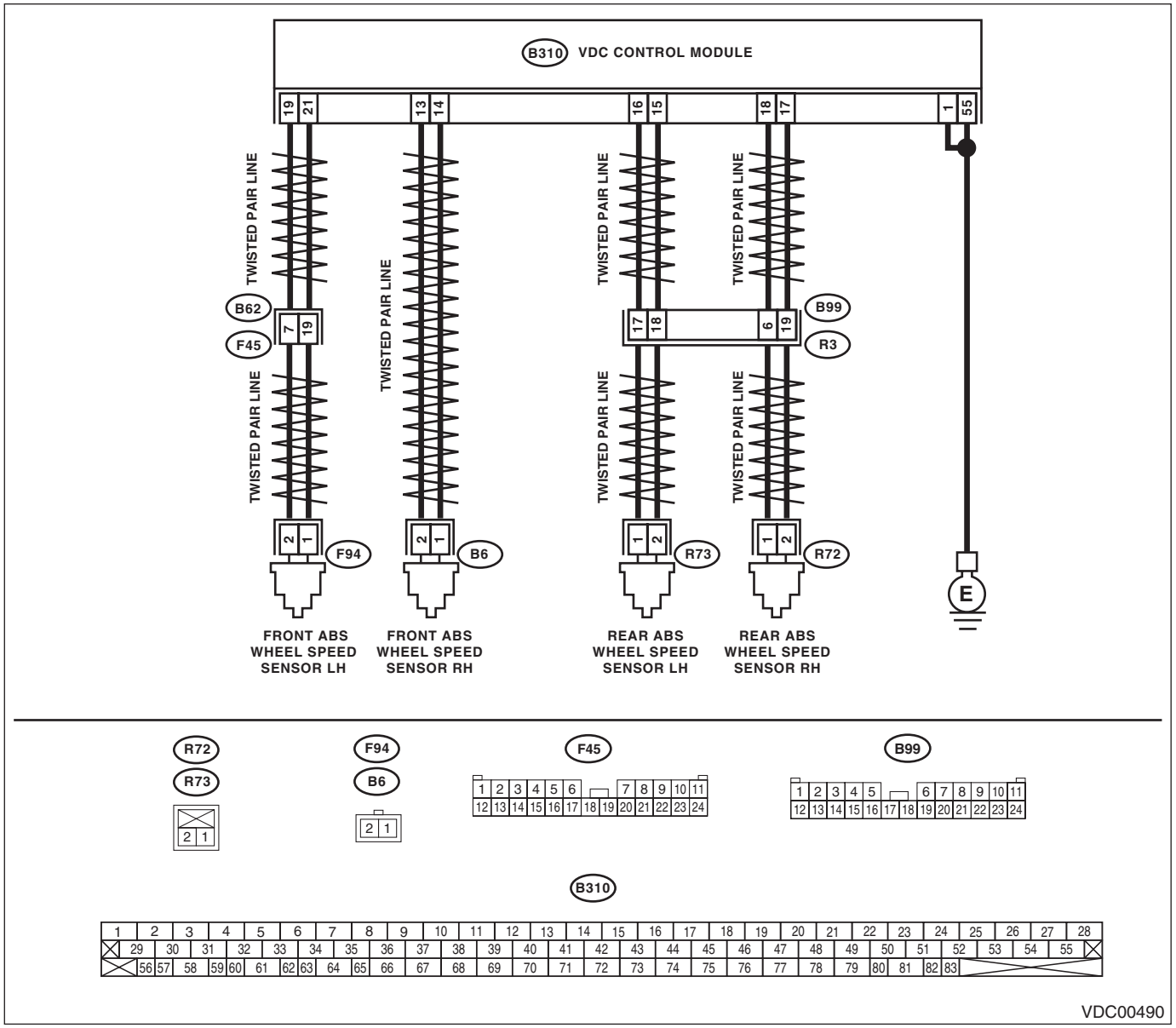
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00490

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the defective ABS wheel speed sensor output.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step **2**.	Go to step **8**.
2	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened to 33±10 N·m (3.4±1.0 kgf-m, 24.6±7.2 ft-lb)?	Go to step **3**.	Tighten the ABS wheel speed sensor installation bolts.
3	**CHECK CLEARANCE OF ABS WHEEL SPEED SENSOR.** Measure the clearance between the tone wheel and protrusion around the entire area around the wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step **4**.	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **5**.	Repair the tone wheel. Front:<Ref. to VDC-30, Front Tone Wheel.>Rear:<Ref. to VDC-31, Rear Tone Wheel.>
5	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7**.
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between VDCCM and ABS wheel speed sensor.
8	**CHECK ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals. ***Terminals*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as shown below? Front: 1.0 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **9**.	Replace the ABS wheel speed sensor. Front:<Ref. to VDC-28, Front ABS Wheel Speed Sensor.>Rear:<Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>

	Step	Check	Yes	No
9	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Disconnect the connectors from VDCCM. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **10**.	Replace the ABS wheel speed sensor. Front:<Ref. to VDC-28, Front ABS Wheel Speed Sensor.>Rear:<Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
10	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11**.	Replace the ABS wheel speed sensor. Front:<Ref. to VDC-28, Front ABS Wheel Speed Sensor.>Rear:<Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
11	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to the ABS wheel speed sensor. 3) Measure the resistance between VDCCM connectors. ***Connector & terminal*** ***DTC 21*** ***(B310) No. 14 — No. 13:*** ***DTC 23*** ***(B310) No. 21 — No. 19:*** ***DTC 25*** ***(B310) No. 18 — No. 17:*** ***DTC 27*** ***(B310) No. 16 — No. 15:***	Is the resistance as shown below? Front: 1.0 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **12**.	Repair the harness connector between VDCCM and ABS wheel speed sensor.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B310) No. 14 (+) — Chassis ground (–):*** ***DTC 23*** ***(B310) No. 21 (+) — Chassis ground (–):*** ***DTC 25*** ***(B310) No. 18 (+) — Chassis ground (–):*** ***DTC 27*** ***(B310) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **13**.	Repair the harness between VDCCM and ABS wheel speed sensor.

	Step	Check	Yes	No
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B310) No. 14 (+) — Chassis ground (–):*** ***DTC 23*** ***(B310) No. 21 (+) — Chassis ground (–):*** ***DTC 25*** ***(B310) No. 18 (+) — Chassis ground (–):*** ***DTC 27*** ***(B310) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **14**.	Repair the harness between VDCCM and ABS wheel speed sensor.
14	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened to 33±10 N·m (3.4±1.0 kgf-m, 24.6±7.2 ft-lb)?	Go to step **15**.	Tighten the ABS wheel speed sensor installation bolts.
15	**CHECK ABS WHEEL SPEED SENSOR CLEARANCE.** Measure the clearance between the tone wheel and protrusion around the entire area around the wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step **16**.	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
16	**CHECK FOR RUNOUT OF THE HUB AND TONE WHEEL.** Measure the runout of the hub and tone wheel.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **17**.	Repair the hub and tone wheel. Front:<Ref. to VDC-28, Front ABS Wheel Speed Sensor.>Rear:<Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
17	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step **18**.
18	**CHECK THE VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **19**.
19	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between VDCCM and ABS wheel speed sensor.

I: DTC 22 FRONT RIGHT ABS SENSOR SIGNAL

NOTE:
Refer to DTC 28 for the diagnostic procedure. <Ref. to VDC(diag)-48, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC 24 FRONT LEFT ABS SENSOR SIGNAL

NOTE:
Refer to DTC 28 for the diagnostic procedure. <Ref. to VDC(diag)-48, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 26 REAR RIGHT ABS SENSOR SIGNAL

NOTE:
Refer to DTC 28 for the diagnostic procedure. <Ref. to VDC(diag)-48, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 28 REAR LEFT ABS SENSOR SIGNAL

DTC DETECTING CONDITION:

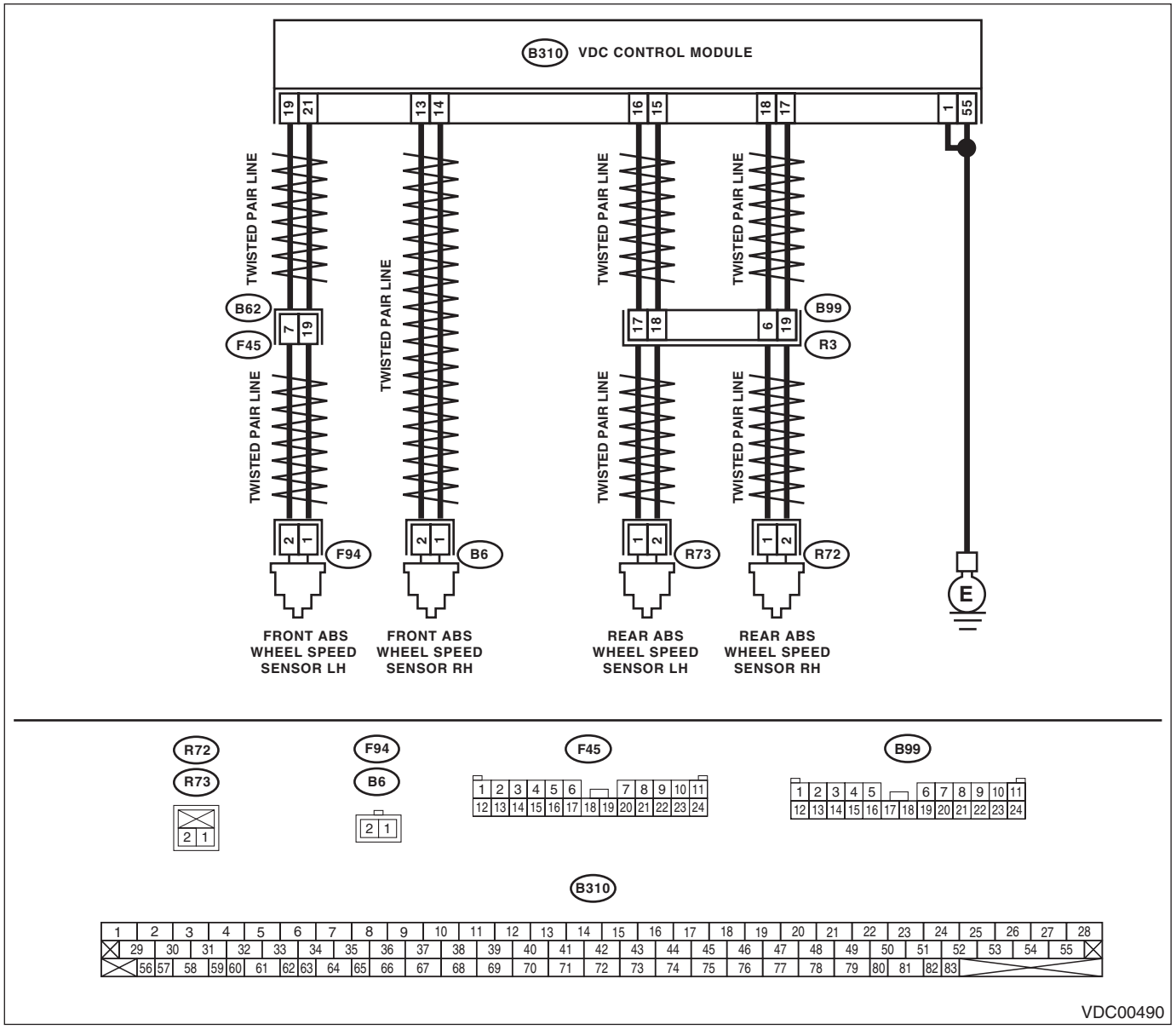
- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:
At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the defective ABS wheel speed sensor output.	Does the speed indicated on the display change in response to the speedometer reading during acceleration or deceleration when the steering wheel is in the straight-ahead position?	Go to step **2**.	Go to step **7**.
2	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.**	Are the radio wave devices and electronic components installed correctly?	Go to step **4**.	Install the radio wave devices and electric components properly.
4	**CHECK CAUSE OF SIGNAL NOISE.**	Are causes of the noise (such as an antenna) installed near the sensor harness?	Install the noise sources away from the sensor harness.	Go to step **5**.
5	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **6**.
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Temporary noise interference occurs.	Go to the diagnosis corresponding to the DTC.
7	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened to 33±10 N·m (3.4±1.0 kgf-m, 24.6±7.2 ft-lb)?	Go to step **8**.	Tighten the ABS wheel speed sensor installation bolts.
8	**CHECK ABS WHEEL SPEED SENSOR CLEARANCE.** Measure the clearance between the tone wheel and protrusion around the wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step **9**.	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
9	**CHECK USING OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **10**.	Go to step **11**.

	Step	Check	Yes	No
10	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Jack up the vehicle until all four wheels are off the ground. 2) Turn the ignition switch to OFF. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-16, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn the ignition switch to ON. 6) Start the wheel, and measure the voltage at the specified frequency. NOTE: When this inspection is completed, VDCCM may record DTC 29. ***Connector & terminal*** ***DTC 22*** ***(B310) No. 14 (+) — No. 13 (–):*** ***DTC 24*** ***(B310) No. 21 (+) — No. 19 (–):*** ***DTC 26*** ***(B310) No. 18 (+) — No. 17 (–):*** ***DTC 28*** ***(B310) No. 16 (+) — No. 15 (–):***	Is the oscilloscope pattern the same waveform as shown in the figure? <Ref. to ABS-17, OUTPUT VOLTAGE, INSPECTION, Front ABS Wheel Speed Sensor.>	Go to step **14**.	Go to step **11**.
11	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor from the hub according to the DTC.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **12**.
12	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Is there breakage or damage in the protrusion of the ABS wheel speed sensor or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front:<Ref. to VDC-28, Front ABS Wheel Speed Sensor.> <Ref. to VDC-30, Front Tone Wheel.>Rear:<Ref. to VDC-29, Rear ABS Wheel Speed Sensor.> <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **13**.
13	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **14**.	Repair the tone wheel. Front:<Ref. to VDC-30, Front Tone Wheel.>Rear:<Ref. to VDC-31, Rear Tone Wheel.>

	Step	Check	Yes	No
14	**CHECK RESISTANCE OF THE ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals. ***Terminals*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as shown below? Front: 1.0 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **15**.	Replace the ABS wheel speed sensor. Front:<Ref. to VDC-28, Front ABS Wheel Speed Sensor.>Rear:<Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
15	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **16**.	Replace the ABS wheel speed sensor. Front:<Ref. to VDC-28, Front ABS Wheel Speed Sensor.>Rear:<Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
16	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND ABS WHEEL SPEED SENSOR.** 1) Connect the connector to the ABS wheel speed sensor. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between the VDCCM connector terminals. ***Connector & terminal*** ***DTC 22*** ***(B310) No. 14 — No. 13:*** ***DTC 24*** ***(B310) No. 21 — No. 19:*** ***DTC 26*** ***(B310) No. 18 — No. 17:*** ***DTC 28*** ***(B310) No. 16 — No. 15:***	Is the resistance as shown below? Front: 1.0 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **17**.	Repair the harness connector between VDCCM and ABS wheel speed sensor.
17	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***(B310) No. 14 — Chassis ground:*** ***DTC 24*** ***(B310) No. 21 — Chassis ground:*** ***DTC 26*** ***(B310) No. 18 — Chassis ground:*** ***DTC 28*** ***(B310) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **18**.	Repair the harness connector between VDCCM and ABS wheel speed sensor.
18	**CHECK GROUND CIRCUIT OF VDCCM.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:*** ***(B310) No. 55 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **19**.	Repair the VDCCM ground harness.
19	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step **20**.

	Step	Check	Yes	No
20	**CHECK CAUSE OF SIGNAL NOISE.**	Are the radio wave devices and electronic components installed correctly?	Go to step **21**.	Install the radio wave devices and electric components properly.
21	**CHECK CAUSE OF SIGNAL NOISE.**	Are causes of the noise (such as an antenna) installed near the sensor harness?	Install the noise sources away from the sensor harness.	Go to step **22**.
22	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **23**.
23	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary noise interference occurs.

M: DTC 29 ANY OF WHEEL SENSORS SIGNAL

DTC DETECTING CONDITION:

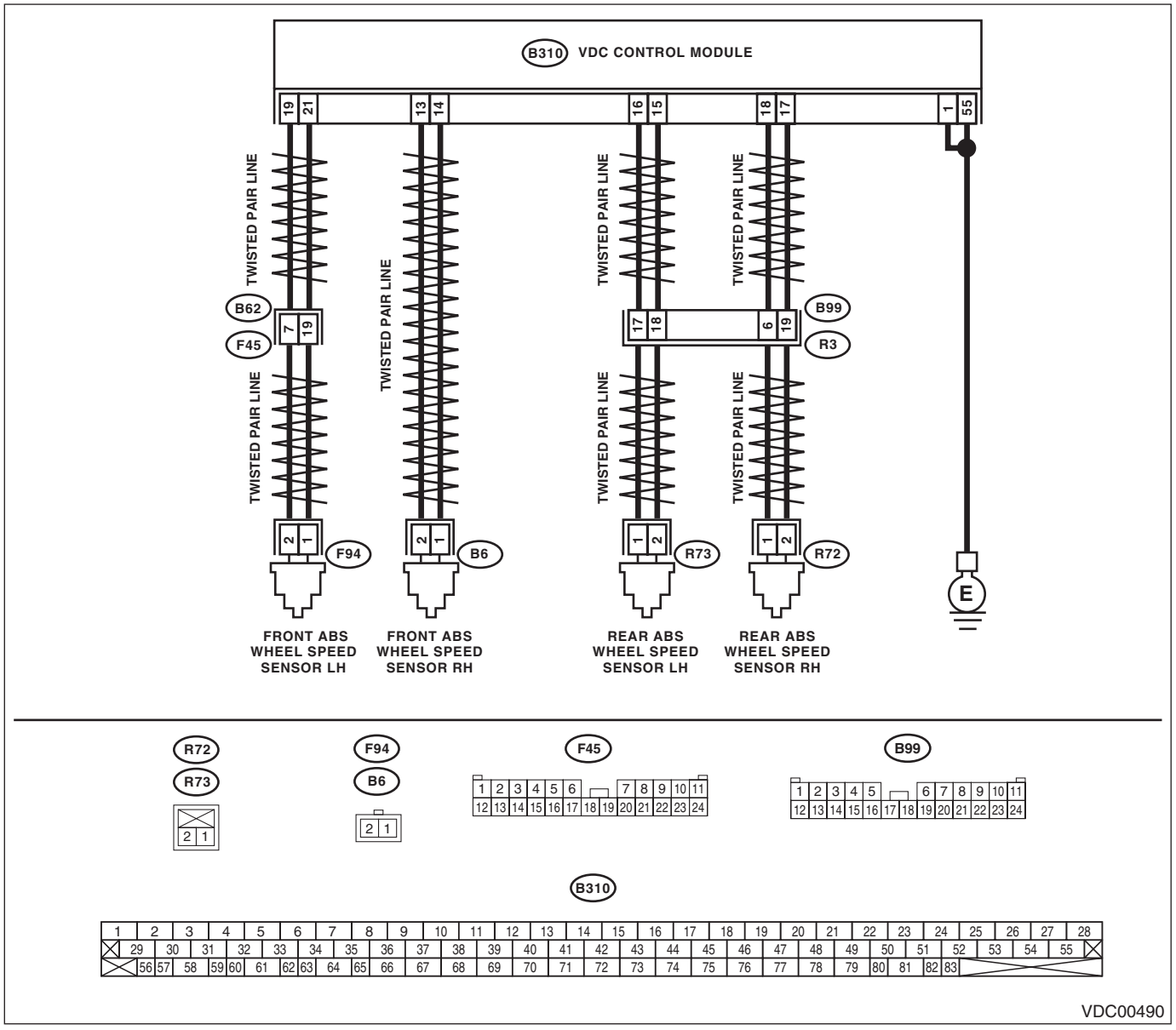
- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- When a wheel is turned freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate. (Depends on the content of the malfunction.)

NOTE:
At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK WHETHER A WHEEL TURNED FREELY OR NOT.**	Did the wheels turn freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when the tires are not in contact with road surface?	VDC is normal. Delete the DTC. NOTE: There are cases in which the DTC is displayed when the wheel is freely rotated for a long period of time, such as when the vehicle is towed, jacked up, or held where the steering wheel is turned completely one direction.	Go to step **2**.
2	**CHECK TIRE SPECIFICATIONS.**	Is the tire specification appropriate?	Go to step **3**.	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4**.
4	**CHECK TIRE AIR PRESSURE.**	Is the tire pressure correct?	Go to step **5**.	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened to 33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)?	Go to step **6**.	Tighten the ABS wheel speed sensor installation bolts.
6	**CHECK ABS WHEEL SPEED SENSOR CLEARANCE.** Measure the clearance between the tone wheel and protrusion around the wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step **7**.	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
7	**CHECK WITH AN OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8**.	Go to step **9**.
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Jack up the vehicle until all four wheels are off the ground. 2) Turn the ignition switch to OFF. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn the ignition switch to ON. 6) Start the wheel, and measure the voltage at the specified frequency. NOTE: When this inspection is completed, VDCCM may record DTC 29. ***Connector & terminal*** ***(B310) No. 14 (+) — No. 13 (–) (Front RH):*** ***(B310) No. 21 (+) — No. 19 (–) (Front LH):*** ***(B310) No. 18 (+) — No. 17 (–) (Rear RH):*** ***(B310) No. 16 (+) — No. 15 (–) (Rear LH):***	Is the oscilloscope pattern the same waveform as shown in the figure? <Ref. to ABS-17, OUTPUT VOLTAGE, INSPECTION, Front ABS Wheel Speed Sensor.>	Go to step **12**.	Go to step **9**.

	Step	Check	Yes	No
9	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor from the hub.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10**.
10	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Is there breakage or damage in the protrusion of the ABS wheel speed sensor or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> and <Ref. to VDC-30, Front Tone Wheel.>Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **11**.
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12**.	Repair the tone wheel. Front:<Ref. to VDC-30, Front Tone Wheel.>Rear:<Ref. to VDC-31, Rear Tone Wheel.>
12	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13**.
13	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: The ABS warning light will remain lit until the vehicle reaches approximately 12 km/h (7.46 MPH) even if the memory is cleared. This is normal.

N: DTC 31 FRONT SOLENOID RIGHT INLET VALVE MALFUNCTION

NOTE:
Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-57, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 33 FRONT LEFT INLET SOLENOID VALVE MALFUNCTION

NOTE:
Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-57, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 35 REAR RIGHT INLET SOLENOID VALVE MALFUNCTION

NOTE:
Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-57, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC 37 REAR LEFT INLET SOLENOID VALVE MALFUNCTION

NOTE:
Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-57, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC 61 SECONDARY CUT SOLENOID VALVE MALFUNCTION

NOTE:
Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-57, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

S: DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION

DTC DETECTING CONDITION:

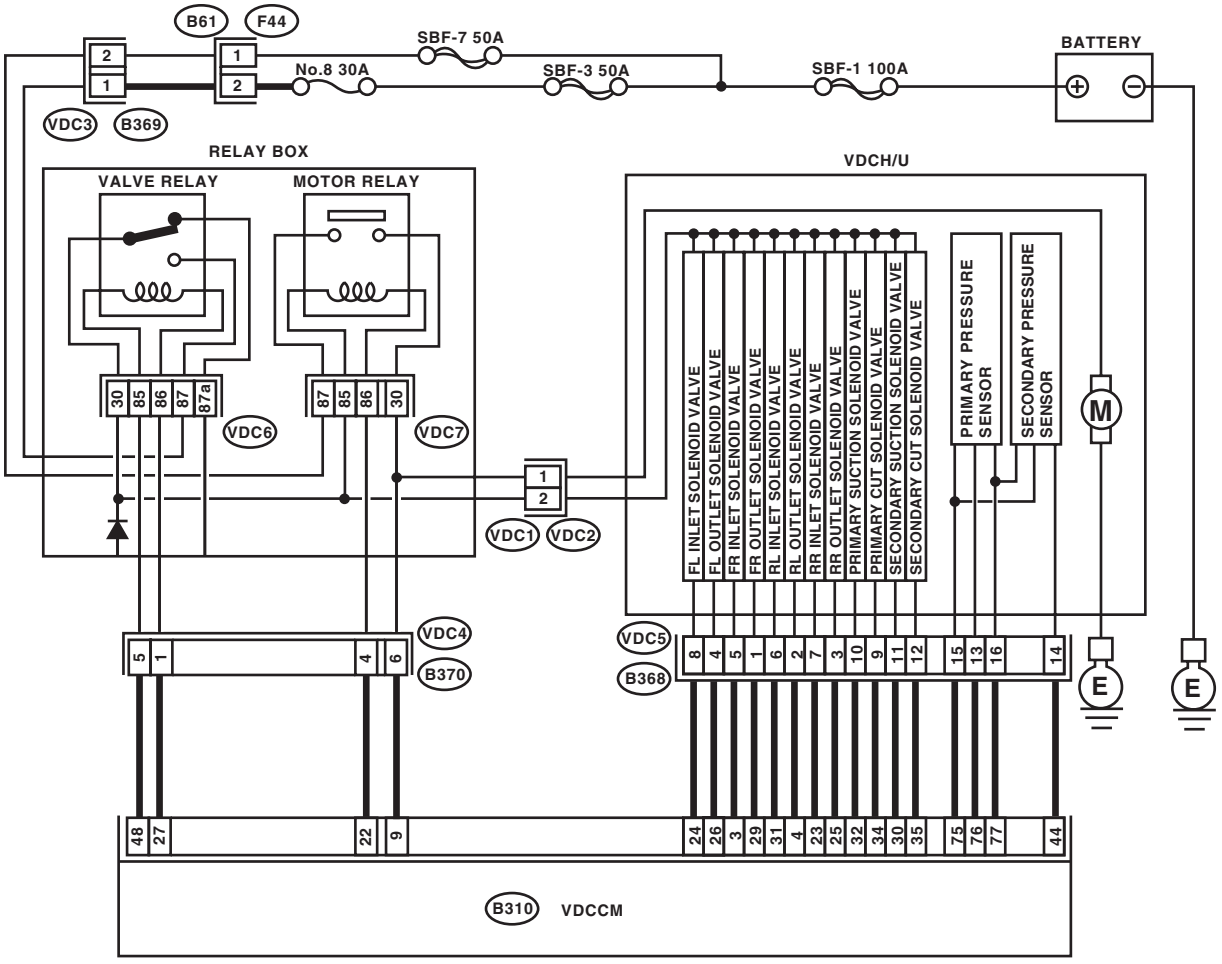
- Defective harness connector
- Defective VDCH/U solenoid valve

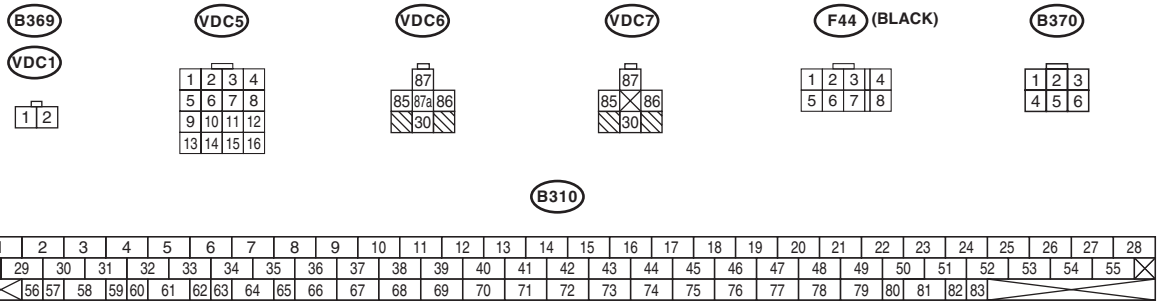
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:
At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:





VDC00538

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect two connectors (VDC1, B368) from VDCH/U. 3) Measure the 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. 12 — (VDC2) No. 2:*** ***DTC 62*** ***(VDC5) No. 9 — (VDC2) No. 2:***	Is the resistance between 8.04 — 9.04 Ω?	Go to step **2**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
2	**CHECK SOLENOID VALVE GROUND SHORT.** Measure the 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. 12 — Chassis ground:*** ***DTC 62*** ***(VDC5) No. 9 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
3	**CHECK SOLENOID VALVE BATTERY SHORT.** 1) Disconnect the connector from VDCCM. 2) Measure the 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. 12 (+) — Chassis ground (–):*** ***DTC 62*** ***(VDC5) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

	Step	Check	Yes	No
4	**CHECK SOLENOID VALVE BATTERY SHORT.** 1) Turn the ignition switch to ON. 2) Measure the 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. 12 (+) — Chassis ground (–):*** ***DTC 62*** ***(VDC5) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **5**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31*** ***(B310) No. 3 (+) — Chassis ground (–):*** ***DTC 33*** ***(B310) No. 24 (+) — Chassis ground (–):*** ***DTC 35*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***DTC 37*** ***(B310) No. 31 (+) — Chassis ground (–):*** ***DTC 61*** ***(B310) No. 35 (+) — Chassis ground (–):*** ***DTC 62*** ***(B310) No. 34 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6**.	Repair the harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31*** ***(B310) No. 3 (+) — Chassis ground (–):*** ***DTC 33*** ***(B310) No. 24 (+) — Chassis ground (–):*** ***DTC 35*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***DTC 37*** ***(B310) No. 31 (+) — Chassis ground (–):*** ***DTC 61*** ***(B310) No. 35 (+) — Chassis ground (–):*** ***DTC 62*** ***(B310) No. 34 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7**.	Repair the harness between VDCCM and VDCH/U.

	Step	Check	Yes	No
7	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31*** ***(B310) No. 3 — Chassis ground:*** ***DTC 33*** ***(B310) No. 24 — Chassis ground:*** ***DTC 35*** ***(B310) No. 23 — Chassis ground:*** ***DTC 37*** ***(B310) No. 31 — Chassis ground:*** ***DTC 61*** ***(B310) No. 35 — Chassis ground:*** ***DTC 62*** ***(B310) No. 34 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Repair the harness between VDCCM and VDCH/U.
8	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect the connectors (B368) to VDCH/U. 2) Measure the resistance between the VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 31*** ***(B310) No. 3 — (VDC2) No. 2:*** ***DTC 33*** ***(B310) No. 24 — (VDC2) No. 2:*** ***DTC 35*** ***(B310) No. 23 — (VDC2) No. 2:*** ***DTC 37*** ***(B310) No. 31 — (VDC2) No. 2:*** ***DTC 61*** ***(B310) No. 35 — (VDC2) No. 2:*** ***DTC 62*** ***(B310) No. 34 — (VDC2) No. 2:***	Is the resistance between 7 — 10 Ω?	Go to step **9**.	Repair the connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connector between the VDCCM and VDCH/U?	Repair the connector.	Go to step **10**.
10	**CHECK THE VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Repair the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11**.
11	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

T: DTC 32 FRONT RIGHT OUTLET SOLENOID VALVE MALFUNCTION

NOTE:
Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-63, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC 34 FRONT LEFT OUTLET SOLENOID VALVE MALFUNCTION

NOTE:
Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-63, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

V: DTC 36 REAR RIGHT OUTLET SOLENOID VALVE MALFUNCTION

NOTE:
Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-63, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

W: DTC 38 REAR LEFT OUTLET SOLENOID VALVE MALFUNCTION

NOTE:
Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-63, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

X: DTC 63 SECONDARY SUCTION SOLENOID VALVE MALFUNCTION

NOTE:
Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-63, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Y: DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION

DTC DETECTING CONDITION:

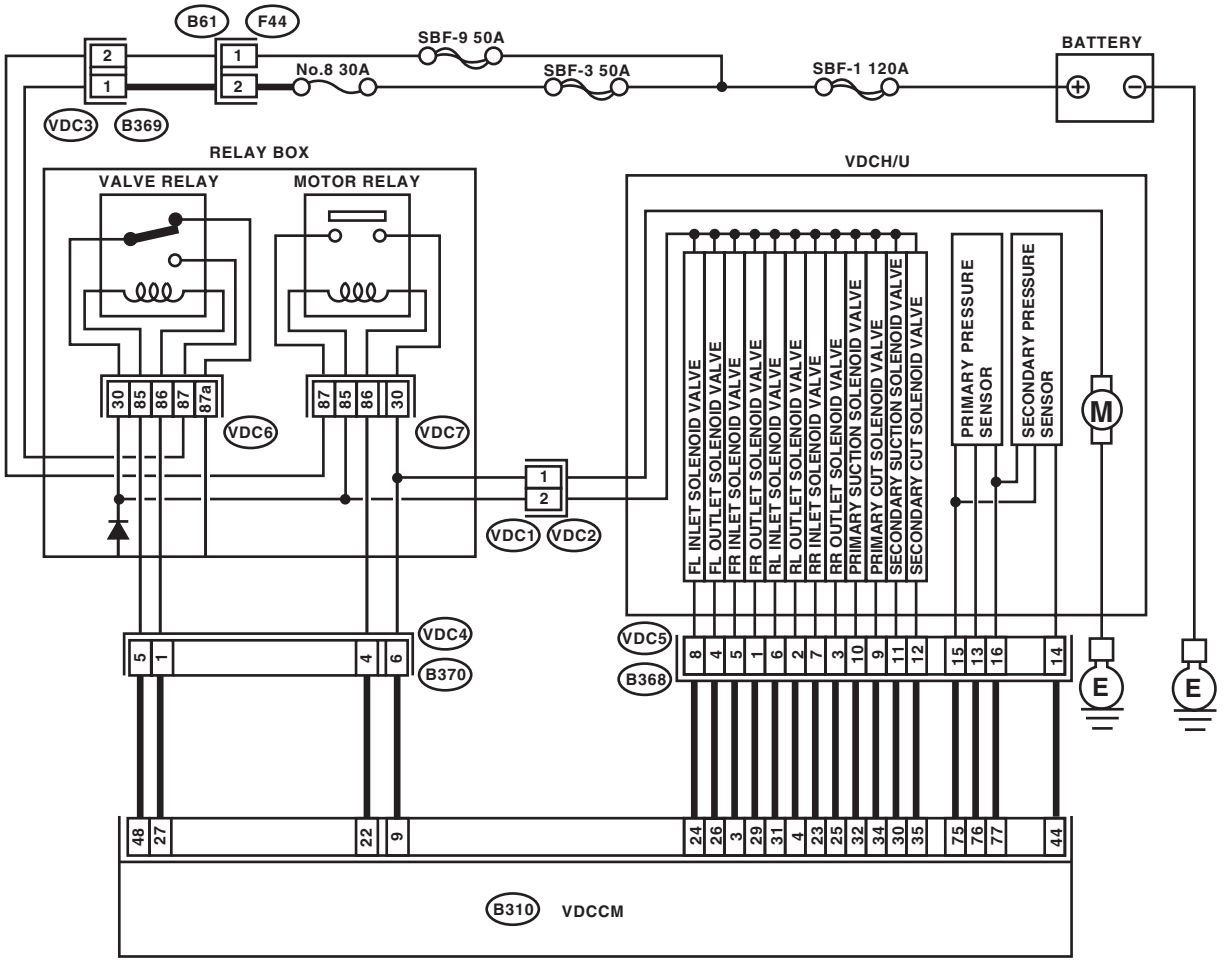
- Defective harness connector
- Defective VDCH/U solenoid valve

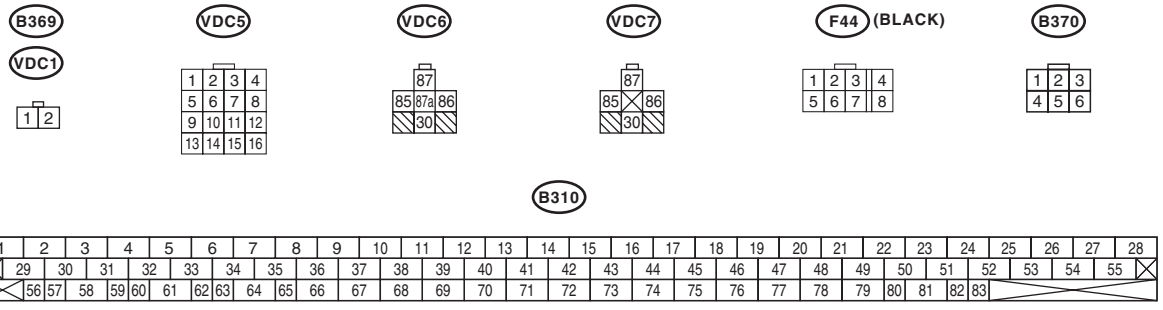
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:
At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:





VDC00504

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect two connectors (VDC1, B368) from VDCH/U. 3) Measure the 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. 11 — (VDC2) No. 2:*** ***DTC 64*** ***(VDC5) No. 10 — (VDC2) No. 2:***	Is the resistance between 3.8 — 4.8 Ω?	Go to step **2**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
2	**CHECK SOLENOID VALVE GROUND SHORT.** Measure the 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. 11 — Chassis ground:*** ***DTC 64*** ***(VDC5) No. 10 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
3	**CHECK SOLENOID VALVE BATTERY SHORT.** 1) Disconnect the connectors from VDCCM. 2) Measure the 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. 11 (+) — Chassis ground (–):*** ***DTC 64*** ***(VDC5) No. 10 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

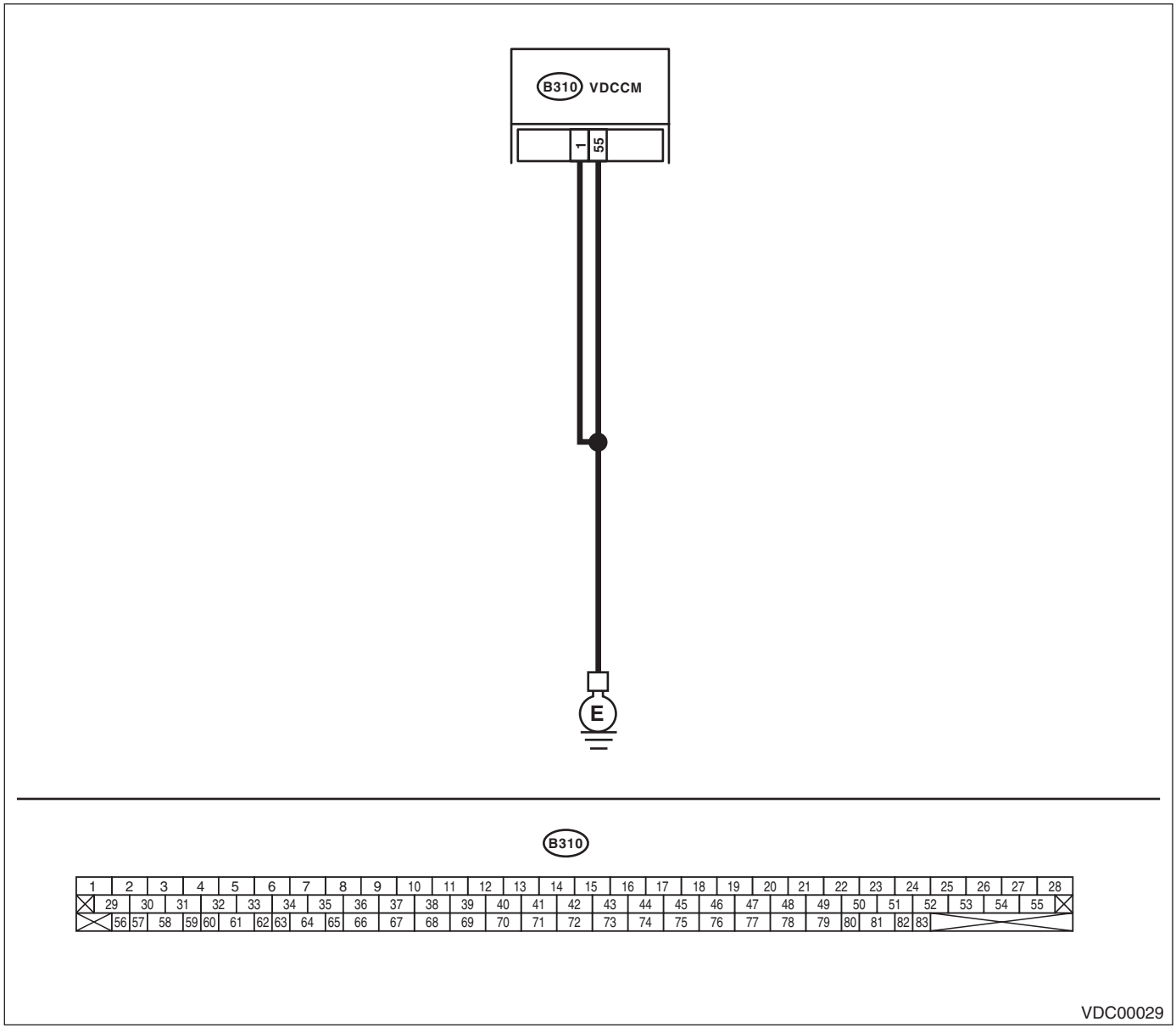
	Step	Check	Yes	No
4	**CHECK SOLENOID VALVE BATTERY SHORT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34*** ***(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36*** ***(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38*** ***(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63*** ***(VDC5) No. 11 (+) — Chassis ground (–):*** ***DTC 64*** ***(VDC5) No. 10 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **5**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(B310) No. 29 (+) — Chassis ground (–):*** ***DTC 34*** ***(B310) No. 26 (+) — Chassis ground (–):*** ***DTC 36*** ***(B310) No. 25 (+) — Chassis ground (–):*** ***DTC 38*** ***(B310) No. 4 (+) — Chassis ground (–):*** ***DTC 63*** ***(B310) No. 30 (+) — Chassis ground (–):*** ***DTC 64*** ***(B310) No. 32 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6**.	Repair the harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(B310) No. 29 (+) — Chassis ground (–):*** ***DTC 34*** ***(B310) No. 26 (+) — Chassis ground (–):*** ***DTC 36*** ***(B310) No. 25 (+) — Chassis ground (–):*** ***DTC 38*** ***(B310) No. 4 (+) — Chassis ground (–):*** ***DTC 63*** ***(B310) No. 30 (+) — Chassis ground (–):*** ***DTC 64*** ***(B310) No. 32 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7**.	Repair the harness between VDCCM and VDCH/U.

	Step	Check	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(B310) No. 29 — Chassis ground:*** ***DTC 34*** ***(B310) No. 26 — Chassis ground:*** ***DTC 36*** ***(B310) No. 25 — Chassis ground:*** ***DTC 38*** ***(B310) No. 4 — Chassis ground:*** ***DTC 63*** ***(B310) No. 30 — Chassis ground:*** ***DTC 64*** ***(B310) No. 32 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Repair the harness between VDCCM and VDCH/U.
8	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect the connectors (B368) to VDCH/U. 2) Measure the resistance between the VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 32*** ***(B310) No. 29 — (VDC2) No. 1:*** ***DTC 34*** ***(B310) No. 26 — (VDC2) No. 1:*** ***DTC 36*** ***(B310) No. 25 — (VDC2) No. 1:*** ***DTC 38*** ***(B310) No. 4 — (VDC2) No. 1:*** ***DTC 63*** ***(B310) No. 30 — (VDC2) No. 1:*** ***DTC 64*** ***(B310) No. 32 — (VDC2) No. 1:***	Is the resistance between 4 — 6 Ω?	Go to step **9**.	Repair the harness connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connector between the VDCCM and VDCH/U?	Repair the connector.	Go to step **10**.
10	**CHECK THE VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11**.
11	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Z: DTC 41 ECM

DTC DETECTING CONDITION:
VDCCM malfunction
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:
At this time, the brake warning light illuminates as well as the VDC and ABS warning light.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:*** ***(B310) No. 55 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2**.	Repair the VDCCM ground harness.
2	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact of the connectors between the battery, ignition switch and VDCCM?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.**	Are the radio wave devices and electronic components installed correctly?	Go to step **4**.	Install the radio wave devices and electric components properly.
4	**CHECK CAUSE OF SIGNAL NOISE.**	Are causes of the noise (such as an antenna) installed near the sensor harness?	Install the noise sources away from the sensor harness.	Go to step **5**.
5	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **6**.
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AA:DTC 42 POWER VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:

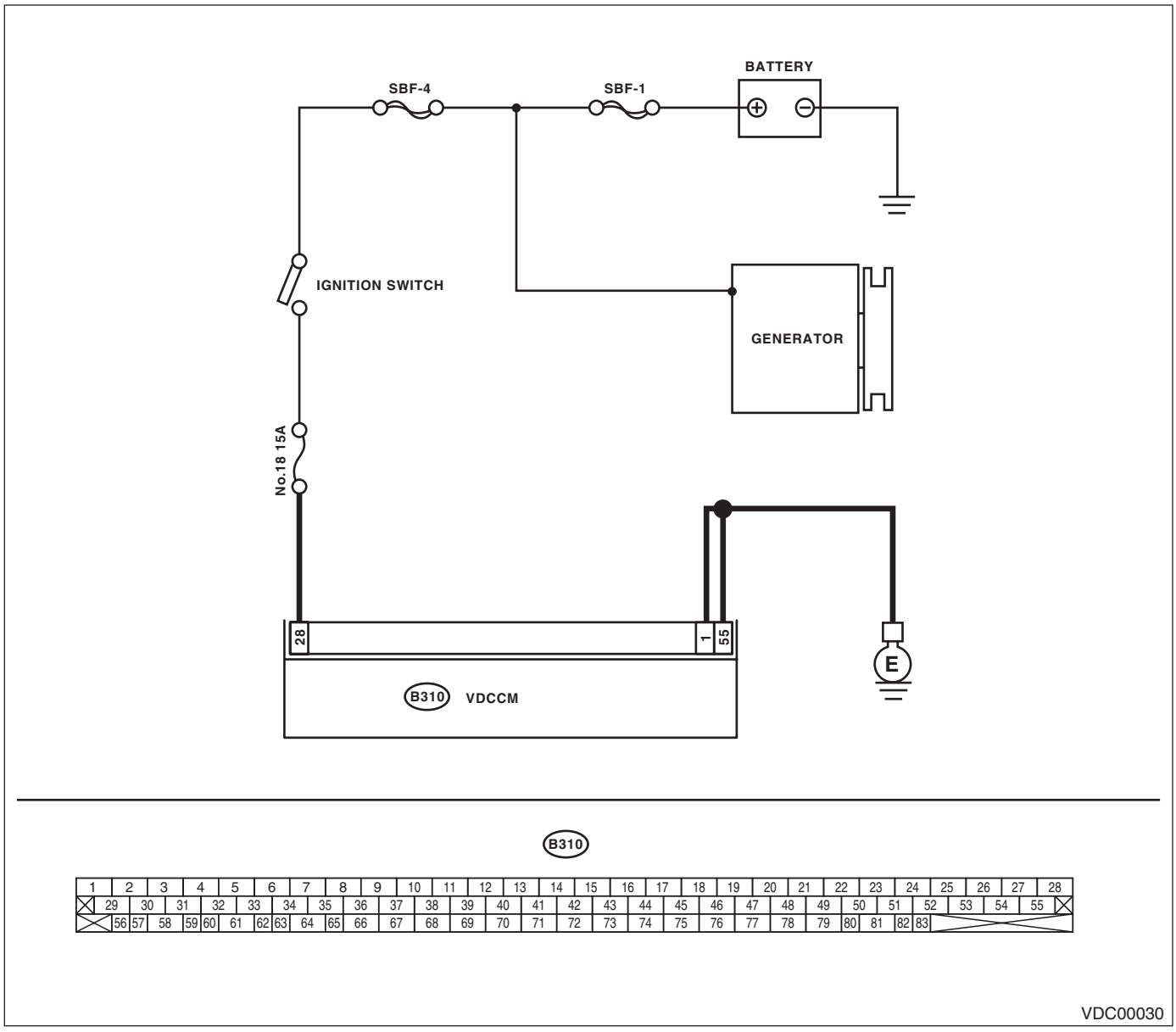
- Power voltage for VDCCM is low.
- VDCCM voltage is too high. (Warning lights go off if voltage returns.)

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate. (When the voltage is excessively low or high)

NOTE:
At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator terminal B and chassis ground. ***Terminals*** ***Generator B terminal — Chassis ground:***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the generator.
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals clamped tightly?	Go to step **3**.	Tighten the clamp of terminal.
3	**CHECK VDCCM INPUT VOLTAGE.** 1) Disconnect the connectors from VDCCM. 2) Run the engine at idle. 3) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Repair the harness connectors between the battery, ignition switch and VDCCM.
4	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:*** ***(B310) No. 55 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5**.	Repair the VDCCM ground harness.
5	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connectors between generator, battery and VDCCM?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7**.
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AB:DTC 44 TCM COMMUNICATION CIRCUIT

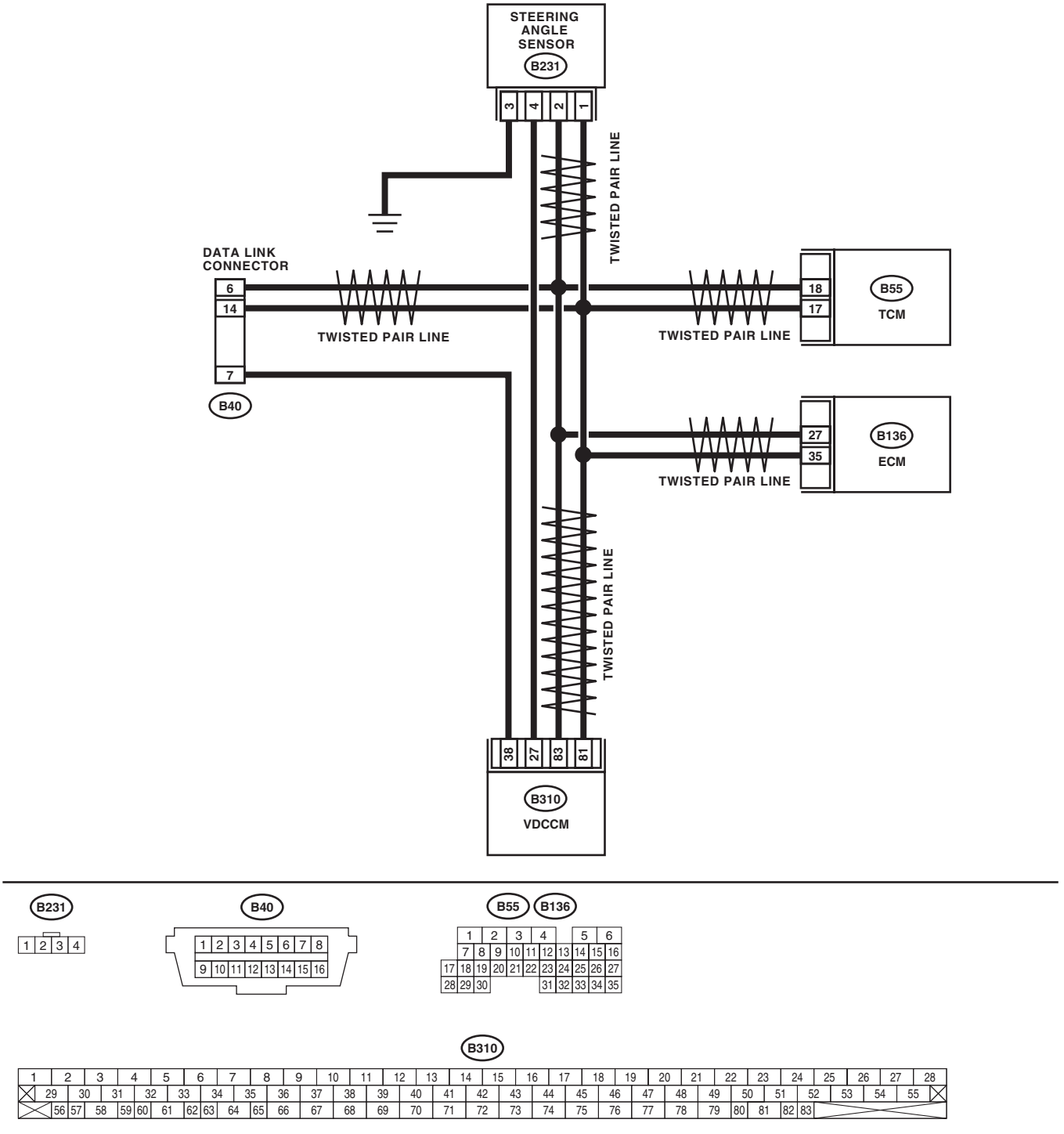
DTC DETECTING CONDITION:

TCM communication failure

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



VDC00505

	Step	Check	Yes	No
1	**CHECK HARNESS RESISTANCE.** 1) Turn the ignition switch to OFF. 2) Disconnect the two connectors from the TCM. 3) Measure the resistance between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 18 — No. 17:***	Is the resistance 60±3 Ω?	Go to step **2**.	Repair the harness between TCM and VDCCM.
2	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in TCM connector?	Repair the connector.	Go to step **3**.
3	**CHECK TCM.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>	Go to step **4**.
4	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AC:DTC 45 INCORRECT VDC CONTROL MODULE SPECIFICATIONS

DTC DETECTING CONDITION:
Different control module specification
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK THE VDCCM SPECIFICATION.** Check the VDCCM identification mark.	Do the VDCCM identification mark and vehicle specification match?	Go to step **2**.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK TCM SPECIFICATION.** Check the TCM identification mark.	Do the TCM identification mark and vehicle specification match?	Go to step **3**.	Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>
3	**CHECK TCM.** 1) Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).> 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Go to step **4**.	Defect exists in original TCM.
4	**CHECK TCM.**	In the current diagnosis, is the same DTC displayed again?	Go to the diagnosis corresponding to the DTC.	Go to step **5**.
5	**CHECK VDCCM.** 1) Install the original TCM. 2) Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).> 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC displayed again?	Go to step **6**.	Defect exists in original VDCCM.
6	**CHECK VDCCM.**	Is the same DTC as current diagnosis still displayed?	Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>	Proceed with the diagnosis corresponding to the DTC.

AD:DTC 45 TCM MALFUNCTION

DTC DETECTING CONDITION:
TCM or VDCCM malfunction
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK AT SYSTEM.** 1) Start the engine. 2) Check the DTC in AT system.	Is the DTC of AT system stored in memory?	Repair the AT system.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

AE:DTC 46 ABNORMAL VOLTAGE OF 5V POWER SUPPLY

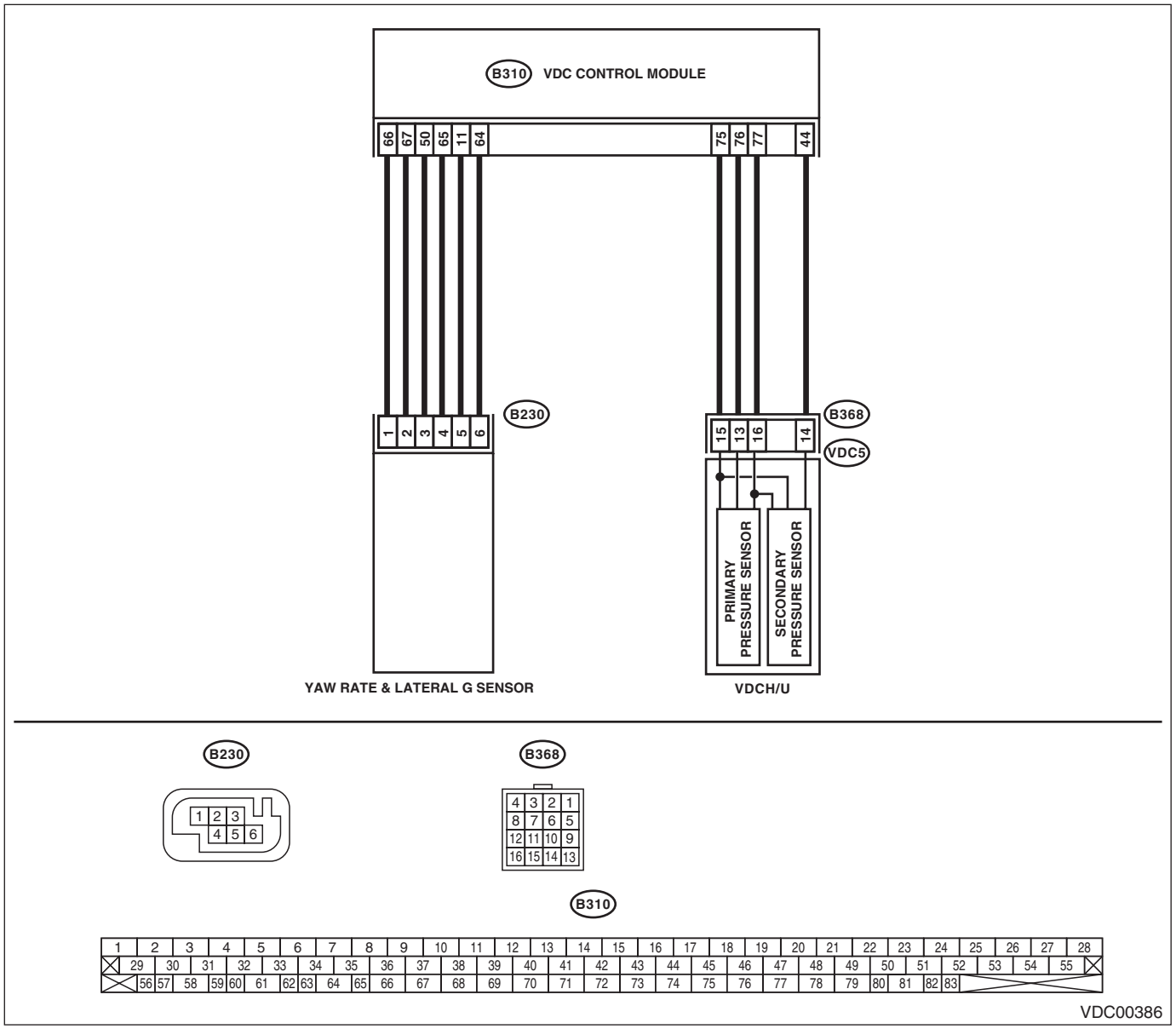
DTC DETECTING CONDITION:

5 V power supply voltage malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND SHORT IN SENSOR AND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 50 — Chassis ground (lateral G sensor):*** ***(B310) No. 77 — Chassis ground (pressure sensor):***	Is the resistance 1 MΩ or more?	Go to step **3**.	Go to step **2**.
2	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Disconnect the connector from the defective sensor. 2) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 — Chassis ground (lateral G sensor):*** ***(B310) No. 77 — Chassis ground (pressure sensor):***	Is the resistance 1 MΩ or more?	Replace the defective sensor.	Repair or replace the harness connector between VDCCM and the defective sensor.
3	**CHECK BATTERY SHORT IN SENSOR AND HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–) (lateral G sensor):*** ***(B310) No. 77 (+) — Chassis ground (–) (pressure sensor):***	Is the voltage less than 0.5 V?	Go to step **4**.	Go to step **5**.
4	**CHECK BATTERY SHORT IN SENSOR AND HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–) (lateral G sensor):*** ***(B310) No. 77 (+) — Chassis ground (–) (pressure sensor):***	Is the voltage less than 0.5 V?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5**.
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the defective sensor. 3) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–) (lateral G sensor):*** ***(B310) No. 77 (+) — Chassis ground (–) (pressure sensor):***	Is the voltage less than 0.5 V?	Go to step **6**.	Repair or replace the harness connector between VDCCM and the defective sensor.

	Step	Check	Yes	No
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–) (lateral G sensor):*** ***(B310) No. 77 (+) — Chassis ground (–) (pressure sensor):***	Is the voltage less than 0.5 V?	Replace the defective sensor.	Repair or replace the harness connector between VDCCM and the defective sensor.

AF:DTC 47 IMPROPER CAN COMMUNICATION

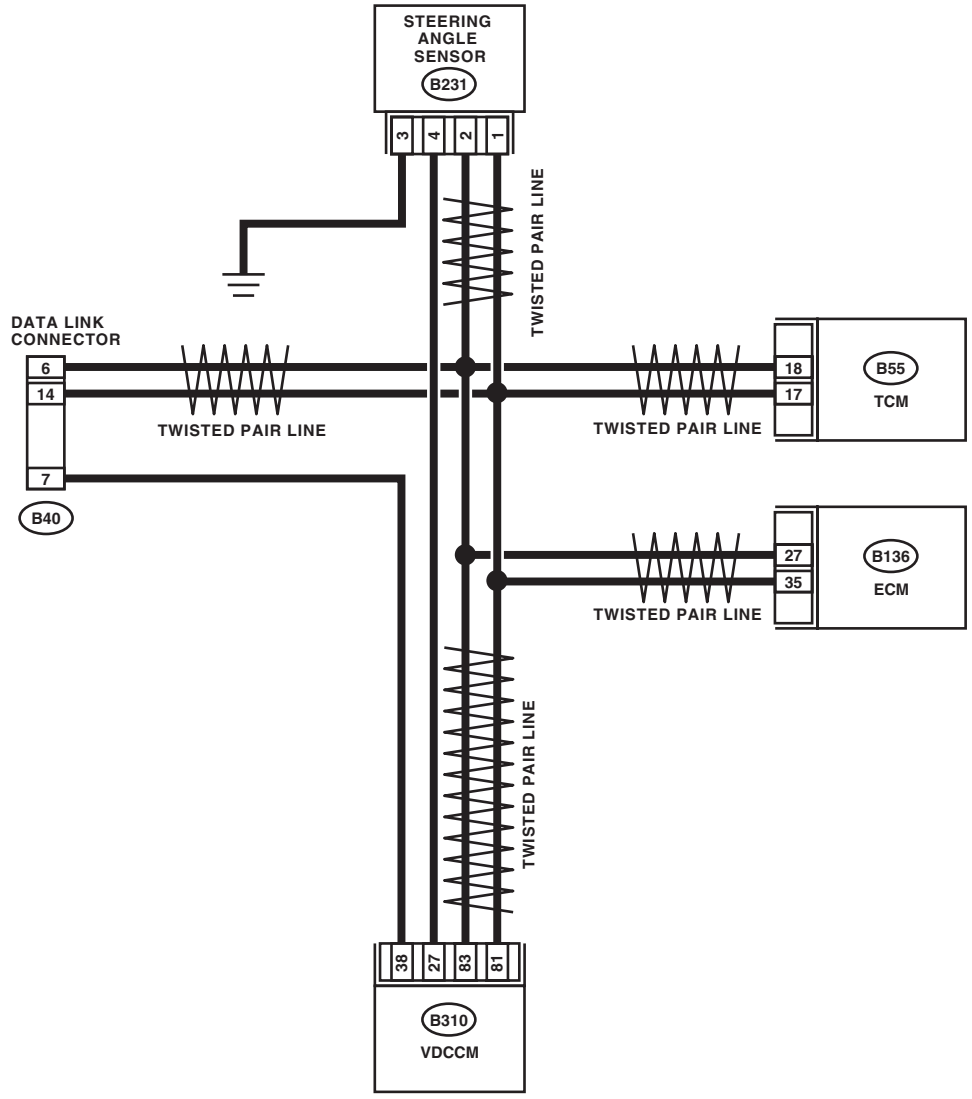
DTC DETECTING CONDITION:

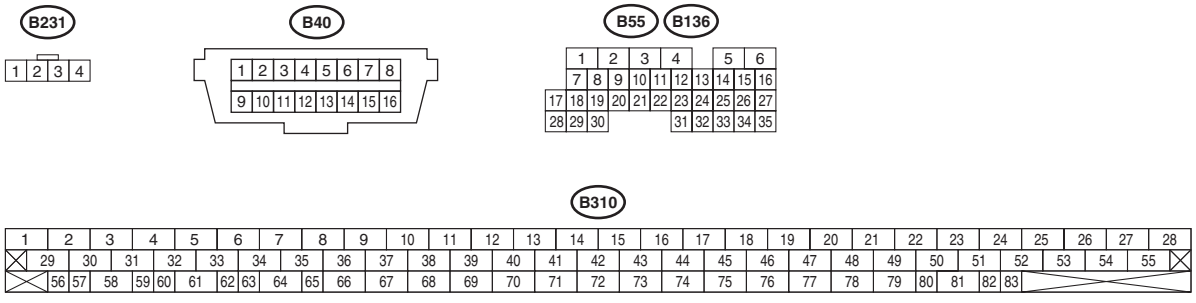
CAN communication line is damaged or circuit is shorted.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00505

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN VDCCM, STEERING ANGLE SENSOR AND TCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the VDCCM, TCM, ECM and the steering angle sensor. 3) Measure the resistance between the VDCCM, TCM, ECM and the steering angle sensor. ***Connector & terminal*** ***(B310) No. 83 — (B55) No. 18:*** ***(B310) No. 81 — (B55) No. 17:*** ***(B310) No. 83 — (B231) No. 2:*** ***(B310) No. 81 — (B231) No. 1:*** ***(B310) No. 83 — (B136) No. 27:*** ***(B310) No. 81 — (B136) No. 35:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Go to step **2**.
2	**CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND TCM.** Measure the resistance between TCM and the steering angle sensor. ***Connector & terminal*** ***(B55) No. 18 — (B231) No. 2:*** ***(B55) No. 17 — (B231) No. 1:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Repair or replace the harness connector between the TCM and the steering angle sensor.
3	**CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND ECM.** Measure the resistance between ECM and the steering angle sensor. ***Connector & terminal*** ***(B231) No. 2 — (B136) No. 27:*** ***(B231) No. 1 — (B136) No. 35:***	Is the resistance less than 0.5 Ω?	Repair or replace the harness connector between the VDCCM and ECM.	Repair or replace the harness connector between the steering angle sensor and ECM.
4	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 83 — Chassis ground:*** ***(B310) No. 81 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair or replace the harness connectors between the VDCCM, TCM, ECM and the steering angle sensor.
5	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 83 (+) — Chassis ground (–):*** ***(B310) No. 81 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **6**.	Repair or replace the harness connectors between the VDCCM, TCM, ECM and the steering angle sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 83 (+) — Chassis ground (–):*** ***(B310) No. 81 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **7**.	Repair or replace the harness connectors between the VDCCM, TCM, ECM and the steering angle sensor.
7	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to the steering angle sensor. 3) Measure the resistance between the VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 83 — No. 81:***	Is the resistance 120±6 Ω?	Go to step **9**.	Go to step **8**.

	Step	Check	Yes	No
8	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in steering angle sensor?	Repair or replace the steering angle sensor connector.	Replace the steering angle sensor.
9	**CHECK VDCCM.** 1) Connect the connector to VDCCM. 2) Disconnect the connector from steering angle sensor. 3) Measure the resistance between connector terminals of the steering angle sensor. ***Connector & terminal*** ***(B231) No. 1 — No. 2:***	Is the resistance 1 MΩ or more?	Go to step **11**.	Go to step **10**.
10	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the VDCCM?	Repair or replace the VDCCM connector.	Replace the VDCCM.
11	**CHECK TCM.** 1) Connect the connector to TCM. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between the steering angle sensor terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:***	Is the resistance 1 MΩ or more?	Go to step **13**.	Go to step **12**.
12	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the TCM?	Repair or replace the TCM connector.	Replace the TCM.
13	**CHECK ECM.** 1) Connect the connector to ECM. 2) Disconnect the connector from TCM. 3) Measure the resistance between the steering angle sensor terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:***	Is the resistance 120±6 Ω?	Go to step **15**.	Go to step **14**.
14	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in ECM?	Repair or replace the ECM connector.	Replace the ECM.
15	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Are other DTCs displayed?	Go to step **16**.	Temporary poor contact occurs.
16	**CHECK ANY OTHER DTC ON DISPLAY.**	Is the same DTC displayed again?	Go to step **17**.	Go to the diagnosis corresponding to the DTC.
17	**CHECK AT SYSTEM DTC DISPLAY.**	Is the DTC P1718 of the AT system displayed?	Replace the steering angle sensor.	Replace the VDCCM.

AG:DTC 51 VALVE RELAY OFF MALFUNCTION/ VALVE RELAY TEST MALFUNCTION

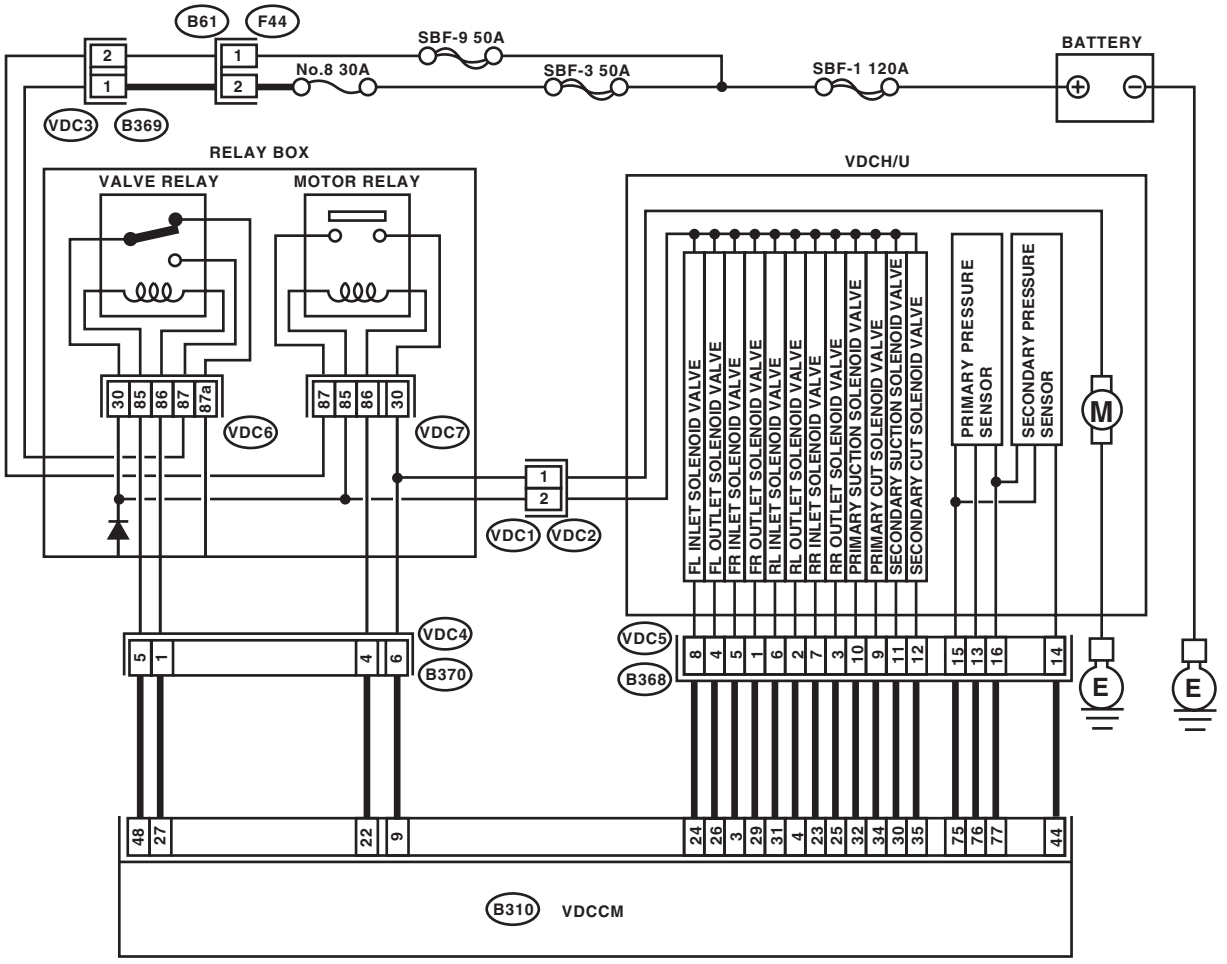
DTC DETECTING CONDITION:
Defective valve relay

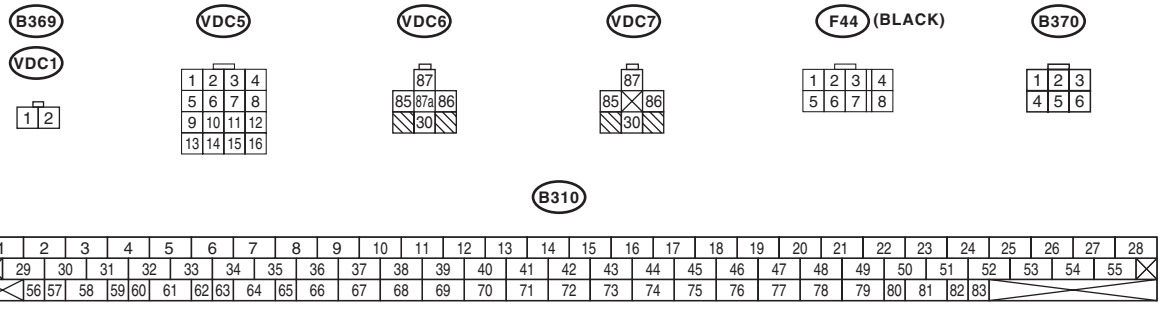
NOTE:
When the DTC 74 check is executed, DTC 51 is stored, but this does not indicate an error in the valve relay.

TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.
- EBD does not operate. (Depends on the content of the malfunction.)

NOTE:
At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:





VDC00504

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF VALVE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the valve relay from the relay box. 3) Measure the resistance between valve relay terminals. ***Terminals*** ***No. 85 — No. 86:***	Is the resistance between 93 — 113 Ω?	Go to step **2**.	Replace the valve relay.
2	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Connect the battery to the valve relay terminals No. 85 and No. 86. 2) Measure the resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Replace the valve relay.
3	**CHECK CONTACT POINT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the valve relay.
4	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Disconnect the battery from the valve relay terminals. 2) Measure the resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the valve relay.
5	**CHECK CONTACT POINT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the resistance less than 0.5 Ω?	Go to step **6**.	Replace the valve relay.
6	**CHECK VALVE RELAY SHORT.** Measure the resistance between valve relay terminals. ***Terminals*** ***No. 86 — No. 87:*** ***No. 86 — No. 87a:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Replace the valve relay.
7	**CHECK POWER SUPPLY FOR VALVE RELAY.** 1) Disconnect the connectors (B369) from relay box. 2) Turn the ignition switch to ON. 3) Measure the voltage between the relay box connector and chassis ground. ***Connector & terminal*** ***(B369) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **8**.	Repair the harness between battery and relay box connector. Check fuse No. 8.

	Step	Check	Yes	No
8	**CHECK GROUND SHORT AND OPEN CIRCUIT ON POWER SUPPLY CIRCUIT OF RELAY BOX.** 1) Disconnect the connector (VDC1) from VDCH/U. 2) Connect the connectors (B369) to relay box. 3) Turn the ignition switch to ON. 4) Measure the relay box voltage. ***Connector & terminal*** ***Valve relay installation point No. 87 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **9**.	Replace the relay box and check fuse No. 8.
9	**CHECK OPEN CIRCUIT OF RELAY BOX CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors (B370) from relay box. 3) Measure the resistance between the relay box connector and valve relay installation point. ***Connector & terminal*** ***(VDC4) No. 5 — Valve relay installation point No. 85:*** ***(VDC4) No. 1 — Valve relay installation point No. 86:***	Is the resistance less than 0.5 Ω?	Go to step **10**.	Replace the relay box.
10	**CHECK GROUND SHORT CIRCUIT OF THE RELAY BOX CONTACT POINT CIRCUIT.** Measure the resistance between the relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 — Chassis ground:*** ***(VDC4) No. 1 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **11**.	Replace the relay box.
11	**CHECK OPEN CIRCUIT OF VALVE RELAY CONTROL SYSTEM HARNESS CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(B310) No. 48 — (B370) No. 5:*** ***(B310) No. 27 — (B370) No. 1:***	Is the resistance less than 0.5 Ω?	Go to step **12**.	Repair the harness between VDCCM and relay box.
12	**CHECK GROUND SHORT OF THE VALVE RELAY CONTROL SYSTEM HARNESS.** Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 48 — Chassis ground:*** ***(B310) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **13**.	Repair the harness between VDCCM and relay box.
13	**CHECK OPEN CIRCUIT OF THE RELAY BOX CONTACT POINT CIRCUIT.** Measure the resistance between the VDCH/U connector and valve relay installation point. ***Connector & terminal*** ***(VDC1) No. 2 — Valve relay installation point No. 30:***	Is the resistance less than 0.5 Ω?	Go to step **14**.	Replace the relay box.
14	**CHECK GROUND SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT.** Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **15**.	Replace the relay box.

	Step	Check	Yes	No
15	**CHECK RESISTANCE OF HOLD VALVE AND CUT SOLENOID VALVE.** 1) Disconnect the connector from VDCH/U. 2) Measure the 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 resistance between 8.04 — 9.04 Ω?	Go to step **16**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
16	**CHECK RESISTANCE OF DECOMPRESSION VALVE.** Measure the 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 resistance between 4.04 — 4.54 Ω?	Go to step **17**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
17	**CHECK SOLENOID VALVE GROUND SHORT.** Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **18**.	Replace the VDCH/U and check all of the fuses. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
18	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 3 — Chassis ground:*** ***(B310) No. 24 — Chassis ground:*** ***(B310) No. 23 — Chassis ground:*** ***(B310) No. 31 — Chassis ground:*** ***(B310) No. 35 — Chassis ground:*** ***(B310) No. 34 — Chassis ground:*** ***(B310) No. 29 — Chassis ground:*** ***(B310) No. 26 — Chassis ground:*** ***(B310) No. 25 — Chassis ground:*** ***(B310) No. 4 — Chassis ground:*** ***(B310) No. 30 — Chassis ground:*** ***(B310) No. 32 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **19**.	Repair the harness between VDCH/U and VDCCM.

	Step	Check	Yes	No
19	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect the connectors (B368) to VDCH/U. 2) Measure the resistance between the VDCCM connector and VDCH/U. ***Connector & terminal*** ***(B310) No. 3 — (VDC2) No. 2:*** ***(B310) No. 24 — (VDC2) No. 2:*** ***(B310) No. 23 — (VDC2) No. 2:*** ***(B310) No. 31 — (VDC2) No. 2:*** ***(B310) No. 35 — (VDC2) No. 2:*** ***(B310) No. 34 — (VDC2) No. 2:***	Is the resistance between 8.0 — 10.0 Ω?	Go to step **20**.	Repair the harness and connector between the VDCH/U and the VDCCM.
20	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U.** Measure the resistance between the VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 29 — (VDC2) No. 2:*** ***(B310) No. 26 — (VDC2) No. 2:*** ***(B310) No. 25 — (VDC2) No. 2:*** ***(B310) No. 4 — (VDC2) No. 2:*** ***(B310) No. 30 — (VDC2) No. 2:*** ***(B310) No. 32 — (VDC2) No. 2:***	Is the resistance between 4.0 — 6.0 Ω?	Go to step **21**.	Repair the harness connector between the VDCH/U and the VDCCM.
21	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connector between the VDCCM and VDCH/U?	Repair the connector.	Go to step **22**.
22	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **23**.
23	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AH:DTC 51 MOTOR AND MOTOR RELAY ON FAILURE

DTC DETECTING CONDITION:

Defective valve relay

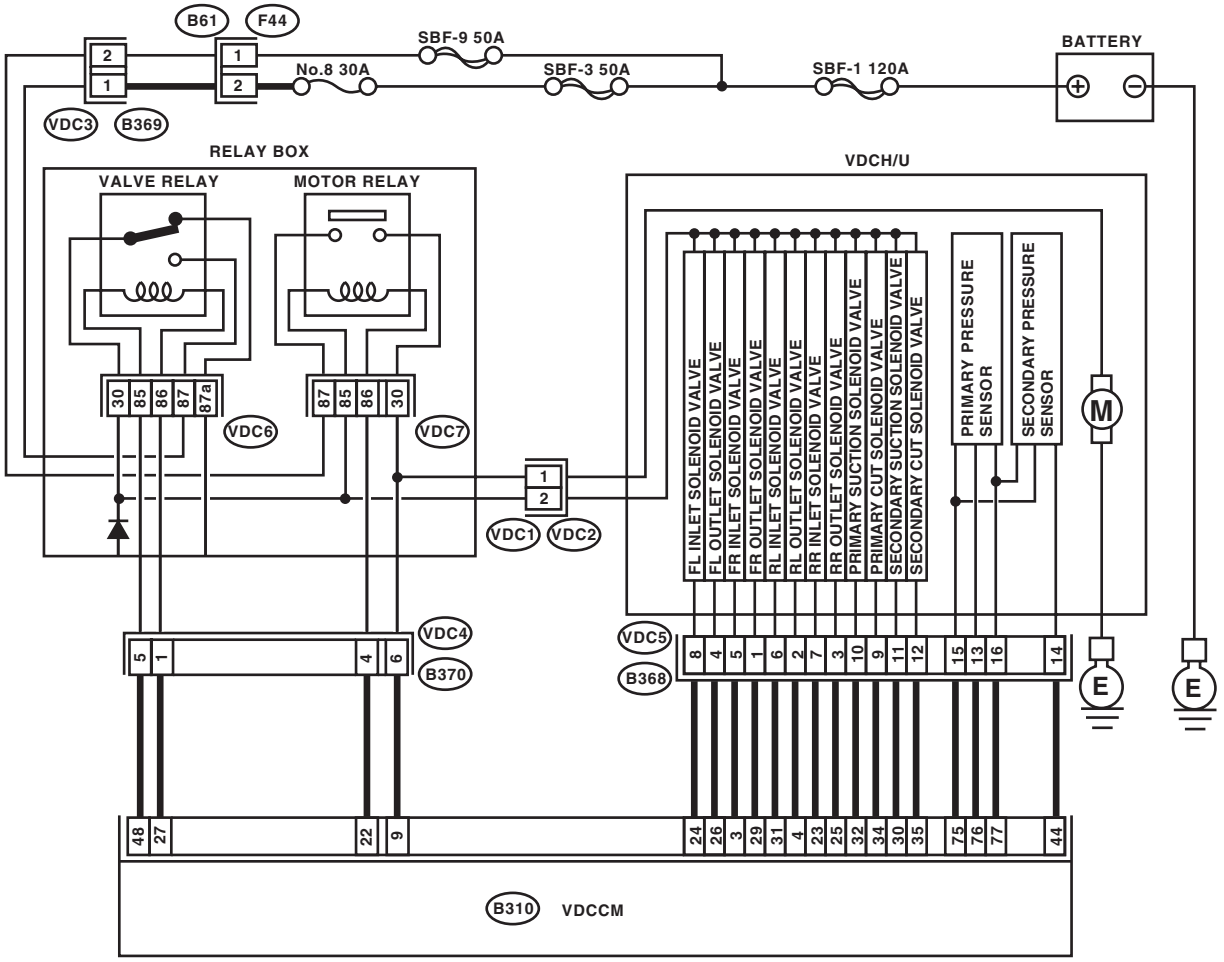
NOTE:

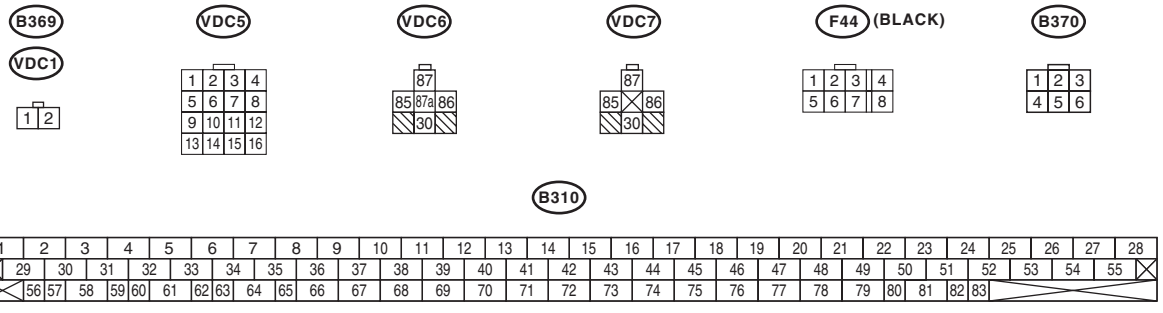
When the DTC 74 check is executed, DTC 51 is stored, but this does not indicate an error in the valve relay.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00504

	Step	Check	Yes	No
1	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the valve relay from the relay box. 3) Connect the battery to the valve relay terminals No. 85 and No. 86. 4) Measure the resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the resistance less than 0.5 Ω?	Go to step **2**.	Replace the valve relay.
2	**CHECK CONTACT POINT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Replace the valve relay.
3	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Disconnect the battery from the valve relay terminals. 2) Measure the resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the valve relay.
4	**CHECK CONTACT POINT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the resistance less than 0.5 Ω?	Go to step **5**.	Replace the valve relay.
5	**CHECK VALVE RELAY SHORT.** Measure the resistance between valve relay terminals. ***Terminals*** ***No. 86 — No. 87:*** ***No. 86 — No. 87a:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the valve relay.
6	**CHECK BATTERY SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT.** 1) Disconnect the connectors (B370) from relay box. 2) Measure the voltage between the relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7**.	Replace the relay box. Check fuse No. 8 and SBF3.
7	**CHECK BATTERY SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8**.	Replace the relay box. Check fuse No. 8 and SBF3.

	Step	Check	Yes	No
8	**CHECK BATTERY SHORT OF THE VALVE RELAY CONTROL SYSTEM HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Disconnect the connector from VDCH/U. 4) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 27 (+) — Chassis ground (–):*** ***(B310) No. 48 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **9**.	Repair the harness between VDCCM and relay box and check all of the fuses.
9	**CHECK BATTERY SHORT OF THE VALVE RELAY CONTROL SYSTEM HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 27 (+) — Chassis ground (–):*** ***(B310) No. 48 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **10**.	Repair the harness between VDCCM and relay box and check all of the fuses.
10	**CHECK BATTERY SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT.** 1) Disconnect the (VDC1) connector from the relay box. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11**.	Replace the relay box.
11	**CHECK BATTERY SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **12**.	Replace the relay box.
12	**CHECK SOLENOID VALVE BATTERY SHORT.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **13**.	Replace the VDCH/U and check all of the fuses. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
13	**CHECK SOLENOID VALVE BATTERY SHORT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **14**.	Replace the VDCH/U and check all of the fuses. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

	Step	Check	Yes	No
14	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 3 (+) — Chassis ground (–):*** ***(B310) No. 24 (+) — Chassis ground (–):*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***(B310) No. 31 (+) — Chassis ground (–):*** ***(B310) No. 35 (+) — Chassis ground (–):*** ***(B310) No. 34 (+) — Chassis ground (–):*** ***(B310) No. 29 (+) — Chassis ground (–):*** ***(B310) No. 26 (+) — Chassis ground (–):*** ***(B310) No. 25 (+) — Chassis ground (–):*** ***(B310) No. 4 (+) — Chassis ground (–):*** ***(B310) No. 30 (+) — Chassis ground (–):*** ***(B310) No. 32 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **15**.	Repair the harness between VDCH/U and VDCCM and check all of the fuses.
15	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 3 (+) — Chassis ground (–):*** ***(B310) No. 24 (+) — Chassis ground (–):*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***(B310) No. 31 (+) — Chassis ground (–):*** ***(B310) No. 35 (+) — Chassis ground (–):*** ***(B310) No. 34 (+) — Chassis ground (–):*** ***(B310) No. 29 (+) — Chassis ground (–):*** ***(B310) No. 26 (+) — Chassis ground (–):*** ***(B310) No. 25 (+) — Chassis ground (–):*** ***(B310) No. 4 (+) — Chassis ground (–):*** ***(B310) No. 30 (+) — Chassis ground (–):*** ***(B310) No. 32 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **16**.	Repair the harness between VDCH/U and VDCCM and check all of the fuses.
16	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between the VDCCM and VDCH/U?	Repair the connector.	Go to step **17**.
17	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **18**.
18	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AI: DTC 52 MOTOR/MOTOR RELAY OFF MALFUNCTION

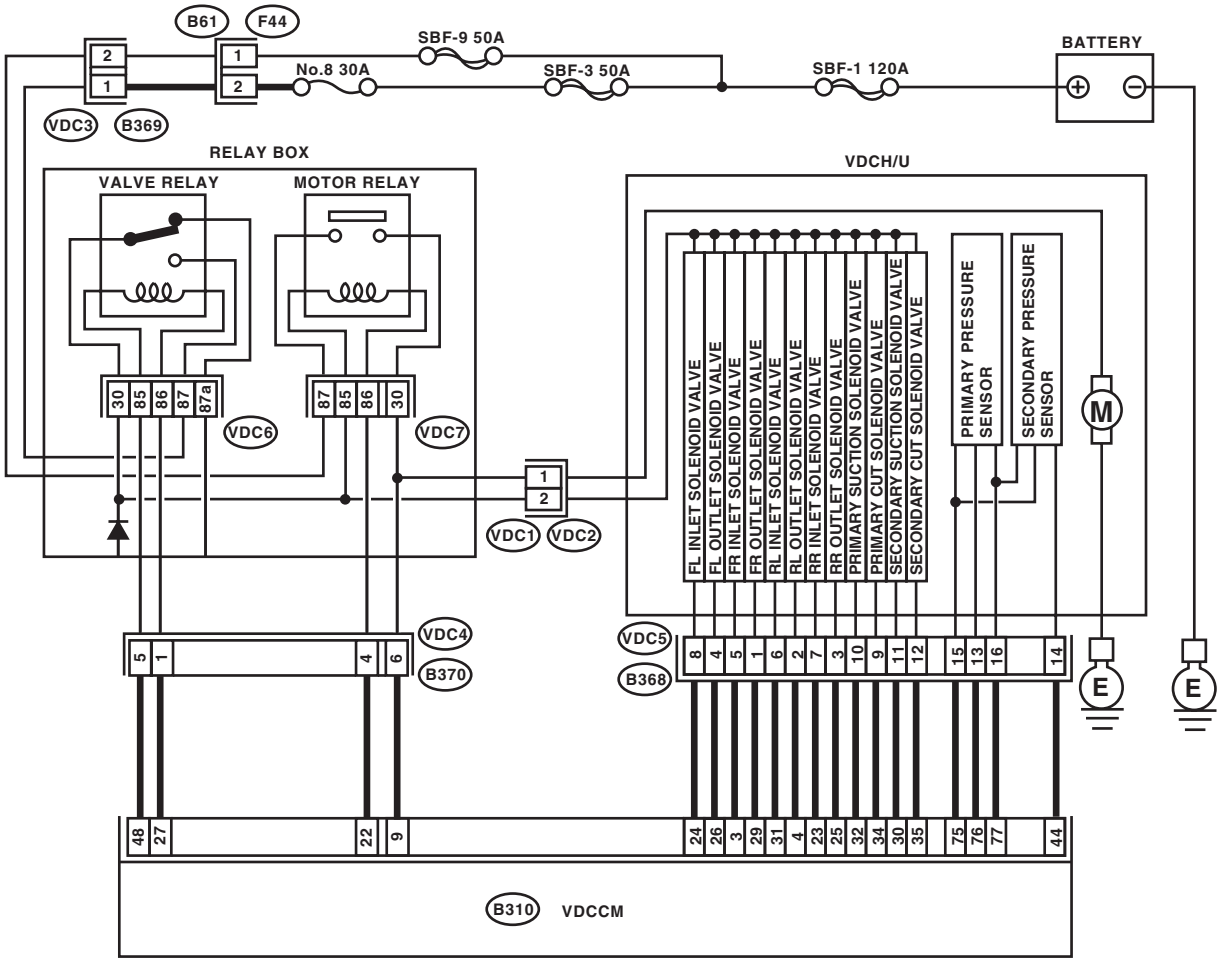
DTC DETECTING CONDITION:

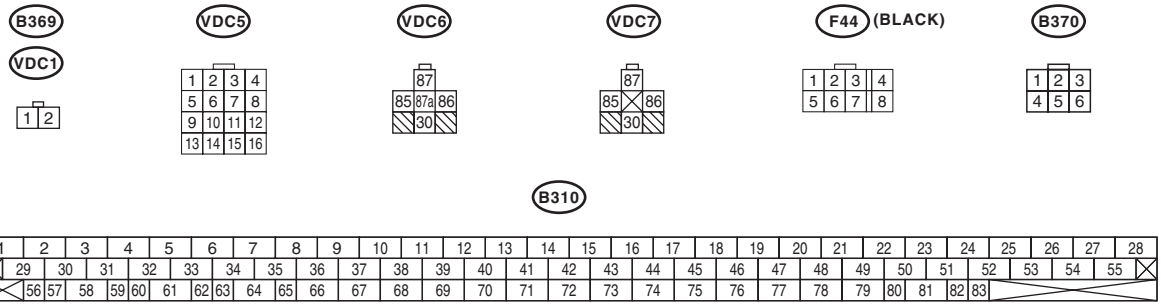
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00504

	Step	Check	Yes	No
1	**CHECK MOTOR GROUND STATUS.**	Is the motor ground terminal tightened to 33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)?	Go to step **2**.	Tighten the motor ground terminal clamp.
2	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the motor relay from the relay box. 3) Measure the resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Replace the motor relay.
3	**CHECK MOTOR RELAY SHORT.** Measure the resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 30:*** ***No. 85 — No. 87:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the motor relay.
4	**CHECK GROUND SHORT CIRCUIT IN RELAY BOX CIRCUIT.** 1) Disconnect the connectors (B370) from relay box. 2) Measure the resistance between the relay box connector unit and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the relay box.
5	**CHECK BATTERY SHORT CIRCUIT IN RELAY BOX CIRCUIT.** Measure the voltage between the relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6**.	Replace the relay box.
6	**CHECK BATTERY SHORT CIRCUIT IN RELAY BOX CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7**.	Replace the relay box.
7	**CHECK HARNESS GROUND SHORT BETWEEN RELAY BOX AND VDCCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.
8	**CHECK HARNESS BATTERY SHORT BETWEEN RELAY BOX AND VDCCM.** Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **9**.	Repair the harness between VDCCM and relay box.
9	**CHECK HARNESS BATTERY SHORT BETWEEN RELAY BOX AND VDCCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **10**.	Repair the harness between VDCCM and relay box.

	Step	Check	Yes	No
10	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between the VDCH/U, relay box and VDCCM?	Repair the connector.	Go to step **11**.
11	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **12**.
12	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: The ABS warning light will remain lit until the vehicle reaches approximately 12 km/h (7.46 MPH) even if the memory is cleared. This is normal.

AJ:DTC 52 MOTOR/MOTOR RELAY ON MALFUNCTION

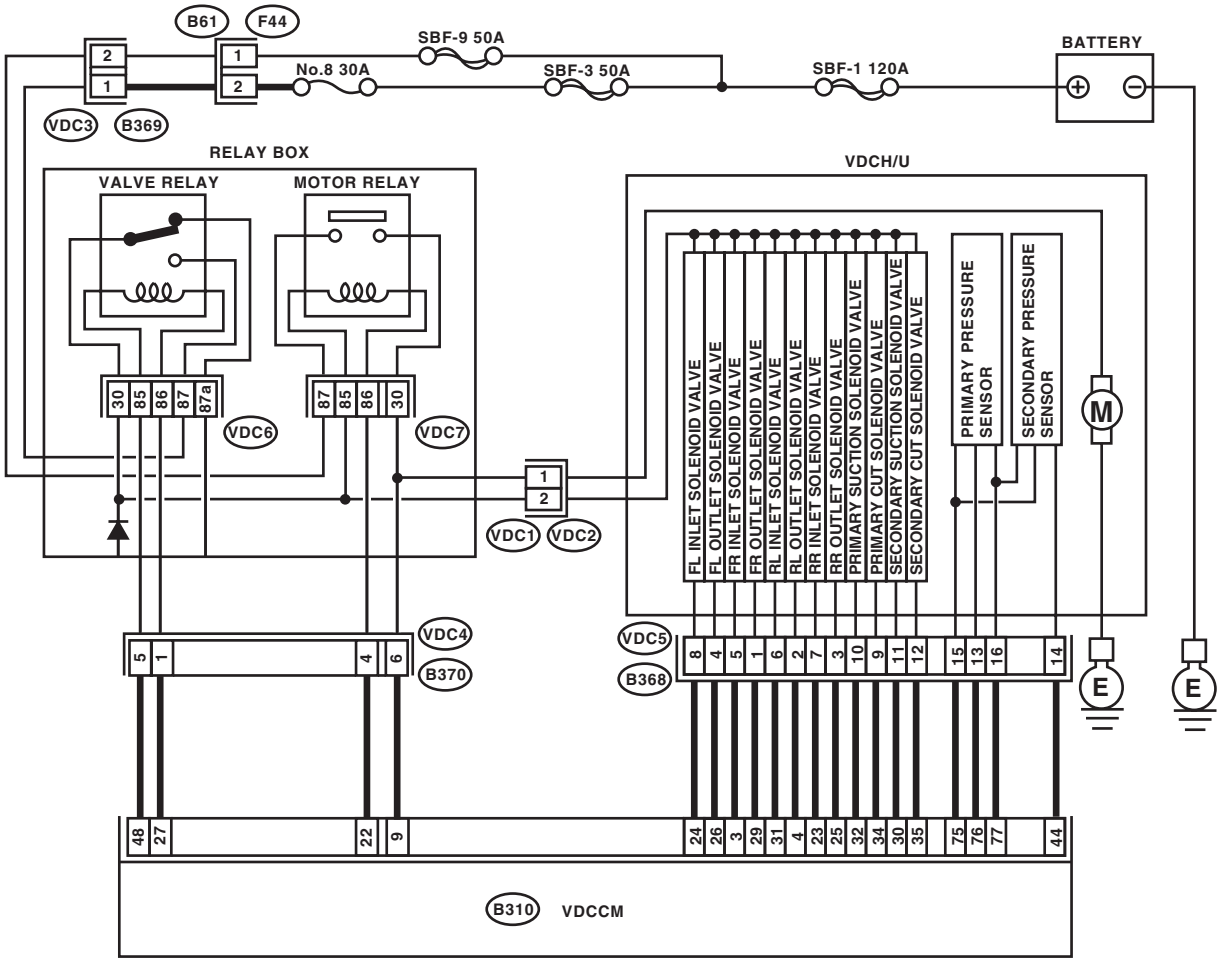
DTC DETECTING CONDITION:

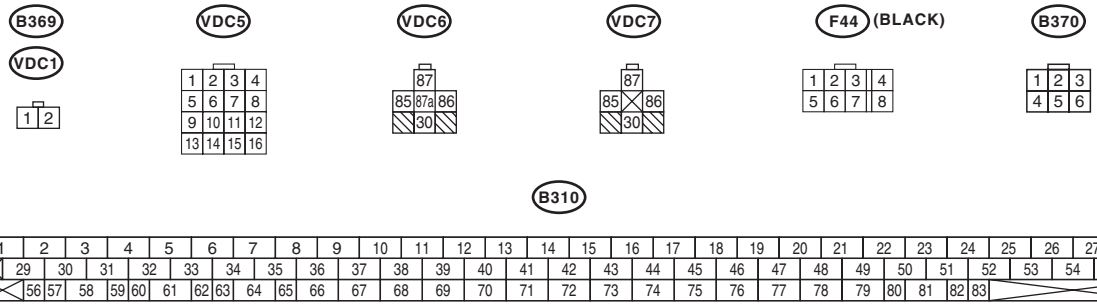
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00504

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the motor relay from the relay box. 3) Measure the resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 86:***	Is the resistance between 70 — 90 Ω?	Go to step **2**.	Replace the motor relay.
2	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Connect the battery to motor relay terminals No. 85 and No. 86. 2) Measure the resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the resistance less than 0.5 Ω?	Go to step **3**.	Replace the motor relay.
3	**CHECK MOTOR RELAY SHORT.** Measure the resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 30:*** ***No. 85 — No. 87:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the motor relay.
4	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect the connectors (B369) from relay box. 2) Disconnect the connectors from VDCCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between the relay box connector and chassis ground. ***Connector & terminal*** ***(F369) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **5**.	Repair the harness connector between battery and relay box and check the fuse SBF-holder.
5	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Connect the connectors (B369) to relay box. 3) Turn the ignition switch to ON. 4) Measure the voltage between the relay box and chassis ground. ***Connector & terminal*** ***Motor relay installation point No. 87 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Replace the relay box.
6	**CHECK OPEN CIRCUIT OF THE RELAY BOX CONTACT POINT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors (VDC2), (B370) from relay box. 3) Measure the resistance between the relay box connector and motor relay installation point. ***Connector & terminal*** ***(VDC1) No. 1 — Motor relay installation point No. 30:***	Is the resistance less than 0.5 Ω?	Go to step **7**.	Replace the relay box.
7	**CHECK OPEN CIRCUIT OF RELAY BOX MONITOR SYSTEM.** Measure the resistance between the relay box connector and motor relay installation point. ***Connector & terminal*** ***(VDC4) No. 6 — Motor relay installation point No. 30:***	Is the resistance less than 0.5 Ω?	Go to step **8**.	Replace the relay box.

	Step	Check	Yes	No
8	**CHECK OPEN CIRCUIT OF RELAY BOX CONTROL CIRCUIT.** Measure the resistance between the motor relay installation point and the relay box connector. ***Connector & terminal*** ***(VDC4) No. 4 — Motor relay installation point No. 86:***	Is the resistance less than 0.5 Ω?	Go to step **9**.	Replace the relay box.
9	**CHECK OPEN CIRCUIT OF RELAY BOX CONTROL CIRCUIT.** 1) Remove the valve relay from the relay box. 2) Measure the resistance between the motor relay installation point and the valve relay installation point. ***Connector & terminal*** ***Motor relay installation point No. 85 — Valve relay installation point No. 30:***	Is the resistance less than 0.5 Ω?	Go to step **10**.	Replace the relay box.
10	**CHECK GROUND SHORT CIRCUIT IN RELAY BOX CIRCUIT.** Measure the resistance between the relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:*** ***(VDC4) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **11**.	Replace the relay box.
11	**CHECK BATTERY SHORT CIRCUIT IN RELAY BOX CIRCUIT.** Measure the voltage between the relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **12**.	Replace the relay box.
12	**CHECK BATTERY SHORT CIRCUIT IN RELAY BOX CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **13**.	Replace the relay box.
13	**CHECK OPEN CIRCUIT OF RELAY CONTROL SYSTEM HARNESS CIRCUIT.** Measure the resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(B310) No. 22 — (B370) No. 4:*** ***(B310) No. 9 — (B370) No. 6:***	Is the resistance less than 0.5 Ω?	Go to step **14**.	Repair the harness connector between the VDCCM and relay box.
14	**CHECK HARNESS GROUND SHORT BETWEEN RELAY BOX AND VDCCM.** Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 22 — Chassis ground:*** ***(B310) No. 9 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **15**.	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.
15	**CHECK HARNESS BATTERY SHORT BETWEEN RELAY BOX AND VDCCM.** Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **16**.	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.

	Step	Check	Yes	No
16	**CHECK HARNESS BATTERY SHORT BETWEEN RELAY BOX AND VDCCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **17**.	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.
17	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between the VDCH/U, relay box and VDCCM?	Repair the connector.	Go to step **18**.
18	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **19**.
19	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: The ABS warning light will remain lit until the vehicle reaches approximately 12 km/h (7.46 MPH) even if the memory is cleared. This is normal.

AK:DTC 52 MOTOR MALFUNCTION

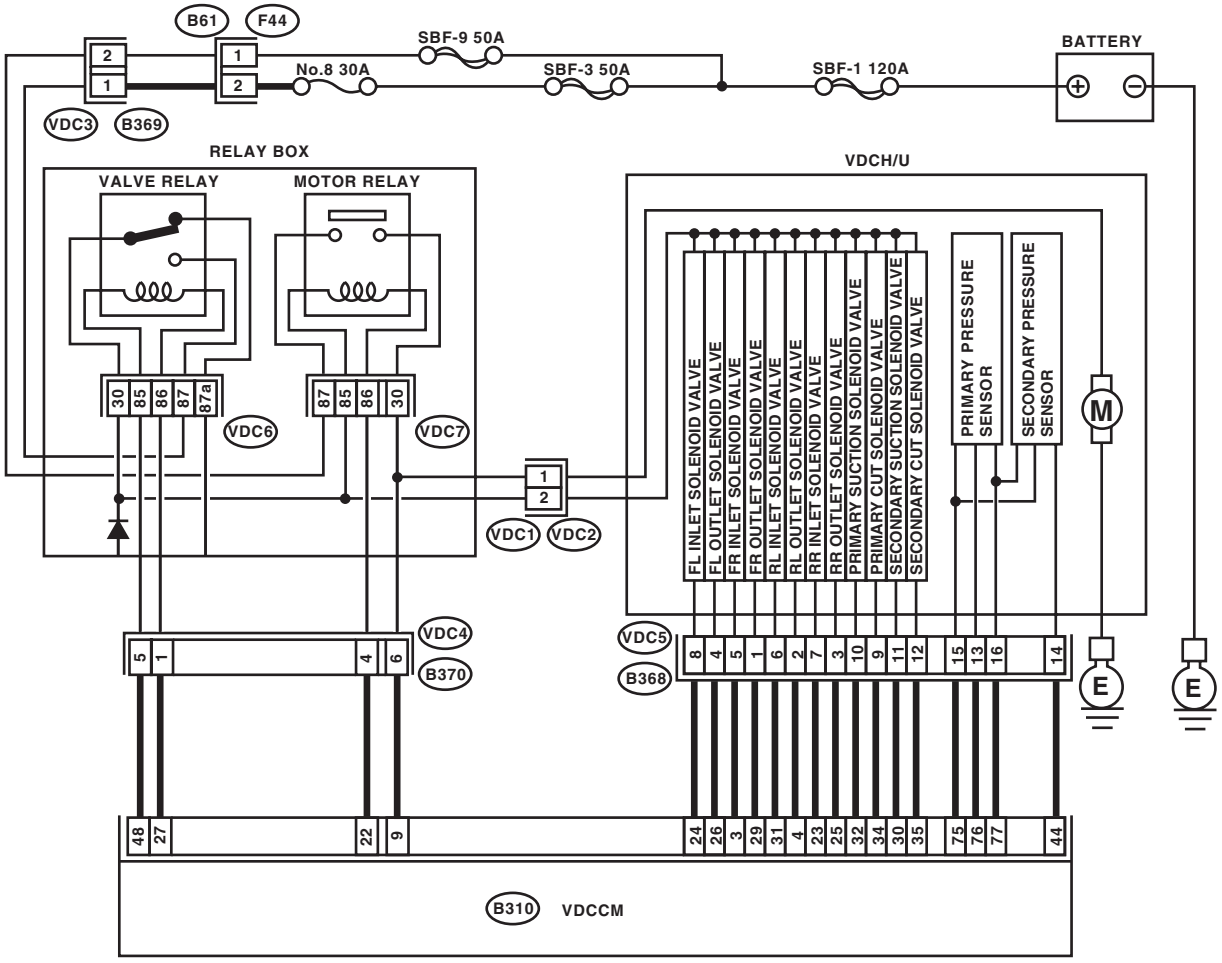
DTC DETECTING CONDITION:

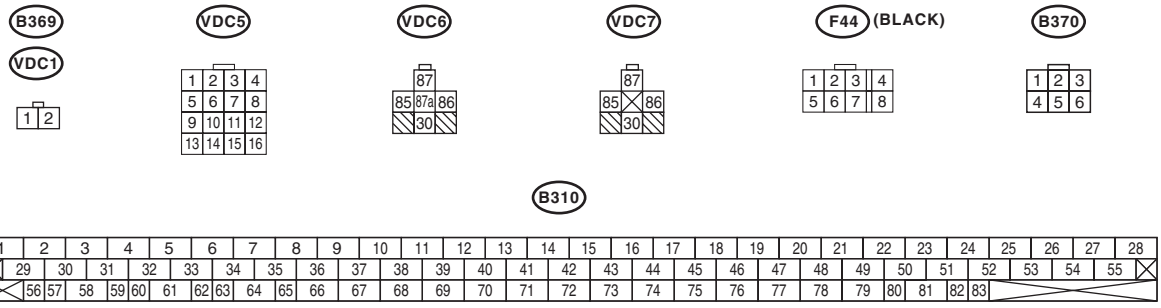
- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00504

	Step	Check	Yes	No
1	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the motor relay from the relay box. 3) Connect the battery to motor relay terminals No. 85 and No. 86. 4) Measure the resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the resistance less than 0.5 Ω?	Go to step **2**.	Replace the motor relay.
2	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Disconnect the battery from the motor relay terminals. 2) Measure the resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Replace the motor relay.
3	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect the connectors (B369) from relay box. 2) Disconnect the connectors from VDCCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between the relay box connector and chassis ground. ***Connector & terminal*** ***(B369) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Repair the harness connector between battery and relay box and check the fuse SBF-holder.
4	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Connect the connectors (B369) to relay box. 3) Turn the ignition switch to ON. 4) Measure the voltage between the relay box and chassis ground. ***Connector & terminal*** ***Motor relay installation point No. 87 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **5**.	Replace the relay box.
5	**CHECK MOTOR GROUND STATUS.**	Is the motor ground terminal tightened to 33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)?	Go to step **6**.	Tighten the motor ground terminal clamp.
6	**CHECK VDCCM MOTOR DRIVE TERMINAL.** 1) Turn the ignition switch to OFF. 2) Remove the VDC connector cover. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 3) Connect all connectors. 4) Install the motor relay. 5) Check the ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.> 6) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 22 (+) — No. 1 (–):***	Does the voltage fall from 10 V — 13 V to less than 1.5 V, and then rise to 10 V — 13 V again when checking the ABS sequence control?	Go to step **7**.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK MOTOR OPERATION.** Check the ABS sequence control. <Ref. to VDC-19, VDC Sequence Control.>	Can the motor revolution noise (engine sound) be heard when checking the ABS sequence control?	Go to step **8**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

	Step	Check	Yes	No
8	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between the VDCH/U, relay box and VDCCM?	Repair the connector.	Go to step **9**.
9	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **10**.
10	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: The ABS warning light will remain lit until the vehicle reaches approximately 12 km/h (7.46 MPH) even if the memory is cleared. This is normal.

AL:DTC 57 ECM COMMUNICATION CIRCUIT

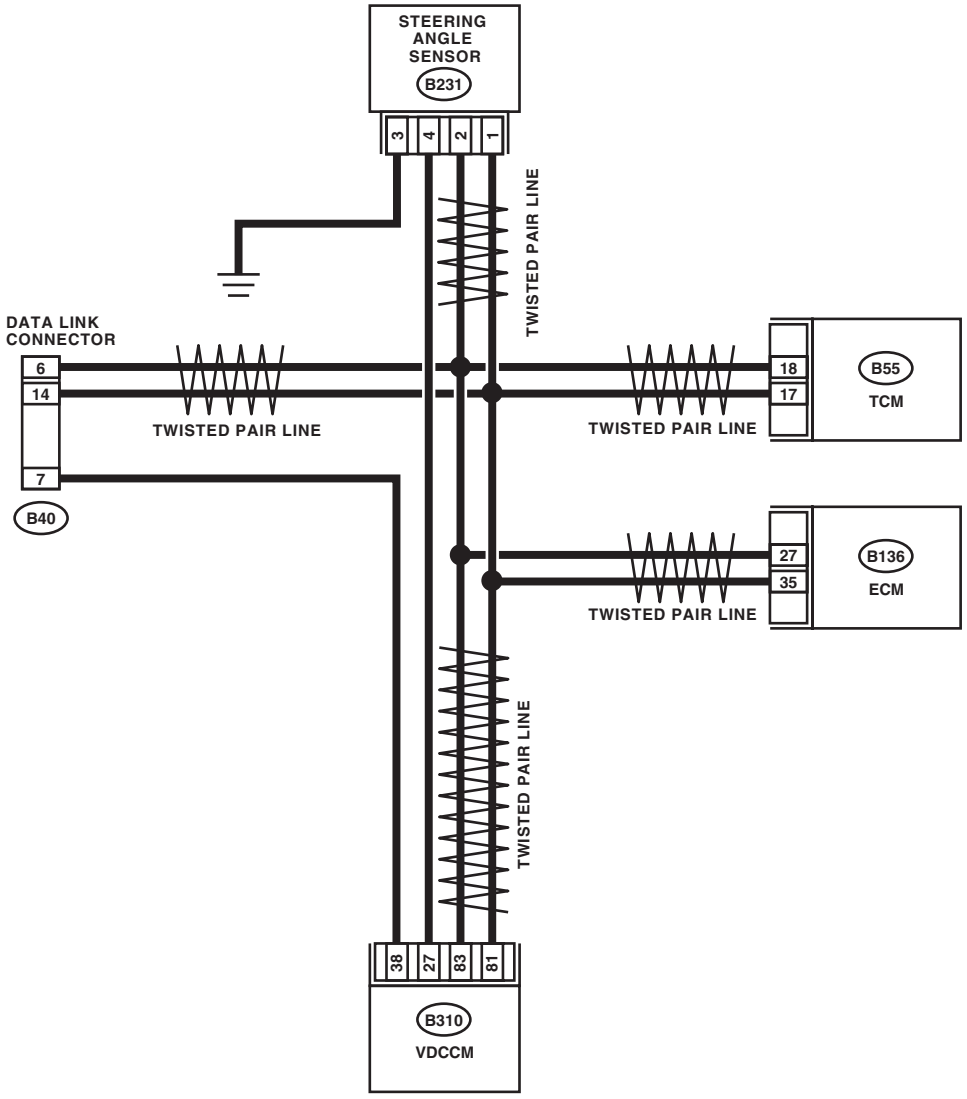
DTC DETECTING CONDITION:

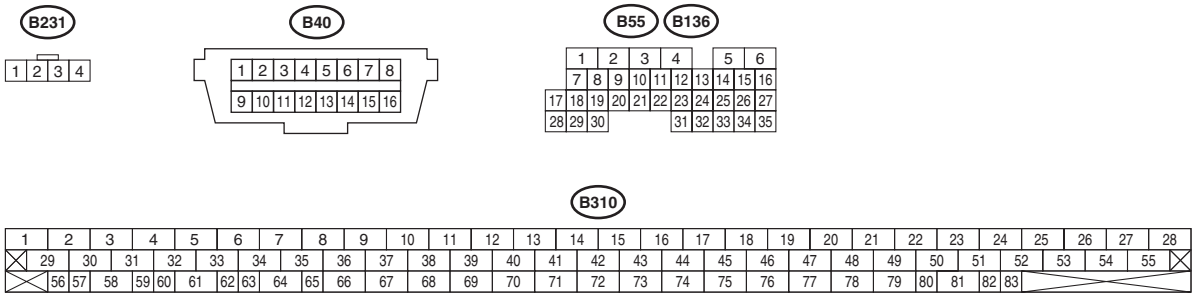
Communication failure between engine control module

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:





VDC00505

	Step	Check	Yes	No
1	**CHECK HARNESS RESISTANCE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector terminals. ***Connector & terminal (B136) No. 35 — No. 27:***	Is the resistance 60±3 Ω?	Go to step **2**.	Repair the harness between ECM and VDCCM.
2	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in ECM connector?	Repair the connector.	Go to step **3**.
3	**CHECK ECM.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the ECM.	Go to step **4**.
4	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AM:DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG

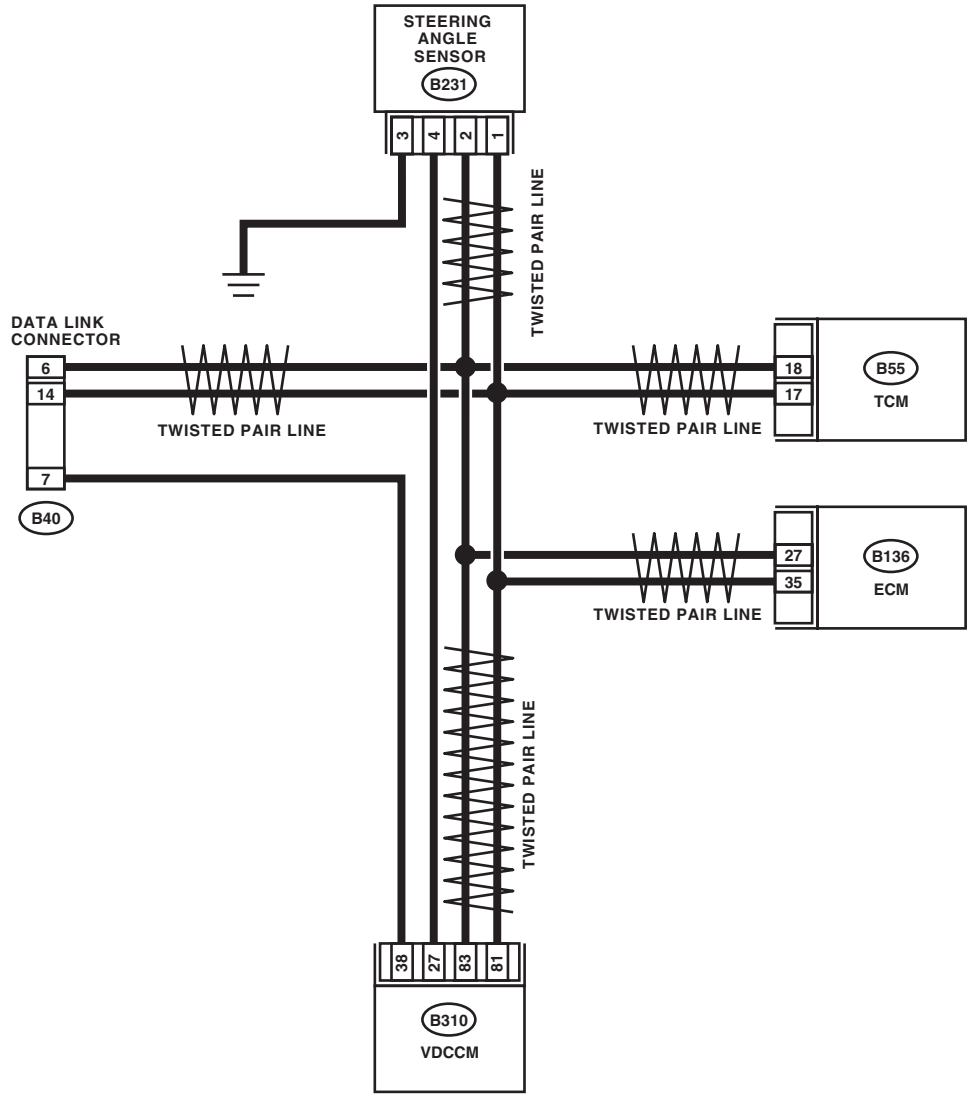
DTC DETECTING CONDITION:

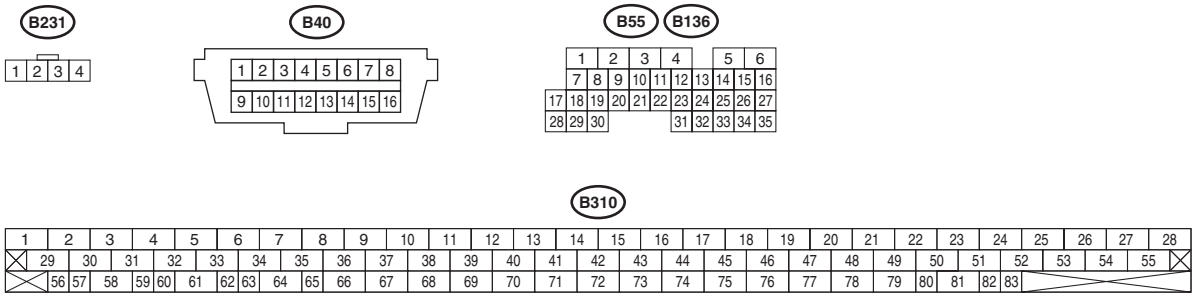
Defective steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:





VDC00505

	Step	Check	Yes	No
1	**CHECK STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight forward direction. 3) Check the steering wheel angle.	Is the deviation from the center of steering wheel less than 5°?	Go to step **2**.	Perform the centering adjustment of steering wheel.
2	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **3**.
3	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AN:DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG

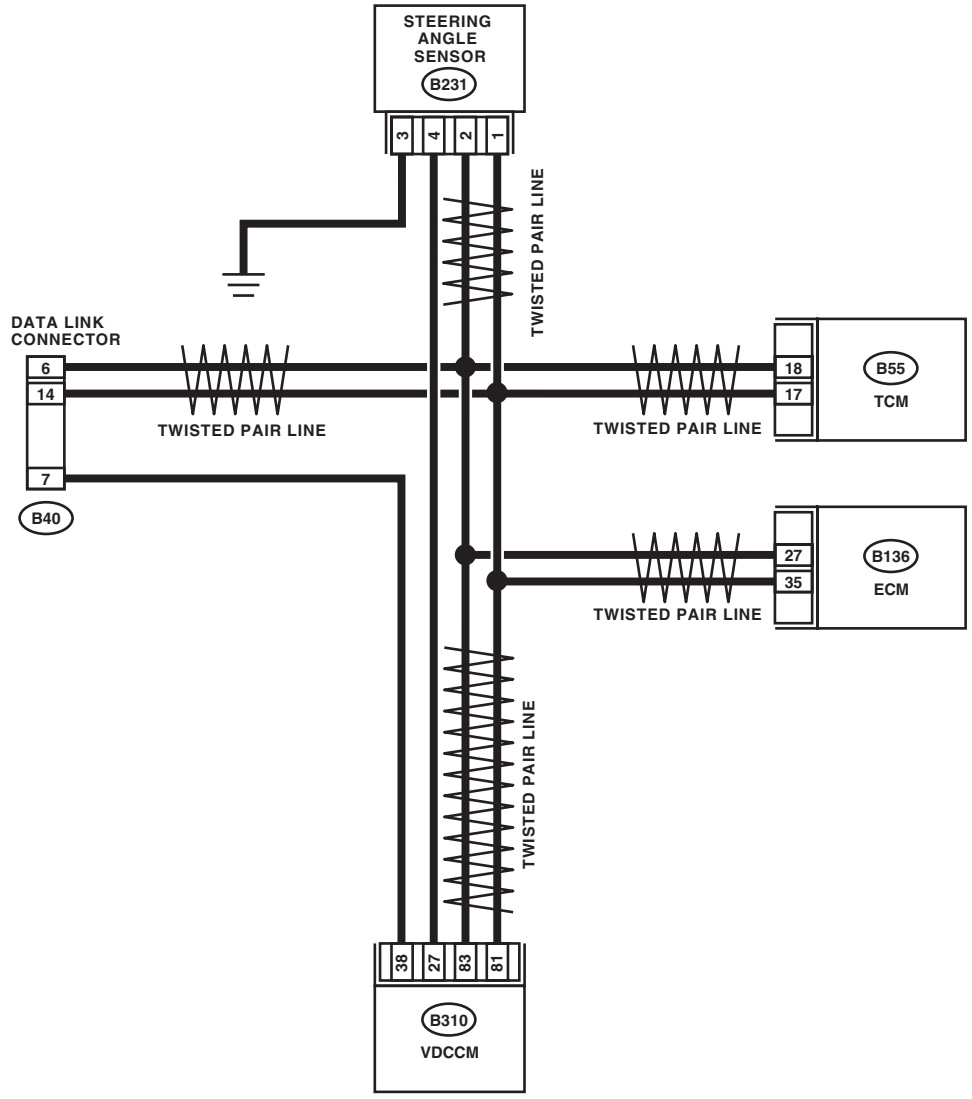
DTC DETECTING CONDITION:

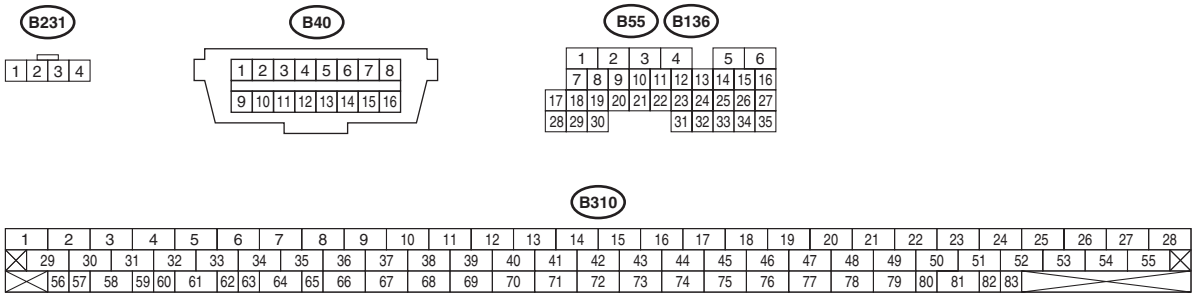
Defective steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:





VDC00505

	Step	Check	Yes	No
1	**CHECK THE VDCCM.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC as current diagnosis still displayed?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **2**.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AO:DTC 71 STEERING ANGLE SENSOR MALFUNCTION

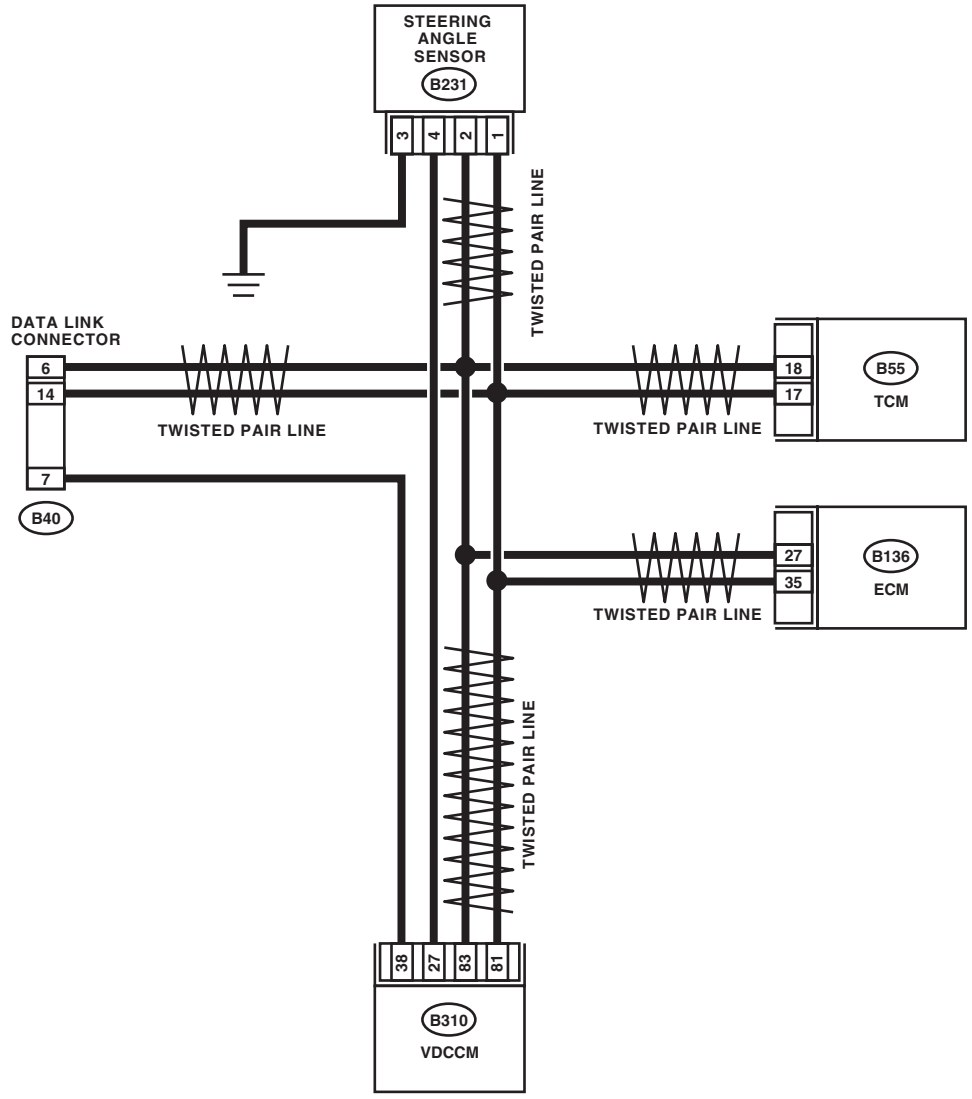
DTC DETECTING CONDITION:

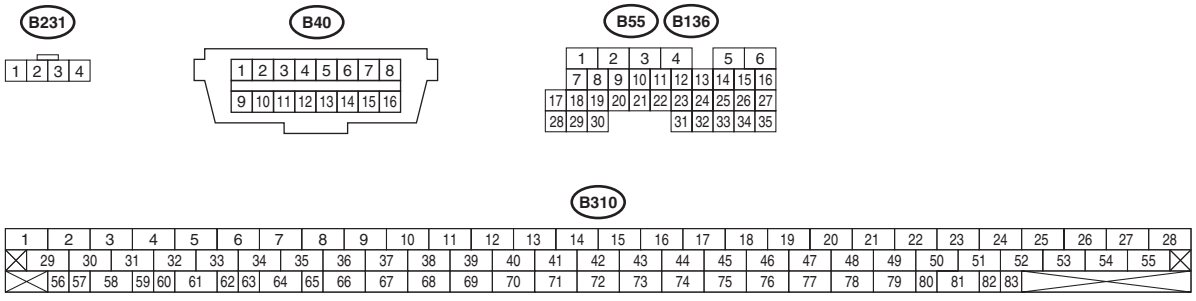
Defective steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:





VDC00505

	Step	Check	Yes	No
1	**CHECK STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight forward direction. 3) Check the steering wheel angle.	Is the angle from the center of steering wheel less than 5°?	Go to step **2**.	Center the steering wheel.
2	**CHECK OUTPUT OF STEERING ANGLE SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the steering sensor output on Subaru Select Monitor display.	Does the output of the steering sensor change on the monitor when the steering wheel turns either way?	Go to step **3**.	Replace the steering angle sensor.
3	**CHECK DRIVING ROAD.** Interview whether the vehicle was driven on the road with banks or sandy surface.	Was the vehicle driven on the road with banks or sandy surface?	If driven on the road with banks or sandy surface, the VDCCM stores the DTC occasionally.	Go to step **4**.
4	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5**.
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AP:DTC 71 STEERING ANGLE SENSOR COMMUNICATION

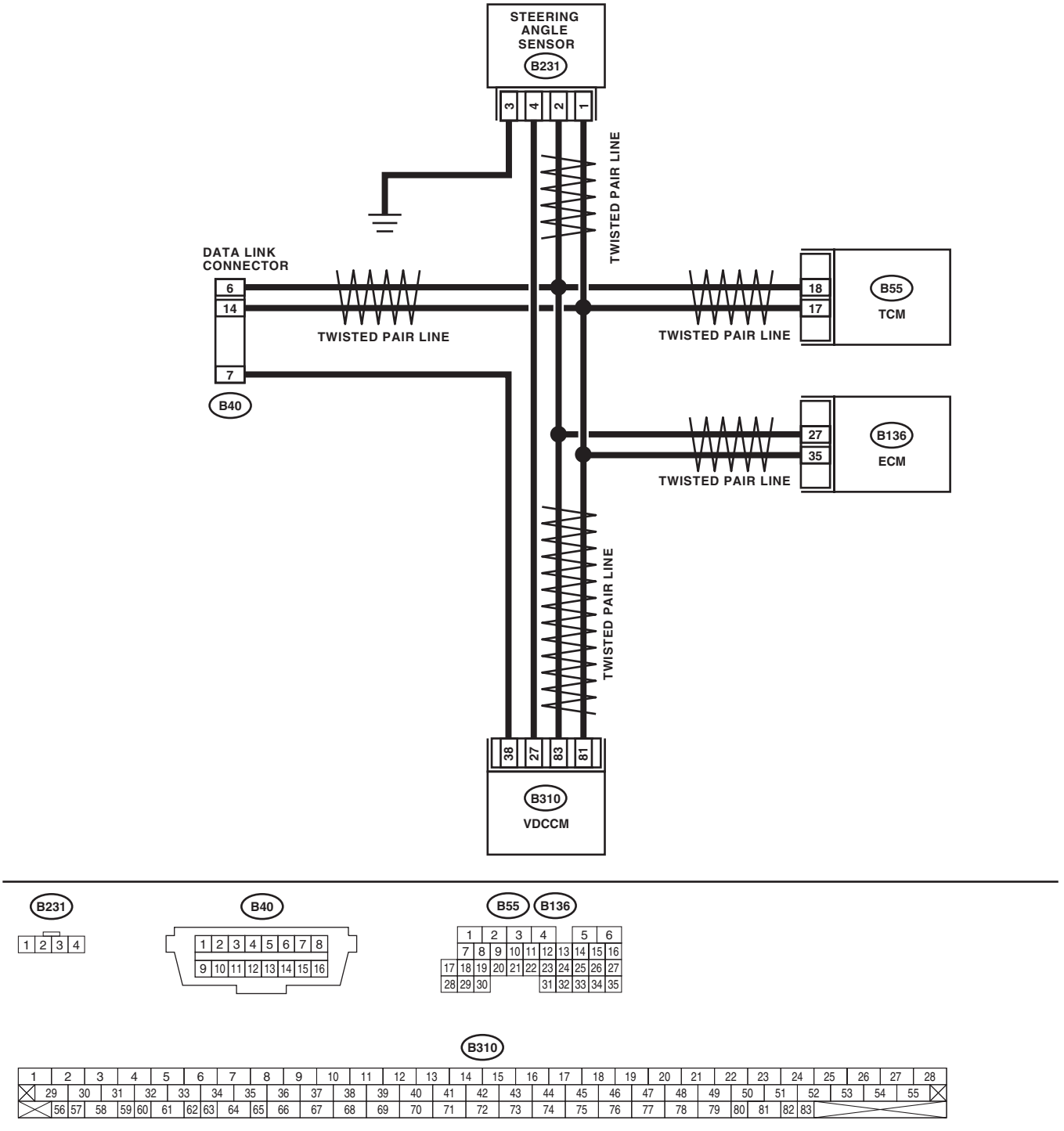
DTC DETECTING CONDITION:

Defective steering angle sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00505

	Step	Check	Yes	No
1	**CHECK STEERING ANGLE SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from steering angle sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Go to step **2**.
2	**CHECK VDCCM OUTPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-16, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 27 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate sensor and VDCCM.	Go to step **3**.
3	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the yaw rate sensor connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.** Measure the resistance between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5**.	Repair the steering angle sensor ground harness.
5	**CHECK STEERING ANGLE SENSOR HARNESS.** 1) Connect the connector to the steering angle sensor. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between the VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 81 — No. 83:***	Is the resistance 120±6 Ω?	Repair the harness between the steering angle sensor and VDCCM.	Go to step **6**.
6	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Go to step **8**.	Go to step **7**.
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.
8	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **9**.
9	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Original steering angle sensor malfunction

AQ:DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT

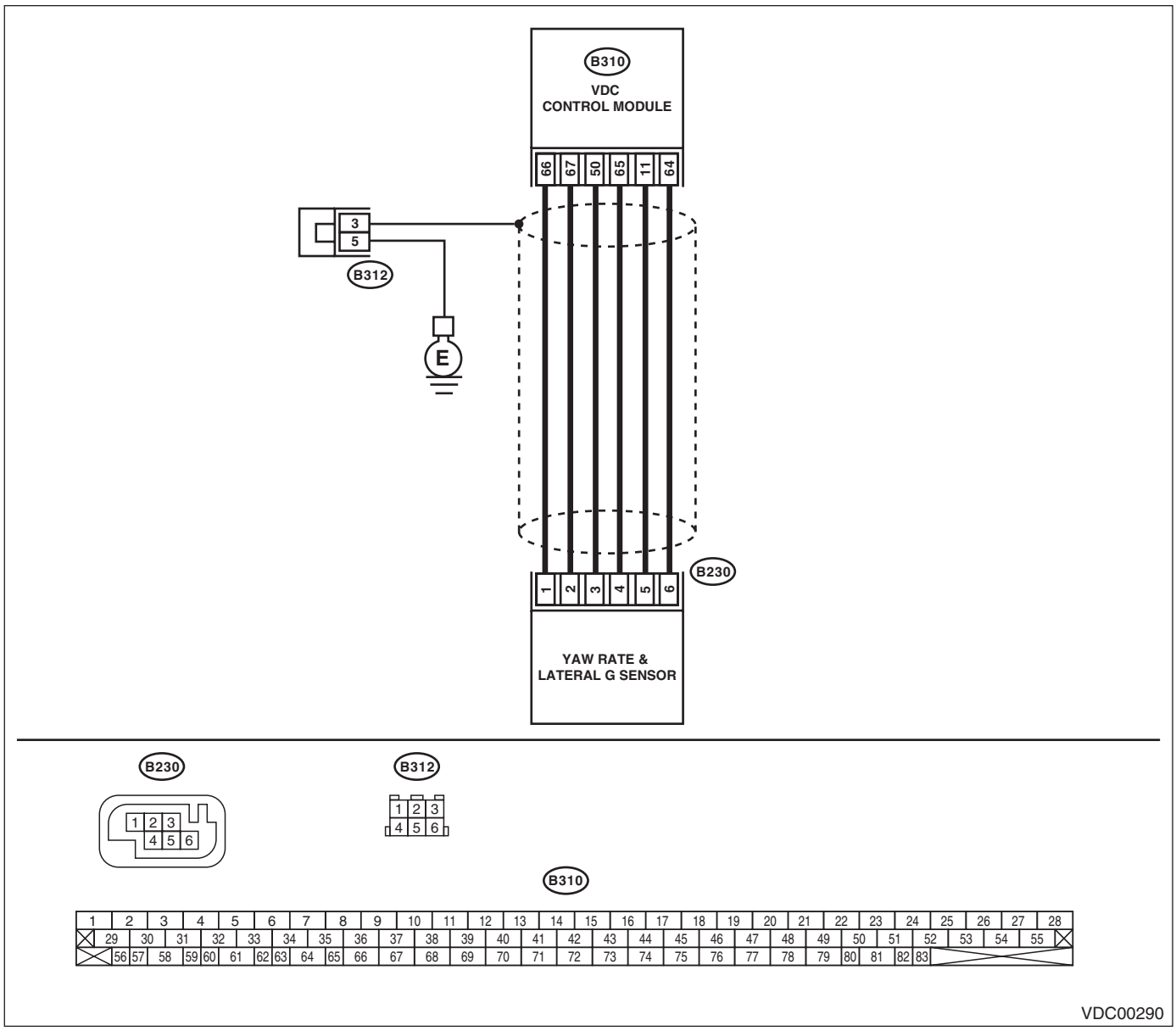
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVING ROAD.** Interview whether the vehicle was driven on the road with banks or sandy surface.	Was the vehicle driven on the road with banks or sandy surface?	If driven on the road with banks or sandy surface, the VDCCM stores the DTC occasionally.	Go to step **2**.
2	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.** Check the yaw rate & lateral G sensor installation.	Is the yaw rate & lateral G sensor tightened securely?	Go to step **3**.	Tighten the yaw rate & lateral G sensor securely.
3	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight forward direction. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the output of the yaw rate & lateral G sensor.	Is the resistance 0±5.25 deg/s?	Go to step **4**.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
4	**CHECK OUTPUT OF STEERING ANGLE SENSOR USING SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight forward direction. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the output of the steering angle sensor.	Is the resistance 0±2.5 deg?	Go to step **5**.	Perform the centering adjustment of steering wheel.
5	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Go to step **7**.	Go to step **6**.
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.
7	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & lateral G sensor. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Go to step **8**.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
8	**CHECK THE DTC DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Malfunction in original yaw rate & lateral G sensor.

AR:DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION

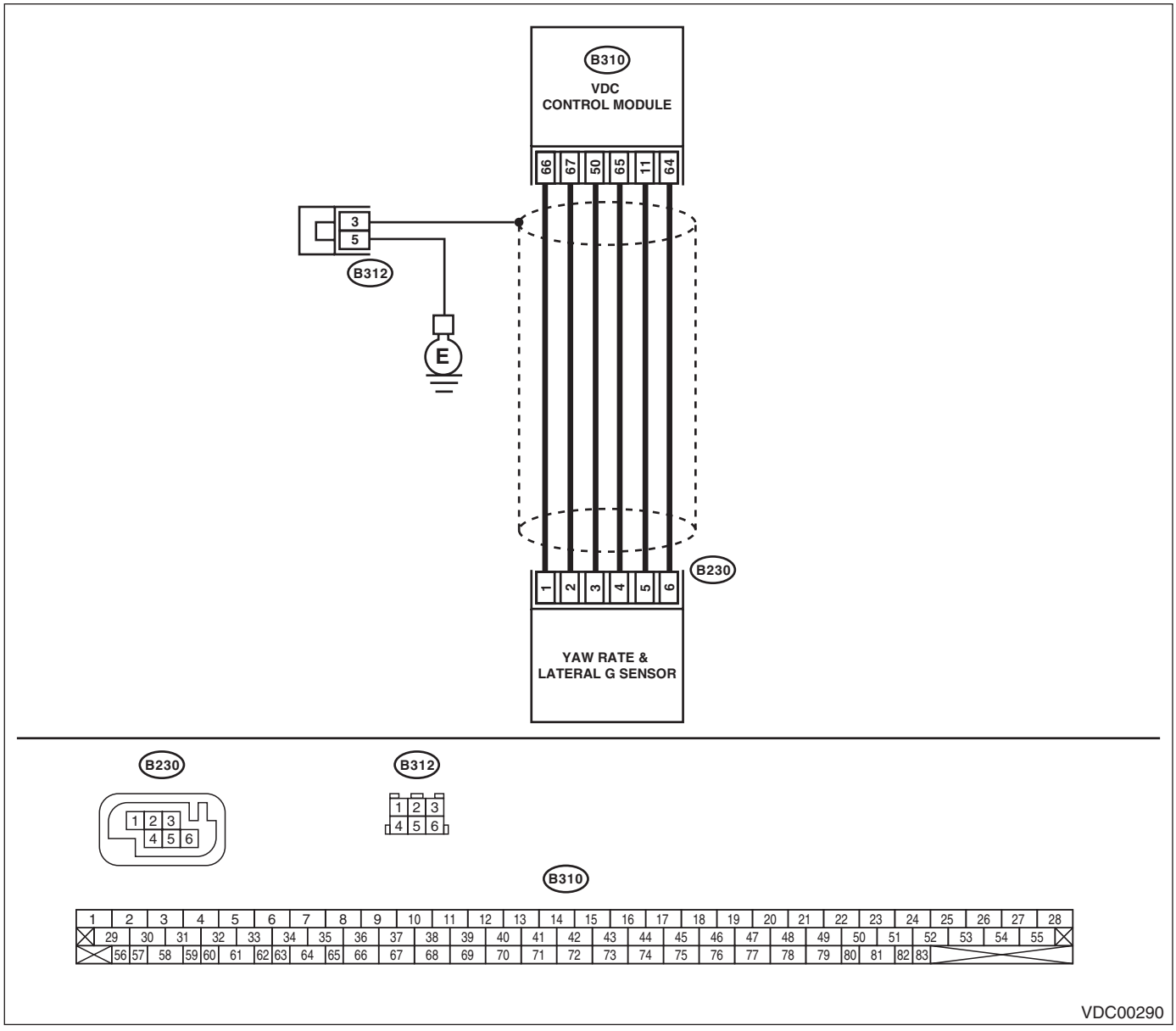
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Go to step **2**.
2	**CHECK VDCCM OUTPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-16, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM.	Go to step **3**.
3	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connector between yaw rate & lateral G sensor?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK YAW RATE & LATERAL G SENSOR HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 65 — (B230) No. 4:***	Is the resistance less than 0.5 Ω?	Go to step **5**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **7**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>	Repair the harness between yaw rate & lateral G sensor and VDCCM.

AS:DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE

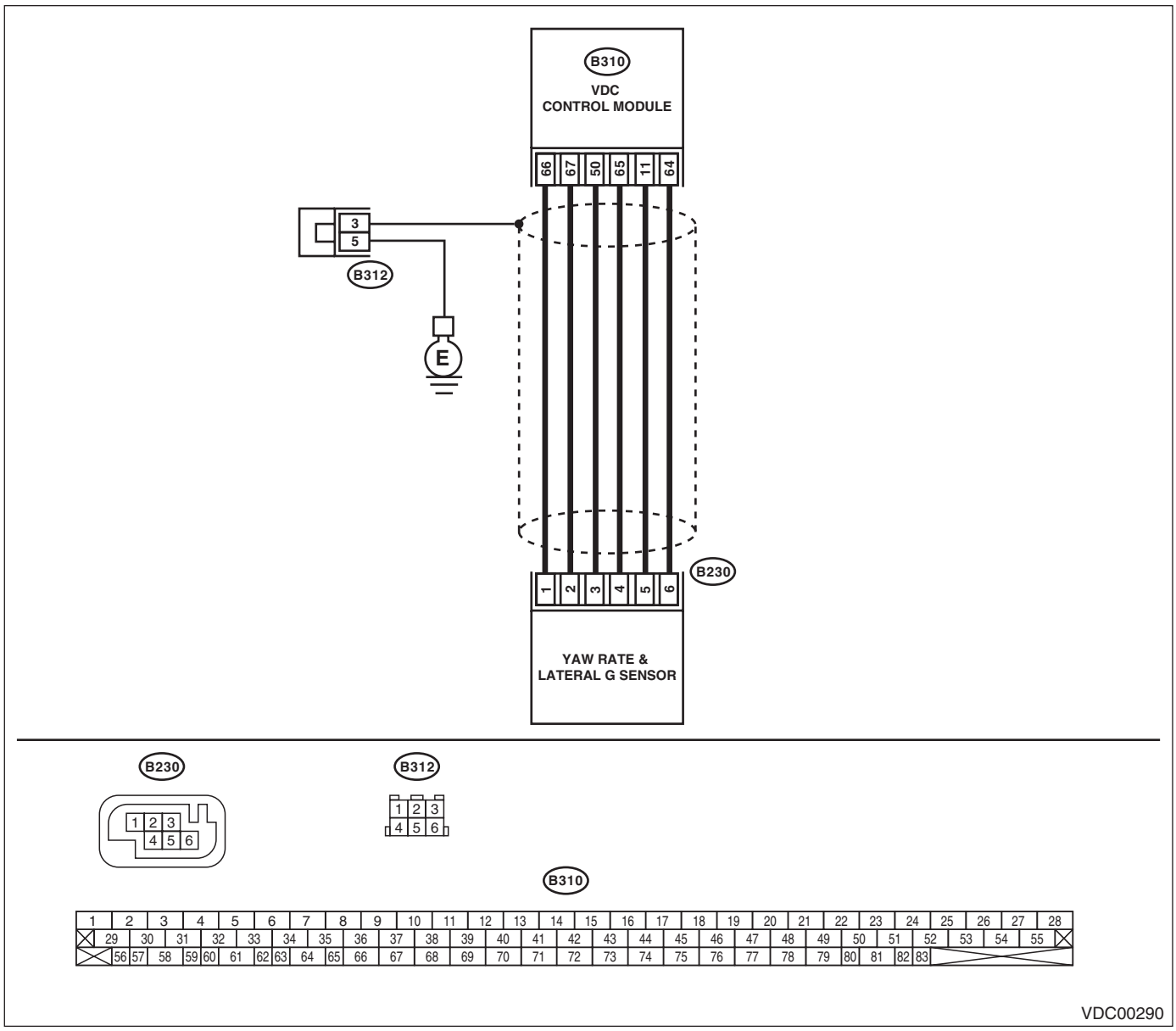
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK VDCCM OUTPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **3**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
3	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connector between yaw rate & lateral G sensor?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK YAW RATE & LATERAL G SENSOR HARNESS.** 1) Disconnect the connectors from VDCCM. 2) Measure the resistance between VDCCM and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 66 — (B230) No. 1:***	Is the resistance less than 0.5 Ω?	Go to step **5**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 66 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 66 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **7**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 66 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **8**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
8	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Install the yaw rate & lateral G sensor to the body. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-16, VDCCM Connector Cover.> 4) Connect all connectors. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 66 (+) — No. 64 (–):***	Is the voltage 2.1 — 2.9 V?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>

AT:DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG

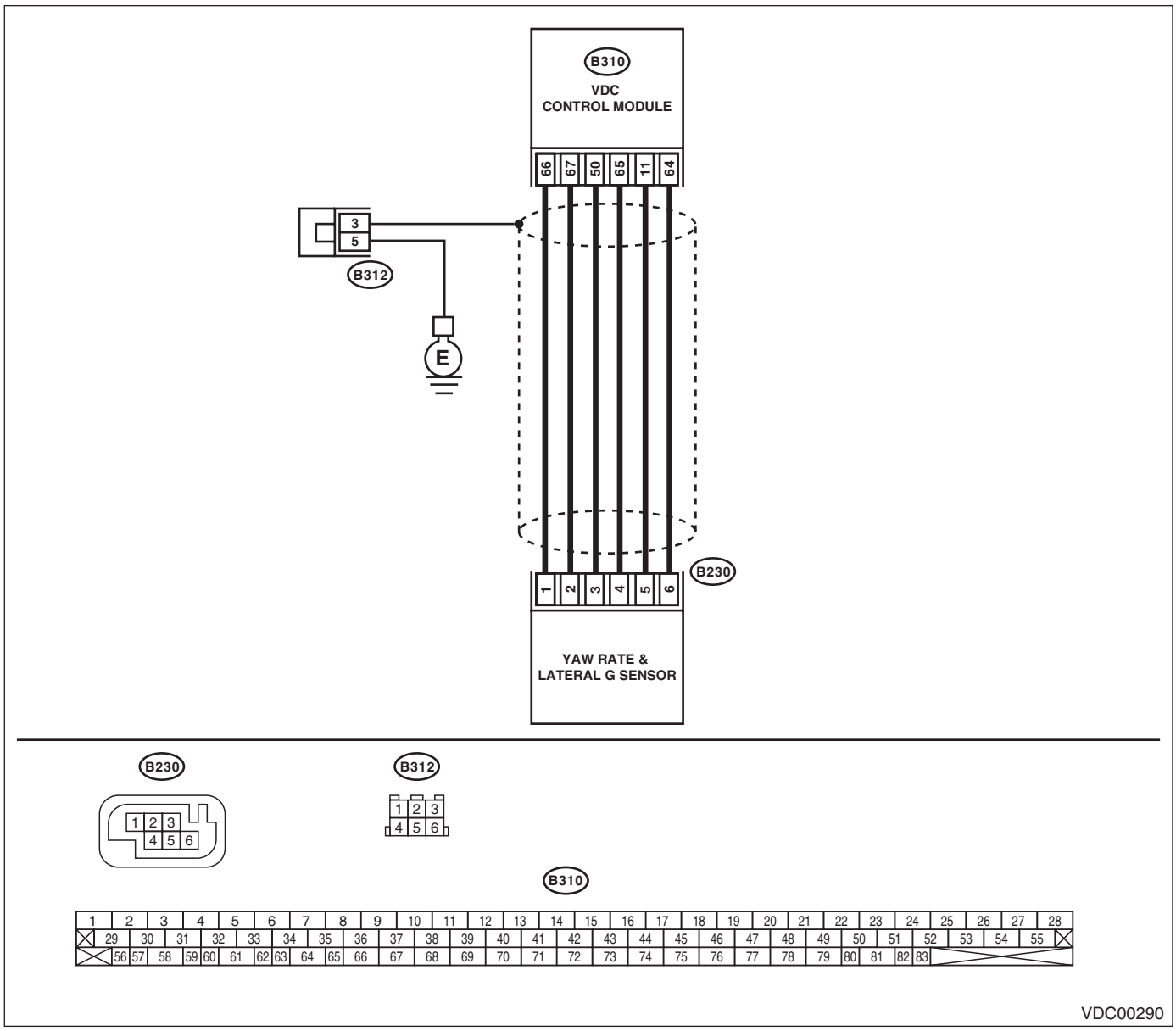
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVING ROAD.** Interview whether the vehicle was driven on the road with banks or sandy surface.	Was the vehicle driven on the road with banks or sandy surface?	If driven on the road with banks or sandy surface, the VDCCM stores the DTC occasionally.	Go to step **2**.
2	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.** Check the yaw rate & lateral G sensor installation.	Is the yaw rate & lateral G sensor tightened securely?	Go to step **3**.	Tighten the yaw rate & lateral G sensor securely.
3	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral sensor and the chassis ground. ***Connector & terminal*** ***(B230) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Go to step **4**.
4	**CHECK VDCCM OUTPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM.	Go to step **5**.
5	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connector between yaw rate & lateral G sensor?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	**CHECK YAW RATE & LATERAL G SENSOR GROUND CIRCUIT.** Measure the resistance between the yaw rate & lateral G sensor and the chassis ground. ***Connector & terminal*** ***(B230) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **9**.	Go to step **7**.
7	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect the connectors from VDCCM. 2) Remove the VDCCM connector cover. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 3) Connect the connector to the VDCCM. 4) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 64 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Repair the harness between yaw rate & lateral G sensor and VDCCM.	Go to step **8**.
8	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
9	**CHECK YAW RATE & LATERAL G SENSOR HARNESS.** 1) Disconnect the connectors from VDCCM. 2) Measure the resistance between VDCCM and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 65 — (B230) No. 4:*** ***(B310) No. 66 — (B230) No. 1:*** ***(B310) No. 67 — (B230) No. 2:***	Is the resistance less than 0.5 Ω?	Go to step **10**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
10	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 — Chassis ground:*** ***(B310) No. 66 — Chassis ground:*** ***(B310) No. 67 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **11**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
11	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 (+) — Chassis ground (–):*** ***(B310) No. 66 (+) — Chassis ground (–):*** ***(B310) No. 67 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **12**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 (+) — Chassis ground (–):*** ***(B310) No. 66 (+) — Chassis ground (–):*** ***(B310) No. 67 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **13**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
13	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Install the yaw rate & lateral G sensor to the body. 3) Connect all connectors. 4) Turn the ignition switch to ON. 5) Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B310) No. 66 (+) — No. 64 (–):***	Is the voltage 2.1 — 2.9 V?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>

AU:DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG

NOTE:
Refer to DTC 73 for the diagnostic procedure. <Ref. to VDC(diag)-120, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT

NOTE:
Refer to DTC 73 for the diagnostic procedure. <Ref. to VDC(diag)-120, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

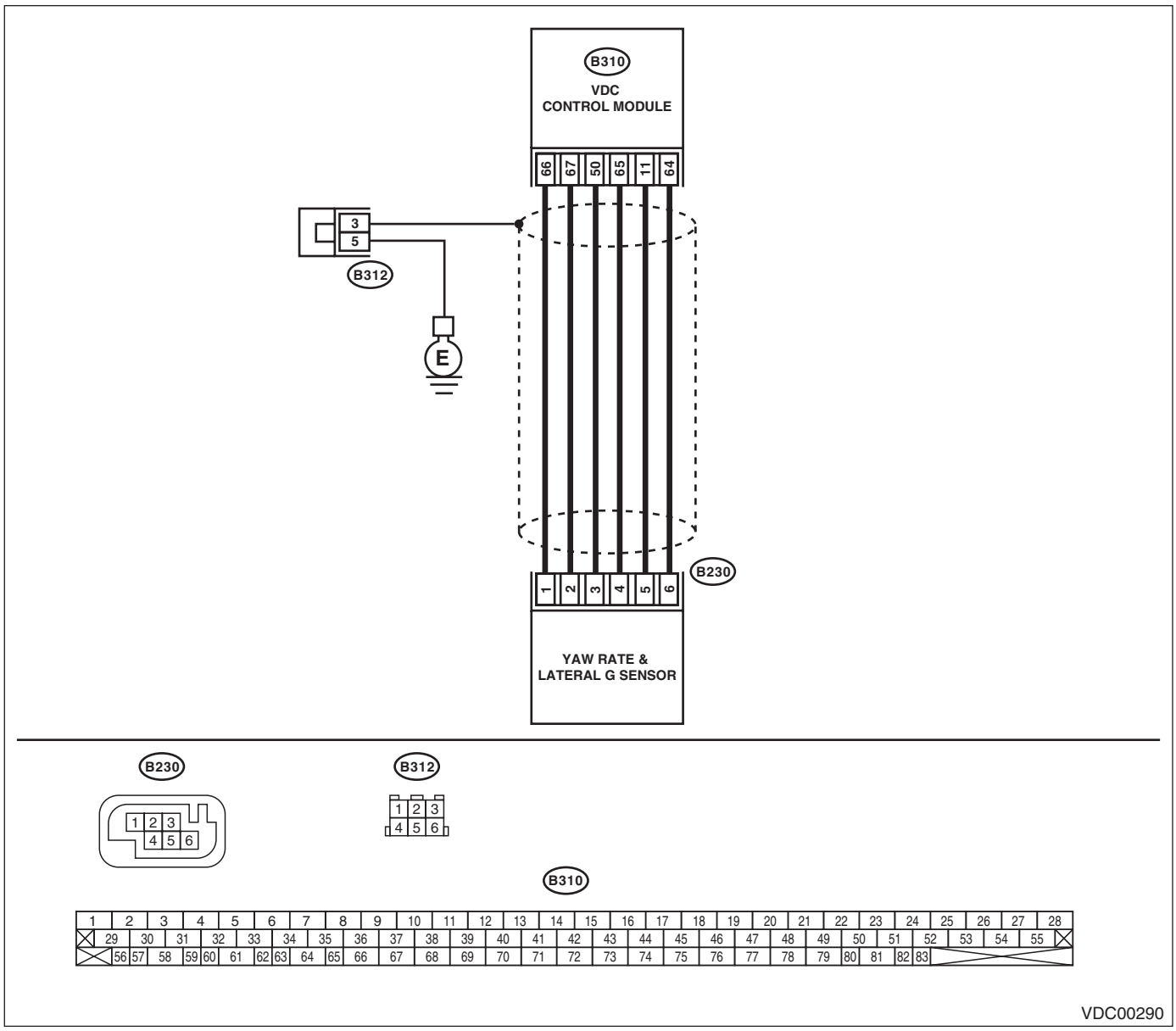
AW:DTC 73 CHANGE RANGE OF LATERAL G SENSOR SIGNAL IS TOO BIG

NOTE:
Refer to DTC 73 for the diagnostic procedure. <Ref. to VDC(diag)-120, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AX:DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL

DTC DETECTING CONDITION:
Lateral G sensor malfunction
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:

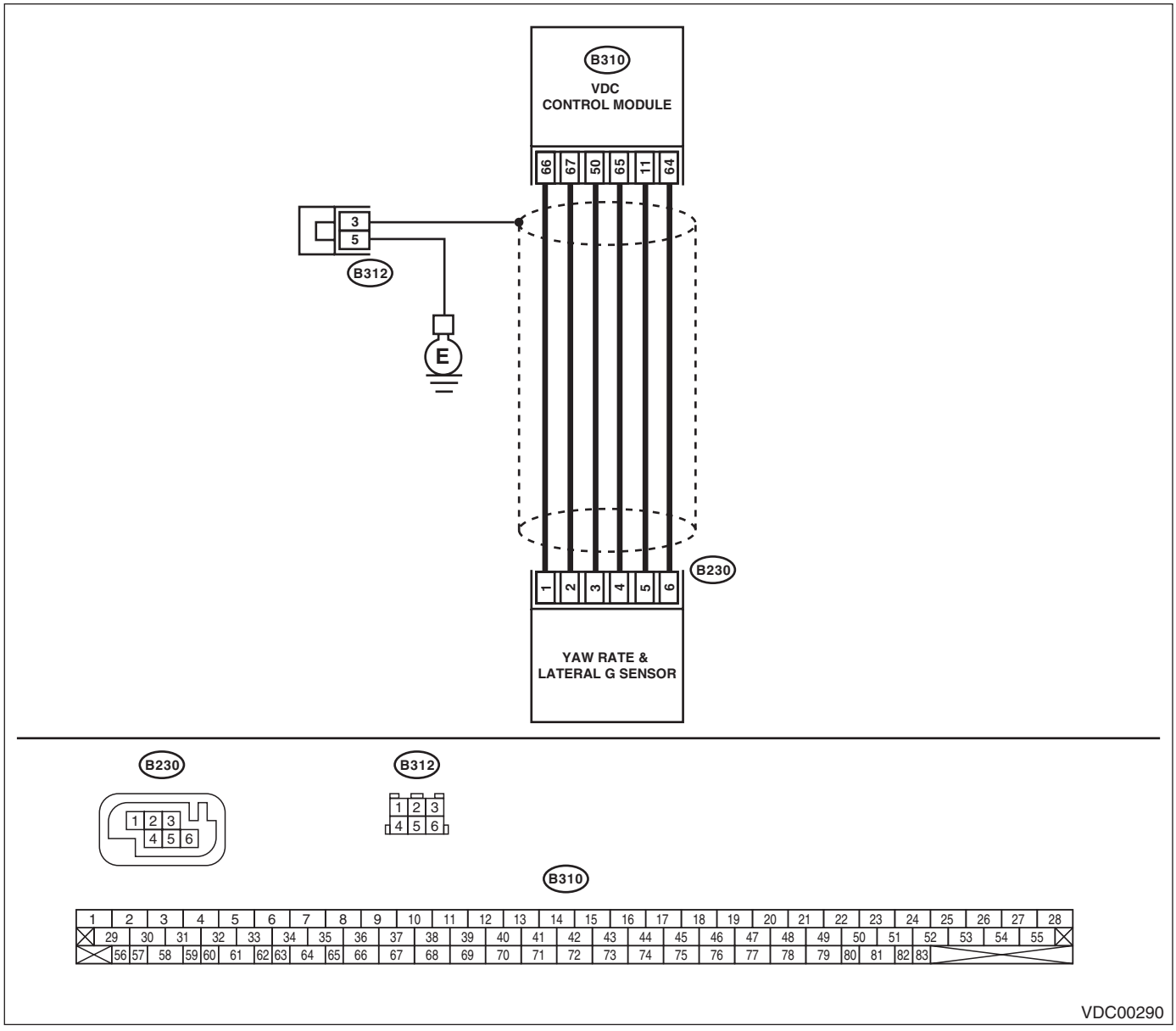


	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.** Check the yaw rate & lateral G sensor installation.	Is the yaw rate & lateral G sensor tightened securely?	Go to step **2**.	Tighten the yaw rate & lateral G sensor securely.
2	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Stop the vehicle on a flat road. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the output of the yaw rate & lateral G sensor.	Is the resistance 2.5±0.2 V?	Go to step **3**.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
3	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between VDCCM and yaw rate & lateral G sensor?	Repair the connector.	Go to step **4**.
4	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5**.
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AY:DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION

DTC DETECTING CONDITION:
Lateral G sensor malfunction
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Stop the vehicle on a flat road. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the output of the yaw rate & lateral G sensor.	Is the resistance 2.5±0.2 V?	Go to step **2**.	Go to step **5**.
2	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between VDCCM and yaw rate & lateral G sensor?	Repair the connector.	Go to step **3**.
3	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **4**.
4	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.
5	**CHECK YAW RATE & LATERAL G SENSOR INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Disconnect the connector from yaw rate & lateral G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B230) No. 3 (+) — No. 6 (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Repair the harness or connector between yaw rate & lateral G sensor and VDCCM.
6	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between yaw rate & lateral G sensor terminals. ***Terminals*** ***No. 5 — No. 6:***	Is the resistance between 4.3 — 4.9 kΩ?	Go to step **7**.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
7	**CHECK OPEN CIRCUIT FOR OUTPUT HARNESS AND GROUND HARNESS OF YAW RATE & LATERAL G SENSOR.** 1) Connect the connector to the yaw rate & lateral G sensor. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between the VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 11 — No. 64:***	Is the resistance between 4.3 — 4.9 kΩ?	Go to step **8**.	Repair the harness connector between yaw rate & lateral G sensor and VDCCM.
8	**CHECK GROUND SHORT IN YAW RATE & LATERAL G SENSOR HARNESS.** 1) Disconnect the connector from yaw rate & lateral G sensor. 2) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 11 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **9**.	Repair the harness between yaw rate & lateral G sensor and VDCCM.

	Step	Check	Yes	No
9	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & lateral G sensors from vehicle. 3) Connect the connector to the yaw rate & lateral G sensor. 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B230) No. 5 (+) — No. 6 (–):***	Is the voltage 2.3 — 2.7 V when yaw rate & lateral G sensor is on a level?	Go to step **10**.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
10	**CHECK YAW RATE & LATERAL G SENSOR.** Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B230) No. 5 (+) — No. 6 (–):***	Is the voltage 3.3 — 3.7 V when yaw rate & lateral G sensor is inclined 90° to the left?	Go to step **11**.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
11	**CHECK YAW RATE & LATERAL G SENSOR.** Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B230) No. 5 (+) — No. 6 (–):***	Is the voltage 1.3 — 1.7 V when yaw rate & lateral G sensor is inclined 90° to the right?	Go to step **12**.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
12	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connector between VDCCM and yaw rate & lateral G sensor?	Repair the connector.	Go to step **13**.
13	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **14**.
14	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

AZ:DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 1 EXCEEDS SPECIFICATION

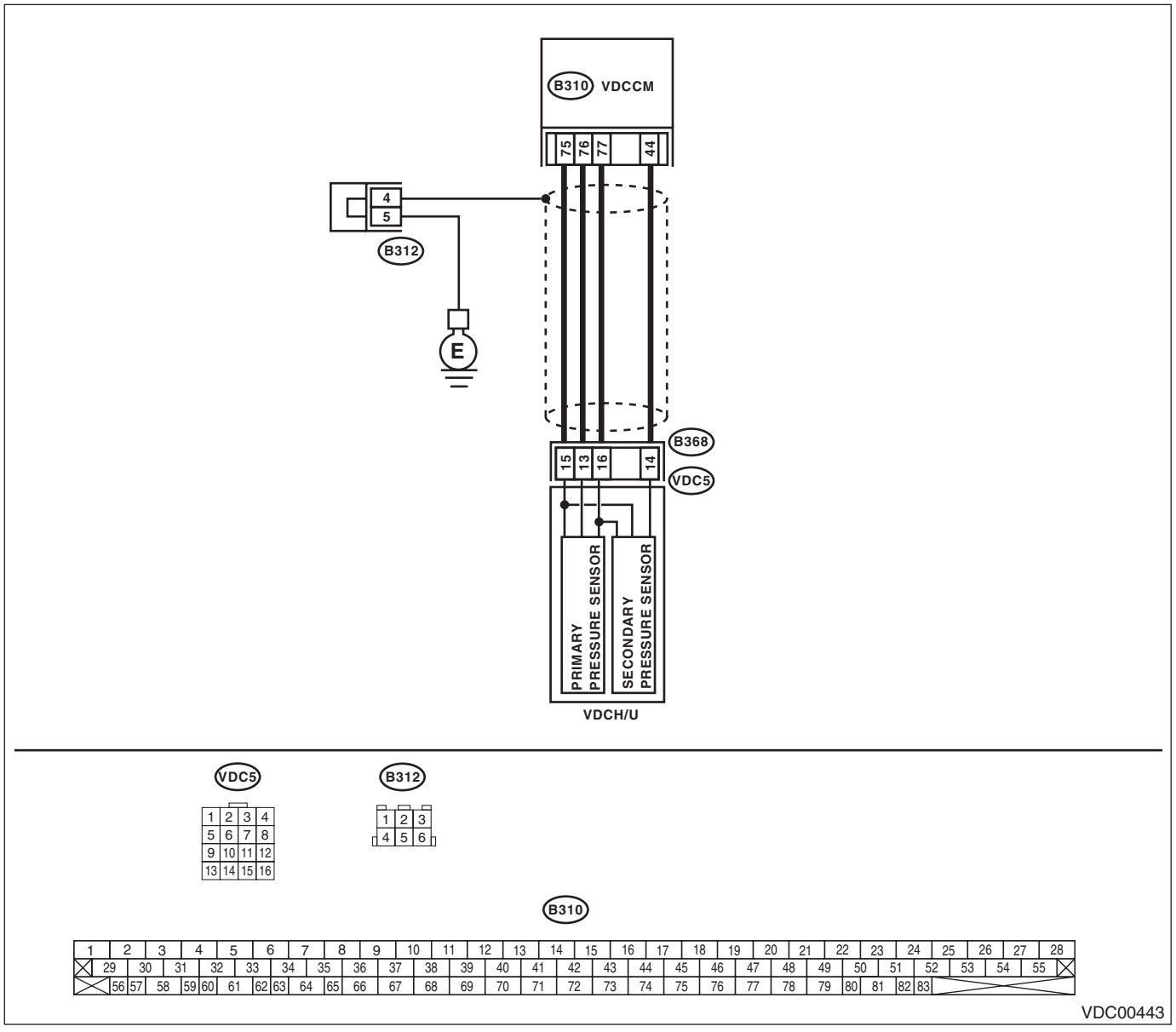
DTC DETECTING CONDITION:

Primary pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



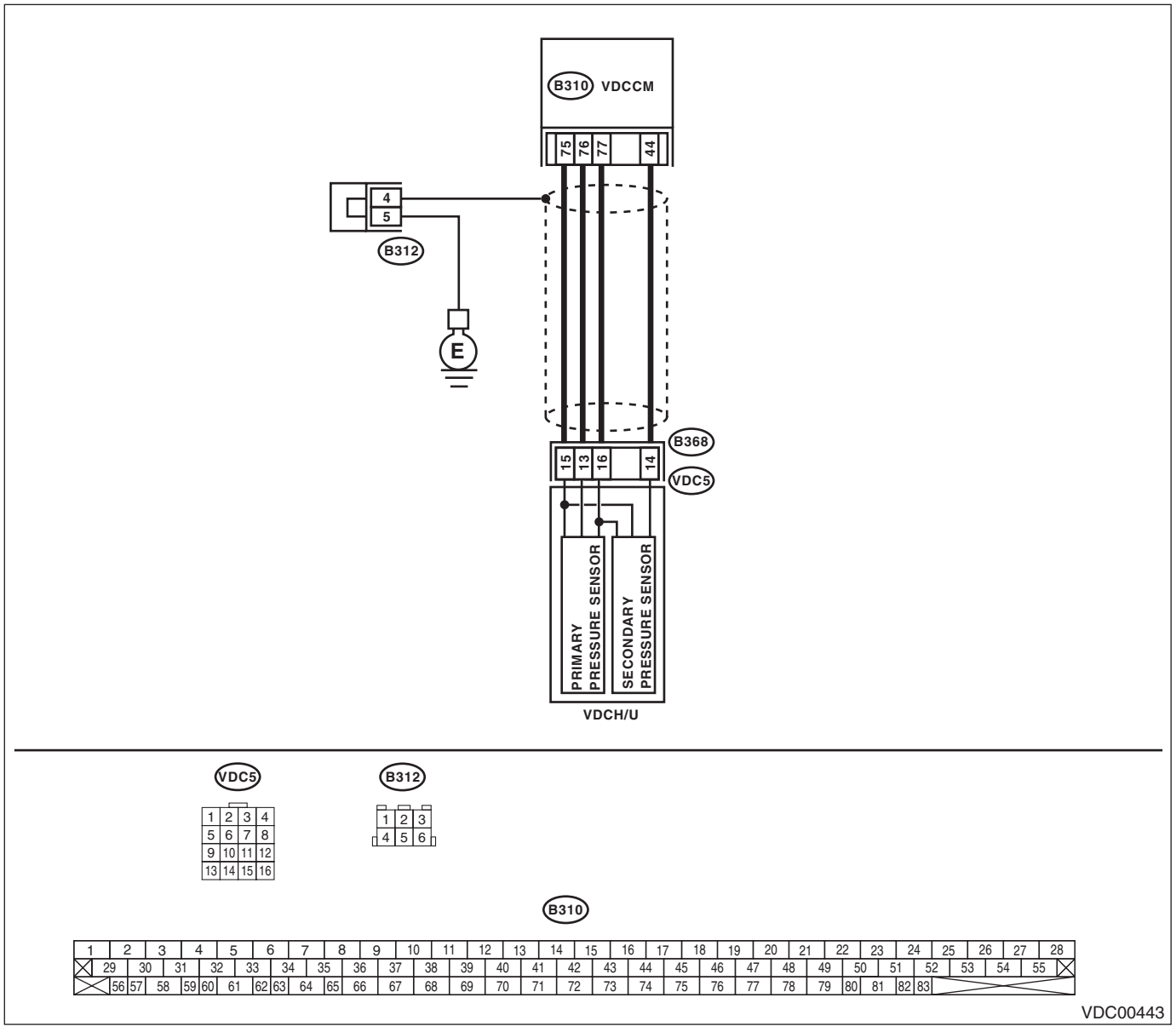
	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors (B368) from VDCH/U. 3) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Go to step **2**.
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect the connectors from VDCCM. 2) Remove the cover from VDCCM. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 3) Connect the connector to the VDCCM. 4) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 75 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Replace the harness between VDCH/U and VDCCM.	Go to step **3**.
3	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY FOR PRESSURE SENSOR.** NOTE: When performing this inspection, DTC 51 VALVE RELAY MALFUNCTION is stored. However, this does not indicate a malfunction of valve relay. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(B368) No. 16 (+) — No. 15 (–):***	Is the voltage 4.75 — 5.25 V?	Go to step **7**.	Go to step **5**.
5	**CHECK VDCCM POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the cover from VDCCM. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 77 (+) — No. 75 (–):***	Is the voltage 4.75 — 5.25 V?	Repair the harness between VDCH/U and VDCCM.	Go to step **6**.
6	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
7	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 13 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Repair the harness between VDCH/U and VDCCM.
8	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **9**.	Repair the harness between VDCH/U and VDCCM.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **10**.	Repair the harness between VDCH/U and VDCCM.
10	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the cover from VDCCM. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Connect all connectors. 6) Turn the ignition switch to ON. 7) Do not depress the brake pedal. 8) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 76 (+) — No. 75 (–):***	Is the voltage 0.48 — 0.72 V?	Go to step **11**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
11	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connectors between VDCCM and pressure sensor?	Repair the connector.	Go to step **12**.
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13**.
13	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

BA:DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 2 EXCEEDS SPECIFICATION

DTC DETECTING CONDITION:
Secondary pressure sensor malfunction
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors (B368) from VDCH/U. 3) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4**.	Go to step **2**.
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect the connectors from VDCCM. 2) Remove the cover from VDCCM. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 3) Connect the connector to the VDCCM. 4) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 75 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Replace the harness between VDCH/U and VDCCM.	Go to step **3**.
3	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY FOR PRESSURE SENSOR.** NOTE: When performing this inspection, DTC 51 VALVE RELAY MALFUNCTION is stored. However, this does not indicate a malfunction of valve relay. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(B368) No. 16 (+) — No. 15 (–):***	Is the voltage 4.75 — 5.25 V?	Go to step **7**.	Go to step **5**.
5	**CHECK VDCCM POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the cover from VDCCM. <Ref. to VDC(diag)-16, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 77 (+) — No. 75 (–):***	Is the voltage 4.75 — 5.25 V?	Repair the harness between VDCH/U and VDCCM.	Go to step **6**.
6	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
7	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 14 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Repair the harness between VDCH/U and VDCCM.
8	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **9**.	Repair the harness between VDCH/U and VDCCM.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 13 (+) — Chassis ground (–):*** ***(B368) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **10**.	Repair the harness between VDCH/U and VDCCM.
10	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the cover from VDCCM. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Connect all connectors. 6) Turn the ignition switch to ON. 7) Do not depress the brake pedal. 8) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 44 (+) — No. 75 (–):***	Is the voltage 0.48 — 0.72 V?	Go to step **11**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
11	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connectors between VDCCM and pressure sensor?	Repair the connector.	Go to step **12**.
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13**.
13	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

BB:DTC 74 PRESSURE SENSOR 1 OFFSET IS TOO BIG

NOTE:
Refer to DTC 74 for the diagnostic procedure. <Ref. to VDC(diag)-131, DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG

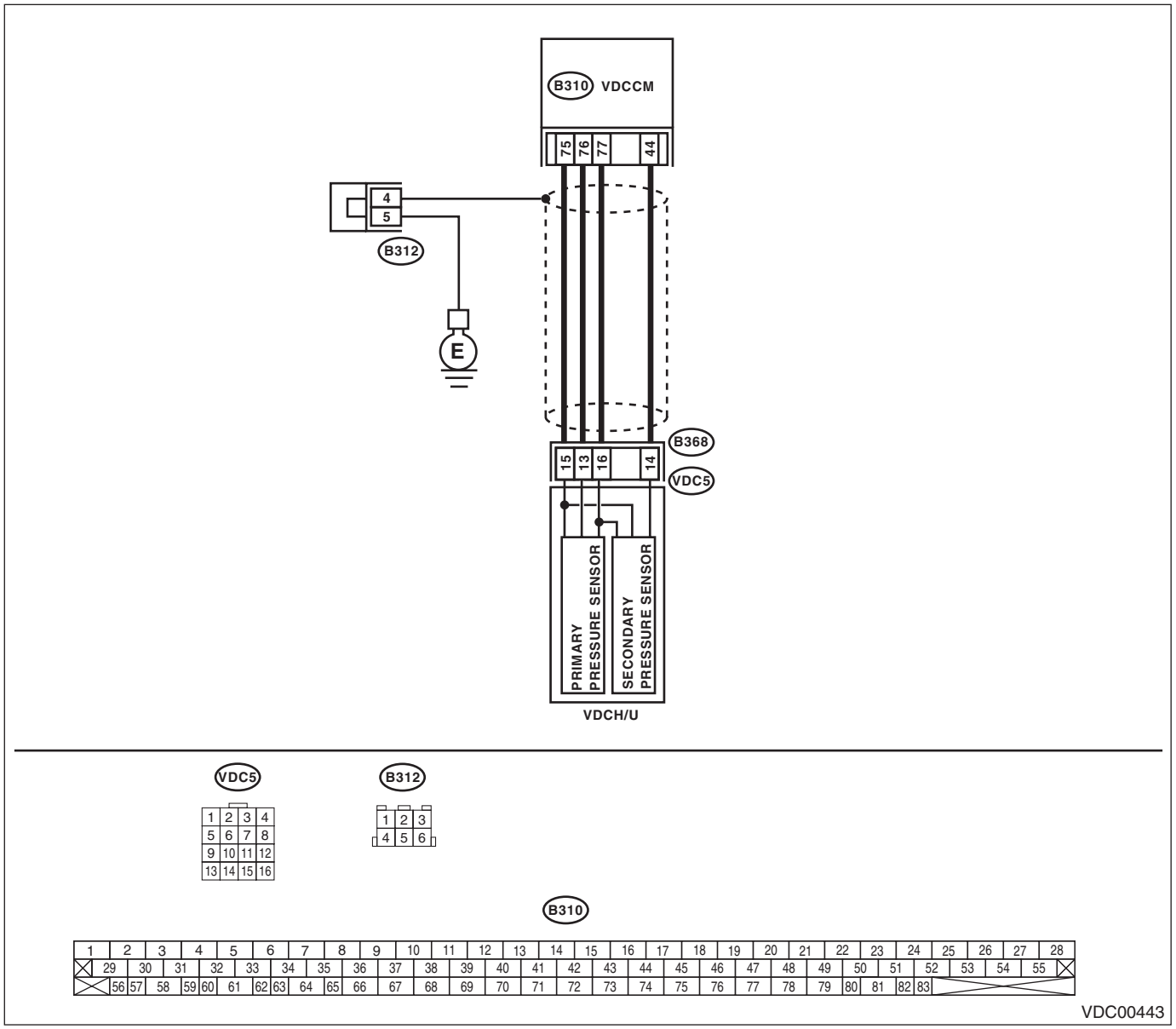
DTC DETECTING CONDITION:

Pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK USER DRIVING METHOD.** Interview the user about their driving habits.	Are the acceleration pedal and brake pedal depressed simultaneously while driving?	Erase the normal DTC for the VDC. NOTE: If the vehicle is driven while both the accelerator pedal and brake pedal are used, the DTC is sometimes stored in memory.	Go to step **2**.
2	**CHECK OUTPUT OF THE PRESSURE SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the output of the pressure sensor.	Is the output value 0.6±0.12 V when the brake pedal is not depressed?	Go to step **3**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
3	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **4**.
4	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

BD:DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG

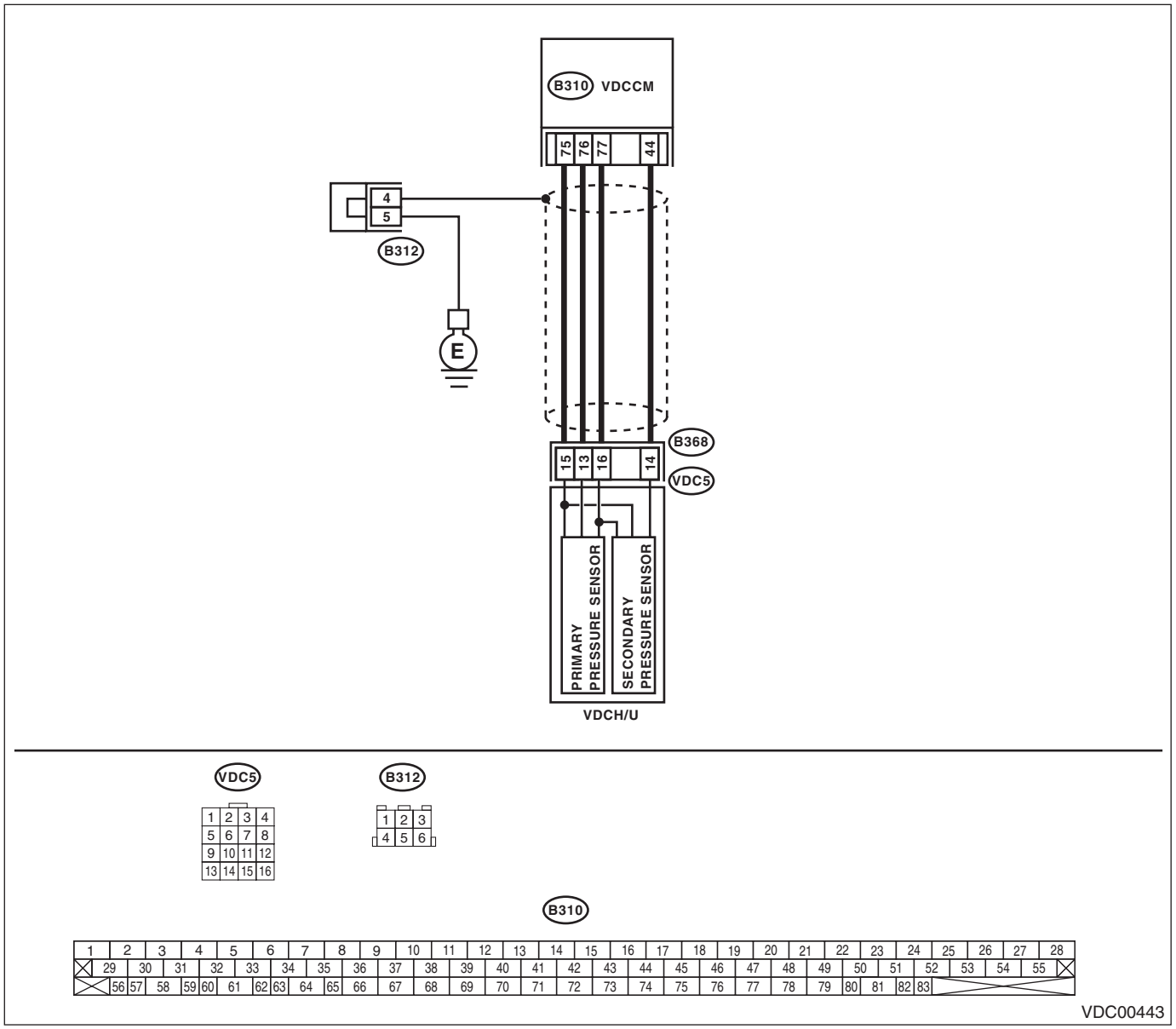
DTC DETECTING CONDITION:

Pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Disconnect the connectors (B368) from VDCH/U. 4) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 13 — Chassis ground:*** ***(B368) No. 14 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the harness between VDCH/U and VDCCM.
2	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 13 (+) — Chassis ground (–):*** ***(B368) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **3**.	Repair the harness between VDCH/U and VDCCM.
3	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(B368) No. 13 (+) — Chassis ground (–):*** ***(B368) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **4**.	Repair the harness between VDCH/U and VDCCM.
4	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the cover from VDCCM. <Ref. to VDC(diag)-16, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Connect all connectors. 6) Turn the ignition switch to ON. 7) Do not depress the brake pedal. 8) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 76 (+) — No. 75 (–):*** ***(B310) No. 44 (+) — No. 75 (–):***	Is the voltage 0.48 — 0.72 V?	Go to step **5**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
5	**CHECK FOR BRAKE FLUID LEAKS.** Check for fluid leaks between brake master cylinder and VDCH/U.	Is brake fluid leaking?	Retighten or replace.	Go to step **6**.
6	**CHECK BRAKE MASTER CYLINDER.** Check the brake master cylinder oil pressure. <Ref. to BR-40, OPERATION CHECK (WITH GAUGE), INSPECTION, Brake Booster.>	Is oil pressure normal?	Go to step **7**.	Replace the master cylinder.
7	**CHECK BRAKE PEDAL STROKE.** Measure the stroke of the brake pedal at 50 kg (110 lb).	Is the stroke less than 105 mm (4.13 in)?	Go to step **8**.	Bleed the air of brake system.
8	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Depress the brake pedal with the force of 50 kg (110 lb). 2) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 76 (+) — No. 75 (–):*** ***(B310) No. 44 (+) — No. 75 (–):***	Is the voltage less than 0.2 V?	Go to step **9**.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

	Step	Check	Yes	No
9	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact in connectors between VDCCM and pressure sensor?	Repair the connector.	Go to step **10**.
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11**.
11	**CHECK ANY OTHER DTC ON DISPLAY.**	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

14.General Diagnostic Table

A: INSPECTION

Symptom		Main probable cause	Other probable cause
Poor brake performance	Long braking/ stopping distance	• VDCH/U • VDCCM • Brake pad • Air in brake line • Tire specifications, tire wear and air pressure • Incorrect wiring or piping	• ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Master cylinder • Brake caliper • Disc rotor • Brake pipe • Brake booster
	Wheels lock-up.	• VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Incorrect wiring or piping	• Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake caliper • Brake pipe
	Brake drag	• VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Master cylinder • Brake caliper • Parking brake • Axle & wheels • Brake pedal play	• Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake pad • Brake pipe
	Brake pedal stroke is large.	• Air in brake line • Brake pedal play	• VDCH/U • Master cylinder • Brake caliper • Brake pad • Brake pipe • Brake booster
	Vehicle pitching	• VDCH/U • VDCCM • Uneven road surface • Suspension play or fatigue (Decreased damping force) • Incorrect wiring or piping	• ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction
Poor brake performance	Unbalance braking or unbalanced braking effect	• VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Brake caliper • Brake pad • Uneven road surface • Tire specifications, tire wear and air pressure • Incorrect wiring or piping	• ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Master cylinder • Disc rotor • Brake pipe • Axle & wheels • Crown shaped road/road with banks • Suspension play or fatigue (Decreased damping force)

Symptom		Main probable cause	Other probable cause
Vibration and noise • When braking suddenly • When accelerating suddenly • When driving on slippery road surfaces	Excessive brake pedal vibration	• Uneven road surface • Incorrect wiring or piping	• VDCH/U • Brake booster • Suspension play or fatigue (Decreased damping force)
	Noise from VDCH/U	• VDCH/U (mount bushing) • ABS wheel speed sensor or clearance of sensor malfunction • Brake pipe	• VDCCM • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction
	Noise from the front side of vehicle	• VDCH/U (mount bushing) • ABS wheel speed sensor or clearance of sensor malfunction • Master cylinder • Brake caliper • Brake pad • Disc rotor • Brake pipe • Brake booster • Suspension play or fatigue (Decreased damping force)	• Axle & wheels • Tire specifications, tire wear and air pressure
	In-vehicle noise	—	• VDCCM • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction
	Noise from the rear side of vehicle	• ABS wheel speed sensor or clearance of sensor malfunction • Brake caliper • Brake pad • Disc rotor • Parking brake • Brake pipe • Suspension play or fatigue (Decreased damping force)	• Axle & wheels • Tire specifications, tire wear and air pressure
Engine speed does not increase, or engine stalls when suddenly accelerated or driving on slippery road surface.		• VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Master cylinder • Brake caliper • Parking brake • Incorrect wiring or piping	• Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake pad • Brake pipe

General Diagnostic Table

Symptom		Main probable cause	Other probable cause
Poor straight directional stability of TCS	Wanders to left or right from straight forward direction.	• VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake caliper • Brake pad • Wheel alignment • Uneven road surface • Crown shaped road/road with banks • Tire specifications, tire wear and air pressure • Incorrect wiring or piping	• Disc rotor • Brake pipe • Axle & wheels • Suspension play or fatigue (Decreased damping force)
	Vehicle spin	• VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake pad • Tire specifications, tire wear and air pressure • Incorrect wiring or piping	• Brake caliper • Brake pipe
Steering wheel drags when driving.		• VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Incorrect wiring or hose connections • Power steering system	• Brake caliper • Brake pad • Disc rotor • Wheel alignment • Uneven road surface • Crown shaped road/road with banks • Suspension play or fatigue (Decreased damping force) • Tire specifications, tire wear and air pressure
VDC operates while driving normally.		• VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Wheel alignment • Uneven road surface • Crown shaped road/road with banks • Suspension play or fatigue (Decreased damping force) • Tire specifications, tire wear and air pressure • Incorrect wiring or piping • Power steering system	—

Symptom	Main probable cause	Other probable cause
VDC warning light/VDC OFF indicator light does not come on when the VDC OFF switch is depressed. NOTE: When pressing the VDC OFF switch for 10 seconds or more while the engine is running, the VDC OFF indicator lights go off and the switch cannot be operated any more. To recover VDC operation, turn the ignition switch from OFF to ON again.	• Harness • VDC warning light/VDC OFF indicator light bulb • VDC OFF switch	—

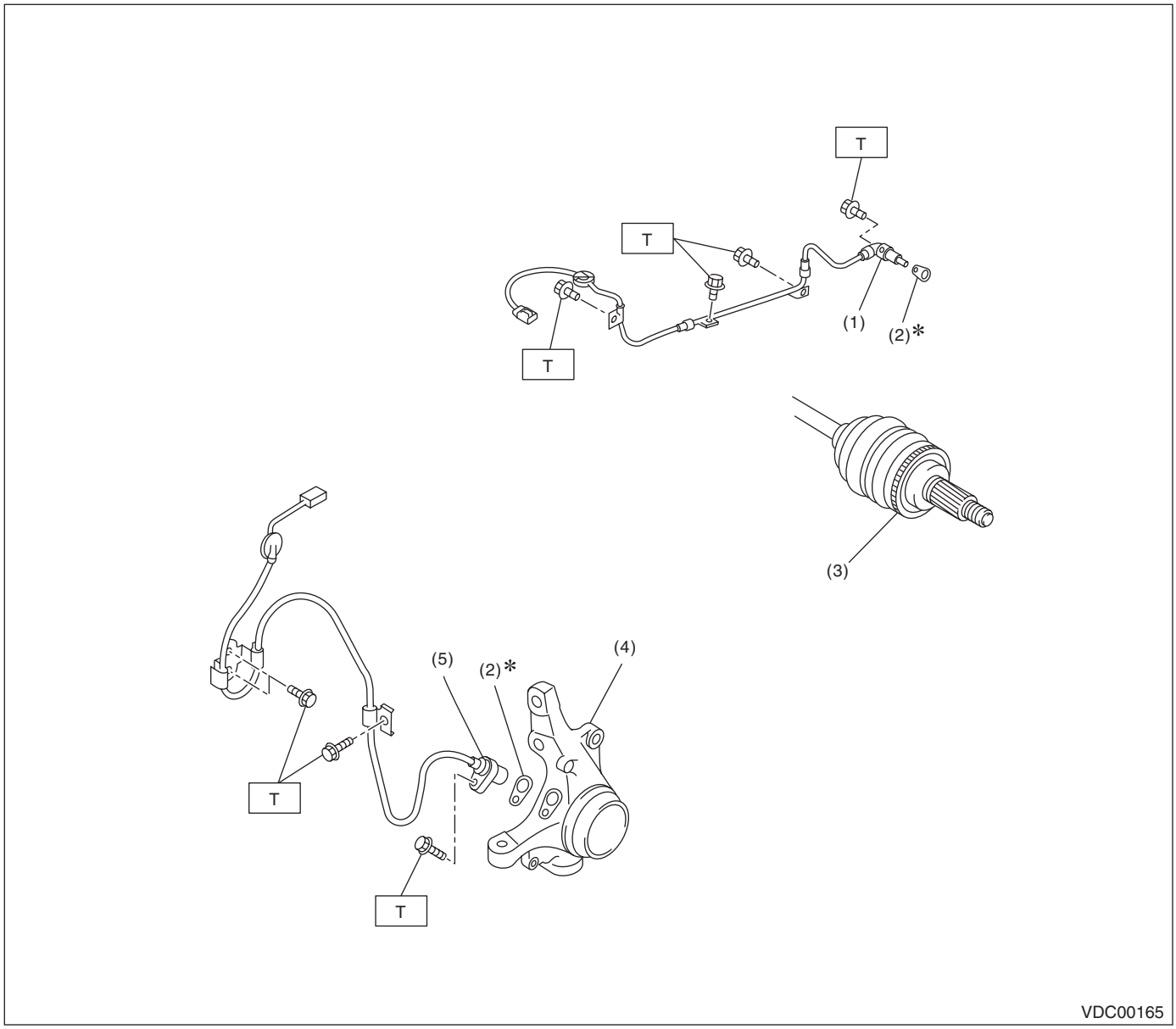
1. General Description

A: SPECIFICATION

Item			Standard value or identification
ABS wheel speed sensor	ABS wheel speed sensor gap	Front	0.3 — 0.8 mm (0.012 — 0.031 in)
		Rear	0.7 — 1.2 mm (0.0276 — 0.0472 in)
	ABS wheel speed sensor resistance	Front/Rear	1.25±0.25 kΩ/1.15±0.115 kΩ
	Identifications of harness (Colors)	Front LH	Pink
		Front RH	Yellow green color
		Rear LH	Yellow
		Rear RH	White
Yaw rate & lateral G sensor	Lateral G sensor voltage		2.5±0.2 V
VDCH/M identification			D3
VDCCM identification			N9

B: COMPONENT

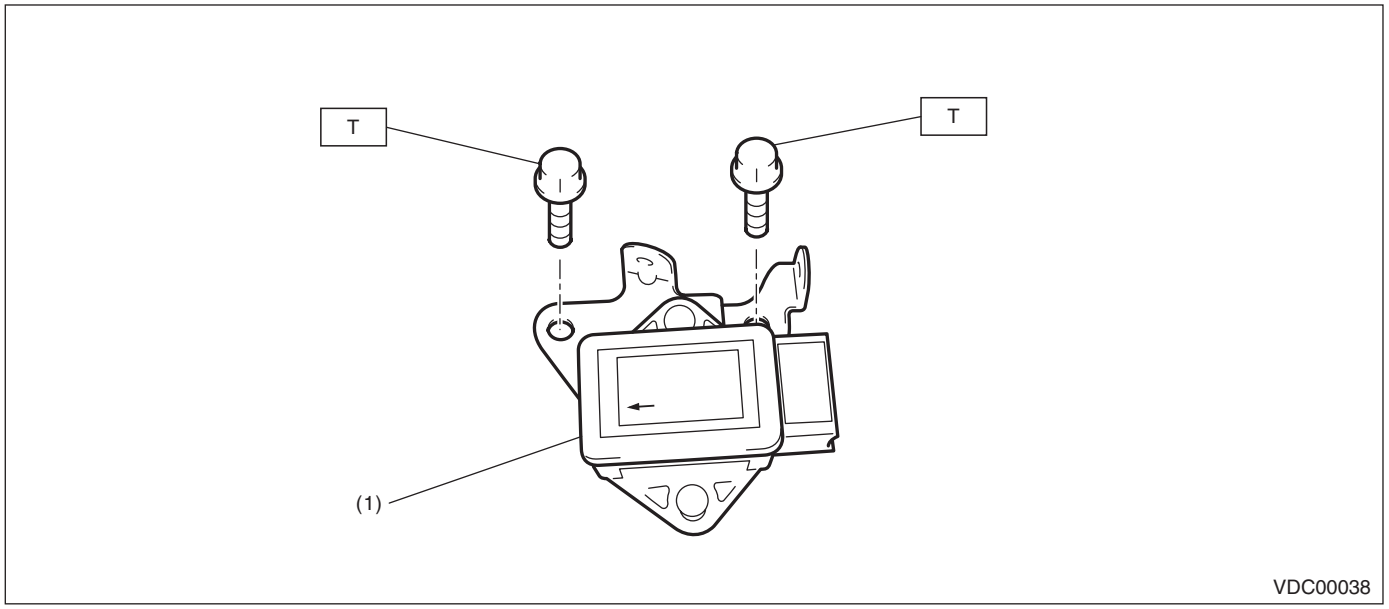
1. ABS WHEEL SPEED SENSOR



(1) Rear ABS wheel speed sensor
(2) Adjusting spacer
(3) Rear tone wheel
(4) Housing
(5) Front ABS wheel speed sensor

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

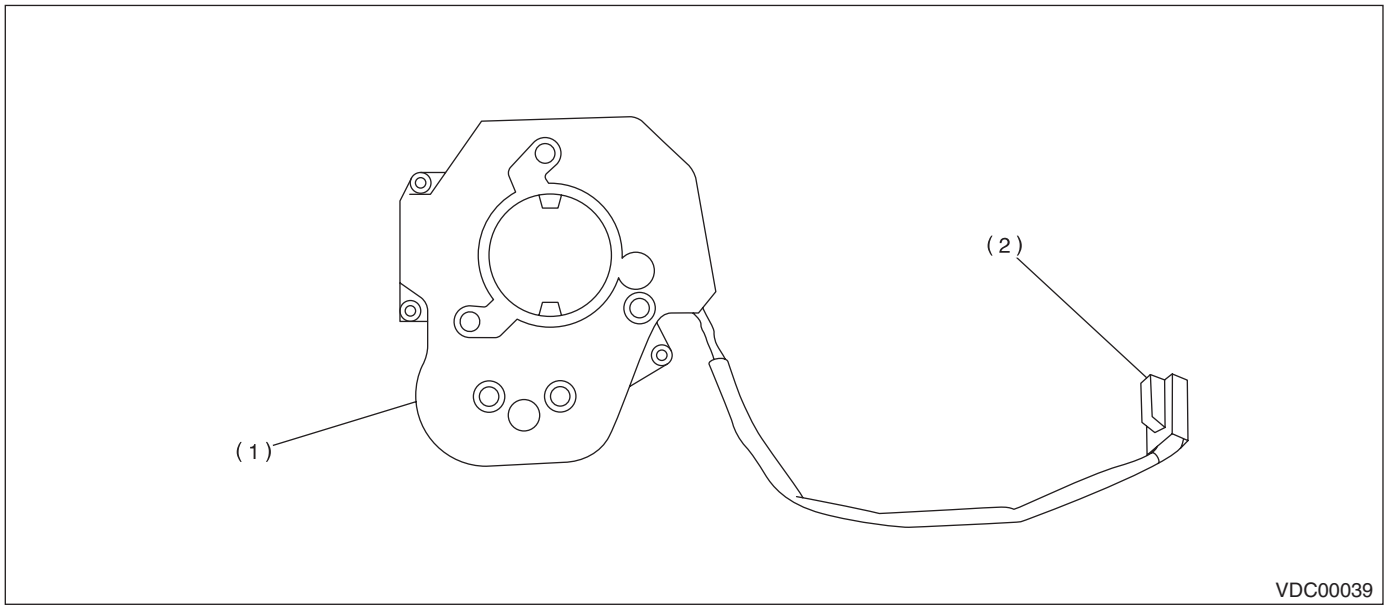
2. YAW RATE & LATERAL G SENSOR



(1) Yaw rate & lateral G sensor

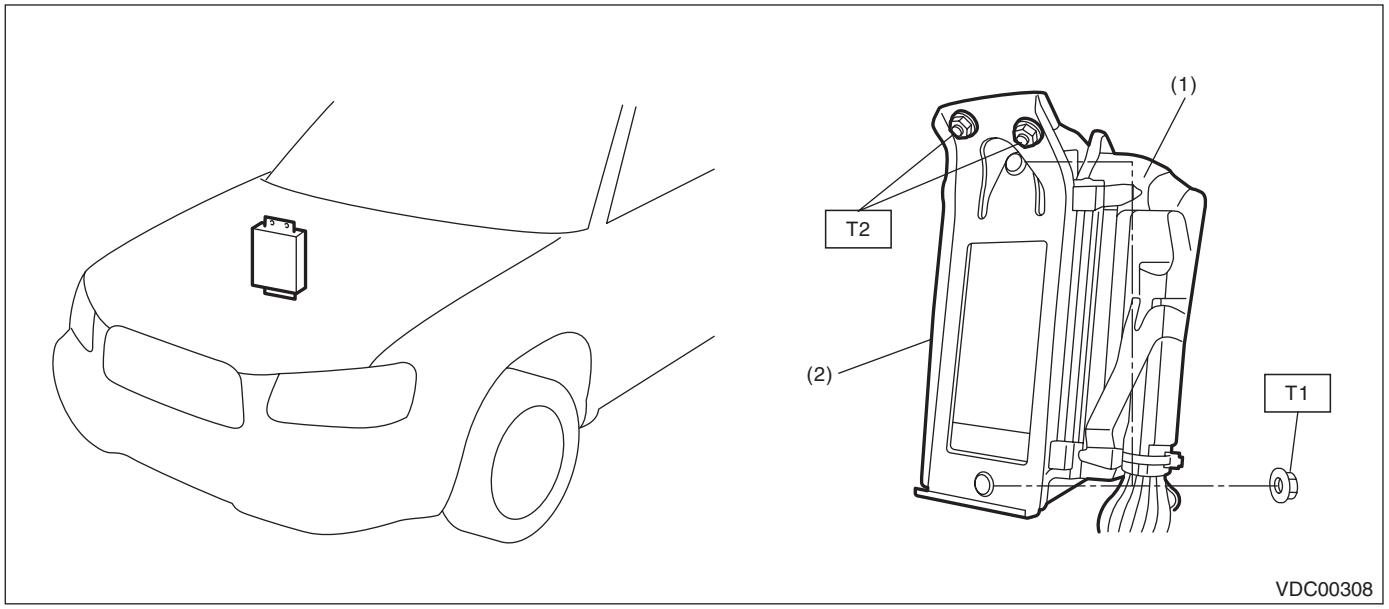
Tightening torque:N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.3)

3. STEERING ANGLE SENSOR



(1) Steering angle sensor (2) Connector

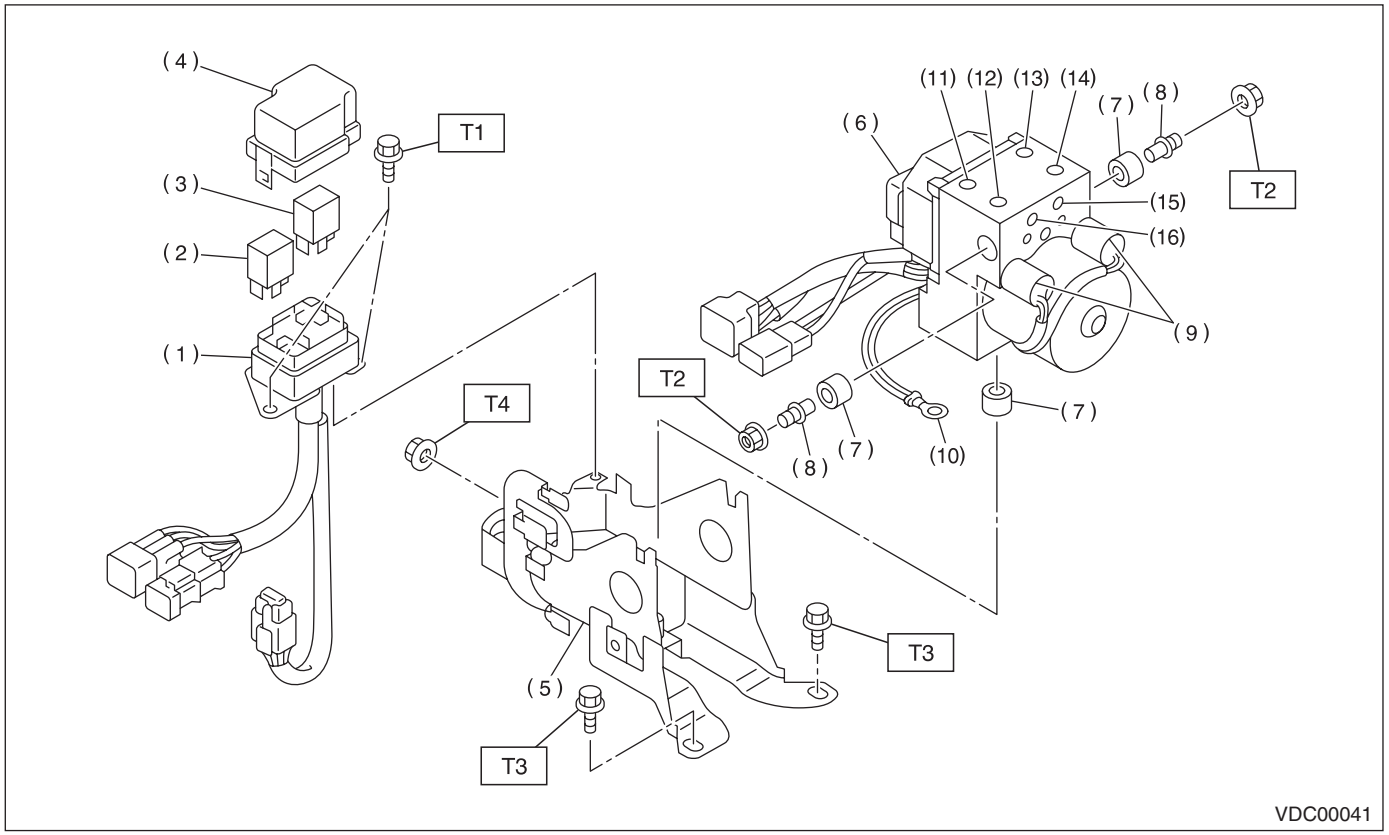
4. VDC CONTROL MODULE (VDCCM)



(1) VDC control module (VDCCM) (2) Bracket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 18 (1.8, 13.3)

5. VDC HYDRAULIC CONTROL MODULE (VDCH/M)



(1) Relay box
(2) Motor relay
(3) Valve relay
(4) Cap
(5) Bracket
(6) VDC hydraulic control module (VDCH/M)
(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, 9.6)
T2: 18 (1.8, 13.3)
T3: 33 (3.4, 24.3)
T4: 38 (3.9, 28.0)

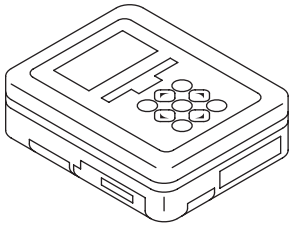
CAUTION:
Parts other than the valve relay and motor relay cannot be disassembled.

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- 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 rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B021XU0	1B021XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting for the electrical system.

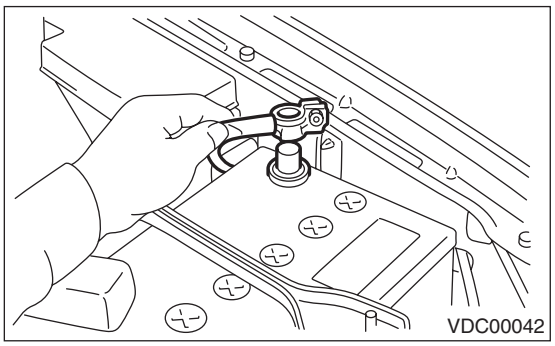
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring the sensor.
Steering puller	Used for removing the steering wheel.

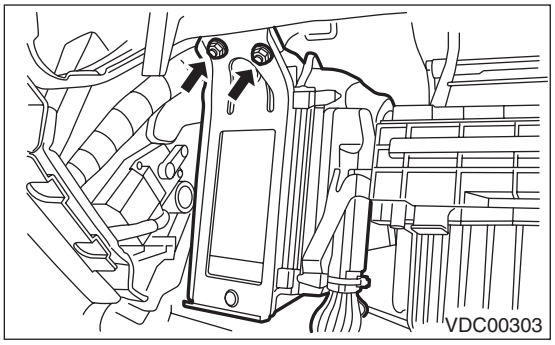
2. VDC Control Module (VDCCM)

A: REMOVAL

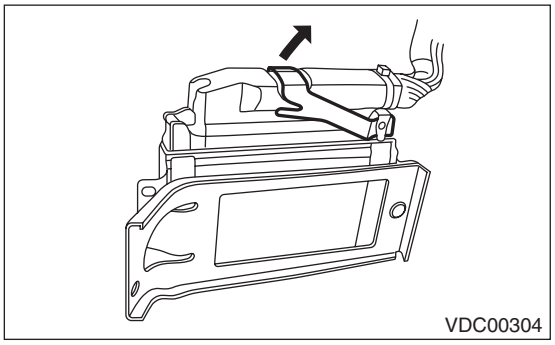
1) Disconnect the ground cable from the battery.



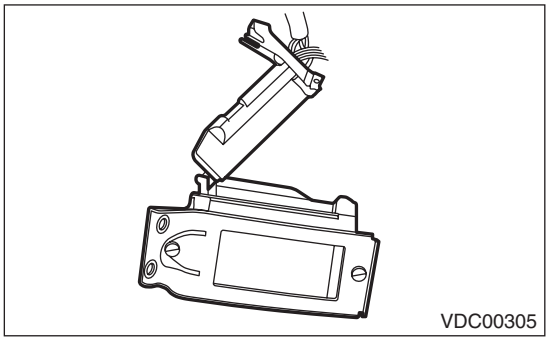
2) Remove the glove box.
3) Remove the two nuts which secures the bracket.



4) Disable the securing holder and disconnect the connector from VDCCM.



5) Remove the VDCCM.



6) Remove the bracket from VDCCM.

B: INSTALLATION

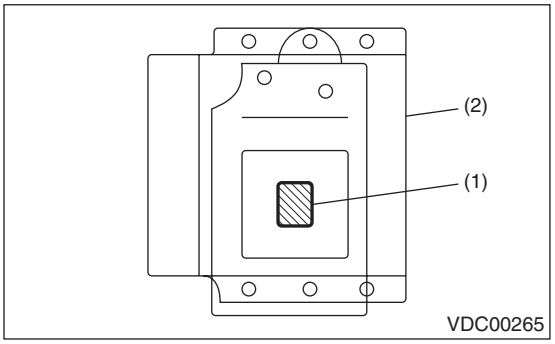
Install in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to VDC-5, VDC CONTROL MODULE (VDCCM), COMPONENT, General Description.>

CAUTION:
After installation, always make the following two settings.
• SRS roll connector and steering angle sensor centering setting
• Yaw rate & lateral G sensor 0 point setting
These two procedures are required to make the VDCCM recognize what position the vehicle is in later. Refer to Adjustments for the procedures for above settings. <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>

C: INSPECTION

Check the VDCCM identification.
Refer to "SPECIFICATION" for the identification mark. <Ref. to VDC-2, SPECIFICATION, General Description.>



(1) Identification mark
(2) VDCCM

D: ADJUSTMENT

When the following replacement, removal and installation are performed, be sure to perform the centering setting of steering angle sensor and to set the zero point of the yaw rate & lateral G sensor.

- VDCCM
- Steering angle sensor
- Yaw rate & lateral G sensor
- Steering wheel parts (Including airbag)
- Suspension parts
- Wheel alignment adjustment

1. WITH SUBARU SELECT MONITOR

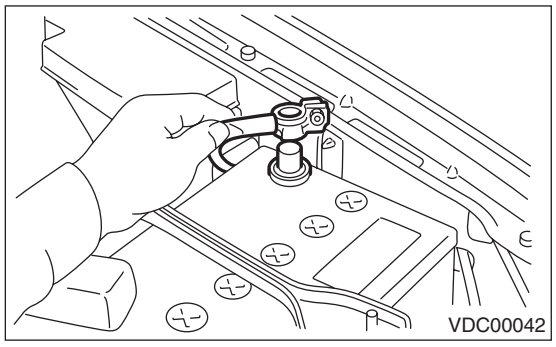
1) Park the vehicle straight on a level surface. (Place the gear in “P” or “N” range and run the engine.)
2) Check that steering wheel is positioned at the center. (When the center position is not correct, adjust the wheel alignment.)
3) Set the Subaru Select Monitor to the vehicle, and select “Set mode Str. A. Sen. N & Lat. Gsen. 0p” in the “Function Check Sequence” display. (Follow the instructions on the screen.)
4) When the above work is completed, select “Current Data Display & Save” on the “Brake Control” display screen, and check that the steering angle sensor displays “0 deg.”
5) If “0 deg” is not displayed on the screen, repeat the above steps and check whether “0 deg” is displayed.
6) Drive for approximately 10 minutes, then check that the ABS warning light and VDC warning light do not light.
7) Also, when driving, repeat steps 1 to 6 if there is any unnecessary operation of the VDC (VDC indicator light or buzzer) or if steering is unnecessarily pulled by the system.

3. VDC Hydraulic Control Module (VDCH/M)

A: REMOVAL

1. VDCH/M

1) Disconnect the ground cable from the battery.



2) Remove the air intake duct from engine room to make it easier to remove the VDCH/M.
3) Disconnect the connector from the VDCH/M.

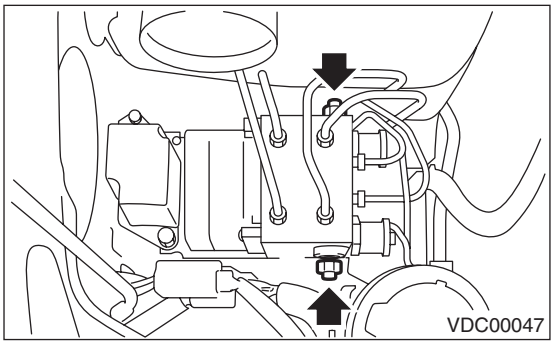
CAUTION:
Be careful to keep water and other foreign materials from coming into contact with the VDCH/M terminals.

4) Remove the cable clip.
5) Remove the brake pipes from the VDCH/M.

CAUTION:
Wrap the brake pipe in a vinyl bag so that brake fluid does not splash on the vehicle body.

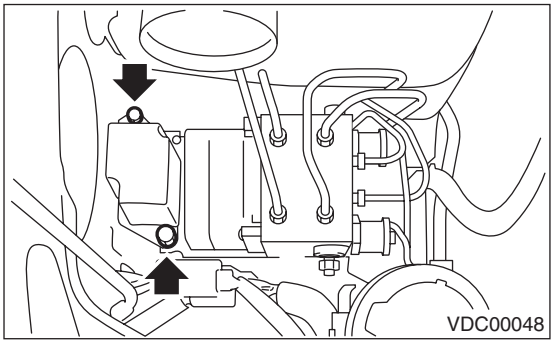
6) Remove the ground wire of the VDCH/M.
7) Remove the two bolts which hold the VDCH/M, then remove the VDCH/M from the engine room.

CAUTION:
• The VDCH/M is not to be disassembled. Do not attempt to loosen the bolts and nuts.
• Do not drop or bump the VDCH/M.
• Do not turn VDCH/M upside down or place it sideways.
• Be careful to prevent foreign particles from getting into the VDCH/M.
• After installing the new VDCH/M, tighten the bracket bolts then apply rust-proofing wax (Nippeco LT or GB) to the bracket bolts.
• Do not pull on the harness when disconnecting the harness connector.



2. RELAY BOX

1) Disconnect the ground cable from the battery.
2) Remove the air intake duct from engine room to make it easier to remove the relay box.
3) Disconnect the connector from relay box.
4) Remove the cable clip.
5) Remove the bolts which secure the relay box, and remove the relay box and connector bracket.

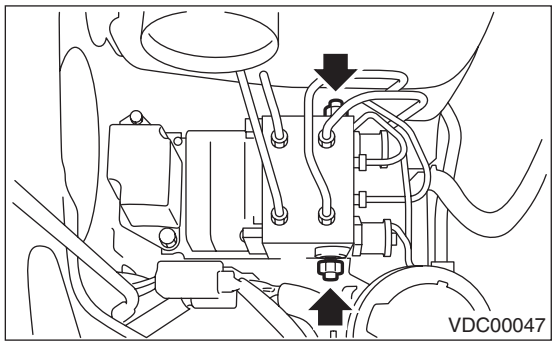


CAUTION:
Do not drop or bump the relay box.

B: INSTALLATION

1. VDCH/M

1) Install the VDCH/M.



Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

2) Secure the grounding wire of the VDCH/M and apply the specified grease to the ground terminals.

Specified grease:
Nippeco LT or GB

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

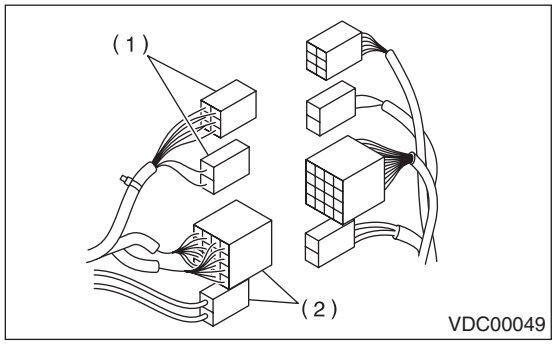
3) Connect brake pipes to the VDCH/M connectors.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

4) Fasten the VDCH/M connector to the connector bracket.

CAUTION:
Match the connector to the corresponding socket.

5) Connect the connector to VDCH/M.



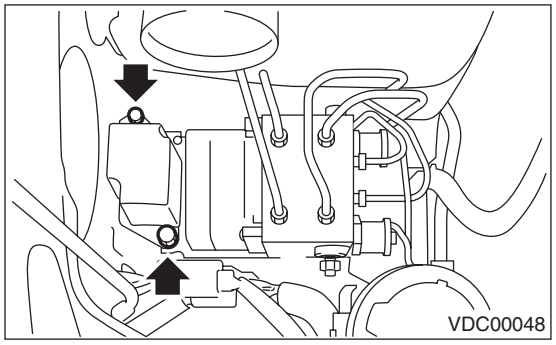
(1) Relay box connector
(2) VDCH/M connector

6) Install the air intake duct.
7) Connect the battery ground cable to the battery.
8) Bleed air from the brake system.

2. RELAY BOX

1) Install the relay box and connector bracket.

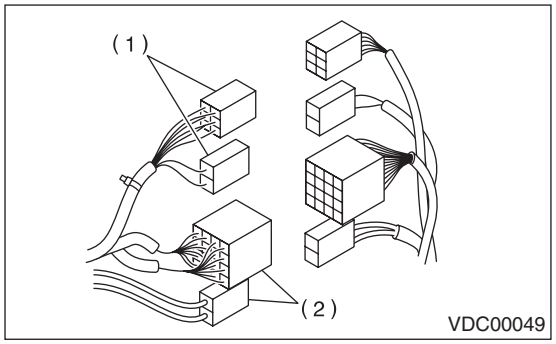
Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



2) Affix the relay box connector to the connector bracket.

CAUTION:
Match the connector to the corresponding socket.

3) Connect the connector to the relay box.

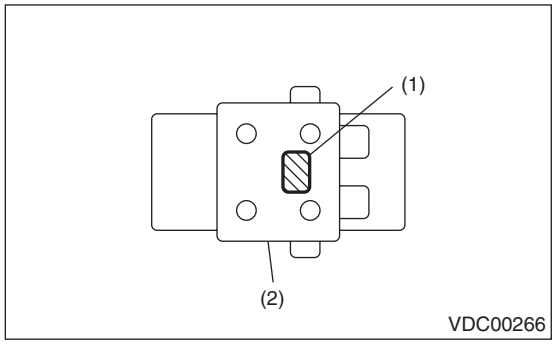


(1) Relay box connector
(2) VDCH/M connector

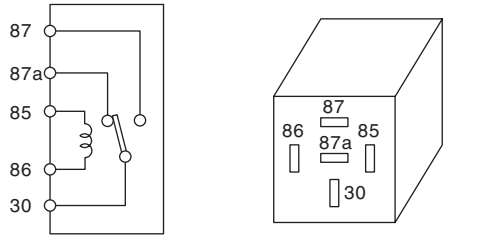
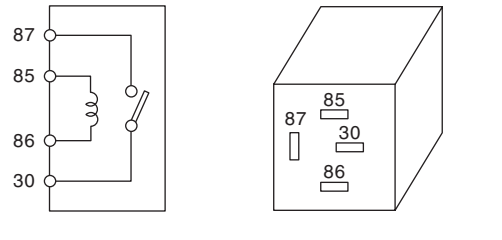
4) Install the air intake duct.
5) Connect the battery ground cable to the battery.

C: INSPECTION

1) Check the connection and fixture of the connector.
2) Inspect the valve relay and motor relay for broken wires or short circuits.
3) Inspect the identification of the VDCH/M.
Refer to “SPECIFICATION” for the identification mark. <Ref. to VDC-2, SPECIFICATION, General Description.>



(1) Identification mark
(2) VDCH/M

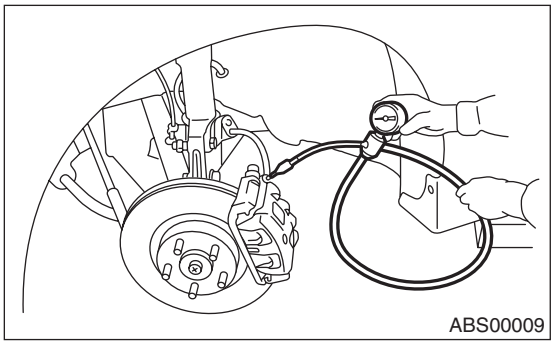
	Condition	Terminal No.	Standard value	
Valve relay	When not applying voltage	85 — 86	103±10 Ω	 VDC00050
		30 — 87a	Less than 0.5 Ω	
		30 — 87	1 MΩ or more	
	When voltage (DC 12 V) is applied between terminal numbers 85 and 86.	30 — 87a	1 MΩ or more	
		30 — 87	Less than 0.5 Ω	
Motor relay	When not applying voltage	85 — 86	80±10 Ω	 VDC00051
		30 — 87	1 MΩ or more	
	When voltage (DC 12 V) is applied between terminal numbers 85 and 86.	30 — 87	Less than 0.5 Ω	

1. CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) ABS OPERATION BY PRESSURE GAUGE

1) Lift up the vehicle and remove the wheel.
2) Disconnect the air bleeder screws from FL and FR caliper bodies.
3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:
• Use a pressure gauge used exclusively for brake fluid measurement.
• Do not use a pressure gauge used previously for measurement of transmission oil pressure, as the piston seal may expand and deform.

NOTE:
Wrap sealing tape around the pressure gauge.



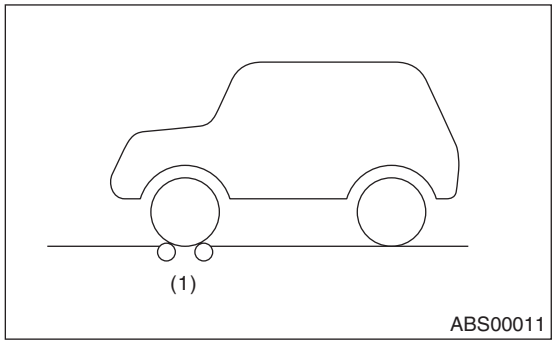
4) Bleed air from the pressure gauge.
5) Perform ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.>
6) When the VDCH/M begins to work, first the FL side performs decompression, hold and compression, and then the FR side performs decompression, hold and compression.
7) Read values indicated on the pressure gauge and check whether the fluctuation of the values between decompression and compression meets the standard values. Also check whether any irregular tightness of the brake pedal can be felt.

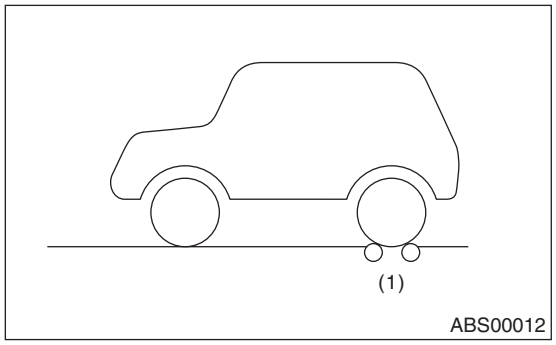
	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm^2, 507 psi)	3,500 kPa (36 kgf/cm^2, 507 psi)
When depressurized	500 kPa (5 kgf/cm^2, 72.5 psi) or less	500 kPa (5 kgf/cm^2, 72.5 psi) or less
When pressurized	3,500 kPa (36 kgf/cm^2, 507 psi) or more	3,500 kPa (36 kgf/cm^2, 507 psi) or more

8) Disconnect the pressure gauges from FL and FR caliper bodies.
9) Install the air bleeder screws of FL and FR caliper bodies.
10) Remove the air bleeder screws from RL and RR caliper bodies.
11) Connect two pressure gauges to RL and RR caliper bodies.
12) Bleed air from RL and RR caliper bodies, and pressure gauge.
13) Perform ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.>
14) When the VDCH/M begins to work, first the RR side performs decompression, hold and compression, and then the RL side performs decompression, hold and compression.
15) Read the values indicated on the pressure gauges and check if it is within specification.
16) After checking, remove the pressure gauges from the caliper bodies.
17) Install the air bleeder screws of RL and RR caliper bodies.
18) Bleed air from the brake line.

2. CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) ABS OPERATION WITH BRAKE TESTER

1) Prepare for 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 position to the "N" range.





(1) Brake tester

3) Operate the brake tester.
4) Perform ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.>
5) When the VDCH/M begins to work, check the following working sequence.
(1) The FL wheel performs decompression, hold and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, hold and compression in sequence, and subsequently the RL wheel repeats the cycle.
6) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets specification.

	Front wheel	Rear wheel
Initial value	1,000 N (102 kgf, 225 lb)	1,000 N (102 kgf, 225 lb)
When depressurized	500 N (51 kgf, 112.4 lb) or less	500 N (51 kgf, 112.4 lb) or less
When pressurized	1,000 N (102 kgf, 225 lb) or more	1,000 N (102 kgf, 225 lb) or more

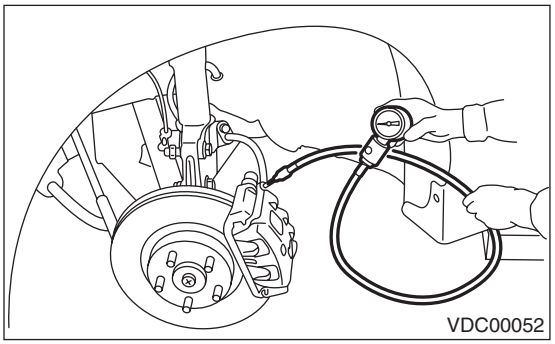
7) After checking, press the brake pedal and check whether any irregular tightness of the brake pedal can be felt.

3. CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) VDC OPERATION BY PRESSURE GAUGE

1) Lift up the vehicle and remove the wheel.
2) Disconnect the air bleeder screws from FL and FR caliper bodies.
3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:
• Use a pressure gauge used exclusively for brake fluid measurement.
• Do not use a pressure gauge used previously for measurement of transmission oil pressure, as the piston seal may expand and deform.

NOTE:
Wrap sealing tape around the pressure gauge.



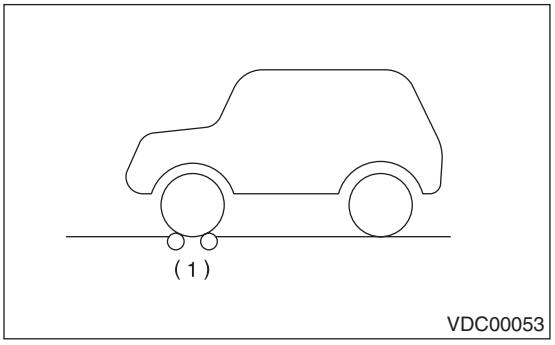
4) Bleed air from the pressure gauge.
5) Perform VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
6) When the VDCH/M begins to work, first the FL side performs hold, decompression, and compression, and then the FR side performs decompression, hold and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check whether any irregular tightness of the brake pedal can be felt.

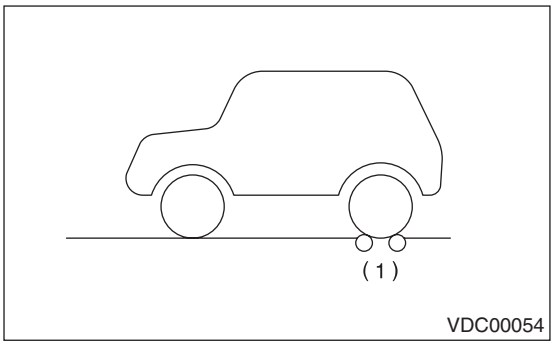
	Front wheel	Rear wheel
When pressurized	3,000 kPa (31 kg/cm^2, 435 psi) or more	2,000 kPa (20 kg/cm^2, 290 psi) or more
When depressurized	500 kPa (5 kg/cm^2, 72.5 psi) or less	500 kPa (5 kg/cm^2, 72.5 psi) or less

8) Disconnect the pressure gauges from FL and FR caliper bodies.
9) Connect the air bleeder screws to the FL and FR caliper bodies.
10) Remove the air bleeder screws from RL and RR caliper bodies.
11) Connect two pressure gauges to RL and RR caliper bodies.
12) Bleed air from RL and RR caliper bodies, and pressure gauge.
13) Perform VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
14) When the hydraulic unit begins to work, first the RR side performs hold, decompression, and compression, and then the RL side performs hold, decompression, and compression.
15) Read the values indicated on the pressure gauges and check if it is within specification.
16) After checking, remove the pressure gauges from the caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from the brake line.

4. CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) VDC OPERATION BRAKE TESTER

1) Prepare for the 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 position to the “N” range.





(1) Brake tester

3) Operate the brake tester.
4) Perform ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.>
5) When the VDCH/M begins to work, check the working sequence in the following order.
(1) The FL wheel performs decompression, hold and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, hold and compression in sequence, and subsequently the RL wheel repeats the cycle.
6) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets specification.

	Front wheel	Rear wheel
When pressurized	2,000 N (204 kgf, 450 lb) or more	1,000 N (102 kgf, 225 lb) or more
When depressurized	500 N (51 kgf, 112.4 lb) or less	500 N (51 kgf, 112.4 lb) or less

7) After inspection, check whether any irregular brake pedal tightness cab be felt.

4. ABS Sequence Control

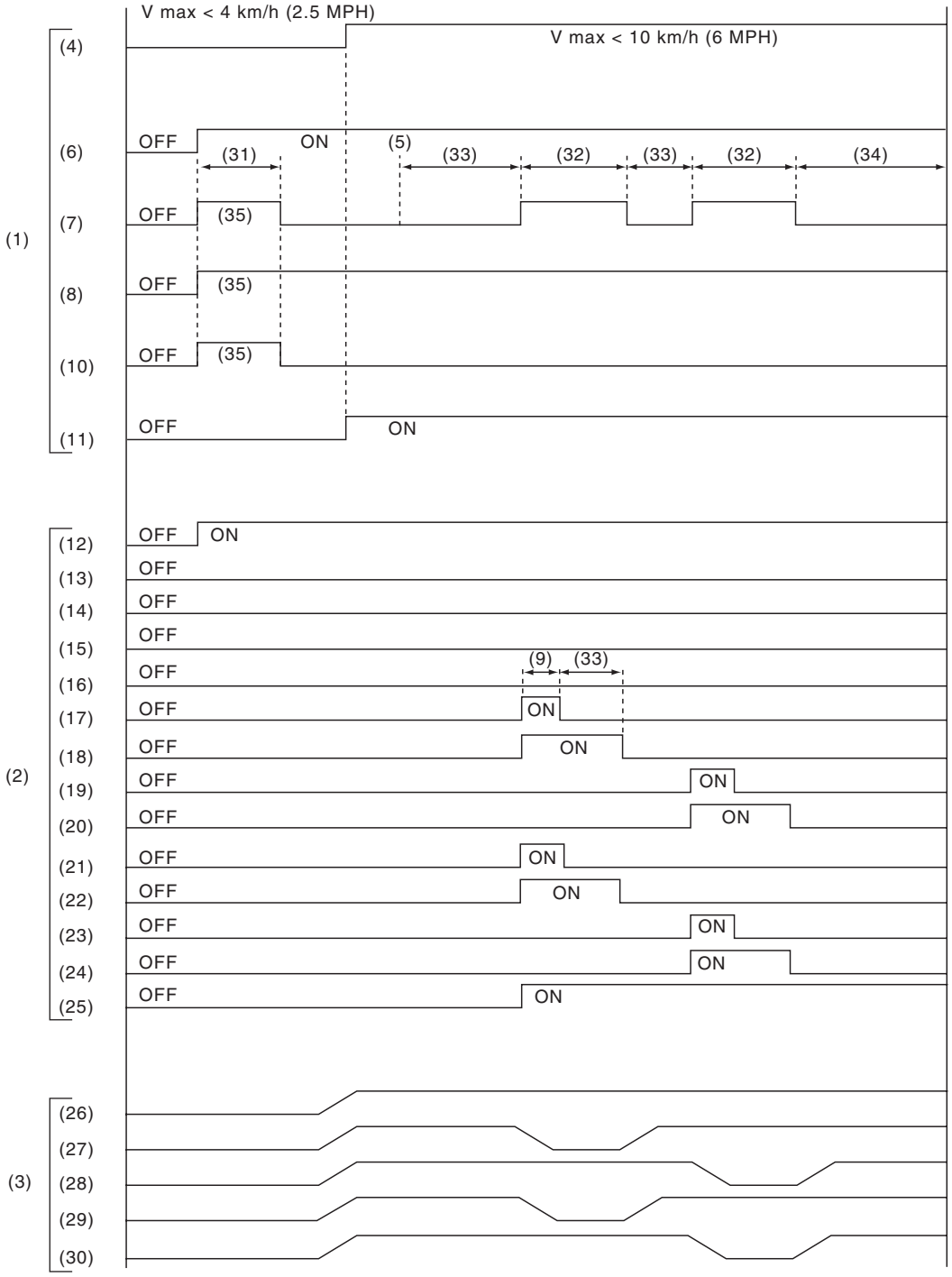
A: OPERATION

1) While the ABS sequence control is being performed, the operation of the VDCH/M can be checked after the operation of the VDCH/M solenoid valve, using the brake tester or pressure gauge.
2) ABS sequence control can be started by the Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

1) Connect the Subaru Select Monitor to the Subaru data link connector under the driver's side instrument panel lower cover.
2) Turn the ignition switch ON.
3) Run the Subaru Select Monitor.
4) Set the Subaru Select Monitor to the "BRAKE CONTROL" mode.
5) When the "Function check sequence" is selected, the "ABS sequence control" will start.
6) Execute the following operations when the message "Press Brake Pedal with braking force of 100 to 150 kgf" is displayed.
   (1) When using a brake tester, press the brake pedal with a force of 1,000 N (102 kgf, 225 lb).
   (2) When using the pressure gauge, press the brake pedal so as to make the pressure gauge indicate 3,500 kPa (36 kg/cm^2, 507 psi).
7) "OK" will be displayed. Select the "OK".
8) The brake system being operated is displayed on the Subaru Select Monitor.

2. CONDITIONS FOR ABS SEQUENCE CONTROL



VDC00353

(1) Operation guide line of the sequence control
(2) Operation pattern of sequence control
(3) Operating pressure of sequence control
(4) All wheel speeds
(5) Point A
(6) Ignition switch
(7) ABS warning light
(8) VDC warning light
(9) 0.4 seconds
(10) VDC indicator light
(11) Pressure sensor
(12) Valve relay
(13) Secondary cut valve
(14) Primary cut valve
(15) Secondary suction valve
(16) Primary suction valve
(17) FL outlet solenoid valve
(18) FL inlet solenoid valve
(19) FR outlet solenoid valve
(20) FR inlet solenoid valve
(21) RR outlet solenoid valve
(22) RR inlet solenoid valve
(23) RL outlet solenoid valve
(24) RL inlet solenoid valve
(25) Pump motor
(26) Master cylinder pressure
(27) FL wheel cylinder pressure
(28) FR wheel cylinder pressure
(29) RR wheel cylinder pressure
(30) RL wheel cylinder pressure
(31) 1.5 seconds
(32) 1.4 seconds
(33) 1.0 second
(34) 0.6 seconds
(35) Light ON

NOTE:
Operation starts from point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is released during sequence control and the stop lamp switch is becomes OFF.
3) After completion of the sequence control.
4) When a problem is detected.

5. VDC Sequence Control

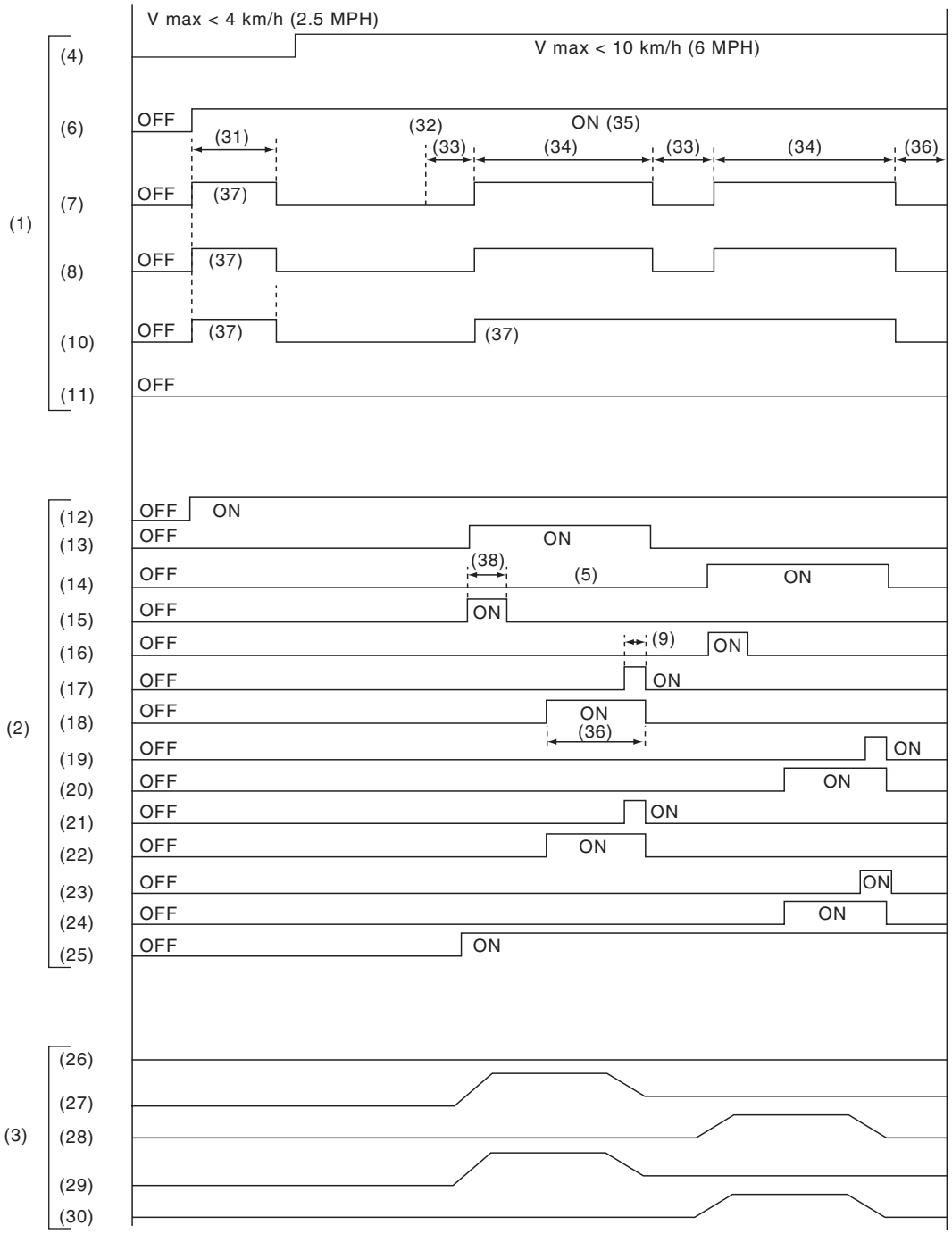
A: OPERATION

1) While the VDC sequence control is performed, the operation of the VDCH/M can be checked after operation of the VDCH/M solenoid valve, using the brake tester or pressure gauge.
2) VDC sequence control can be started by Subaru Select Monitor.

1. VDC SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

1) Connect the Subaru Select Monitor to the Subaru data link connector, located next to the lower cover under the driver's side instrument panel.
2) Turn the ignition switch ON.
3) Run the Subaru Select Monitor.
4) Set the Subaru Select Monitor to the "BRAKE CONTROL" mode.
5) When the "VDC Check Mode" is selected from the "Function check sequence" menu, the "VDC sequence control" will start.
6) "OK" will be displayed. Select the "OK".
7) The brake system being operated is displayed on the Subaru Select Monitor.

2. CONDITIONS FOR VDC SEQUENCE CONTROL



VDC00519

(1) Operation guide line of the sequence control
(2) Operation pattern of sequence control
(3) Operating pressure of sequence control
(4) All wheel speeds
(5) Within 0.4 seconds
(6) Ignition switch
(7) ABS warning light
(8) VDC warning light
(9) 0.4 seconds
(10) VDC indicator light
(11) Pressure sensor
(12) Valve relay
(13) Secondary cut valve
(14) Primary cut valve
(15) Secondary suction valve
(16) Primary suction valve
(17) FL outlet solenoid valve
(18) FL inlet solenoid valve
(19) FR outlet solenoid valve
(20) FR inlet solenoid valve
(21) RR outlet solenoid valve
(22) RR inlet solenoid valve
(23) RL outlet solenoid valve
(24) RL inlet solenoid valve
(25) Pump motor
(26) Master cylinder pressure
(27) FL wheel cylinder pressure
(28) FR wheel cylinder pressure
(29) RR wheel cylinder pressure
(30) RL wheel cylinder pressure
(31) 1.5 seconds
(32) Point A
(33) 1.0 second
(34) 3.4 seconds
(35) Engine ON
(36) 1.6 seconds
(37) Light ON
(38) 0.8 seconds

NOTE:
Operation starts from point A.

B: SPECIFICATION

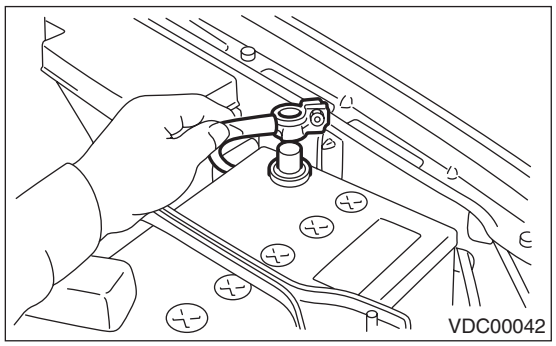
1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

When the following conditions develop, the VDC sequence control stops and VDC operation is returned to the normal mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is pressed during sequence control and the stop lamp switch is set to ON.
3) After completion of the sequence control.
4) When a problem is detected.

6. Yaw Rate & Lateral G Sensor

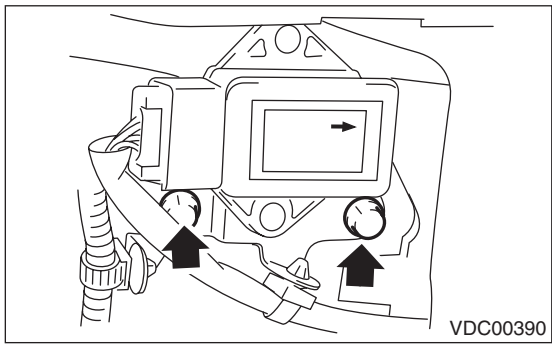
A: REMOVAL

1) Disconnect the ground cable from the battery.



2) Remove the console box.
<Ref. to EI-37, Console Box.>
3) Disconnect the connector from yaw rate & lateral G sensor.
4) Remove the yaw rate & lateral G sensor.

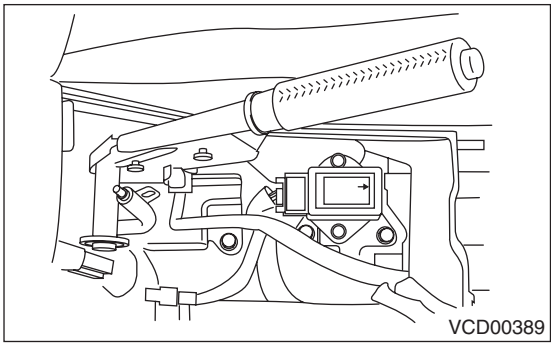
CAUTION:
• Do not drop or bump the yaw rate & lateral G sensor.
• The sensor and bracket is considered a single part. Do not disassemble.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not install the yaw rate & lateral G sensors facing an incorrect direction. There is an arrow mark on the sensor showing the front direction of the vehicle.



Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

CAUTION:
Do not drop or bump the yaw rate & lateral G sensor. After installation, always make the following two settings.
• Steering angle sensor centering setting
• Yaw rate & lateral G sensor 0 point setting
These two procedures are required to make the VDCCM recognize what position the vehicle is in later. Refer to VDCCM Adjustments for procedures regarding the above settings. <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>

C: INSPECTION

1. LATERAL G SENSOR SIGNAL

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Is the Subaru Select Monitor available?	Go to step **5**.	Go to step **2**.
2	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Move the vehicle to a level surface. 2) Turn the ignition switch to OFF. 3) Connect the connector to the yaw rate & lateral G sensor. 4) Turn the ignition switch ON. 5) Measure the voltage between connector terminals of the yaw rate & lateral G sensor when the yaw rate & lateral G sensor is horizontally positioned. ***Connector & terminal*** ***(B230) No. 5 (+) — No. 6 (–)***	Is the voltage 2.3 — 2.7 V?	Go to step **3**.	Replace the yaw rate & lateral G sensor.
3	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Remove the yaw rate & lateral G sensors from vehicle. 2) Measure the voltage between connector terminals of the yaw rate & lateral G sensor when the yaw rate & lateral G sensor are inclined 90° to the right. ***Connector & terminal*** ***(B230) No. 5 (+) — No. 6 (–)*** NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the voltage 3.3 — 3.7 V?	Go to step **4**.	Replace the yaw rate & lateral G sensor.
4	**CHECK YAW RATE & LATERAL G SENSOR.** Measure the voltage between connector terminals of the yaw rate & lateral G sensor when the yaw rate & lateral G sensor are inclined 90° to the left. ***Connector & terminal*** ***(B230) No. 5 (+) — No. 6 (–)*** NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the voltage 1.3 — 1.7 V?	Yaw rate & lateral G sensors are normal.	Replace the yaw rate & lateral G sensor.
5	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru data link connector to the data link connector. 3) Turn the ignition switch ON. 4) Set the Subaru Select Monitor to {Current Data Display & Save} mode. 5) Set the screen to the {Current Data Display & Save} mode. 6) Read the output voltage of yaw rate & lateral G sensor when the vehicle is in a flat horizontal position. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the reading indicated on monitor display 2.3 — 2.7 V?	Go to step **6**.	Replace the yaw rate & lateral G sensor.

	Step	Check	Yes	No
6	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the yaw rate & lateral G sensors from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display when the yaw rate & lateral G sensor are inclined 90° to the right. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the reading indicated on monitor display 3.3 — 3.7 V?	Go to step **7**.	Replace the yaw rate & lateral G sensor.
7	**CHECK YAW RATE & LATERAL G SENSOR.** Read the Subaru Select Monitor display when the yaw rate & lateral G sensor are inclined 90° to the left. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the reading indicated on monitor display 1.3 — 1.7 V?	Yaw rate & lateral G sensors are normal.	Replace the yaw rate & lateral G sensor.

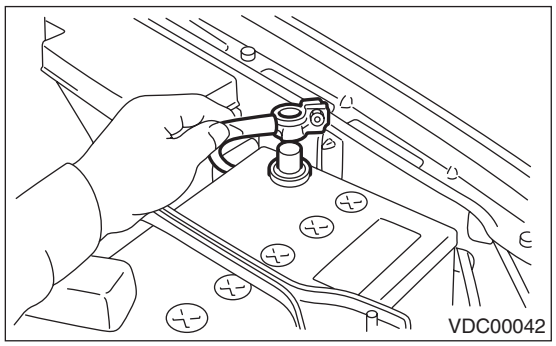
2. YAW RATE SENSOR SIGNAL

	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSORS USING AN OSCILLOSCOPE.** 1) Connect all connectors. 2) Set the oscilloscope to the connector terminal of yaw rate & lateral G sensor. Positive probe; (B230) No. 4 Grounding wire; (B230) No. 6 3) Start the engine. 4) Measure the signal voltage indicated on oscilloscope. <Ref. to VDC(diag)-14, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>	Is the voltage 2.1 — 2.9 V?	Go to step **2**.	Replace the yaw rate & lateral G sensor.
2	**INSPECT USING AN OSCILLOSCOPE.** 1) Turn the ignition switch to OFF. 2) Set the oscilloscope to the connector terminal of yaw rate & lateral G sensor. Positive probe; (B230) No. 2 Grounding wire; (B230) No. 6 3) Start the engine. 4) Measure the signal voltage indicated on oscilloscope. <Ref. to VDC(diag)-14, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>	Is the voltage 5 V?	Yaw rate & lateral G sensors are normal.	Replace the yaw rate & lateral G sensor.

7. Steering Angle Sensor

A: REMOVAL

1) Disconnect the ground cable from the battery.

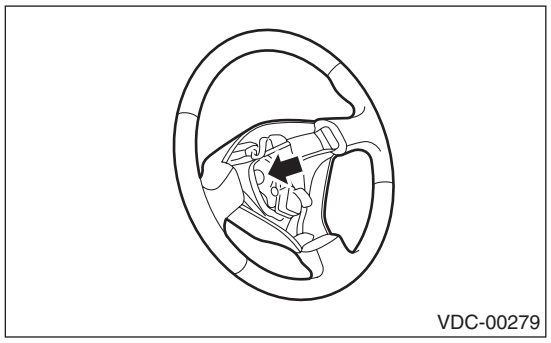


2) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

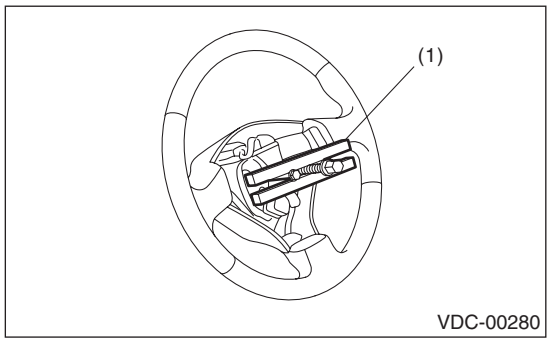
WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>

3) Remove the steering wheel nut.

NOTE:
Always remove the steering wheel with it positioned straight-ahead.

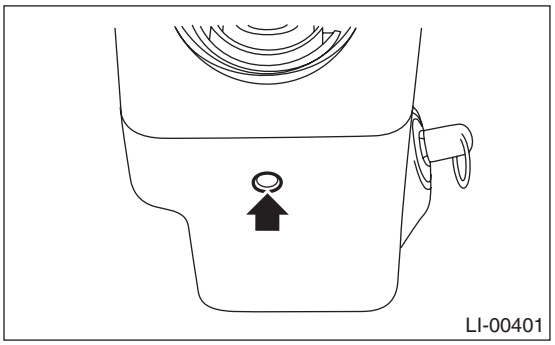


4) Pull off the steering wheel from the shaft using a steering puller.



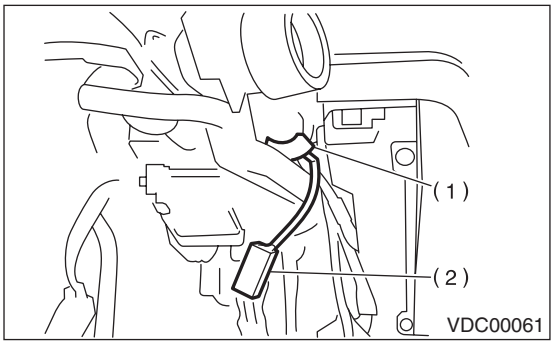
(1) Steering puller

5) Remove the screw securing the steering column lower cover.



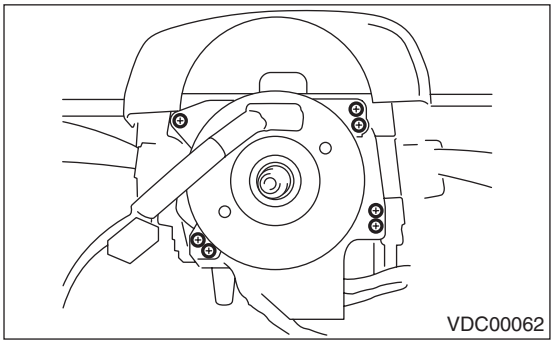
6) Remove the two screws securing the steering column upper cover.

7) Unlock the harness band and disconnect the connector of the steering angle sensor.

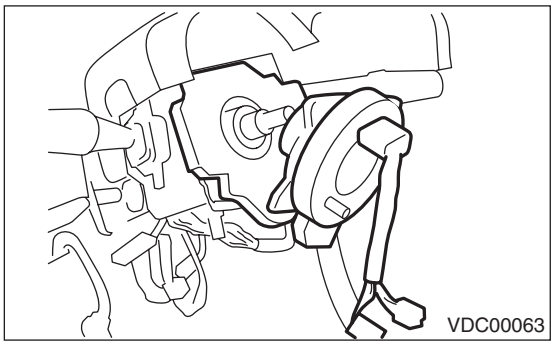


(1) Harness band
(2) Connector

8) Remove the bolt which secure the roll connector and steering angle sensor to the steering column.



9) Remove the roll connector and steering angle sensor.

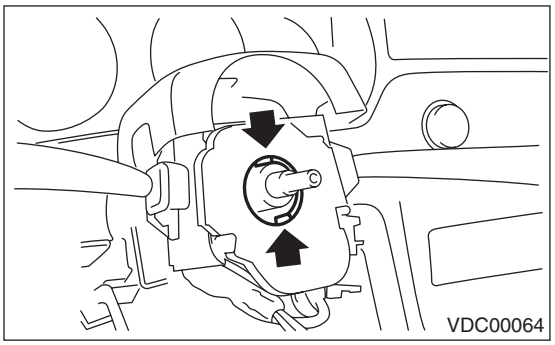


NOTE:
Do not rotate the steering angle sensor because the center position will be recognized by the VDC-CM.

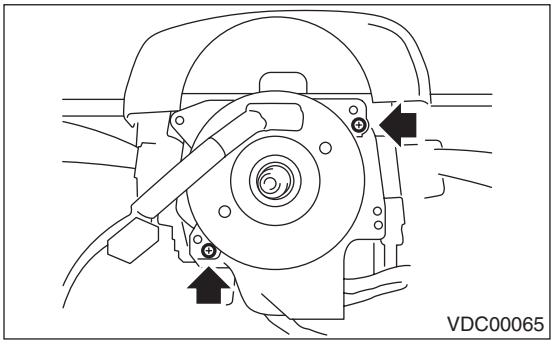
B: INSTALLATION

CAUTION:
Check that front wheels are positioned in a straight ahead direction.

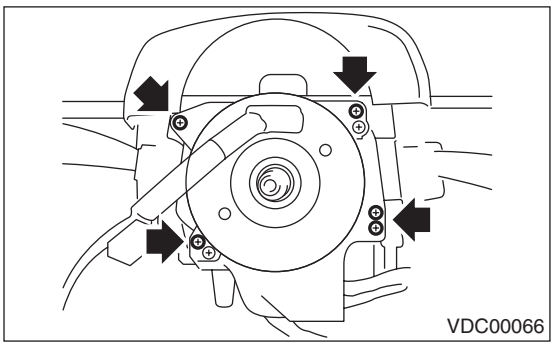
1) Install the steering angle sensor to the steering column while confirming that the sensor is positioned as shown in the figure.



2) Align the roll connector with the center.
<Ref. to AB-20, INSTALLATION, Roll Connector.>
3) Place the roll connector on top of the steering angle sensor, then tighten the bolts that secure the roll connector and steering angle sensor.



4) Tighten the bolts which secure the roll connector and steering angle sensor to the steering column.



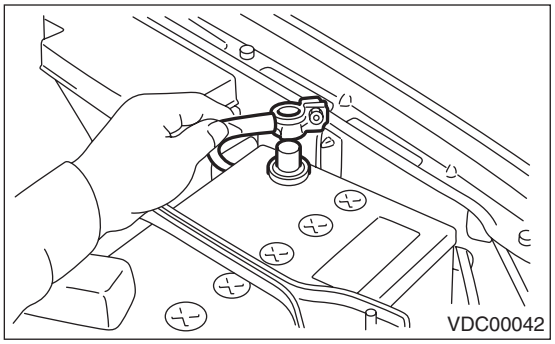
5) Put the steering wheel in a neutral position and install it onto the steering shaft.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert the roll connector guide pin into the guide hole on lower end of steering wheel surface, being careful not to damage them. Remove by drawing out the airbag system connector, horn connector and cruise control connectors from the guide hole of steering wheel lower end.
6) Install the airbag module to the steering wheel.
<Ref. to AB-14, INSTALLATION, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before servicing.
<Ref. to AB-4, CAUTION, General Description.>
7) Connect the battery ground cable to the battery.



CAUTION:
After installation, always make the following two settings.
• SRS roll connector and steering angle sensor center setting
• Yaw rate & lateral G sensor 0 point setting
These two procedures are required to make the VDCCM recognize what position the vehicle is in later. Refer to VDCCM Adjustments for procedures regarding the above settings. <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>

C: INSPECTION

Refer to "VDC (Diagnostics) Section" for inspection procedures of the steering angle sensor.
<Ref. to VDC(diag)-103, DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-105, DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-107, DTC 71 STEERING ANGLE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-109, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

8. Front ABS Wheel Speed Sensor

A: NOTE

Vehicles equipped with VDC have the same ABS wheel speed sensor as installed on vehicles equipped with ABS. Refer to “Front ABS Wheel Speed Sensor” for removal, installation and inspection procedure.
<Ref. to ABS-14, Front ABS Wheel Speed Sensor.>

9. Rear ABS Wheel Speed Sensor

A: NOTE

Vehicles equipped with VDC have the same ABS wheel speed sensor as installed on vehicles equipped with ABS. Refer to “Rear ABS Wheel Speed Sensor” for removal, installation and inspection procedure.
<Ref. to ABS-18, Rear ABS Wheel Speed Sensor.>

10.Front Tone Wheel

A: NOTE

The front tone wheel is built into the front drive shaft. For removal, installation and inspection, refer to the “DS” section.
<Ref. to DS-30, Front Drive Shaft.>

11.Rear Tone Wheel

A: REMOVAL

Remove the bolt to remove the hub from the tone wheel.
<Ref. to DS-22, REMOVAL, Rear Axle.>

B: INSTALLATION

Remove any dirt on the contact surface of the hub and tone wheel, then install the tone wheel to the hub using the bolts.
<Ref. to DS-25, INSTALLATION, Rear Axle.>

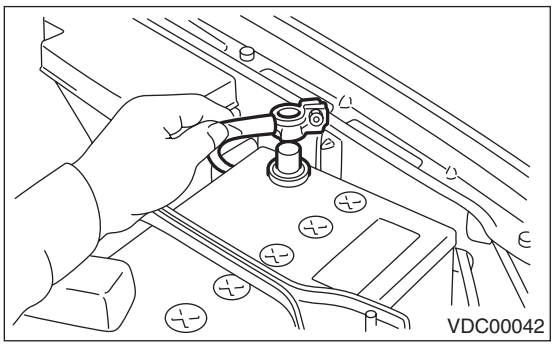
C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace with a new tone wheel.

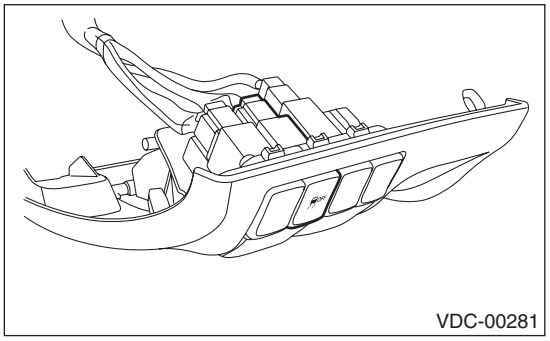
12.VDC OFF Switch

A: REMOVAL

1) Disconnect the ground cable from the battery.



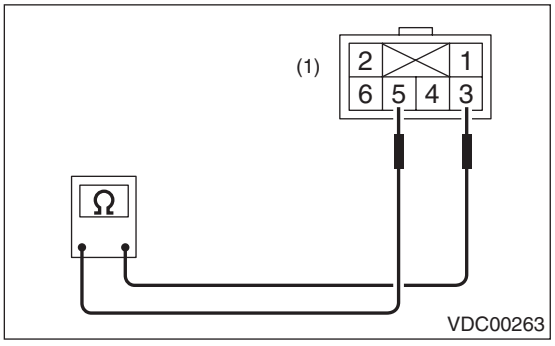
2) Remove the instrument panel lower cover. <Ref. to EI-38, REMOVAL, Instrument Panel Assembly.>
3) Disconnect the VDC OFF switch connector, push outside, and press the VDC OFF switch.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



(1) VDC OFF switch side

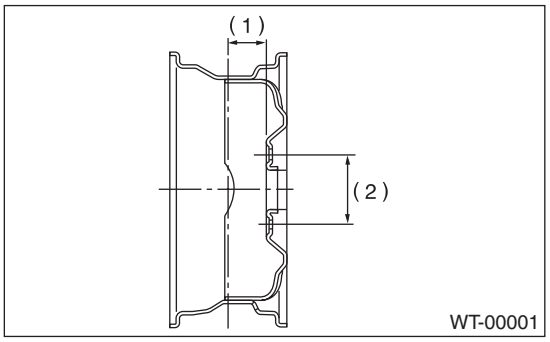
Inspect the resistance between VDC OFF switch terminals.

Switch position	Tester connection	Standard
OFF	3 — 5	1 MΩ or more
ON	3 — 5	Less than 1 Ω

If NG, replace the VDC OFF switch.

1. General Description

A: SPECIFICATION



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

	Model	Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Front and rear	X	P215/60 R16 94H	16 × 61/2JJ, 16 × 61/2J	48 (1.89)	100 (3.94) Dia.
	XS		16 × 61/2JJ		
	XT	P215/55 R17 93H	17 × 7JJ		
	L.L.Bean	P215/60 R16 94H	16 × 61/2JJ		
Spare tire	X, XS, XT L.L.Bean	T135/80 D16	16 × 4T	50 (1.97)	100 (3.94) Dia.
	*1 X, *1 XS	Equipped with a spare tire of the same size as the front and rear tire.			

*1: Vehicle for Canada

NOTE:
Vehicles for Canada excluding non-turbo model are supplied with “T-type” spare tires for temporary use.

	Model	Tire size	Tire inflation pressure kPa (kgf/cm^2, psi)	
			Low load	Full load
Front and rear	X, XS, L.L.Bean	P215/60 R16 94H	Front: 200 (2.0, 29) Rear: 190 (1.9, 28)	Front: 200 (2.0, 29) Rear: 250 (2.5, 36)
	XT	P215/55 R17 93H	Front: 220 (2.2, 32) Rear: 210 (2.1, 30)	Front: 220 (2.2, 32) Rear: 220 (2.2, 32)
“T-type” Tire	XT	T135/80 D16	420 (4.2, 60)	—

NOTE:
Rear tire inflation pressure when towing a trailer

16-inch tire	280 kPa (2.8 kg/cm^2, 41 psi)
17-inch tire	250 kPa (2.5 kg/cm^2, 36 psi)

1. SERVICE DATA

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

2. ADJUSTING PARTS

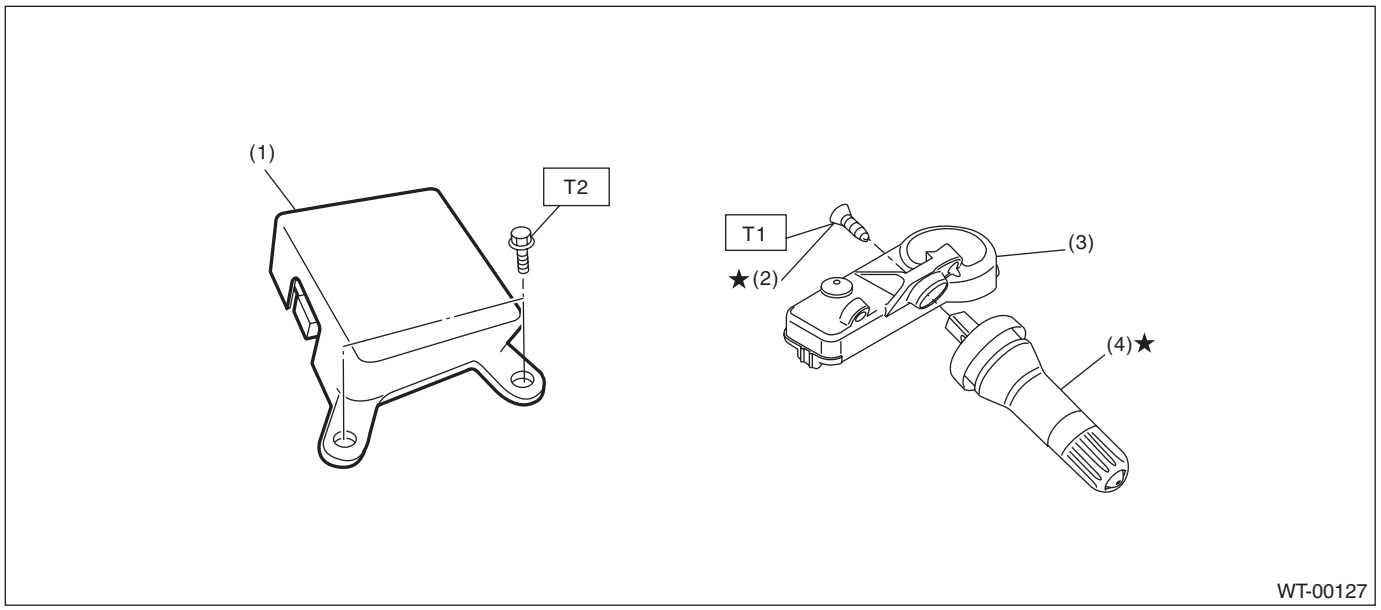
Wheel balancing	Standard:	Service limit
Dynamic unbalance	5 g (0.18 oz) or less	

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
28101SA160	30 g (1.06 oz)
28101SA170	35 g (1.23 oz)
28101SA180	40 g (1.41 oz)
28101SA190	45 g (1.59 oz)
28101SA200	50 g (1.76 oz)
28101SA210	55 g (1.94 oz)
28101SA220	60 g (2.12 oz)

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

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG002	5 g (0.18 oz)
28101AG012	7.5 g (0.26 oz)
28101AG022	10 g (0.35 oz)
28101AG032	12.5 g (0.44 oz)
28101AG042	15 g (0.53 oz)
28101AG052	17.5 g (0.62 oz)
28101AG062	20 g (0.71 oz)
28101AG072	22.5 g (0.79 oz)
28101AG082	25 g (0.88 oz)
28101AG092	27.5 g (0.97 oz)
28101AG102	30 g (1.06 oz)
28101AG112	32.5 g (1.15 oz)
28101AG122	35 g (1.23 oz)
28101AG132	37.5 g (1.32 oz)
28101AG142	40 g (1.41 oz)
28101AG152	42.5 g (1.50 oz)
28101AG162	45 g (1.59 oz)
28101AG172	47.5 g (1.68 oz)
28101AG182	50 g (1.76 oz)
28101AG192	52.5 g (1.85 oz)
28101AG202	55 g (1.94 oz)
28101AG212	57.5 g (2.03 oz)
28101AG222	60 g (2.12 oz)
28101AG232	62.5 g (2.20 oz)
28101AG242	65 g (2.29 oz)
28101AG252	67.5 g (2.38 oz)
28101AG262	70 g (2.47 oz)
28101AG272	72.5 g (2.56 oz)
28101AG282	75 g (2.65 oz)
28101AG292	77.5 g (2.73 oz)
28101AG302	80 g (2.82 oz)
28101AG312	82.5 g (2.91 oz)
28101AG322	85 g (3.00 oz)
28101AG332	87.5 g (3.09 oz)
28101AG342	90 g (3.17 oz)
28101AG352	92.5 g (3.26 oz)
28101AG362	95 g (3.35 oz)
28101AG372	97.5 g (3.44 oz)
28101AG382	100 g (3.53 oz)
28101SA300	102.5 g (3.62 oz)
28101SA310	105 g (3.70 oz)
28101SA320	107.5 g (3.79 oz)
28101SA330	110 g (3.88 oz)
28101SA340	112.5 g (3.97 oz)
28101SA350	115 g (4.06 oz)
28101SA360	117.5 g (4.14 oz)
28101SA370	120 g (4.23 oz)

B: COMPONENT



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

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.4 (0.14, 1)
T2: 2 (0.2, 1.5)

C: PREPARATION TOOL

1. GENERAL TOOL

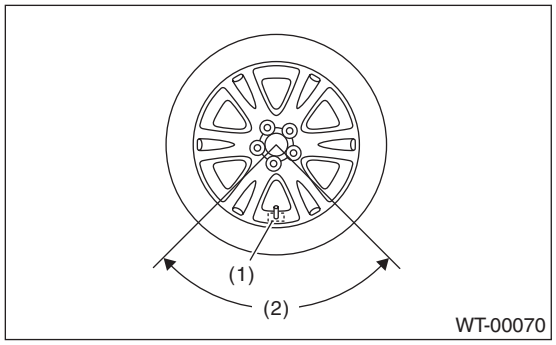
TOOL NAME	REMARKS
Air pressure gauge	Used for measuring tire air pressure.
Dial gauge with magnet stand	Used for measuring wheel runout.
Wheel balancer	Used for adjusting wheel balance.

2. Tire

A: INSPECTION

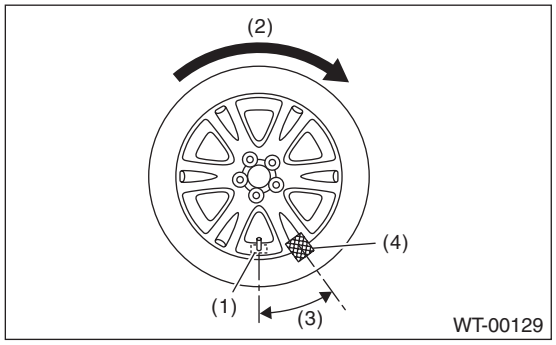
1) Take stones, glass, nails etc. out of the tread groove.
2) Replace tires in the following cases.

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



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

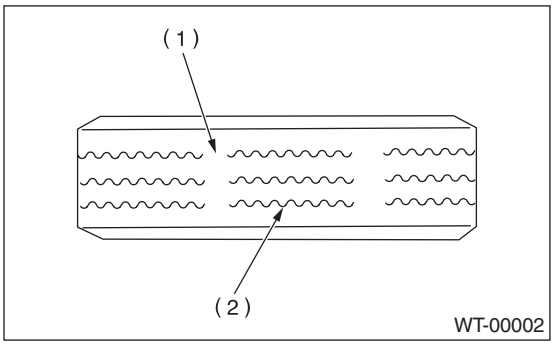
• To prevent damaging the transmitter, set the tire changer boom in the position as shown in the figure.



(1) Transmitter
(2) Direction of turn table rotation
(3) 30°
(4) Tire changer boom

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

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



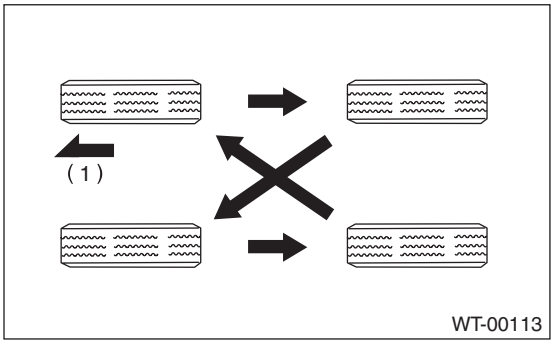
(1) Tread wear indicator
(2) Tire tread

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

1. TIRE ROTATION

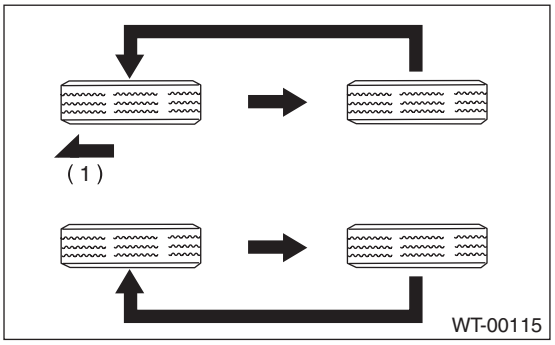
Rotate tires periodically (12,500 km/7,500 miles) as shown in the figure, in order to prevent uneven wear and to prolong life.

• When the direction of tire rotation is not specified



(1) Front

• When the direction of tire rotation is specified



(1) Front

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

3. Steel Wheel

A: REMOVAL

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

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

B: INSTALLATION

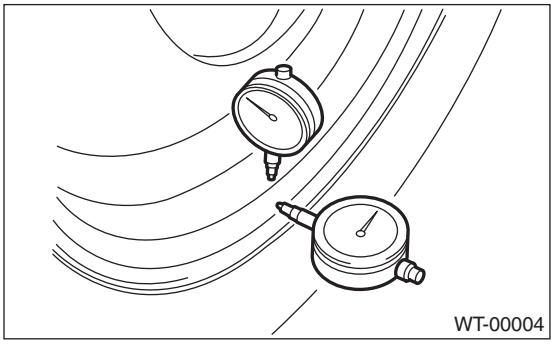
1) Remove dirt from the mating surface of the wheel and brake rotor.
2) Attach the wheel to the hub by aligning the wheel bolt holes with the hub bolts.
3) Temporarily attach the wheel nuts to the hub bolts. (In the case of aluminum wheels, use SUBARU genuine wheel nuts for aluminum wheels.)
4) Tighten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

Wheel nut tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

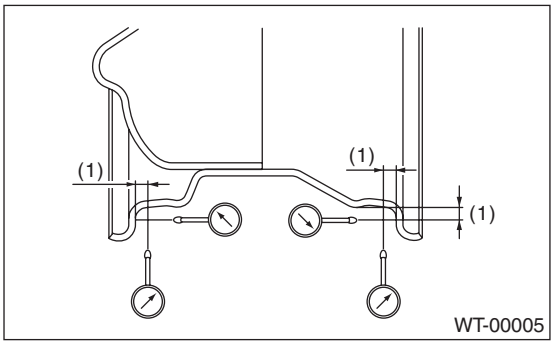
CAUTION:
• Tighten the wheel nuts in two or three steps by gradually increasing the torque on opposing nuts, until they reach the specified torque. For drum brake model, excess tightening of wheel nuts may cause wheels to “judder”.
• Do not push the wrench by foot. Always use both hands when tightening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

C: INSPECTION

1) Deformation or damage to the rim may cause air leakage. Check the rim flange for deformation, cracks or damage, and repair or replace as necessary.
2) Jack-up the vehicle until tires clear the floor.
3) Slowly rotate the 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 the rim runout exceeds specifications, remove the tire from wheel and check runout with the dial gauge attached to positions shown in the figure.
5) If the measured runout still exceeds specifications, replace the wheel.

4. Aluminum Wheel

A: REMOVAL

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

B: INSTALLATION

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

C: INSPECTION

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

Rim runout:

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

D: CAUTION

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

5. Wheel Balancing

A: ADJUSTMENT

NOTE:
Change the setting of wheel balancer to adhesive type weight if adhesive type weight is adopted.
1) Remove the balance weights.

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

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

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
28101SA160	30 g (1.06 oz)
28101SA170	35 g (1.23 oz)
28101SA180	40 g (1.41 oz)
28101SA190	45 g (1.59 oz)
28101SA200	50 g (1.76 oz)
28101SA210	55 g (1.94 oz)
28101SA220	60 g (2.12 oz)

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

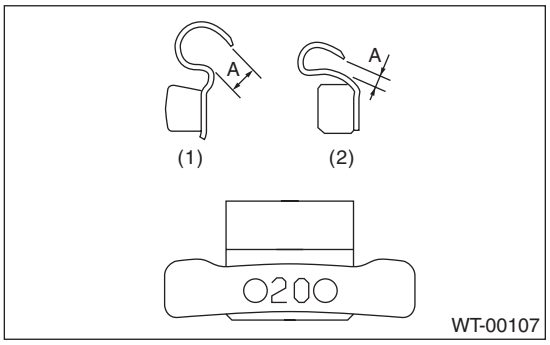
Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG002	5 g (0.18 oz)
28101AG012	7.5 g (0.26 oz)
28101AG022	10 g (0.35 oz)
28101AG032	12.5 g (0.44 oz)
28101AG042	15 g (0.53 oz)
28101AG052	17.5 g (0.62 oz)
28101AG062	20 g (0.71 oz)
28101AG072	22.5 g (0.79 oz)
28101AG082	25 g (0.88 oz)
28101AG092	27.5 g (0.97 oz)
28101AG102	30 g (1.06 oz)
28101AG112	32.5 g (1.15 oz)
28101AG122	35 g (1.23 oz)
28101AG132	37.5 g (1.32 oz)
28101AG142	40 g (1.41 oz)
28101AG152	42.5 g (1.50 oz)
28101AG162	45 g (1.59 oz)
28101AG172	47.5 g (1.68 oz)
28101AG182	50 g (1.76 oz)
28101AG192	52.5 g (1.85 oz)
28101AG202	55 g (1.94 oz)
28101AG212	57.5 g (2.03 oz)
28101AG222	60 g (2.12 oz)
28101AG232	62.5 g (2.20 oz)
28101AG242	65 g (2.29 oz)
28101AG252	67.5 g (2.38 oz)
28101AG262	70 g (2.47 oz)
28101AG272	72.5 g (2.56 oz)
28101AG282	75 g (2.65 oz)
28101AG292	77.5 g (2.73 oz)
28101AG302	80 g (2.82 oz)
28101AG312	82.5 g (2.91 oz)
28101AG322	85 g (3.00 oz)
28101AG332	87.5 g (3.09 oz)
28101AG342	90 g (3.17 oz)
28101AG352	92.5 g (3.26 oz)
28101AG362	95 g (3.35 oz)
28101AG372	97.5 g (3.44 oz)
28101AG382	100 g (3.53 oz)
28101SA300	102.5 g (3.62 oz)
28101SA310	105 g (3.70 oz)
28101SA320	107.5 g (3.79 oz)
28101SA330	110 g (3.88 oz)
28101SA340	112.5 g (3.97 oz)
28101SA350	115 g (4.06 oz)
28101SA360	117.5 g (4.14 oz)
28101SA370	120 g (4.23 oz)

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

CAUTION:
• Remove grease from the applying surface of adhesive type weight for wheel.
• Press the adhesive type weight by 25 N (2.5 kgf, 5.6 lbf) or more per 5 g (0.18 oz) for 2 seconds or more to attain close contact.
• Total application of the adhesive type weight should be 120 g (4.23 oz) or less.

5) Using the wheel balancer, measure the wheel balance again. Check that wheel balance is correctly adjusted.
6) Use Subaru genuine balance weights.

NOTE:
• 55 g (1.94 oz) weight used with aluminum wheel is not available.
• Knock-on type balance weight can be used for any of 15- to 18-inch wheels.



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

Service limit: A
Knock-on type weight for steel wheel:
2.0 mm (0.079 in)
Knock-on type weight for aluminum wheel:
5.0 mm (0.197 in)

6. "T-type" Tire

A: NOTE

Vehicles for Canada excluding non-turbo model are supplied with "T type" spare tires for temporary use.

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

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

C: INSPECTION

1) Check the tire air pressure.

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

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

7. Tire Pressure Monitoring System

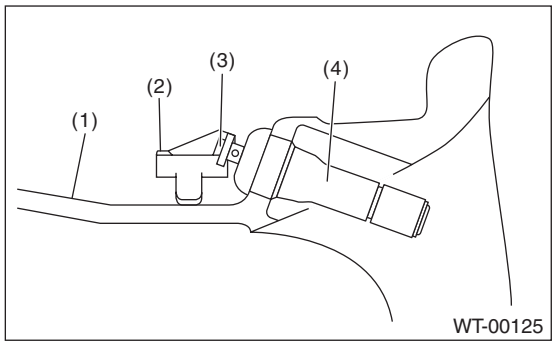
A: REMOVAL

1. TRANSMITTER (SNAP IN TYPE)

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

CAUTION:
Use a tire changer when removing the tire from the wheel.
3) Remove the screws and detach the transmitter from the valve stem.

NOTE:
When reusing the transmitter, replace the valve and screw with new parts.

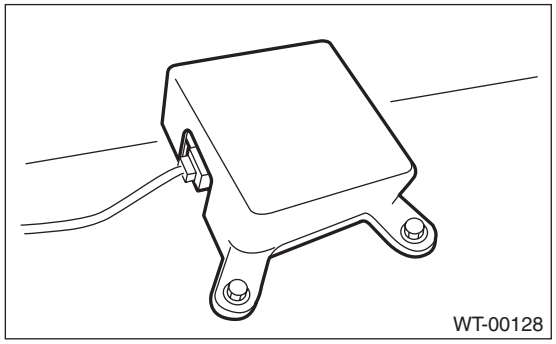


(1) Wheel
(2) Transmitter
(3) Screw
(4) Valve

4) Remove the valve from the wheel.

2. TIRE PRESSURE MONITORING CONTROL MODULE

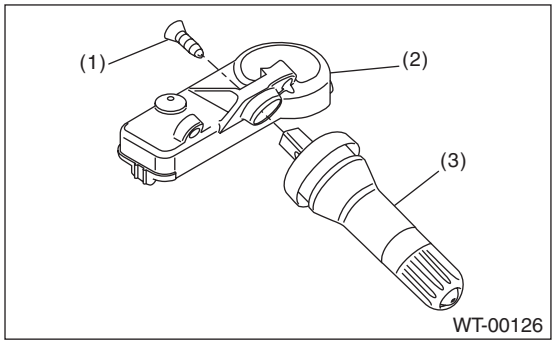
1) Remove the luggage floor mat. <Ref. to EI-48, REMOVAL, Luggage Floor Mat.>
2) Remove the connector to remove the tire pressure monitoring control module.



B: INSTALLATION

1. TRANSMITTER (SNAP IN TYPE)

CAUTION:
Use the new transmitter assembly or replace with the new valve and screw, when installing.
1) When reusing the transmitter, assemble after replacing the valve and screw with new parts.

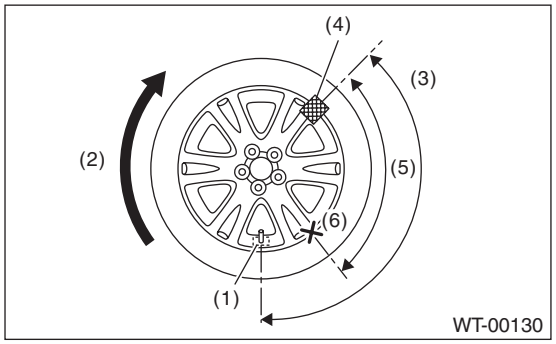


(1) Screw
(2) Transmitter
(3) Valve

Tightening torque:
1.4 N·m (0.14 kgf-m, 1 ft-lb)
2) Install the transmitter to the wheel by aligning it with valve hole.

NOTE:
When using a jig that hooks and then pulls the bottom of the valve cap, use a different short cap.
3) Attach the tires to wheels.

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



(1) Transmitter
(2) Direction of turn table rotation
(3) 135°
(4) Tire changer boom
(5) 90°
(6) Starting point for inserting the bead to the rim

4) Install the wheels to vehicle. <Ref. to WT-6, INSTALLATION, Steel Wheel.>
5) Register the transmitter ID to the tire pressure monitoring control module. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.>

2. TIRE PRESSURE MONITORING CONTROL MODULE

Install in the reverse order of removal.

Tightening torque:
2 N·m (0.2 kgf-m, 1.5 ft-lb)

C: ADJUSTMENT

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

8. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Vehicle sways	Improperly inflated tire.	Adjust the tire pressure. Refer to specifications for the tire air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>
	Abnormal wear	Inspect the tire referring to “Uneven tire wear” in this table, and perform the indicated procedures and replace the tire.
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-7, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-13, INSPECTION, Rear Strut.>
	Front axle	Check the front axle. <Ref. to DS-21, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-29, INSPECTION, Rear Axle.>
Abnormal vehicle pitching	Improperly inflated tire.	Adjust the tire pressure. Refer to “SPECIFICATIONS” for the tire air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>
	Abnormal wear	Inspect the tire referring to “Uneven tire wear” in this table, and perform the indicated procedures and replace the tire.
	Front stabilizer	Inspect the front stabilizer. <Ref. to FS-22, INSPECTION, Front Stabilizer.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-7, INSPECTION, Wheel Alignment.>

General Diagnostic Table

Symptoms	Possible cause	Corrective action
Abnormal wheel vibration	Improperly inflated tire.	Adjust the tire pressure. Refer to specifications for the tire air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>
	Abnormal wear	Inspect the tire referring to “Uneven tire wear” in this table, and perform the indicated procedures and replace the tire.
	Wheel is out of balance.	Adjust wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Front axle	Check the front axle. <Ref. to DS-21, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-29, INSPECTION, Rear Axle.>
Uneven tire wear	Improperly inflated tire.	Adjust the tire pressure. Refer to specifications for the tire air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>
	Wheel is out of balance.	Adjust wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-7, INSPECTION, Wheel Alignment.>