

ABS (DIAGNOSTICS)

BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

CAUTION:

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

NOTE:

- To check the harness for broken wires or short circuits, shake it while holding it or the connector.
- When the ABS warning light illuminates, read and record the DTC indicated by ABS warning light.

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1)Ask the customer when and how trouble occurred using interview checklist. <Ref. to ABS-4, Check List for Interview.> 2)Before performing diagnosis, inspect the unit which might influence ABS problem. <Ref. to ABS-8, INSPECTION, General Description.>	Is the unit that might influence the ABS problem normal?	Go to step 2.	Repair or replace each unit.
2 CHECK INDICATION OF DTC. Calling up the DTC. <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).> Record all DTCs.	Is only the start code issued?	Go to step 3.	Go to step 4.
3 PERFORM THE GENERAL DIAGNOSTICS. 1)Inspect using "General Diagnostics Table". <Ref. to ABS-159, General Diagnostics Table.> 2)Perform the clear memory mode. <Ref. to ABS-21, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3)Perform the inspection mode. <Ref. to ABS-20, Inspection Mode.> Calling up the DTC. <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).>	Is only the start code issued?	Complete the diagnosis.	Go to step 4.
4 PERFORM THE DIAGNOSIS. 1)Repair trouble cause. NOTE: For DTC list, refer to "List of DTC".<Ref. to ABS-23, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).> 2)Perform the clear memory mode. <Ref. to ABS-21, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3)Perform the inspection mode. <Ref. to ABS-20, Inspection Mode.> 4)Calling up the DTC. <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).>	Is only the start code issued?	Complete the diagnosis.	Repeat the step 4 until only start code is issued.

2. WITH SUBARU SELECT MONITOR

CAUTION:

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

NOTE:

- To check the harness for broken wires or short circuits, shake it while holding it or the connector.

BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

- Check list for interview. <Ref. to ABS-4, Check List for Interview.>

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1)Ask the customer when and how trouble occurred using interview checklist. <Ref. to ABS-4, Check List for Interview.> 2)Before performing diagnosis, inspect the unit which might influence the ABS problem. <Ref. to ABS-8, INSPECTION, General Description.>	Is the unit that might influence the ABS problem normal?	Go to step 2.	Repair or replace each unit.
2 CHECK INDICATION OF DTC DISPLAY. 1)Turn the ignition switch to OFF. 2)Connect the SUBARU SELECT MONITOR to data link connector. 3)Turn the ignition switch to ON and SUBARU SELECT MONITOR to ON. NOTE: If the communication function of Subaru Select Monitor cannot be executed normally, check communication circuit. <Ref. to ABS-79, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Procedure with Subaru Select Monitor.> 4)Read the DTC. <Ref. to ABS-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5)Record all DTCs and freeze frame data.	Is the DTC displayed?	Go to step 4.	Go to step 3.
3 PERFORM THE GENERAL DIAGNOSTICS. 1)Inspect using "General Diagnostics Table". <Ref. to ABS-159, General Diagnostics Table.> 2)Perform the clear memory mode. <Ref. to ABS-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3)Perform the inspection mode. <Ref. to ABS-20, Inspection Mode.> 4)Calling up the DTC. <Ref. to ABS-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Check DTC is not displayed.	Is the ABS warning light turned off after ignition switch OFF?	Complete the diagnosis.	Inspect using "diagnostics procedure for No DTC". <Ref. to ABS-82, NO TROUBLE CODE.>
4 PERFORM THE DIAGNOSIS. 1)For the DTC list, refer to "List of DTC". <Ref. to ABS-24, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).> 2)Repair trouble cause. 3)Perform the clear memory mode. <Ref. to ABS-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4)Perform the inspection mode. <Ref. to ABS-20, Inspection Mode.> 5)Calling up the DTC. <Ref. to ABS-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Are the DTCs indicated on display?	Inspect using "diagnostics procedure with Subaru Select Monitor". <Ref. to ABS-79, Diagnostics Procedure with Subaru Select Monitor.>	Complete the diagnosis.

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	☐ Always ☐ Sometimes ☐ Only once ☐ Does not come on • When / how long does it come on?:		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (before starting engine) ☐ START ☐ On after starting (Engine is running) ☐ On after starting (Engine is stop)		
Timing	☐ Immediately after ignition is ON. ☐ Immediately after ignition starts.		
	☐ When advancing	km/h to km/h MPH to MPH	
	☐ While traveling at a constant speed	km/h	MPH
	☐ When decelerating	km/h to km/h MPH to MPH	
	☐ When turning to right	Steering angle :	deg
		Steering time :	sec
	☐ When turning to left	Steering angle :	deg
		Steering time :	sec
	☐ When moving other electrical parts		
	• Parts name : • Operating condition :		

2. STATE OF BRAKE WARNING LIGHT

Brake warning light comes on.	☐ Always ☐ Sometimes ☐ Only once ☐ Does not come on ☐ When parking brake lever is pulled ☐ When parking brake lever is released • When / how long does it come on?:		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (before starting engine) ☐ START ☐ On after starting (Engine is running) ☐ On after starting (Engine is stop)		

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

Timing	☐ Immediately after ignition is ON. ☐ Immediately after ignition starts.		
	☐ When advancing	km/h to km/h	
		MPH to MPH	
	☐ While traveling at a constant speed	km/h	MPH
	☐ When decelerating	km/h to km/h	
		MPH to MPH	
	☐ When turning to right	Steering angle :	deg
		Steering time :	sec
	☐ When turning to left	Steering angle :	deg
		Steering time :	sec
☐ When operating other electrical parts			
• Parts name : • Operating condition :			

3. SYMPTOMS

ABS operating condition	☐ Does not operate.		
	☐ Operates only when abruptly applying brakes.	Vehicle speed :	km/h
			MPH
	• How to step on brake pedal :		
	a) Operating time :	sec	
	b) Operating noise : ☐ Produce / ☐ Does not produce		
	• What kind of noise?	☐ Knock ☐ Gong gong ☐ Bong ☐ Buzz ☐ Gong gong buzz ☐ Others :	
		c) Reaction force of brake pedal	
	☐ Stick ☐ Press down once with a clunk ☐ Press and released ☐ Others :		

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

Behavior of vehicle	a) Directional stability cannot be obtained or steering refuses to work when applying brakes : ☐ Yes / ☐ No	
	• When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	b) Directional stability cannot be obtained or steering refuses to work when accelerating : ☐ Yes / ☐ No	
	• When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	c) Brakes out of order : ☐ Yes / ☐ No	
	• What :	☐ Braking distance is long ☐ Brakes lock or drag ☐ Pedal stroke is long ☐ Pedal sticks ☐ Others :
	d) Poor acceleration : ☐ Yes / ☐ No	
	• What :	☐ Fails to accelerate ☐ Engine stalls ☐ Others :
	e) Occurrence of vibration : ☐ Yes / ☐ No	
	• Where • What kind :	
	f) Occurrence of abnormal noise : ☐ Yes / ☐ No	
	• Where • What kind :	
g) Occurrence of other phenomena : ☐ Yes / ☐ No		
• What kind :		

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others :
	b) Ambient temperature	°C (°F)
	c) Road	☐ Urban area ☐ Suburbs ☐ Highway ☐ General road ☐ Ascending slope ☐ Descending slope ☐ Paved road ☐ Gravel road ☐ Muddy road ☐ Sandy place ☐ Others :
	d) Road surface	☐ Dry ☐ Wet ☐ New-fallen snow ☐ Compressed snow ☐ Frozen slope ☐ Others :

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

Condition	a) Brakes	Deceleration : g	
		☐ Continuous / ☐ Intermittent	
	b) Accelerator	Acceleration : g	
		☐ Continuous / ☐ Intermittent	
	c) Vehicle speed	km/h	MPH
		☐ Advancing ☐ Accelerating ☐ Reducing speed ☐ Low speed ☐ Turning ☐ Others :	
	d) Tire inflation pressure	Front RH tire : kPa	
		Front LH tire : kPa	
		Rear RH tire : kPa	
		Rear LH tire : kPa	
	e) Degree of wear	Front RH tire :	
		Front LH tire :	
		Rear RH tire :	
		Rear LH tire :	
	f) Genuine parts are used. : ☐ Yes / ☐ No		
	g) Chain is passed around tires. : ☐ Yes / ☐ No		
	h) T tire is used. : ☐ Yes / ☐ No		
	i) Condition of suspension alignment :		
j) Loading state :			
k) Repair parts are used. : ☐ Yes / ☐ No			
• What :			
l) Others :			

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor, ABS control module and hydraulic control unit.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect ABS problems:

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

- 1) Check the brake fluid level.
- 2) Check the brake fluid leakage.

3. HYDRAULIC UNIT

Check the hydraulic unit.

- With brake tester <Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
- Without brake tester <Ref. to ABS-7, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

4. BRAKE DRAG

Check for brake drag.

5. BRAKE PAD AND ROTOR

Check the brake pad and rotor.

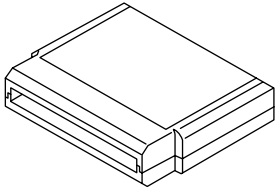
- Front <Ref. to BR-18, INSPECTION, Front Brake Pad.> and <Ref. to BR-21, INSPECTION, Front Disc Rotor.>
- Rear <Ref. to BR-29, INSPECTION, Rear Brake Pad.> and <Ref. to BR-30, INSPECTION, Rear Disc Rotor.>

6. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOLS

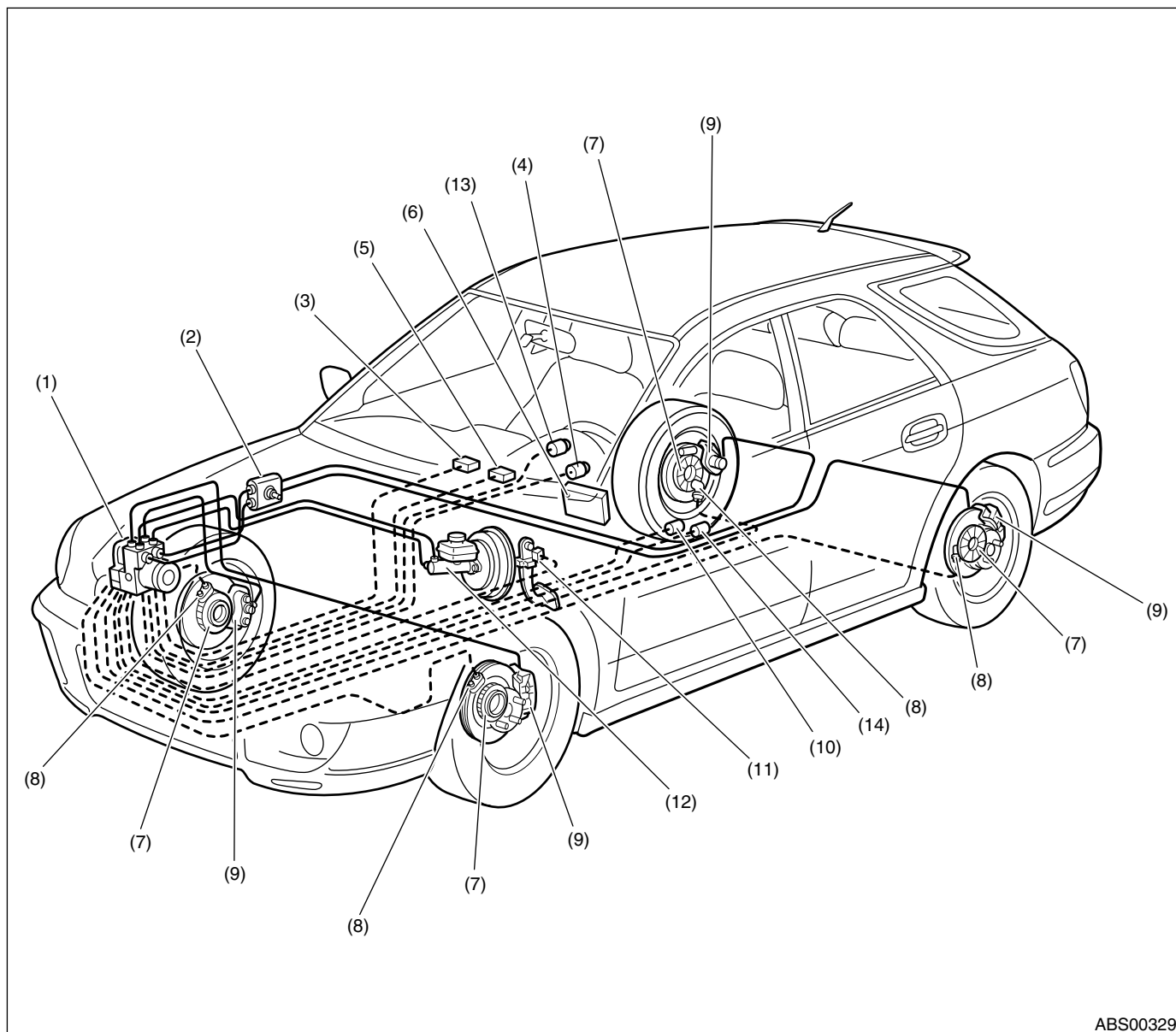
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

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

4. Electrical Components Location

A: LOCATION

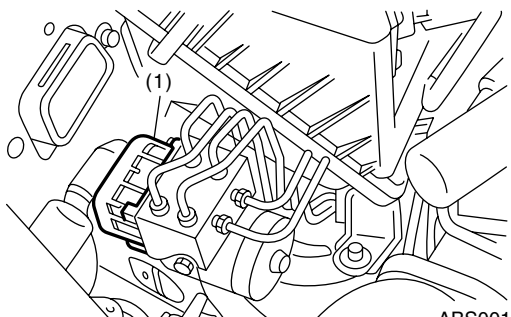


ABS00329

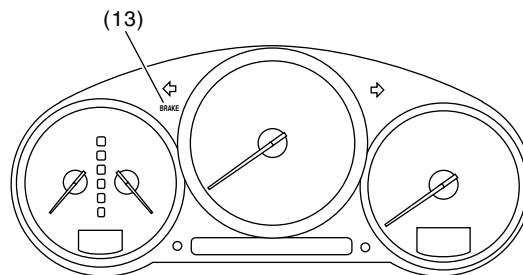
(1) ABS control module and hydraulic control unit (ABSCM&H/U)	(6) Transmission control module (TCM) (AT model)	(12) Master cylinder
(2) Connector	(7) Tone wheel	(13) Brake & EBD warning light
(3) Diagnosis connector	(8) ABS wheel speed sensor	(14) Lateral G sensor (STi model)
(4) ABS warning light	(9) Wheel cylinder	
(5) Data link connector (for Subaru Select Monitor)	(10) G sensor	
	(11) Stop light switch	

ELECTRICAL COMPONENTS LOCATION

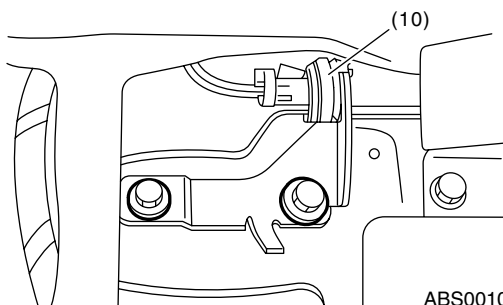
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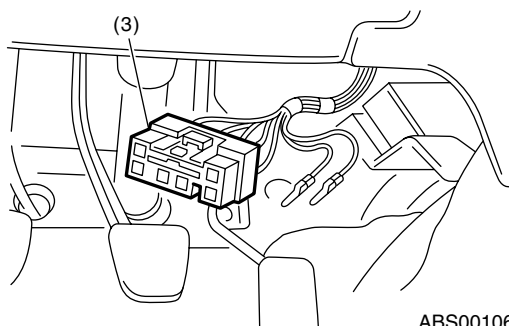
ABS00101



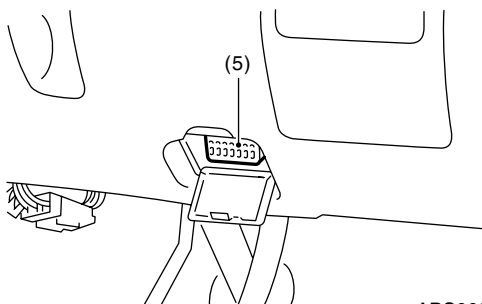
ABS-00379



ABS00102

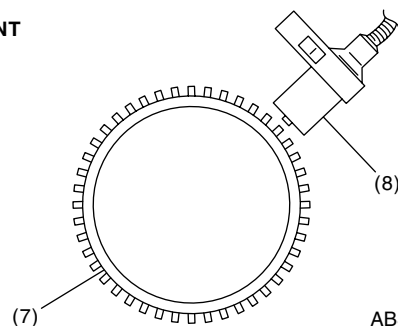


ABS00106



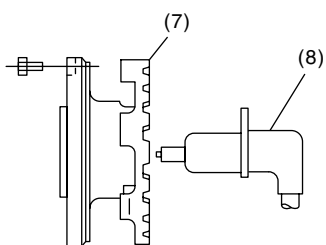
ABS00344

FRONT

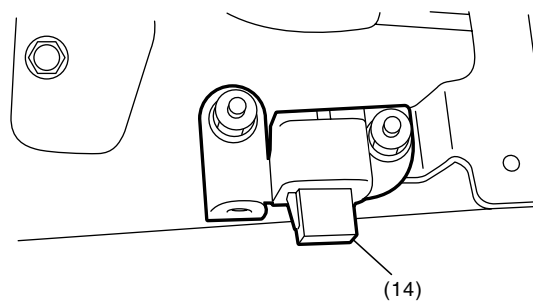


ABS00107

REAR



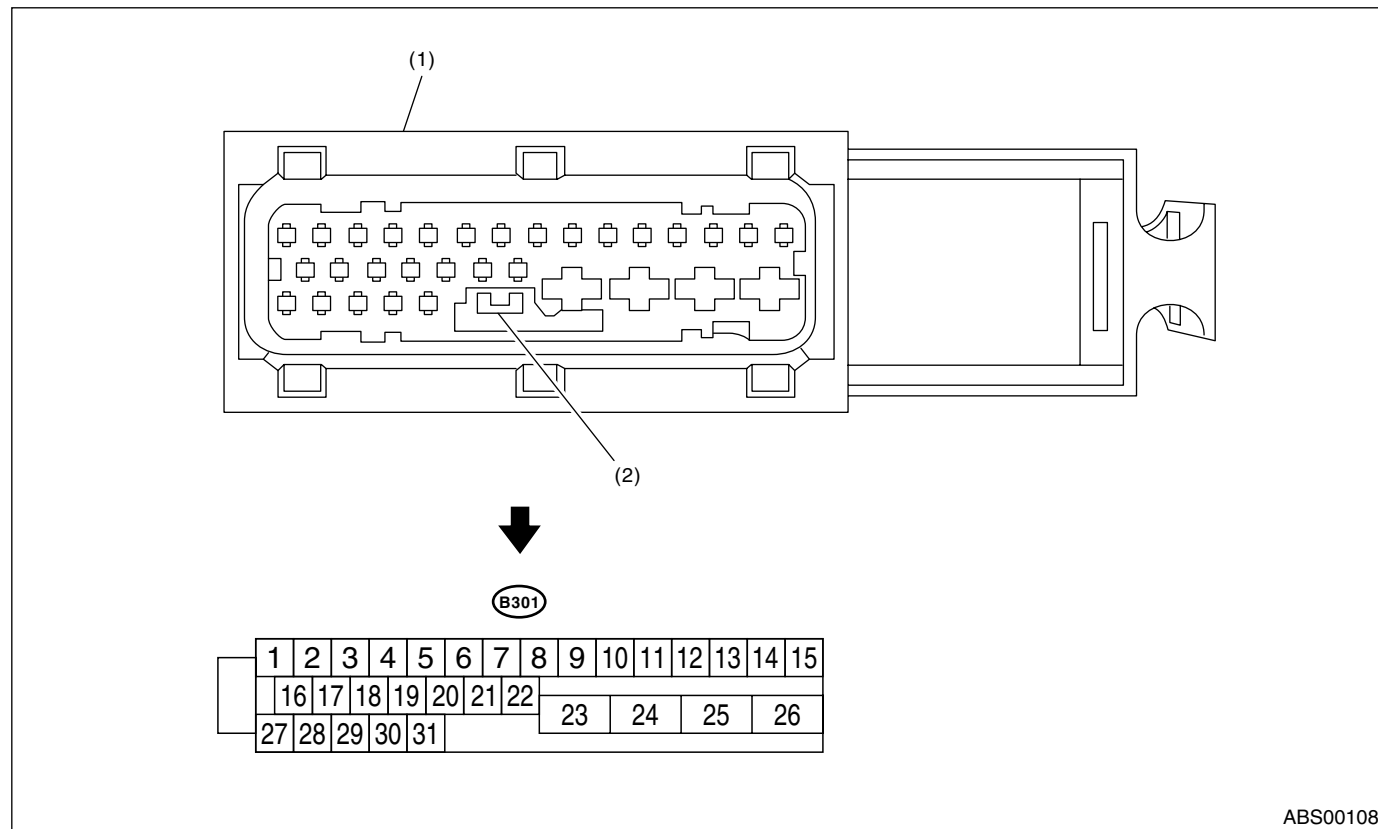
ABS00104



ABS00345

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



- (1) ABS control module and hydraulic control unit (ABSCM&H/U) connector
- (2) Connector switch

NOTE:

- The terminal numbers in ABS control module and hydraulic control unit connector are as shown in the figure.
- When the connector is removed from ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

CONTROL MODULE I/O SIGNAL

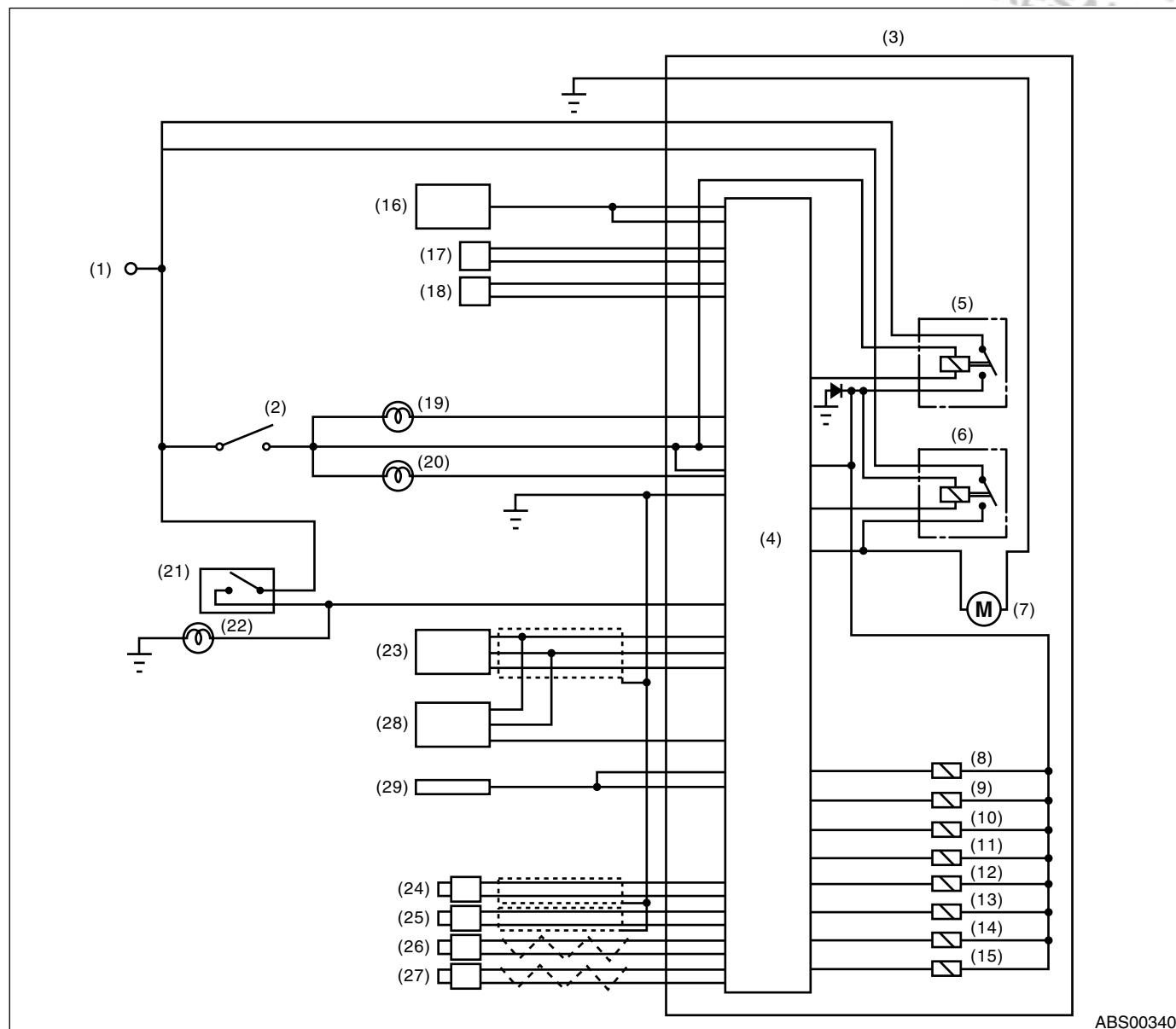
ABS (DIAGNOSTICS)

Contents		Terminal No. (+) — (—)	Input/Output signal
			Measured value and measuring conditions
ABS wheel speed sensor*2 (Wheel speed sensor)	Front left wheel	9 — 10	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	11 — 12	
	Rear left wheel	7 — 8	
	Rear right wheel	14 — 15	
Valve relay power supply*1		24 — 23	10 — 15 V
Motor relay power supply*1		25 — 23	10 — 15 V
G sensor*2	Power supply	30 — 28	4.75 — 5.25 V
	Ground	28	—
	Output	6 — 28	2.1 — 2.5 V when vehicle is in horizontal position.
Lateral G sensor (STi model)	Power supply	30 — 28	4.75 — 5.25 V
	Ground	28	—
	Output	29 — 28	2.3 — 2.7 V when vehicle is in horizontal position.
Stop light switch*1		2 — 23	Less than 1.5 V when the stop light is OFF and, 10 — 15 V when the stop light is ON.
ABS warning light*2		22 — 23	Less than 1.5 V within 1.5 seconds immediately after ignition switch has been turned to ON, and 10 — 15 V after 1.5 seconds has elapsed.
Brake warning light*2 (EBD warning light)		21 — 23	Less than 1.5 V within 1.5 seconds immediately after ignition switch has been turned to ON, and 10 — 15 V after 1.5 seconds has elapsed.
AT ABS signal (AT models only)		31 — 23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
ABS operation signal monitor		3 — 23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
Subaru Select Monitor*2	Data is received.	20 — 23	Less than 1.5 V when no data is received.
	Data is sent.	5 — 23	4.75 — 5.25 V when no data is sent.
ABS diagnosis connector	Terminal No. 3	29 — 23	10 — 15 V when ignition switch is ON.
	Terminal No. 6	4 — 23	10 — 15 V when ignition switch is ON.
Power supply*1		1 — 23	10 — 15 V when ignition switch is ON.
Grounding line		23	—
Grounding line		26	—

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

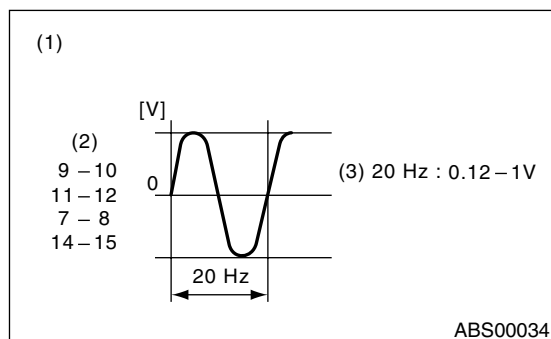
*2: Measure the I/O signal voltage at connector (F2).

B: SCHEMATIC



ABS00340

(1) Battery	(12) Rear inlet solenoid valve LH	(23) G sensor
(2) IGN	(13) Rear outlet solenoid valve LH	(24) Front ABS wheel speed sensor LH
(3) ABS control module and hydraulic control unit (ABSCM&H/U)	(14) Rear inlet solenoid valve RH	(25) Front ABS wheel speed sensor RH
(4) ABS control module area	(15) Rear outlet solenoid valve RH	(26) Rear ABS wheel speed sensor LH
(5) Valve relay	(16) Transmission control module (TCM) (AT model)	(27) Rear ABS wheel speed sensor RH
(6) Motor relay	(17) Diagnosis connector	(28) Lateral G sensor (STi model)
(7) Motor	(18) Data link connector	(29) Driver's control center differential control module (STi model)
(8) Front inlet solenoid valve LH	(19) Brake warning light	
(9) Front outlet solenoid valve LH	(20) ABS warning light	
(10) Front inlet solenoid valve RH	(21) Stop light switch	
(11) Front outlet solenoid valve RH	(22) Stop light	

C: WAVEFORM

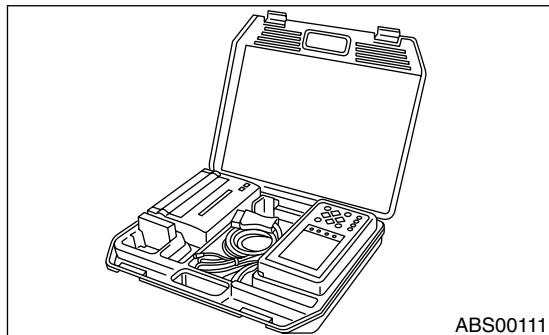
- (1) ABS wheel speed sensor
- (2) Terminal No.
- (3) Standard output voltage

6. Subaru Select Monitor

A: OPERATION

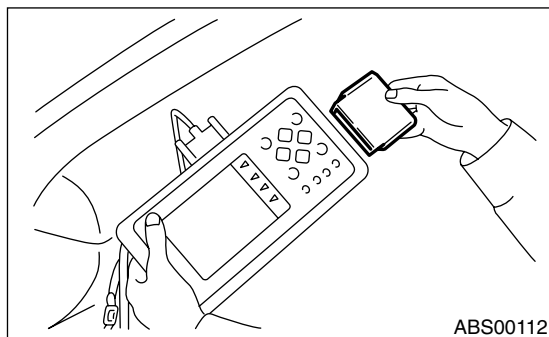
1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit.



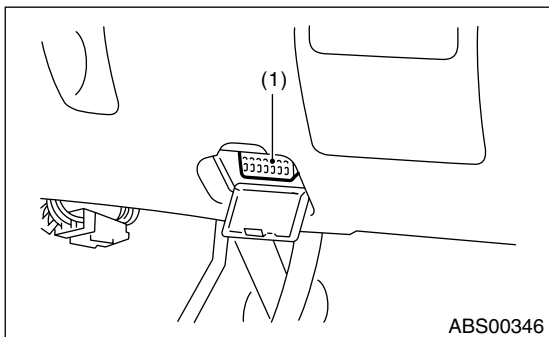
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor.
<Ref. to ABS-9, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

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



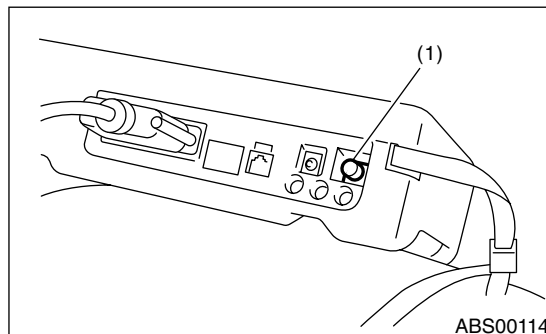
(1) Data link connector

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

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.

7) On the «System Selection Menu» display screen, select the {Brake Control System} and press [YES] key.

8) Press the [YES] key after the information of engine type is displayed.

9) On the «ABS Diagnosis» display screen, select the {DTC Display} and press [YES] key.

10) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For detailed concerning the DTC, refer to the LIST OF DTC. <Ref. to ABS-23, List of Diagnostic Trouble Code (DTC).>

- A maximum of 3 DTCs are displayed in order of occurrence.

- If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark "?", appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
Latest	The most recent DTC appears on Subaru Select Monitor display.
Old	The second most recent DTC appears on Subaru Select Monitor display.
Older	The third most recent DTC appears on Subaru Select Monitor display.
Reference	DTC issued after elapse of a specified period of time.

2. READ CURRENT DATA

- 1) On the «Main Menu» display screen, select the {Each System Check} and press «YES» key.
 - 2) On the «System Selection Menu» display screen, select the {Brake Control System} and press «YES» key.
 - 3) Press the «YES» key after the information of ABS type is displayed.
 - 4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display & Save} and press «YES» key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press «YES» key.
 - 6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Display screen	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by Front ABS wheel speed sensor RH is displayed	km/h or MPH
FL Wheel Speed	Wheel speed detected by Front ABS wheel speed sensor LH is displayed	km/h or MPH
RR Wheel Speed	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed	km/h or MPH
RL Wheel Speed	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed	km/h or MPH
Stop Light Switch	Stop light switch signal	ON or OFF
Stop Light Switch	Stop light switch monitor voltage is displayed.	V
G Sensor Output Signal	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.	V
Lateral G Sensor Output Signal	Lateral G detected by Lateral G sensor is displayed in voltage. (STi model)	V
Valve Relay Signal	Valve Relay Signal	ON or OFF
Motor Relay Signal	Motor Relay Signal	ON or OFF
ABS Signal to TCM	ABS operation signal from ABS control module to TCM	ON or OFF
ABS Warning Lamp	ON operation of ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Operating condition of motor relay is displayed.	ON or OFF
Valve Relay Monitor	Operating condition of the valve relay is displayed.	ON or OFF
CCM Signal	ABS operation signal from ABS control module to TCM	ON or OFF

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press «YES» key.
- 2) On the «System Select Menu» display screen, select the {Brake System} and press «YES» key.
- 3) Press the «YES» key after the information of engine type is displayed.
- 4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press «YES» key.

Display screen	Contents to be monitored
Clear memory?	Function of clearing DTC.

- 5) When the “Done” and “turn ignition switch to OFF” are shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. ABS SEQUENCE CONTROL

Display screen	Contents to be monitored	Index No.
ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to ABS-9, ABS Sequence Control.>

5. FREEZE FRAME DATA

NOTE:

- Data stored at the time of trouble occurrence is shown on display.
- Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
- Freeze frame data will be memorized maximum to three.
- If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a DTC, preceded by a question mark "?", appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by Front ABS wheel speed sensor RH is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front ABS wheel speed sensor LH is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed in km/h or mile/h.
ABSCM power voltage	Power (in volts) supplied to ABSCM & H/U appears on the Subaru Select Monitor display.
G sensor output voltage	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.
Lateral G sensor output voltage	Voltage equivalent to Lateral G detected by analog Lateral G sensor is displayed.
Motor relay monitor	Motor relay operation monitor signal
Stop light switch	Stop light switch signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS-AT control	ABS operation signal from ABS control module to TCM
ABS operation signal	ABS operation signal
Condition of malfunction	Displays if the malfunction has occurred to ABS only, or to ABS and EBD.

6. ANALOG DATA ARE DISPLAYED

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by Front ABS wheel speed sensor RH is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front ABS wheel speed sensor LH is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed in km/h or mile/h.
Stop light switch	Stop light switch monitor voltage is displayed.
G sensor output voltage	Refers to vehicle acceleration detecting by analog G sensor. It appears on the Subaru Select Monitor display in volts.
Lateral G sensor output voltage	Voltage equivalent to Lateral G detected by analog Lateral G sensor is displayed.

7. ON/OFF DATA ARE DISPLAYED

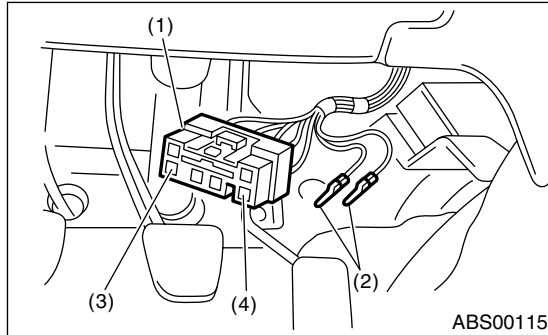
Display screen	Contents to be monitored
Stop light switch	Stop light switch signal
Valve relay signal	Valve relay signal
Motor relay signal	Motor relay signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS warning light	ABS warning light
Valve relay monitor	Valve relay operation monitor signal
Motor relay monitor	Motor relay operation monitor signal
CCM signal	ABS operation signal from ABS control module to TCM

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

1) Take out the diagnosis connector from side of driver's seat.

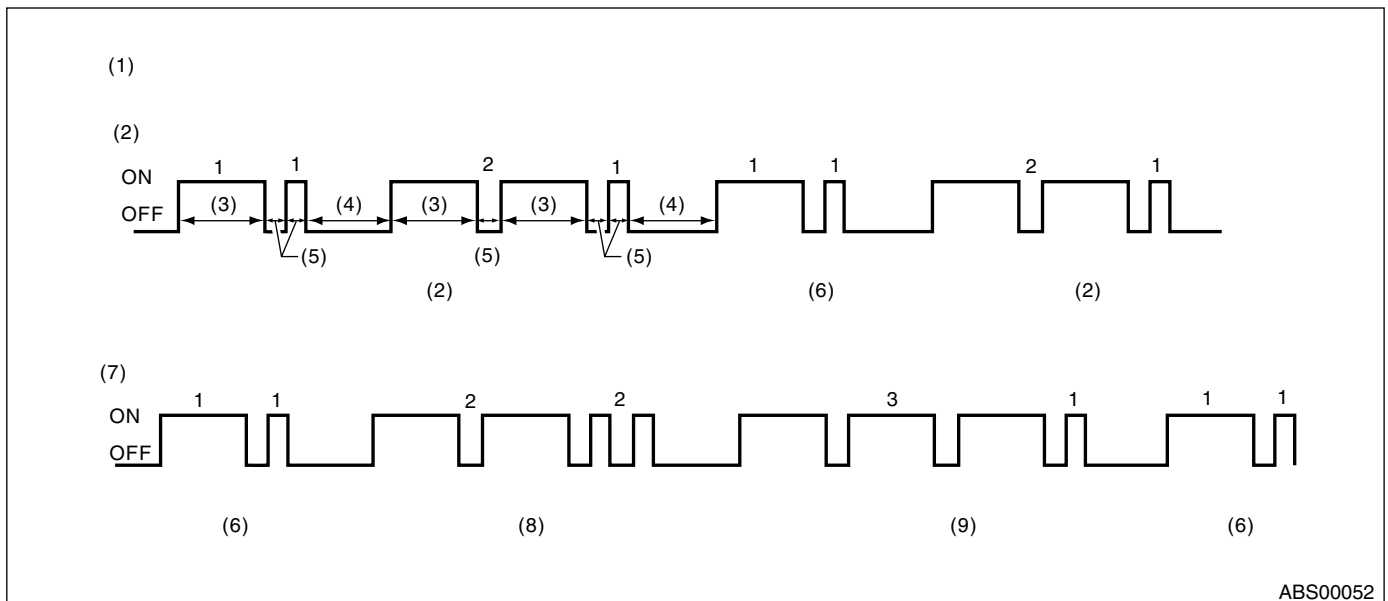


- (1) Diagnosis connector
- (2) Ground terminal
- (3) Terminal No. 3
- (4) Terminal No. 6

- 2) Turn the ignition switch to OFF.
- 3) Connect the diagnosis connector terminal 6 to Ground terminal.
- 4) Turn the ignition switch to ON.
- 5) ABS warning light is set in the diagnostic mode and blinks to identify DTC.
- 6) After the start code (11) is shown, the DTCs will be shown in order of the last information first. These repeat for a maximum of 3 minutes.

NOTE:

- When there are no DTCs in memory, only the start code (11) is shown.
- When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in EEPROM as a DTC. When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



- (1) Example of DTC indication
- (2) DTC: 21
- (3) 1.2 sec.
- (4) 1.0 sec.
- (5) 0.3 sec.
- (6) Start code
- (7) DTC: 22, 31
- (8) DTC: 22
- (9) DTC: 31

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand DTCs.
<Ref. to ABS-16, Subaru Select Monitor.>

8. Inspection Mode

A: OPERATION

Reproduce the condition under which the problem has occurred as much as possible.

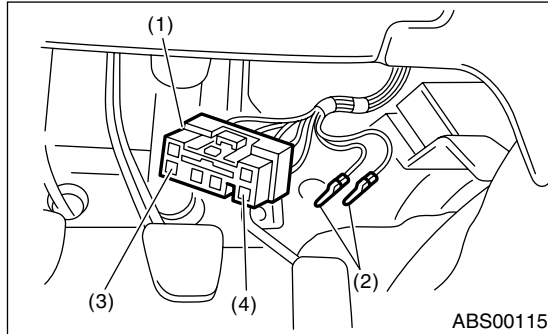
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least 1 minute.

9. Clear Memory Mode

A: OPERATION

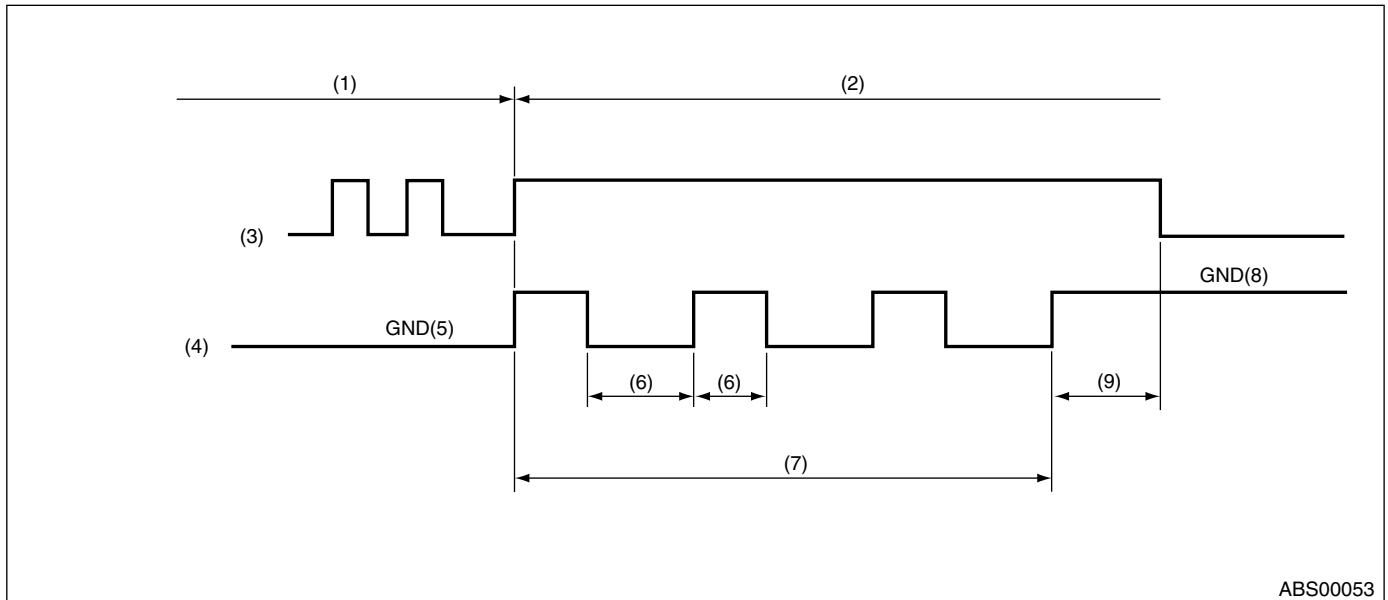
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a DTC, disconnect the diagnosis connector terminal 6 from Ground terminal.



- (1) Diagnosis connector
- (2) Ground terminal
- (3) Terminal No. 3
- (4) Terminal No. 6

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 6 and Ground terminal for at least 0.2 seconds each time.



(1) Diagnostic trouble code (DTC) indication mode	(4) Terminal No. 8	(8) Open (high level)
(2) Clear memory mode	(5) Low level	(9) 1.5 sec.
(3) ABS warning lamp	(6) 0.2 sec. or more	
	(7) 12 sec. or less	

NOTE:

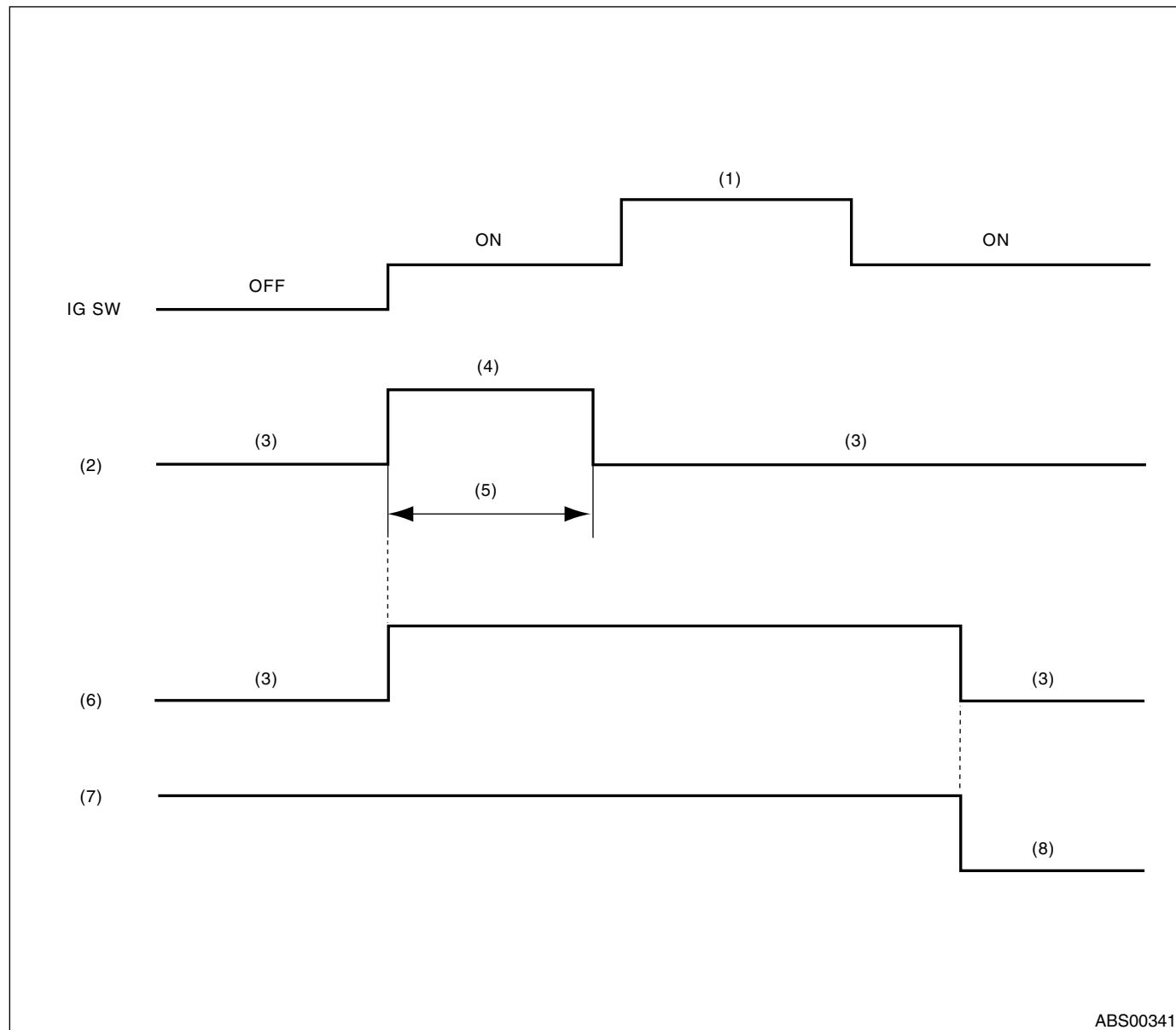
After the diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear DTC. <Ref. to ABS-16, Subaru Select Monitor.>

10.ABS Warning Light/Brake Warning Light Illumination Pattern

A: INSPECTION



(1) START	(4) Illuminates	(7) Parking brake
(2) ABS warning light	(5) 1.5 sec.	(8) Release
(3) Goes out	(6) Brake warning light (EBD warning light)	

1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.

2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit. <Ref. to ABS-28, Diagnostics Procedure without Subaru Select Monitor.>

NOTE:

Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approx. 12 km/h (7 MPH). However, the Anti-lock brakes do not work while ABS warning light is illuminated.

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

11.List of Diagnostic Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC	Contents of diagnosis		Index No.
—	ABS warning light does not illuminate.		<Ref. to ABS-28, ABS WARNING LIGHT DOES NOT COME ON, Diagnostics Procedure without Subaru Select Monitor.>
—	ABS warning light remains on.		<Ref. to ABS-31, ABS WARNING LIGHT DOES NOT GO OFF, Diagnostics Procedure without Subaru Select Monitor.>
—	Brake warning light remains on.		<Ref. to ABS-34, BRAKE WARNING LIGHT DO NOT GO OFF, Diagnostics Procedure without Subaru Select Monitor.>
—	DTC does not illuminate.		<Ref. to ABS-36, DTC DOES NOT APPEAR, Diagnostics Procedure without Subaru Select Monitor.>
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.		—
21	Abnormal ABS wheel speed sensor (Open circuit or input voltage too high)	Front ABS wheel speed sensor RH	<Ref. to ABS-37, DTC 21 — ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH) —, Diagnostics Procedure without Subaru Select Monitor.>
23		Front ABS wheel speed sensor LH	<Ref. to ABS-37, DTC 23 — ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH) —, Diagnostics Procedure without Subaru Select Monitor.>
25		Rear ABS wheel speed sensor RH	<Ref. to ABS-37, DTC 25 — ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH) —, Diagnostics Procedure without Subaru Select Monitor.>
27		Rear ABS wheel speed sensor LH	<Ref. to ABS-38, DTC 27 — ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>
22	Abnormal ABS wheel speed sensor (Abnormal ABS wheel speed sensor signal)	Front ABS wheel speed sensor RH	<Ref. to ABS-42, DTC 22 — ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (FRONT RH) —, Diagnostics Procedure without Subaru Select Monitor.>
24		Front ABS wheel speed sensor LH	<Ref. to ABS-42, DTC 24 — ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (FRONT LH) —, Diagnostics Procedure without Subaru Select Monitor.>
26		Rear ABS wheel speed sensor RH	<Ref. to ABS-42, DTC 26 — ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR RH) —, Diagnostics Procedure without Subaru Select Monitor.>
28		Rear ABS wheel speed sensor LH	<Ref. to ABS-43, DTC 28 — ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>
29		Any one of four	<Ref. to ABS-47, DTC 29 — ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (ANY ONE OF FOUR) —, Diagnostics Procedure without Subaru Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

DTC	Contents of diagnosis		Index No.
31	Inlet valve, outlet valve in hydraulic control unit	Front inlet valve RH	<Ref. to ABS-51, DTC 31 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —, Diagnostics Procedure without Subaru Select Monitor.>
32		Front outlet valve RH	<Ref. to ABS-54, DTC 32 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —, Diagnostics Procedure without Subaru Select Monitor.>
33		Front inlet valve LH	<Ref. to ABS-51, DTC 33 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —, Diagnostics Procedure without Subaru Select Monitor.>
34		Front outlet valve LH	<Ref. to ABS-54, DTC 34 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —, Diagnostics Procedure without Subaru Select Monitor.>
35		Rear inlet valve RH	<Ref. to ABS-51, DTC 35 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —, Diagnostics Procedure without Subaru Select Monitor.>
36		Rear outlet valve RH	<Ref. to ABS-54, DTC 36 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —, Diagnostics Procedure without Subaru Select Monitor.>
37		Rear inlet valve LH	<Ref. to ABS-52, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>
38		Rear outlet valve LH	<Ref. to ABS-55, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>
41	Abnormal ABS control module		<Ref. to ABS-58, DTC 41 — ABNORMAL ABS CONTROL MODULE —, Diagnostics Procedure without Subaru Select Monitor.>
42	Source voltage is abnormal.		<Ref. to ABS-60, DTC 42 — SOURCE VOLTAGE IS ABNORMAL —, Diagnostics Procedure without Subaru Select Monitor.>
44	A combination of AT control abnormal		<Ref. to ABS-63, DTC 44 — A COMBINATION OF AT CONTROL ABNORMAL —, Diagnostics Procedure without Subaru Select Monitor.>
51	Abnormal valve relay		<Ref. to ABS-65, DTC 51 — ABNORMAL VALVE RELAY —, Diagnostics Procedure without Subaru Select Monitor.>
52	Abnormal motor and/or motor relay		<Ref. to ABS-68, DTC 52 — ABNORMAL MOTOR AND/OR MOTOR RELAY —, Diagnostics Procedure without Subaru Select Monitor.>
54	Abnormal stop light switch		<Ref. to ABS-71, DTC 54 — ABNORMAL STOP LIGHT SWITCH —, Diagnostics Procedure without Subaru Select Monitor.>
56	Abnormal G sensor output voltage		<Ref. to ABS-73, DTC 56 — ABNORMAL G SENSOR OUTPUT VOLTAGE —, Diagnostics Procedure without Subaru Select Monitor.>
73	Abnormal Lateral G sensor output voltage		<Ref. to ABS-76, DTC 73 — ABNORMAL LATERAL G SENSOR OUTPUT VOLTAGE —, Diagnostics Procedure without Subaru Select Monitor.>

2. WITH SUBARU SELECT MONITOR

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
—	—	Communication for initializing impossible	Subaru Select Monitor communication failure	<Ref. to ABS-79, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Procedure with Subaru Select Monitor.>
—	—	No DTC	Although no DTC appears on the Subaru Select Monitor display, the ABS warning light remains on.	<Ref. to ABS-82, NO TROUBLE CODE, Diagnostics Procedure with Subaru Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
21	4A02	Open or short circuit in Front ABS wheel speed sensor RH circuit	Open or short circuit in Front ABS wheel speed sensor RH circuit	<Ref. to ABS-85, DTC 21 — OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>
22	48C5, 4945 48E5, 4845 4905, 4885	Front ABS wheel speed sensor RH abnormal signal	Front ABS wheel speed sensor RH abnormal signal	<Ref. to ABS-91, DTC 22 — FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —, Diagnostics Procedure with Subaru Select Monitor.>
23	4202	Open or short circuit in Front ABS wheel speed sensor LH circuit	Open or short circuit in Front ABS wheel speed sensor LH circuit	<Ref. to ABS-85, DTC 23 — OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>
24	40C5, 4145 40E5, 4045 4105, 4085	Front ABS wheel speed sensor LH abnormal signal	Front ABS wheel speed sensor LH abnormal signal	<Ref. to ABS-91, DTC 24 — FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —, Diagnostics Procedure with Subaru Select Monitor.>
25	4602	Open or short circuit in Rear ABS wheel speed sensor RH circuit	Open or short circuit in Rear ABS wheel speed sensor RH circuit	<Ref. to ABS-85, DTC 25 — OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>
26	44C5, 4545 44E5, 4445 4505, 4485	Rear ABS wheel speed sensor RH abnormal signal	Rear ABS wheel speed sensor RH abnormal signal	<Ref. to ABS-91, DTC 26 — REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —, Diagnostics Procedure with Subaru Select Monitor.>
27	4E02	Open or short circuit in Rear ABS wheel speed sensor LH circuit	Open or short circuit in Rear ABS wheel speed sensor LH circuit	<Ref. to ABS-86, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>
28	4CC5, 4D45 4CE5, 4C45 4D05, 4C85	Rear ABS wheel speed sensor LH abnormal signal	Rear ABS wheel speed sensor LH abnormal signal	<Ref. to ABS-92, DTC 28 — REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —, Diagnostics Procedure with Subaru Select Monitor.>
29	5080 50C0	Abnormal ABS wheel speed sensor signal on any one of four sensor	Abnormal ABS wheel speed sensor signal on any one of four	<Ref. to ABS-97, DTC 29 — ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR —, Diagnostics Procedure with Subaru Select Monitor.>
31	3200	Front inlet valve RH malfunction	Front inlet valve RH malfunction	<Ref. to ABS-101, DTC 31 — FRONT RIGHT INLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
32	3600	Front outlet valve RH malfunction	Front outlet valve RH malfunction	<Ref. to ABS-104, DTC 32 — FRONT RIGHT OUTLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
33	2200	Front inlet valve LH malfunction	Front inlet valve LH malfunction	<Ref. to ABS-101, DTC 33 — FRONT LEFT INLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
34	2600	Front outlet valve LH malfunction	Front outlet valve LH malfunction	<Ref. to ABS-104, DTC 34 — FRONT LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
35	2A00	Rear inlet valve RH malfunction	Rear inlet valve RH malfunction	<Ref. to ABS-101, DTC 35 — REAR RIGHT INLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
36	2E00	Rear outlet valve RH malfunction	Rear outlet valve RH malfunction	<Ref. to ABS-104, DTC 36 — REAR RIGHT OUTLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
37	3A00	Rear inlet valve LH malfunction	Rear inlet valve LH malfunction	<Ref. to ABS-102, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
38	3E00	Rear outlet valve LH malfunction	Rear outlet valve LH malfunction	<Ref. to ABS-105, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
41	02A0, 0040, 0020, 02C0, 00E0, 0340, 0140, 0160, 0280, 0460, 0260, 0060, 0080, 0300	ABS control module malfunction	ABS control module and hydraulic control unit malfunction	<Ref. to ABS-108, DTC 41 — ABS CONTROL MODULE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
42	5A00	Power supply voltage too low	Power supply voltage too low	<Ref. to ABS-110, DTC 42 — POWER SUPPLY VOLTAGE TOO LOW —, Diagnostics Procedure with Subaru Select Monitor.>
	5A80	Power supply voltage too high	Power supply voltage too high	<Ref. to ABS-113, DTC 42 — POWER SUPPLY VOLTAGE TOO HIGH —, Diagnostics Procedure with Subaru Select Monitor.>
44	1600	ABS-AT control (Non Controlled)	ABS-AT control (Non Controlled)	<Ref. to ABS-116, DTC 44 — ABS-AT CONTROL (NON CONTROLLED) —, Diagnostics Procedure with Subaru Select Monitor.>
	1500	ABS-AT control (Controlled)	ABS-AT control (Controlled)	<Ref. to ABS-118, DTC 44 — ABS-AT CONTROL (CONTROLLED) —, Diagnostics Procedure with Subaru Select Monitor.>
51	0C80 0EA0	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS-120, DTC 51 — VALVE RELAY MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
	0C40	Valve relay ON failure	Valve relay ON failure	<Ref. to ABS-123, DTC 51 — VALVE RELAY ON FAILURE —, Diagnostics Procedure with Subaru Select Monitor.>
52	10A1	Open circuit in motor relay circuit	Open circuit in motor relay circuit	<Ref. to ABS-125, DTC 52 — OPEN CIRCUIT IN MOTOR RELAY CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>
	10E1	Motor relay ON failure	Motor relay ON failure	<Ref. to ABS-127, DTC 52 — MOTOR RELAY ON FAILURE —, Diagnostics Procedure with Subaru Select Monitor.>
	10C1	Motor malfunction	Motor malfunction	<Ref. to ABS-129, DTC 52 — MOTOR MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
54	5600	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS-131, DTC 54 — STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>
56	7600	Open or short circuit in G sensor circuit	Open or short circuit in G sensor circuit	<Ref. to ABS-133, DTC 56 — OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>
	7580	Battery short in G sensor circuit	Battery short in G sensor circuit	<Ref. to ABS-136, DTC 56 — BATTERY SHORT IN G SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>
	7540	Abnormal G sensor high μ output	Abnormal G sensor high μ output	<Ref. to ABS-140, DTC 56 — ABNORMAL G SENSOR HIGH μ OUTPUT —, Diagnostics Procedure with Subaru Select Monitor.>
	7500	Detection of G sensor stick	Detection of G sensor stick	<Ref. to ABS-143, DTC 56 — DETECTION OF G SENSOR STICK —, Diagnostics Procedure with Subaru Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
73	7A00	Open or short circuit in Lateral G sensor circuit	Open or short circuit in Lateral G sensor circuit	<Ref. to ABS-146, DTC 73 — OPEN OR SHORT CIRCUIT IN LATERAL G SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>
	7980	Battery short in Lateral G sensor circuit	Battery short in Lateral G sensor circuit	<Ref. to ABS-149, DTC 73 — BATTERY SHORT IN LATERAL G SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>
	7940	Abnormal Lateral G sensor high μ output	Abnormal Lateral G sensor high μ output	<Ref. to ABS-153, DTC 73 — ABNORMAL LATERAL G SENSOR HIGH m OUTPUT —, Diagnostics Procedure with Subaru Select Monitor.>
	7900	Detection of Lateral G sensor stick	Detection of Lateral G sensor stick	<Ref. to ABS-156, DTC 73 — DETECTION OF LATERAL G SENSOR STICK —, Diagnostics Procedure with Subaru Select Monitor.>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

12. Diagnostics Procedure without Subaru Select Monitor

A: ABS WARNING LIGHT DOES NOT COME ON

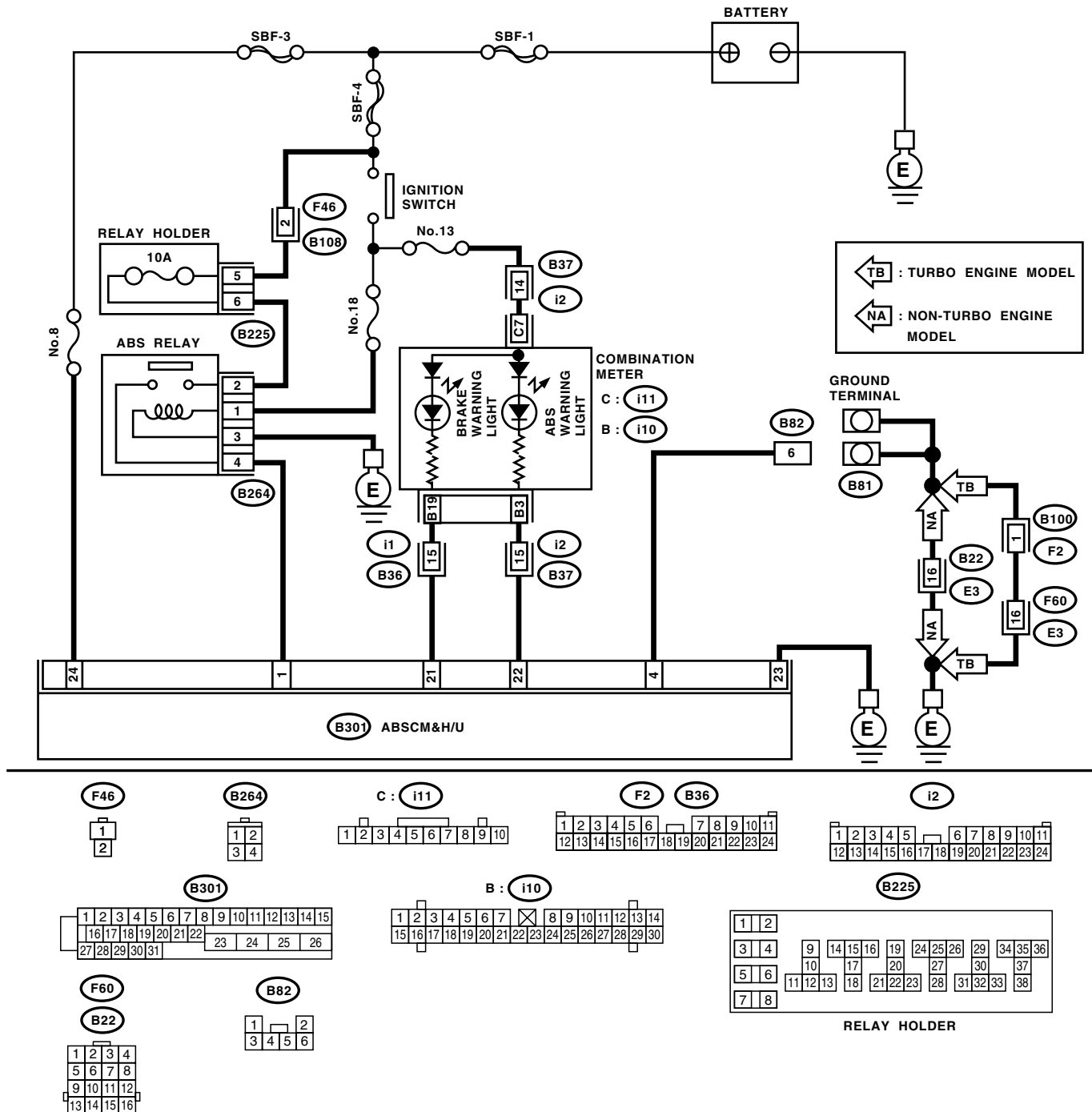
DIAGNOSIS:

- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



ABS00347

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK IF OTHER WARNING LIGHTS TURN ON. Turn the ignition switch to ON (engine OFF).	Are other warning lights turned on?	Go to step 2.	Repair the combination meter. <Ref. to IDI-10, Combination Meter Assembly.>
2	CHECK ABS AND BRAKE WARNING LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the ABS warning light and brake warning light.	Is the ABS warning light bulb open?	Replace the ABS and brake warning light bulb. <Ref. to IDI-10, Combination Meter Assembly.>	Go to step 3.
3	CHECK BATTERY SHORT OF ABS HARNESS. 1) Disconnect the connector (i2) from connector (B37). 2) Measure the voltage between connector (i2) and chassis ground. Connector & terminal (i2) No. 15 (+) — Chassis ground (-):	Is the voltage less than 3 V?	Go to step 4.	Repair battery short in the warning light harness.
4	CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (i2) and chassis ground. Connector & terminal (i2) No. 15 (+) — Chassis ground (-):	Is the voltage less than 3 V?	Go to step 5.	Repair battery short in the warning light harness.
5	CHECK WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Install the combination meter. 3) Turn the ignition switch to ON. 4) Measure the voltage between connector (i2) and chassis ground. Connector & terminal (i2) No. 15 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 6.	Repair open circuit in the wiring harness.
6	CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS. 1) Turn the ignition switch to OFF. 2) Measure the voltage between connector (B37) and chassis ground. Connector & terminal (B37) No. 15 (+) — Chassis ground (-):	Is the voltage less than 3 V?	Go to step 7.	Repair battery short in the wiring harness.
7	CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (B37) and chassis ground. Connector & terminal (B37) No. 15 (+) — Chassis ground (-):	Is the voltage less than 3 V?	Go to step 8.	Repair battery short in the wiring harness.
8	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 9.	Repair open circuit in the ABSCM&H/U ground harness.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
9	CHECK WIRING HARNESS. Measure the resistance between connector (B37) and chassis ground. Connector & terminal (B37) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 10.	Repair open circuit in the harness/connector.
10	CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connectors between combination meter and ABSCM&H/U?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

B: ABS WARNING LIGHT DOES NOT GO OFF

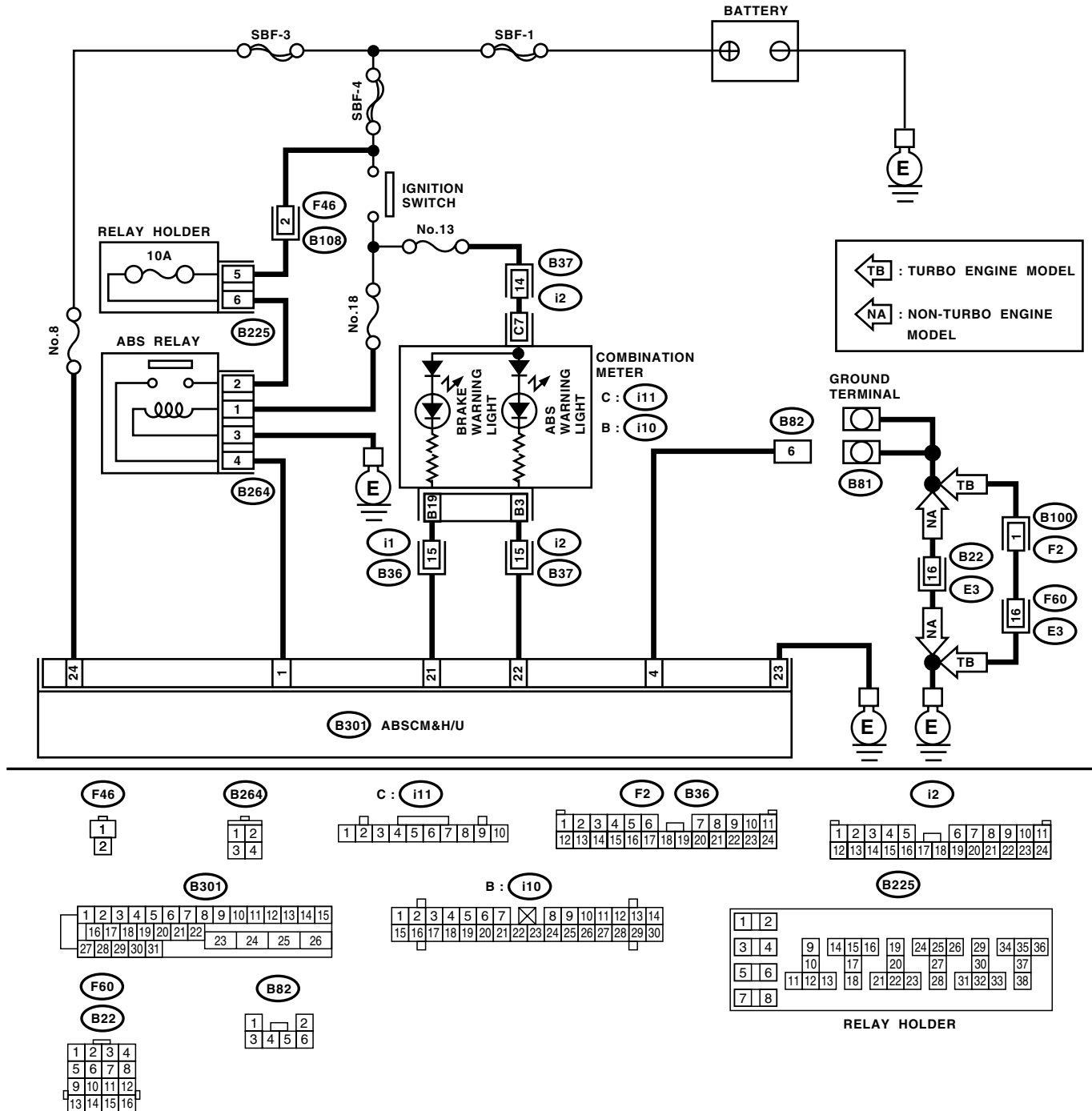
DIAGNOSIS:

- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while ABS warning light is kept ON.

WIRING DIAGRAM:



ABS00347

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INSTALLATION OF ABSCM&H/U CONNECTOR. Turn the ignition switch to OFF.	Is the ABSCM&H/U connector inserted into ABSCM until the clamp locks onto it?	Go to step 2.	Insert the ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.
2 CHECK GROUND TERMINAL. Measure the resistance between Ground terminals (B81) and chassis ground. Terminals Ground terminal (A) — Chassis ground: Ground terminal (B) — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the open circuit in Ground terminal harness.
3 CHECK DIAGNOSIS LINE. 1)Connect the Ground terminal (B81) to diagnosis connector (B82) No. 6. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 4 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 4.	Repair the open circuit in harness connector between ABSCM&H/U and diagnosis connector.
4 CHECK GENERATOR. 1)Start the engine. 2)Idle the engine. 3)Measure the voltage between generator and chassis ground. Terminals Generator B terminal (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 5.	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
5 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step 6.
6 CHECK POWER SUPPLY OF ABSCM. 1)Start the engine. 2)Idle the engine. 3)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 7.	Repair the ABSCM&H/U power supply circuit.
7 CHECK WIRING HARNESS. 1)Disconnect the connector (i2) from connector (B37). 2)Turn the ignition switch to ON.	Does the ABS warning light turn on?	Repair the front or body wiring harness.	Go to step 8.
8 CHECK PROJECTION AT ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Check for damage at the ABSCM&H/U terminal. NOTE: For detail of connector switch, refer to following. <Ref. to ABS-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Is there any damage on projection which switches connector switch?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 9.
9 CHECK ABSCM&H/U. Measure the resistance between ABSCM&H/U terminals. Terminals No. 22 — No. 23:	Is the resistance more than 1 M Ω ?	Go to step 10.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK WIRING HARNESS. Measure the resistance between connector (B37) and chassis ground. Connector & terminal (B37) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 11.	Repair the harness.
11 CHECK WIRING HARNESS. 1)Connect the connector to ABSCM&H/U. 2)Measure the resistance between connector (B37) and chassis ground. Connector & terminal (B37) No. 15 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 12.	Repair the harness.
12 CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.	Is there poor contact in ABSCM&H/U connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

C: BRAKE WARNING LIGHT DO NOT GO OFF

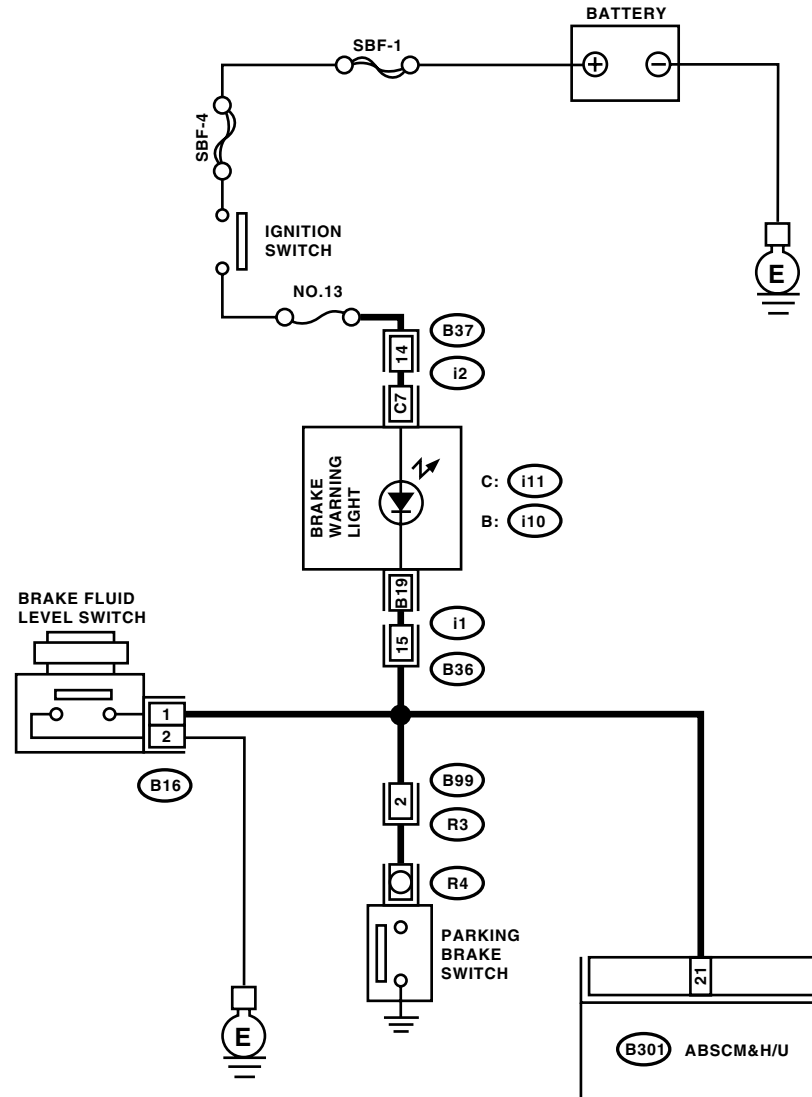
DIAGNOSIS:

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

TROUBLE SYMPTOM:

- After starting the engine, brake warning light is kept ON, even if the parking brake lever has been released.

WIRING DIAGRAM:



B16

1
2

i1

1	2	3	4	5	6	7	8	9	10	11		
12	13	14	15	16	17	18	19	20	21	22	23	24

B301

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

B: i10

1	2	3	4	5	6	7	8	9	10	11	12	13	14		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

C: i11

1	2	3	4	5	6	7	8	9	10

B99 i2

1	2	3	4	5	6	7	8	9	10	11		
12	13	14	15	16	17	18	19	20	21	22	23	24

ABS00350

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK BRAKE FLUID AMOUNT. Check the amount of brake fluid in reservoir tank of master cylinder.	Is the brake fluid amount between "MAX" line and "MIN" line?	Go to step 2.	Fill the brake fluid to specified amount.
2	CHECK BRAKE FLUID LEVEL SWITCH. 1)Disconnect the level switch connector (B16) from master cylinder. 2)Measure the resistance of master cylinder terminals. Terminals No. 1 — No. 2:	Is the resistance more than 1 MΩ?	Go to step 3.	Replace the master cylinder.
3	CHECK PARKING BRAKE SWITCH. 1)Disconnect the connector (R4) from parking brake switch. 2)Release the parking brake switch. 3)Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance more than 1 MΩ?	Go to step 4.	Replace the parking brake switch.
4	CHECK GROUND SHORT OF HARNESS. 1)Disconnect the connector from ABSCM & H/U. 2)Disconnect the connector (i1) from combination meter. 3)Turn the ignition switch to ON.	Does the brake warning light go off?	Go to step 5.	Repair the harness.
5	CHECK POOR CONTACT IN ABSCM & H/U.	Is there poor contact in ABSCM & H/U connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GROUND TERMINAL. 1) Turn the ignition switch to OFF. 2) Measure the resistance between Ground terminals (B81) and chassis ground. Terminals Ground terminal (A) — Chassis ground: Ground terminal (B) — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 2.	Repair the Ground terminal harness.
2 CHECK DIAGNOSIS LINE. 1) Connect the Ground terminal (B81) to diagnosis connector (B82) No. 6. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 4 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the harness connector between ABSCM&H/U and diagnosis connector.
3 CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.	Is there poor contact in ABSCM&H/U connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

E: DTC 21

— ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH) —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-38, DTC 27 — ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

F: DTC 23

— ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH) —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-38, DTC 27 — ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

G: DTC 25

— ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH) —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-38, DTC 27 — ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

H: DTC 27

— ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —

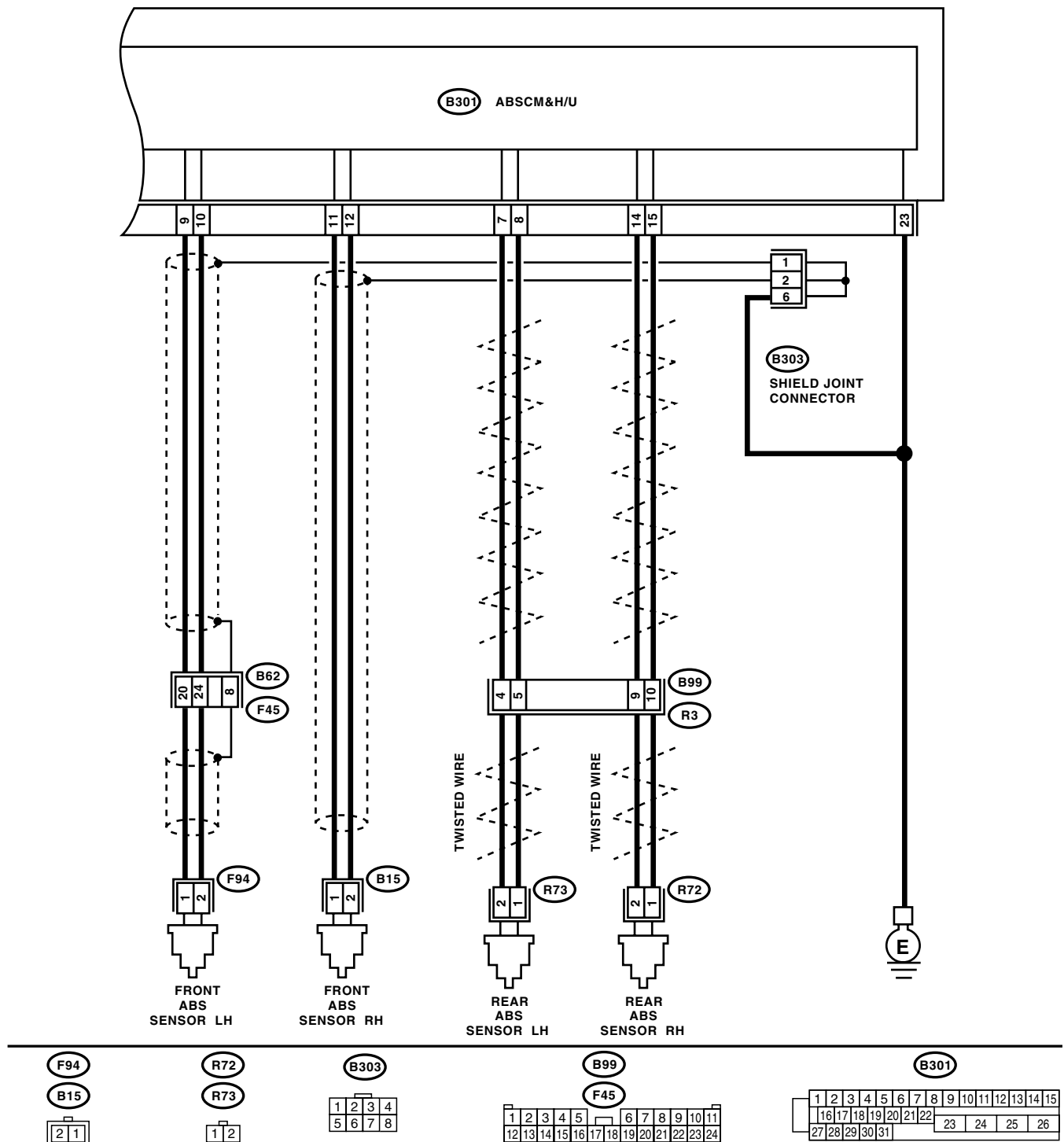
DIAGNOSIS:

- Faulty ABS wheel speed sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00353

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance of ABS wheel speed sensor connector terminals while shaking the harness lightly. Terminals Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 2.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
2 CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR. 1) Disconnect the connector from ABSCM&H/U. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. Terminals Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 1 (+) — Chassis ground (-): Rear LH No. 1 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
3 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 4.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
4 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal DTC 21 (B301) No. 11 — No. 12: DTC 23 (B301) No. 9 — No. 10: DTC 25 (B301) No. 14 — No. 15: DTC 27 (B301) No. 7 — No. 8:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 5.	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 21 (B301) No. 11 (+) — Chassis ground (—): DTC 23 (B301) No. 9 (+) — Chassis ground (—): DTC 25 (B301) No. 14 (+) — Chassis ground (—): DTC 27 (B301) No. 7 (+) — Chassis ground (—):	Is the voltage less than 1 V?	Go to step 6.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
6 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. 11 (+) — Chassis ground (—): DTC 23 (B301) No. 9 (+) — Chassis ground (—): DTC 25 (B301) No. 14 (+) — Chassis ground (—): DTC 27 (B301) No. 7 (+) — Chassis ground (—):	Is the voltage less than 1 V?	Go to step 7.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
7 CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR. Turn the ignition switch to OFF.	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step 8.	Tighten the ABS wheel speed sensor installation bolts securely.
8 CHECK ABS WHEEL SPEED SENSOR GAP. Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 9.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
9 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 10.	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to ON. 2) Measure the resistance between ABS wheel speed sensor and chassis ground. Terminals Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 11.	Replace the ABS wheel speed sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
11 CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminal and chassis ground. Connector & terminal DTC 21 (B301) No. 11 — Chassis ground: DTC 23 (B301) No. 11 — Chassis ground: DTC 25 (B301) No. 14 — Chassis ground: DTC 27 (B301) No. 7 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 12.	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).>
12 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step 13.
13 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 14.
14 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

I: DTC 22

— ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (FRONT RH) —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-43, DTC 28 — ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

J: DTC 24

— ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (FRONT LH) —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-43, DTC 28 — ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

K: DTC 26

— ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR RH) —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-43, DTC 28 — ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

L: DTC 28

— ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH) —

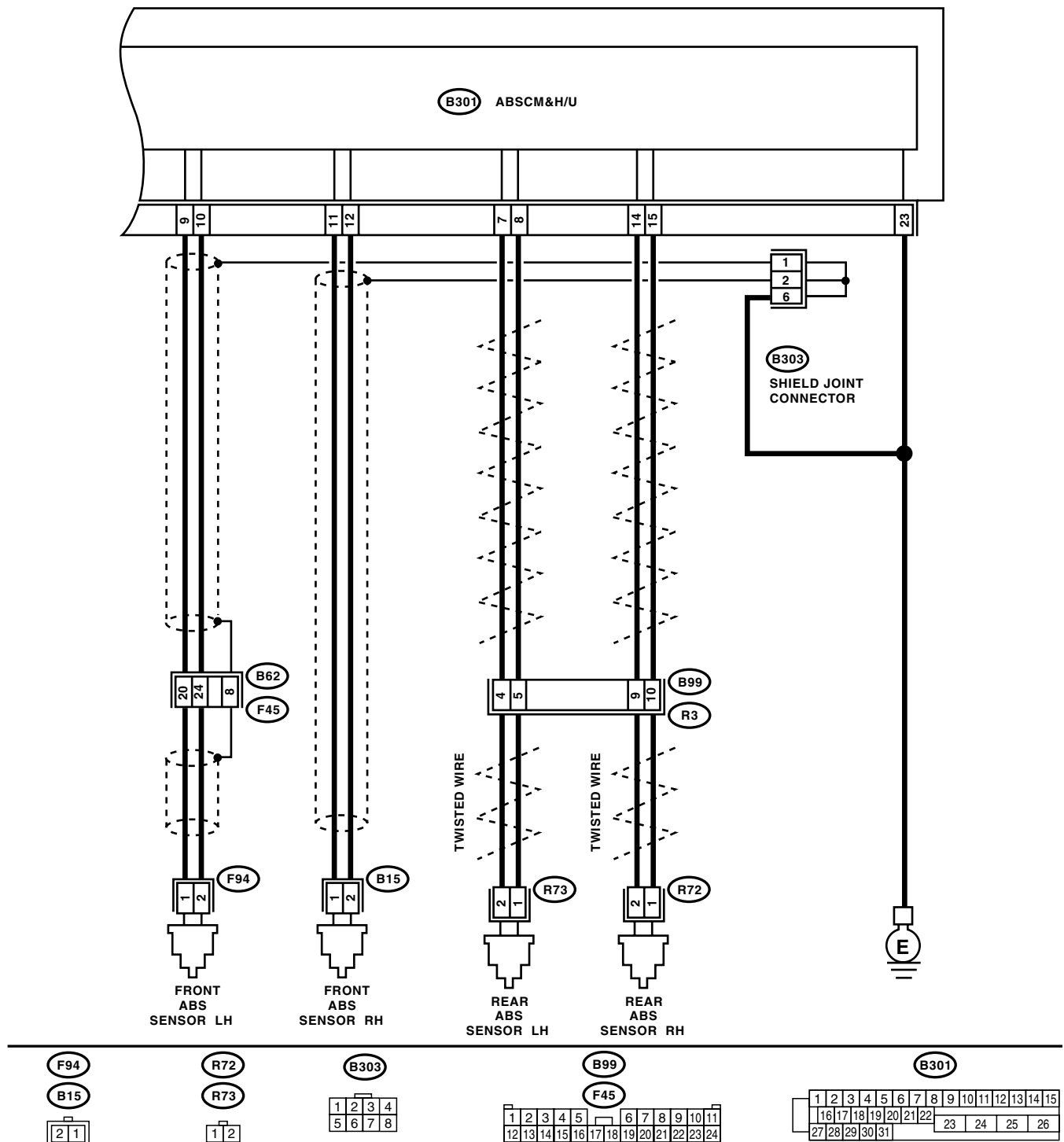
DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00353

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR. Turn the ignition switch to OFF.	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step 2.	Tighten the ABS wheel speed sensor installation bolts securely.
2	CHECK ABS WHEEL SPEED SENSOR GAP. Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 3.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacer cannot correct gap, replace worn sensor or worn tone wheel.
3	PREPARE OSCILLOSCOPE.	Is an oscilloscope available?	Go to step 4.	Go to step 5.
4	CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1)Raise all four wheels off ground. 2)Turn the ignition switch to OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch to ON. 5)Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS control module sometimes stores DTC 29 or DTC 56. Connector & terminal DTC 22 (B15) No. 1 (+) — No. 2 (-): DTC 24 (F45) No. 20 (+) — No. 24 (-): DTC 26 (B99) No. 10 (+) — No. 9 (-): DTC 28 (B99) No. 5 (+) — No. 4 (-):	Is an oscilloscope pattern smooth, as shown in the figure?	Go to step 8.	Go to step 7.
5	CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor or drum from hub in accordance with DTC.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step 6.
6	CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.	Are there broken or damaged in the ABS wheel speed sensor piece or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>	Go to step 7.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 8.	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
8 CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals while shaking the harness lightly. Terminals Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 9.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
9 CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR. Measure the resistance between ABS wheel speed sensor and chassis ground. Terminals Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 10.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
10 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR. 1) Connect the connector to ABS wheel speed sensor. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance at ABSCM&H/U connector terminals. Connector & terminal DTC 22 (B301) No. 11 — No. 12: DTC 24 (B301) No. 9 — No. 10: DTC 26 (B301) No. 14 — No. 15: DTC 28 (B301) No. 7 — No. 8:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 11.	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
11 CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 22 (B301) No. 11 — Chassis ground: DTC 24 (B301) No. 9 — Chassis ground: DTC 26 (B301) No. 14 — Chassis ground: DTC 28 (B301) No. 7 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 12.	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK GROUND CIRCUIT OF ABSCM&H/U. Measure the resistance between ABSCM&H/U and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 13.	Repair the ABSCM&H/U ground harness.
13 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Go to step 14.	Repair the connector.
14 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or wireless transmitter properly installed?	Go to step 15.	Properly install the car telephone or wireless transmitter.
15 CHECK SOURCES OF SIGNAL NOISE.	Are noise sources (such as an antenna) installed near the sensor harness?	Go to step 16.	Install the noise sources apart from sensor harness.
16 CHECK SHIELD CIRCUIT. 1)Disconnect the connectors (B303). 2)Measure the resistance between shield connector and chassis ground. Connector & terminal DTC 22 (B303) No. 2 — Chassis ground: DTC 24 (B303) No. 1 — Chassis ground: NOTE: If the DTC is 26, 28: Go to YES.	Is the resistance less than 0.5 Ω ?	Go to step 17.	Repair the shield harness.
17 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 18.
18 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

M: DTC 29

— ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (ANY ONE OF FOUR) —

DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

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

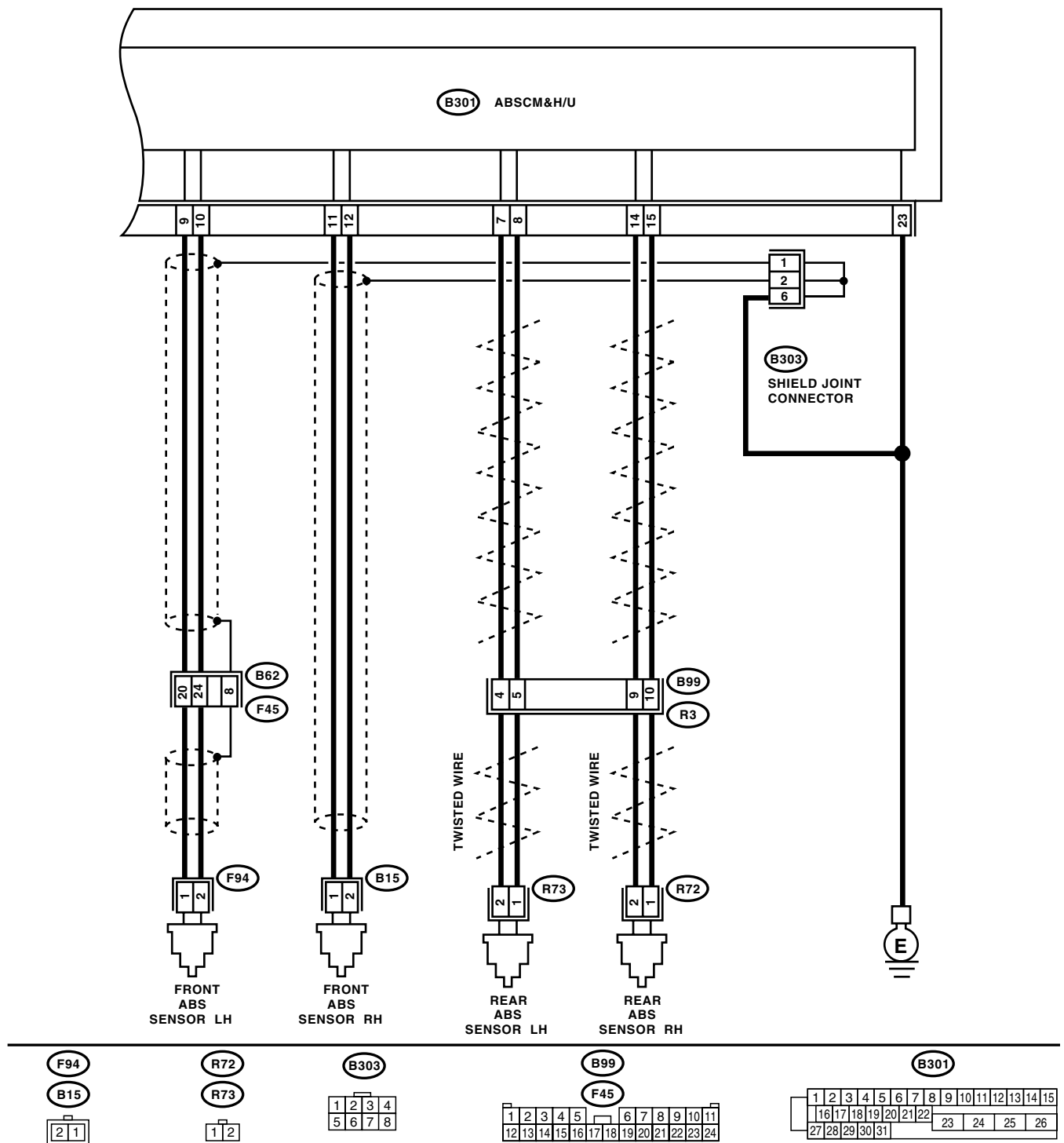
NOTE:

In addition to the ABS warning light, brake warning light illuminates.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00353

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME. Check if the wheels have been turned freely for more than 1 minute, such as when vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Have the wheels been turned freely?	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this DTC may sometimes occur.	Go to step 2.
2	CHECK TIRE SPECIFICATIONS. Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step 3.	Replace the tire.
3	CHECK WEAR OF TIRE.	Is the tire worn excessively?	Replace tire.	Go to step 4.
4	CHECK TIRE PRESSURE.	Is the tire pressure correct?	Go to step 5.	Adjust tire pressure.
5	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step 6.	Tighten the ABS wheel speed sensor installation bolts securely.
6	CHECK ABS WHEEL SPEED SENSOR GAP. Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 7.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacer cannot correct gap, replace worn sensor or worn tone wheel.
7	PREPARE OSCILLOSCOPE.	Is an oscilloscope available?	Go to step 8.	Go to step 9.
8	CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS/SCM&H/U sometimes stores the DTC 29. Connector & terminal Front RH (B15) No. 1 (+) — No. 2 (-): Front LH (F45) No. 20 (+) — No. 24 (-): Rear RH (B99) No. 10 (+) — No. 9 (-): Rear LH (B99) No. 5 (+) — No. 4 (-):	Is an oscilloscope pattern smooth, as shown in the figure?	Go to step 12.	Go to step 9.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
9	CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor or drum from hub.	Is the ABS wheel speed sensor piece or 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 broken or damaged teeth in the ABS wheel speed sensor piece or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, 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-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
12	CHECK ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13.
13	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

N: DTC 31

**— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(FRONT RH) —**

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-52, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

O: DTC 33

**— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(FRONT LH) —**

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-52, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

P: DTC 35

**— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(REAR RH) —**

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-52, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Q: DTC 37

**— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(REAR LH) —**

DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

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

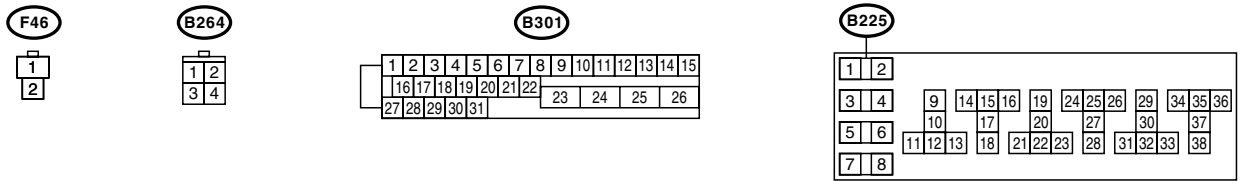
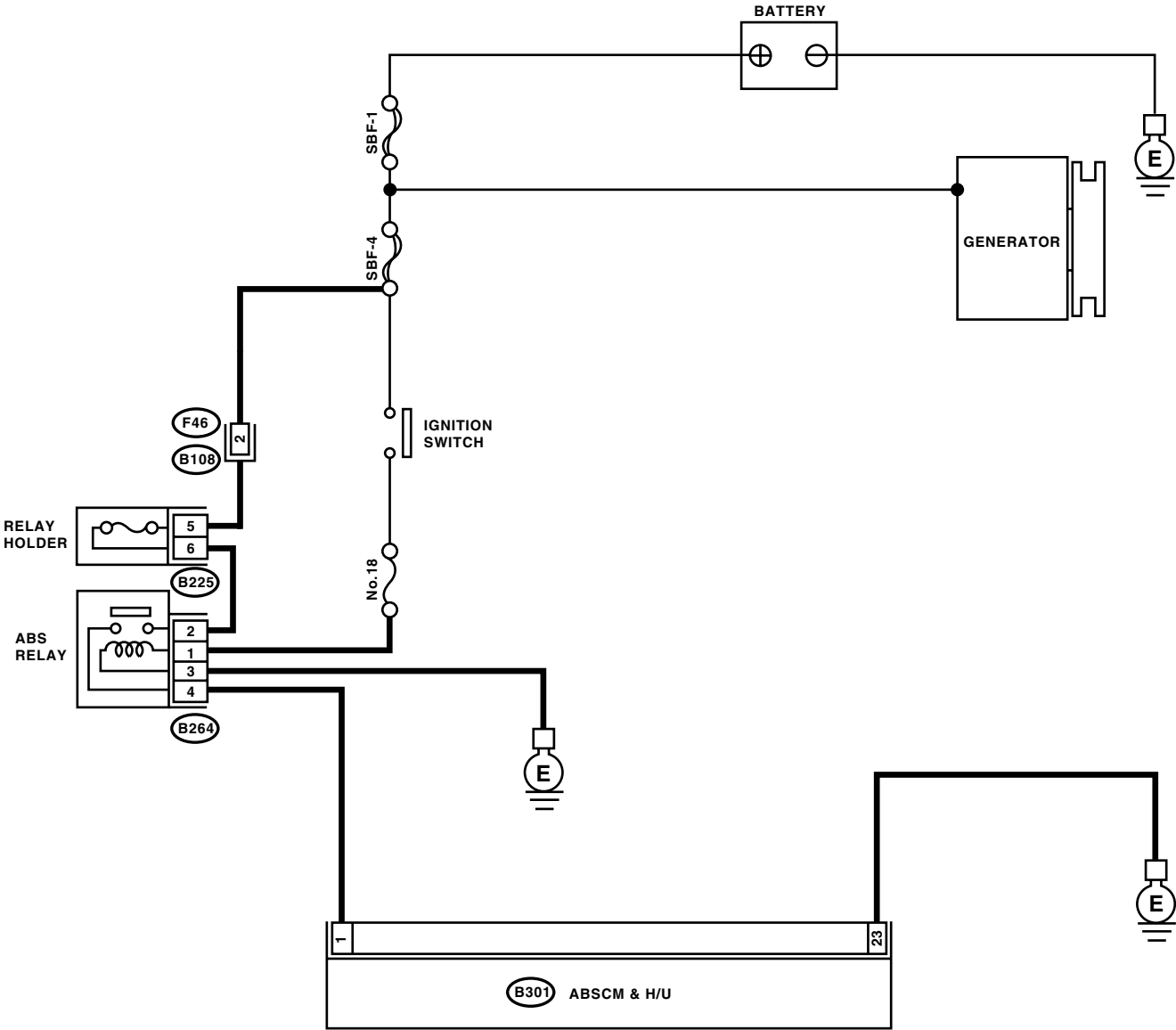
NOTE:

In addition to the ABS warning light, brake warning light illuminates.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00322

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the power supply circuit and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 4.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 5.
5 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

R: DTC 32

— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-55, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

S: DTC 34

— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-55, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

T: DTC 36

— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-55, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Procedure without Subaru Select Monitor.>

U: DTC 38

— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(REAR LH) —

DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

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

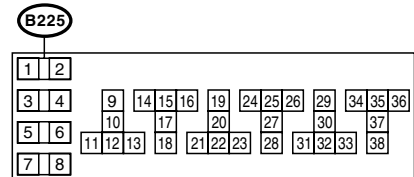
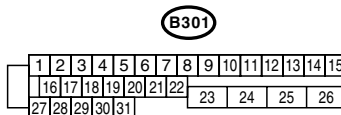
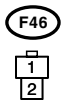
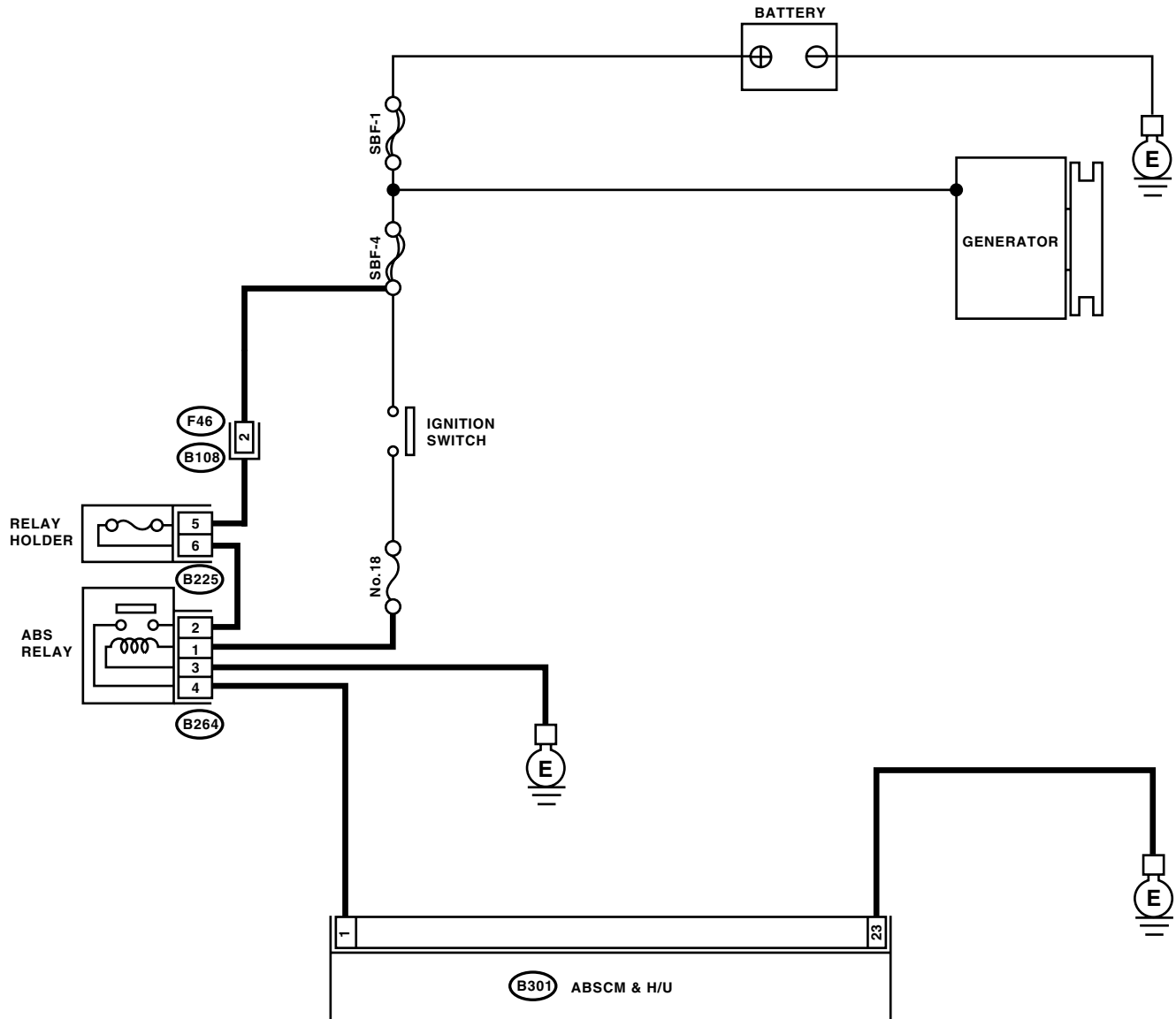
NOTE:

In addition to the ABS warning light, brake warning light illuminates.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00322

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the power supply circuit and ABSCM&H/U.
2	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 4.
4	CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 5.
5	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

V: DTC 41

— ABNORMAL ABS CONTROL MODULE —

DIAGNOSIS:

- Faulty ABSCM&H/U.

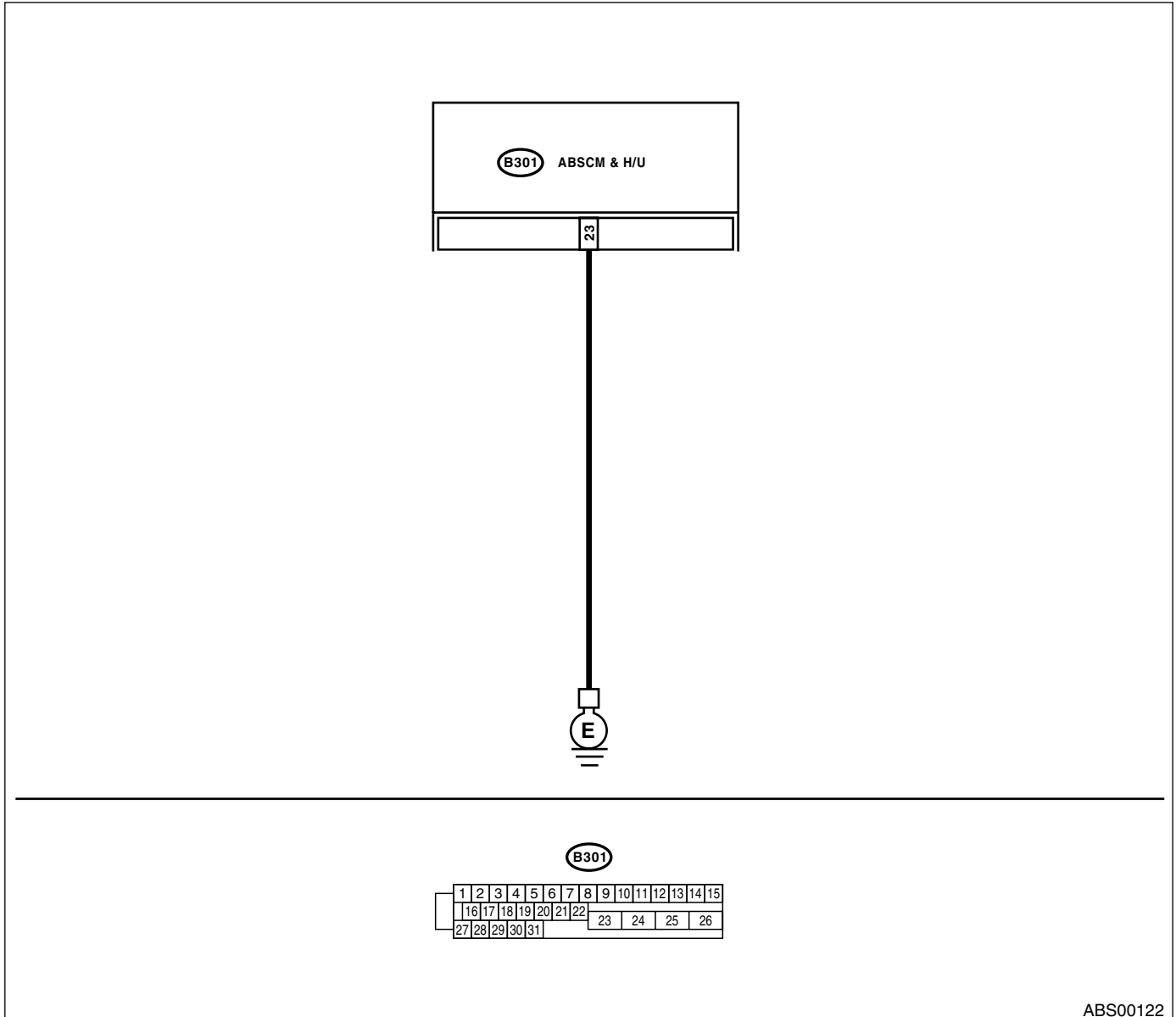
TROUBLE SYMPTOM:

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

NOTE:

In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 2.	Repair the ABSCM&H/U ground harness.
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or the wireless transmitter properly installed?	Go to step 4.	Properly install the car telephone or wireless transmitter.
4 CHECK SOURCES OF SIGNAL NOISE.	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from 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 out the DTC.	Is the same DTC as in current diagnosis still being output?	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 ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

W: DTC 42

— SOURCE VOLTAGE IS ABNORMAL —

DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low or high.

TROUBLE SYMPTOM:

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

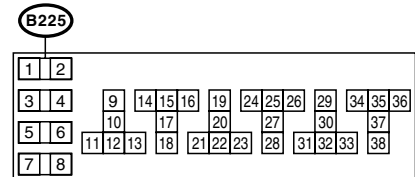
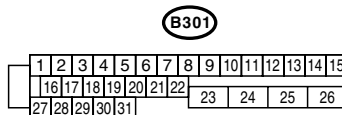
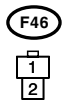
NOTE:

In addition to the ABS warning light, brake warning light illuminates temporarily. Both warning lights go off on the recovery of voltage.

ABS (DIAGNOSTICS)

U SELECT MONITOR

ABS (DIAGNOSTICS)



ABS-61

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK GENERATOR. 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. Terminals Generator B terminal (+) — Chassis ground (-):	Is the voltage 10 — 17 V?	Go to step 2.	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
2	CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step 3.	Tighten the clamp of terminal.
3	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Operate the electric load applying devices, such as the headlight, A/C, and defogger. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 17 V?	Go to step 4.	Repair the power supply circuit and ABSCM&H/U.
4	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the ABSCM&H/U ground harness.
5	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 6.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

X: DTC 44

— A COMBINATION OF AT CONTROL ABNORMAL —

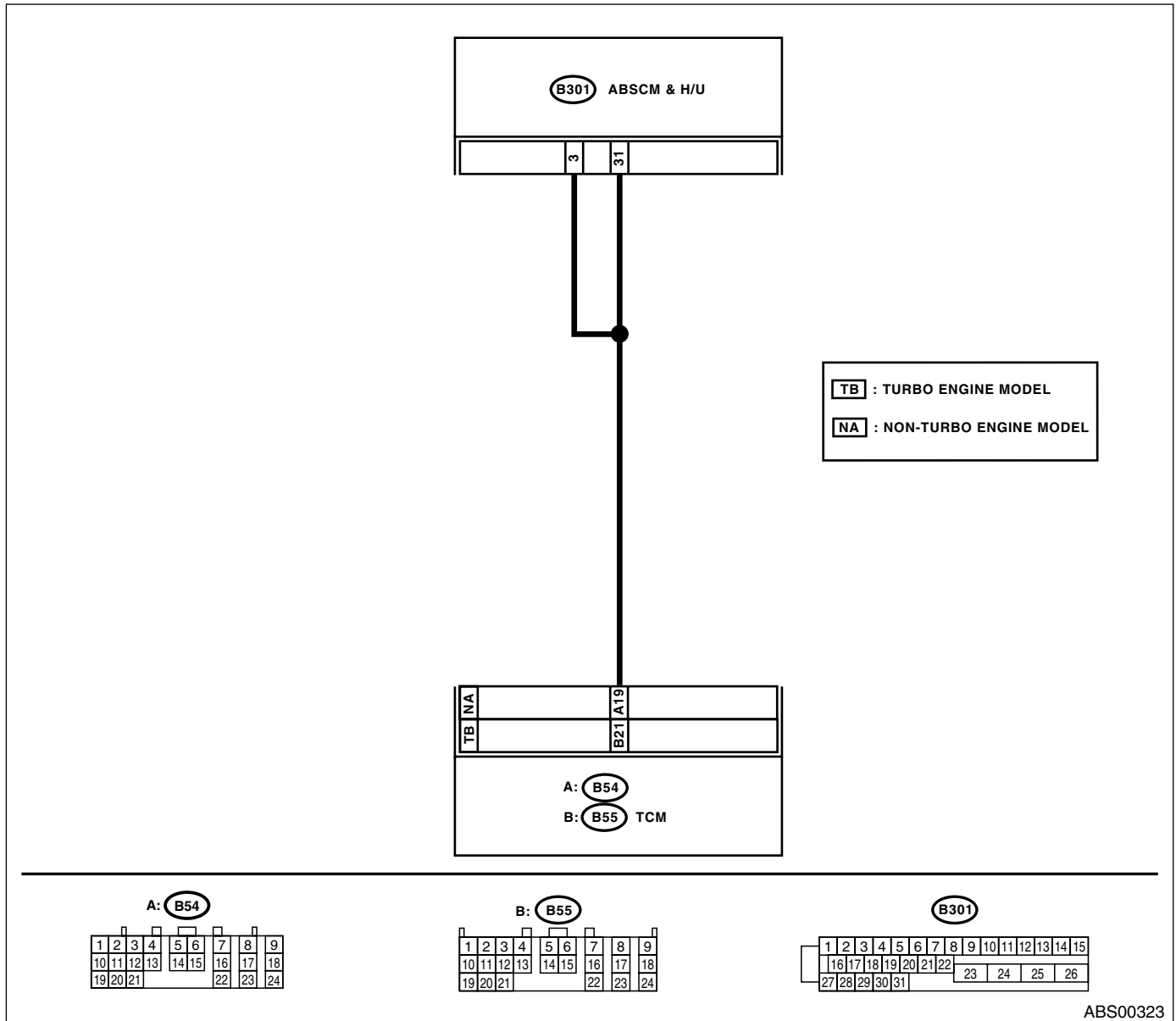
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00323

Step	Check	Yes	No
1	CHECK SPECIFICATIONS OF THE AB-SCM&H/U. Check the specifications of mark on ABSCM&H/U. CU: AT CV: MT (Except STi model) CY: MT (STi model)	Specifications between vehicle and ABSCM&H/U are matched?	Go to step 2.
			Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect all connectors from TCM. 3) Disconnect the connector from ABSCM&H/U. 4) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 3 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair the harness between TCM and ABSCM&H/U.
3 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Repair the harness between TCM and ABSCM&H/U.
4 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 (B301) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 5.	Repair the harness between TCM and ABSCM&H/U.
5 CHECK TCM. 1) Turn the ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between TCM connector terminal and chassis ground. Connector & terminal Non-turbo model (B54) No. 19 (+) — Chassis ground (-): Turbo model (B55) No. 21 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 7.	Go to step 6.
6 CHECK AT.	Is the AT functioning normally?	Replace the TCM.	Repair the AT.
7 CHECK OPEN CIRCUIT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 3 (+) — Chassis ground (-): (B301) No. 31 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 8.	Repair the harness/connector between TCM and ABSCM&H/U.
8 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair the connector.	Go to step 9.
9 CHECK ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 10.
10 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

Y: DTC 51

— ABNORMAL VALVE RELAY —

DIAGNOSIS:

- Faulty valve relay

TROUBLE SYMPTOM:

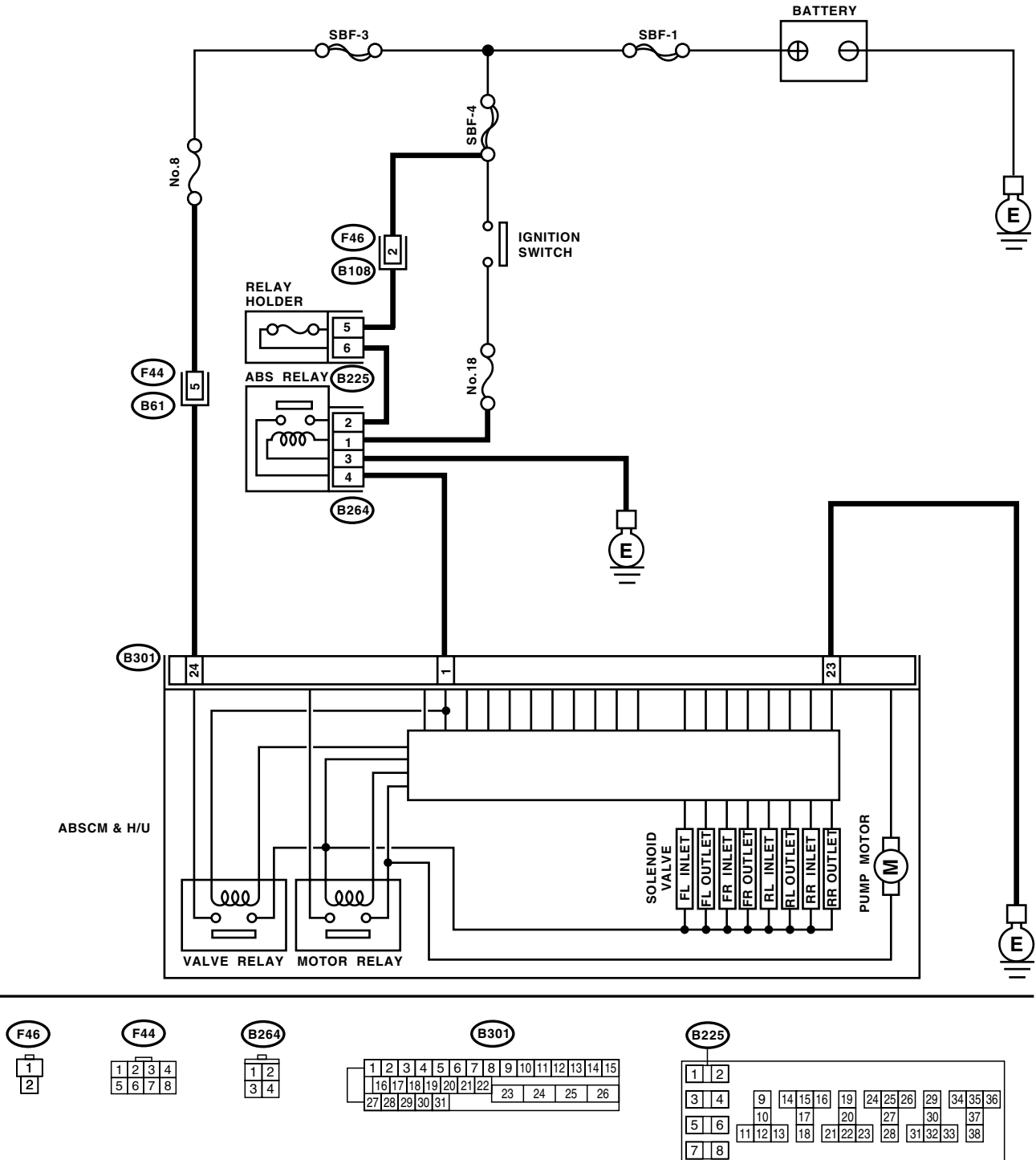
- ABS does not operate.
- EBD does not operate in some malfunctions.

NOTE:

In addition to the ABS warning light, brake warning light illuminates, if the EBD does not operate.

ABS (DIAGNOSTICS)

ABSCM & H/U



ABS00377

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-): (B301) No. 24 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness connector between battery, ABS relay and ABSCM&H/U.
2	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3	CHECK VALVE RELAY IN ABSCM&H/U. Measure the resistance between ABSCM&H/U and terminals. Terminals No. 23 — No. 24:	Is the resistance more than 1 M Ω ?	Go to step 4.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	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 out the DTC.	Is the same DTC as in the current diagnosis still being output?	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 ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Z: DTC 52

— ABNORMAL MOTOR AND/OR MOTOR RELAY —

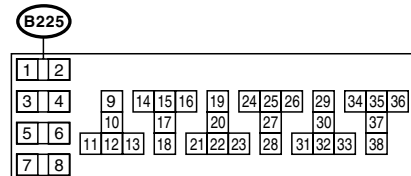
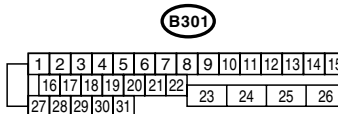
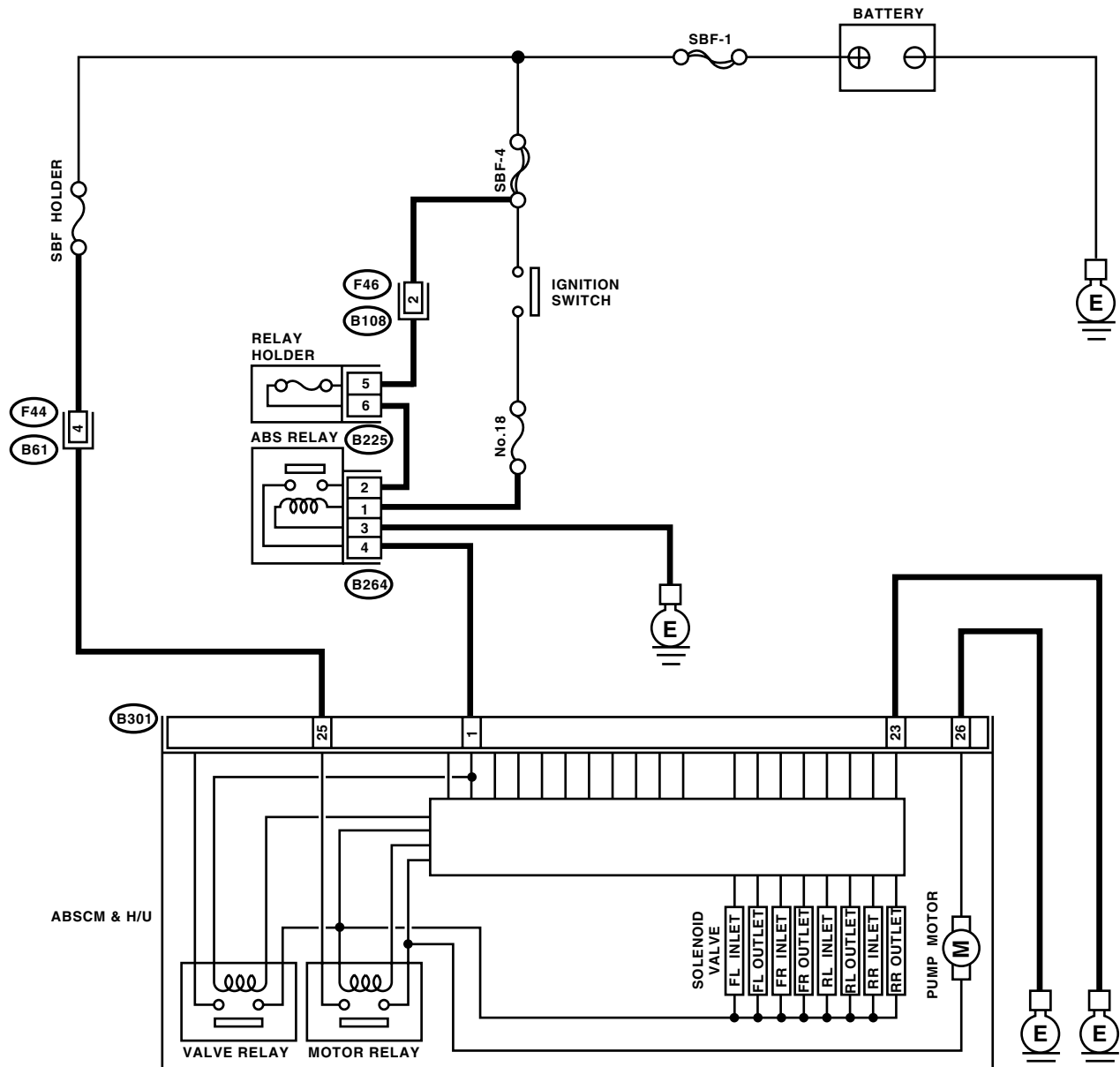
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00325

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 25 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF-holder.
2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 26 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the ABSCM&H/U ground harness.
5 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step 6.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 7.
7 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 8.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AA:DTC 54

— ABNORMAL STOP LIGHT SWITCH —

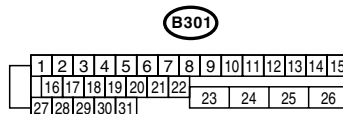
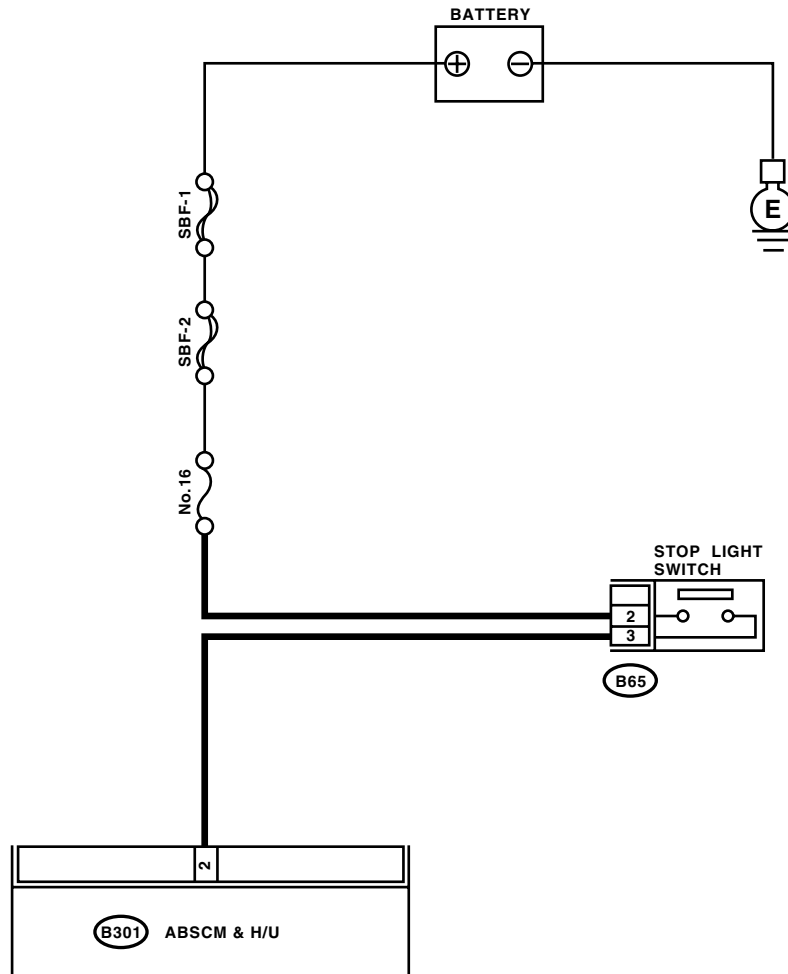
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00378

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK STOP LIGHTS COME ON. Depress the brake pedal.	Do the stop lights come on?	Go to step 2.	Repair the stop lights circuit.
2	CHECK OPEN CIRCUIT IN HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Depress the brake pedal. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 2 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 3.	Repair the harness between stop light switch and ABSCM&H/U.
3	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Repair the connector.	Go to step 4.
4	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 5.
5	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AB:DTC 56

— ABNORMAL G SENSOR OUTPUT VOLTAGE —

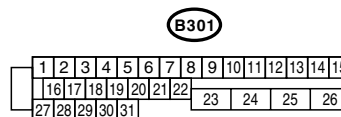
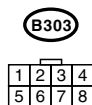
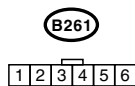
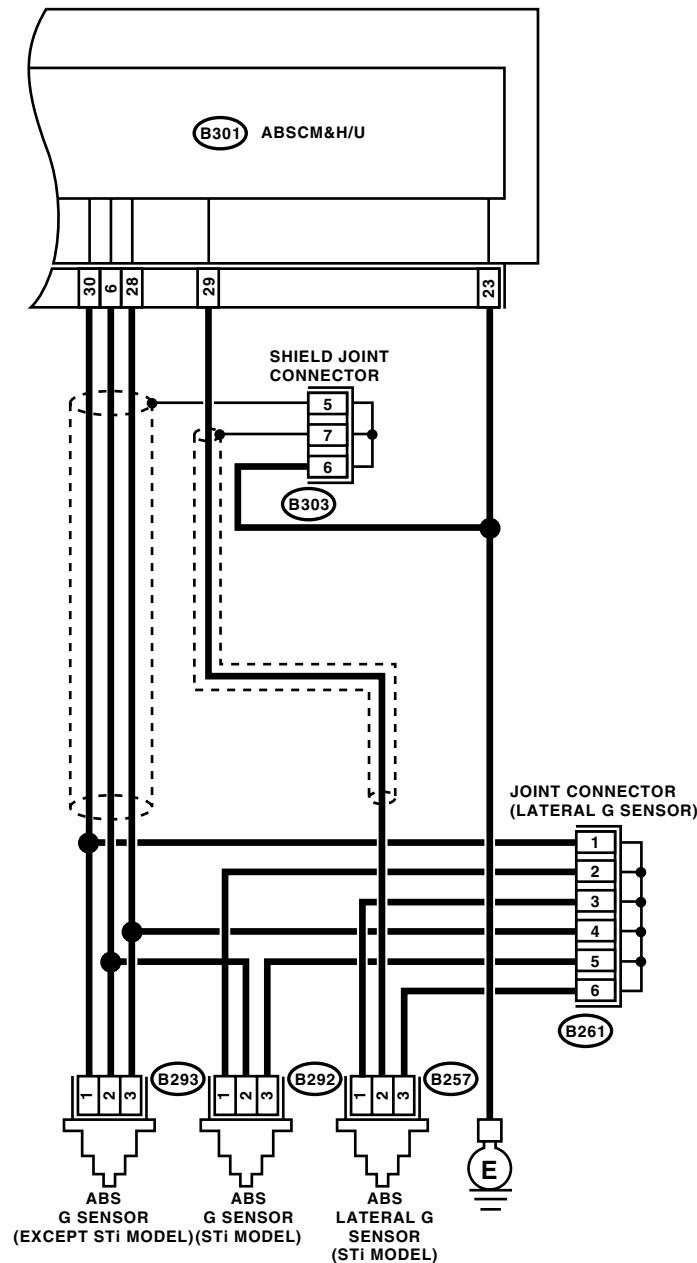
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK ALL FOUR WHEELS FOR FREE TURNING.	Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a free roller or rolling road?	The ABS is normal. Erase the DTC.	Go to step 2.
2	CHECK SPECIFICATIONS OF ABSCM&H/U. Check the specifications of mark on ABSCM&H/U. CU: AT CV: MT (Except STi model) CY: MT (STi model)	Does the vehicle specification and ABSCM&H/U specification match?	Go to step 3.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	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 4.	Repair the harness/connector between G sensor and ABSCM&H/U.
4	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 6 — No. 28:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 5.	Repair the harness/connector between G sensor and ABSCM&H/U.
5	CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS. 1)Disconnect the connector from G sensor. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 6 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 6.	Repair the harness between G sensor and ABSCM&H/U.
6	CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 6 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 7.	Repair the harness between G sensor and ABSCM&H/U.
7	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 (B301) No. 6 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 8.	Repair the harness between G sensor and ABSCM&H/U.
8	CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 28 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 9.	Repair the harness between G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
9	CHECK G SENSOR. 1)Turn the ignition switch to OFF. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Connect the connector to ABSCM&H/U. 5)Turn the ignition switch to ON. 6)Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.4 V when G sensor is horizontal?	Go to step 10.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
10	CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step 11.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
11	CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step 12.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
12	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 13.
13	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 14.
14	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK ALL FOUR WHEELS FOR FREE TURNING.	Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a free roller or rolling road?	The ABS is normal. Erase the DTC.	Go to step 2.
2	CHECK SPECIFICATIONS OF ABSCM&H/U. Check the specifications of mark on ABSCM&H/U. CU: AT CV: MT (Except STi model) CY: MT (STi model)	Does the vehicle specification and ABSCM&H/U specification match?	Go to step 3.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	CHECK INPUT VOLTAGE OF LATERAL G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 1 (+) — No. 3 (-):	Is the voltage 4.75 — 5.25 V?	Go to step 4.	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
4	CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 29 — No. 28:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 5.	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
5	CHECK GROUND SHORT IN LATERAL G SENSOR OUTPUT HARNESS. 1) Disconnect the connector from lateral G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 29 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 6.	Repair the harness between lateral G sensor and ABSCM&H/U.
6	CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 29 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 7.	Repair the harness between lateral G sensor and ABSCM&H/U.
7	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 (B301) No. 29 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 8.	Repair the harness between lateral G sensor and ABSCM&H/U.

DIAGNOSTICS PROCEDURE WITHOUT SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
8	CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 28 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 9.	Repair the harness between lateral G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
9	CHECK LATERAL G SENSOR. 1)Turn the ignition switch to OFF. 2)Remove the lateral G sensor from vehicle. 3)Connect the connector to lateral G sensor. 4)Connect the connector to ABSCM&H/U. 5)Turn the ignition switch to ON. 6)Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 2.3 — 2.7 V when lateral G sensor is horizontal?	Go to step 10.	Replace the lateral G sensor. <Ref. to ABS-20, G Sensor.>
10	CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage between 3.7 — 4.1 V when lateral G sensor is inclined right to 90°?	Go to step 11.	Replace the lateral G sensor. <Ref. to ABS-20, G Sensor.>
11	CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage between 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step 12.	Replace the lateral G sensor. <Ref. to ABS-20, G Sensor.>
12	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step 13.
13	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 14.
14	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSIS:

- TROUBLE SYMPTOM:**

- Communication cannot be executed between ABS and Subaru select monitor.

BATTERY

GENERATOR

IGNITION SWITCH

RELAY HOLDER

ABS RELAY

DATA LINK CONNECTOR

B301 ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT

F46

B108

B225

B264

B40

No. 18

SBF-1

SBF-4

1

5

20

23

1

2

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ABS-79

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK IGNITION SWITCH.	Is the ignition switch turned to ON?	Go to step 2.	Turn the ignition switch to ON, and select ABS mode using Subaru Select Monitor.
2 CHECK BATTERY. 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage or more 11 V?	Go to step 3.	Charge or replace the battery.
3 CHECK BATTERY TERMINAL.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step 4.
4 CHECK COMMUNICATION OF SUBARU SELECT MONITOR. 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other system can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step 8.	Go to step 5.
5 CHECK COMMUNICATION OF SUBARU SELECT MONITOR. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Replace the ABSCM&H/U. <Ref. to ABS-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 connectors. 3) Measure the resistance between data link connector and chassis ground. Connector & terminal (B40) No. 5 — Chassis ground: (B40) No. 4 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 7.	Repair the harness and connector between each control module and data link connector.
7 CHECK OUTPUT SIGNAL FOR ABSCM&H/U. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U and chassis ground. Connector & terminal (B40) No. 5 (+) — Chassis ground (-): (B40) No. 4 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 8.	Repair the harness and connector between each control module and data link connector.
8 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR. Measure the resistance between ABSCM&H/U connector and data link connector. Connector & terminal (B301) No. 20 — (B40) No. 5: (B301) No. 5 — (B40) No. 4:	Is the resistance less than 0.5 Ω?	Go to step 9.	Repair the harness and connector between ABSCM&H/U and data link connector.
9 CHECK INSTALLATION OF ABSCM&H/U CONNECTOR. Turn the ignition switch to OFF.	Is the ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it?	Go to step 10.	Insert the ABSCM&H/U connector into ABSCM&H/U.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>(B301) No. 1 (+) — Chassis ground (-):</i>	Is the voltage 10 — 15 V?	Go to step 11.	Repair the open circuit in harness between ABSCM&H/U and battery.
11 CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U and transmission. 3) Measure the resistance of harness between ABSCM&H/U and chassis ground. <i>Connector & terminal</i> <i>(B301) No. 23 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 12.	Repair the open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

B: NO TROUBLE CODE

DIAGNOSIS:

- ABS warning light circuit is shorted.

TROUBLE SYMPTOM:

- ABS warning light remains on.
- NO TROUBLE CODE displayed on the Subaru Select Monitor.

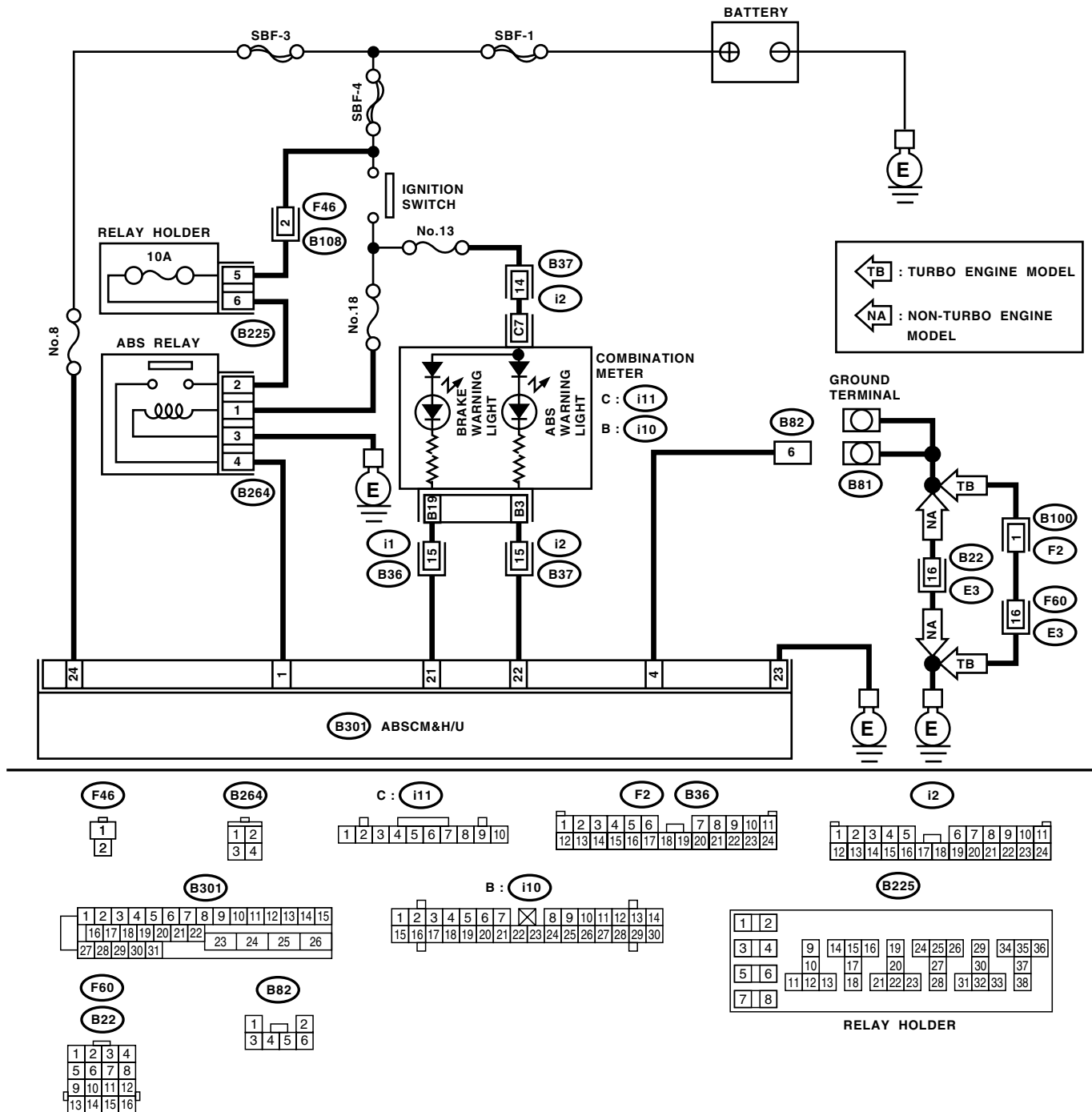
NOTE:

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

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00347

Step	Check	Yes	No
1	CHECK WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector (i2) from connector (B37). 3) Turn the ignition switch to ON.	Go to step 2.	Repair the front wiring harness.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
2	CHECK PROJECTION AT ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. NOTE: For detail of connector switch, refer to following. <Ref. to ABS-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Is there any damage on projection which switches connector switch?	Go to step 3.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	CHECK ABSCM&H/U. Measure the resistance between ABSCM&H/U terminals. Terminals No. 22 — No. 23:	Is the resistance more than 1 MΩ?	Go to step 4.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	CHECK WIRING HARNESS. Measure the resistance between connector and chassis ground. Connector & terminal (B301) No. 22 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 5.	Repair the harness.
5	CHECK WIRING HARNESS. 1) Connect the connector to ABSCM&H/U. 2) Measure the resistance between connector and chassis ground. Connector & terminal (B301) No. 22 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 6.	Repair the harness.
6	CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.	Is there poor contact in ABSCM&H/U connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

C: DTC 21
— OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-86, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>

D: DTC 23
— OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-86, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>

E: DTC 25
— OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-86, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT —, Diagnostics Procedure with Subaru Select Monitor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

F: DTC 27

— OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT —

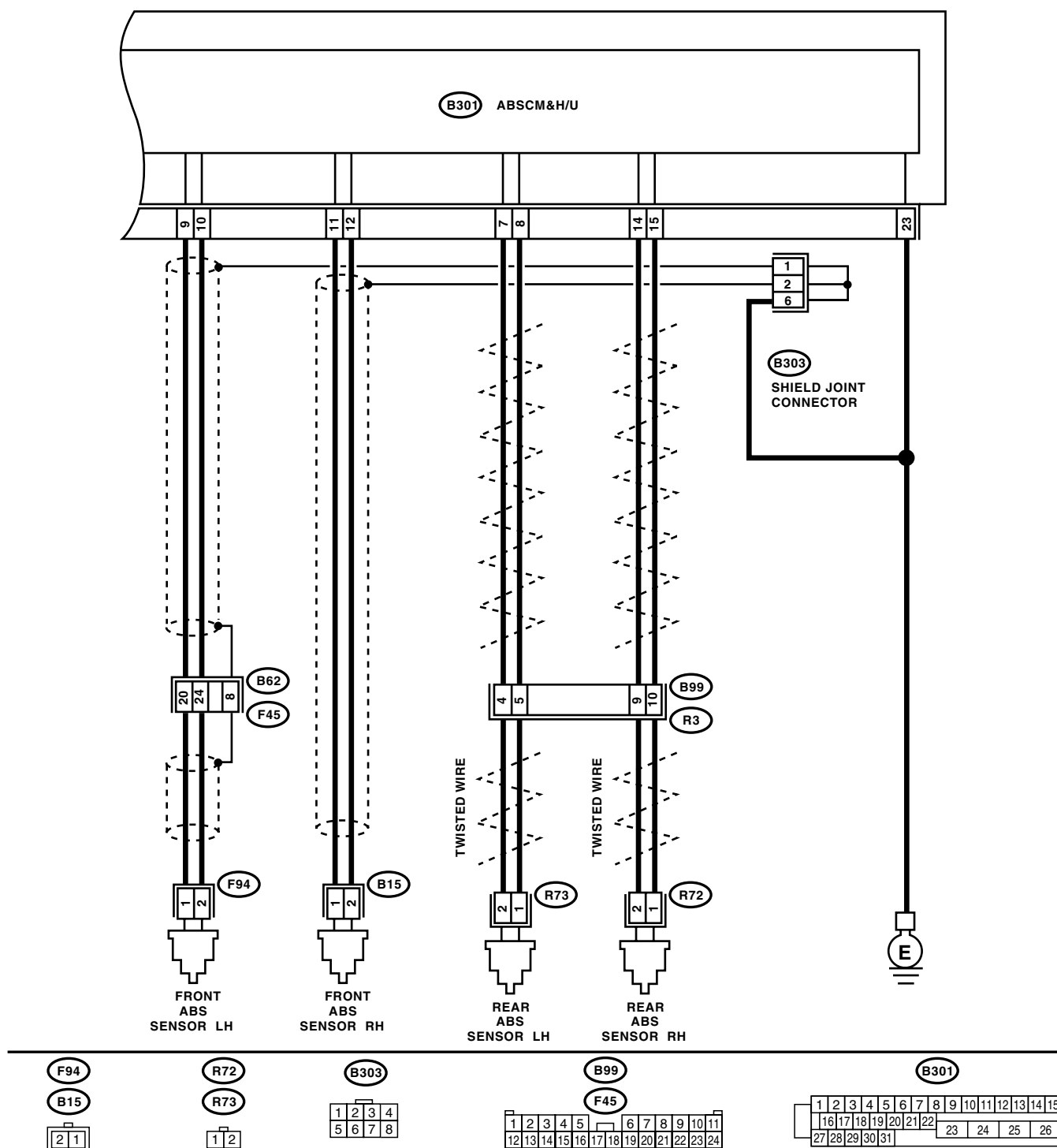
DIAGNOSIS:

- Faulty ABS wheel speed sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00353

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR. 1)Select "Current data display & Save" on the Subaru Select Monitor. 2)Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode.	Go to step 2.	Go to step 8.
2	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Go to step 3.	Tighten the ABS wheel speed sensor installation bolts securely.
3	CHECK ABS WHEEL SPEED SENSOR GAP. Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Go to step 4.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
4	CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Go to step 5.	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
5	CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Repair the connector.	Go to step 6.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER DTC APPEARANCE.	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
8	CHECK ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance of ABS wheel speed sensor connector terminals while shaking the harness lightly. Terminals Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 9.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
9	CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR. 1) Disconnect the connector from ABSCM&H/U. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. Terminals Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 1 (+) — Chassis ground (-): Rear LH No. 1 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 10.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, 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-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
11	CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal DTC 21 (B301) No. 11 — No. 12: DTC 23 (B301) No. 9 — No. 10: DTC 25 (B301) No. 14 — No. 15: DTC 27 (B301) No. 7 — No. 8:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 12.	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 21 <i>(B301) No. 11 (+) — Chassis ground (-):</i> DTC 23 <i>(B301) No. 9 (+) — Chassis ground (-):</i> DTC 25 <i>(B301) No. 14 (+) — Chassis ground (-):</i> DTC 27 <i>(B301) No. 7 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 13.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
13 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 21 <i>(B301) No. 11 (+) — Chassis ground (-):</i> DTC 23 <i>(B301) No. 9 (+) — Chassis ground (-):</i> DTC 25 <i>(B301) No. 14 (+) — Chassis ground (-):</i> DTC 27 <i>(B301) No. 7 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 14.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
14 CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step 15.	Tighten the ABS wheel speed sensor installation bolts securely.
15 CHECK ABS WHEEL SPEED SENSOR GAP. Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 16.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
16 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 17.	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
17 CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to ON. 2) Measure the resistance between ABS wheel speed sensor and chassis ground. Terminals Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 18.	Replace the ABS wheel speed sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, 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 ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminal and chassis ground. Connector & terminal DTC 21 (B301) No. 11 — Chassis ground: DTC 23 (B301) No. 9 — Chassis ground: DTC 25 (B301) No. 14 — Chassis ground: DTC 27 (B301) No. 7 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 19.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor. And replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
19 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step 20.
20 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U.	Go to step 21.
21 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

G: DTC 22

— FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-92, DTC 28 — REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —, Diagnostics Procedure with Subaru Select Monitor.>

H: DTC 24

— FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-92, DTC 28 — REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —, Diagnostics Procedure with Subaru Select Monitor.>

I: DTC 26

— REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-92, DTC 28 — REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —, Diagnostics Procedure with Subaru Select Monitor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

J: DTC 28

— REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL —

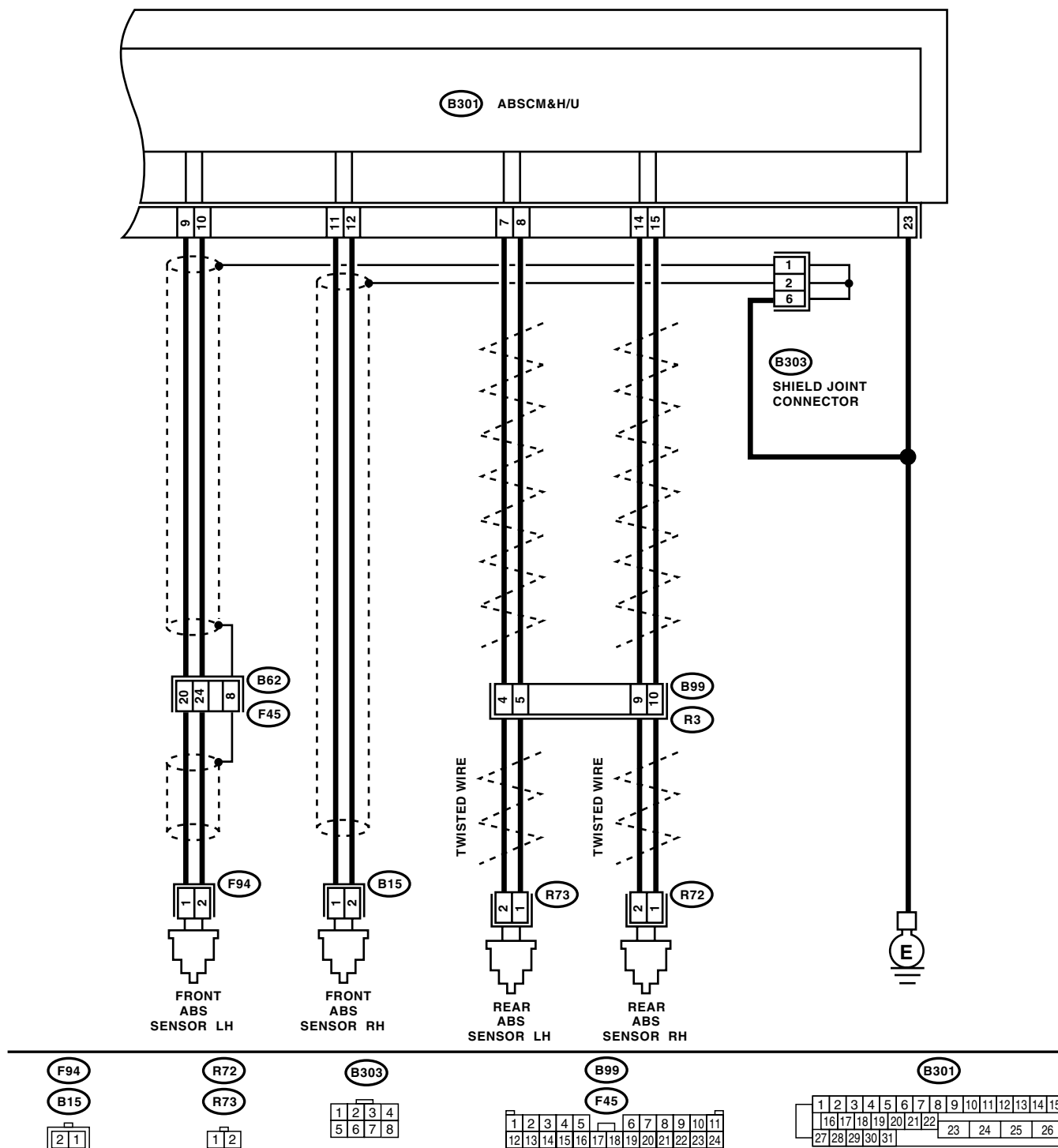
DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00353

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR. 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode.	Go to step 2.	Go to step 8.
2	CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector. Go to step 3.
3	CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or wireless transmitter properly installed?	Go to step 4. Properly install the car telephone or wireless transmitter.
4	CHECK SOURCES OF SIGNAL NOISE.	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness. Go to step 5.
5	CHECK SHIELD CIRCUIT. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Measure the resistance between shield connector and chassis ground. Connector & terminal DTC 22 (B303) No. 2 — Chassis ground: DTC 24 (B303) No. 1 — Chassis ground: NOTE: If the DTC is 26, 28: Go to YES.	Is the resistance less than 0.5 Ω?	Go to step 6. Repair the shield harness.
6	CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> Go to step 7.
7	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC. A temporary noise interference.
8	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step 9. Tighten the ABS wheel speed sensor installation bolts securely.
9	CHECK ABS WHEEL SPEED SENSOR GAP. Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 10. Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
10	PREPARE OSCILLOSCOPE.	Is an oscilloscope available?	Go to step 11. Go to step 12.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
11	CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1)Raise all four wheels off ground. 2)Turn the ignition switch to OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch to ON. 5)Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores DTC 29 or DTC 56. Connector & terminal DTC 22 (B15) No. 1 (+) — No. 2 (-): DTC 24 (B62) No. 20 (+) — No. 24 (-): DTC 26 (B99) No. 10 (+) — No. 9 (-): DTC 28 (B99) No. 5 (+) — No. 4 (-):	Is an oscilloscope pattern smooth, as shown in the figure?	Go to step 15.	Go to step 12.
12	CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor or drum from hub in accordance with DTC.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step 13.
13	CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.	Are there broken or damaged in the ABS wheel speed sensor piece or tone wheel?	Go to step 14.	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
14	CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 15.	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
15 CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals while shaking the harness lightly. Terminals Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 16.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
16 CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR. Measure the resistance between ABS wheel speed sensor and chassis ground. Terminals Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 17.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
17 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR. 1) Connect the connector to ABS wheel speed sensor. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance at ABSCM&H/U connector terminals. Connector & terminal DTC 22 (B301) No. 11 — No. 12: DTC 24 (B301) No. 9 — No. 10: DTC 26 (B301) No. 14 — No. 15: DTC 28 (B301) No. 7 — No. 8:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 18.	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
18 CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 22 (B301) No. 11 — Chassis ground: DTC 24 (B301) No. 9 — Chassis ground: DTC 26 (B301) No. 14 — Chassis ground: DTC 28 (B301) No. 7 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 19.	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
19 CHECK GROUND CIRCUIT OF ABSCM&H/U. Measure the resistance between ABSCM&H/U and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 20.	Repair the ABSCM&H/U ground harness.
20 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step 21.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
21	CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or the wireless transmitter properly installed?	Go to step 22.	Properly install the car telephone or wireless transmitter.
22	CHECK SOURCES OF SIGNAL NOISE.	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness.	Go to step 23.
23	CHECK SHIELD CIRCUIT. 1)Connect all connectors. 2)Measure the resistance between shield connector and chassis ground. Connector & terminal DTC 22 (B303) No. 2 — Chassis ground: DTC 24 (B303) No. 1 — Chassis ground: NOTE: If the DTC is 26, 28: Go to YES.	Is the resistance less than 0.5 Ω ?	Go to step 24.	Repair the shield harness.
24	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 25.
25	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

K: DTC 29

— ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR —

DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

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

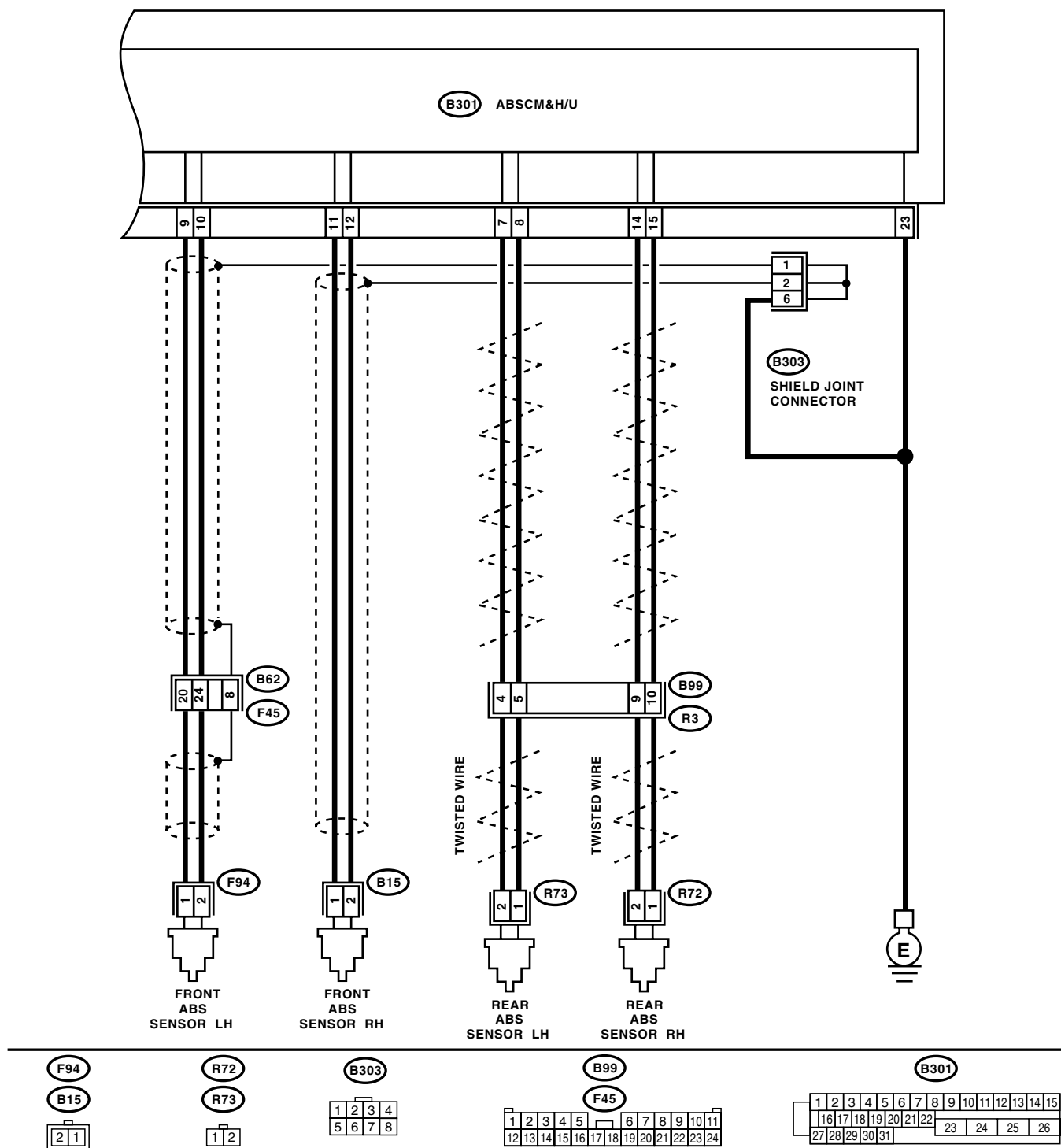
NOTE:

In addition to the ABS warning light, brake warning light illuminates.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00353

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.	Go to step 2.	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when vehicle is towed or jacked-up, or when steering wheel is continuously turned all way, this DTC may sometimes occur.
2	CHECK TIRE SPECIFICATIONS. Turn the ignition switch to OFF.	Go to step 3.	Replace the tire.
3	CHECK WEAR OF TIRE.	Replace the tire.	Go to step 4.
4	CHECK TIRE PRESSURE.	Go to step 5.	Adjust the tire pressure.
5	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Go to step 6.	Tighten the ABS wheel speed sensor installation bolts securely.
6	CHECK ABS WHEEL SPEED SENSOR GAP. Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Go to step 7.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
7	PREPARE OSCILLOSCOPE.	Go to step 8.	Go to step 9.
8	CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1)Raise all four wheels off ground. 2)Turn the ignition switch to OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch to ON. 5)Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM& H/U sometimes stores the DTC 29. Connector & terminal Front RH (B15) No. 1 (+) — No. 2 (-): Front LH (B62) No. 20 (+) — No. 24 (-): Rear RH (B99) No. 10 (+) — No. 9 (-): Rear LH (B99) No. 5 (+) — No. 4 (-):	Go to step 12.	Go to step 9.
9	CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor or drum from hub.	Thoroughly remove dirt or other foreign matter.	Go to step 10.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
10	CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.	Are there broken or damaged teeth in the ABS wheel speed sensor piece or tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, 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-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
12	CHECK ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13.
13	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

L: DTC 31 **— FRONT RIGHT INLET VALVE MALFUNCTION —**

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-102, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>

M: DTC 33 **— FRONT LEFT INLET VALVE MALFUNCTION —**

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-102, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>

N: DTC 35 **— REAR RIGHT INLET VALVE MALFUNCTION —**

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-102, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

O: DTC 37

— REAR LEFT INLET VALVE MALFUNCTION —

DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:

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

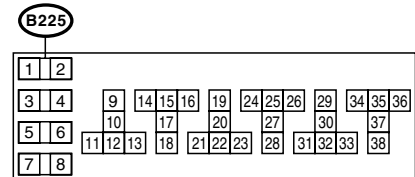
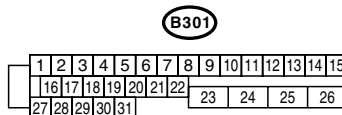
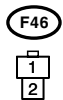
NOTE:

In addition to the ABS warning light, brake warning light illuminates.

ABS (DIAGNOSTICS)

SELECT MONITOR

ABS (DIAGNOSTICS)



ABS-103

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 4.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 5.
5 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

P: DTC 32

— FRONT RIGHT OUTLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-105, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>

Q: DTC 34

— FRONT LEFT OUTLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-105, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>

R: DTC 36

— REAR RIGHT OUTLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-105, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Procedure with Subaru Select Monitor.>

S: DTC 38

— REAR LEFT OUTLET VALVE MALFUNCTION —

DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve

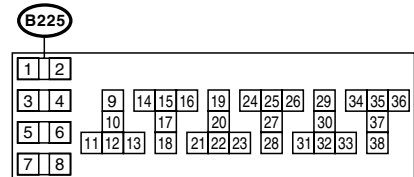
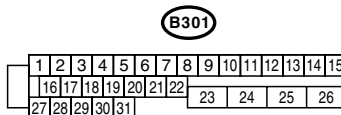
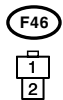
TROUBLE SYMPTOM:

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

NOTE:

In addition to the ABS warning light, brake warning light illuminates.

ABS (DIAGNOSTICS)

[illegible]

ABS-106

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 4.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 5.
5 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

T: DTC 41

— ABS CONTROL MODULE MALFUNCTION —

DIAGNOSIS:

- Faulty ABSCM&H/U

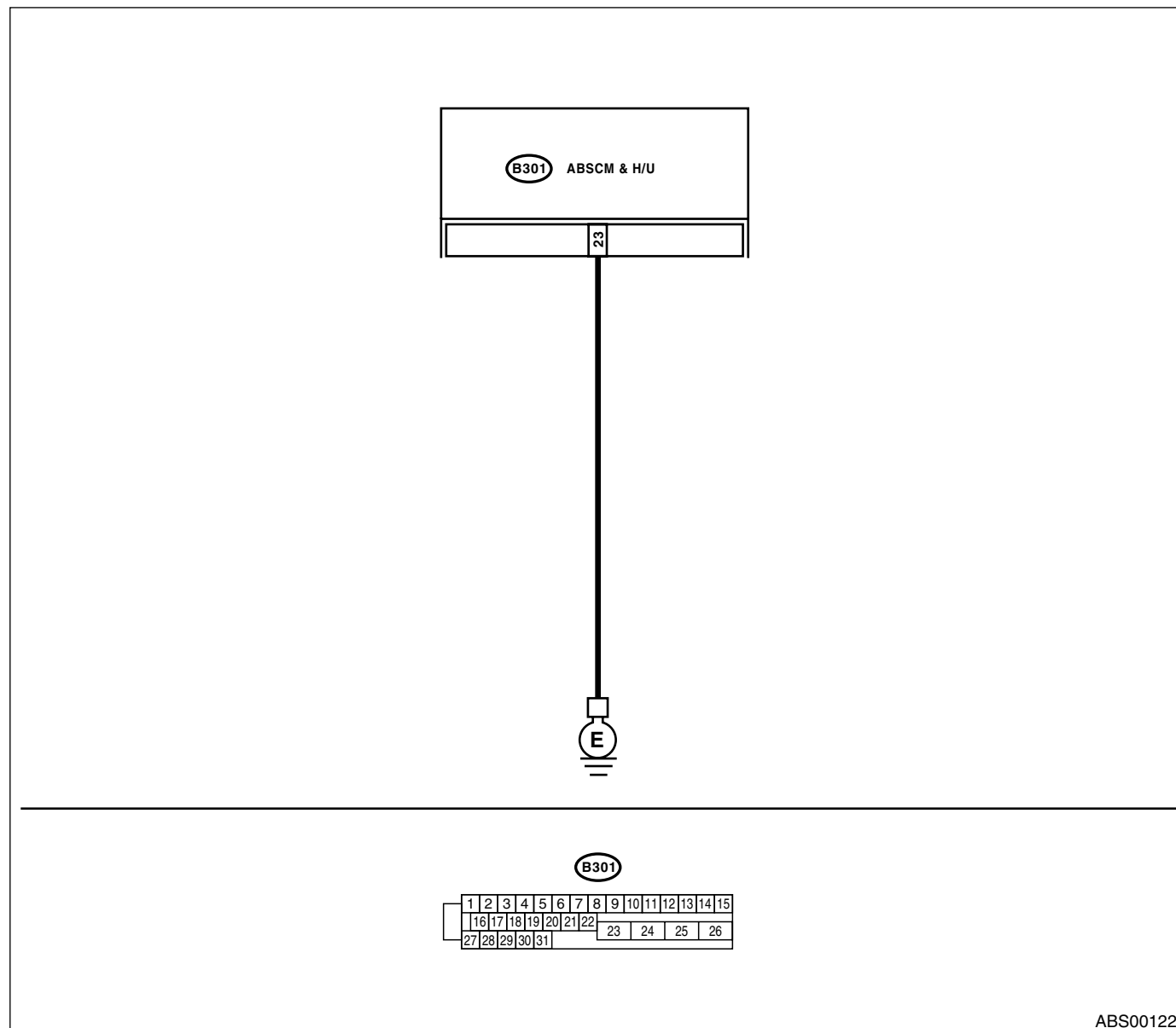
TROUBLE SYMPTOM:

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

NOTE:

In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 2.	Repair the ABSCM&H/U ground harness.
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or wireless transmitter properly installed?	Go to step 4.	Properly install the car telephone or wireless transmitter.
4 CHECK SOURCES OF SIGNAL NOISE.	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness.	Go to step 5.
5 CHECK ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 6.
6 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

U: DTC 42

— POWER SUPPLY VOLTAGE TOO LOW —

DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low.

TROUBLE SYMPTOM:

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

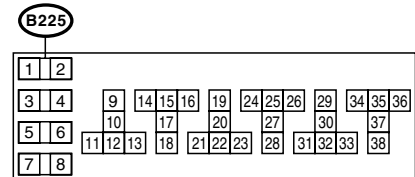
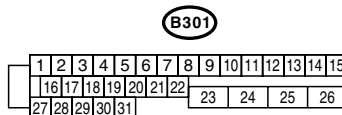
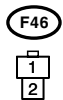
NOTE:

In addition to the ABS warning light, brake warning light illuminates temporarily. Both warning lights go off on the recovery of voltage.

ABS (DIAGNOSTICS)

SELECT MONITOR

ABS (DIAGNOSTICS)



ABS-111

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK GENERATOR. 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. Terminals Generator B terminal (+) — Chassis ground (-):	Is the voltage 10 — 17 V?	Go to step 2.	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
2	CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step 3.	Tighten the clamp of terminal.
3	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Operate the electric load applying devices, such as the headlight, A/C, and defogger. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 17 V?	Go to step 4.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the ABSCM&H/U ground harness.
5	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 6.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

V: DTC 42

— POWER SUPPLY VOLTAGE TOO HIGH —

DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is high.

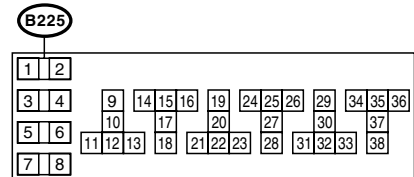
TROUBLE SYMPTOM:

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

NOTE:

In addition to the ABS warning light, brake warning light illuminates temporarily. Both warning lights go off on the recovery of voltage.

ABS (DIAGNOSTICS)

[illegible]

ABS-114

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK GENERATOR. 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. Terminals Generator B terminal (+) — Chassis ground (-):	Is the voltage 10 — 17 V?	Go to step 2.	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
2	CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step 3.	Tighten the clamp of terminal.
3	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Operate the electric load applying devices, such as the headlight, A/C, and defogger. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 and 17 V?	Go to step 4.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the ABSCM&H/U ground harness.
5	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 6.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

W: DTC 44

— ABS-AT CONTROL (NON CONTROLLED) —

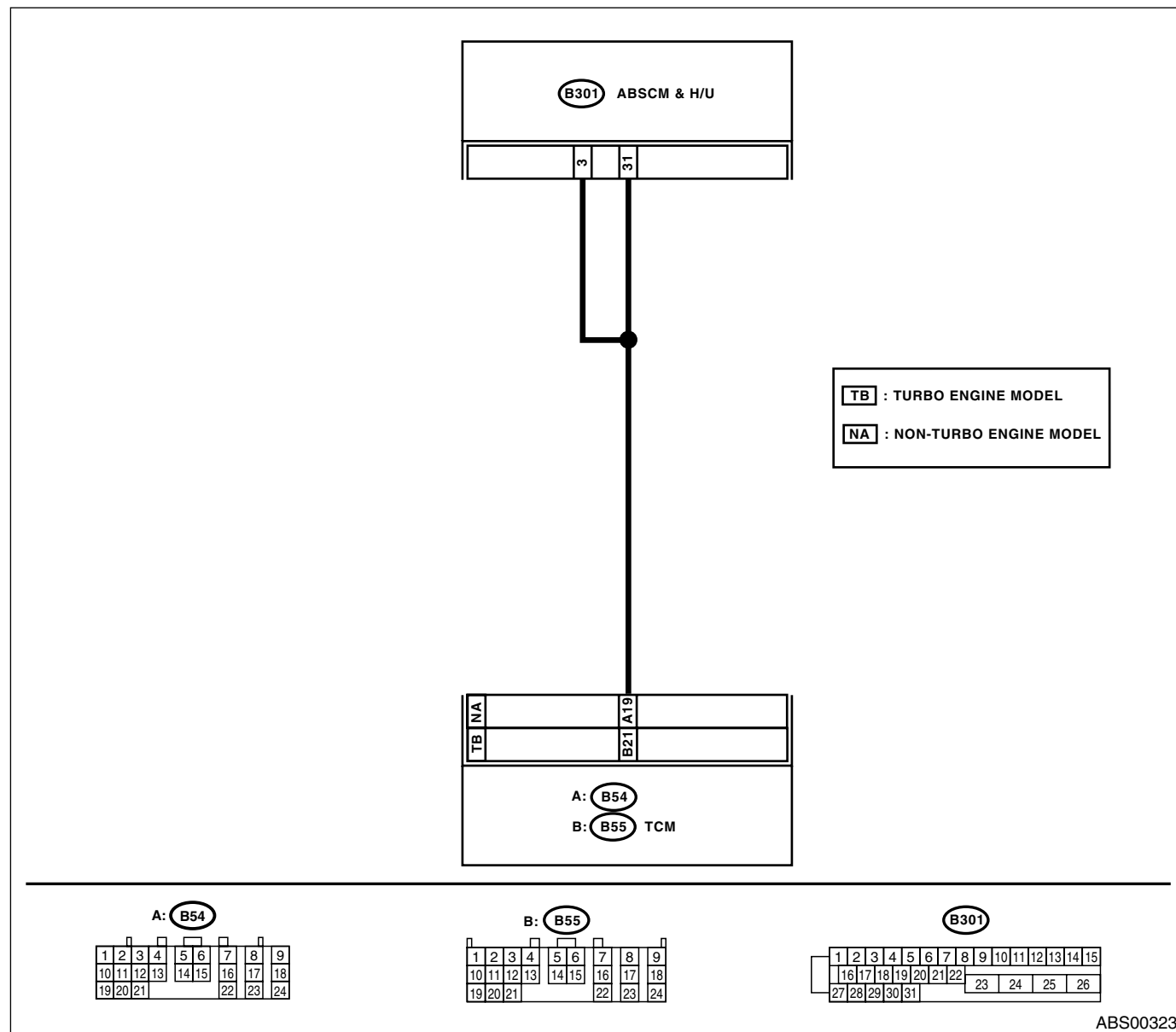
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00323

Step	Check	Yes	No
1	CHECK SPECIFICATIONS OF THE AB-SCM&H/U. Check specifications of mark on ABSCM&H/U. CU: AT CV: MT (Except STi model) CY: MT (STi model)	Go to step 2.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the two connectors from TCM. 3) Disconnect the connector from ABSCM&H/U. 4) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 3 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair the harness between TCM and ABSCM&H/U.
3 CHECK TCM. 1) Connect all connectors to TCM. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector terminal and chassis ground. Connector & terminal Non-turbo model (B54) No. 19 (+) — Chassis ground (-): Turbo model (B55) No. 21 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 5.	Go to step 4.
4 CHECK AT.	Is the AT functioning normally?	Replace the TCM.	Repair the AT.
5 CHECK OPEN CIRCUIT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 3 (+) — Chassis ground (-): (B301) No. 31 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 6.	Repair the harness/connector between TCM and ABSCM&H/U.
6 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair the connector.	Go to step 7.
7 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 8.
8 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

X: DTC 44

— ABS-AT CONTROL (CONTROLLED) —

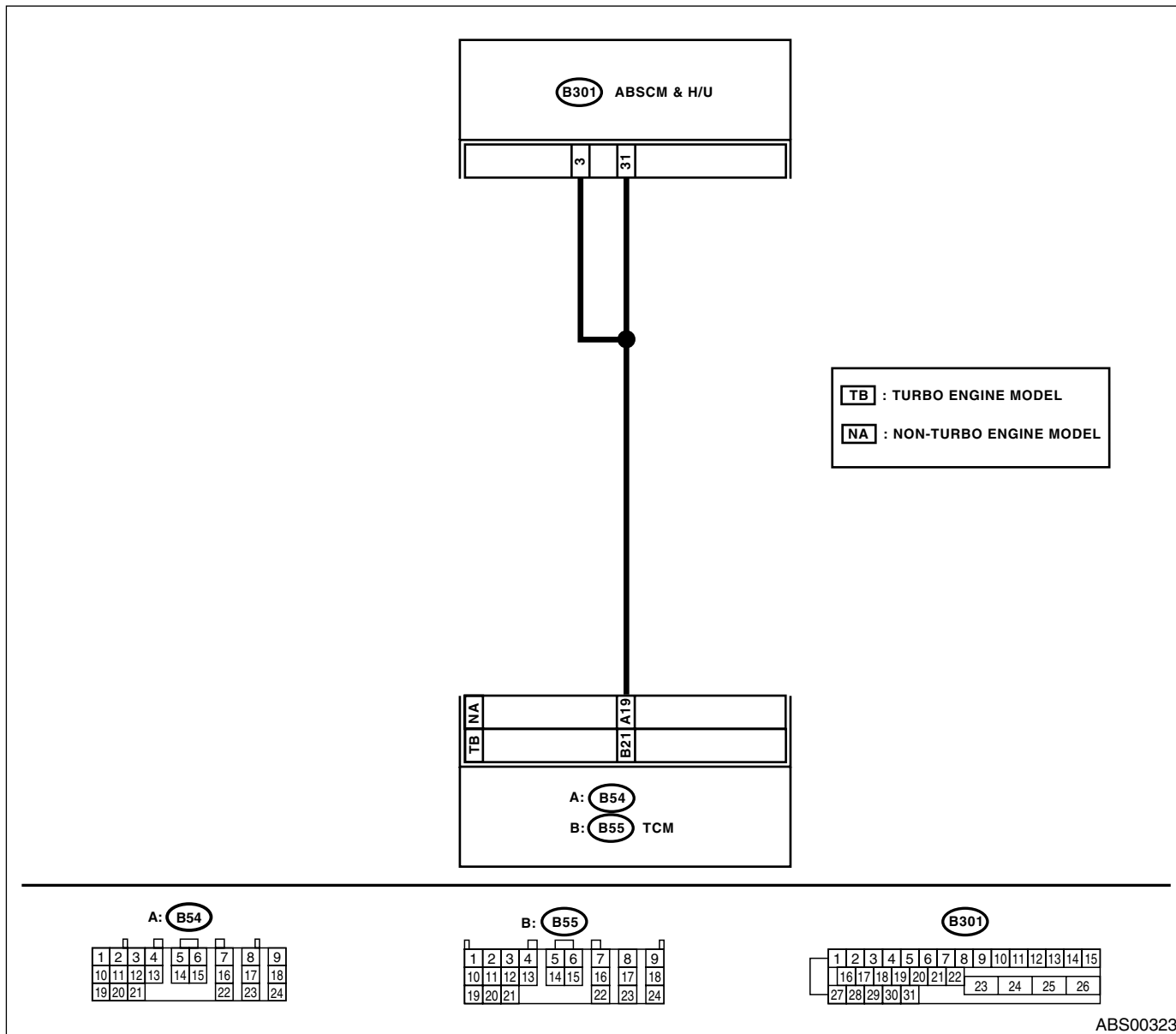
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00323

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BATTERY SHORT OF HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect all connectors from TCM. 3)Disconnect the connector from ABSCM&H/U. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 2.	Repair the harness between TCM and ABSCM&H/U.
2 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 (B301) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Repair the harness between TCM and ABSCM&H/U.
3 CHECK OPEN CIRCUIT OF HARNESS. 1)Turn the ignition switch to OFF. 2)Connect all connectors to TCM. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 3 (+) — Chassis ground (-): (B301) No. 31 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the harness/connector between TCM and ABSCM&H/U.
4 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connectors between TCM 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 out the DTC.	Is the same DTC as in current diagnosis still being output?	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 ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Y: DTC 51

— VALVE RELAY MALFUNCTION —

DIAGNOSIS:

- Faulty valve relay

TROUBLE SYMPTOM:

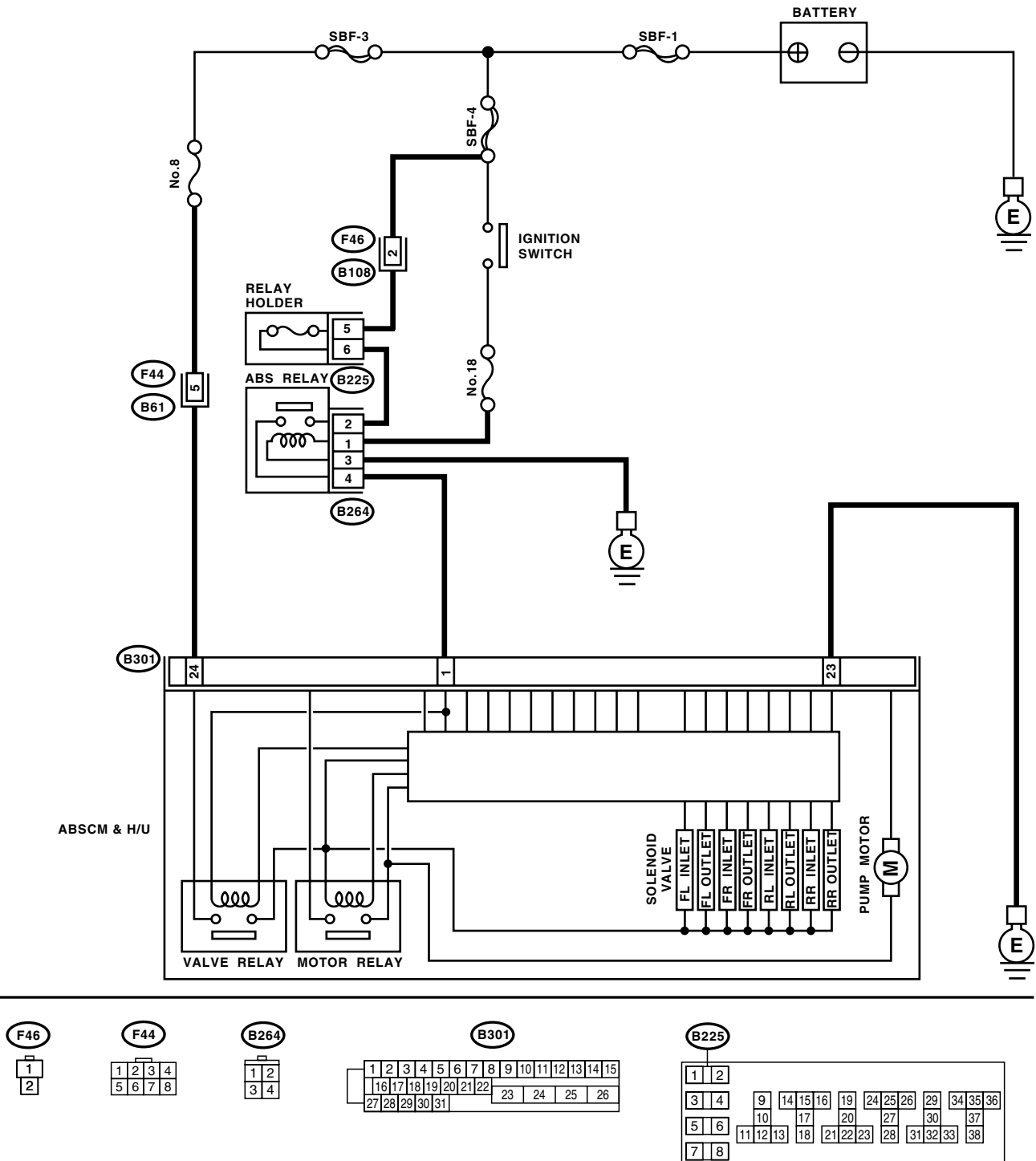
- ABS does not operate.
- EBD does not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates.

ABS (DIAGNOSTICS)

ABSCM & H/U



ABS00377

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-): (B301) No. 24 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness connector between battery and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 4.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&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 APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

ABS (DIAGNOSTICS)

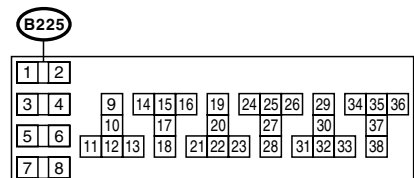
— VALVE RELAY ON FAILURE —

- Faulty valve relay

- Faulty valve relay

- ABS does not operate.

WIRING DIAGRAM:



ABS-123

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK VALVE RELAY IN ABSCM&H/U. 1) Disconnect the connector from ABSCM&H/U. 2) Measure the resistance between ABSCM&H/U terminals. Terminals No. 23 — No. 24:	Is the resistance more than 1 MΩ?	Go to step 2.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AA:DTC 52

— OPEN CIRCUIT IN MOTOR RELAY CIRCUIT —

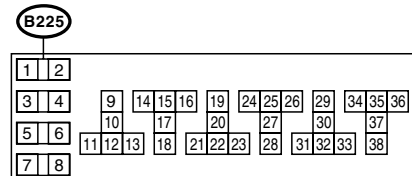
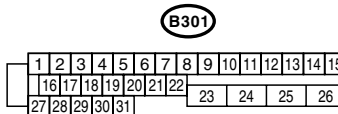
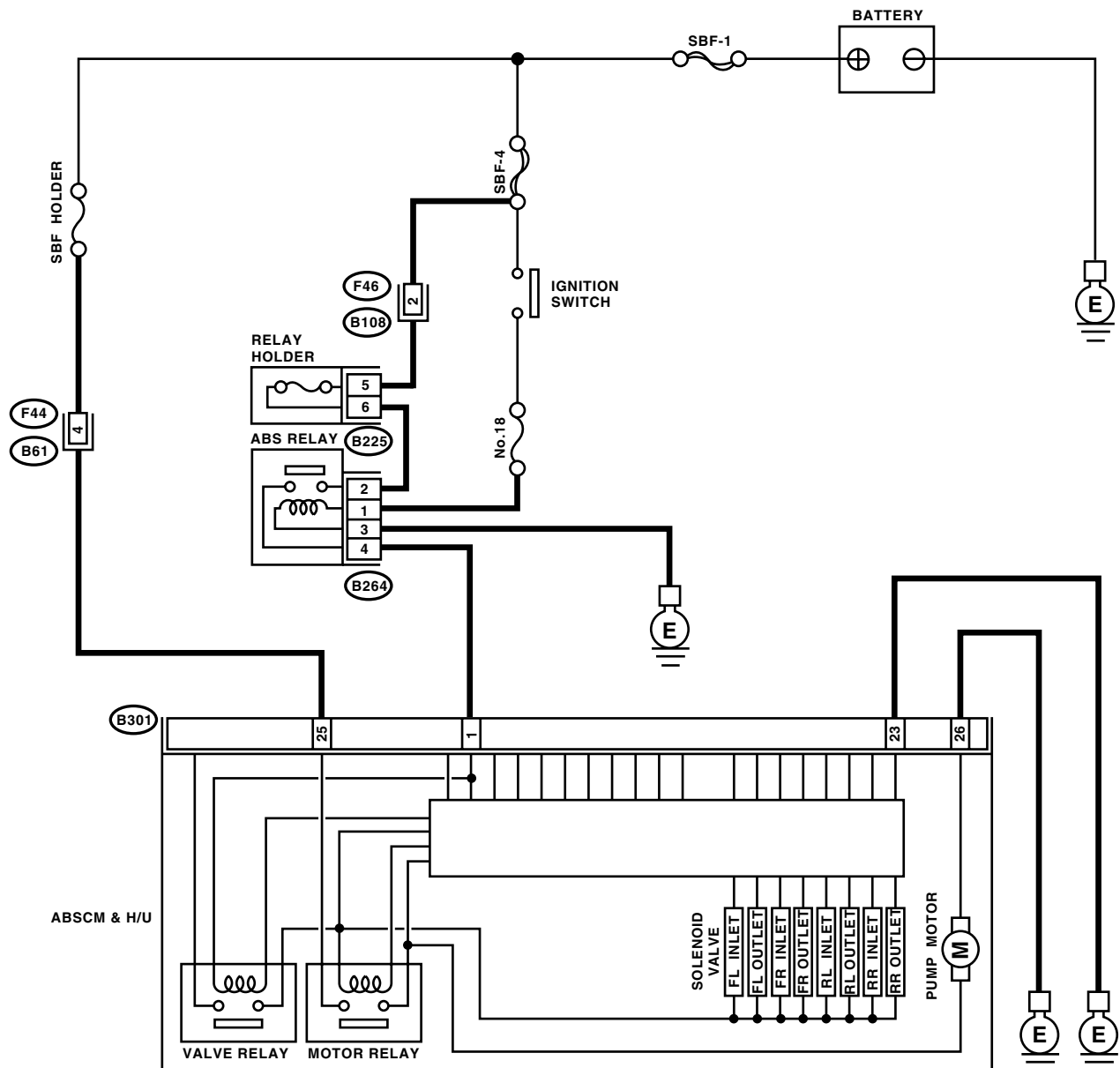
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00325

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 25 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF8.
2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 26 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate sequence control.	Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Go to step 4.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 5.
5 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	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 ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AB:DTC 52

— MOTOR RELAY ON FAILURE —

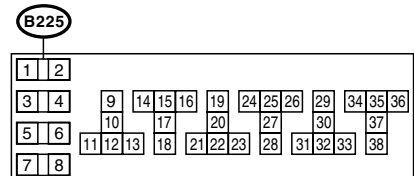
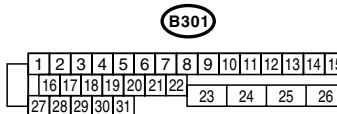
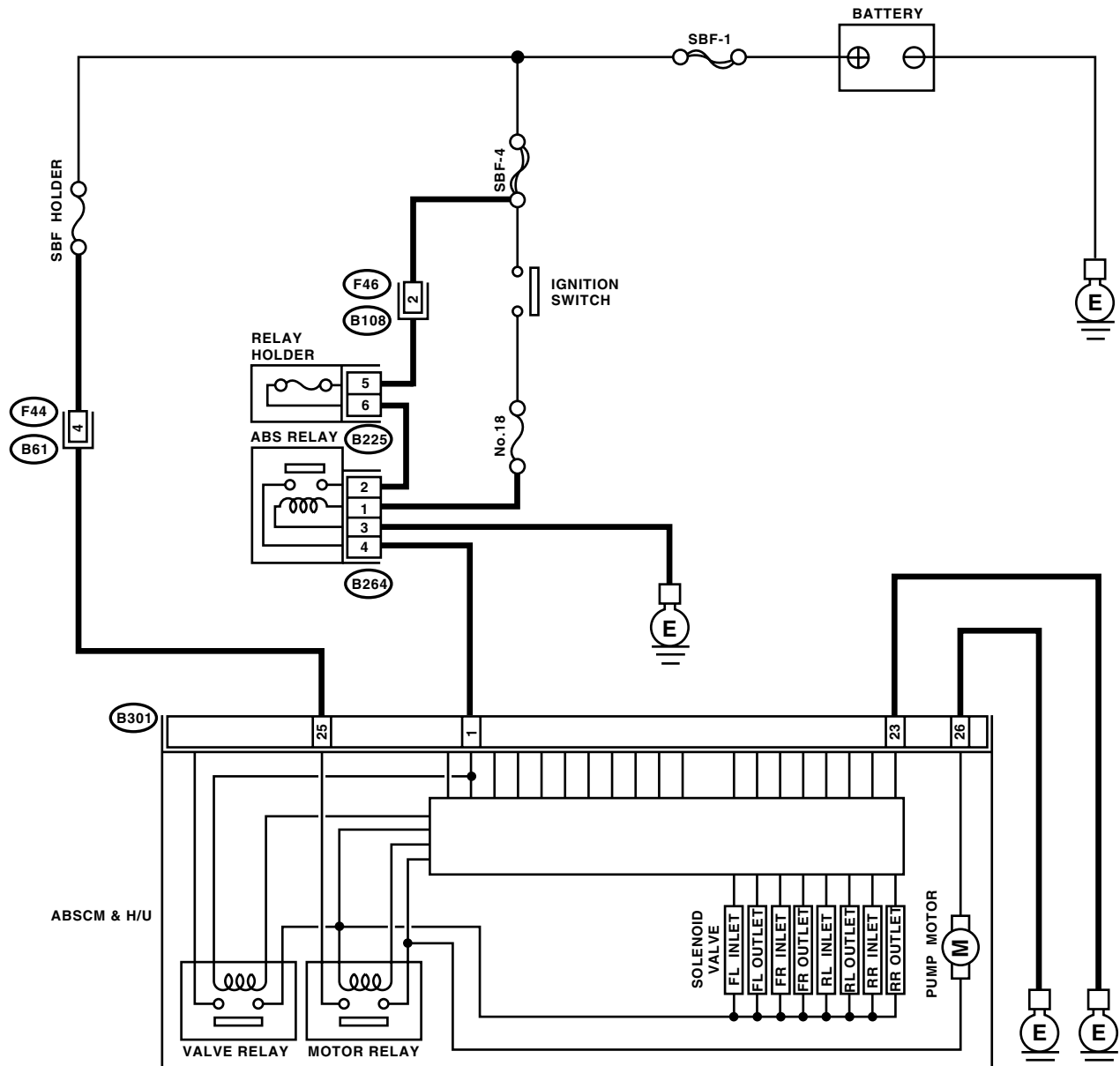
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK MOTOR RELAY IN ABSCM&H/U. 1) Disconnect the connector from ABSCM&H/U. 2) Measure the resistance between ABSCM&H/U terminals. Terminals No. 25 — No. 26:	Is the resistance more than 1 MΩ?	Go to step 2.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step 3.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 4.
4	CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&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 APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AC:DTC 52

— MOTOR MALFUNCTION —

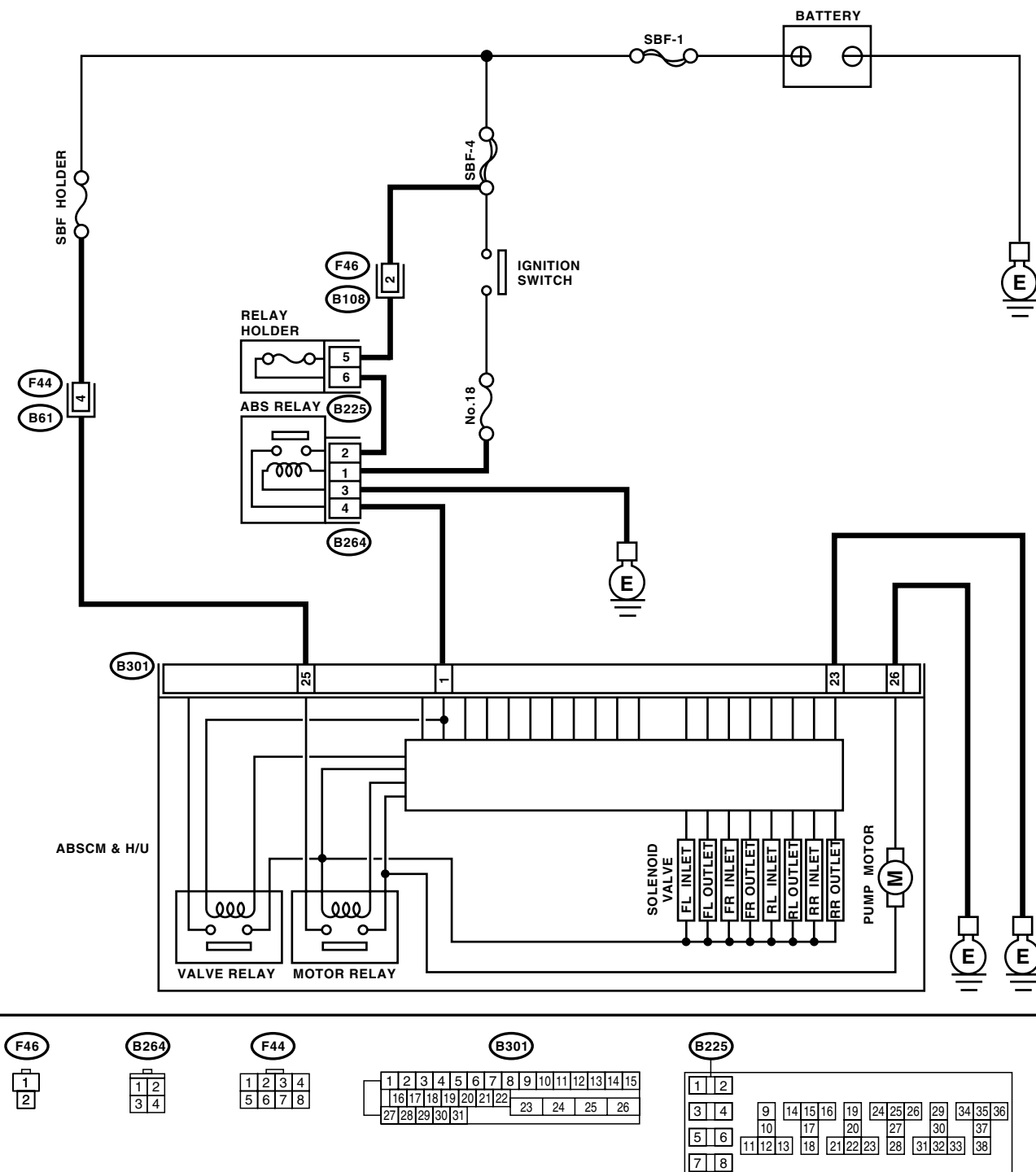
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00325

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 25 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF8.
2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 26 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the ABSCM&H/U ground harness.
5 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step 6.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 7.
7 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 8.
8 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AD:DTC 54

— STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION —

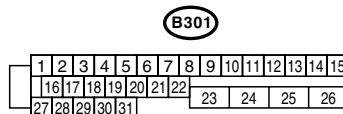
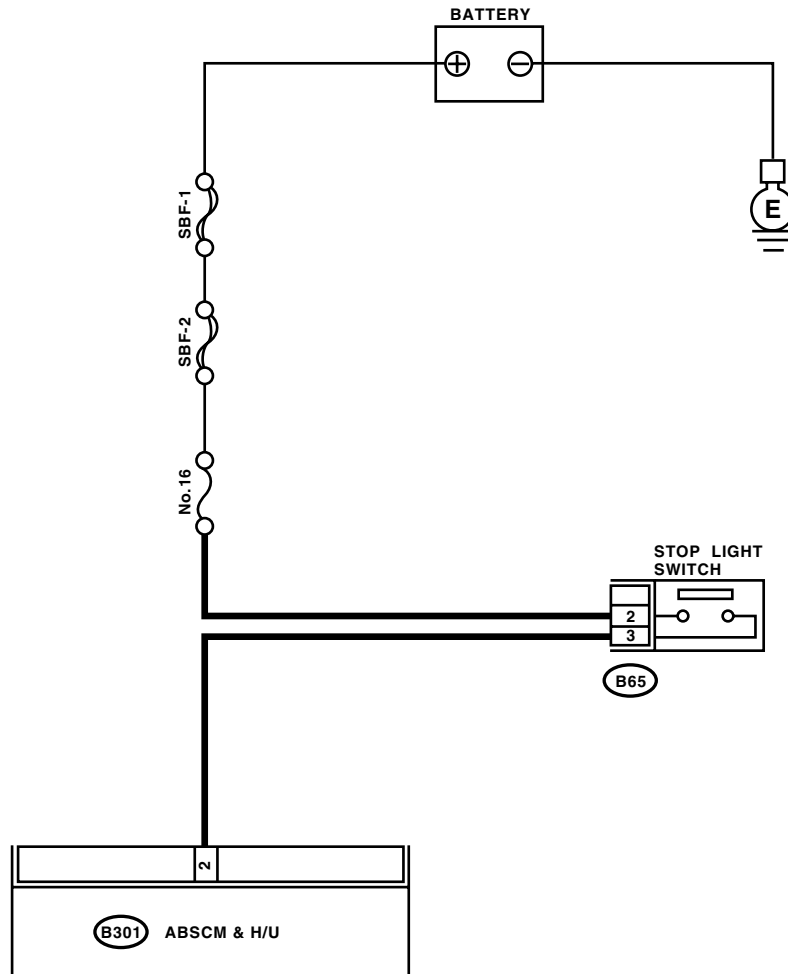
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR. 1)Select "Current data display & Save" on the Subaru Select Monitor. 2)Release the brake pedal. 3)Read the stop light switch output in Subaru Select Monitor data display.	Is the reading indicated on monitor display less than 1.5 V?	Go to step 2.	Go to step 3.
2	CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR. 1)Depress the brake pedal. 2)Read the stop light switch output in Subaru Select Monitor data display.	Is the reading indicated on monitor display 10 — 15 V?	Go to step 5.	Go to step 3.
3	CHECK IF STOP LIGHTS COME ON. Depress the brake pedal.	Do the stop lights turn on?	Go to step 4.	Repair the stop lights circuit.
4	CHECK OPEN CIRCUIT IN HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Depress the brake pedal. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 2 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 5.	Repair the harness between stop light switch and ABSCM&H/U connector.
5	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Go to step 6.	Repair the connector.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AE:DTC 56

— OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT —

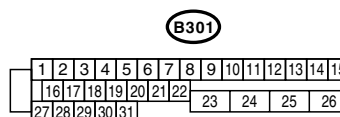
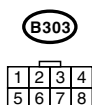
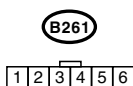
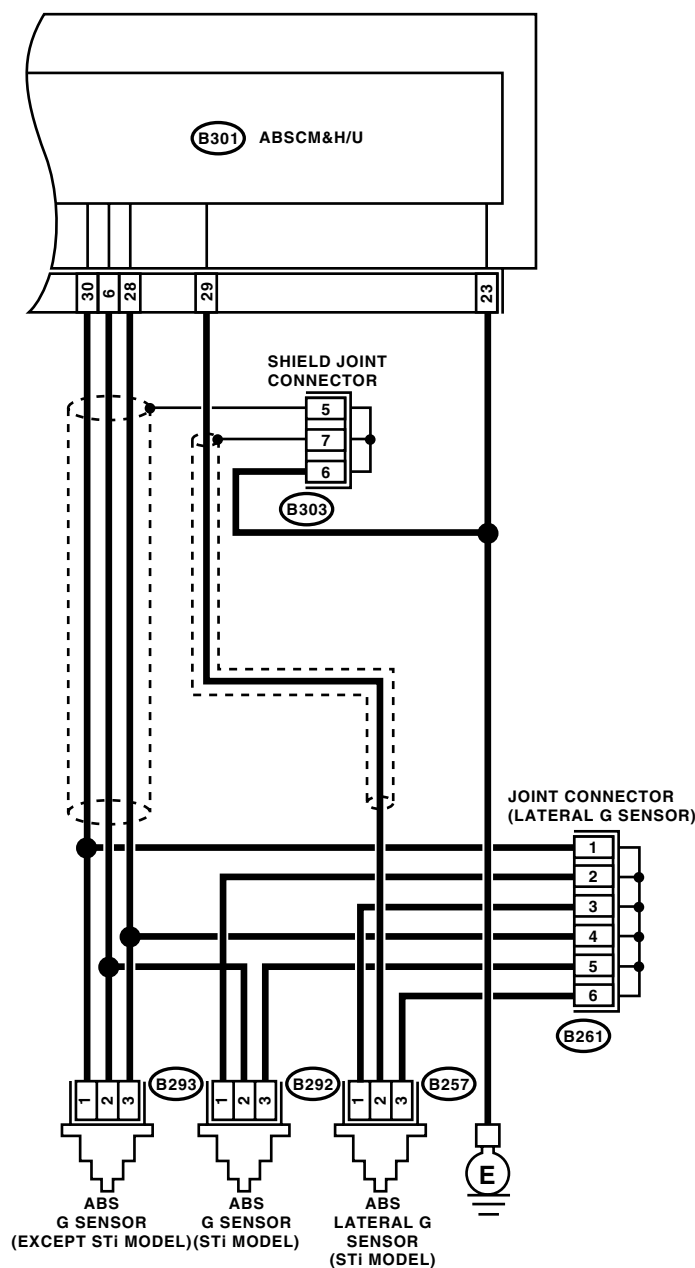
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR. 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the G sensor output in Subaru Select Monitor data display.	Is the G sensor output on monitor display 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step 2.	Go to step 5.
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5 CHECK INPUT VOLTAGE OF G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 1 (+) — No. 3 (-):	Is the voltage 4.75 — 5.25 V?	Go to step 6.	Repair the harness/connector between G sensor and ABSCM&H/U.
6 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 6 — No. 28:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 7.	Repair the harness/connector between G sensor and ABSCM&H/U.
7 CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS. 1) Disconnect the connector from G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 6 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 8.	Repair the harness between G sensor and ABSCM&H/U.
8 CHECK G SENSOR. 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step 9.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
9 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step 10.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step 11.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
11 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 12.
12 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13.
13 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AF:DTC 56

— BATTERY SHORT IN G SENSOR CIRCUIT —

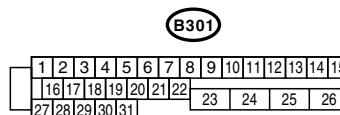
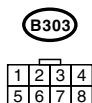
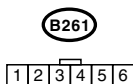
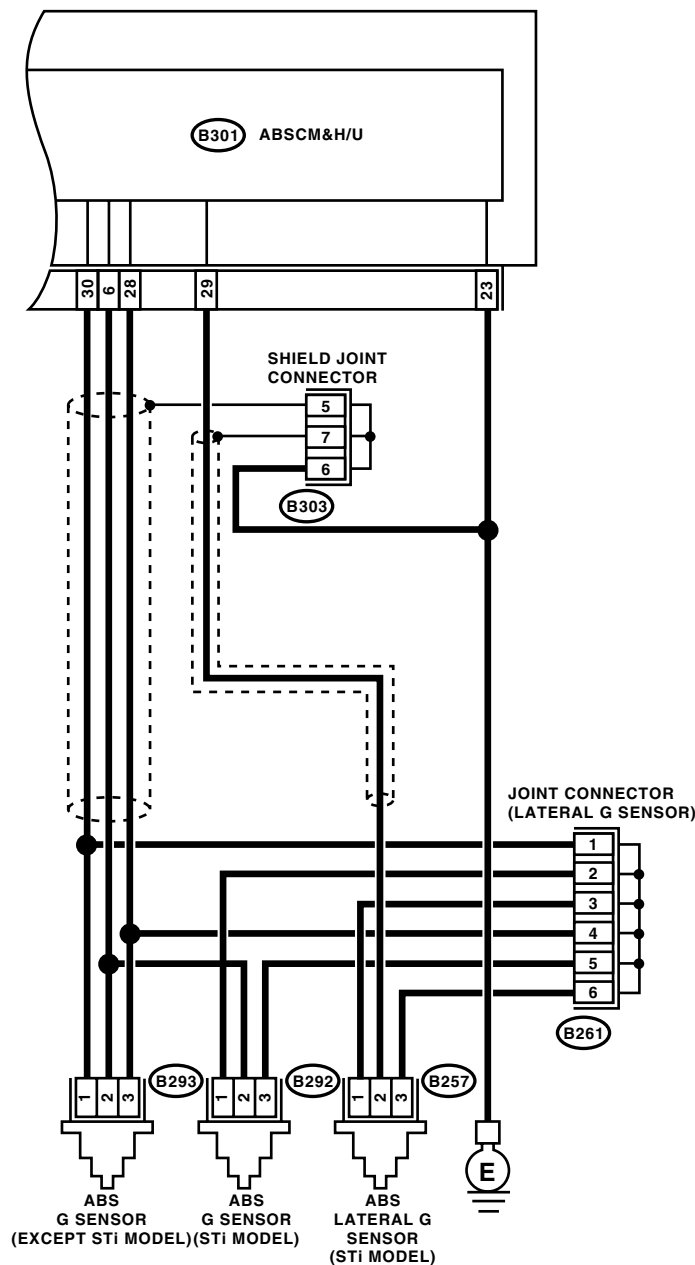
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00368

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR. 1)Select "Current data display & Save" on the Subaru Select Monitor. 2)Read the G sensor output in Subaru Select Monitor data display.	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step 2.	Go to step 5.
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5 CHECK FREEZE FRAME DATA. 1)Select "Freeze frame data" on the Subaru Select Monitor. 2)Read front right wheel speed on the Subaru Select Monitor display.	Is the front right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step 6.	Go to step 16.
6 CHECK FREEZE FRAME DATA. Read front left wheel speed on the Subaru Select Monitor display.	Is the front left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step 7.	Go to step 16.
7 CHECK FREEZE FRAME DATA. Read rear right wheel speed on the Subaru Select Monitor display.	Is the rear right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step 8.	Go to step 16.
8 CHECK FREEZE FRAME DATA. Read rear left wheel speed on the Subaru Select Monitor display.	Is the rear left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step 9.	Go to step 16.
9 CHECK FREEZE FRAME DATA. Read G sensor output on the Subaru Select Monitor display.	Is the G sensor output on monitor display more than 3.65 V?	Go to step 10.	Go to step 16.
10 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 6 — No. 28:	Is the resistance 4.3 — 4.9 k Ω ?	Go to step 11.	Repair the harness/connector between G sensor and ABSCM&H/U.
11 CHECK BATTERY SHORT OF HARNESS. 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Disconnect the connector from G sensor. 4)Disconnect the connector from ABSCM&H/U. 5)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 6 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 12.	Repair the harness between G sensor and ABSCM&H/U.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 6 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 13.	Repair the harness between G sensor and ABSCM&H/U.
13 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 14.
14 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 15.
15 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
16 CHECK INPUT VOLTAGE OF G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 1 (+) — No. 3 (-):	Is the voltage 4.75 — 5.25 V?	Go to step 17.	Repair the harness/connector between G sensor and ABSCM&H/U.
17 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 6 — No. 28:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 18.	Repair the harness/connector between G sensor and ABSCM&H/U.
18 CHECK G SENSOR. 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step 19.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
19 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step 20.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
20 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step 21.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
21 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 22.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
22 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 23.
23 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AG:DTC 56

— ABNORMAL G SENSOR HIGH μ OUTPUT —

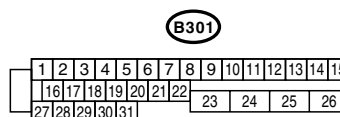
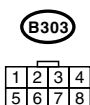
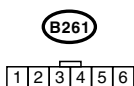
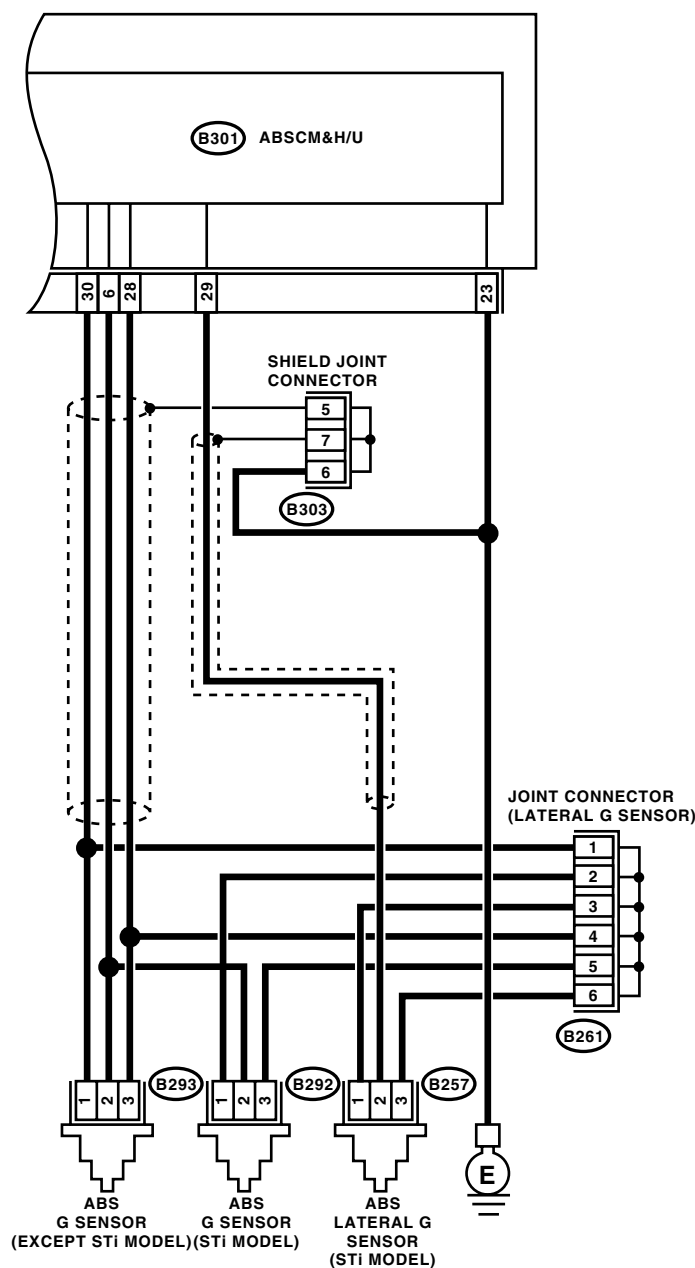
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00368

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR. 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read G sensor output on the Subaru Select Monitor display.	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step 2.	Go to step 6.
2 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 6 — No. 28:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 6.	Repair the harness/connector between G sensor and ABSCM&H/U.
6 CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 28 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 7.	Repair the harness between G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7 CHECK G SENSOR. 1) Remove the console box. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step 8.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
8 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step 9.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
9 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step 10.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
10	CHECK ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 11.
11	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AH:DTC 56

— DETECTION OF G SENSOR STICK —

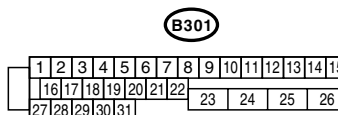
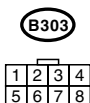
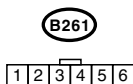
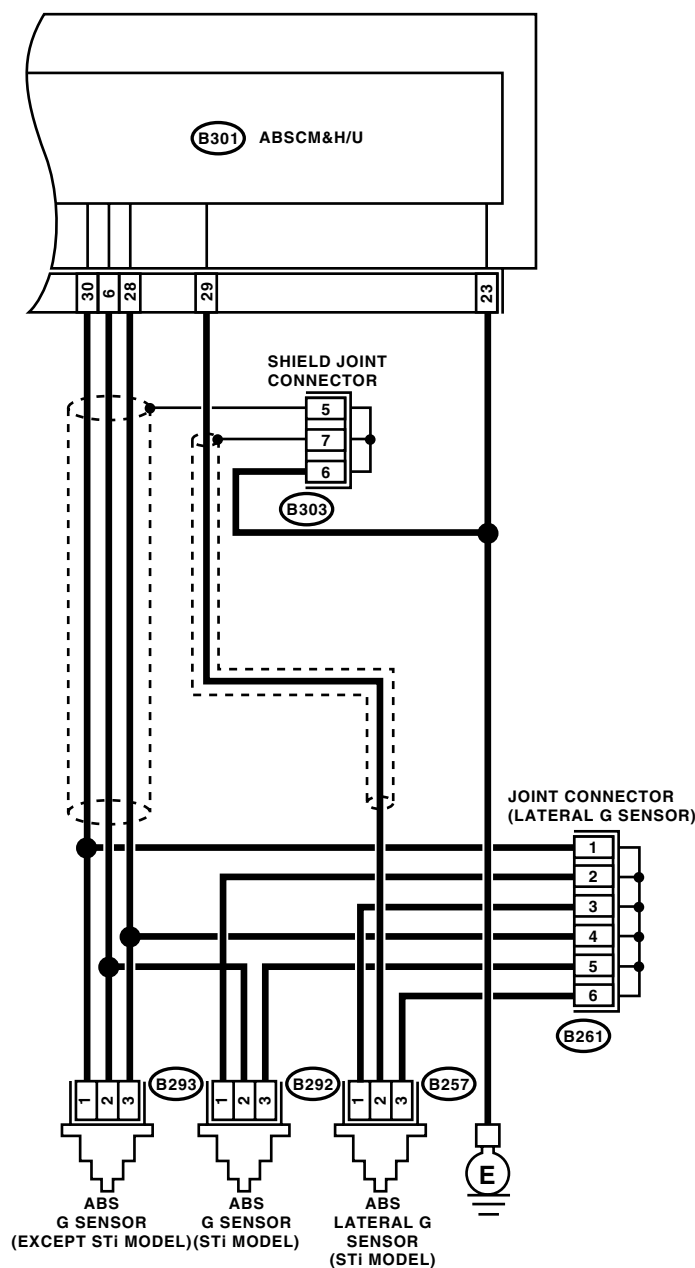
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK ALL FOUR WHEELS FOR FREE TURNING.	Have the wheels been turned freely such as when vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the DTC.	Go to step 2.
2	CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR. 1)Select "Current data display & Save" on the Subaru Select Monitor. 2)Read the Subaru Select Monitor display.	Is the G sensor output on monitor display 2.1 — 2.5 V when the vehicle is in horizontal position?	Go to step 3.	Go to step 8.
3	CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR. 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Remove the G sensor from vehicle. (Do not disconnect the connector.) 4)Turn the ignition switch to ON. 5)Select "Current data display & Save" on the Subaru Select Monitor. 6)Read the Subaru Select Monitor display.	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step 4.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
4	CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR. Read the Subaru Select Monitor display.	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step 5.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
5	CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 6.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
8	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 6 — No. 28:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 9.	Repair the harness/connector between G sensor and ABSCM&H/U.
9	CHECK G SENSOR. 1)Remove the console box. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Connect the connector to ABSCM&H/U. 5)Turn the ignition switch to ON. 6)Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step 10.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step 11.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
11 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step 12.	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
12 CHECK ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13.
13 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AI: DTC 73

— OPEN OR SHORT CIRCUIT IN LATERAL G SENSOR CIRCUIT —

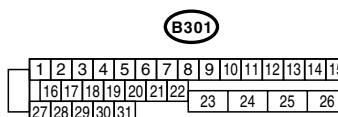
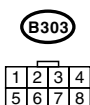
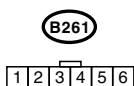
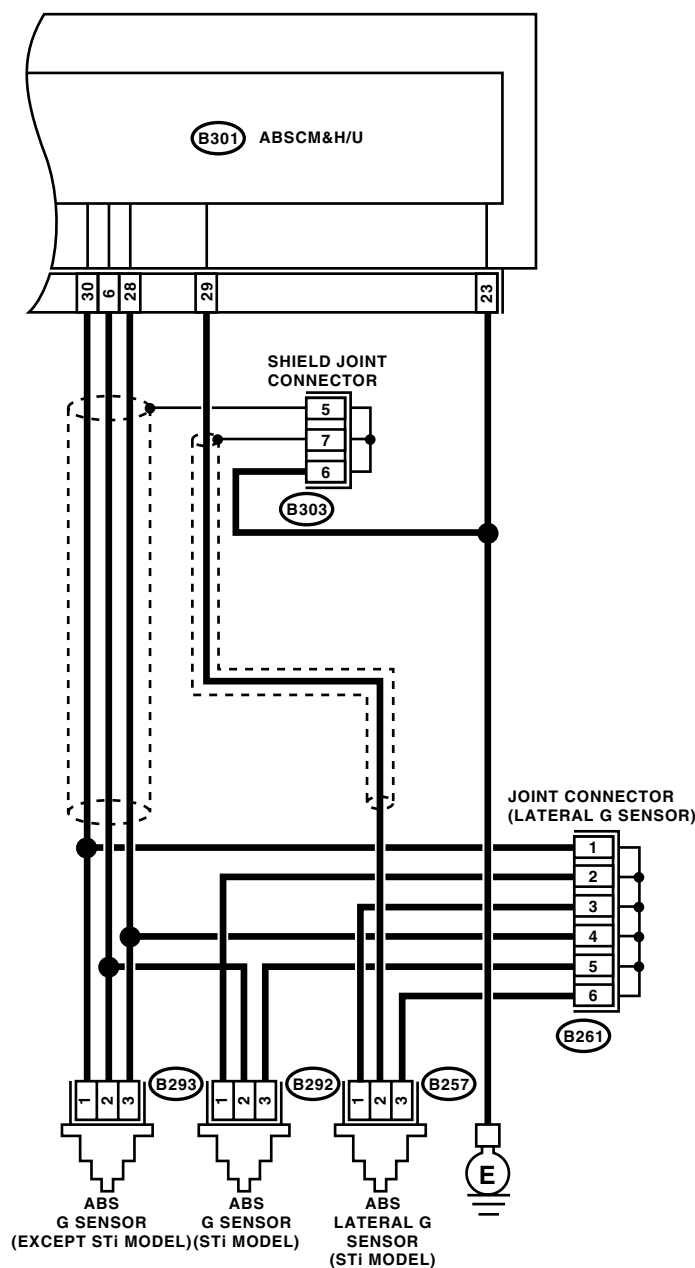
DIAGNOSIS:

- Faulty Lateral G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00368

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the lateral G sensor output in Subaru Select Monitor data display.	Is the lateral G sensor output on monitor display 2.3 — 2.7 V when lateral G sensor is in horizontal position?	Go to step 2.	Go to step 5.
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5 CHECK INPUT VOLTAGE OF LATERAL G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 1 (+) — No. 3 (-):	Is the voltage 4.75 — 5.25 V?	Go to step 6.	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
6 CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 28 — No. 30:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 7.	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
7 CHECK GROUND SHORT IN LATERAL G SENSOR OUTPUT HARNESS. 1) Disconnect the connector from lateral G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 29 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 8.	Repair the harness between lateral G sensor and ABSCM&H/U.
8 CHECK LATERAL G SENSOR. 1) Connect the connector to lateral G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step 9.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 3.7 — 4.1 V when lateral G sensor is inclined right to 90°?	Go to step 10.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
10 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step 11.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
11 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step 12.
12 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13.
13 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

ABS (DIAGNOSTICS)

— BATTERY SHORT IN LATERAL G SENSOR CIRCUIT —

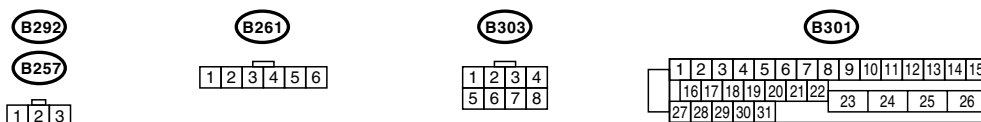
- Faulty Lateral G sensor output voltage

- ABS does not operate.

Wiring Diagram for ABS System

Components and Connections:

- ABS Control Unit (B301):**
 - Terminal 30: Connected to terminal 1 of connector B293.
 - Terminal 6: Connected to terminal 2 of connector B293.
 - Terminal 28: Connected to terminal 3 of connector B293.
 - Terminal 29: Connected to terminal 1 of connector B292.
 - Terminal 23: Connected to terminal 1 of connector B257.
- Shield Joint Connector (B303):**
 - Terminal 5: Connected to terminal 1 of connector B293.
 - Terminal 7: Connected to terminal 2 of connector B293.
 - Terminal 6: Connected to terminal 3 of connector B293.
- Joint Connector (Lateral G Sensor) (B261):**
 - Terminal 1: Connected to terminal 1 of connector B292.
 - Terminal 2: Connected to terminal 2 of connector B292.
 - Terminal 3: Connected to terminal 3 of connector B292.
 - Terminal 4: Connected to terminal 1 of connector B257.
 - Terminal 5: Connected to terminal 2 of connector B257.
 - Terminal 6: Connected to terminal 3 of connector B257.
- Sensors:**
 - ABS G Sensor (Except STI Model):** Connected to connector B293 (Terminals 1, 2, 3).
 - ABS G Sensor (STI Model):** Connected to connector B292 (Terminals 1, 2, 3).
 - ABS Lateral G Sensor (STI Model):** Connected to connector B257 (Terminals 1, 2, 3).
- Grounding:**
 - Terminal 23 of the control unit is connected to a ground symbol (E).



ABS-149

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the lateral G sensor output in Subaru Select Monitor data display.	Is the voltage 2.3 — 2.7 V when lateral G sensor is in horizontal position?	Go to step 2.	Go to step 5.
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5 CHECK FREEZE FRAME DATA. 1) Select "Freeze frame data" on the Subaru Select Monitor. 2) Read front right wheel speed on the Subaru Select Monitor display.	Is the front right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step 6.	Go to step 16.
6 CHECK FREEZE FRAME DATA. Read front left wheel speed on the Subaru Select Monitor display.	Is the front left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step 7.	Go to step 16.
7 CHECK FREEZE FRAME DATA. Read rear right wheel speed on the Subaru Select Monitor display.	Is the rear right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step 8.	Go to step 16.
8 CHECK FREEZE FRAME DATA. Read rear left wheel speed on the Subaru Select Monitor display.	Is the rear left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step 9.	Go to step 16.
9 CHECK FREEZE FRAME DATA. Read lateral G sensor output on the Subaru Select Monitor display.	Is the lateral G sensor output on monitor display more than 3.65 V?	Go to step 10.	Go to step 16.
10 CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 29 — No. 28:	Is the resistance 4.3 — 4.9 kΩ?	Go to step 11.	Repair the harness/connector between Lateral G sensor and ABSCM&H/U.
11 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Disconnect the connector from lateral G sensor. 4) Disconnect the connector from ABSCM&H/U. 5) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 29 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 12.	Repair the harness between lateral G sensor and ABSCM&H/U.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 29 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 13.	Repair the harness between lateral G sensor and ABSCM&H/U.
13 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step 14.
14 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 15.
15 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
16 CHECK INPUT VOLTAGE OF LATERAL G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 1 (+) — No. 3 (-):	Is the voltage 4.75 — 5.25 V?	Go to step 17.	Repair the harness/connector between Lateral G sensor and ABSCM&H/U.
17 CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 29 — No. 28:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 18.	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
18 CHECK LATERAL G SENSOR. 1) Connect the connector to lateral G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step 19.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
19 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step 20.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
20 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step 21.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
21 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step 22 .
22 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 23 .
23 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AK:DTC 73

— ABNORMAL LATERAL G SENSOR HIGH μ OUTPUT —

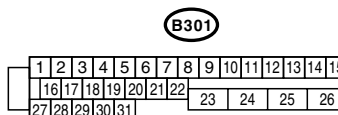
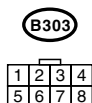
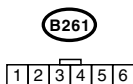
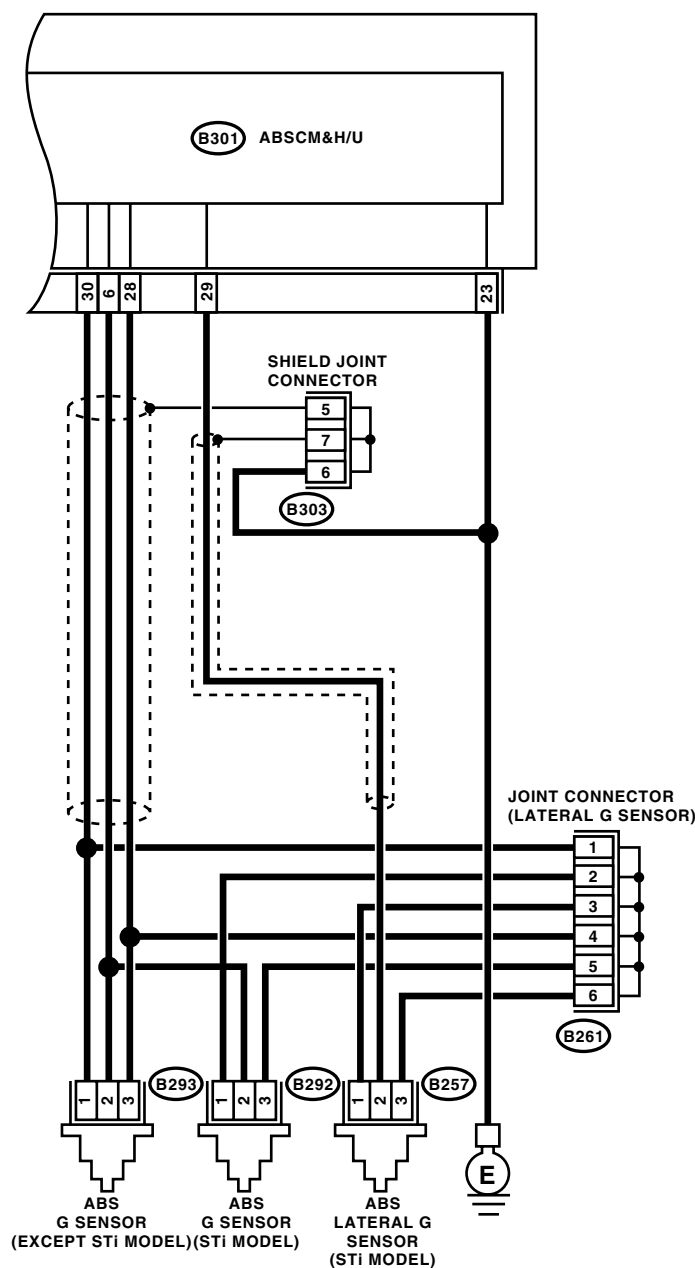
DIAGNOSIS:

- Faulty Lateral G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read Lateral G sensor output on the Subaru Select Monitor display.	Is the voltage 2.3 — 2.7 V when Lateral G sensor is in horizontal position?	Go to step 2.	Go to step 6.
2 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5 CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 29 — No. 28:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 6.	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
6 CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 28 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 7.	Repair the harness between lateral G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7 CHECK LATERAL G SENSOR. 1) Remove the console box. 2) Remove the lateral G sensor from vehicle. 3) Connect the connector to lateral G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step 8.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
8 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step 9.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step 10.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
10 CHECK ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 11.
11 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AL:DTC 73

— DETECTION OF LATERAL G SENSOR STICK —

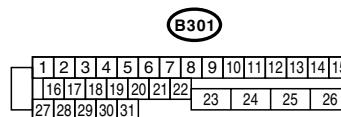
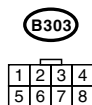
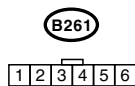
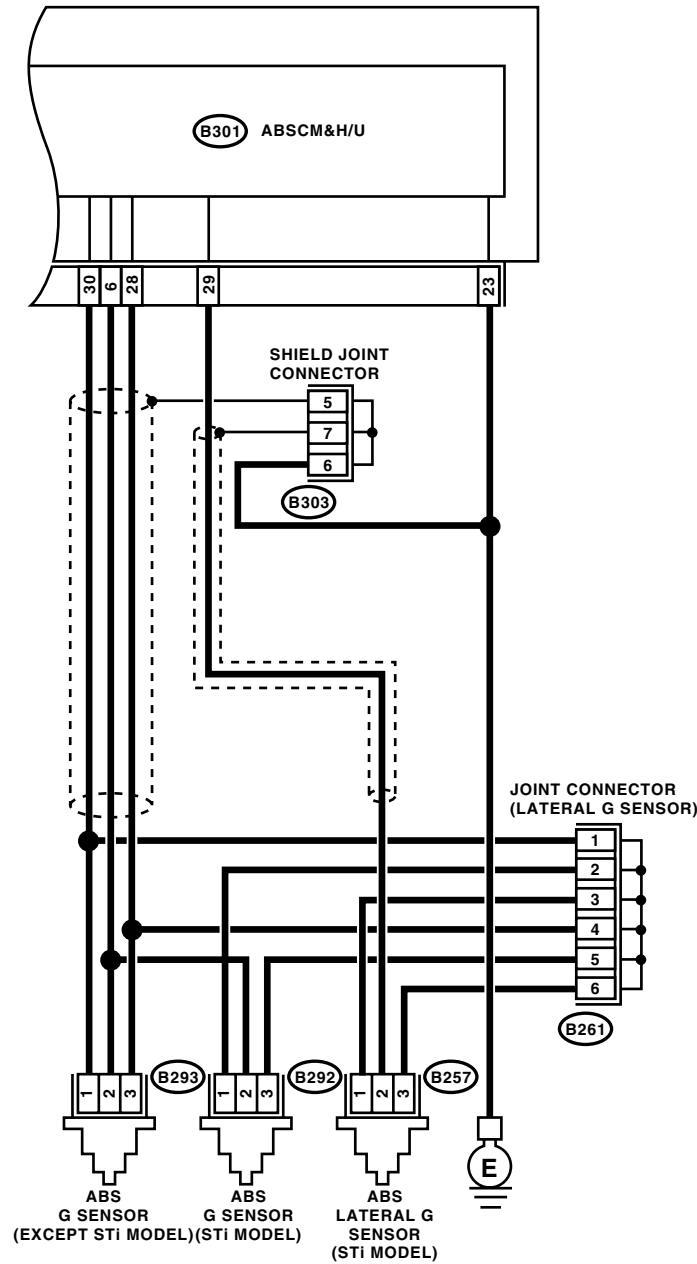
DIAGNOSIS:

- Faulty Lateral G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00368

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK ALL FOUR WHEELS FOR FREE TURNING.	Have the wheels been turned freely such as when vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the DTC.	Go to step 2.
2	CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1)Select "Current data display & Save" on the Subaru Select Monitor. 2)Read the Subaru Select Monitor display.	Is the lateral G sensor output on monitor display 2.3 — 2.7 V when the vehicle is in horizontal position?	Go to step 3.	Go to step 8.
3	CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Remove the lateral G sensor from vehicle. (Do not disconnect the connector.) 4)Turn the ignition switch to ON. 5)Select "Current data display & Save" on the Subaru Select Monitor. 6)Read the Subaru Select Monitor display.	Is the voltage 3.7 — 4.1 V when lateral G sensor is inclined right to 90°?	Go to step 4.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
4	CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR. Read the Subaru Select Monitor display.	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step 5.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
5	CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step 6.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
8	CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 29 — No. 28:	Is the resistance 5.0 — 5.6 kΩ?	Go to step 9.	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
9	CHECK LATERAL G SENSOR. 1)Remove the console box. 2)Remove the lateral G sensor from vehicle. 3)Connect the connector to lateral G sensor. 4)Connect the connector to ABSCM&H/U. 5)Turn the ignition switch to ON. 6)Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step 10.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>

DIAGNOSTICS PROCEDURE WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step 11.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
11 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step 12.	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
12 CHECK ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13.
13 CHECK ANY OTHER DTC APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

14. General Diagnostics Table

A: INSPECTION

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

GENERAL DIAGNOSTICS TABLE

ABS (DIAGNOSTICS)

Brought to you by Eris Studios
NOT FOR RESALE

ABS

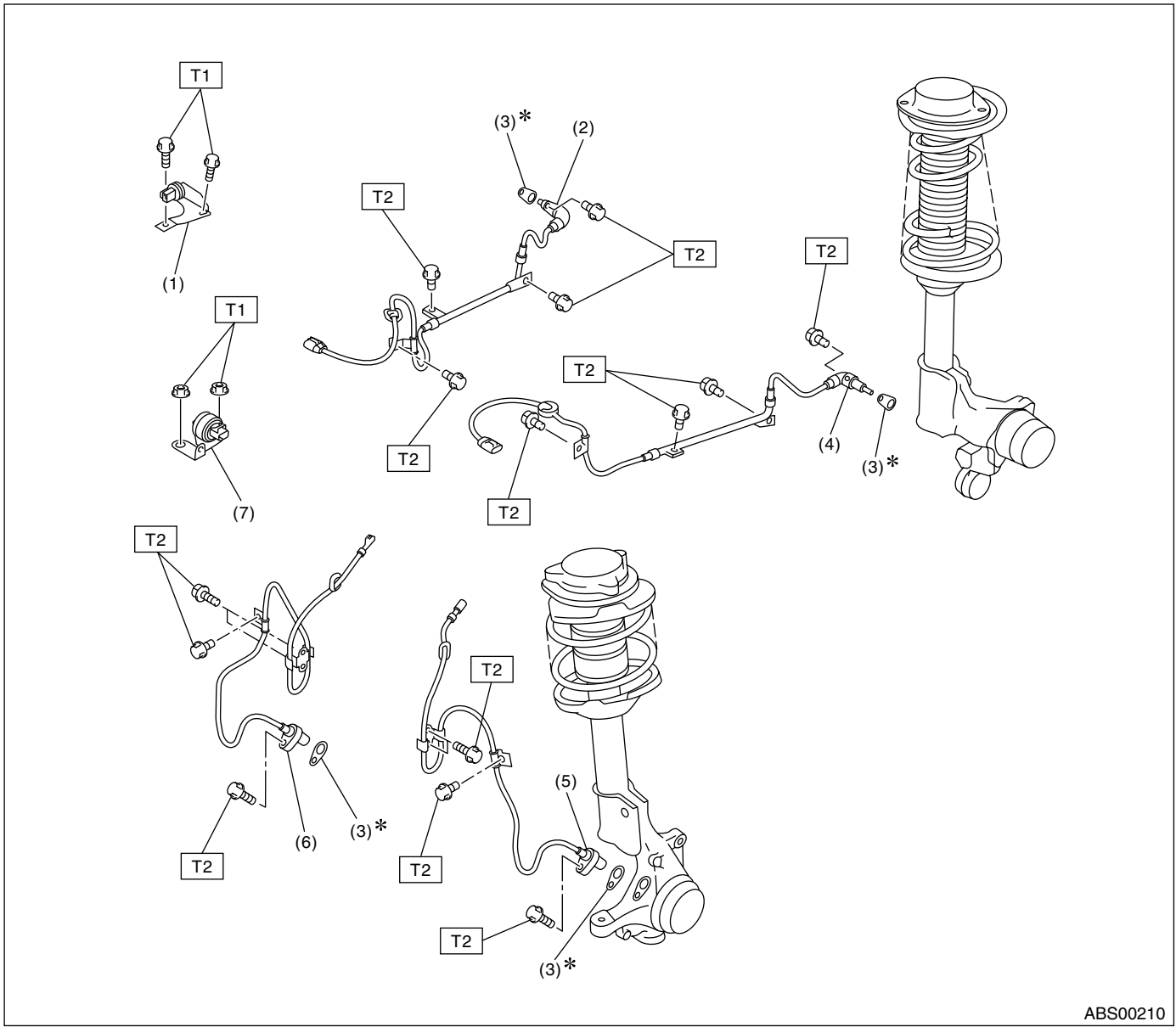
1. General Description

A: SPECIFICATIONS

Item				Specification or remarks	
ABS wheel speed sensor	ABS wheel speed sensor gap		Front	0.3 — 0.8 mm (0.012 — 0.031 in)	
			Rear	0.7 — 1.2 mm (0.028 — 0.047 in)	
	ABS wheel speed sensor resistance		Front	1.25±0.25 kΩ	
			Rear	1.15±0.115 kΩ	
	Marks of harness	Front	RH	White	
			LH	Yellow	
		Rear	RH	Light blue	
			LH	Brown	
G sensor		G sensor voltage		2.3±0.2 V	
Lateral G sensor (STi model)		Lateral G sensor voltage		2.5±0.2 V	
ABSCM&H/U marks		AT model		CU	
		MT model (Except Sedan STi model)		CV	
		MT model (Sedan STi model)		CY	

B: COMPONENT

1. SENSOR



ABS00210

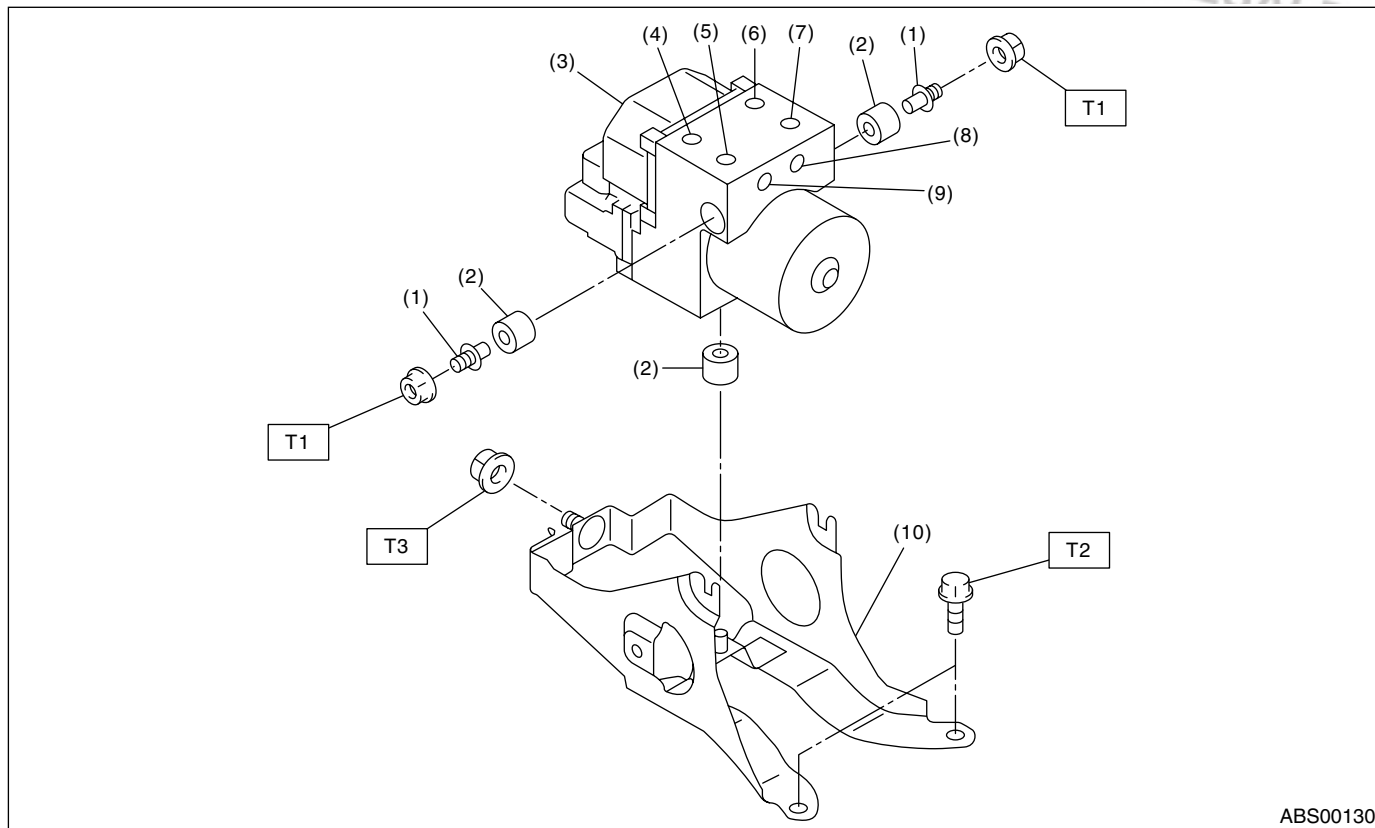
(1) G sensor	(5) Front ABS wheel speed sensor LH
(2) Rear ABS wheel speed sensor RH	(6) Front ABS wheel speed sensor RH
(3) Adjusting spacer	(7) Lateral G sensor (STi model)
(4) Rear ABS wheel speed sensor LH	

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 33 (3.3, 24)

GENERAL DESCRIPTION

ABS

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



ABS00130

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

Tightening torque: N·m (kgf·m, ft·lb)

T1: 18 (1.8, 13.0)

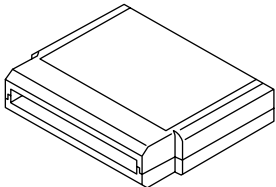
T2: 33 (3.3, 24)

T3: 38 (3.8, 27.5)

C: CAUTION

- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.

D: PREPARATION TOOL**1. SPECIAL TOOLS**

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

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

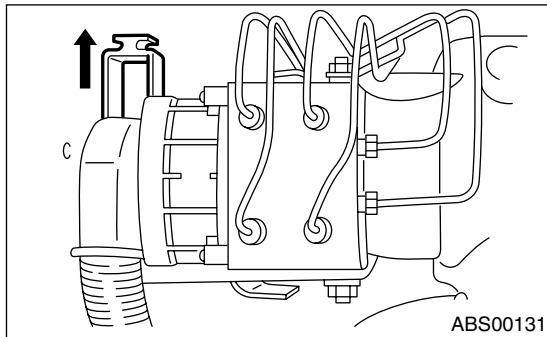
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake duct from engine compartment to facilitate removal of ABSCM&H/U.
- 3) Use an air gun to get rid of water around the ABSCM&H/U.

NOTE:

Contact will be insufficient if the terminal gets wet.

- 4) Remove the ground cable from ABSCM&H/U.
- 5) Pull off the lock of ABSCM&H/U connector to remove it.



- 6) Disconnect the connector from ABSCM&H/U.

CAUTION:

Do not pull the harness when disconnecting the connector.

- 7) Unlock the cable clip.
- 8) Disconnect the brake pipes from ABSCM&H/U.
- 9) Wrap the brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

CAUTION:

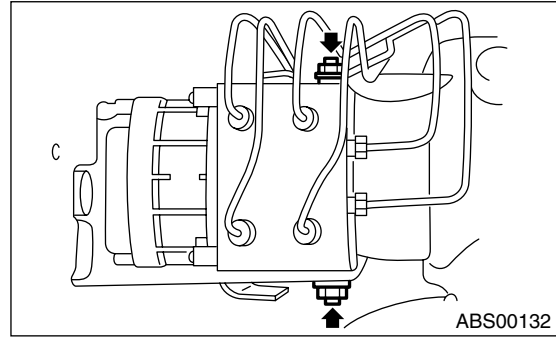
Brake fluid spilt on the vehicle body will harm the painted surface; wash away quickly with water if spilt.

- 10) Remove the ABSCM&H/U from engine compartment.

CAUTION:

- ABSCM&H/U cannot be disassembled. Do not attempt to loosen bolts and nuts.
- Do not drop or bump the ABSCM&H/U.
- Do not turn the ABSCM&H/U upside down or place it on its side.
- Be careful to prevent foreign particles from getting into ABSCM&H/U.

- Do not let water get into the connector.



B: INSTALLATION

- 1) Install the ABSCM&H/U bracket.

Tightening torque:

33 N·m (3.3 kgf-m, 24 ft-lb)

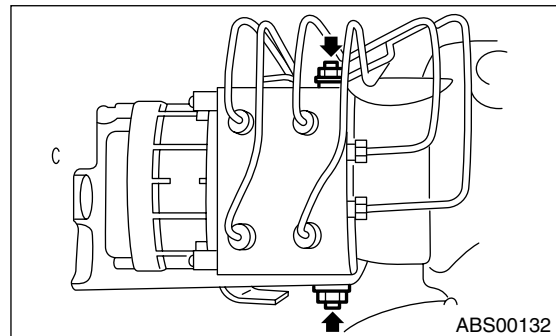
- 2) Apply a coat of grease (Nippeco LT or GB) to the bracket attaching bolt.
- 3) Align the width across flat portion of ABSCM&H/U side stud bolt with the bolt hole groove on bracket, and then install the ABSCM&H/U.

NOTE:

Confirm the specification mark of ABSCM&H/U.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 4) Connect the brake pipes to their correct ABSCM&H/U connections.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

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

NOTE:

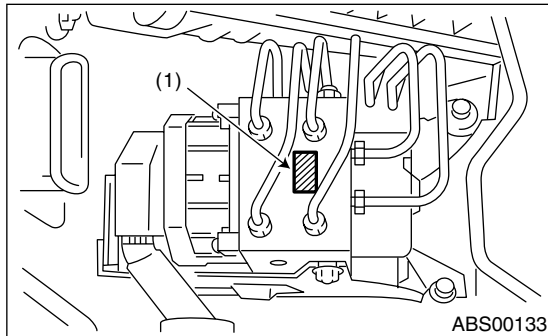
- Be sure to remove all foreign matter from inside of the connector before connecting.
- Ensure the ABSCM&H/U connector is securely locked.

- 7) Connect the ground cable to ABSCM&H/U, and then apply grease.
- 8) Install the air intake duct.
- 9) Bleed air from the brake system.

C: INSPECTION

- 1) Check the connected and fixed condition of connector.
- 2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
CU	AT model
CV	MT model (Except Sedan STi model)
CY	Sedan STi model



(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

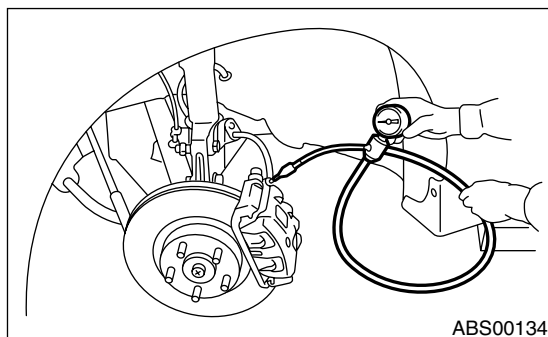
- 1) Lift-up the vehicle and remove the wheels.
- 2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
- 3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:

- Pressure gauges used exclusively for brake fluid must be used.
- Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:

Wrap sealing tape around the pressure gauge.



- 4) Bleed air from the pressure gauges.
- 5) Perform the ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
- 6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
- 7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm ² , 511 psi)	3,500 kPa (36 kgf/cm ² , 511 psi)
Decompressed	500 kPa (5 kgf/cm ² , 73 psi) or less	500 kPa (5 kgf/cm ² , 73 psi) or less
Compressed	3,500 kPa (36 kgf/cm ² , 511 psi) or more	3,500 kPa (36 kgf/cm ² , 511 psi) or more

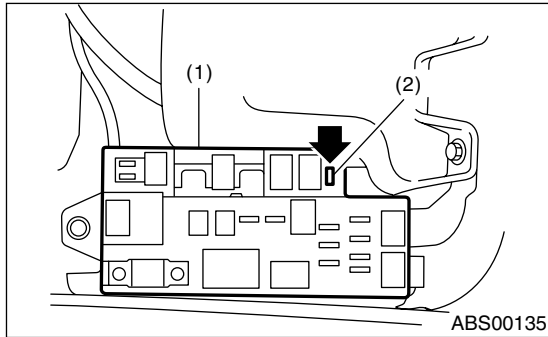
- 8) Remove the pressure gauges from the FL and FR caliper bodies.
- 9) Remove the air bleeder screws from the RL and RR caliper bodies.
- 10) Connect the air bleeder screws to the FL and FR caliper bodies.
- 11) Connect two pressure gauges to the RL and RR caliper bodies.
- 12) Bleed air from the pressure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

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

ABS

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

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



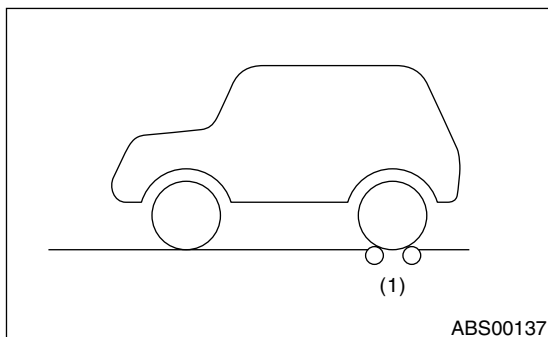
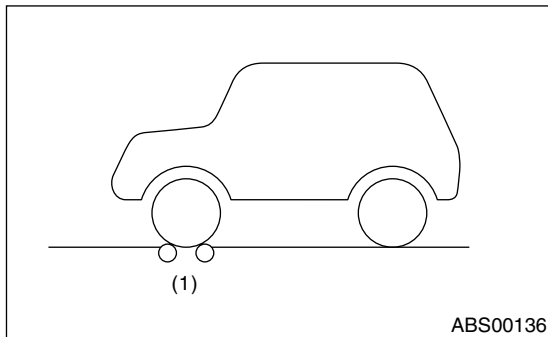
- (1) Main fuse box
- (2) FWD connector

NOTE:

AWD circuit of MT models can not be disabled because viscous coupling is used inside center differential.

2) Prepare for operating the ABS sequence control. <Ref. to ABS-9, ABS Sequence Control.>

3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "N" range.



- (1) Brake tester

4) Operate the brake tester.

5) Perform the ABS sequence control.

<Ref. to ABS-9, ABS Sequence Control.>

6) Hydraulic unit begins to work; and check the following working sequence.

(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.

(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.

7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meets the standard values.

	Front wheel	Rear wheel
Initial value	1,000 N (102 kgf, 225 lb)	1,000 N (102 kgf, 225 lb)
Decompressed	500 N (51 kgf, 112 lb) or less	500 N (51 kgf, 112 lb) or less
Compressed	1,000 N (102 kgf, 225 lb) or more	1,000 N (102 kgf, 225 lb) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

3. ABS Sequence Control

A: OPERATION

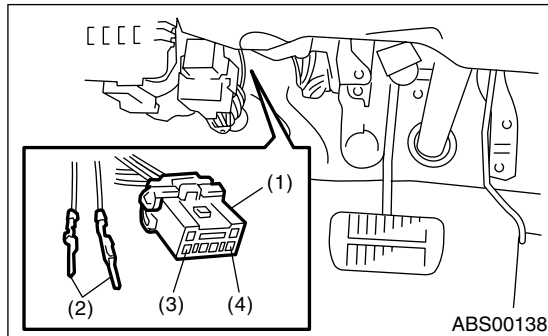
1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.

2) ABS sequence control can be started by diagnosis connector or Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Turn the ignition switch to OFF.

2) Connect the diagnosis terminal to terminal No. 6 of the diagnosis connector beside driver's seat.



- (1) Diagnosis connector
- (2) Diagnosis terminals
- (3) Terminal No. 3
- (4) Terminal No. 6

3) Turn the ignition switch to ON.

4) Confirm that start code (code 11) is only displayed.

5) Turn the ignition switch to OFF.

6) Connect the diagnosis terminals to terminals No. 6 and No. 3 of diagnosis connector.

7) Set the speed of all wheels at 4 km/h (2 MPH) or less.

8) Turn the ignition switch to ON.

9) Within 0.5 seconds after the ABS warning light goes out, depress the brake pedal and hold it depressed.

NOTE:

Engine must not operate.

10) After completion of ABS sequence control, turn the ignition switch to OFF.

2. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:

• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to "ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR".

<Ref. to ABS-9, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, ABS Sequence Control.>

• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect the Subaru Select Monitor to data link connector under driver's seat instrument panel lower cover.

2) Turn the ignition switch to ON.

3) Turn the Subaru Select Monitor switch to ON.

4) Put the Subaru Select Monitor to "BRAKE CONTROL" mode.

5) When "Function check sequence" is selected, 'ABS sequence control' will start.

6) When the message "Press Brake Pedal Firmly" is displayed, perform the followings.

(1) When using the brake tester, depress the brake pedal with braking force of 1,000 N (102 kgf, 225 lb).

(2) When using the pressure gauge, depress the brake pedal so as to make the pressure gauge indicate 3,500 kPa (36 kg/cm², 511 psi).

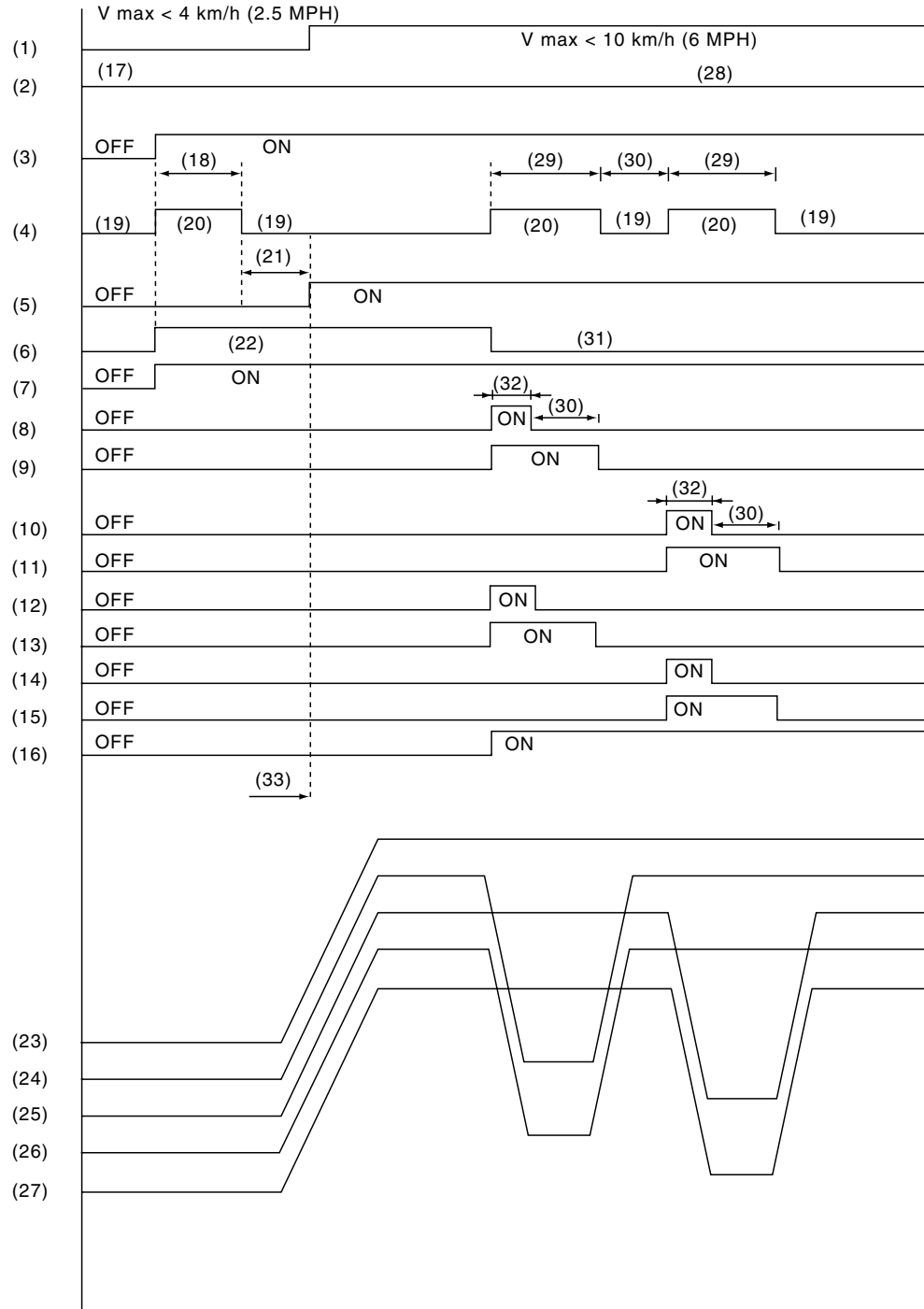
7) When the message "Press YES" is displayed, press the YES key.

8) The braking system in operation is displayed on Subaru Select Monitor.

ABS SEQUENCE CONTROL

ABS

3. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00014

(1) Speed of wheels	(12) RR outlet valve	(24) Pressure of FL wheel cylinder
(2) Terminal DK and DL	(13) RR inlet valve	(25) Pressure of FR wheel cylinder
(3) Ignition key	(14) RL outlet valve	(26) Pressure of RR wheel cylinder
(4) ABS warning light	(15) RL inlet valve	(27) Pressure of RL wheel cylinder
(5) Stop light switch	(16) Pump motor	(28) Either HI or LO possible, if using Subaru Select Monitor
(6) Signal to Transmission control module (TCM)	(17) Connection to ground terminal	(29) 1.4 second
(7) Valve relay	(18) 1.5 seconds	(30) 1.0 second
(8) FL outlet valve	(19) Not illuminated	(31) ABS working
(9) FL inlet valve	(20) Illuminated	(32) 0.4 second
(10) FR outlet valve	(21) Within 0.5 second	(33) Point A
(11) FR inlet valve	(22) ABS not working	
	(23) Pressure of master cylinder	

NOTE:

When the Subaru Select Monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector. (However, the brake light switch must be ON before point A.)

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

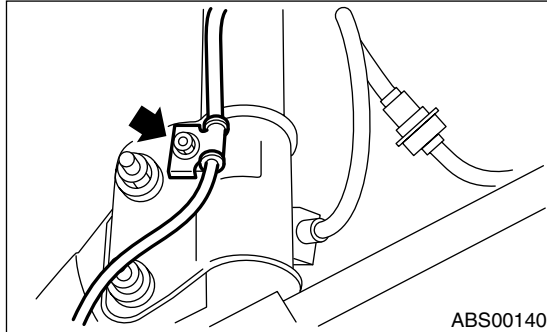
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

- 1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
- 2) When terminal No. 3 or No. 6 are separated from diagnosis terminals. (When the Subaru Select Monitor is not used.)
- 3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
- 4) When the brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When the Subaru Select Monitor is not used.)
- 5) When the brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When the Subaru Select Monitor is not used.)
- 6) After completion of the sequence control.
- 7) When malfunction is detected. (When the Subaru Select Monitor is used.)

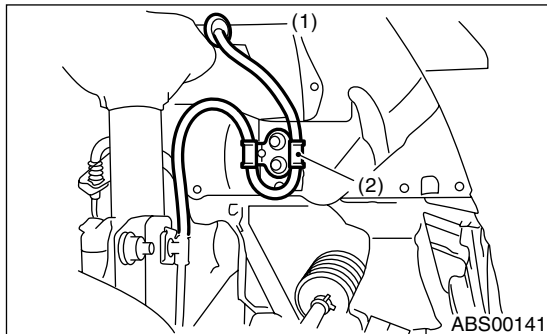
4. Front ABS Wheel Speed Sensor

A: REMOVAL

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



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



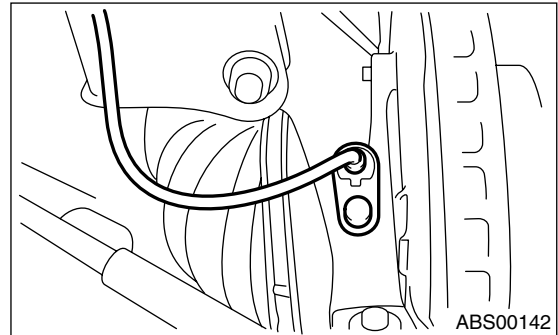
- (1) To front ABS wheel speed sensor connector
- (2) Bracket

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

CAUTION:

- Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.

- Do not pull the sensor harness during removal.

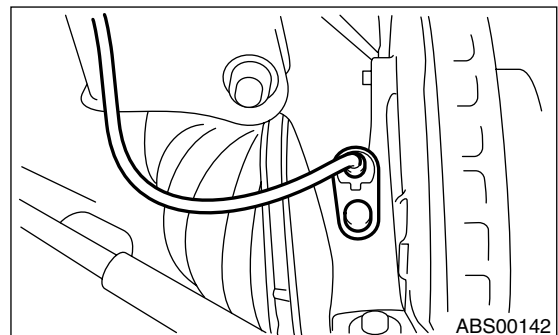


B: INSTALLATION

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

CAUTION:

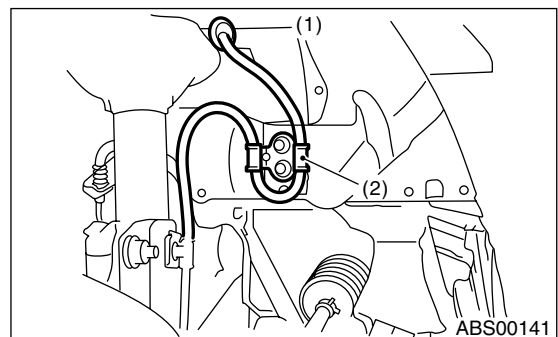
- Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.



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

Tightening torque:

33 N·m (3.3 kgf-m, 24 ft-lb)

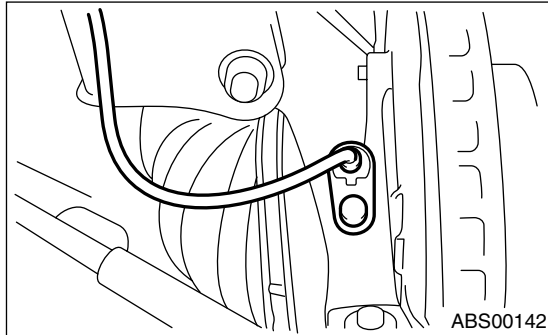


- (1) To front ABS wheel speed sensor connector
- (2) Bracket

3) Check the ABS wheel speed sensor gap. <Ref. to ABS-13, SENSOR GAP, INSPECTION, Front ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on housing to specified torque.
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

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

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



NOTE:

- Check the marks on the harness and make sure that no kink exists. (RH: White, LH: Yellow)
- Make sure the harness is not pulled and does not contact to suspension or body when steering wheel is turned.

4) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.

5) Connect the battery ground cable to battery.

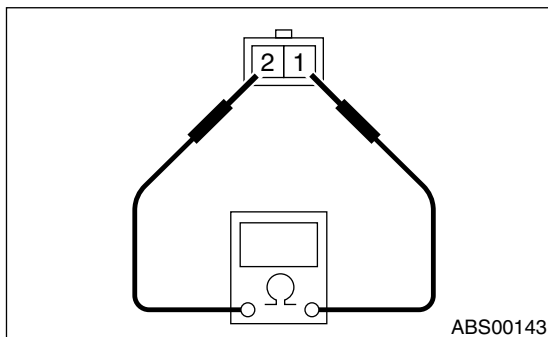
C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.

2) Measure the ABS wheel speed sensor resistance.

If the resistance is outside standard value, replace the ABS wheel speed sensor with a new one.



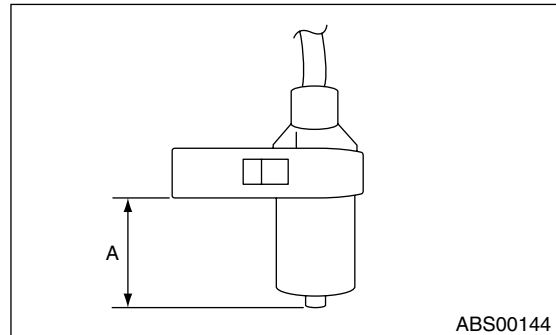
Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

NOTE:

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

2. SENSOR GAP

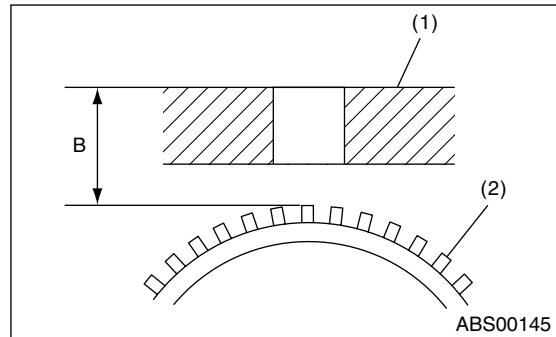
1) Measure the distance “A” between ABS wheel speed sensor surface and sensor pole face.



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

NOTE:

Measure so that the gauge touches the tone wheel teeth top.



(1) Axle housing

(2) Tone wheel

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

$$\text{ABS wheel speed sensor clearance} = B - A$$

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

NOTE:

If the clearance is out of specification, readjust using spacer (Part No. 26755AA000).

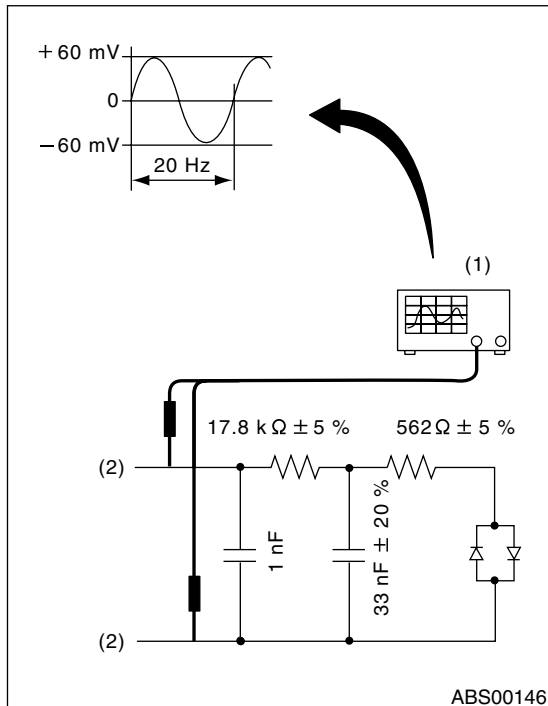
3. OUTPUT VOLTAGE

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

Output voltage specification:
0.12 to 1 V (at 20 Hz)

NOTE:

Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-13, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>



- (1) Oscilloscope
- (2) Terminal

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755A000).

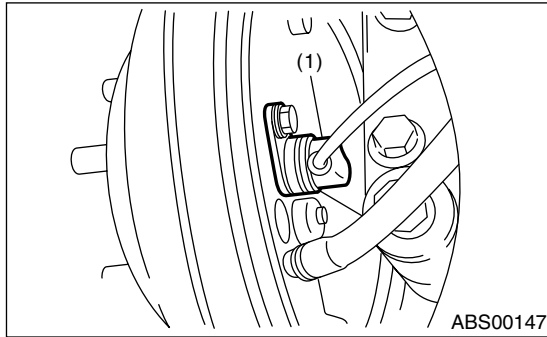
5. Rear ABS Wheel Speed Sensor

A: REMOVAL

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

CAUTION:

- Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
- Do not pull the sensor harness during removal.



(1) Rear ABS wheel speed sensor

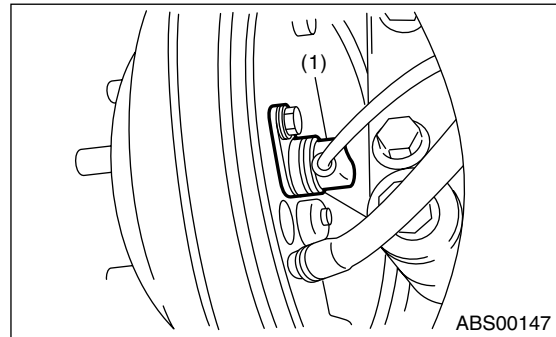
- 6) Remove the rear tone wheel while removing the hub from housing and hub assembly. <Ref. to DS-23, REMOVAL, Rear Axle.>

B: INSTALLATION

- 1) Install the rear tone wheel on hub, then rear housing on hub. <Ref. to DS-26, ASSEMBLY, Rear Axle.>
- 2) Temporarily install the rear ABS wheel speed sensor on back plate.

CAUTION:

Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.

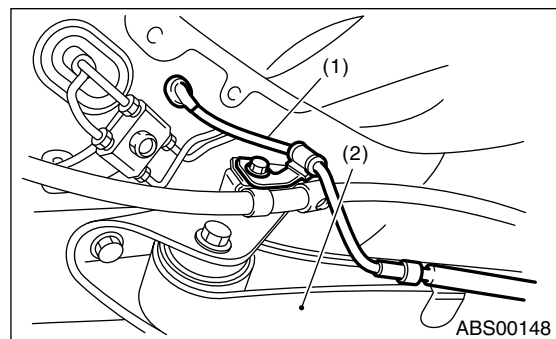


(1) Rear ABS wheel speed sensor

- 3) Install the rear drive shaft to rear housing and rear differential spindle. <Ref. to DS-24, INSTALLATION, Rear Axle.>
- 4) Install the rear sensor harness on rear trailing link.

Tightening torque:

33 N·m (3.3 kgf-m, 24 ft-lb)



(1) Rear sensor harness
(2) Trailing link

- 5) Check the ABS wheel speed sensor gap. <Ref. to ABS-16, SENSOR GAP, INSPECTION, Rear ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on back plate to specified torque. If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

REAR ABS WHEEL SPEED SENSOR

ABS

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

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

NOTE:

Check the marks on the harness and make sure no kink exists. (RH: Light blue, LH: Brown)

6) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.

7) Connect the battery ground cable to battery.

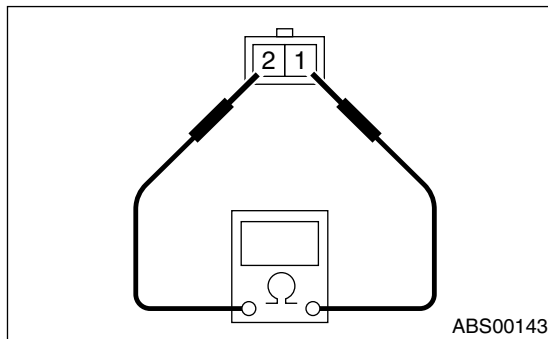
C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.

2) Measure the ABS wheel speed sensor resistance.

If resistance is out of standard value, replace the ABS wheel speed sensor with a new one.



Terminal No.	Standard
1 and 2	1.15±0.115 kΩ

NOTE:

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

2. SENSOR GAP

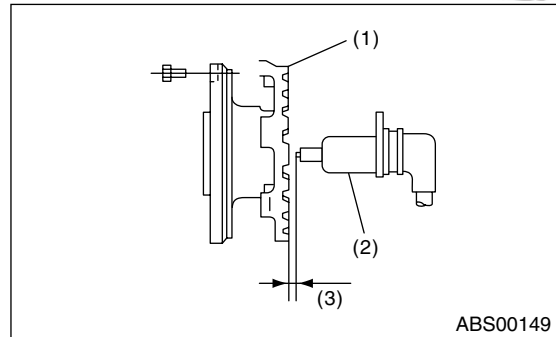
1) Measure the clearance between tone wheel and ABS wheel speed sensor at whole periphery.

NOTE:

If clearance is narrow, adjust by using spacer (Part No. 26755AA000).

If clearance is wide, check the outputted voltage then replace the ABS wheel speed sensor or tone wheel if the outputted voltage is outside specification.

ABS wheel speed sensor clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)



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

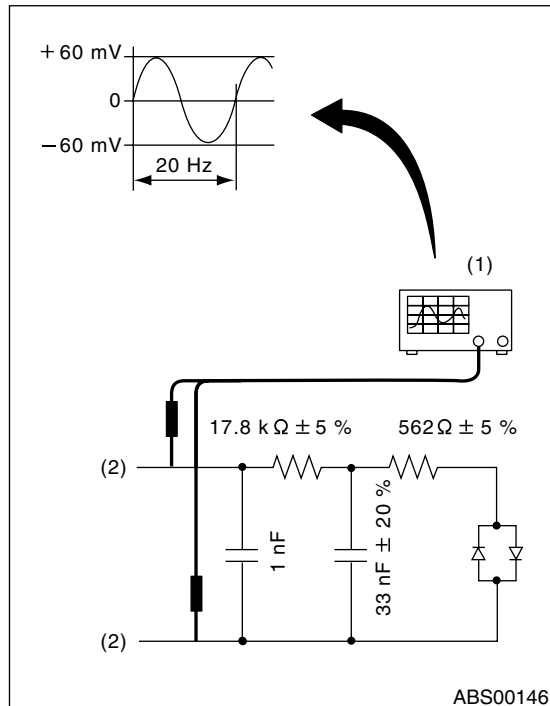
3. OUTPUT VOLTAGE

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

Output voltage specification:
0.12 — 1 V (at 20 Hz)

NOTE:

Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-16, ABS WHEEL SPEED SENSOR, INSPECTION, Rear ABS Wheel Speed Sensor.>



(1) Oscilloscope

(2) Terminal

D: ADJUSTMENT

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

6. Front Tone Wheel

A: REMOVAL

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.

<Ref. to DS-29, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.

<Ref. to DS-29, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

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

NOTE:

Replace the BJ assembly with a new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

7. Rear Tone Wheel

A: REMOVAL

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.

<Ref. to DS-23, REMOVAL, Rear Axle.>

B: INSTALLATION

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.

<Ref. to DS-24, INSTALLATION, Rear Axle.>

C: INSPECTION

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

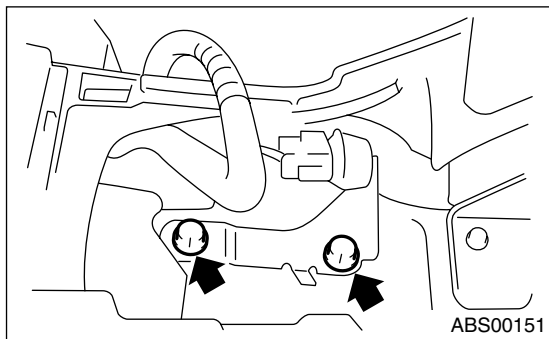
8. G Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the console cover.
<Ref. to EI-43, REMOVAL, Console Box.>
- 3) Disconnect the connector from G sensor.
- 4) Remove the G sensor from body.

CAUTION:

- Do not drop or bump the G sensor.
- G sensor and the bracket are integrated into one unit. Therefore, do not disassemble it.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Do not drop or bump the G sensor.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

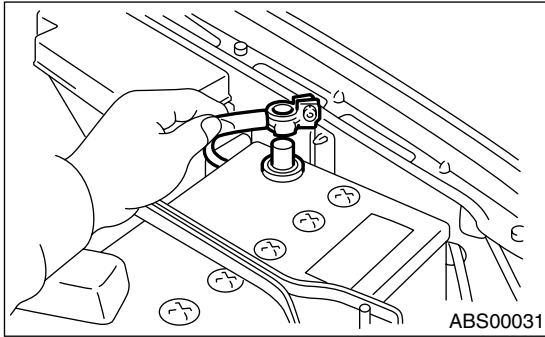
C: INSPECTION

	Step	Check	Yes	No
1	CHECK SUBARU SELECT MONITOR.	Do you have a SUBARU SELECT MONITOR?	Go to step 5.	Go to step 2.
2	CHECK G SENSOR. 1)Turn the ignition switch to OFF. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Turn the ignition switch to ON. 5)Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 2.3±0.2 V when G sensor is horizontal?	Go to step 3.	Replace the G sensor.
3	CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step 4.	Replace the G sensor.
4	CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace the G sensor.
5	CHECK G SENSOR. 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the Subaru Select Monitor into {BRAKE CONTROL} mode. 4)Set the display in the {Current Data Display & Save} mode. 5)Read the G sensor output voltage.	Is the indicated reading 2.3±0.2 V when the vehicle is in horizontal position?	Go to step 6.	Replace the G sensor.
6	CHECK G SENSOR. 1)Remove the console box. 2)Remove the G sensor from vehicle. (Do not disconnect the connector.) 3)Read the Subaru Select Monitor display.	Is the indicated reading 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step 7.	Replace the G sensor.
7	CHECK G SENSOR. Read the Subaru Select Monitor display.	Is the indicated reading 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace the G sensor.

9. Lateral G Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the console cover.

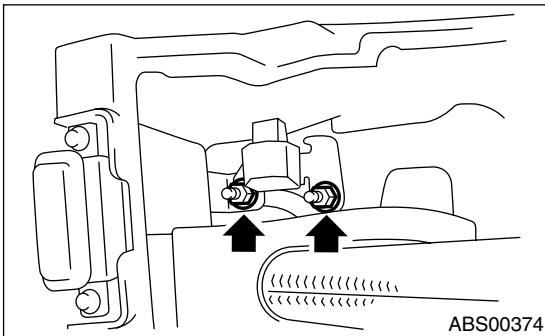
<Ref. to EI-43, REMOVAL, Console Box.>

3) Disconnect the connector from lateral G sensor.

4) Remove the lateral G sensor from vehicle.

CAUTION:

Do not drop or bump the lateral G sensor.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Do not drop or bump the lateral G sensor.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: INSPECTION

Step	Check	Yes	No
1 CHECK SUBARU SELECT MONITOR.	Do you have a SUBARU SELECT MONITOR?	Go to step 5.	Go to step 2.
2 CHECK LATERAL G SENSOR. 1)Turn the ignition switch to OFF. 2)Remove the lateral G sensor from vehicle. 3)Connect the connector to lateral G sensor. 4)Turn the ignition switch to ON. 5)Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 2.5 ± 0.2 V when lateral G sensor is horizontal?	Go to step 3.	Replace the lateral G sensor.
3 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 3.5 ± 0.2 V when lateral G sensor is inclined forwards to 90° ?	Go to step 4.	Replace the lateral G sensor.
4 CHECK LATERAL G SENSOR. Measure the voltage between lateral G sensor connector terminals. Connector & terminal (B257) No. 2 (+) — No. 3 (-):	Is the voltage 1.5 ± 0.2 V when lateral G sensor is inclined backwards to 90° ?	Lateral G sensor is normal.	Replace the lateral G sensor.
5 CHECK LATERAL G SENSOR. 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the Subaru Select Monitor into {BRAKE CONTROL} mode. 4)Set the display in the {Current Data Display & Save} mode. 5)Read the lateral G sensor output voltage.	Is the indicated reading 2.5 ± 0.2 V when the vehicle is in horizontal position?	Go to step 6.	Replace the lateral G sensor.
6 CHECK LATERAL G SENSOR. 1)Remove the console box. 2)Remove the lateral G sensor from vehicle. (Do not disconnect the connector.) 3)Read the Subaru Select Monitor display.	Is the indicated reading 3.5 ± 0.2 V when lateral G sensor is inclined forwards to 90° ?	Go to step 7.	Replace the lateral G sensor.
7 CHECK LATERAL G SENSOR. Read the Subaru Select Monitor display.	Is the indicated reading 1.5 ± 0.2 V when lateral G sensor is inclined backwards to 90° ?	Lateral G sensor is normal.	Replace the lateral G sensor.

LATERAL G SENSOR

ABS

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BRAKE

GENERAL DESCRIPTION

BRAKE

1. General Description

A: SPECIFICATIONS

Model		Other models	WRX	STi
Front disc brake	Size	15 inch type	16 inch type	17 inch type
	Type	Disc (Floating type, ventilated)	Disc (Fixed type, ventilated)	
	Effective disc diameter	228 mm (8.98 in)	255 mm (10.04 in)	268 mm (10.55 in)
	Disc thickness × Outer diameter	24 × 277 mm (0.94 × 10.91 in)	24 × 294 mm (0.94 × 11.57 in)	30 × 326 mm (1.18 × 12.83 in)
	Effective cylinder diameter	42.8 mm (1.685 in) × 2	40.4 mm (1.591 in) × 4	40.0 mm × 2, 46.0 mm × 2 (1.575 in × 2, 1.811 in × 2)
	Pad dimensions (length × width × thickness)	117.8 × 50.5 × 11.0 mm (4.638 × 1.988 × 0.433 in)	116.0 × 47.7 × 10.0 mm (4.567 × 1.878 × 0.394 in)	129.8 × 60.5 × 9.2 mm (5.110 × 2.382 × 0.362 in)
	Clearance adjustment	Automatic adjustment		
Rear disc brake	Size	14 inch type		17 inch type
	Type	Disc (Floating type)		Disc (Fixed type, ventilated)
	Effective disc diameter	230 mm (9.06 in)		268 mm (10.55 in)
	Disc thickness × Outer diameter	10 × 266 mm (0.39 × 10.47 in)		20 × 316 mm (0.79 × 12.44 in)
	Effective cylinder diameter	38.1 mm (1.500 in)		36.0 mm (1.417 in)
	Pad dimensions (length × width × thickness)	89.4 × 33.7 × 9.0 mm (3.520 × 1.327 × 0.354 in)		74.8 × 45.0 × 9.0 mm (2.945 × 1.772 × 0.354 in)
	Clearance adjustment	Automatic adjustment		
Master cylinder	Type	Tandem		
	Effective diameter	26.99 mm (1-1/16 in)		
	Reservoir type	Sealed type		
	Brake fluid reservoir capacity	205 cm ³ (12.51 cu in)		
Brake booster	Type	Vacuum suspended		
	Effective diameter	205 + 230 mm (8.07 + 9.06 in)		
Brake line		Dual circuit system		
Brake fluid CAUTION: • Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading. • When brake fluid is supplemented, be careful not to allow any dust into the reservoir. • Use fresh DOT3 brake fluid when replacing or refilling the fluid.		FMVSS No. 116, DOT3		

NOTE:

Refer to "PB section" for parking brake SPECIFICATIONS. <Ref. to PB-2, SPECIFICATIONS, General Description.>

GENERAL DESCRIPTION

BRAKE

ITEM			STANDARD	SERVICE LIMIT
Front brake	Pad thickness	15"	11 mm (0.43 in)	1.5 mm (0.059 in)
		16"	11 mm (0.43 in)	1.5 mm (0.059 in)
		17"	9.2 mm (0.362 in)	1.2 mm (0.047 in)
	Disc thickness	Except 17"	24 mm (0.94 in)	22 mm (0.87 in)
		17"	30 mm (1.18 in)	28 mm (1.10 in)
	Disc runout		—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness	14"	9.0 mm (0.354 in)	1.5 mm (0.059 in)
		17"	9.0 mm (0.354 in)	1.2 mm (0.047 in)
	Disc thickness	14"	10 mm (0.39 in)	8.5 mm (0.335 in)
		17"	20 mm (0.79 in)	18 mm (0.71 in)
	Disc runout		—	0.07 mm (0.0028 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/196 N (20 kgf, 44 lb)	

		Brake pedal force	Fluid pressure		
			Other models	WRX	STi
Brake booster	Brake fluid pressure without engine running	147 N (15 kgf, 33 lb)	588 kPa (6 kg/cm ² , 85 psi)		
		294 N (30 kgf, 66 lb)	1,471 kPa (15 kg/cm ² , 213 psi)		
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lb)	5,296 kPa (54 kg/cm ² , 768 psi)	4,707 kPa (48 kg/cm ² , 683 psi)	4,021 kPa (41 kg/cm ² , 583 psi)
		294 N (30 kgf, 66 lb)	9,120 kPa (93 kg/cm ² , 1,323 psi)		8,336 kPa (85 kg/cm ² , 1,209 psi)

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

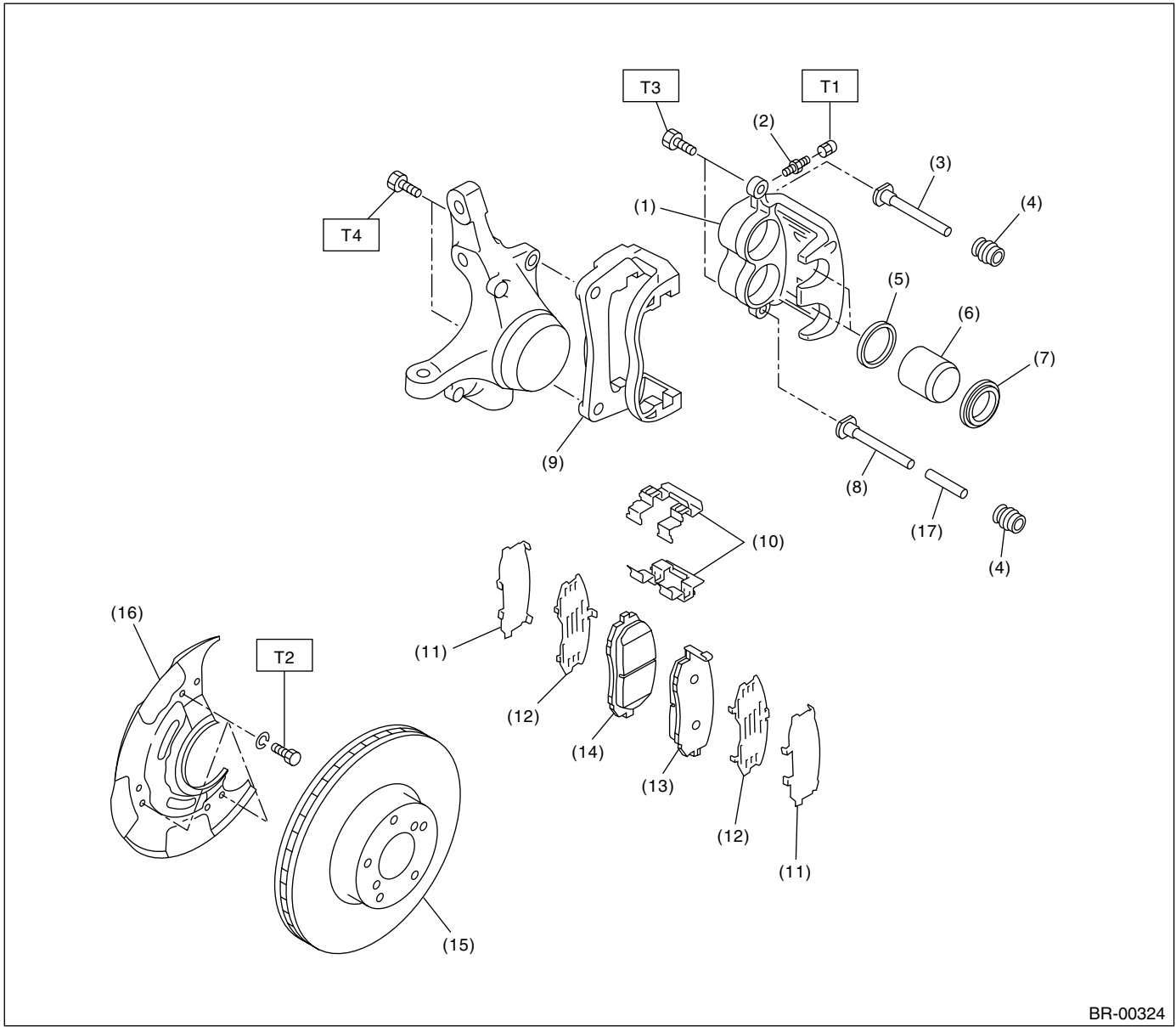
GENERAL DESCRIPTION

BRAKE

B: COMPONENT

1. FRONT DISC BRAKE

• 15 INCH TYPE



- (1) Caliper body
- (2) Air bleeder screw
- (3) Guide pin (Green)
- (4) Pin boot
- (5) Piston seal
- (6) Piston
- (7) Piston boot
- (8) Lock pin (Yellow)

- (9) Support
- (10) Pad clip
- (11) Outer shim
- (12) Inner shim
- (13) Pad (Outside)
- (14) Pad (Inside)
- (15) Disc rotor
- (16) Disc cover

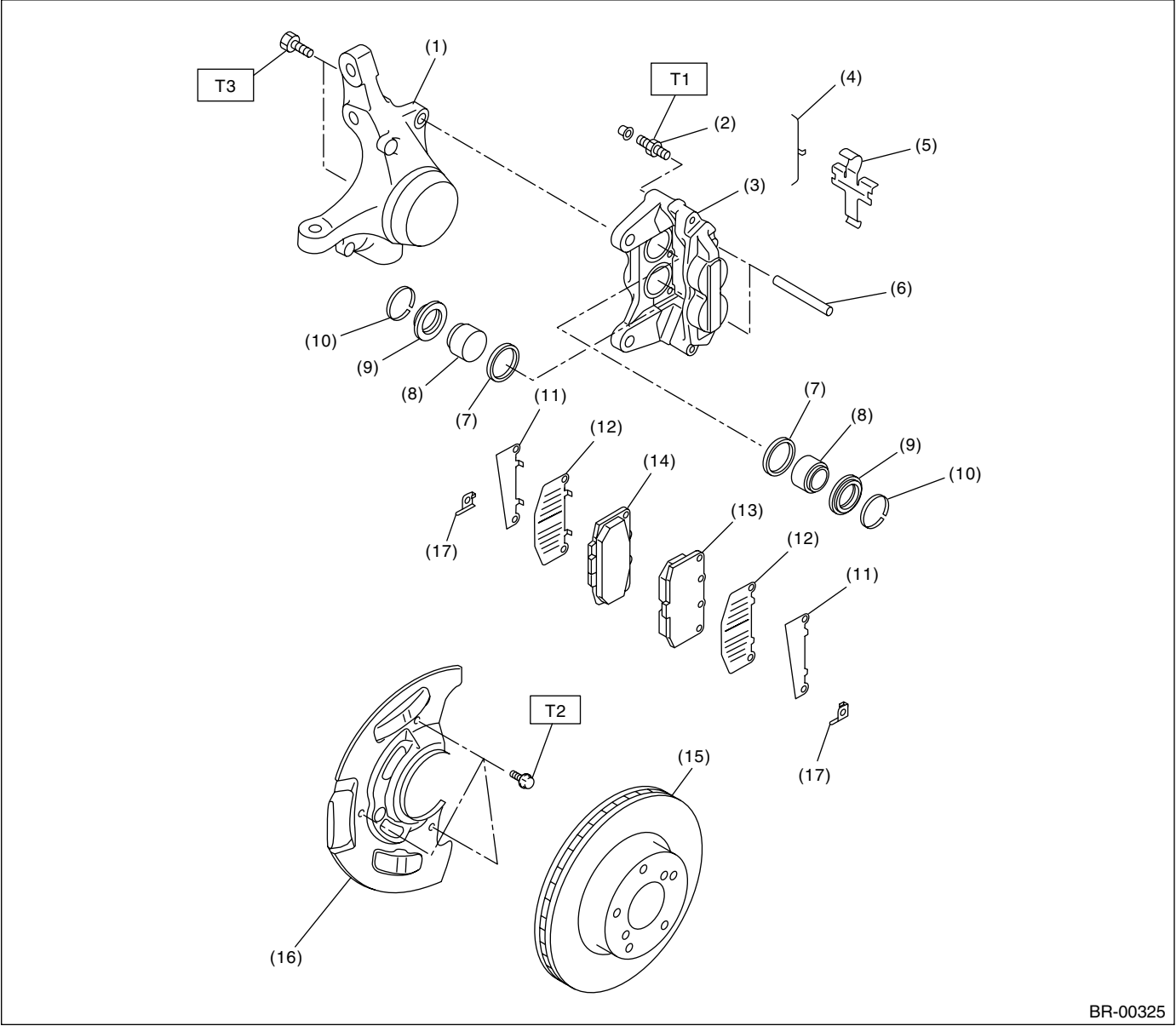
- (17) Bushing

Tightening torque: N-m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 27 (2.8, 19.9)
T3: 37 (3.8, 27.5)
T4: 80 (8.2, 59)

GENERAL DESCRIPTION

BRAKE

• 16 INCH TYPE



BR-00325

- (1) Housing
- (2) Air bleeder screw
- (3) Caliper body
- (4) M clip
- (5) Cross spring
- (6) Pad pin
- (7) Piston seal
- (8) Piston

- (9) Piston boot
- (10) Boot ring
- (11) Outer shim
- (12) Inner shim
- (13) Pad (Outside)
- (14) Pad (Inside)
- (15) Disc rotor
- (16) Disc cover

- (17) Spacer

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

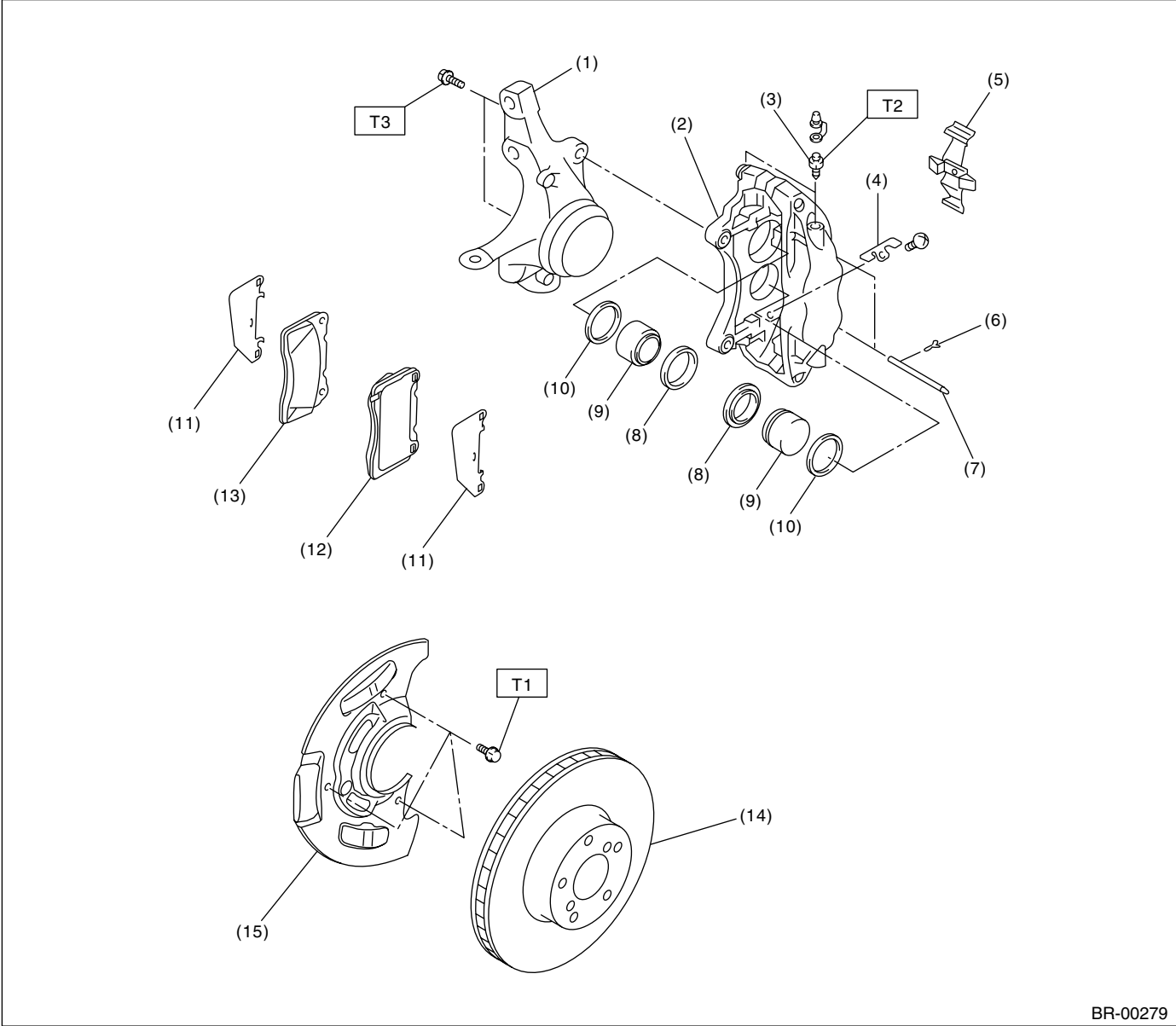
T2: 18 (1.8, 13.0)

T3: 80 (8.2, 59)

GENERAL DESCRIPTION

BRAKE

• 17 INCH TYPE



BR-00279

- (1) Housing
- (2) Caliper body
- (3) Air bleeder screw
- (4) Guide plate
- (5) Cross spring
- (6) Clip
- (7) Pad pin

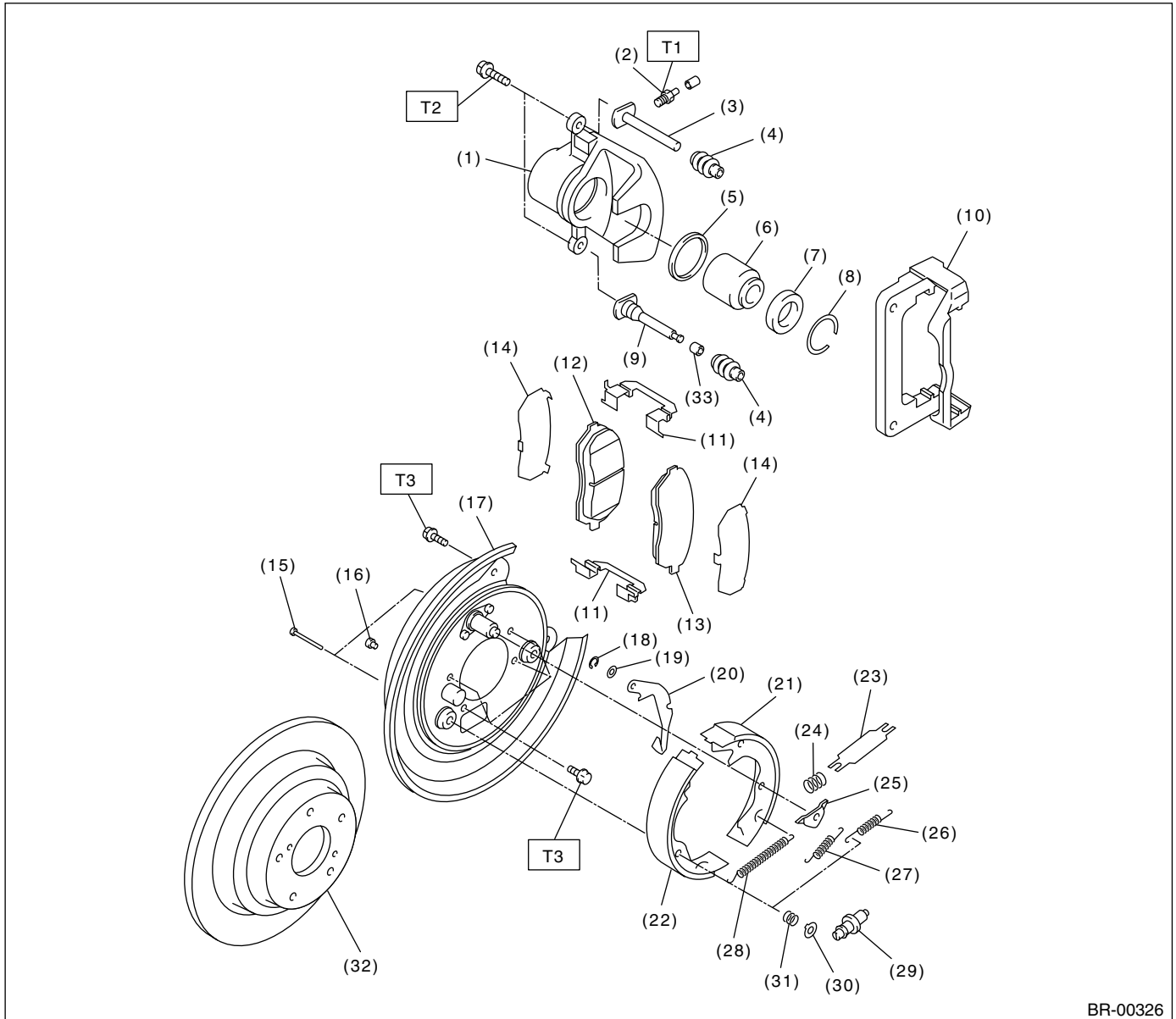
- (8) Piston boot
- (9) Piston
- (10) Piston seal
- (11) Pad shim
- (12) Pad (Outside)
- (13) Pad (Inside)
- (14) Disc rotor

- (15) Disc cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 20 (2.0, 14.5)
T3: 155 (15.8, 114.3)

2. REAR DISC BRAKE

• 14 INCH TYPE



BR-00326

(1) Caliper body	(14) Shim	(27) Primary shoe return spring
(2) Air bleeder screw	(15) Shoe hold-down pin	(28) Adjusting spring
(3) Guide pin (Green)	(16) Cover	(29) Adjuster
(4) Pin boot	(17) Back plate	(30) Shoe hold-down cup
(5) Piston seal	(18) Retainer	(31) Shoe hold-down spring
(6) Piston	(19) Spring washer	(32) Disc rotor
(7) Piston boot	(20) Parking brake lever	(33) Bushing
(8) Boot ring	(21) Parking brake shoe (Secondary)	
(9) Lock pin (Yellow)	(22) Parking brake shoe (Primary)	
(10) Support	(23) Strut	
(11) Pad clip	(24) Strut shoe spring	
(12) Inner pad	(25) Shoe guide plate	
(13) Outer pad	(26) Secondary shoe return spring	

Tightening torque: N-m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

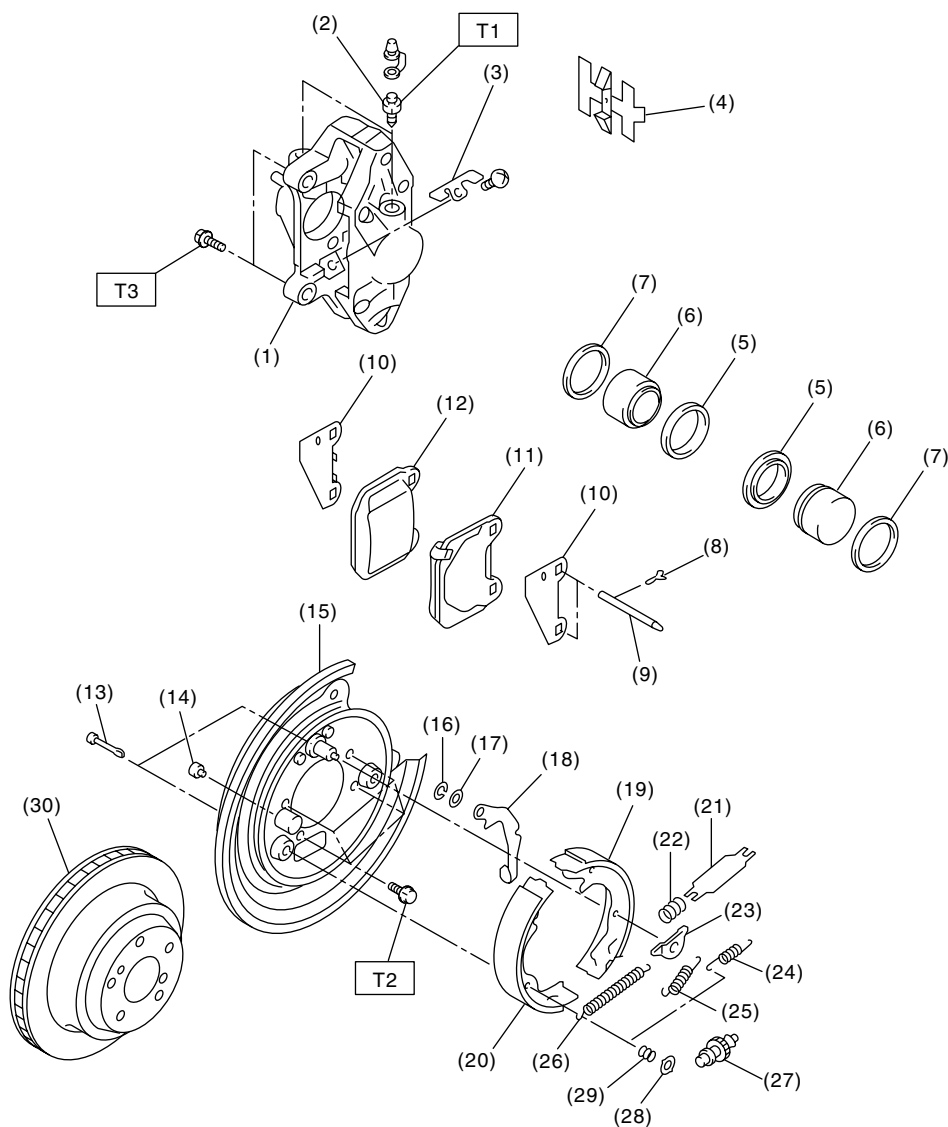
T2: 37 (3.8, 27.5)

T3: 52 (5.3, 38.3)

GENERAL DESCRIPTION

BRAKE

• 17 INCH TYPE



BR-00281

(1) Caliper body	(13) Shoe hold-down pin	(25) Primary shoe return spring
(2) Air bleeder screw	(14) Cover	(26) Adjusting spring
(3) Guide plate	(15) Back plate	(27) Adjuster
(4) Cross spring	(16) Retainer	(28) Shoe hold-down cup
(5) Piston boot	(17) Spring washer	(29) Shoe hold-down spring
(6) Piston	(18) Parking brake lever	(30) Disc rotor
(7) Piston seal	(19) Parking brake shoe (Secondary)	
(8) Clip	(20) Parking brake shoe (Primary)	
(9) Pad pin	(21) Strut	
(10) Pad shim	(22) Strut shoe spring	
(11) Pad (Outside)	(23) Shoe guide plate	
(12) Pad (Inside)	(24) Secondary shoe return spring	

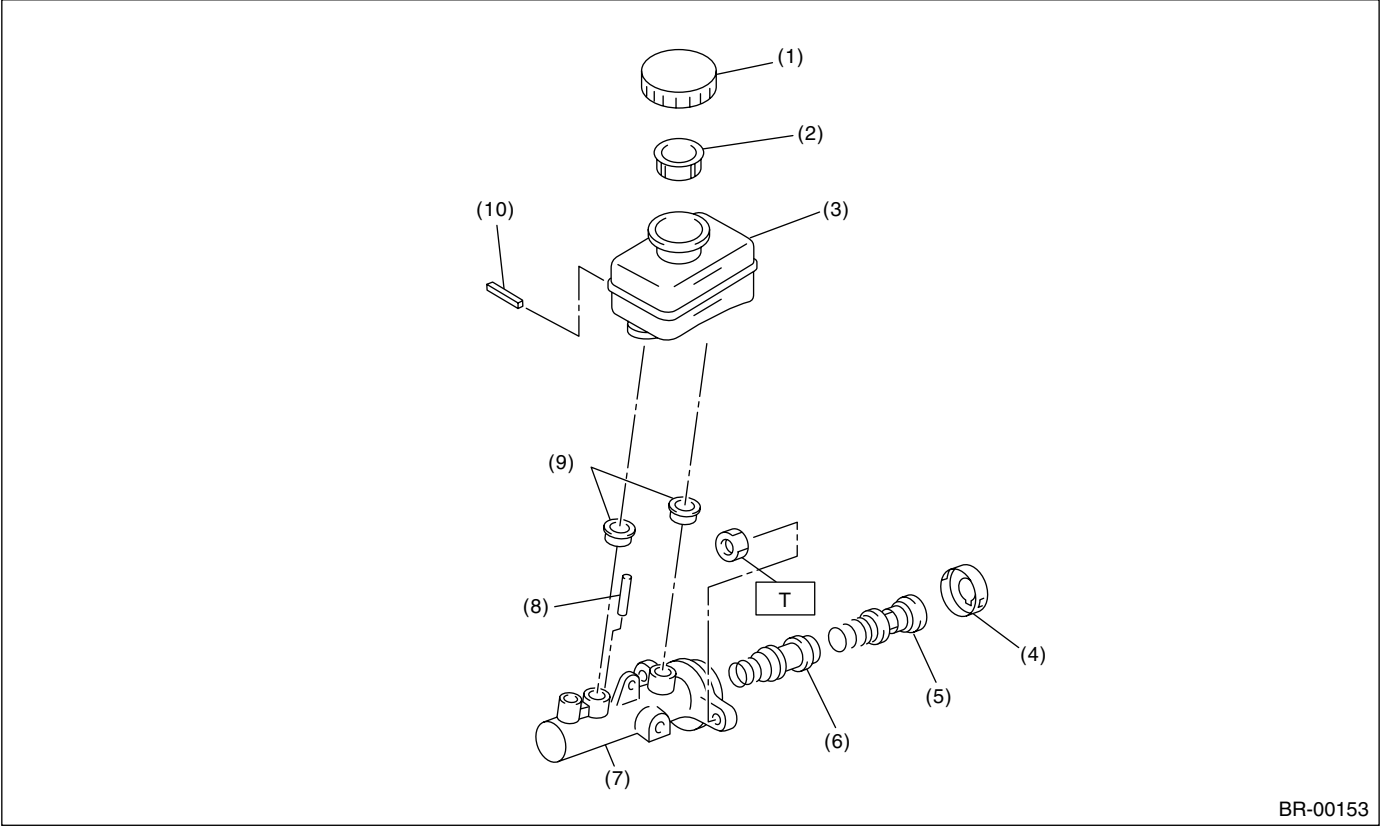
Tightening torque: N·m (kgf-m, ft-lb)

T1: 20 (2.0, 14.5)

T2: 52 (5.3, 38.3)

T3: 65 (6.6, 47.9)

3. MASTER CYLINDER

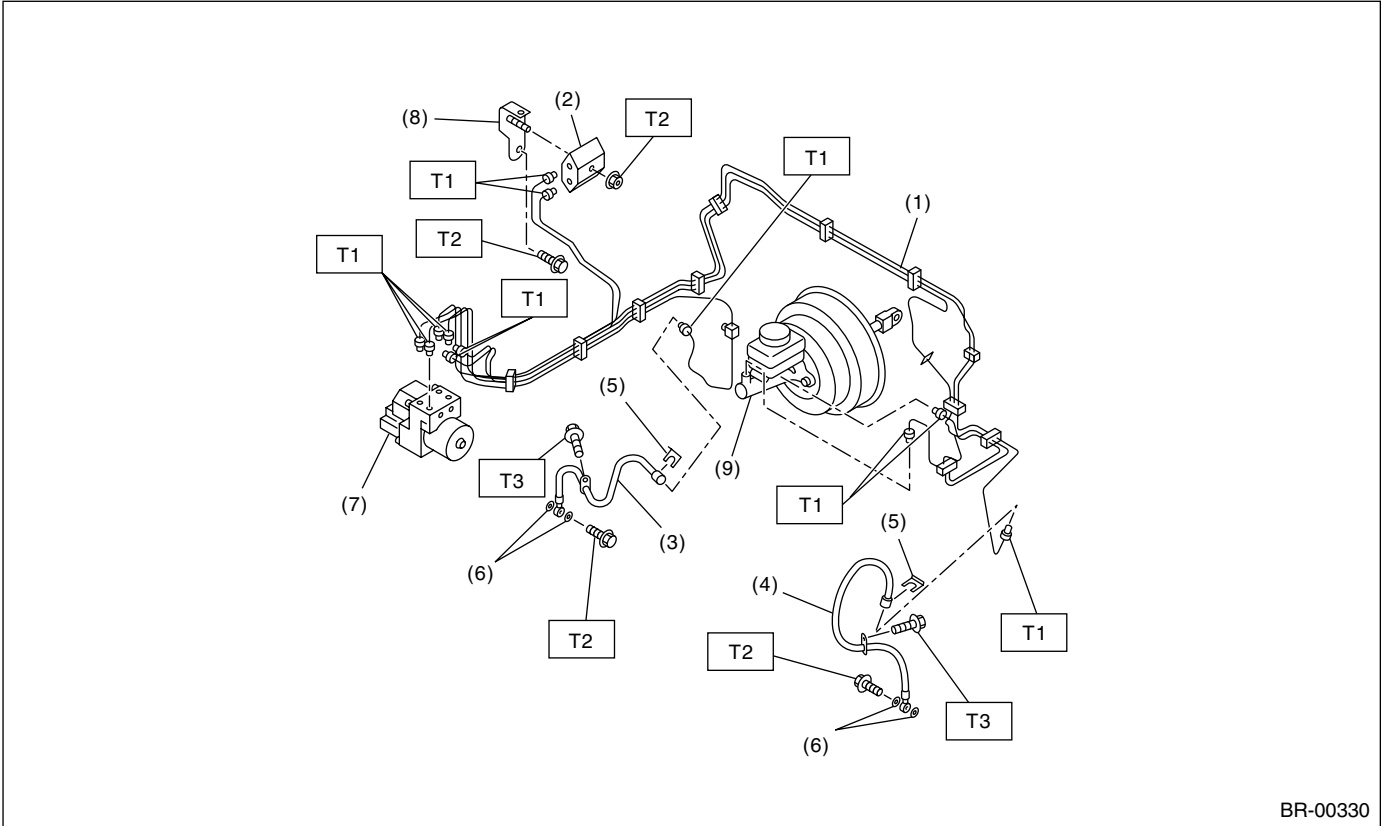


(1) Cap	(6) Secondary piston
(2) Filter	(7) Cylinder body
(3) Reservoir tank	(8) Cylinder pin
(4) Piston retainer	(9) Seal
(5) Primary piston	(10) Pin

GENERAL DESCRIPTION

BRAKE

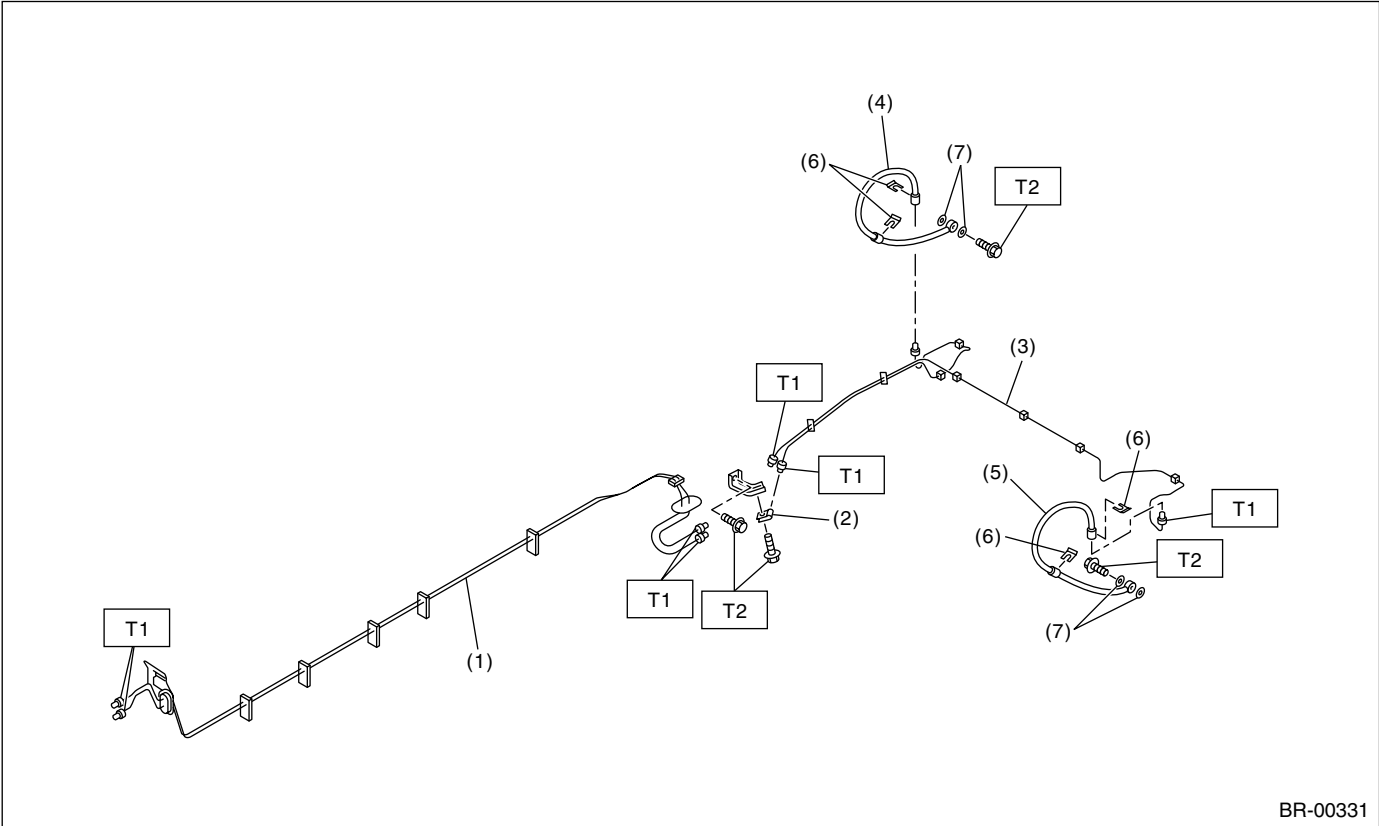
4. FRONT BRAKE PIPES AND HOSE



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

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	15 (1.5, 10.8)
T2:	18 (1.8, 13.0)
T3:	32 (3.3, 23.6)

5. CENTER AND REAR BRAKE PIPES AND HOSES



- (1) Center brake pipe assembly
- (2) Two-way connector
- (3) Rear brake pipe assembly

- (4) Rear brake hose RH
- (5) Rear brake hose LH
- (6) Clamp
- (7) Gasket

Tightening torque: N·m (kgf·m, ft·lb)

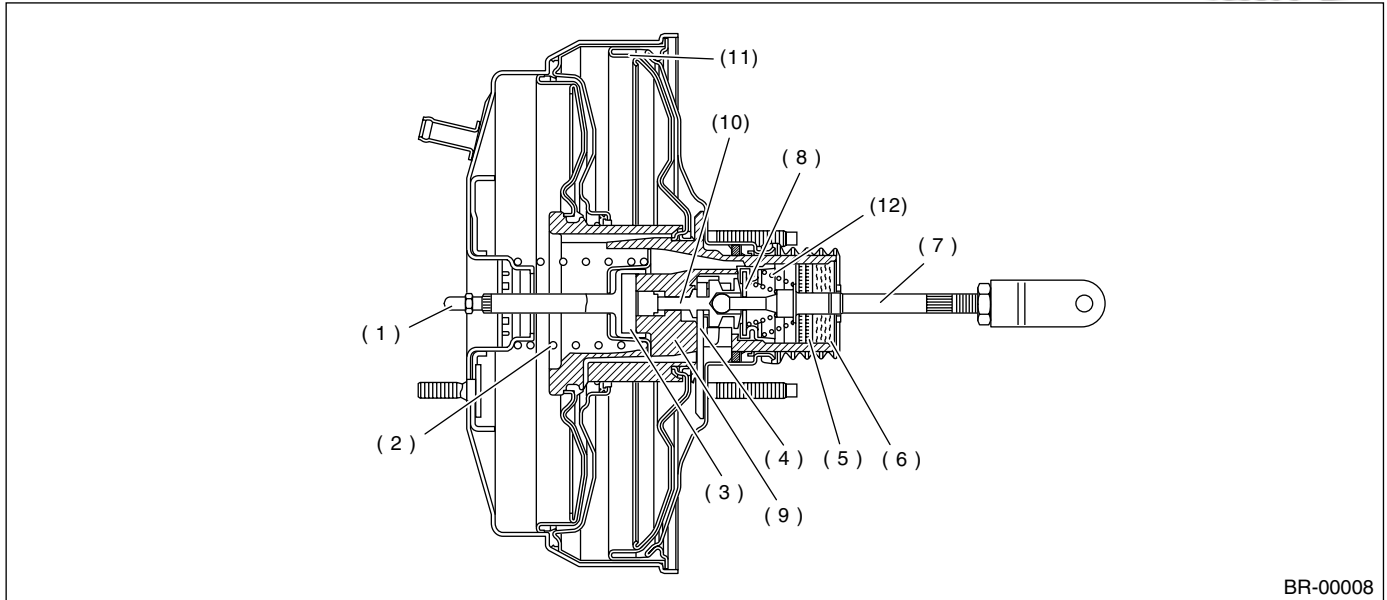
T1: 15 (1.5, 10.8)

T2: 18 (1.8, 13.0)

GENERAL DESCRIPTION

BRAKE

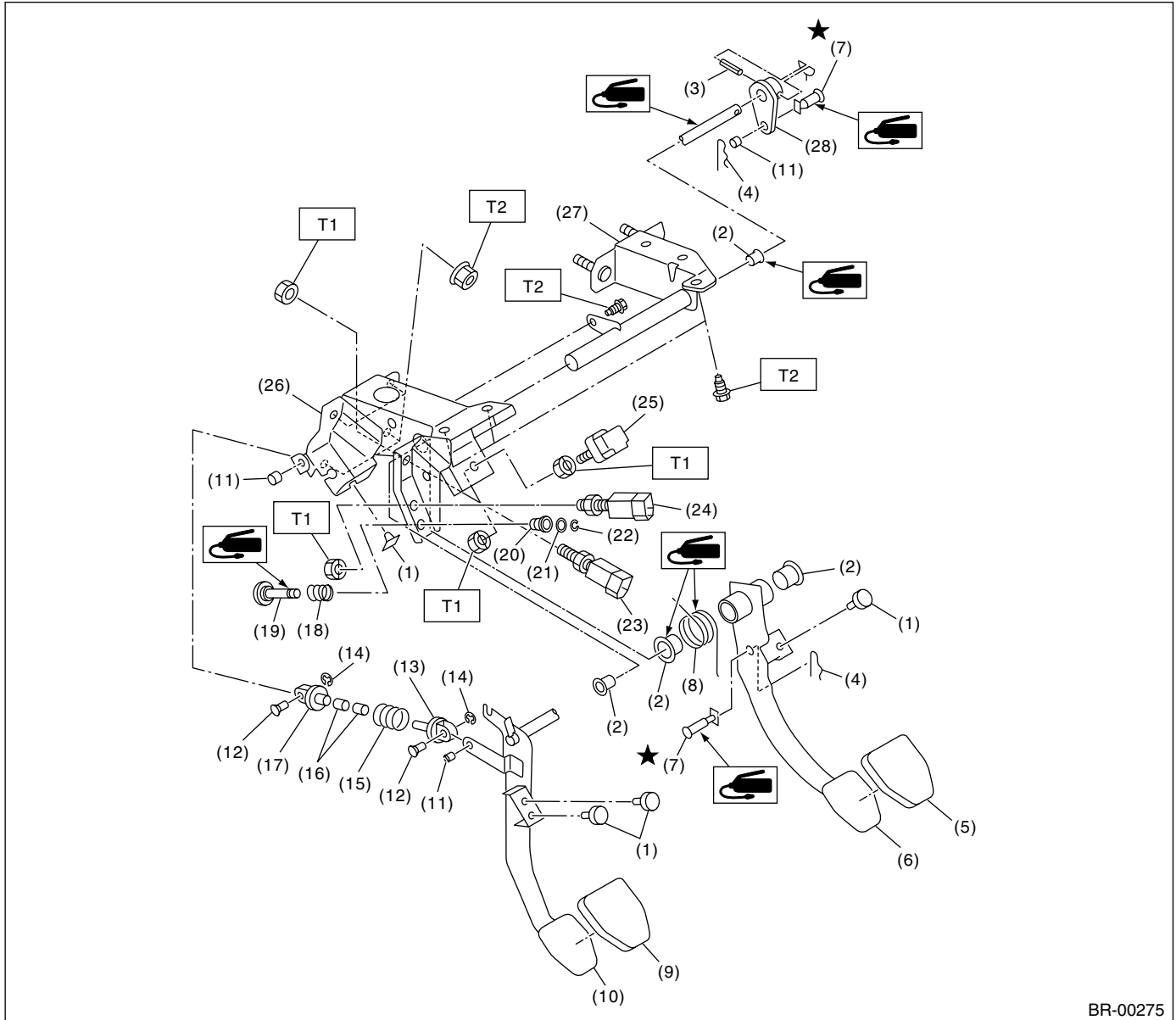
6. BRAKE BOOSTER



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

7. BRAKE PEDAL

• MT MODEL



BR-00275

(1) Stopper	(12) Clutch clevis pin	(23) Clutch switch (Starter interlock)
(2) Bushing	(13) Assist rod A	(24) Clutch switch (With cruise control)
(3) Spring pin	(14) Clip	(25) Stop light switch
(4) Snap pin	(15) Assist spring	(26) Pedal bracket
(5) Brake pedal pad	(16) Assist bushing	(27) Clutch master cylinder bracket
(6) Brake pedal	(17) Assist rod B	(28) Lever
(7) Clevis pin	(18) Spring S	
(8) Brake pedal spring	(19) Rod S	
(9) Clutch pedal pad	(20) Bushing S	
(10) Clutch pedal	(21) O-ring	
(11) Bushing C	(22) Clip	

Tightening torque: N·m (kgf·m, ft·lb)

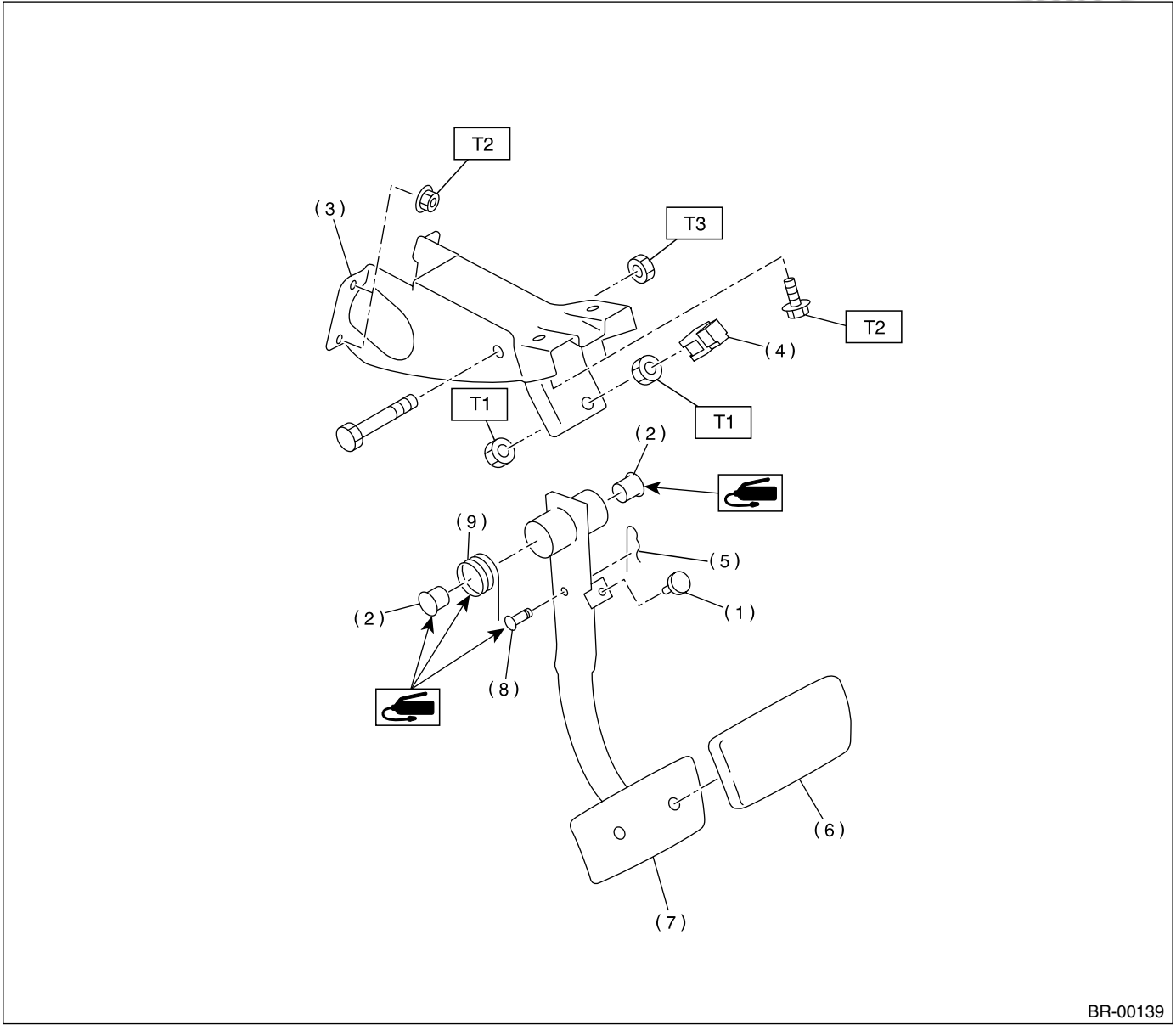
T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

GENERAL DESCRIPTION

BRAKE

• AT MODEL



- (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)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands 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. GENERAL PURPOSE TOOLS**

TOOL NAME	REMARKS
SNAP RING PLIERS	Used for removing and installing snap ring.

2. Front Brake Pad

A: REMOVAL

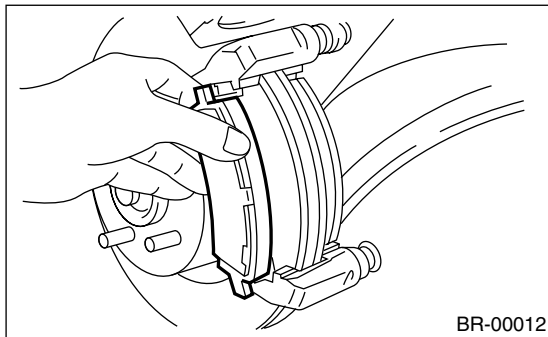
1. 15 INCH TYPE

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

NOTE:

Do not disconnect the brake hose from caliper body.

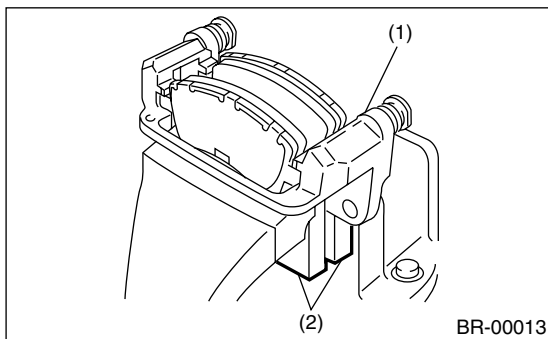
- 6) Remove the pad.



NOTE:

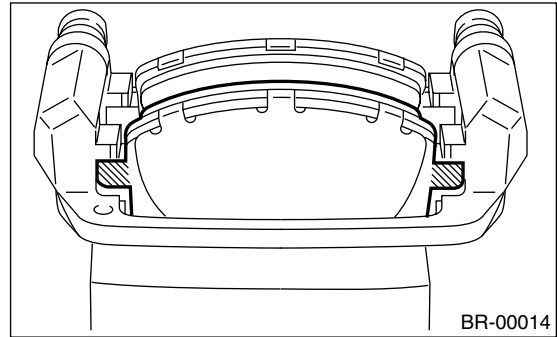
If the brake pad is difficult to remove, proceed as follows:

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



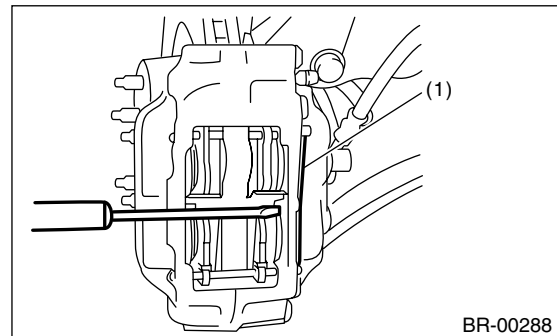
- (1) Support
- (2) Wooden blocks

- (4) Attach a rod of less than 12 mm (0.47 in) dia. to the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.



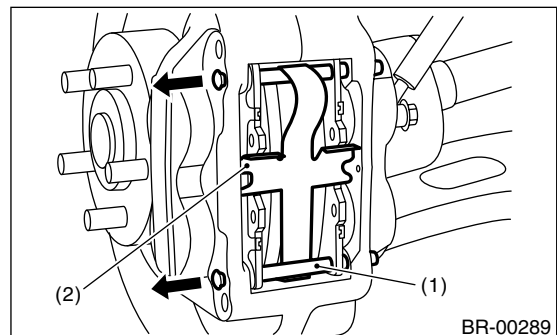
2. 16 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the M clip.



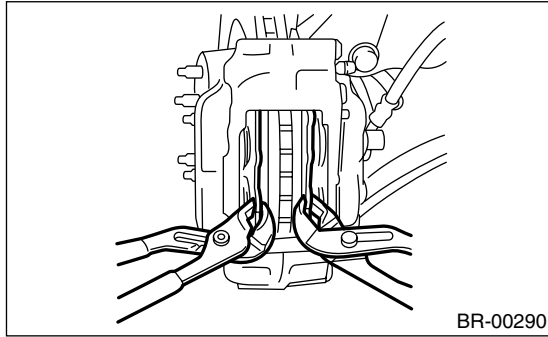
- (1) M clip

- 5) Remove the pad pins, then remove the cross spring.

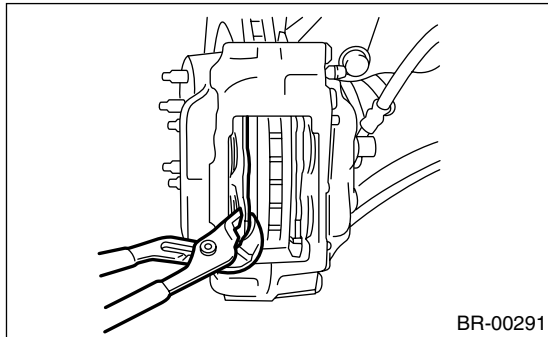


- (1) Pad pin
- (2) Cross spring

6) Use a wrench to expand the pads, and then push the piston back.

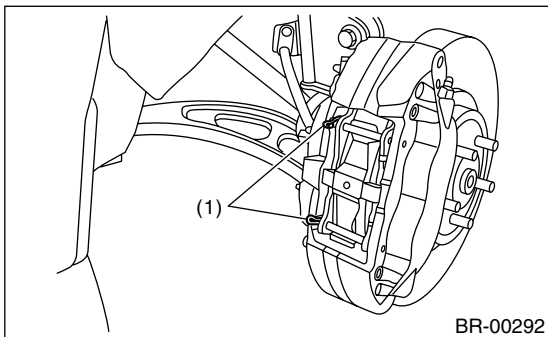


7) Remove the pad.



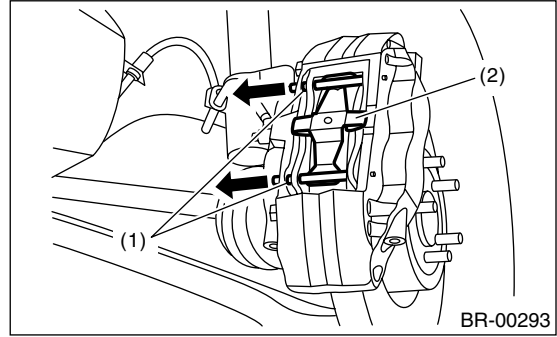
3. 17 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the clip.



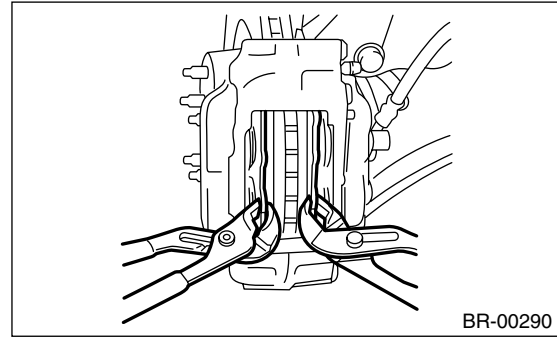
(1) Clip

5) Remove the pad pins and cross spring.

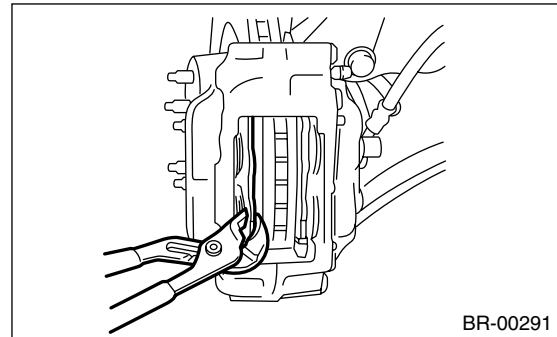


- (1) Pad pin
- (2) Cross spring

6) Use a wrench to expand the pads, and then push the piston back.



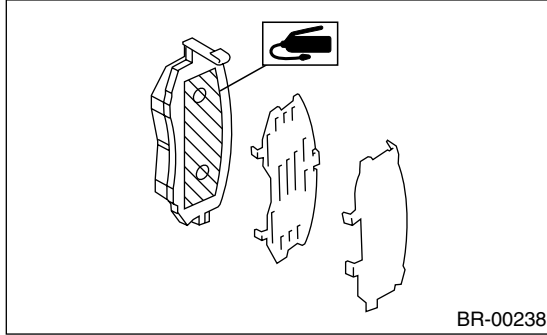
7) Remove the pad.



B: INSTALLATION

1. 15 INCH TYPE

- 1) Apply thin coat of Molykote AS880N (Part No. K0779YA010) to the frictional portion between pad and pad clip.
- 2) Apply thin coat of Molykote AS880N (Part No. K0779YA010) to the frictional portion between pad and pad inner shim.



- 3) Install the pads on support.
- 4) Install the caliper body on support.

Tightening torque:

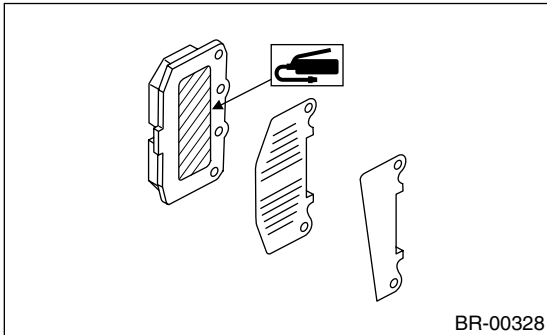
37 N·m (3.8 kgf-m, 27.5 ft-lb)

NOTE:

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

2. 16 INCH TYPE

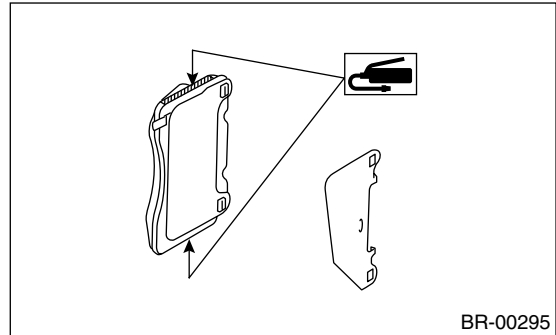
- 1) Apply thin coat of Molykote AS880N (Part No. K0779YA010) to the frictional portion between pad and pad inner shim.



- 2) Install the pads on caliper body.
- 3) Install the pad pins on caliper body.
- 4) Install the M clip.
- 5) Install the cross spring.

3. 17 INCH TYPE

- 1) Apply thin coat of Molykote AS880N (Part No. K0779YA010) to the frictional portion between pad and pad shim.

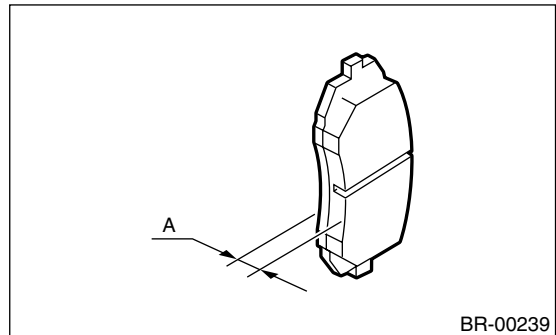


- 2) Install the pads on caliper body.
- 3) Install the cross spring.
- 4) Install the pad pins.
- 5) Install the clip.

C: INSPECTION

1. 15 INCH TYPE

Check the pad thickness A.



Pad thickness	Standard value	11 mm (0.43 in)
	Wear limit	1.5 mm (0.059 in)

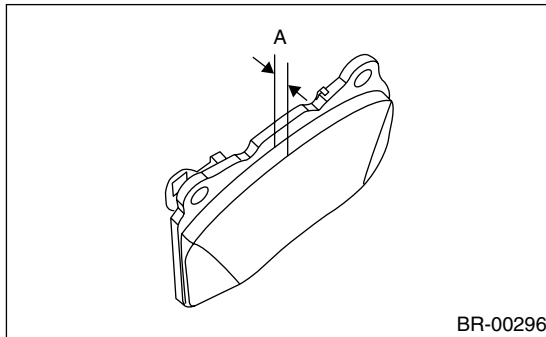
NOTE:

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

2. 16 INCH TYPE

- Replace the pad if there is oil or grease on it.

Check the pad thickness A.



BR-00296

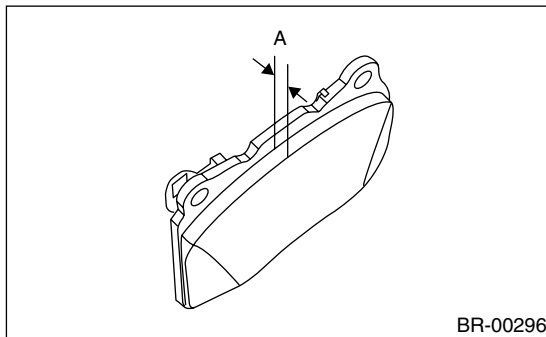
Pad thickness	Standard value	11 mm (0.43 in)
	Wear limit	1.5 mm (0.59 in)

NOTE:

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

3. 17 INCH TYPE

Check the pad thickness A.



BR-00296

Pad thickness	Standard value	9.2 mm (0.362 in)
	Wear limit	1.2 mm (0.047 in)

NOTE:

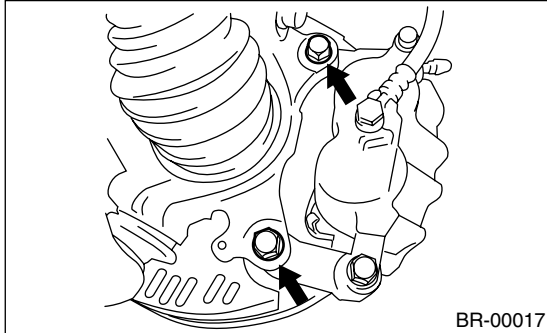
- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.

3. Front Disc Rotor

A: REMOVAL

1. 15 INCH TYPE

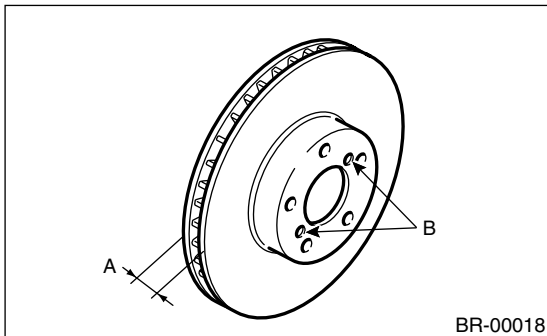
- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the caliper body and support from housing, and suspend it from strut using a wire.



- 5) Remove the disc rotor.

NOTE:

If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes (B) on rotor.

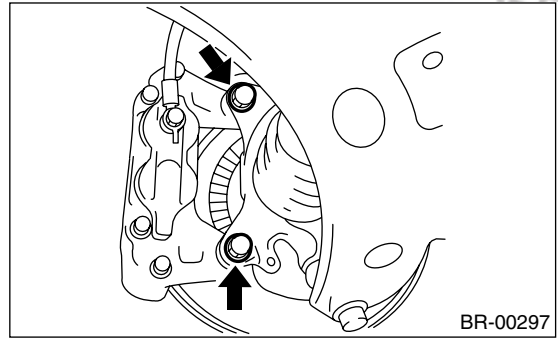


- 6) Clean mud and foreign particles from the caliper body assembly and support.

2. 16 INCH AND 17 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nut.
- 3) Lift-up the vehicle, and then remove the front wheel.

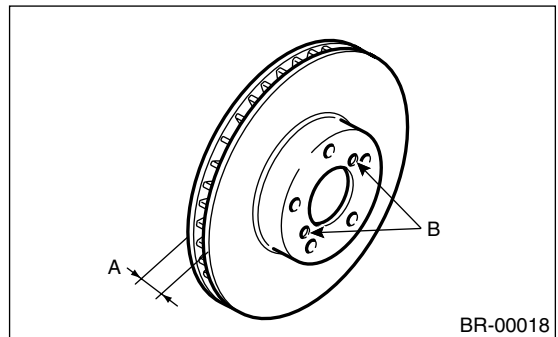
- 4) Remove the caliper body from housing and suspend from strut using a wire.



- 5) Remove the disc rotor from hub.

NOTE:

If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes (B) on rotor.



- 6) Clean mud and foreign particles from the caliper body assembly and support.

B: INSTALLATION

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

Tightening torque:

Except 17 inch type:

80 N·m (8.2 kgf-m, 59 ft-lb)

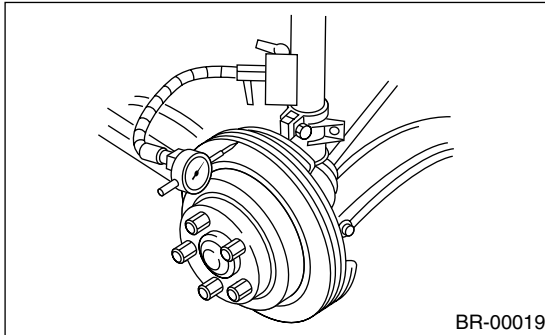
17 inch type:

155 N·m (15.8 kgf-m, 114.3 ft-lb)

- 3) Install the wheel.

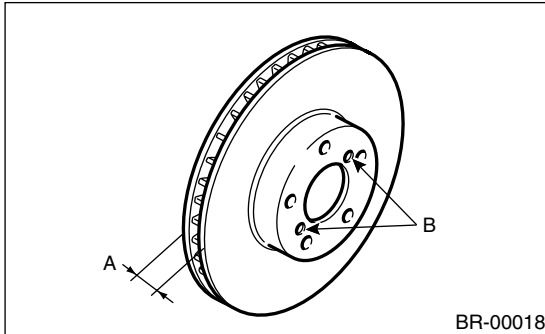
C: INSPECTION

- 1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-22, INSPECTION, Front Axle.>
- 2) Secure the disc rotor by tightening five wheel nuts.
- 3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout is above specified value, replace the disc rotor.



Disc rotor runout limit: 0.075 mm (0.0030 in)

- 4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor is outside the service limit, replace the disc rotor.



		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	15"	24 mm (0.94 in)	22 mm (0.87 in)	277 mm (10.91 in)
	16"	24 mm (0.94 in)	22 mm (0.87 in)	294 mm (11.57 in)
	17"	30 mm (1.18 in)	28 mm (1.10 in)	326 mm (12.83 in)

4. Front Disc Brake Assembly

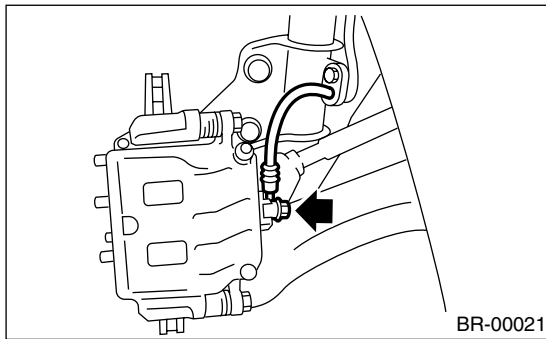
A: REMOVAL

1. 15 INCH TYPE

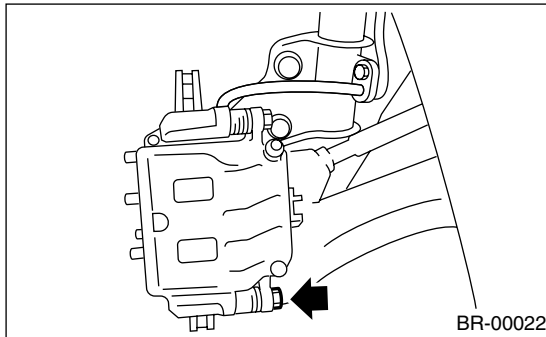
CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

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



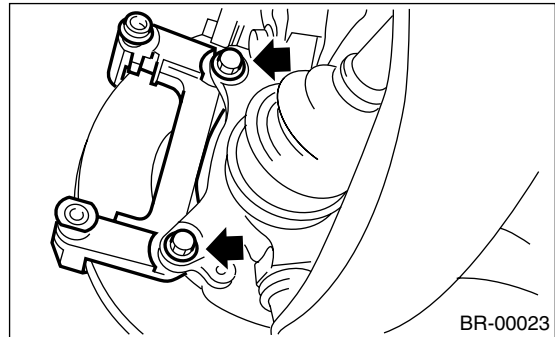
- 5) Remove the bolt securing lock pin to caliper body.



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

NOTE:

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



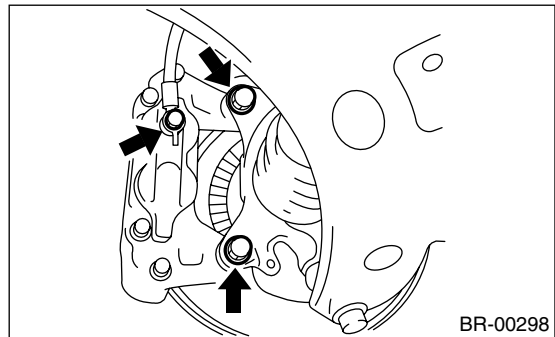
- 8) Clean mud and foreign particles from the caliper body assembly and support.

2. 16 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

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



- 6) Clean mud and foreign particles from the caliper body assembly and support.

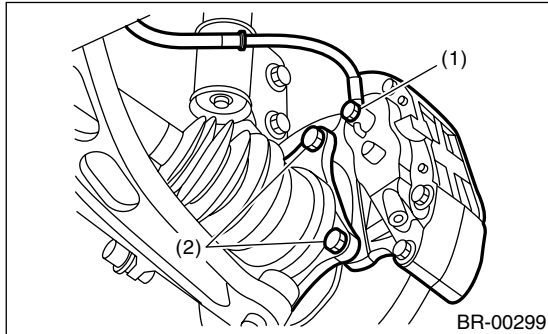
3. 17 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.

- 4) Remove the brake pads from caliper body. <Ref. to BR-17, 17 INCH TYPE, REMOVAL, Front Brake Pad.>.
- 5) Remove the union bolt and brake hose from caliper body assembly.
- 6) Remove two installation bolts from housing.



- (1) Union bolt
(2) Installation bolt

- 7) Clean mud and foreign particles from the caliper body assembly.

B: INSTALLATION

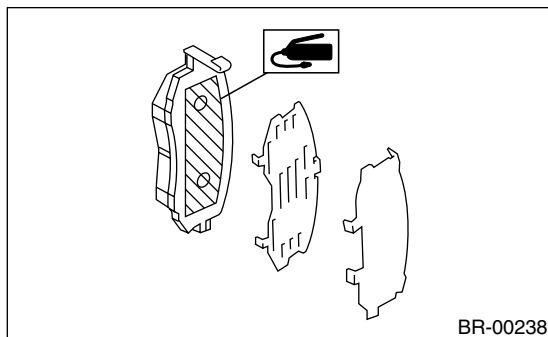
1. 15 INCH TYPE

- 1) Install the support on housing.

Tightening torque:

80 N·m (8.2 kgf-m, 59 ft-lb)

- 2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
- 3) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and inner shim.



- 4) Install the pads on support.
- 5) Install the caliper body on support.

Tightening torque:

37 N·m (3.8 kgf-m, 27.5 ft-lb)

- 6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 7) Bleed air from the brake system.

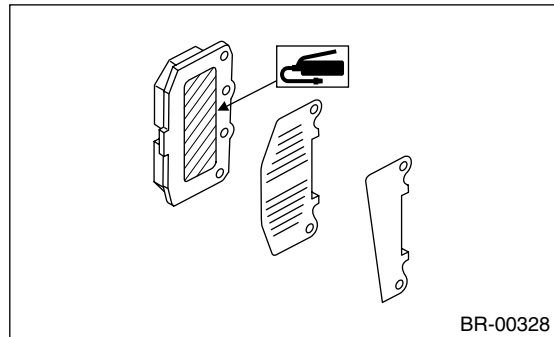
2. 16 INCH TYPE

- 1) Install the caliper body on housing.

Tightening torque:

80 N·m (8.2 kgf-m, 59 ft-lb)

- 2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



- 3) Install the pads on caliper body.
- 4) Install the pad pins and cross spring on caliper body.
- 5) Install the M clip.
- 6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 7) Bleed air from the brake system.

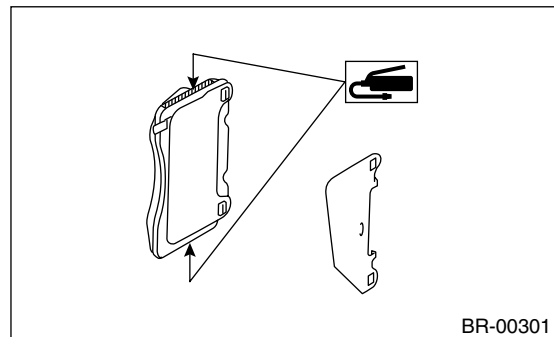
3. 17 INCH TYPE

- 1) Install the caliper body assembly on housing.

Tightening torque:

155 N·m (15.8 kgf-m, 114.3 ft-lb)

- 2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad shim.



- 3) Install the pads on caliper body.
- 4) Install the cross spring.
- 5) Install the pad pins.
- 6) Install the clip.

FRONT DISC BRAKE ASSEMBLY

BRAKE

7) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

8) Bleed air from the brake system.

C: DISASSEMBLY

1. 15 INCH TYPE

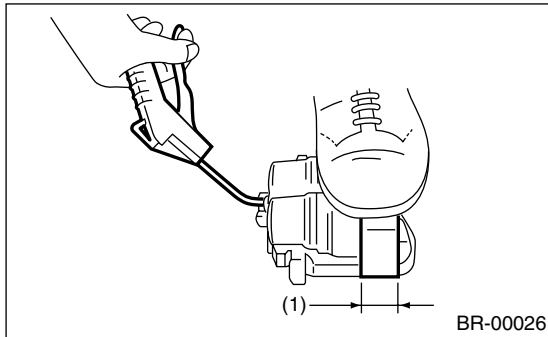
1) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:

Be careful not to allow foreign particles to enter the brake hose connector.

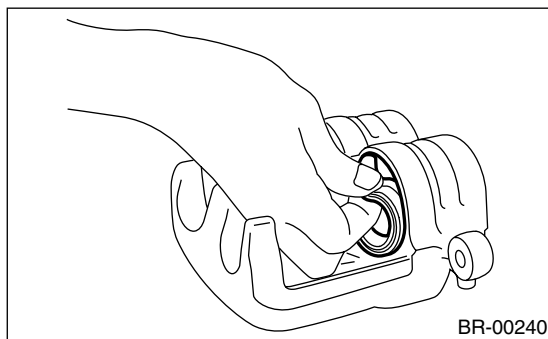
2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

3) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

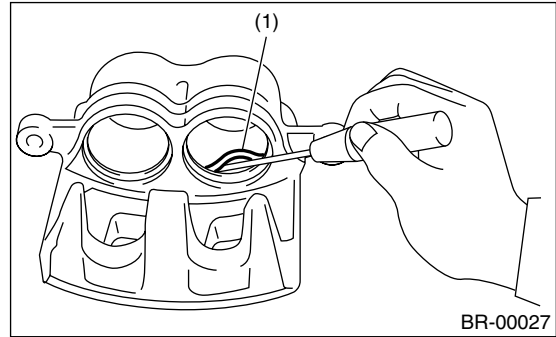
4) Remove the piston boot.



5) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the cylinder and piston seal groove.



(1) Piston seal

6) Remove the guide pin and boot from caliper body.

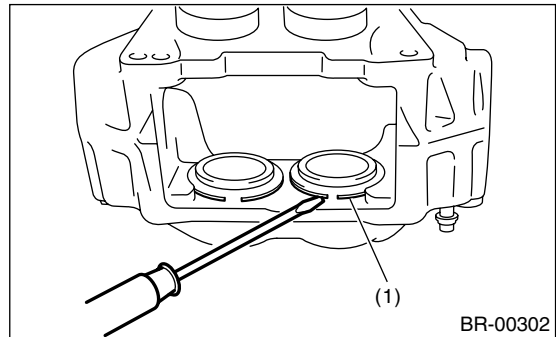
2. 16 INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly.

CAUTION:

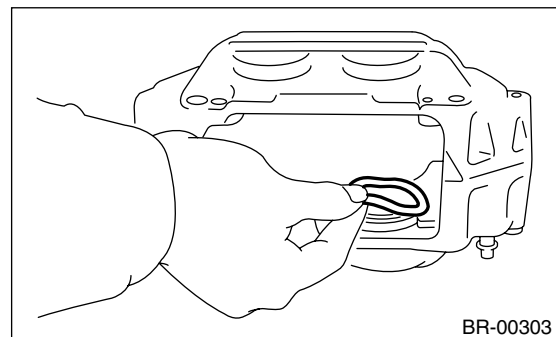
Be careful not to allow foreign particles to enter the brake hose connector.

2) Using a standard screwdriver, remove the boot ring from piston.

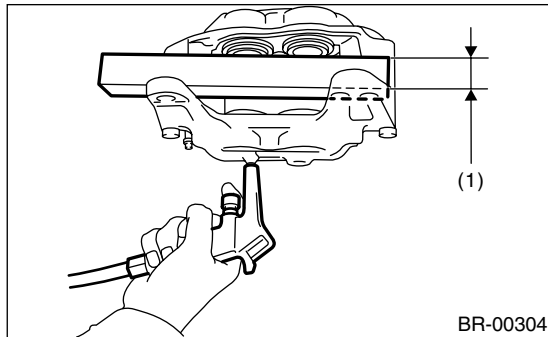


(1) Boot ring

3) Remove the boot from piston end.



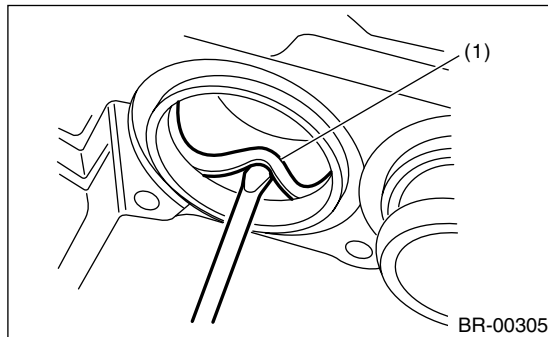
- 4) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
- 5) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



- (1) Place a 30 mm (1.18 in) wide wooden block here.

- 6) Remove the piston seal from caliper body cylinder.

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



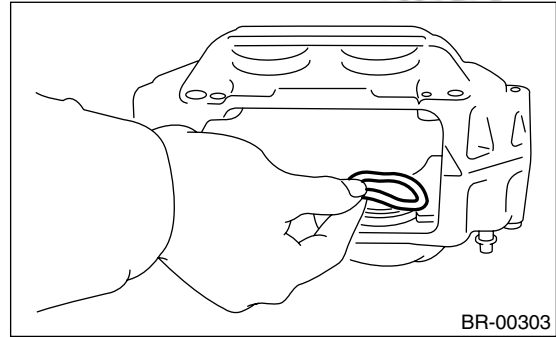
- (1) Piston seal

3. 17 INCH TYPE

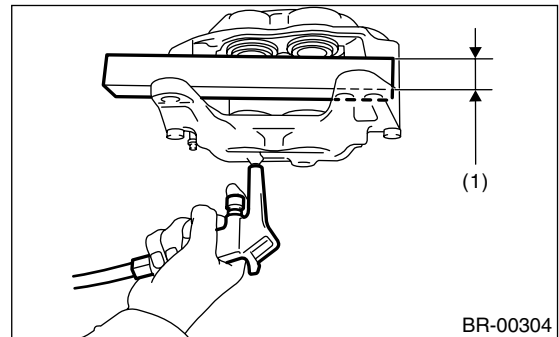
- 1) Clean mud and foreign particles from the caliper body assembly.

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

- 2) Remove the piston boots from each piston end.



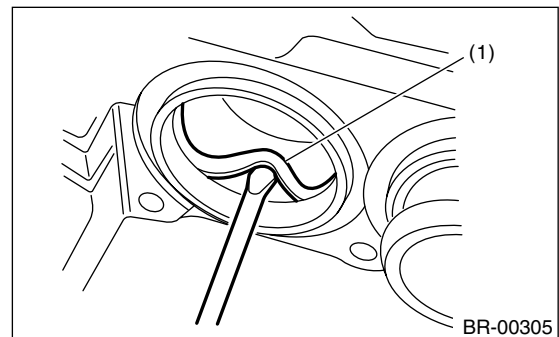
- 3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
- 4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



- (1) Place a 30 mm (1.18 in) wide wooden block here.

- 5) Remove the piston seal from caliper body cylinder.

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



- (1) Piston seal

FRONT DISC BRAKE ASSEMBLY

BRAKE

D: ASSEMBLY

1. 15 INCH TYPE

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

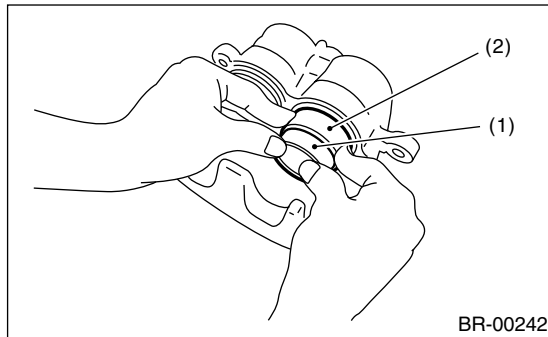
Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

- 5) Insert the piston into cylinder.

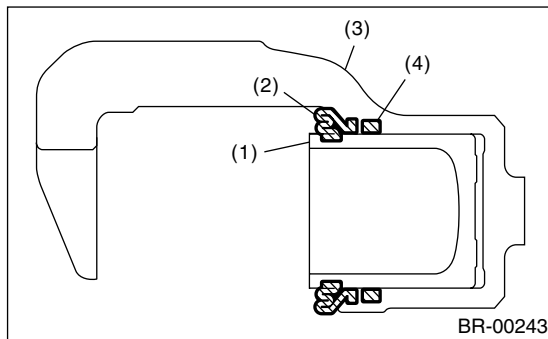
CAUTION:

Do not force the piston into cylinder.



- (1) Piston
- (2) Piston boot

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



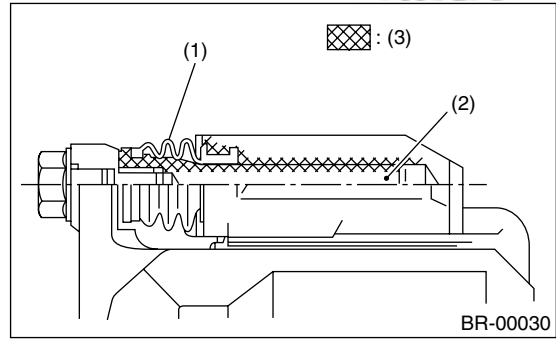
- (1) Piston
- (2) Piston boot
- (3) Caliper body
- (4) Piston seal

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

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

- 8) Install the lock and guide pin boot on support.



- (1) Pin boot
- (2) Lock pin or guide pin
- (3) Apply grease.

2. 16 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

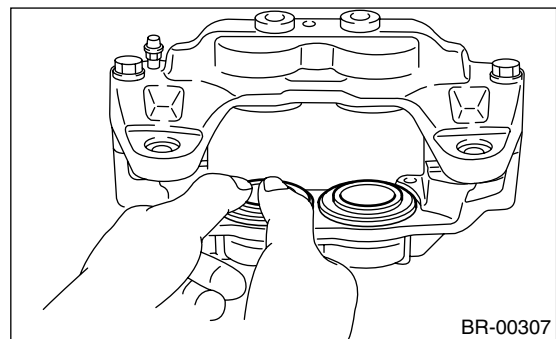
Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

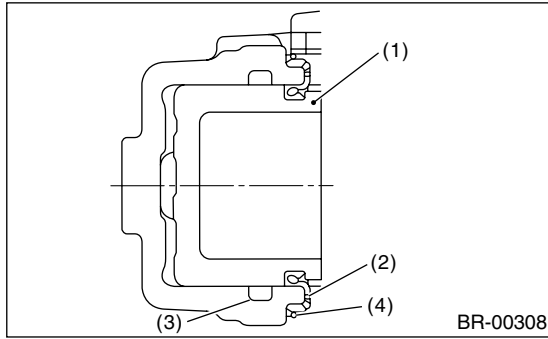
- 5) Insert the piston into cylinder.

CAUTION:

Do not force the piston into cylinder.

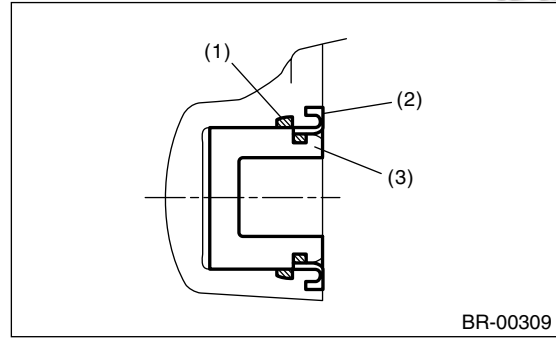


6) Position the boot in grooves on cylinder and piston.



- (1) Piston
- (2) Piston boot
- (3) Piston seal
- (4) Boot ring

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



- (1) Piston seal
- (2) Piston boot
- (3) Piston

7) Install the boot ring. Be careful not scratch the boot.

3. 17 INCH TYPE

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

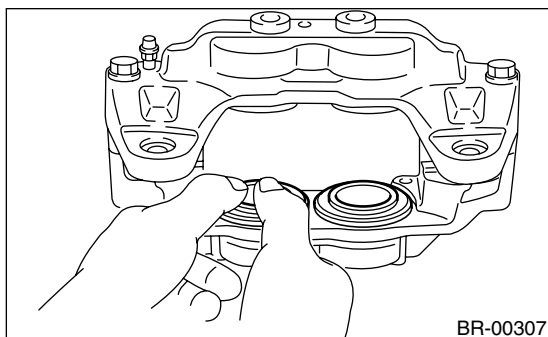
Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:

Do not force the piston into cylinder.



E: INSPECTION

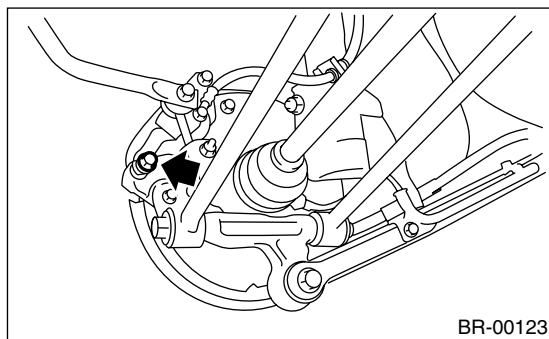
- 1) Repair or replace the faulty parts.
- 2) Check the caliper body and piston for uneven wear, damage or rust.
- 3) Check the rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

1. 14 INCH TYPE

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



- 5) Raise the caliper body upward and support it.

NOTE:

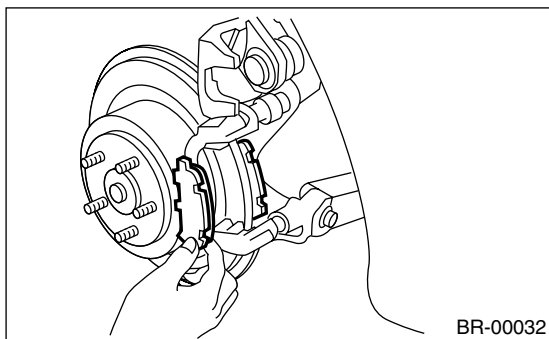
Do not disconnect the brake hose from caliper body.

- 6) Remove the pad.

NOTE:

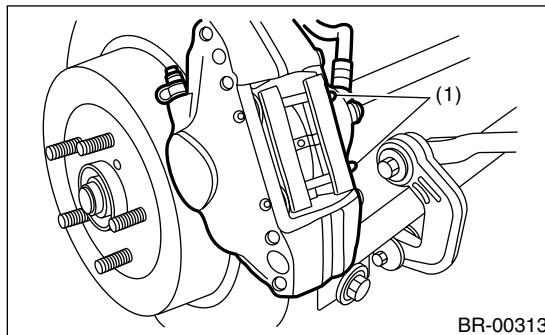
If the brake pad is difficult to remove, use the same procedure as for front disc brake pad.

<Ref. to BR-16, REMOVAL, Front Brake Pad.>



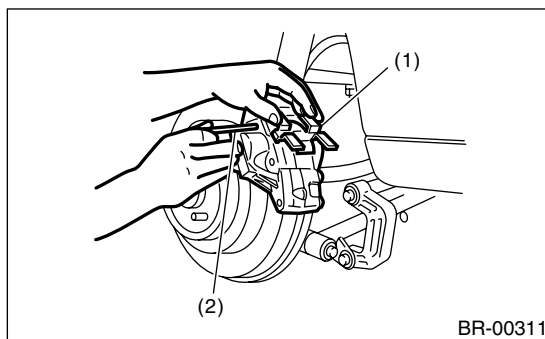
2. 17 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheel.
- 4) Remove the clip.



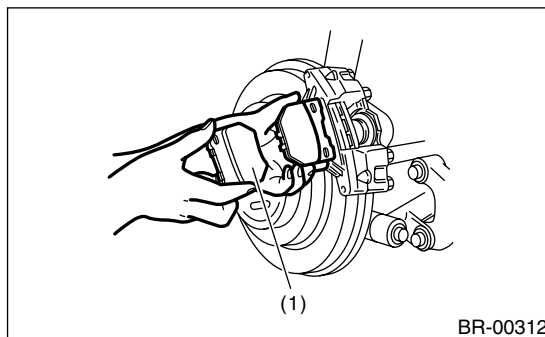
- (1) Clip

- 5) Remove the pad pins and cross spring.



- (1) Cross spring
- (2) Pad pin

- 6) Expand the pads and push piston back.
- 7) Remove the pad.



- (1) Rear brake pad

B: INSTALLATION

1. 14 INCH TYPE

- 1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
- 2) Install the pad on support.
- 3) Install the caliper body on support.

Tightening torque:

37 N·m (3.8 kgf-m, 27.5 ft-lb)

NOTE:

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

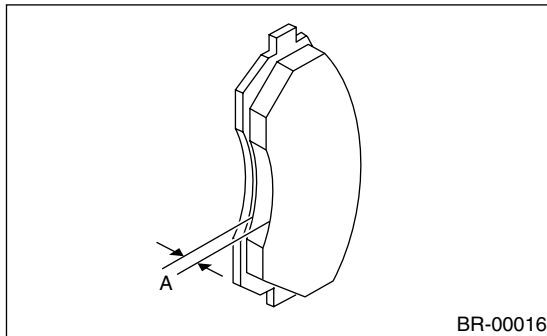
2. 17 INCH TYPE

- 1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to frictional portion between pad and pad inner shim.
- 2) Install the pads on caliper body.
- 3) Install the cross spring and pad pins.
- 4) Install the Clip.

C: INSPECTION

1. 14 INCH TYPE

Check pad thickness A.



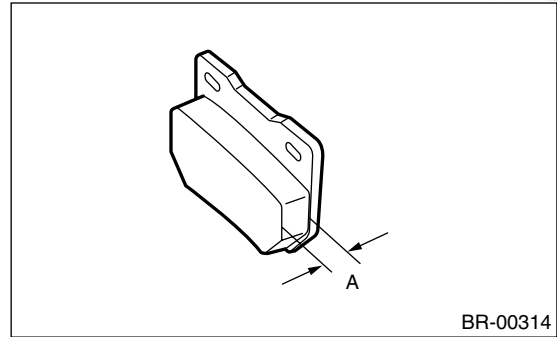
Pad thickness	Standard value	9.0 mm (0.354 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

2. 17 INCH TYPE

Check the pad thickness A.



Pad thickness	Standard value	9.0 mm (0.354 in)
	Wear limit	1.2 mm (0.047 in)

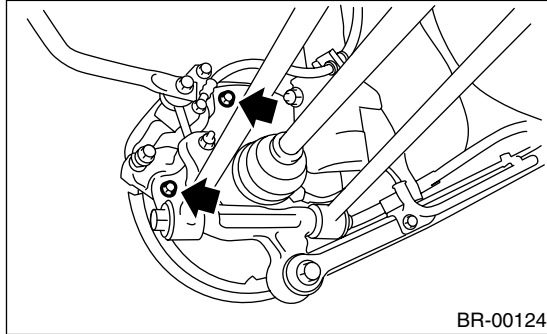
NOTE:

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the wheels.
- 4) Pull down and release the parking brake.
- 5) Remove the two mounting bolts, and then remove the disc brake assembly.

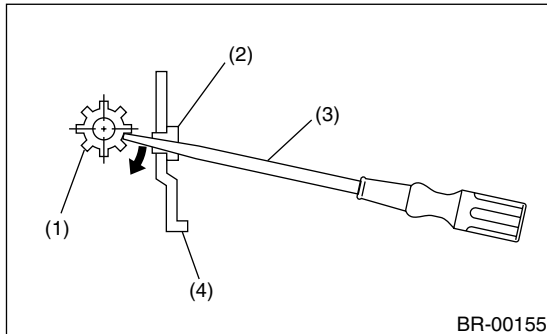


- 6) Suspend the disc brake assembly so that hose is not stretched.
- 7) Remove the disc rotor.

NOTE:

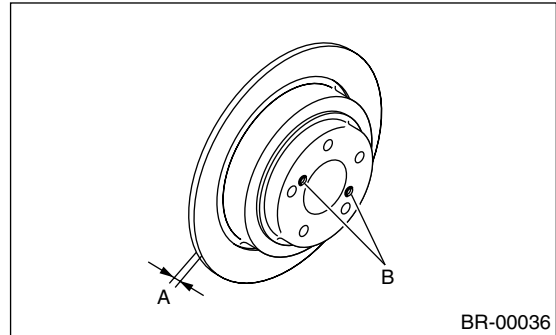
If the disc rotor is difficult to remove try following two methods in order.

- (1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.



- (1) Adjusting screw
- (2) Cover
- (3) Flat tip screwdriver
- (4) Back plate

- (2) If the disc rotor seizes up within hub, drive the disc rotor out by installing an 8-mm bolt in holes B on rotor.

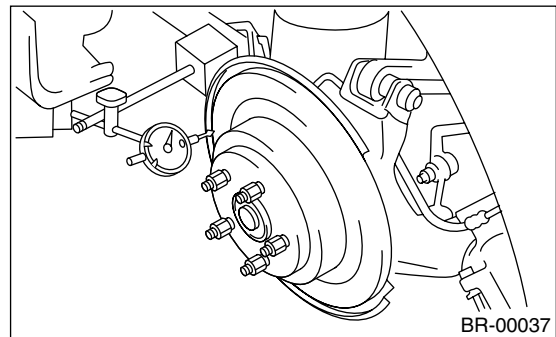


B: INSTALLATION

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

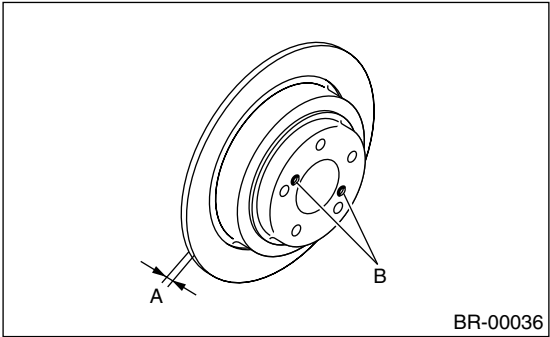
C: INSPECTION

- 1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-28, INSPECTION, Rear Axle.>
- 2) Secure the disc rotor by tightening five wheel nuts.
- 3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout is above specified value, replace the disc rotor.



Disc rotor runout limit:
0.070 mm (0.0027 in)

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



		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	14"	10 mm (0.39 in)	8.5 mm (0.335 in)	266 mm (10.47 in)
	17"	20 mm (0.79 in)	18 mm (0.71 in)	316 mm (12.44 in)

7. Rear Disc Brake Assembly

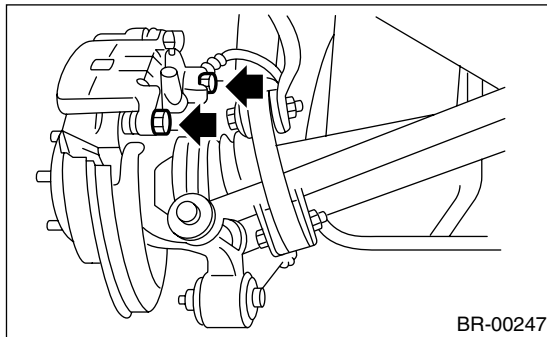
A: REMOVAL

1. 14 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

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



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

NOTE:

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

- 8) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:

Be careful not to allow foreign particles to enter brake hose connector.

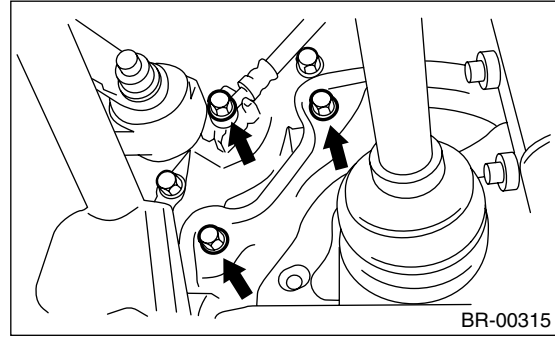
2. 17 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the wheels.
- 4) Remove the brake pads from caliper body. <Ref. to BR-28, 17 INCH TYPE, REMOVAL, Rear Brake Pad.>
- 5) Disconnect the brake hose from caliper body.

- 6) Remove the caliper body from housing.



- 7) Clean mud and foreign particles from the caliper body.

CAUTION:

Be careful not to allow foreign particles to enter brake hose connector.

B: INSTALLATION

1. 14 INCH TYPE

- 1) Install the support on housing.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 ft-lb)

- 2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
- 3) Install the pads on support.
- 4) Install the caliper body on support.

Tightening torque:

37 N·m (3.8 kgf-m, 27.5 ft-lb)

- 5) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 6) Bleed air from the brake system.

2. 17 INCH TYPE

- 1) Install the caliper body on housing.

Tightening torque:

65 N·m (6.6 kgf-m, 47.9 ft-lb)

- 2) Install the pads on caliper body.
- 3) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:

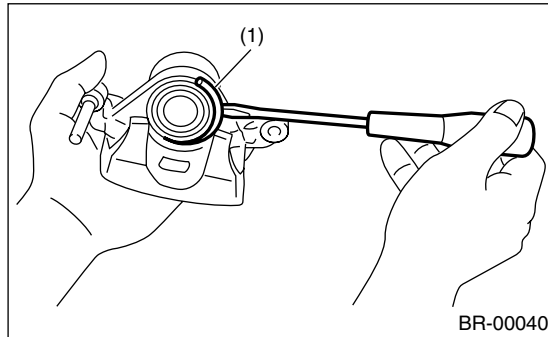
18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 4) Bleed air from the brake system.

C: DISASSEMBLY

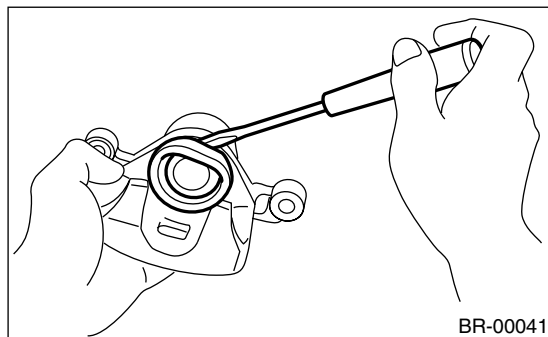
1. 14 INCH TYPE

1) Remove the boot ring.



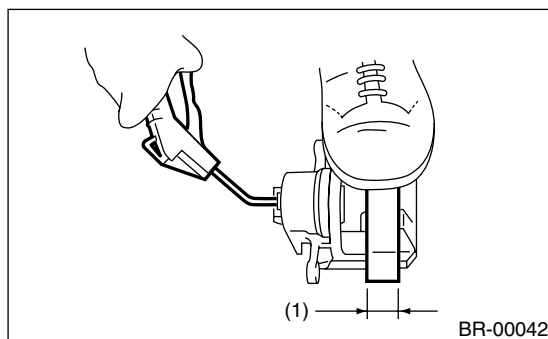
(1) Boot ring

2) Remove the piston boot.



3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.

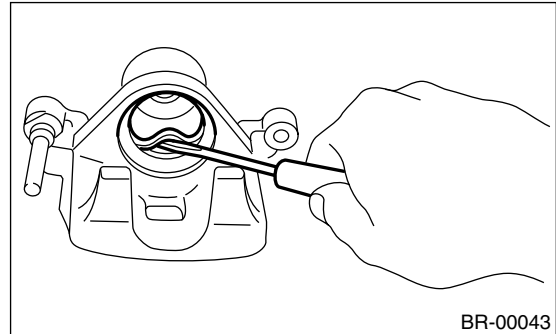


(1) Place a 30 mm (1.18 in) wide wooden block here.

5) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the cylinder and piston seal groove.

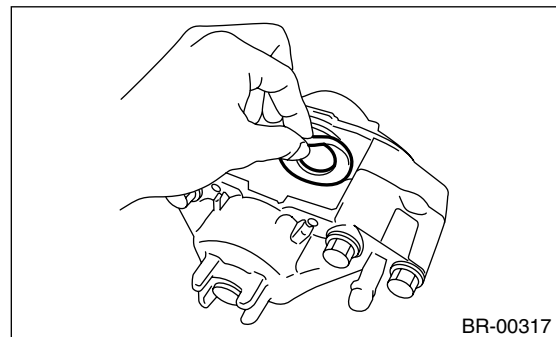


6) Remove the lock pin sleeve and boot from caliper body.

7) Remove the guide pin boot.

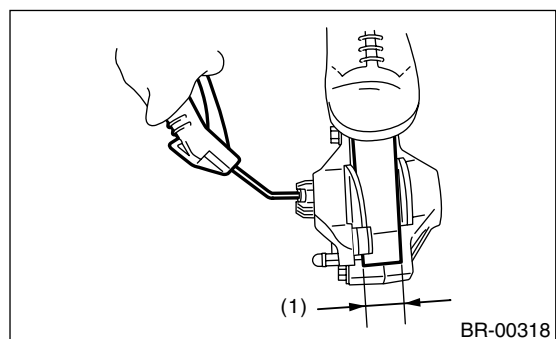
2. 17 INCH TYPE

1) Remove the piston boot from piston end.



2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

3) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 20 mm (0.79 in) wide wooden block here.

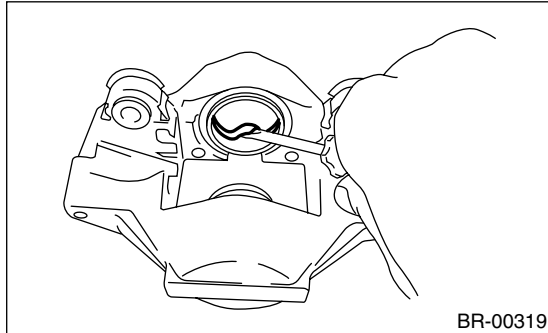
REAR DISC BRAKE ASSEMBLY

BRAKE

- 4) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the cylinder and piston seal groove.



D: ASSEMBLY

1. 14 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Insert the piston into cylinder.

CAUTION:

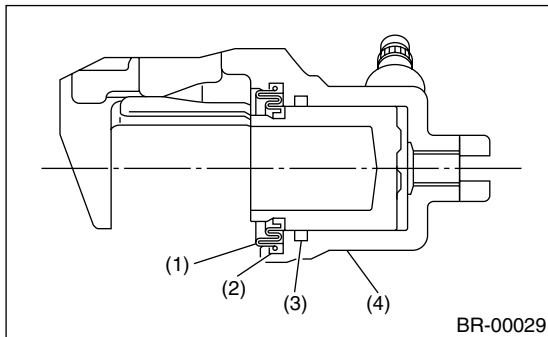
Do not force piston into cylinder.

- 5) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

- 6) Install the piston boot to caliper body, and then attach boot ring.

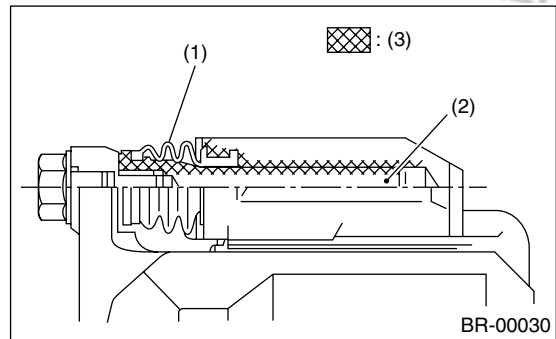


- (1) Piston boot
- (2) Boot ring
- (3) Piston seal
- (4) Caliper body

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

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)



- (1) Pin boot
- (2) Lock pin or guide pin
- (3) Apply grease.

- 8) Install the guide pin boot on support.

- 9) Install the lock pin boot on support, and then insert the lock pin sleeve into place.

2. 17 INCH TYPE

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

Grease:

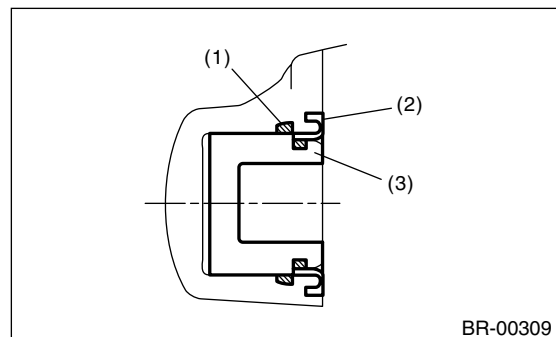
NIGLUBE RX-2 (Part No. K0779GA102)

- 5) Insert the piston into cylinder.

CAUTION:

Do not force the piston into cylinder.

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



- (1) Piston seal
- (2) Piston boot
- (3) Piston

E: INSPECTION

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

8. Master Cylinder

A: REMOVAL

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

- 1) Thoroughly drain brake fluid from reservoir tank.
- 2) Disconnect the fluid level indicator harness connector.
- 3) Remove the brake pipes from master cylinder.
- 4) Remove the master cylinder mounting nuts, and take out master cylinder from brake booster.

B: INSTALLATION

- 1) To install the master cylinder to body, reverse the sequence of removal procedure.

Tightening torque:

Master cylinder mounting nut

14 N·m (1.4 kgf-m, 10.1 ft-lb)

Piping flare nut

15 N·m (1.5 kgf-m, 10.8 ft-lb)

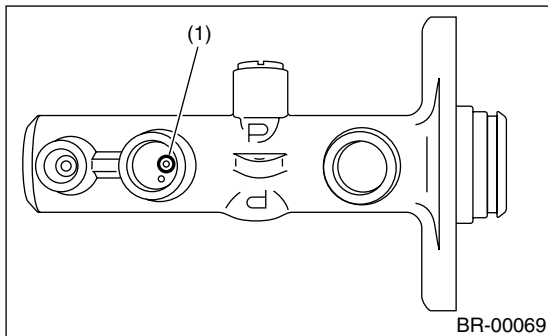
CAUTION:

Be sure to use recommended brake fluid.

- 2) Bleed air from the brake system. <Ref. to BR-44, PROCEDURE, Air Bleeding.>

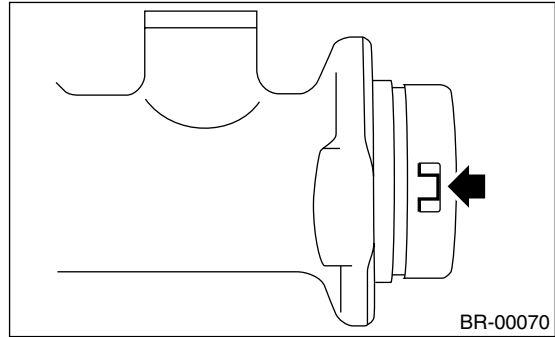
C: DISASSEMBLY

- 1) Remove mud and dirt from the surface of brake master cylinder.
- 2) Secure the master cylinder on a vise.
- 3) Remove the pin which secures 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 primary piston by screwdriver which wrapped with tape.



(1) Cylinder pin (straight pin)

- 5) Pry up the pawl, and then remove the piston retainer. Hold piston retainer tight, because the piston may jump out from master cylinder.

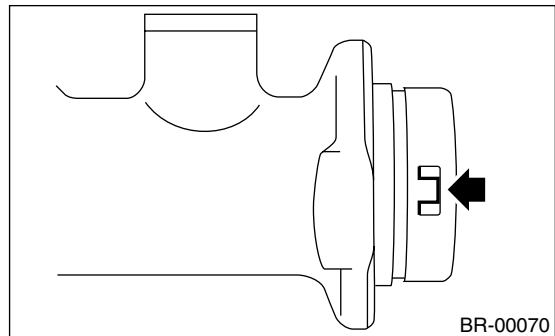


- 6) Extract the primary piston assembly and secondary piston assembly straight out, while taking care not to scratch the inner surface of cylinder.

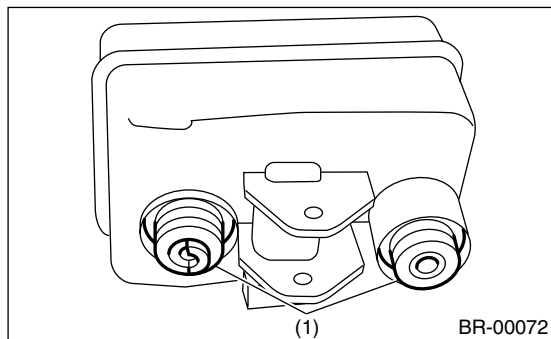
- 7) Use brake fluid to wash the inside wall of cylinder, and piston assembly. If any damage, deformation, wear, rust, and other faults are found, replace the faulty part.

D: ASSEMBLY

- 1) Apply recommended brake fluid to the inside wall of cylinder, and to outer surface of the piston assembly.
- 2) Ensure that the inside wall of cylinder, and piston assembly are free from dirt when assembling. Install the primary piston assembly and secondary piston assembly, while taking care not to damage, scratch, or dent the cylinder inside wall, and piston assembly.
- 3) Install the cylinder pin while pushing in primary piston by screwdriver which wrapped with tape.
- 4) Install the piston retainer, and then secure it by pressing the pawl.



5) Install the seal to reservoir tank.



(1) Seal

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

E: INSPECTION

If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly, secondary piston assembly, supply the valve stopper, or gasket, replace the faulty part.

NOTE:

- The primary and secondary pistons must be replaced as complete assemblies.
- The service limit of clearance between each piston and the master cylinder inner dia. is 0.11 mm (0.0043 in).

9. Brake Booster

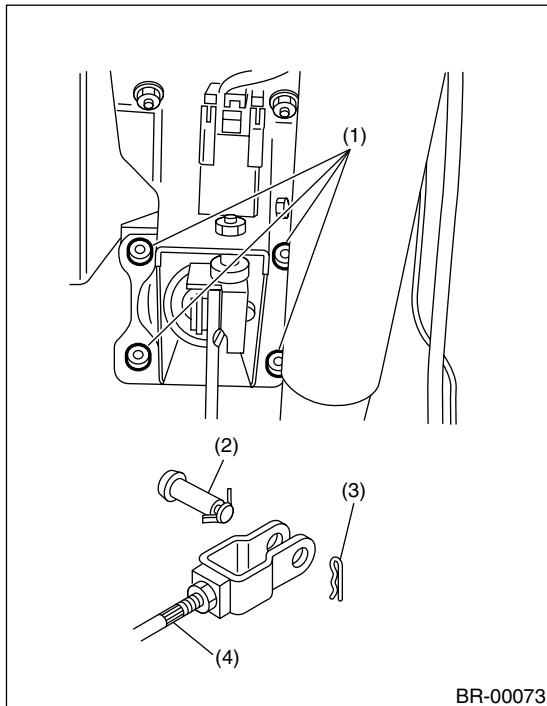
A: REMOVAL

1) Remove or disconnect the following parts at engine compartment.

- (1) Disconnect the connector for brake fluid level indicator.
- (2) Remove the brake pipes from master cylinder.
- (3) Remove the master cylinder installing nuts.
- (4) Disconnect the vacuum hose from brake booster.

2) Remove the following parts from pedal bracket.

- (1) Snap pin and clevis pin
- (2) Four brake booster installing nuts



- (1) Nuts
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod

3) Remove the brake booster while shunning brake pipes.

NOTE:

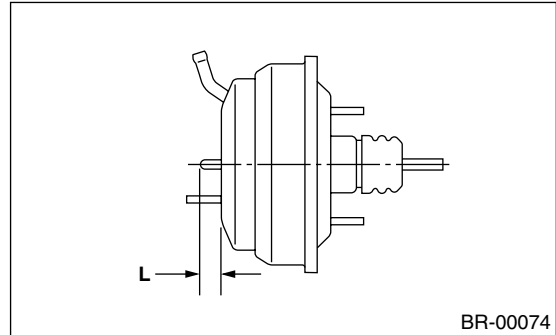
- Be careful not to drop the brake booster. The brake booster should be discarded if it has been dropped.
- Use special care when handling the operating rod.

If excessive force is applied to the operating rod, sufficient to cause a change in the angle in excess of $\pm 3^\circ$, it may result in damage to the power piston cylinder.

- Use care when placing the brake booster on floor.
- Do not change the push rod length. If it has been changed, reset the projected length "L" to standard length.

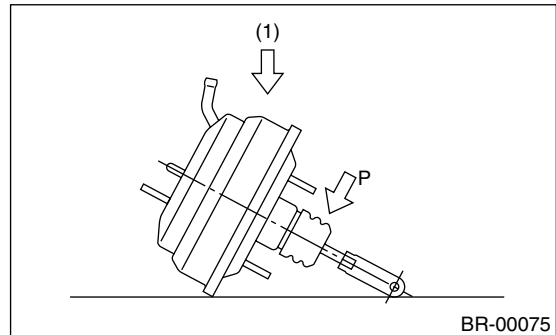
Standard L

10.05 mm (0.40 in)



CAUTION:

If external force is applied from above when the brake booster is placed in this position, the resin portion as indicated by "P", may be damaged.



(1) Force

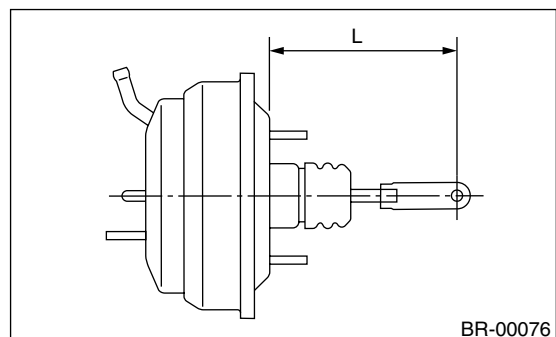
B: INSTALLATION

1) Adjust the operating rod of brake booster.

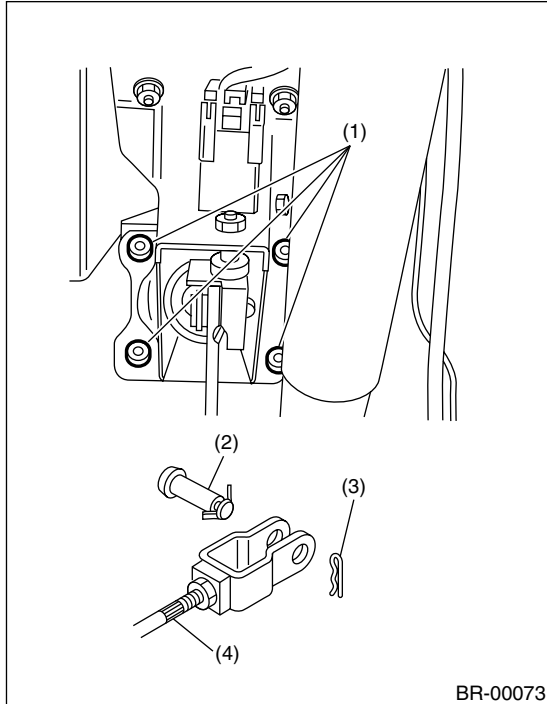
Standard L

144.6 mm (5.69 in)

If it is not within specified value, adjust it by adjusting the brake booster operating rod.

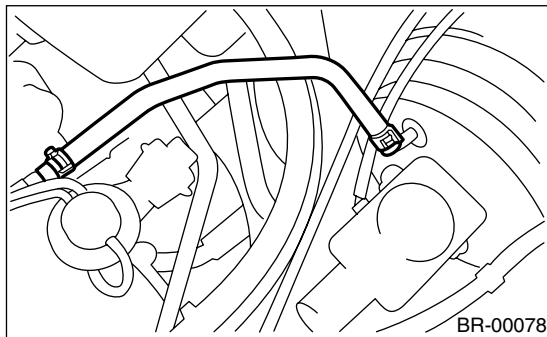


- 2) Mount the brake booster in position.
- 3) Connect the operating rod to brake pedal with clevis pin and snap pin.



- (1) Nuts
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod

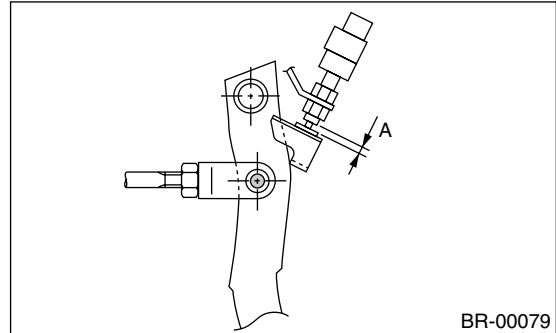
- 4) Connect the vacuum hose to brake booster.



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

CAUTION:
Be careful not to rotate the stop light switch.

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



- 9) Apply grease to operating rod connecting pin to prevent it from wearing.
- 10) Bleed air from the brake system.

Tightening torque (Air bleeder screw):
Except for 17 inch type:
8 N·m (0.8 kgf-m, 5.8 ft-lb)
17 inch type:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

- 11) Conduct road tests to ensure brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

CAUTION:

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

• Checking without gauges

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of failure if checking is conducted in accordance with the following procedures.

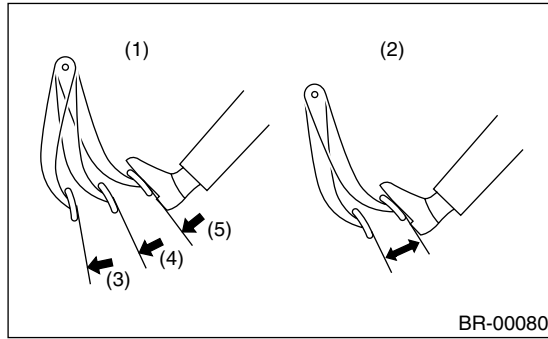
• Air tightness check

Start the engine, and run it for 1 to 2 minutes, then turn it off. Depress the brake pedal several times applying same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on 1st depression, and it should become smaller with each successive depression. If no

BRAKE BOOSTER

BRAKE

change occurs in the pedal height while in a depressed state, the brake booster is faulty.



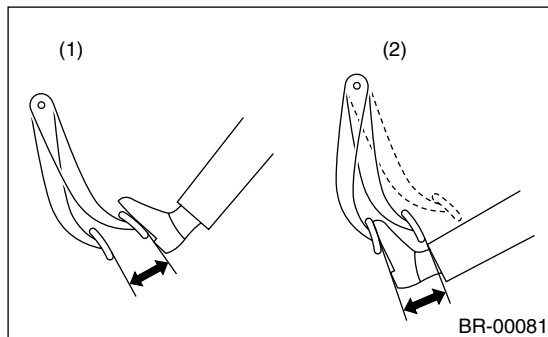
- (1) OK
- (2) NOT OK
- (3) 1st
- (4) 2nd
- (5) 3rd

NOTE:

- In the event of defective operation, inspect the condition of check valve and vacuum hose.
- Replace them if faulty and conduct the test again.
- If no improvement is observed, check precisely with gauges.

• Operation check

1) With the engine off, depress the brake pedal several times applying same pedal force and make sure that pedal height does not vary with each depression of pedal.



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

2) With the brake pedal depressed, start the engine.

3) As the engine starts, the brake pedal should move slightly toward the floor. If no change occurs in the pedal height, the brake booster is faulty.

NOTE:

If faulty, check precisely with gauges.

• Loaded air tightness check

Depress the brake pedal while engine is running, and turn off the engine while pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, the brake booster is functioning normally; if the pedal height increases, it is faulty.

NOTE:

If faulty, check precisely with gauges.

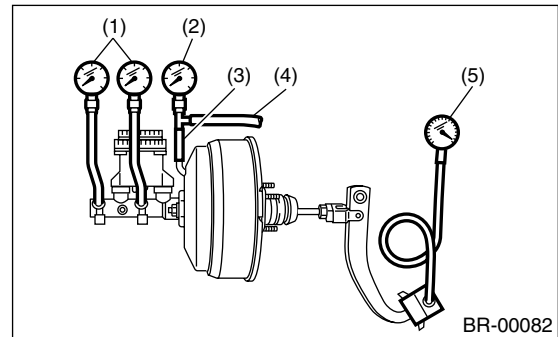
2. OPERATION CHECK (WITH GAUGES)

CAUTION:

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

• Checking with gauges

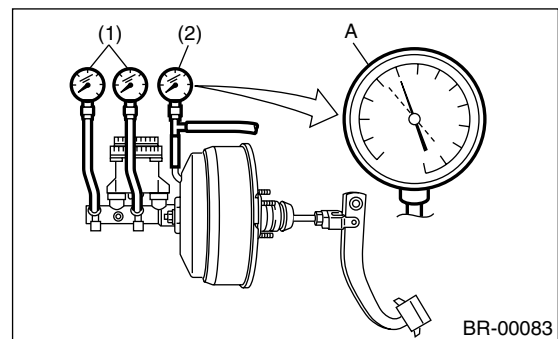
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



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

• Air tightness check

1) Start the engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress the brake pedal.



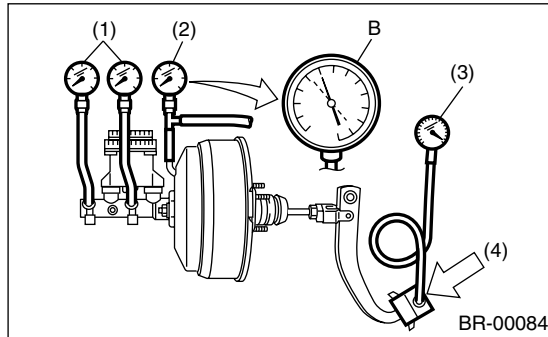
- (1) Pressure gauge
- (2) Vacuum gauge

2) Stop the engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly. If defective, the cause may be one of those listed below.

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

• Loaded air tightness check

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



- (1) Pressure gauge
- (2) Vacuum gauge
- (3) Pedal force gauge
- (4) Depress

2) Stop the engine and watch vacuum gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly. If defective, refer to "AIR TIGHTNESS CHECK".

<Ref. to BR-39, INSPECTION, Brake Booster.>

3) If any fault is found on brake booster, replace the brake booster with a new one.

• Lack of boosting action check

Turn off the engine, and set the vacuum gauge reading at "0". Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Brake pedal force		147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	15"	588 kPa (6 kg/cm ² , 85 psi)	1,471 kPa (15 kg/cm ² , 213 psi)
	16"		
	17"		

• Boosting action check

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

Brake pedal force		147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	15"	5,296 kPa (54 kg/cm ² , 768 psi)	9,120 kPa (93 kg/cm ² , 1,323 psi)
	16"	4,707 kPa (48 kg/cm ² , 683 psi)	
	17"	4,021 kPa (41 kg/cm ² , 583 psi)	8,336 kPa (85 kg/cm ² , 1,209 psi)

10.Brake Fluid

A: INSPECTION

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

B: REPLACEMENT

CAUTION:

- To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
- The FMVSS No. 116, fresh DOT3 brake fluid must be used.
- Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
- Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
- Avoid mixing different brands of brake fluid to prevent degrading the quality of fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

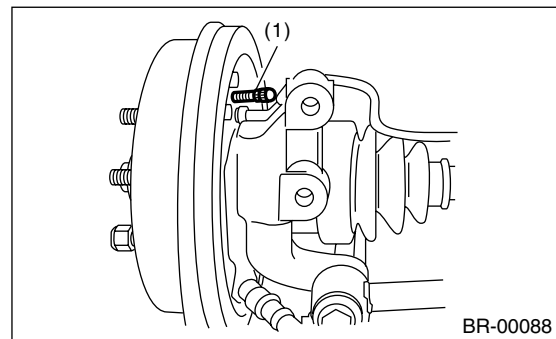
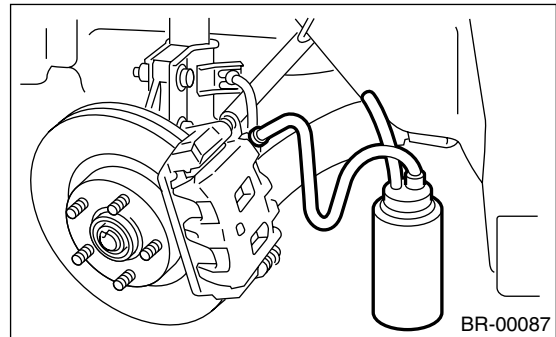
NOTE:

- During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - The brake pedal operating must be very slow.
 - For convenience and safety, two people should do the work.
 - The amount of brake fluid required is approx. 500 ml (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.
- 1) Either lift-up the vehicle and place a safety stand under it, or lift-up vehicle.
 - 2) Remove both front and rear wheels.
 - 3) Draw out the brake fluid from master cylinder with syringe.
 - 4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:

FMVSS No. 116, fresh DOT3 brake fluid

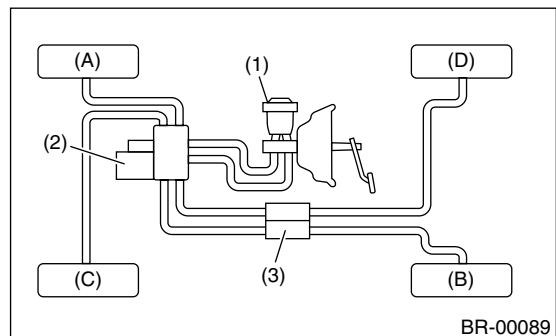
- 5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.



(1) Air bleeder screw

CAUTION:

Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



- (1) Master cylinder
- (2) Hydraulic unit
- (3) Proportioning valve

- 6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
- 7) Loosen the bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.

8) Release the brake pedal slowly. Repeat steps 6) through 8) until there are no air bubbles in the drained brake fluid and new fluid flows through vinyl tube.

NOTE:

Add brake fluid as necessary while performing air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque (Bleeder screw):

Except for 17 inch type:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

17 inch type:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 8) above.

11) Depress the brake pedal with a force of approx. 294 N (30 kg, 66 lb) and hold it there for approx. 20 seconds. At this time check for mix in air and pedal height change. Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.

12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

11. Air Bleeding

A: PROCEDURE

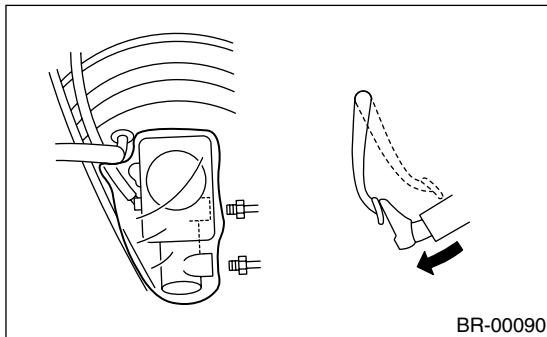
CAUTION:

- The FMVSS No. 116, fresh DOT3 brake fluid must be used.
- Cover the bleeder with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
- Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
- Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

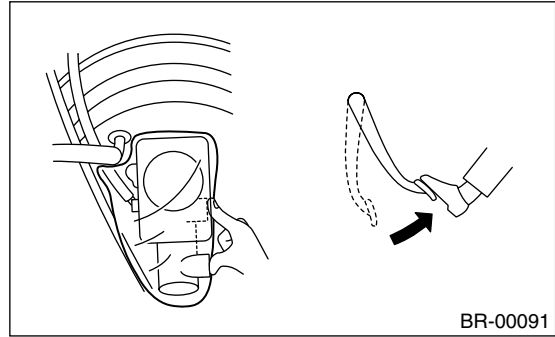
1. MASTER CYLINDER

NOTE:

- If the master cylinder is disassembled or reservoir tank is empty, bleed the master cylinder.
 - During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - The brake pedal operating must be very slow.
 - For convenience and safety, two people should do the work.
- 1) Loosen the wheel nuts, jack-up the vehicle, support it with safety stands, and remove the wheel.
 - 2) Disconnect the brake line at primary and secondary sides.
 - 3) Put a plastic bag cover on master cylinder.
 - 4) Carefully depress and hold the brake pedal.



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



- 6) Repeat step4) and 5) until the brake fluid is completely bled from outlet plug.
- 7) Remove the plastic bag.
- 8) Install the brake pipes to master cylinder.

Tightening torque:

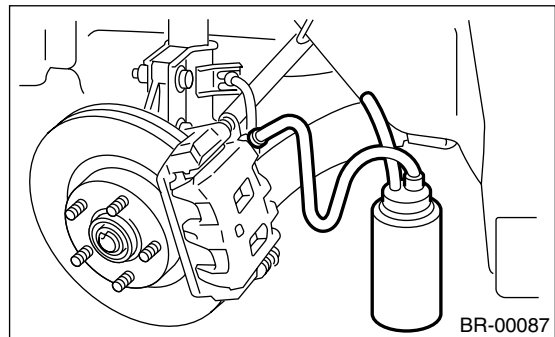
15 N·m (1.5 kgf-m, 10.8 ft-lb)

- 9) Bleed air from the brake line. <Ref. to BR-44, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

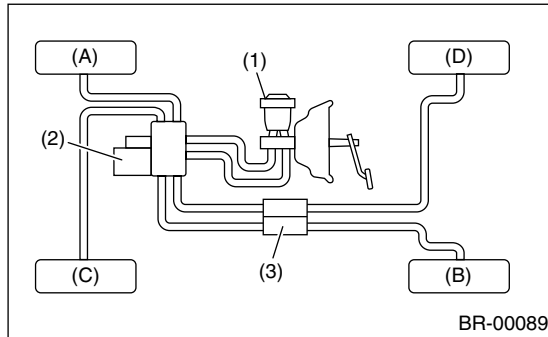
NOTE:

- During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - The brake pedal operating must be very slow.
 - For convenience and safety, two people should do the work.
- 1) Make sure that there is no leak from the joints and connections of brake system.
 - 2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.



CAUTION:

Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



- (1) Master cylinder
- (2) Hydraulic unit
- (3) Proportioning valve

3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.

Release the air bleeder for 1 to 2 seconds.

Next, with the bleeder closed, slowly release the brake pedal.

Repeat these steps until there are no more air bubbles in the vinyl tube.

Allow 3 to 4 seconds between two brake pedal operations.

CAUTION:

Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

NOTE:

The brake pedal operating must be very slow.

4) Tighten the air bleeder securely when no air bubbles are visible.

Air bleeder tightening torque:

Except for 17 inch type:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

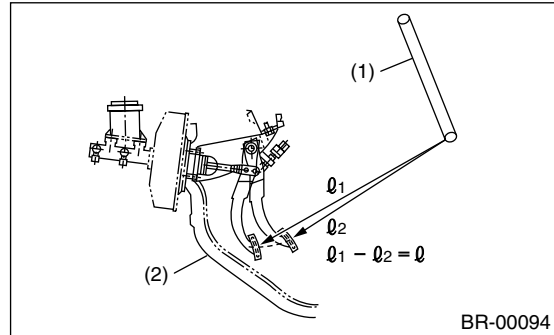
17 inch type:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

5) Perform these steps for the brakes connecting to secondary chamber of master cylinder, first, and then for the ones connecting to primary chamber. With all procedures completed, fully depress the brake pedal and keep it in that position for approx. 20 seconds to make sure that there is no leak evident in the entire system.

6) Check the pedal stroke.

While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must not be more than specified.



- (1) Steering wheel
- (2) Toe board

Specified pedal stroke

WRX AT model: 105 mm (4.13 in)

Except WRX AT model: 90 mm (3.54 in)

When depressing brake pedal with a 490 N (50 kgf, 110 lbf) load.

7) If the distance is more than the specifications, there is a possibility that air is in the brake line. Bleed the brake line until pedal stroke meets the specification.

8) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-9, ABS Sequence Control.>

9) Recheck the pedal stroke.

10) If the distance is more than specifications, there is a possibility air is in the inside of hydraulic unit. Repeat above steps 2) to 9) above until pedal stroke meets the specification.

11) Add brake fluid to the required level (MAX. level) of reservoir tank.

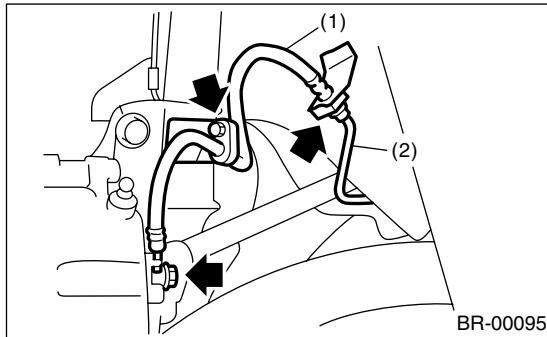
12) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

12.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

- 1) Separate the brake pipe from brake hose.
(Always use the flare nut wrench and be careful not to deform the flare nut.)
- 2) Pull out the clamp to remove brake hose.
- 3) Remove the bolt at strut and union bolt.



- (1) Brake hose
- (2) Brake pipe

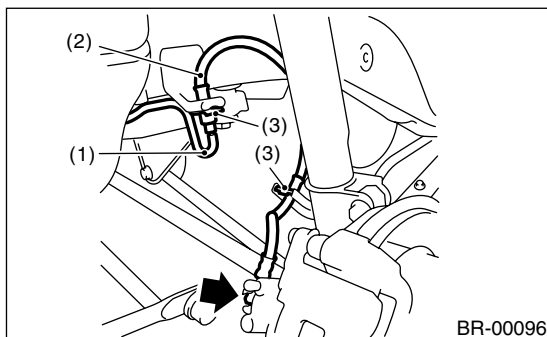
2. REAR BRAKE HOSE

- 1) Separate the brake pipe from brake hose.

NOTE:

Always use the flare nut wrench and be careful not to deform the flare nut.

- 2) Remove the clamp and union bolt.



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

B: INSTALLATION

1. FRONT BRAKE HOSE

- 1) Secure the brake hose to strut.

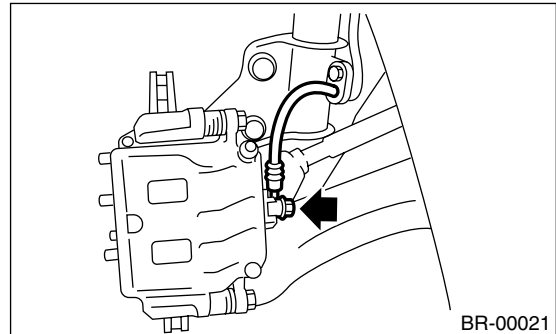
Tightening torque:

32 N·m (3.3 kgf-m, 23.6 ft-lb)

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

Tightening torque (Union bolt):

18 N·m (1.8 kgf-m, 13.0 ft-lb)



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

CAUTION:

Be sure brake hose is not twisted.

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

Tightening torque (Brake pipe flare nut):

15 N·m (1.5 kgf-m, 10.8 ft-lb)

- 7) Bleed air from the brake system.

2. REAR BRAKE HOSE

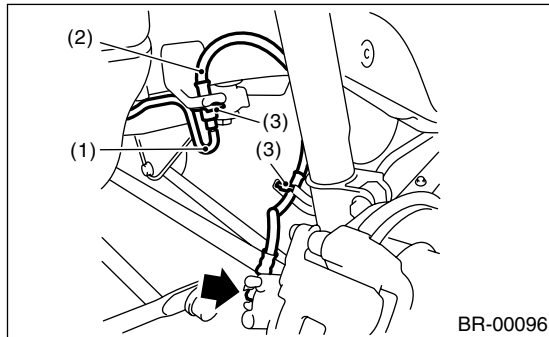
- 1) Pass the brake hose through hole of bracket, and then lightly tighten the flare nut to connect brake pipe.
- 2) Insert the clamp upward to fix brake hose.
- 3) Install the brake hose to caliper using a new gasket.

Tightening torque (Union bolt):

18 N·m (1.8 kgf-m, 13.0 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.

C: INSPECTION

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

13.Brake Pipe

A: REMOVAL

NOTE:

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

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
- When removing the brake pipe, make sure that it is not bent.

B: INSTALLATION

NOTE:

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

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
- When installing the brake pipe, make sure that it is not bent.
- After installing the brake pipe and hose, bleed the air.
- After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

Brake pipe tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the pipe.

NOTE:

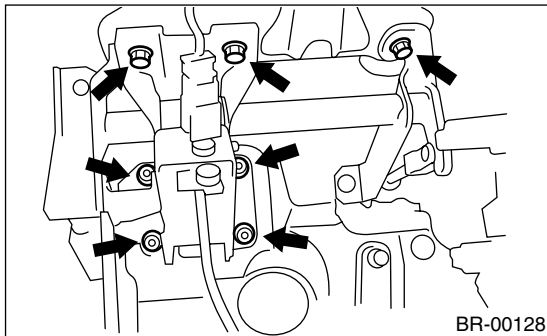
Use a mirror when inspecting low-visible part or back side.

14.Brake Pedal

A: REMOVAL

1. MT MODEL

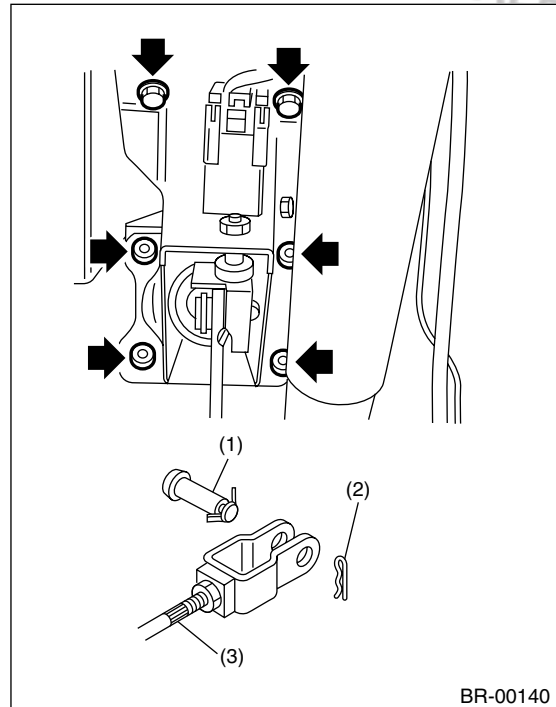
- 1) Remove the steering shaft.
- 2) Disconnect the connectors (for stop light switch, etc.) from pedal bracket.
- 3) Remove the clevis pin which secures the lever to push rod.
- 4) Remove the nut which secures the clutch master cylinder.
- 5) Remove the accelerator pedal.
- 6) Remove the bolts and nuts which the secure pedal bracket.



2. AT MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover from instrument panel.
- 3) Remove the clevis pin which secures the brake pedal to brake booster operating rod. Also disconnect the stop light switch connector.

- 4) Remove the four bolts and four nuts which secure the brake pedal to pedal.



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

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- Always use new clevis pins.

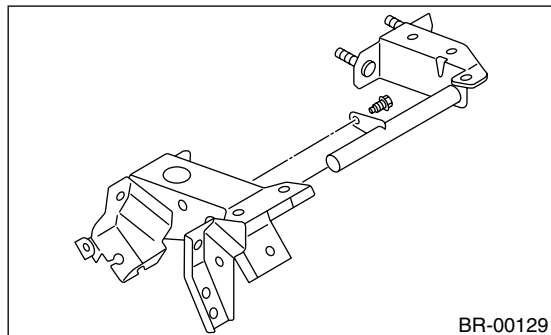
- 2) Adjust the clutch pedal <Ref. to CL-28, ADJUSTMENT, Clutch Pedal.>

- 3) Inspect the brake pedal after installation <Ref. to BR-51, INSPECTION, Brake Pedal.>

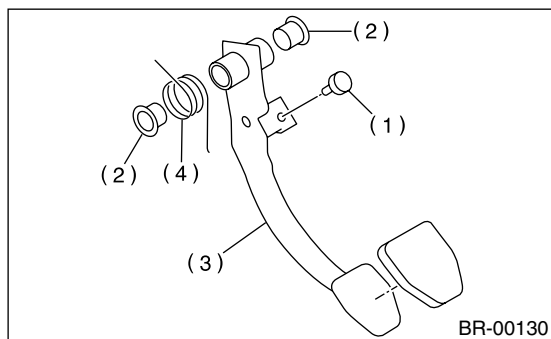
C: DISASSEMBLY

1. 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.

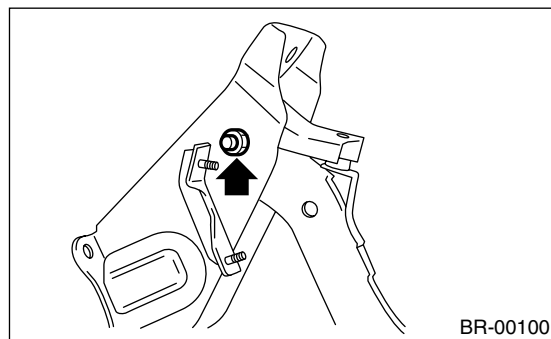


- (1) Stopper
- (2) Bushing
- (3) Brake pedal
- (4) Brake pedal spring

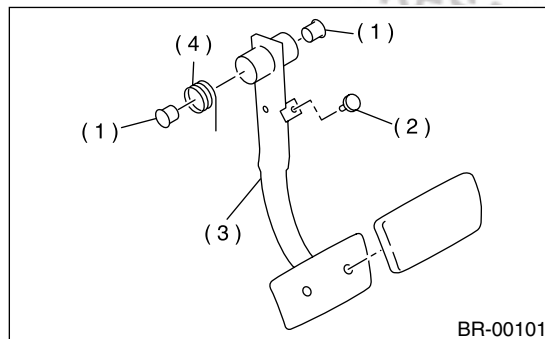
- 5) Remove the brake pedal pad.

2. AT MODEL

- 1) Remove the brake switch.
- 2) Unbolt, and then remove the brake pedal.



- 3) Remove the bushing, spacer and spring.



- (1) Plug
- (2) Stopper
- (3) Brake pedal
- (4) Brake pedal spring

- 4) Remove the brake pedal pad.

D: ASSEMBLY

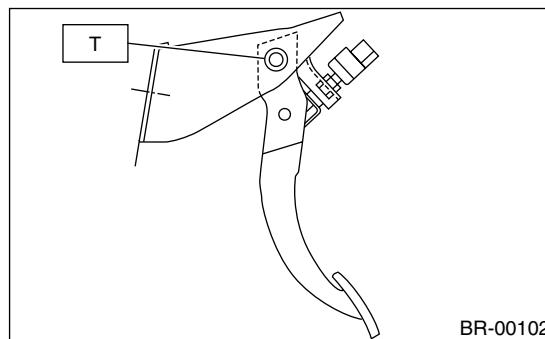
- 1) Attach the stop light switch, etc. to pedal bracket temporarily.
- 2) Clean the inside of bores of clutch pedal and brake pedal, apply grease, and set the bushings into bores.
- 3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring and clutch pedal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

NOTE:

Clean up the inside of bushings and apply grease before installing spacer.

Tightening torque:

T: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



- 4) Adjust the stop light switch position after installing the brake pedal to vehicle.

E: INSPECTION

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

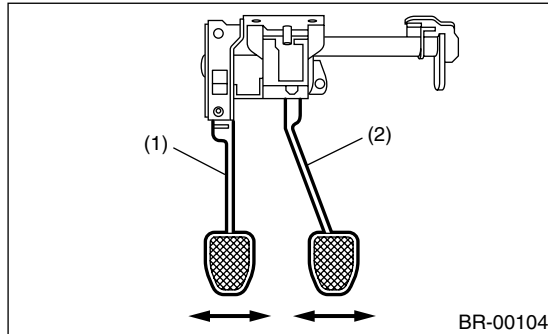
CAUTION:

If excessive deflection is noted, replace the bushings with new ones.

Deflection of brake and clutch pedal:

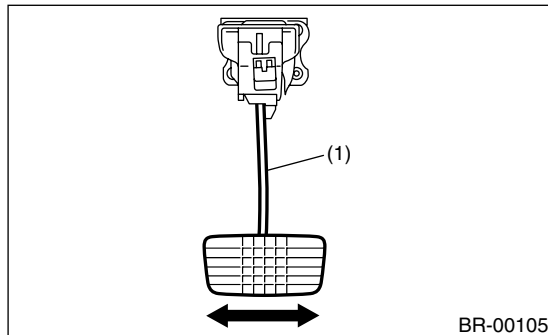
Service limit

5.0 mm (0.197 in) or less



(1) Clutch pedal

(2) Brake pedal



(1) Brake pedal

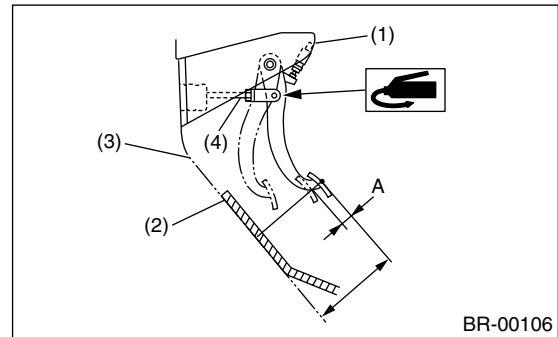
2) Check the position of pedal pad.

Pedal height: L

148 mm (5.83 in)

Brake pedal free play: A

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



(1) Stop light switch

(2) Mat

(3) Toe board

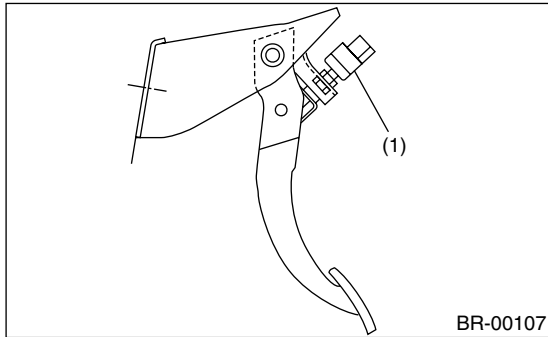
(4) Brake booster operating rod

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

15.Stop Light Switch

A: REMOVAL

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



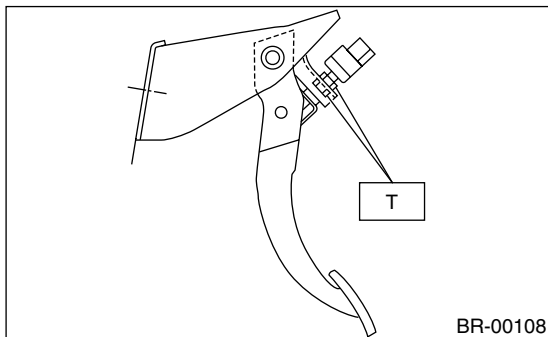
(1) Stop light switch

B: INSTALLATION

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

Tightening torque:

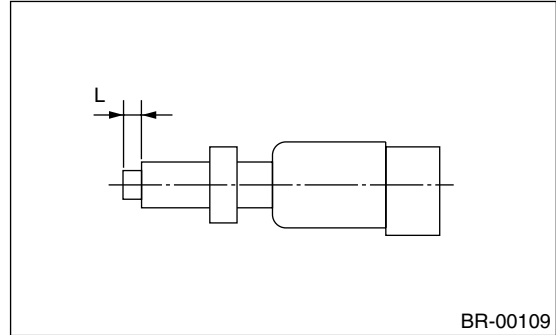
8 N·m (0.8 kgf-m, 5.8 ft-lb)



C: INSPECTION

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

Specified position: L
2 mm (0.079 in)

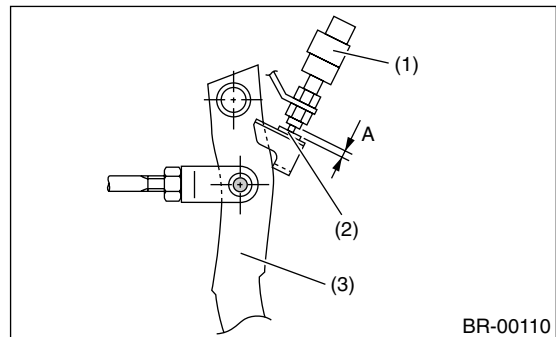


- 2) Measure the clearance between threaded end of stop light switch and stopper.

CAUTION:

Be careful not to rotate stop light switch.

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



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

- 3) If it is not within specified value, adjust it by adjusting position of stop light switch.

CAUTION:

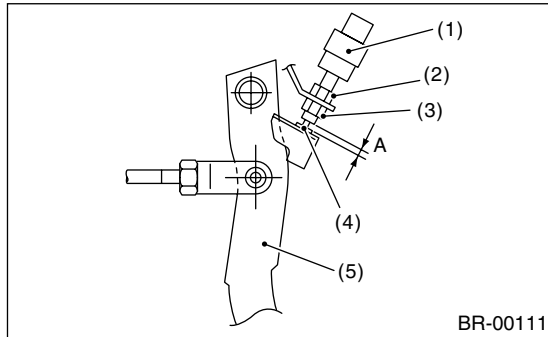
Be careful not to rotate the stop light switch.

D: ADJUSTMENT

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

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



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

NOTE:

Tighten the lock nut B until the clearance between threaded end of stop light switch and stopper becomes 0 mm (0 in). Hold the stop light switch to prevent turning, and then loosen the lock nut B approx. 60°. The clearance (A) will become 0.3 mm (0.012 in).

16. General Diagnostics

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(2) Entry of air into the hydraulic mechanism	Bleed the air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining, drum or rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Drum or rotor eccentricity	Correct or replace the drum or rotor.
	(3) Worn brake drum, or damage to the drum caused by sand	Correct by grinding, or replace.
	(4) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(5) Deformed back plate	Correct or replace.
	(6) Improper tire inflation	Inflate to correct pressure.
	(7) Disordered wheel alignment	Adjust alignment.
	(8) Loosened back plate or the support installing bolts	Retighten.
	(9) Loosened wheel bearing	Retighten to normal tightening torque or replace.
	(10) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
	(11) Uneven effect of the parking brake	Check, adjust, or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed the air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(4) Improperly adjusted shoe clearance	Adjust.
	(5) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Correct or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Wheel bearing faulty	Replace the wheel bearing.
5. Brake noise (1) (creak sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loosened back plate or the support installing bolts	Retighten.
	(4) Loose wheel bearing	Retighten to normal tightening torque.
	(5) Dirty drum or rotor	Clean the drum or rotor, or clean and replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improper installed shoe or pad	Correct or replace the shoe assembly or pad.
	(3) Loose or bent drum or rotor	Retighten or replace.

GENERAL DIAGNOSTICS

BRAKE

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

GENERAL DIAGNOSTICS

BRAKE

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DIFFERENTIALS

GENERAL DESCRIPTION

DIFFERENTIALS

1. General Description

A: SPECIFICATIONS

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

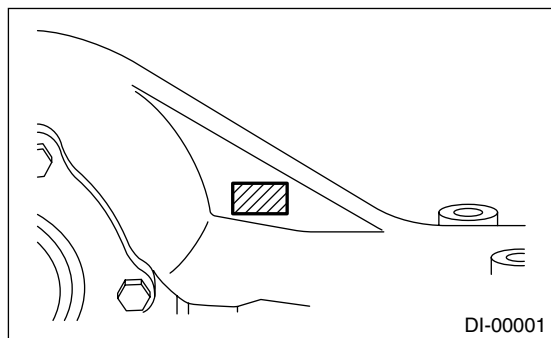
NOTE:

Using the different rear differential assembly causes the drive line and tires to “drag” or emit abnormal noise when AWD is selected.

MODEL	2.5 L				2.0 L Turbo	
	AT		MT		AT	MT
	Wagon	Sedan	Wagon	Sedan		
Rear differential type	T-type model without LSD				T-type model with LSD	
LSD type	—				Viscous coupling	
Identification	EH	EL	EG	EH	EJ	EF
Type of gear	Hypoid gear					
Gear ratio (Number of gear teeth)	4.111 (37/9)	4.444 (37/9)	3.900 (39/10)	4.111 (37/9)		3.545 (39/11)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)					
Rear differential gear oil	GL-5					

MODEL	2.5 L Turbo STi
	6MT
Rear differential type	T-type model with LSD
LSD type	Mechanical
Identification	HK
Type of gear	Hypoid gear
Gear ratio (Number of gear teeth)	3.900 (39/10)
Oil capacity	0.9 — 1.1 ℓ (1.0 — 1.2 US qt, 0.8 — 1.0 Imp qt)
Rear differential gear oil	GL-5 (For mechanical LSD)

• Identification

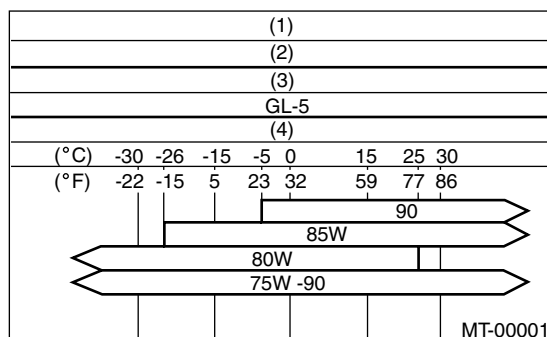


• Rear differential gear oil

Recommended oil

CAUTION:

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



- (1) Item
- (2) Differential gear oil
- (3) API Classification
- (4) SAE Viscosity NO. and Application Temperature

1. SERVICE DATA

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	Except STi model	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
	STi model	24.1 — 38.6 (2.5 — 3.9, 5.4 — 8.7)
Side gear backlash mm (in)		0.10 — 0.20 (0.0039 — 0.0079)
Side bearing standard width mm (in)		20.00 (0.7874)
Crown gear to drive pinion backlash mm (in)		0.10 — 0.20 (0.0039 — 0.0079)
Crown gear runout on its back surface mm (in)		Less than 0.05 (0.0020)

2. ADJUSTING PARTS

• Except STi model

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

GENERAL DESCRIPTION

DIFFERENTIALS

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

• STi model

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

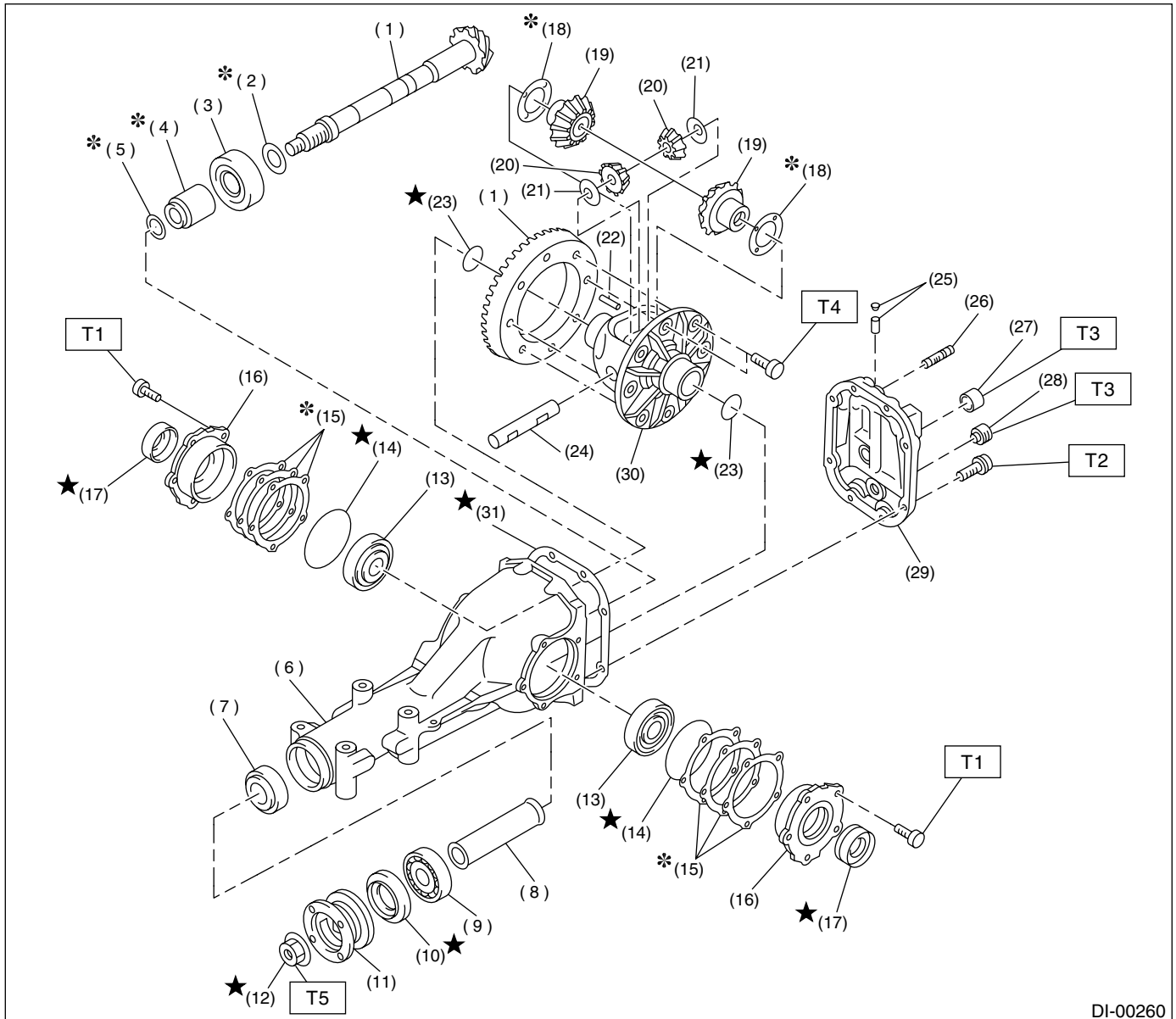
GENERAL DESCRIPTION

DIFFERENTIALS

Preload adjusting washer	Part No.	Length mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
Pinion height adjusting shim	Part No.	Length mm (in)
	38336AA230	3.09 (0.1217)
	38336AA240	3.12 (0.1228)
	38336AA250	3.15 (0.1240)
	38336AA260	3.18 (0.1252)
	38336AA270	3.21 (0.1264)
	38336AA280	3.24 (0.1276)
	38336AA290	3.27 (0.1287)
	38336AA300	3.30 (0.1299)
	38336AA310	3.33 (0.1311)
	38336AA320	3.36 (0.1323)
	38336AA330	3.39 (0.1335)
	38336AA340	3.42 (0.1346)
	38336AA350	3.45 (0.1358)
	38336AA360	3.48 (0.1370)
	38336AA370	3.51 (0.1382)
	38336AA380	3.54 (0.1394)
	38336AA390	3.57 (0.1406)
	38336AA400	3.60 (0.1417)
	38336AA410	3.63 (0.1429)
	38336AA420	3.66 (0.1441)
Side bearing standard width mm (in)	20.00 (0.7874)	
Side bearing retainer shim	Part No.	Thickness mm (in)
	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)
Crown gear to drive pinion backlash mm (in)	Limit	0.10 — 0.20 (0.0039 — 0.0079)
Crown gear runout on its back surface mm (in)		0.05 (0.0020)

B: COMPONENT

1. REAR DIFFERENTIAL WITHOUT LSD



DI-00260

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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 10.3 (1.05, 7.6)

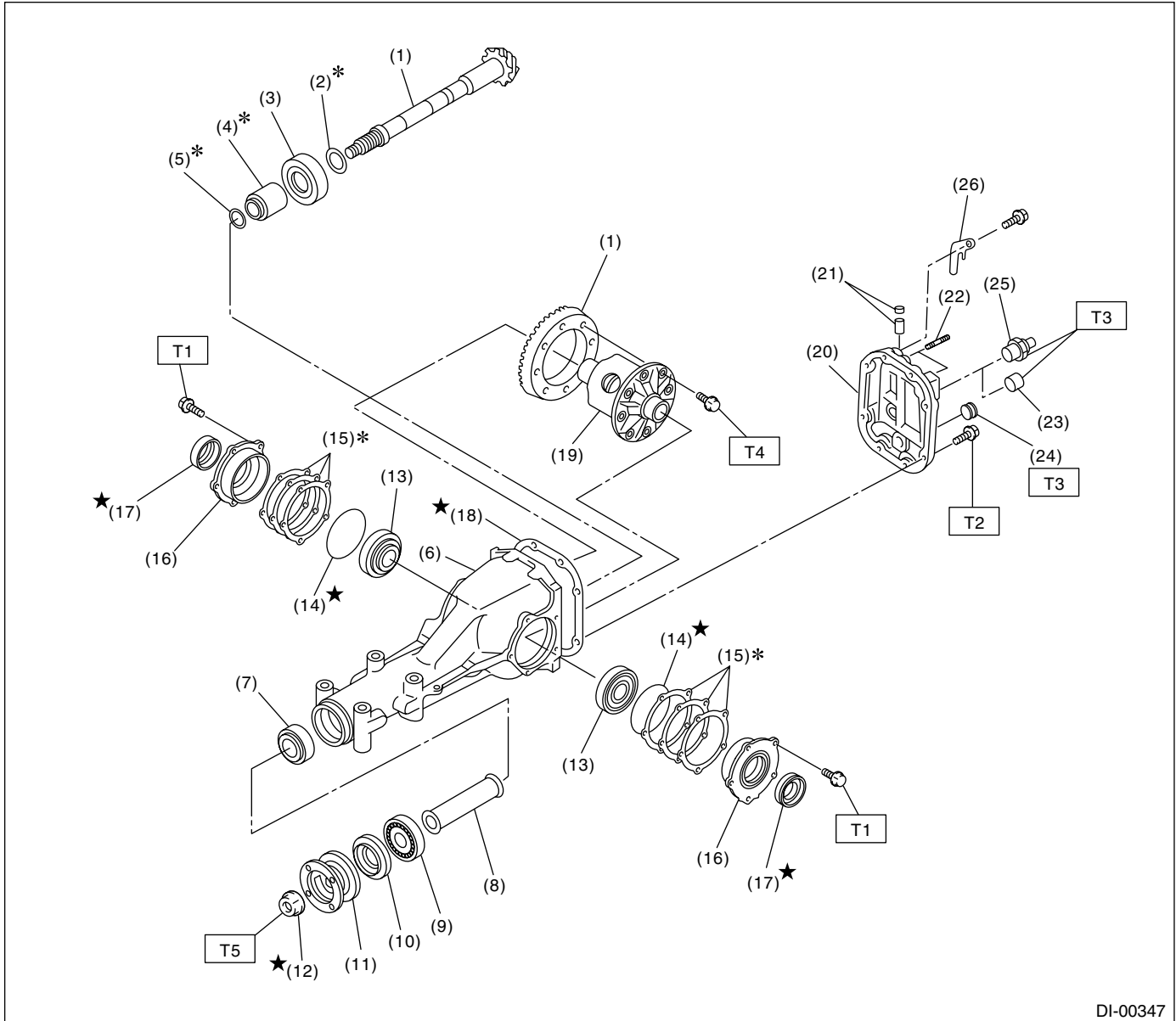
T2: 29 (3.0, 21.7)

T3: 49 (5.0, 36.2)

T4: 105 (10.7, 77.4)

T5: 181 (18.5, 134)

2. REAR DIFFERENTIAL WITH LSD



DI-00347

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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 10.3 (1.05, 7.6)

T2: 29 (3.0, 21.7) (Except for STi model)

44 (4.5, 32.5) (STi model)

T3: 49 (5.0, 36.2)

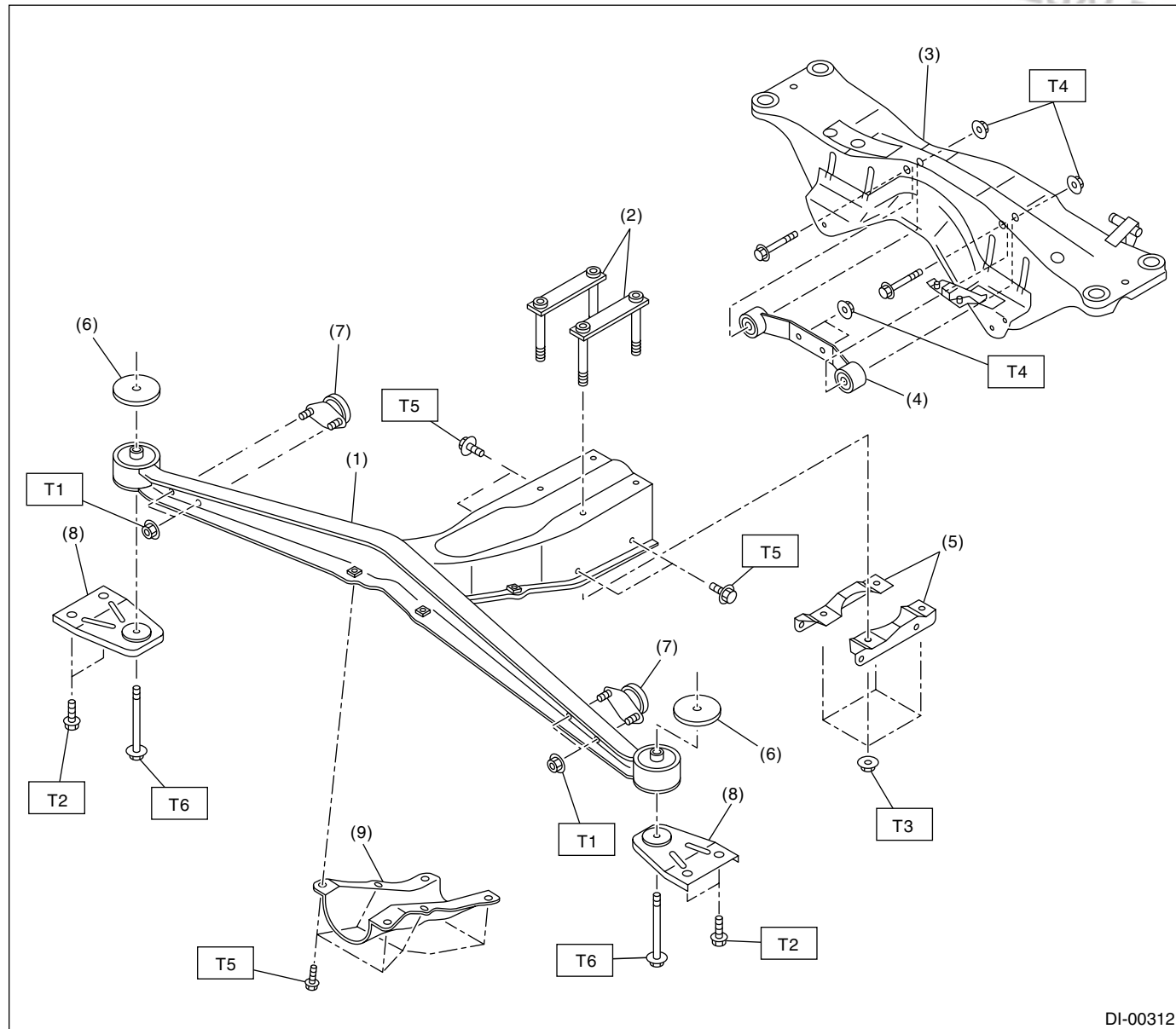
T4: 105 (10.7, 77.4)

T5: 181 (18.5, 134)

GENERAL DESCRIPTION

DIFFERENTIALS

3. REAR DIFFERENTIAL MOUNTING SYSTEM



DI-00312

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

Tightening torque: N-m (kgf-m, ft-lb)

T1: 20 (2.0, 14.5)

T2: 33 (3.4, 24.3)

T3: 65 (6.6, 47.9)

T4: 70 (7.1, 51.6)

T5: 90 (9.2, 66.4)

T6: 100 (10.2, 73.8)

C: CAUTION

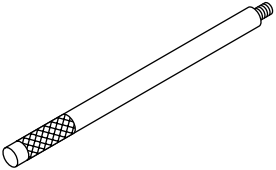
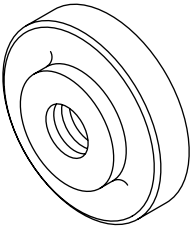
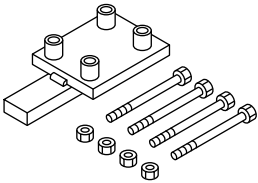
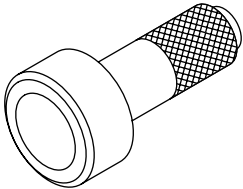
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation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

GENERAL DESCRIPTION

DIFFERENTIALS

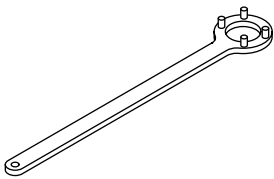
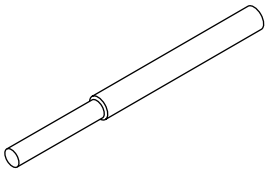
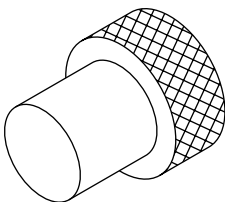
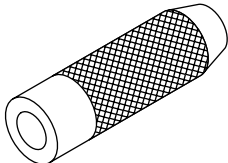
D: PREPARATION TOOL

1. SPECIAL TOOLS

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

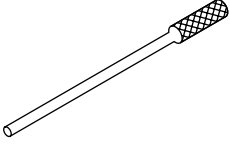
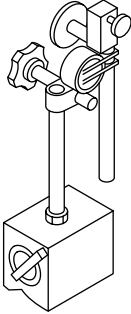
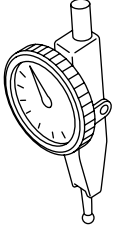
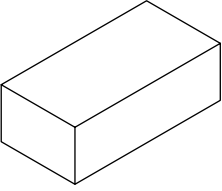
GENERAL DESCRIPTION

DIFFERENTIALS

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

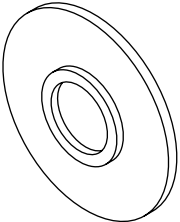
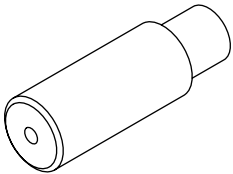
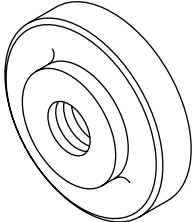
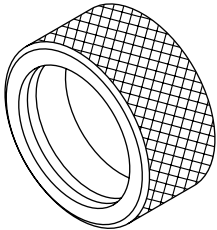
GENERAL DESCRIPTION

DIFFERENTIALS

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

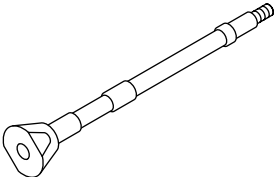
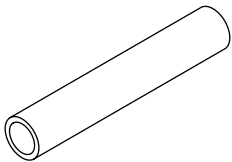
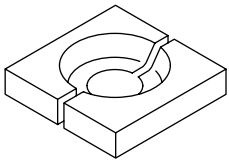
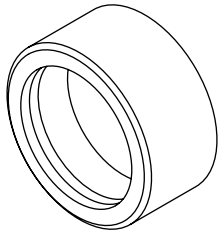
GENERAL DESCRIPTION

DIFFERENTIALS

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

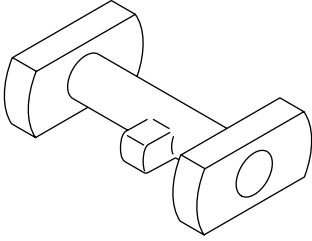
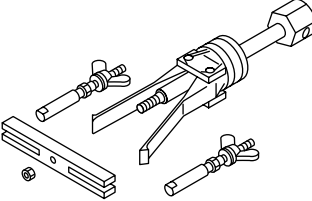
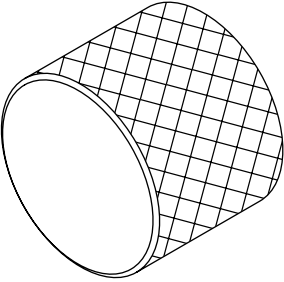
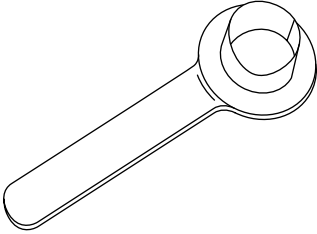
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 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.
 ST-398487700	398487700	DRIFT	Used for press-fitting the side bearing cone.

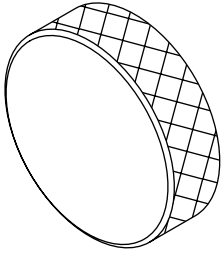
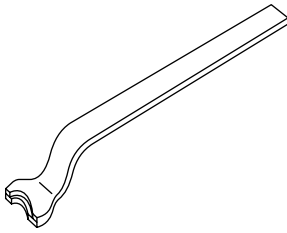
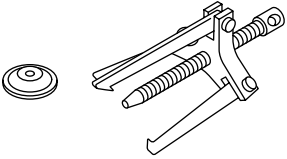
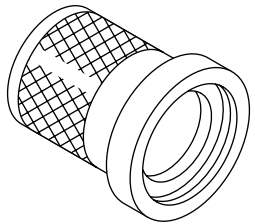
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 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-398227700	398227700	WEIGHT	Used for installing side bearing.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	- Used for installing rear drive shaft into rear differential. - For protecting oil seal.

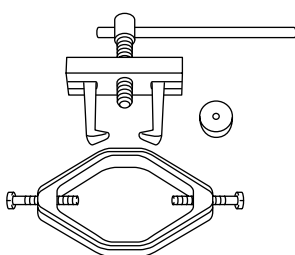
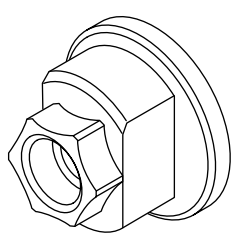
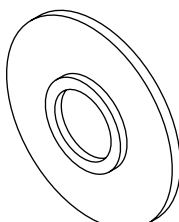
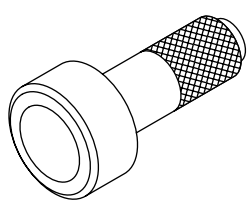
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398237700	398237700	GAUGE	Used for installing side bearing.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-899874100	899874100	INSTALLER	Used for installing companion flange.

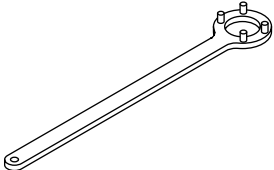
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18759AA000	18759AA000 (Newly adopted tool)	PULLER ASSY	Used for removing side bearing cone of differential.
 ST-498937110	498937110	HOLDER DRIVE PINION (This special tool is used for current automatic transmission.)	• Used for installing pilot bearing. • For STi model.
 ST18674AA000	18674AA000 (Newly adopted tool)	INSTALLER	• Used for installing rear bearing cone. • For STi model.
 ST-398417700	398417700	DRIFT (This special tool was prepared for the vehicles of 92MY and before.)	• Used for installing side bearing race. • For STi model.

GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18633AA000	18633AA000 (Newly adopted tool)	WRENCH COMPL	- Used for stopping rotating of companion flange when loosening and tightening self-locking nut. - For STi model.

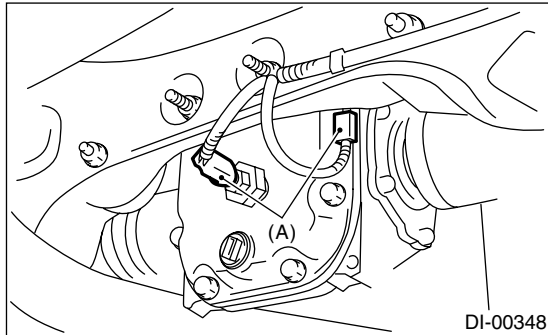
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Transmission jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer.
Thickness gauge	Used for measuring clearance.

2. Differential Gear Oil

A: INSPECTION

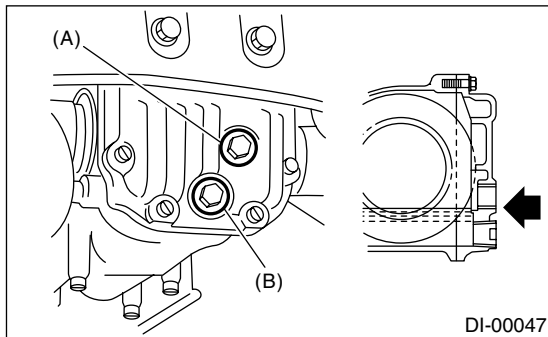
1) Disconnect the oil temperature switch connector. (STi model)



(A) Connector

2) Remove the filler plug or rear differential oil temperature switch and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. <Ref. to DI-19, REPLACEMENT, Differential Gear Oil.>

3) Check the gear oil level is up to the bottom part of filler bolt. If the level is low, refill up to the bottom of filler bolt.

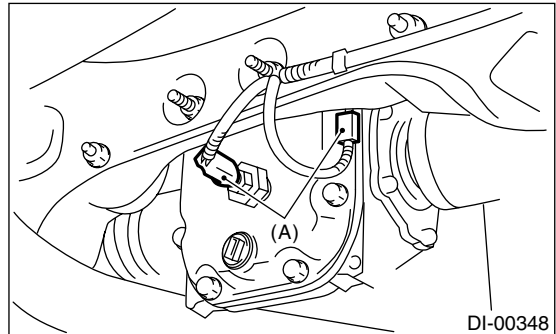


(A) Filler plug
(B) Drain plug

B: REPLACEMENT

1) Jack-up the vehicle and support it with sturdy racks.

2) Disconnect the oil temperature switch connector. (STi model)

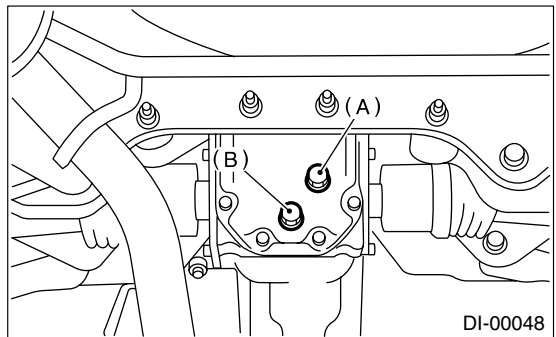


(A) Connector

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

CAUTION:

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



(A) Filler plug
(B) Drain plug

4) Tighten the oil drain plug.

NOTE:

Apply fluid packing to the drain plug.

Fluid packing:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

49 N·m (5.0 kgf-m, 36.2 ft-lb)

DIFFERENTIAL GEAR OIL

DIFFERENTIALS

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

NOTE:

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

Recommended oil:

Except for STi model:

GL-5 (75W-90) or equivalent

STi model:

GEAR OIL LSD (Part No. K0904AA080) or equivalent

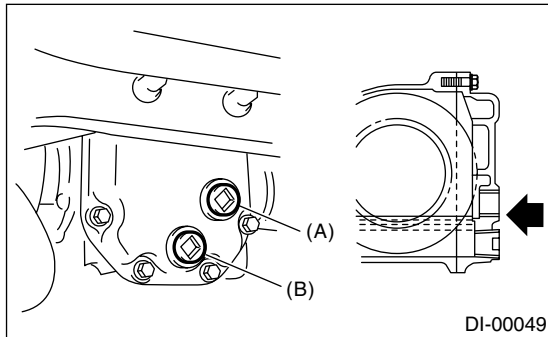
Oil capacity:

Except STi model:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)

STi model:

0.9 — 1.1 ℓ (1.0 — 1.2 US qt, 0.8 — 1.0 Imp qt)



(A) Filler plug

(B) Drain plug

6) Install the filler plug or rear differential oil temperature switch.

NOTE:

Apply fluid packing to the filler plug or rear differential oil temperature switch.

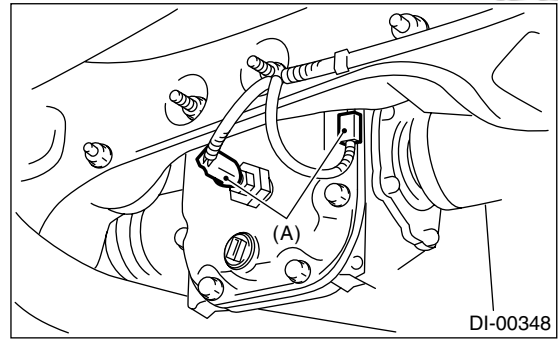
Fluid packing:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

49 N·m (5.0 kgf-m, 36.2 ft-lb)

7) Connect the oil temperature switch connector. (STi model)



(A) Connector

3. Front Differential

A: NOTE

1. AT MODEL

For front differential of AUTOMATIC TRANSMISSION, refer to "AT" section. <Ref. to 4AT-108, Front Differential.>

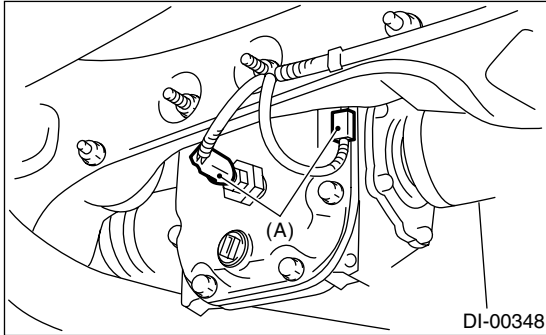
2. MT MODEL

For front differential of manual transmission, refer to "5MT" or "6MT" section. <Ref. to 5MT-68, Front Differential Assembly.> or <Ref. to 6MT-103, Front Differential Assembly.>

4. Rear Differential

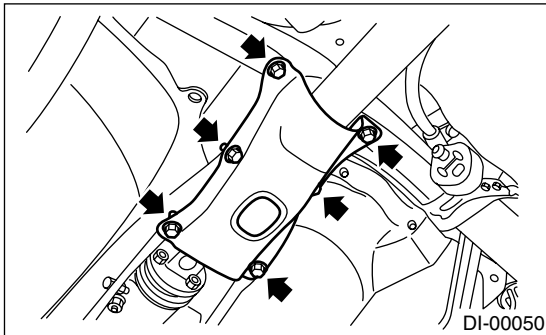
A: REMOVAL

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



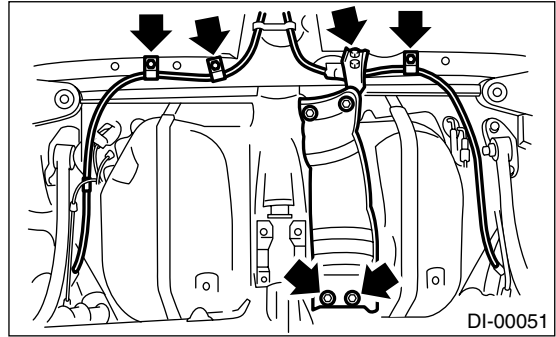
(A) Connector

- 9) Remove the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
DOHC Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
- 10) Remove the heat shield cover. (If equipped)
- 11) Remove the front cover of rear differential mount.

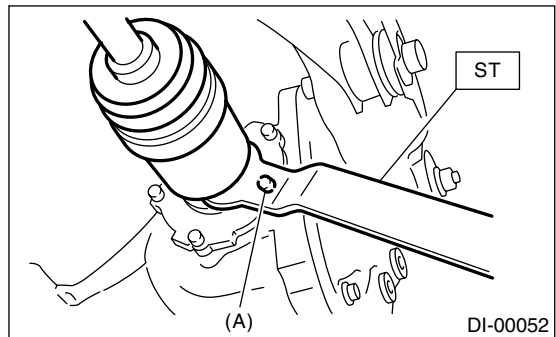


- 12) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
- 13) Remove the rear differential protector. (If equipped)

- 14) Remove the clamps and bracket of parking brake cable.

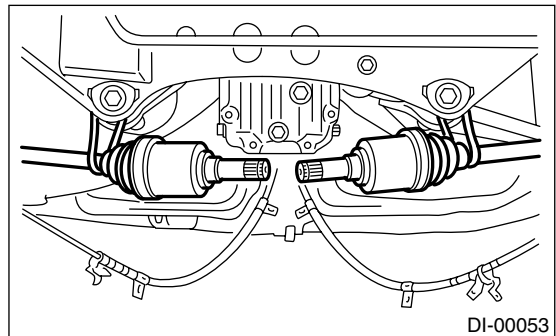


- 15) Remove the DOJ of rear drive shaft from rear differential using ST. <Ref. to DI-50, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA100 DRIVE SHAFT REMOVER

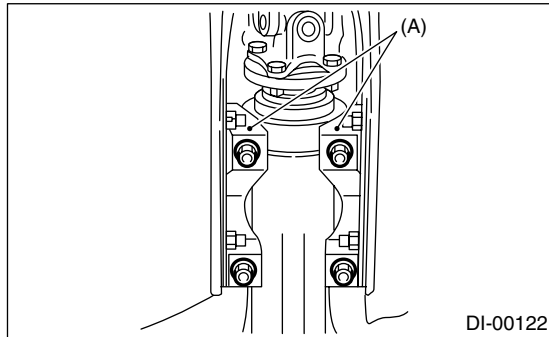


(A) Bolt

- 16) Secure the rear drive shaft to rear crossmember using wire.

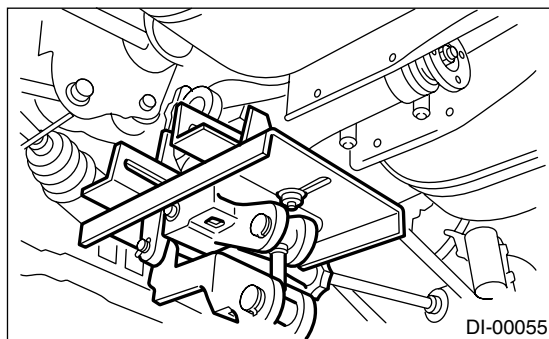


17) Remove the lower bracket.

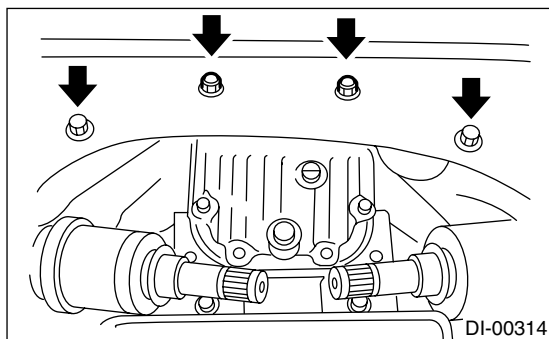


(A) Lower bracket

18) Support the rear differential with transmission jack.



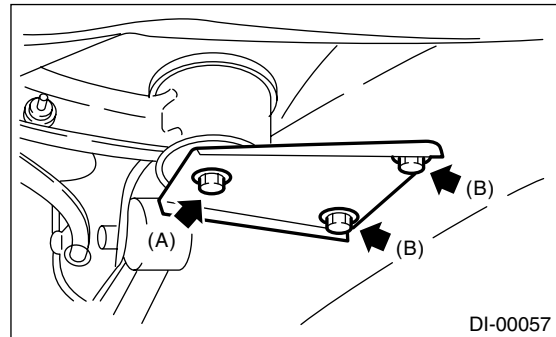
19) Remove the self-locking nuts and bolts.



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

NOTE:

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

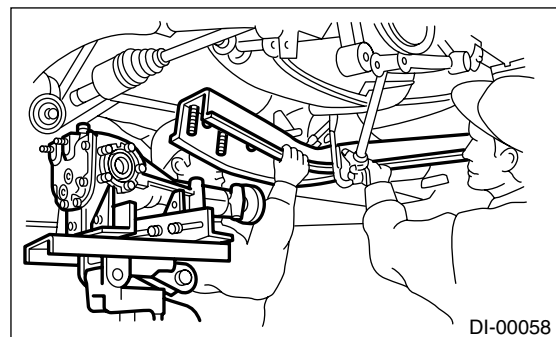


(A) Bolt A

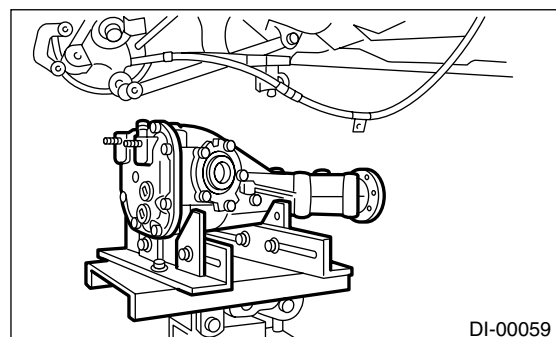
(B) Bolt B

21) Remove the bolt A.

22) While slowly lowering the transmission jack, move the rear differential forward and remove front member and rear differential from vehicle.



23) Remove the rear differential from vehicle.



B: INSTALLATION

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

NOTE:

Be sure to install a new air breather cap.

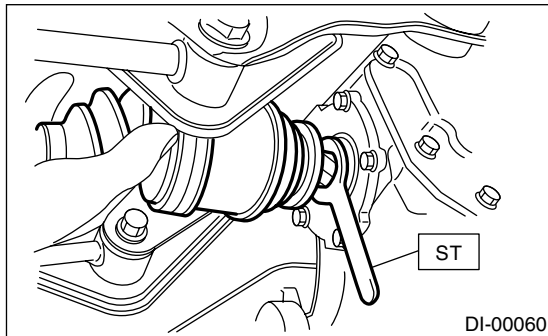
2) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:

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

3) Install the DOJ of drive shaft into rear differential. <Ref. to DI-50, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



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

5) After installation, fill the differential carrier with gear oil to the filler plug level. <Ref. to DI-19, Differential Gear Oil.>

C: DISASSEMBLY

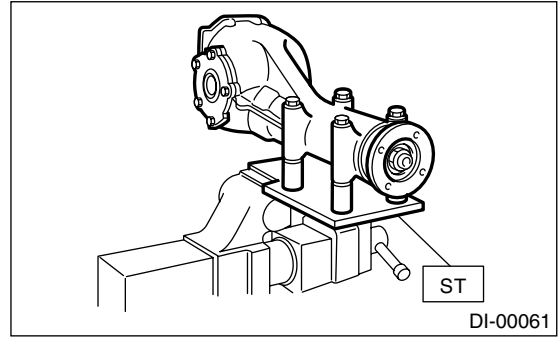
1. EXCEPT STi MODEL

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

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

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

ST 398217700 ATTACHMENT

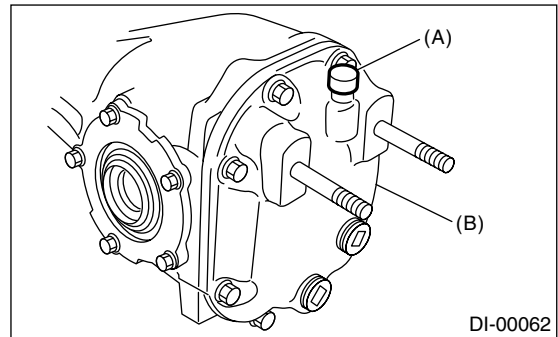


2) Drain the gear oil by removing the plug.

3) Remove the air breather cap.

NOTE:

- Do not attempt to remove the air breather cap if unnecessary.
- When removing the air breather cap, replace the air breather cap with a new one.



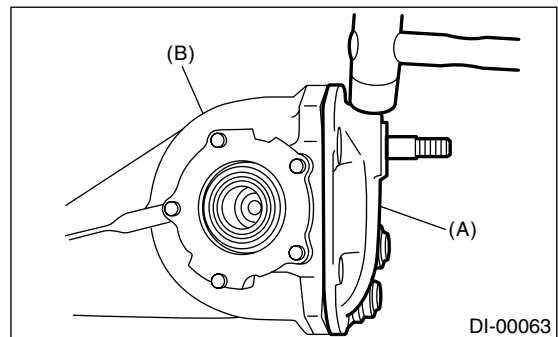
(A) Air breather cap

(B) Rear cover

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

NOTE:

Remove it by tapping with plastic hammer.



(A) Rear cover

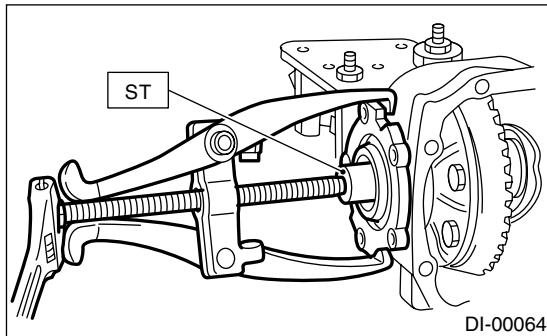
(B) Differential carrier

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

NOTE:

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

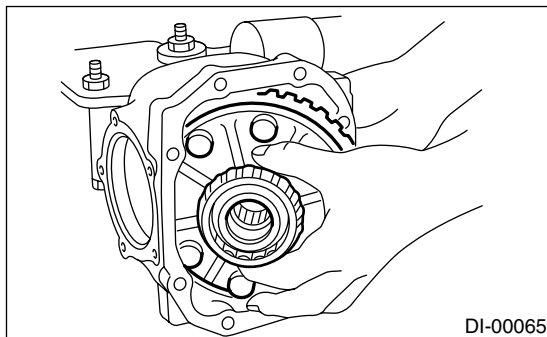
ST 398457700 ATTACHMENT



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

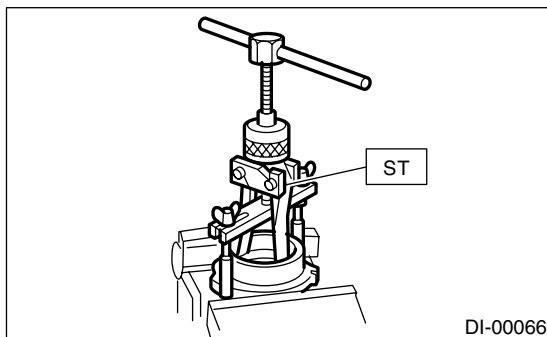
NOTE:

Be careful not to hit the teeth against the case.



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

ST 398527700 PULLER ASSY

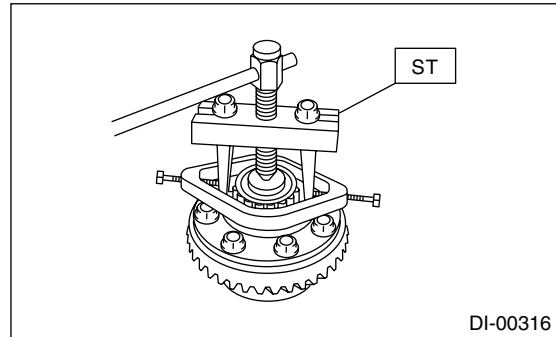


8) Extract the bearing cone with ST.

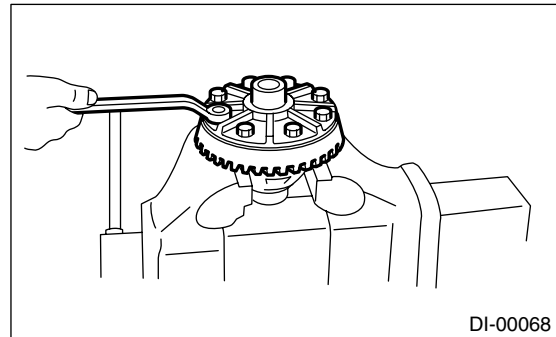
NOTE:

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

ST 18759AA000 PULLER ASSY



9) Remove the crown gear by loosening the crown gear bolts.

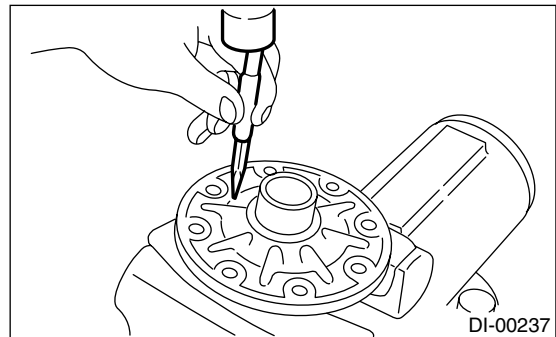


10) Drive out the pinion shaft lock pin from crown gear side. (Model without LSD)

NOTE:

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

ST 899904100 STRAIGHT PIN REMOVER



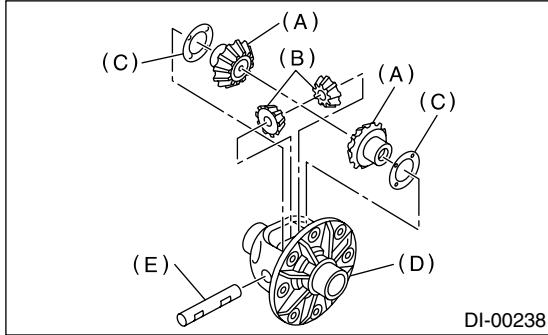
REAR DIFFERENTIAL

DIFFERENTIALS

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

NOTE:

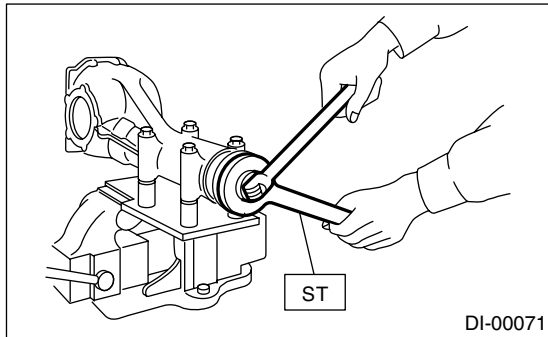
The gears as well as thrust washers should be marked or kept separated right and left, front and rear.



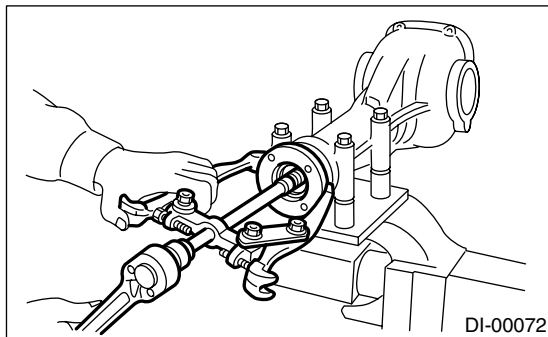
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

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

ST 498427200 FLANGE WRENCH



13) Extract the companion flange with a puller.

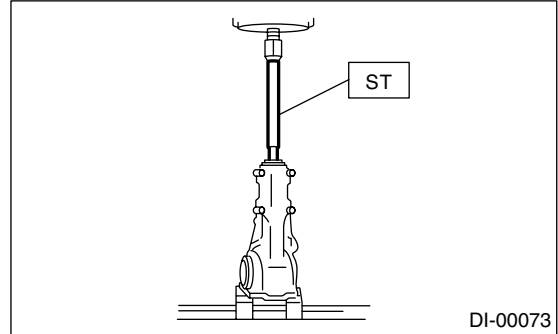


14) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

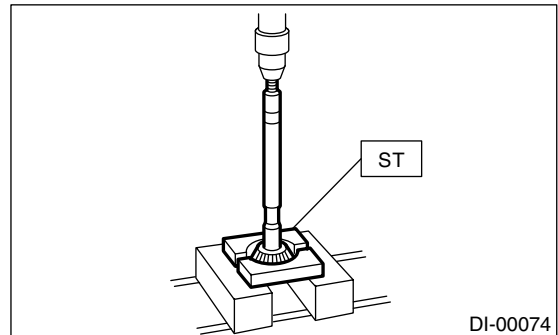


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:

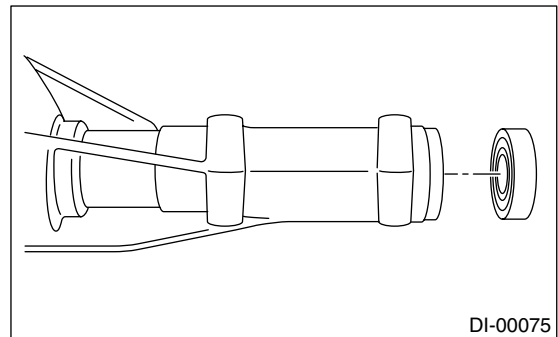
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



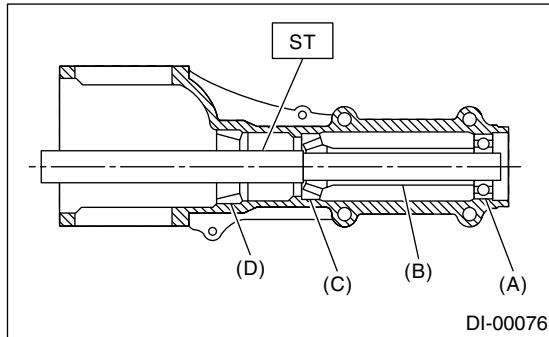
16) Remove the front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



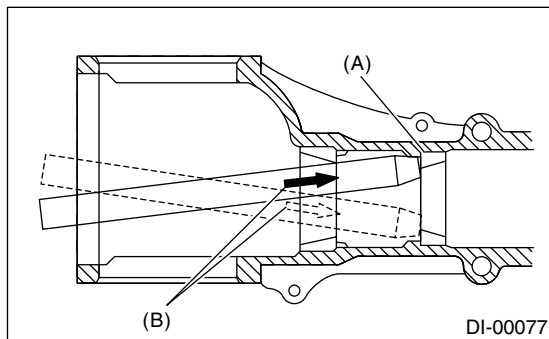
17) Remove the pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT



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

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



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

2. STi MODEL

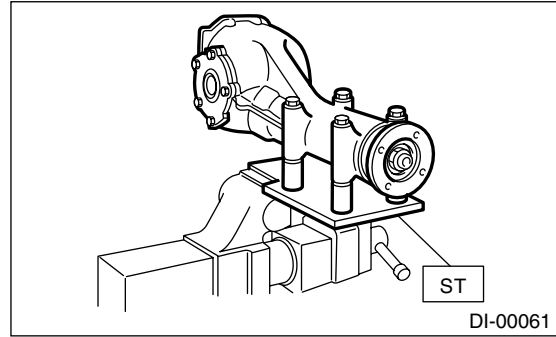
To detect the real cause of trouble, inspect the following items before disassembling.

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

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

ST 398217700

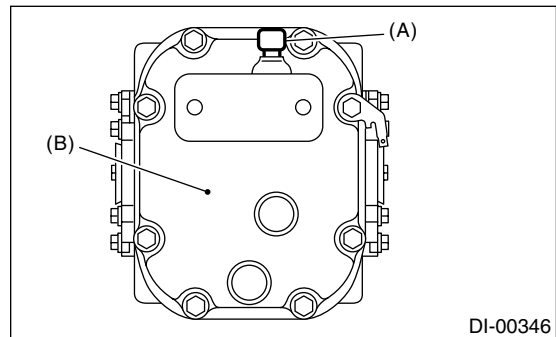
ATTACHMENT



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

NOTE:

- Do not attempt to remove the air breather cap if unnecessary.
- When removing the air breather cap, replace the air breather cap with a new one.

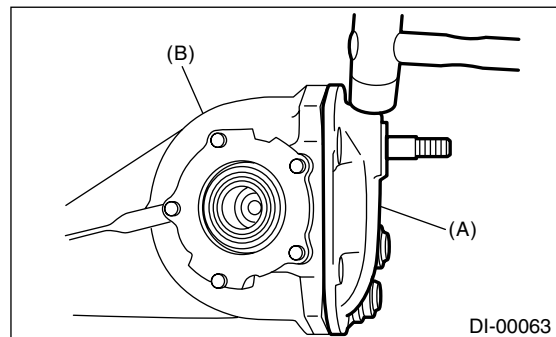


- (A) Air breather cap
- (B) Rear cover

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

NOTE:

Remove it by tapping with plastic hammer.



- (A) Rear cover
- (B) Differential carrier

REAR DIFFERENTIAL

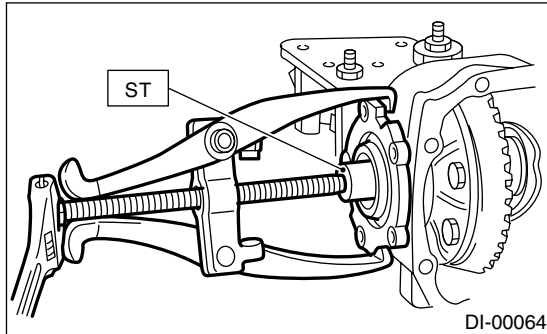
DIFFERENTIALS

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

NOTE:

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

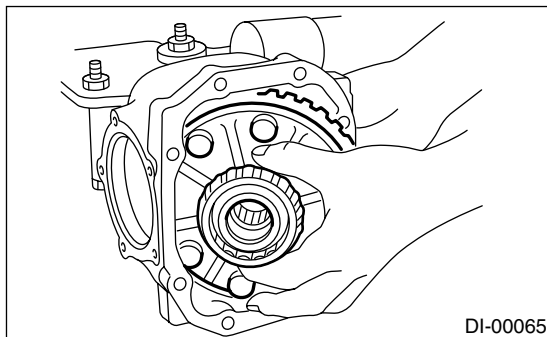
ST 398457700 ATTACHMENT



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

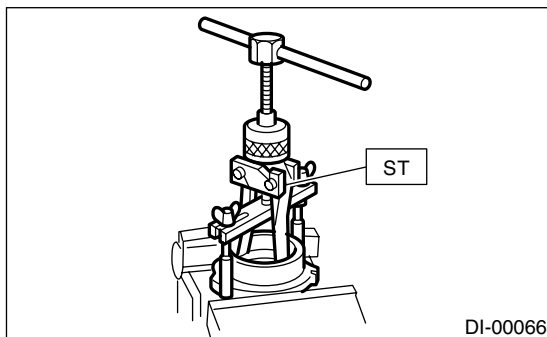
NOTE:

Be careful not to hit the teeth against the case.



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

ST 398527700 PULLER ASSY

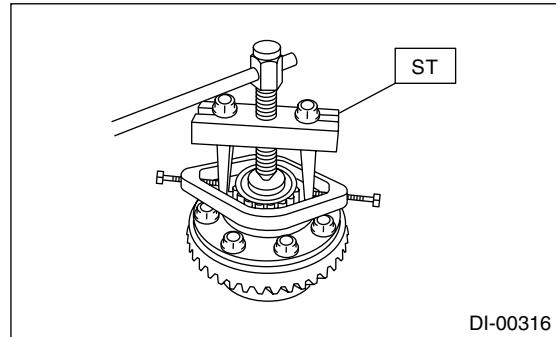


8) Extract the bearing cone with ST.

NOTE:

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

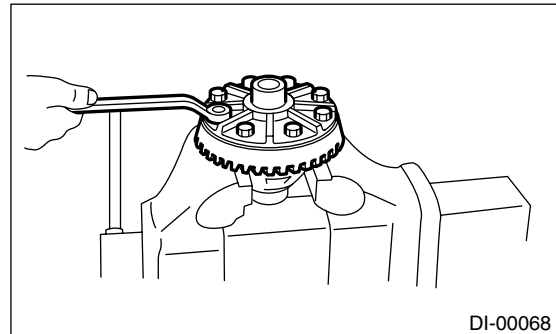
ST 18759AA000 PULLER ASSY



9) Remove the crown gear by loosening the crown gear bolts.

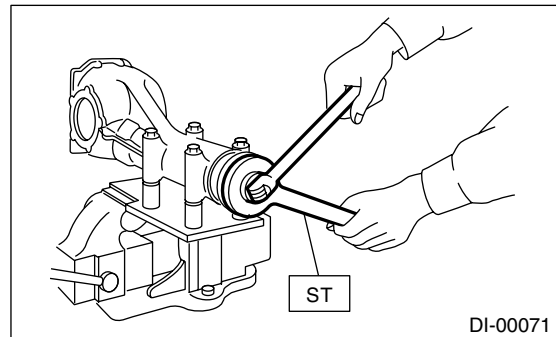
NOTE:

Disassembling the differential case is not allowed.

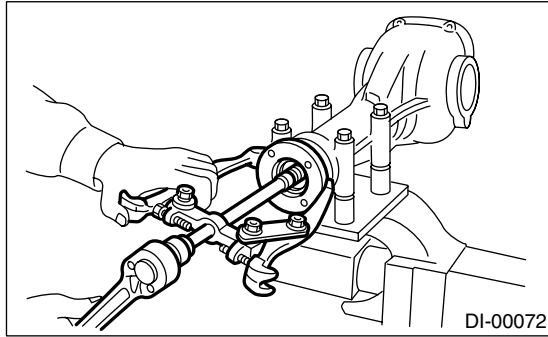


10) Hold the companion flange with ST and remove the drive pinion nut.

ST 18633AA000 WRENCH COMPL



11) Extract the companion flange with a puller.

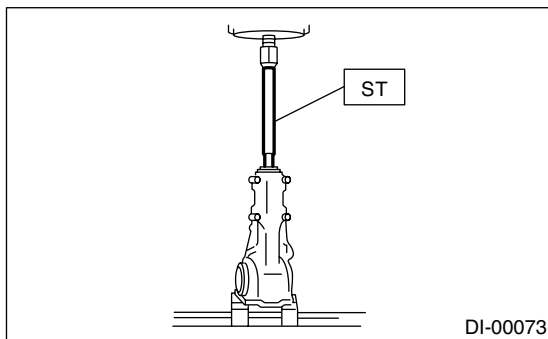


12) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

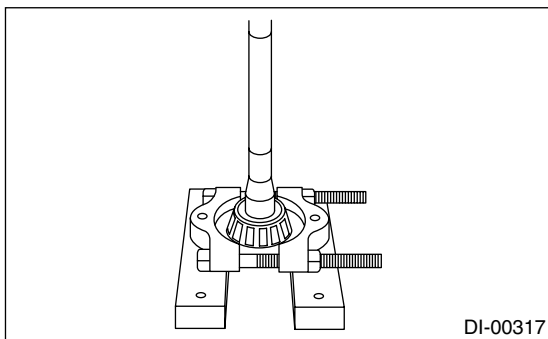
NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

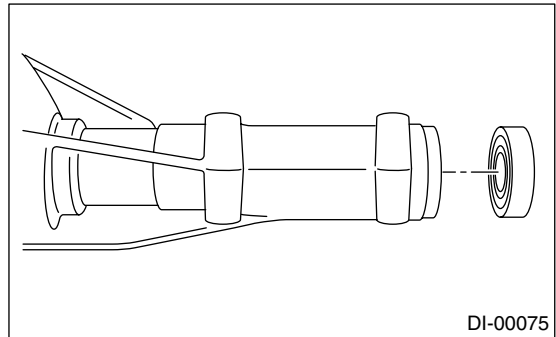


13) Remove the rear bearing cone from drive pinion.



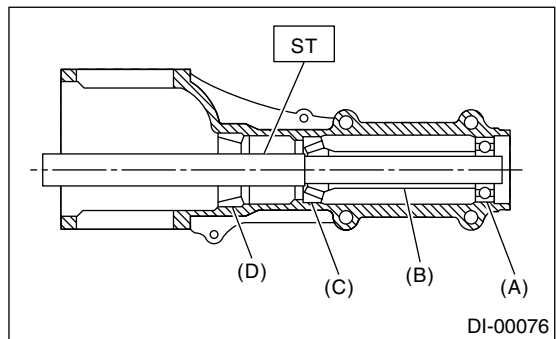
14) Remove the front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



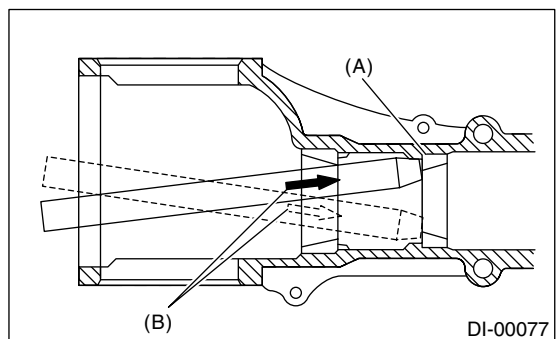
15) Remove the pilot bearing together with front bearing cone and spacer using ST.

ST 398467700 DRIFT



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

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



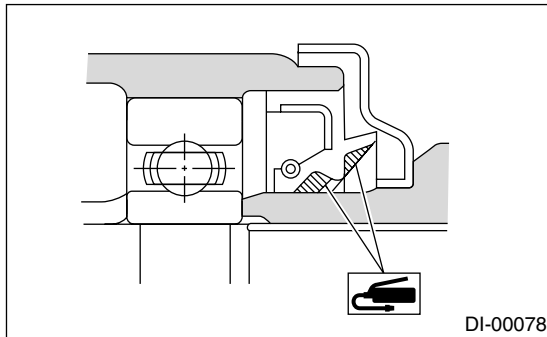
- (A) 2 cutouts along diagonal lines
- (B) Hit out alternately with brass bar.

D: ASSEMBLY

1. EXCEPT STi MODEL

NOTE:

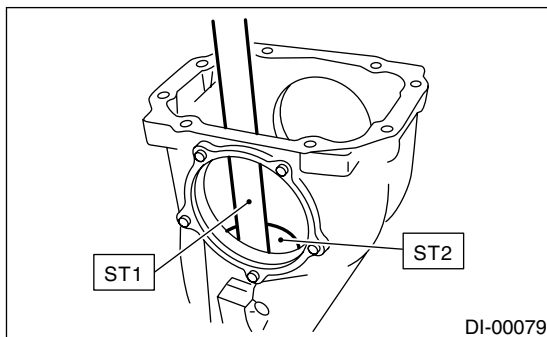
- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing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



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

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

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



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

ST1 398477701 HANDLE

ST2 398477703 DRIFT 2

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

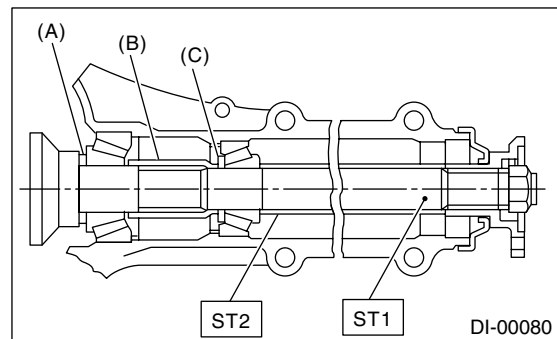
NOTE:

- If tooth contact (Drive pinion, Crown gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.
- Use a new rear bearing cone.

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

ST1 398507702 DUMMY SHAFT

ST2 398507703 DUMMY COLLAR

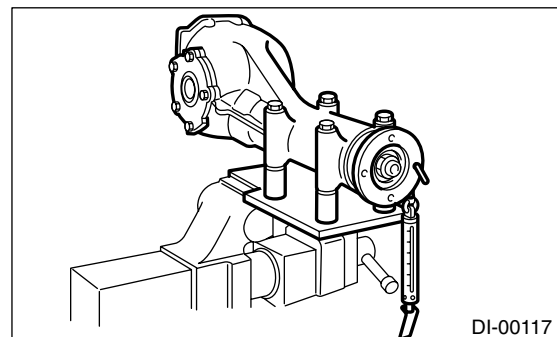


(A) Pinion height adjusting shim

(B) Preload adjusting spacer

(C) Preload adjusting washer

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



NOTE:

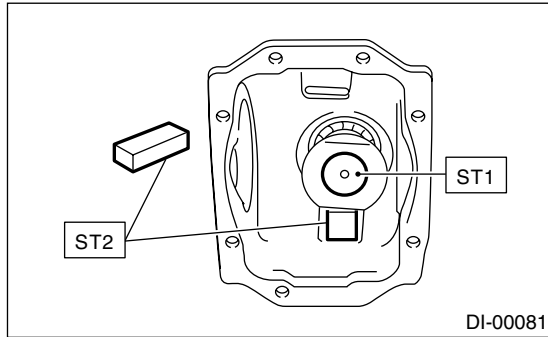
- Use a new lock nut.
- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.
- Measure the preload in direction of tangent to flange.

ST1 398507702 DUMMY SHAFT

ST2 398507704 BLOCK

Tightening torque:

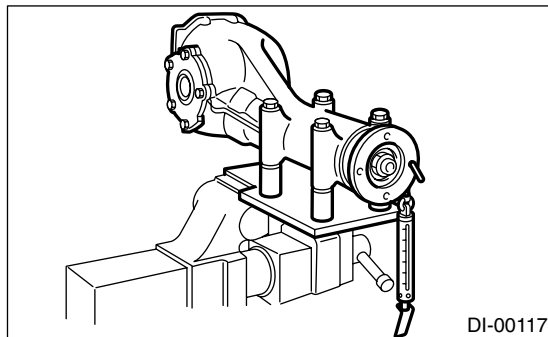
181 N·m (18.5 kgf-m, 134 ft-lb)



Front and rear bearing preload

For new bearing:

18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lb)
at companion flange bolt hole



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

2) Adjusting drive pinion height

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

(1) Install the ST2.

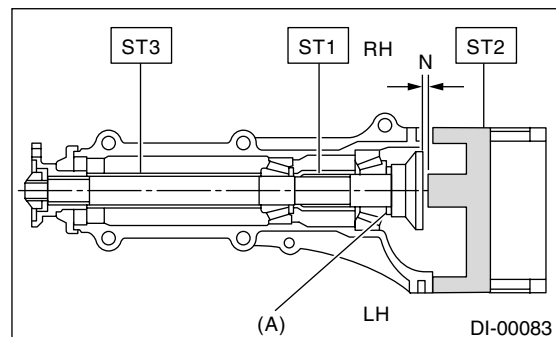
NOTE:

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

ST1 398507702 DUMMY SHAFT

ST2 398507701 DIFFERENTIAL CARRIER GAUGE

ST3 398507703 DUMMY COLLAR



(A) Pinion height adjusting shim

REAR DIFFERENTIAL

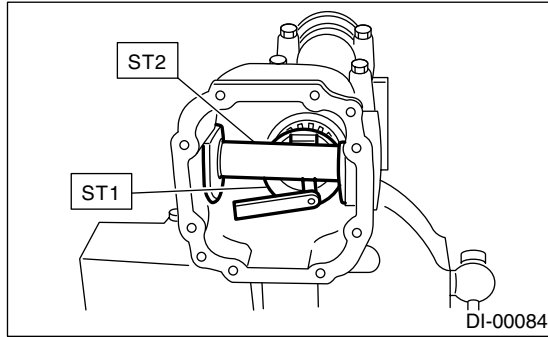
DIFFERENTIALS

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

NOTE:

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

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



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

$$T = T_o + N - (H \times 0.01) - 0.20 \text{ mm (0.0079 in)}$$

NOTE:

Use copies of this page.

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

(Example of calculation)

$$T_o = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$N = 0.23 \text{ mm } H = + 1$$

$$T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42$$

$$\text{Result: Thickness} = 3.42 \text{ mm}$$

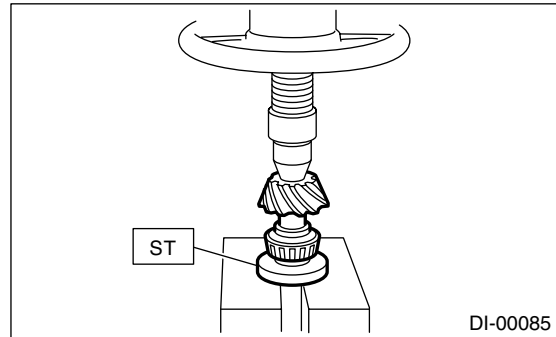
Therefore use the shim 383605200.

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

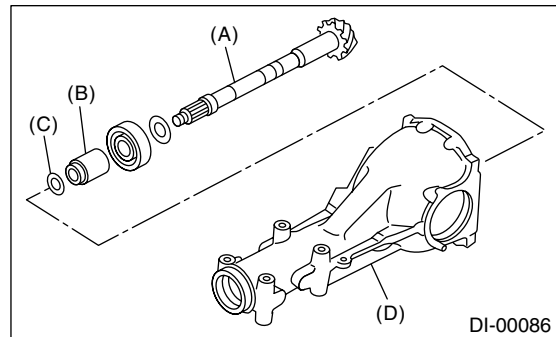
Pinion height adjusting shim	
Part No.	Thickness mm (in)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

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

ST 398177700 INSTALLER



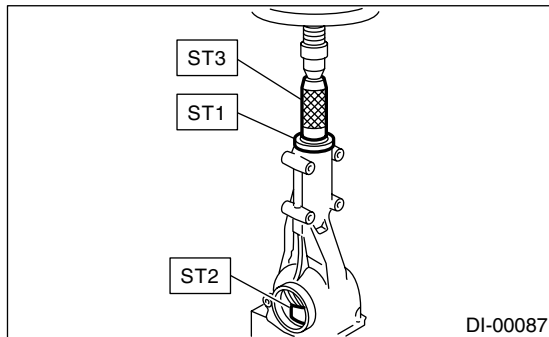
- 4) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



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

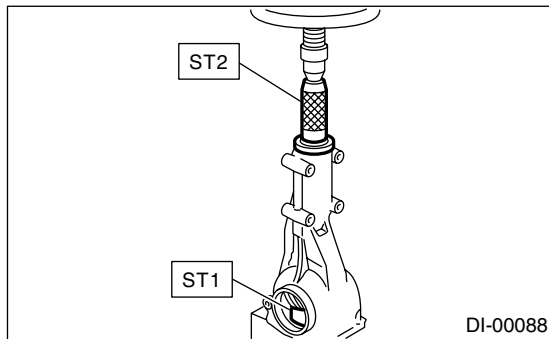
5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.

ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



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

ST1 399780104 WEIGHT
ST2 899580100 INSTALLER

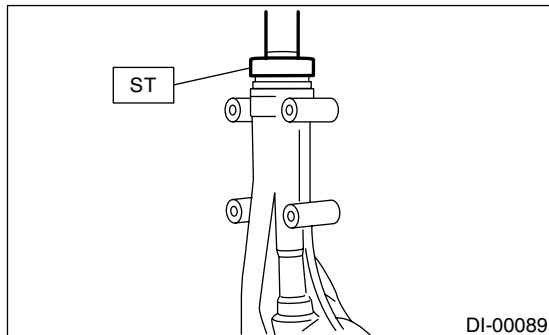


7) Fit a new oil seal with ST.

NOTE:

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

ST 498447120 INSTALLER

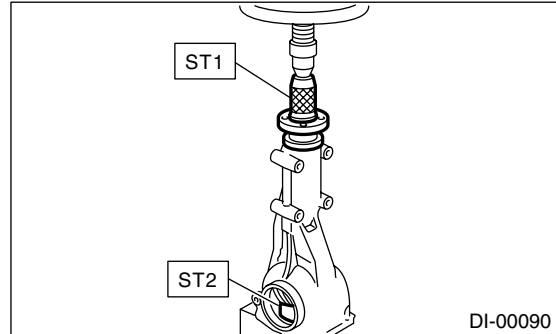


8) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT

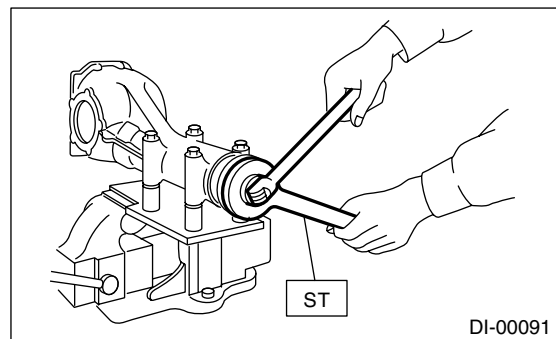


9) Install a new self-locking nut. Then tighten it with the ST.

ST 498427200 FLANGE WRENCH

Tightening torque:

181 N·m (18.5 kgf-m, 134 ft-lb)



10) Assembling differential case

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

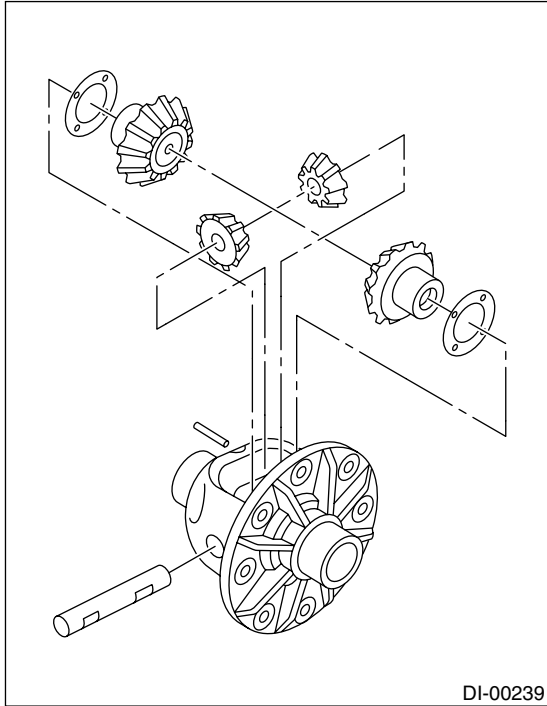
NOTE:

- Apply gear oil on both sides of the washer and on the side gear shaft before installing.

REAR DIFFERENTIAL

DIFFERENTIALS

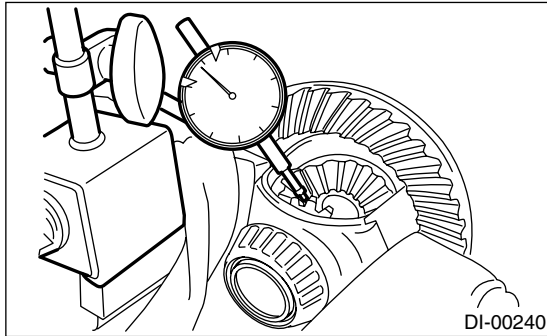
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



- (1) Measure the side gear backlash.

Side gear backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



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

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

- (3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

- (4) After inserting the pinion shaft lock pin into differential case, stake both sides of the hole to prevent pin from falling off.

- 11) Install the crown gear on differential case.

NOTE:

Before installing the bolts, apply Lock Tite to bolt threads.

Lock Tite:

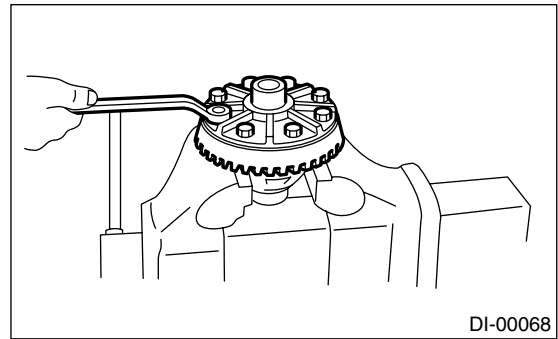
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:

Tighten diagonally while tapping the bolt heads.

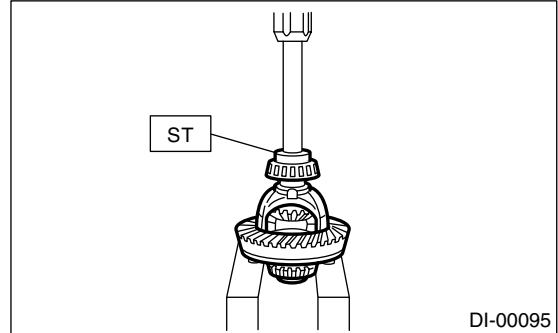
Tightening torque:

105 N·m (10.7 kgf-m, 77.4 ft-lb)



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

ST 398237700 DRIFT



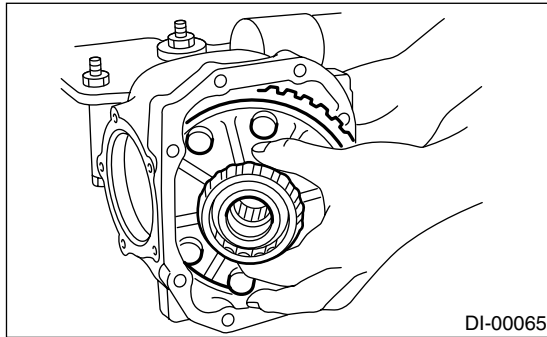
- 13) Press the side bearing cone into side bearing retainer using ST.

ST 398487700 DRIFT

- 14) Adjusting side bearing retainer shims

(1) The driven gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.

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



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

NOTE:

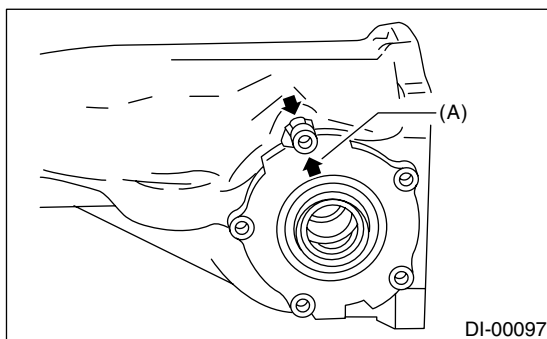
Replace the broken or corroded side retainer shim with a new one of same thickness.

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

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

NOTE:

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



(A) Arrow mark

- (5) Tighten the side bearing retainer bolts.

NOTE:

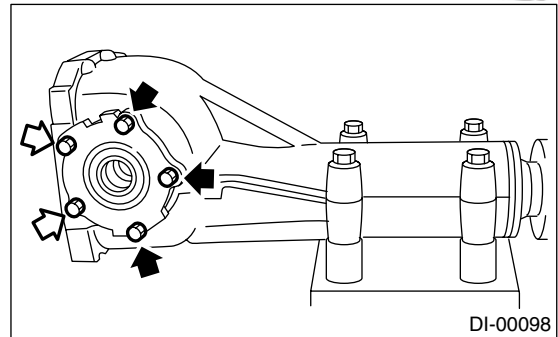
Before tightening the two side bearing retainer bolts, apply Lock Tite to bolt threads.

Lock Tite:

THREE BOND 1105 (Part No.004403010) or equivalent

Tightening torque:

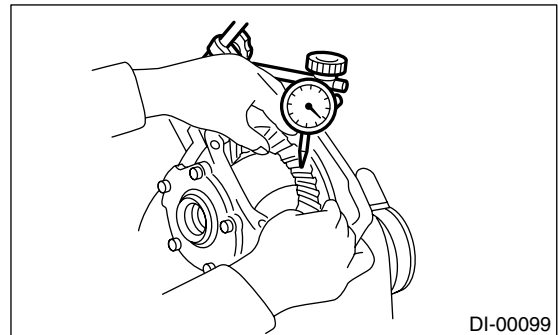
10.3 N·m (1.05 kgf·m, 7.6 ft·lb)



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

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



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

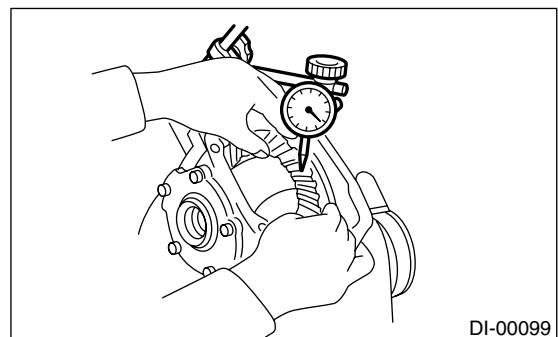
Total preload:

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

- 15) Re-check the crown gear-to-pinion backlash.

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



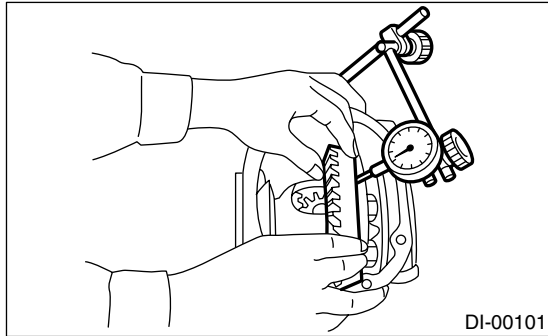
REAR DIFFERENTIAL

DIFFERENTIALS

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

Limit of runout:

Less than 0.05 mm (0.0020 in)



17) Checking and adjusting tooth contact of crown gear

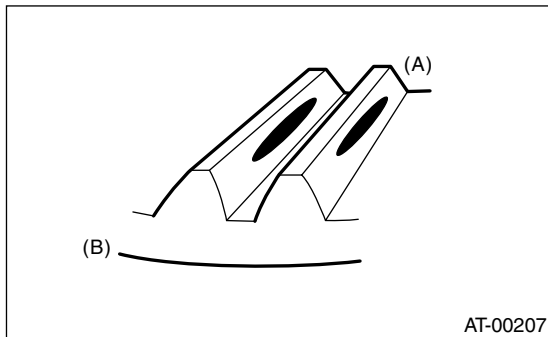
- (1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating the crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.
- (2) When the contact pattern is incorrect, readjust according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

NOTE:

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

- Correct tooth contact

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

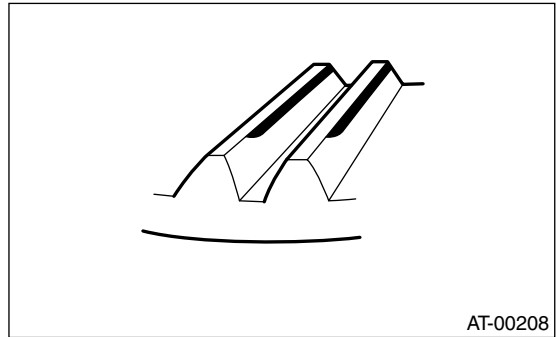


- (A) Toe side
(B) Heel side

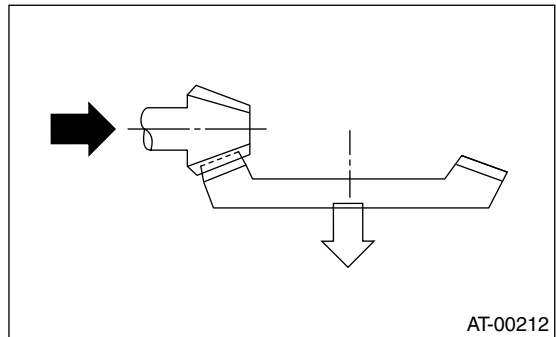
- Face contact

Checking item: Backlash is too large.

Contact pattern



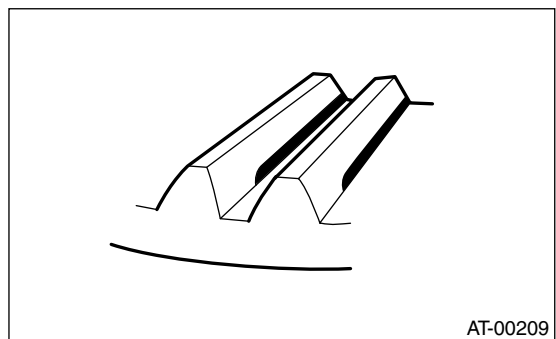
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



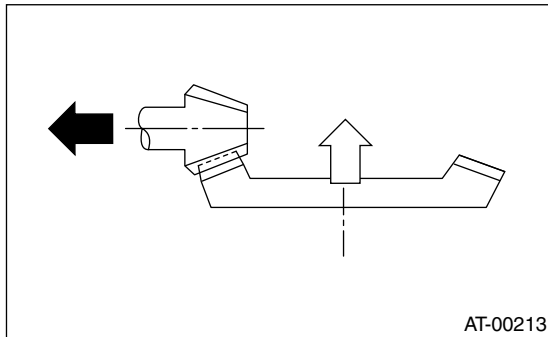
- Flank contact

Checking item: Backlash is too small.

Contact pattern



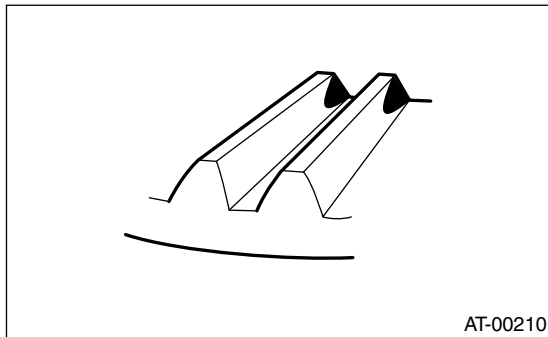
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



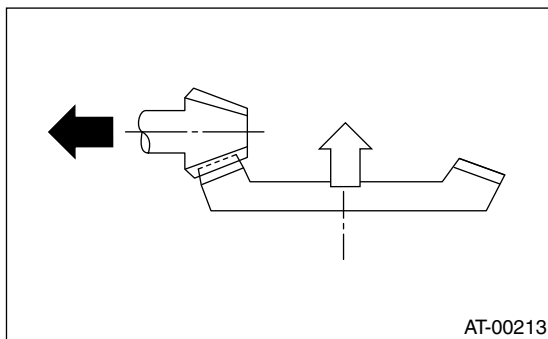
- Toe contact (Inside end contact)

Checking item: Contact area is small.

Contact pattern



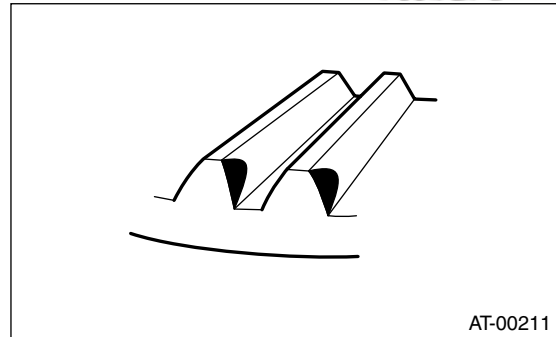
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



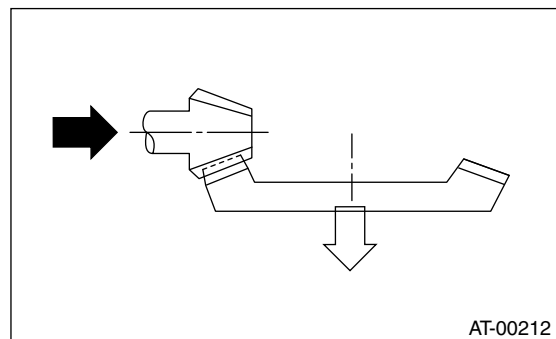
- Heel contact (Outside end contact)

Checking item: Contact area is small.

Contact pattern



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



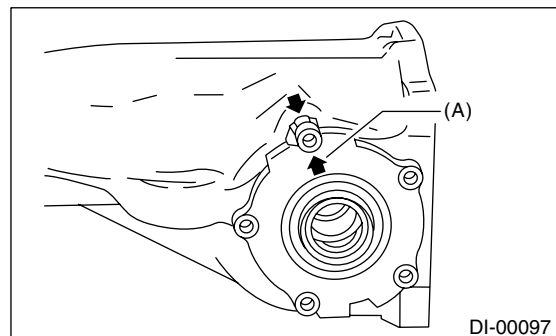
18) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.

19) Remove the side bearing retainers on right and left side.

20) Install new O-rings to side bearing retainers on right and left side.

21) Install the oil seals to side bearing retainers on right and left side.

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



(A) Arrow mark

REAR DIFFERENTIAL

DIFFERENTIALS

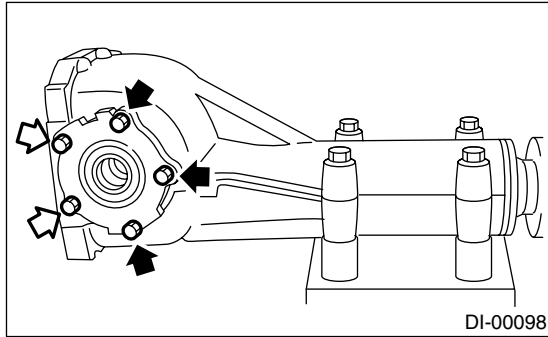
23) Tighten the side bearing retainer bolts.

Lock Tite:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

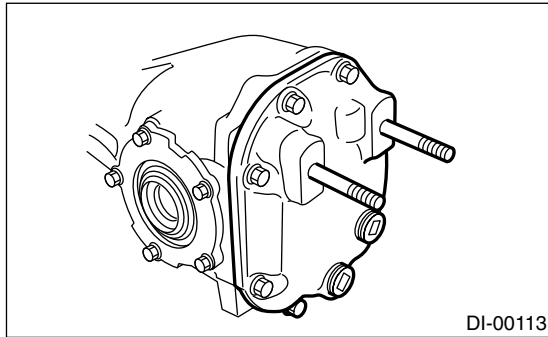
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



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

Tightening torque:

29 N·m (3.0 kgf-m, 21.7 ft-lb)



25) Install the breather cap.

26) Install the drain plug and filler plug.

Tightening torque:

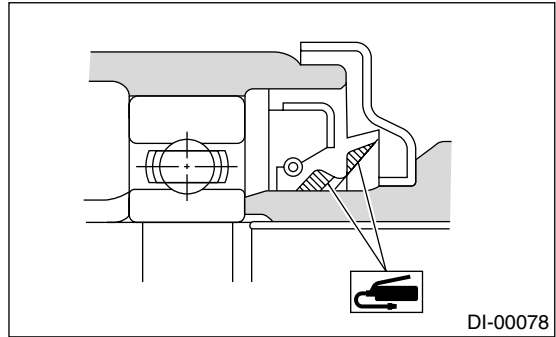
49 N·m (5.0 kgf-m, 36.2 ft-lb)

2. STi MODEL

1) Precautions for assembling

- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the right and left hand races of the bearings.

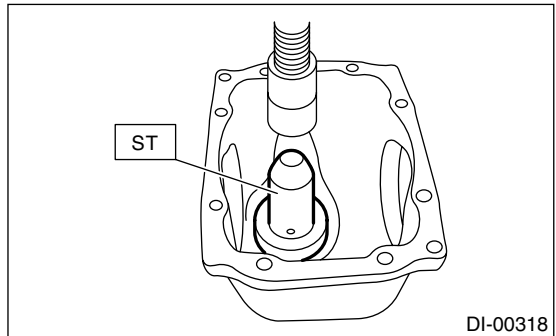
- Replace the oil seal with a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



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

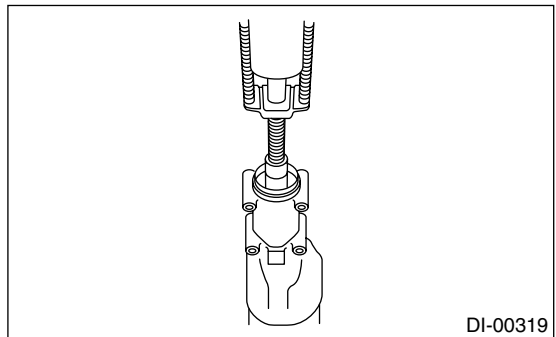
2) Press-fit the rear bearing race into differential carrier using ST.

ST 398417700 DRIFT



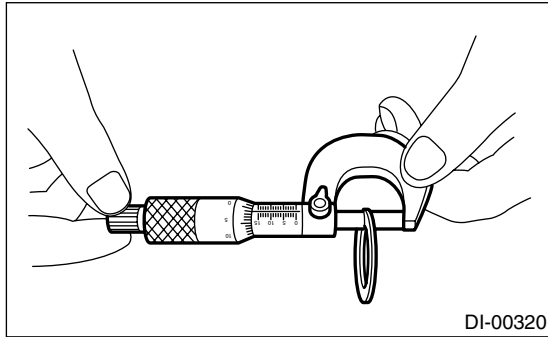
3) Press-fit the front bearing race into differential carrier using ST.

ST 398477702 DRIFT



4) Pinion height adjusting shim selection.

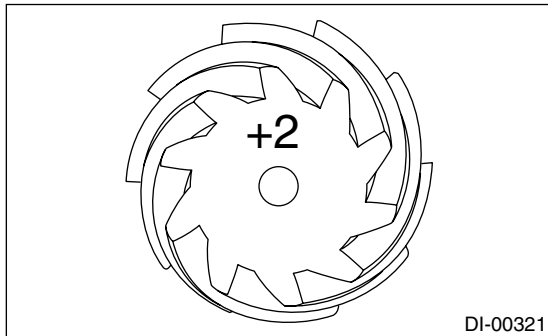
- (1) Measure the thickness of inserted pinion height adjusting shim.



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

NOTE:

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



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

$$T = T1 + (T2 \times 0.01 - T3 \times 0.01)$$

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

(Example of calculation)

$$T1 = 3.30, T2 = +2, T3 = -1$$

$$T = 3.30 + \{(2 \times 0.01) - (-1 \times 0.01)\} = 3.33$$

Result: Thickness = 3.33 mm

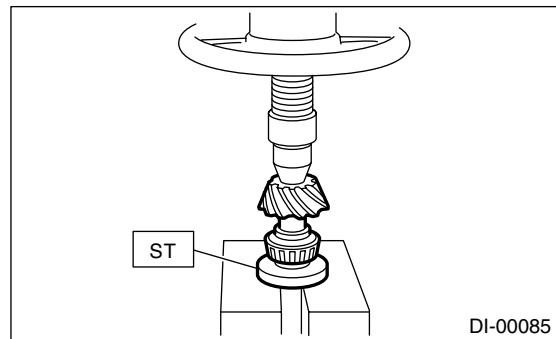
Therefore use the shim 38336AA310.

Pinion height adjusting shim	
Part No.	Thickness T mm (in)
38336AA230	3.09 (0.1217)
38336AA240	3.12 (0.1228)
38336AA250	3.15 (0.1240)
38336AA260	3.18 (0.1252)
38336AA270	3.21 (0.1264)

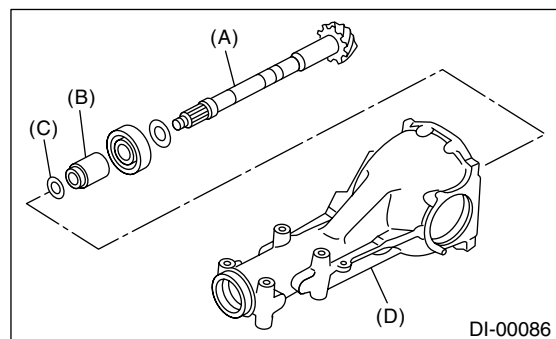
Pinion height adjusting shim	
Part No.	Thickness T mm (in)
38336AA280	3.24 (0.1276)
38336AA290	3.27 (0.1287)
38336AA300	3.30 (0.1299)
38336AA310	3.33 (0.1311)
38336AA320	3.36 (0.1323)
38336AA330	3.39 (0.1335)
38336AA340	3.42 (0.1346)
38336AA350	3.45 (0.1358)
38336AA360	3.48 (0.1370)
38336AA370	3.51 (0.1382)
38336AA380	3.54 (0.1394)
38336AA390	3.57 (0.1406)
38336AA400	3.60 (0.1417)
38336AA410	3.63 (0.1429)
38336AA420	3.66 (0.1441)

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

ST 18674AA000 INSTALLER



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



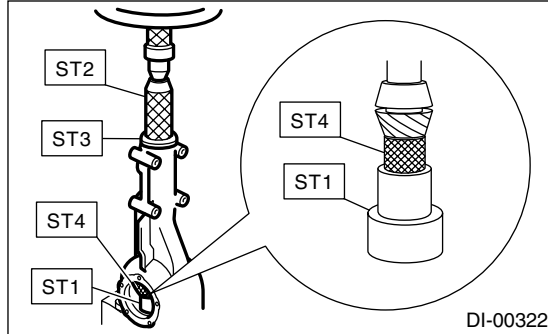
- (A) Drive pinion
- (B) Bearing preload adjusting spacer
- (C) Bearing preload adjusting washer
- (D) Differential carrier

REAR DIFFERENTIAL

DIFFERENTIALS

7) Insert the spacer, then press-fit the pilot bearing with STs.

ST1 399780104 WEIGHT
ST2 899580100 INSTALLER
ST3 398507703 DUMMY COLLER
ST4 498937110 HOLDER DRIVE PINION

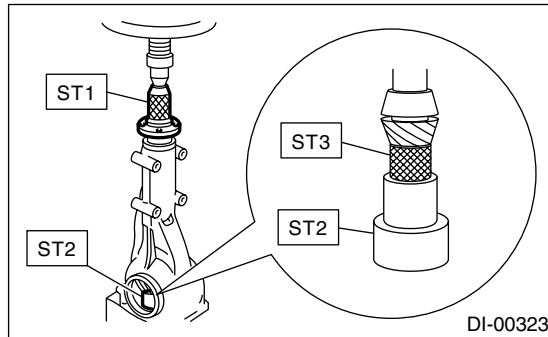


8) Press-fit the companion flange with ST1, ST2 and ST3.

NOTE:

Be careful not to damage the bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT
ST3 498937110 HOLDER DRIVE PINION

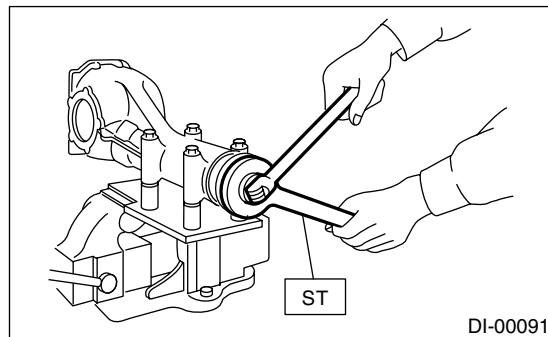


9) Install the self-locking nut. Then tighten it with the ST.

ST 18633AA000 WRENCH COMPL

Tightening torque:

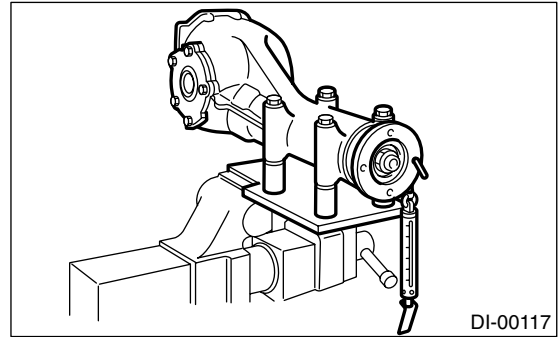
181 N·m (18.5 kgf-m, 134 ft-lb)



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

Bearing preload:

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

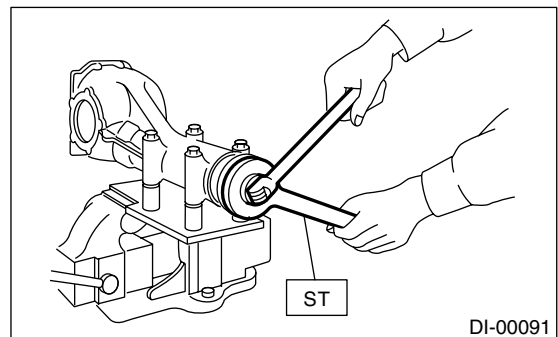


11) If bearing preload is out of specification, adjust to specification by selecting preload adjusting washer and spacer from the following table.

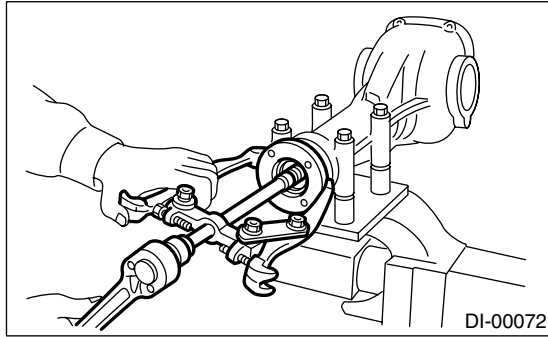
Preload adjusting washer	Part No.	Thickness mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
Preload adjusting spacer	Part No.	Length mm (in)
	31454AA130	52.2 (2.055)
	31454AA140	52.4 (2.063)
	31454AA150	52.6 (2.071)
	31454AA160	52.8 (2.079)
	31454AA170	53.0 (2.087)
	31454AA180	53.2 (2.094)

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

ST 18633AA000 WRENCH COMPL



13) Extract the companion flange with a puller.

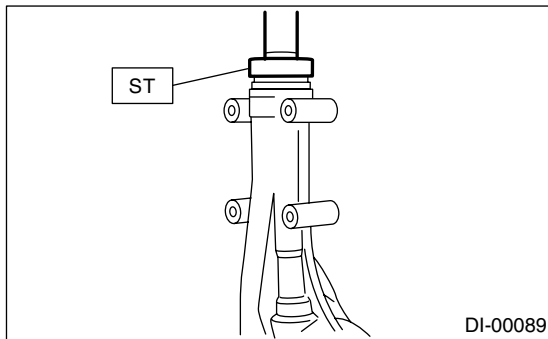


14) Fit a new oil seal with ST.

NOTE:

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

ST 498447120 INSTALLER



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

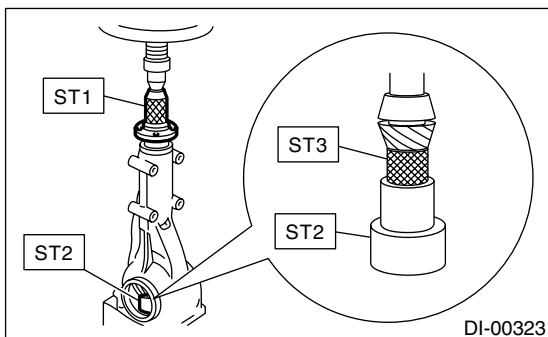
ST1 899874100 INSTALLER

ST2 399780104 WEIGHT

ST3 498937110 HOLDER DRIVE PINION

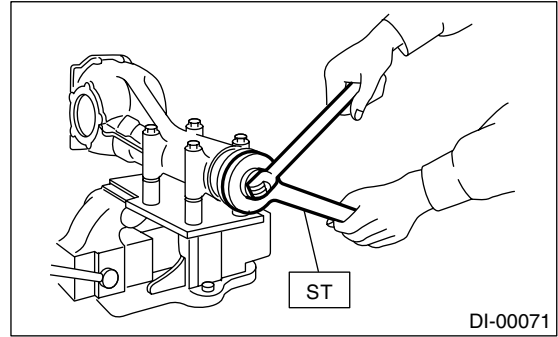
NOTE:

Be careful not to damage the bearing.



16) Install the self-lock nut. Then tighten it with the ST.

ST 18633AA000 WRENCH COMPL



17) Install the crown gear on differential case.

NOTE:

Before installing the bolts, apply Lock Tite to bolt threads.

Lock Tite:

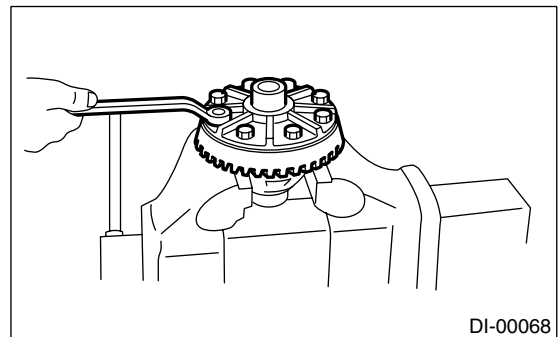
THREE BOND 1324 (Part No.004403042) or equivalent

NOTE:

Tighten diagonally while tapping the bolt heads.

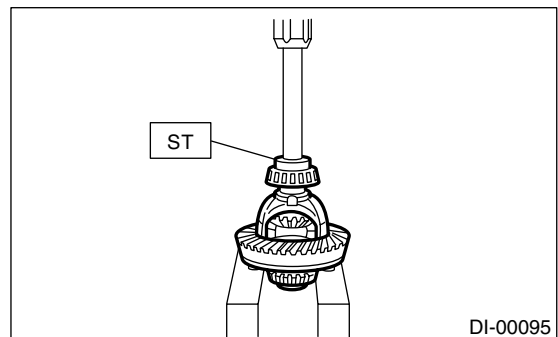
Tightening torque:

105 N·m (10.7 kgf-m, 77.4 ft-lb)



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

ST 398487700 DRIFT



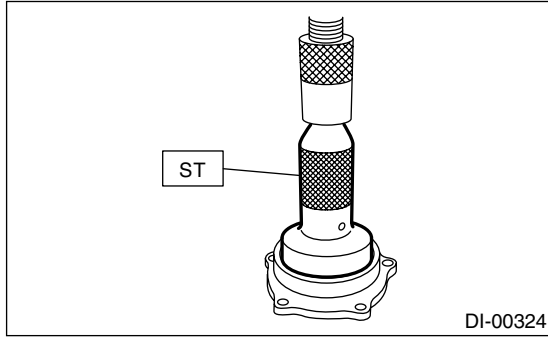
19) Assembling side retainer.

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

REAR DIFFERENTIAL

DIFFERENTIALS

ST 398417700 DRIFT

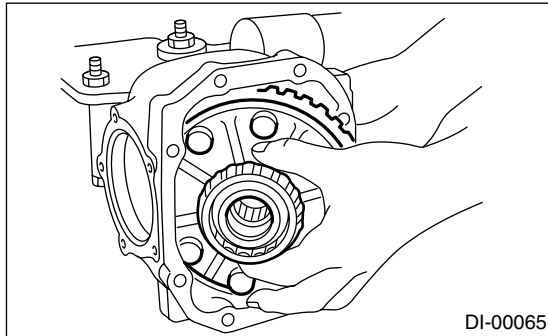


(2) Install the oil seal. <Ref. to DI-50, REPLACEMENT, Rear Differential Side Oil Seal.>

20) Adjusting side bearing retainer shims

(1) The driven gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.

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



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

NOTE:

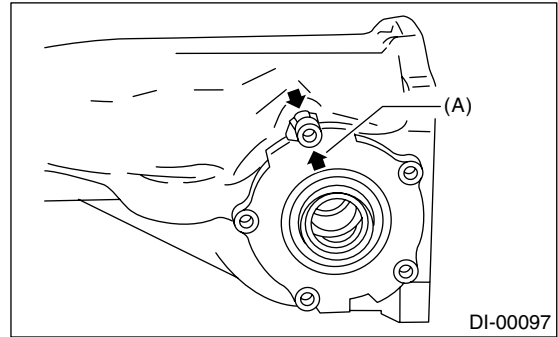
Replace the broken or corroded side retainer shim with a new one of same thickness.

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

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

NOTE:

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

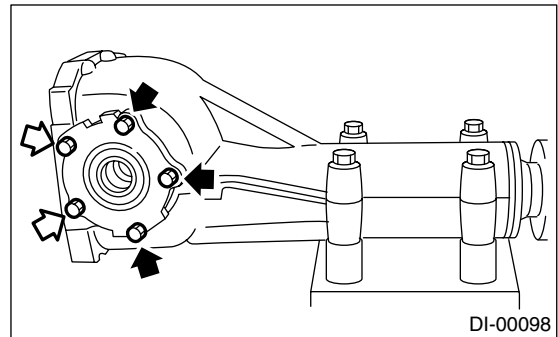


(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

Tightening torque:

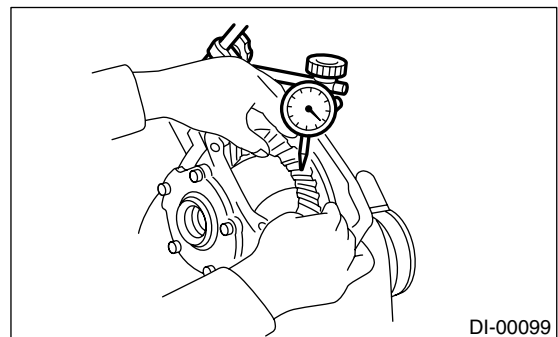
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



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

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



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

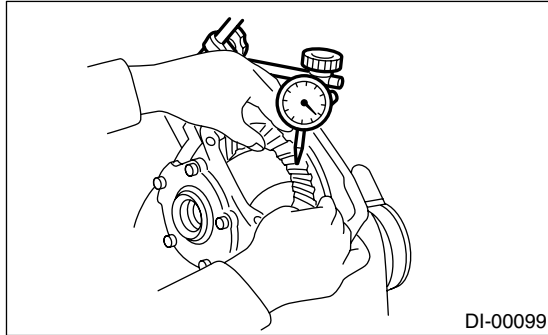
Total preload:

26.95 — 53.90 N (2.75 — 5.50 kgf, 6.1 — 12.1 lb)

21) Re-check the crown gear-to-pinion backlash.

Backlash:

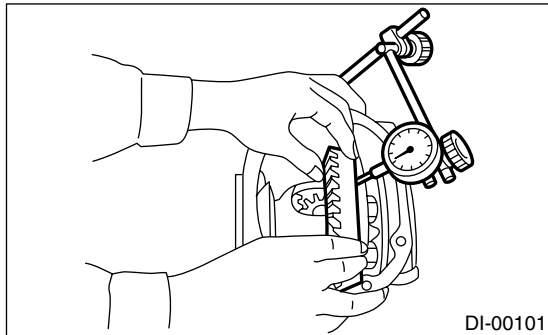
0.10 — 0.20 mm (0.0039 — 0.0079 in)



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

Limit of runout:

Less than 0.05 mm (0.0020 in)



23) Checking and adjusting tooth contact of crown gear

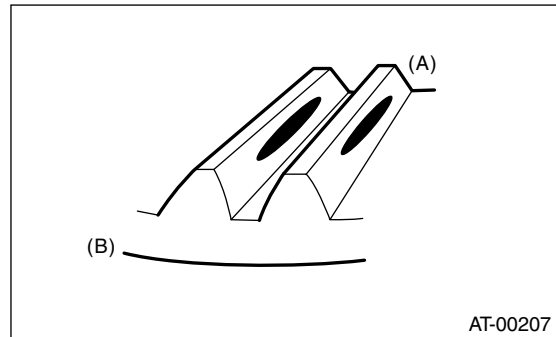
- (1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating the crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.
- (2) When the contact pattern is incorrect, readjust according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

NOTE:

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

- Correct tooth contact

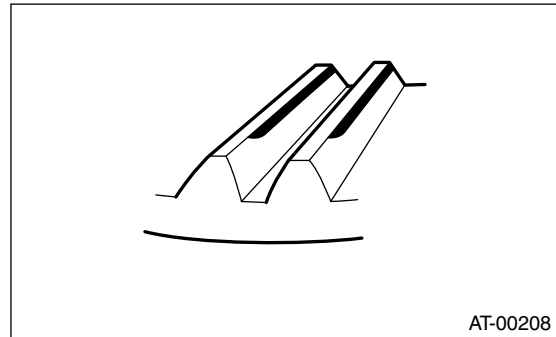
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)



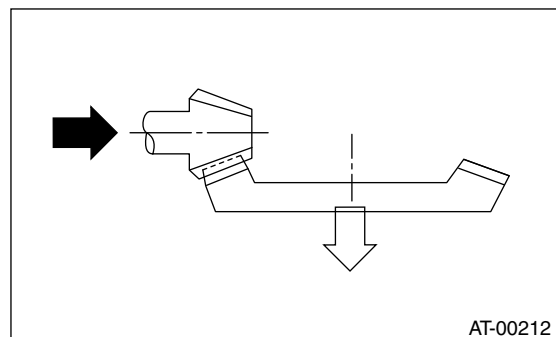
- (A) Toe side
- (B) Heel side

- Face contact

Checking item: Backlash is too large. Contact pattern



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



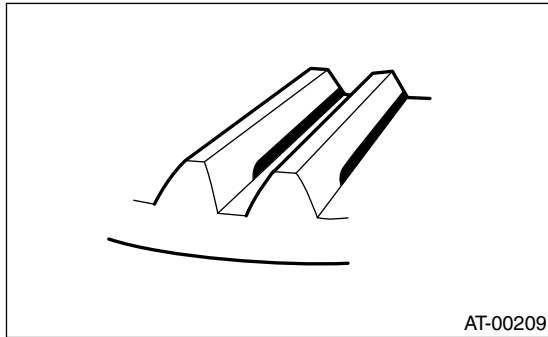
REAR DIFFERENTIAL

DIFFERENTIALS

- Flank contact

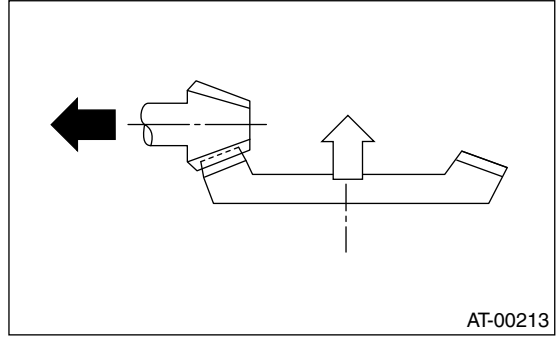
Checking item: Backlash is too small.

Contact pattern



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

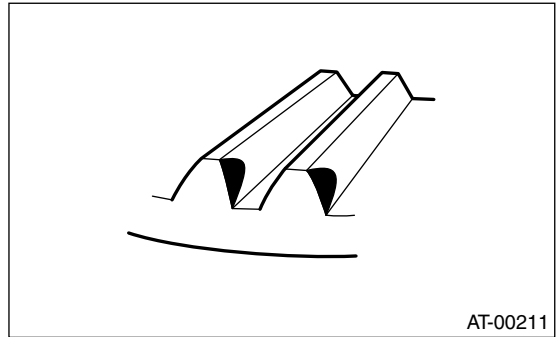
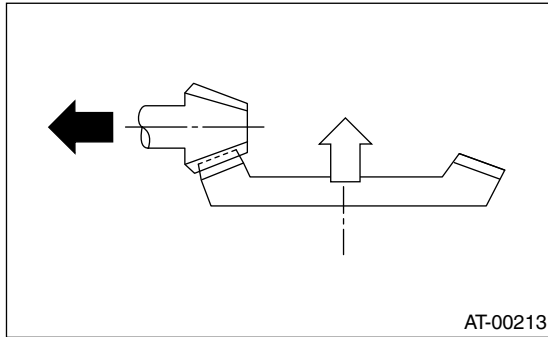
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



- Heel contact (Outside end contact)

Checking item: Contact area is small.

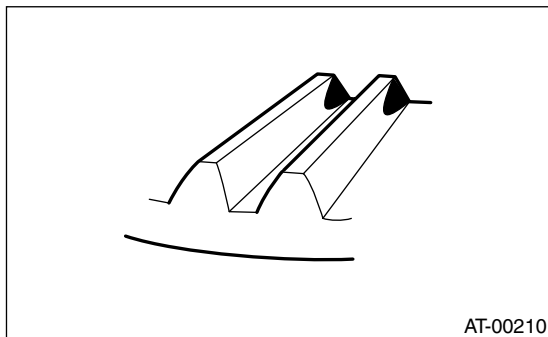
Contact pattern



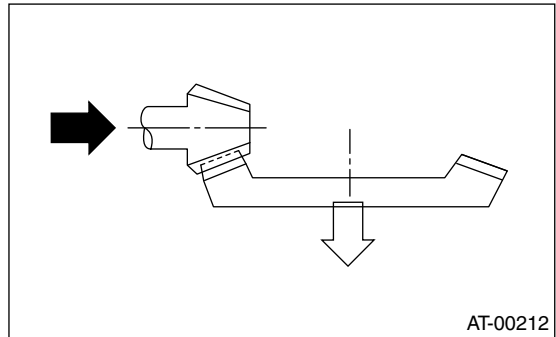
- Toe contact (Inside end contact)

Checking item: Contact area is small.

Contact pattern



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

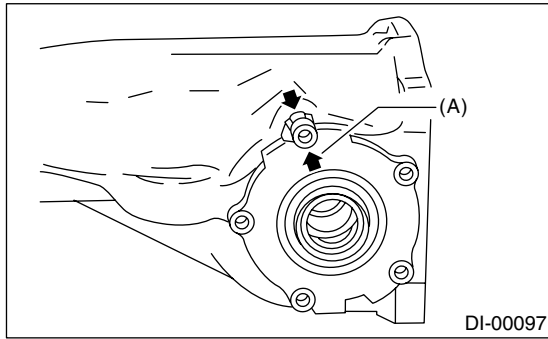


24) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.

25) Remove the side bearing retainers on right and left side.

26) Install new O-rings to side bearing retainers on right and left side.

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



(A) Arrow mark

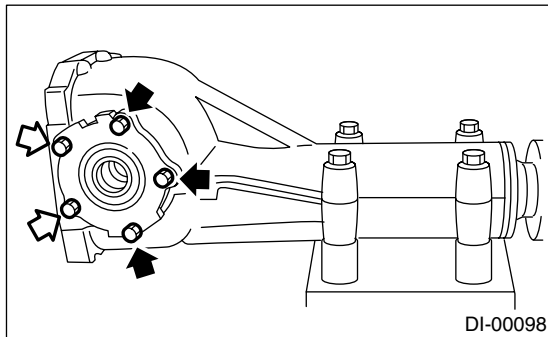
28) Tighten the side bearing retainer bolts.

Lock Tite:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

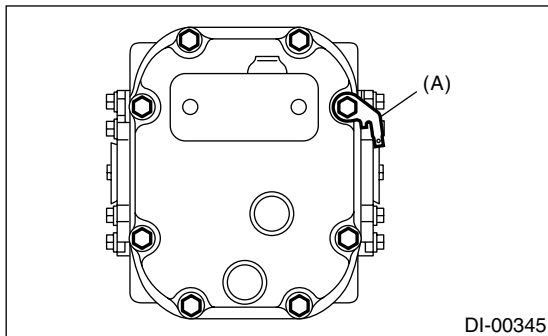
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



29) Install the new gasket, rear cover and stay ground and tighten the bolts to specified torque.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Stay ground

30) Install the breather cap.

31) Install the drain plug and rear differential oil temperature switch or oil temperature sensor.

Tightening torque:

49 N·m (5.0 kgf-m, 36.2 ft-lb)

E: INSPECTION

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

1) Crown gear and drive pinion

- If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.

- If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if crack, score, or other defects are evident on tooth surface.

- Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washers of side gear and pinion mate gear

Replace if seizure, flaw, abnormal wear or other defect is evident.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if its sliding surfaces are worn or cracked.

8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

9) Rear differential oil temperature switch

If the results of the following inspections are not satisfactory, replace rear differential temperature switch.

(1) At room temperature, check for continuity between the sensor terminal and body.

(2) Soak the sensor in oil, then raise the oil temperature. Check that the continuity is cut off when the oil temperature is between 144°C (291°F) and 156°C (313°F). Then, check that the continuity resumes by the time the oil temperature drops to 135°C (275°F).

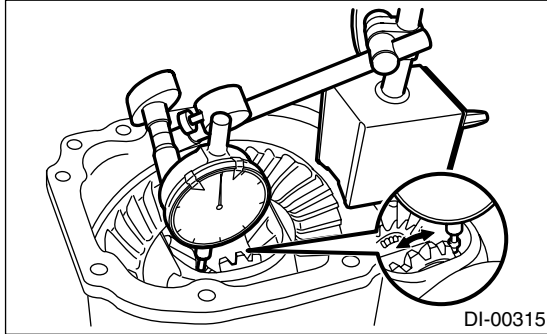
1. SIDE GEAR BACKLASH

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

Side gear backlash:

0.1 — 0.2 mm (0.004 — 0.008 in)

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



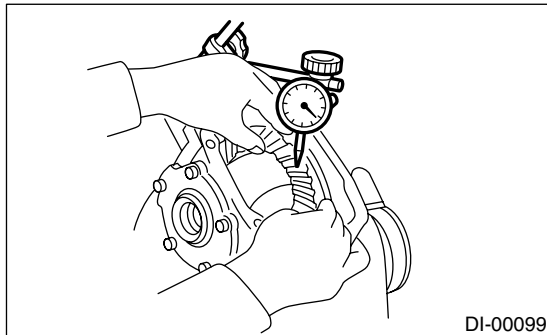
2. CROWN GEAR BACKLASH

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

Crown gear backlash:

0.1 — 0.2 mm (0.004 — 0.008 in)

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



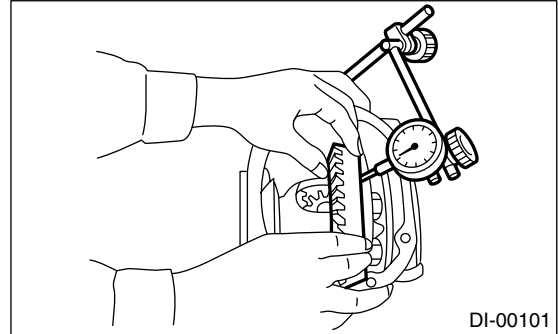
3. CROWN GEAR RUNOUT

Using a dial gauge, check the crown gear runout.

Crown gear runout:

Less than 0.05 mm (0.0020 in)

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



4. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

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

5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Total preload:

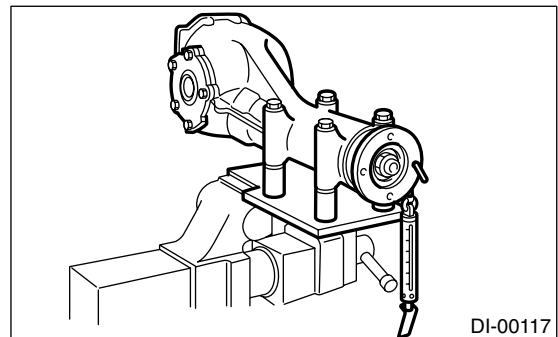
Except for STi model:

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

STi model:

26.95 — 53.90 N (2.75 — 5.50 kgf, 6.1 — 12.1 lb)

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



F: ADJUSTMENT**1. SIDE GEAR BACKLASH**

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

2. CROWN GEAR BACKLASH

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

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

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

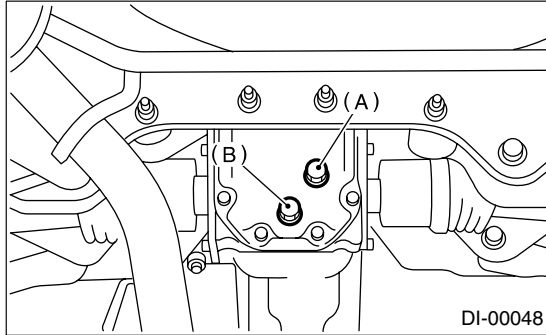
4. TOTAL PRELOAD

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

5. Rear Differential Front Oil Seal

A: REPLACEMENT

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Move the select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Remove the oil drain plug, and drain the 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) Jack-up the vehicle and support with sturdy racks.

- 8) Remove the rear exhaust pipe and muffler.

- 9) Remove the propeller shaft from body. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

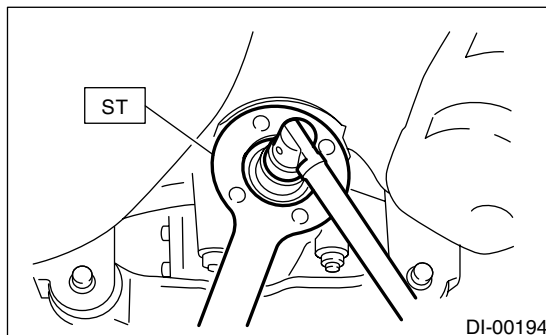
- 10) Remove the self-locking nut while holding the companion flange with ST.

Except STi model

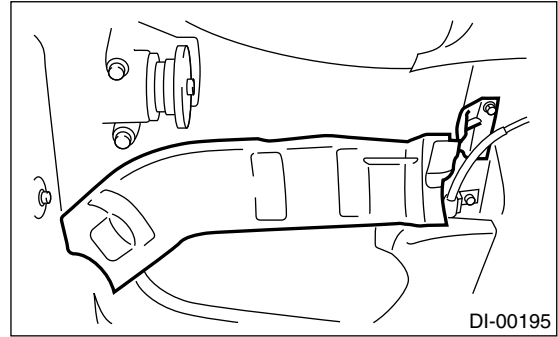
ST 498427200 FLANGE WRENCH

STi model

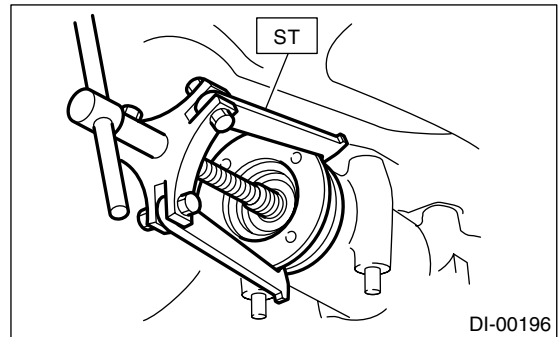
ST 18633AA000 WRENCH COMPL



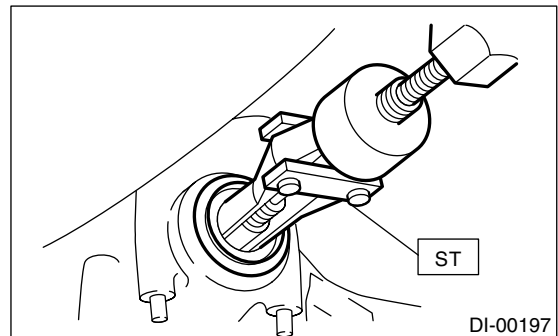
- 11) Remove the tank cover.



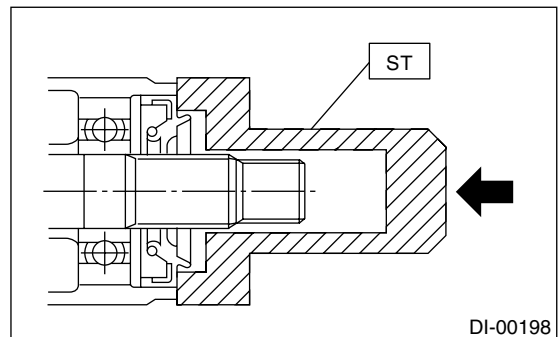
- 12) Extract the companion flange using ST.
ST 399703600 PULLER ASSY



- 13) Remove the oil seal using ST.
ST 398527700 PULLER ASSY



- 14) Fit a new oil seal using ST.
ST 498447120 INSTALLER



15) Install the companion flange.

NOTE:

Use a plastic hammer to install the companion flange.

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

Except STi model

ST 498427200 FLANGE WRENCH

STi model

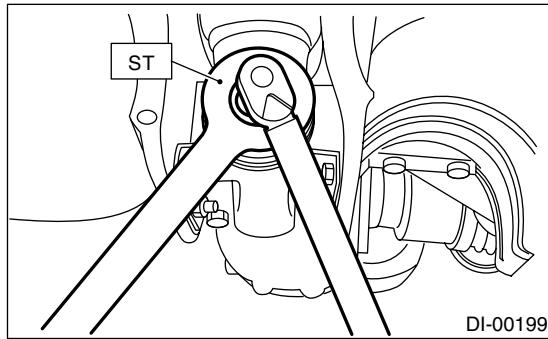
ST 18633AA000 WRENCH COMPL

NOTE:

Use a new self-locking nut.

Tightening torque:

181 N·m (18.5 kgf-m, 134 ft-lb)



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

18) Fill the differential carrier with gear oil to the bottom of filler plug hole after installing. <Ref. to DI-19, Differential Gear Oil.>

6. Rear Differential Side Oil Seal

A: INSPECTION

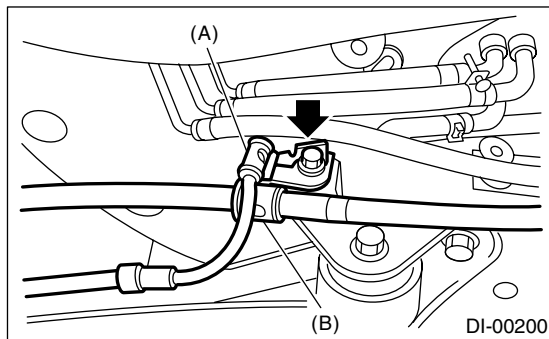
Make sure that there is no oil leakage from side oil seal.

If there is any oil leakage, replace the oil seal.

B: REPLACEMENT

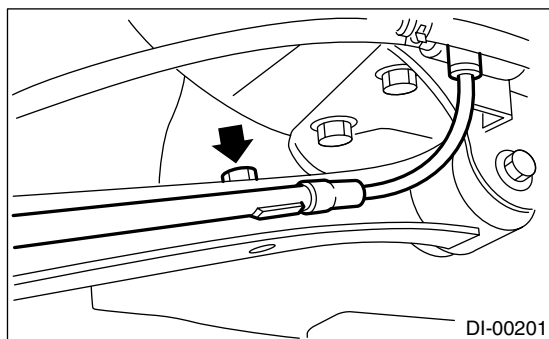
- 1) Disconnect the ground cable from battery.
 - 2) Move the select lever or gear shift lever to "N".
 - 3) Release the parking brake.
 - 4) Loosen both wheel nuts.
 - 5) Jack-up the vehicle and support it with rigid racks.
 - 6) Remove the wheels.
 - 7) Remove the rear exhaust pipe and muffler.
- SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
- DOHC Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <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 parking brake cable clamp from bracket.

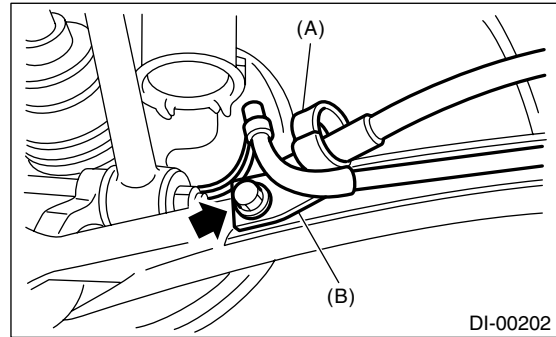


- (A) ABS wheel speed sensor cable clamp
(B) Parking brake cable clamp

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

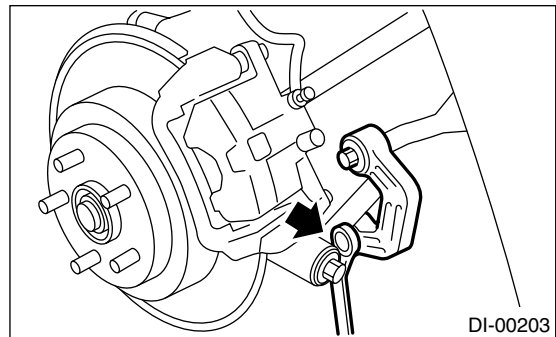


- (3) Remove the ABS wheel speed sensor cable clamp and parking brake cable guide from trailing link.

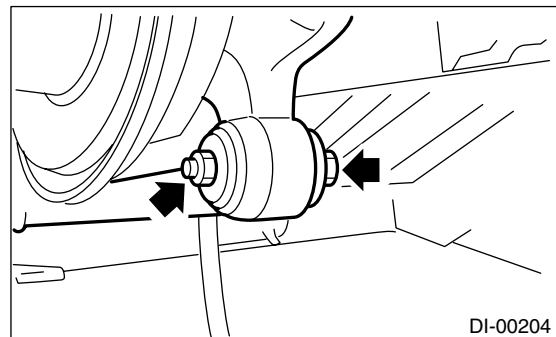


- (A) Parking brake cable guide
(B) ABS wheel speed sensor cable clamp

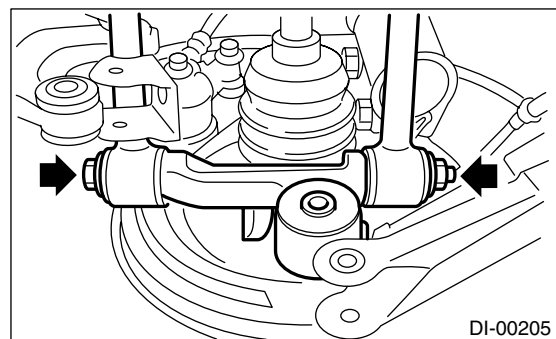
- (4) Remove the rear stabilizer link.



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



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



REAR DIFFERENTIAL SIDE OIL SEAL

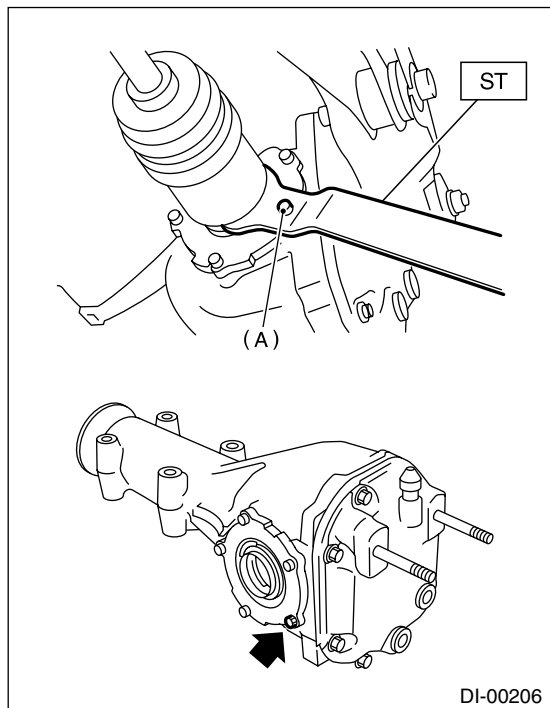
DIFFERENTIALS

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

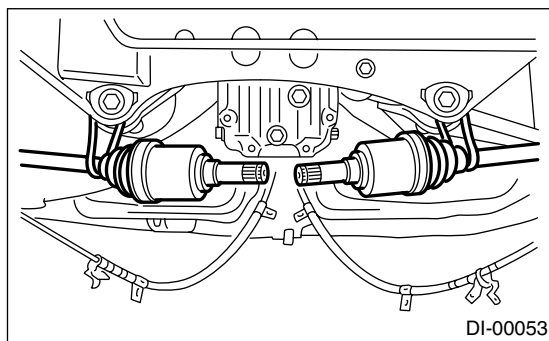
NOTE:

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

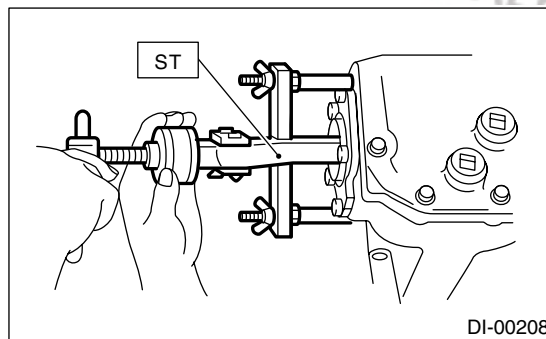
ST 208099PA100 DRIVE SHAFT REMOVER



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



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

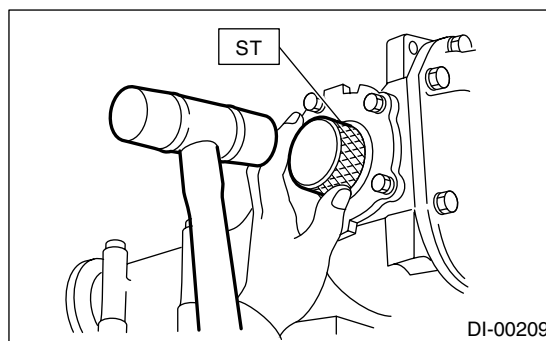


- 11) Drive in a new side oil seal using ST.

NOTE:

Apply chassis grease between the oil seal lips.

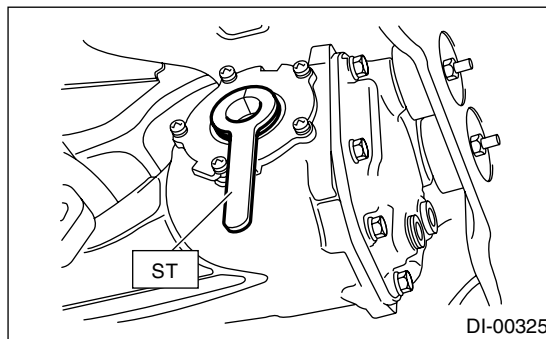
ST 398437700 DRIFT



- 12) Insert the DOJ into rear differential.

- (1) Install the ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

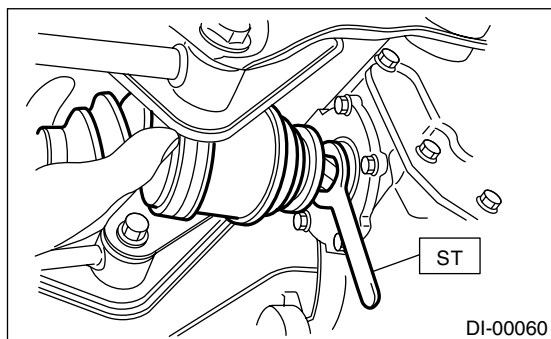


- (2) Install the spline shaft until the spline portion is inside the side oil seal using ST.

REAR DIFFERENTIAL SIDE OIL SEAL

DIFFERENTIALS

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(3) Remove the ST.

ST 28099PA090 SIDE 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 battery.
- 3) Move the selector lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Loosen the wheel nuts.
- 6) Jack-up the vehicle and support it with study racks.
- 7) Remove the wheels.
- 8) Remove the rear exhaust pipe and muffler.

SOHC model

<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>

DOHC Turbo model

<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>

- 9) Remove the rear differential front member.

NOTE:

When removing the rear differential front member, work the removal procedure as rear differential.

<Ref. to DI-22, REMOVAL, Rear Differential.>

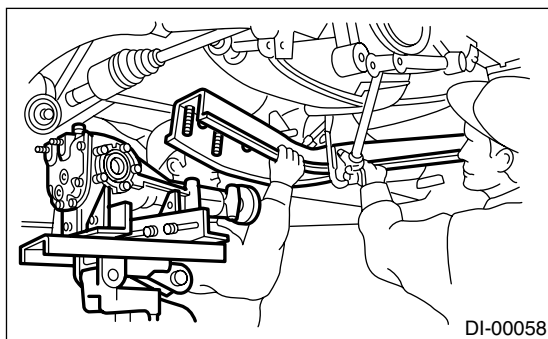
- 10) Remove the differential rear member.

B: INSTALLATION

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

NOTE:

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

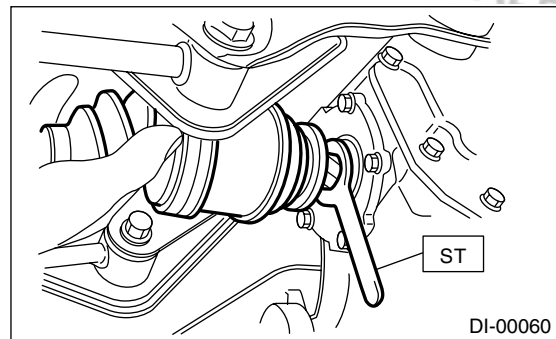


- 2) Insert the DOJ of rear drive shaft into rear differential. <Ref. to DI-50, REPLACEMENT, Rear Differential Side Oil Seal.>

NOTE:

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

ST 28099PA090 SIDE OIL SEAL PROTECTOR



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

C: INSPECTION

- 1) Check the rear differential member for damage, bend, or corrosion.

If damage, bend, or corrosion is excessive, replace the rear differential member.

- 2) Check the bushings of rear differential member for cracking, hardening, or damage.

If cracking, hardening, or damage is excessive, replace the rear differential member.

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

GENERAL DIAGNOSTIC TABLE

DIFFERENTIALS

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

GENERAL DIAGNOSTIC TABLE

DIFFERENTIALS

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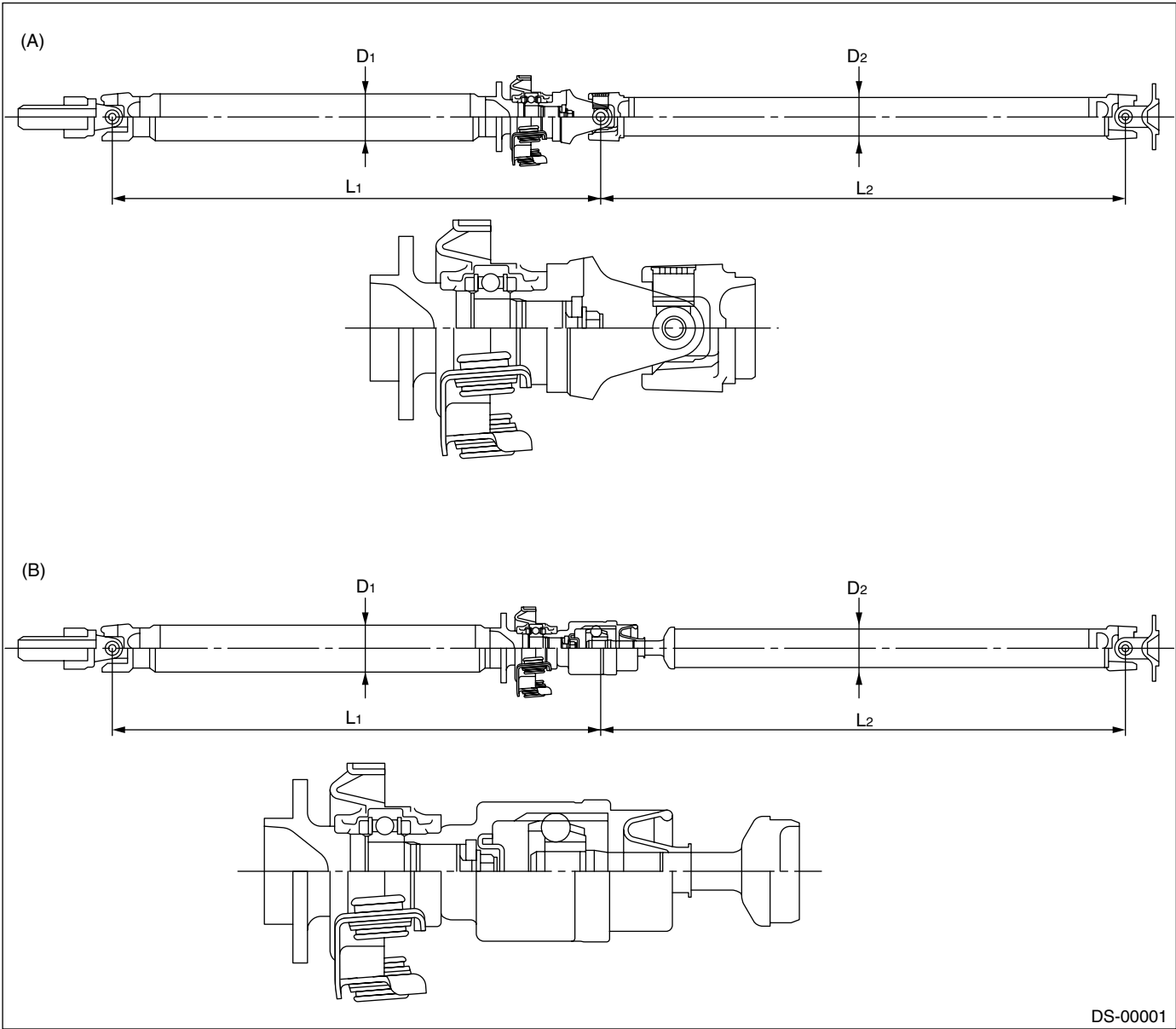
DRIVE SHAFT SYSTEM

1. General Description

A: SPECIFICATIONS

1. PROPELLER SHAFT

Model		Non-turbo	Turbo (except STi)	STi
Propeller shaft type		UJ	DOJ	UJ
Front propeller shaft Joint-to-joint length: L ₁ mm (in)	AT	584 (22.99)	579 (22.79)	—
	MT	643 (25.32)	638 (25.12)	574 (22.60)
Rear propeller shaft Joint-to-joint length: L ₂ mm (in)		708 (27.87)	713 (28.07)	706 (27.80)
Outer diameter of tube: mm (in)	D ₁	63.5 (2.500)		70 (2.756)
	D ₂	57.0 (2.244)		



DS-00001

(A) UJ type

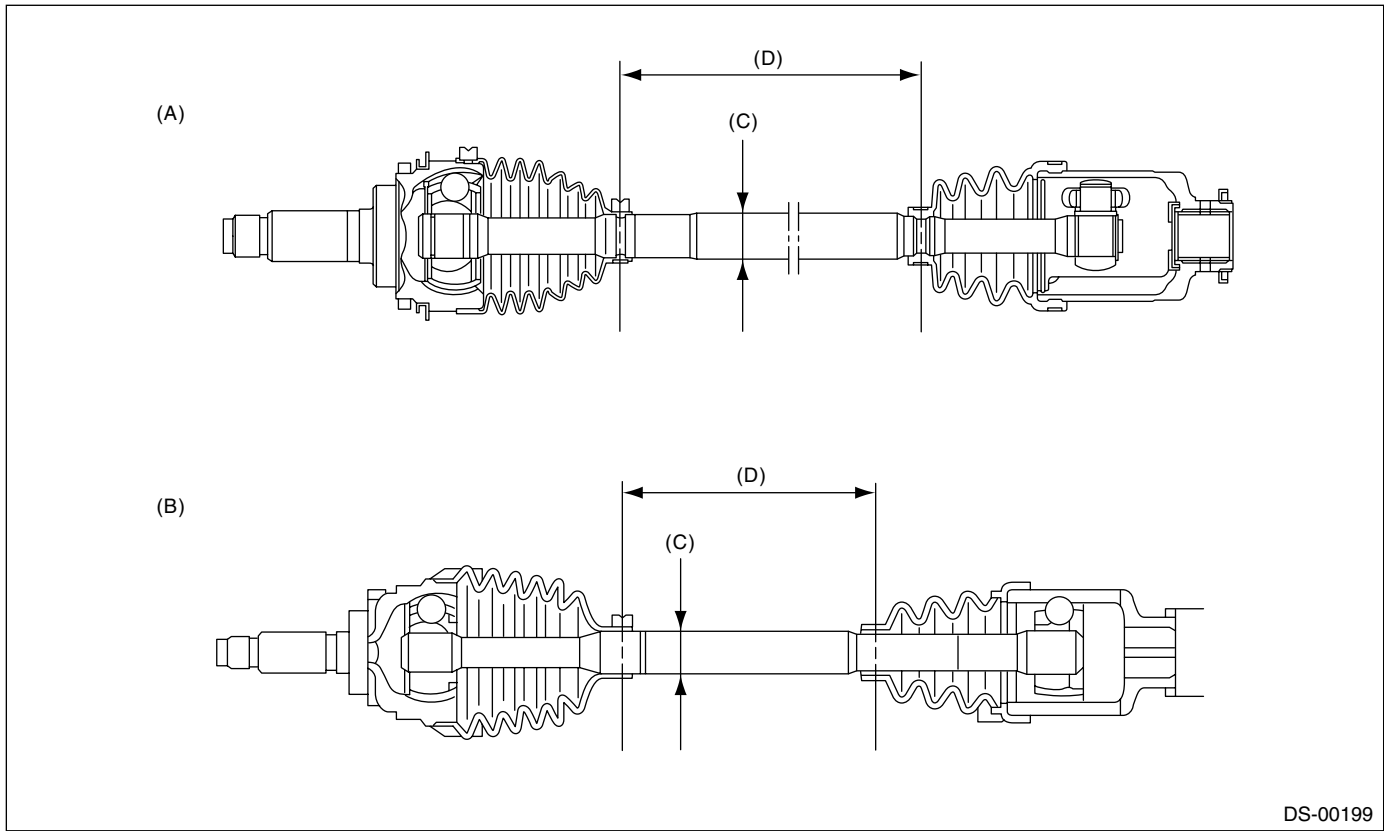
(B) DOJ type

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

2. FRONT DRIVE SHAFT ASSEMBLY

Model		Type of drive shaft	Axle diameter ϕ D (mm)	Axle length L (mm)
Sedan	Non-turbo, Turbo AT	EBJ87+SFJ82	26 (1.02)	325
	Turbo MT (except STi)	EBJ87+SFJ82	28 (1.10)	325
	Turbo MT (STi)	BJ92+DOJ87	28 (1.10)	250
Wagon	Non-turbo, Turbo AT	EBJ87+SFJ82	26 (1.02)	314
	Turbo MT	EBJ87+SFJ82	28 (1.10)	314



DS-00199

(A) EBJ87+SFJ82
(B) BJ92+DOJ87

(C) Axle diameter

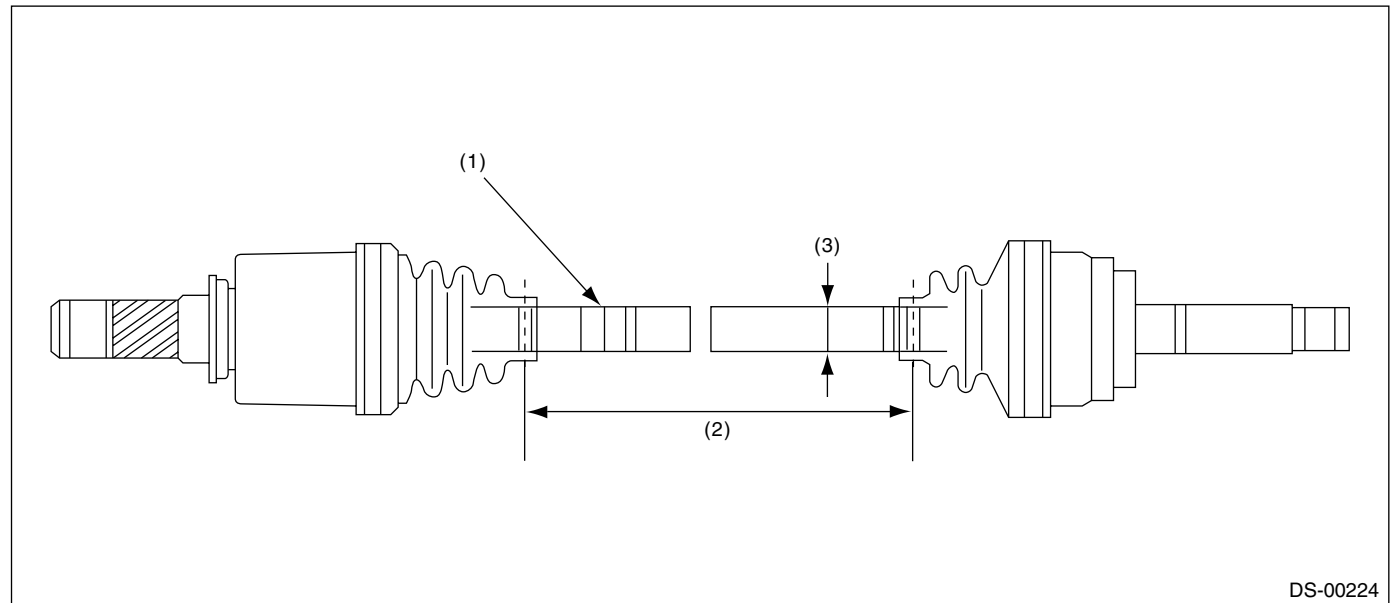
(D) Axle length

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

3. REAR DRIVE SHAFT ASSEMBLY

Type of drive shaft assembly	Model	No. of identification protrusion on shaft	Axle length (mm)	Axle diameter (mm)
EBJ82+DOJ82 RH	Sedan turbo	2 (Two)	363	24
EBJ82+DOJ82 LH		1 (One)	353	24
BJ79+DOJ79 RH	Sedan Non-turbo	2 (Two)	368	23
BJ79+DOJ79 LH		1 (One)	358	23
EBJ82+DOJ82 RH	Wagon turbo	2 (Two)	353	24
EBJ82+DOJ82 LH		1 (One)	343	24
BJ79+DOJ79 RH	Wagon Non-turbo	2 (Two)	358	23
BJ79+DOJ79 LH		1 (One)	348	23
BJ87+DOJ87	STi	1 (One)	295.2	25



DS-00224

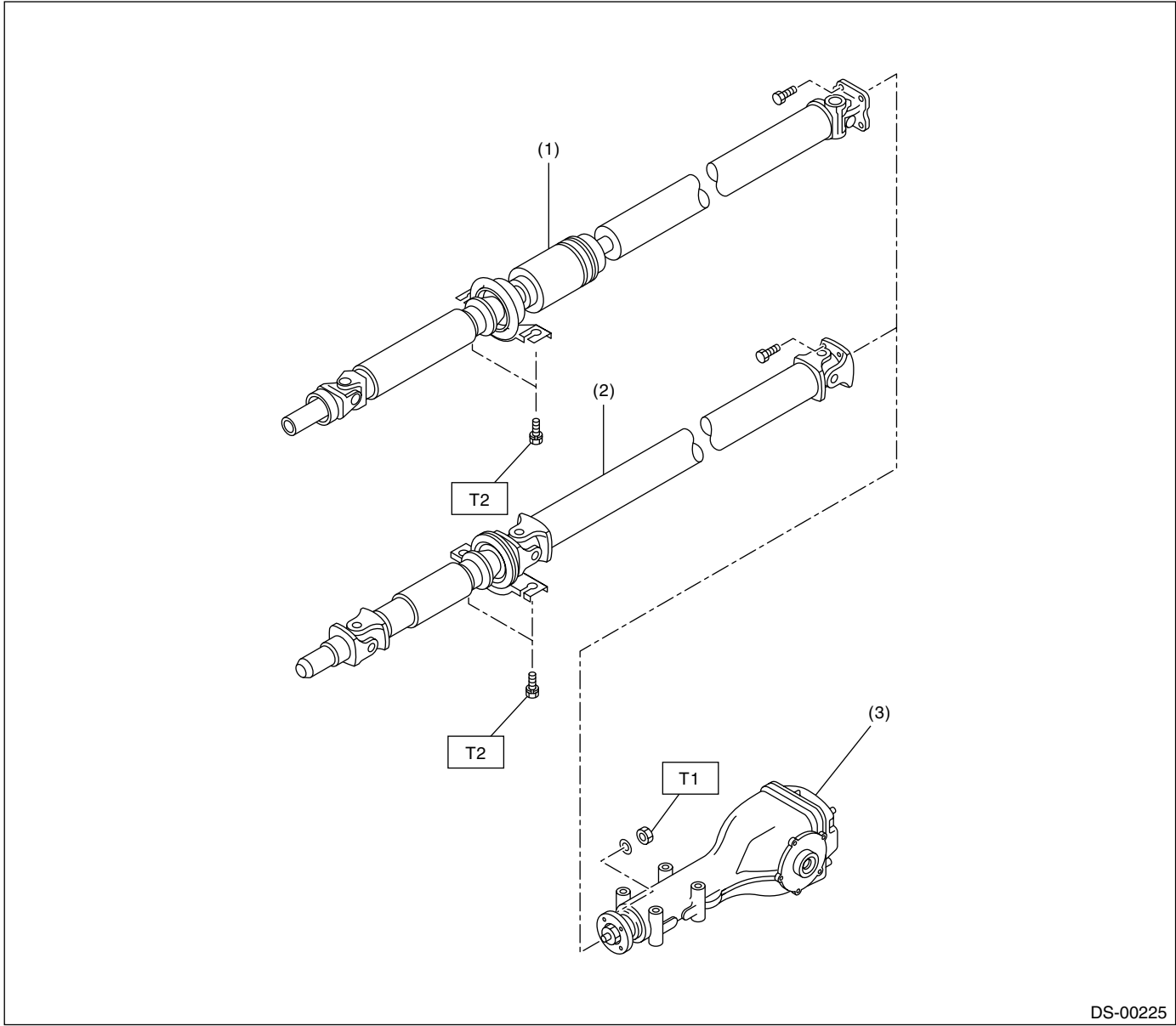
(1) Identification protrusion

(2) Axle length

(3) Axle diameter

B: COMPONENT

1. PROPELLER SHAFT



DS-00225

- (1) Propeller shaft (DOJ type)
(2) Propeller shaft (UJ type)

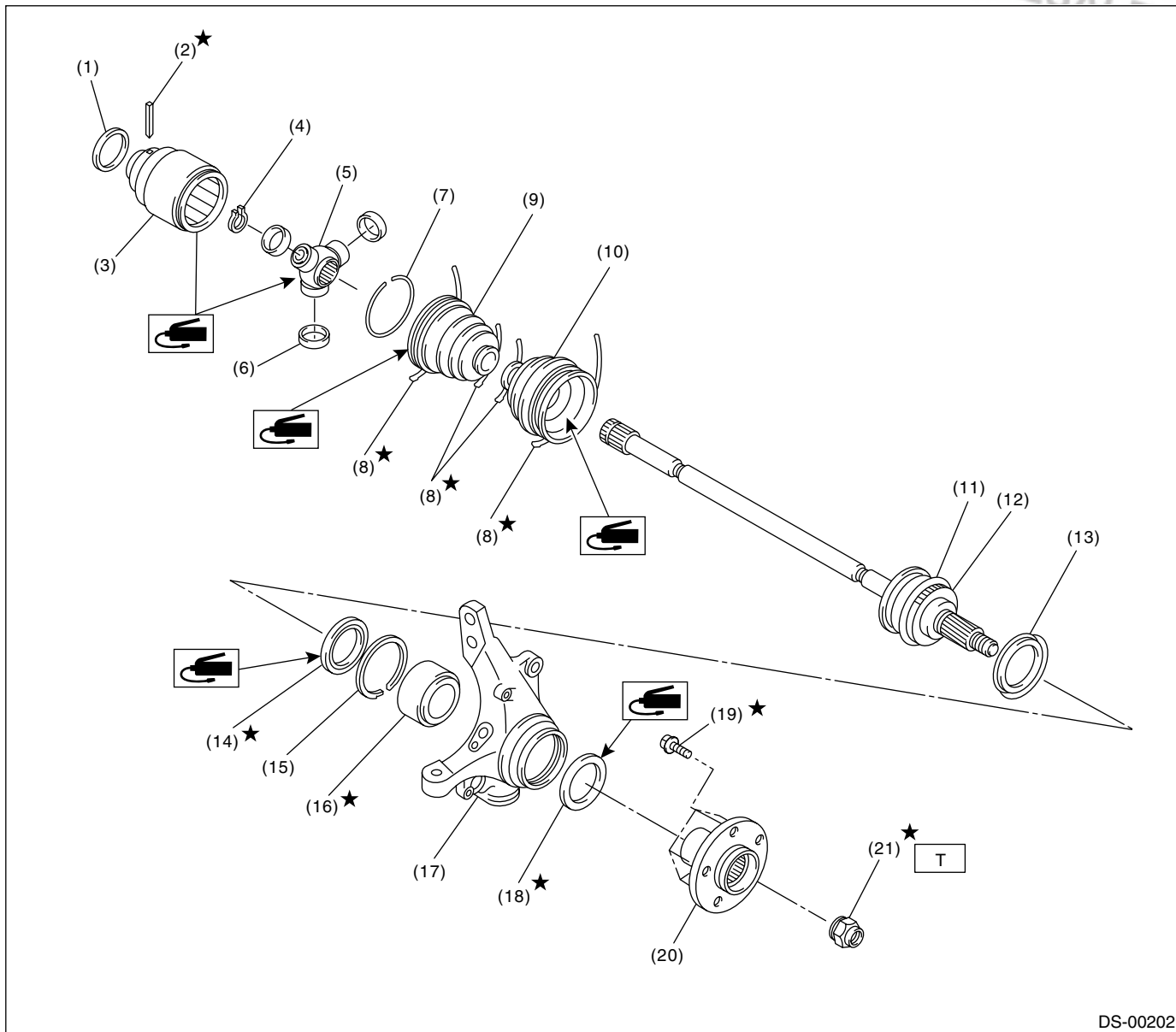
- (3) Rear differential

Tightening torque: N·m (kgf-m, ft-lb)
T1: 38 (3.9, 28.3)
T2: 52 (5.3, 38.3)

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

2. FRONT AXLE



DS-00202

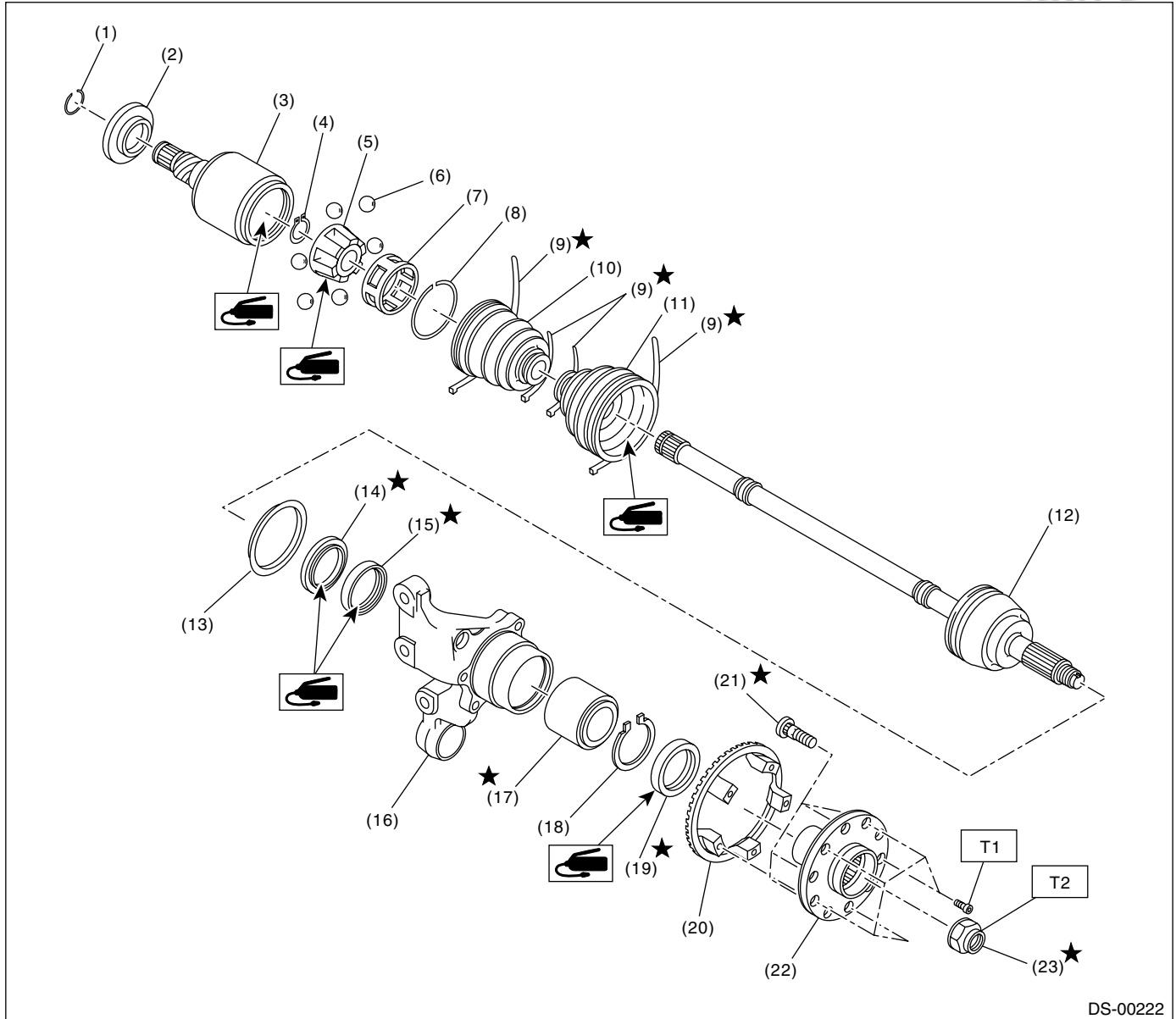
- (1) Baffle plate (SFJ)
- (2) Spring pin
- (3) Outer race (SFJ)
- (4) Snap ring
- (5) Trunnion
- (6) Free ring
- (7) Circlip
- (8) Boot band

- (9) Boot (SFJ)
- (10) Boot (EBJ)
- (11) EBJ ASSY
- (12) Tone wheel
- (13) Baffle plate
- (14) Oil seal (IN)
- (15) Snap ring
- (16) Bearing

- (17) Housing
- (18) Oil seal (OUT)
- (19) Hub bolt
- (20) Hub
- (21) Axle nut

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

3. REAR AXLE



DS-00222

(1) Circlip	(11) Boot	(20) Tone wheel
(2) Baffle plate (DOJ)	(12) Non-turbo: BJ ASSY	(21) Hub bolt
(3) Outer race (DOJ)	Turbo: EBJ ASSY	(22) Hub
(4) Snap ring	(13) Baffle plate	(23) Axle nut
(5) Inner race	(14) Oil seal (IN. No. 2)	
(6) Ball	(15) Oil seal (IN.)	
(7) Cage	(16) Housing	
(8) Circlip	(17) Bearing	
(9) Boot band	(18) Snap ring	
(10) Boot (DOJ)	(19) Oil seal (OUT)	

Tightening torque: N·m (kgf·m, ft·lb)

T1: 13 (1.3, 9.4)

T2: 190 (19.4, 140)

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

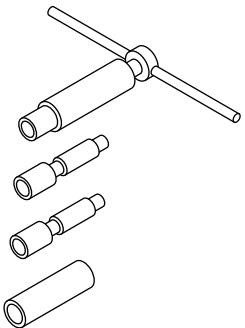
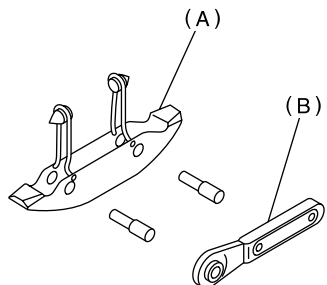
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.

- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

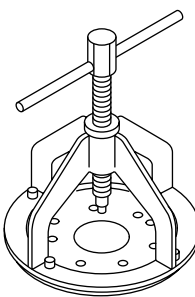
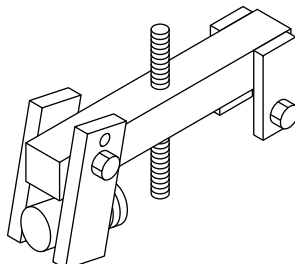
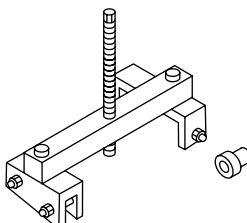
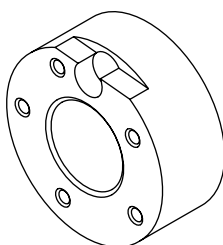
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-922431000	922431000	AXLE SHAFT INSTALLER	• Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening boot band. (A) Jig for band (B) Ratchet wrench

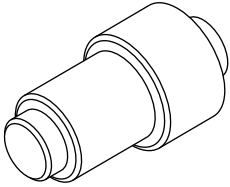
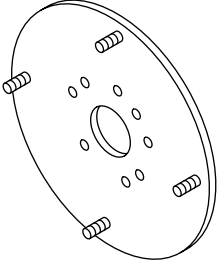
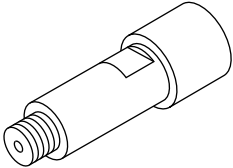
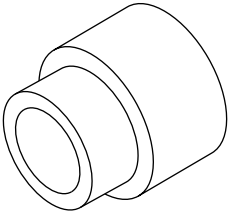
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926470000	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 ST-927060000	927060000	HUB REMOVER	- Used for removing front hub. - Used with HUB STAND (927080000).
 ST-927420000	927420000	HUB REMOVER	- Used for removing rear hub. - Used with HUB STAND (927080000).
 ST-927080000	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.

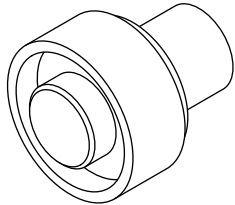
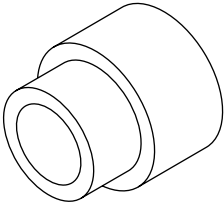
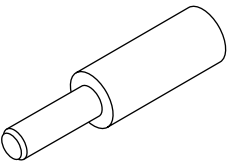
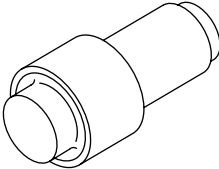
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

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

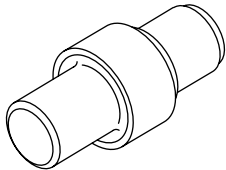
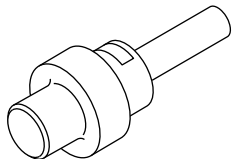
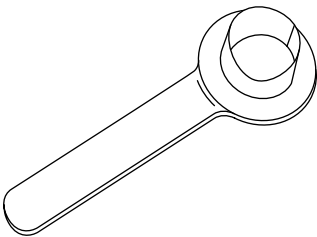
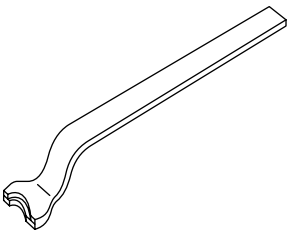
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

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

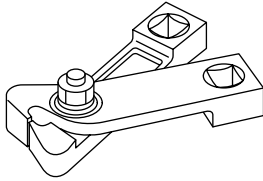
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927460000	927460000	OIL SEAL INSTALLER	- Used for installing outer oil seal. - Used with HOUSING STAND (927430000).
 ST-927450000	927450000	HUB INSTALLER	- Used for pressing hub bearing into hub. - Used with HUB STAND (927080000).
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	- Used for installing rear drive shaft into rear differential. - For protecting oil seal.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099AC000	28099AC000	BOOT BAND PLIERS	Used for tightening front BJ boot band.

2. GENERAL PURPOSE TOOLS

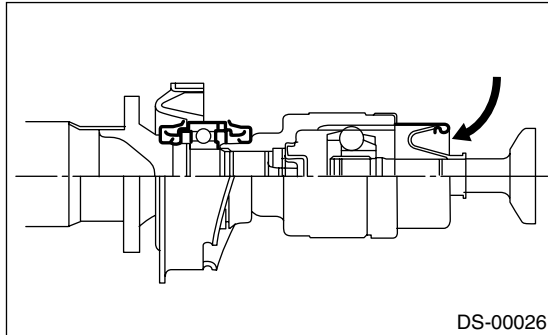
TOOL NAME	REMERKS
Puller	Used for removing ball joint from knuckle arm.
Dial gauge	Used for inspecting propeller shaft run-out.
Snap ring pliers	Used for installing and removing snap ring.

2. Propeller Shaft

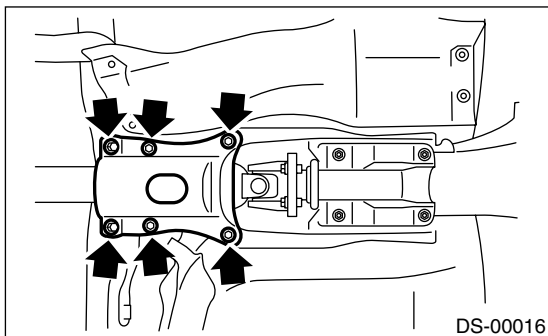
A: REMOVAL

NOTE:

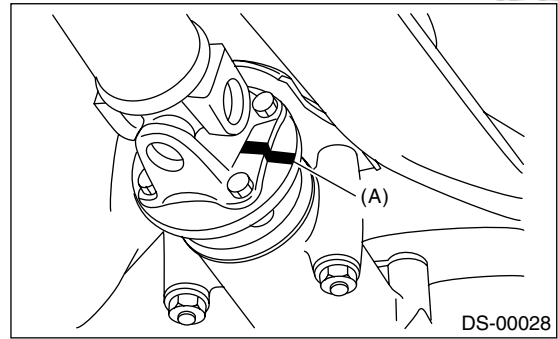
- Before removing the propeller shaft, wrap the metal parts with a cloth or rubber material.
- In case of DOJ type, before removing the propeller shaft, wrap the metal parts (installed at the rubber boot of center DOJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be damaged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



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

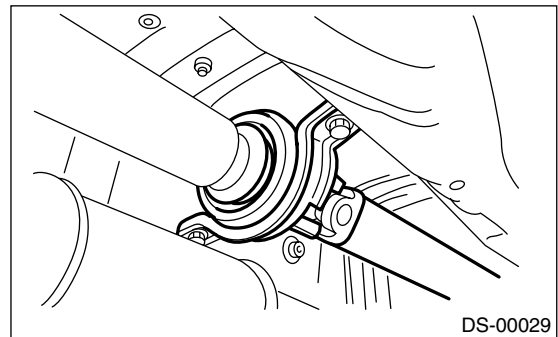


- 8) Make matching marks on affected parts before removal.



(A) Matching mark

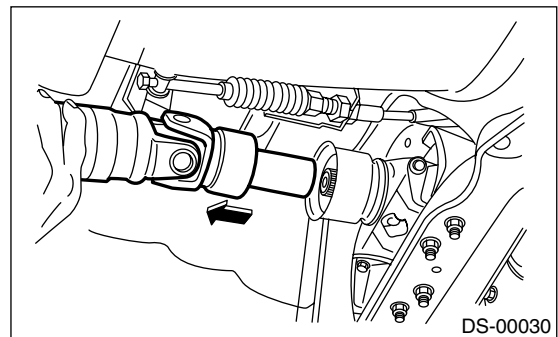
- 9) Remove the three bolts which hold the propeller shaft to rear differential.
- 10) Remove the remaining bolt.
- 11) Remove the two bolts which hold the center bearing to vehicle body.



- 12) Remove the propeller shaft from transmission.

CAUTION:

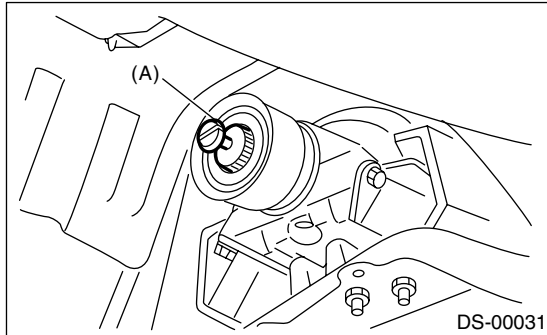
- Be careful not to damage the oil seals and frictional surface of sleeve yoke.
- Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing the propeller shaft.



13) Install the extension cap to transmission.

NOTE:

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



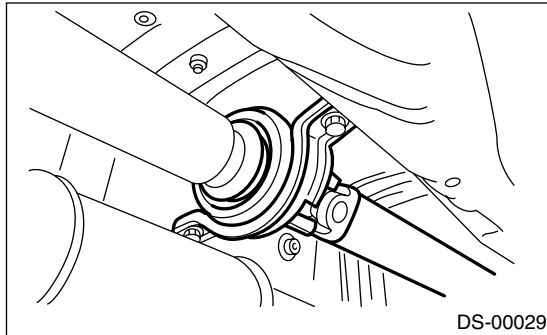
(A) Extension cap

B: INSTALLATION

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

Tightening torque:

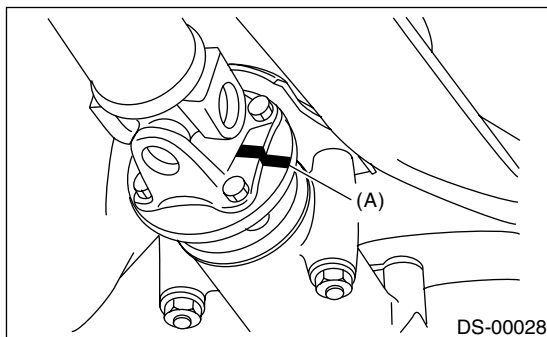
52 N·m (5.3 kgf-m, 38.3 ft-lb)



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

Tightening torque:

38 N·m (3.9 kgf-m, 28.3 ft-lb)



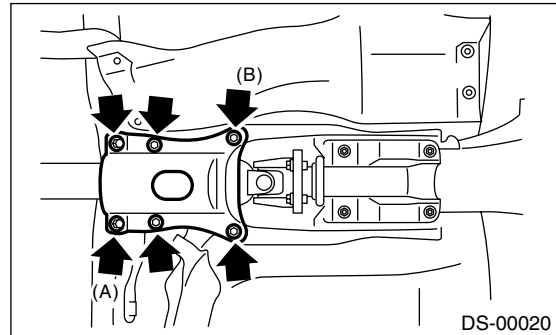
(A) Matching mark

3) Using new bolts, install the differential mount front cover.

- (1) Temporarily tighten the bolt (A) while pushing cover forward.
- (2) Tighten the bolt (B) to specified torque.
- (3) Tighten the bolt (A) to specified torque.
- (4) Tighten the remaining bolts to specified torque.

Tightening torque:

90 N·m (9.2 kgf-m, 66 ft-lb)



4) Install the center exhaust pipes.

5) Install the rear exhaust pipe and muffler.

C: INSPECTION

NOTE:

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

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

Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

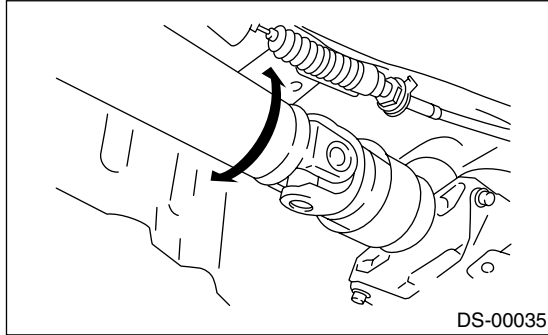
- 1) Remove the center exhaust pipes.
- 2) Remove the heat shield cover.
- 3) Check for any looseness of the yoke flange mounting bolts which connect to rear differential and center bearing bracket mounting bolts.

PROPELLER SHAFT

DRIVE SHAFT SYSTEM

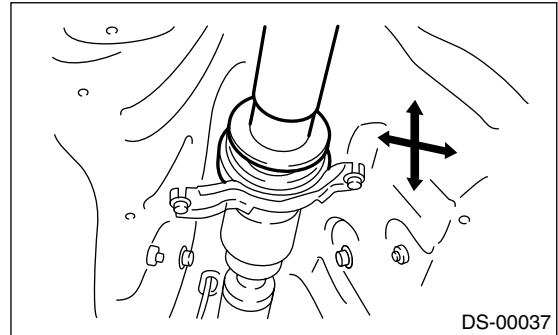
2. SPLINES AND BEARING LOCATIONS

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



4. CENTER BEARING FREE PLAY

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

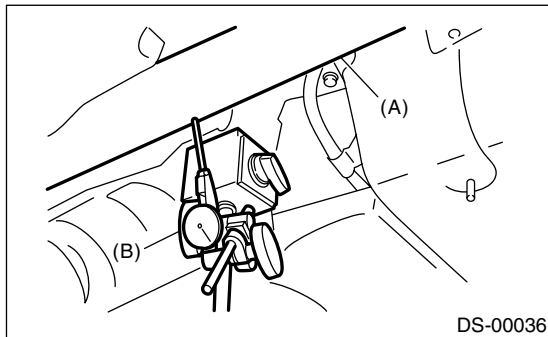


3. RUNOUT OF PROPELLER SHAFT

- 1) Remove the center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the heat shield cover.
- 4) Set the dial gauge with its indicator stem at center of propeller shaft tube.
- 5) Turn the propeller shaft slowly by hands to check for "runout" of propeller shaft.

Runout:

Limit 0.6 mm (0.024 in)

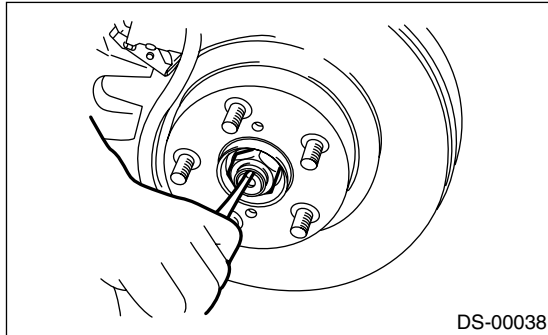


- (A) Propeller shaft
(B) Dial gauge

3. Front Axle

A: REMOVAL

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



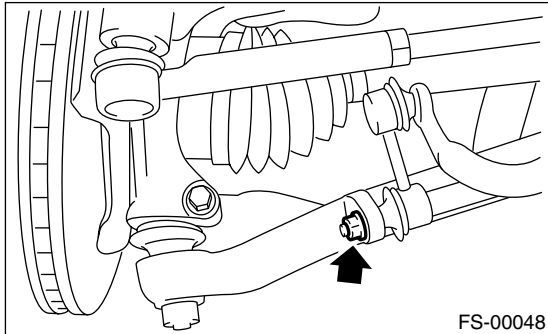
- 3) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:

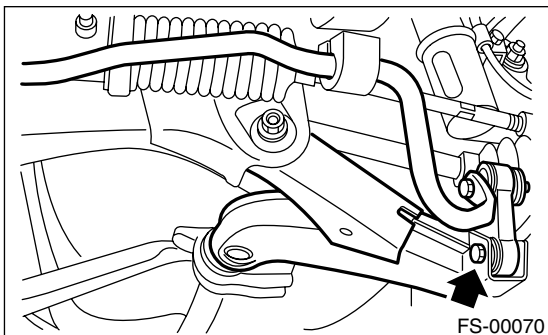
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

- 4) Remove the stabilizer link.

SEDAN:



WAGON:

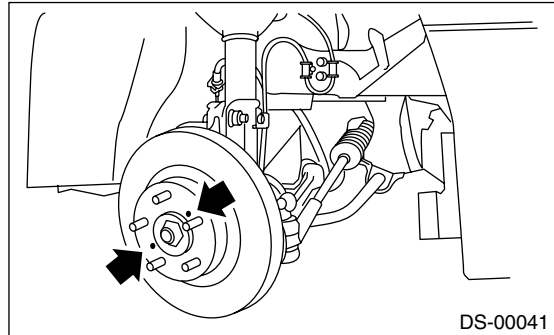


- 5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.

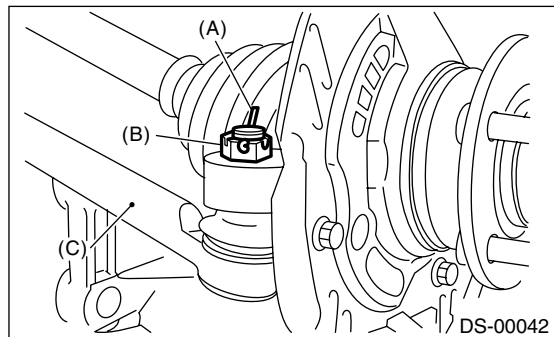
- 6) Remove the disc rotor from hub.

NOTE:

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

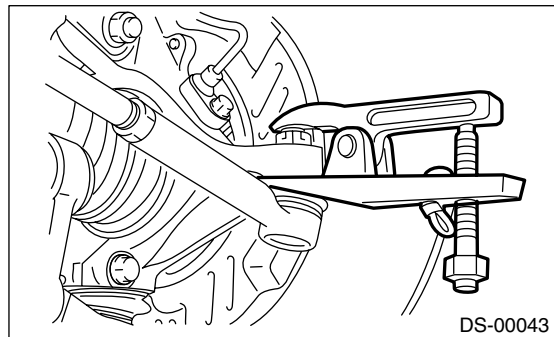


- 7) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.



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

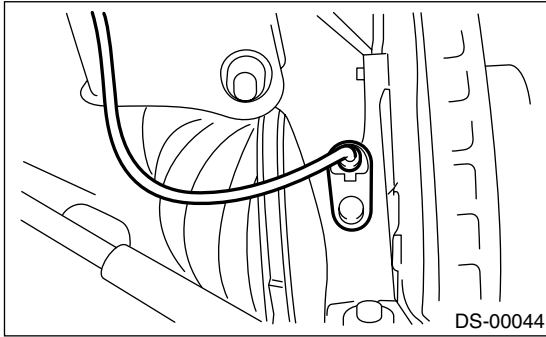
- 8) Using a puller, remove the tie-rod ball joint from knuckle arm.



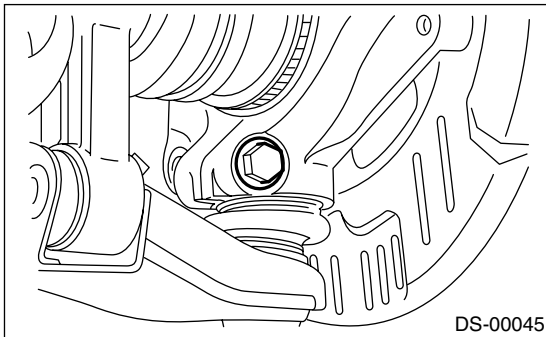
FRONT AXLE

DRIVE SHAFT SYSTEM

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



- 10) Remove the transverse link ball joint from housing.

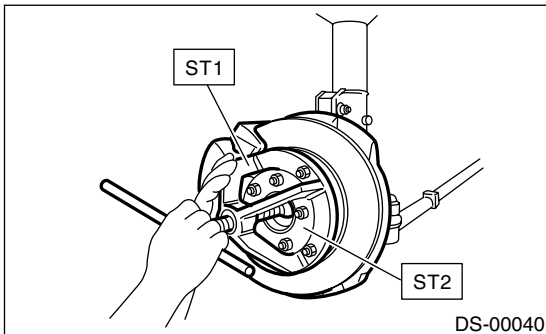


- 11) Remove the front drive shaft assembly from hub. If it is hard to remove, use the STs.

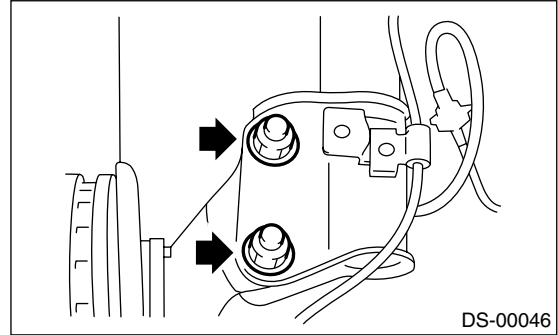
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

CAUTION:

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



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



B: INSTALLATION

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

Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)

- 5) While aligning the alignment mark on the camber adjusting bolt head, tighten the housing and strut using a new self-locking nut.

Tightening torque:

175 N·m (17.8 kgf-m, 129 ft-lb)

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

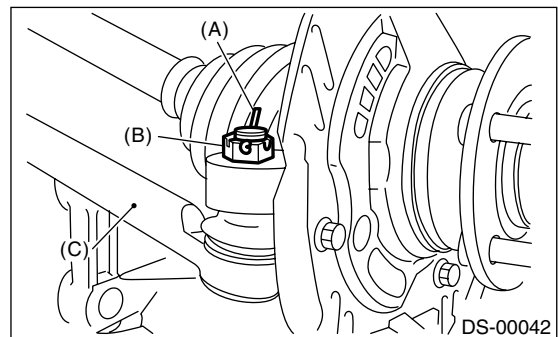
Tightening torque:

27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:

When connecting, do not hit the cap at bottom of tie-rod with hammer.

- 7) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



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

- 8) Install the disc rotor on hub.

9) Install the disc brake caliper on housing.

Tightening torque:

Except STi model

80 N·m (8.2 kgf-m, 59 ft-lb)

STi model

155 N·m (15.8 kgf-m, 114.3 ft-lb)

10) Connect the stabilizer link.

Tightening torque:

Except STi model

30 N·m (3.1 kgf-m, 22 ft-lb)

STi model

45 N·m (4.6 kgf-m, 33 ft-lb)

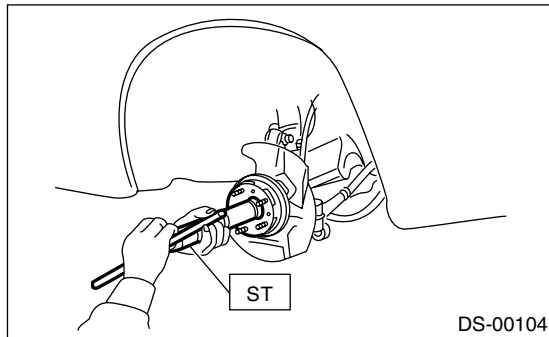
CAUTION:

Use a new self-locking nut.

11) Using the ST1 and ST2, pull the front drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER

ST2 927390000 ADAPTER



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

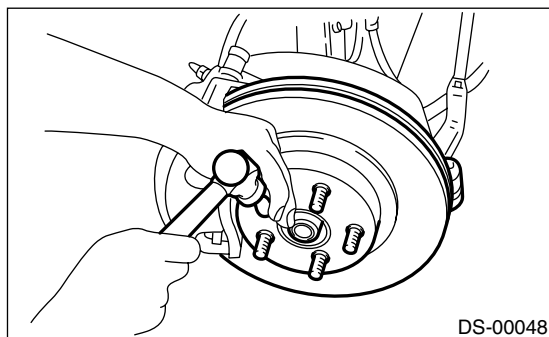
Tightening torque:

220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:

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

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



14) Install the ABS wheel speed sensor on housing.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

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

Tightening torque:

90 N·m (9.2 kgf-m, 66 ft-lb)

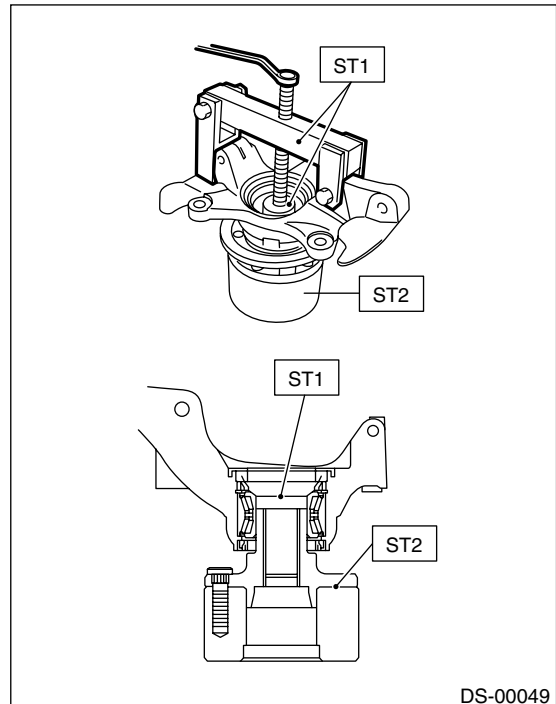
C: DISASSEMBLY

1) Using the ST1, support the housing and hub securely.

2) Attach the ST2 to housing and drive the hub out.

ST1 927060000 HUB REMOVER

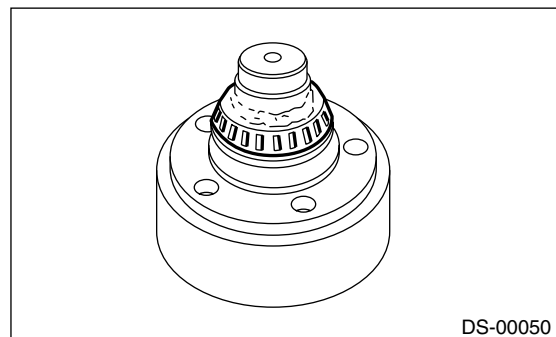
ST2 927080000 HUB STAND



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

NOTE:

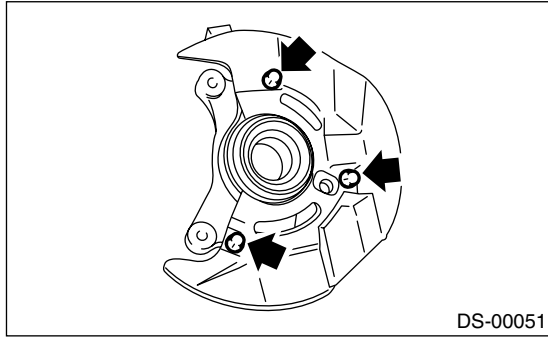
Be careful not to scratch the polished area of hub.



CAUTION:

Do not reuse the bearing if the hub was removed.

3) Remove the disc cover from housing.

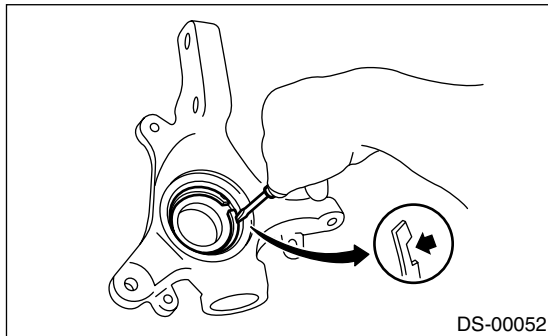


4) Using a standard screwdriver, remove the outer and inner oil seals.

5) Using a flat tip screwdriver, remove the snap ring.

NOTE:

Be careful not to damage the housing at removal.

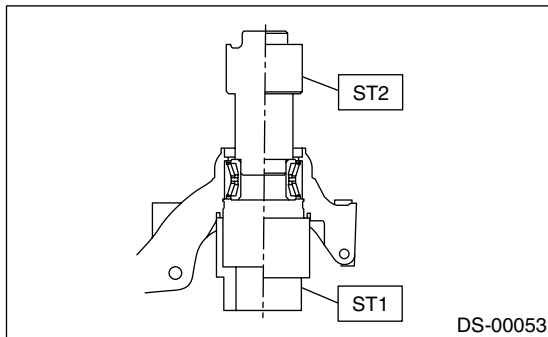


6) Using the ST1, support the housing securely.

7) Using the ST2, hold the inner race to drive out the outer race of bearing.

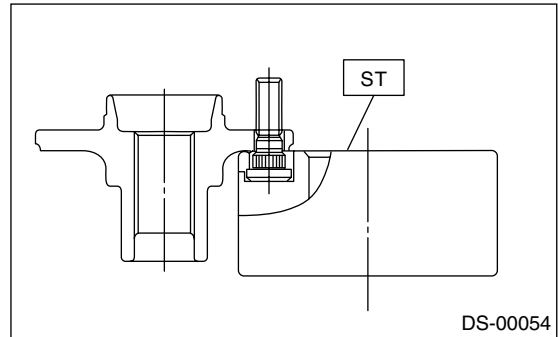
ST1 927400000 HOUSING STAND

ST2 927100000 BEARING PULLER



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

ST 927080000 HUB STAND



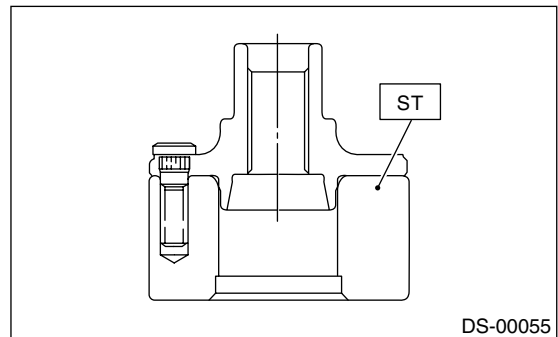
D: ASSEMBLY

NOTE:

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

1) Attach the hub to ST securely.

ST 927080000 HUB STAND



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

NOTE:

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

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

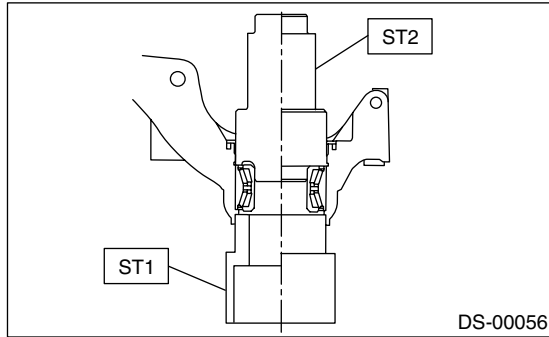
4) Using the ST1 and ST2, press a new bearing into place.

ST1 927400000 HOUSING STAND

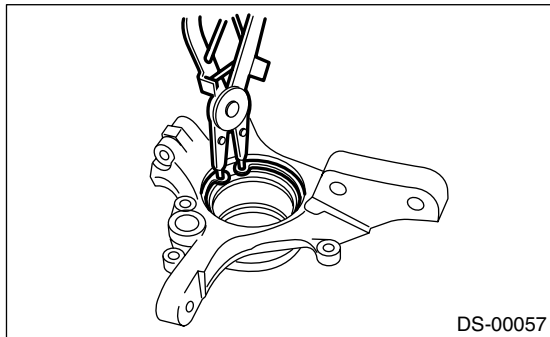
ST2 927100000 BEARING PULLER

NOTE:

Be careful not to remove the plastic lock from inner race when installing the bearing.

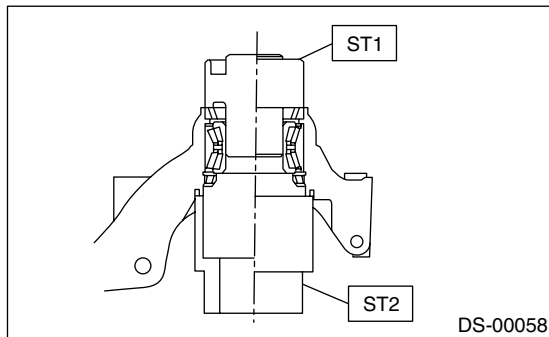


5) Using pliers, install the snap ring firmly.



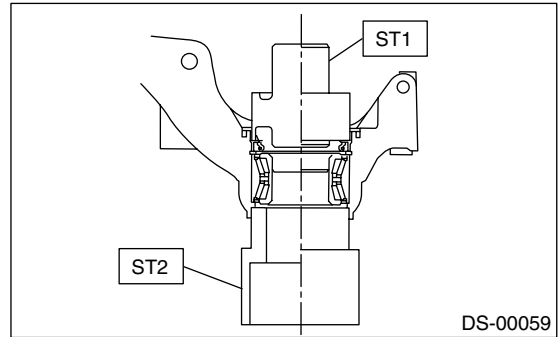
6) Using the ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



7) Using the ST1 and ST2, press the inner oil seal until it contacts the circlip.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



8) Invert the ST and housing.

ST 927400000 HOUSING STAND

9) Apply sufficient grease to the oil seal lip.

Specified grease:
SHELL 6459N

NOTE:

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

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

Tightening torque:

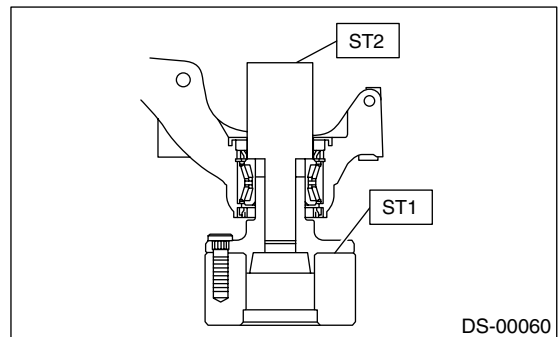
18 N·m (1.8 kgf-m, 13.0 ft-lb)

11) Attach the hub to ST1 securely.

12) Clean dust or foreign particles from the polished surface of hub.

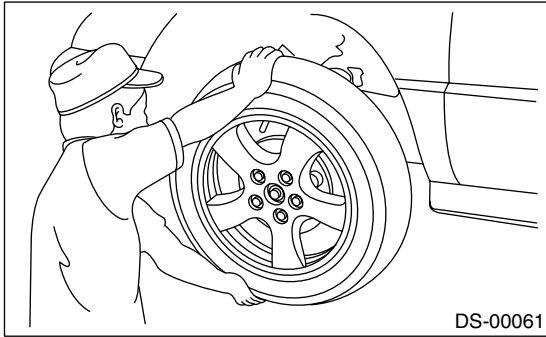
13) Using the ST2, press the bearing into hub by driving the inner race.

ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER



E: INSPECTION

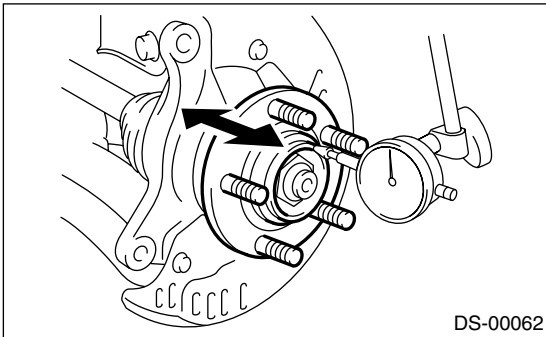
1) Moving the front tire up and down by hand, check there is no backlash in bearing, and check the wheel rotates smoothly.



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

Limit:

Maximum: 0.05mm (0.0020 in)



4. Rear Axle

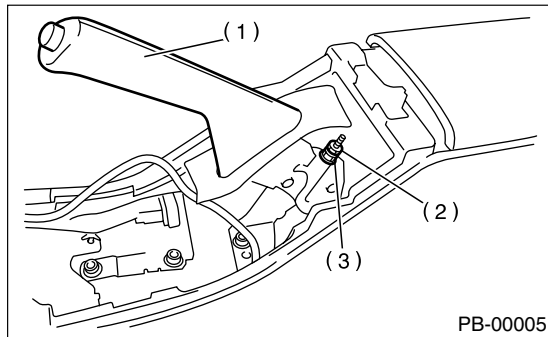
A: REMOVAL

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

CAUTION:

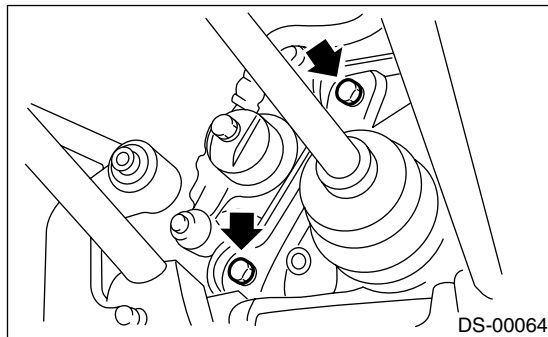
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

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



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

- 6) Remove the disc brake caliper from back plate, and suspend it from strut using a piece of wire.

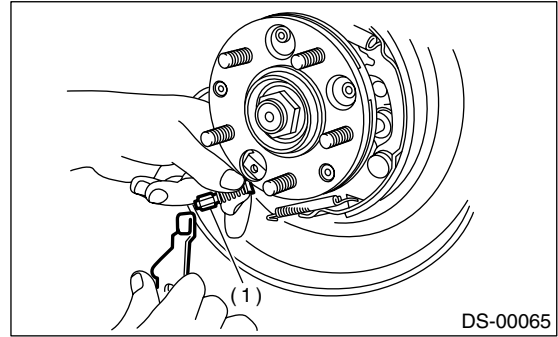


- 7) Remove the disc rotor from hub.

NOTE:

If the disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

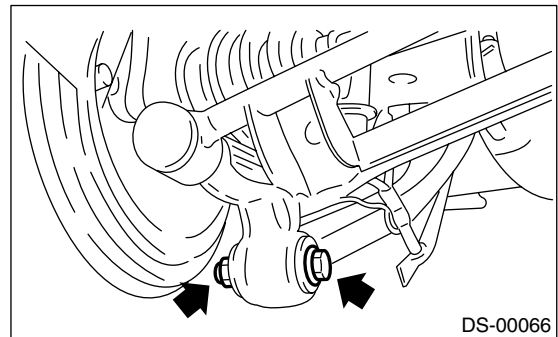
- 8) Disconnect the parking brake cable end.



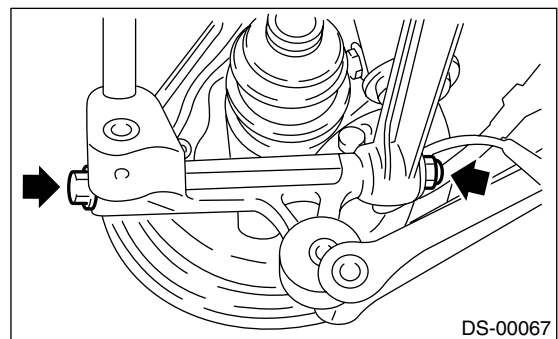
- (1) Cable end

- 9) Disconnect the rear stabilizer from rear lateral link.

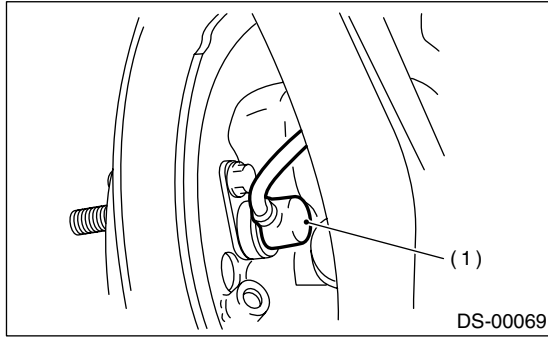
- 10) Remove the bolts which secure the trailing link assembly to rear housing.



- 11) Remove the bolts which secure the lateral assembly to rear housing.



12) Remove the rear ABS wheel speed sensor from back plate.



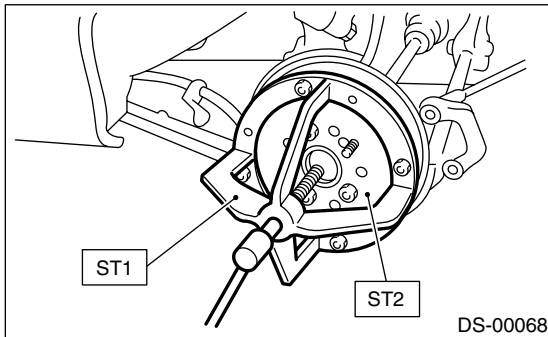
(1) ABS wheel speed sensor

13) Disengage the BJ from housing splines, and then remove the rear drive shaft assembly. If it is hard to remove, use the STs.

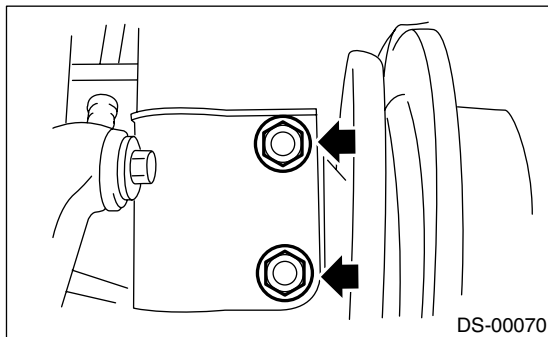
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

NOTE:

- Be careful not to damage the oil seal lip when removing the rear drive shaft.
- When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



14) Remove the bolts which secure the rear housing to strut, and separate the two.



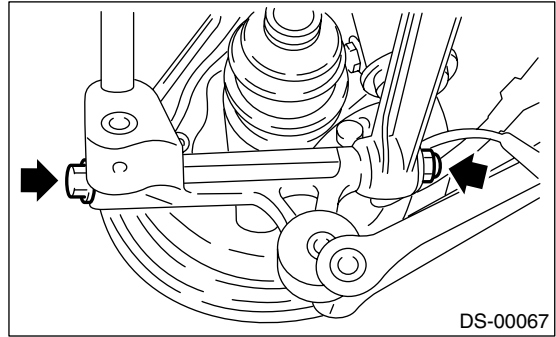
B: INSTALLATION

- 1) Temporarily tighten the rear axle to strut.
- 2) Insert the rear drive shaft into rear axle.

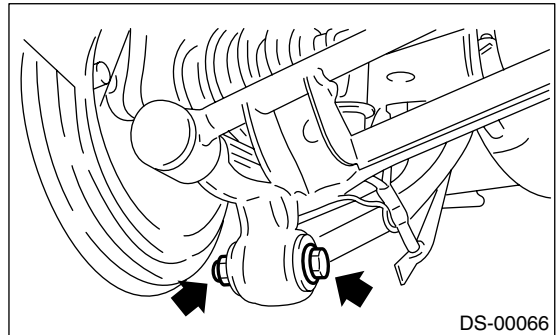
NOTE:

Be careful not to damage the inner oil seal lip.

- 3) Temporarily tighten the axle nut.
- 4) Using a new self-locking nut, temporarily tighten the rear housing assembly and lateral link assembly.



- 5) Using a new self-locking nut, temporarily tighten the rear housing assembly and trailing link assembly.



- 6) Tighten the rear housing assembly and strut assembly using a new self-locking nut.

Tightening torque:

200 N·m (20.4 kgf-m, 148 ft-lb)

- 7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)

- 8) Connect the parking brake cable to parking brake.
- 9) Install the disc rotor on rear housing assembly.

10) Install the disc brake caliper on back plate.

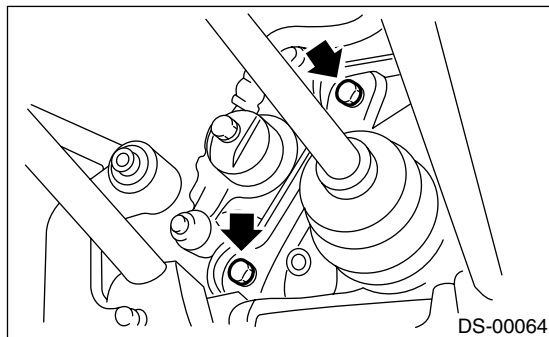
Tightening torque:

Except STi model

52 N·m (5.3 kgf-m, 38.3 ft-lb)

STi model

65 N·m (6.6 kgf-m, 47.9 ft-lb)



11) Adjust the parking brake lever stroke by turning the adjuster.

12) While applying the parking brake, tighten a new axle nut using a socket wrench. Lock the axle nut after tightening.

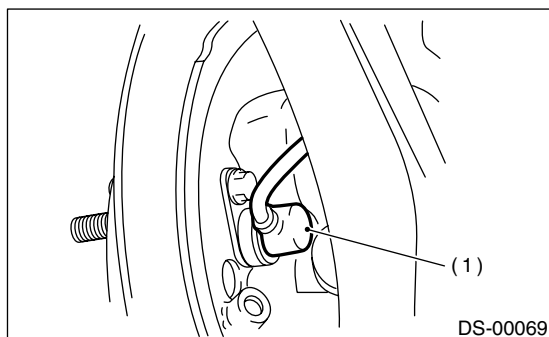
Tightening torque:

190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:

Do not overtighten it as this may damage the wheel bearing.

13) Install rear ABS wheel speed sensor.



(1) ABS wheel speed sensor

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

Tightening torque:

90 N·m (9.2 kgf-m, 66 ft-lb)

15) Make the tires contact the ground fully.

CAUTION:

Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

16) Tighten the installation bolt of rear housing assembly and lateral link assembly.

Tightening torque:

140 N·m (14.3 kgf-m, 103 ft-lb)

17) Tighten the installation bolt of rear housing assembly and trailing link assembly.

Tightening torque:

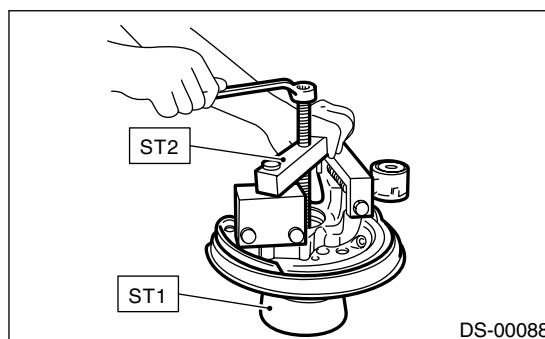
90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

1) Using the ST1 and ST2, remove the hub from rear housing.

ST1 927080000 HUB STAND

ST2 927420000 HUB REMOVER



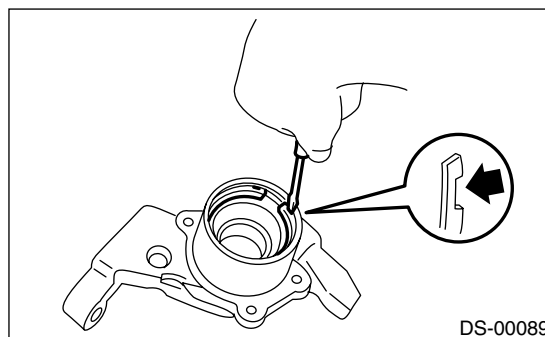
2) Remove the back plate from rear housing.

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

4) Using a flat tip screwdriver, remove the snap ring.

NOTE:

Be careful not to damage the housing at removal.



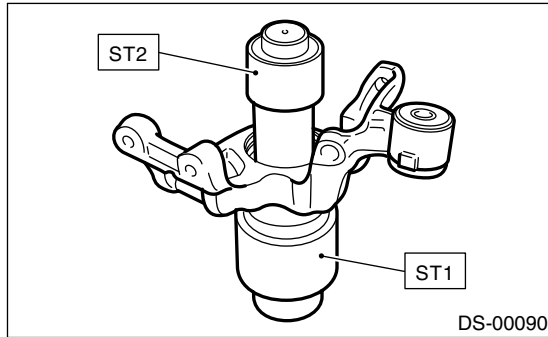
REAR AXLE

DRIVE SHAFT SYSTEM

5) Using the ST1 and ST2, remove the bearing by pressing the inner race.

ST1 927430000 HOUSING STAND

ST2 927440000 BEARING REMOVER



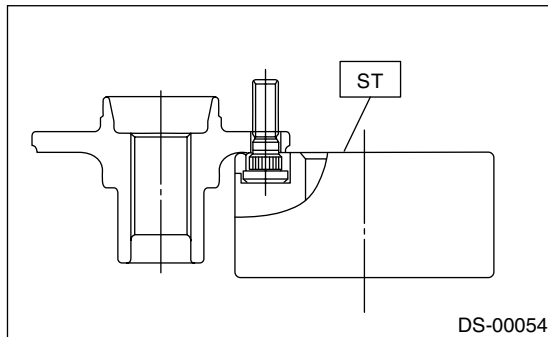
6) Remove the tone wheel bolts, and then remove the tone wheel from hub.

7) Using the 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 to be removed from housing, replace the bearing set and oil seal with new ones.

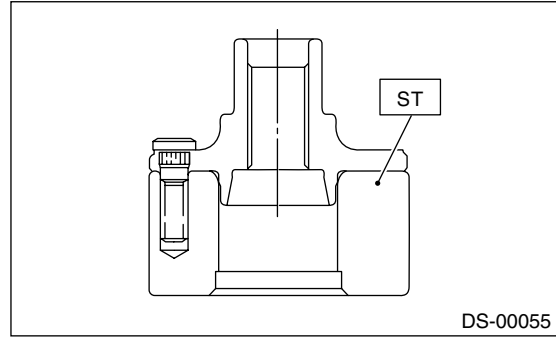
1) Using the ST, press the new hub bolt into place.

NOTE:

- Ensure the hub bolt closely contacts the hub.
- Use a 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

ST 927080000

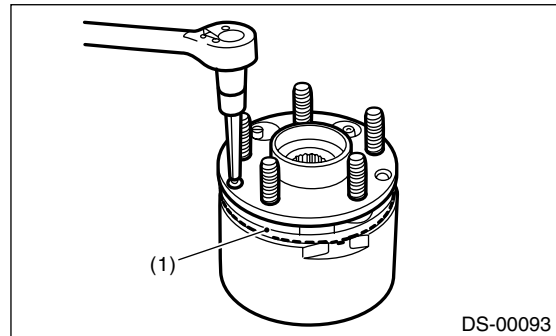
HUB STAND



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of the hub tone wheel, and then install the tone wheel to hub.

NOTE:

- Ensure the tone wheel closely contacts the hub.
- Be careful not to damage the tone wheel teeth.



(1) Tone wheel

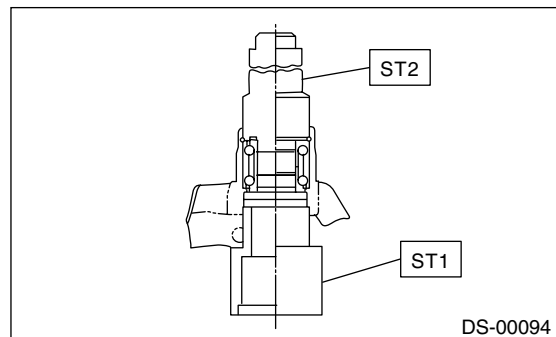
3) Clean the housing interior completely. Using the ST1 and ST2, press the bearing into housing.

ST1 927430000 HOUSING STAND

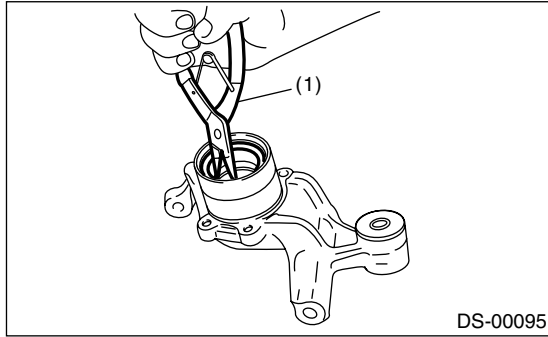
ST2 927440000 BEARING REMOVER

NOTE:

Be careful not to remove the plastic lock from inner race when installing the bearing.



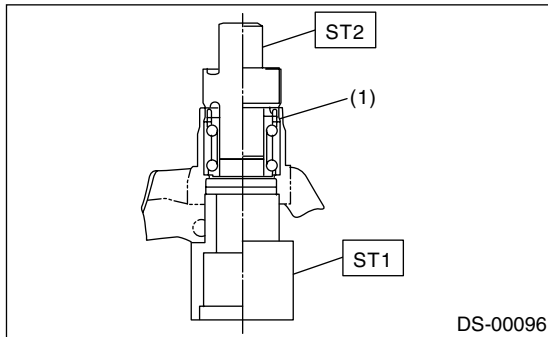
4) Using pliers, install the snap ring firmly.



(1) Pliers

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

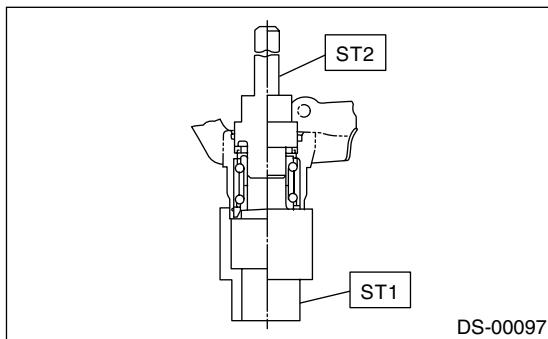


(1) Snap ring

6) Invert both ST1 and housing.

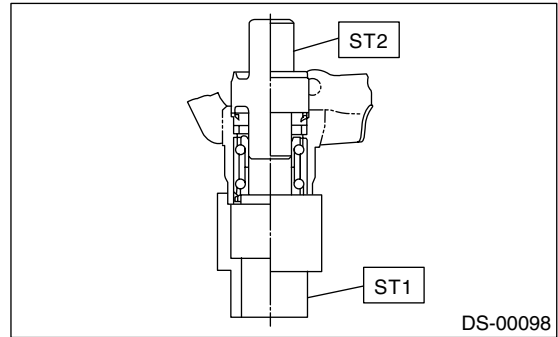
7) Using the ST2, press the inner oil seal into housing until it touches the bottom.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



8) Using the ST1 and ST2, press the sub seal into place.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



9) Apply sufficient grease to oil seal lip.

Specified grease:
SHELL 6459N

NOTE:

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

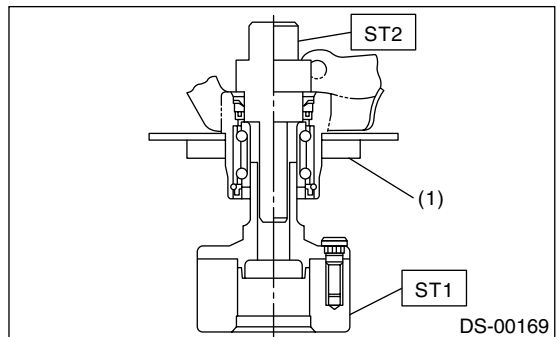
10) Install the back plate to rear housing.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 ft-lb)

11) Using the ST1 and ST2, press the bearing into hub.

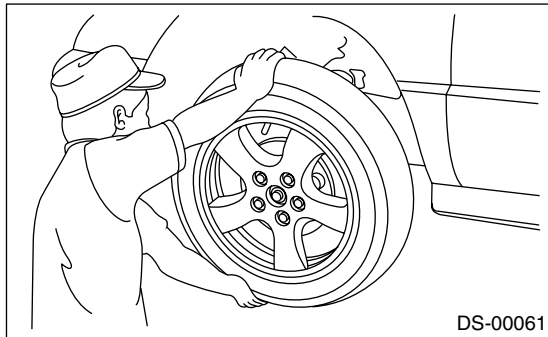
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER



(1) Back plate

E: INSPECTION

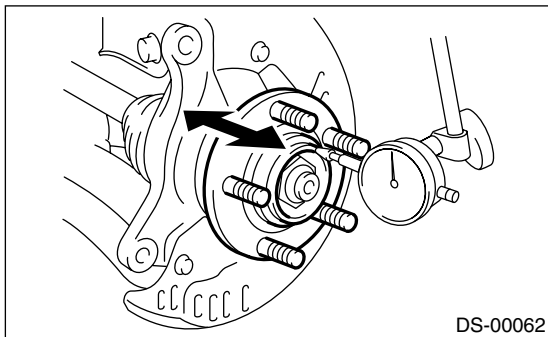
1) Moving the front tire up and down by hand, check there is no backlash in bearing, and check the wheel rotates smoothly.



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

Limit:

Maximum: 0.05mm (0.0020 in)



5. Front Drive Shaft

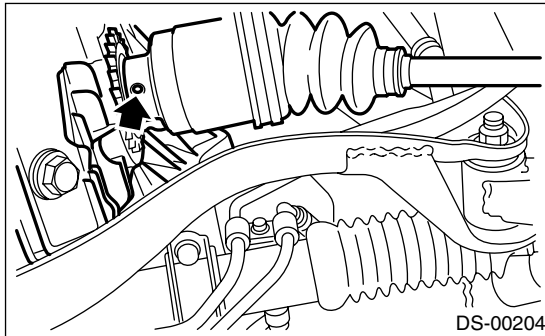
A: REMOVAL

- 1) Jack-up the vehicle, support it with rigid racks, and then remove the front wheel cap and wheels.
- 2) Raise the caulking portion of axle nut.
- 3) Depress the brake pedal and remove the axle nut using a socket wrench.

CAUTION:

Be sure to loosen the axle nut after removing the wheel from vehicle. Failure to follow this rule may damage the wheel bearings.

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

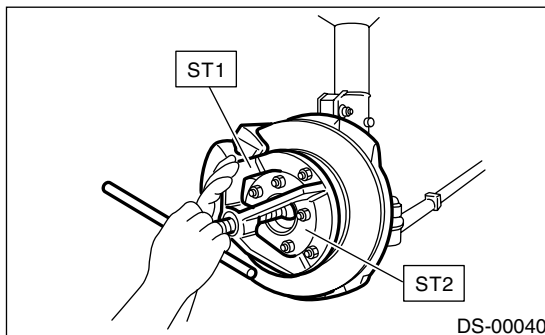


- 7) Remove the front drive shaft assembly. If it is hard to remove, use the ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

CAUTION:

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



B: INSTALLATION

- 1) Insert the BJ into hub splines.

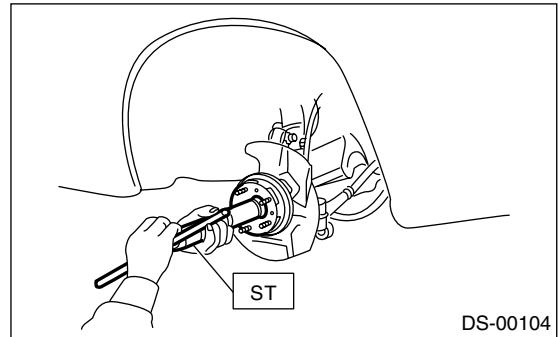
CAUTION:

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

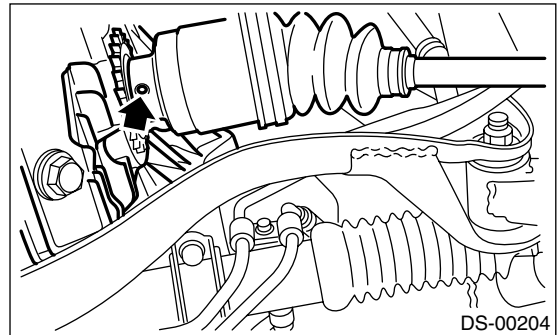
- 2) Using the ST1 and ST2, pull the drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER

ST2 927390000 ADAPTER



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



- 5) Connect the transverse link to housing.

Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)

- 6) Install the stabilizer bracket.
- 7) While depressing the brake pedal, tighten the axle nut to specified torque.

Tightening torque:

220 N·m (22.4 kgf-m, 162 ft-lb)

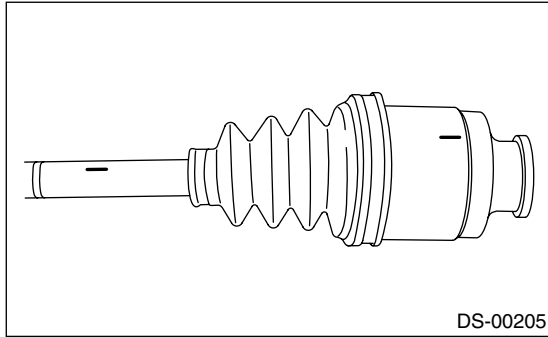
CAUTION:

- Always tighten the axle nut before installing wheel on vehicle. If the tire is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

- 8) After tightening the axle nut, caulk and lock it.

C: DISASSEMBLY

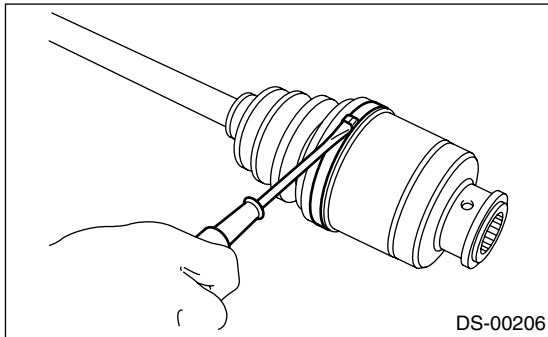
1) Place alignment marks on shaft and outer race.



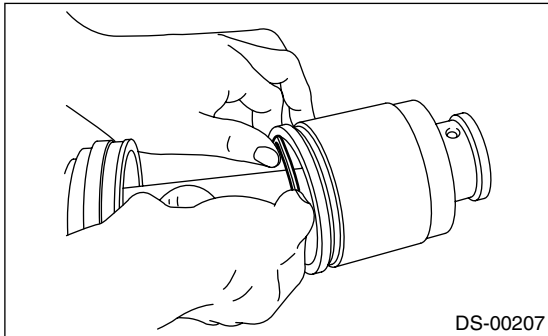
2) Remove the SFJ boot band and boot.

CAUTION:

Be careful not to damage the boot.



3) Remove the circlip from SFJ outer race using a screwdriver.



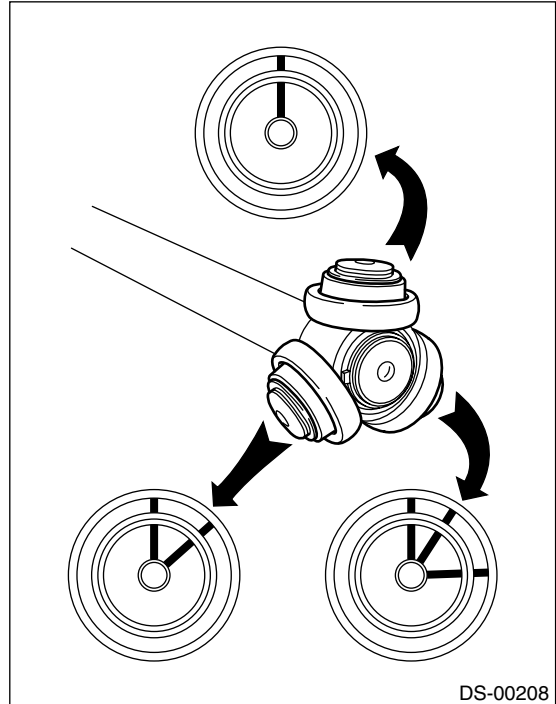
4) Remove the SFJ outer race from shaft assembly.

5) Wipe off the grease.

CAUTION:

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

6) Place alignment marks on free ring and trunnion.

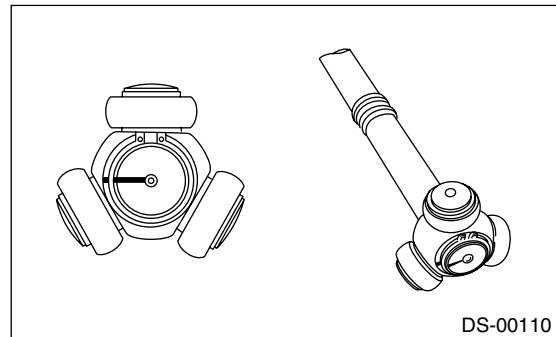


7) Remove the free ring from trunnion.

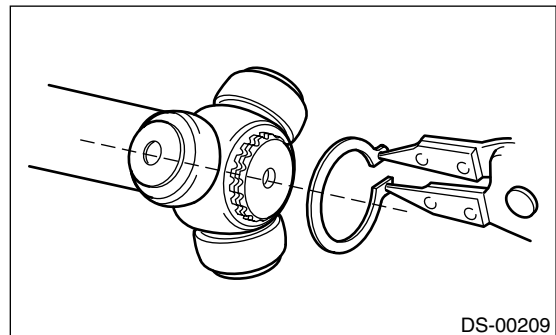
CAUTION:

Be careful with the free ring position.

8) Place an alignment mark on trunnion and shaft.



9) Remove the snap ring and trunnion.



CAUTION:

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

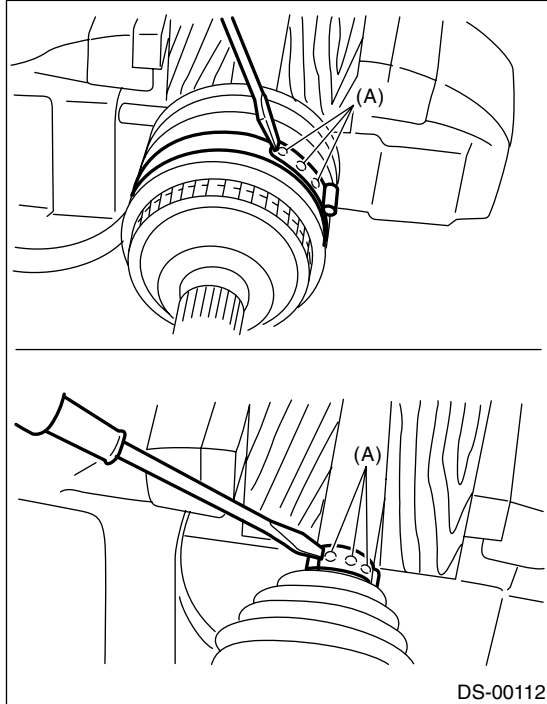
10) Remove the SFJ boot.

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

CAUTION:

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

12) Raise the boot band claws by means of screw-driver and hammer.

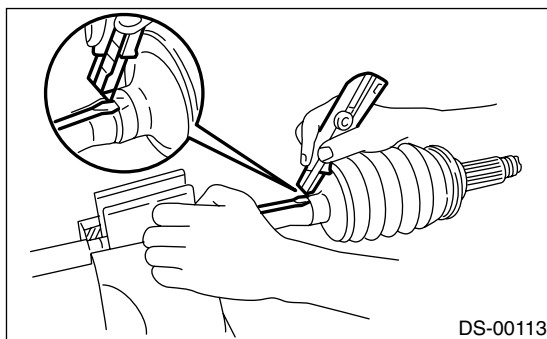


(A) Boot band claws

13) Cut and remove the boot.

CAUTION:

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



NOTE:

Further disassembly of axle is impossible because the BJ cannot be disassembled.

D: ASSEMBLY

NOTE:

Use specified grease.

BJ side:

NTG2218 (Part No. 28093AA000)

SFJ side:

SSG6003 (Part No. 28093TA000)

DOJ side:

VU-3A702 (Part No. 23223GA050)

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

CAUTION:

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

2) Place the drive shaft in a vise.

CAUTION:

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

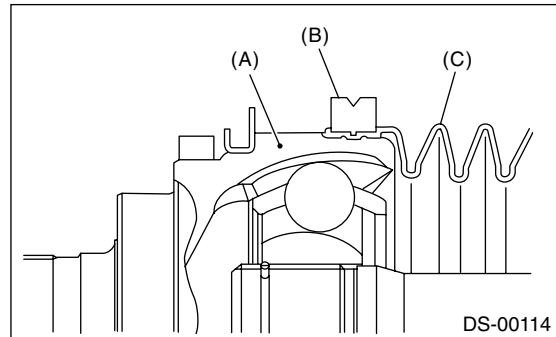
3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to BJ.

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

NOTE:

BJ installation surface of BJ boot shall be cleaned so as to be free from grease and other substances.

5) Install the boot projecting portion to BJ groove.



(A) BJ

(B) Large boot band

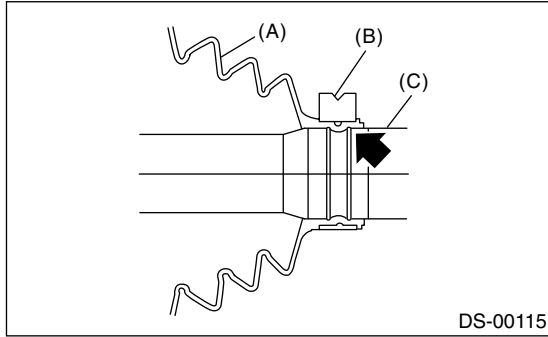
(C) Boot

6) Set the large boot band in place.

FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

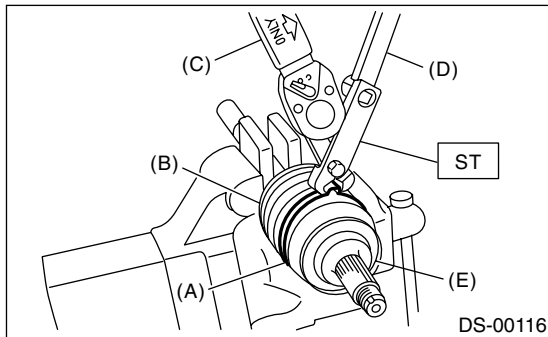
7) Install the boot projecting portion to shaft groove.



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

8) Tighten the boot bands using the ST, torque wrench and socket flex handle.

ST 28099AC000 BOOT BAND PLIER



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

Tightening torque:

Large boot band

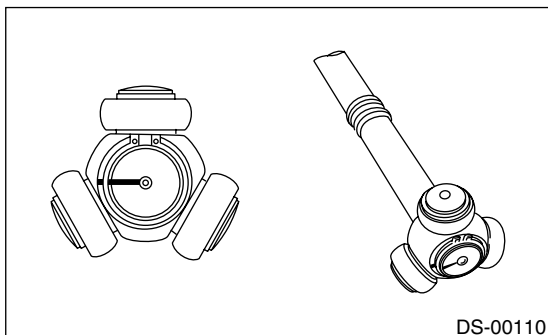
157 N·m (16.0 kgf-m, 116 ft-lb) or more

Small boot band

133 N·m (13.6 kgf-m, 98 ft-lb) or more

9) Place the SFJ boot at the center of shaft.

10) Align the alignment marks, and then install the trunnion on shaft.



11) Install the snap ring to shaft.

CAUTION:

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

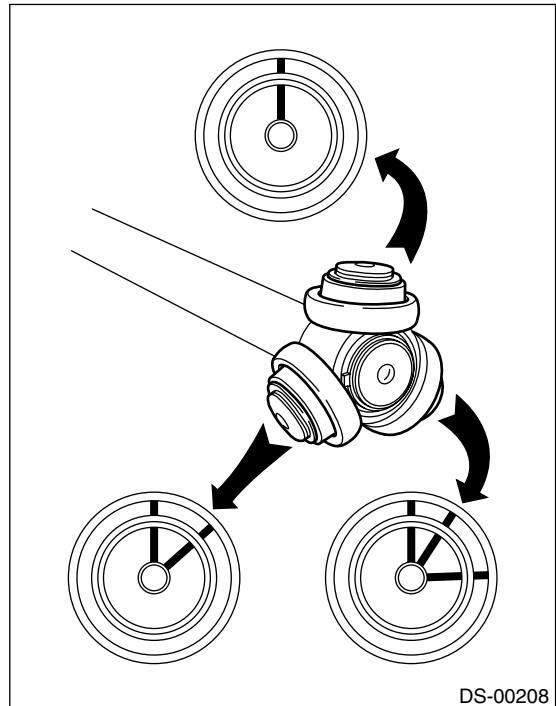
12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of SFJ outer race.

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

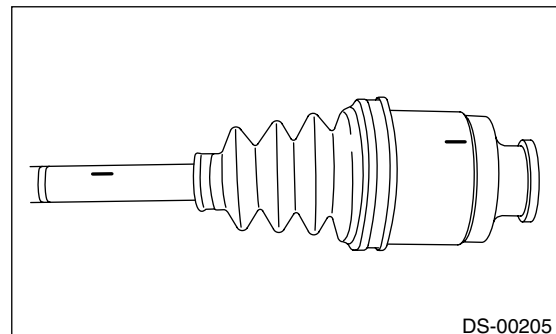
14) Align the alignment marks on free ring and trunnion, and then install the free ring.

CAUTION:

Be careful with the free ring position.



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



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

CAUTION:

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

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

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

CAUTION:

- **SFJ installation surface of SFJ boot shall be cleaned so as to be free from grease and other substances.**
- **When installing the SFJ boot, position the outer race of SFJ at center of its travel.**

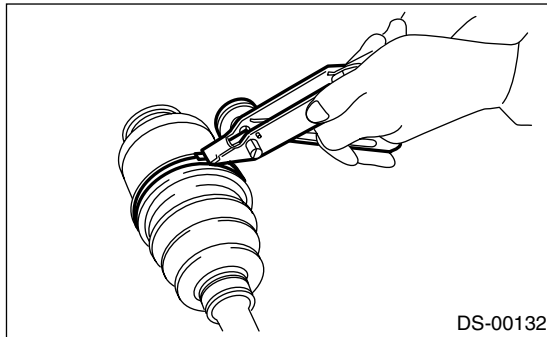
19) Put a new band through the clip and wind twice in alignment with band groove of boot.

20) Tighten the band by using the ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten the band until it cannot be moved by hand.

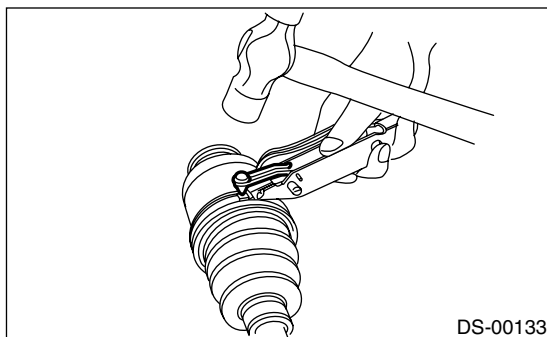


21) Tap on the clip with punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

CAUTION:

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



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

CAUTION:

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

23) Extend and retract the SFJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.

1) DOJ (Double Offset Joint)

Check seizure, corrosion, damage, wear and excessive play.

2) SFJ (Shudder-less Freering tripod Joint)

Check seizure, corrosion, damage and excessive play.

3) Shaft

Check excessive bending, twisting, damage and wear.

4) BJ (Bell Joint)

Check seizure, corrosion, damage and excessive play.

5) Boot

Check for wear, warping, breakage or scratches.

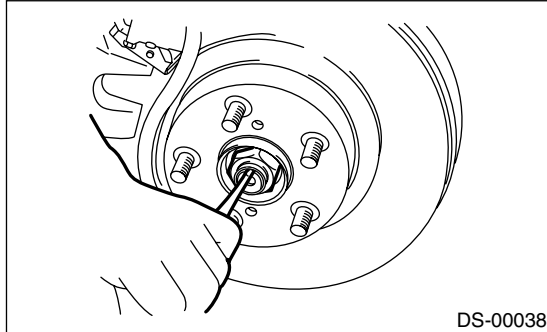
6) Grease

Check for discoloration or fluidity.

6. Rear Drive Shaft

A: REMOVAL

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

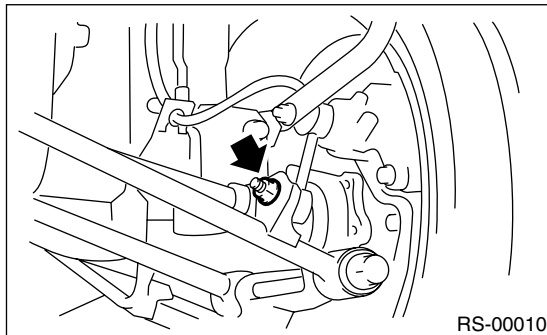


- 4) Remove the axle nut using a socket wrench with parking brake applied.

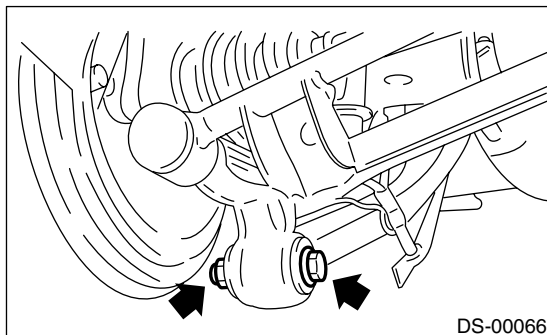
CAUTION:

Remove the axle nut with vehicle weight not applied on axle.

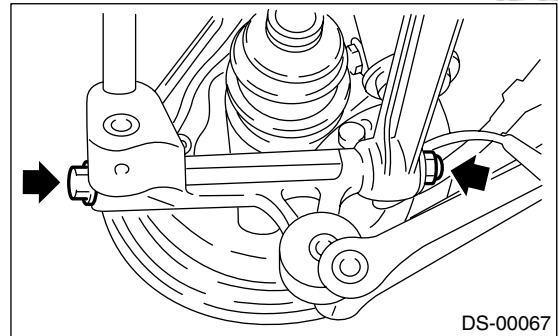
- 5) Disconnect the stabilizer link.



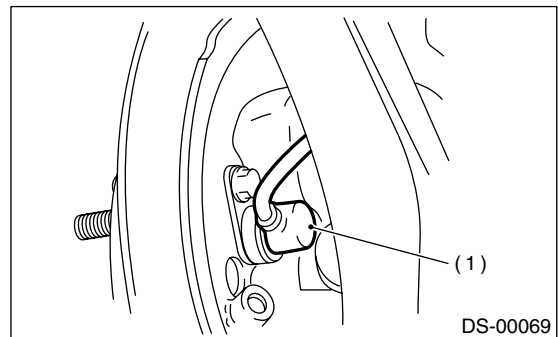
- 6) Remove the bolt which secures the trailing link to housing.



- 7) Remove the bolts which secure the front lateral link and rear lateral link to housing.



- 8) Remove the rear ABS wheel speed sensor from back plate.



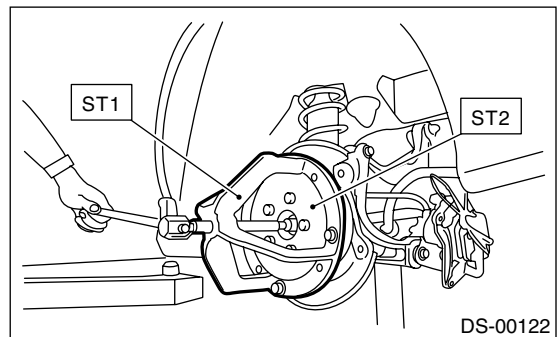
(1) ABS wheel speed sensor

- 9) Remove the rear drive shaft from rear axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

CAUTION:

- Do not hammer the drive shaft when removing.
- Do not damage the oil seal and tone wheel.

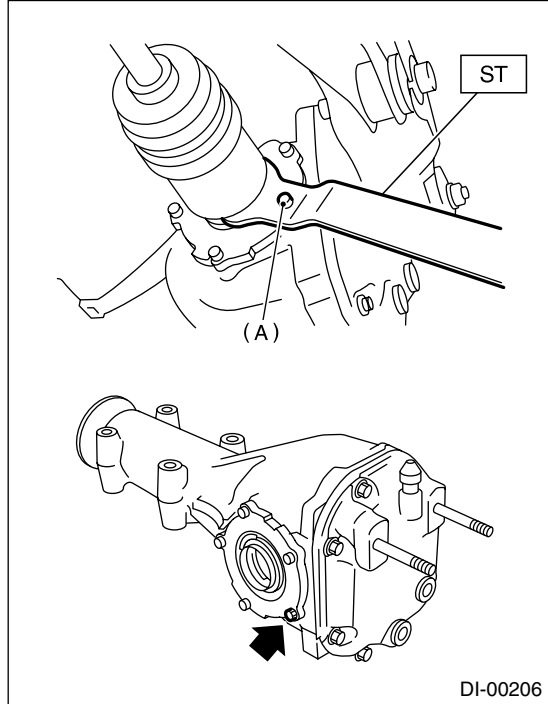


10) Remove the rear drive shaft from rear differential using the ST.

ST 208099PA100 DRIVE SHAFT REMOVER

NOTE:

Fit the ST to the bolt (A) as shown in the figure to avoid damage on the side bearing retainer.

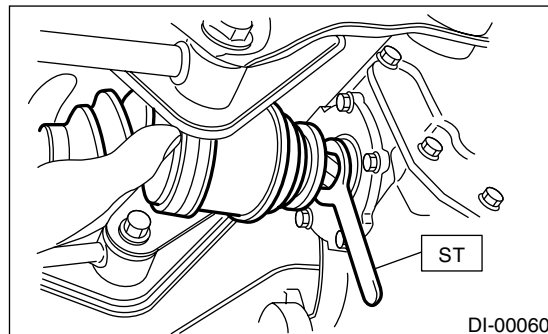


(A) Bolt

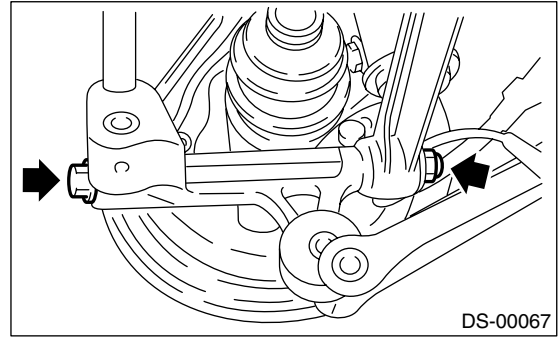
B: INSTALLATION

- 1) Insert the rear drive shaft into rear axle.
- 2) Temporarily tighten the axle nut.
- 3) Install the rear drive shaft to rear differential using the ST.

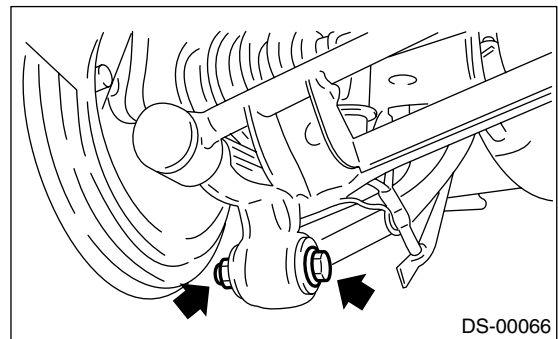
ST 28099PA090 OIL SEAL PROTECTOR



- 4) Temporarily tighten the front lateral link and rear lateral link to housing using a new self-locking nuts.



- 5) Temporarily tighten the trailing link to housing using a new self-locking nut.



- 6) Install the stabilizer link.

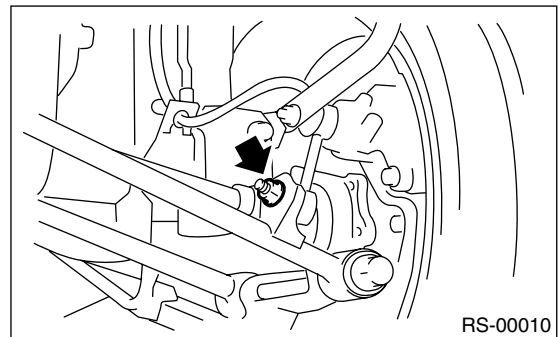
Tightening torque:

Except STi model

30 N·m (3.1 kgf-m, 22 ft-lb)

STi model

45 N·m (4.6 kgf-m, 33 ft-lb)



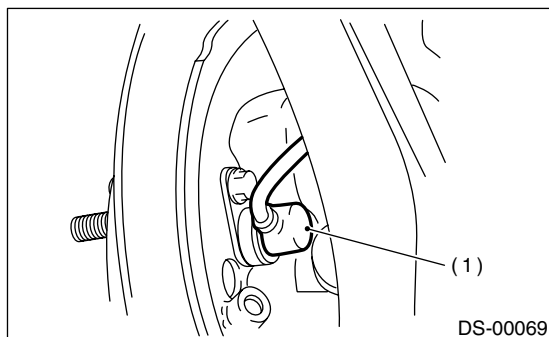
REAR DRIVE SHAFT

DRIVE SHAFT SYSTEM

7) Install the ABS wheel speed sensor.

Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)

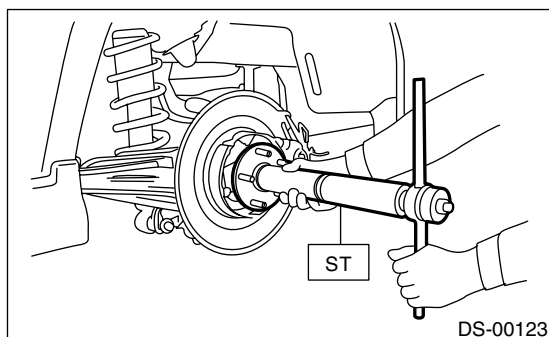


(1) ABS wheel speed sensor

8) Using the ST1 and ST2, pull the rear drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER

ST2 927390000 ADAPTER

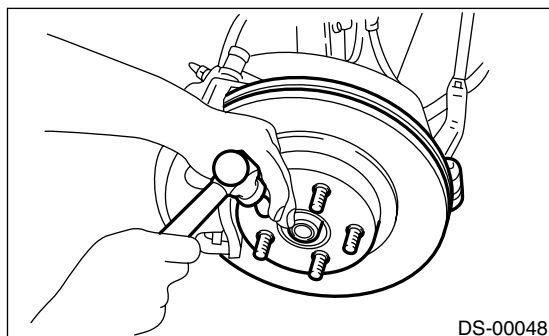


9) Tighten a new axle nut to the specified torque with parking brake applied.

Tightening torque:

190 N·m (19.4 kgf-m, 140 ft-lb)

10) Lock the axle nut.



11) Install the wheel.

Tightening torque:

88 N·m (9.0 kgf-m, 65 ft-lb)

12) Make the tires contact the ground fully.

CAUTION:

Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

13) Tighten the installation bolt of rear housing assembly and lateral link assembly.

Tightening torque:

140 N·m (14.3 kgf-m, 103 ft-lb)

14) Tighten the installation bolt of rear housing assembly and trailing link assembly.

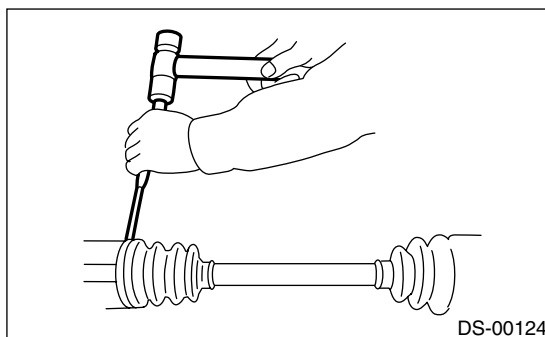
Tightening torque:

90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

1) Straighten the bent claw of larger end of DOJ boot.

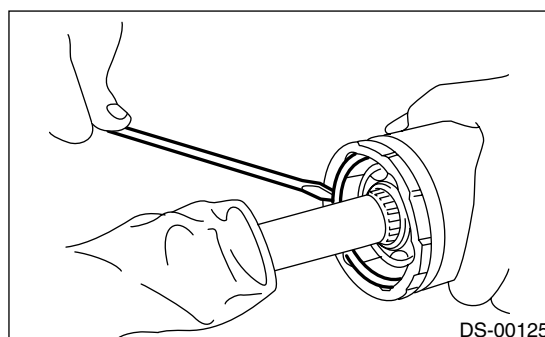
2) Loosen the band by means of screwdriver or pliers with care of not damaging boot.



3) Remove the boot band on the small end of DOJ boot in the same manner.

4) Remove the larger end of DOJ boot from DOJ outer race.

5) Pry and remove the round circlip located at neck of DOJ outer race with a screwdriver.

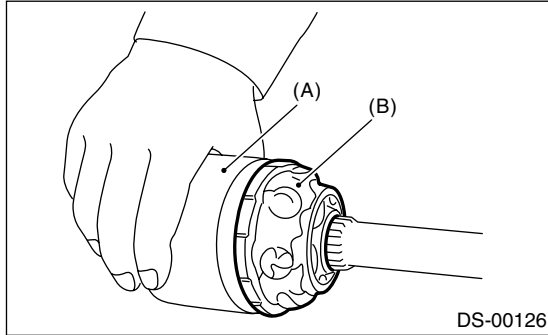


6) Take out the DOJ outer race from shaft assembly.

7) Wipe off the grease, and then take out the balls.

NOTE:

- The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.
- Disassemble with exercising care not to lose balls (6 pcs).



(A) Outer race
(B) Grease

- 8) To remove the cage from inner race, turn the cage by a half pitch to the track groove of inner race, and shift the cage.
- 9) Remove the snap ring, which fixes the inner race to shaft, by using pliers.
- 10) Take out the DOJ inner race.
- 11) Take off the DOJ cage from shaft and remove the DOJ boot.
- 12) Wrap the shaft splines with vinyl tape.
- 13) Remove the BJ boot in the same procedure as DOJ boot.

NOTE:

Further disassembly of axle is impossible because the BJ cannot be disassembled.

D: ASSEMBLY

NOTE:

Use specified grease.

BJ side:

Except STi model:

Molylex No. 2 (Part No. 723223010)

STi model:

NTG2218-M (Part No. 28395FE010)

DOJ side:

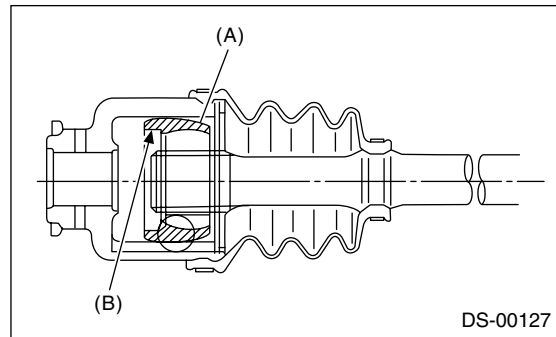
VU-3A702 (Yellow) (Part No. 23223GA050)

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

- 4) Insert the DOJ cage onto shaft.

NOTE:

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

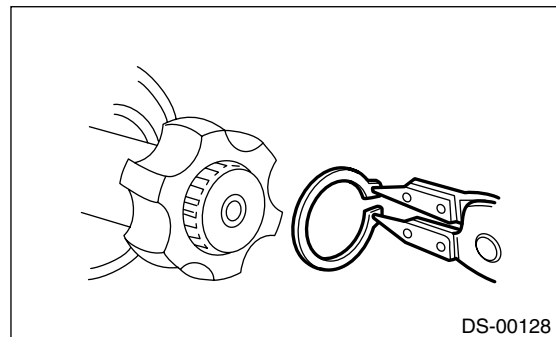


(A) Cage
(B) Cut-out portion

- 5) Install the DOJ inner race on shaft, and fit the snap ring with pliers.

NOTE:

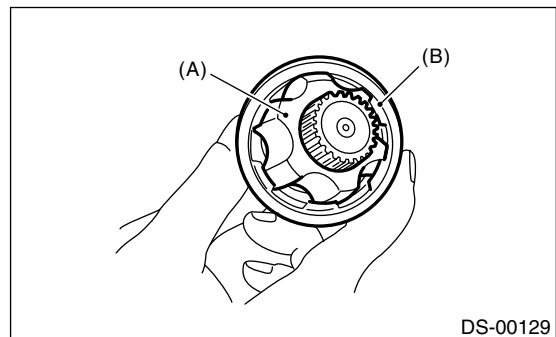
Confirm the snap ring is completely fitted in shaft groove.



- 6) Install the cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:

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

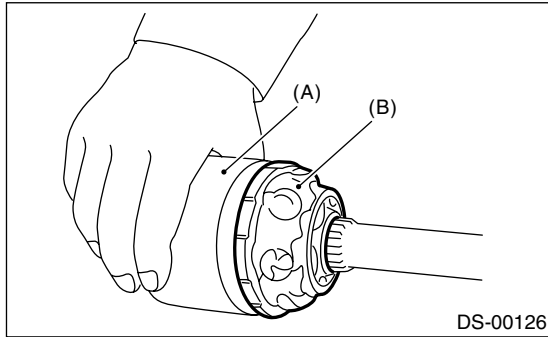


(A) Inner race
(B) Cage

REAR DRIVE SHAFT

DRIVE SHAFT SYSTEM

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

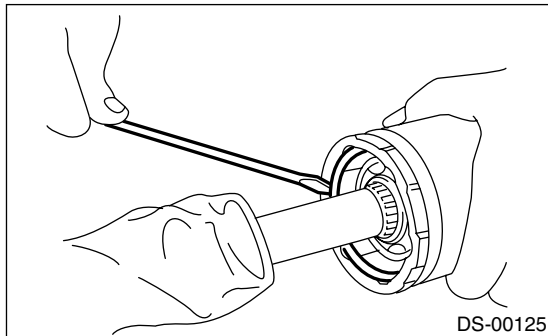


- (A) Outer race
(B) Grease

- 11) Install the circlip in the groove on DOJ outer race.

NOTE:

- Assure the balls, cage and inner race are completely fitted in the outer race of DOJ.
- Exercise care not to place the matched position of circlip in ball groove of outer race.
- Pull the shaft lightly and assure that the circlip is completely fitted in groove.



- 12) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.
- 13) Install the DOJ boot taking care not to twist it.

NOTE:

- Inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
- When installing the DOJ boot, position the outer race of DOJ at center of its travel.

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

NOTE:

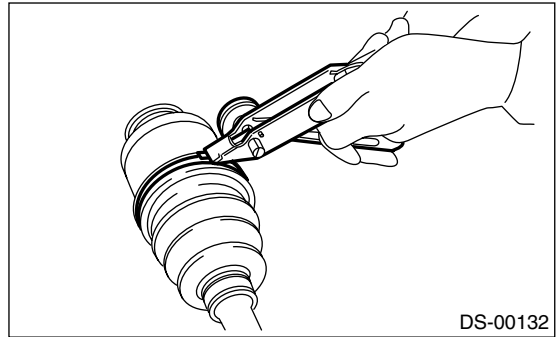
When tightening the boot, exercise care so that air within boot is appropriate.

- 15) Tighten the band using the ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten the band until it cannot be moved by hand.

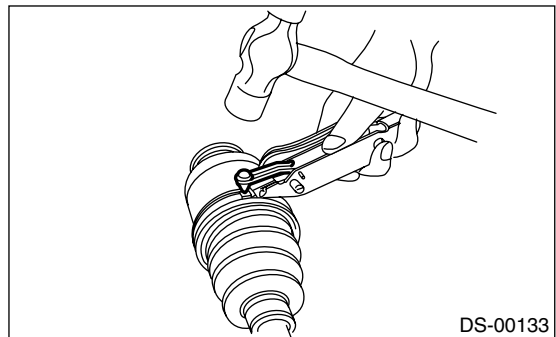


- 16) Tap on the clip with the punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

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



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

NOTE:

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

- 18) Fix up the boot on BJ in the same manner.

- 19) Extend and retract the DOJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion, etc. If faulty, repair or replace.

1) DOJ (Double Offset Joint)

Check seizure, corrosion, damage, wear and excessive play.

2) Shaft

Check excessive bending, twisting, damage and wear.

3) BJ (Bell Joint)

Check seizure, corrosion, damage and excessive play.

4) Boot

Check for wear, warping, breakage or scratches.

5) Grease

Check for discoloration or fluidity.

GENERAL DIAGNOSTIC TABLE

DRIVE SHAFT SYSTEM

7. General Diagnostic Table

A: INSPECTION

NOTE:

Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Remedy
1. Vibration of propeller shaft NOTE: Vibration is caused by propeller shaft during operation and is transferred to vehicle body. Generally vibration increase in proportion to vehicle speed.	(1) Worn or damaged universal joint.	Replace.
	(2) Unbalanced propeller shaft due to bend or dent.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Worn or damaged center bearing and damaged center mounting rubber.	Replace.
2. Tapping when starting and noise while cruising, caused by propeller shaft	(1) Worn or damaged universal joint.	Replace.
	(2) Worn spline of sleeve yoke.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Loose installation of joint.	Replace.
	(5) Worn or damaged center bearing and damaged center mounting rubber.	Replace.

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FRONT SUSPENSION

GENERAL DESCRIPTION

FRONT SUSPENSION

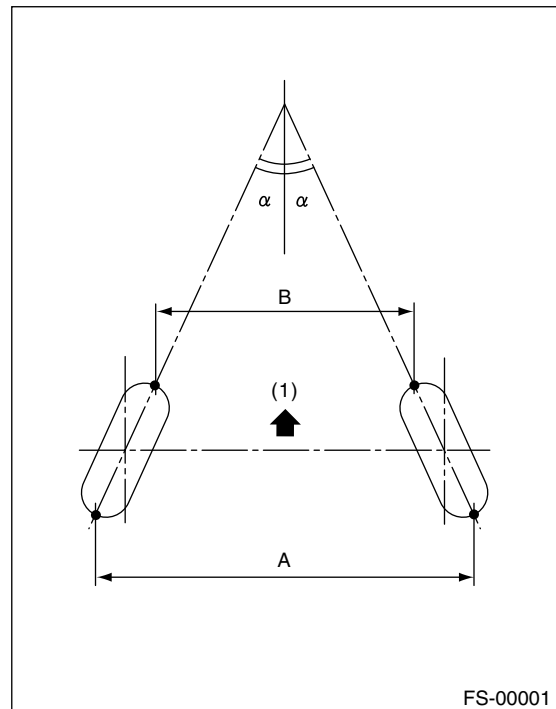
1. General Description

A: SPECIFICATIONS

	Model	Sedan			Wagon		OUT- BACK
		Non-turbo	Turbo	STi	Non-turbo	Turbo	
Front	Camber (tolerance: $\pm 0^{\circ}45'$)	$-0^{\circ}15'$	$-0^{\circ}25'$	$-0^{\circ}30'$	$-0^{\circ}10'$	$-0^{\circ}20'$	$-0^{\circ}05'$
	Caster (common difference: $\pm 0^{\circ}45'$)	$3^{\circ}25'$	$3^{\circ}35'$	$4^{\circ}50'$	$3^{\circ}25'$	$3^{\circ}35'$	$3^{\circ}25'$
	Toe-in	0 ± 3 mm (0 ± 0.12 in) Each toe angle: $\pm 0^{\circ}07'30''$					
	Kingpin angle (tolerance: $\pm 0^{\circ}45'$)	$14^{\circ}20'$	$14^{\circ}35'$	$14^{\circ}50'$	$13^{\circ}30'$	$13^{\circ}45'$	$13^{\circ}20'$
	Wheel arch height [tolerance: ± 12 mm (± 0.47 in)]	406 mm (15.98 in)	396 mm (15.59 in)	386 mm (15.20 in)	397 mm (15.28 in)	387 mm (15.24 in)	402 mm (15.83 in)
	Diameter of stabilizer	20 mm (0.79 in)	20 mm (0.79 in)	19 mm (0.75 in)	20 mm (0.79 in)	20 mm (0.79 in)	20 mm (0.79 in)
Rear	Camber (tolerance: $\pm 0^{\circ}45'$)	$-1^{\circ}25'$	$-1^{\circ}30'$	$-0^{\circ}40'$	$-1^{\circ}15'$	$-1^{\circ}20'$	$-1^{\circ}10'$
	Toe-in	0 ± 3 mm (0 ± 0.12 in) Each toe angle: $\pm 0^{\circ}09'$					
	Thrust angle	$0^{\circ} \pm 30'$					
	Wheel arch height [tolerance: ± 12 mm (± 0.47 in)]	381 mm (15.0 in)	376 mm (14.80 in)	366 mm (14.41 in)	381 mm (15.0 in)	376 mm (14.80 in)	386 mm (15.20 in)
	Diameter of stabilizer	13 mm (0.51 in)	17 mm (0.67 in)	20 mm (0.79 in)	13 mm (0.51 in)	17 mm (0.67 in)	13 mm (0.51 in)

NOTE:

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



FS-00001

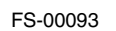
(1) Front

A – B = Positive: Toe-in, Negative: Toe-out

α = Each toe angle

FRONT SUSPENSION

FRONT SUSPENSION



GENERAL DESCRIPTION

FRONT SUSPENSION

(1) Front crossmember	(18) Strut mount	Tightening torque: N·m (kgf-m, ft-lb)
(2) Bolt ASSY	(19) Spacer	T1: 20 (2.0, 14.5)
(3) Housing	(20) Upper spring seat	T2: 25 (2.5, 18.1)
(4) Washer	(21) Rubber seat	T3: 30 (3.1, 22)
(5) Stopper rubber (Rear)	(22) Dust cover	T4: 34 (3.5, 25)
(6) Rear bushing	(23) Helper	T5: 40 (4.1, 30)
(7) Stopper rubber (Front)	(24) Coil spring	T6: 45 (4.6, 33)
(8) Ball joint	(25) Damper strut	T7: 50 (5.1, 37)
(9) Transverse link	(26) Adjusting bolt	T8: 55 (5.6, 41)
(10) Cotter pin	(27) Castle nut	T9: 70 (7.1, 52)
(11) Front bushing	(28) Self-locking nut	T10: 105 (10.7, 77)
(12) Stabilizer link	(29) Sub frame	T11: 125 (12.7, 92)
(13) Clamp	(30) Cover	T12: 155 (15.8, 114)
(14) Bushing	(31) Boss	T13: 175 (17.8, 129)
(15) Stabilizer	(32) Clip	T14: 190 (19.4, 140)
(16) Jack-up plate	(33) Front support arm	T15: 250 (25.5, 184)
(17) Dust seal	(34) STi model	

C: CAUTION

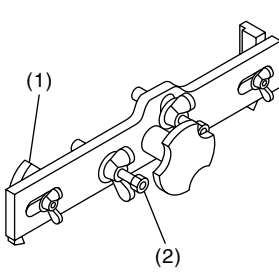
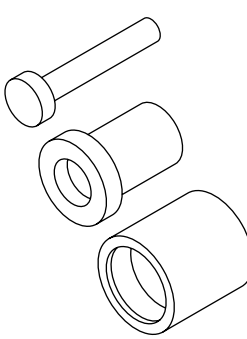
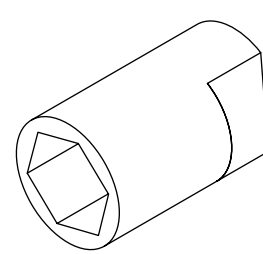
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent.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

GENERAL DESCRIPTION

FRONT SUSPENSION

D: PREPARATION TOOL

1. SPECIAL TOOLS

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

2. GENERAL PURPOSE TOOLS

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

2. Wheel Alignment

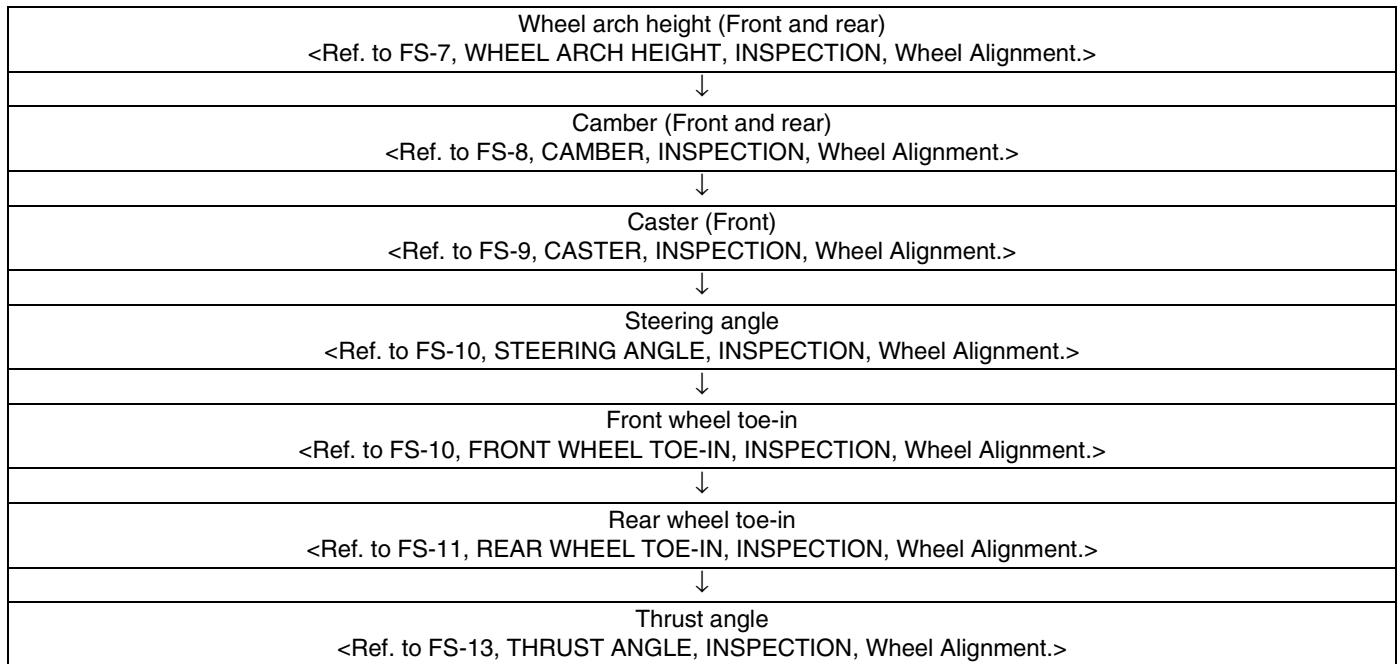
A: INSPECTION

Check the following items before taking wheel alignment measurement.

Check items before taking wheel alignment measurement:

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

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

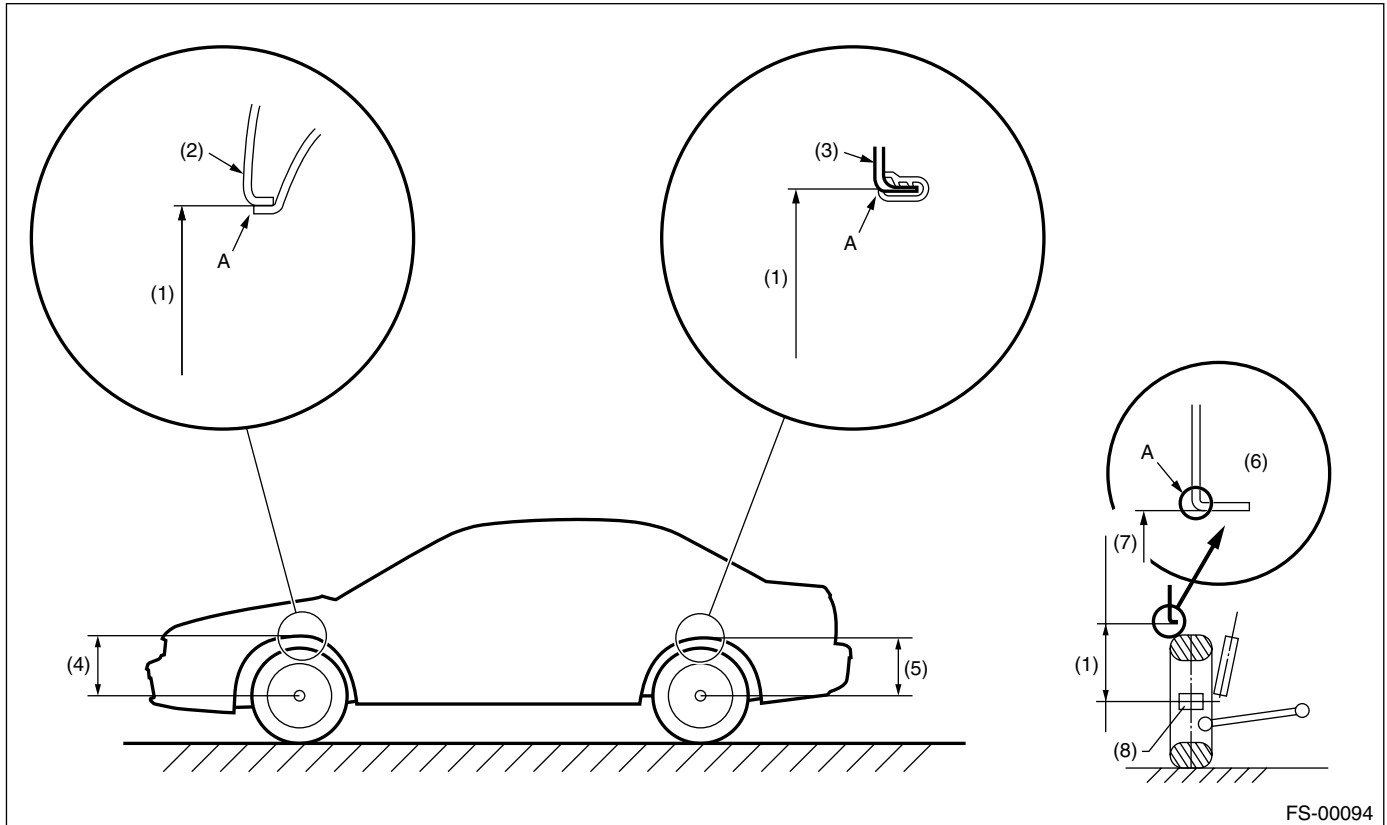


WHEEL ALIGNMENT

FRONT SUSPENSION

1. WHEEL ARCH HEIGHT

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



FS-00094

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

Model		Specified wheel arch height	
		Non-turbo	Turbo
Sedan	Front	406±12 mm (15.98±0.47 in)	396±12 mm (15.59±0.47 in)
	Rear	381±12 mm (15.0±0.47 in)	376±12 mm (14.80±0.47 in)
Wagon	Front	397±12 mm (15.63±0.47 in)	387±12 mm (15.24±0.47 in)
	Rear	381±12 mm (15.0±0.47 in)	376±12 mm (14.80±0.47 in)
OUTBACK	Front	402±12 mm (15.83±0.47 in)	—
	Rear	386±12 mm (15.20±0.47 in)	—
STi	Front	—	386±12 mm (15.20±0.47 in)
	Rear	—	366±12 mm (14.41±0.47 in)

WHEEL ALIGNMENT

FRONT SUSPENSION

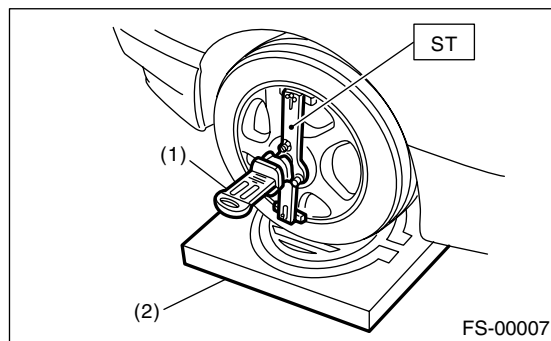
2. CAMBER

• Inspection

1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.

2) Set the ST into the center of wheel, and then install the wheel alignment gauge.

ST 927380002 ADAPTER



(1) Alignment gauge

(2) Turning radius gauge

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

NOTE:

Refer to the "SPECIFICATIONS" for camber values.

Front: <Ref. to FS-2, SPECIFICATIONS, General Description.>

Rear: <Ref. to RS-2, SPECIFICATIONS, General Description.>

• Front Camber Adjustment

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

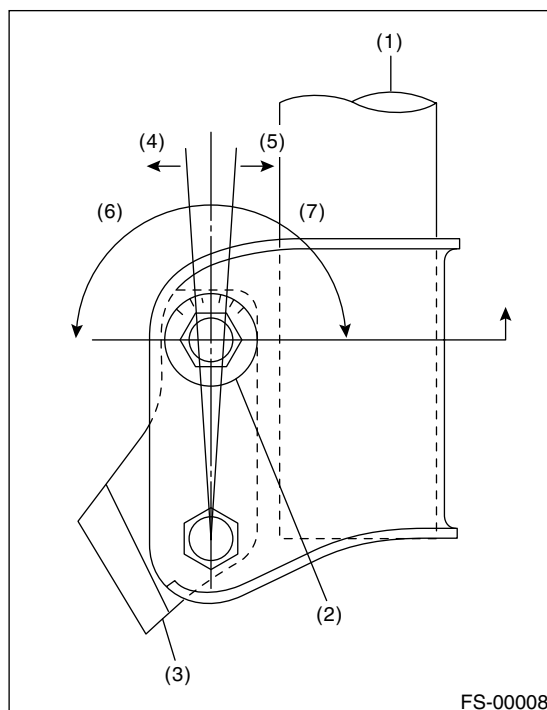
NOTE:

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

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

NOTE:

Moving the adjusting bolt by one scale graduation changes camber by approx. $0^{\circ}10'$.



(1) Strut

(2) Adjusting bolt

(3) Housing

(4) Outer

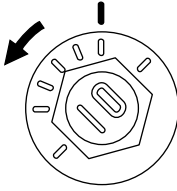
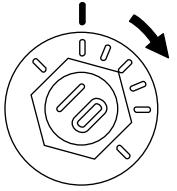
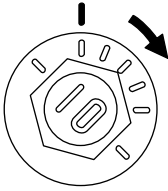
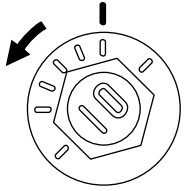
(5) Inner

(6) Camber is increased.

(7) Camber is decreased.

WHEEL ALIGNMENT

FRONT SUSPENSION

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

3) Tighten the new two self-locking nuts.

Tightening torque:

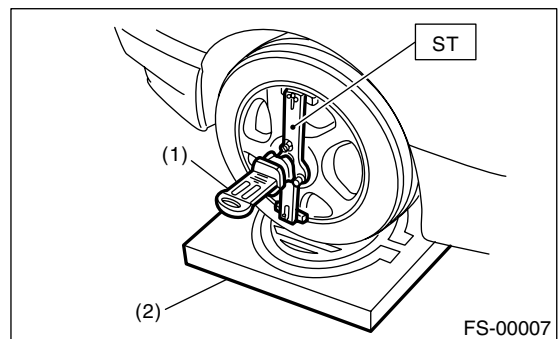
175 N·m (17.8 kgf-m, 129 ft-lb)

3. CASTER

• Inspection

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

ST 927380002 ADAPTER



- (1) Alignment gauge
- (2) Turning radius gauge

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

NOTE:

Refer to the "SPECIFICATIONS" for caster values.
<Ref. to FS-2, SPECIFICATIONS, General Description.>

WHEEL ALIGNMENT

FRONT SUSPENSION

4. STEERING ANGLE

• Inspection

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

Steering angle:

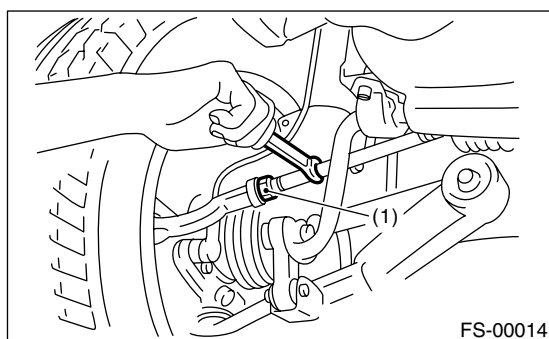
Model	Turbo and OUTBACK	Others
Inner wheel	$34.5^{\circ} \pm 1.5^{\circ}$	$37.3^{\circ} \pm 1.5^{\circ}$
Outer wheel	$30.3^{\circ} \pm 1.5^{\circ}$	$32.4^{\circ} \pm 1.5^{\circ}$

• Adjustment

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

NOTE:

Correct the boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• Inspection

Toe-in:

$0 \pm 3 \text{ mm } (0 \pm 0.12 \text{ in})$

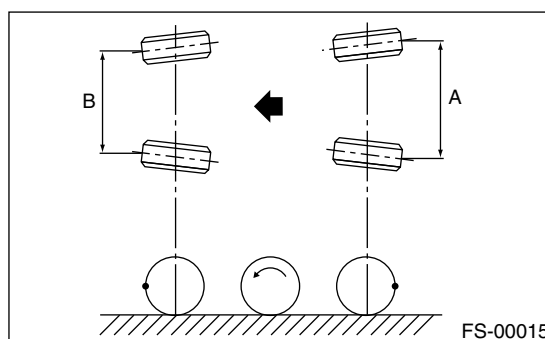
- 1) Set the toe-in gauge to rear sides of right and left front tires at height corresponding to center of spindle.
- 2) Mark each right and left tires at height corresponding to center of spindle and measure the distance "A" between marks.
- 3) Move the vehicle forward to rotate wheels 180° .

NOTE:

Whenever rotating the wheels, drive the vehicle forward.

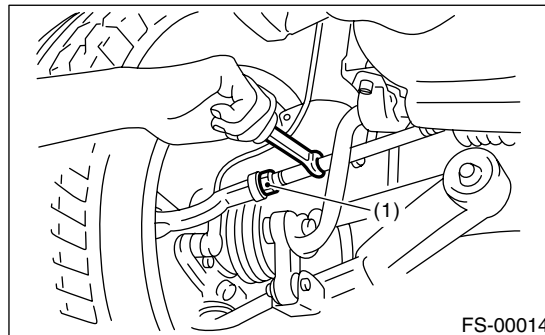
- 4) Measure the distance "B" between right and left marks. Toe-in can then be obtained by the following equation:

$$A - B = \text{Toe-in}$$



• Adjustment

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



(1) Lock nut

- 4) Tighten the tie-rod lock nut.

Tightening torque:

$83 \text{ N}\cdot\text{m } (8.5 \text{ kgf}\cdot\text{m}, 61.5 \text{ ft}\cdot\text{lb})$

NOTE:

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

6. REAR WHEEL TOE-IN

• Inspection

Toe-in:

$0 \pm 3 \text{ mm}$ ($0 \pm 0.12 \text{ in}$)

For rear toe-in inspection procedure, refer to FRONT WHEEL TOE-IN procedure.

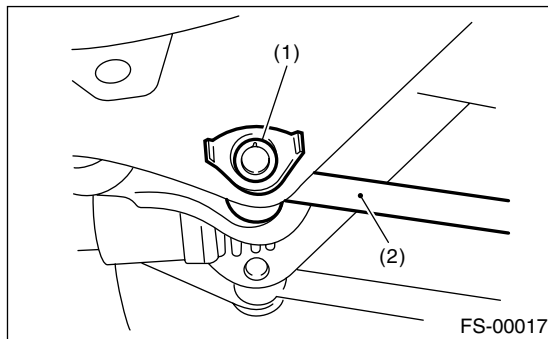
<Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

• Adjustment

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

NOTE:

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



- (1) Adjusting bolt
- (2) Link rear

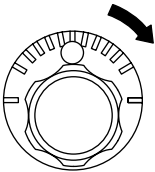
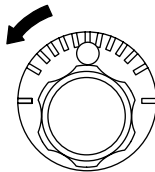
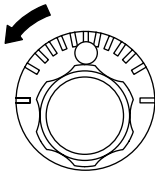
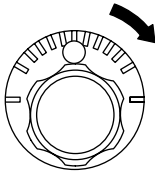
2) Turn the adjusting bolt head until toe-in is at the specification.

NOTE:

When the right and left wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.5 mm (0.6 in).

WHEEL ALIGNMENT

FRONT SUSPENSION

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

3) Tighten a new self-locking nut.

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

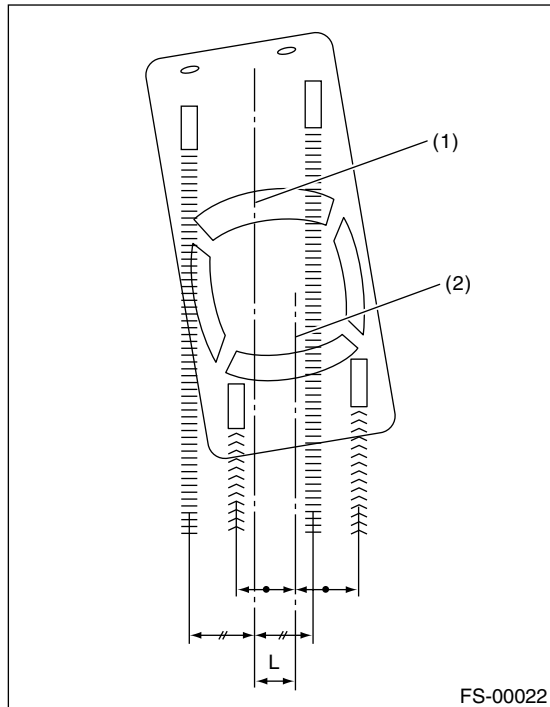
7. THRUST ANGLE

• Inspection

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

Thrust angle:

Less than 30' when "L" is less than 22 mm (0.9 in).



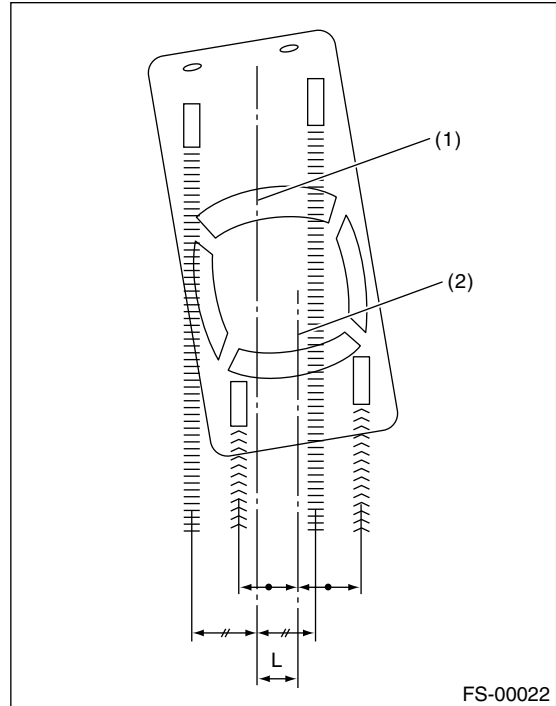
- (1) Center line of loci (front axle)
- (2) Center line of loci (rear axle)

• Adjustment

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

Thrust angle:

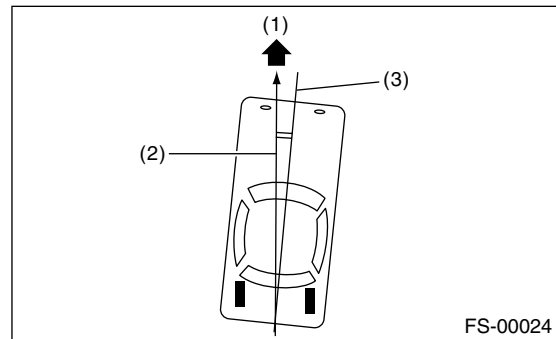
0°±30'



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

NOTE:

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



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

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

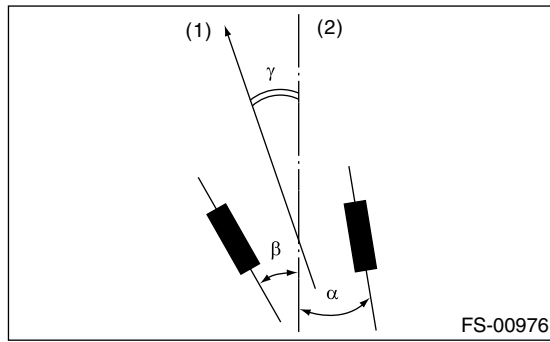
α : Right rear wheel toe-in angle

β : Left rear wheel toe-in angle

WHEEL ALIGNMENT

FRONT SUSPENSION

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



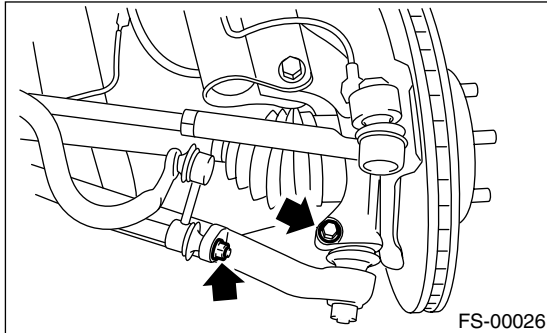
- (1) Front
- (2) Body center line

3. Front Transverse Link

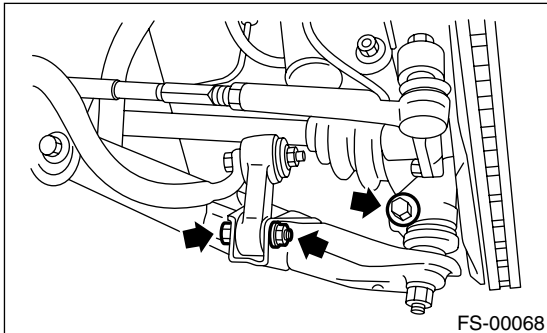
A: REMOVAL

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

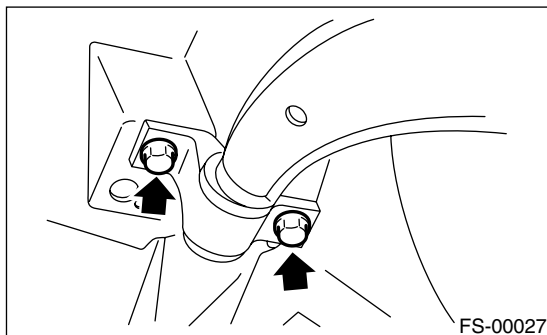
SEDAN MODEL:



WAGON MODEL:

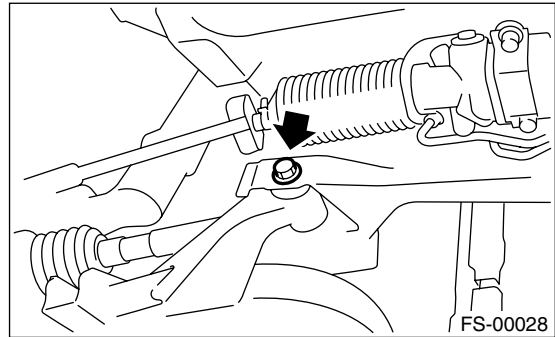


- 6) Remove the nut (do not remove bolt) securing transverse link to crossmember.
- 7) Remove the two bolts securing bushing bracket of transverse link to the vehicle body at rear bushing location.



- 8) Extract the ball joint from housing.

- 9) Remove the bolt securing transverse link to crossmember, and then extract the transverse link from crossmember.



B: INSTALLATION

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

NOTE:

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

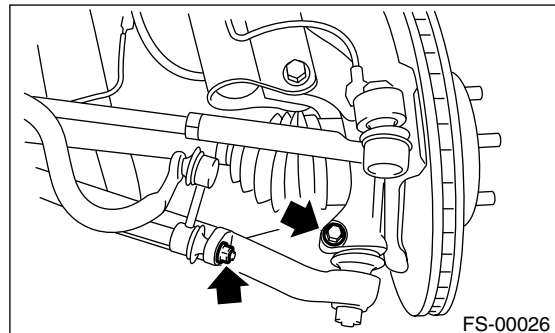
- 2) Install the bolts used to connect transverse link to crossmember and temporarily tighten with a new self-locking nut.

CAUTION:

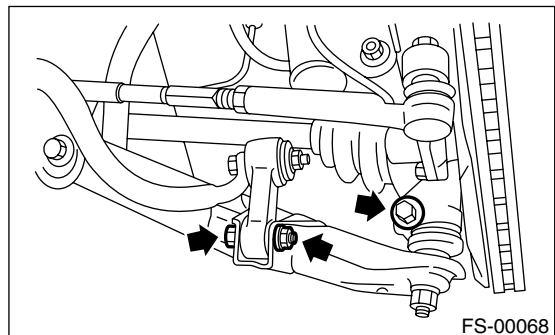
Discard the loosened self-locking nut and replace with a new one.

- 3) Insert the ball joint into housing.
- 4) Connect the stabilizer link to transverse link, and then temporarily tighten a new self-locking nut.

SEDAN MODEL:



WAGON MODEL:



FRONT TRANSVERSE LINK

FRONT SUSPENSION

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

- (1) Transverse link and stabilizer

Tightening torque:

STi model:

45 N·m (4.6 kgf-m, 33 ft-lb)

Except STi model:

30 N·m (3.1 kgf-m, 22 ft-lb)

- (2) Transverse link and crossmember

Tightening torque:

125 N·m (12.7 kgf-m, 92 ft-lb)

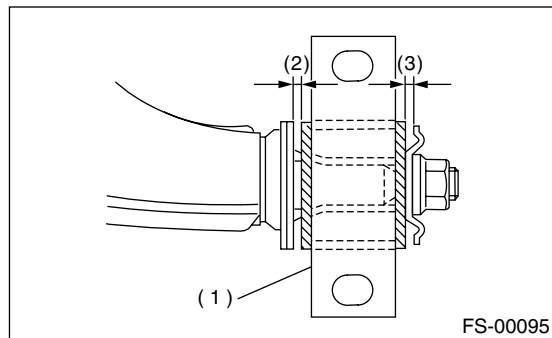
- (3) Transverse link rear bushing and body

Tightening torque:

250 N·m (25.5 kgf-m, 184 ft-lb)

NOTE:

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



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

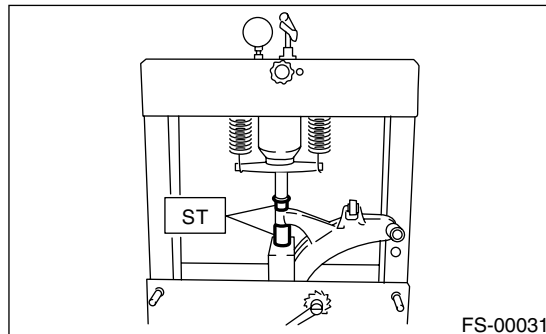
6) Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

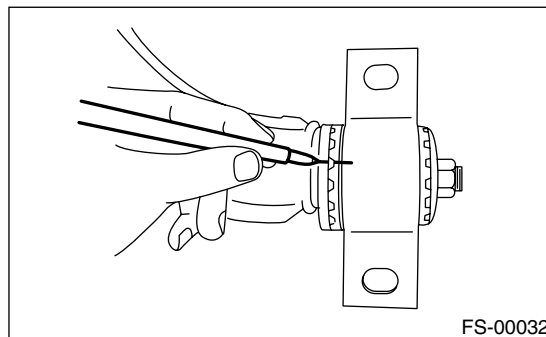
Using the ST, press the front bushing out of place.

ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

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



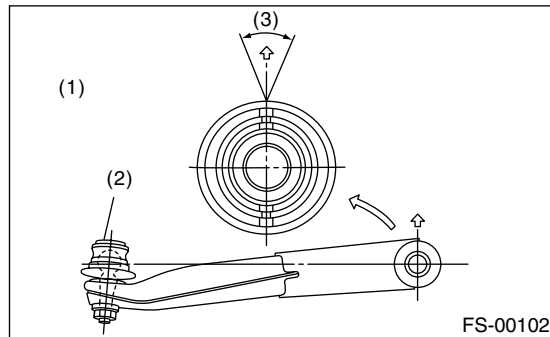
D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

CAUTION:

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



- (1) Face bushing toward center of ball joint
- (2) Ball joint
- (3) $\pm 3^\circ$

2. REAR BUSHING

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

NOTE:

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

Tightening torque:

190 N·m (19.4 kgf-m, 140 ft-lb)

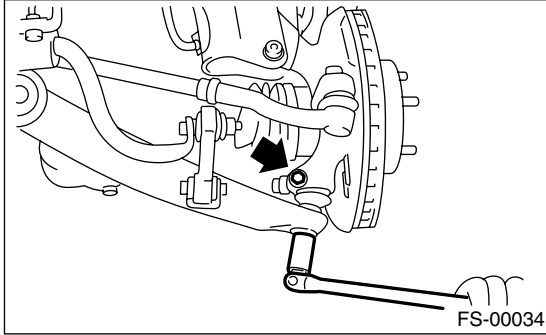
E: INSPECTION

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

4. Front Ball Joint

A: REMOVAL

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



- 4) Extract the ball joint from housing.

B: INSTALLATION

- 1) Install the ball joint onto housing.

Tightening torque (Bolt):

50 N·m (5.1 kgf-m, 37 ft-lb)

CAUTION:

Do not apply grease to tapered portion of ball stud.

- 2) Connect the ball joint to transverse link.

Tightening torque (Castle nut):

STi model:

30 N·m (3.1 kgf-m, 22 ft-lb)

Except STi model:

40 N·m (4.1 kgf-m, 30 ft-lb)

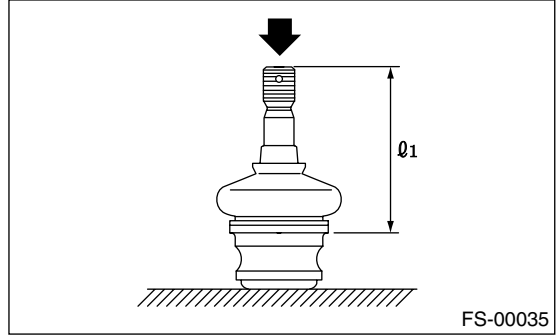
- 3) Retighten the castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert a new cotter pin and bend it around castle nut.

- 4) Install the front wheel.

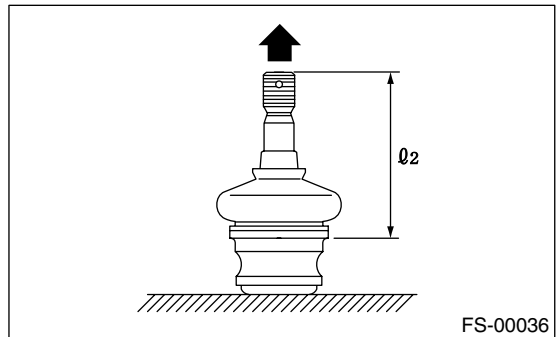
C: INSPECTION

- 1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds specified value.

- (1) With 686 N (70 kgf, 154 lb) loaded in direction shown in the figure, measure the dimension $\varnothing_1$.



- (2) With 686 N (70 kgf, 154 lb) loaded in opposite direction shown in the figure, measure the dimension $\varnothing_2$.



- (3) Calculate plays from the following formula.

$$S = \varnothing_2 - \varnothing_1$$

- (4) When plays are larger than the following value, replace with a new one.

FRONT BALL JOINT

Specified play for replacement: S

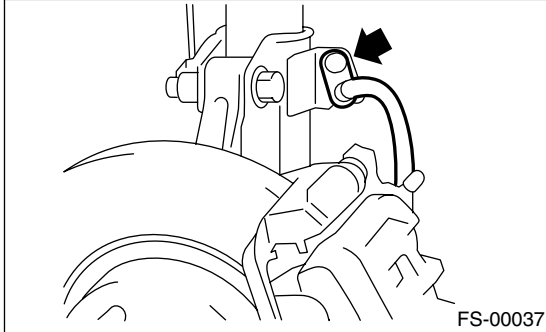
Less than 0.3 mm (0.012 in)

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

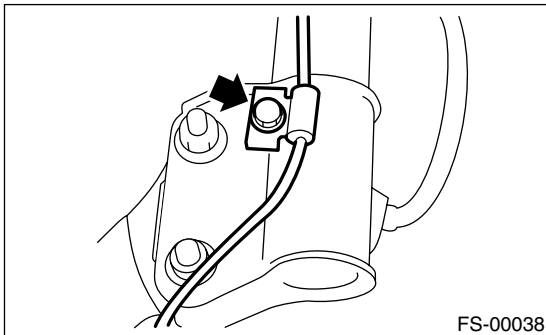
5. Front Strut

A: REMOVAL

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



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

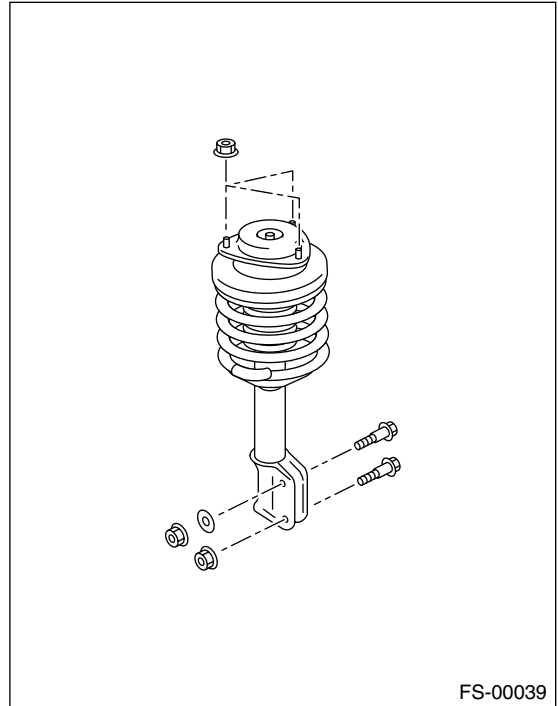


- 5) Remove the two bolts securing housing to strut.

NOTE:

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

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



B: INSTALLATION

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

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

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

NOTE:

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

Tightening torque:

175 N·m (17.8 kgf-m, 129 ft-lb)

- 3) Install the ABS wheel speed sensor harness to strut.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

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

Tightening torque:

32 N·m (3.3 kgf-m, 23.6 ft-lb)

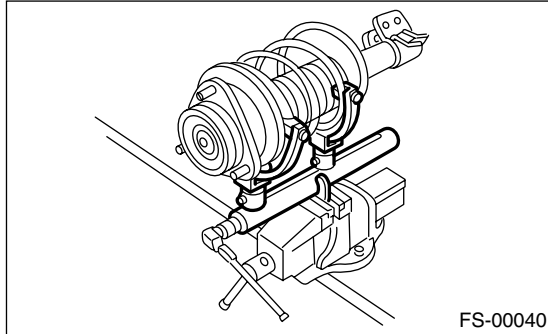
- 5) Install the wheels.

NOTE:

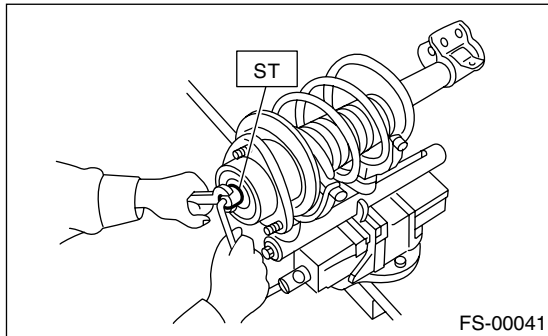
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

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



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



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

D: ASSEMBLY

- 1) Before installing the coil spring, strut mount, etc., on strut, check for the presence of air in the damping force generating mechanism of strut since air prevents proper damping force from being produced.

- 2) Checking for the presence of air

- (1) Place the strut vertically with piston rod facing up.
- (2) Move the piston rod to center of its entire stroke.
- (3) While holding the piston rod end with fingertips, move the rod up and down.
- (4) If the piston rod moves at least 10 mm (0.39 in) in the former step, purge air from the strut.

- 3) Air purging procedure

- (1) Place the strut vertically with piston rod facing up.
- (2) Fully extend the piston rod.
- (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.

- (4) Fully contract the piston rod.
- (5) Repeat three or four times from first step.

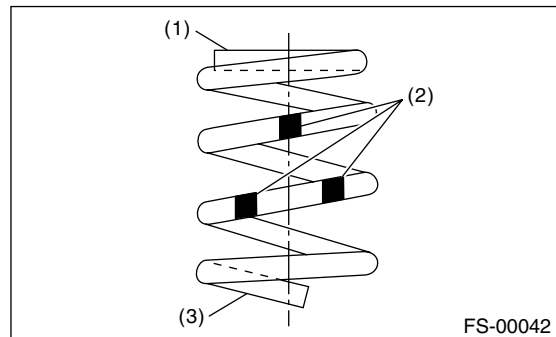
NOTE:

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

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

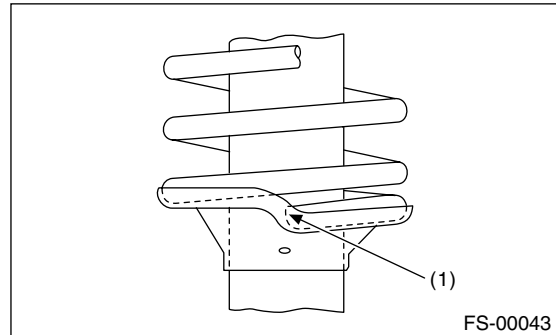
NOTE:

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



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

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



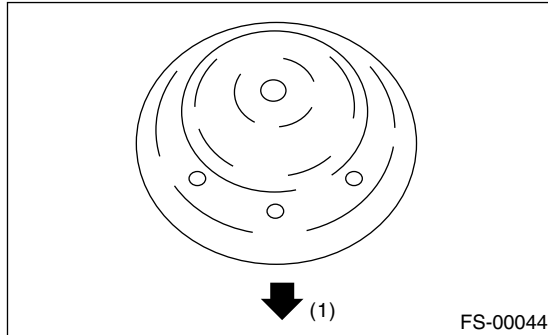
- (1) Coil spring end face

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

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

NOTE:

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



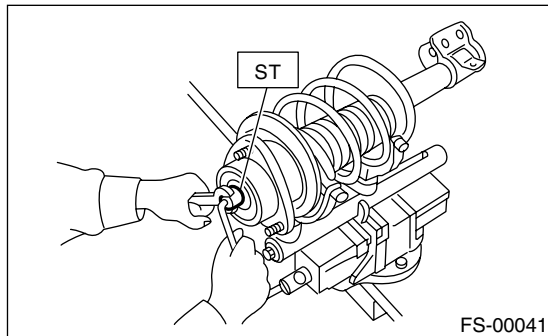
(1) Outside of body

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

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

Tightening torque:

55 N·m (5.6 kgf-m, 41 ft-lb)



10) Loosen the coil spring carefully.

E: INSPECTION

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

1. DAMPER STRUT

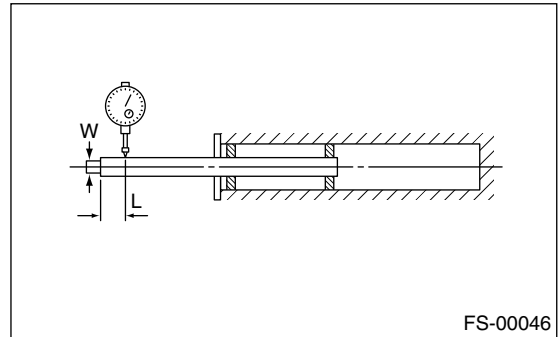
1) Check for oil leakage.

2) Move the piston rod up and down to check that it operates smoothly without any binding.

3) Play of piston rod

- Measure the play as follows:

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



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

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

2. STRUT MOUNT

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

3. DUST COVER

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

4. COIL SPRING

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

5. HELPER

Replace it with a new one if cracked or damaged.

FRONT STRUT

FRONT SUSPENSION

F: DISPOSAL

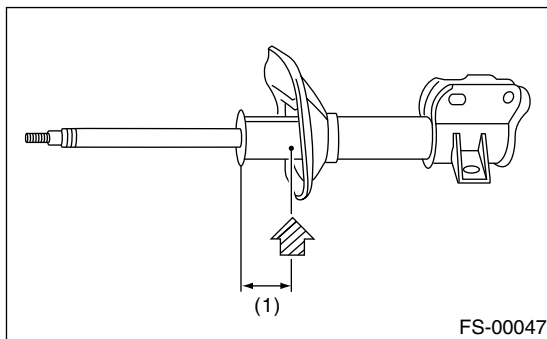
1. EXCEPT STi MODEL

CAUTION:

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

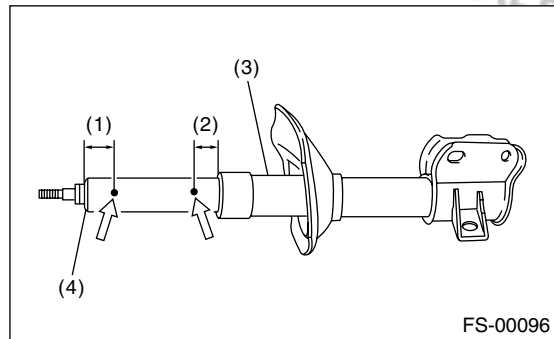
1) Place the gas filled strut on a flat and level surface with piston rod fully extended.

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



(1) 40 mm (1.57 in)

2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in (1), and then make a hole in (2).



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

2. STi MODEL

CAUTION:

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

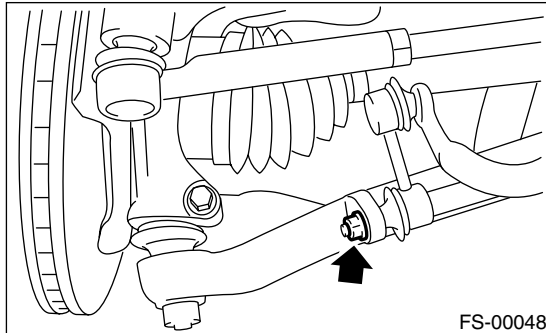
1) Place the gas filled strut on a flat and level surface with damping tube fully extended.

6. Front Stabilizer

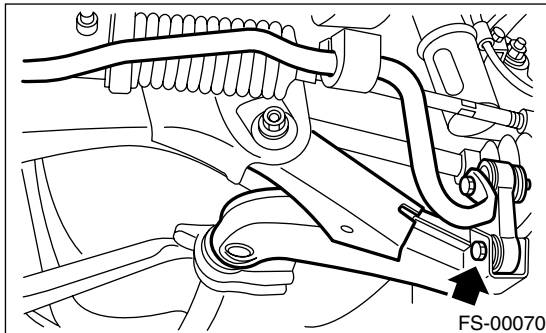
A: REMOVAL

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

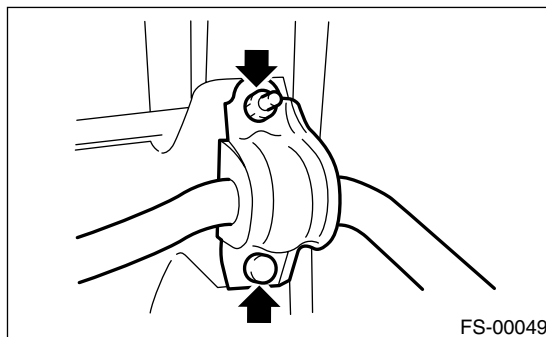
SEDAN MODEL:



WAGON MODEL:



- 5) Remove the bolts which secure stabilizer to crossmember.

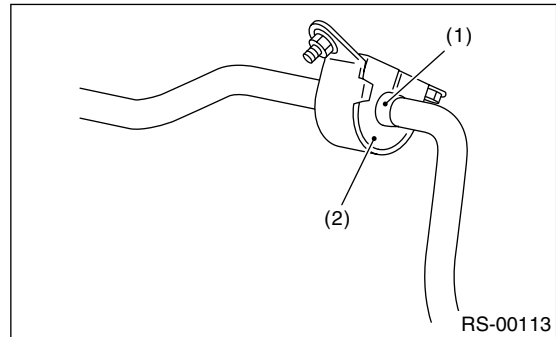


B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

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



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

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

Tightening torque:

Jack-up plate to crossmember (Except STi model):

20 N·m (2.0 kgf-m, 14.5 ft-lb)

Jack-up plate to crossmember (STi model):

70 N·m (7.1 kgf-m, 52 ft-lb)

Stabilizer link to front transverse link (STi model):

45 N·m (4.6 kgf-m, 33 ft-lb)

Stabilizer link to front transverse link (Except STi model):

30 N·m (3.1 kgf-m, 22 ft-lb)

Stabilizer to crossmember:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

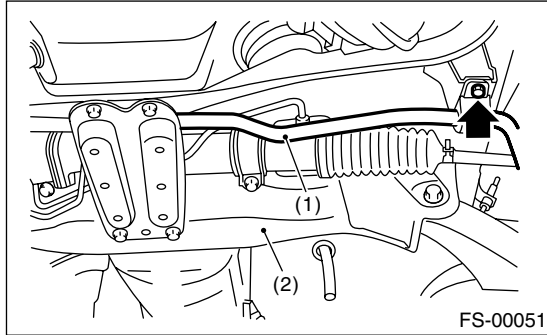
C: INSPECTION

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

7. Front Crossmember

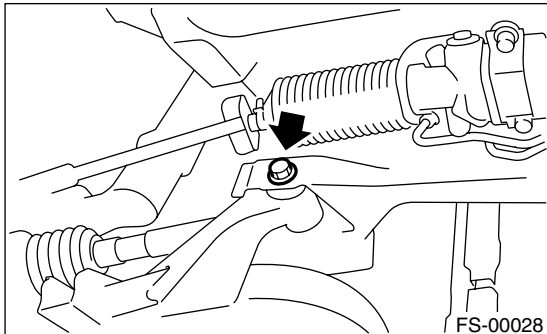
A: REMOVAL

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



- (1) Front stabilizer
- (2) Front crossmember

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



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

CAUTION:

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

B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

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

Tightening torque:

Transverse link bushing to crossmember:

125 N·m (12.7 kgf-m, 92 ft-lb)

Stabilizer to bushing:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

Tie-rod end to housing:

27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

Front cushion rubber to crossmember:

85 N·m (8.7 kgf-m, 62.7 ft-lb)

Universal joint to pinion shaft:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

Crossmember to body:

105 N·m (10.7 kgf-m, 77 ft-lb)

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

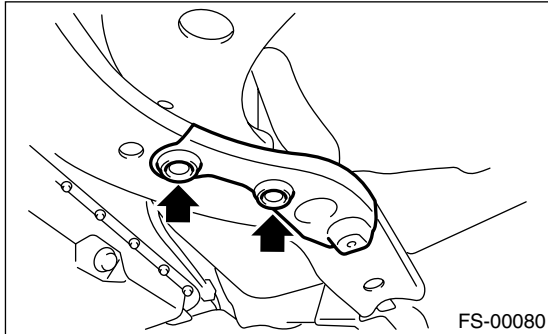
C: INSPECTION

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

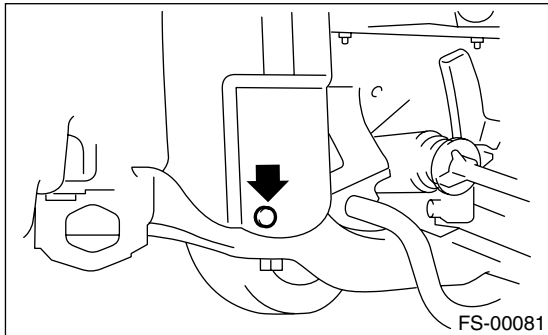
8. Sub Frame

A: REMOVAL

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



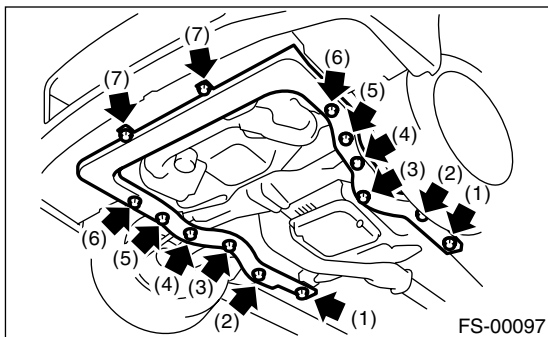
- 4) Remove the clip.



- 5) Remove the sub frame.

NOTE:

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



- (4) Only for STi model

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the M12 bolt with a new one.

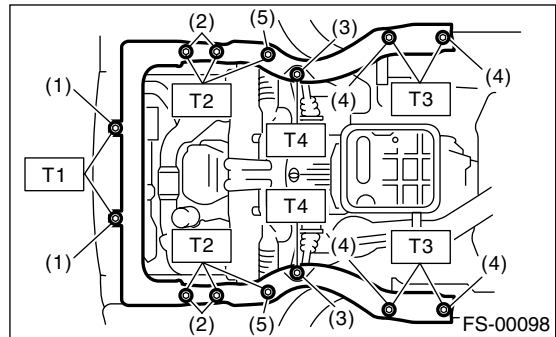
Tightening torque:

T1: 34 N·m (3.5 kgf-m, 25 ft-lb)

T2: 55 N·m (5.6 kgf-m, 41 ft-lb)

T3: 71 N·m (7.2 kgf-m, 52 ft-lb)

T4: 105 N·m (10.7 kgf-m, 77 ft-lb)



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

C: INSPECTION

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

NOTE:

The tightening torque differs by the color for bolt (3). Always verify the bolt color before checking tightening torque.

Tightening torque:

T1: 34 N·m (3.5 kgf-m, 25 ft-lb)

T2: 55 N·m (5.6 kgf-m, 41 ft-lb)

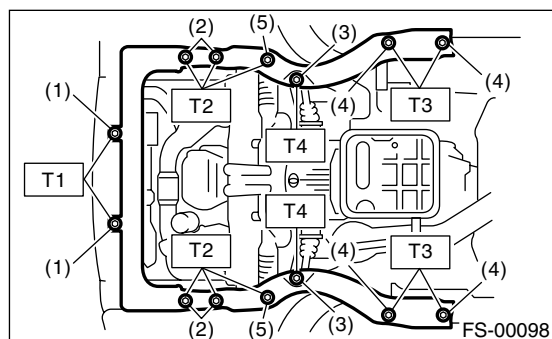
T3: 71 N·m (7.2 kgf-m, 52 ft-lb)

T4: Dark green bolt

105 N·m (10.7 kgf-m, 77 ft-lb)

T4: Except dark green bolt

55 N·m (5.6 kgf-m, 41 ft-lb)

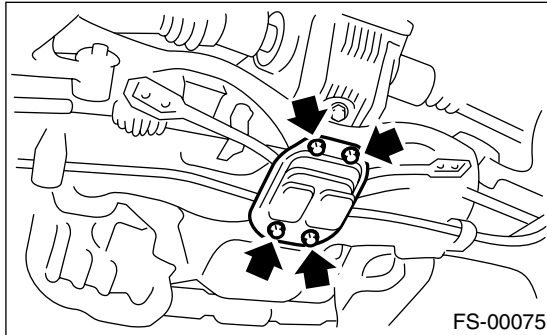


- (1) M8 bolt
- (2) M12 bolt
- (3) M12 bolt
- (4) M10 bolt
- (5) M12 bolt (Only for STi model)

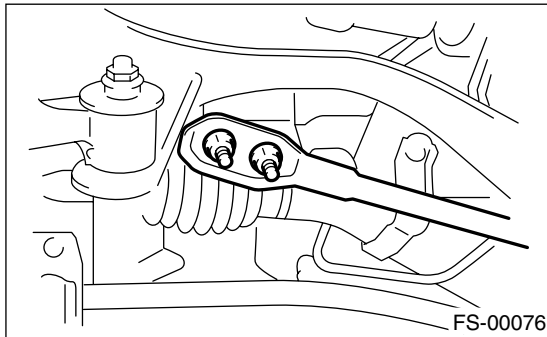
9. Front Support Arm

A: REMOVAL

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



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



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Front support arm to crossmember:

30 N·m (3.1 kgf-m, 22 ft-lb)

Jack-up plate to crossmember:

70 N·m (7.1 kgf-m, 52 ft-lb)

C: INSPECTION

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

10. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

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

2. POOR RIDE COMFORT

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

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

3. NOISE

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

PARKING BRAKE

GENERAL DESCRIPTION

PARKING BRAKE

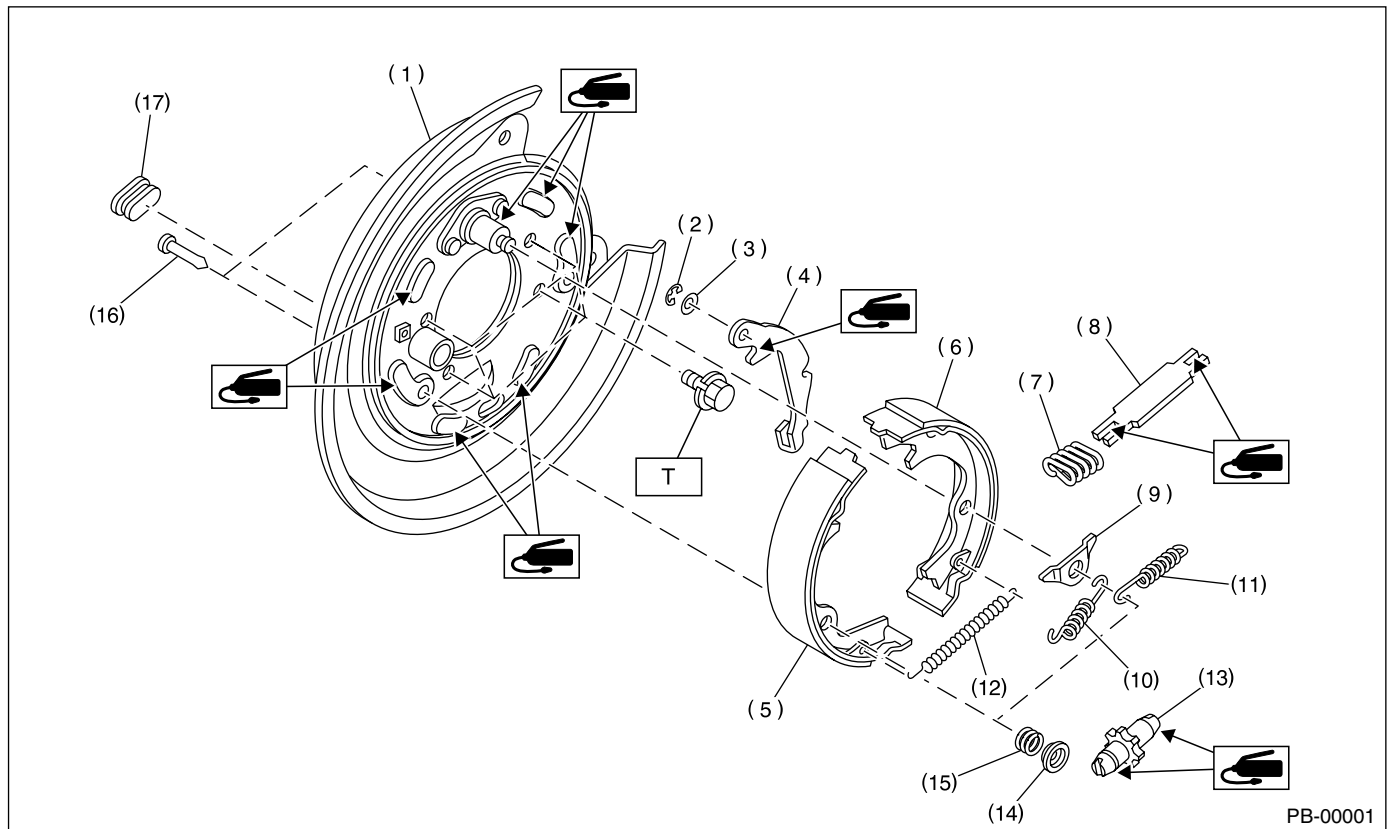
1. General Description

A: SPECIFICATIONS

Model		Except STi model	STi model
Type		Mechanical on rear brakes, drum in disc	
Effective drum diameter	mm (in)	170 (6.69)	190 (7.48)
Lining dimensions (length × width × thickness)	mm (in)	162.6 × 30.0 × 3.2 (6.40 × 1.181 × 0.126)	182.3 × 30.0 × 3.2 (7.18 × 1.181 × 0.126)
Clearance adjustment		Manual adjustment	
Lever stroke	notches/N (kgf, lb)	7 to 8/196 (20, 44)	

B: COMPONENT

1. PARKING BRAKE (REAR DISC BRAKE)



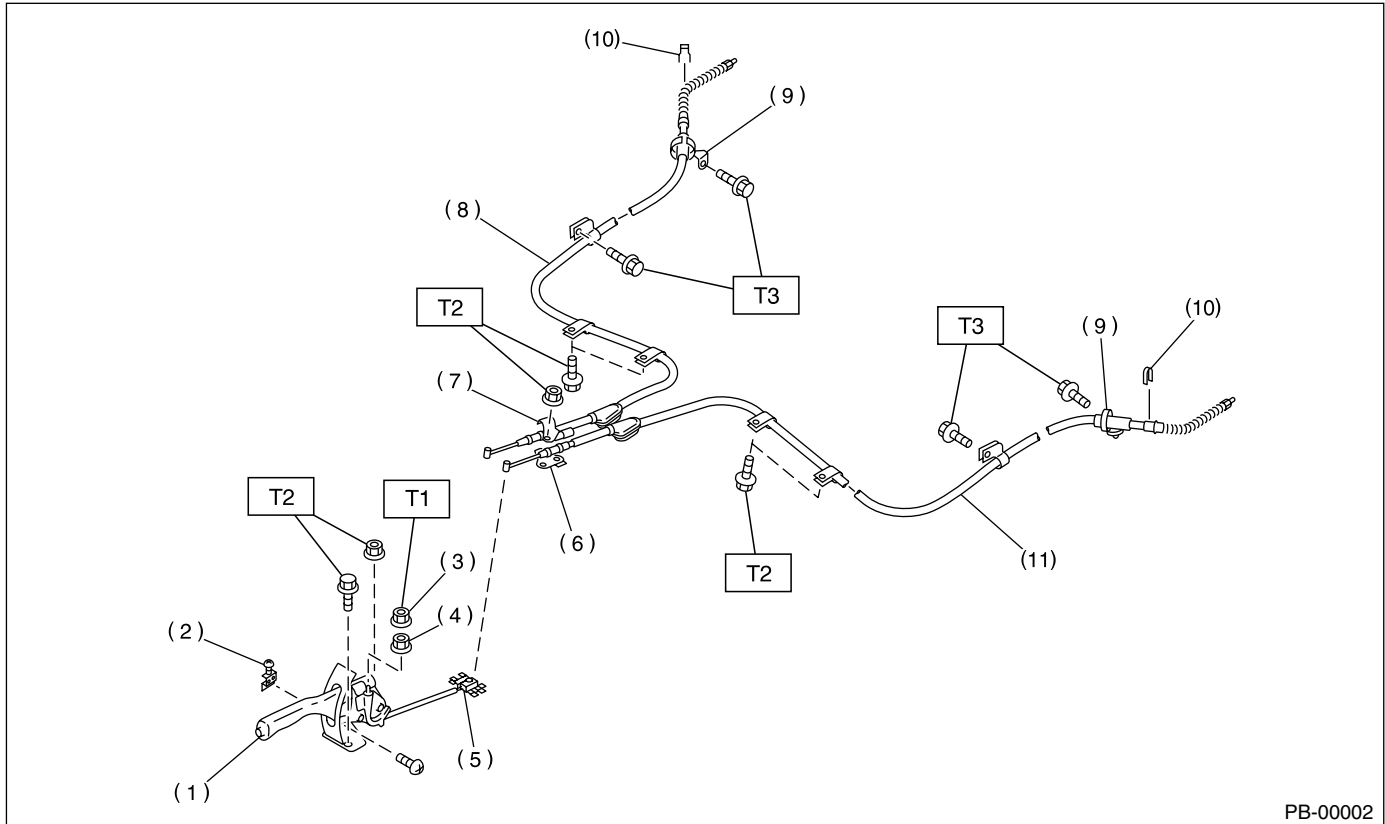
- (1) Back plate
- (2) Retainer
- (3) Spring washer
- (4) Lever
- (5) Parking brake shoe (Primary)
- (6) Parking brake shoe (Secondary)
- (7) Strut spring

- (8) Strut
- (9) Shoe guide plate
- (10) Primary return spring
- (11) Secondary return spring
- (12) Adjusting spring
- (13) Adjuster
- (14) Shoe hold-down cup

- (15) Shoe hold-down spring
- (16) Shoe hold-down pin
- (17) Adjusting hole cover

Tightening torque: N-m (kgf-m, ft-lb)
T: 53 (5.4, 39.1)

2. PARKING BRAKE CABLE



PB-00002

(1) Parking brake lever	(7) Clamp
(2) Parking brake switch	(8) Parking brake cable RH
(3) Lock nut	(9) Cable guide
(4) Adjusting nut	(10) Clamp (Rear disc brake model)
(5) Equalizer	(11) Parking brake cable LH
(6) Bracket	

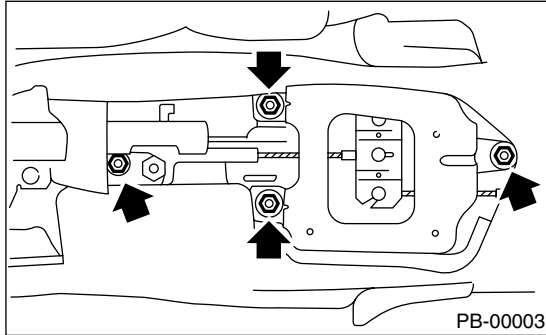
Tightening torque: N·m (kgf-m, ft-lb)**T1: 5.9 (0.6, 4.3)****T2: 18 (1.8, 13.0)****T3: 32 (3.3, 23.6)****C: CAUTION**

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep grease etc. away from parking brake shoes.

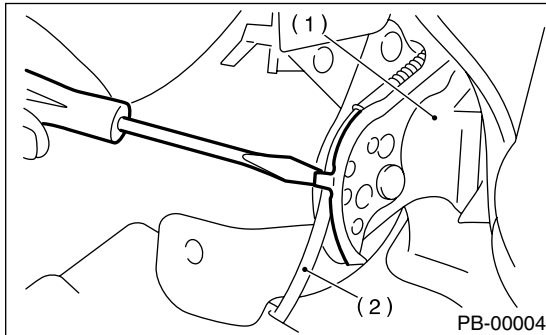
2. Parking Brake Lever

A: REMOVAL

- 1) Lift up the vehicle.
- 2) Remove the rear wheel.
- 3) Remove the rear seat cushion.
- 4) Remove the console box.
- 5) Loosen the parking cable adjusting nut and console bracket.
- 6) Disconnect the connector of parking brake switch.
- 7) Remove the parking brake lever.



- 8) Unbend the parking brake lever pawls and remove cable.



- (1) Parking brake lever
- (2) Cable

B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

Parking brake lever;

18 N·m (1.8 kgf·m, 13.0 ft-lb)

Adjusting nut;

5.9 N·m (0.6 kgf·m, 4.3 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 not as specified, adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

D: ADJUSTMENT

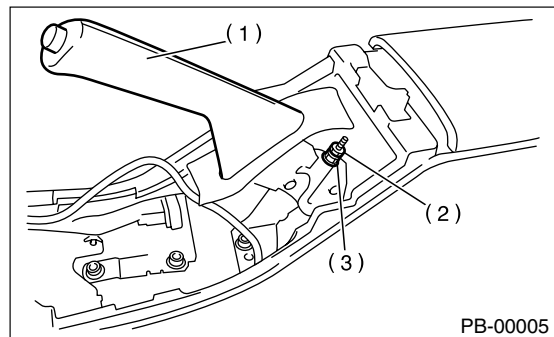
- 1) Remove the console cover.
- 2) Forcibly pull the parking brake lever 3 to 5 times.
- 3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).
- 4) Tighten the lock nut.

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Lock nut):

5.9 N·m (0.6 kgf·m, 4.3 ft-lb)



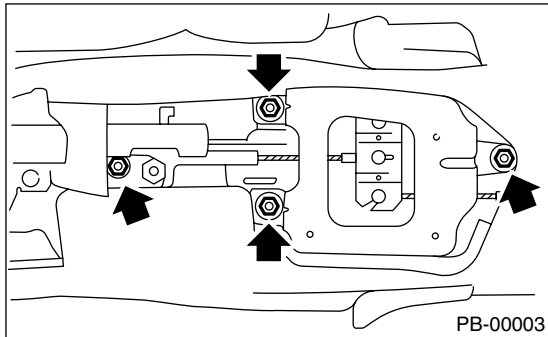
- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

- 5) Install the console cover.

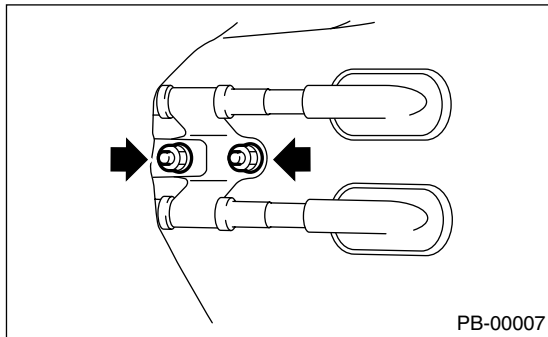
3. Parking Brake Cable

A: REMOVAL

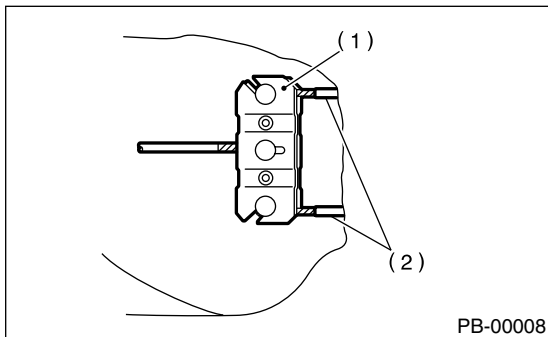
- 1) Lift up the vehicle.
- 2) Remove the rear wheels.
- 3) Remove the rear seat cushion.
- 4) Remove the console box.
- 5) Loosen the parking cable adjusting nut and console bracket.
- 6) Remove the parking brake lever.



- 7) Roll up the floor mat and remove clamps.



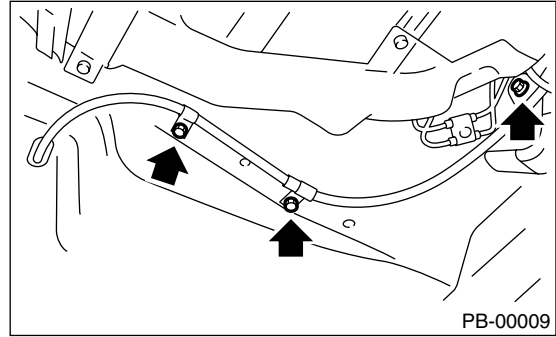
- 8) Remove the equalizer cover.
- 9) Remove the inner cable end from equalizer.



- (1) Equalizer
- (2) Inner cable end

- 10) Remove the parking brake cable from rear brake. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
- 11) Remove the clamp from rear brake.
- 12) Remove the bolt and bracket from trailing link bracket.

- 13) Remove the bolt and clamp from rear floor.



- 14) Detach the grommet from rear floor.
- 15) Remove the cable assembly from cabin by forcibly pulling it backward.
- 16) Detach the parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

- 1) Install the (new) parking brake assembly in the reverse order of removal.

NOTE:

Be sure to pass the cable through cable guide inside the tunnel.

- 2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

Check the removed cable and replace it if damaged, rusty or malfunctioning.

- 1) Check for smooth operation of the cable.
- 2) Check the inner cable for damage and rust.
- 3) Check the outer cable for damage, bends and cracks.
- 4) Check the boot for damage, cracks and deterioration.

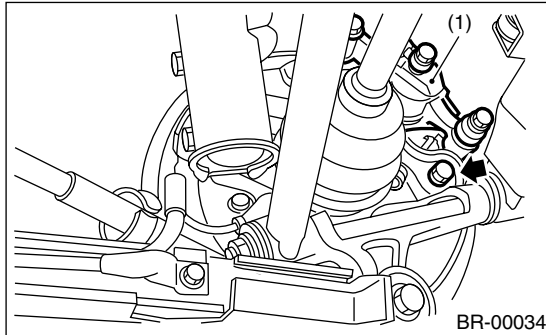
PARKING BRAKE ASSEMBLY (REAR DISC BRAKE)

PARKING BRAKE

4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

- 1) Pull down and release the parking brake.
- 2) Remove the two mounting bolts and remove the brake caliper assembly.



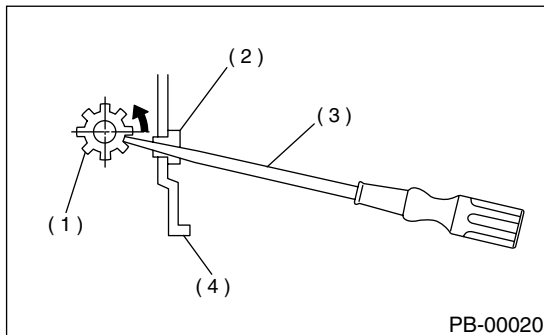
(1) Brake caliper assembly

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

NOTE:

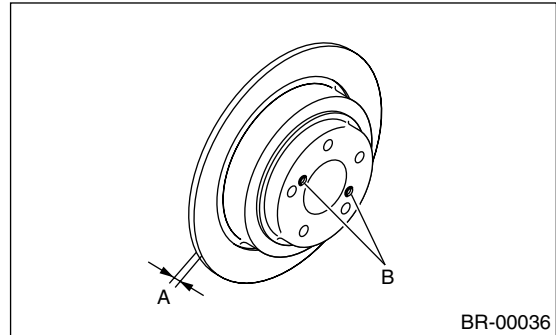
If the disc rotor is difficult to remove, try the two following methods in order.

- (1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.

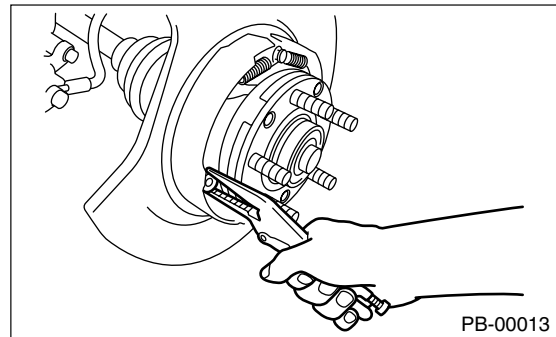


- (1) Adjusting screw
- (2) Adjusting hole cover (rubber)
- (3) Flat tip screwdriver
- (4) Back plate

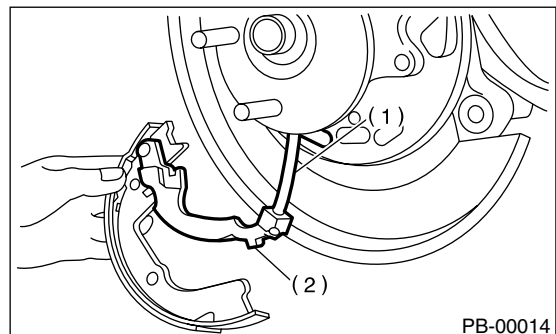
- (2) If the disc rotor seizes up within hub, drive the disc rotor out by installing two 8-mm bolts in holes B on rotor.



- 5) Remove the shoe return spring from 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 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 parking brake lever.



- (1) Parking brake cable
- (2) Parking brake lever

- 12) Using a standard screwdriver, raise the retain-er. Remove the parking brake lever and washer from brake shoe.

B: INSTALLATION

CAUTION:

Be sure the lining surface is free from oil and grease contamination.

1) Apply brake grease to the following places.

Brake grease:

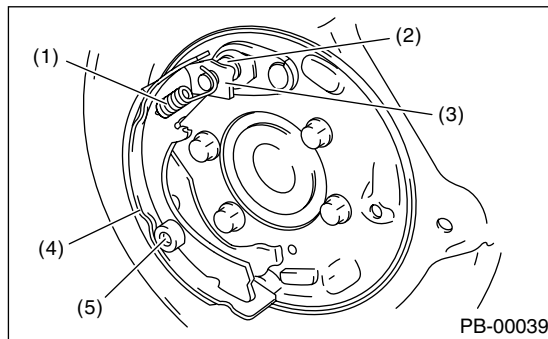
Brake Grease (Part No. 003602002)

- Six contact surfaces of shoe rim and back plate packing
- Contact surface of shoe wave and anchor pin
- Contact surface of lever and strut
- Contact surface of shoe wave and adjuster assembly
- Contact surface of shoe wave and strut
- Contact surface of lever and shoe wave

2) Insert the primary side brake shoe into anchor pin groove.

3) Secure the brake shoe with shoe hold-down pin and cup.

4) Install the plate to anchor pin, and then assemble the primary return spring to anchor pin.



- (1) Primary return spring
- (2) Anchor pin
- (3) Plate
- (4) Primary shoe
- (5) Shoe hold-down pin & cup

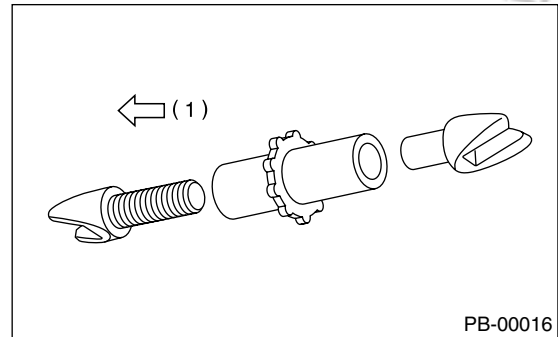
5) Install the parking brake cable to parking brake lever.

6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with shoe hold-down pin & cup.

NOTE:

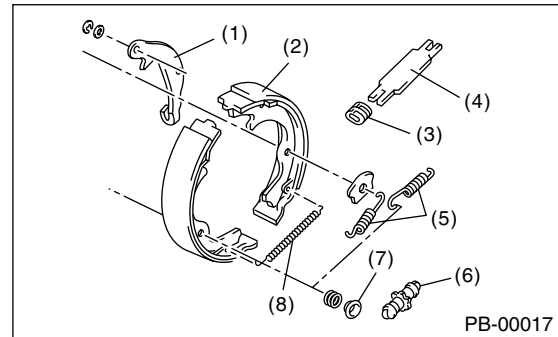
- Install the strut spring of both right and left wheels facing vehicle front.

- Install the adjuster assembly with screw on left side.



- (1) Left

7) Install the secondary return spring and adjusting spring.



- (1) Lever
- (2) Secondary brake shoe
- (3) Strut spring
- (4) Strut
- (5) Return spring
- (6) Adjuster
- (7) Shoe hold-down cup
- (8) Adjusting spring

8) Adjust the parking brakes. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

9) Drive the vehicle for parking brake lining "break-in".

- (1) Drive the vehicle at about 35 km/h (22 MPH).
- (2) With the parking brake release button pushed in, pull the parking brake lever gently.
- (3) Drive the vehicle for about 200 meter (0.12 mile) in this condition.
- (4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
- (5) After breaking-in, re-adjust the parking brakes.

PARKING BRAKE ASSEMBLY (REAR DISC BRAKE)

PARKING BRAKE

C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

Disc rotor inside diameter:

Standard

Except STi model 170 mm (6.69 in)

STi model 190 mm (7.48 in)

Service limit

Except STi model 171 mm (6.73 in)

STi model 191 mm (7.52 in)

2) Measure the lining thickness. If it exceeds the limit, replace the shoe assembly.

Lining thickness:

Standard

3.2 mm (0.126 in)

Service limit

1.5 mm (0.059 in)

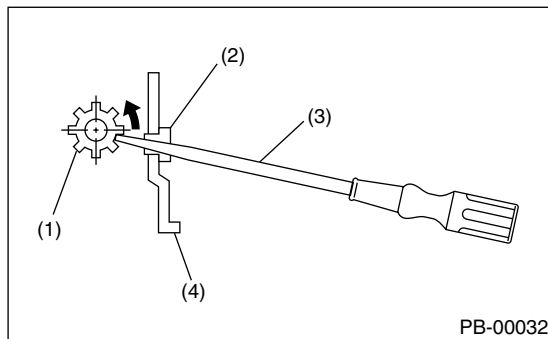
NOTE:

Replace the right and left brake shoes at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove the adjusting hole cover from back plate.
2) Turn the adjusting screw using a flat tip screwdriver until brake shoe is in close contact with disc rotor.



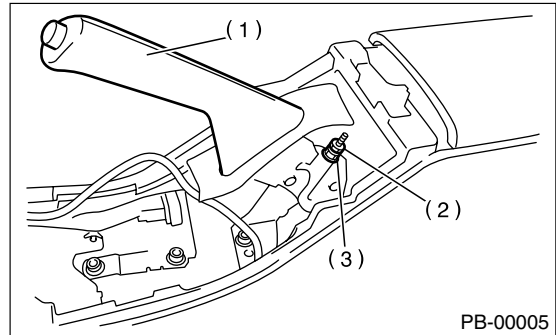
- (1) Adjusting screw
- (2) Adjusting hole cover (rubber)
- (3) Flat tip screwdriver
- (4) Back plate

3) Turn back (downward) the adjusting screw 3 or 4 notches.

4) Install the adjusting hole cover to back plate.

2. LEVER STROKE

1) Remove the console box lid.
2) Forcibly pull the parking brake lever 3 to 5 times.
3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).



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

4) Tighten the lock nut.
5) Install the console box lid.

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Lock nut):

5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Brake drag	Parking brake lever is maladjusted.	Adjustment.
	Parking brake cable does not move.	Repair or replace.
	Parking brake shoe clearance is maladjusted.	Adjustment.
	Return spring is faulty.	Replace.
Noise from brake	Return spring is faulty.	Replace.
	Shoe hold-down spring is faulty.	Replace.

GENERAL DIAGNOSTIC TABLE

PARKING BRAKE

POWER ASSISTED SYSTEM (POWER STEERING)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

1. General Description

A: SPECIFICATIONS

Model			NON-TURBO		TURBO	
			Others	SEDAN and OUTBACK	WRX	STi
Whole system	Minimum turning radius m (ft)		5.1 (16.7)	5.4 (17.7)		
	Steering angle (Inside-Outside)		37.3° — 32.4°	34.5° — 30.3°		
	Steering wheel diameter mm (in)		385 (15.16)			375 (14.76)
	Overall gear ratio (Turns, lock to lock Gear box)		3.2	3.0		2.7
Gearbox	Type		Rack and pinion, Integral			
	Backlash		0 (Automatically adjustable)			
	Valve (Power steering system)		Rotary valve			
Pump (Power steering system)	Type		Vane pump			
	Oil tank		Installed on body			
	Output cm ³ (cu in)/rev.		7.8 (0.476)		7.2 (0.439)	
	Relief pres- sure kPa (kg/cm ² , psi)		6,767 — 7,453 (69 — 76, 981 — 1,081)		7,350 — 8,036 (75 — 82, 1,067 — 1,165)	
	Hydraulic fluid control		Dropping in response to increased engine revolutions			
	Hydraulic fluid ℓ (US qt, Imp qt)/min		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)		7.5 (7.9, 6.6) ^{*1} 7 (7.4, 6.2) ^{*2}	
	Range of revolution rpm		700 — 9,000			
	Revolving direction		Clockwise			
	Working fluid (Power steering system)	Name		ATF DEXRON III		
Capacity		Oil tank	0.3 (0.3, 0.3)			
ℓ (US qt, Imp qt)		Total	0.7 (0.7, 0.6)			

*1: With maximum load.

*2: With no load.

Steering wheel	Free play		mm (in)	17 (0.67)
Turning angle	Inner tire & wheel	TURBO, OUTBACK, NON-TURBO SEDAN		34.5°±1.5°
		Except TURBO, OUTBACK, NON-TURBO SEDAN		37.3°±1.5°
	Outer tire & wheel	TURBO, OUTBACK, NON-TURBO SEDAN		30.3°±1.5°
		Except TURBO, OUTBACK, NON-TURBO SEDAN		32.4°±1.5°
Steering shaft	Clearance between steering wheel and column cover		mm (in)	4.0 (0.16)
Steering gear-box (Power steering system)	Sliding resistance		N (kgf, lb)	400 (41, 90) or less
	Rack shaft play in radial direction	Right-turn steering	mm (in)	0.19 (0.0075) or less
		Left-turn steering	mm (in)	Horizontal movement: 0.15 (0.0059) or less Vertical movement: 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
	Turning resistance		N (kgf, lb)	Maximum allowable value: Less than 10.5 (1.1, 2.4) Difference between right and left sliding resistance: Less than 20%

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less	
		Axial play	mm (in)	0.9 (0.035) or less	
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less	
		Resistance to rotation	N (kgf, lb)	9.22 (0.94, 2.07) or less	
	Regular pressure (Unloaded)			kPa (kg/cm ² , psi)	981 (10, 142) or less
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road			N (kgf, lb)	31.4 (3.2, 7.1) or less
	At standstill with engine stalled on a concrete road			N (kgf, lb)	294.2 (30, 66.2) or less

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

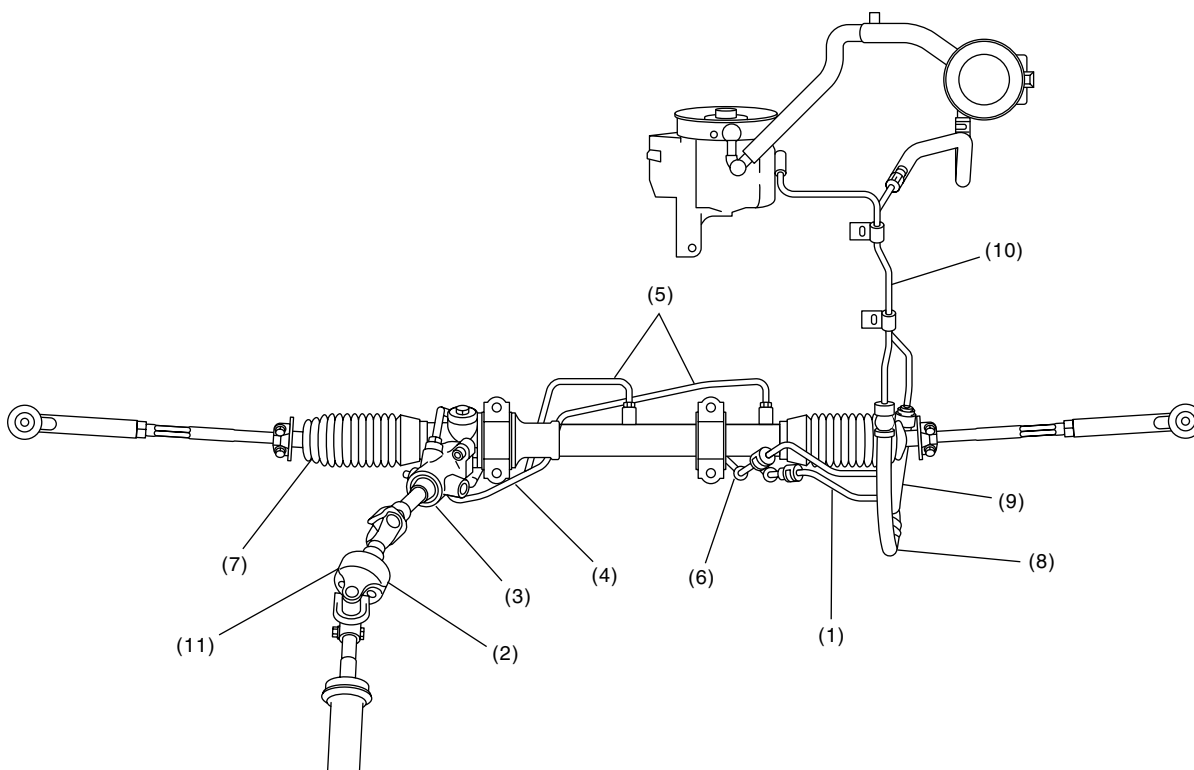
CAUTION:

This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

Location	Minimum allowance
(1) Crossmember — Pipe	5 mm (0.20 in)
(2) DOJ — Shaft or joint	14 mm (0.55 in)
(3) DOJ — Valve housing	11 mm (0.43 in)
(4) Pipe — Pipe	2 mm (0.08 in)
(5) Stabilizer — Pipe	5 mm (0.20 in)
(6) Exhaust pipe — Pipe	11 mm (0.43 in)
(7) Exhaust pipe — Gearbox bolt	15 mm (0.59 in)
(8) Side frame — Hose A and B	10 mm (0.39 in)
(9) Cruise control pump — Hose A and B	15 mm (0.59 in)
(10) Pipe portion of hose A — Pipe portion of hose B	1.5 mm (0.059 in)
(11) AT cooling hose — Joint	20 mm (0.79 in)



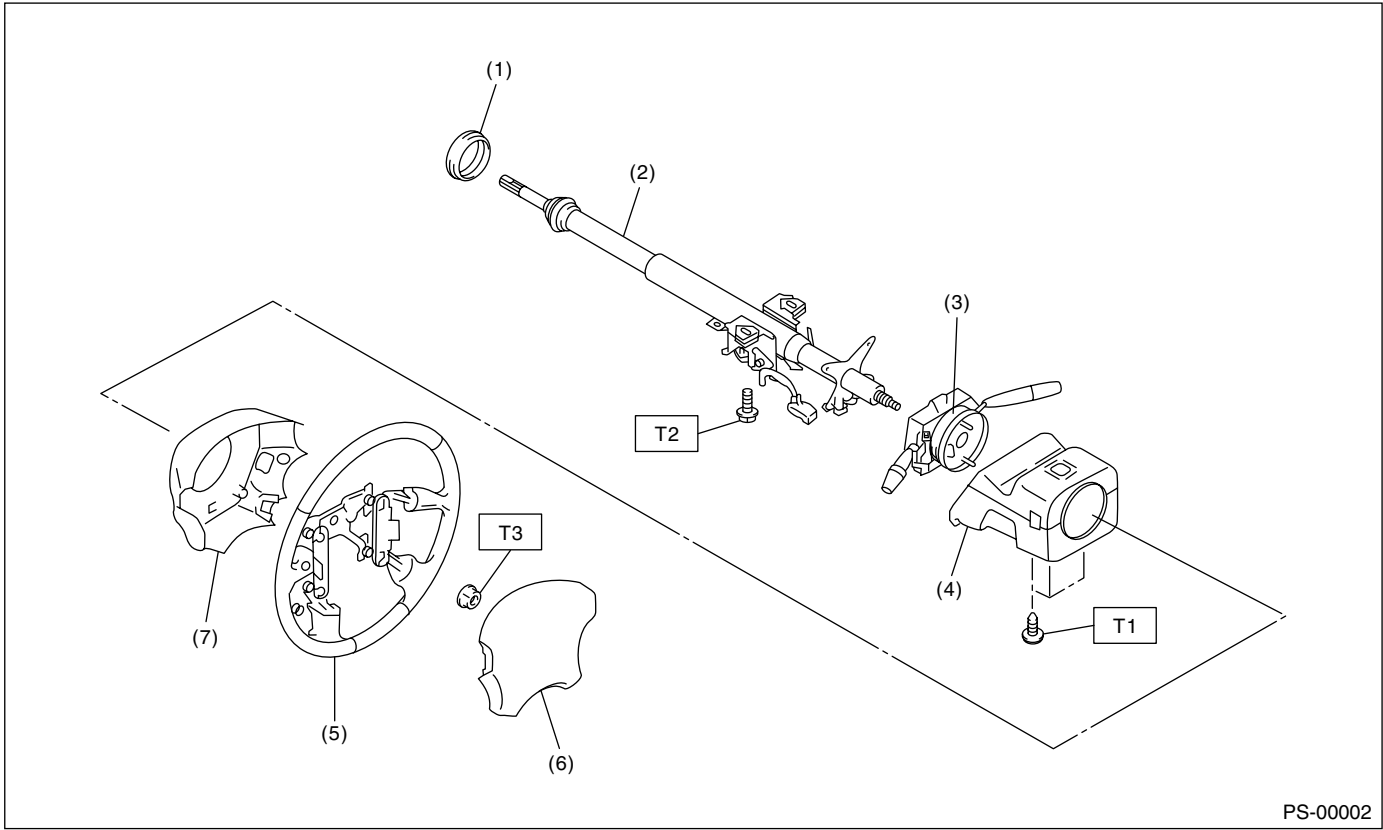
PS-00355

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

B: COMPONENT

1. STEERING WHEEL AND COLUMN



PS-00002

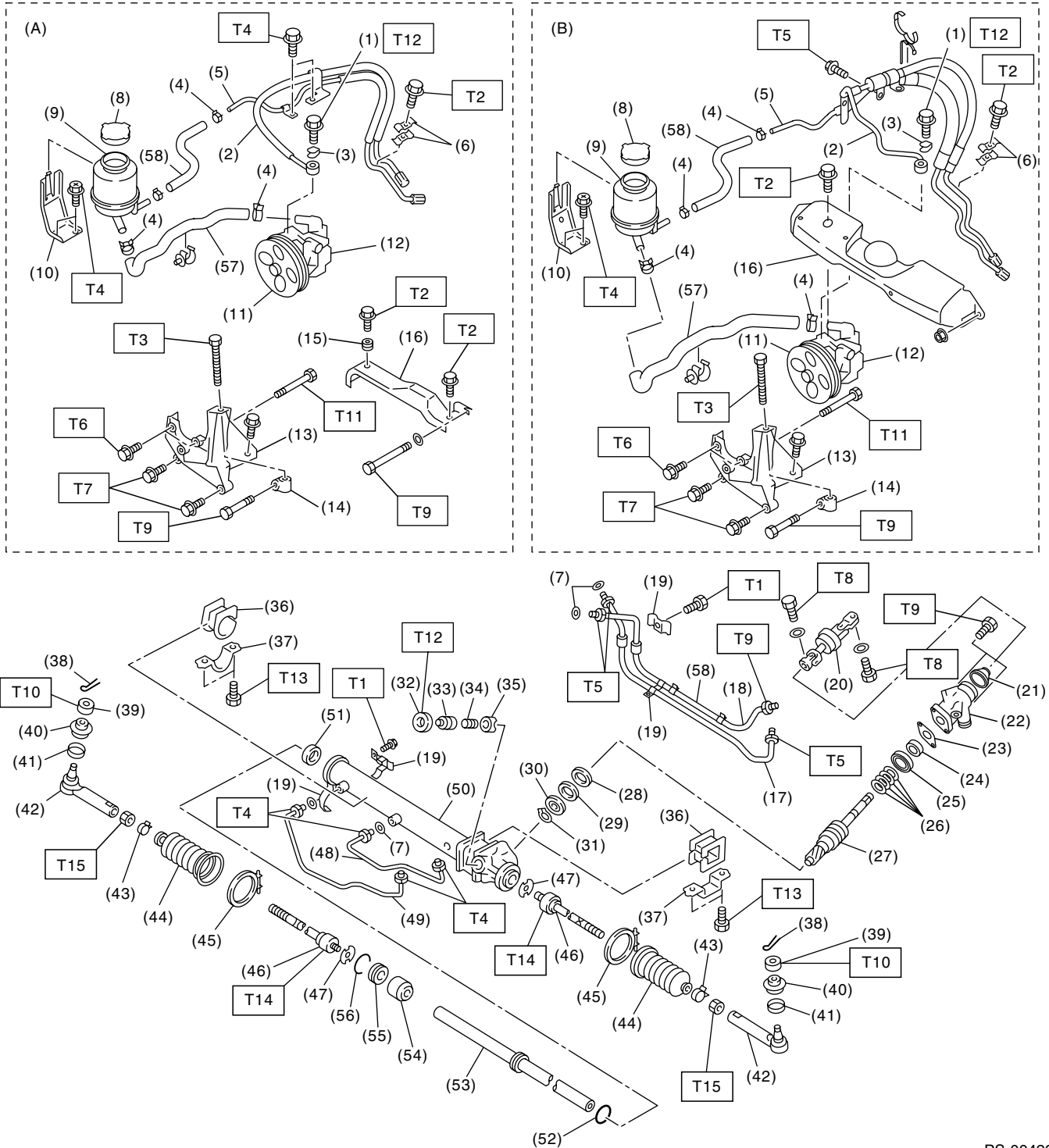
(1) Bushing	(5) Steering wheel
(2) Steering shaft	(6) Airbag module
(3) Steering roll connector	(7) Steering wheel lower cover
(4) Column cover	

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)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

2. POWER ASSISTED SYSTEM



PS-00429

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

(A) NON-TURBO MODEL

(B) TURBO MODEL

(1) Eye bolt

(2) Pipe C

(3) Gasket

(4) Clip

(5) Pipe D

(6) Clamp E

(7) O-ring

(8) Cap

(9) Reservoir tank

(10) Reservoir tank bracket

(11) Pulley

(12) Oil pump

(13) Bracket

(14) Belt tension nut

(15) Bush

(16) Belt cover

(17) Pipe E

(18) Pipe F

(19) Clamp plate

(20) Universal joint

(21) Dust seal

(22) Valve housing

(23) Gasket

(24) Oil seal

(25) Ball bearing

(26) Seal ring

(27) Pinion and valve ASSY

(28) Oil seal

(29) Back-up washer

(30) Ball bearing

(31) Snap ring

(32) Lock nut

(33) Adjusting screw

(34) Spring

(35) Sleeve

(36) Adapter

(37) Clamp

(38) Cotter pin

(39) Castle nut

(40) Dust cover

(41) Clip

(42) Tie-rod end

(43) Clip

(44) Boot

(45) Band

(46) Tie-rod

(47) Lock washer

(48) Pipe B

(49) Pipe A

(50) Steering body

(51) Oil seal

(52) Piston ring

(53) Rack

(54) Rack bushing

(55) Rack stopper

(56) Circlip

(57) Suction hose

(58) Hose

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6 (0.6, 4.3)

T2: 7.4 (0.75, 5.4)

T3: 8 (0.8, 5.8)

T4: 13 (1.3, 9.4)

T5: 15 (1.5, 10.8)

T6: 15.7 (1.6, 11.6)

T7: 22 (2.2, 15.9)

T8: 24 (2.4, 17.4)

T9: 25 (2.5, 18.1)

T10: 27 (2.75, 19.9)

T11: 37.3 (3.8, 27.5)

T12: 39 (4.0, 28.9)

T13: 59 (6.0, 43.4)

T14: 78 (8.0, 57.9)

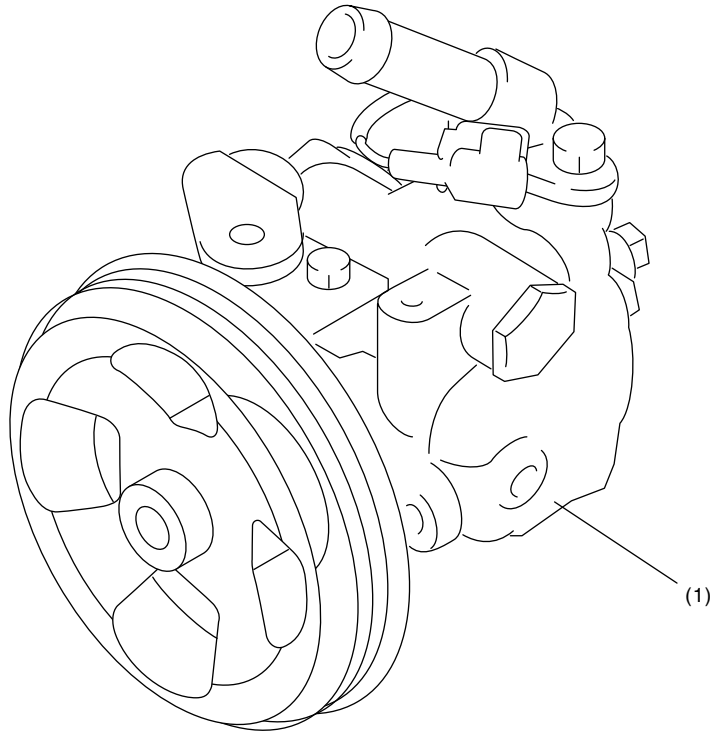
T15: 83 (8.5, 61.5)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

3. OIL PUMP

- EXCEPT DOHC TURBO MODEL



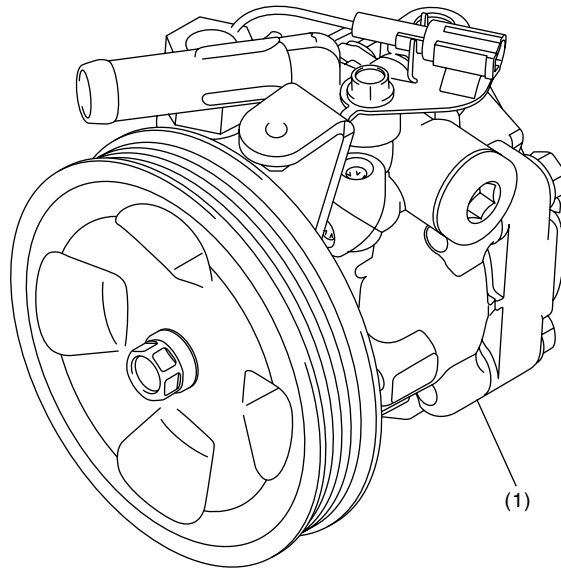
PS-00024

(1) Oil pump ASSY

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

- DOHC TURBO MODEL



PS-00440

(1) Oil pump ASSY

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

C: CAUTION

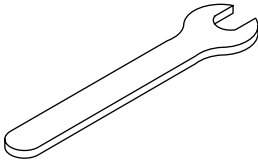
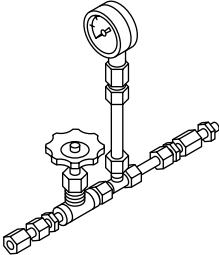
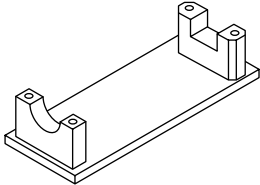
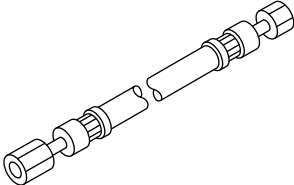
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine power steering fluid, grease etc. or the equivalent. Do not mix steering fluid, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- 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.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

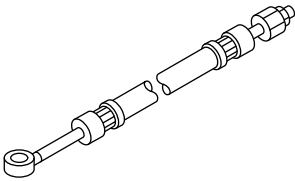
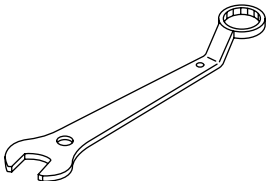
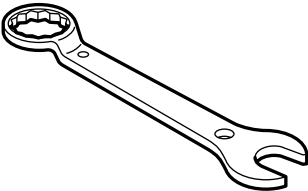
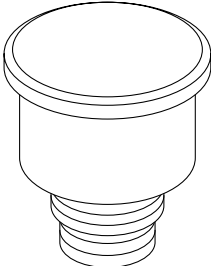
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925700000	925700000	WRENCH	- Used for removing and installing tie-rod. - Apply this tool to rack.
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

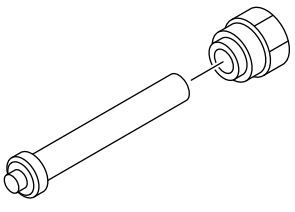
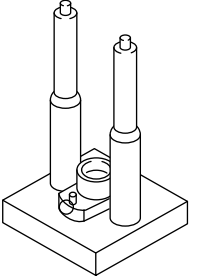
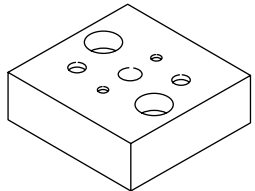
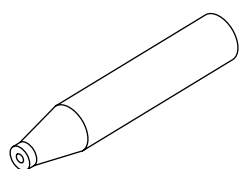
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 ST926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gearbox.
 ST34099PA100	34099PA100	SPANNER	Used for measuring the rotating resistance of gear-box assembly.
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering fluid.

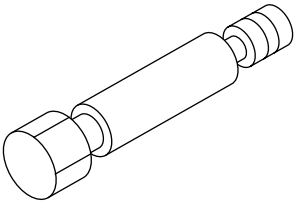
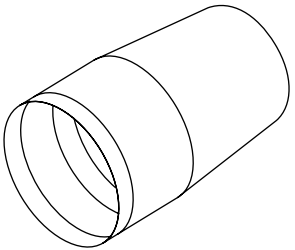
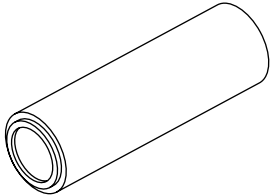
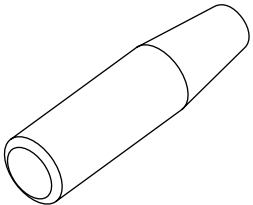
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926420000	926420000	PLUG	When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.
 ST-926370000	926370000	INSTALLER A	- Used for installing valve assembly into valve housing assembly. - Used with STAND BASE (34099FA100).
 ST34099FA100	34099FA100	STAND BASE	Used for assembling power steering gearbox.
 ST-926390001	926390001	COVER & REMOVER ASSY	Used for assembling rack assembly.

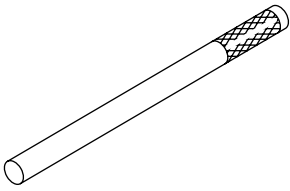
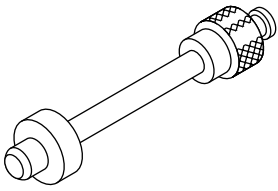
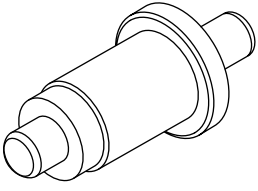
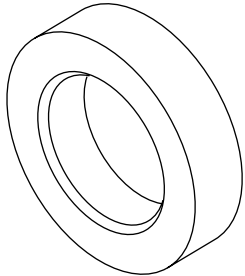
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926400000	926400000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (927660000).
 ST-927660000	927660000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (926400000).
 ST-927620000	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).
 ST-926360000	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000).

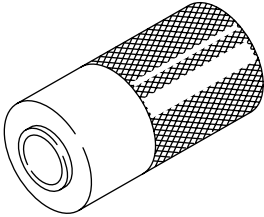
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE050	34199AE050	OIL SEAL REMOVER	Used for removing oil seal.
 ST34099FA110	34099FA110	INSTALLER	Used for installing oil seal.
 ST34099FA120	34099FA120	INSTALLER AND REMOVER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER SEAL. (34099FA130) • Used for installing valve housing ball bearing. • Used for removing oil seal and ball bearing from valve housing.
 ST34099FA130	34099FA130	INSTALLER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER AND REMOVER SEAL (34099FA120).

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927640000	927640000	INSTALLER B	Used for ball bearing into housing.

STEERING WHEEL

POWER ASSISTED SYSTEM (POWER STEERING)

2. Steering Wheel

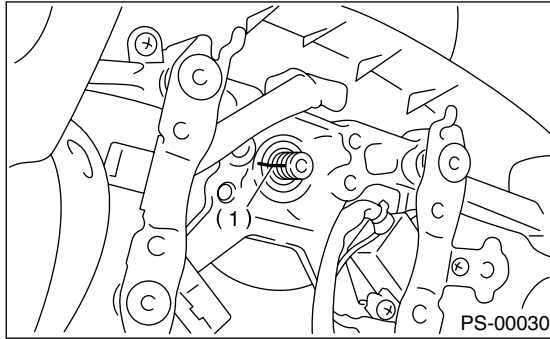
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Set the tires to straight-ahead position.
- 3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

WARNING:

Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

- 4) Make matching marks on the steering wheel and steering shaft.



(1) Matching mark

- 5) Remove the steering wheel nut, and then draw out the steering wheel from shaft using steering puller.

B: INSTALLATION

WARNING:

Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

- 1) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
- 2) Install in the reverse order of removal.

NOTE:

Align matching marks on the steering wheel and steering shaft.

Tightening torque:

45 N·m (4.6 kgf-m, 33.2 ft-lb)

Column cover-to-steering wheel clearance:

2 — 4 mm (0.08 — 0.16 in)

CAUTION:

Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

C: INSPECTION

- 1) Check the steering wheel for deformation. If the deformation is excessive, replace steering wheel.
- 2) Check the splines on steering wheel for damage. If the damage is excessive, replace steering wheel.

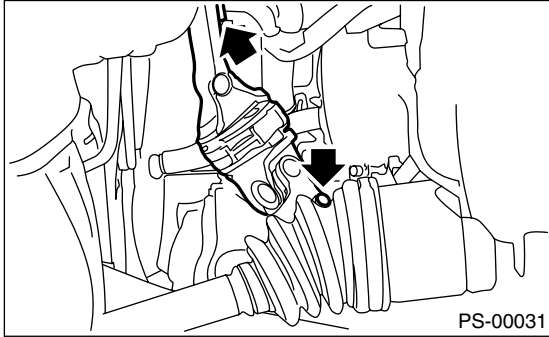
UNIVERSAL JOINT

POWER ASSISTED SYSTEM (POWER STEERING)

3. Universal Joint

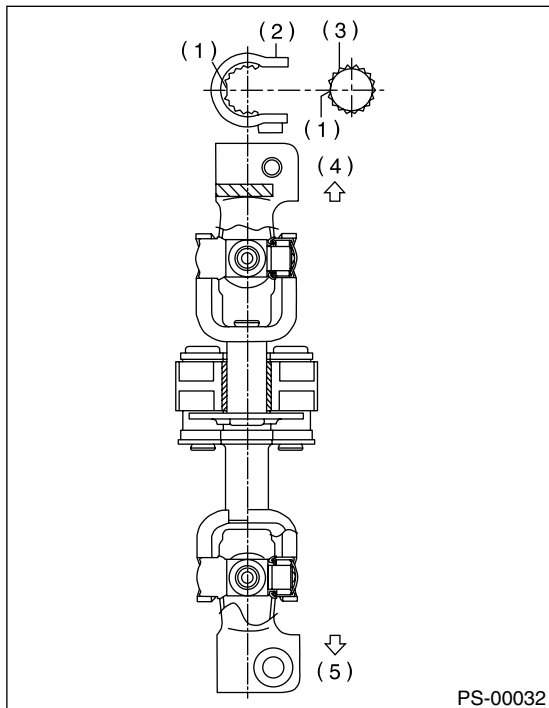
A: REMOVAL

- 1) Remove the steering wheel. <Ref. to PS-17, REMOVAL, Steering Wheel.>
- 2) Make matching mark on the universal joint.
- 3) Remove the universal joint bolts, and then remove the universal joint.



B: INSTALLATION

- 1) Align the cutout at serrated section of the column shaft and yoke, and then insert the universal joint into column shaft.



- (1) Cutout
- (2) Yoke
- (3) Column shaft
- (4) Column shaft side
- (5) Gearbox side

- 2) Align the matching marks, and then insert the universal joint to serrated section of gear box assembly.

- 3) Tighten the bolt.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:

Excessively large tightening torque of the universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 14 mm (0.55 in)

- 4) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
- 5) Install the steering wheel and airbag module. <Ref. to PS-17, INSTALLATION, Steering Wheel.>

WARNING:

Always refer to “Airbag System” before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

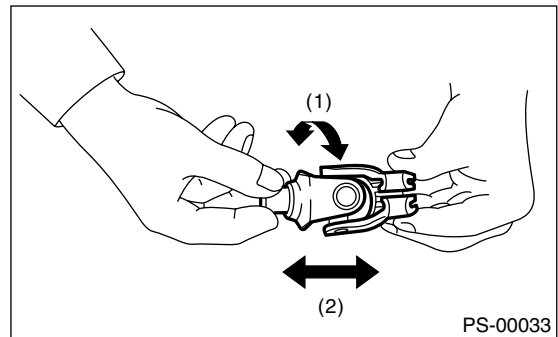
C: INSPECTION

Check for wear, damage, or any other faults. If necessary, replace.

Service limit:

Universal joint play; 0 mm (0 in)

Maximum swing torque; 0.3 N (0.03 kgf, 0.07 lb)



- (1) Swing torque
- (2) Play

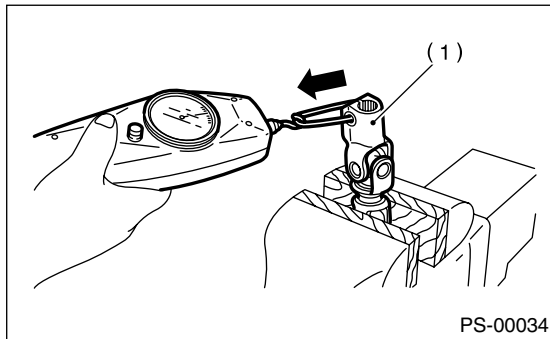
UNIVERSAL JOINT

POWER ASSISTED SYSTEM (POWER STEERING)

Measurement of folding torque of universal joint is as shown in the figures.

Service limit:

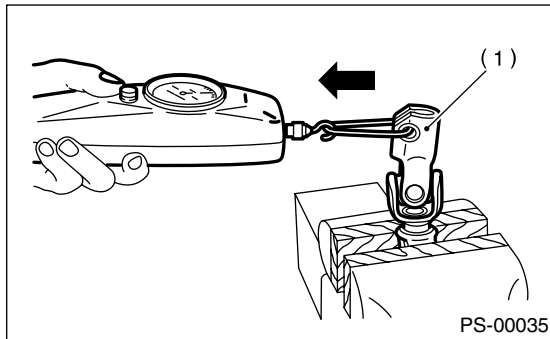
Maximum load; 3.8 N (0.39 kgf, 0.86 lb) or less



(1) Yoke (gearbox side)

Service limit:

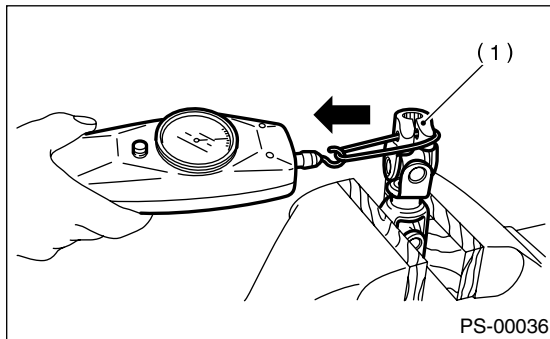
Maximum load; 3.8 N (0.39 kgf, 0.86 lb) or less



(1) Yoke (gearbox side)

Service limit:

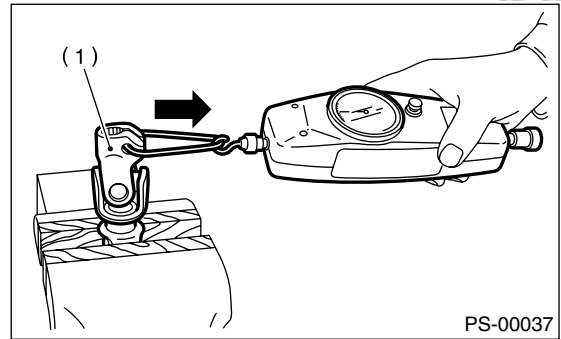
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

Service limit:

Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



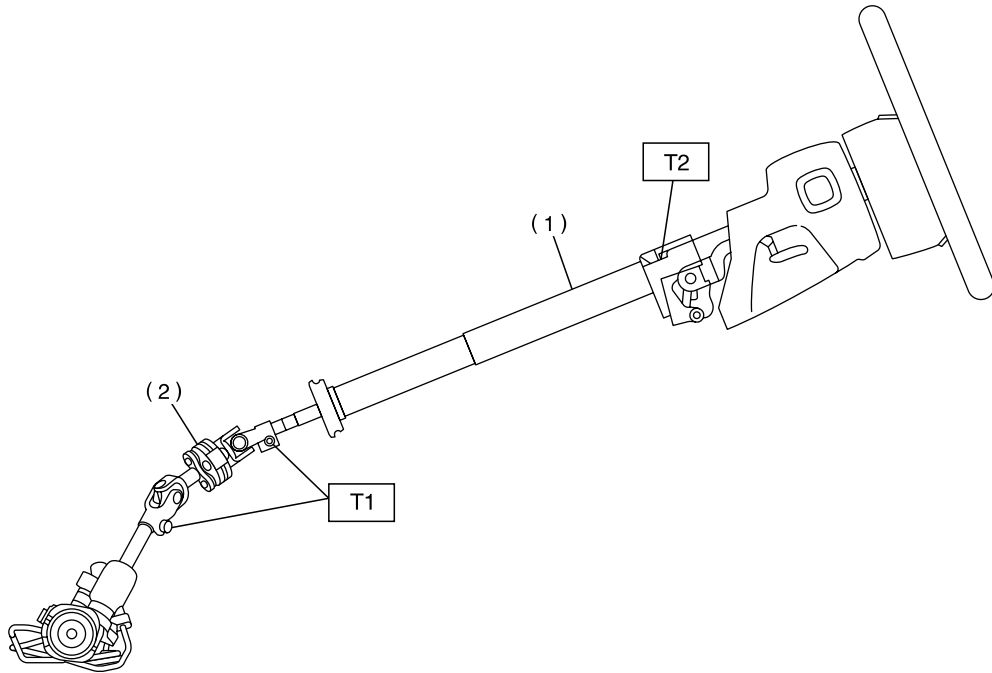
(1) Yoke (Steering column side)

TILT STEERING COLUMN

POWER ASSISTED SYSTEM (POWER STEERING)

4. Tilt Steering Column

A: REMOVAL



PS-00038

(1) Tilt steering column

(2) Universal joint

Tightening torque: N·m (kgf·m, ft·lb)

T1: 24 (2.4, 17.4)

T2: 25 (2.5, 18.1)

TILT STEERING COLUMN

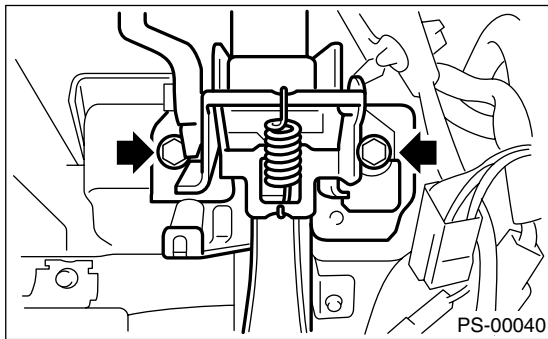
POWER ASSISTED SYSTEM (POWER STEERING)

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

WARNING:

Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

- 4) Remove the steering wheel. <Ref. to PS-17, REMOVAL, Steering Wheel.>
- 5) Remove the universal joint. <Ref. to PS-18, REMOVAL, Universal Joint.>
- 6) Remove the trim panel under instrument panel.
- 7) Remove the steering column lower cover.
- 8) Remove all connectors from steering column.
- 9) Remove the two bolts under instrument panel securing steering column.



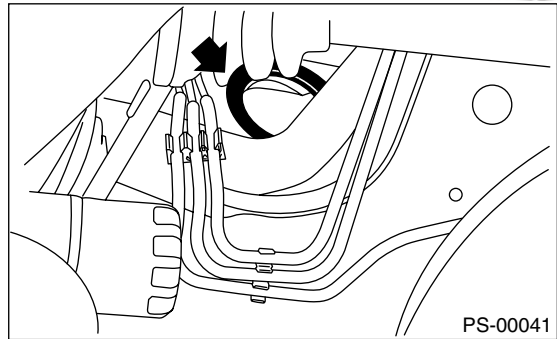
- 10) Pull out the steering shaft assembly from hole on toe board.

CAUTION:

- Be sure to remove the universal joint before removing the steering shaft assembly installing bolts when removing the steering shaft assembly or when lowering it for servicing of other parts.
- Do not loosen the tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

- 1) Set the grommet to toe board.



- 2) Insert the end of steering shaft into toe board grommet.
- 3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

- 4) Connect all connectors under instrument panel.
- 5) Connect the airbag system connector at harness spool.

NOTE:

Make sure to apply double lock.

- 6) Install the lower column cover with tilt lever held in the lowered position.
- 7) Install the universal joint. <Ref. to PS-18, INSTALLATION, Universal Joint.>
- 8) Align center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
- 9) Install the steering wheel. <Ref. to PS-17, INSTALLATION, Steering Wheel.>

CAUTION:

Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

- 10) Install the airbag module to steering wheel.

WARNING:

Always refer to "Airbag System" before performing the service operation. <Ref. to AB-3, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and two screws securing combination switch, and then remove the related parts.

TILT STEERING COLUMN

POWER ASSISTED SYSTEM (POWER STEERING)

D: ASSEMBLY

1) Insert the combination switch to upper column shaft, and then install the upper column cover. Then route the ignition key harness and combination switch harness between column cover mounting bosses.

Tightening torque:

1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

CAUTION:

Do not overtighten the screw.

E: INSPECTION

1. BASIC INSPECTION

Measure overall length of the steering column. If not as specified, replace.

Standard value:

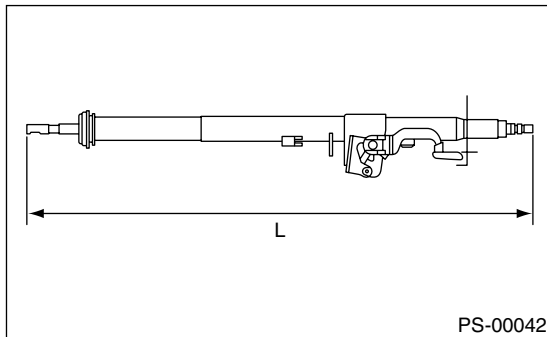
Overall length L

Except STi model

825.7±1.5 mm (32.51±0.059 in)

STi model

818.7±1.5 mm (32.23±0.059 in)



2. AIRBAG MODEL INSPECTION

WARNING:

For airbag inspection procedures, refer to “Airbag System”. <Ref. to AB-3, CAUTION, General Description.>

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

5. Steering Gearbox

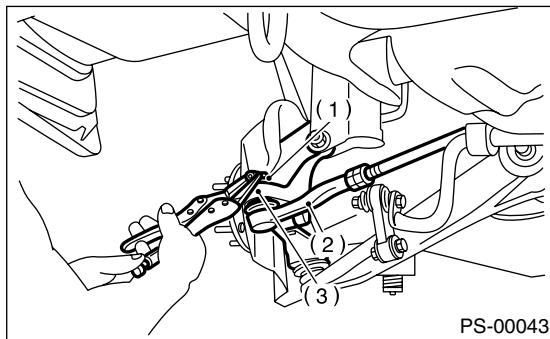
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Loosen the front wheel nut.
- 4) Lift-up the vehicle, and then remove the front wheels.
- 5) Remove the under cover.
- 6) Remove the sub frame. <Ref. to FS-25, REMOVAL, Sub Frame.>
- 7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

WARNING:

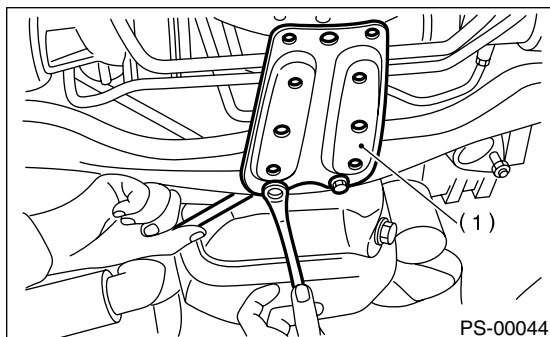
Be careful, the exhaust pipe is hot.

- 8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



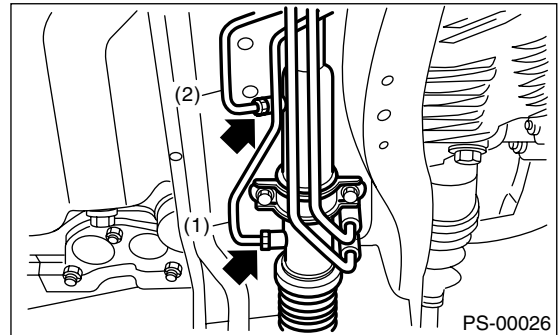
- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

- 9) Remove the jack-up plate and front stabilizer.



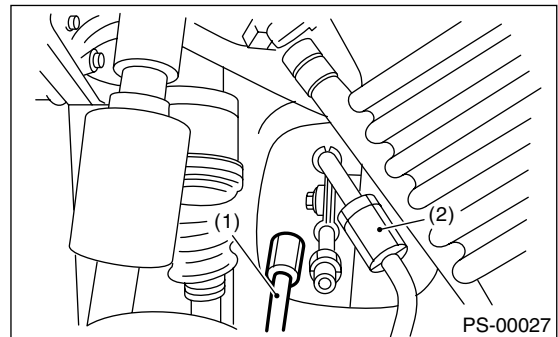
- (1) Jack-up plate

- 10) Remove the one pipe joint at center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



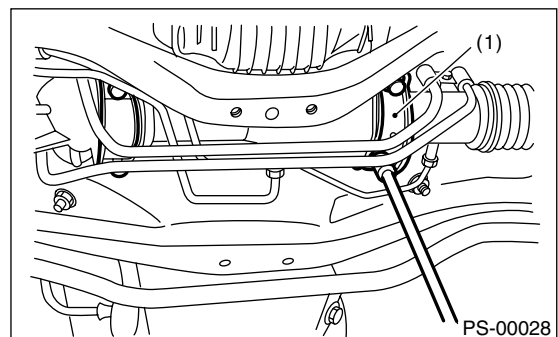
- (1) Pipe A
- (2) Pipe B

- 11) Remove the universal joint. <Ref. to PS-18, REMOVAL, Universal Joint.>
- 12) Disconnect the lower pipe C from gear box first, and upper pipe D second.



- (1) Pipe C
- (2) Pipe D

- 13) Remove the clamp bolts securing the gearbox to crossmember, and then remove the gearbox.



- (1) Clamp

STEERING GEARBOX

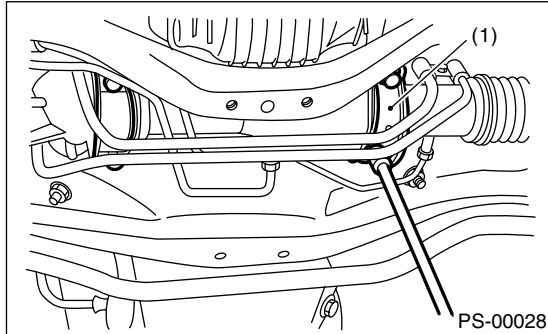
POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

- 1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.
- 2) Tighten the gearbox to crossmember bracket via clamp with bolts to specified torque.

Tightening torque:

59 N·m (6.0 kgf-m, 43.4 ft-lb)

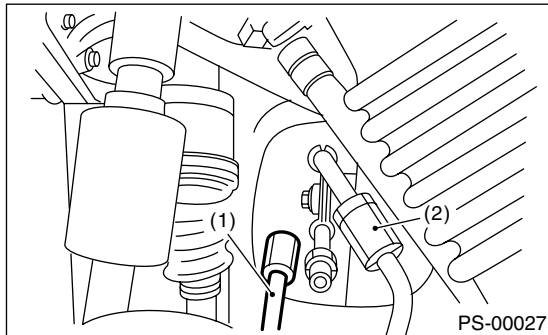


(1) Clamp

- 3) Connect the pipe D first to gear box, and pipe C second.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Pipe C

(2) Pipe D

- 4) Install the universal joint. <Ref. to PS-18, INSTALLATION, Universal Joint.>
- 5) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

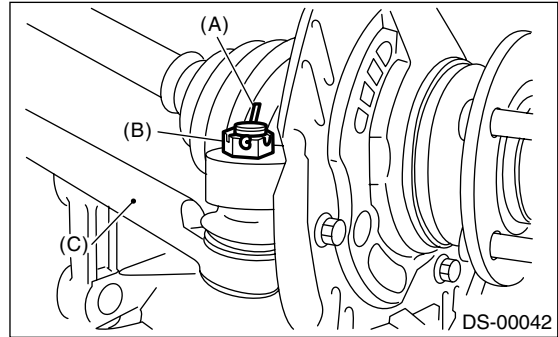
Castle nut tightening torque:

27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:

When connecting, do not hit the cap at bottom of tie-rod end with hammer.

- 6) After tightening the castle nut to specified torque, tighten it further within 60° until cotter pin hole is aligned with the slot in nut, and then bend the cotter pin to lock.



(A) Cotter pin

(B) Castle nut

(C) Tie-rod end

- 7) Install the front stabilizer to vehicle. <Ref. to FS-23, INSTALLATION, Front Stabilizer.>
- 8) Install the front exhaust pipe assembly.
- 9) Install the sub frame. <Ref. to FS-25, INSTALLATION, Sub Frame.>
- 10) Install the under cover. <Ref. to EI-22, INSTALLATION, Front Under Cover.>
- 11) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
- 12) Install the steering wheel. <Ref. to PS-17, INSTALLATION, Steering Wheel.>
- 13) Install the front wheels.
- 14) Tighten the wheel nuts to specified torque.

Tightening torque:

90 N·m (9.1 kgf-m, 65.8 ft-lb)

- 15) Connect the battery ground cable to battery.
- 16) Pour fluid into the oil tank, and bleed air. <Ref. to PS-55, Power Steering Fluid.>
- 17) Check for fluid leaks.
- 18) Install the jack-up plate.
- 19) Lower the vehicle.
- 20) Check the fluid level in oil tank.

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

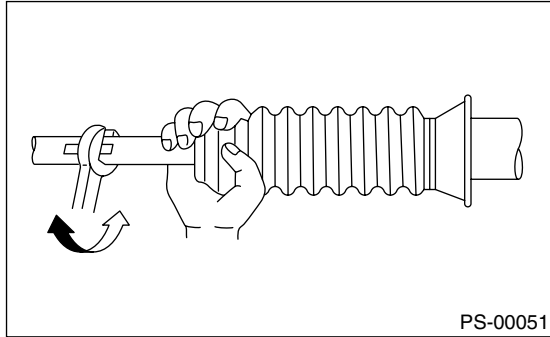
21) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:

83 N-m (8.5 kgf-m, 61.5 ft-lb)

NOTE:

When adjusting the toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

1. RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:

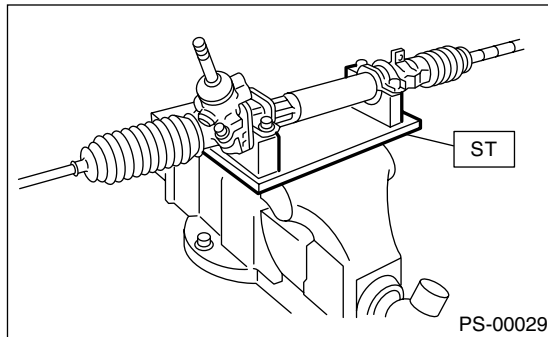
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from vehicle in vice using ST.

ST 926200000 STAND

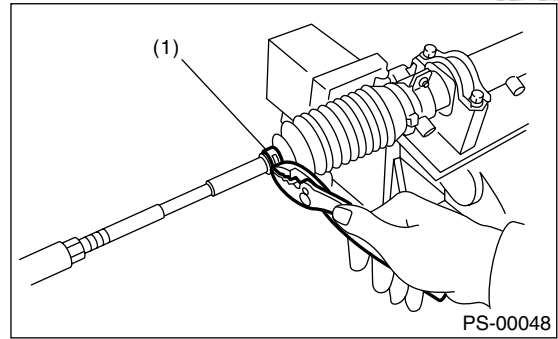
CAUTION:

Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.



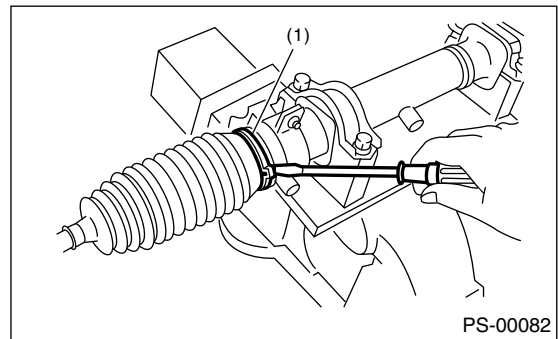
3) Remove the tie-rod end and lock nut from gearbox.

4) Remove the small clip from boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

5) Using a flat tip screwdriver, remove the band from boot.

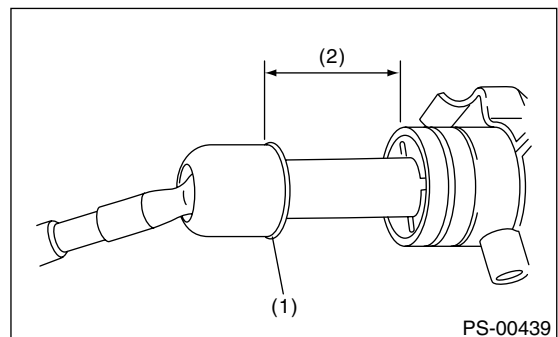


(1) Band

6) Extend the rack approx. 40 mm (1.57 in) out. Unlock the lock washer on both side of tie-rod end using a flat tip screwdriver.

CAUTION:

Be careful not to scratch the rack surface as oil leaks may result.



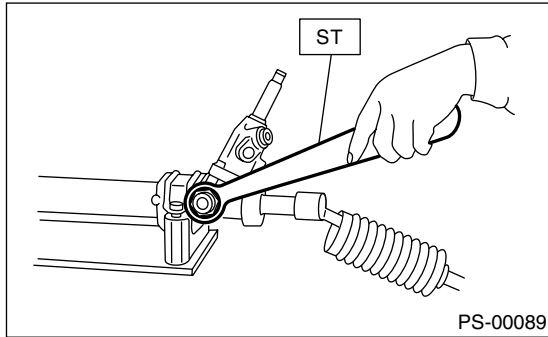
(1) Lock washer

(2) Approx. 40 mm (1.57 in)

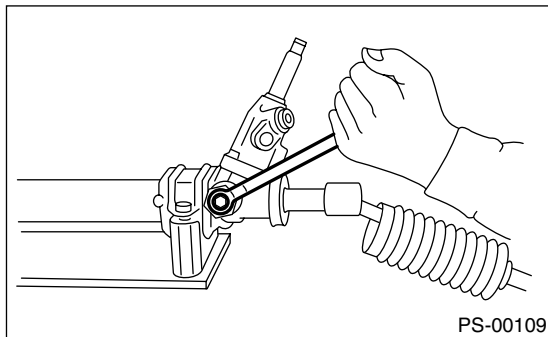
STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

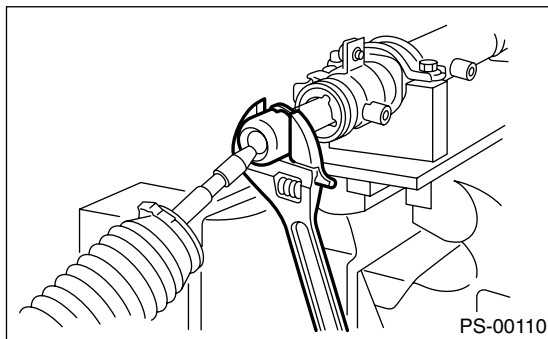
- 7) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



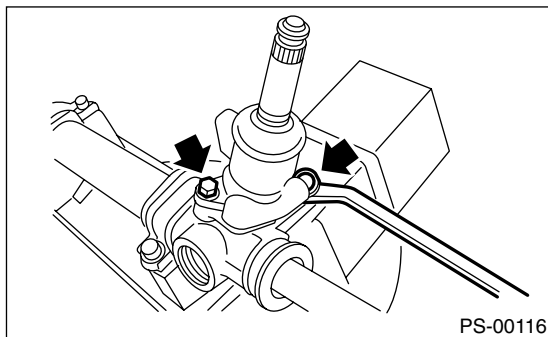
- 8) Tighten the adjusting screw until it no longer tightens.



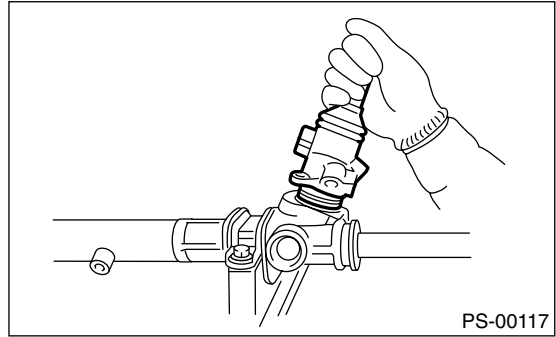
- 9) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove the tie-rod.



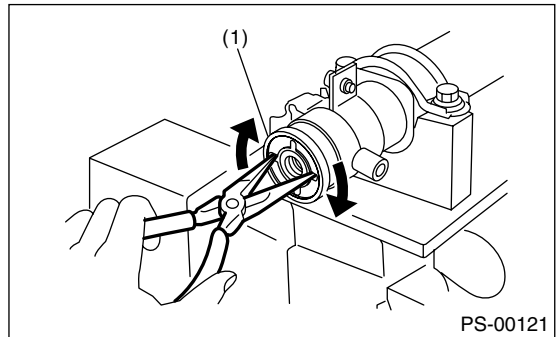
- 10) Loosen the adjusting screw, and then remove the spring and sleeve.
11) Remove the two bolts securing valve assembly.



- 12) Carefully draw out the input shaft, and then remove the valve assembly.



- 13) Using a sharp pointed pliers, rotate the rack stopper in direction of the arrow until end of the circlip comes out of stopper. Rotate the circlip in opposite direction and pull it out.

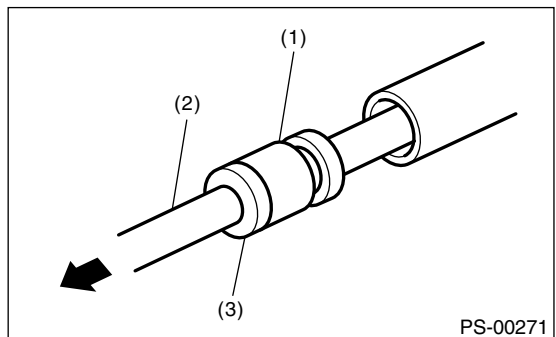


(1) Rack stopper

- 14) Pull the rack assembly from cylinder side, and draw out the rack bushing and rack stopper together with the rack assembly.

CAUTION:

Be careful not to contact the rack to inner wall of cylinder when drawing out. Any scratch on the cylinder inner wall will cause oil leakage.



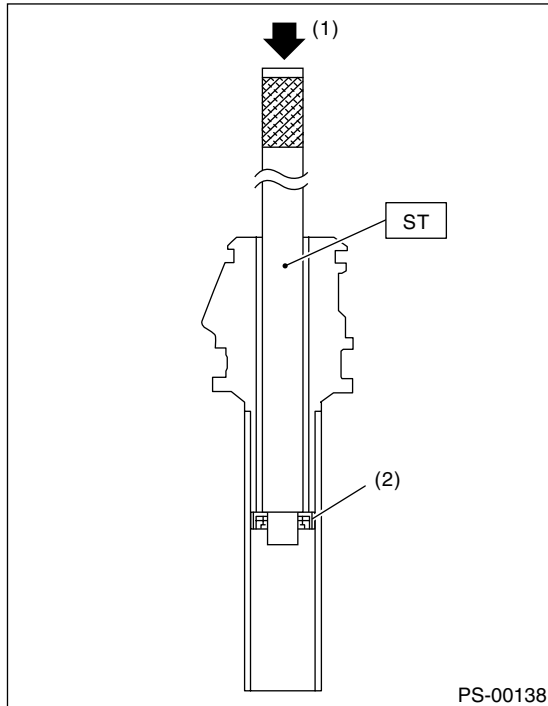
- (1) Rack bushing
(2) Rack assembly
(3) Rack stopper

- 15) Remove the rack bushing and rack stopper from rack assembly.

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

- 16) Remove the oil seal from rack.
17) Insert the ST from pinion housing side, and then remove the oil seal using a press.
ST 34199AE050 REMOVER



- (1) Press
(2) Oil seal

2. CONTROL VALVE

- 1) Disconnect the four pipes from gearbox.

NOTE:

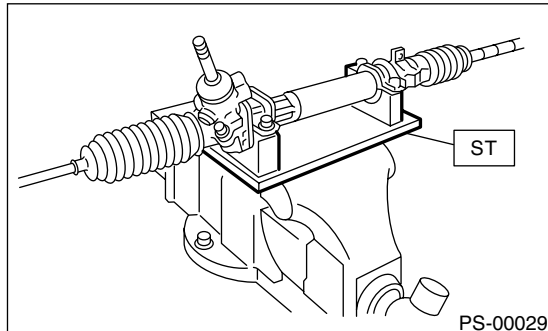
Remove the pipes E and F as a single unit being fixed at clamp plate.

- 2) Secure the gearbox removed from the vehicle in vise using ST.

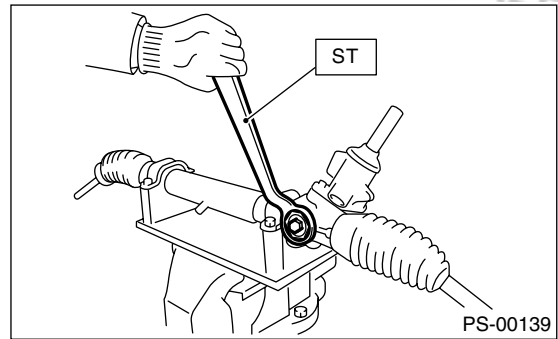
ST 926200000 STAND

CAUTION:

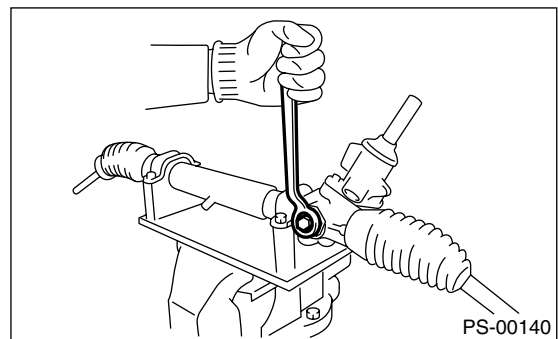
Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.



- 3) Using the ST, loosen the lock nut.
ST 926230000 SPANNER

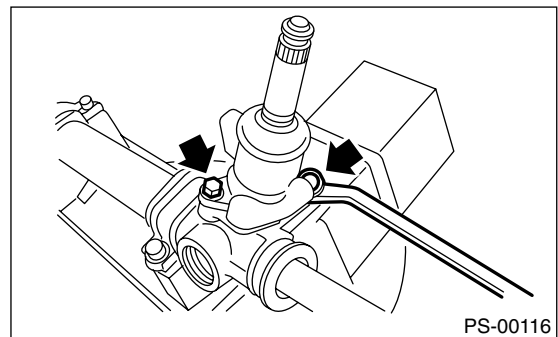


- 4) Tighten the adjusting screw until it no longer tightens.

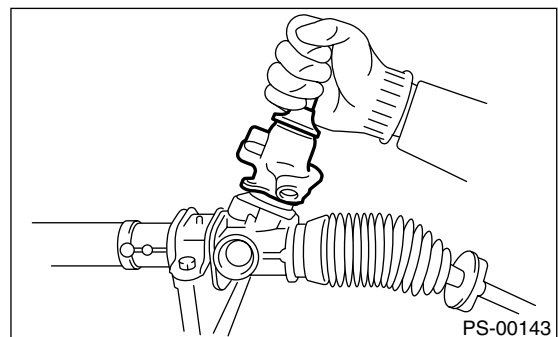


- 5) Loosen the adjusting screw, and then remove the spring and sleeve.

- 6) Remove the two bolts securing valve assembly.



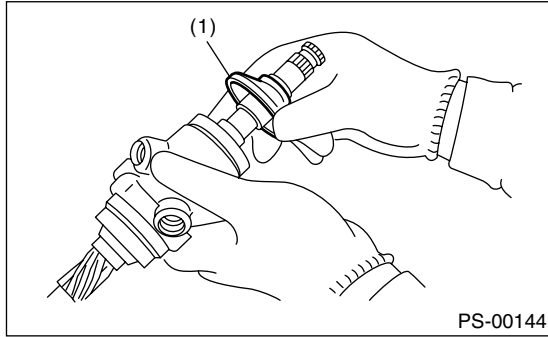
- 7) Carefully draw out the input shaft, and then remove the valve assembly.



STEERING GEARBOX

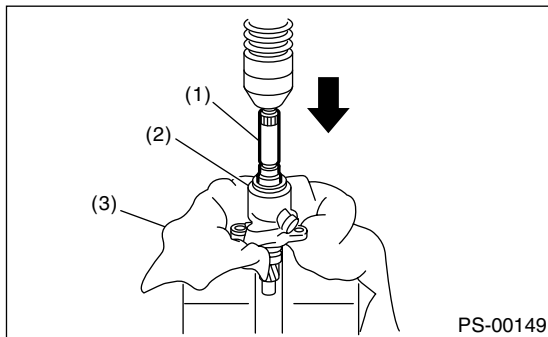
POWER ASSISTED SYSTEM (POWER STEERING)

8) Slide the dust cover out.



(1) Dust cover

9) Using a press remove the pinion and valve assembly from valve housing.

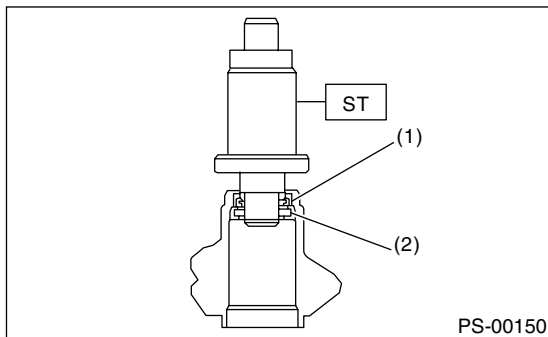


(1) Valve assembly
(2) Valve housing
(3) Cloth

10) Using the ST and press, remove the dust seal, oil seal and special bearing from valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL

CAUTION:

- Do not apply force to the end surface of valve housing.
- Do not reuse the oil seal after removal.

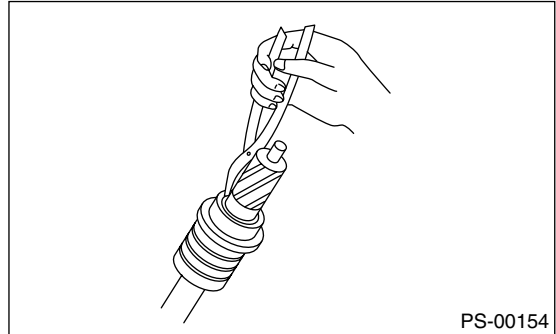


(1) Oil seal
(2) Special bearing

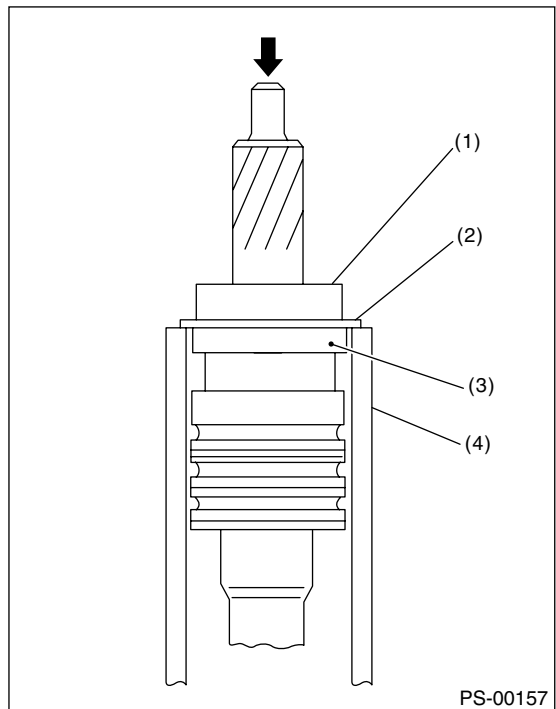
11) Remove the snap ring using snap ring pliers.

CAUTION:

Be careful not to scratch the pinion and valve assembly.



12) Press out the bearing together with the back up washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.



(1) Bearing
(2) Backing washer
(3) Oil seal
(4) Pipe

13) Remove the oil seal.

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

D: ASSEMBLY

1. RACK HOUSING ASSEMBLY

CAUTION:

Use only SUBARU genuine grease for the gearbox.

Specified grease for gearbox:

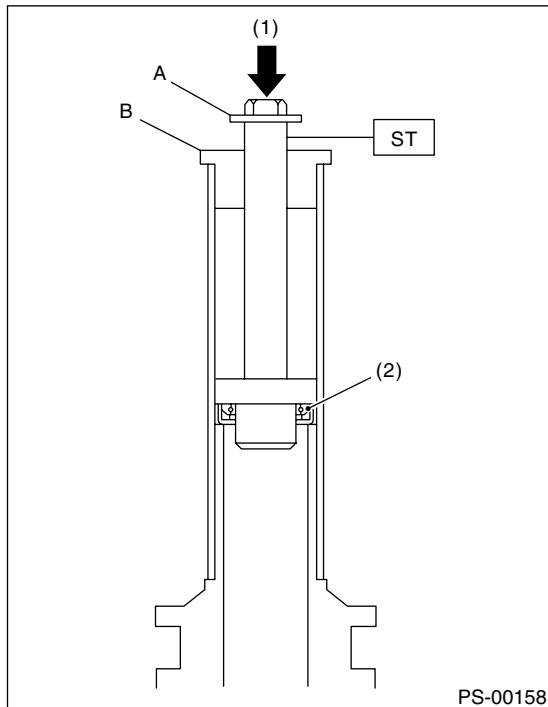
VALIANT GREASE M2 (Part No. 003608001)

- 1) Apply power steering fluid to a new oil seal.
- 2) Install the oil seal in correct position as shown in the figure. Push the oil seal using a press until portion A of ST contacts face of B.

ST 34099FA110 INSTALLER

CAUTION:

Be careful not to damage or scratch the cylinder inner wall.



- (1) Press
(2) Oil seal

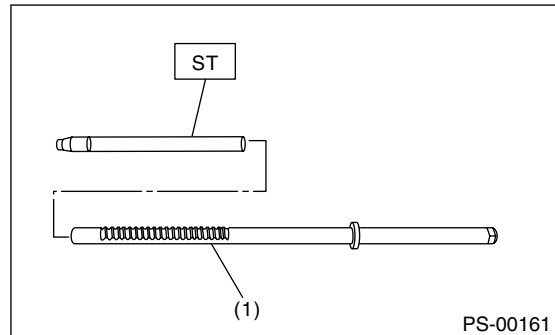
- 3) Fix the rack housing in vise using ST.
ST 926200000 STAND

NOTE:

- When fixing the rack housing in vise, be sure to use this special tool. Do not fix rack housing in vise using pad such as aluminum plates, etc.
- When using the old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

- 4) Fit the ST over toothed portion of rack assembly, and check for binding or irregular insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.

ST 926390001 COVER & REMOVER



- (1) Rack assembly

- 5) Apply genuine grease to the teeth of thoroughly washed rack assembly, and then fit the ST over the toothed portion.

CAUTION:

- Be careful not to block the air passage with grease. Remove excessive grease.
- After fitting cover, check the air passage hole for clogging. If clogged, open by removing grease from the hole.

- 6) Before inserting the rack assembly, apply a coat of specified power steering fluid to the surfaces of ST and rack piston.

- 7) Insert the rack assembly into rack housing from cylinder side, and then remove the ST after it has passed completely through oil seal.

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

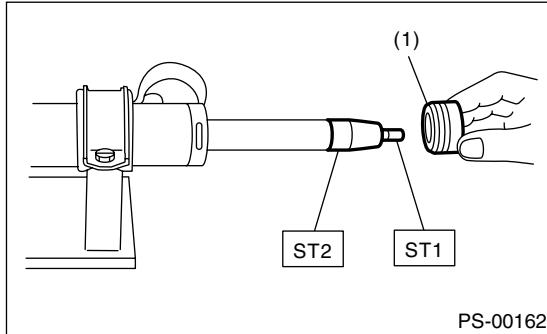
8) Fit the ST1 and ST2 over the end of rack, and then install a new rack bushing.

ST1 926400000 GUIDE

ST2 927660000 GUIDE

CAUTION:

- If burrs or nicks are found on this guide and rack shaft portion, remove by filing.
- Dip the rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.



(1) Rack bushing assembly

9) Insert the rack stopper into the cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn the rack stopper with ST so that the rack stopper hole is seen through cylinder slits.

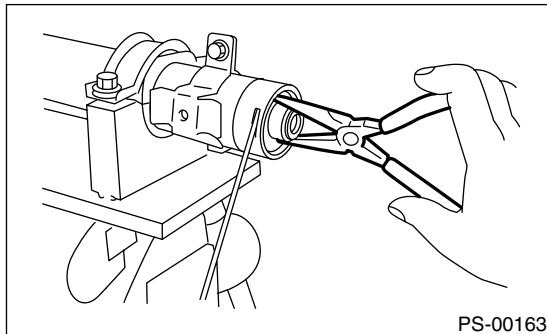
10) Insert the rack stopper into the rack housing, and then wrap a new circlip using a sharp pointed pliers to secure the rack stopper in position.

CAUTION:

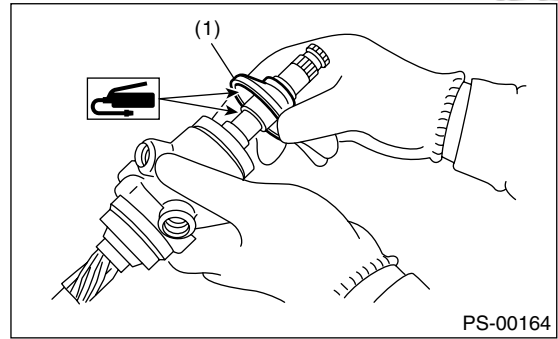
Be careful not to scratch the rack while winding circlip.

NOTE:

Rotate the wrench another 90 to 180° after end of circlip has been wrapped in.

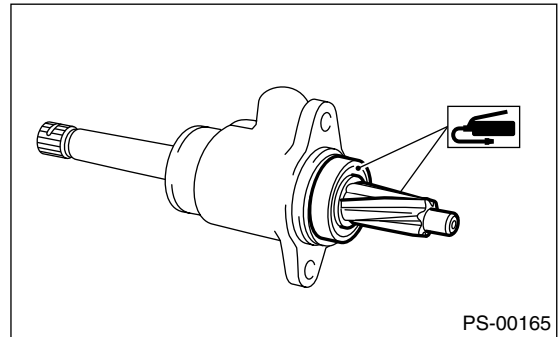


11) Apply genuine grease to dust cover, and then install the dust cover to valve assembly.

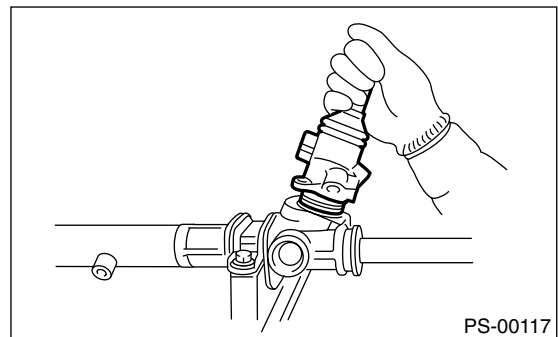


(1) Dust cover

12) Apply genuine grease to the pinion gear and bearing of valve assembly.



13) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.



14) Tighten the bolts alternately to secure valve assembly.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:

Be sure to alternately tighten the bolts.

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

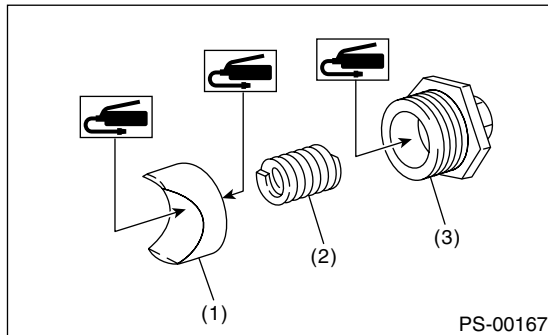
15) Temporarily install the rack, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

CAUTION:

If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

16) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert sleeve into steering body.

Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



- (1) Sleeve
- (2) Spring
- (3) Adjusting screw

17) Tighten the adjusting screw to specified torque.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

18) After tightening to the specified tightening torque, loosen it by 25°.

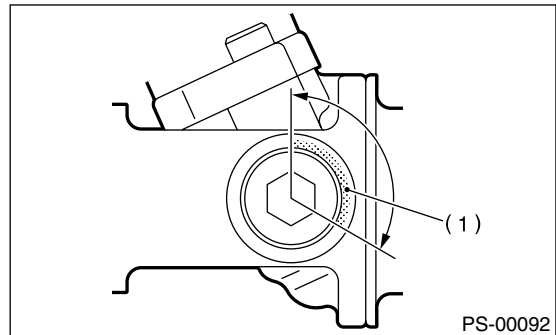
19) Remove the tie-rod.

20) Verify that play is within specified value. <Ref. to PS-38, SERVICE LIMIT, INSPECTION, Steering Gearbox.>

21) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:

THREE BOND 1141



- (1) Apply liquid gasket to at least 1/3 of entire perimeter.

22) Tighten the adjusting screw to specified torque.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

23) After tightening to the specified tightening torque, loosen it by 25°.

24) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST. ST 926230000 SPANNER

Tightening torque (Lock nut):

39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

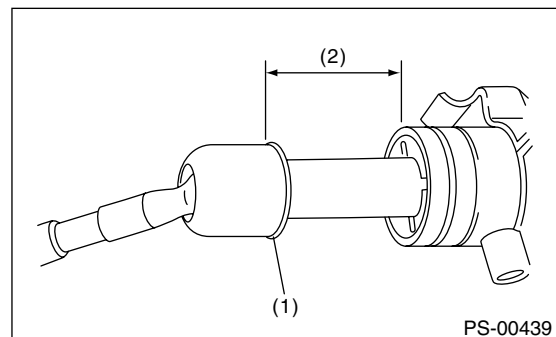
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

25) Extend the rack approx. 40 mm (1.57 in) beyond side of steering body.

26) Install the tie-rod and a new lock washer into rack.

Tightening torque:

78 N·m (8.0 kgf-m, 57.9 ft-lb)



- (1) Lock washer
- (2) Approx. 40 mm (1.57 in)

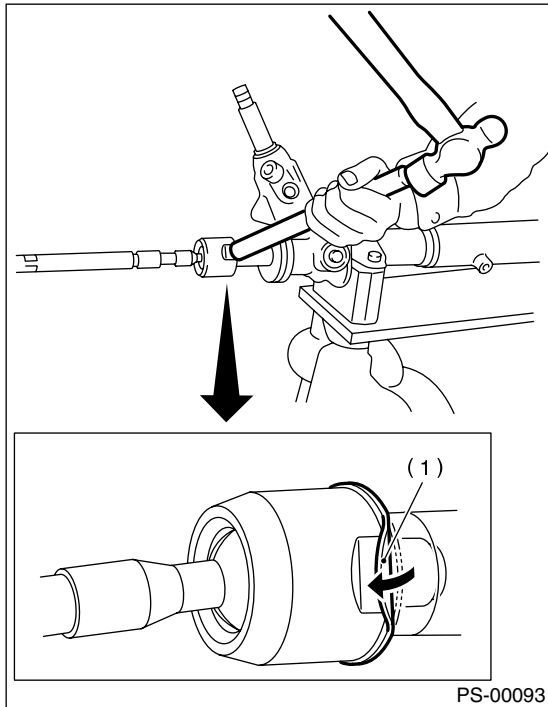
STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

27) Bend the lock washer.

CAUTION:

Be careful not to scratch the rack when bending lock washer.

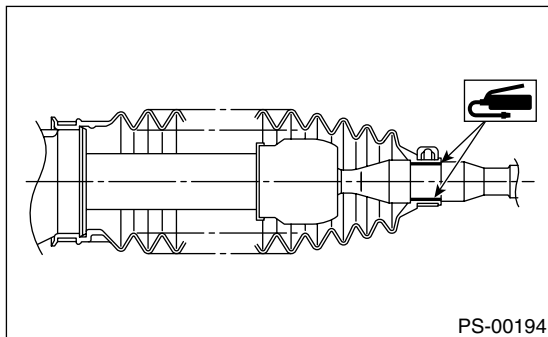


(1) Lock washer

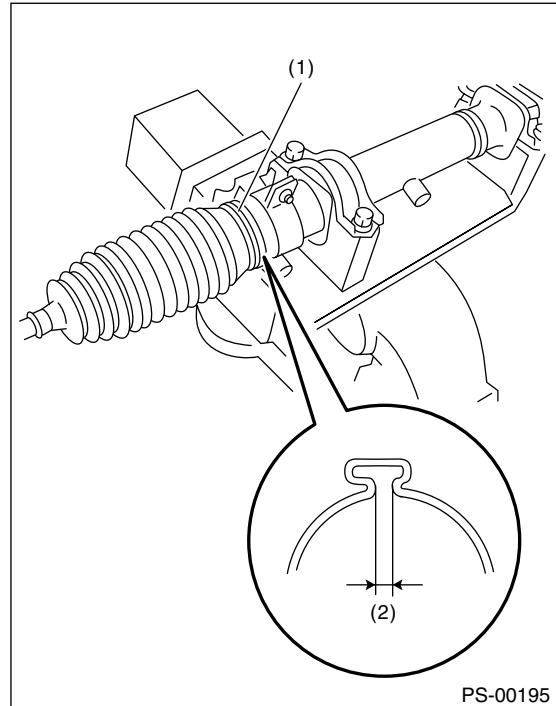
28) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:

Make sure that the boot is installed without unusual inflation or deflation.



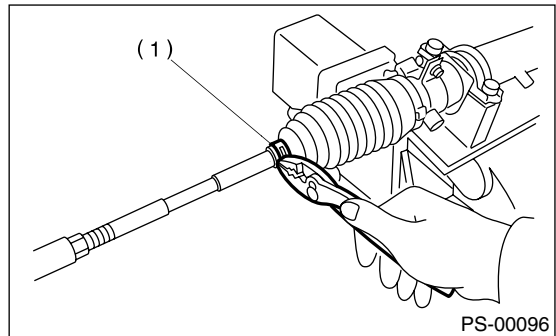
29) Install a new boot band. Using band clamp pliers, caulk the boot band until caulking part clearance is 2 mm (0.079 in) or less.



(1) Boot band

(2) 2 mm (0.079 in) or less

30) Fix the boot end with clip (small).



(1) Clip

31) After installing, check the boot end is positioned into groove on tie-rod.

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

32) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

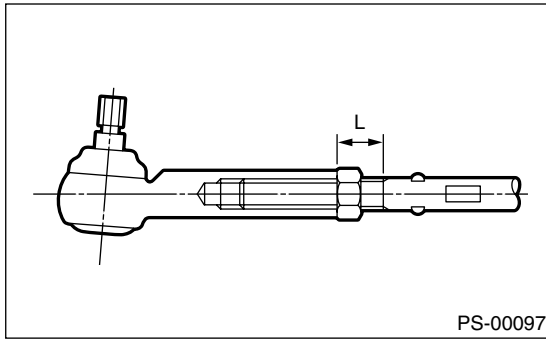
Installed tie-rod length: L

Sedan:

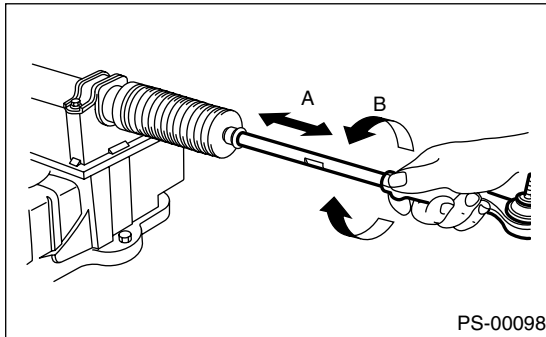
25 mm (0.98 in)

Wagon:

15 mm (0.59 in)



33) Inspect the gearbox as follows:
“A” Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
“B” Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that the boot is installed in specified position without deflation.



34) Remove the gearbox from ST.

ST 926200000 STAND

35) Install the four pipes on gearbox.

(1) Connect the pipe A and B to four pipe joints of gearbox.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect the pipe E and F to gearbox.

Tightening torque:

Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

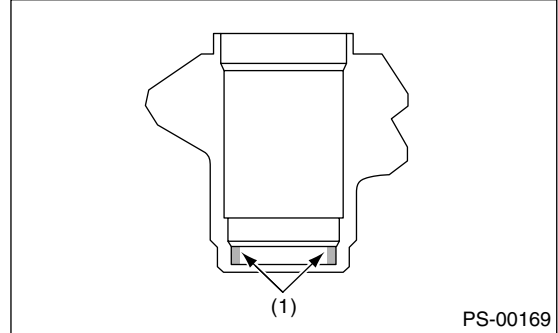
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

2. CONTROL VALVE ASSEMBLY

Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

- 1) Clean all parts and tools before reassembling.
- 2) Apply a coat of specified power steering fluid to the inner wall of valve housing.



(1) Apply fluid.

3) Attach the ST2 to ST1.

ST1 34099FA120 INSTALLER & REMOVER SEAL

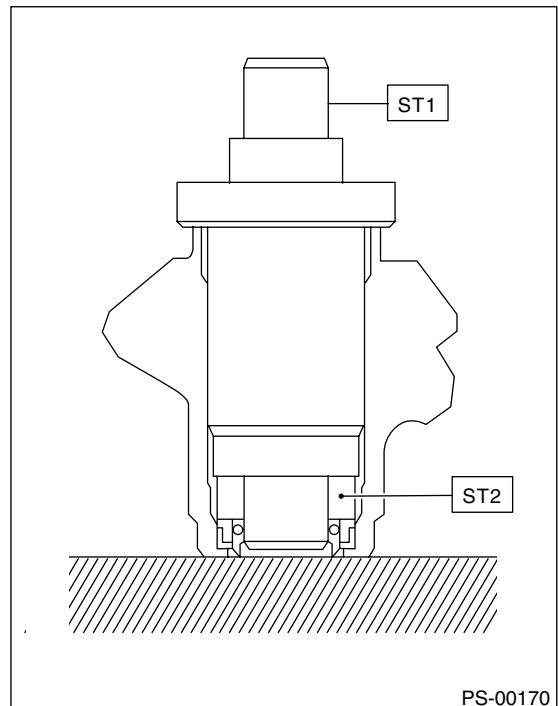
ST2 34099FA130 INSTALLER SEAL

4) To avoid scratching the oil seal, apply a coat of grease to the contact surface of installer and oil seal.

5) Verify the oil seal direction.

Attach the oil seal to installer and position in valve housing before pressing into place.

6) Press the oil seal into place using a press.

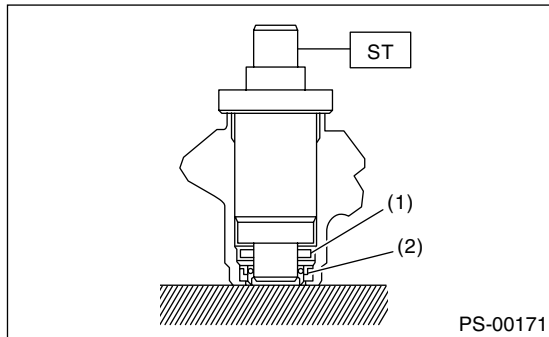


STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

7) Attach the bearing to ST, and then position in value housing. Using the ST and press, install the special bearing in valve housing.

ST 34099FA120 INSTALLER & REMOVER
SEAL



- (1) Special bearing
- (2) Oil seal

8) Put vinyl tape around the pinion shaft splines to protect oil seal from damage.

9) Fit the pinion and valve assembly into valve housing.

10) Secure the valve assembly to ST1 and ST2.

ST1 926370000 INSTALLER A

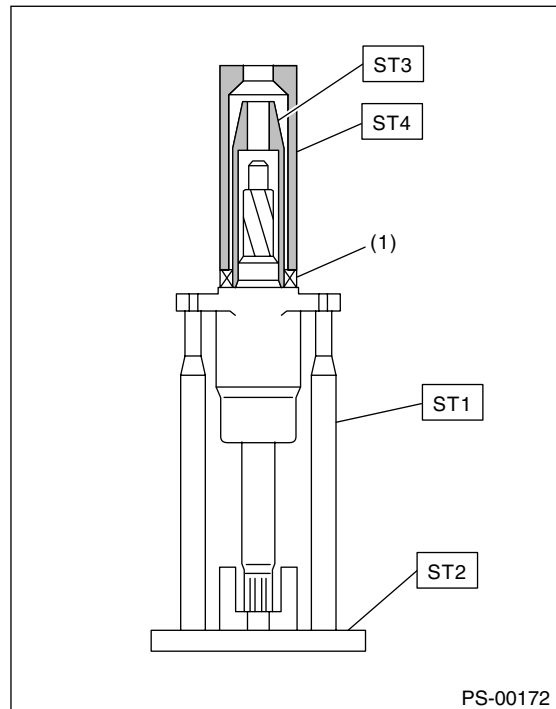
ST2 34099FA100 STAND BASE

11) Apply specified power steering fluid to oil seal and ST3.

12) Install the ST3 to pinion, and then insert the oil seal. Press the oil seal using a press until ST4 contacts face end of valve housing.

ST3 926360000 INSTALLER A

ST4 927620000 INSTALLER B



- (1) Oil seal

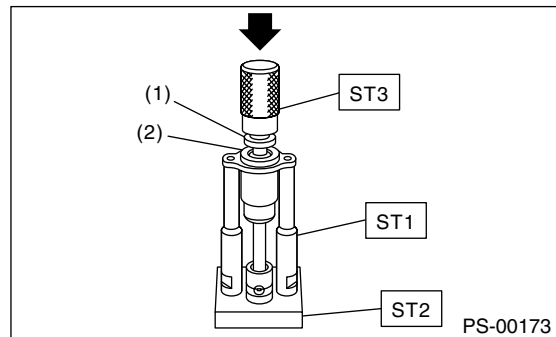
13) Remove the ST3, and then fit the back-up washer.

14) Force-fit the ball bearing using ST3.

ST1 926370000 INSTALLER A

ST2 34099FA100 STAND BASE

ST3 927640000 INSTALLER B



- (1) Ball bearing
- (2) Back-up washer

NOTE:

Be careful not to tilt the ball bearing during installation.

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

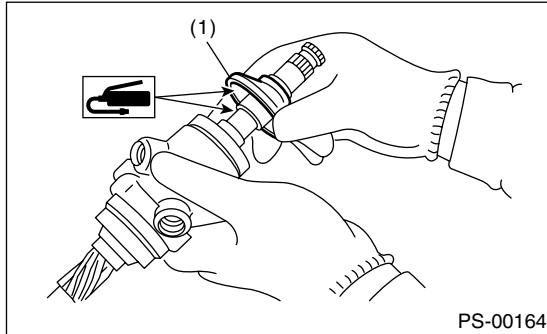
15) Install the snap ring using snap ring pliers.

NOTE:

Rotate the snap ring to check for proper installation.

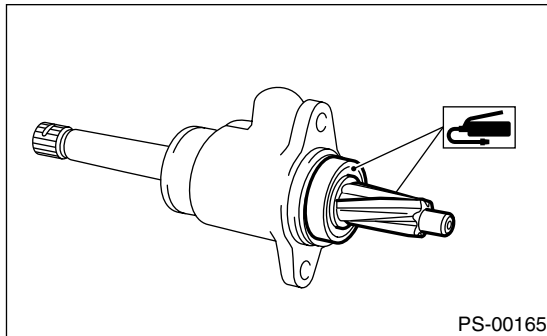
16) Apply the specified grease to dust cover.

17) Install the dust cover on valve assembly.

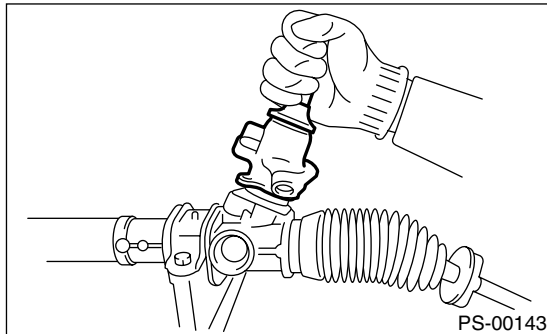


(1) Dust cover

18) Apply genuine grease to the pinion gear and bearing of valve assembly.



19) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.



20) Tighten the bolts alternately to secure valve assembly.

Tightening torque:

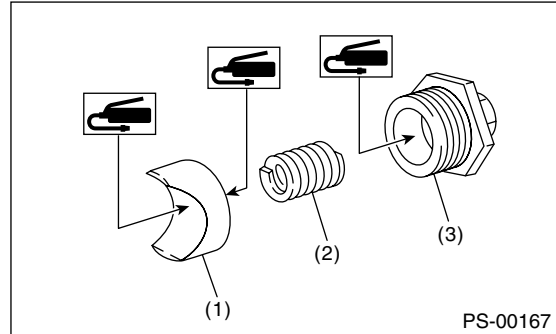
25 N-m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:

Be sure to alternately tighten the bolts.

21) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert sleeve into steering body.

Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



(1) Sleeve

(2) Spring

(3) Adjusting screw

22) Tighten the adjusting screw to specified torque.

Tightening torque:

7.4 N-m (0.75 kgf-m, 5.4 ft-lb)

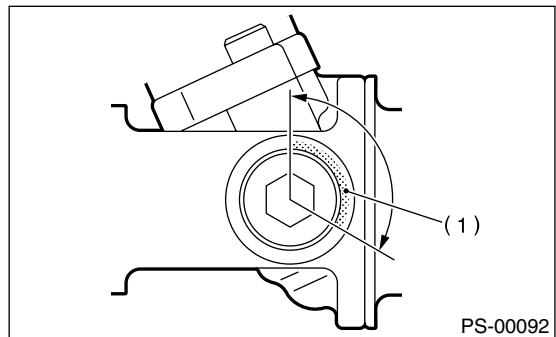
23) After tightening to the specified tightening torque, loosen it by 25°.

24) Verify that play is within specified value. <Ref. to PS-38, SERVICE LIMIT, INSPECTION, Steering Gearbox.>

25) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:

THREE BOND 1141



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

26) Tighten the adjusting screw to specified torque.

Tightening torque:

7.4 N-m (0.75 kgf-m, 5.4 ft-lb)

27) After tightening to the specified tightening torque, loosen it by 25°.

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

28) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

29) Remove the gearbox from ST.

30) Install the four pipes on gearbox.

(1) Connect the pipe A and B to the gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect the pipe E and F to gearbox.

Tightening torque:
Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.

2) When disassembling, check the inside of gearbox for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to "Service limit".) (2) Keeping the rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with a new one. (Refer to "Service limit".)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox with a new one. (Refer to "Service limit".)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

2. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

NOTE:

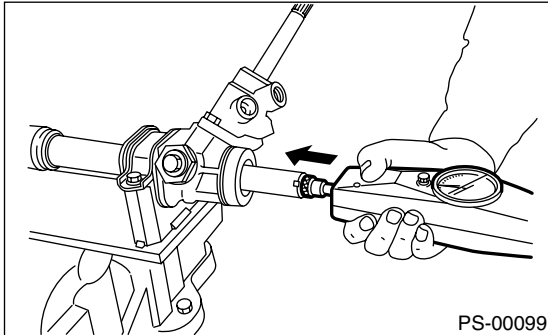
When making a measurement, vise the gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

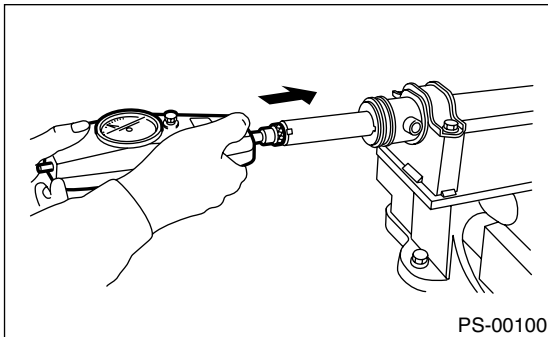
Sliding resistance of rack shaft:

Service limit

400 N (41 kgf, 90 lb) or less



PS-00099



PS-00100

3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

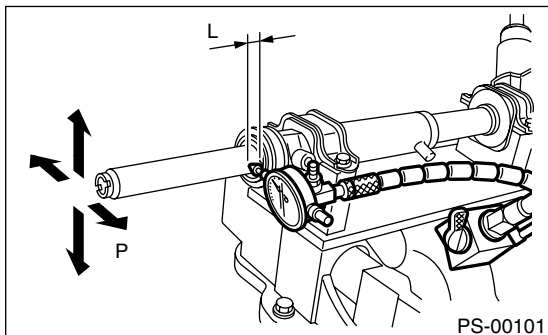
Service limit

0.19 mm (0.0075 in) or less

On condition

L: 5 mm (0.20 in)

P: 122.6 N (12.5 kgf, 27.6 lb)



PS-00101

Left-turn steering:

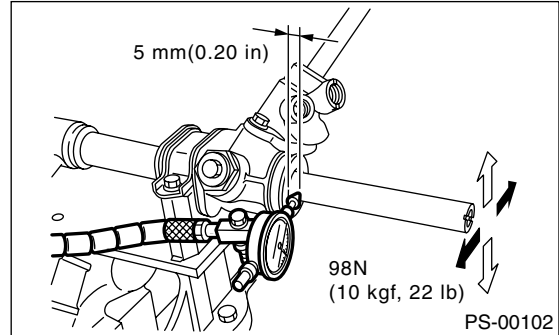
Service limit

Direction

0.3 mm (0.012 in) or less

Direction

0.15 mm (0.0059 in) or less



PS-00102

4. INPUT SHAFT PLAY

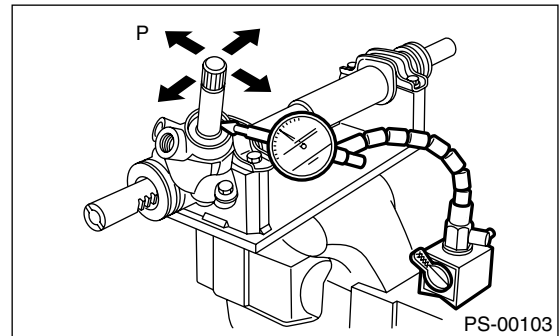
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

On condition

P: 98 N (10 kgf, 22 lb)



PS-00103

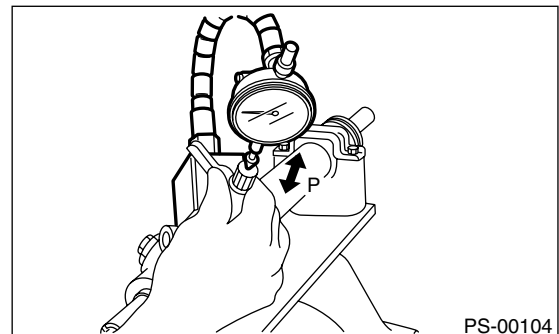
In axial direction:

Service limit

0.5 mm (0.020 in) or less

On condition

P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



PS-00104

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.

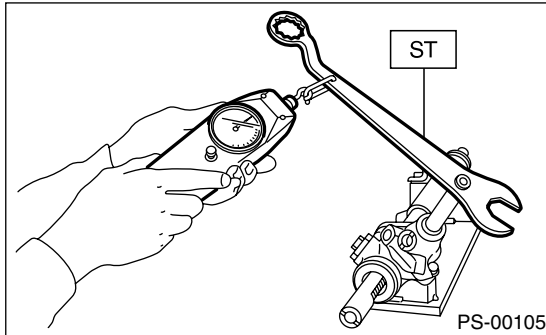
ST 34099PA100 SPANNER

Service limit

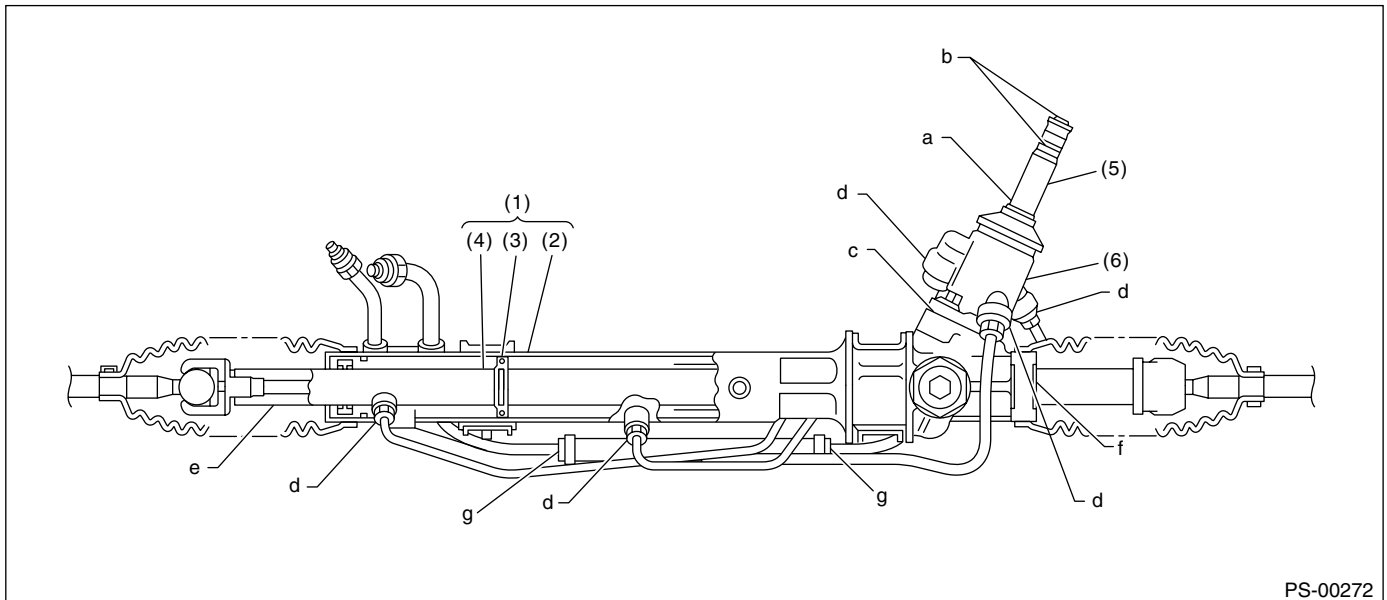
Maximum allowable resistance

10.5 N (1.1 kgf, 2.4 lb) or less

Difference between right and left turning resistance: Less than 20%



6. OIL LEAKING



- (1) Power cylinder
- (2) Cylinder

- (3) Rack piston
- (4) Rack axle

- (5) Input shaft
- (6) Valve housing

STEERING GEARBOX

POWER ASSISTED SYSTEM (POWER STEERING)

- 1) Lift up the vehicle.
- 2) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the fluid from the suspected portion and turn the steering wheel from lock to lock about thirty to forty times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.
- 3) Inspect leakage from "a".
The oil seal is damaged. Replace the valve assembly with a new one.
- 4) Inspect leakage from "b".
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
- 5) Inspect leakage from "c".
The oil seal is damaged. Replace the valve assembly or oil seal with a new one.
- 6) Inspect leakage from "d".
The pipe is damaged. Replace the faulty pipe or O-ring.
- 7) Inspect leakage from "g".
The hose is damaged. Replace the hose with a new one.
- 8) If leak is other than a, b, c, d, or g, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from the surrounding portions. Then, turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.

(1) Leakage from "e"

The cylinder seal is damaged. Replace the rack bush with a new one.

(2) Leakage from "f"

There are two possible causes. Take the following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.

- If leakage from "f" is noted again:

The oil seal of pinion and valve assembly is damaged. Replace the pinion and valve assembly with a new one. Or replace the oil seal and parts that are damaged during disassembly with new ones.

- If oil stops leaking from "f":

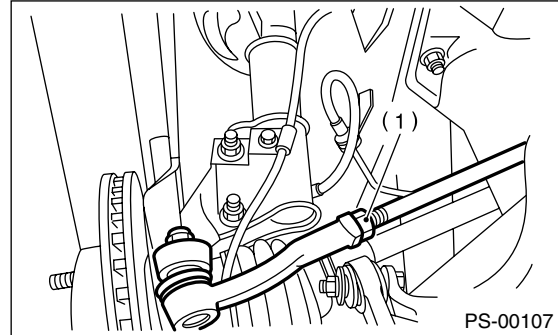
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

- 1) Adjust the front toe. <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:

IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



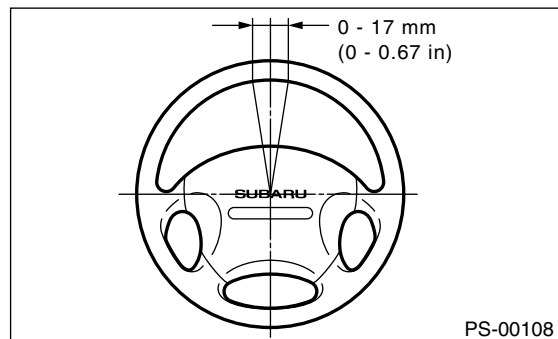
(1) Lock nut

- 2) Adjust the steering angle of wheels.

Standard of steering angle:

Model	TURBO, SEDAN and OUTBACK	Others
Inner wheel	34.5°±1.5°	37.3°±1.5°
Outer wheel	30.3°±1.5°	32.4°±1.5°

- 3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



- 4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in opposite direction by same angle.

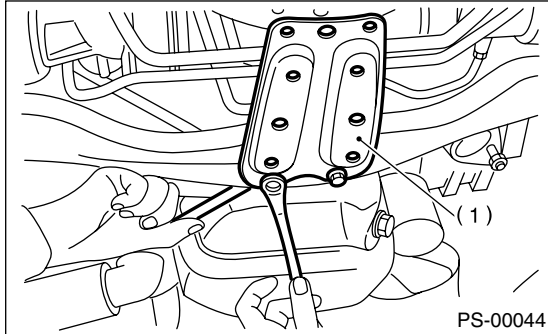
PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

6. Pipe Assembly

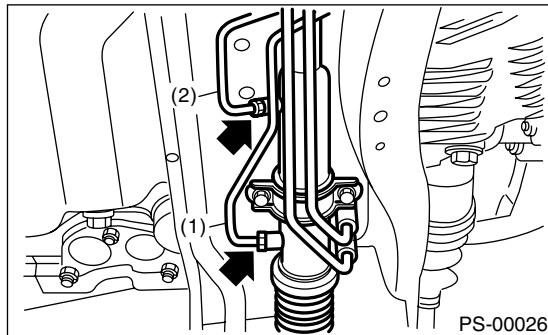
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and then remove the jack-up plate.



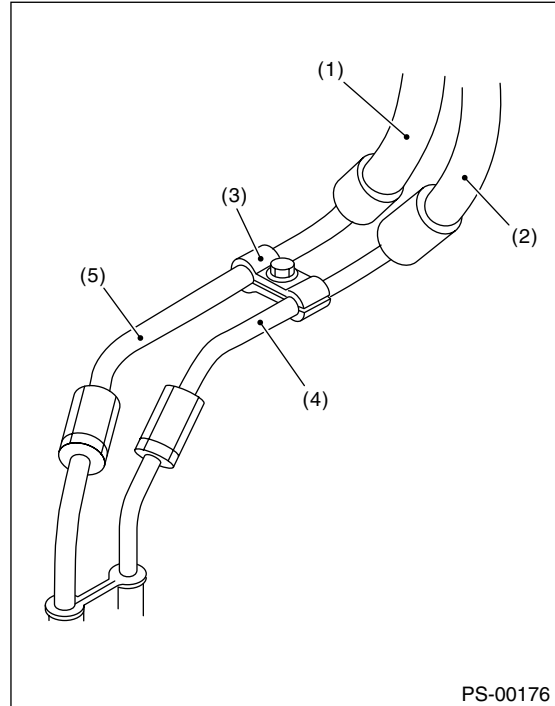
(1) Jack-up plate

- 3) Remove the one pipe joint at the center of gear-box, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



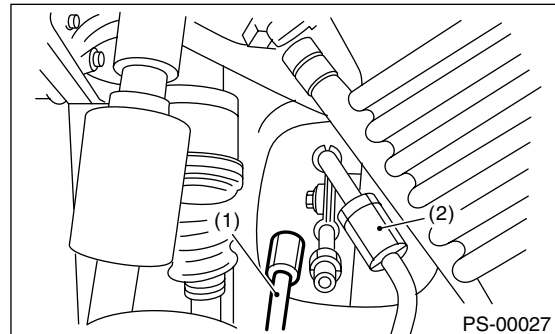
(1) Pipe A
(2) Pipe B

- 4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

- 5) Disconnect the pipe C and D from gear box.



(1) Pipe C
(2) Pipe D

PIPE ASSEMBLY

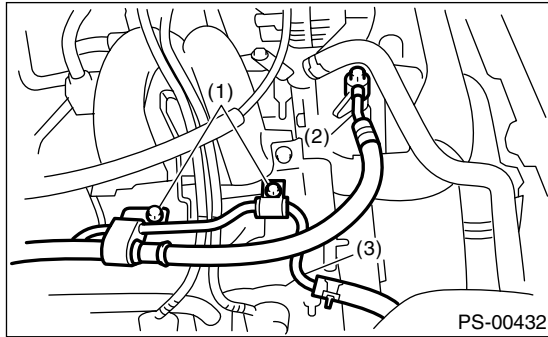
POWER ASSISTED SYSTEM (POWER STEERING)

6) NON-TURBO MODEL

- (1) Remove the air intake duct. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
- (2) Remove the bolt A.
- (3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:

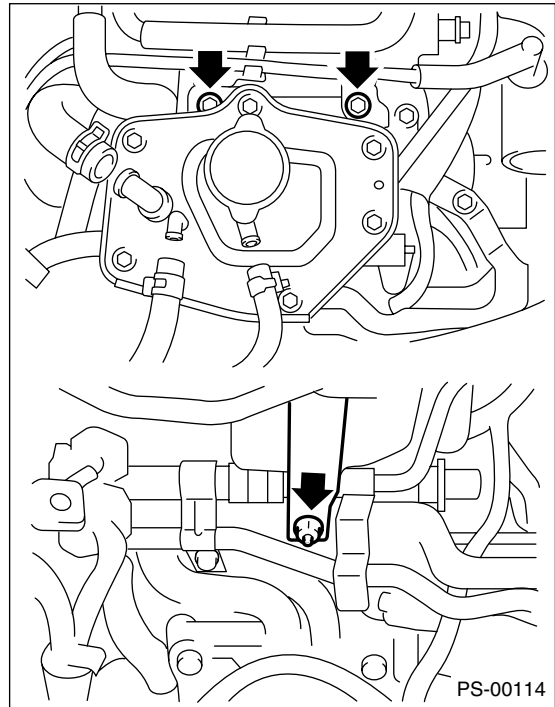
- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

7) TURBO MODEL

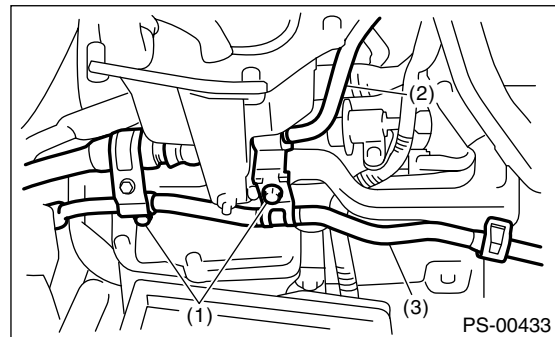
- (1) Remove the air cleaner. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
- (2) Remove the coolant filler tank.



- (3) Remove the two bolts fixing pipe C and D.
- (4) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt
- (2) Pipe C
- (3) Pipe D

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

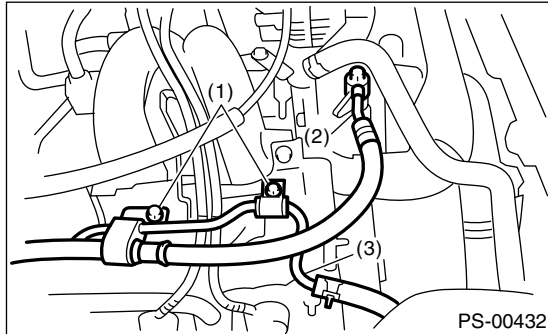
B: INSTALLATION

1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A)

NOTE:

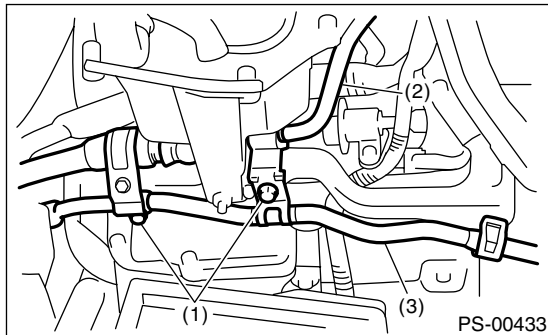
Visually check that the hose between tank and pipe D is free from bending or twisting.

• NON-TURBO MODEL



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

• TURBO MODEL



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

(1) Connect the pipe D to oil tank.

(2) Using a new gasket, connect the pipe C to oil pump.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten the two bolts fixing pipe C and D. (bolt A)

Tightening torque:

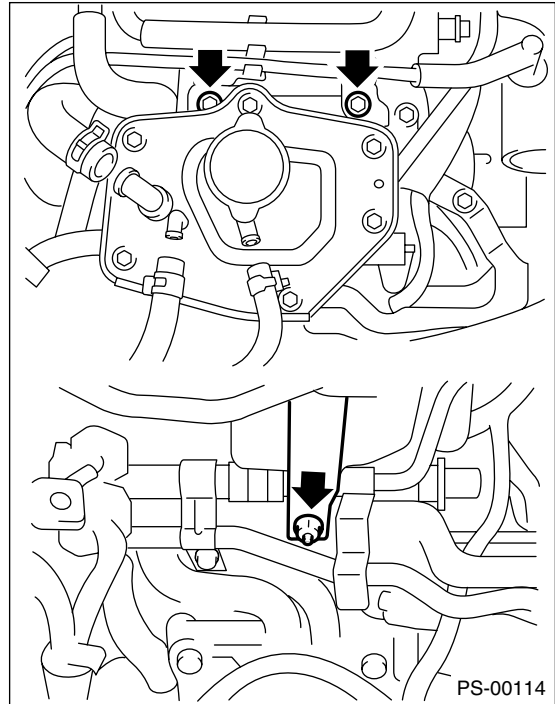
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:

T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)

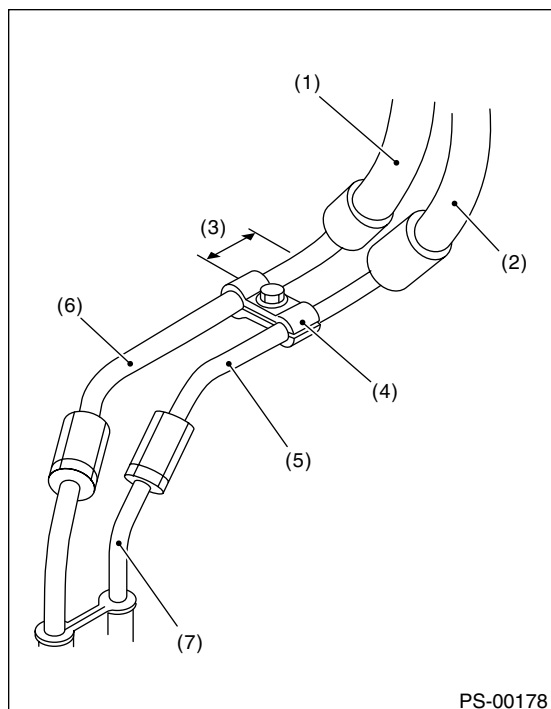
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

3) Temporarily connect the pipe C and D to gear box.

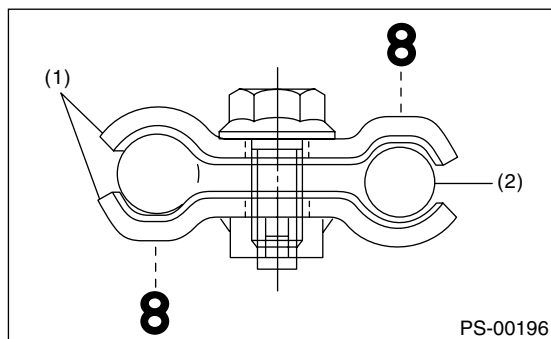


- (1) Return hose
- (2) Pressure hose
- (3) Approx. 30 mm (1.18 in)
- (4) Clamp E
- (5) Pipe C
- (6) Pipe D
- (7) Pipe (Gear box side)

4) Temporarily install the clamp E on pipes C and D.

NOTE:

Ensure the letter "8" on each clamp are diagonally opposite each other as shown in the figure.



- (1) Clamp E
- (2) Pipe C

5) Tighten the clamp E firmly.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten the joint nut.

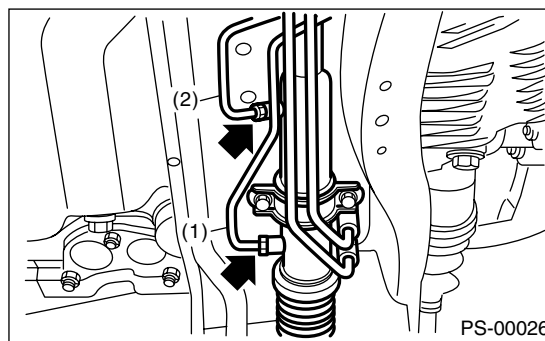
Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A second.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



- (1) Pipe A
- (2) Pipe B

8) Install the jack-up plate.

9) Install the air intake duct. <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>

10) Install the air intake duct, air cleaner upper cover and air intake boot.

<Ref. to IN(H4DOTC)-7, INSTALLATION, Air Cleaner.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>

11) Connect the battery ground cable to battery.

12) Feed the specified fluid.

CAUTION:

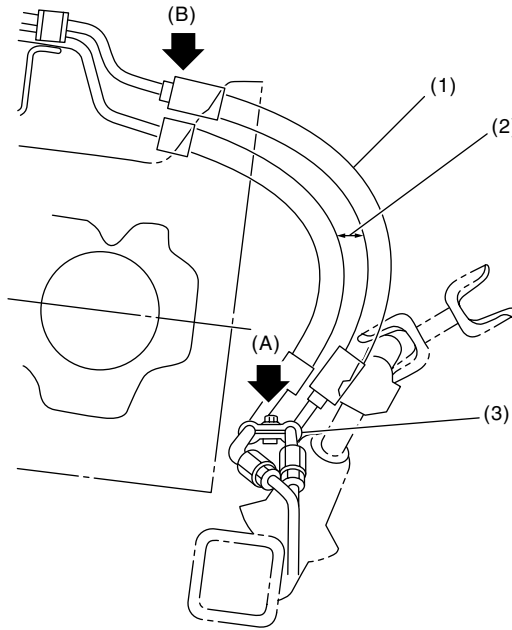
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

13) Finally check clearance between pipes and/or hoses, as shown above.

If cruise control actuator-to-power steering hose clearance is less than 10 mm (0.39 in), move the portion (A) secured by clamp to other portion, or bend portion (B) to adjust.



PS-00179

(1) High pressure hose

(2) No interference is allowed between hoses.

(3) Clearance between crossmember and pipe: 3 — 8 mm (0.12 — 0.31 in)

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
Pipe	- O-ring fitting surface for damage - Nut for damage - Pipe for damage	Replace with a new one.
Clamp	Clamps for weak clamping force	Replace with a new one.
Hose	- Flared surface for damage - Flare nut for damage - Outer surface for cracks - Outer surface for wear - Clip for damage - End coupling or adapter for degradation	Replace with a new one.

CAUTION:

Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.

Since the resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform the careful inspection frequently when the vehicle is used in hot weather areas, cold weather area and a driving condition in which many steering operations are required in short time.

Particularly, continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

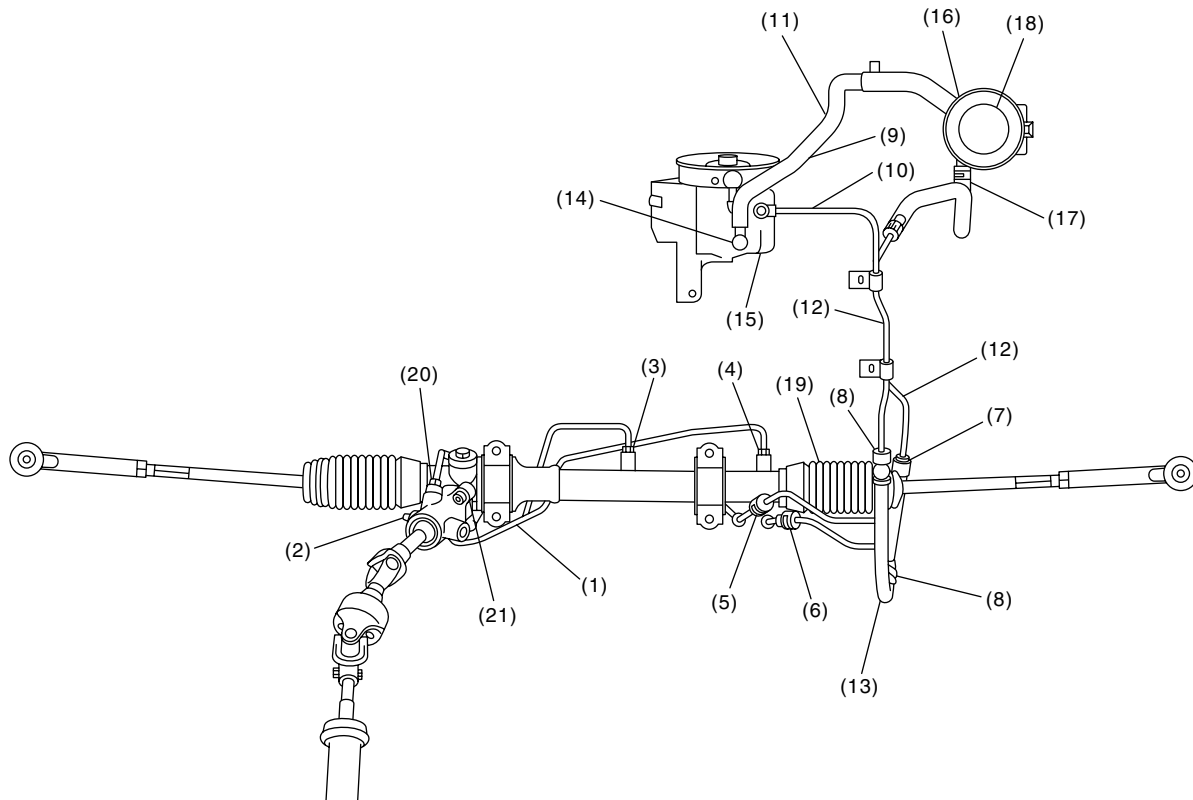
Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the defective parts.
	Improper stop position of pitching stopper	Replace the defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct the customers.

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:

It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



PS-00022

Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose (11), (12) and (13) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (14) and (15) in figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

Fluid leaking area	Possible cause	Corrective action
Leakage from oil tank (16) and (17) in figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gear-box (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

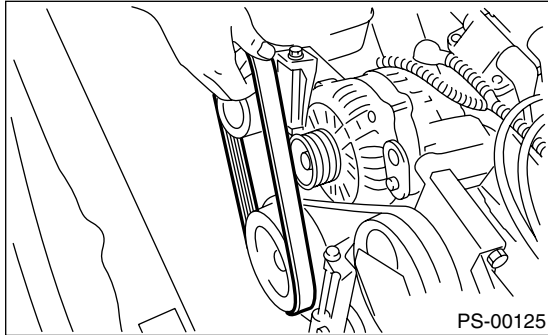
OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

7. Oil Pump

A: REMOVAL

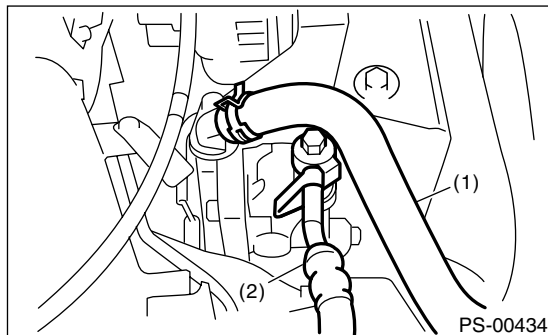
- 1) Disconnect the ground cable from battery.
- 2) Remove the pulley belt cover.
- 3) Loosen the belt tension adjusting bolt and generator securing bolt, and then remove the power steering pump V-belt.



- 4) Disconnect the connector from power steering pump switch.
- 5) Disconnect the pipe C and suction hose from oil pump.

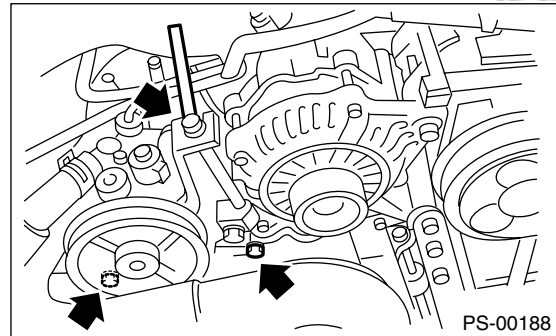
CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



- (1) Suction hose
(2) Pipe C

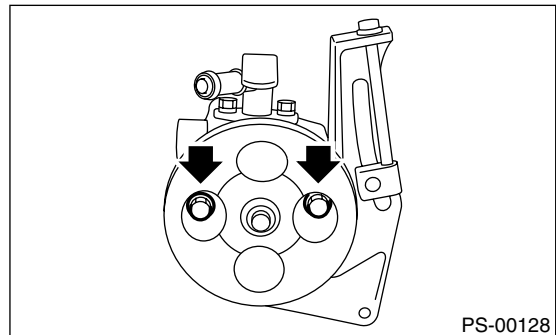
- 6) Remove the bolts which install the power steering pump bracket.



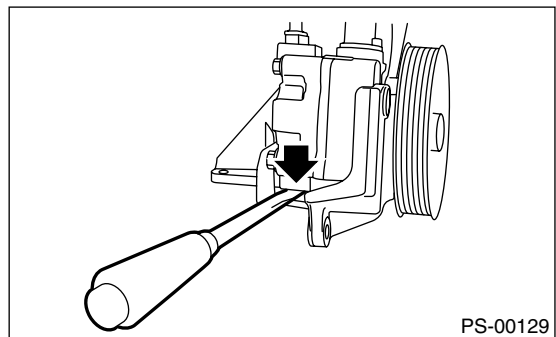
- 7) Place the oil pump bracket in a vise, remove the two bolts from front side of oil pump.

CAUTION:

Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



- 8) Remove the bolt from the rear side of oil pump.
- 9) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

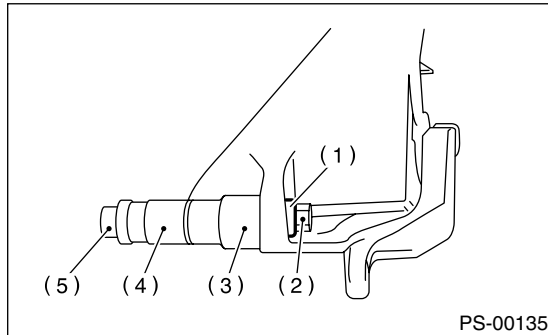
B: INSTALLATION

1) Install the oil pump to bracket.

(1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2") type 14 mm and 21 mm box wrench until it is in contact with the oil pump mounting surface.

CAUTION:

Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

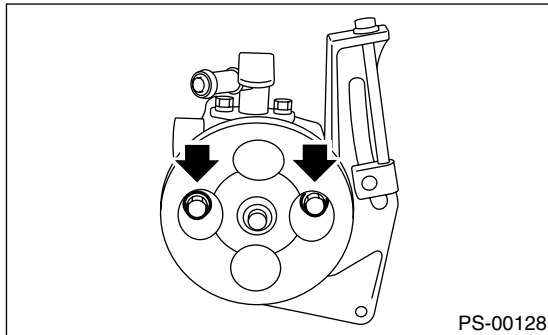


- (1) Bush
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

(2) Tighten the bolts which install the oil pump to bracket.

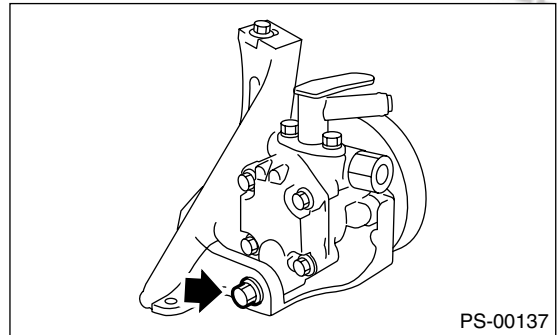
Tightening torque:

15.7 (1.6 kgf-m, 11.6 ft-lb)

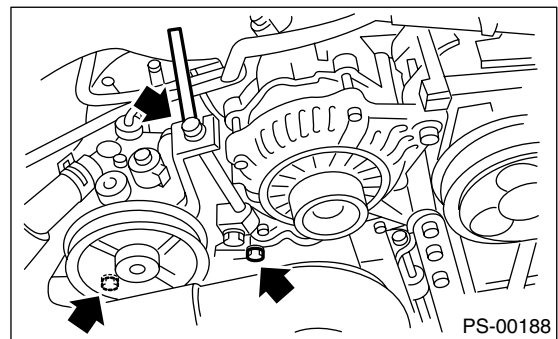


Tightening torque:

37.3 (3.8 kgf-m, 27.5 ft-lb)



2) Tighten the bolts which install the power steering pump bracket.



3) Interconnect the pipe C and suction hose.

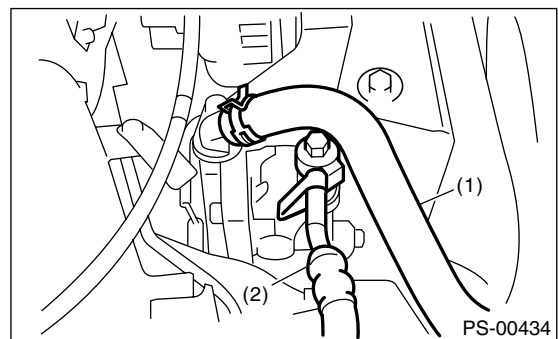
Tightening torque:

Eye bolt

39 N-m (4.0 kgf-m, 28.9 ft-lb)

CAUTION:

If a hose is twisted at this step, the hose may come into contact with some other parts.



- (1) Suction hose
- (2) Pipe C

4) Connect the connector to power steering pump switch.

5) Install the pulley belt to oil pump.

6) Check the pulley belt tension.

<Ref. to ME(H4SO)-41, INSPECTION, V-belt.>

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

7) Tighten the bolt of belt tension.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft-lb)

8) Install the pulley belt cover.

9) Connect the battery ground cable to battery.

10) Feed the specified power steering fluid. <Ref. to PS-55, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new one.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure the V ditch deflection. If it exceeds the service limit, replace the pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check the resistance to rotation of pulley. If it is past the service limit, replace the oil pump with a new one.
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace the oil pump with a new one.
4	O-ring	Crack or deterioration	Replace it with a new one.
5	Bracket	Crack	Replace it with a new one.

2. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:

- Fix the oil pump on a vise to make a measurement. At this time, hold the oil pump with least possible force between two wood pieces.
- Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

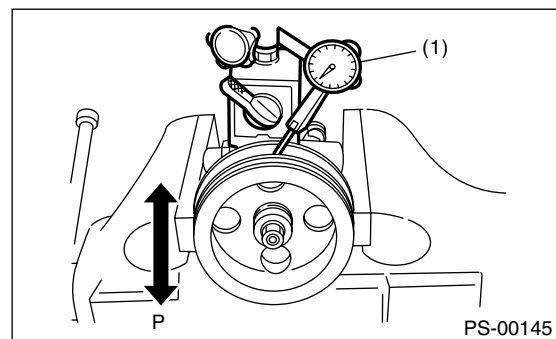
1) Play of the pulley shaft

Condition:

P: When applying the force of 9.8 N (1.0 kgf, 2.2 lb)

Service limit:

Radial play (Direction ↔)
0.4 mm (0.016 in) or less

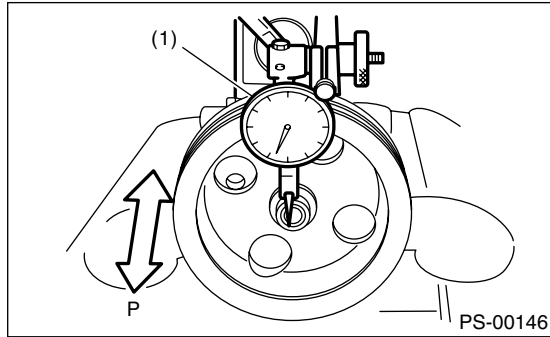


(1) Dial indicator

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

Axial play (Direction $\longleftrightarrow$)
0.9 mm (0.035 in) or less



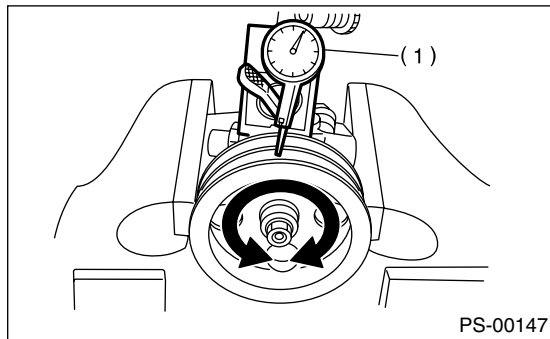
(1) Dial indicator

2) Ditch deflection of pulley

Service limit:
1.0 mm (0.039 in) or less

NOTE:

Read the value for one surface of V ditch, and then the value for another off the dial.



(1) Dial indicator

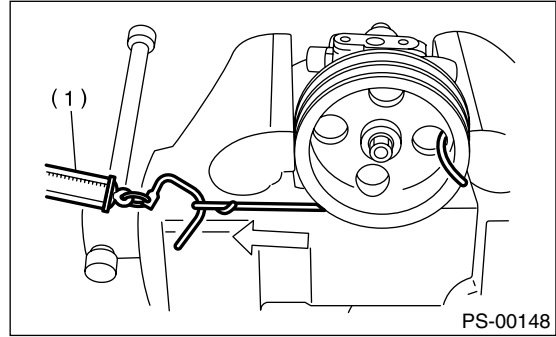
3) Resistance to rotation of pulley

Service limit:
Maximum load; 9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:

- A rather higher value may be indicated when pulley starts turning.

- Measure the load during rotation and make a judgment.



(1) Spring balance

3. HYDRAULIC PRESSURE

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-56, INSPECTION, General Diagnostic Table.>

- Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.

- Put a cotton cloth waste at a place where fluid drops before the pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

1) REGULAR PRESSURE MEASUREMENT

(1) Connect the ST1, ST2 and ST3.

ST1 92511000 PRESSURE GAUGE

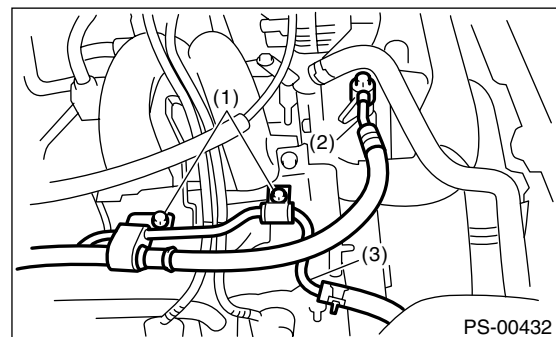
ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A

(2) Remove the air intake duct.

(3) Disconnect the pipe C from the pump.

(4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to the pump instead of pipe C.



(1) Bolt A

(2) Pipe C

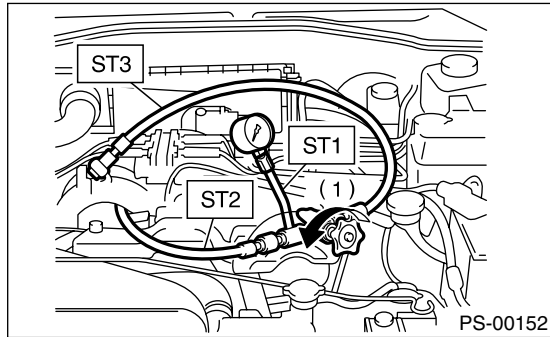
(3) Pipe D

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

- (5) Install the ST3 to end of pipe C removed from pump.
- (6) Replenish power steering fluid up to the specified level.
- (7) Open the valve, and start the engine.
- (8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:

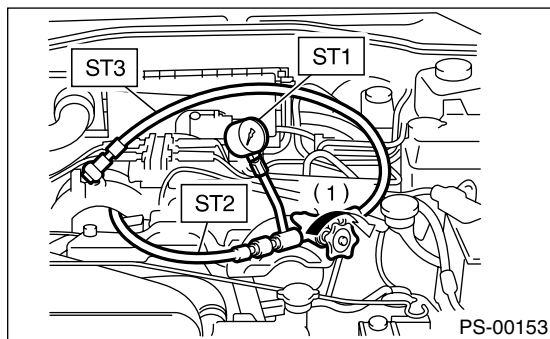
981 kPa (10 kg/cm², 142 psi) or less

- (9) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

2) Measure the relief pressure.

- (1) Using the STs, measure the relief pressure.
- (2) Close the valve.
- (3) Measure the relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:

Non-turbo model:

**6,767 — 7,453 kPa
(69 — 76 kg/cm², 981 — 1,081 psi)**

Turbo model:

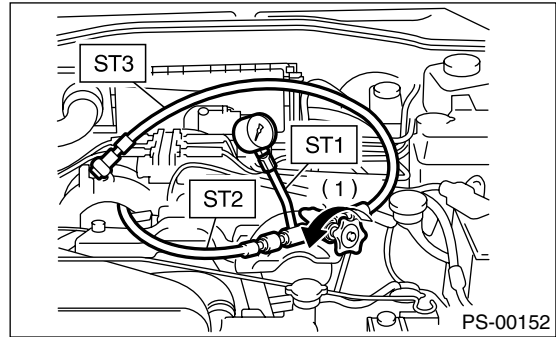
**7,350 — 8,036 kPa
(75 — 82 kg/cm², 1,067 — 1,165 psi)**

- (4) If it is not within the specified value, replace the oil pump.

3) Measure the working pressure.

- (1) Using the STs, measure the working pressure.
- (2) Open the valve.
- (3) Measure the working pressure of control valve by turning wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:

Non-turbo model:

**6,767 — 7,453 kPa
(69 — 76 kg/cm², 981 — 1,081 psi)**

Turbo model:

**7,350 — 8,036 kPa
(75 — 82 kg/cm², 1,067 — 1,165 psi)**

- (4) If it is within the specified value, measure the steering effort. <Ref. to PS-58, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace the control valve itself or control valve and pinion as a single unit with new ones.

RESERVOIR TANK

POWER ASSISTED SYSTEM (POWER STEERING)

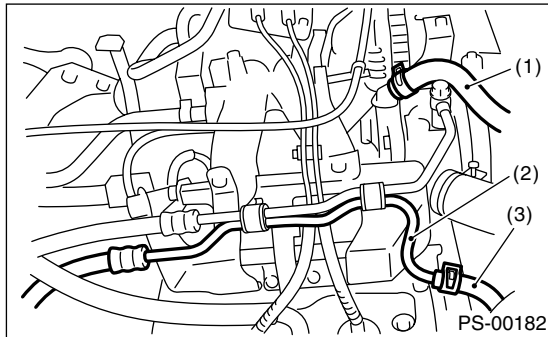
8. Reservoir Tank

A: REMOVAL

- 1) Remove the air intake duct. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
- 2) Drain fluid from the reservoir tank.
- 3) Disconnect the pipe D from return hose and suction hose from oil pump.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

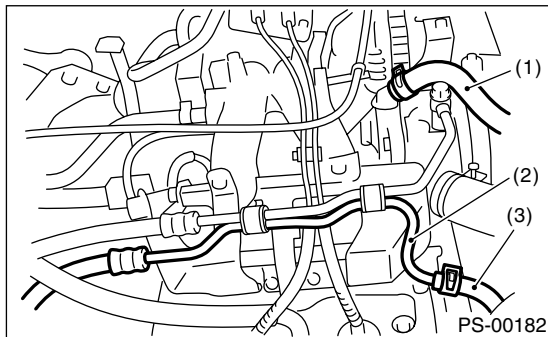


- (1) Suction hose
- (2) Pipe D
- (3) Return hose

- 4) Remove the reservoir tank from bracket by pulling it upwards.

B: INSTALLATION

- 1) Install the reservoir tank to bracket.
- 2) Connect the pipes D to return hose and suction hose to oil pump.



- (1) Suction hose
- (2) Pipe D
- (3) Return hose

- 3) Feed the power steering fluid to the specified level. <Ref. to PS-55, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace the reservoir tank.

POWER STEERING FLUID

POWER ASSISTED SYSTEM (POWER STEERING)

9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.

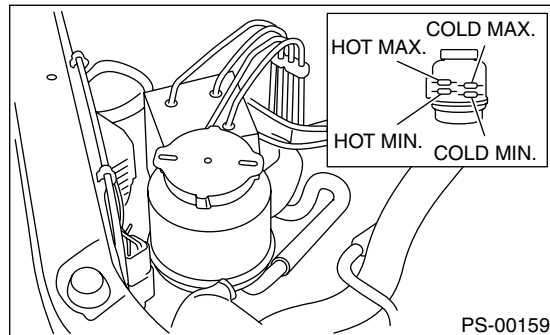
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.

3) Inspect the fluid level on flat and level surface with engine "OFF" by indicator of reservoir tank.

If the level is at MIN. point or below, add fluid to keep the level in the specified range of the indicator. If at MAX. point or above, drain fluid by using a syringe or the like.

(1) Check at power steering fluid temperature 20°C (68°F); read the fluid level on the "COLD" side.

(2) Check at power steering fluid temperature 80°C (176°F); read the fluid level on the "HOT" side.



C: REPLACEMENT

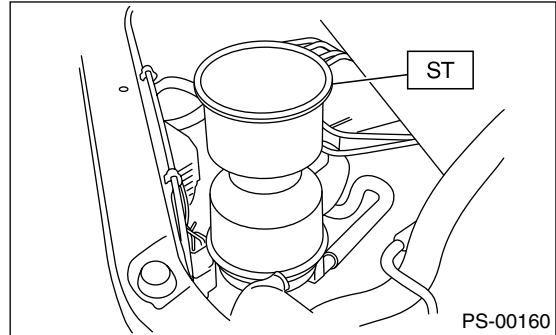
1) Lift up the vehicle.

2) Remove the jack up plate.

3) Remove the pipe joint in center of gear box, and then install the vinyl hose to pipe and joint. Drain the fluid while turning steering wheel.

4) Set the ST on top of reservoir tank and fill it about half way with the specified fluid.

ST 34199AE040 OIL CHARGE



5) Continue to turn the steering wheel slowly from lock to lock until bubbles stop appearing on oil surface while keeping the fluid at that level.

6) If turning the steering wheel in low fluid level condition, air will be sucked in pipe. In this case, leave it about half an hour and then do the step 5) again.

7) Lift up the vehicle, start the engine and let it idle.

8) Continue to turn the steering wheel slowly from lock to lock again until bubbles stop appearing on oil surface while keeping the fluid at that level.

It is normal that bubbles stop appearing after three times turning of steering wheel from lock to lock.

9) In case the bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 4) all over again.

10) Lower the vehicle, and then idle the engine.

11) Continue to turn the steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).

12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.

(1) The fluid level changes over 3 mm (0.12 in).

(2) Bubbles remain on the upper surface of the fluid.

(3) Grinding noise is generated from oil pump.

13) Check the fluid leakage after turning steering wheel from lock to lock with engine running.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
- Heavy steering effort in all ranges - Heavy steering effort at stand still - Steering wheel surges when turning.	1. Pulley belt - Unequal length of pulley belts - Adhesion of oil and grease - Loose or damage of pulley belt - Poor uniformity of pulley belt cross section - Pulley belt touches to pulley bottom - Poor revolution of pulleys (except oil pump pulley) - Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and wheel - Improper tires out of specification - Improper wheels out of specification - Tires not properly inflated *1	Replace or reinflate.
	3. Fluid - Low fluid level - Aeration - Dust mix - Deterioration of fluid - Poor warming-up of fluid *2	Refill, bleed air, replace or instruct the customer.
	4. Idle speed - Lower idle speed - Excessive drop of idle speed at start or at turning steering wheel *3	Adjust or instruct the customer.
	5. Measure hydraulic pressure.<Ref. to PS-51, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure steering effort.<Ref. to PS-56, INSPECTION, General Diagnostic Table.>	Adjust or replace.
- Vehicle leads to one side or the other. - Poor return of steering wheel to center - Steering wheel surges when turning.	1. Fluid line - Folded hose - Flattened pipe	Reform or replace.
	2. Tire and wheel - Flat tire - Mix use of different tires - Mix use of different wheels - Abnormal wear of tire - Unbalance of remained grooves - Unbalance of tire pressure	Adjust, fix or replace.
	3. Front alignment - Improper or unbalance caster - Improper or unbalance toe-in - Loose connection of suspension	Adjust or retighten.
	4. Others - Damaged joint assembly - Unbalanced height - One-sided weight	Replace, adjust or instruct the customer.
	5. Measure steering effort.<Ref. to PS-56, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or wheels are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.

*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.

*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

1. NOISE AND VIBRATION

CAUTION:

Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:

- Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
- Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
- When turning the steering wheel with service brake and/or parking brake applied, the noise is generated by creaking between disk and pads. However this does not indicate abnormal function in system.
- There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts have no defects.

Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.

This phenomena does not indicate there is some abnormal function in the system.

The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in "D" range for automatic transmission vehicle.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	Defective Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-46, INSPECTION, Pipe Assembly.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace the faulty parts of gearbox or oil pump.
Knocking When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Loosened tightening or play of tie-rod, or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten the fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Pulley bearing seizing of oil pump	Replace the oil pump.
	Folded hose, flat pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

Trouble	Possible cause	Corrective action
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the wrong part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Abnormal inside of hose or pipe Flat hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install the cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace the faulty parts of gearbox or hose.
Whine or growl (continuous or intermittent) While engine is running with/ without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace the oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace the faulty parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Too low engine speed	Adjust and instruct customers.
	Vane pump aeration	Fix the wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace the oil pump, faulty parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

2. MEASUREMENT OF STEERING EFFORT

Step	Check	Yes	No
1 CHECK STEERING EFFORT. 1) Stop the vehicle on a concrete road. 2) Start the engine. 3) Idle the engine. 4) Install the spring scale on the steering wheel. 5) Pull the spring scale at an right angle to steering wheel, and measure both right and left steering wheel effort. NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem.	Is the steering effort less than 31.4 N (3.2 kgf, 7.1 lb)?	Go to step 2.	Adjust the backlash.
2 CHECK STEERING EFFORT. 1) Stop the engine. 2) Pull the spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort.	Is the steering effort less than 294.2 N (30 kgf, 66.2 lb)?	Go to step 3.	Perform adjustment.
3 CHECK STEERING WHEEL EFFORT. 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is the maximum steering effort less than 2.26 N (0.23 kgf, 0.51 lb)?	Go to step 4.	Check, adjust and replace if necessary.
4 CHECK STEERING WHEEL EFFORT. Measure the steering wheel effort.	Is the difference of steering effort between clockwise and counterclockwise less than 20%?	Go to step 5.	Check, adjust and replace if necessary.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

Step		Check	Yes	No
5	CHECK UNIVERSAL JOINT. Measure the folding torque of the joint (yoke of steering column side). <Ref. to PS-18, INSPECTION, Universal Joint.>	Is the folding torque less than 7.3 N (0.74 kgf, 1.64 lb)?	Go to step 6.	Replace with new one.
6	CHECK UNIVERSAL JOINT. Measure the folding torque of the joint (yoke of gearbox side). <Ref. to PS-18, INSPECTION, Universal Joint.>	Is the folding torque less than 3.8 N (0.39 kgf, 0.86 lb)?	Go to step 7.	Replace with new one.
7	CHECK FRONT WHEEL. Check the front wheel.	Are the front wheels for unsteady revolution or rattling and brake for dragging?	Inspect, readjust and replace if necessary.	Go to step 8.
8	CHECK TIE-ROD ENDS. Remove the tie-rod ends.	Are the tie-rod ends of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 9.
9	CHECK BALL JOINT. Remove the ball joint.	Are the ball joints of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 10.
10	CHECK GEARBOX. Measure the rotating of gearbox. <Ref. to PS-39, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the rotating resistance of gear box less than 10.5 N (1.1 kgf, 2.4 lb)? Is the difference between clockwise and counterclockwise 20%?	Go to step 11.	Readjust the backlash, and if ineffective, replace the faulty parts.
11	CHECK GEARBOX. Measure the sliding of gearbox. <Ref. to PS-38, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is the sliding resistance of gear box less than 400 N (41 kgf, 90 lb)? Is the difference between right and left 20%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

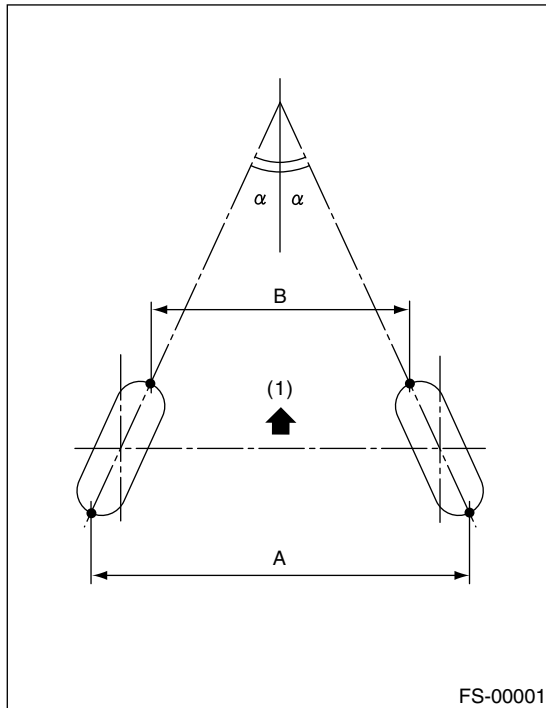
GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

REAR SUSPENSION

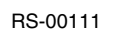
Model	Sedan			Wagon		OUTBACK
	Non-turbo	Turbo	STi	Non-turbo	Turbo	
Camber (tolerance: $\pm 0^{\circ}45'$)	$-1^{\circ}25'$	$-1^{\circ}30'$	$-1^{\circ}40'$	$-1^{\circ}15'$	$-1^{\circ}20'$	$-1^{\circ}10'$
Toe-in	0 $\pm$ 3 mm (0 $\pm$ 0.12 in) Each toe angle: $\pm 0^{\circ}09'$					
Thrust angle	0 $\pm$ 30'					
Wheel arch height [tolerance: ± 12 mm (± 0.47 in)]	381 mm (15.0 in)	376 mm (14.80 in)	366 mm (14.41 in)	381 mm (15.0 in)	376 mm (14.80 in)	386 mm (15.20 in)
Diameter of stabilizer	13 mm (0.51 in)	17 mm (0.67 in)	20 mm (0.79 in)	13 mm (0.51 in)	17 mm (0.67 in)	13 mm (0.51 in)

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



$A - B = \text{Positive: Toe-in, Negative: Toe-out}$
 $\alpha = \text{Each toe angle}$

1. REAR SUSPENSION



GENERAL DESCRIPTION

REAR SUSPENSION

(1) Stabilizer	(15) Trailing link front bushing	(30) Rear lateral link (STi model)
(2) Stabilizer bracket	(16) Trailing link bracket	
(3) Stabilizer bushing	(17) Cap (Protection)	Tightening torque: N·m (kgf-m, ft-lb)
(4) Clamp	(18) Washer	T1: 20 (2.0, 14.5)
(5) Floating bushing	(19) Rear crossmember	T2: 25 (2.5, 18.1)
(6) Stopper	(20) Strut mount cap	T3: 45 (4.6, 33.2)
(7) Stabilizer link (except STi model)	(21) Strut mount	T4: 60 (6.1, 44)
(8) Rear lateral link (with stabilizer, except STi model)	(22) Self-locking nut	T5: 70 (7.1, 52)
(9) Bushing (C)	(23) Dust cover	T6: 90 (9.2, 66)
(10) Bushing (A)	(24) Coil spring	T7: 100 (10.2, 74)
(11) Front lateral link	(25) Helper	T8: 115 (11.7, 85)
(12) Bushing (B)	(26) Lower rubber seat	T9: 130 (13.3, 96)
(13) Trailing link rear bushing	(27) Damper strut	T10: 140 (14.3, 103)
(14) Trailing link	(28) Rear differential member rear	T11: 200 (20.0, 145)
	(29) Stabilizer link (STi model)	

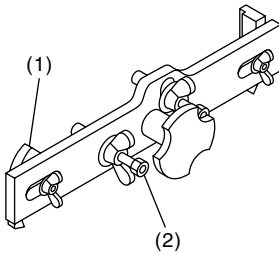
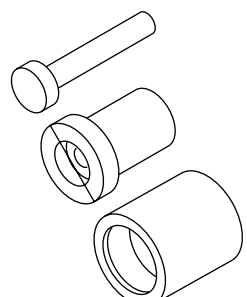
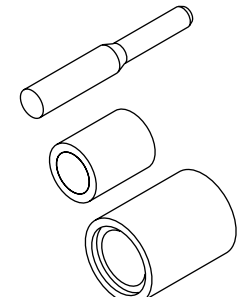
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

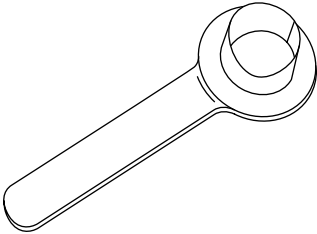
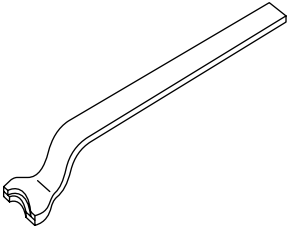
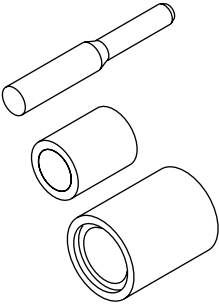
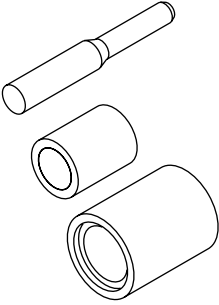
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380002	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927720000	927720000	INSTALLER & REMOVER	Used for replacing front bushing.
 ST-927730000	927730000	INSTALLER & REMOVER	Used for replacing rear bushing.

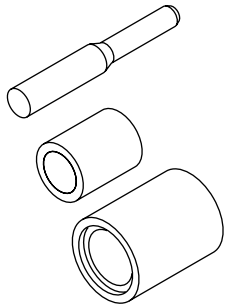
GENERAL DESCRIPTION

REAR SUSPENSION

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

GENERAL DESCRIPTION

REAR SUSPENSION

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

2. GENERAL PURPOSE TOOLS

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

2. Wheel Alignment

A: INSPECTION

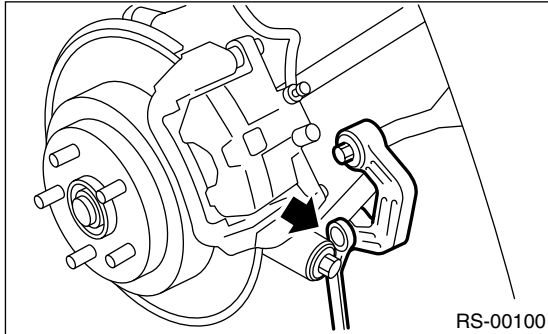
NOTE:

Front and rear wheel alignment must be simultaneously measured and/or adjusted. Follow the procedure in "FS" section "Wheel Alignment" for measurement and/or adjustment of wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

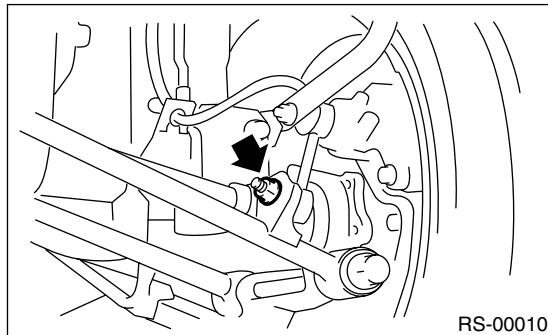
3. Rear Stabilizer

A: REMOVAL

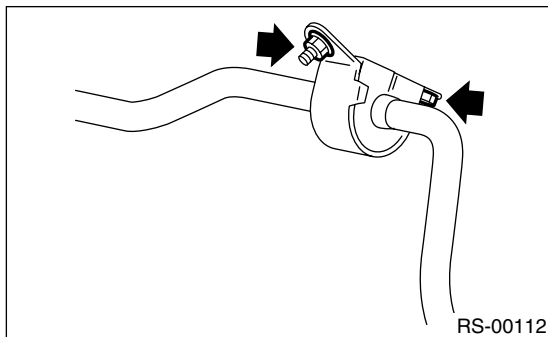
- 1) Lift-up the vehicle.
- 2) Remove the stabilizer link.
- Except STi MODEL



- STi MODEL



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

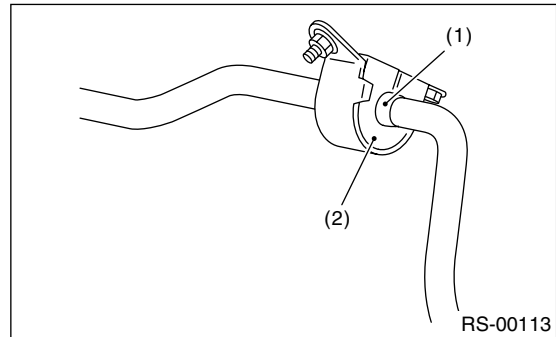


B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

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



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

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

Tightening torque:

Stabilizer link to rear lateral link

45 N·m (4.6 kgf-m, 33.2 ft-lb)

Stabilizer to stabilizer bracket

25 N·m (2.5 kgf-m, 18.1 ft-lb)

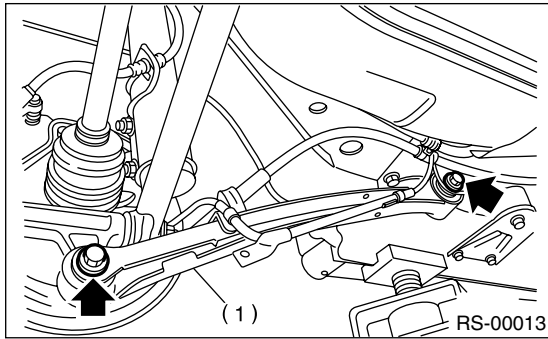
C: INSPECTION

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

4. Rear Trailing Link

A: REMOVAL

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



(1) Trailing link

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

B: INSTALLATION

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

NOTE:

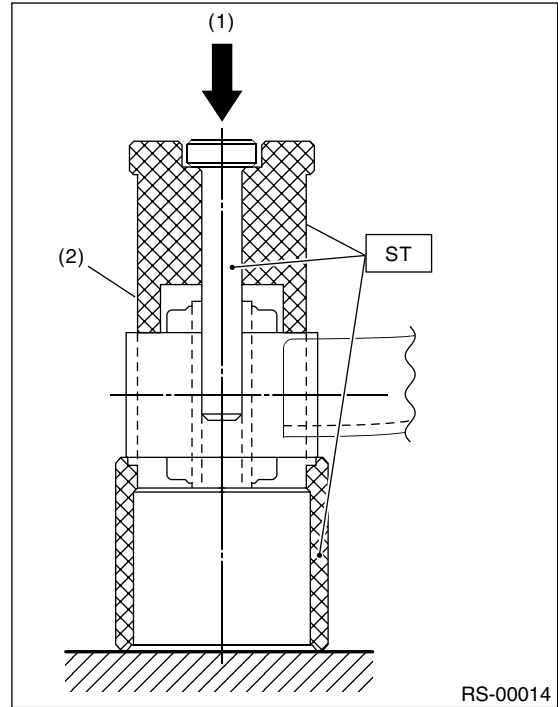
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

Using the ST, press the front bushing out of place.

ST 927720000 INSTALLER & REMOVER SET

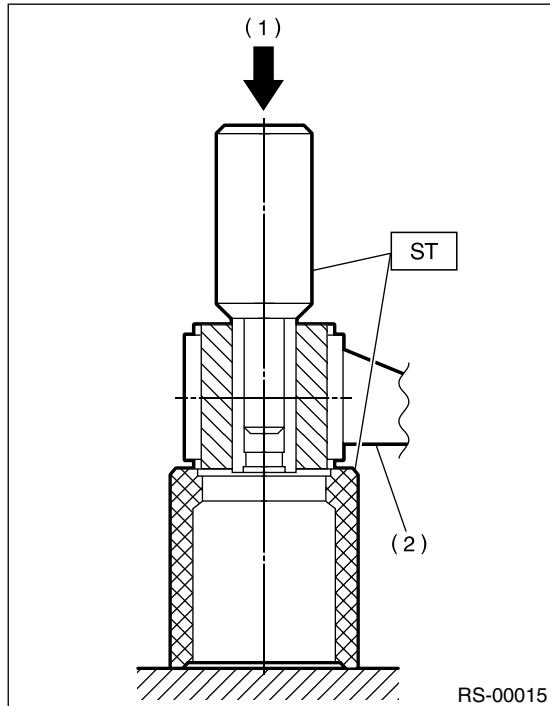


- (1) Press
- (2) Trailing link

2. REAR BUSHING

- 1) Remove the housing. <Ref. to DS-23, REMOVAL, Rear Axle.>
- 2) Using the ST, press the rear bushing out of place.

ST 927730000 INSTALLER & REMOVER SET



- (1) Press
- (2) Housing

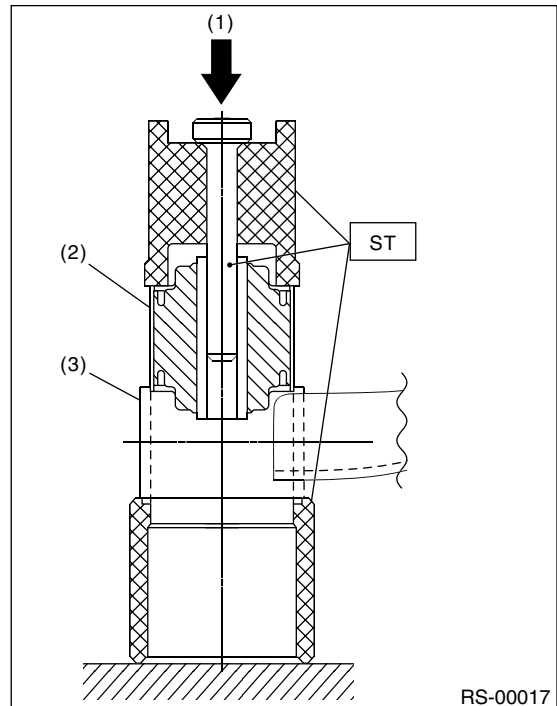
D: ASSEMBLY

1. FRONT BUSHING

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

CAUTION:

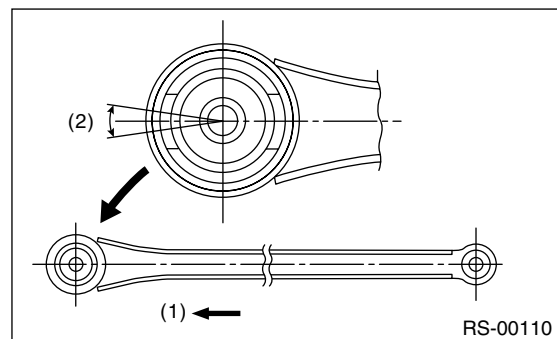
Turn the ST plunger upside down and press it until the plunger end surface contacts the trailing link end surface.



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

CAUTION:

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



- (1) Front
- (2) $\pm 5^\circ$

REAR TRAILING LINK

REAR SUSPENSION

2. REAR BUSHING

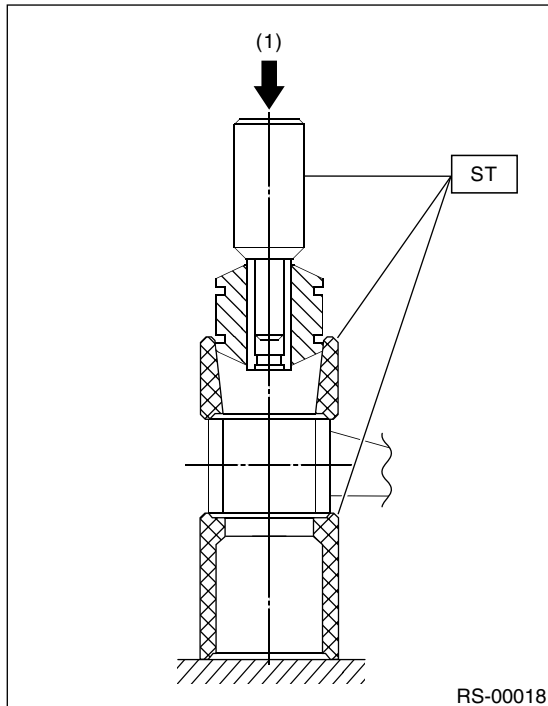
1) Using the ST, press the bushing into trailing link.
ST 927730000 INSTALLER & REMOVER
SET

NOTE:

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

SPECIFIED lubricant:

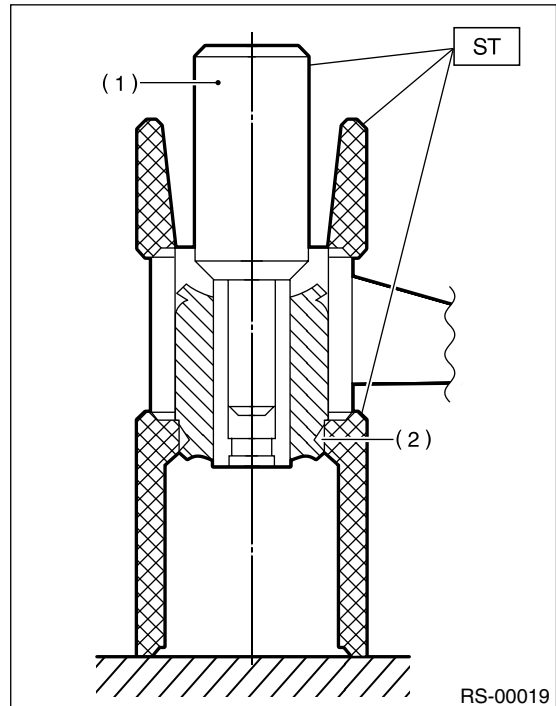
TIRE LUBE: water = 1: 3



(1) Press

2) Press the ST plunger until the bushing flange protrudes beyond trailing link.

ST 927730000 INSTALLER & REMOVER
SET

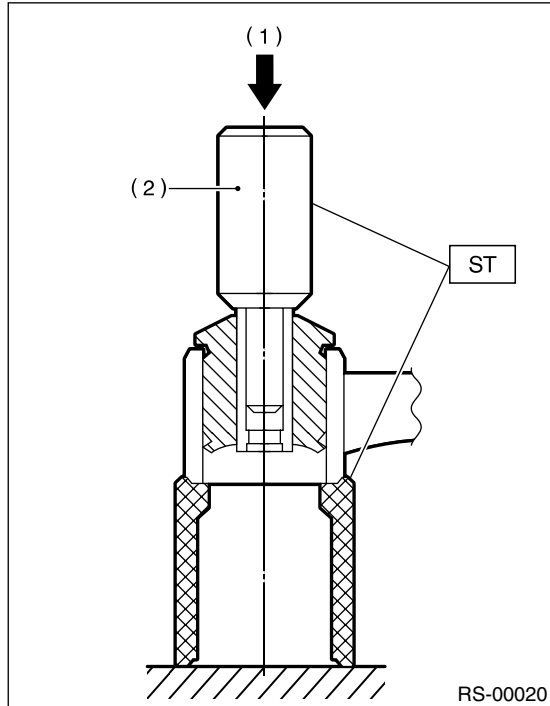


(1) Plunger

(2) Flange

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

ST 927730000 INSTALLER & REMOVER SET



- (1) Press
- (2) Plunger

4) Install the housing. <Ref. to DS-24, INSTALLATION, Rear Axle.>

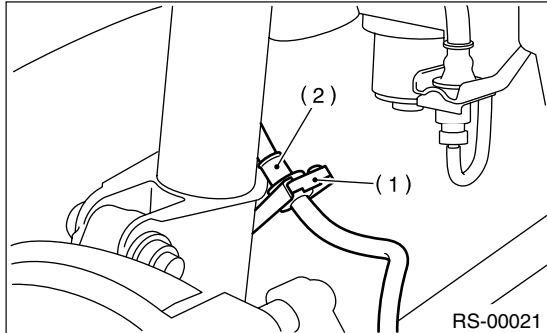
E: INSPECTION

Check the trailing links for bends, corrosion or damage.

5. Rear Strut

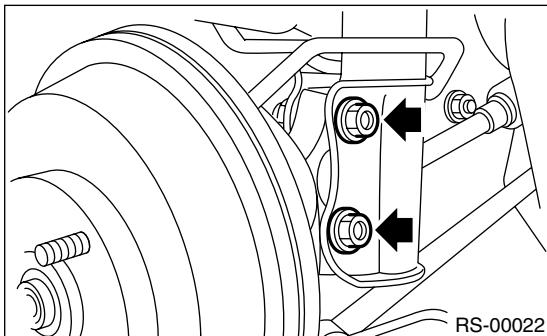
A: REMOVAL

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



- (1) Brake hose clip
(2) Brake hose

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



- 7) Remove the nuts securing strut mount to body.

B: INSTALLATION

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

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

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

Tightening torque:

200 N·m (20.0 kgf-m, 145 ft-lb)

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

CAUTION:

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

- 4) Lower the vehicle and tighten wheel nut.

Tightening torque:

90 N·m (9.2 kgf-m, 66 ft-lb)

- 5) Install the rear seat backrest and rear seat cushion. (Sedan model)

- 6) Install the strut cap to rear quarter trim. (Wagon model)

NOTE:

Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

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

D: ASSEMBLY

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

E: INSPECTION

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

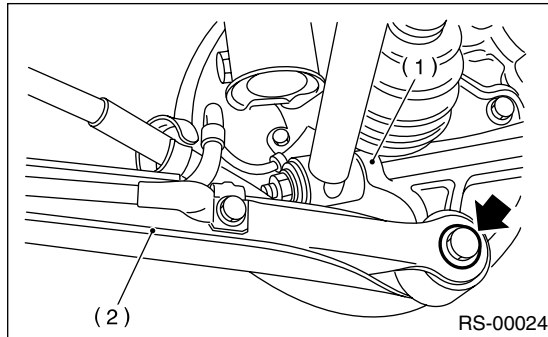
F: DISPOSAL

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

6. Lateral link

A: REMOVAL

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

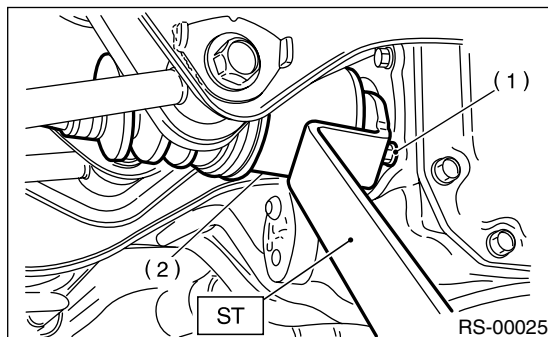


- (1) Rear housing
(2) Trailing link

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

NOTE:

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



- (1) Bolt
(2) DOJ

CAUTION:

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

- 7) Scribe an alignment mark on the rear lateral link adjusting bolt and crossmember.

- 8) Remove the bolts securing front and rear lateral links to crossmember, detach lateral links.

CAUTION:

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

B: INSTALLATION

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

- Installation of DOJ to differential: <Ref. to DS-35, INSTALLATION, Rear Drive Shaft.>

CAUTION:

- Replace the self-locking nut and DOJ circlip with new ones.
- Always use the special tool not to allow the DOJ splines to damage the side oil seal.
ST 28099PA090 OIL SEAL PROTECTOR
- Always tighten the bushing location when tires are in full contact with the ground and vehicle is curb weight.
- Secure the bolt head and tighten the nut when installing the adjusting bolt.

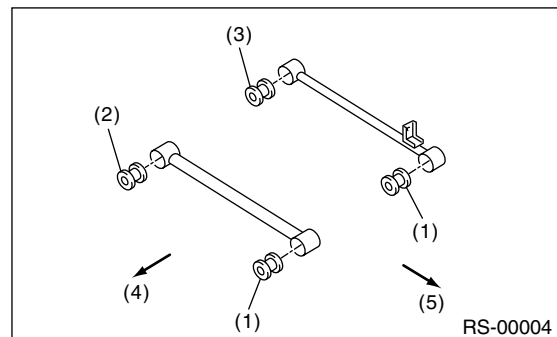
NOTE:

Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

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

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

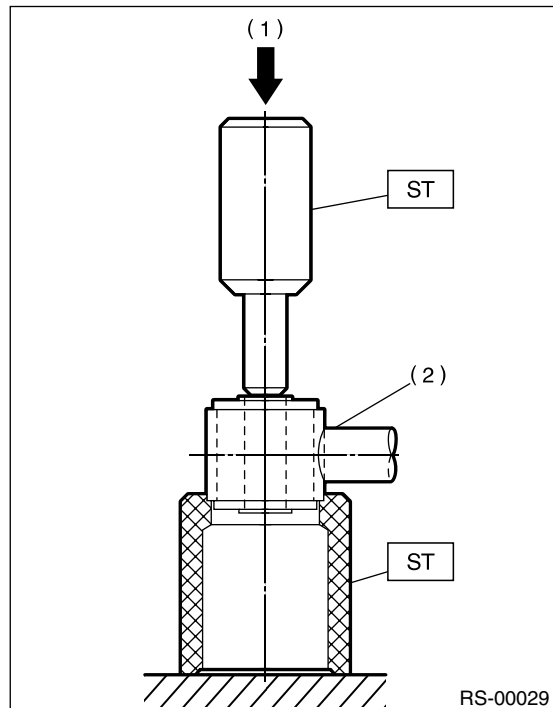


- (1) Bushing A
(2) Bushing B
(3) Bushing C
(4) Front
(5) Outside of body

LATERAL LINK

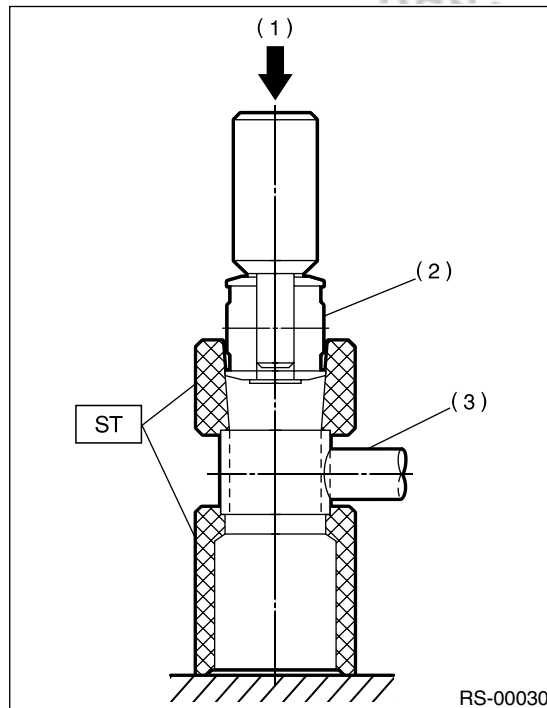
REAR SUSPENSION

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



- (1) Press
- (2) Lateral link

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



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

D: ASSEMBLY

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

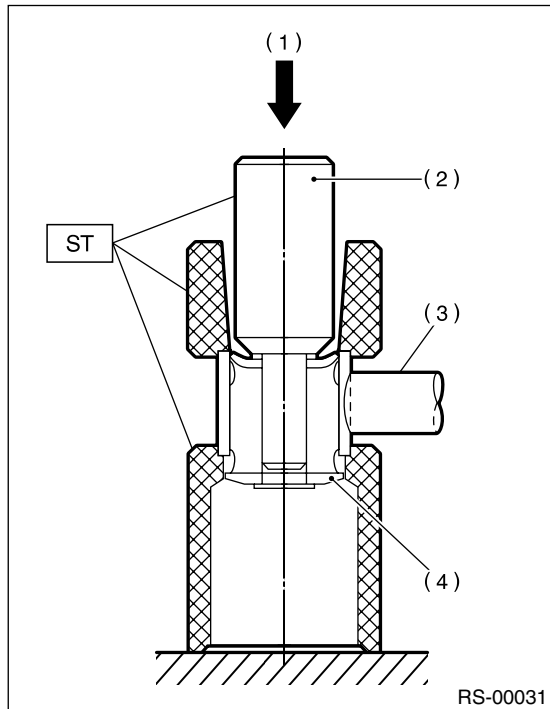
Specified lubricant:

TIRE LUBE: water = 1: 3

LATERAL LINK

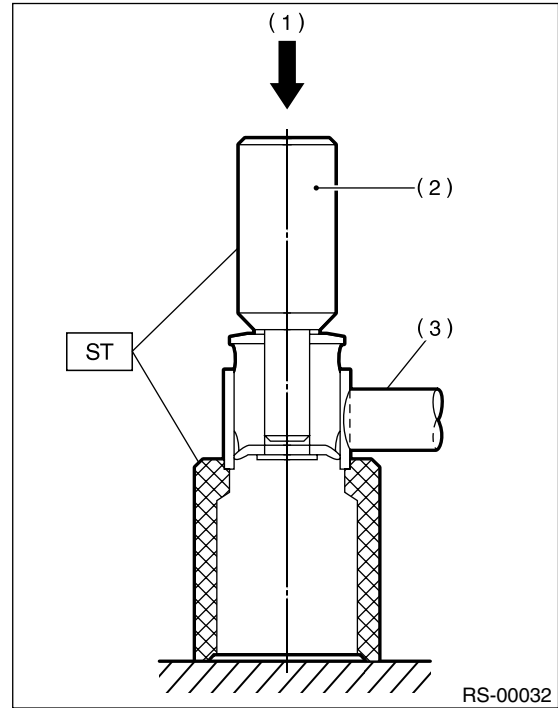
REAR SUSPENSION

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



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

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



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

E: INSPECTION

Visually check the lateral links for damage or bends.

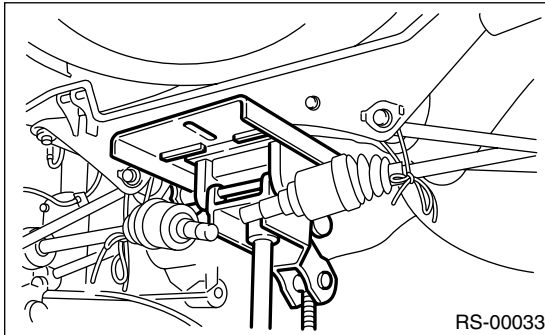
7. Rear Crossmember

A: REMOVAL

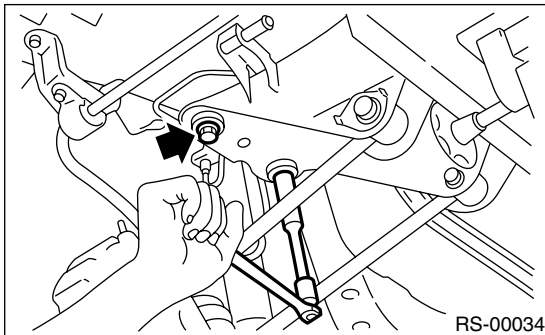
CAUTION:

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

- 1) Separate the front exhaust pipe and rear exhaust pipe.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the rear differential.
<Ref. to DI-22, REMOVAL, Rear Differential.>
- 4) Place the transmission jack under rear crossmember.



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



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

B: INSTALLATION

NOTE:

- Discard the loosened self-locking nut and replace it with a new one.
- Always secure the bolt head and tighten the nut when tightening the adjusting bolt.

- 1) Install in the reverse order of removal.
- 2) For installation and tightening torque of rear differential;
<Ref. to DI-24, INSTALLATION, Rear Differential.>
- 3) Always tighten the rubber bushing when tires are in full contact with the ground and vehicle is curb weight.
- 4) Check the wheel alignment and adjust if necessary.

C: INSPECTION

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

8. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

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

2. POOR RIDE COMFORT

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

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

3. NOISE

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

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SECTION 6

CHASSIS

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TRANSFER CASE

1. General Description

A: NOTE

For general description, refer to “4AT”, “5MT” or “6MT” section.

4AT model:

<Ref. to 4AT-2, General Description.>

5MT model:

<Ref. to 5MT-2, General Description.>

6MT model:

<Ref. to 6MT-2, General Description.>

2. Transfer Case and Extension (MT)

A: NOTE

For removal, installation and inspection work, refer to "5MT" or "6MT" section.

5MT model:

<Ref. to 5MT-39, Transfer Case and Extension Case Assembly.>

6MT model:

<Ref. to 6MT-47, Extension Case.>

TRANSFER CLUTCH AND EXTENSION (4AT)

TRANSFER CASE

3. Transfer Clutch and Extension (4AT)

A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-79, Transfer Clutch.>, <Ref. to 4AT-75, Extension Case.>

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to "4AT", "5MT" or "6MT" section.

4AT model:

<Ref. to 4AT-44, Extension Case Oil Seal.>

5MT model:

<Ref. to 5MT-34, Oil Seal.>

6MT model:

<Ref. to 6MT-31, Oil Seal.>

5. Transfer Drive Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to "5MT" or "6MT" section.

5MT model:

<Ref. to 5MT-43, Transfer Drive Gear.>

6MT model:

<Ref. to 6MT-56, Transfer Drive Gear.>

6. Transfer Driven Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to "5MT" or "6MT" section.

5MT model:

<Ref. to 5MT-45, Transfer Driven Gear.>

6MT model:

<Ref. to 6MT-58, Transfer Driven Gear.>

REDUCTION DRIVE GEAR (4AT WITHOUT VTD)

TRANSFER CASE

7. Reduction Drive Gear (4AT without VTD)

A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-89, Reduction Drive Gear.>

8. Reduction Drive Gear (4AT with VTD)

A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-89, Reduction Drive Gear.>

REDUCTION DRIVEN GEAR (4AT WITHOUT VTD)

TRANSFER CASE

9. Reduction Driven Gear (4AT without VTD)

A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-87, Reduction Driven Gear.>

10.Reduction Driven Gear (4AT with VTD)

A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-87, Reduction Driven Gear.>

11.Center Differential

A: NOTE

For removal, installation and inspection work, refer to "4AT", "5MT" or "6MT" section.

4AT model:

<Ref. to 4AT-91, Center Differential Carrier.>

5MT model:

<Ref. to 5MT-47, Center Differential.>

6MT model:

<Ref. to 6MT-60, Center Differential.>

12. Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to "4AT" section. <Ref. to 4AT-35, Transfer Clutch Pressure Test.>

13. Transfer Duty Solenoid and Valve Body

A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

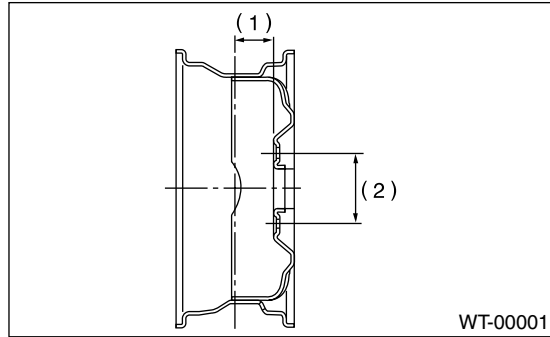
WHEEL AND TIRE SYSTEM

GENERAL DESCRIPTION

WHEEL AND TIRE SYSTEM

1. General Description

A: SPECIFICATIONS



(1) Offset

(2) P.C.D.

Specifications		Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Front and rear	TS	P195/60R15 87H	15 × 6JJ	55 (2.17)	100 (3.94)
	RS, OBK, WRX	P205/55R16 89V	16 × 6 1/2JJ		
	WRX: OPTION	215/45R17 87W	17 × 7JJ	55 (2.17)	
	STi	225/45R17 90W	17 × 7 1/2JJ	53 (2.09)	
T-type tire	TS, RS, OBK, WRX	T135/70D16 100M	16 × 4T	50 (1.97)	
	STi	T135/70D17 102M	17 × 4T	40 (1.57)	

Specifications		Tire size	Tire air pressure kPa (kgf/cm ² , psi)
Front and rear	TS	P195/60R15 87H	Fr: 220 (2.2, 32) Rr: 200 (2.0, 29)
	RS, OBK, WRX	P205/55R16 89V	
	WRX: OPTION	215/45R17 87W	Fr: 230 (2.3, 33) Rr: 220 (2.2, 32)
	STi	225/45R17 90W	Fr: 250 (2.5, 36) Rr: 210 (2.1, 30)
T-type tire	TS, RS, OBK, WRX	T135/70D16 100M	420 (4.2, 60)
	STi	T135/70D17 102M	

NOTE:

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

GENERAL DESCRIPTION

WHEEL AND TIRE SYSTEM

1. SERVICE DATA

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

2. ADJUSTING PARTS

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

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

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

B: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

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

2. Tire

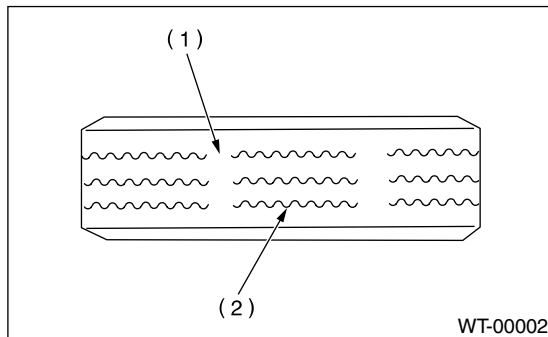
A: INSPECTION

- 1) Take stone, glass, nail etc. off from tread groove.
- 2) Replace the tire if as follows.

CAUTION:

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

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

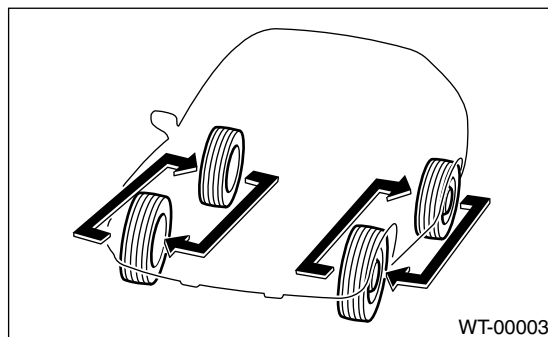


- (1) Tread wear indicator
- (2) Tire tread

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

1. TIRE ROTATION

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



3. Steel Wheel

A: REMOVAL

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

NOTE:

- While removing the wheels, prevent the hub bolts from damage.
- Place the wheels with their outer sides facing upward to prevent the wheels from damage.

B: INSTALLATION

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

Wheel nut tightening torque:

90 N·m (9.1 kgf-m, 65.7 ft-lb)

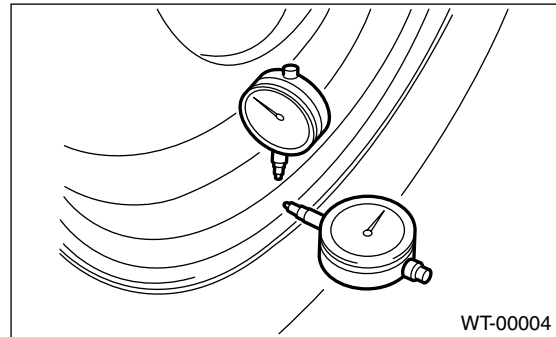
CAUTION:

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

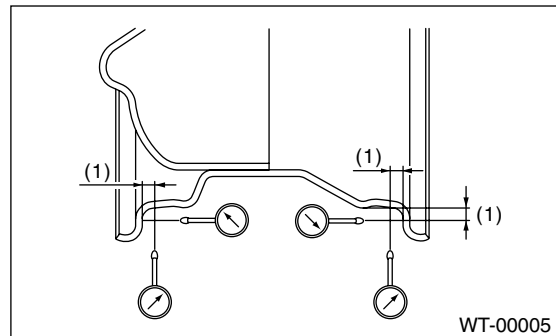
- 6) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

C: INSPECTION

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



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



(1) Approx. 7 mm (0.28 in)

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

4. Aluminum Wheel

A: REMOVAL

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

B: INSTALLATION

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

C: INSPECTION

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

Rim runout:

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

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the following:

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

5. Wheel Balancing

A: REPLACEMENT

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

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
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723241580	55 g (1.94 oz)
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Balance weight part number (For aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

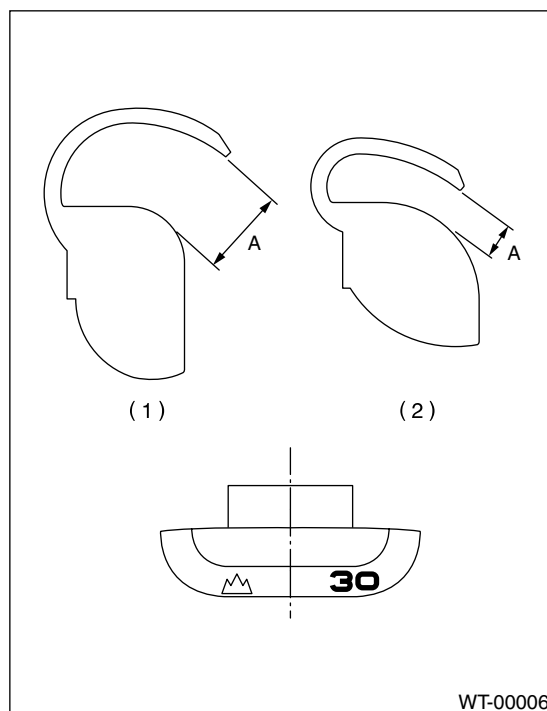
- 4) Install the selected weight to the point designated by wheel balancer.
- 5) Using wheel balancer, measure the wheel balance again. Check the wheel balance is correctly adjusted.

B: INSPECTION

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

NOTE:

- 55 g (1.94 oz) weight used with the aluminum wheel is not available.
- Balance weights are available for use with any of 15 to 17-inch wheels.



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

Service limit: A

Weight for steel wheel;

- 5 g (0.18 oz) — 25 g (0.88 oz) 2.0 mm (0.08 in)
- 30 g (1.06 oz) or more 1.8 mm (0.07 in)

Weight for aluminum wheel;

- 5 g (0.18 oz) — 25 g (0.88 oz) 5.0 mm (0.20 in)
- 30 g (1.06 oz) or more 4.5 mm (0.177 in)

6. “T-type” Tire

A: NOTE

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

CAUTION:

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

B: REPLACEMENT

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

CAUTION:

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

C: INSPECTION

- 1) Check the tire inflation pressure.

Specification:

420 kPa (4.2 kg/cm², 60 psi)

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

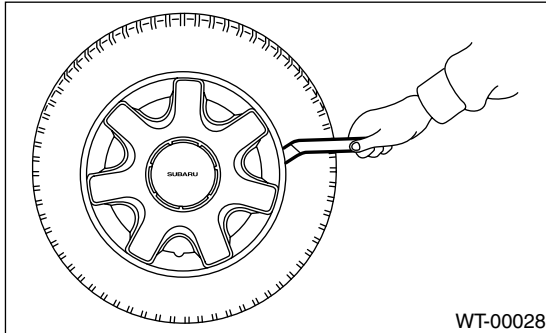
CAUTION:

Replace the tire with a new one.

7. Full Wheel Cap

A: REMOVAL

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



B: INSTALLATION

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

C: INSPECTION

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

GENERAL DIAGNOSTICS TABLE

WHEEL AND TIRE SYSTEM

8. General Diagnostics Table

A: INSPECTION

Symptom	Possible cause	Remedy
Front wheel shimmy	Worn or improperly inflated tire.	In case of worn tire, replace the tire. In case of improperly inflated tire, adjust the tire air pressure properly.
	Wheel is out of balance.	Adjustment
Abnormal tire wear	Improperly inflated tire.	Replace
Sways/pitches	Worn or improperly inflated tire.	In case of worn tire, replace the tire. In case of improperly inflated tire, adjust the tire air pressure properly.
Wander/pulls	Worn or improperly inflated tire.	In case of worn tire, replace the tire. In case of improperly inflated tire, adjust the tire air pressure properly.