

ABS (DIAGNOSTICS)

Basic Diagnostic Procedure

ABS (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:

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

NOTE:

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

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS(diag)-4, Check List for Interview.> 2) Before performing diagnostics, check the component which might affect ABS problems. <Ref. to ABS(diag)-8, INSPECTION, General Description.>	Is the component that might influence the ABS problem normal?	Go to step 2.	Repair or replace each unit.
2 CHECK INDICATION OF DTC ON SCREEN. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor power switch to ON. NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 4) Read the DTC. <Ref. to ABS(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Record all DTCs and Freeze Frame Data.	Is DTC displayed?	Go to step 4.	Go to step 3.
3 PERFORM THE GENERAL DIAGNOSTICS. 1) Inspect using "General Diagnostic Table". <Ref. to ABS(diag)-77, General Diagnostic Table.> 2) Perform clear memory mode. <Ref. to ABS(diag)-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.> 4) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Check the DTC does not displayed.	Does the ABS warning light go off after turning the ignition switch to ON?	Finish the diagnosis.	Check in accordance with "Diagnostic Procedure for ABS". <Ref. to ABS(diag)-21, NO TROUBLE CODE, INSPECTION, Subaru Select Monitor.>

Basic Diagnostic Procedure

ABS (DIAGNOSTICS)

Step	Check	Yes	No
4 PERFORM THE DIAGNOSIS. 1) Refer to the "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-34, LIST, List of Diagnostic Trouble Code (DTC).> 2) Fix the wrong part. 3) Perform clear memory mode. <Ref. to ABS(diag)-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.> 5) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Repeat step 1 to 4 until DTC is not shown.	Finish 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 ☐ Not come on • When / how long does it come on?		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (before starting engine) ☐ START ☐ ON (after Engine starting, engine is running) ☐ ON (after Engine starting, engine is at a standstill)		
Timing	☐ Immediately after turning the ignition to ON ☐ Immediately after turning the ignition to START		
	☐ When accelerating	—	km/h
		—	MPH
	☐ When driving at a constant speed	km/h	MPH
	☐ When decelerating	—	km/h
		—	MPH
	☐ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	☐ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	☐ When operating other electrical parts • Parts name: • Operating condition:		

Check List for Interview

ABS (DIAGNOSTICS)

2. STATE OF BRAKE WARNING LIGHT

Brake warning light comes on.	☐ Always ☐ Sometimes ☐ Only once ☐ Not come on ☐ When pulling the parking brake lever up. ☐ When releasing the parking brake lever down. ☐ When / how long does it come on?		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (before starting engine) ☐ START ☐ ON (after Engine starting, engine is running) ☐ ON (after Engine starting, engine is at a standstill)		
Timing	☐ Immediately after turning the ignition to ON ☐ Immediately after turning the ignition to START		
	☐ When accelerating	— km/h	
		— MPH	
	☐ When driving at a constant speed	km/h	MPH
	☐ When decelerating	— km/h	
		— MPH	
	☐ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	☐ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	☐ When operating other electrical parts		
	☐ Parts name: ☐ Operating condition:		

Check List for Interview

ABS (DIAGNOSTICS)

3. SYMPTOMS

ABS operating condition	☐ Does not move.		
	☐ Operates only when applying an abrupt brake.	Vehicle speed:	km/h
	MPH		
	• How to step on brake pedal:		
	a) Operating time:	Sec.	
	b) Operating noise: ☐ Occurs. / ☐ Does not occur.		
	• What kind of noise?	☐ Knocking ☐ Gong gong ☐ Bong ☐ Buzz ☐ Gong gong buzz ☐ Others:	
	c) Reaction force of brake pedal		
		☐ Stick ☐ Weak pedal resistance ☐ Strong pedal resistance ☐ Others:	
	Behavior of vehicle	a) Directional stability cannot be obtained or the steering refuses to work when applying brakes: ☐ Yes / ☐ No	
• When:		☐ When turning to the right ☐ When turning to the left ☐ When spinning ☐ Others:	
b) Directional stability cannot be obtained or the steering refuses to work when accelerating: ☐ Yes / ☐ No			
• When:		☐ When turning to the right ☐ When turning to the left ☐ When spinning ☐ Others:	
c) Poor brake performance: ☐ Yes / ☐ No			
• What kind:		☐ Long braking/stopping distance ☐ Brakes lock or drag ☐ Long pedal stroke ☐ Pedal sticks. ☐ Others:	
d) Poor acceleration: ☐ Yes / ☐ No			
• What kind:		☐ Not accelerate ☐ Engine stalls. ☐ Others:	
e) Occurrence of vibration: ☐ Yes / ☐ No			
• Where			
• What kind:			
f) Occurrence of noise: ☐ Yes / ☐ No			
• Where			
• What kind:			
g) Other troubles occurred: ☐ Yes / ☐ No			
• What kind:			

Check List for Interview

ABS (DIAGNOSTICS)

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

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

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

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

CAUTION:

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

B: INSPECTION

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

1. BATTERY

Measure battery voltage and check electrolyte.

Standard voltage: 12 V or more

Specific gravity: More than 1.260

2. GROUND

Check the ABS ground (B302) bolt, tightening torque.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

3. BRAKE FLUID

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

4. HYDRAULIC UNIT

Check the hydraulic unit.

- With brake tester <Ref. to ABS-9, 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-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

Check the brake pad and rotor.

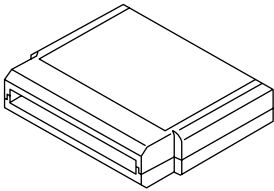
- FRONT <Ref. to BR-19, INSPECTION, Front Brake Pad.> <Ref. to BR-21, INSPECTION, Front Disc Rotor.>
- REAR <Ref. to BR-30, INSPECTION, Rear Brake Pad.> <Ref. to BR-32, INSPECTION, Rear Disc Rotor.>

7. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOL

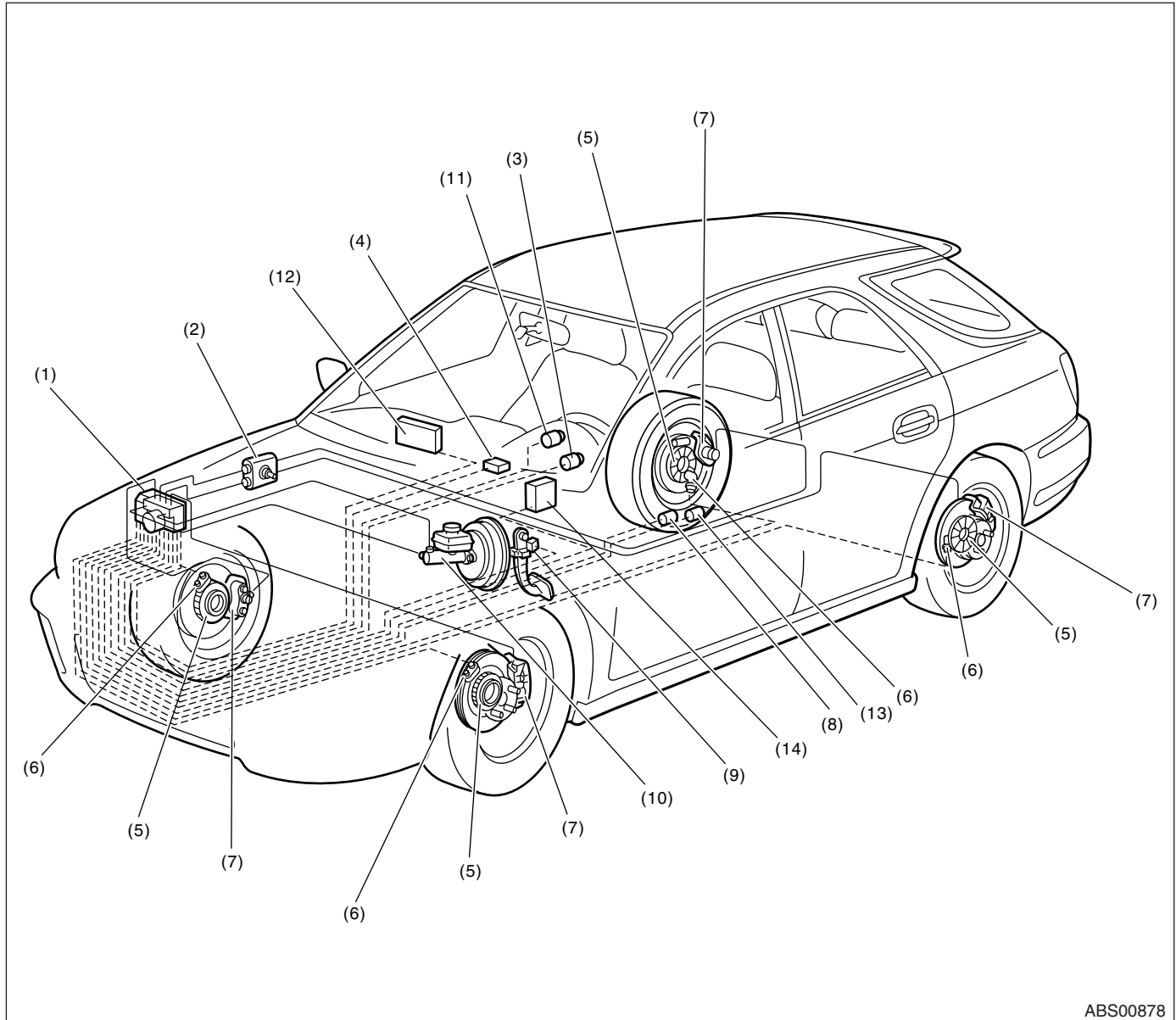
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA010	18482AA010 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOL

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

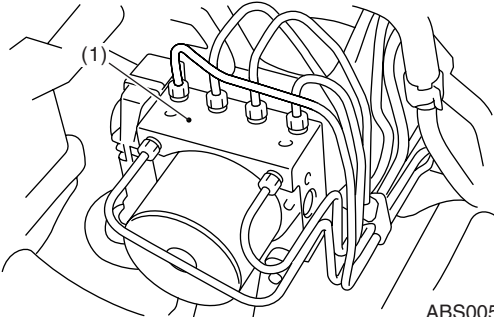
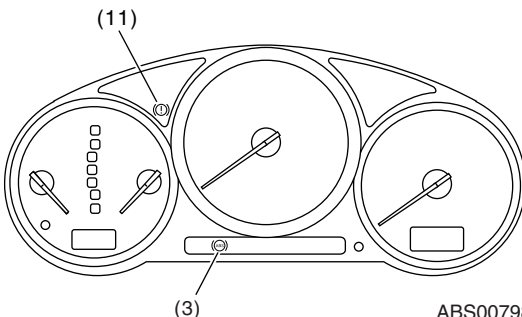
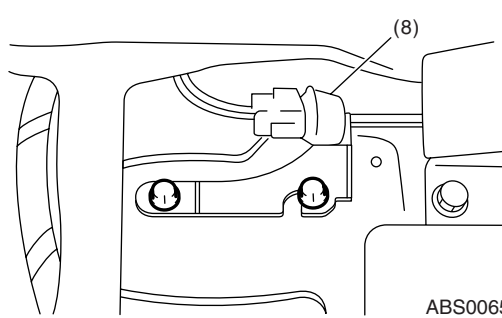
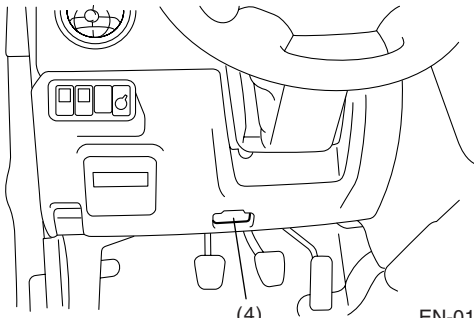
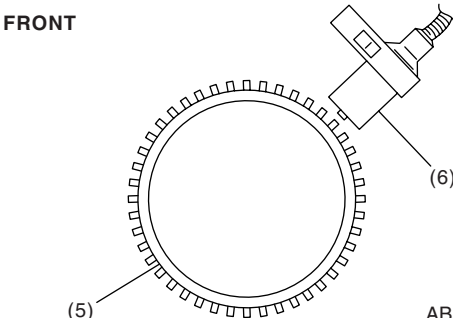
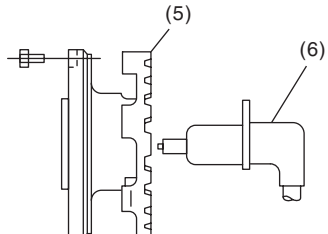
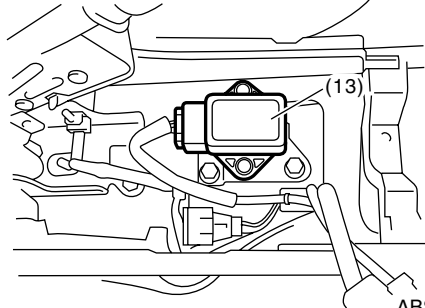
4. Electrical Component Location

A: LOCATION



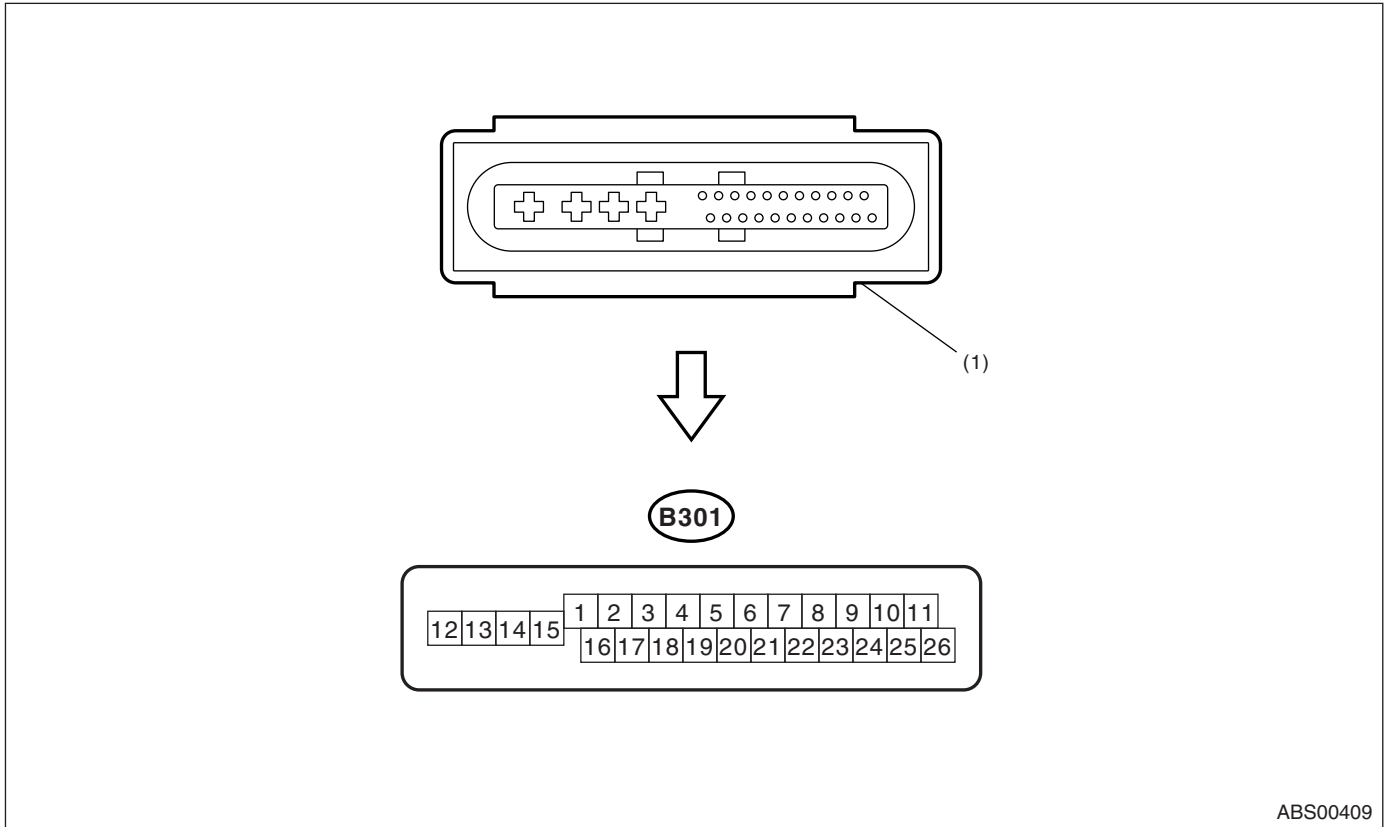
ABS00878

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

 ABS00563	 ABS00798
 ABS00658	 EN-01150
FRONT  ABS00659	REAR  ABS00660
 ABS00651	SUBARU.

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



ABS00409

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

NOTE:

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

Control Module I/O Signal

ABS (DIAGNOSTICS)

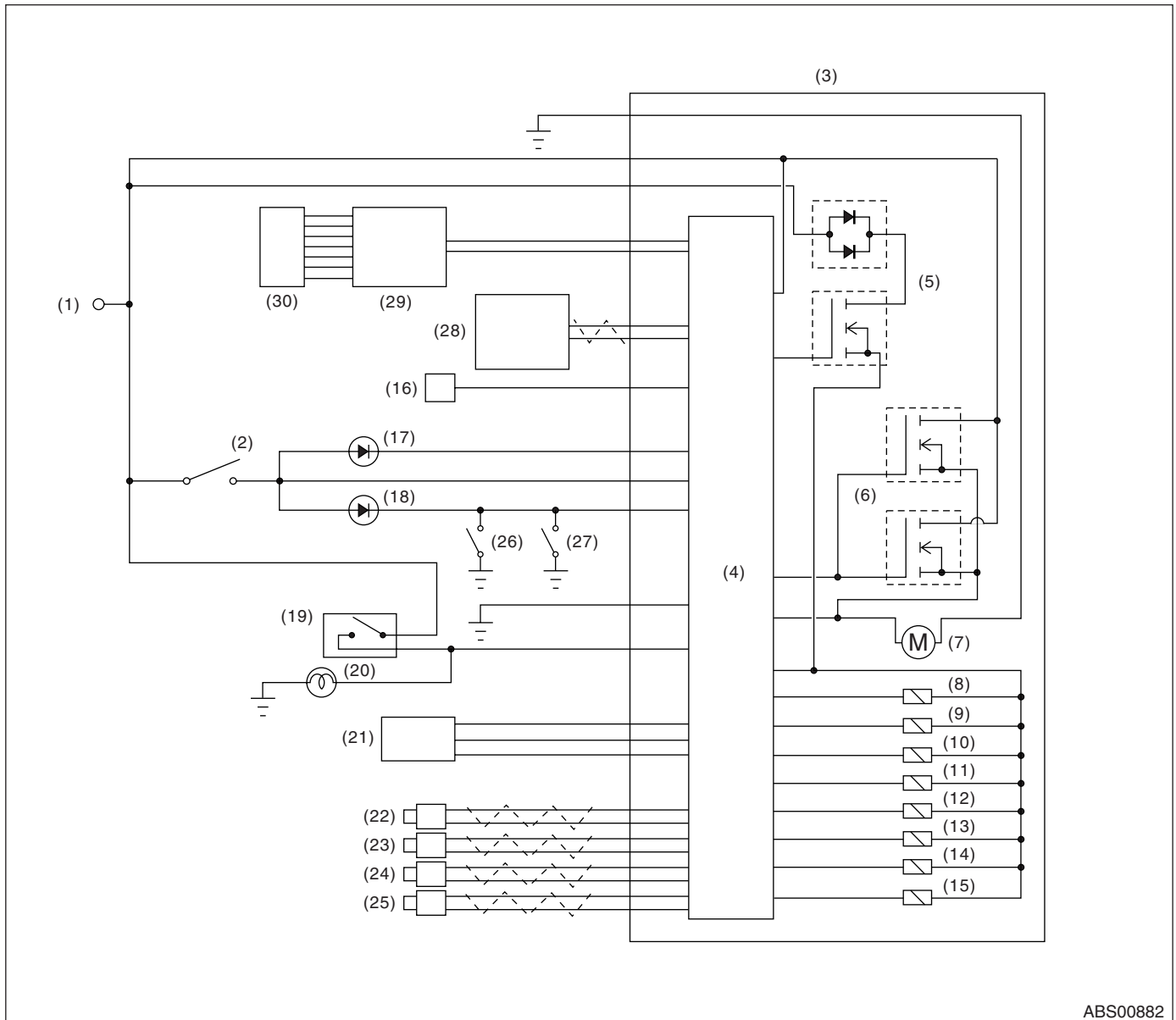
Description			Terminal No. (+) — (-)	Input/Output signal
				Measured value and measuring conditions
ABS wheel speed sensor (Wheel speed sensor)	Front LH wheel	Ground	16	—
		Signal	1 — 16	When the 20 Hz. 0.12 — 1 V
	Front RH wheel	Ground	5	—
		Signal	6 — 5	When the 20 Hz. 0.12 — 1 V
	Rear LH wheel	Ground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

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

Control Module I/O Signal

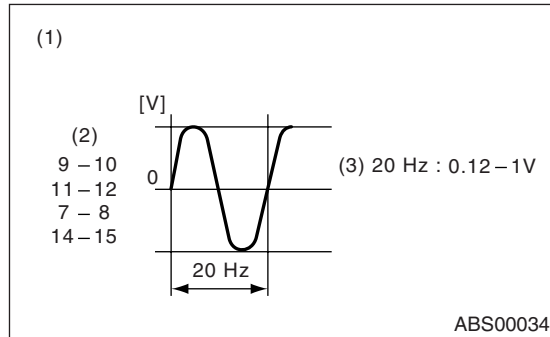
ABS (DIAGNOSTICS)

B: WIRING DIAGRAM



ABS00882

(1) Battery	(12) Rear inlet solenoid valve LH	(23) Front ABS wheel speed sensor RH
(2) Ignition switch	(13) Rear outlet solenoid valve LH	(24) Rear ABS wheel speed sensor LH
(3) ABS control module and hydraulic control unit (ABSCM&H/U)	(14) Rear inlet solenoid valve RH	(25) Rear ABS wheel speed sensor RH
(4) ABS control module	(15) Rear outlet solenoid valve RH	(26) Parking brake switch
(5) Valve relay	(16) Data link connector	(27) Brake fluid level switch
(6) Motor relay	(17) ABS warning light	(28) Transmission control module (AT model)
(7) Motor	(18) Brake warning light	(29) Driver's control center differential control module (STI model)
(8) Front inlet solenoid valve LH	(19) Stop light switch	(30) Yaw rate & lateral G sensor (STI model)
(9) Front outlet solenoid valve LH	(20) Stop light	
(10) Front inlet solenoid valve RH	(21) G sensor	
(11) Front outlet solenoid valve RH	(22) Front ABS wheel speed sensor LH	

C: WAVEFORM

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

6. Subaru Select Monitor

A: OPERATION

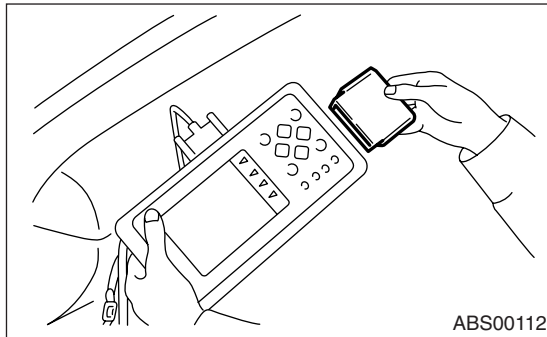
1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit.



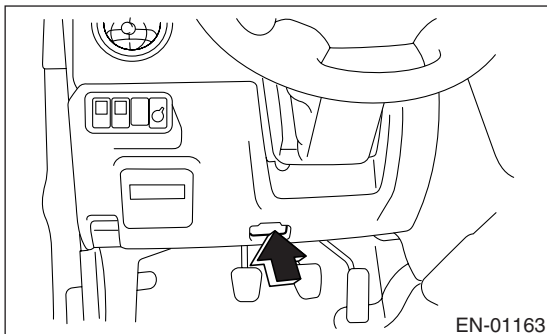
2) Connect the diagnosis cable to Subaru Select Monitor.

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



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

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

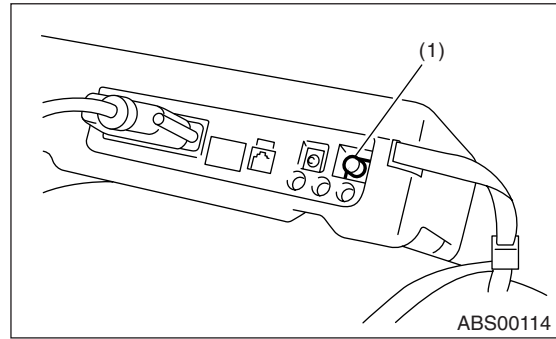


(2) Connect the diagnosis cable to data link connector.

CAUTION:

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

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



(1) Power switch

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

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

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

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

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

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning the DTC, refer to the LIST OF DTC. <Ref. to ABS(diag)-34, 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
G Sensor Output Signal	Vehicle acceleration detected by analog G sensor is displayed.	m/s (m/s ²)
Lateral G Sensor Output Signal	Lateral G detected by Lateral G sensor is displayed in voltage. (STI model)	m/s (m/s ²)
Valve Relay Signal	Valve Relay Signal	ON or OFF
ABS Warning Lamp	ON operation of ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Monitor voltage of motor relay is displayed.	V
IG power supply voltage	Voltage supplied to ABSCM&H/U is displayed.	V
ABS Control Flag	ABS control condition is displayed.	ON or OFF
ABS OK B Signal	ABS system normal/abnormal is displayed.	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 power switch and ignition switch to OFF.

NOTE:

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

4. ABS SEQUENCE CONTROL

Display screen	Contents to be monitored	Index No.
ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to ABS-10, ABS Sequence Control.>

5. FREEZE FRAME DATA

NOTE:

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

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by Front ABS wheel speed sensor RH is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front ABS wheel speed sensor LH is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed in km/h or mile/h.
IG power voltage	Power (in volts) supplied to ABSCM & H/U appears on the Subaru Select Monitor display.
G sensor output voltage	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.
Lateral G sensor output voltage	Voltage equivalent to Lateral G detected by analog Lateral G sensor is displayed.
Motor relay monitor	Motor relay operation monitor signal
Stop light switch	Stop light switch signal
ABS operation signal	ABS operation signal
Power Supply Failure	Occurrence of abnormal voltage during malfunction is displayed.
Vehicle speed	Vehicle speed is displayed.

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

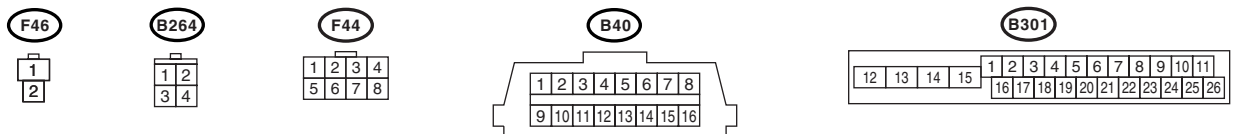
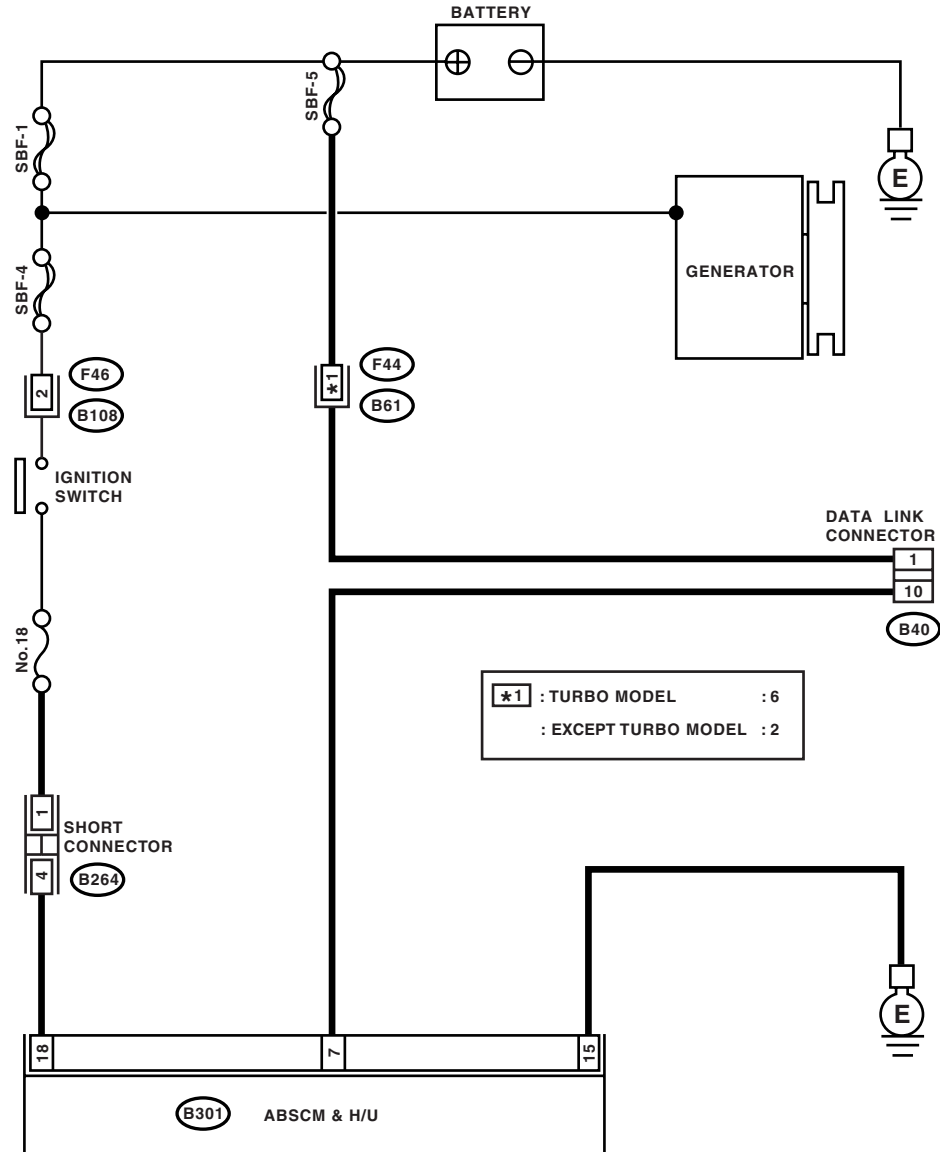
DETECTING CONDITION:

Faulty harness connector

TROUBLE SYMPTOM:

Communication cannot be executed between ABS and Subaru select monitor.

WIRING DIAGRAM:



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

Step	Check	Yes	No
10 CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 18 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 11.	Repair the open circuit in harness between ABSCM&H/U and battery.
11 CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U and transmission. 3) Measure the resistance of harness between ABSCM&H/U and chassis ground. Connector & terminal (B301) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 12.	Repair the open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2. NO TROUBLE CODE

DETECTING CONDITION:

ABS warning light circuit is shorted.

TROUBLE SYMPTOM:

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

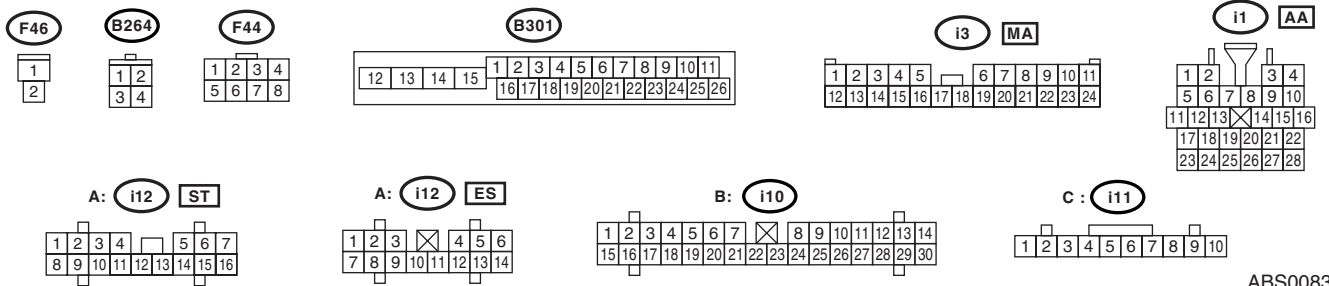
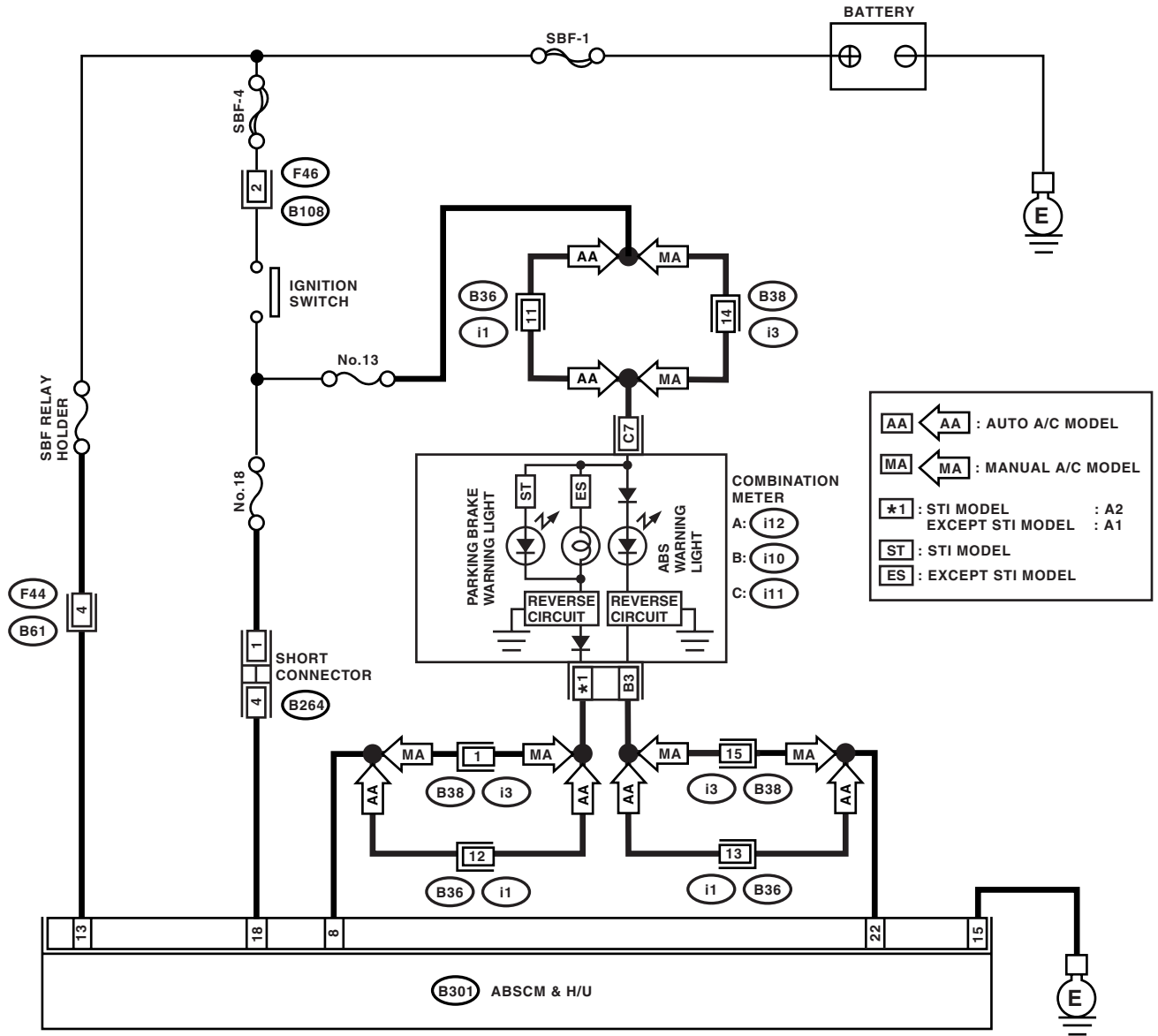
NOTE:

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

Subaru Select Monitor

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00833

Subaru Select Monitor

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 DATA CHECK SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the condition of "ABS warning light".	Is "ON" indicated?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 2.
2 CHECK WIRING HARNESS. Measure the resistance between ABSCM connector and combination meter connector. Connector & terminal (i10) No. 3 — (B301) No. 22:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair harness and connector between ABSCM&H/U and combination meter connector.
3 CHECK POOR CONTACT IN CONNECTOR.	Is there poor contact in ABSCM connector and combination meter connector?	Repair the connector.	Check the combination meter.

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

Refer to SUBARU SELECT MONITOR for details about reading of DTCs. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

8. Inspection Mode

A: PROCEDURE

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

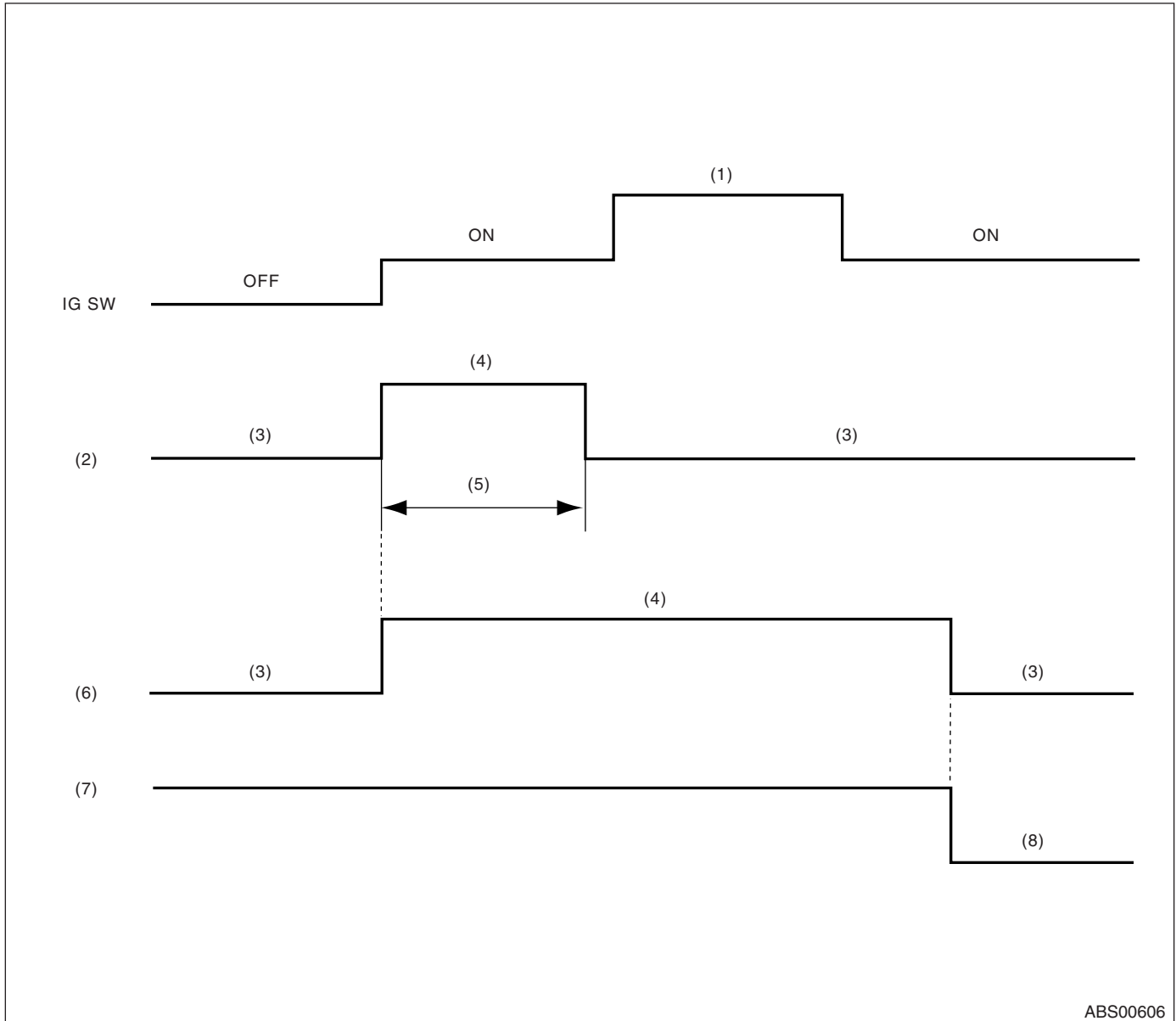
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least 1 minute.

9. Clear Memory Mode

A: OPERATION

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

A: INSPECTION



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

2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit.

Even though the ABS warning light does not go out about 2 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approx. 12 km/h (7 MPH). However, the Anti-lock brakes do not work while ABS warning light is illuminated.

ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

B: ABS WARNING LIGHT DOES NOT COME ON

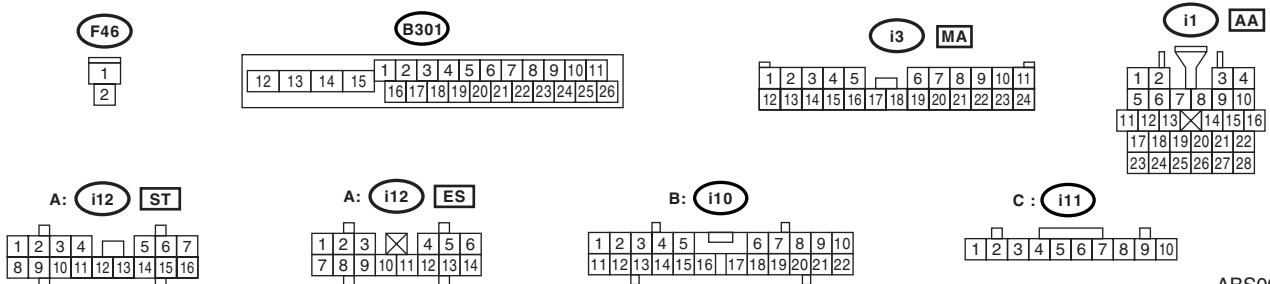
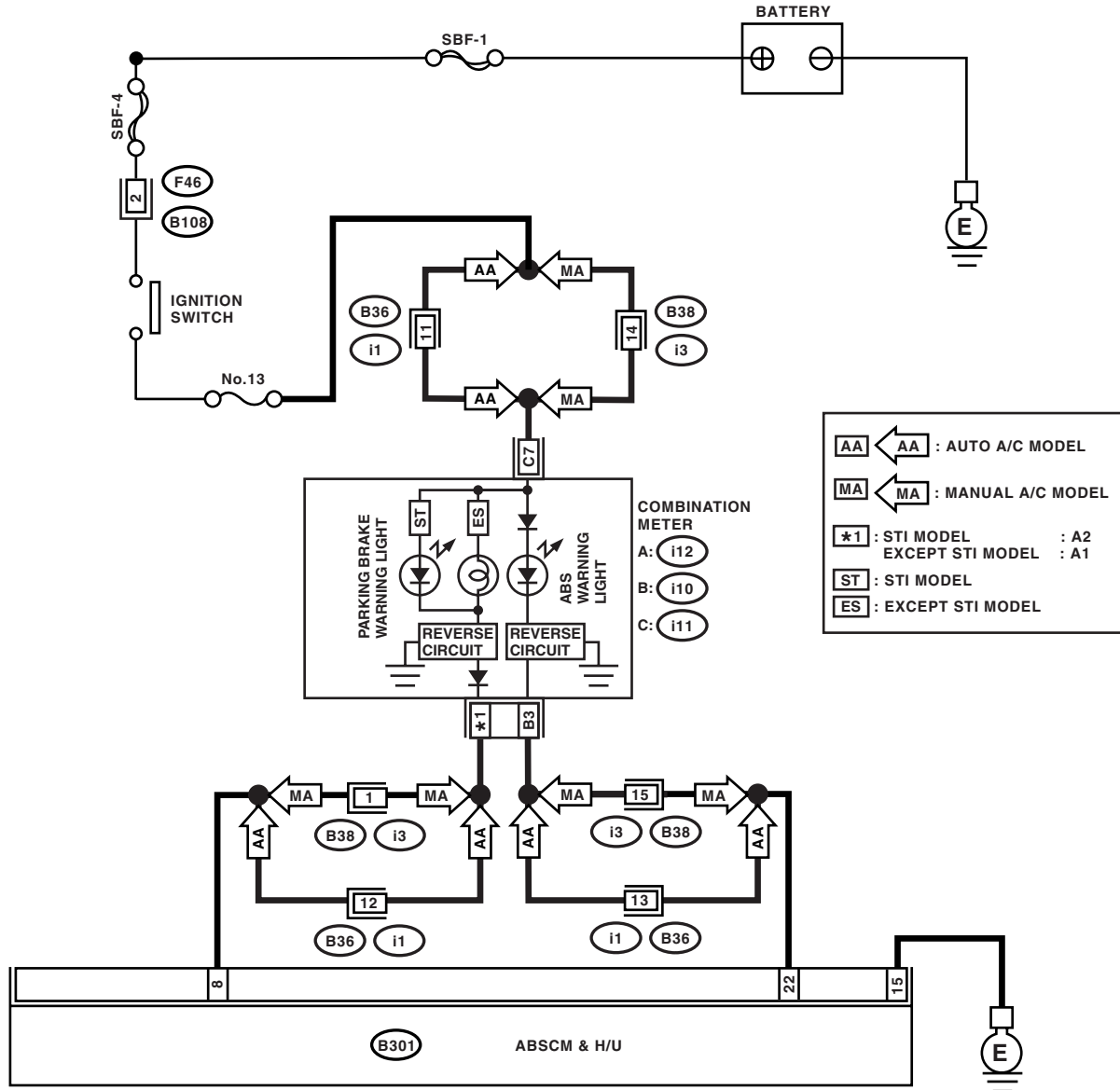
DETECTING CONDITION:

- Defective combination meter
- Defective harness

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



ABS00834

ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ILLUMINATION OF OTHER LIGHTS. Turn the ignition switch to ON. (engine OFF)	Do other warning lights illuminate?	Go to step 2 .	Check the combination meter.
2 READ DTC. Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step 3 .
3 CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Disconnect the connector from the combination meter. 4) Measure the resistance between ABSCM connector and chassis ground. Connector & terminal (B301) No. 22 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4 .	Repair harness and connector between ABSCM&H/U and combination meter connector.
4 CHECK ABSCM. 1) Connect the connector to the ABSCM&H/U. 2) Turn the ignition to ON. 3) Immediately after turning ignition switch to ON (within 1.5 seconds), measure the resistance of harness between the combination meter connector and chassis ground. Connector & terminal (i10) No. 3 — Chassis ground:	Is the resistance more than 1 MΩ?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

C: ABS WARNING LIGHT DOES NOT GO OFF

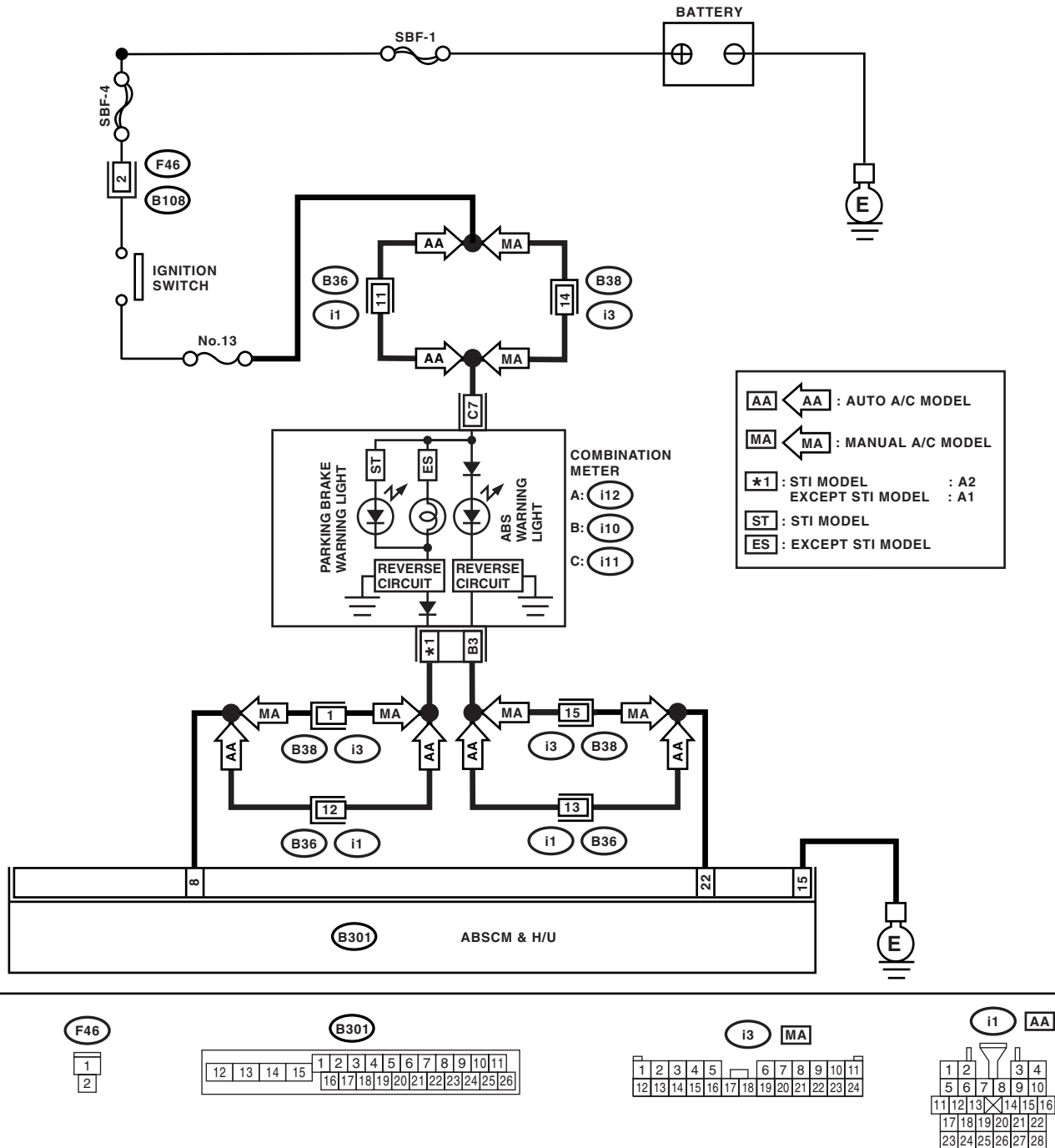
DETECTING CONDITION:

- Defective combination meter
- Open in harness

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



ABS00834

ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 READ DTC. Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step 2.
2 CHECK WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Disconnect the connector from the combination meter. 4) Measure the resistance between ABSCM connector and combination meter connector. Connector & terminal (B301) No. 22 — (i10) No. 3:	Is the resistance less than 0.5 Ω?	Go to step 3.	Repair harness and connector between ABSCM&H/U and combination meter connector.
3 CHECK POOR CONTACT IN CONNECTOR. Check poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step 4.
4 CHECK ABSCM. 1) Connect the connector to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. Connector & terminal (i10) No. 3 — Chassis ground:	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

D: BRAKE WARNING LIGHT DOES NOT GO OFF

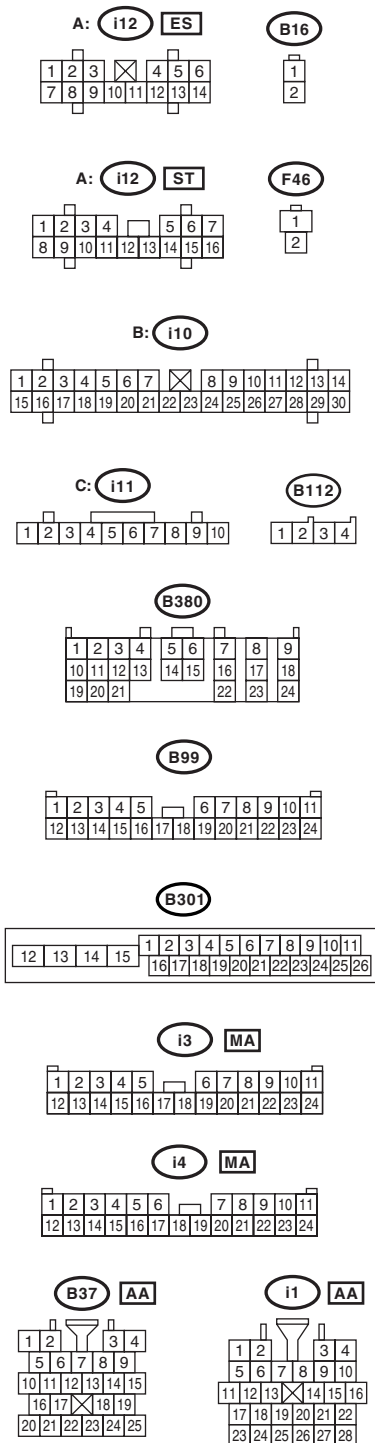
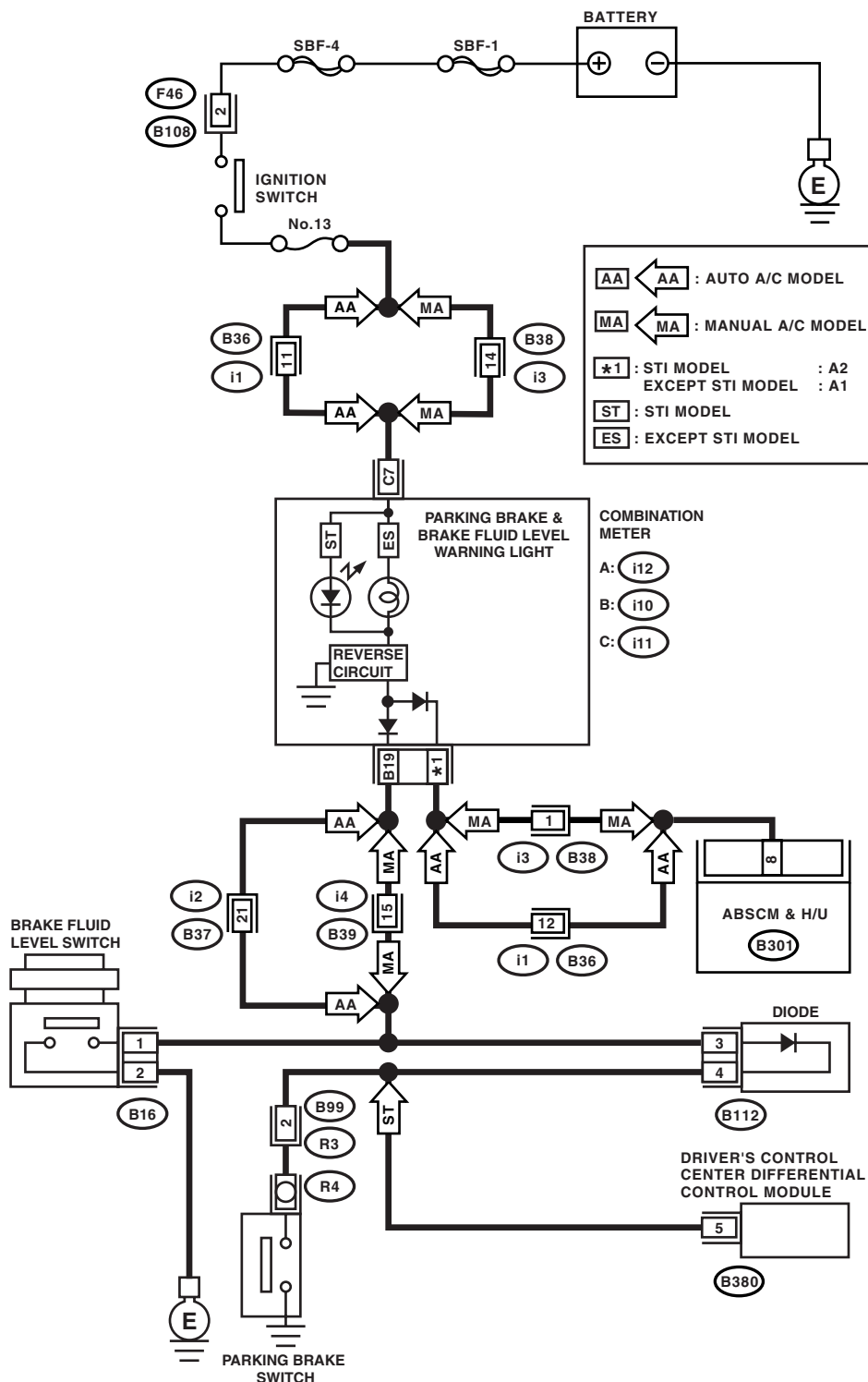
DETECTING CONDITION:

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

TROUBLE SYMPTOM:

After starting the engine, the brake warning light is kept on though the parking lever is released.

WIRING DIAGRAM:



ABS00835

ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INSTALLATION OF ABSCM&H/U CONNECTOR. 1) Turn the ignition switch to OFF. 2) Check that the ABSCM&H/U connector is inserted to ABSCM&H/U until the clamp locks onto it.	Is the connector correctly inserted?	Go to step 2.	Insert the ABSCM&H/U connector until the clamp locks onto it.
2 READ DTC. Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step 3.
3 CHECK THE BRAKE FLUID AMOUNT. Check the amount of brake fluid in the reservoir tank of master cylinder.	Is the amount of brake fluid between the lines of MAX and MIN?	Go to step 4.	Replenish brake fluid to the specified value.
4 CHECK BRAKE FLUID LEVEL SWITCH. 1) Disconnect the brake fluid level switch connector (B16) from master cylinder. 2) Measure the resistance of brake fluid switch terminals. Terminals No. 1 — No. 2:	Is the resistance more than 1 MΩ?	Go to step 5.	Replace the master cylinder.
5 CHECK PARKING BRAKE SWITCH. 1) Disconnect the connector (R4) from parking brake switch. 2) Release the parking brake. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance more than 1 MΩ?	Go to step 6.	Replace the parking brake switch.
6 CHECK GROUND SHORT OF HARNESS. 1) Disconnect the connector from combination meter. 2) Measure the resistance between combination meter connector and chassis ground. Connector & terminal (i10) No. 19 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 7.	Repair the harness connector between combination meter and parking brake switch.
7 CHECK HARNESS. 1) Disconnect the connector from ABSCM&H/U. 2) Disconnect the connector from the combination meter. 3) Measure the resistance between ABSCM&H/U connector and combination meter connector. Connector & terminal (B301) No. 8 — (i12) No. 1:	Is the resistance less than 0.5 Ω?	Go to step 8.	Repair harness between ABSCM&H/U and combination meter connector.
8 CHECK POOR CONTACT IN CONNECTOR. Check poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step 9.
9 CHECK ABSCM. 1) Connect the connector to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. Connector & terminal (i12) No. 1 — Chassis ground:	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

List of Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

11. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Subaru Select Monitor communication failure	<Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>
—	No DTC	Although no DTC appears on the Subaru Select Monitor display, the ABS warning light remains on.	<Ref. to ABS(diag)-21, NO TROUBLE CODE, INSPECTION, Subaru Select Monitor.>
21	Open or short circuit in Front ABS wheel speed sensor RH circuit	Open or short circuit in Front ABS wheel speed sensor RH circuit	<Ref. to ABS(diag)-36, DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Front ABS wheel speed sensor RH abnormal signal	Front ABS wheel speed sensor RH abnormal signal	<Ref. to ABS(diag)-42, DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Open or short circuit in Front ABS wheel speed sensor LH circuit	Open or short circuit in Front ABS wheel speed sensor LH circuit	<Ref. to ABS(diag)-36, DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Front ABS wheel speed sensor LH abnormal signal	Front ABS wheel speed sensor LH abnormal signal	<Ref. to ABS(diag)-42, DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	Open or short circuit in Rear ABS wheel speed sensor RH circuit	Open or short circuit in Rear ABS wheel speed sensor RH circuit	<Ref. to ABS(diag)-36, DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	Rear ABS wheel speed sensor RH abnormal signal	Rear ABS wheel speed sensor RH abnormal signal	<Ref. to ABS(diag)-42, DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	Open or short circuit in Rear ABS wheel speed sensor LH circuit	Open or short circuit in Rear ABS wheel speed sensor LH circuit	<Ref. to ABS(diag)-37, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	Rear ABS wheel speed sensor LH abnormal signal	Rear ABS wheel speed sensor LH abnormal signal	<Ref. to ABS(diag)-43, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
29	Abnormal ABS wheel speed sensor signal on any one of four sensor	Abnormal ABS wheel speed sensor signal on any one of four	<Ref. to ABS(diag)-47, DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Front inlet valve RH malfunction	Front inlet valve RH malfunction	<Ref. to ABS(diag)-51, DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Front outlet valve RH malfunction	Front outlet valve RH malfunction	<Ref. to ABS(diag)-53, DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Front inlet valve LH malfunction	Front inlet valve LH malfunction	<Ref. to ABS(diag)-51, DTC 33 FRONT LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	Front outlet valve LH malfunction	Front outlet valve LH malfunction	<Ref. to ABS(diag)-53, DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	Rear inlet valve RH malfunction	Rear inlet valve RH malfunction	<Ref. to ABS(diag)-51, DTC 35 REAR RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

DTC	Display screen	Contents of diagnosis	Index No.
36	Rear outlet valve RH malfunction	Rear outlet valve RH malfunction	<Ref. to ABS(diag)-53, DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	Rear inlet valve LH malfunction	Rear inlet valve LH malfunction	<Ref. to ABS(diag)-51, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Rear outlet valve LH malfunction	Rear outlet valve LH malfunction	<Ref. to ABS(diag)-53, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
41	ABS control module malfunction	ABSCM&H/U	<Ref. to ABS(diag)-56, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	Power supply voltage Failure	Power voltage malfunction	<Ref. to ABS(diag)-57, DTC 42 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
47	Improper CAN Communication	CAN communication circuit failure	<Ref. to ABS(diag)-60, DTC 47 IMPROPER CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS(diag)-63, DTC 51 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	Motor and motor Relay	Motor/motor relay on failure	<Ref. to ABS(diag)-66, DTC 52 MOTOR / MOTOR RELAY ON FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS(diag)-69, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
56	G sensor Failure	Faulty G sensor output voltage or output signal	<Ref. to ABS(diag)-71, DTC 56 FAULTY G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	Lateral G sensor Failure	Lateral G sensor output voltage or output signal malfunction	<Ref. to ABS(diag)-74, DTC 73 LATERAL G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-37, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-37, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-37, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT

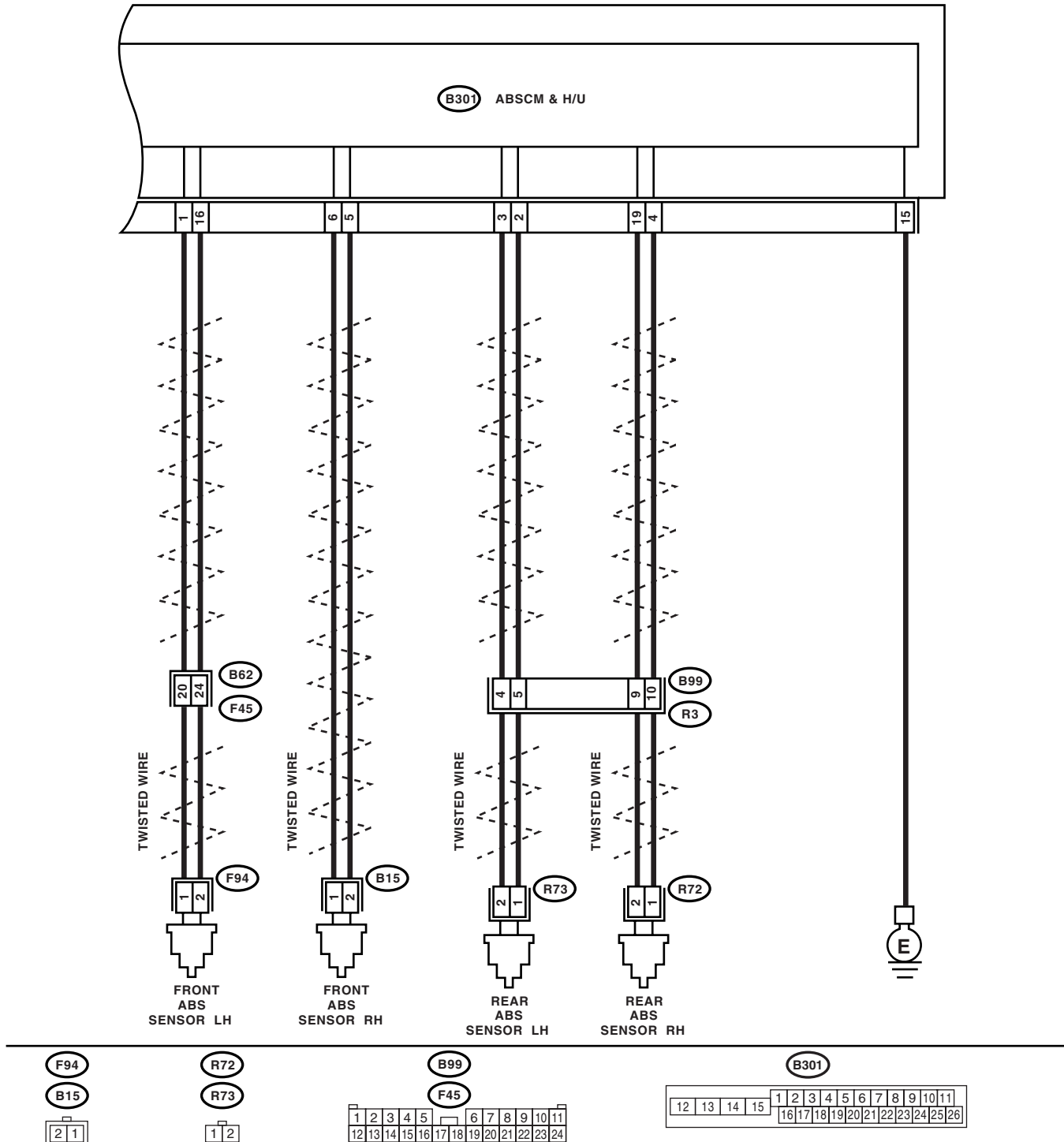
DIAGNOSIS:

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

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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.	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step 2.	Go to step 8.
2 CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step 3.	Tighten the ABS wheel speed sensor installation bolts securely.
3 CHECK ABS WHEEL SPEED SENSOR GAP. Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 4.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
4 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 5.	Replace the tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
5 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step 6.
6 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-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. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, 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-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, 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-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, 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. 6 — No. 5: DTC 23 (B301) No. 1 — No. 16: DTC 25 (B301) No. 19 — No. 4: DTC 27 (B301) No. 3 — No. 2:	Is the resistance 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.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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. 6 (+) — Chassis ground (-):</i> DTC 23 <i>(B301) No. 1 (+) — Chassis ground (-):</i> DTC 25 <i>(B301) No. 19 (+) — Chassis ground (-):</i> DTC 27 <i>(B301) No. 3 (+) — 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. 6 (+) — Chassis ground (-):</i> DTC 23 <i>(B301) No. 1 (+) — Chassis ground (-):</i> DTC 25 <i>(B301) No. 19 (+) — Chassis ground (-):</i> DTC 27 <i>(B301) No. 3 (+) — 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-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, 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. 6 — Chassis ground: DTC 23 (B301) No. 1 — Chassis ground: DTC 25 (B301) No. 19 — Chassis ground: DTC 27 (B301) No. 3 — Chassis ground:	Is the resistance 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.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

E: DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-43, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-43, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-43, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

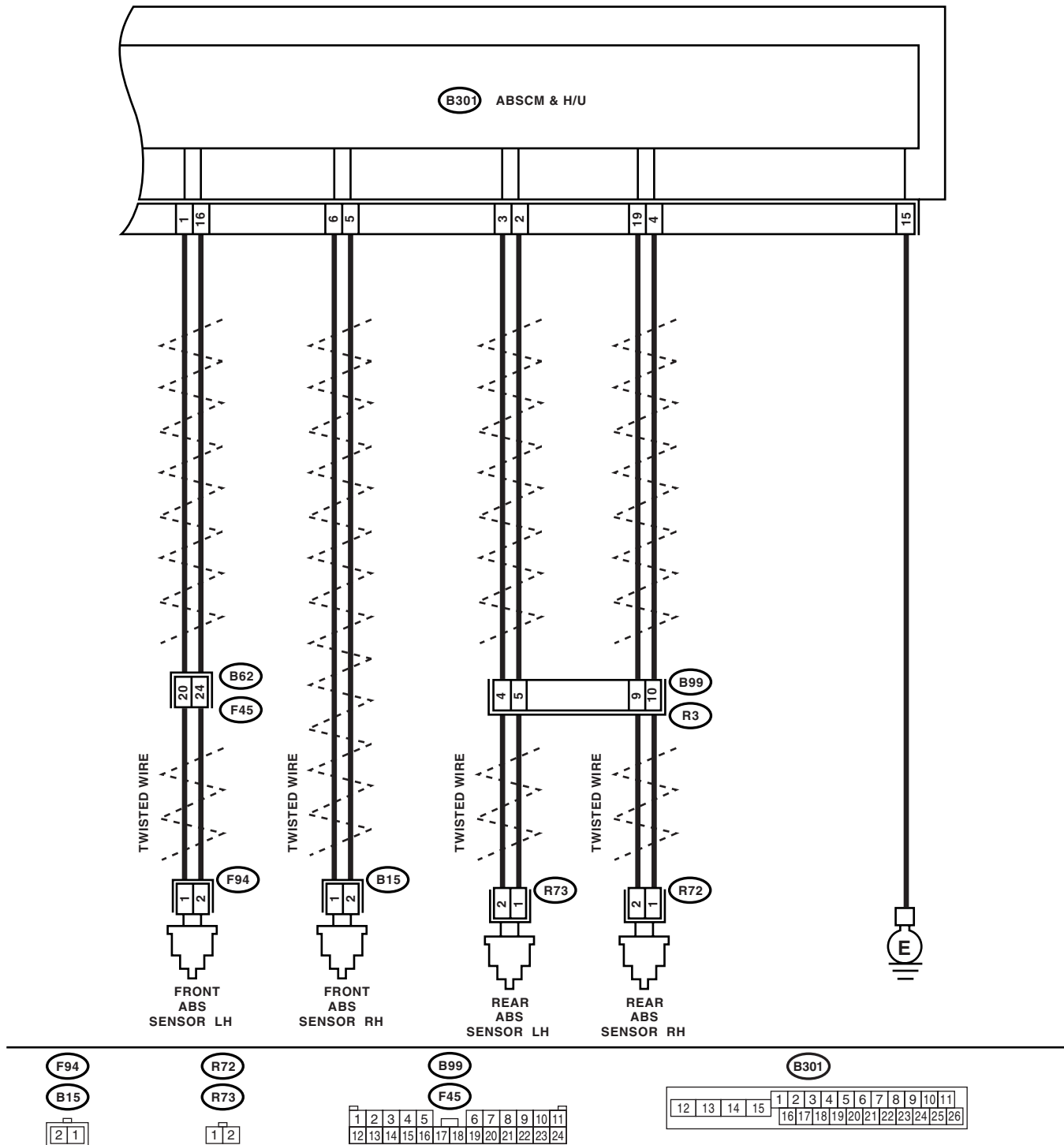
DIAGNOSIS:

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

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00607

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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.	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step 2.	Go to step 7.
2 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE.	Is the car 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) 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 noise interference.
7 CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step 8.	Tighten the ABS wheel speed sensor installation bolts securely.
8 CHECK ABS WHEEL SPEED SENSOR GAP. Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 9.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
9 PREPARE OSCILLOSCOPE.	Is an oscilloscope available?	Go to step 10.	Go to step 11.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS&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 the waveform pattern on oscilloscope as shown in the figure?	Go to step 14.	Go to step 11.
11 CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor or drum from hub in accordance with DTC.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step 12.
12 CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.	Are there broken or damaged in the ABS wheel speed sensor piece or tone wheel?	Go to step 13.	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
13 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 14.	Replace the tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals while shaking the harness lightly. Terminals Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 15.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.>
15 CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR. Measure the resistance between ABS wheel speed sensor and chassis ground. Terminals Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 16.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.>
16 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR. 1) Connect the connector to ABS wheel speed sensor. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance at ABSCM&H/U connector terminals. Connector & terminal DTC 22 (B301) No. 6 — No. 5: DTC 24 (B301) No. 1 — No. 16: DTC 26 (B301) No. 19 — No. 4: DTC 28 (B301) No. 3 — No. 2:	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 17.	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
17 CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 22 (B301) No. 6 — Chassis ground: DTC 24 (B301) No. 1 — Chassis ground: DTC 26 (B301) No. 19 — Chassis ground: DTC 28 (B301) No. 3 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 18.	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
18 CHECK GROUND CIRCUIT OF ABSCM&H/U. Measure the resistance between ABSCM&H/U and chassis ground. Connector & terminal (B301) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 19.	Repair the ABSCM&H/U ground harness.
19 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step 20.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
20 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or the wireless transmitter properly installed?	Go to step 21 .	Properly install the car telephone or wireless transmitter.
21 CHECK SOURCES OF SIGNAL NOISE.	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness.	Go to step 22 .
22 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-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 noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

I: DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR

DIAGNOSIS:

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

TROUBLE SYMPTOM:

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

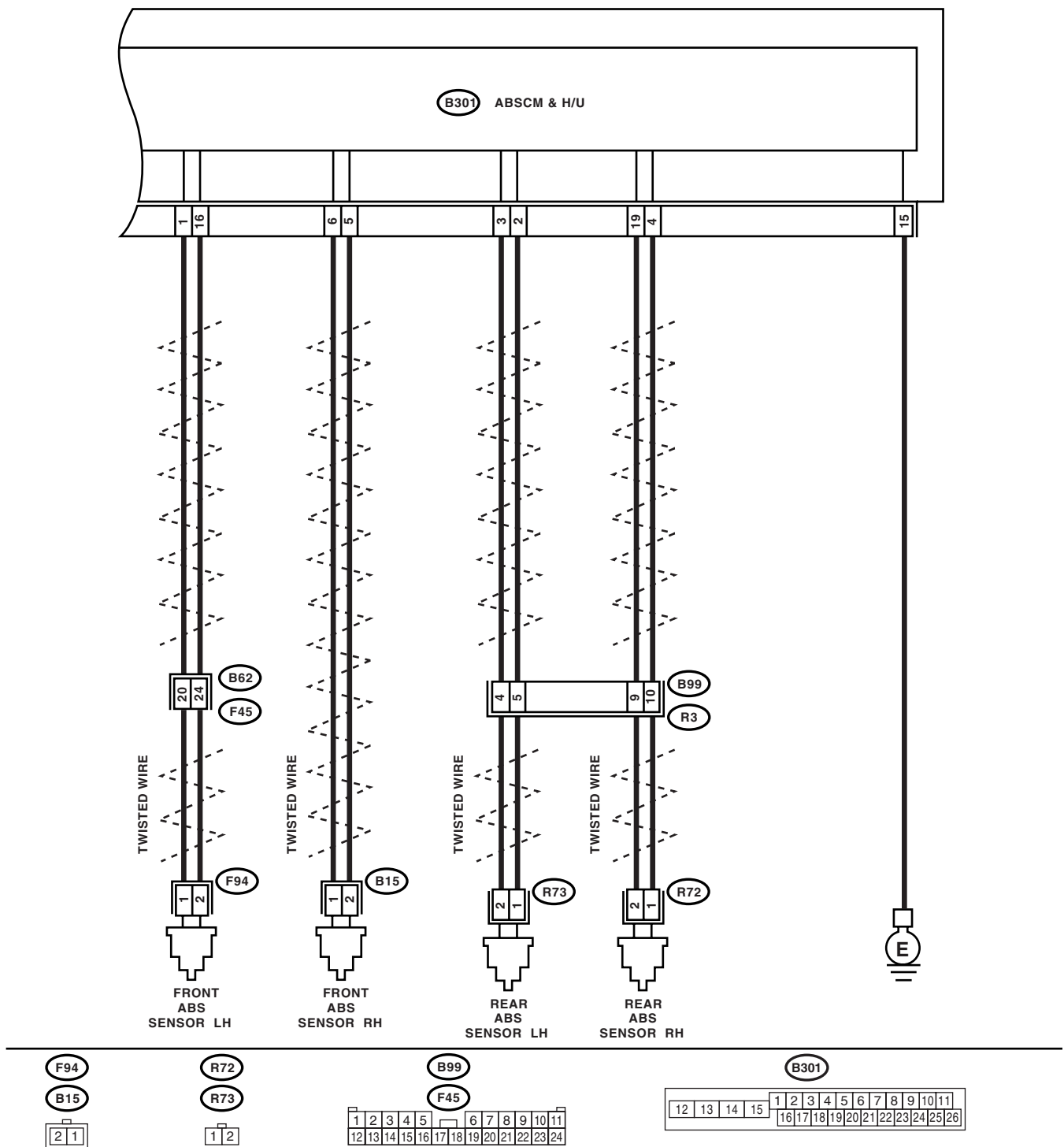
NOTE:

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00607

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.	Is the wheels have been turned freely for more than one minute, such as when vehicle is jacked-up, under full-lock cornering or the tires not in contact with road surface?	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when vehicle is towed or jacked-up, or when steering wheel is continuously turned all way, this DTC may sometimes occur.
2	CHECK TIRE SPECIFICATIONS. Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step 3.
3	CHECK WEAR OF TIRE.	Is the tire worn excessively?	Replace the tire.
4	CHECK TIRE PRESSURE.	Is the tire pressure correct?	Go to step 5.
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.
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.
7	PREPARE OSCILLOSCOPE.	Is an oscilloscope available?	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.
8	CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM&H/U sometimes stores the DTC 29. Connector & terminal 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 (-):	Is the waveform pattern on oscilloscope as shown in the figure?	Go to step 8.
9	CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor or drum from hub.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Go to step 9.
		Thoroughly remove dirt or other foreign matter.	Go to step 10.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, 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-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, 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.

J: DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-51, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 33 FRONT LEFT INLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-51, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 35 REAR RIGHT INLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-51, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC 37 REAR LEFT INLET VALVE MALFUNCTION

DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:

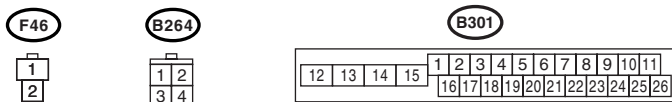
- ABS does not operate.
- EBD does not operate.

NOTE:

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

ABS (DIAGNOSTICS)

The diagram illustrates the electrical system for the generator. The battery is connected to the generator through a fuse block containing fuses F46 and B108. The circuit includes an ignition switch, a short connector with fuses B264 and B301, and a ground connection. The generator is labeled 'GENERATOR' and the battery is labeled 'BATTERY'.



ABS(diag)-52

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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. 18 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN 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.

N: DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-53, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-53, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-53, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION

DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve

TROUBLE SYMPTOM:

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

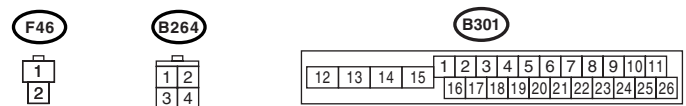
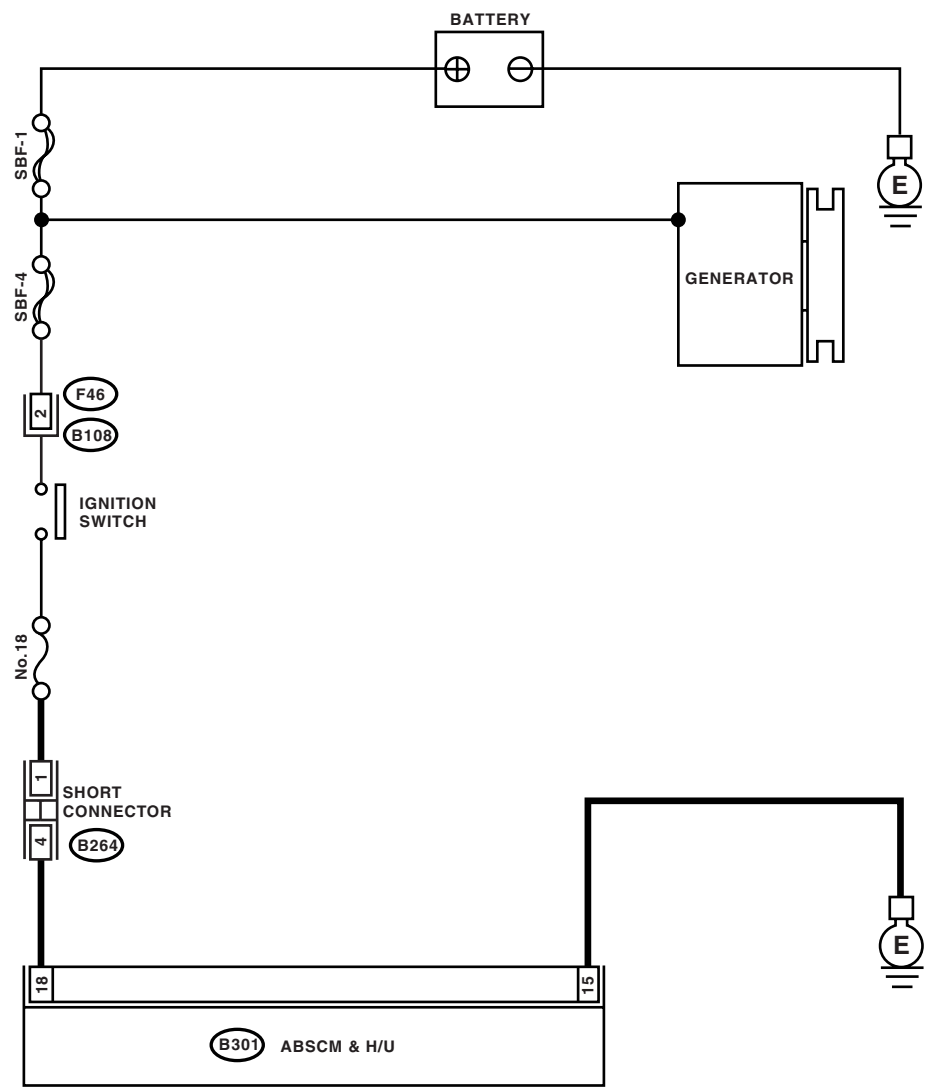
NOTE:

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00836

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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. 18 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN 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.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

R: DTC 41 ABS CONTROL MODULE MALFUNCTION

DIAGNOSIS:

Faulty ABSCM&H/U

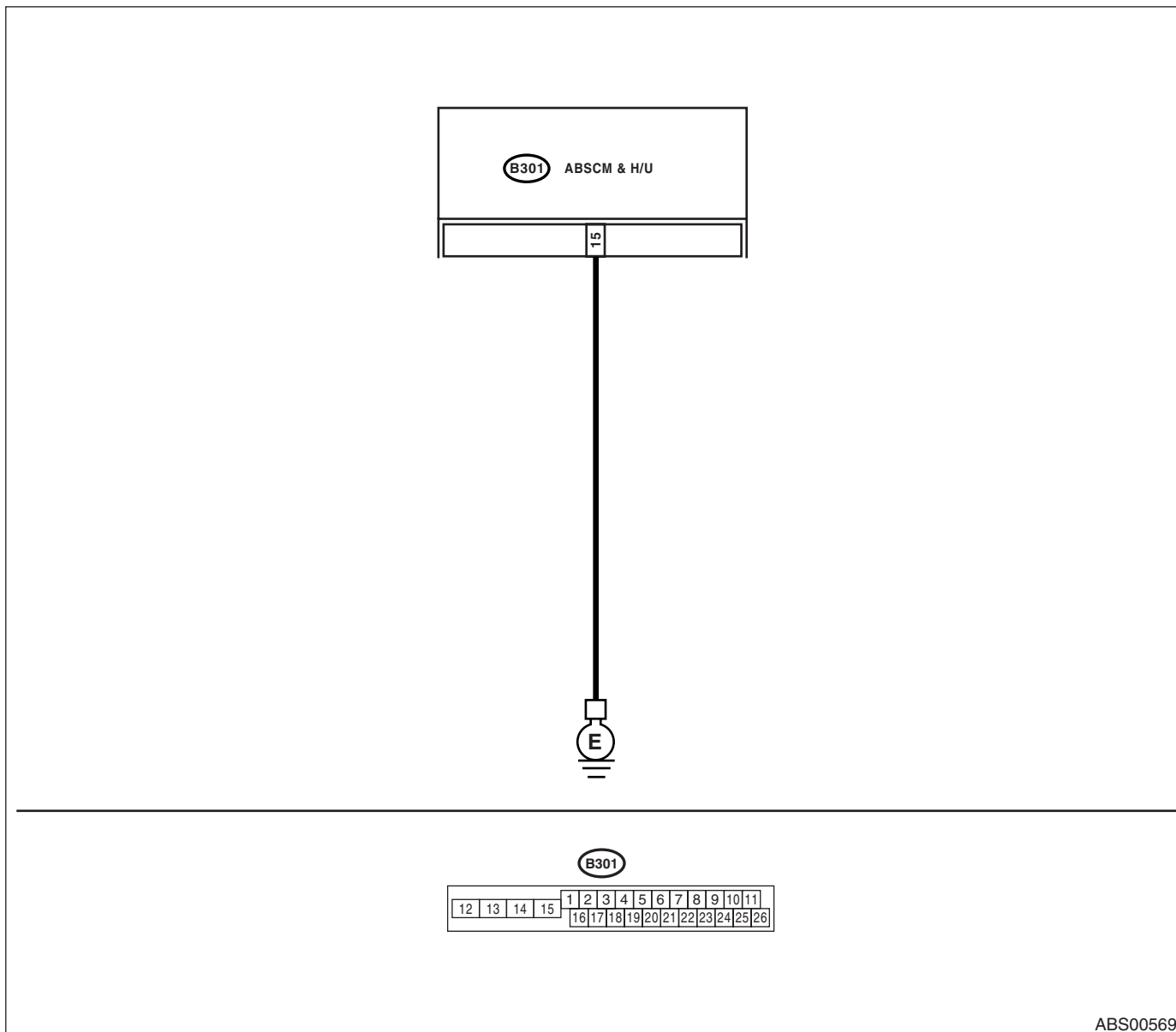
TROUBLE SYMPTOM:

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

NOTE:

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

WIRING DIAGRAM:



ABS00569

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 2.	Repair the ABSCM&H/U ground harness.
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE.	Is the car 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.

S: DTC 42 POWER VOLTAGE MALFUNCTION

DIAGNOSIS:

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

TROUBLE SYMPTOM:

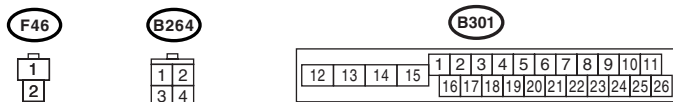
- ABS does not operate.
- EBD may not operate.

NOTE:

If EBD does not operate, brake warning light comes on as well as ABS warning light. Both warning lights go off if voltage returns.

ABS (DIAGNOSTICS)

Wiring diagram of the generator circuit. The circuit starts with a BATTERY (positive terminal) connected to a fuse block containing fuses F46 and B108. The circuit then passes through an IGNITION SWITCH and a fuse block containing fuses B264 and B301. The circuit is completed by a GENERATOR and a terminal block with terminals 18 and 15. The diagram also shows a ground connection for the generator and a terminal block with terminals 18 and 15.



ABS(diag)-58

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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. 18 (+) — Chassis ground (-):	Is the voltage 10 — 17 V?	Go to step 4.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the ABSCM&H/U ground harness.
5 CHECK POOR CONTACT IN 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.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

T: DTC 47 IMPROPER CAN COMMUNICATION

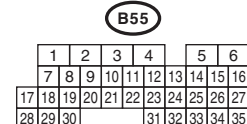
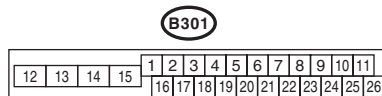
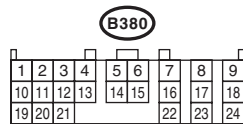
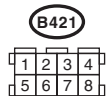
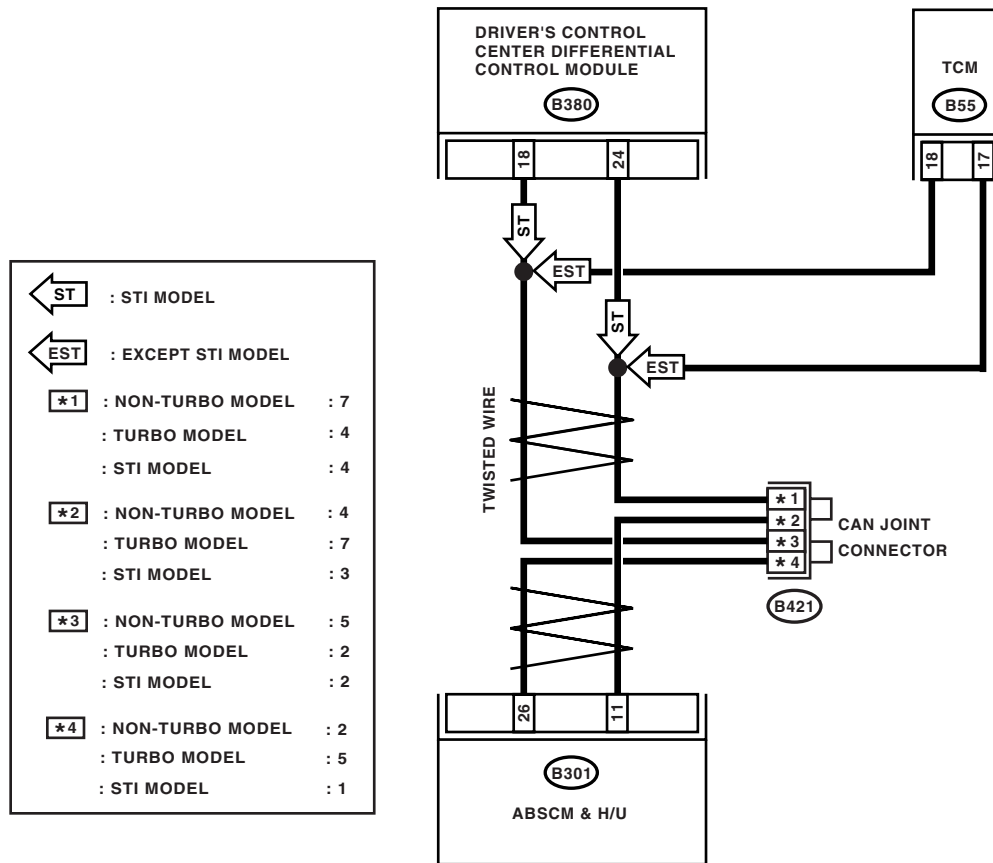
DIAGNOSIS:

CAN communication circuit is damaged or shorted.

TROUBLE SYMPTOM:

- ABS does not operate. (STI model)
- Tight corner braking phenomenon occurs. (AT model)

WIRING DIAGRAM:



ABS00837

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK MODEL TYPE.	Go to step 2.	Go to step 11.
2	CHECK HARNESS CONNECTOR BETWEEN ABSCM AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE. 1) Turn the ignition switch to ON. 2) Disconnect the connector from ABSCM and driver's control center differential control module. 3) Measure the resistance of harness connector between ABSCM and driver's control center differential control module. Connector & terminal (B301) No. 26 — (B380) No. 18: (B301) No. 11 — (B380) No. 24:	Go to step 3.	Repair or replace the harness connector between ABSCM and driver's control center differential control module.
3	CHECK GROUND SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE. Measure the resistance between ABSCM connector and chassis ground. Connector & terminal (B301) No. 26 — Chassis ground: (B301) No. 11 — Chassis ground:	Go to step 4.	Repair or replace the harness connector between ABSCM and driver's control center differential control module.
4	CHECK BATTERY SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE. 1) Turn the ignition switch to ON. 2) Measure the resistance between ABSCM connector and chassis ground. Connector & terminal (B301) No. 26 — Chassis ground: (B301) No. 11 — Chassis ground:	Go to step 5.	Repair or replace the harness connector between ABSCM and driver's control center differential control module.
5	CHECK ABSCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to ABSCM. 3) Measure the resistance between driver's control center differential control module connector terminals. Connector & terminal (B380) No. 18 — (B380) No. 24:	Go to step 7.	Go to step 6.
6	CHECK POOR CONTACT IN ABSCM CONNECTOR.	Repair poor contact in ABSCM connector.	Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE. 1) Connect the connector to driver's control differential control module. 2) Disconnect the connector from ABSCM. 3) Measure the resistance between ABSCM connector terminals. Connector & terminal (B301) No. 11 — (B301) No. 26:	Go to step 9.	Go to step 8.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK POOR CONTACT IN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE CONNECTOR.	Is there poor contact?	Repair poor contact in driver's control center differential control module connector.	Replace the driver's control center differential control module. <Ref. to 6MT-126, Driver's Control Center Differential Control Module.>
9 CHECK DTC.	Is DTC 47 detected?	Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 10 .
10 CHECK DTC P1720 INDICATION FOR DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO SYSTEM.	Is DTC P1720 displayed?	Replace the driver's control center differential control module. <Ref. to 6MT-126, Driver's Control Center Differential Control Module.>	Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
11 CHECK HARNESS CONNECTOR BETWEEN ABSCM AND TCM. 1) Turn the ignition switch to ON. 2) Disconnect the connector from ABSCM and TCM. 3) Measure the resistance of harness connector between ABSCM and TCM. Connector & terminal (B301) No. 26 — (B55) No. 18: (B301) No. 11 — (B55) No. 17:	Is the resistance less than 0.5 Ω?	Go to step 12 .	Repair or replace the harness connector between ABSCM and TCM.
12 CHECK GROUND SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND TCM. Measure the resistance between ABSCM connector and chassis ground. Connector & terminal (B301) No. 26 — Chassis ground: (B301) No. 11 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 13 .	Repair or replace the harness connector between ABSCM and TCM.
13 CHECK BATTERY SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND TCM. 1) Turn the ignition switch to ON. 2) Measure the resistance between ABSCM connector and chassis ground. Connector & terminal (B301) No. 26 — Chassis ground: (B301) No. 11 — Chassis ground:	Is the voltage less than 1.0 V?	Go to step 14 .	Repair or replace the harness connector between ABSCM and TCM.
14 CHECK ABSCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to ABSCM. 3) Measure the resistance between TCM connector terminals. Connector & terminal (B55) No. 17 — (B55) No. 18:	Is the resistance 120 ± 6 Ω?	Go to step 16 .	Go to step 15 .

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
15 CHECK POOR CONTACT IN ABSCM CONNECTOR.	Is there poor contact?	Repair poor contact in ABSCM connector.	Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
16 CHECK TCM. 1) Connect the connector to TCM. 2) Disconnect the connector from ABSCM. 3) Measure the resistance between ABSCM connector terminals. Connector & terminal (B301) No. 11 — (B301) No. 26:	Is the resistance $120 \pm 6 \Omega$?	Go to step 18 .	Go to step 17 .
17 CHECK POOR CONTACT IN TCM CONNECTOR.	Is there poor contact?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-62, Transmission Control Module (TCM).>
18 CHECK DTC.	Is DTC 47 detected?	Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 19 .
19 CHECK DTC P1718 INDICATION FOR TCM SYSTEM.	Is DTC P1718 displayed?	Replace the TCM. <Ref. to 4AT-62, Transmission Control Module (TCM).>	Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

U: DTC 51 VALVE RELAY MALFUNCTION

DIAGNOSIS:

Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate depending on the trouble contents.

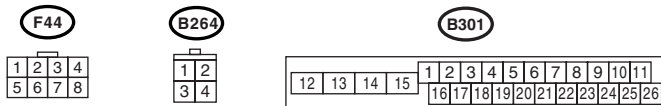
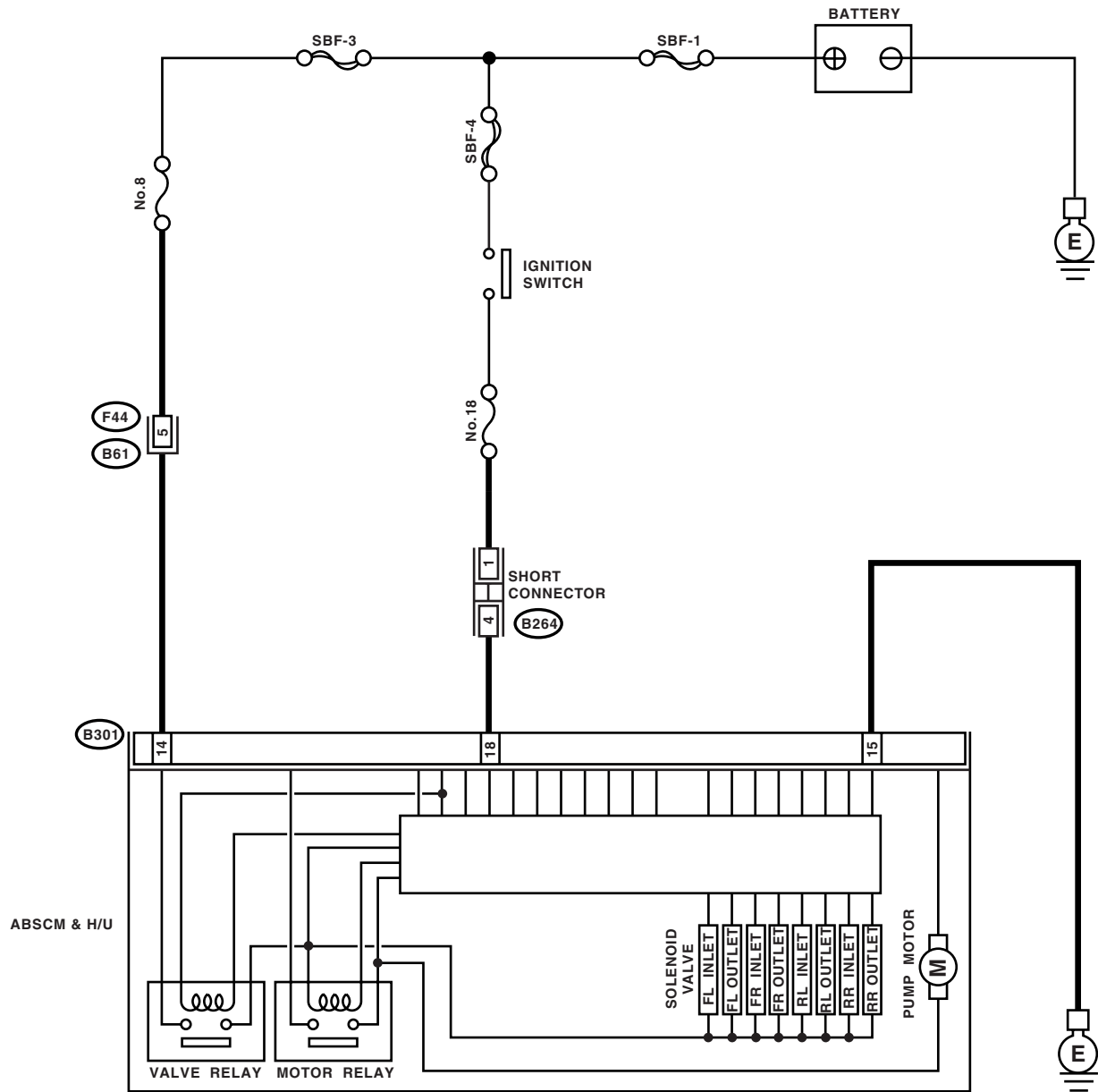
NOTE:

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00872

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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. 18 (+) — Chassis ground (-): (B301) No. 14 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness connector between battery and ABSCM&H/U.
2 CHECK 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. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK VALVE RELAY IN ABSCM&H/U. Measure the resistance between ABSCM&H/U terminals. Terminals No. 14 — No. 15:	Is the resistance more than 1 M Ω ?	Go to step 4.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK POOR CONTACT IN 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 still displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 6.
6 CHECK ANY OTHER DTC.	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

V: DTC 52 MOTOR / MOTOR RELAY ON FAILURE

DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector
- Insufficient tightening of earth bolt

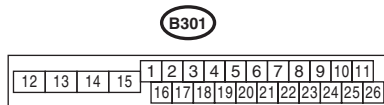
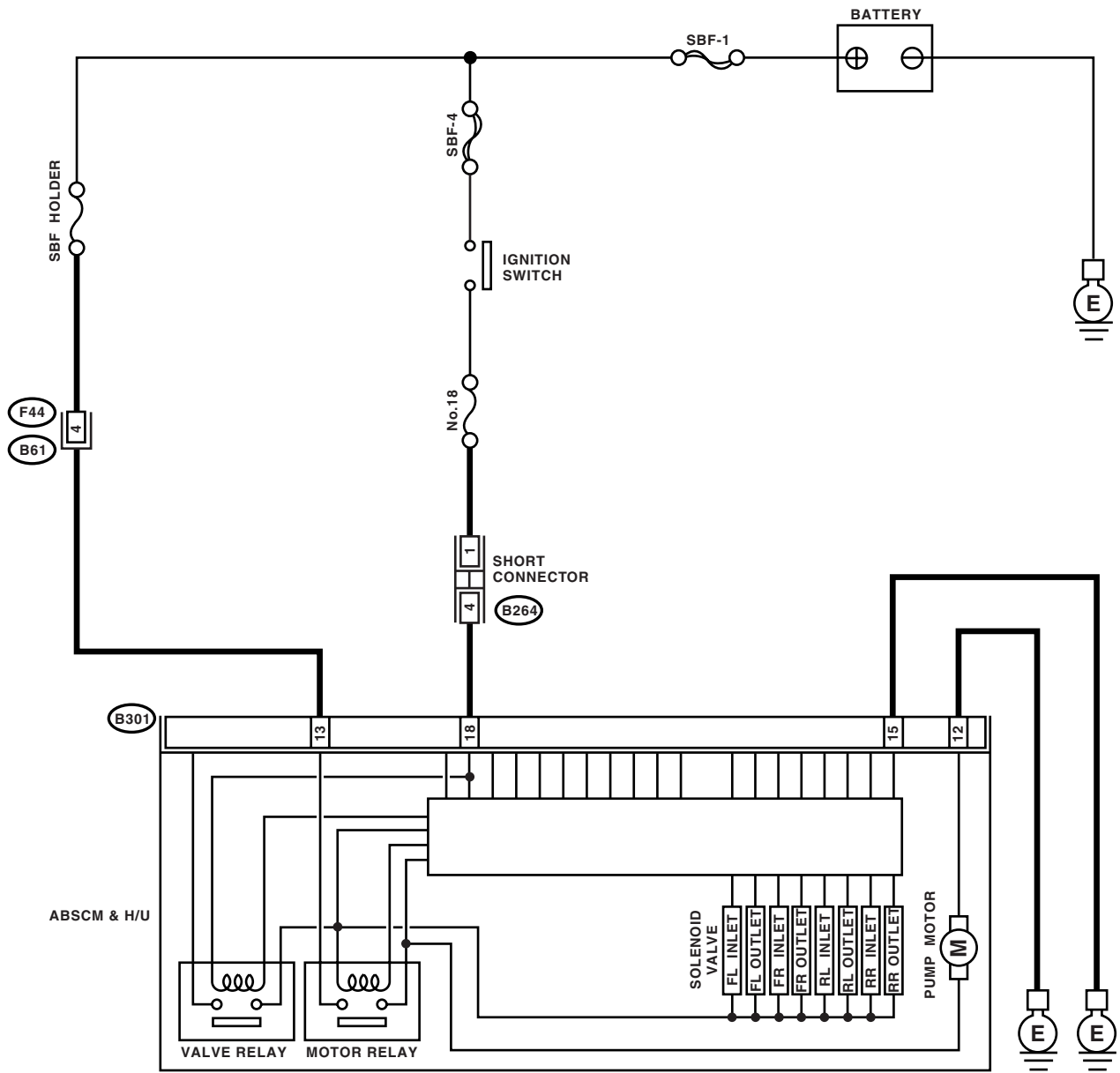
TROUBLE SYMPTOM:

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS00873

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

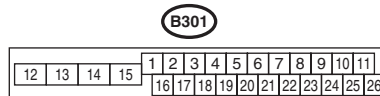
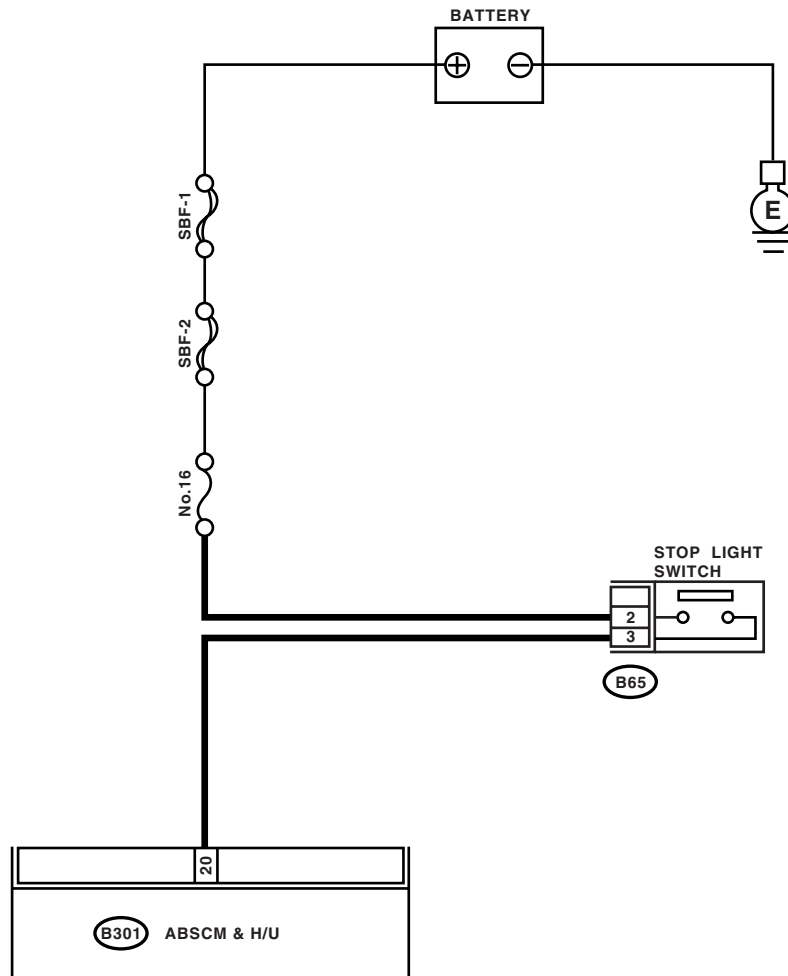
Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 13 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF8.
2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 12 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 18 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the ABSCM&H/U ground harness.
5 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-10, 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.

W: DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

DIAGNOSIS:

Faulty stop light switch

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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 signal in Subaru Select Monitor data display.	Is "OFF" indicated?	Go to step 2.	Go to step 3.
2 CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR. 1) Depress the brake pedal. 2) Read the stop light switch signal in Subaru Select Monitor data display.	Is "ON" indicated?	Go to step 5.	Go to step 3.
3 CHECK IF STOP LIGHTS COME ON. Depress the brake pedal.	Do the stop lights turn on?	Go to step 4.	Repair the stop lights circuit.
4 CHECK OPEN CIRCUIT IN HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 20 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 5.	Repair the harness between stop light switch and ABSCM&H/U connector.
5 CHECK POOR CONTACT 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.

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

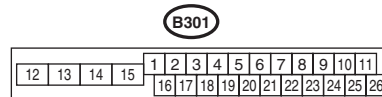
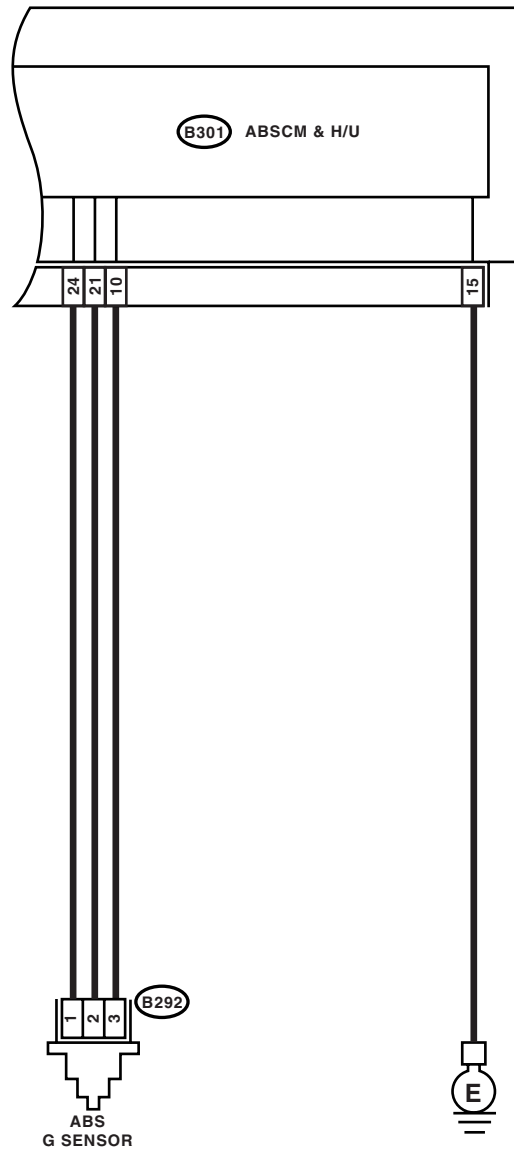
DIAGNOSIS:

Faulty G sensor

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 WHETHER A WHEEL TURNED FREELY OR NOT.	Have the wheels been turned freely when the vehicle is lifted up or drove on a rolling road?	ABS is normal. Erase the memory.	Go to step 2.
2 CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the G sensor output on Subaru Select Monitor.	Is the reading indicated on display -1.2 — 1.2 m/s when G sensor is horizontal?	Go to step 3.	Go to step 6.
3 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 4.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC still displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
6 CHECK INPUT VOLTAGE OF G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 1 (+) — No. 3 (-):	Is the voltage 4.75 — 5.25 V?	Go to step 7.	Repair the harness connector between G sensor and ABSCM&H/U.
7 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal (B301) No. 21 — No. 10:	Is the resistance 3.6 — 3.8 kΩ?	Go to step 8.	Repair the harness connector between G sensor and ABSCM&H/U.
8 CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS. 1) Disconnect the connector from G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 21 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 9.	Repair the harness/connector between G sensor and ABSCM&H/U.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK G SENSOR. 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 2.1 — 2.5 V when G sensor is on a level?	Go to step 10.	Replace the G sensor. <Ref. to ABS-21, G Sensor.>
10 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 3.6 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step 11.	Replace the G sensor. <Ref. to ABS-21, G Sensor.>
11 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 0.5 — 1.0 V when G sensor is inclined backward to 90°?	Go to step 12.	Replace the G sensor. <Ref. to ABS-21, G Sensor.>
12 CHECK POOR CONTACT IN CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 13.
13 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC still displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 14.
14 CHECK ANY OTHER DTC.	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Y: DTC 73 LATERAL G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION

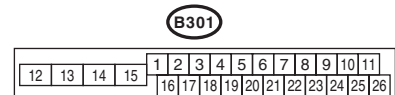
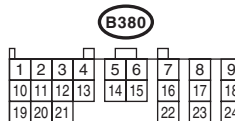
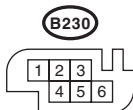
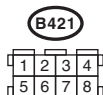
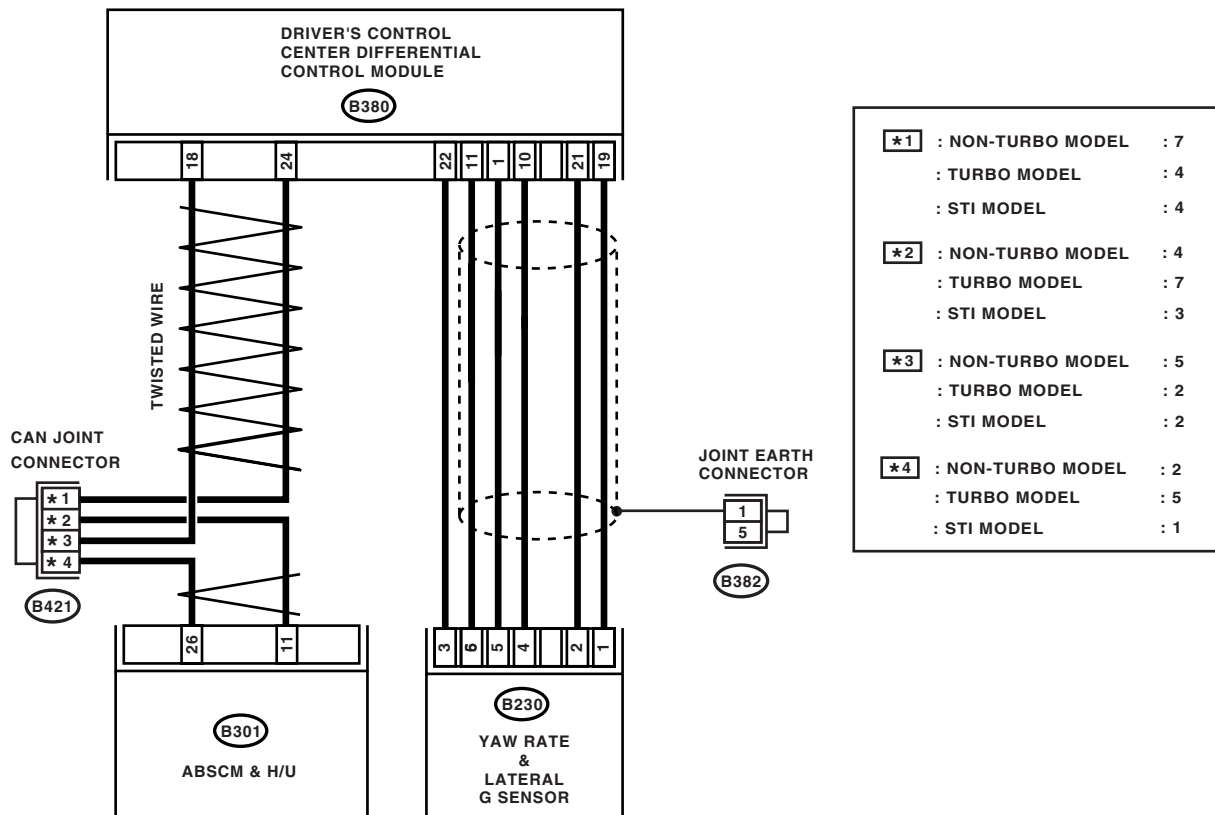
DIAGNOSIS:

Faulty Lateral G sensor

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00838

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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 YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the Subaru Select Monitor display.	Is the lateral G sensor output on monitor display $-1.5 \sim 1.5$ m/s ² when the vehicle is in horizontal position?	Go to step 3.	Go to step 8.
3 CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the yaw rate & lateral G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Select "Current data display & Save" on the Subaru Select Monitor. 6) Read the Subaru Select Monitor display.	Is the voltage $6.8 \sim 12.8$ m/s ² when lateral G sensor is inclined right to 90°?	Go to step 4.	Replace the yaw rate & lateral G sensor. <Ref. to 6MT-125, Yaw Rate and Lateral G Sensor.>
4 CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR. Read the Subaru Select Monitor display.	Is the voltage $6.8 \sim 12.8$ m/s ² when lateral G sensor is inclined left to 90°?	Go to step 5.	Replace the yaw rate & lateral G sensor. <Ref. to 6MT-125, Yaw Rate and Lateral G Sensor.>
5 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between driver's control center differential control module and yaw rate & lateral G sensor?	Repair the connector.	Go to step 6.
6 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-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 YAW RATE & LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from driver's control center differential control module. 3) Measure the resistance between driver's control center differential control module connector terminals. Connector & terminal (B380) No. 1 — No. 11:	Is the resistance $4.3 \sim 4.9$ k Ω ?	Go to step 9.	Repair the harness/connector between yaw rate & lateral G sensor and ABSCM&H/U.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (B380) No. 11 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 10.	Repair the harness between yaw rate & lateral G sensor and driver's control center differential control module. Replace the driver's control center differential control module. <Ref. to 6MT-126, Driver's Control Center Differential Control Module.>
10 CHECK YAW RATE & LATERAL G SENSOR. 1) Remove the console box. 2) Remove the yaw rate & lateral G sensor from vehicle. 3) Connect the connector to yaw rate & lateral G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between yaw rate & lateral G sensor connector terminals. Connector & terminal (B230) No. 5 (+) — (B230) No. 6 (-):	Is the voltage 2.1 — 2.5 V when yaw rate & lateral G sensor is in horizontal position?	Go to step 11.	Replace the yaw rate & lateral G sensor. <Ref. to 6MT-125, Yaw Rate and Lateral G Sensor.>
11 CHECK YAW RATE & LATERAL G SENSOR. Measure the voltage between yaw rate & lateral G sensor connector terminals. Connector & terminal (B230) No. 5 (+) — (B230) No. 6 (-):	Is the voltage 3.3 — 3.7 V when yaw rate & lateral G sensor is inclined right to 90°?	Go to step 12.	Replace the lateral G sensor. <Ref. to 6MT-125, Yaw Rate and Lateral G Sensor.>
12 CHECK YAW RATE & LATERAL G SENSOR. Measure the voltage between yaw rate & lateral G sensor connector terminals. Connector & terminal (B230) No. 5 (+) — (B230) No. 6 (-):	Is the voltage 0.5 — 0.9 V when yaw rate & lateral G sensor is inclined left to 90°?	Go to step 13.	Replace the lateral G sensor. <Ref. to 6MT-125, Yaw Rate and Lateral G Sensor.>
13 CHECK ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-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.

13.General Diagnostic Table

A: INSPECTION

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

General Diagnostic Table

ABS (DIAGNOSTICS)

ABS

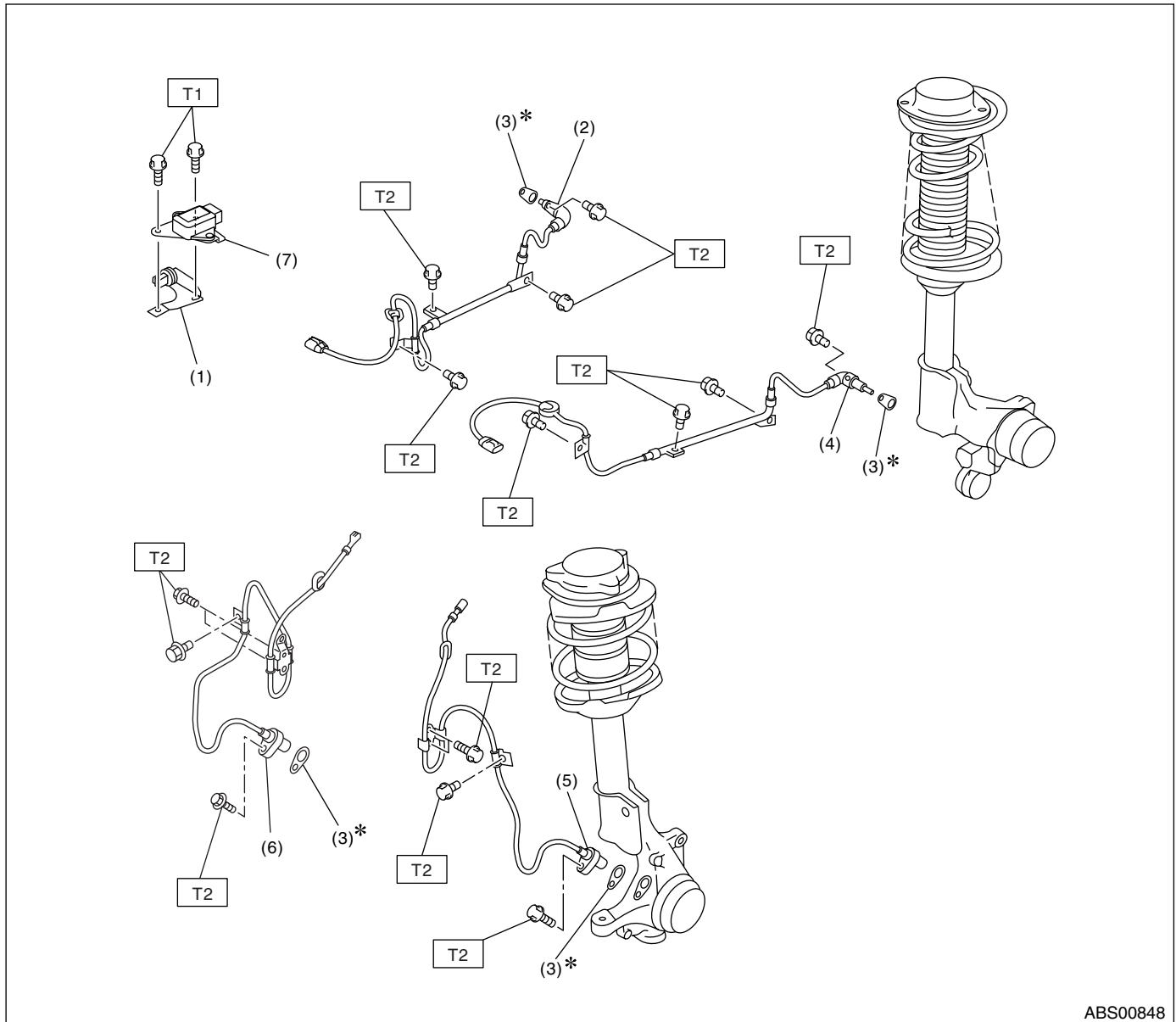
1. General Description

A: SPECIFICATION

Item				Standard value or identification	
ABS wheel speed sensor	ABS wheel speed sensor gap		Front	0.3 — 0.8 mm (0.012 — 0.031 in)	
			Rear	0.7 — 1.2 mm (0.028 — 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			PK
		MT model (Except STI model)			PL
		MT model (STI model)			MJ

B: COMPONENT

1. SENSOR



ABS00848

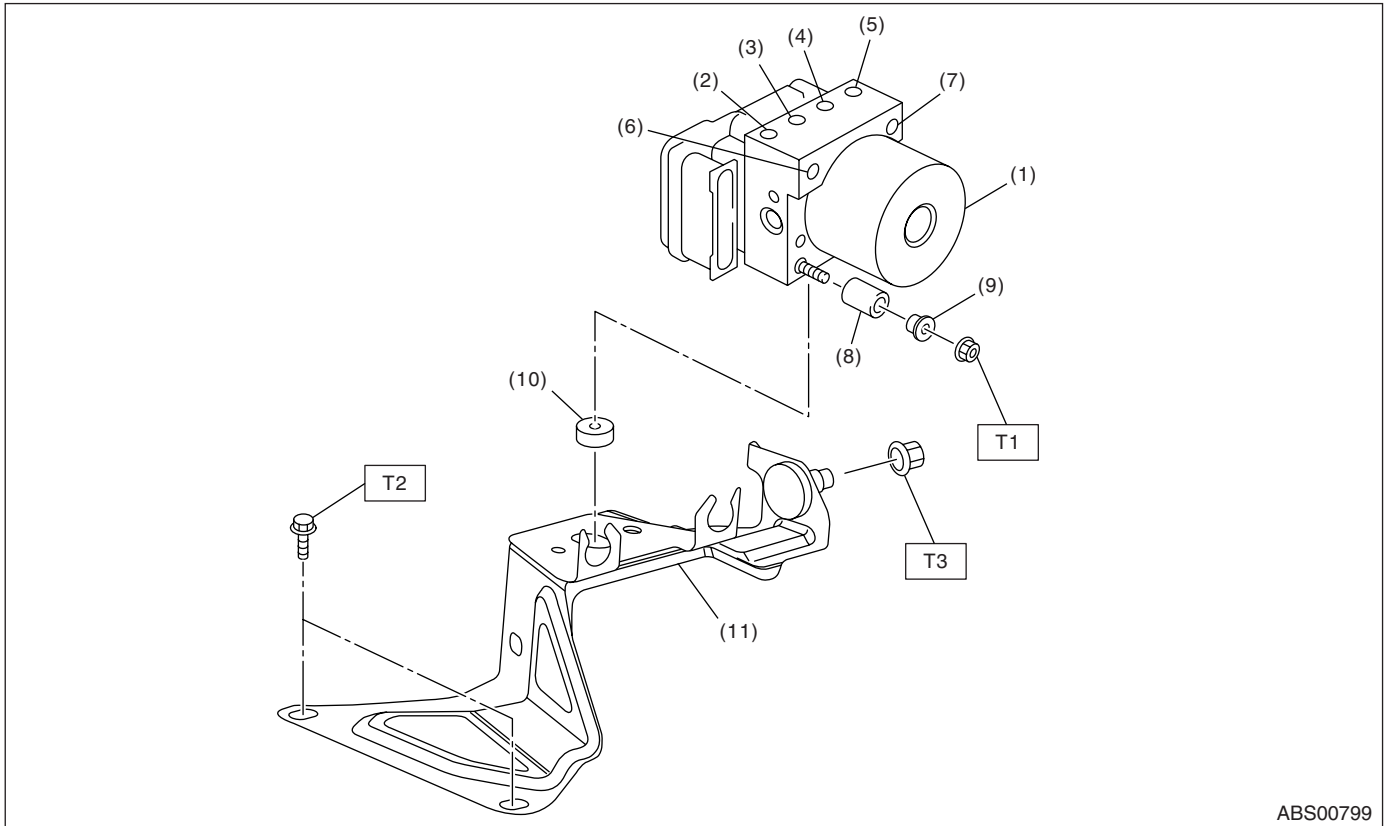
(1) G sensor	(5) Front ABS wheel speed sensor LH
(2) Rear ABS wheel speed sensor RH	(6) Front ABS wheel speed sensor RH
(3) Adjusting spacer	(7) Yaw rate & lateral G sensor (STI model)
(4) Rear ABS wheel speed sensor LH	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 18 (1.8, 13.0)

T2: 33 (3.3, 24)

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



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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

T2: 33 (3.3, 24)

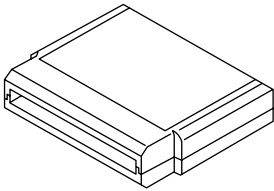
T3: 38 (3.8, 27.5)

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA010	18482AA010 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.
TORX® BIT E5	Used for removing ABSCM.

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 and air cleaner case from the engine compartment to facilitate removal of ABSCM&H/U. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 3) Use compressed air to get rid of water around the ABSCM&H/U.

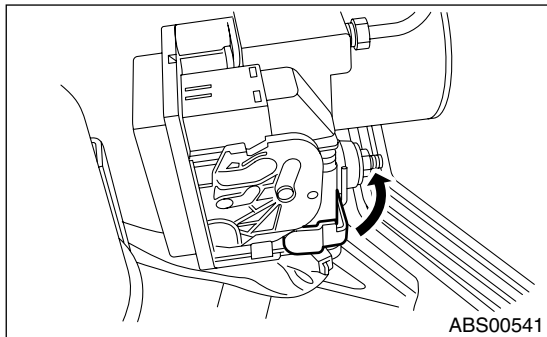
NOTE:

Contact will be insufficient if the terminal gets wet.

- 4) Disconnect the ABSCM&H/U connector pulling up the lock lever.

CAUTION:

Do not pull the harness when disconnecting connector.



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

CAUTION:

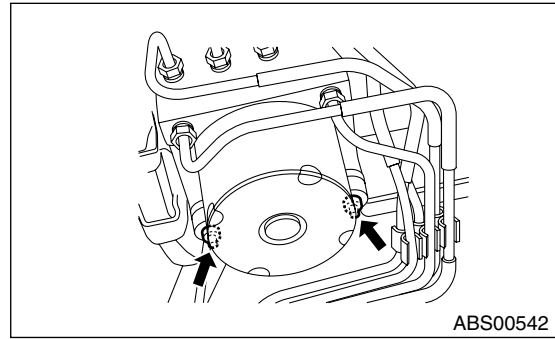
When brake fluid is attached to the vehicle body, wash it off with water and wipe the water.

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

CAUTION:

- Do not drop or bump the ABSCM&H/U.
- Do not turn ABSCM&H/U upside down or place it sideways for storage.
- Be careful that no foreign objects are mixed in ABSCM&H/U.

- Be careful that no water enters inside the connectors.



- 9) Remove the ABSCM&H/U bracket.

B: INSTALLATION

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

Tightening torque:

33 N·m (3.3 kgf-m, 24 ft-lb)

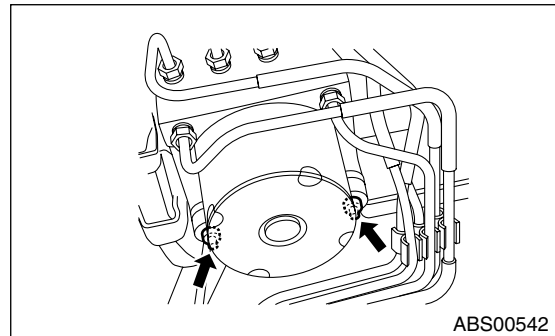
- 2) Install the ABSCM&H/U aligning the groove of damper on ABSCM&H/U side with the pawl of bracket.

NOTE:

Check the identification mark of ABSCM&H/U.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



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

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

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

NOTE:

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

- 6) Connect the ground cable to ABSCM&H/U, and then apply anti-corrosive wax.

7) Install the air cleaner case and air intake duct.
 <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
 <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>
 <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>
 <Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>

8) Bleed air from the brake system.

C: REPLACEMENT

CAUTION:

- Because the seal of ABSCM cannot be replaced, do not pull or peel it with lifting up.
- Because the screw part of H/U deteriorates in every replacement procedure, do not perform the replacement more than five times on it. When the malfunction is found though the replacement that performed is less than five times, replace the H/U body.
- Use new screws for installation of ABSCM.
- When the sealing surface of ABSCM or H/U is dirty or damaged and it cannot be removed or repaired, replace it with new one.

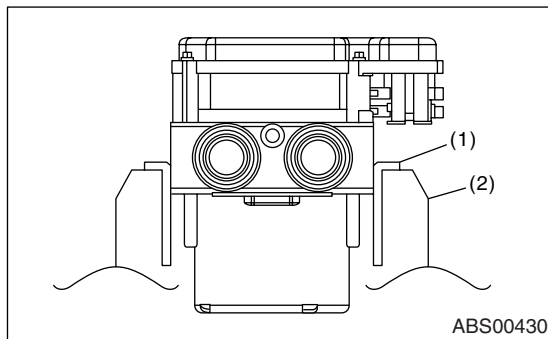
1) Remove the ABSCM&H/U. <Ref. to ABS-6, REMOVAL, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2) To prevent entering foreign matter and brake fluid leakage, plug the oil pressure port of ABSCM&H/U using screw plug and etc.

3) Set the pump motor part of removed ABSCM&H/U faces down in the vise.

NOTE:

Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate or cloth between the part and vice.

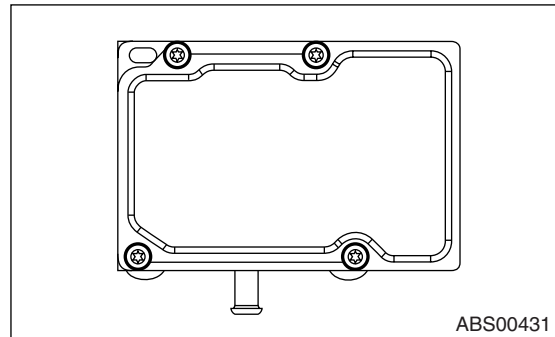


- (1) Aluminum plate or etc.
 (2) Vise

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

NOTE:

Always use new screws.



5) Slowly remove the ABSCM upward from H/U.

NOTE:

To prevent damaging of coil part, remove the ABSCM straightly from H/U.

6) Ensure there are no dirt or damage on sealing surface of H/U.

CAUTION:

- Do not clean the ABSCM & H/U with applying compressed air.
- Do not repair the damages of H/U sealing surface using file or metal scraper. To remove the sealing, use resin scraper. Do not use the chemical materials (thinner and etc.).

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

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

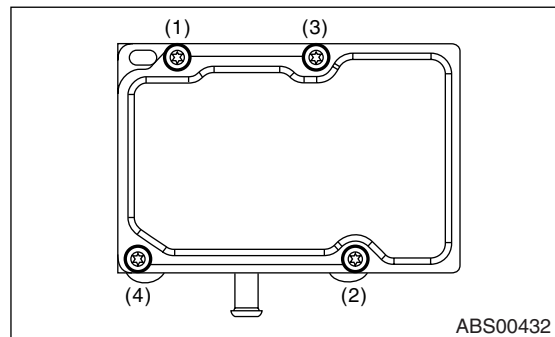
9) Using TORX® BIT E5, tighten the screws step-wise in the order of (1) through (4).

CAUTION:

Always use new screws.

Tightening torque:

1.5 N·m (0.15 kgf·m, 1.1 ft·lb)



10) Check that there is no foreign matter in aligning part between ABSCM and H/U.

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

ABS

11) Using TORX® BIT E5, tighten the screws step-wise in the order of (1) through (4) again.

Tightening torque:

3 N·m (0.3 kgf-m, 2.2 ft-lb)

12) Check that there is no clearance in aligning part between ABSCM and H/U.

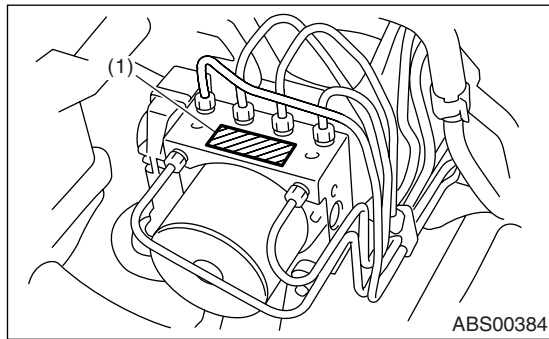
13) Install the ABSCM&H/U to vehicle. <Ref. to ABS-6, INSTALLATION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: INSPECTION

1) Check the connected and fixed condition of connector.

2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
PK	AT
PL	MT (Except for STI)
MJ	STI



(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.

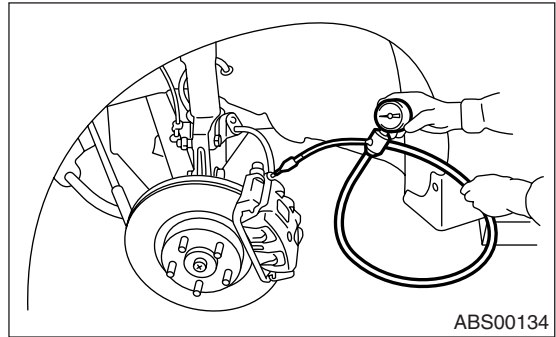
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:

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

NOTE:

Wrap sealing tape around the pressure gauge.



ABS00134

4) Bleed air from the pressure gauges.

5) Perform the ABS sequence control.

<Ref. to ABS-10, 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 (35 kgf/cm ² , 498 psi)	3,500 kPa (35 kgf/cm ² , 498 psi)
Decompressed	500 kPa (5 kgf/cm ² , 71 psi) or less	500 kPa (5 kgf/cm ² , 71 psi) or less
Compressed	3,500 kPa (35 kgf/cm ² , 498 psi) or more	3,500 kPa (35 kgf/cm ² , 498 psi) or more

8) Remove the pressure gauges from 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 FL and FR caliper bodies.

13) Perform the ABS sequence control.

<Ref. to ABS-10, ABS Sequence Control.>

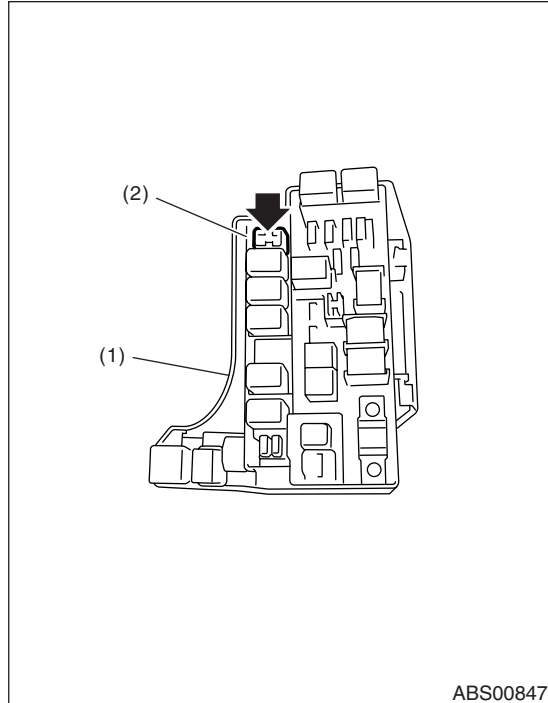
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding and compression, and then the RL side performs decompression, holding and compression.

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 system.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

- 1) In the case of non-turbo AT model, install a spare fuse with the FWD connector in the main fuse box to simulate FWD model.



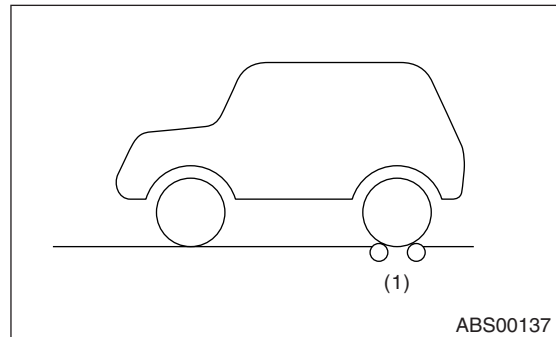
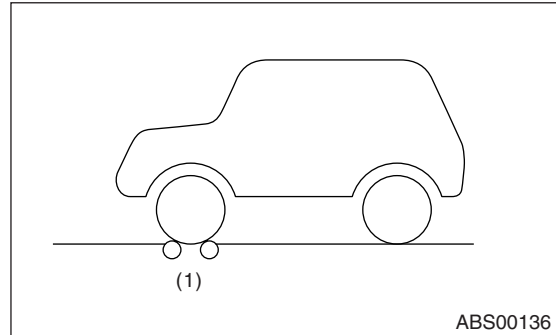
- (1) Main fuse box
- (2) FWD connector

NOTE:

The AWD circuit of MT and turbo AT model can not be disabled.

- 2) Prepare for operating the ABS sequence control.
<Ref. to ABS-10, 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-10, ABS Sequence Control.>
- 6) Hydraulic unit begins to work; and check the following working sequence.

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

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

- 7) Read values indicated on the brake tester and check if the fluctuation of values, while decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	1,000 N (100 kgf, 221 lbf)	1,000 N (100 kgf, 221 lbf)
Decompressed	500 N (50 kgf, 110 lbf) or less	500 N (50 kgf, 110 lbf) or less
Compressed	1,000 N (100 kgf, 221 lbf) or more	1,000 N (100 kgf, 221 lbf) 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 Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:

In the event of any trouble, the sequence control may not be operative. In such a case, perform the diagnosis. <Ref. to ABS(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

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

2) Turn the ignition switch to ON.

3) Turn the Subaru Select Monitor switch to ON.

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

5) When {Function check sequence} is selected, ABS sequence control will start.

6) When the message {Press Brake Pedal with braking force of 100 to 150 kgf} is displayed, perform the followings.

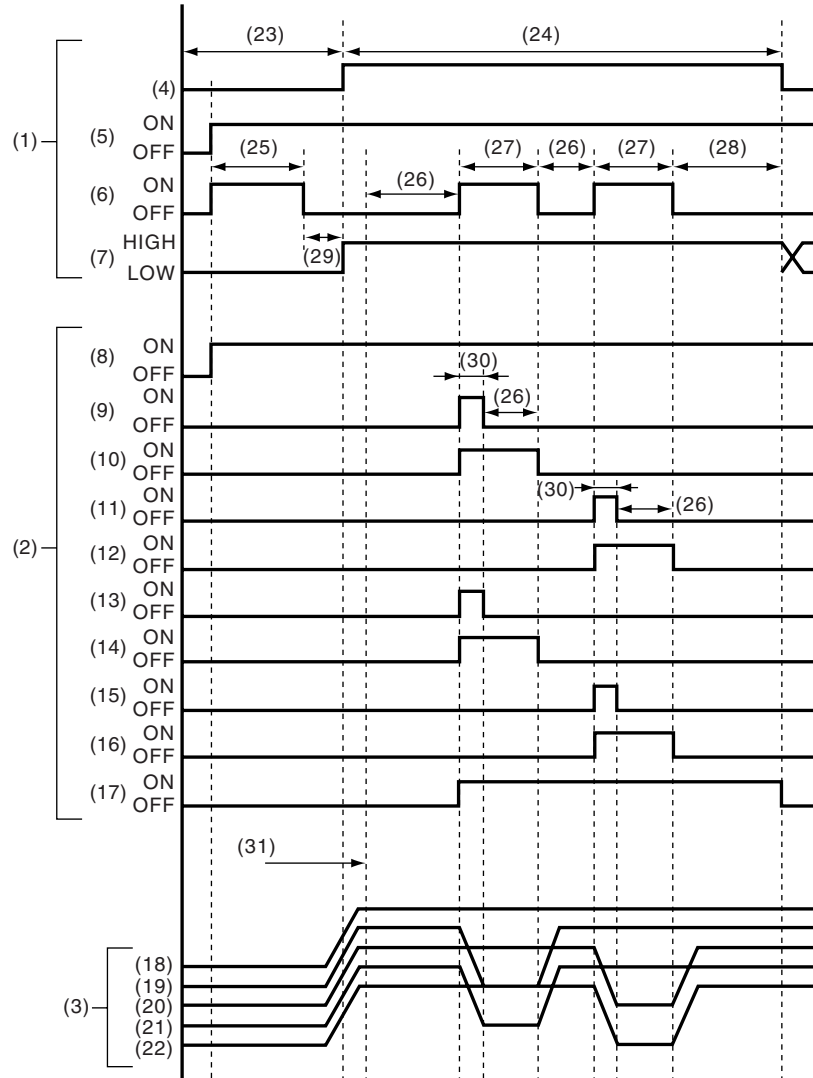
(1) When using the brake tester, depress the brake pedal with braking force of 981 N (100 kgf, 221 lbf).

(2) When using the pressure gauge, depress the brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kgf/cm², 498 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.

2. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00625

(1) Operational guide line of sequence control	(10) FL inlet valve	(22) Pressure of RL wheel cylinder
(2) Operational pattern of sequence control	(11) FR outlet valve	(23) 4 km/h (2 MPH) or less
(3) Operational pressure of sequence control	(12) FR inlet valve	(24) 10 km/h (6 MPH) or less
(4) Speed of all wheels	(13) RR outlet valve	(25) Approx. 2.0 seconds
(5) Ignition key switch	(14) RR inlet valve	(26) 1.0 second
(6) ABS warning light	(15) RL outlet valve	(27) 1.4 seconds
(7) Stop light switch	(16) RL inlet valve	(28) 0.6 seconds
(8) Valve relay	(17) Pump motor	(29) Within 0.5 seconds
(9) FL outlet valve	(18) Pressure of master cylinder	(30) 0.4 seconds
	(19) Pressure of FL wheel cylinder	(31) Point A
	(20) Pressure of FR wheel cylinder	
	(21) Pressure of RR wheel cylinder	

NOTE:

- When the Subaru Select Monitor is used, control operation starts at point A. (However, the stop light switch must be ON before point A.)
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

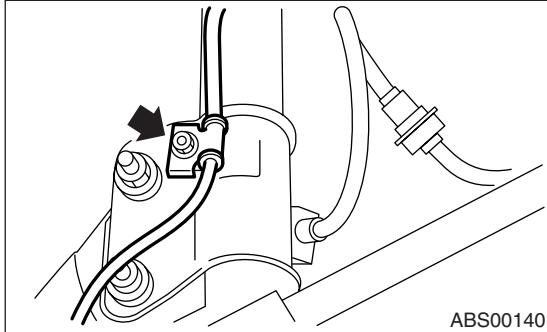
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

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

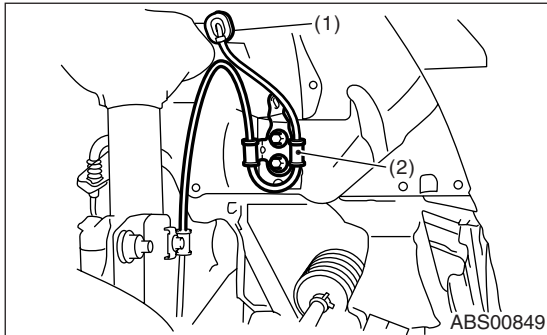
4. Front ABS Wheel Speed Sensor

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.



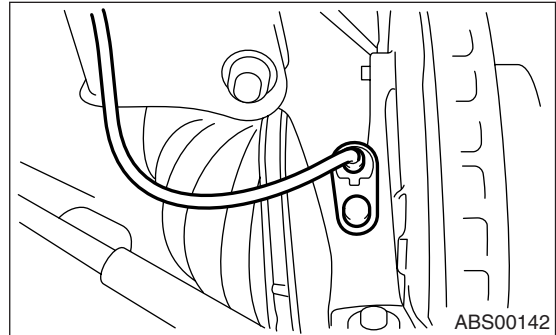
- (1) To front ABS wheel speed sensor connector
- (2) Bracket

- 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.

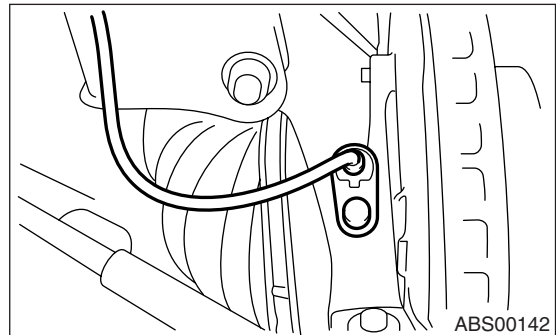


B: INSTALLATION

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

CAUTION:

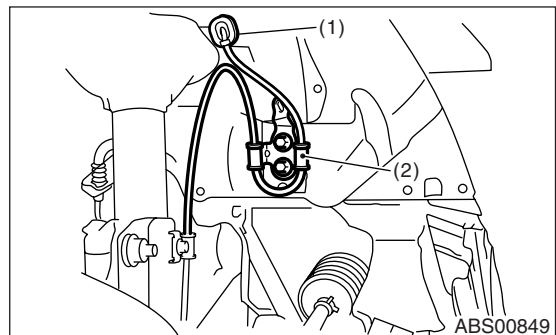
- Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.



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

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-14, SENSOR GAP, INSPECTION, Front ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on housing to specified torque.

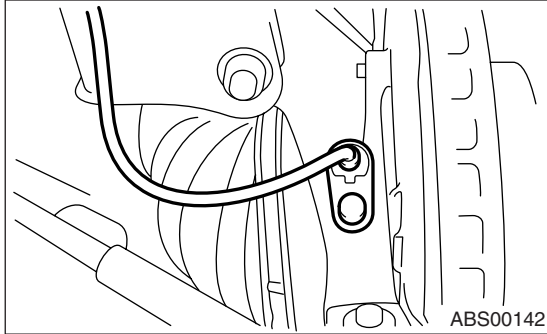
Front ABS Wheel Speed Sensor

ABS

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.

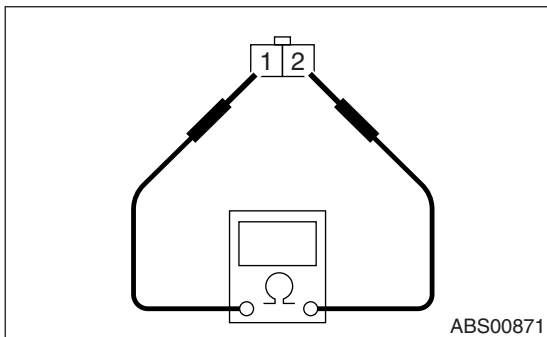
C: INSPECTION

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.



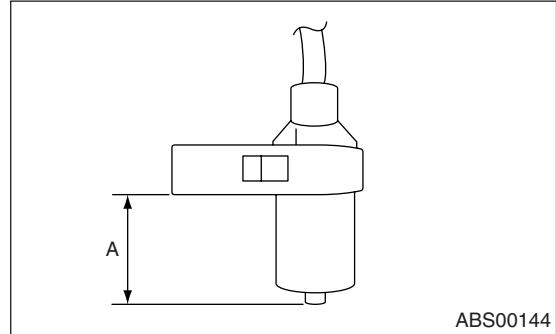
Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

NOTE:

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

2. SENSOR GAP

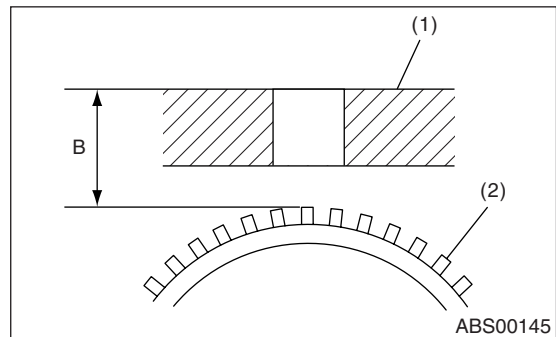
1) Measure the distance “A” between ABS wheel speed sensor surface and sensor pole face.



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.

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).

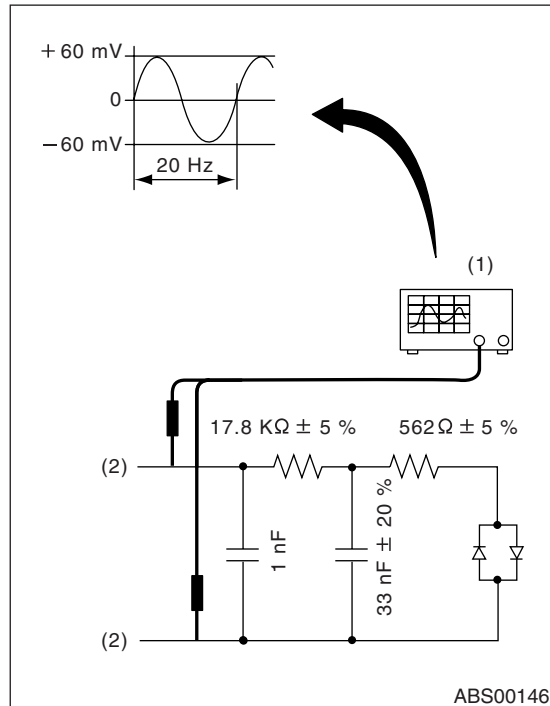
3. OUTPUT VOLTAGE

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-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>



(1) Oscilloscope

(2) Terminal

D: ADJUSTMENT

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

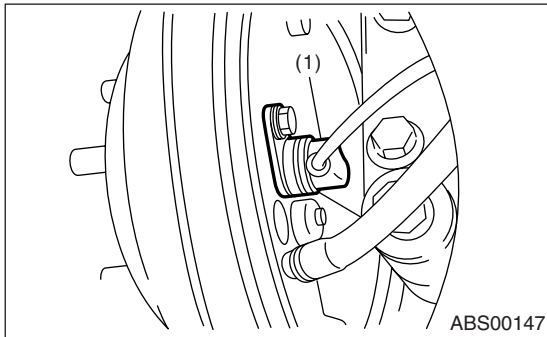
5. Rear ABS Wheel Speed Sensor

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

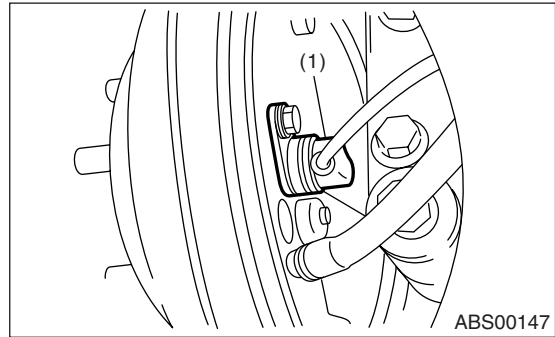
- 6) Remove the rear tone wheel while removing the hub from housing and hub assembly. <Ref. to DS-27, REMOVAL, Rear Axle.>

B: INSTALLATION

- 1) Install the rear tone wheel on hub, then rear housing on hub. <Ref. to DS-30, 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.

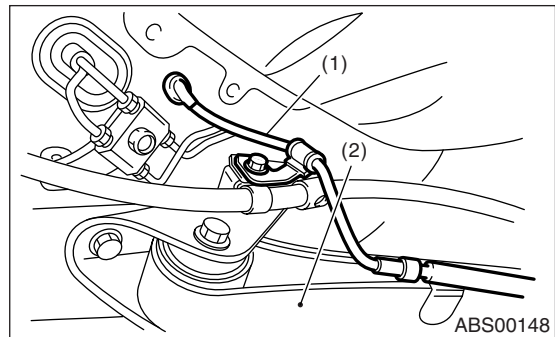


(1) Rear ABS wheel speed sensor

- 3) Install the rear drive shaft to rear housing and rear differential spindle. <Ref. to DS-28, 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-17, SENSOR GAP, INSPECTION, Rear ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on back plate to specified torque. If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

ABS wheel speed sensor standard clearance:

0.7 — 1.2 mm (0.028 — 0.047 in)

Tightening torque:

33 N·m (3.3 kgf-m, 24 ft-lb)

NOTE:

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

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

7) Connect the battery ground cable to battery.

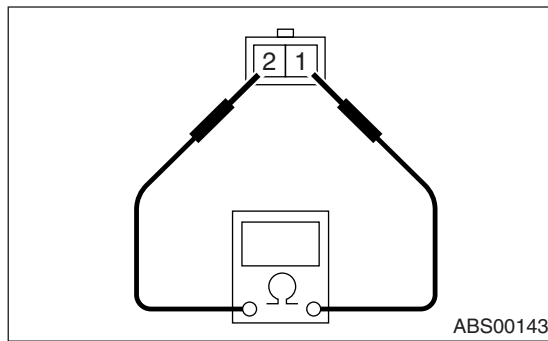
C: INSPECTION

1. ABS WHEEL SPEED SENSOR

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

2) Measure the ABS wheel speed sensor resistance.

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



Terminal No.	Standard
1 and 2	$1.15 \pm 0.115 \text{ k}\Omega$

NOTE:

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

2. SENSOR GAP

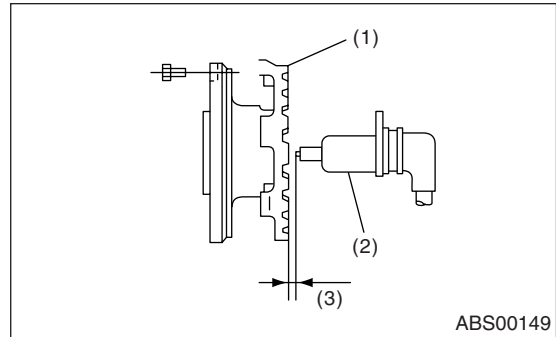
1) Measure the clearance between tone wheel and ABS wheel speed sensor at whole periphery.

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

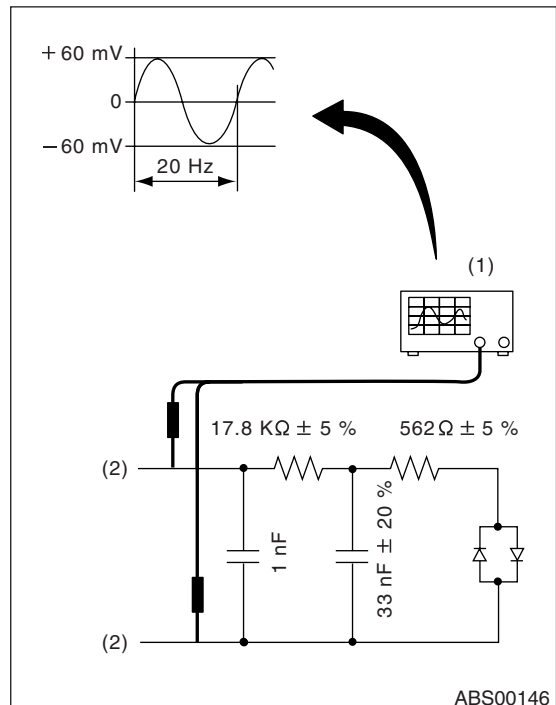
3. OUTPUT VOLTAGE

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-17, 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-33, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

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

<Ref. to DS-33, 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:

Tone wheel forms a unit with BJ assembly of drive shaft. Replace the BJ assembly when the tone wheel is damaged.

7. Rear Tone Wheel

A: REMOVAL

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

<Ref. to DS-27, REMOVAL, Rear Axle.>

B: INSTALLATION

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

<Ref. to DS-28, 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.

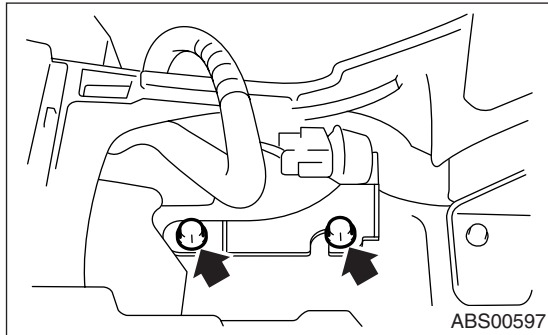
8. G Sensor

A: REMOVAL

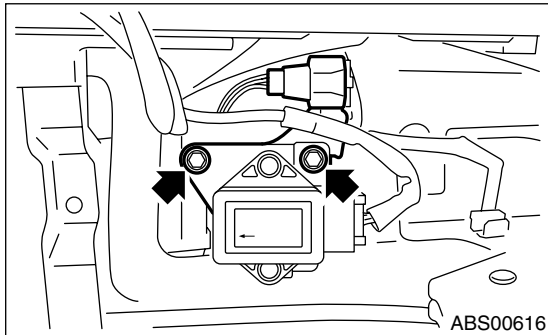
- 1) Disconnect the ground cable from battery.
- 2) Remove the console cover. <Ref. to EI-46, REMOVAL, Console Box.>
- 3) Disconnect the connector from G sensor.
- 4) Remove the G sensor from body.

CAUTION:

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



- STI model



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.	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 (-):	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 (-):	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 (-):	G sensor is normal.	Replace the G sensor.
5	CHECK G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the Subaru Select Monitor into {BRAKE CONTROL} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output value.	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.	Go to step 7.	Replace the G sensor.
7	CHECK G SENSOR. Read the Subaru Select Monitor display.	G sensor is normal.	Replace the G sensor.

9. Yaw Rate and Lateral G Sensor

A: REMOVAL

For removal procedure of the yaw rate & lateral G sensor, refer to "6MT" section. <Ref. to 6MT-125, REMOVAL, Yaw Rate and Lateral G Sensor.>

B: INSTALLATION

For installation procedure of the yaw rate & lateral G sensor, refer to "6MT" section. <Ref. to 6MT-125, INSTALLATION, Yaw Rate and Lateral G Sensor.>

BRAKE

General Description

BRAKE

1. General Description

A: SPECIFICATION

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	15 inch type	17 inch type
	Type	Disc (Floating type)	Disc (Fixed type, ventilated)	
	Effective disc diameter	230 mm (9.06 in)	261 mm (10.28 in)	268 mm (10.55 in)
	Disc thickness × Outer diameter	10 × 266 mm (0.39 × 10.47 in)	18 × 290 mm (0.71 × 11.42 in)	20 × 316 mm (0.79 × 12.44 in)
	Effective cylinder diameter	38.1 mm (1.500 in)		36.0 mm (1.417 in)
	Pad dimensions (length × width × thickness)	89.4 × 33.7 × 9.0 mm (3.520 × 1.327 × 0.354 in)	71.8 × 35.0 × 11.5 mm (2.827 × 1.378 × 0.453 in)	74.8 × 45.0 × 9.0 mm (2.945 × 1.772 × 0.354 in)
	Clearance adjustment	Automatic adjustment		
Master cylinder	Type	Tandem		
	Effective diameter	26.99 mm (1-1/16 in)	25.4 mm (1 in)	26.99 mm (1-1/16 in)
	Reservoir type	Sealed type		
	Brake fluid reservoir capacity	205 cm ³ (12.51 cu in)		
Brake booster	Type	Vacuum suspended		
	Effective diameter	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 or DOT4		

NOTE:

Refer to “PB section” for parking brake specifications. <Ref. to PB-2, SPECIFICATION, 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"	10 mm (0.393 in)	1.5 mm (0.059 in)
		17"	9.2 mm (0.362 in)	1.2 mm (0.047 in)
	Disc thickness	Except 17"	24 mm (0.94 in)	22 mm (0.87 in)
		17"	30 mm (1.18 in)	28 mm (1.10 in)
	Disc runout		—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness	14"	9.0 mm (0.354 in)	1.5 mm (0.059 in)
		15"	11.5 mm (0.452 in)	1.5 mm (0.059 in)
		17"	9.0 mm (0.354 in)	1.2 mm (0.047 in)
	Disc thickness	14"	10 mm (0.39 in)	8.5 mm (0.335 in)
		15"	18 mm (0.71 in)	16 mm (0.63 in)
		17"	20 mm (0.79 in)	18 mm (0.71 in)
	Disc runout		—	0.07 mm (0.0028 in)
Rear brake (Disc type parking) (Except STI model)	Inside diameter		170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness		3.2 mm (0.126 in)	1.5 mm (0.059 in)
Rear brake (Disc type parking) (STI model)	Inside diameter		190 mm (7.48 in)	191 mm (7.52 in)
	Lining thickness		3.2 mm (0.126 in)	1.5 mm (0.059 in)
Parking brake	Lever stroke		7 to 8 notches/196 N (20 kgf, 44 lbf)	

		Brake pedal force	Fluid pressure		
			Other models	WRX	STI
Brake booster	Brake fluid pressure without engine running	147 N (15 kgf, 33 lbf)	588 kPa (6 kgf/cm ² , 85 psi)		
		294 N (30 kgf, 66 lbf)	1,471 kPa (15 kgf/cm ² , 213 psi)	1,667 kPa (17 kgf/cm ² , 242 psi)	1,471 kPa (15 kgf/cm ² , 213 psi)
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lbf)	5,296 kPa (54 kgf/cm ² , 768 psi)	6,276 kPa (64 kgf/cm ² , 910 psi)	4,021 kPa (41 kgf/cm ² , 583 psi)
		294 N (30 kgf, 66 lbf)	9,120 kPa (93 kgf/cm ² , 1,323 psi)	10,000 kPa (102 kgf/cm ² , 1,450 psi)	8,336 kPa (85 kgf/cm ² , 1,209 psi)

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

1. FRONT DISC BRAKE

This exploded view diagram illustrates the components of a vehicle brake assembly. The parts are numbered as follows:

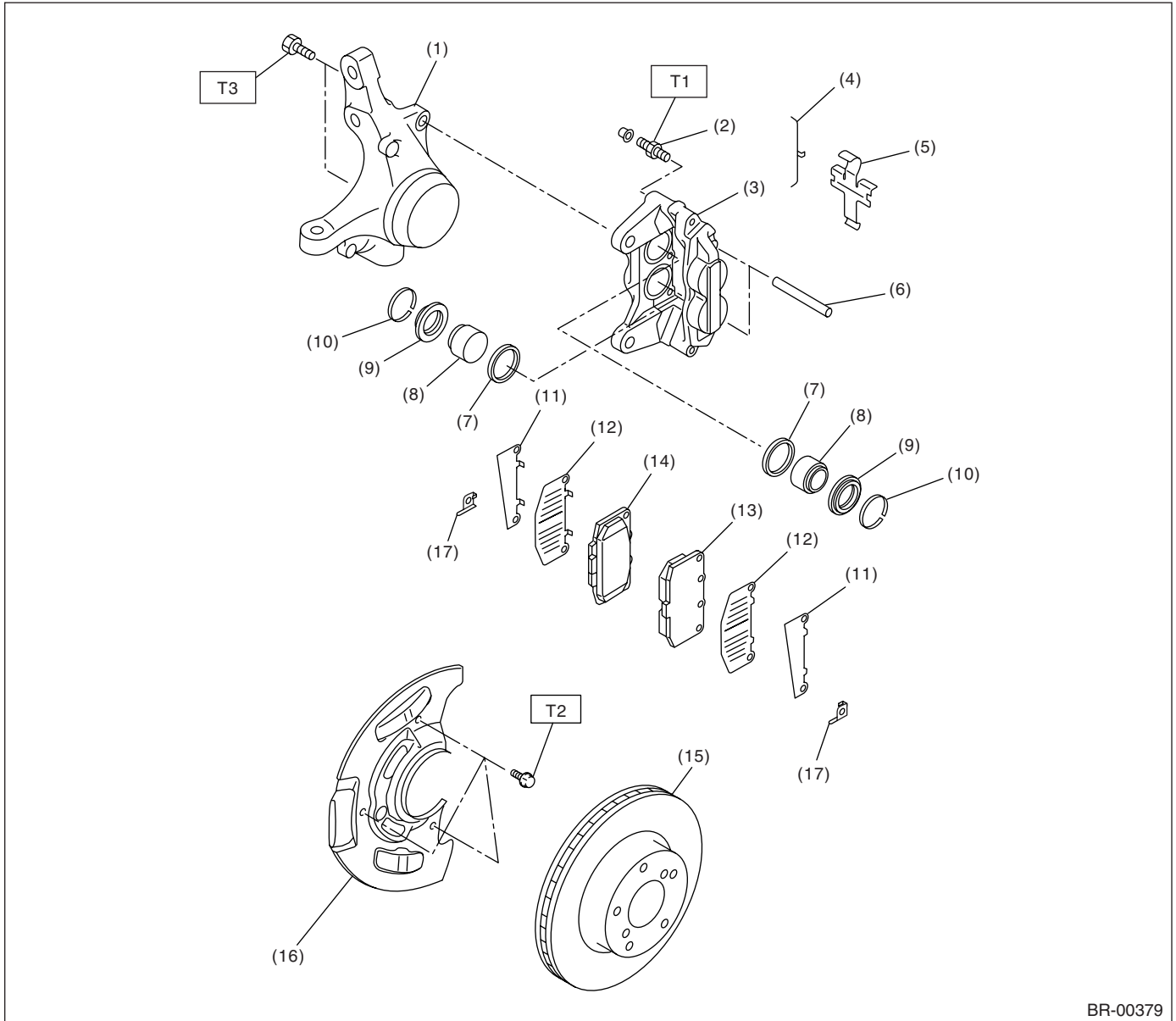
- (1) Brake caliper housing
- (2) Piston pin
- (3) Piston pin sleeve
- (4) Piston pin lock nut
- (5) Piston seal
- (6) Piston
- (7) Piston seal
- (8) Piston pin
- (9) Brake caliper bracket
- (10) Brake caliper bracket
- (11) Brake pad
- (12) Brake pad
- (13) Brake pad
- (14) Brake pad
- (15) Brake disc
- (16) Brake caliper bracket
- (17) Piston pin
- (18) Brake caliper bracket

Torque specifications are indicated by boxes labeled T1, T2, T3, and T4:

- T1: Torque for the piston pin lock nut (4).
- T2: Torque for the piston pin (2).
- T3: Torque for the piston pin (8).
- T4: Torque for the piston pin (17).

- Tightening torque: N·m (kgf-m, ft-lb)**
- | | |
|------------|-------------------------|
| T1: | 8 (0.8, 5.8) |
| T2: | 18 (1.8, 13.0) |
| T3: | 26.5 (2.7, 19.5) |
| T4: | 80 (8.2, 59) |

• 16 INCH TYPE



BR-00379

(1) Housing	(10) Boot ring
(2) Air bleeder screw	(11) Outer shim
(3) Caliper body	(12) Inner shim
(4) M clip	(13) Pad (Outside)
(5) Cross spring	(14) Pad (Inside)
(6) Pad pin	(15) Disc rotor
(7) Piston seal	(16) Disc cover
(8) Piston	(17) Spacer
(9) Piston boot	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

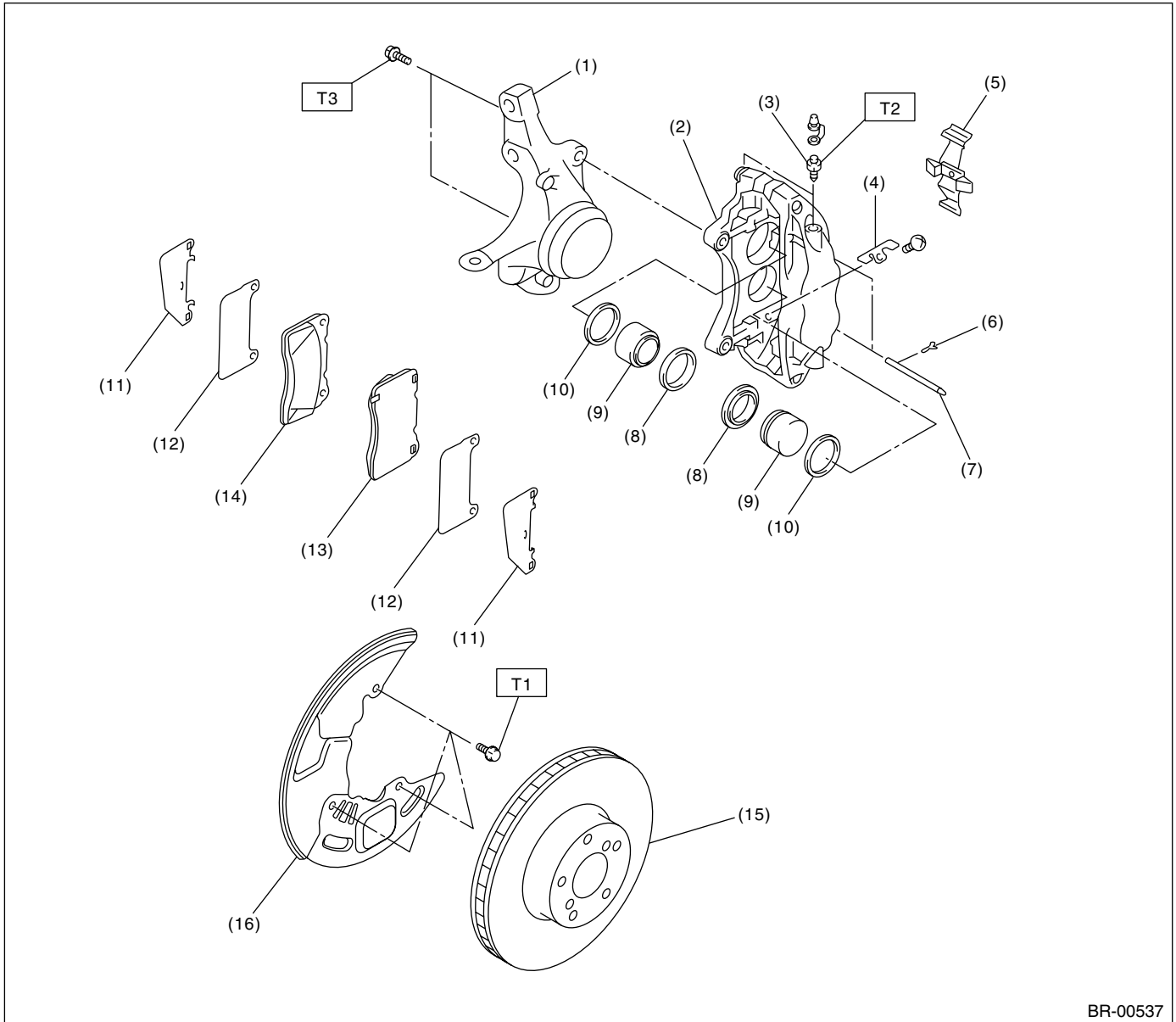
T2: 18 (1.8, 13.0)

T3: 80 (8.2, 59)

General Description

BRAKE

• 17 INCH TYPE



BR-00537

(1) Housing	(8) Piston boot
(2) Caliper body	(9) Piston
(3) Air bleeder screw	(10) Piston seal
(4) Guide plate	(11) Pad shim (Outside)
(5) Cross spring	(12) Pad shim (Inside)
(6) Clip	(13) Pad (Outside)
(7) Pad pin	(14) Pad (Inside)

- | |
|-----------------|
| (15) Disc rotor |
| (16) Disc cover |

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

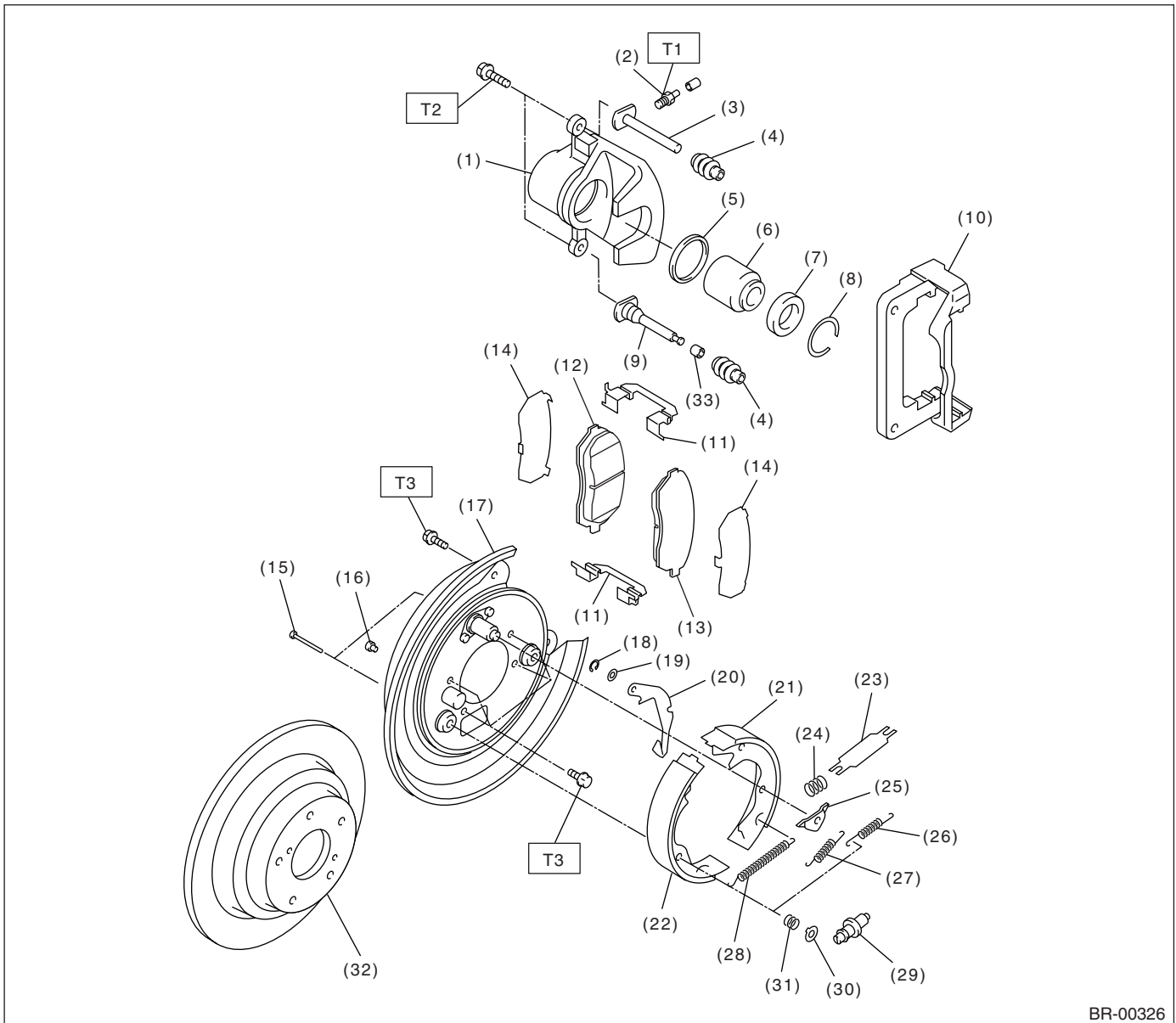
T1: 18 (1.8, 13.0)

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)

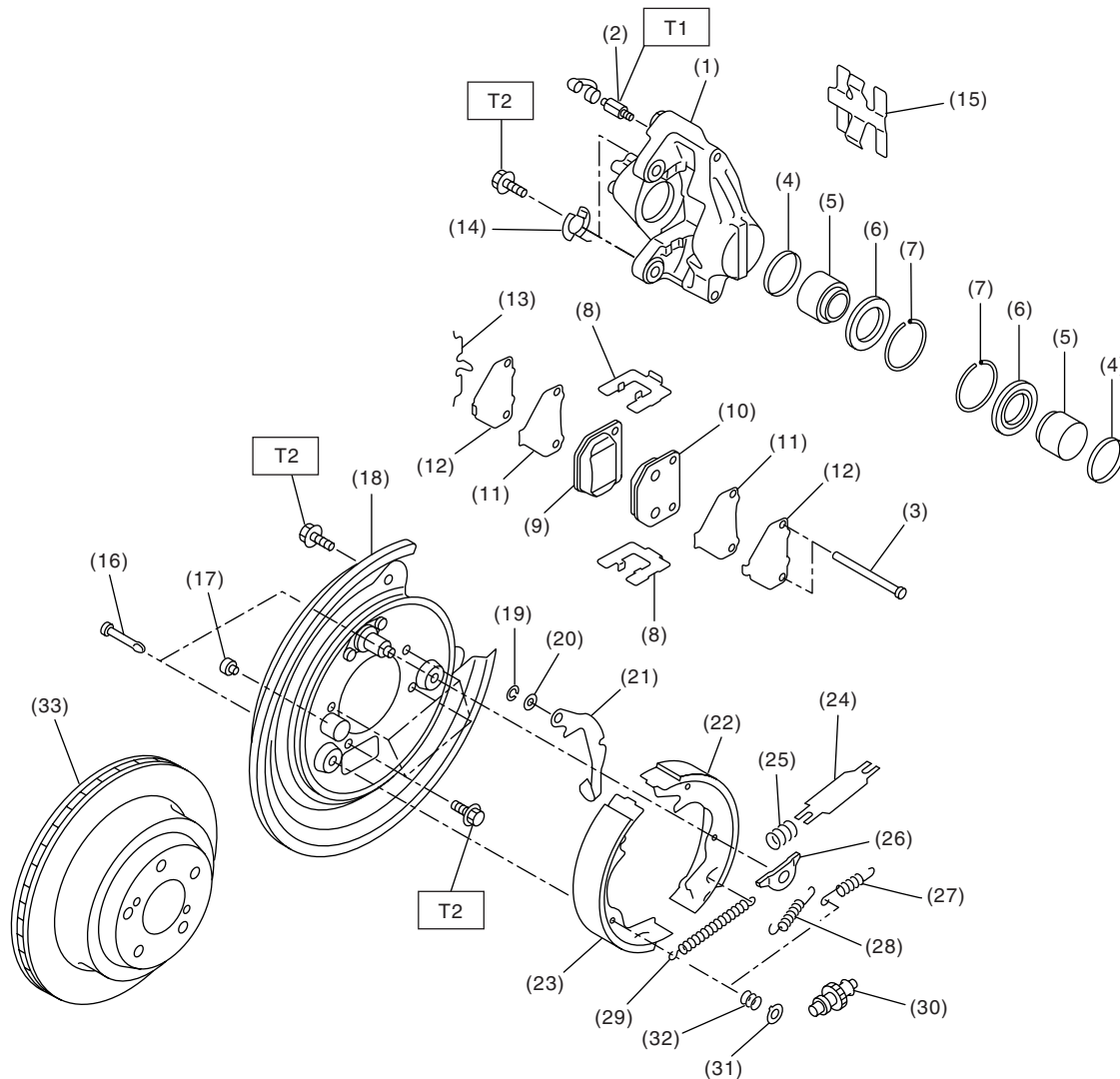
T2: 37 (3.8, 27.5)

T3: 53 (5.4, 39.1)

General Description

BRAKE

• 15 INCH TYPE



BR-00327

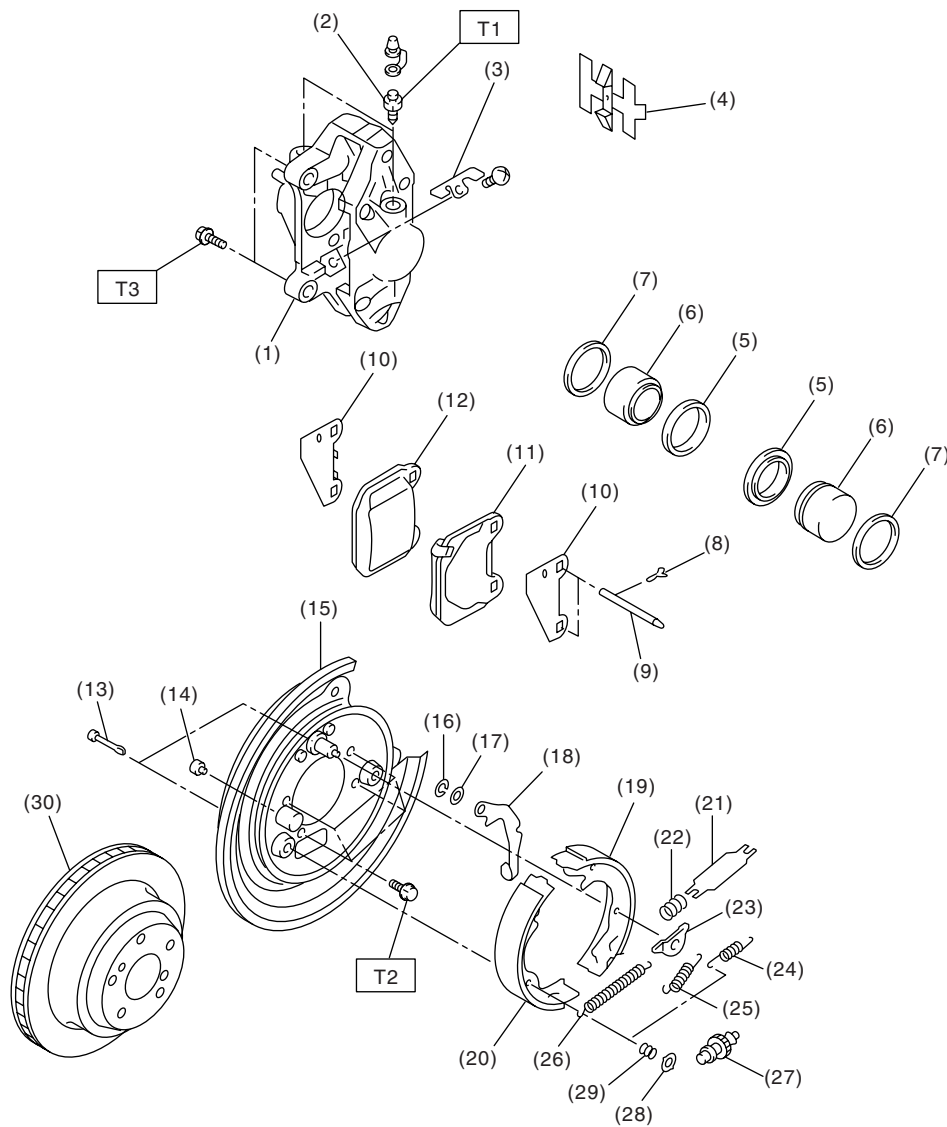
(1) Caliper body	(14) Washer	(27) Secondary shoe return spring
(2) Air bleeder screw	(15) Cross spring	(28) Primary shoe return spring
(3) Pad pin	(16) Shoe hold-down pin	(29) Adjusting spring
(4) Piston seal	(17) Cover	(30) Adjuster
(5) Piston	(18) Back plate	(31) Shoe hold-down cup
(6) Piston boot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

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

T1: 8 (0.8, 5.8)

T2: 53 (5.4, 39.1)

• 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)

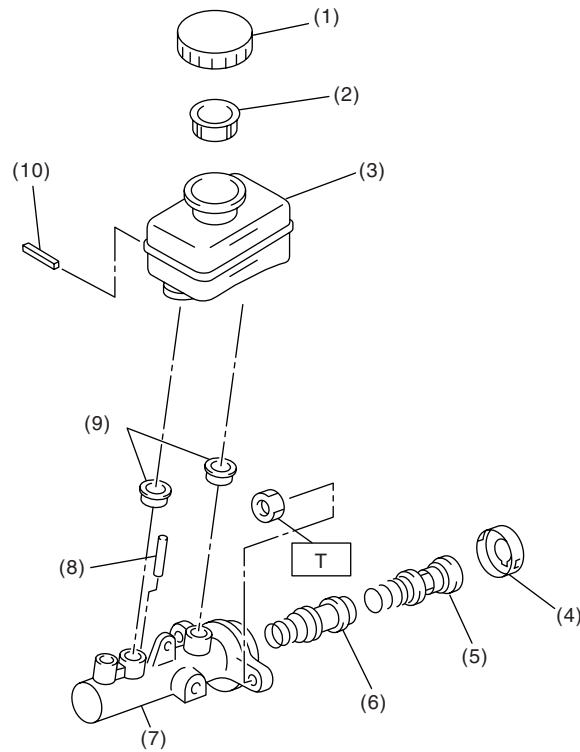
T2: 53 (5.4, 39.1)

T3: 65 (6.6, 47.9)

General Description

BRAKE

3. MASTER CYLINDER



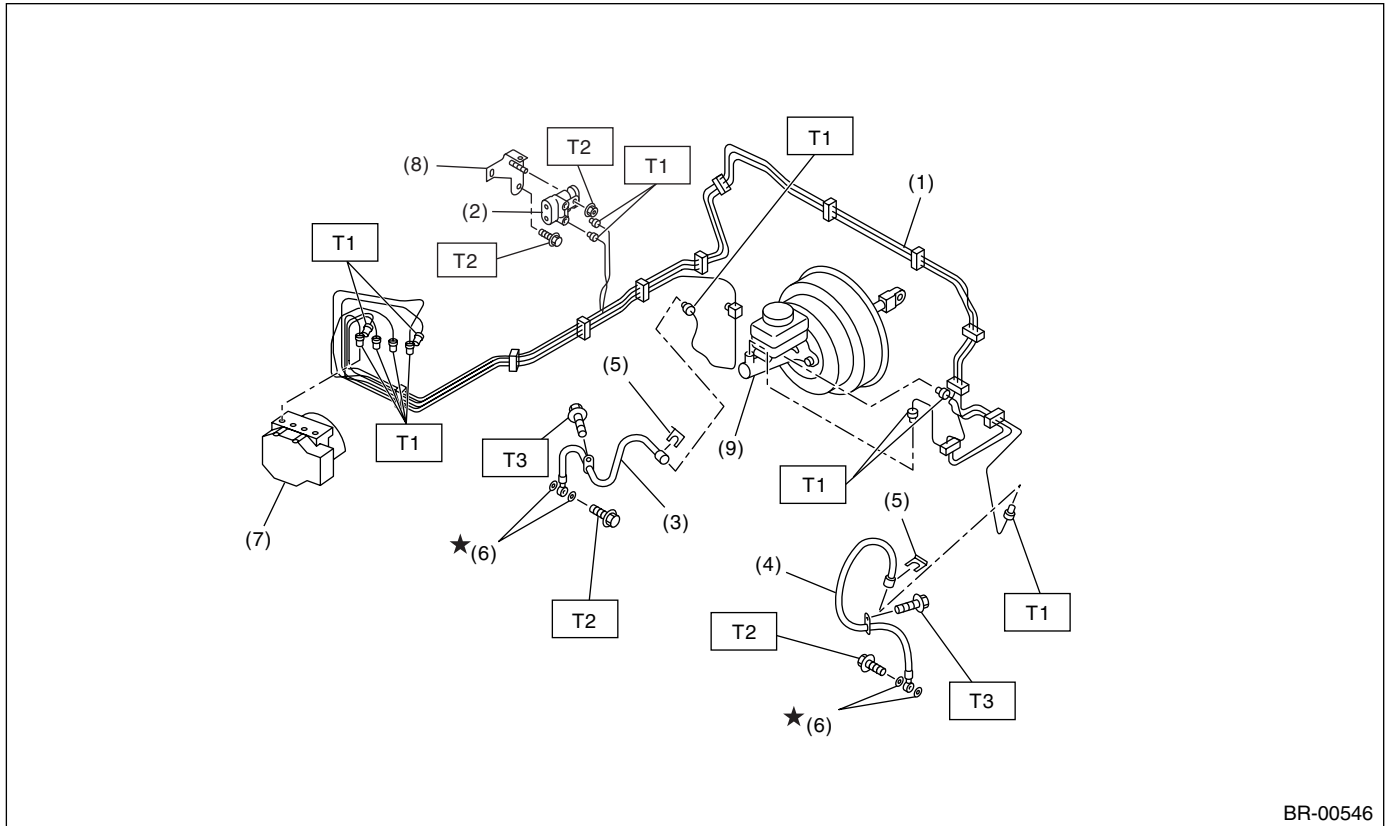
BR-00153

(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

Tightening torque: N·m (kgf-m, ft-lb)

T: 15 (1.5, 10.8)

4. FRONT BRAKE PIPES AND HOSE



BR-00546

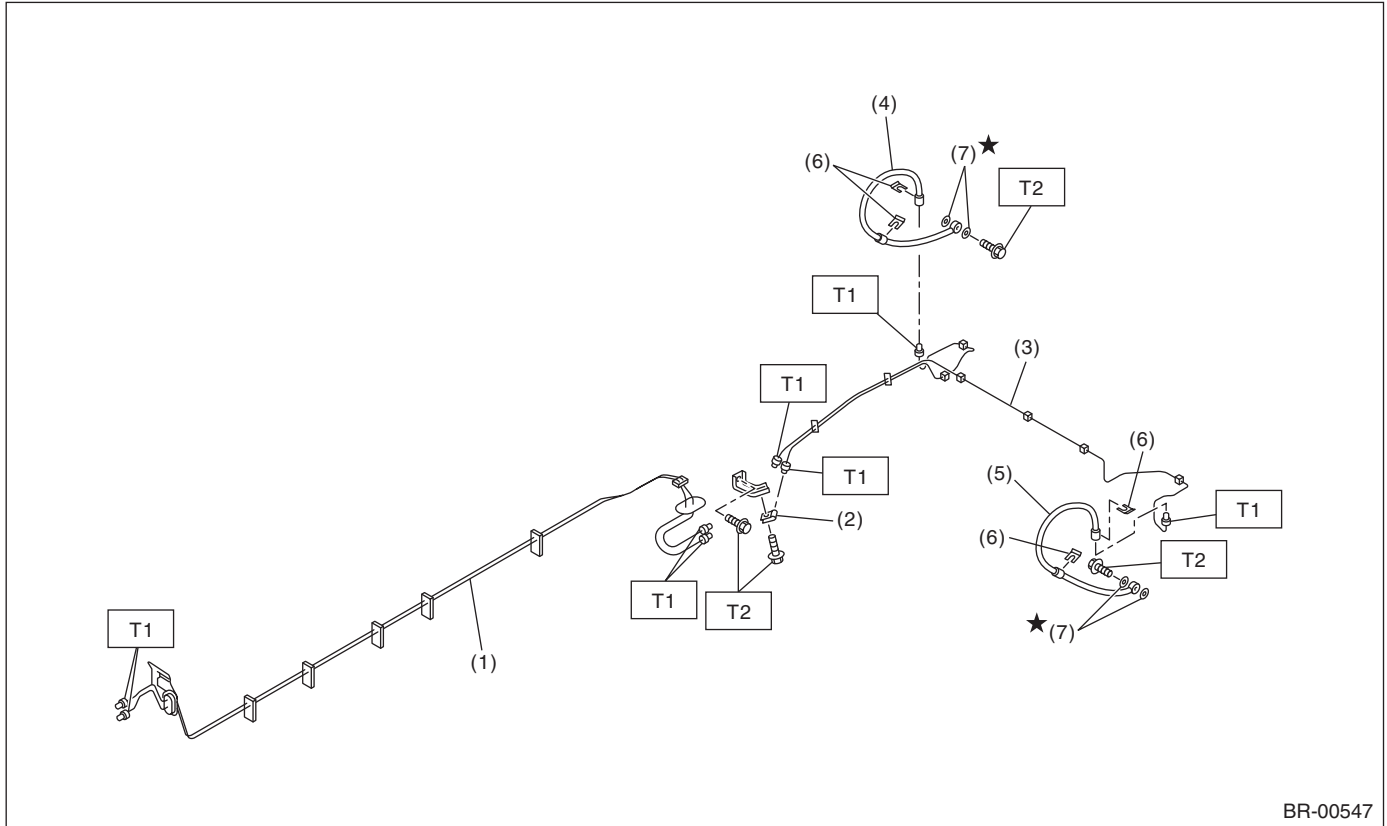
(1) Front brake pipe ASSY	(6) Gasket
(2) Two-way connector	(7) ABS control module and hydraulic control unit (ABSCM&H/U)
(3) Front brake hose RH	(8) Bracket
(4) Front brake hose LH	(9) Master cylinder
(5) Clamp	

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)**T2: 18 (1.8, 13.0)****T3: 33 (3.4, 25)**

General Description

BRAKE

5. CENTER AND REAR BRAKE PIPES AND HOSES



BR-00547

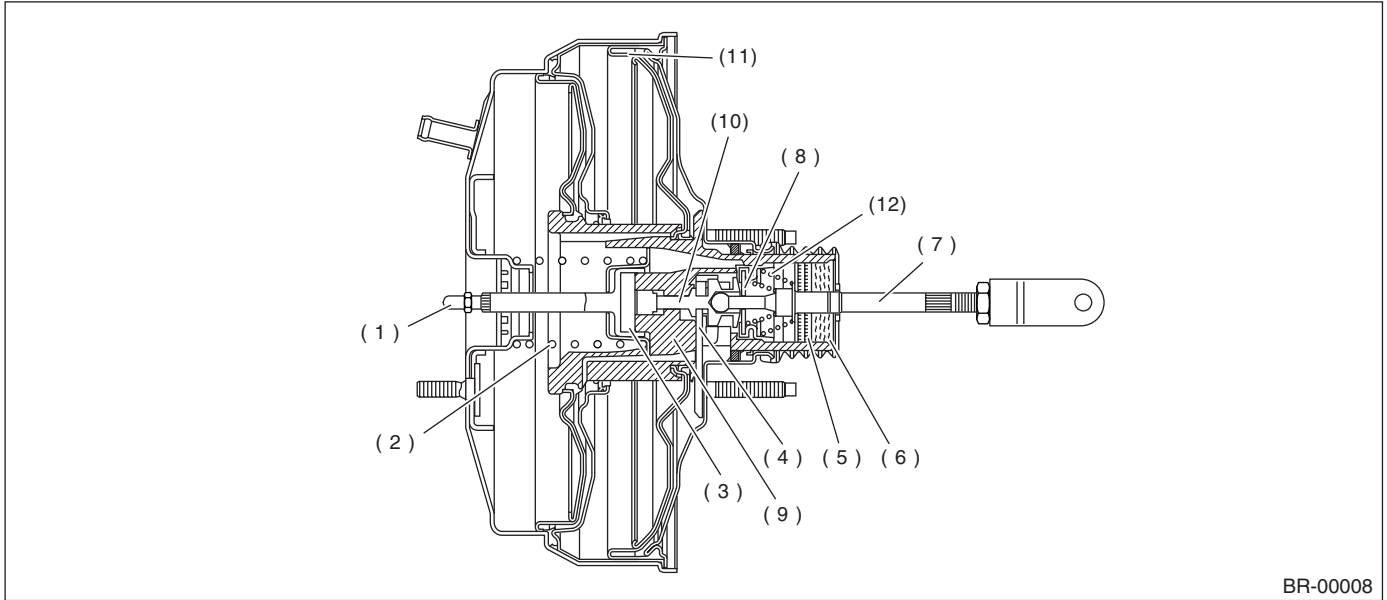
(1) Center brake pipe ASSY	(5) Rear brake hose LH
(2) Two-way connector	(6) Clamp
(3) Rear brake pipe ASSY	(7) Gasket
(4) Rear brake hose RH	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 15 (1.5, 10.8)

T2: 18 (1.8, 13.0)

6. BRAKE BOOSTER



BR-00008

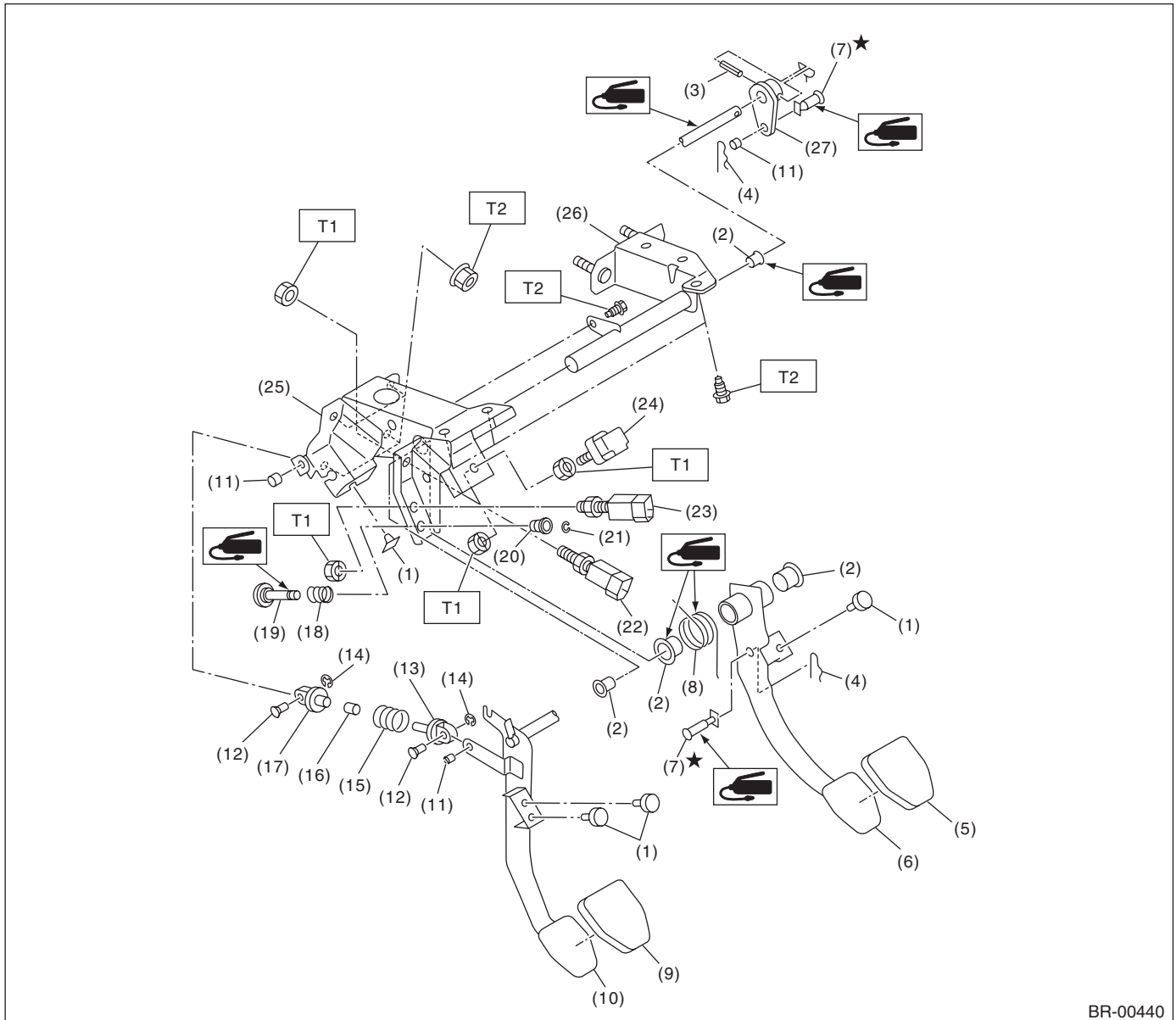
(1) Push rod	(5) Filter	(9) Valve body
(2) Return spring	(6) Silencer	(10) Plunger valve
(3) Reaction disc	(7) Operating rod	(11) Diaphragm plate
(4) Key	(8) Poppet valve	(12) Valve return spring

General Description

BRAKE

7. BRAKE PEDAL

• MT MODEL



BR-00440

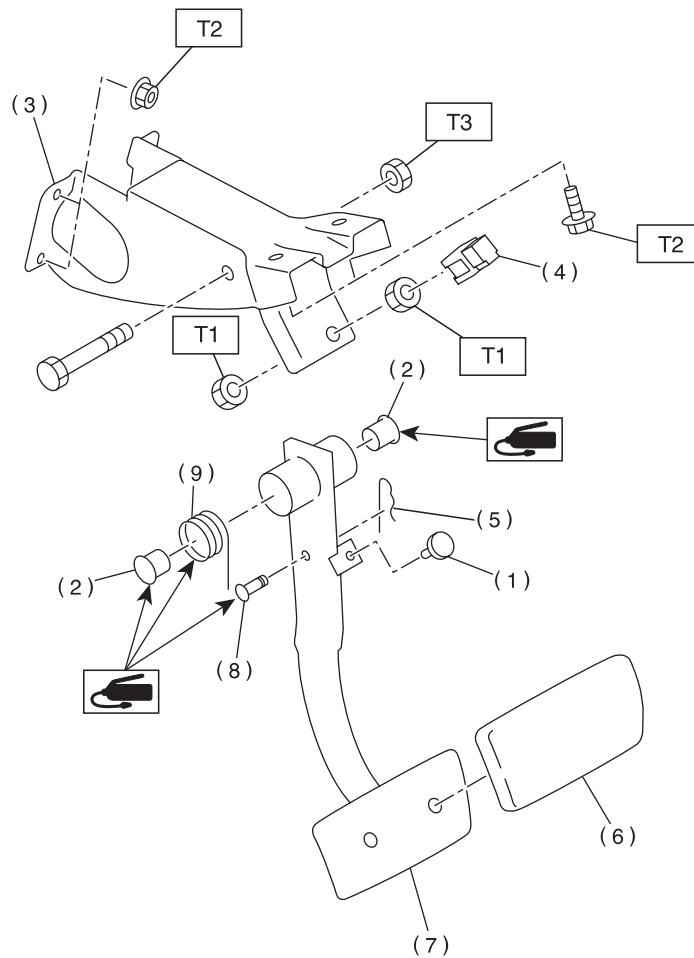
(1) Stopper	(12) Clutch clevis pin	(23) Clutch switch (With cruise control)
(2) Bushing	(13) Assist rod A	(24) Stop light switch
(3) Spring pin	(14) Clip	(25) Pedal bracket
(4) Snap pin	(15) Assist spring	(26) Clutch master cylinder bracket
(5) Brake pedal pad	(16) Assist bushing	(27) Lever
(6) Brake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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

• AT MODEL



BR-00139

- (1) Stopper
- (2) Bushing
- (3) Pedal bracket
- (4) Stop light switch
- (5) Snap pin

- (6) Brake pedal pad
- (7) Brake pedal
- (8) Clevis pin
- (9) Brake pedal spring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.1)

General Description

BRAKE

C: CAUTION

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

D: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Snap ring pliers	Used for removing and installing snap ring.

2. Front Brake Pad

A: REMOVAL

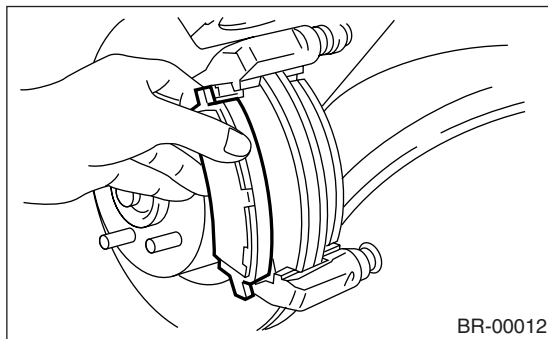
1. 15 INCH TYPE

- 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.

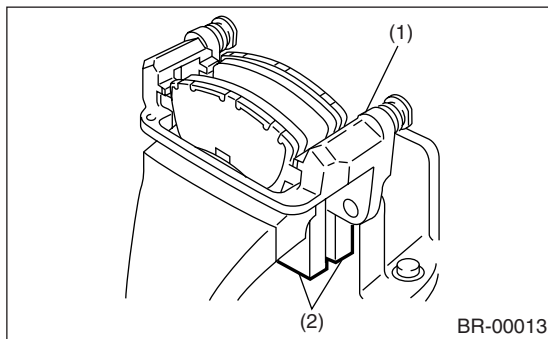
- 6) Remove the pad.



NOTE:

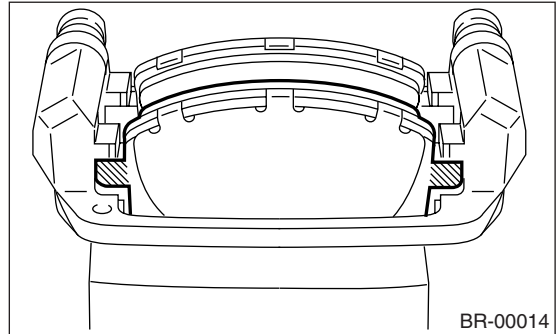
If the brake pad is difficult to remove, proceed as follows:

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



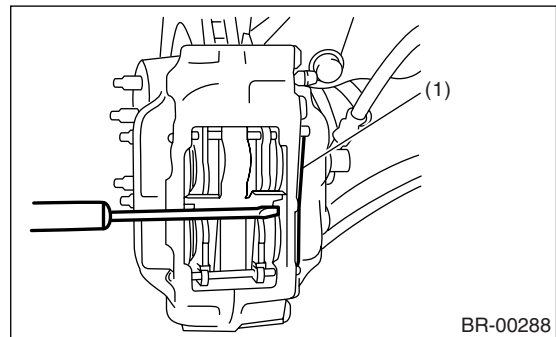
- (1) Support
- (2) Wooden blocks

- (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.



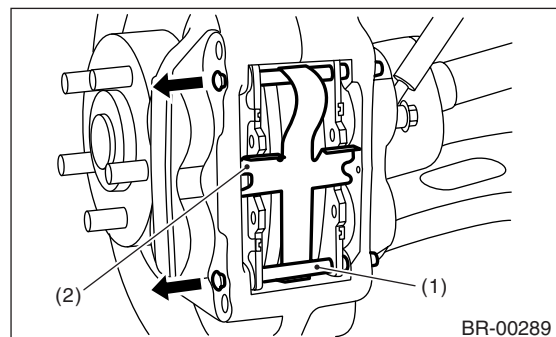
2. 16 INCH TYPE

- 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.

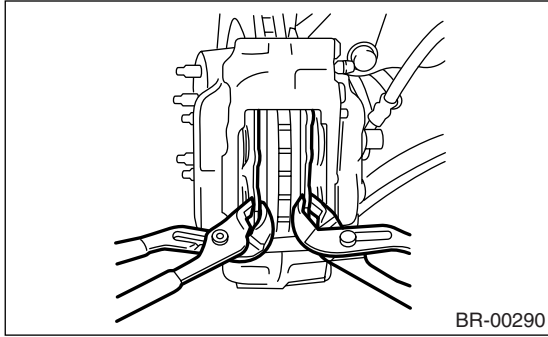


- (1) Pad pin
- (2) Cross spring

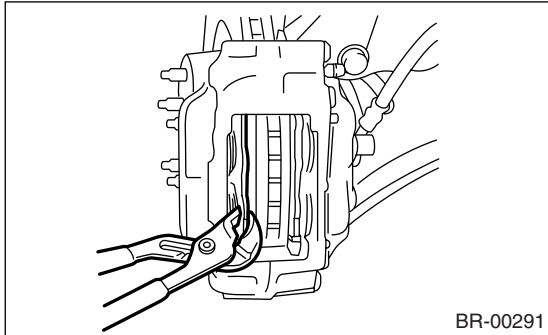
Front Brake Pad

BRAKE

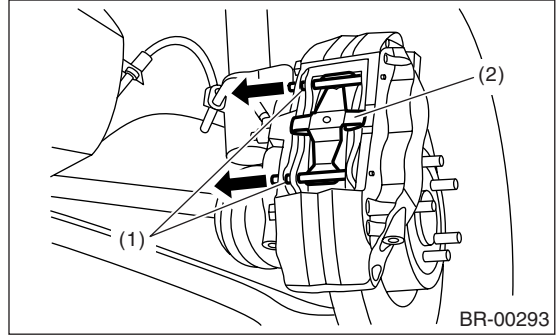
6) Use a wrench to expand the pads, and then push the piston back.



7) Remove the pad.

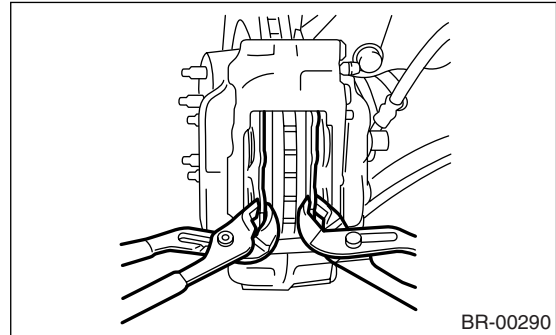


5) Remove the pad pins and cross spring.

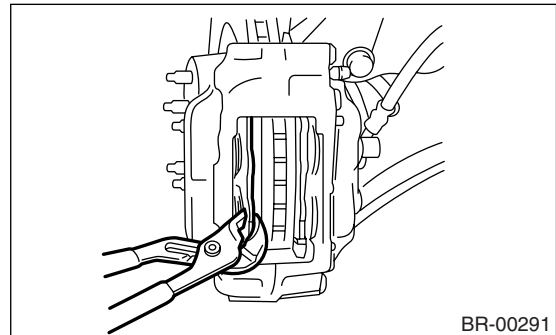


- (1) Pad pin
- (2) Cross spring

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

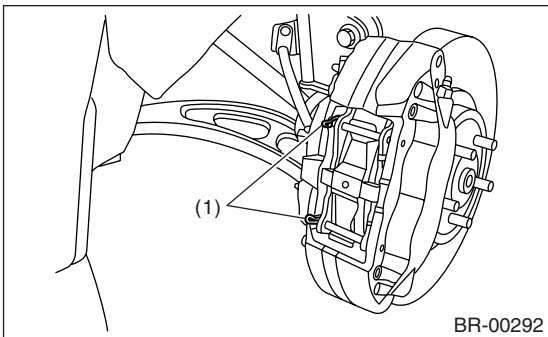


7) Remove the pad.



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.

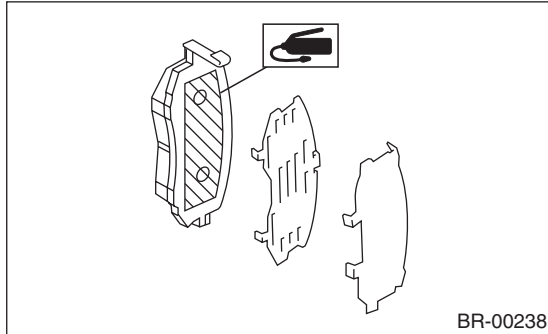


- (1) Clip

B: INSTALLATION

1. 15 INCH TYPE

- 1) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
- 2) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



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

Tightening torque:

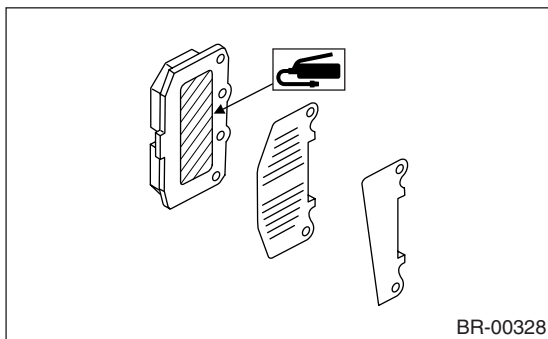
26.5 N·m (2.7 kgf-m, 19.5 ft-lb)

NOTE:

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

2. 16 INCH TYPE

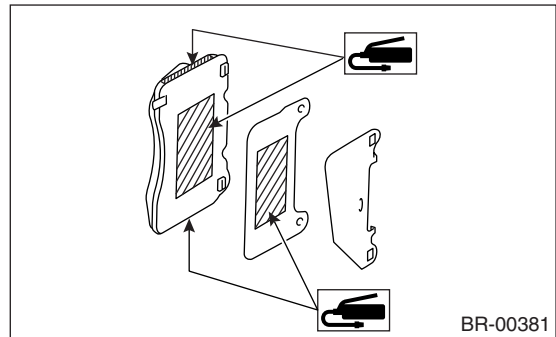
- 1) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



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

3. 17 INCH TYPE

- 1) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad shim.

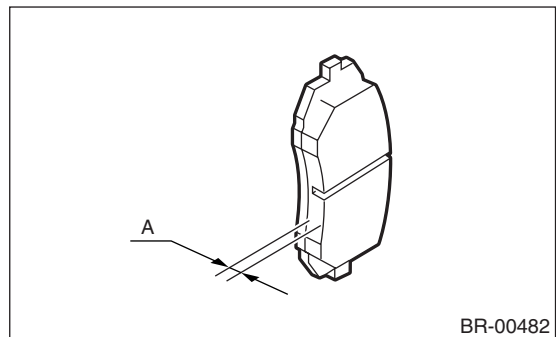


- 2) Install the pads on caliper body.
- 3) Install the cross spring.
- 4) Install the pad pins.
- 5) Install the clip.

C: INSPECTION

1. 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:

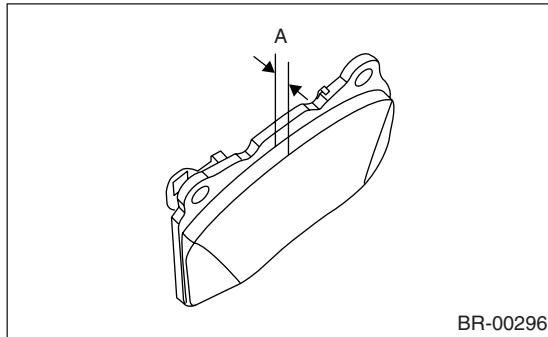
- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound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

Front Brake Pad

BRAKE

2. 16 INCH TYPE

Check the pad thickness A.



- 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.

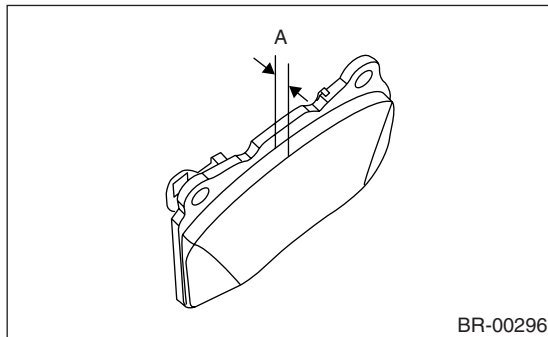
Pad thickness	Standard value	10 mm (0.393 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:

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

3. 17 INCH TYPE

Check the pad thickness A.



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

NOTE:

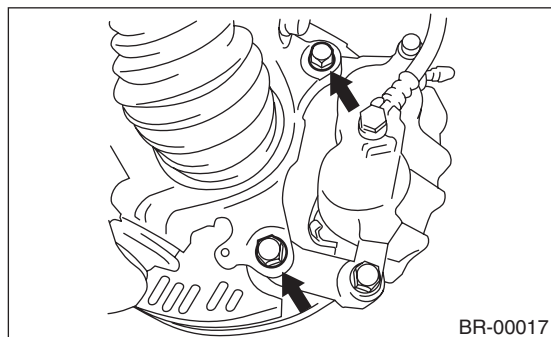
- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.

3. Front Disc Rotor

A: REMOVAL

1. 15 INCH TYPE

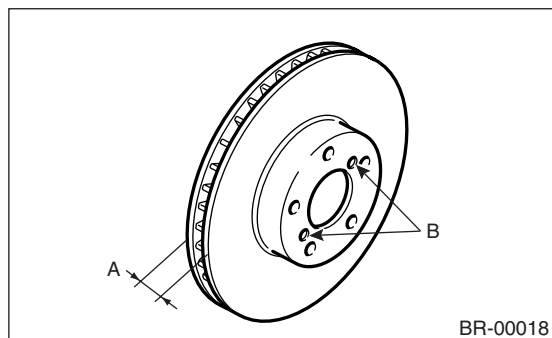
- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the caliper body and support from housing, and suspend it from strut using a wire.



- 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 disc rotor.

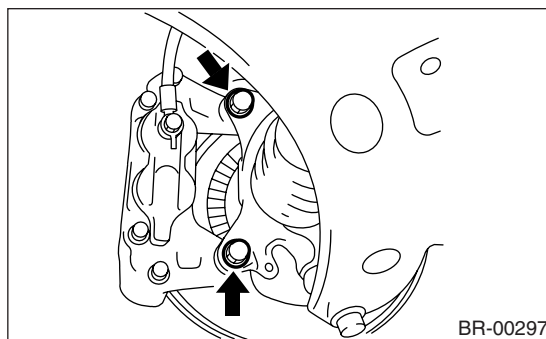


- 6) Clean mud and foreign particles from the caliper body assembly and support.

2. 16 INCH TYPE & 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.

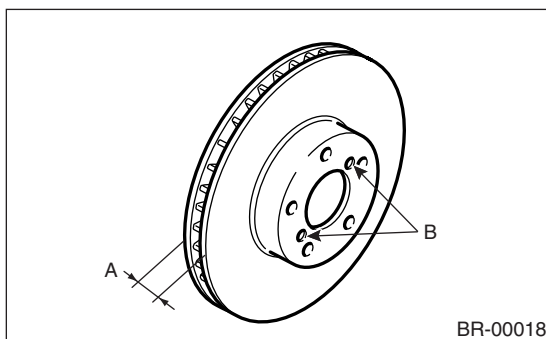
- 4) Remove the caliper body from housing, and suspend it from strut using a wire.



- 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 disc rotor.



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

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.

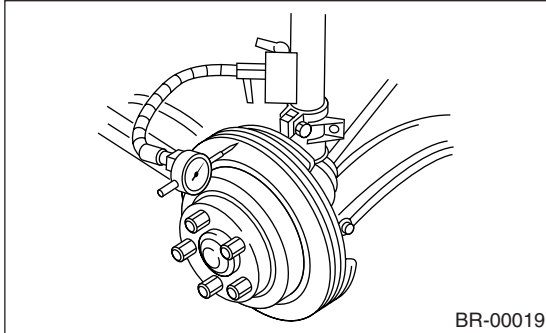
C: INSPECTION

- 1) Check front wheel bearing play and axle hub play before disc rotor runout limit inspection. <Ref. to DS-24, INSPECTION, Front Axle.>
- 2) Secure the disc rotor by tightening five wheel nuts.

Front Disc Rotor

BRAKE

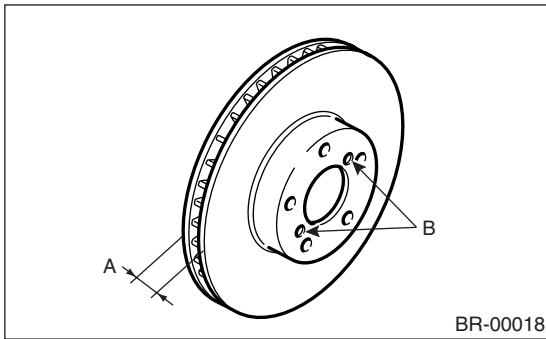
3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout exceeds the service limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4.



BR-00019

Disc rotor runout limit: 0.075 mm (0.0030 in)

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



BR-00018

		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

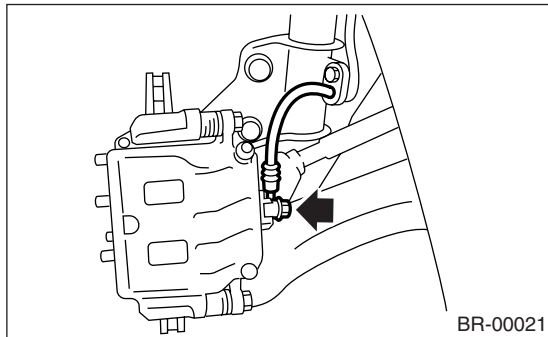
A: REMOVAL

1. 15 INCH TYPE

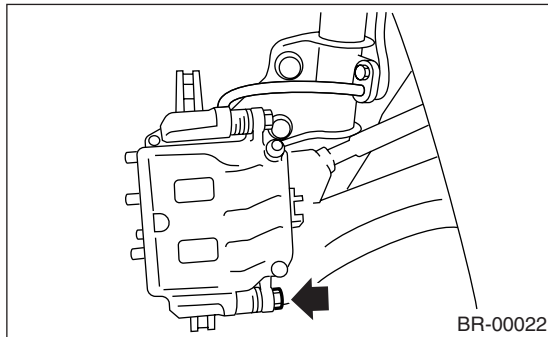
CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away immediately 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.



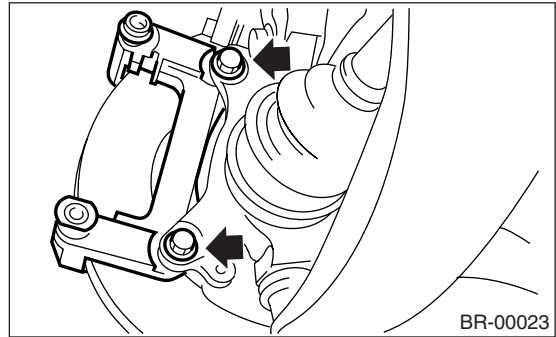
- 5) Remove the bolt securing lock pin to caliper body.



- 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 disc rotor. It need not be removed when servicing the caliper body assembly.



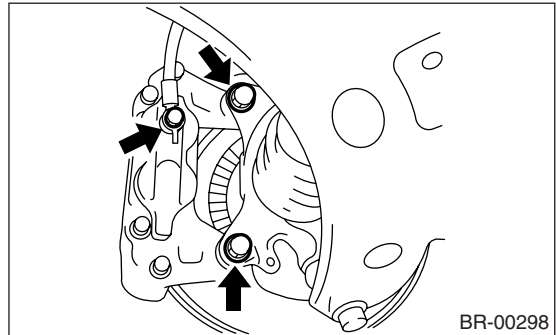
- 8) Clean mud and foreign particles from the caliper body assembly and support.

2. 16 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away at once 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:

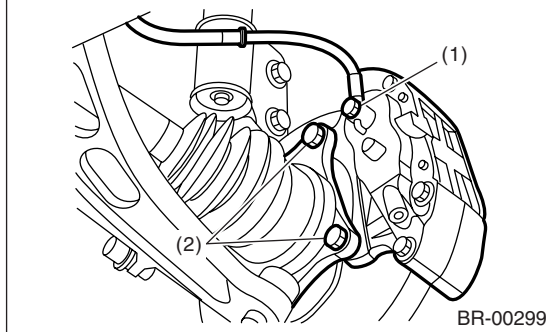
Do not allow brake fluid to come in contact with vehicle body; wash away immediately with water and wipe off completely if spilled.

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

Front Disc Brake Assembly

BRAKE

- 4) Remove the brake pads from caliper body. <Ref. to BR-18, 17 INCH TYPE, REMOVAL, Front Brake Pad.>
- 5) Remove the union bolt (1) and brake hose from caliper body assembly.
- 6) Remove installation bolts (2) from housing.



- (1) Union bolt
(2) Installation bolt

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

B: INSTALLATION

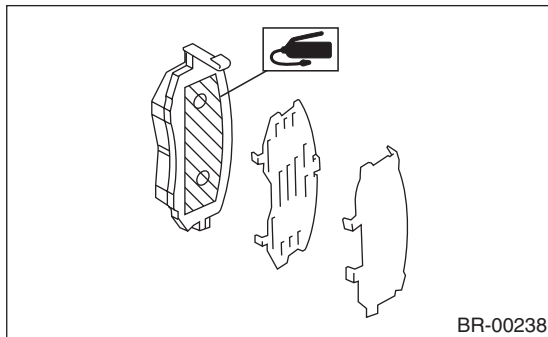
1. 15 INCH TYPE

- 1) Install the support on housing.

Tightening torque:

80 N·m (8.2 kgf-m, 59 ft-lb)

- 2) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
- 3) Apply thin coat of Molykote AS-880N (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:

26.5 N·m (2.7 kgf-m, 19.5 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.

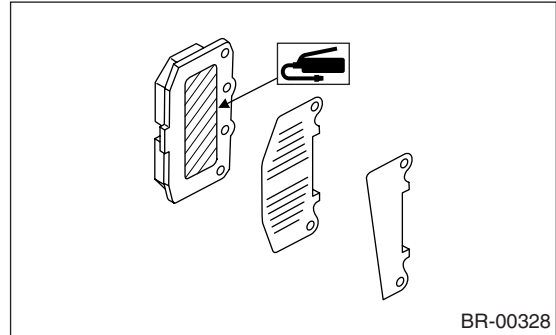
2. 16 INCH TYPE

- 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 AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



- 3) Install the pads on caliper body.
- 4) Install the pad pin 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.

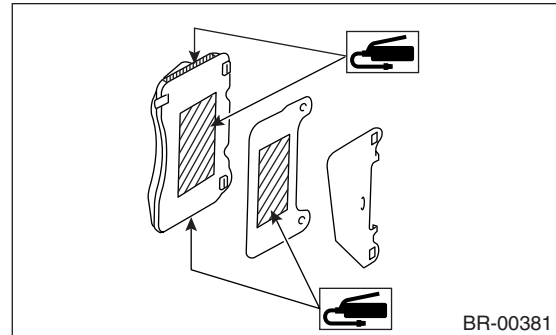
3. 17 INCH TYPE

- 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 AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad shim.



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

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

8) Bleed air from the brake system.

C: DISASSEMBLY

1. 15 INCH TYPE

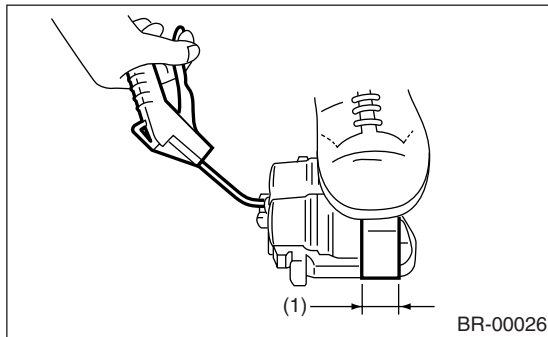
1) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:

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

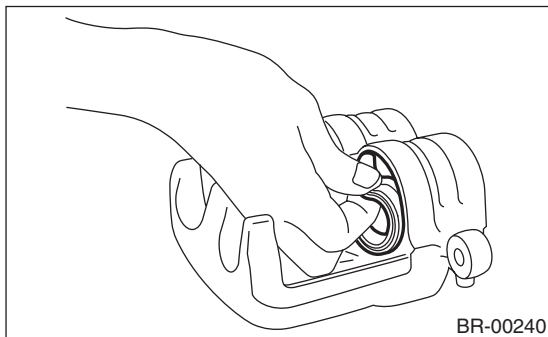
2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

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.

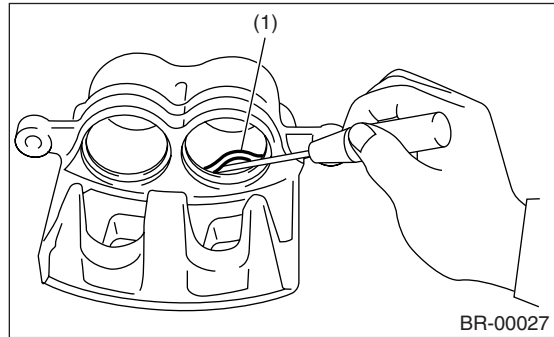
4) Remove the piston boot.



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.

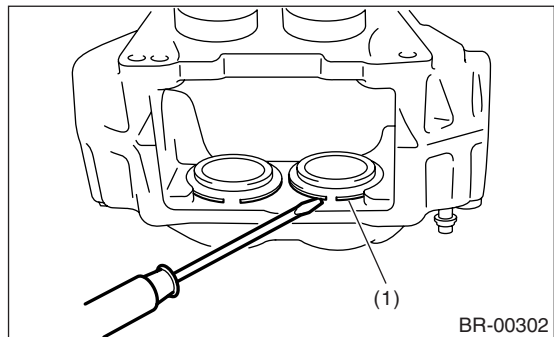
2. 16 INCH TYPE

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

CAUTION:

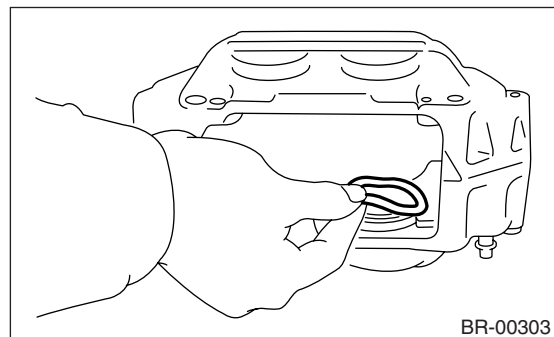
Be careful not to allow foreign particles to enter the brake hose connector.

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



(1) Boot ring

3) Remove the boot from piston end.

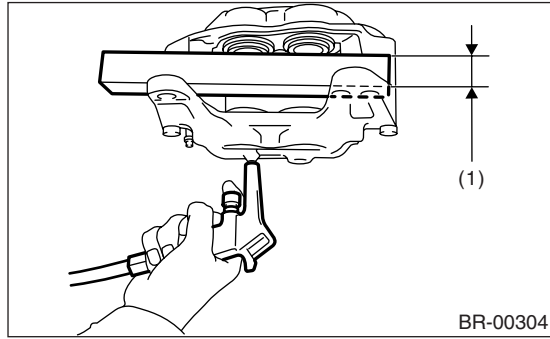


4) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

Front Disc Brake Assembly

BRAKE

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

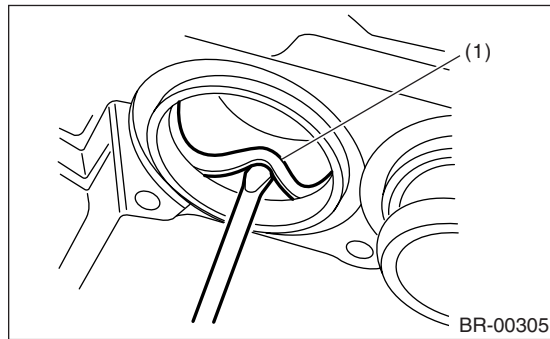


(1) Place a 30 mm (1.18 in) wide wooden block here.

6) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the cylinder and piston seal groove.



(1) Piston seal

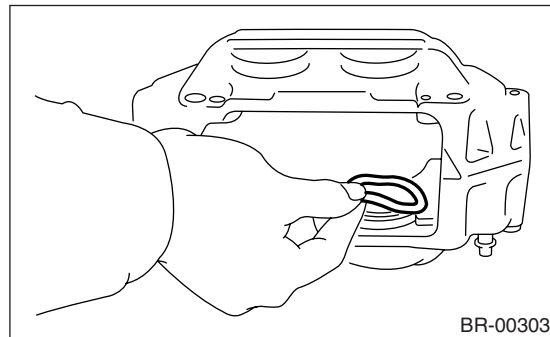
3. 17 INCH TYPE

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

CAUTION:

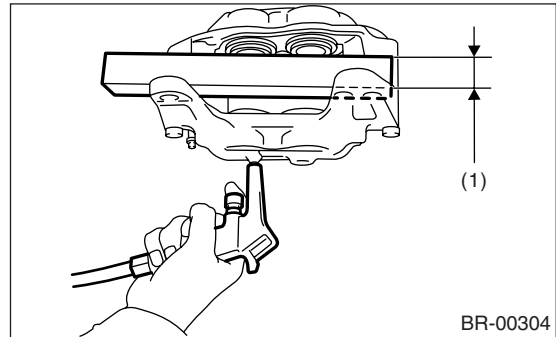
Be careful not to allow foreign particles to enter the brake hose connector.

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.

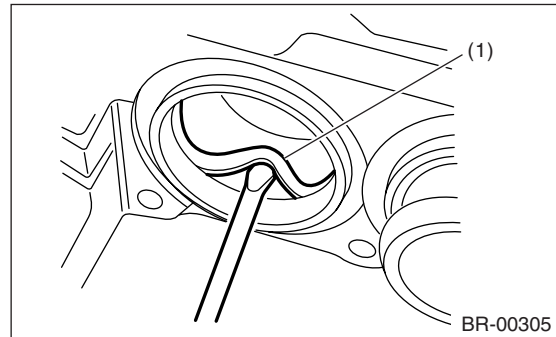


(1) Place a 30 mm (1.18 in) wide wooden block here.

5) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the cylinder and piston seal groove.



(1) Piston seal

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.

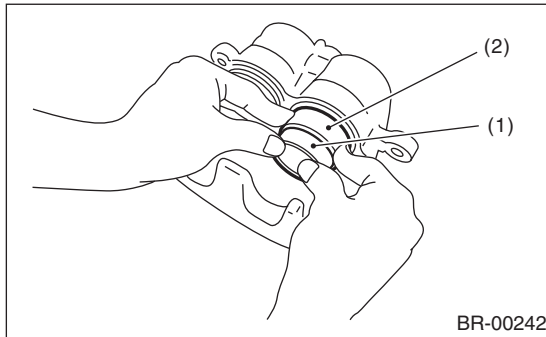
Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

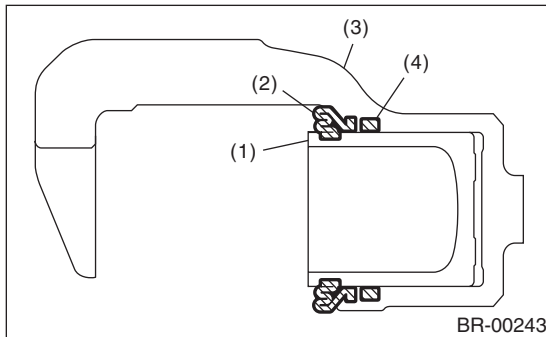
CAUTION:

Do not force the piston into cylinder.



- (1) Piston
- (2) Piston boot

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



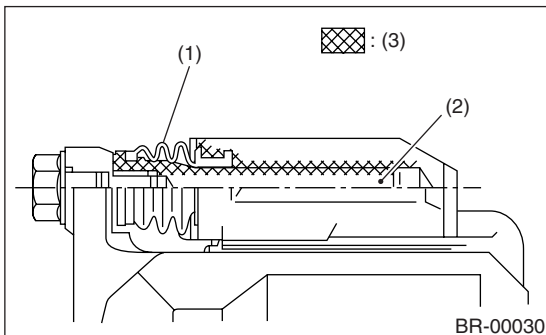
- (1) Piston
- (2) Piston boot
- (3) Caliper body
- (4) Piston seal

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.

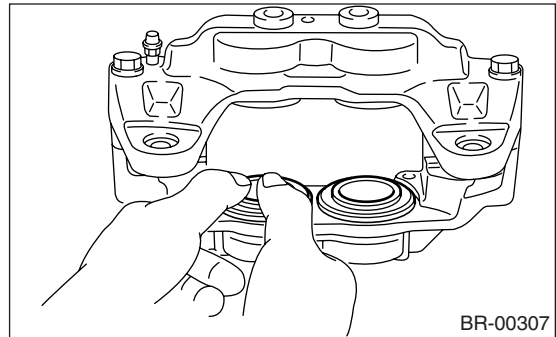
Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

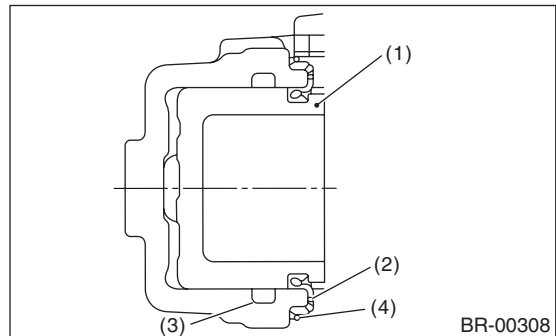
5) Insert the piston into cylinder.

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

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

Front Disc Brake Assembly

BRAKE

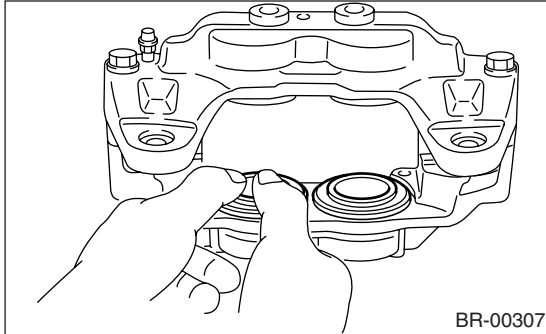
Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

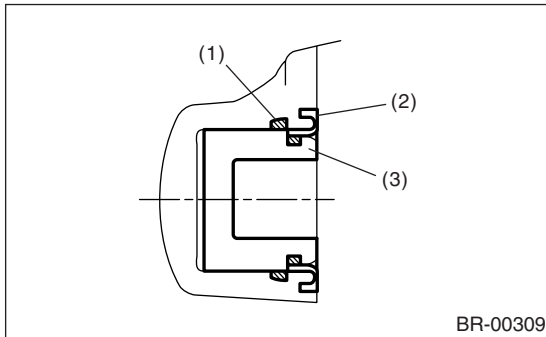
5) Insert the piston into cylinder.

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

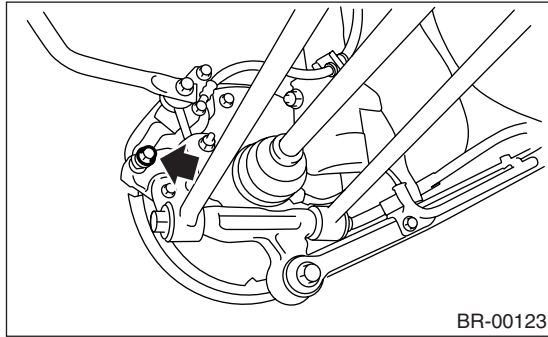
- 1) Repair or replace the faulty parts.
- 2) Check the caliper body and piston for uneven wear, damage or rust.
- 3) Check the rubber parts for damage or deterioration.

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:

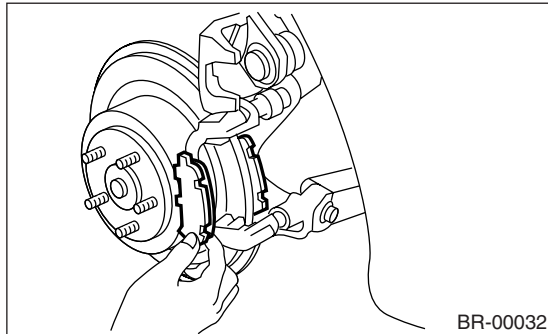
Do not disconnect the brake hose from caliper body.

- 6) Remove the pad.

NOTE:

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

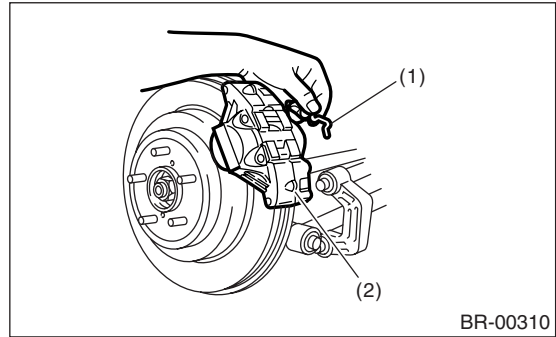
<Ref. to BR-17, REMOVAL, Front Brake Pad.>



2. 15 INCH TYPE

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

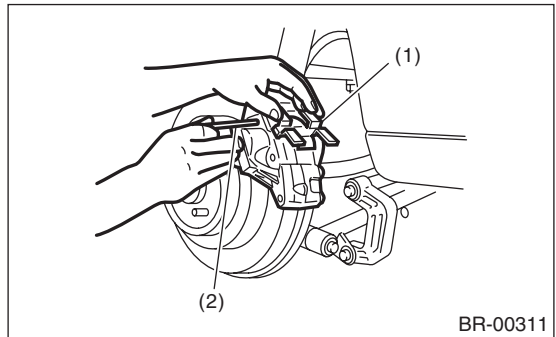
- 4) Remove the M clip.



- (1) M clip
- (2) Caliper body

- 5) Remove the two pad pins.

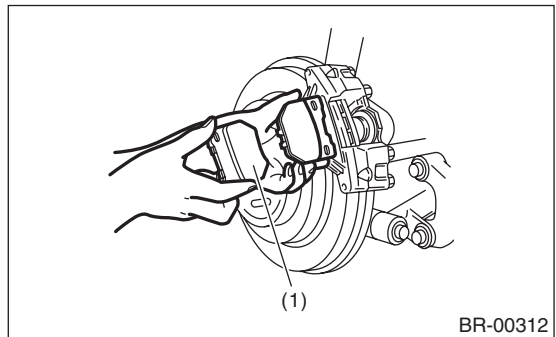
- 6) Remove the cross spring.



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

- 7) Expand the pads and push piston back.

- 8) Remove the pad and shim.



- (1) Brake pad

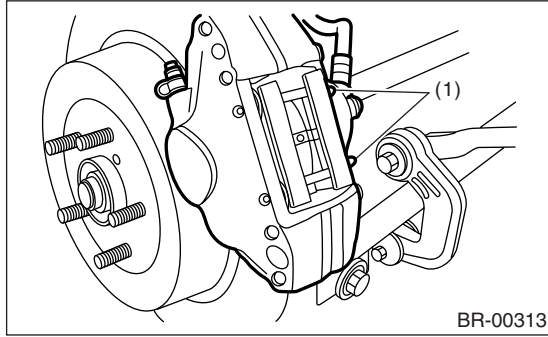
3. 17 INCH TYPE

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

Rear Brake Pad

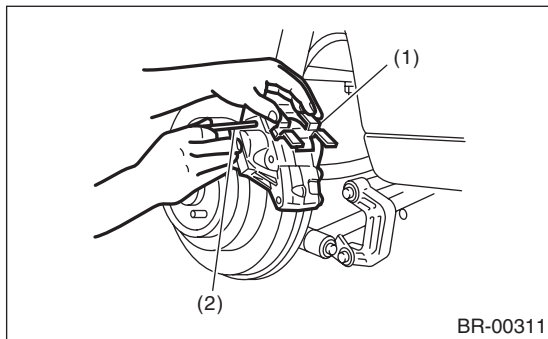
BRAKE

4) Remove the clip.



(1) Clip

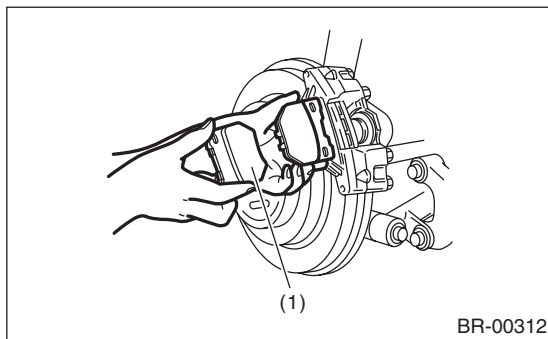
5) Remove the pad pins and cross spring.



(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 AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.

2) Install the pads 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 the air bleeder screw to facilitate work.

2. 15 INCH TYPE

1) Apply a thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.

2) Install the pads on caliper body.

3) Install the cross spring.

4) Install the pad pin on caliper body.

5) Install the M clip.

3. 17 INCH TYPE

1) Apply a thin coat of Molykote AS-880N (Part No. K0777YA010) to frictional portion between pad and pad inner shim.

2) Install the pads on caliper body.

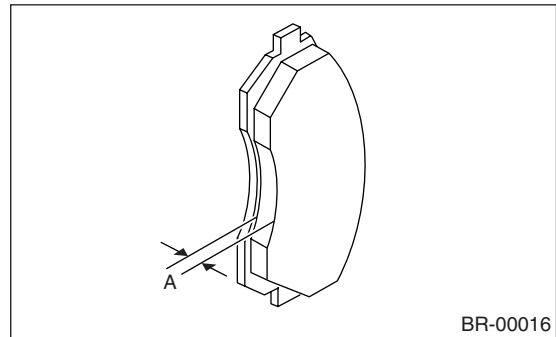
3) Install the cross spring and pad pins.

4) Install the clip.

C: INSPECTION

1. 14 INCH TYPE

Check pad thickness A.



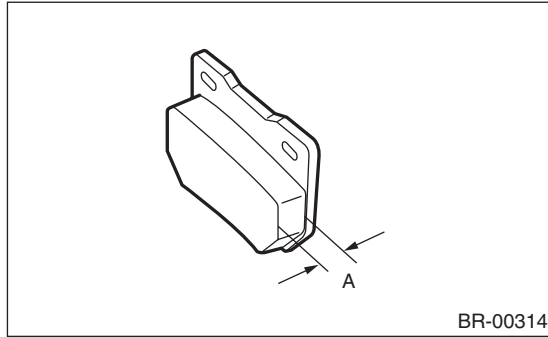
Pad thickness	Standard value	9.0 mm (0.354 in)
	Wear limit	1.5 mm (0.059 in)

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. 15 INCH TYPE

Check the pad thickness A.



- 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.

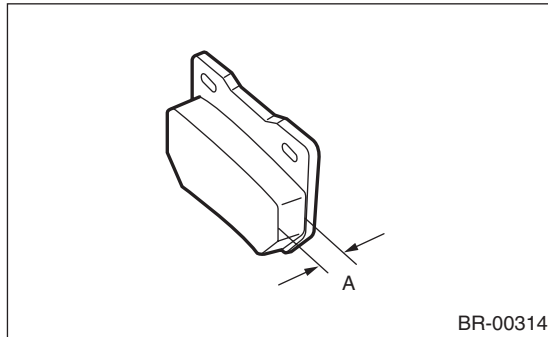
Pad thickness	Standard value	11.5 mm (0.452 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:

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

3. 17 INCH TYPE

Check the pad thickness A.



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

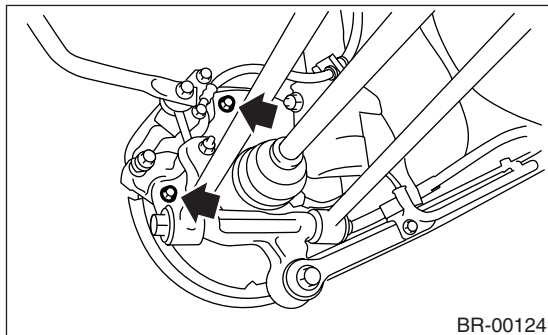
NOTE:

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.

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) Release the parking brake.
- 5) Remove the two mounting bolts, and then remove the disc brake assembly.

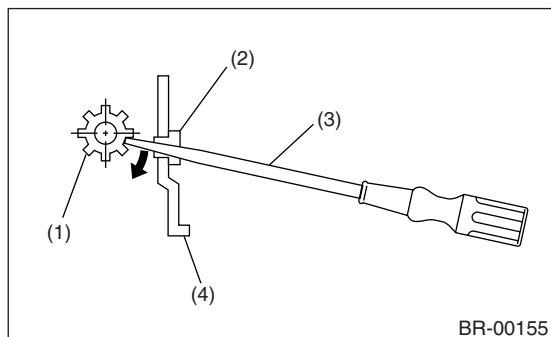


- 6) Suspend the disc brake assembly so that hose is not stretched.
- 7) Remove the disc rotor.

NOTE:

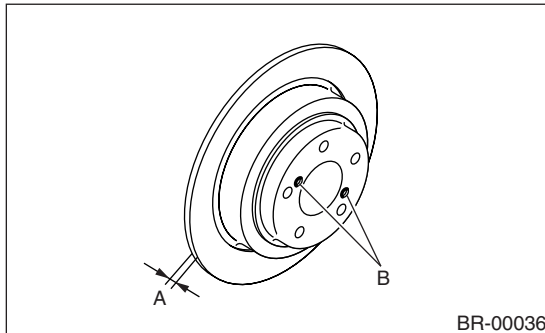
If the disc rotor is difficult to remove try following two methods in order.

- (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 disc rotor.

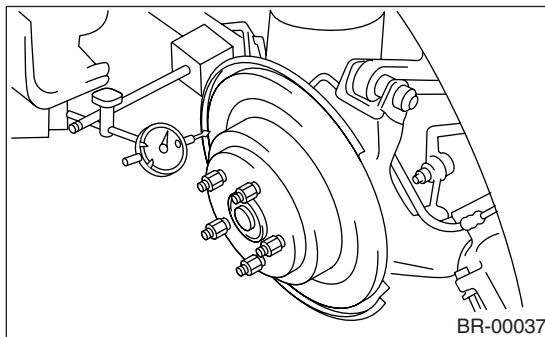


B: INSTALLATION

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

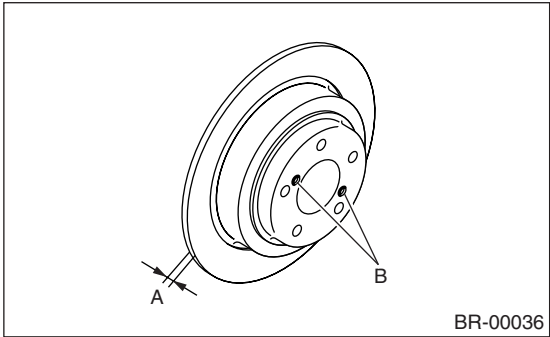
C: INSPECTION

- 1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-32, 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 exceeds the service limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4.



Disc rotor runout limit:
0.070 mm (0.0028 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 exceeds the service limit, replace with a new disc rotor.



BR-00036

		Standard	Limit	Disc outer dia.
Disc rotor thickness A	14"	10 mm (0.39 in)	8.5 mm (0.335 in)	266 mm (10.47 in)
	15"	18 mm (0.71 in)	16 mm (0.63 in)	290 mm (11.42 in)
	17"	20 mm (0.79 in)	18 mm (0.71 in)	316 mm (12.44 in)

7. Rear Disc Brake Assembly

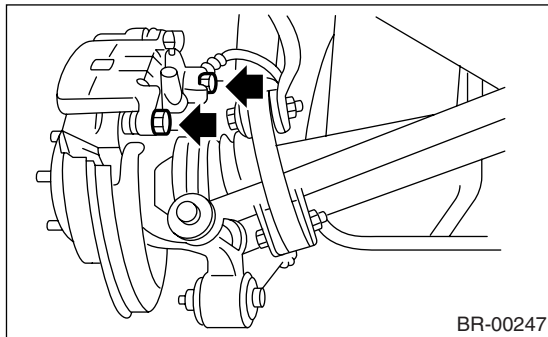
A: REMOVAL

1. 14 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away immediately 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 disc rotor. It need not be removed when servicing the caliper body assembly.

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

CAUTION:

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

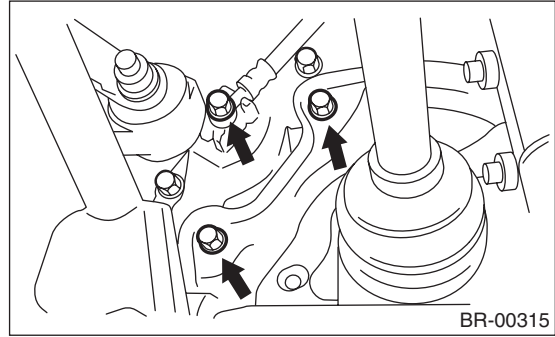
2. 15 INCH TYPE

CAUTION:

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

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the wheels.
- 4) Remove the pads from caliper body. <Ref. to BR-29, REMOVAL, Rear Brake Pad.>
- 5) Disconnect the brake hose from caliper body assembly.

- 6) Remove the caliper body from housing.



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

CAUTION:

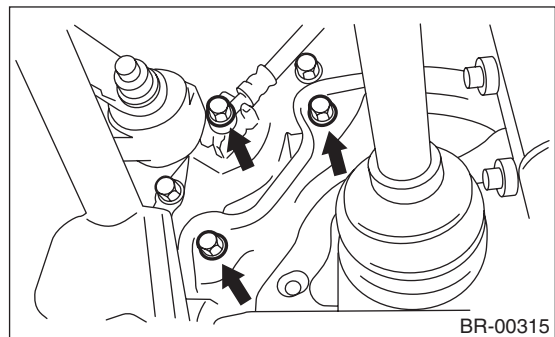
Be careful not to allow foreign particles to enter brake hose connector.

3. 17 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wash away immediately 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-29, 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:

53 N·m (5.4 kgf-m, 39.1 ft-lb)

- 2) Apply thin coat of Molykote AS-880N (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. 15 INCH TYPE

- 1) Install the caliper body on housing.

Tightening torque:

53 N·m (5.4 kgf-m, 39.1 ft-lb)

- 2) Apply a thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
- 3) Install the pads on caliper body.
- 4) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 5) Bleed air from the brake system.

3. 17 INCH TYPE

- 1) Install the caliper body on housing.

Tightening torque:

65 N·m (6.6 kgf-m, 47.9 ft-lb)

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

Tightening torque:

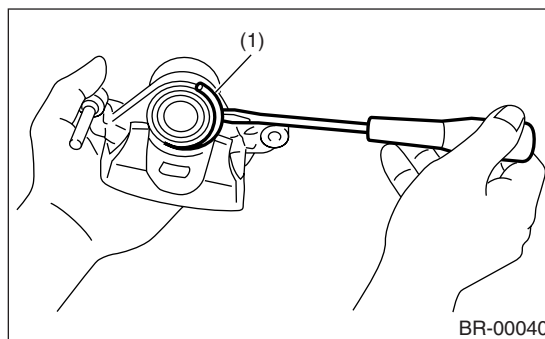
18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 4) Bleed air from the brake system.

C: DISASSEMBLY

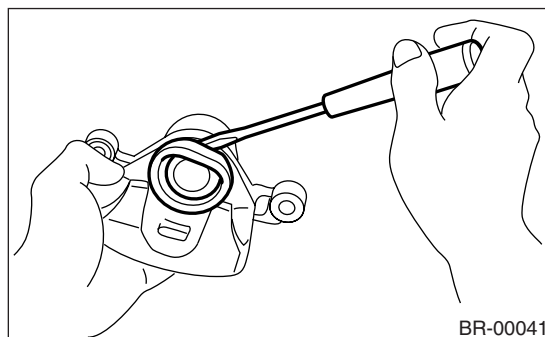
1. 14 INCH TYPE

- 1) Remove the boot ring.



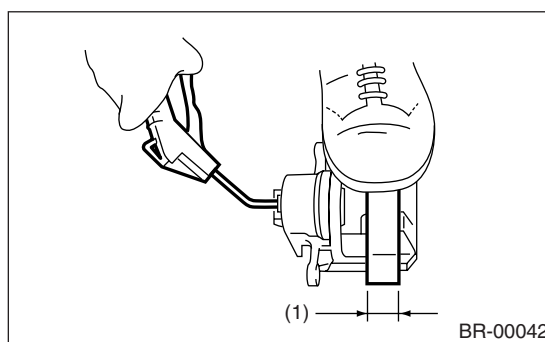
(1) Boot ring

- 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.



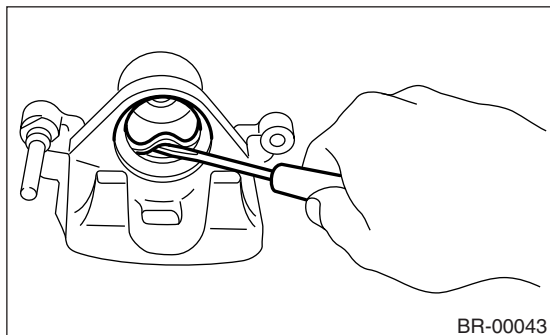
(1) Place a 30 mm (1.18 in) wide wooden block here.

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

Rear Disc Brake Assembly

BRAKE

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

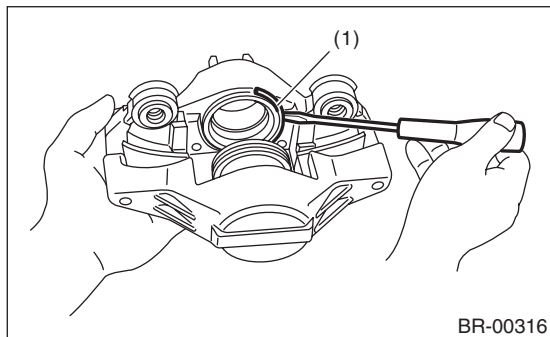


6) Remove the lock pin sleeve and boot from caliper body.

7) Remove the guide pin boot.

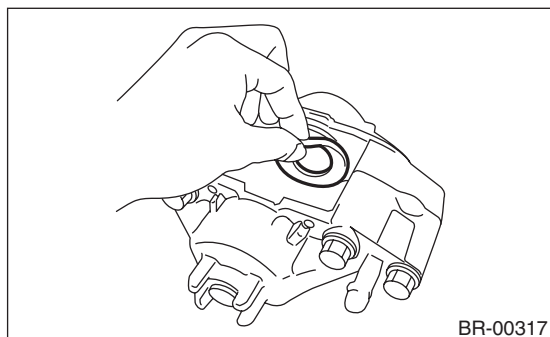
2. 15 INCH TYPE

1) Remove the boot ring.



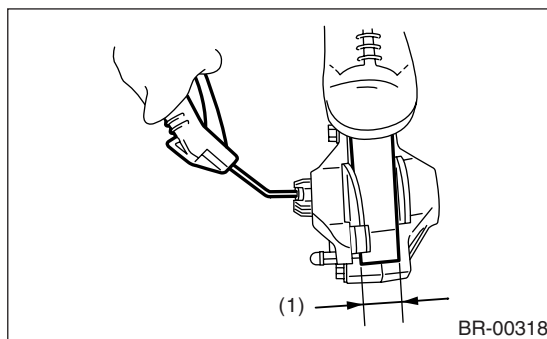
(1) Boot ring

2) Remove the piston boot.



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

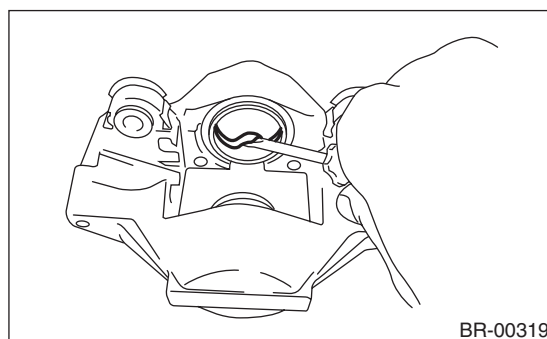
4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



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

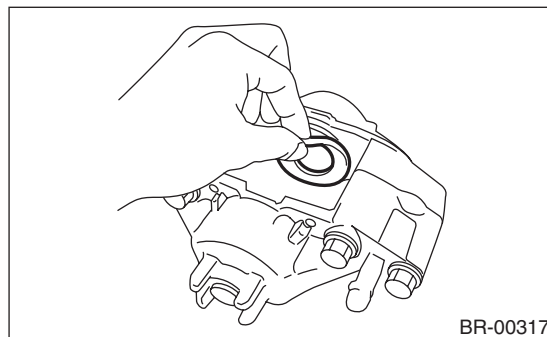
5) Remove the piston seal from caliper body cylinder.

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



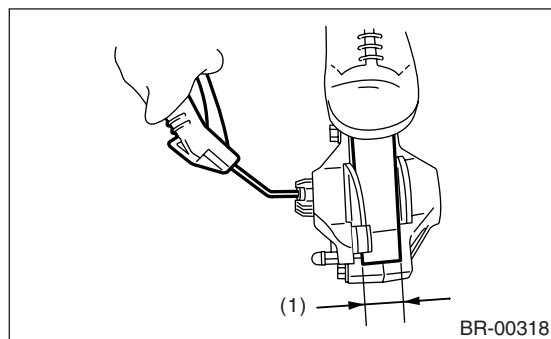
3. 17 INCH TYPE

1) Remove the piston boots from each 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.

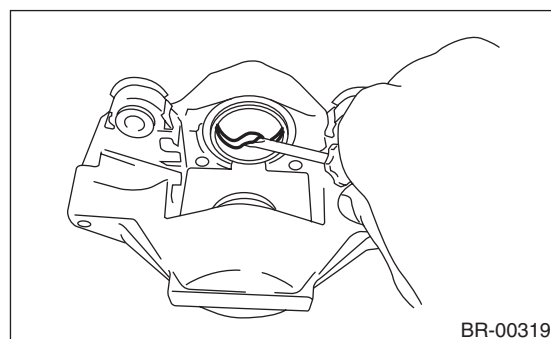


- (1) Place a 20 mm (0.79 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the cylinder and piston seal groove.



D: ASSEMBLY

1. 14 INCH TYPE

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

CAUTION:

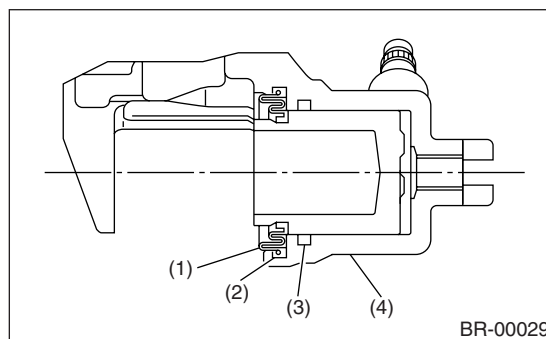
Do not force piston into cylinder.

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

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

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

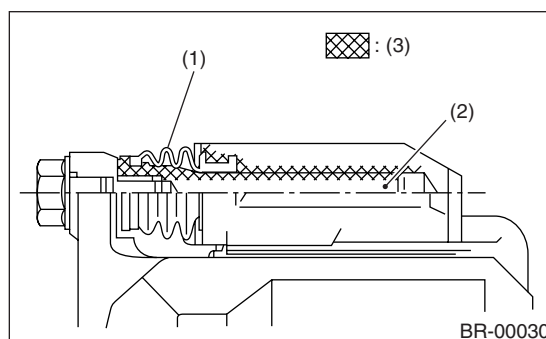


- (1) Piston boot
(2) Boot ring
(3) Piston seal
(4) Caliper body

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

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)



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

8) Install the guide pin boot on support.

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

2. 15 INCH TYPE

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

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

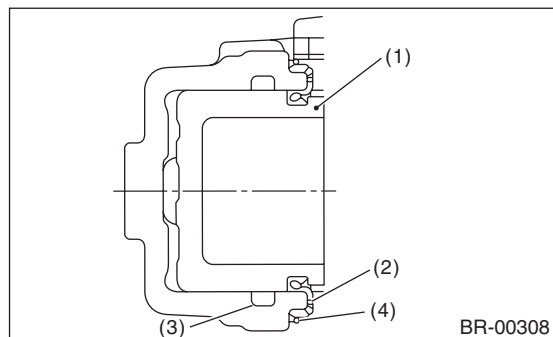
Rear Disc Brake Assembly

BRAKE

CAUTION:

Do not force the piston into cylinder.

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



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

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.

3. 17 INCH TYPE

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

Grease:

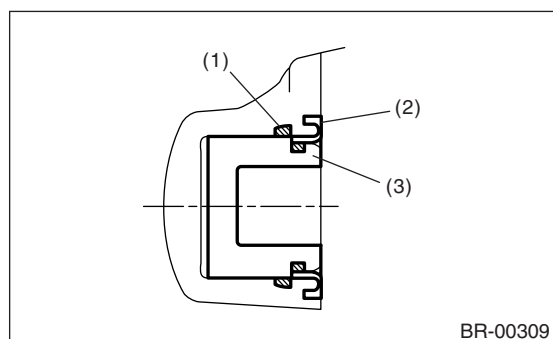
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:

Do not force the piston into cylinder.

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



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

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

15 N·m (1.5 kgf-m, 10.8 ft-lb)

Piping flare nut

15 N·m (1.5 kgf-m, 10.8 ft-lb)

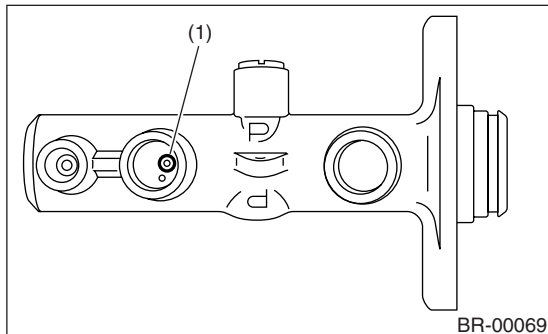
CAUTION:

Be sure to use recommended brake fluid.

- 2) Bleed air from the brake system. <Ref. to BR-47, PROCEDURE, Air Bleeding.>

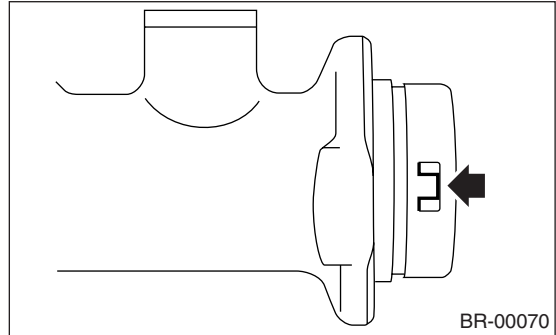
C: DISASSEMBLY

- 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.

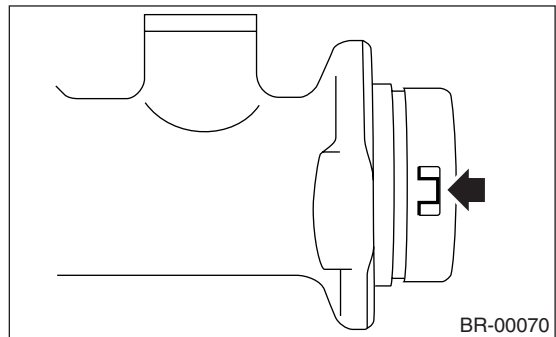


- 6) Extract the primary piston assembly and secondary piston assembly straight out, while taking care not to scratch the inner surface of cylinder.

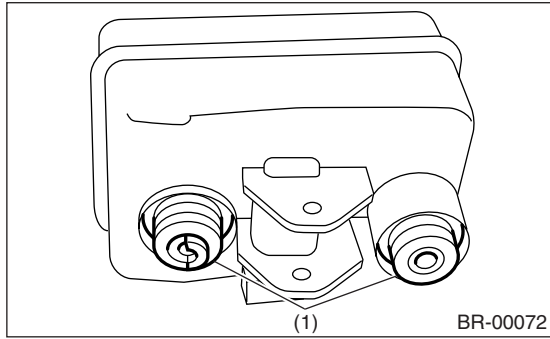
- 7) Use brake fluid to wash the inside wall of cylinder, and piston assembly. If any damage, deformation, wear, rust, and other faults are found, replace the faulty part.

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 or secondary piston assembly, 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

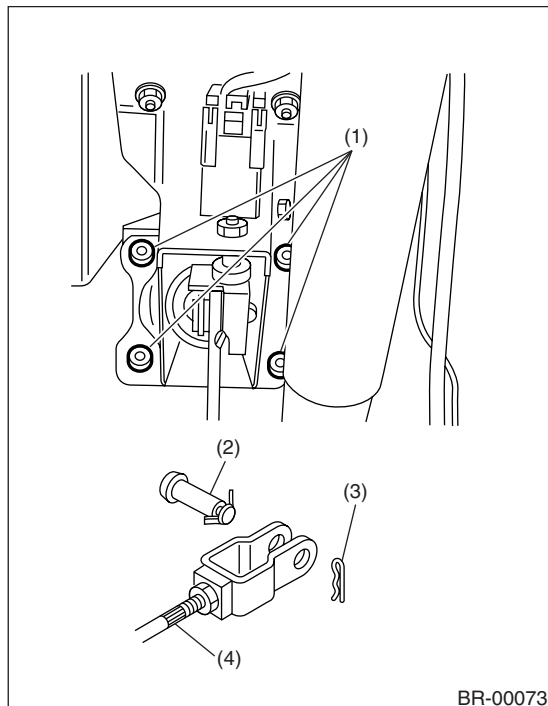
A: REMOVAL

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.

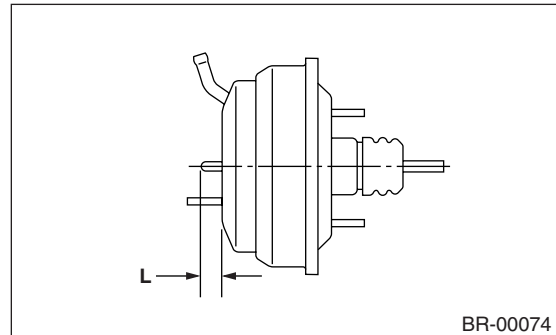
NOTE:

- 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.

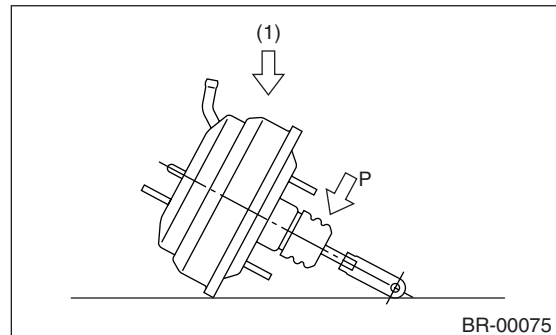
Standard L:

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

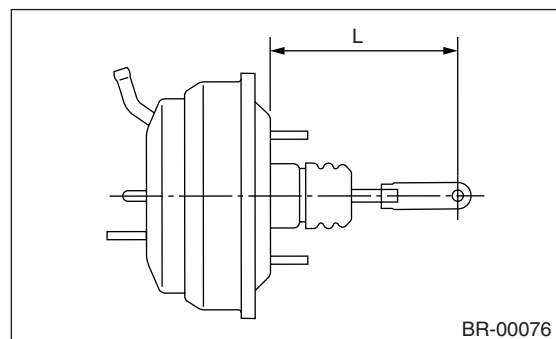
B: INSTALLATION

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.

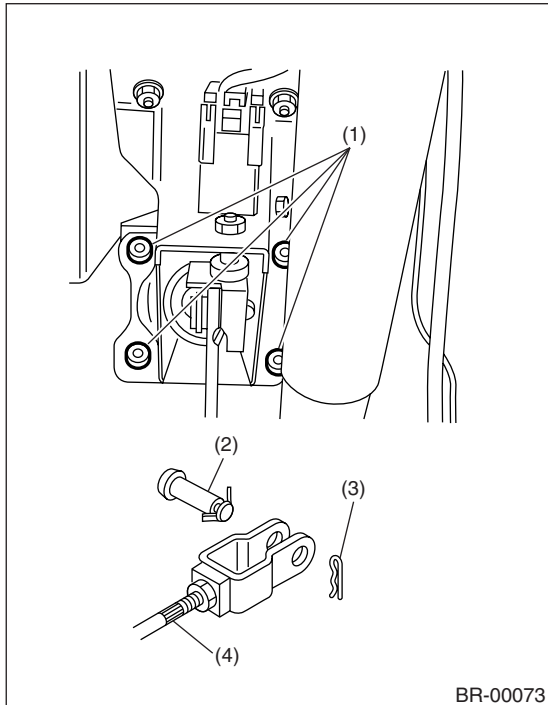


2) Mount the brake booster in position.

Brake Booster

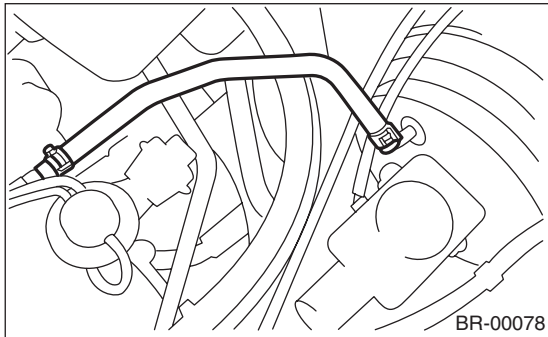
BRAKE

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.

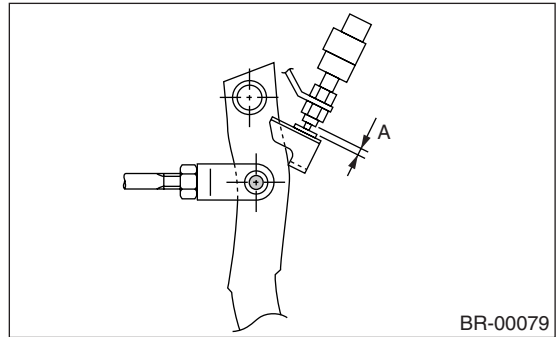


- 5) Mount the master cylinder onto brake booster.
- 6) Connect the brake pipes to master cylinder.
- 7) Connect the electric connector for brake fluid level indicator.
- 8) Measure the clearance between threaded end of stop light switch and stopper.
If it is not within specified value, adjust it by adjusting the position of stop light switch. <Ref. to BR-56, ADJUSTMENT, Stop Light Switch.>

CAUTION:

Be careful not to rotate the stop light switch.

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



9) Apply grease to operating rod connecting pin to prevent it from wearing.

10) Bleed air from the brake system.

Tightening torque (Air bleeder screw):

Except 17 inch type:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

17 inch type:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

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

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

CAUTION:

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

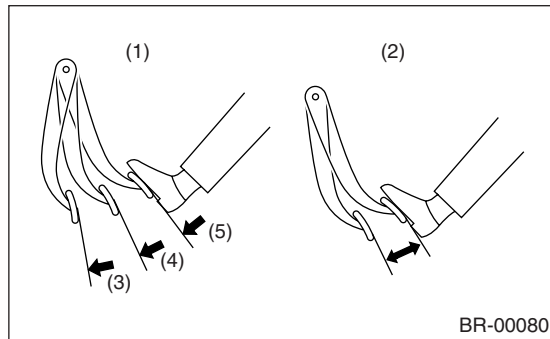
• Checking without gauges

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

• Air tightness check

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

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



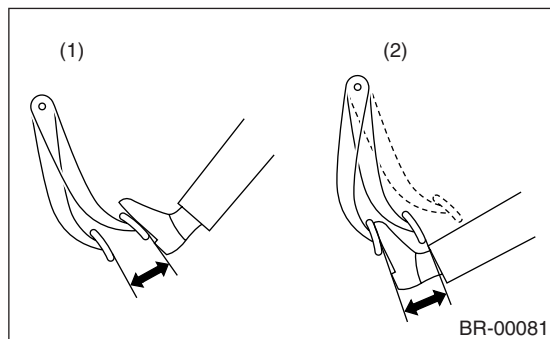
- (1) OK
- (2) NG
- (3) 1st
- (4) 2nd
- (5) 3rd

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.

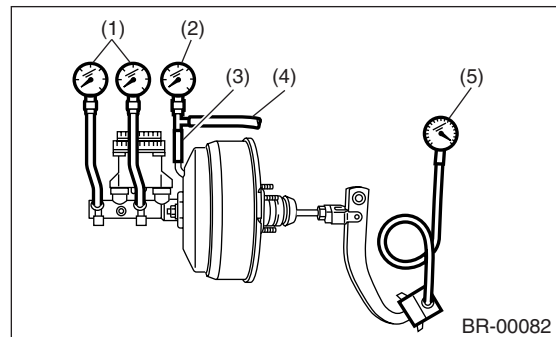
2. OPERATION CHECK (WITH GAUGES)

CAUTION:

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

• Checking with gauges

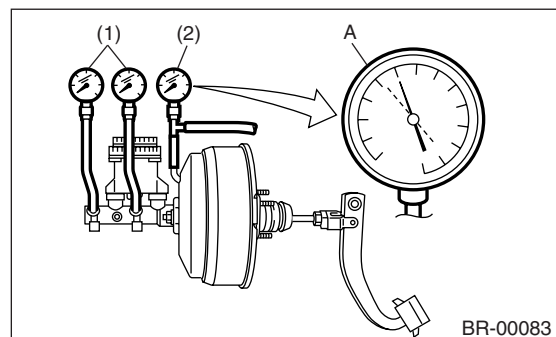
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



- (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

Brake Booster

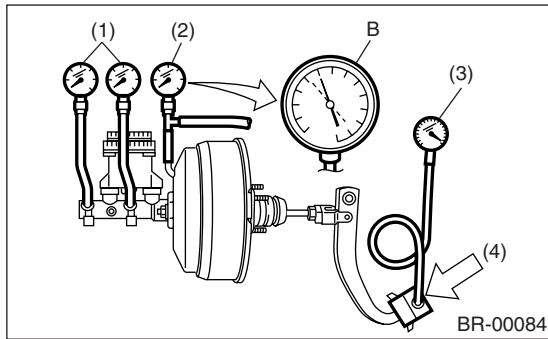
BRAKE

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

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

• Loaded air tightness check

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



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

2) Stop the engine and watch vacuum gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly. If defective, refer to "AIR TIGHTNESS CHECK".
<Ref. to BR-42, INSPECTION, Brake Booster.>
3) If any fault is found on brake booster, replace the brake booster with a new one.

• Lack of boosting action check

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

Brake pedal force		147 N (15 kgf, 33 lbf)	294 N (30 kgf, 66 lbf)
Fluid pressure	15"	588 kPa (6 kgf/cm ² , 85 psi)	1,471 kPa (15 kgf/cm ² , 213 psi)
	16"		1,667 kPa (17 kgf/cm ² , 242 psi)
	17"		1,471 kPa (15 kgf/cm ² , 213 psi)

• Boosting action check

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

Brake pedal force		147 N (15 kgf, 33 lbf)	294 N (30 kgf, 66 lbf)
Fluid pressure	15"	5,296 kPa (54 kgf/cm ² , 768 psi)	9,120 kPa (93 kgf/cm ² , 1,323 psi)
	16"	6,276 kPa (64 kgf/cm ² , 910 psi)	10,000 kPa (102 kgf/cm ² , 1,450 psi)
	17"	4,021 kPa (41 kgf/cm ² , 583 psi)	8,336 kPa (85 kgf/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 or DOT4 brake fluid must be used.
- Cover the air bleeder screw 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.

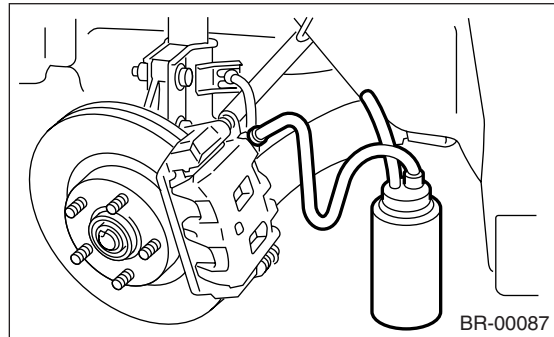
NOTE:

- During replacement, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - The brake pedal operating must be very slow.
 - For convenience and safety, two people should do the work.
 - The amount of brake fluid required is approx. 500 ml (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.
- 1) Either lift-up the vehicle and place a rigid racks 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:

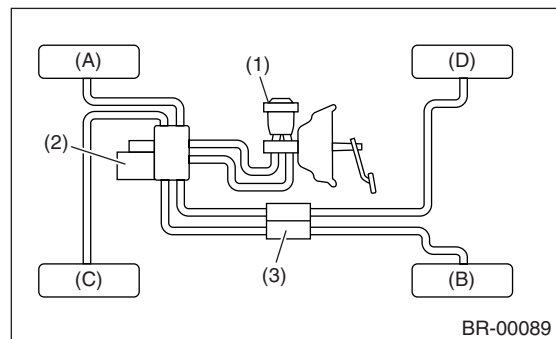
FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

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



CAUTION:

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



- (1) Master cylinder
- (2) Hydraulic unit
- (3) Two-way connector

- 6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
- 7) Loosen the air 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 new fluid flows through vinyl tube.

NOTE:

Add brake fluid as necessary during replacement, in order to prevent the tank from running short of brake fluid.

- 9) After completing the replacement, hold brake pedal depressed and tighten screw and install air bleeder screw cap.

Tightening torque (Air bleeder screw):

Except 17 inch type:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

17 inch type:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

Brake Fluid

BRAKE

10) Replace brake fluid of 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 lbf) and hold it there for approx. 20 seconds. At this time check for mix in air and pedal height change.

Visually inspect the air 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

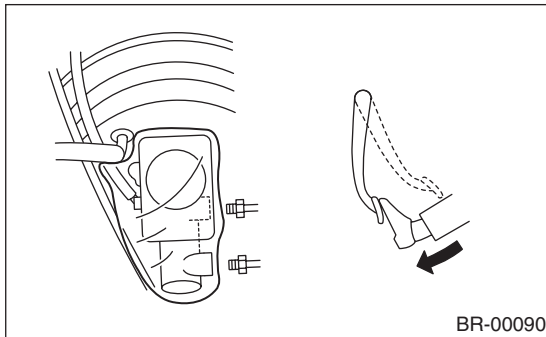
CAUTION:

- The FMVSS No. 116, fresh DOT3 or DOT4 brake fluid must be used.
- Cover the air bleeder screw 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.

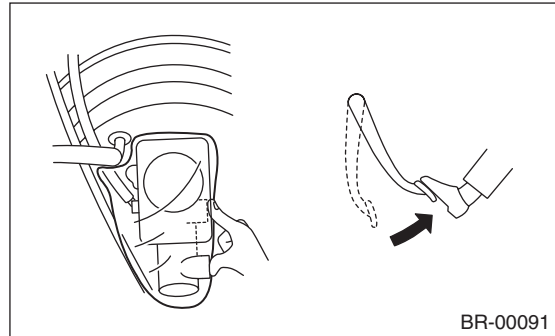
1. MASTER CYLINDER

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 rigid racks, and remove the wheel.
 - 2) Disconnect the brake line at primary and secondary sides.
 - 3) Put a plastic bag cover on master cylinder.
 - 4) Carefully depress and hold the brake pedal.



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



- 6) Repeat step 4) 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:

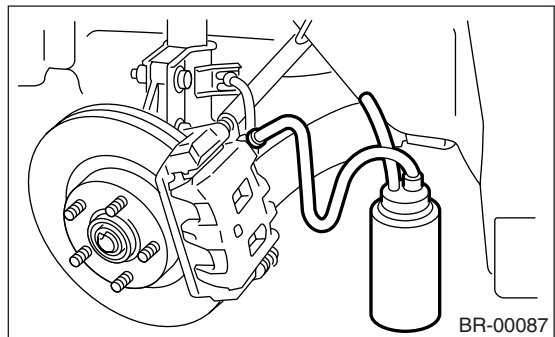
15 N·m (1.5 kgf-m, 10.8 ft-lb)

- 9) Bleed air from the brake line. <Ref. to BR-47, 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 screw and put the other end into a brake fluid container.

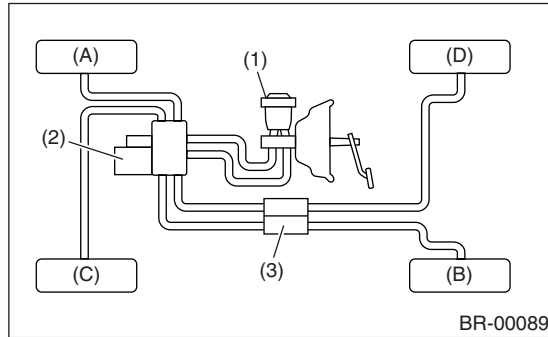


Air Bleeding

BRAKE

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 screw to discharge air together with the fluid.

Release the air bleeder screw for 1 to 2 seconds.

Next, with the air bleeder screw 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 air bleeder screw 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 screw securely when no air bubbles are visible.

Tightening torque:

Except 17 inch type:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

17 inch type:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

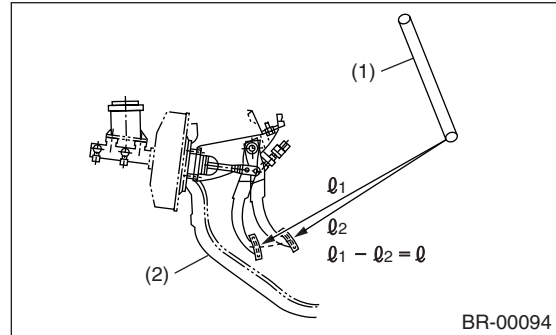
NOTE:

For 17 inch type, do not allow brake fluid come in contact with caliper body; wash away with water. (Especially for air bleeder screw.)

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 lbf) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must not be more than specified.



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

Specified pedal stroke

WRX model

105 mm (4.13 in)

Except WRX 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-10, 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.

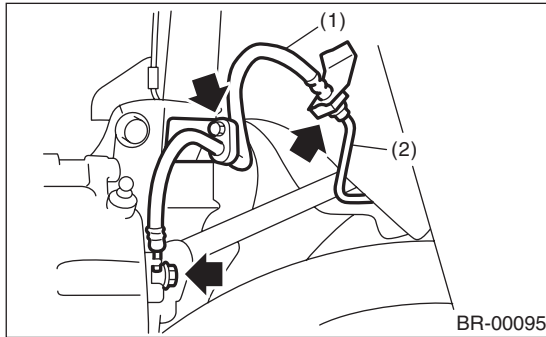
12) As a final step, test run the vehicle at low speed and apply brakes to ensure that brakes provide normal braking action.

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

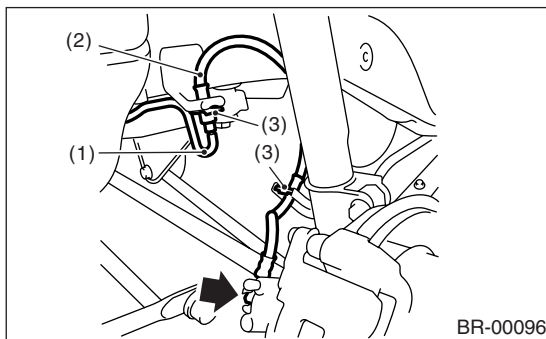
2. REAR BRAKE HOSE

- 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 mount.

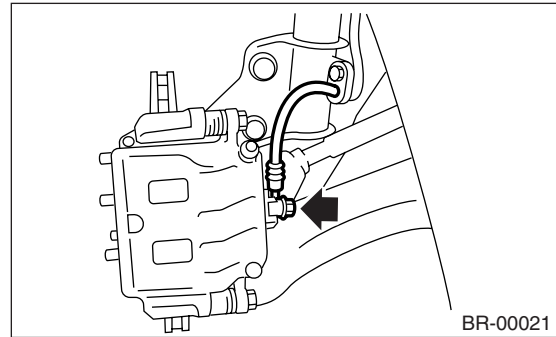
Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)

- 2) Install the brake hose to caliper body 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

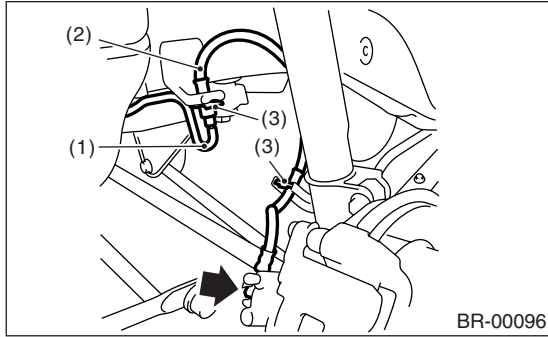
- 1) Pass the brake hose through hole of bracket, and then lightly tighten the flare nut to connect brake pipe.
- 2) Insert the clamp upward to fix brake hose.
- 3) Install the brake hose to caliper body using a new gasket.

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:

- Airbag system 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, use flare nut wrench.
- 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:

- Airbag system 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, use flare nut wrench.
- 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.

Tightening torque (Brake pipe):

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:

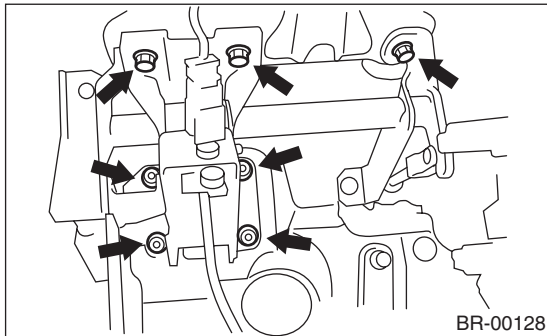
Use a mirror when inspecting low-visible part or back side.

14.Brake Pedal

A: REMOVAL

1. MT MODEL

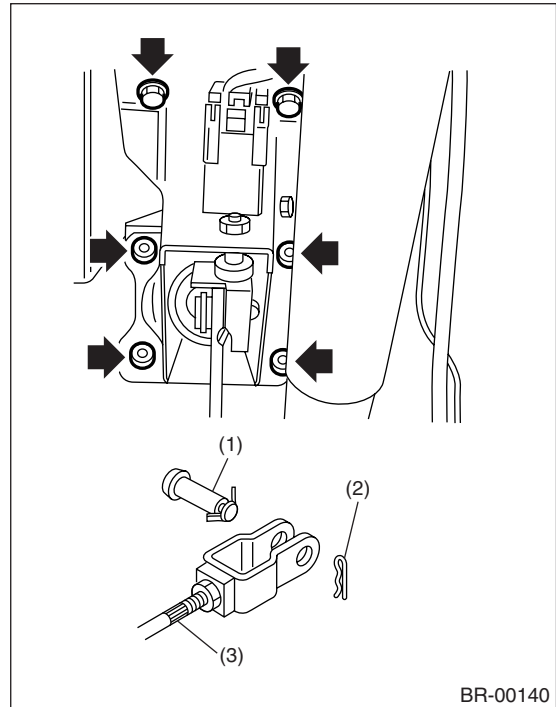
- 1) Remove the steering shaft.
- 2) Disconnect the connectors (for stop light switch, etc.) from pedal bracket.
- 3) Remove the clevis pin which secures the lever to push rod.
- 4) Remove the nut which secures the clutch master cylinder.
- 5) Remove the accelerator pedal.
- 6) Remove the bolts and nuts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

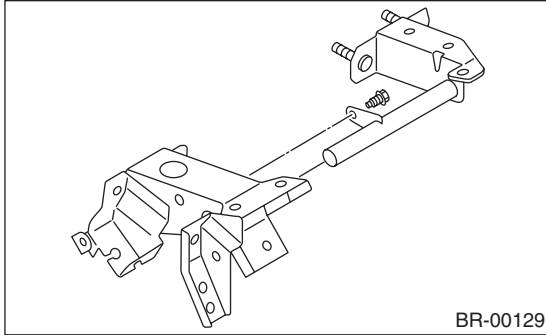
- 2) Adjust the clutch pedal <Ref. to CL-33, ADJUSTMENT, Clutch Pedal.>
- 3) Inspect the brake pedal after installation <Ref. to BR-53, INSPECTION, Brake Pedal.>

C: DISASSEMBLY

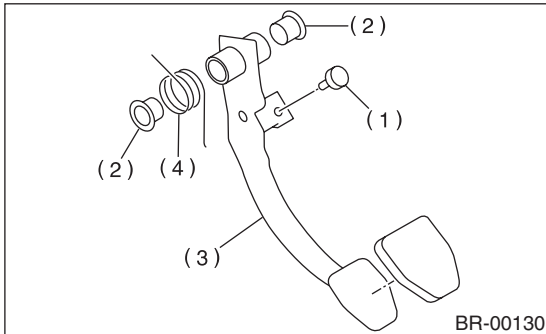
1. MT MODEL

- 1) Remove the brake switch.
<Ref. to BR-55, REMOVAL, Stop Light Switch.>
- 2) Remove the clutch pedal.
<Ref. to CL-32, DISASSEMBLY, Clutch Pedal.>

3) Remove the clutch master cylinder bracket.



4) Remove the bushing, spring and stopper.

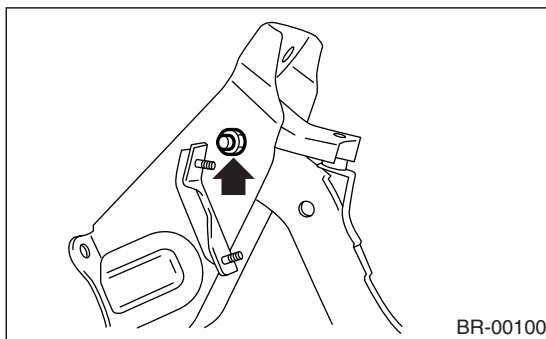


- (1) Stopper
- (2) Bushing
- (3) Brake pedal
- (4) Brake pedal spring

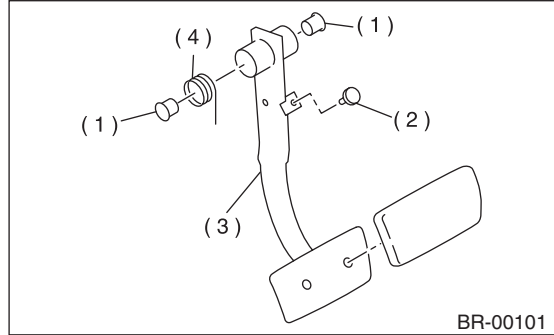
5) Remove the brake pedal pad.

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

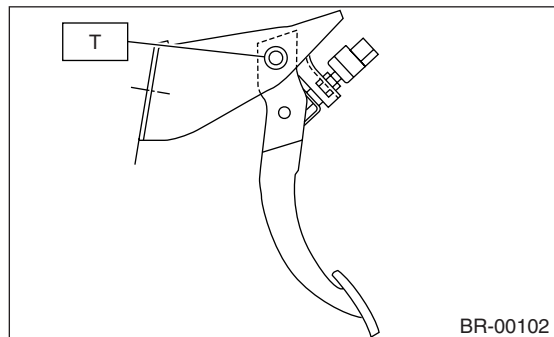
- 1) Attach the stop light switch, etc. to pedal bracket temporarily.
- 2) Clean the inside of bores of clutch pedal and brake pedal, apply grease, and set the bushings into bores.
- 3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring, and then install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

NOTE:

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

Tightening torque:

T: 30 N·m (3.1 kgf-m, 22.1 ft-lb)



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

E: INSPECTION

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

CAUTION:

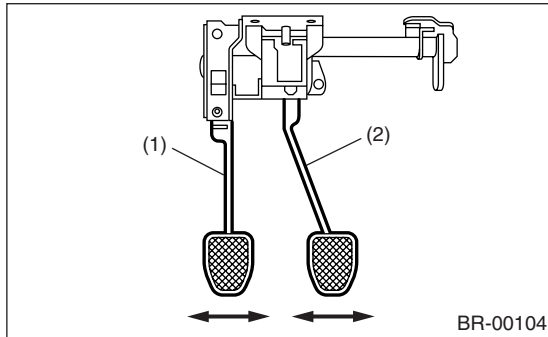
If excessive deflection is noted, replace the bushings with new ones.

Brake Pedal

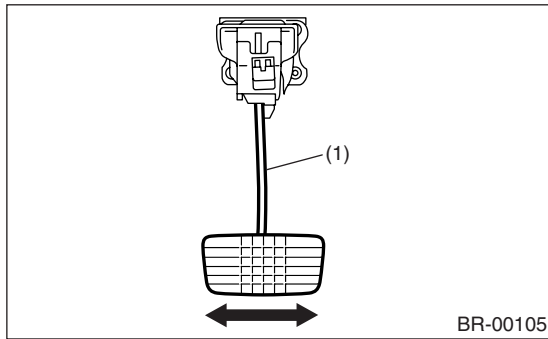
BRAKE

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

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



- (1) Clutch pedal
- (2) Brake pedal

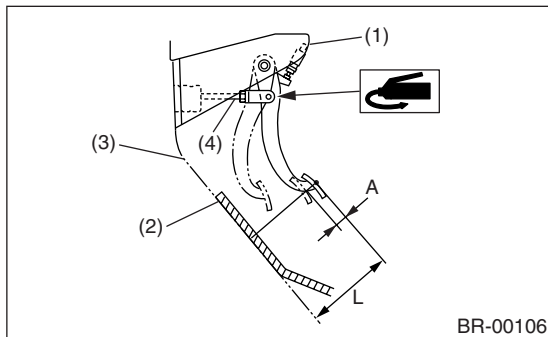


- (1) Brake pedal

2) Check the position of pedal pad.

Pedal height L:
148 mm (5.83 in)

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

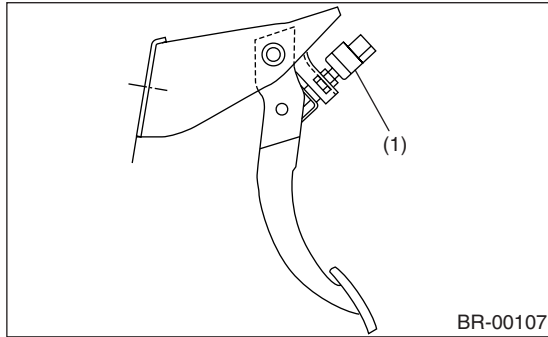


- (1) Stop light switch
- (2) Mat
- (3) Toe board
- (4) Brake booster operating rod

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.



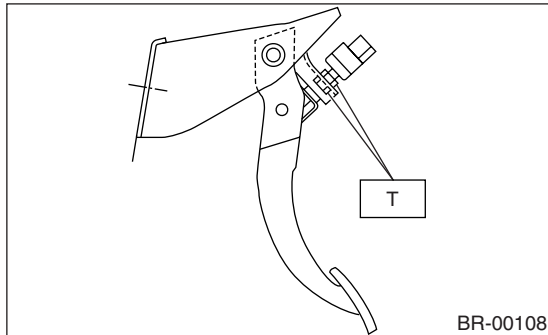
(1) Stop light switch

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-56, ADJUSTMENT, Stop Light Switch.>

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

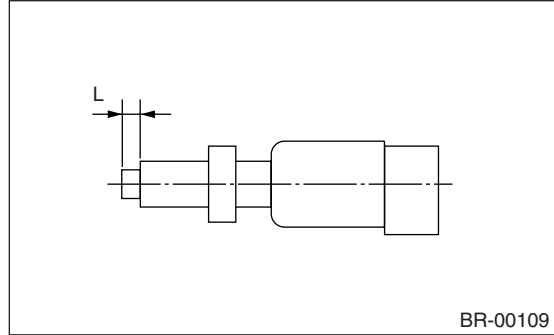


C: INSPECTION

- 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)



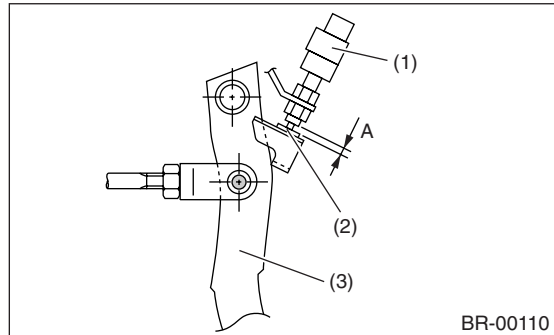
- 2) Measure the clearance between threaded end of stop light switch and stopper.

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:

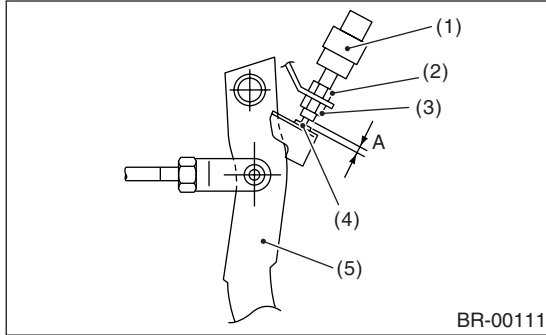
Be careful not to rotate the stop light switch.

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 Diagnostic Table

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(2) Entry of air into the hydraulic mechanism	Bleed the air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining, drum or disc rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Drum or disc rotor eccentricity	Correct or replace the drum or disc 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 disc rotor	Clean the drum or disc 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 disc rotor	Retighten or replace.

General Diagnostic Table

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.

DIFFERENTIALS

1. SERVICE DATA

Drive pinion bearing preload at companion flange bolt hole	N (kgf, lbf)	Except STI model	17.7 — 38.8 (1.8 — 4.0, 4.0 — 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 (0.004 — 0.008)
Side bearing standard width	mm (in)		20.00 (0.7874)
Hypoid driven gear to drive pinion backlash	mm (in)		0.10 — 0.20 (0.004 — 0.008)
Hypoid driven gear runout on its back surface	mm (in)		Less than 0.05 (0.0020)

2. ADJUSTING PARTS

• Except STI model

Drive pinion bearing preload at companion flange bolt hole	N (kgf, lbf)	17.7 — 38.8 (1.8 — 4.0, 4.0 — 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 washer		Part No.	Thickness mm (in)
		383495200	3.09 (0.1217)
		383505200	3.12 (0.1228)
		383515200	3.15 (0.1240)
		383525200	3.18 (0.1252)
		383535200	3.21 (0.1264)
		383545200	3.24 (0.1276)
		383555200	3.27 (0.1287)
		383565200	3.30 (0.1299)
		383575200	3.33 (0.1311)
		383585200	3.36 (0.1323)
		383595200	3.39 (0.1335)
		383605200	3.42 (0.1346)
		383615200	3.45 (0.1358)
		383625200	3.48 (0.1370)
		383635200	3.51 (0.1382)
		383645200	3.54 (0.1394)
		383655200	3.57 (0.1406)
		383665200	3.60 (0.1417)
		383675200	3.63 (0.1429)
		383685200	3.66 (0.1441)
Side gear backlash		mm (in)	0.1 — 0.2 (0.004 — 0.008)
Side gear thrust washer (Model without LSD)		Part No.	Thickness mm (in)
		383445201	0.75 — 0.80 (0.0295 — 0.0315)
		383445202	0.80 — 0.85 (0.0315 — 0.0335)
		383445203	0.85 — 0.90 (0.0335 — 0.0354)
Side bearing standard width		mm (in)	— 20.00 (0.7874)
Side bearing retainer shim		Part No.	Thickness mm (in)
		383475201	0.20 (0.0079)
		383475202	0.25 (0.0098)
		383475203	0.30 (0.0118)
		383475204	0.40 (0.0157)
		383475205	0.50 (0.0197)
Limit	mm (in)	—	0.10 — 0.20 (0.004 — 0.008)
	Hypoid driven gear to drive pinion backlash Hypoid driven gear runout on its back surface		0.05 (0.0020)

• STI model

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

General Description

DIFFERENTIALS

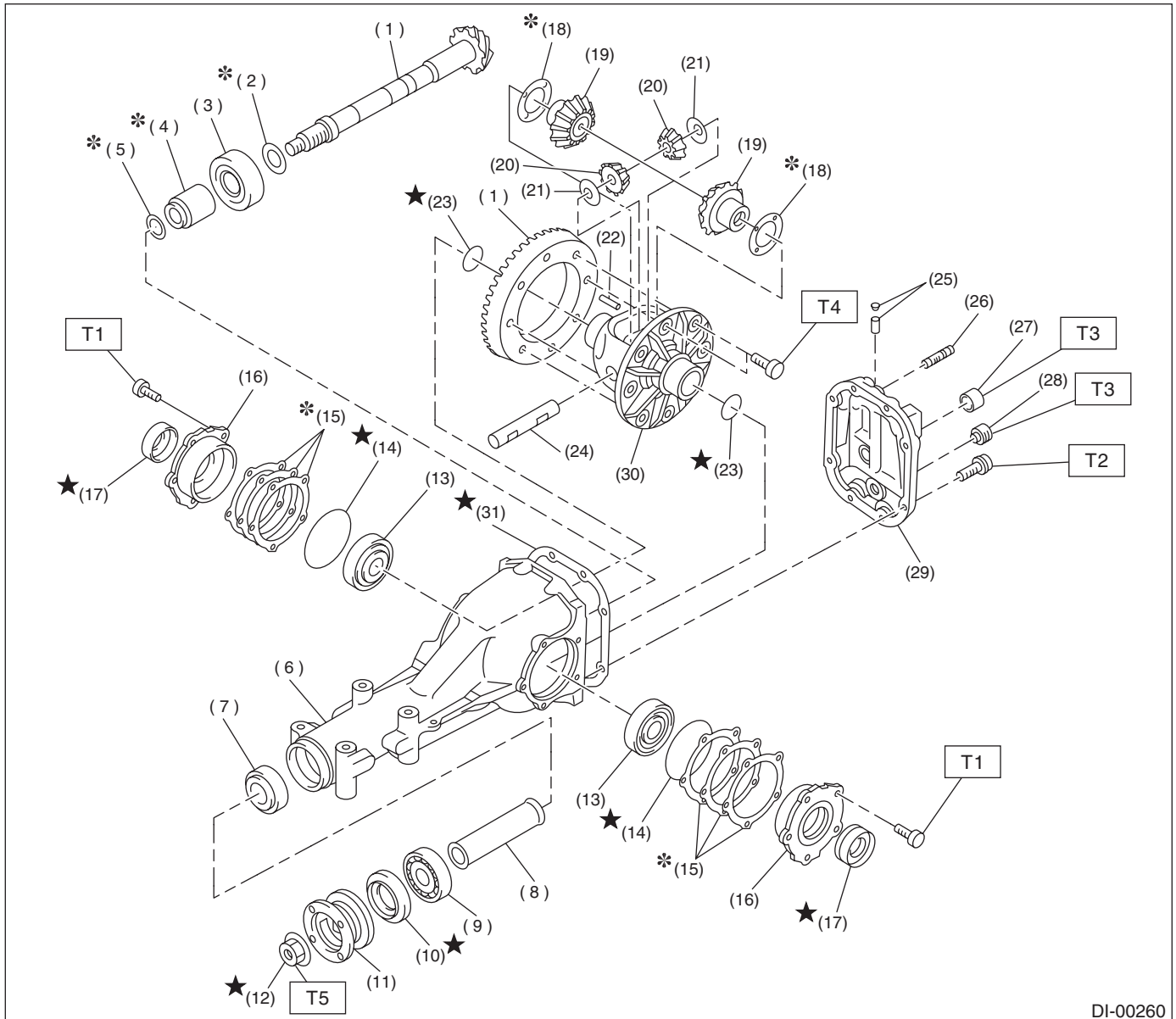
Preload adjusting washer		Part No.	Length mm (in)
		383705200	2.59 (0.1020)
		383715200	2.57 (0.1012)
		383725200	2.55 (0.1004)
		383735200	2.53 (0.0996)
		383745200	2.51 (0.0988)
		383755200	2.49 (0.0980)
		383765200	2.47 (0.0972)
		383775200	2.45 (0.0965)
		383785200	2.43 (0.0957)
		383795200	2.41 (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 washer		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)
Limit	mm (in)	Hypoid driven gear to drive pinion backlash	0.10 — 0.20 (0.004 — 0.008)
		Hypoid driven gear runout on its back surface	0.05 (0.0020)

General Description

DIFFERENTIALS

B: COMPONENT

1. REAR DIFFERENTIAL WITHOUT LSD



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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 10.5 (1.1, 7.7)

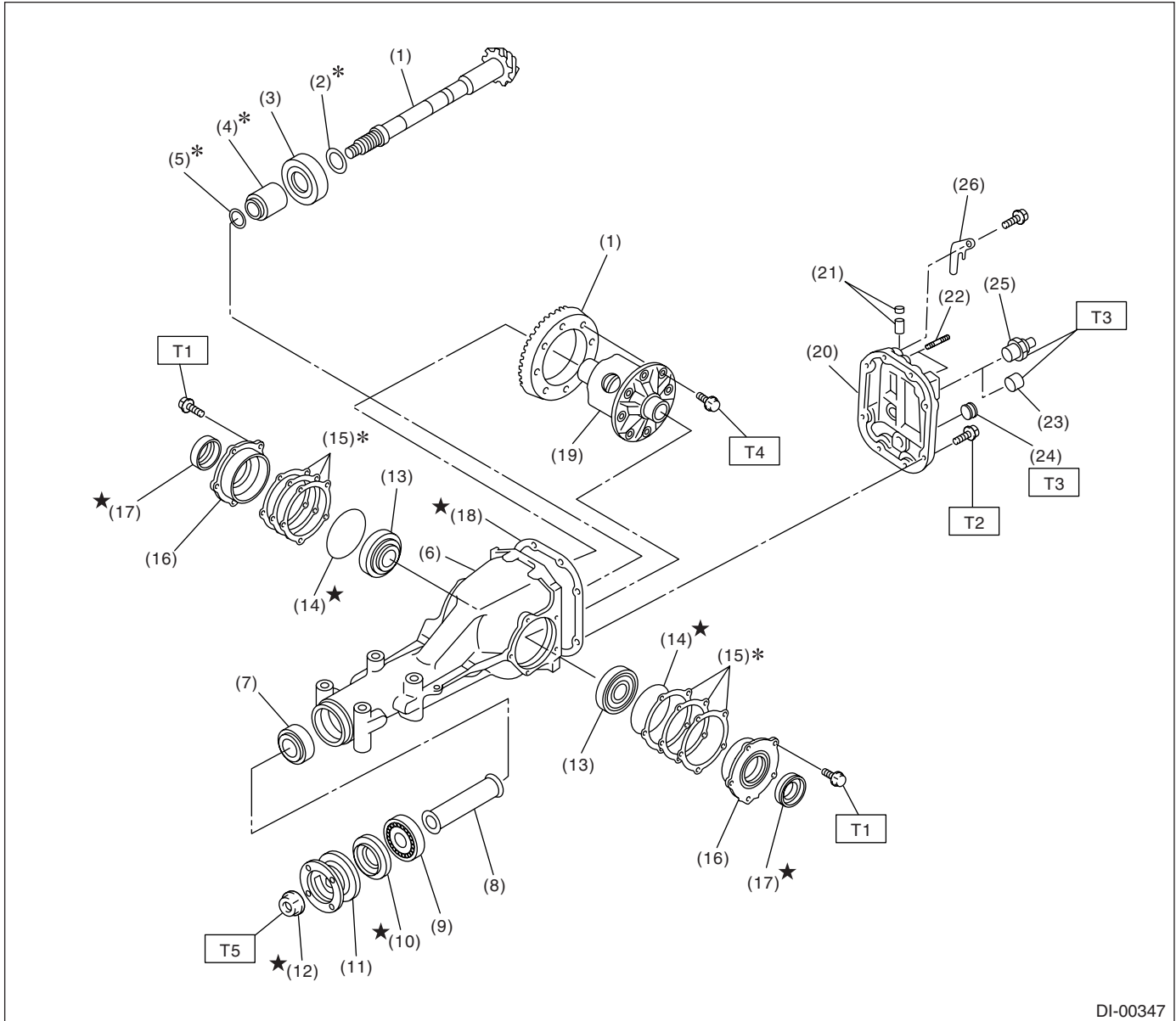
T2: 29.5 (3.0, 21.8)

T3: 49 (5.0, 36.2)

T4: 103 (10.5, 76)

T5: 181.5 (18.5, 134)

2. REAR DIFFERENTIAL WITH LSD



DI-00347

(1) Driven gear and drive pinion set	(14) O-ring	(24) Oil drain plug
(2) Pinion height adjusting washer	(15) Side bearing retainer shim	(25) Oil filler plug (Rear differential oil temperature switch) (STI model)
(3) Rear bearing	(16) Side bearing retainer	(26) Stay ground (STI model)
(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 STI model)	Tightening torque: N·m (kgf-m, ft-lb)
(7) Front bearing	(19) Differential case (Mechanical type) (STI model)	T1: 10.5 (1.1, 7.7)
(8) Collar		T2: 29.5 (3.0, 21.8) (Except STI model)
(9) Pilot bearing		44 (4.5, 32.5) (STI model)
(10) Front oil seal	(20) Rear cover	T3: 49 (5.0, 36.2)
(11) Companion flange	(21) Air breather cap	T4: 103 (10.5, 76)
(12) Self-locking nut	(22) Stud bolt	T5: 181.5 (18.5, 134)
(13) Side bearing	(23) Oil filler plug	

This diagram illustrates the assembly of a vehicle chassis, specifically the rear suspension and frame components. The main assembly is shown in the center, with various parts labeled with numbers and letters. The components are as follows:

- (1)**: Main chassis frame.
- (2)**: Rear suspension arm.
- (3)**: Rear suspension arm.
- (4)**: Rear suspension arm.
- (5)**: Rear suspension arm.
- (6)**: Rear suspension arm.
- (7)**: Rear suspension arm.
- (8)**: Rear suspension arm.
- T1**: Bolt.
- T2**: Bolt.
- T3**: Bolt.
- T4**: Bolt.
- T5**: Bolt.

The diagram shows the assembly of the rear suspension system, including the main frame, suspension arms, and various bolts and nuts. The components are shown in an exploded view, indicating their relative positions and assembly sequence.

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

C: CAUTION

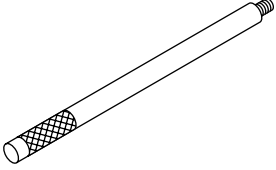
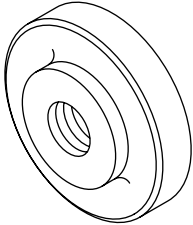
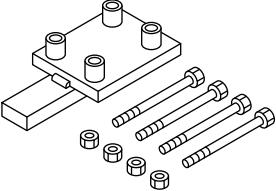
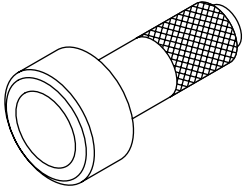
- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, 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 rigid racks at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating face of the case.

General Description

DIFFERENTIALS

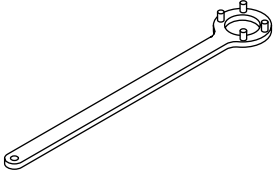
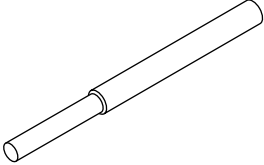
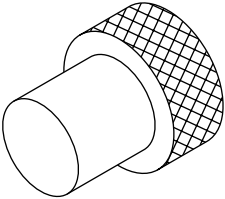
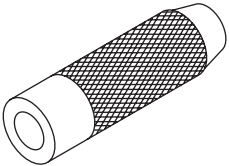
D: PREPARATION TOOL

1. SPECIAL TOOL

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

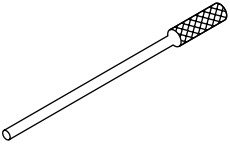
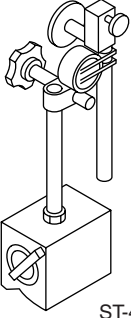
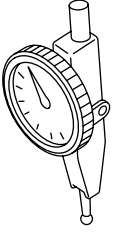
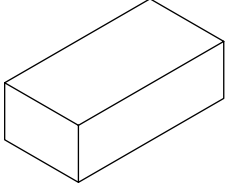
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498427200	498427200	FLANGE WRENCH	- Used for stopping rotation of companion flange when loosening and tightening self-locking 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.

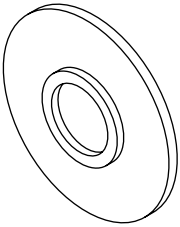
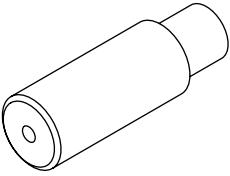
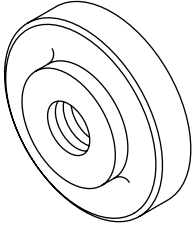
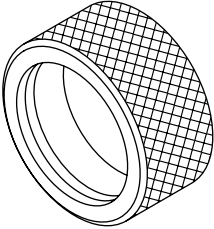
General Description

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.

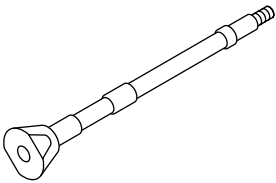
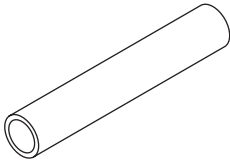
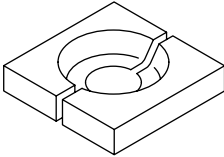
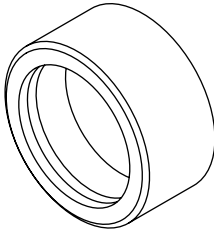
General Description

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.

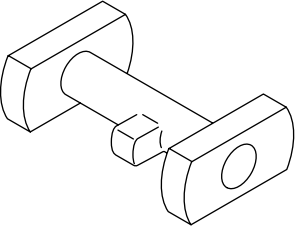
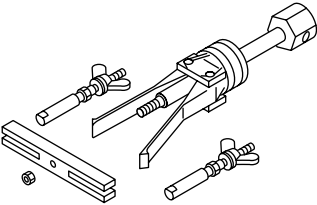
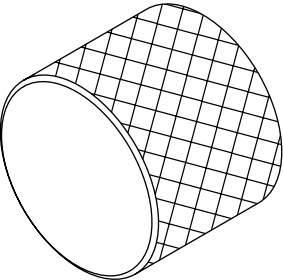
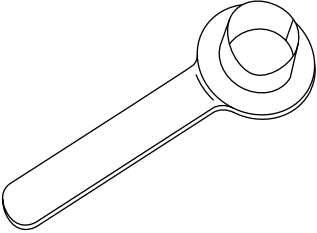
General Description

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.

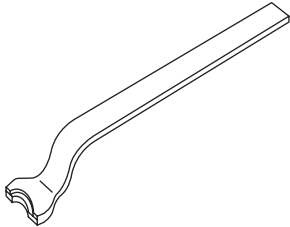
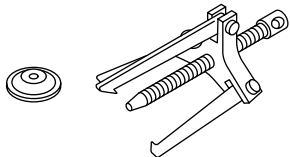
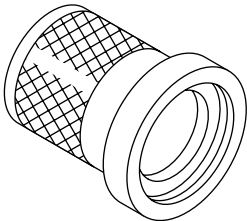
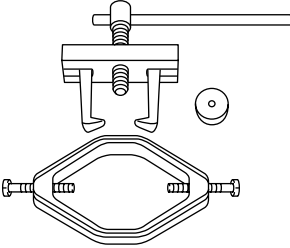
General Description

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.

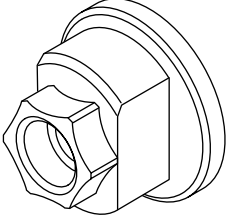
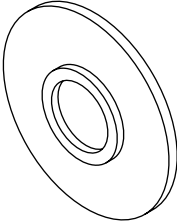
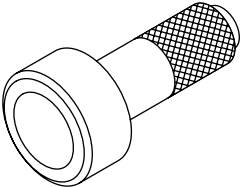
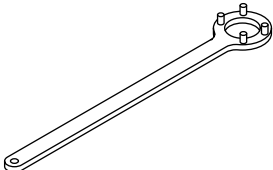
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 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.
 ST18759AA000	18759AA000	PULLER ASSY	Used for removing side bearing cone of differential.

General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937110	498937110	HOLDER	- Used for installing pilot bearing. - For STI model.
 ST18674AA000	18674AA000	INSTALLER	- Used for installing rear bearing cone. - For STI model.
 ST-398417700	398417700	DRIFT	Used for installing side bearing race.
 ST18633AA000	18633AA000	WRENCH COMPL	- Used for stopping rotating of companion flange when loosening and tightening self-locking nut. - For STI model.

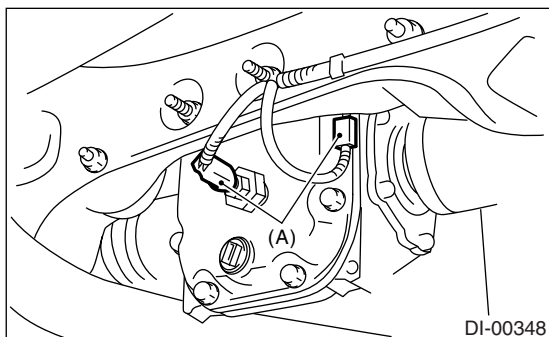
2. GENERAL TOOL

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

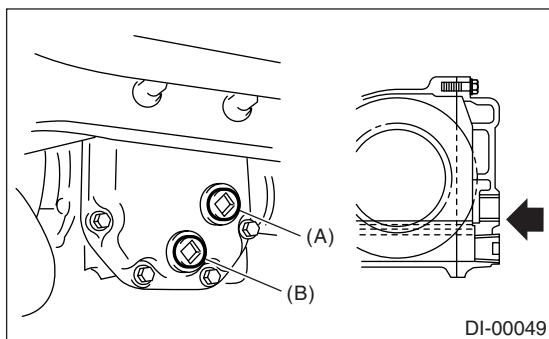
1) Disconnect the oil temperature switch connector. (STI model)



(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-18, 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.

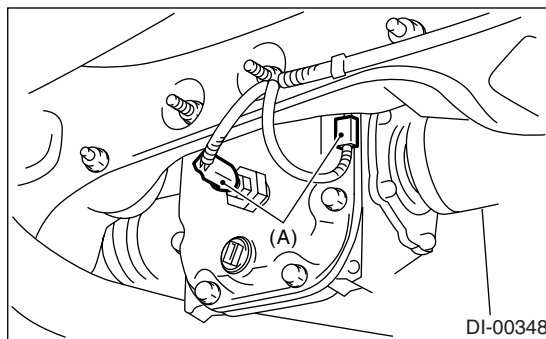


(A) Filler plug
(B) Drain plug

B: REPLACEMENT

1) Lift-up the vehicle.

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

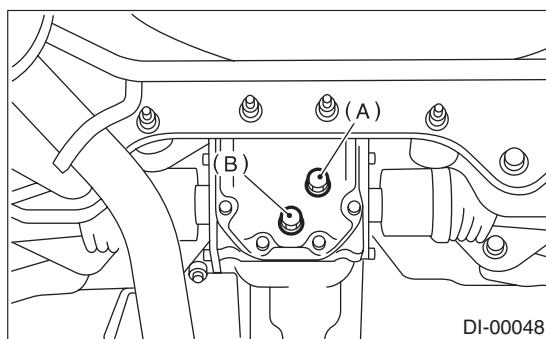


(A) Connector

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 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)

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 STI model:

GL-5 (75W-90) or equivalent

STI model:

GEAR OIL LSD (Part No. K0305Y0900), GL-5 (90) or equivalent

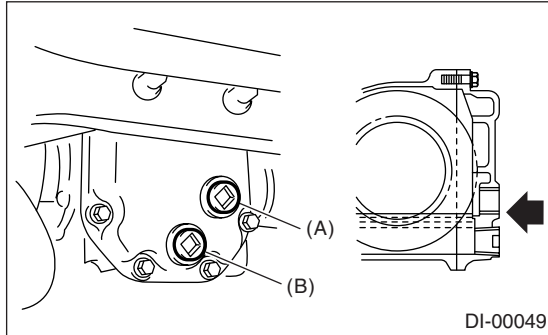
Oil capacity:

Except STI model:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)

STI model:

1.0 ℓ (1.1 US qt, 0.9 Imp qt)



- (A) Filler plug
- (B) Drain plug

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

NOTE:

Apply liquid gasket to the filler plug or rear differential oil temperature switch.

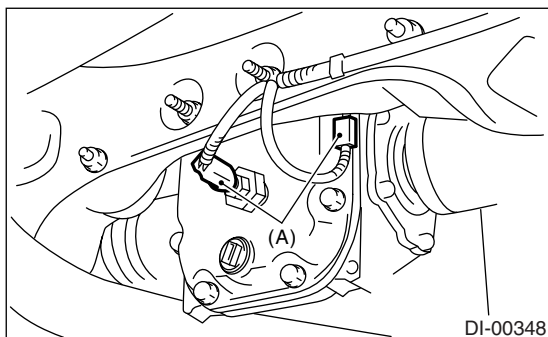
Liquid gasket:

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 Assembly

A: NOTE

1. AT MODEL

For front differential of AUTOMATIC TRANSMISSION, refer to "AT" section. <Ref. to 4AT-99, Front Differential Assembly.>

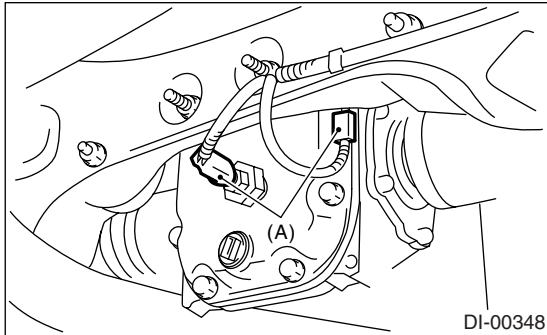
2. MT MODEL

For front differential of manual transmission, refer to "5MT" or "6MT" section. <Ref. to 5MT-68, Front Differential Assembly.> <Ref. to 6MT-102, Front Differential Assembly.>

4. Rear Differential

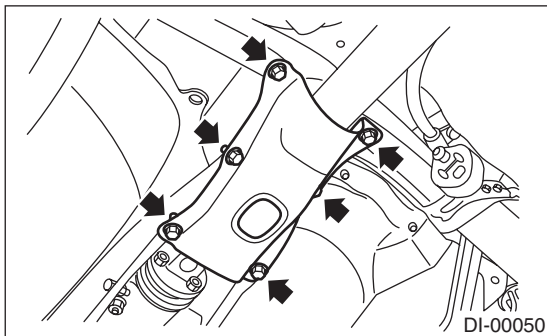
A: REMOVAL

- 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 nut.
- 6) Jack-up the vehicle and support it with sturdy racks.
- 7) Remove the wheel.
- 8) Disconnect the connector from oil temperature switch. (STI model)



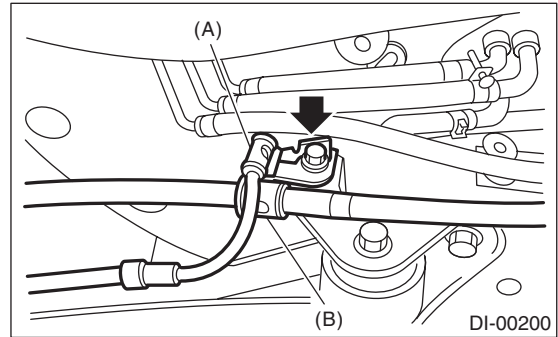
(A) Connector

- 9) Remove the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
DOHC Turbo model
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 10) Remove the front cover of rear differential mount.



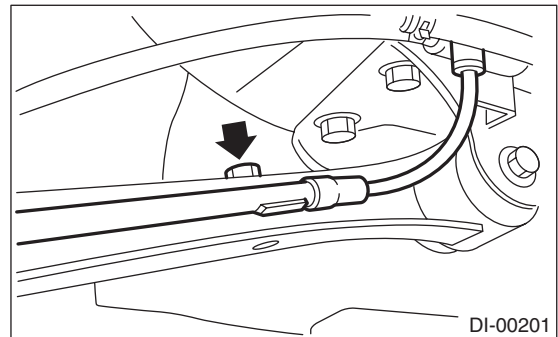
- 11) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>
- 12) Remove the rear differential protector. (If equipped)
- 13) Remove the DOJ of rear drive shaft from rear differential.

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

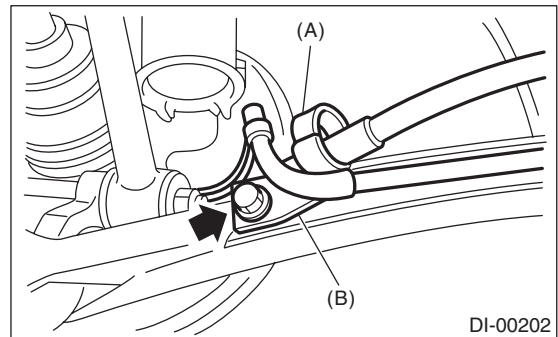


(A) ABS wheel speed sensor cable clamp
(B) Parking brake cable clamp

- (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.

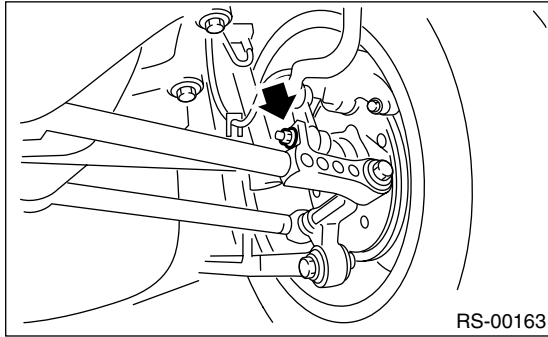


(A) Parking brake cable guide
(B) ABS wheel speed sensor cable clamp

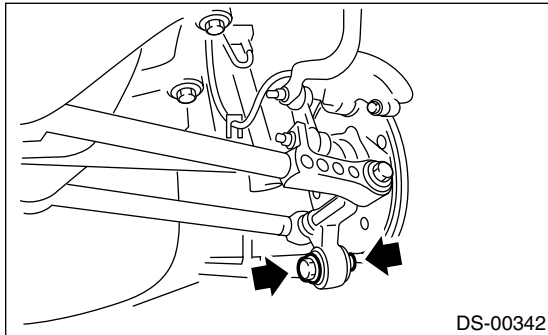
Rear Differential

DIFFERENTIALS

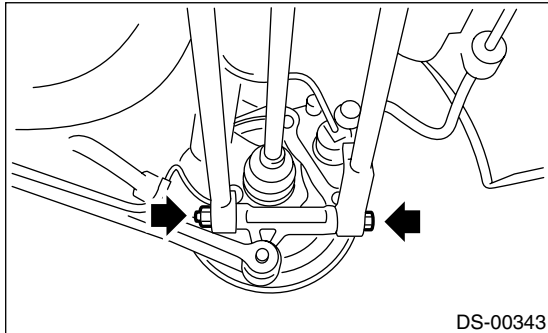
(4) Remove the rear stabilizer link.



(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.

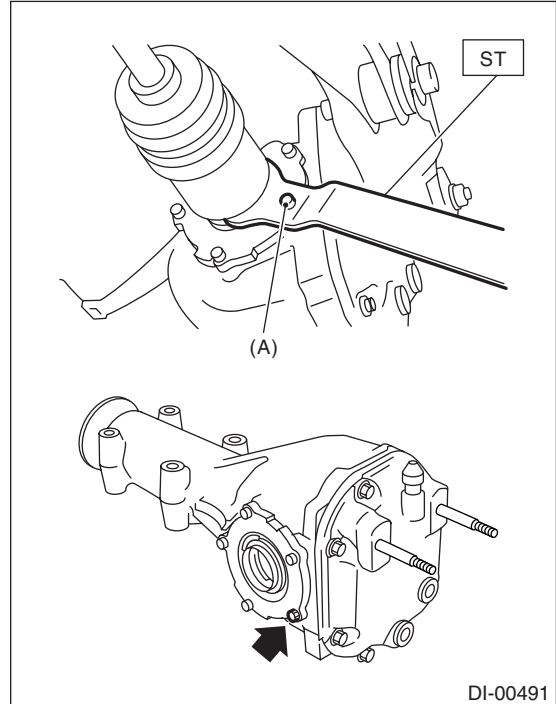


(7) Remove the DOJ from the rear differential by using ST.

NOTE:

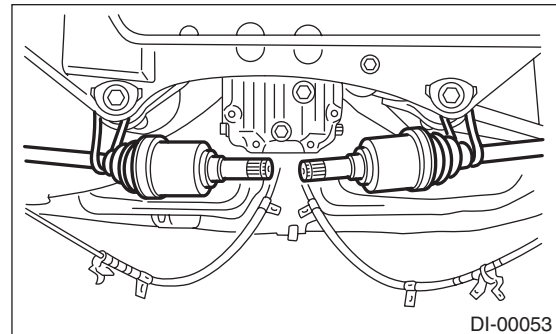
When removing the DOJ from rear differential, fit ST to the bolts as shown in the figure so as not to damage the side bearing retainer.

ST 208099PA100 DRIVE SHAFT REMOVER

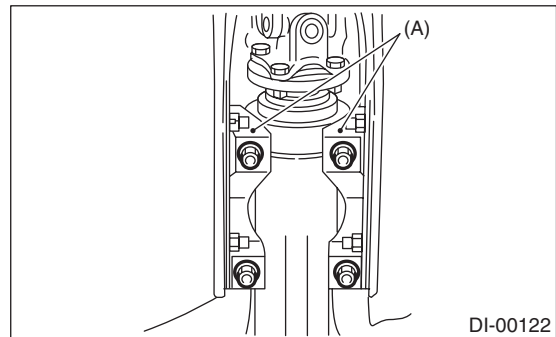


(A) Bolt

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

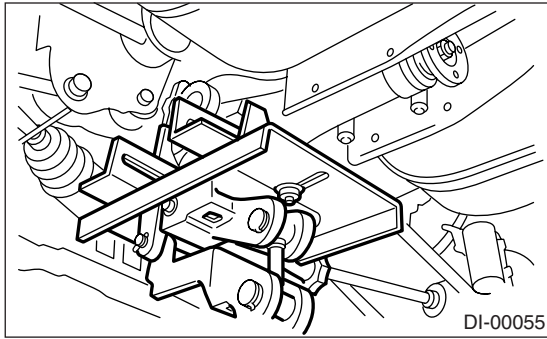


15) Remove the differential mount lower bracket.

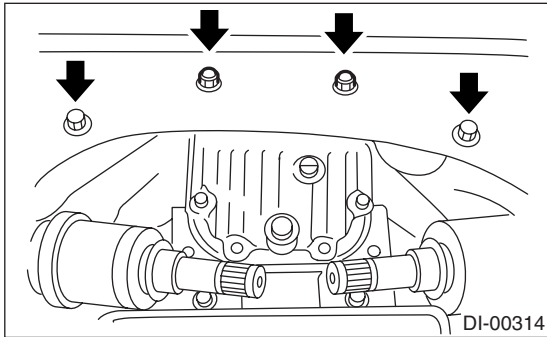


(A) Differential mount lower bracket

16) Support the rear differential with transmission jack.



17) Remove the self-locking nuts and bolts.

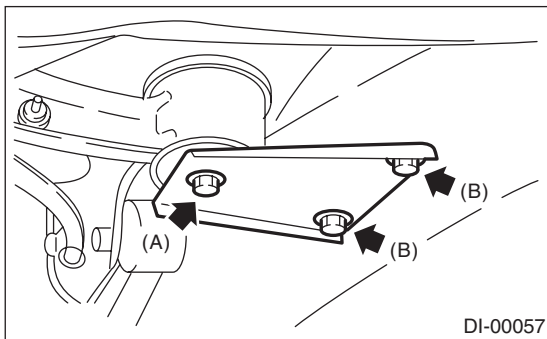


18) Remove the bolts which secure the front differential member to body.

Loosen the bolt A first, then remove the bolts B.

NOTE:

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

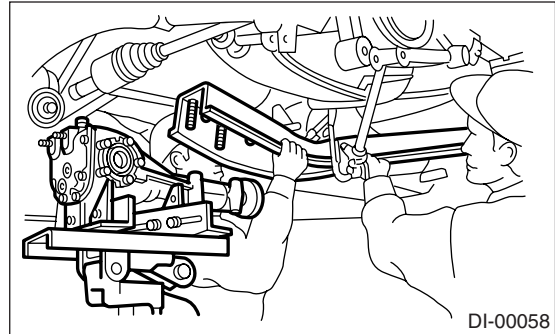


(A) Bolt A

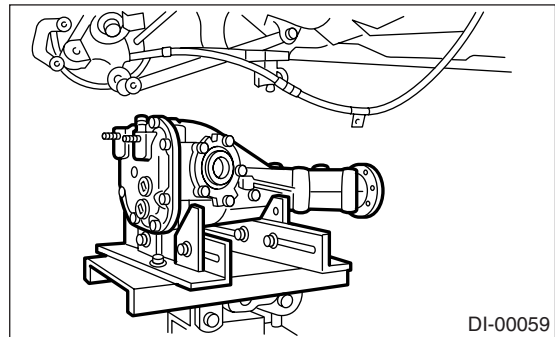
(B) Bolt B

19) Remove the bolt A.

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



21) 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.

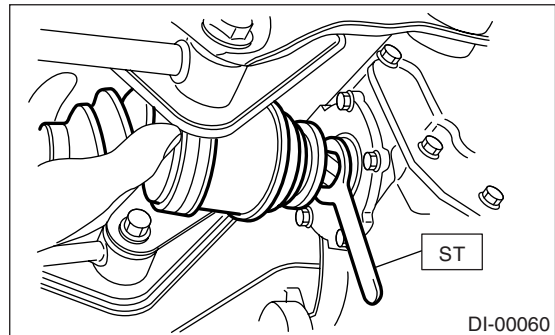
2) Position the differential front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:

When installing the differential front member of rear differential, 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 OIL SEAL PROTECTOR



Rear Differential

DIFFERENTIALS

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-18, Differential Gear Oil.>

C: DISASSEMBLY

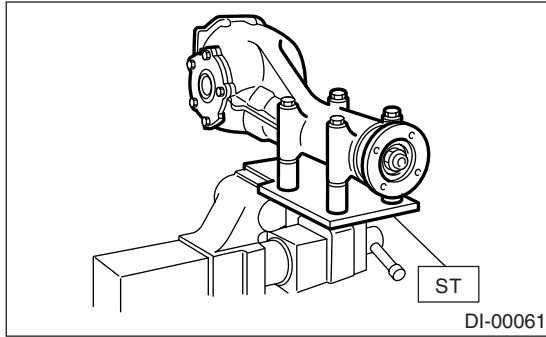
1. EXCEPT STI MODEL

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

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

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

ST 398217700 ATTACHMENT

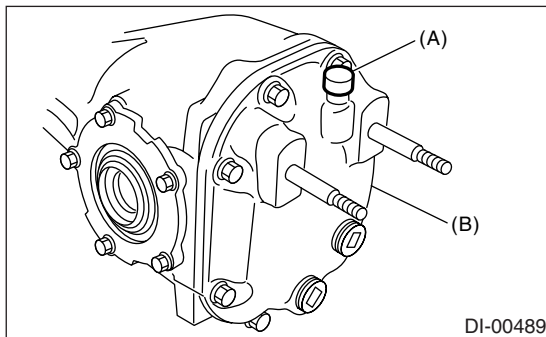


2) Drain the gear oil by removing the plug.

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.



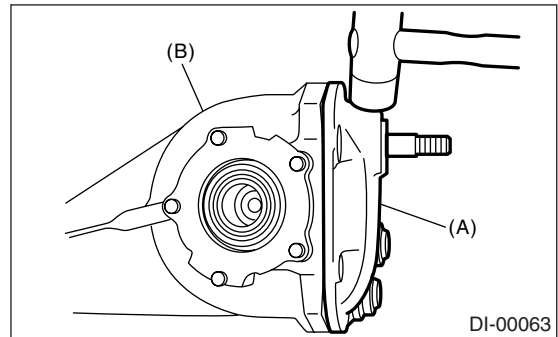
(A) Air breather cap

(B) Rear cover

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

NOTE:

Remove it by tapping with plastic hammer.



(A) Rear cover

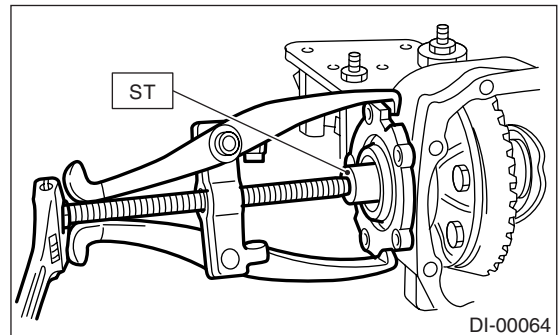
(B) Differential carrier

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.

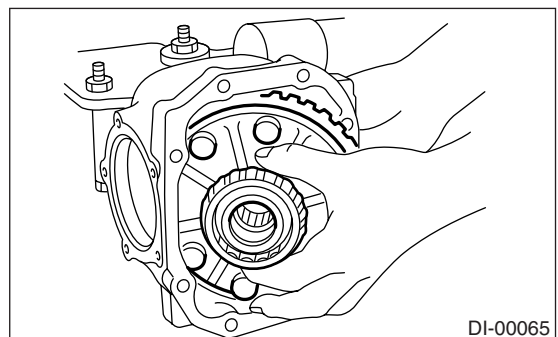
ST 398457700 ATTACHMENT



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

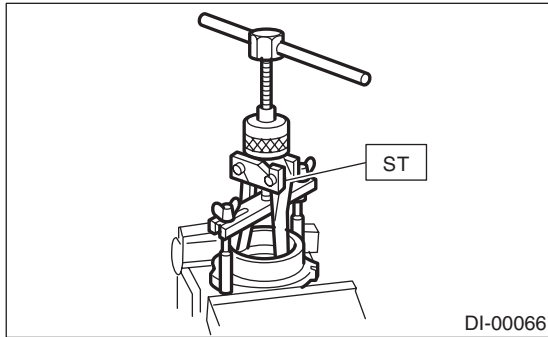
NOTE:

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

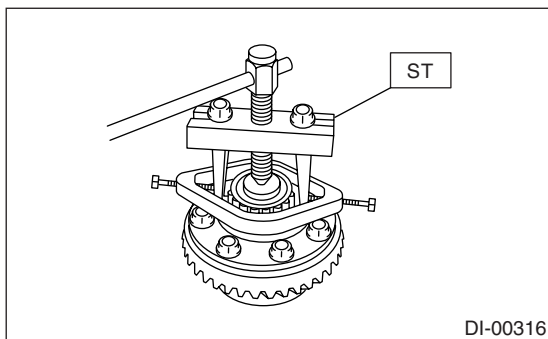


8) Extract the bearing cone with ST.

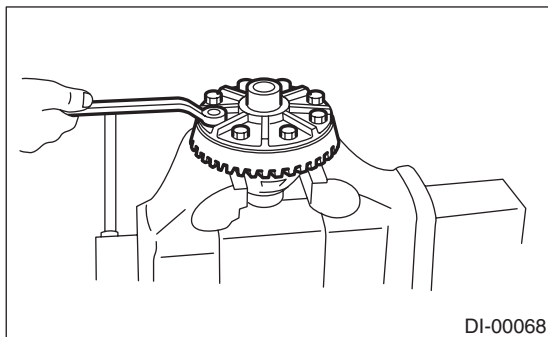
NOTE:

- 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 hypoid driven gear by loosening the hypoid driven gear bolts.

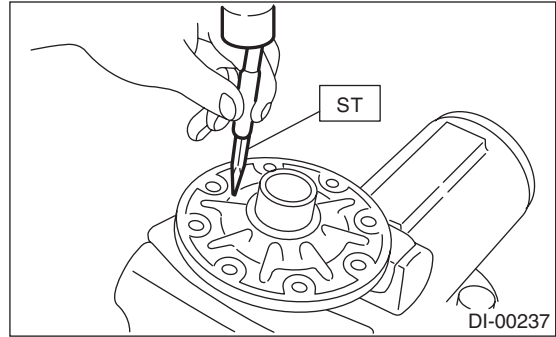


10) Drive out the pinion shaft lock pin from hypoid driven gear side. (Model without LSD)

NOTE:

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

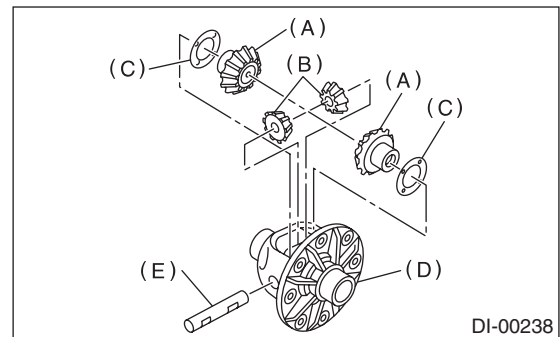
ST 899904100 STRAIGHT PIN REMOVER



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

NOTE:

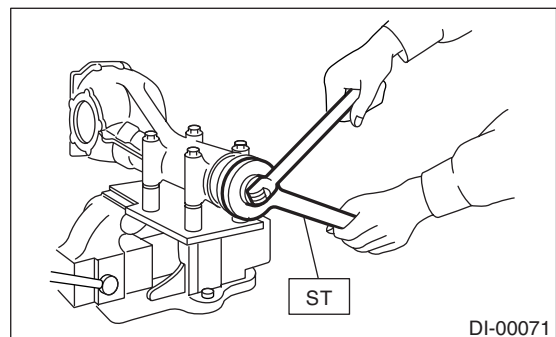
The gears as well as thrust washers should be marked or kept separated right and left, front and rear.



- (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 self-locking nut.

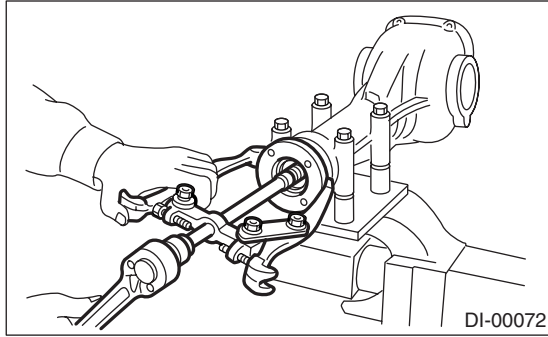
ST 498427200 FLANGE WRENCH



Rear Differential

DIFFERENTIALS

13) Extract the companion flange with a puller.

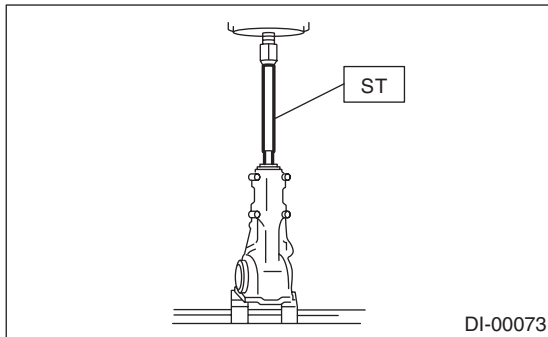


14) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

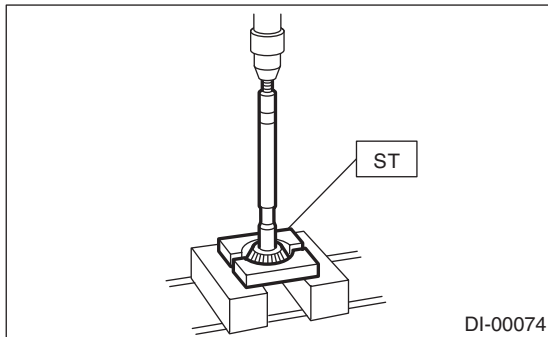


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:

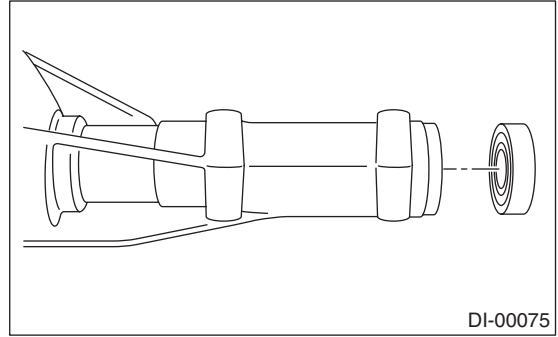
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



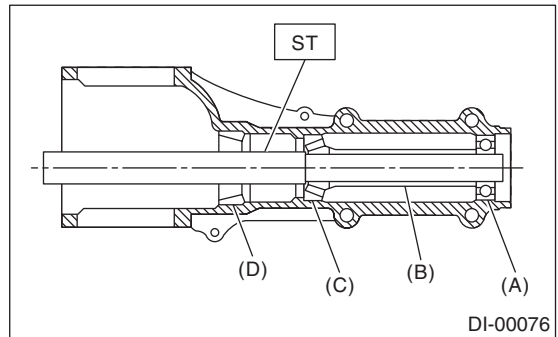
16) Remove the front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



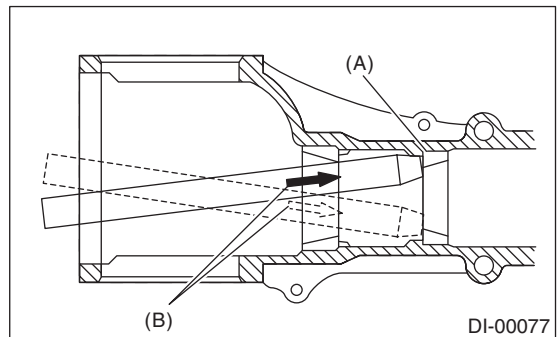
17) Remove the pilot bearing together with front bearing cone and spacer using ST.

ST 398467700 DRIFT



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

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



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

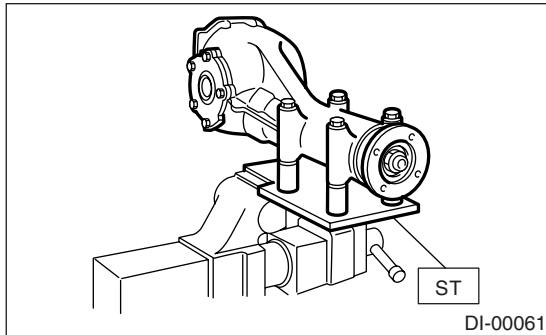
2. STI MODEL

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

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

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

ST 398217700 ATTACHMENT

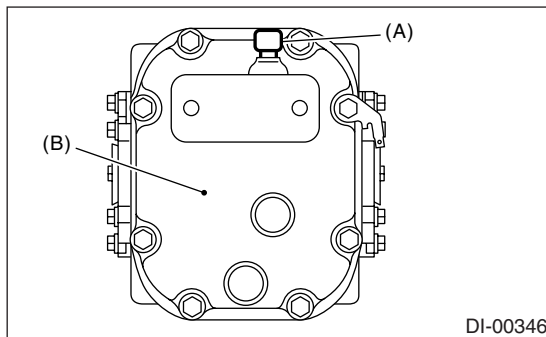


2) Drain the gear oil by removing the plug.

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.



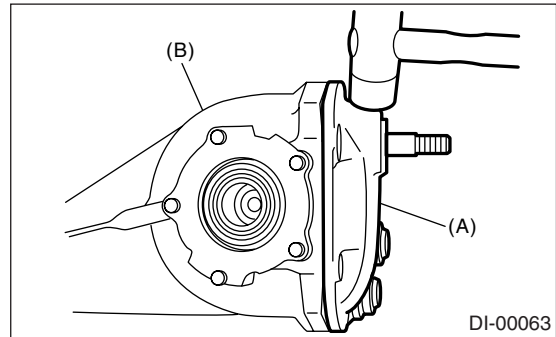
(A) Air breather cap

(B) Rear cover

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

NOTE:

Remove it by tapping with plastic hammer.



(A) Rear cover

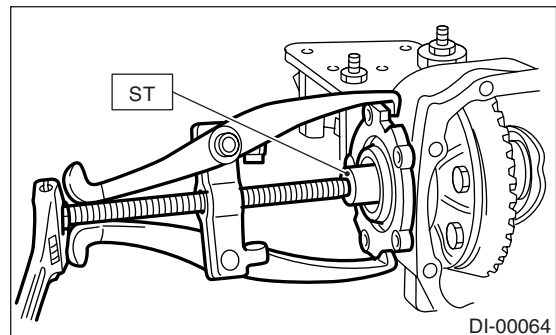
(B) Differential carrier

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.

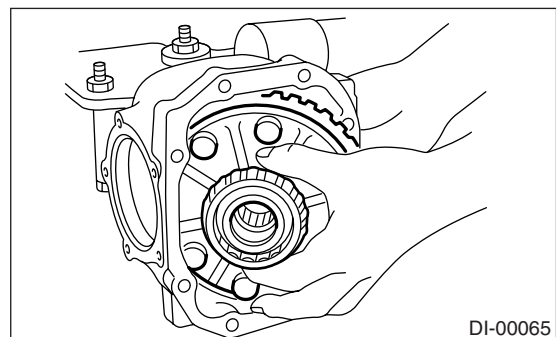
ST 398457700 ATTACHMENT



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

NOTE:

Be careful not to hit the teeth against the case.

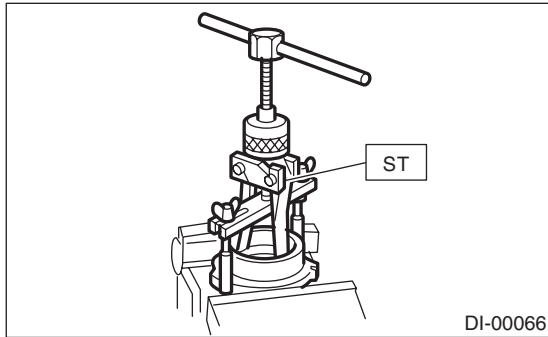


Rear Differential

DIFFERENTIALS

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

ST 398527700 PULLER ASSY

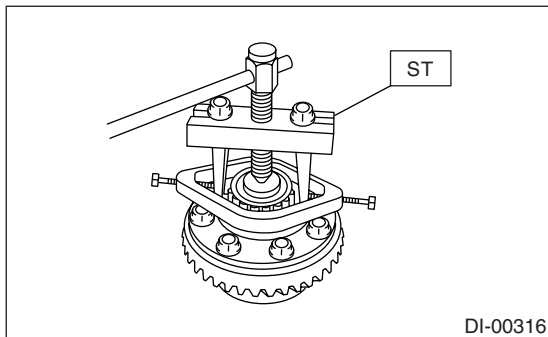


8) Extract the bearing cone with ST.

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.

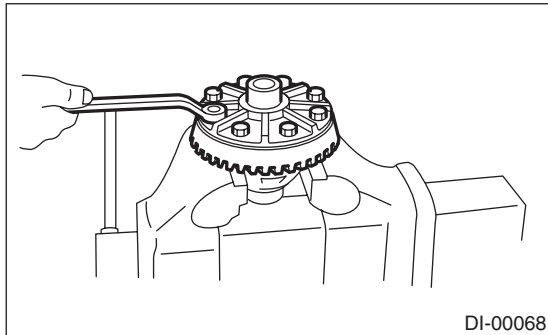
ST 18759AA000 PULLER ASSY



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

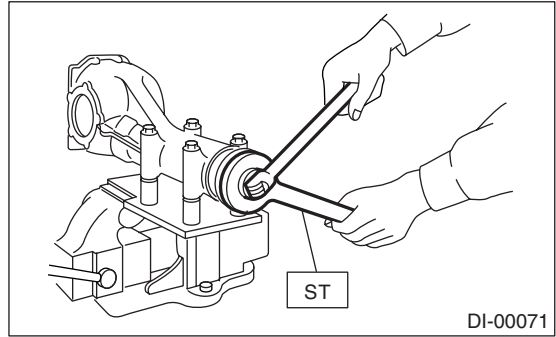
NOTE:

Disassembling the differential case is not allowed.

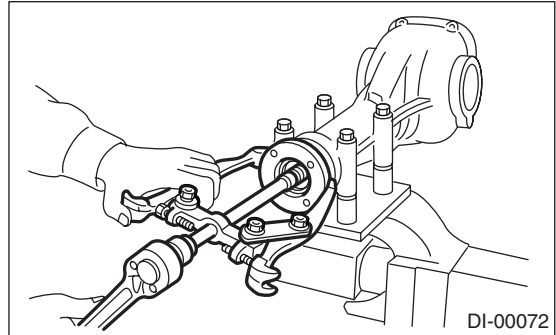


10) Hold the companion flange with ST and remove self-locking nut.

ST 18633AA000 WRENCH COMPL



11) Extract the companion flange with a puller.

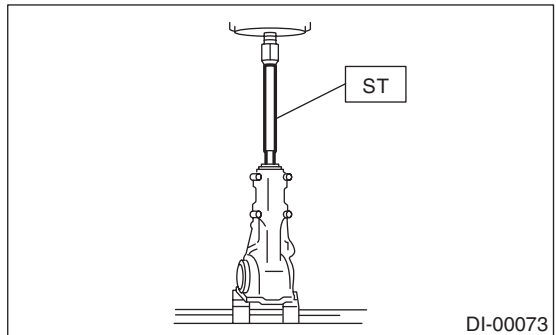


12) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

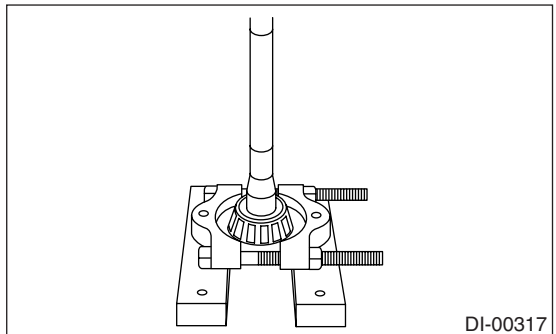
NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

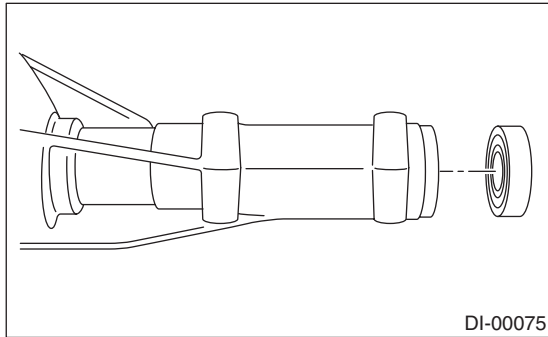


13) Remove the rear bearing cone from drive pinion.



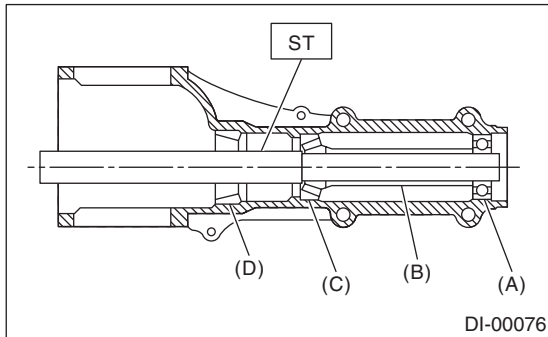
14) Remove the front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



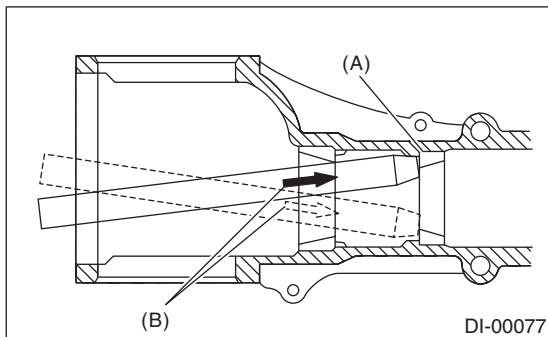
15) Remove the pilot bearing together with front bearing cone and spacer using ST.

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.



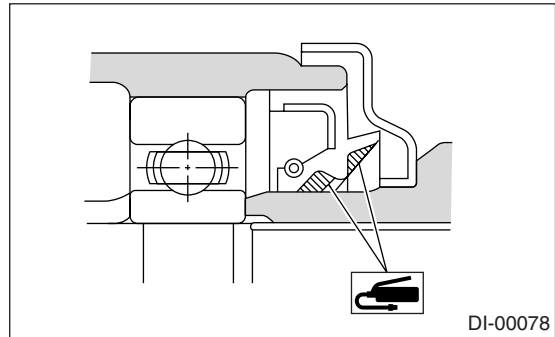
- (A) 2 cutouts along diagonal lines
- (B) Hit out alternately with brass bar.

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.



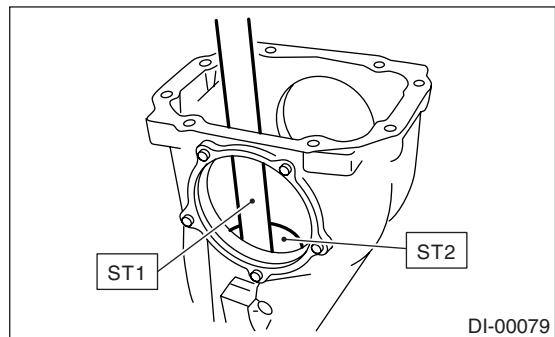
1) Adjusting preload for front and rear bearings

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



Rear Differential

DIFFERENTIALS

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

ST1 398477701 HANDLE

ST2 398477702 DRIFT

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

NOTE:

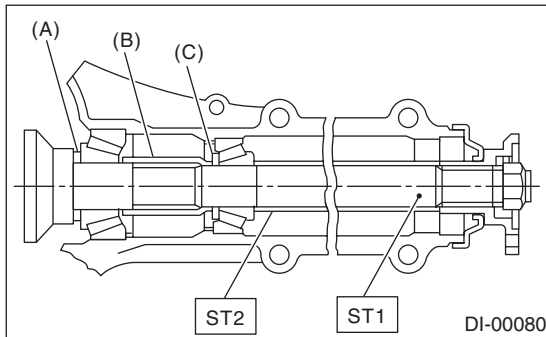
- If tooth contact (Drive pinion, Hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.

- 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.

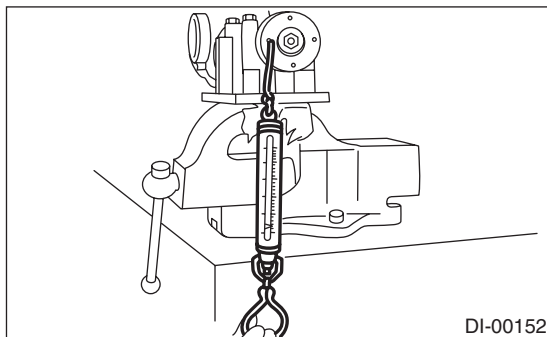
ST1 398507702 DUMMY SHAFT

ST2 398507703 DUMMY COLLAR



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

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



NOTE:

- Use a new self-locking nut.
- Be careful not to give excessive preload.

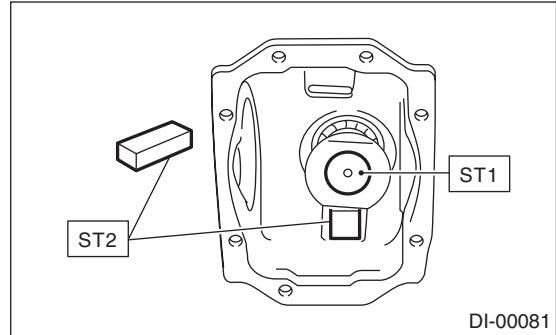
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.
- Measure the preload in direction of tangent to flange.

ST1 398507702 DUMMY SHAFT

ST2 398507704 BLOCK

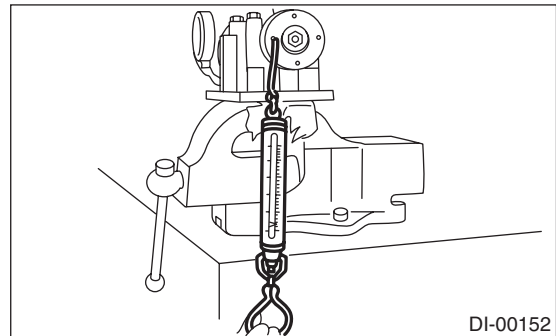
Tightening torque:

181.5 N·m (18.5 kgf·m, 134 ft·lb)



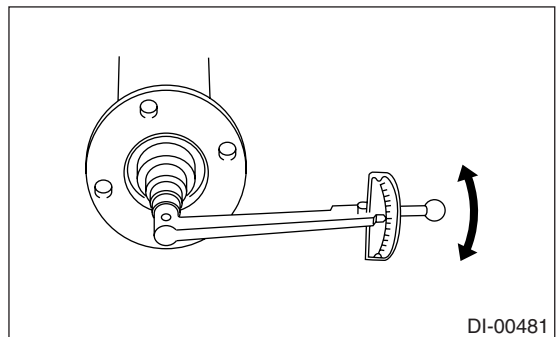
Starting load:

17.7 — 38.8 N (1.8 — 4.0 kgf, 4.0 — 8.7 lbf)



Starting torque:

0.48 — 1.22 N·m (0.045 — 0.124 kgf·m, 0.32 — 0.9 ft·lb)



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

2) Drive pinion height adjustment

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

(1) Install the ST2.

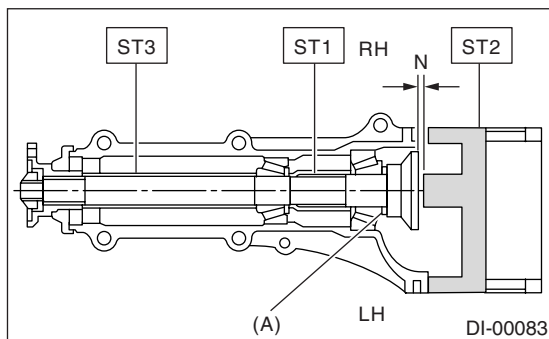
NOTE:

At this time, install a pinion height adjusting washer 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 washer

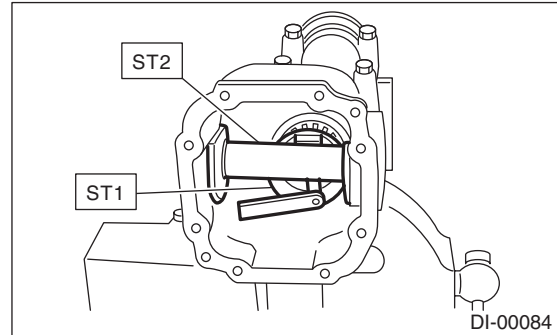
(2) Measure the clearance N between the end of ST2 and end surface of ST1 by using a thickness gauge.

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 washer 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 washer	mm (in)	
T _o	Thickness of washer temporarily inserted	mm (in)	
N	Reading of thickness gauge	mm (in)	
H	Figure marked on drive pinion head		
Memo:			

(Example of calculation)

$$T_o = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$N = 0.23 \text{ mm}$$

$$H = +1$$

$$T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42$$

Result: Thickness = 3.42 mm

Therefore use the washer 383605200.

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

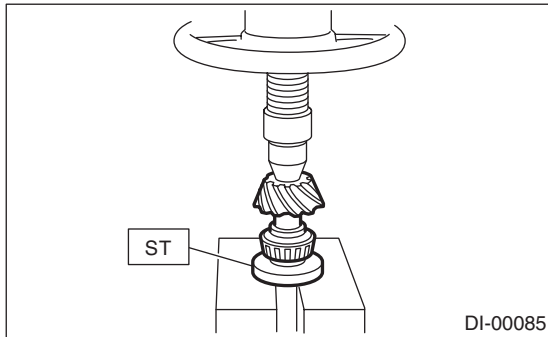
Rear Differential

DIFFERENTIALS

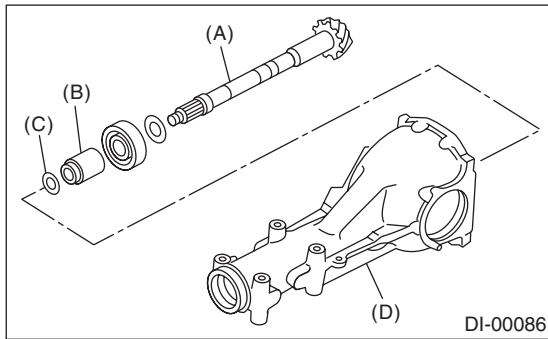
Pinion height adjusting washer	
Part No.	Thickness mm (in)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

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

ST 398177700 INSTALLER



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

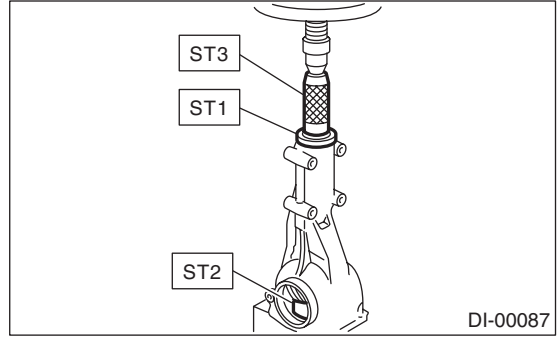


- (A) Drive pinion
- (B) Bearing preload adjusting spacer
- (C) Bearing preload adjusting washer
- (D) Differential carrier

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

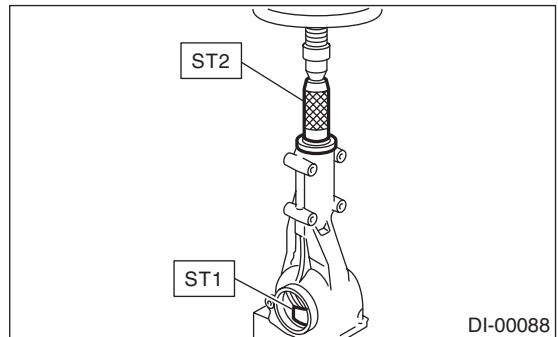
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT

ST3 899580100 INSTALLER



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

ST1 399780104 WEIGHT
ST2 899580100 INSTALLER

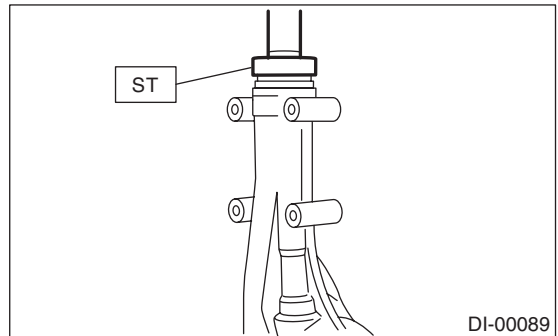


7) Fit a new oil seal with ST.

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



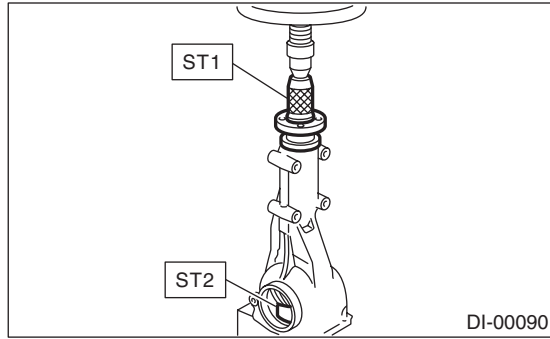
8) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the bearing.

ST1 899874100 INSTALLER

ST2 399780104 WEIGHT



9) Apply Lock Tite to the bolt threads of drive pinion shaft, and the seating surface of new self-locking nut.

Lock Tite:

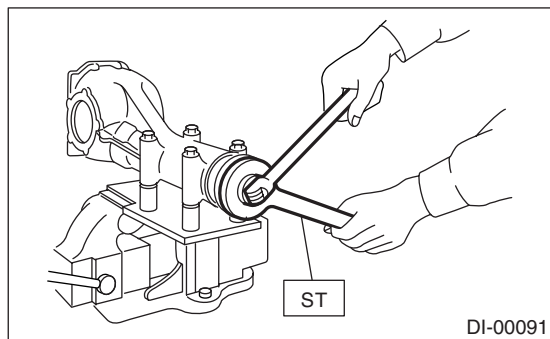
THREE BOND 1324 (Part No. 004403042)

10) Install a new self-locking nut. Then tighten it with the ST.

ST 498427200 FLANGE WRENCH

Tightening torque:

181.5 N·m (18.5 kgf-m, 134 ft-lb)



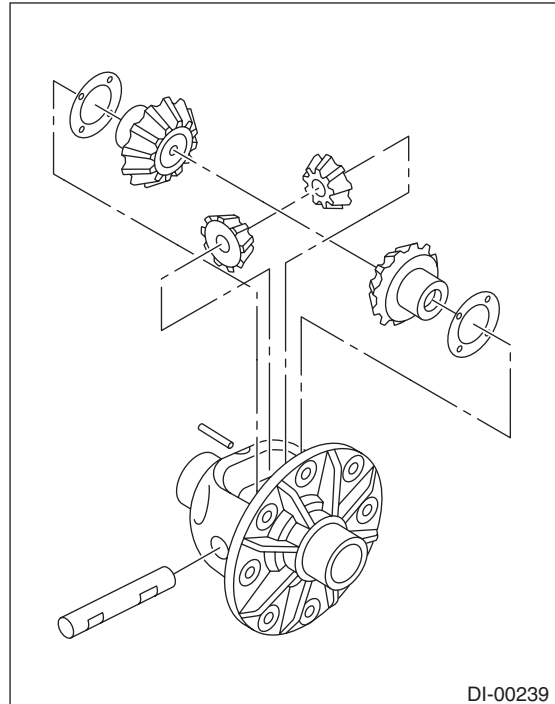
11) Assembling differential case

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

NOTE:

- Apply gear oil on both sides of the washer and on the side gear shaft before installing.

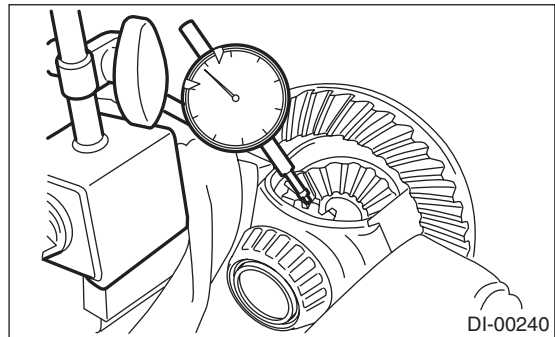
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

Side gear backlash:

0.10 — 0.20 mm (0.004 — 0.008 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.

12) Install the hypoid driven gear on differential case.

Rear Differential

DIFFERENTIALS

NOTE:

- Before installing the bolts, apply Lock Tite to bolt threads.
- Make sure that there is no clearance between differential case and driven gear.

Lock Tite:

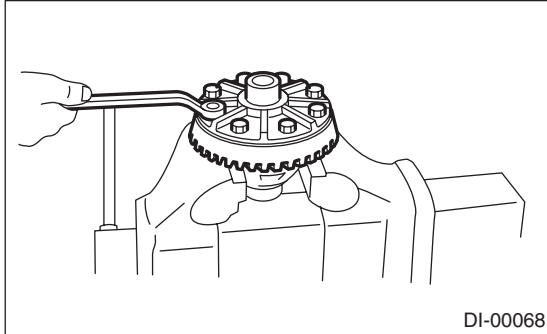
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:

Tighten diagonally while tapping the bolt heads.

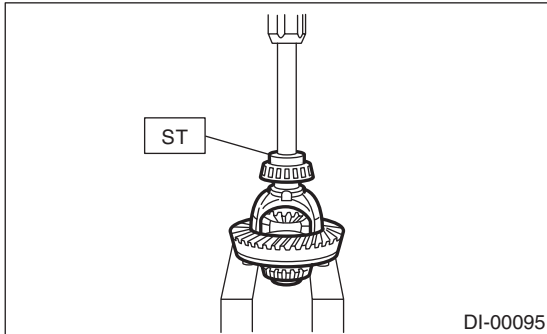
Tightening torque:

103 N·m (10.5 kgf-m, 76 ft-lb)



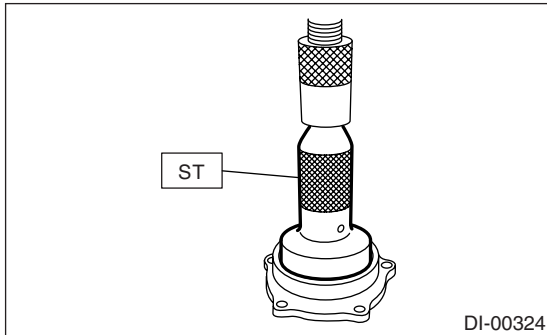
13) Press-fit the side bearing into differential case using ST.

ST 398487700 DRIFT



14) Press the side bearing outer race into side bearing retainer using ST.

ST 398417700 DRIFT

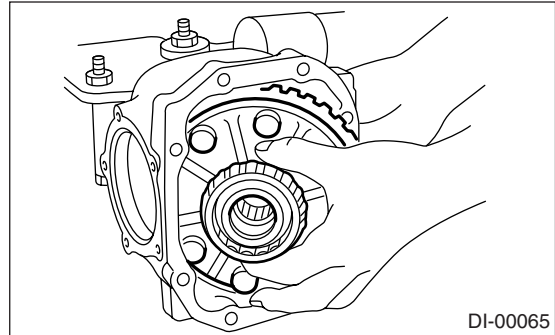


15) Adjusting side bearing retainer shims

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

NOTE:

Be careful not to hit the teeth against the case.



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

NOTE:

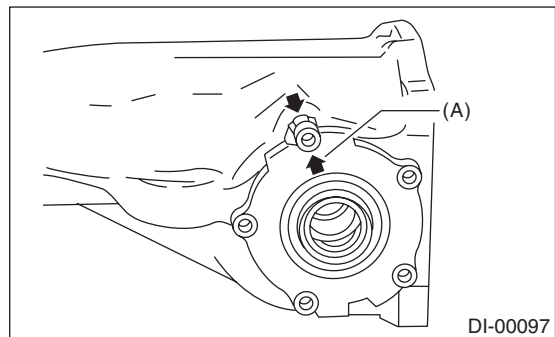
Replace the broken or corroded side bearing retainer shim with a new one of same thickness.

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 bearing retainer during installation.

NOTE:

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

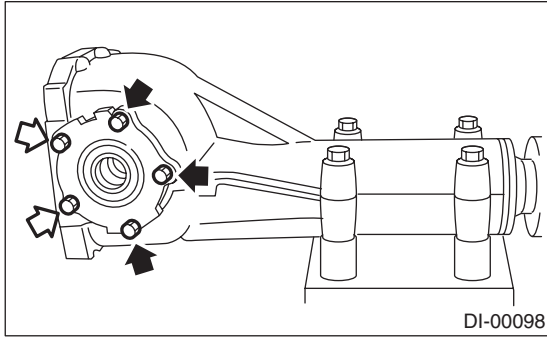


(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

Tightening torque:

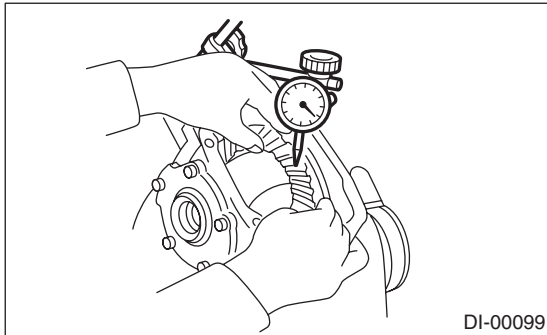
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



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

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)



NOTE:

If the backlash exceeds 0.20 mm (0.008 in), reduce the thickness of shim on the back face of hypoid driven gear and increase the thickness of shim on the tooth face of hypoid driven gear. If the backlash is less than 0.10 mm (0.004 in), increase the thickness of shim on the back face of hypoid driven gear and reduce the thickness of shim on the tooth face of hypoid driven gear.

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

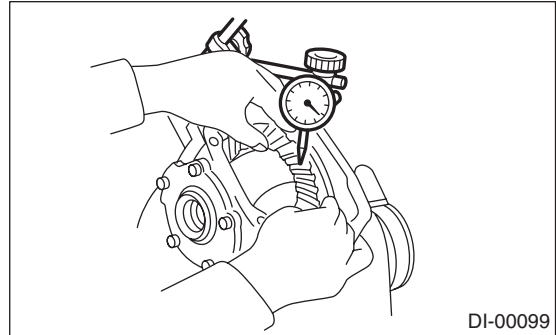
Total preload:

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

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

Backlash:

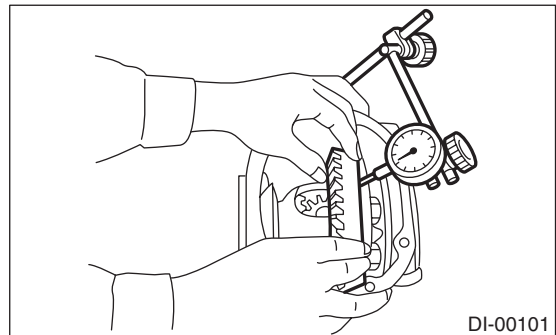
0.10 — 0.20 mm (0.004 — 0.008 in)



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

Limit of runout:

Less than 0.05 mm (0.0020 in)



18) Checking and adjusting tooth contact of hypoid driven gear

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

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

NOTE:

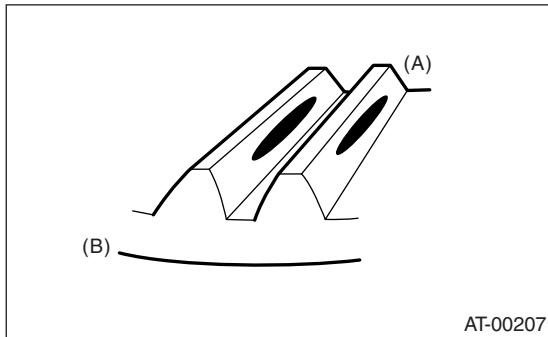
Be sure to wipe off red lead completely after adjustment is completed.

Rear Differential

DIFFERENTIALS

- Correct tooth contact

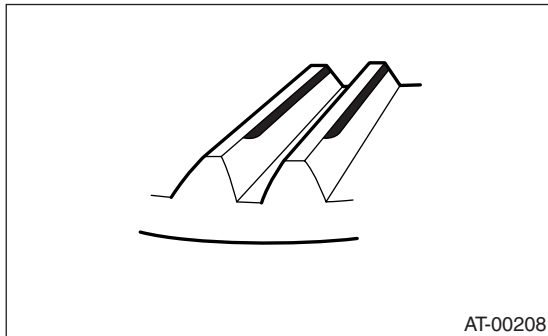
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)



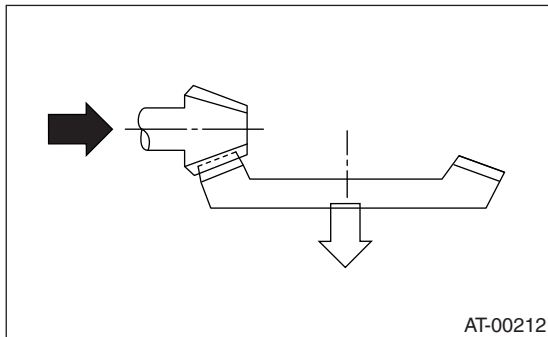
- (A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

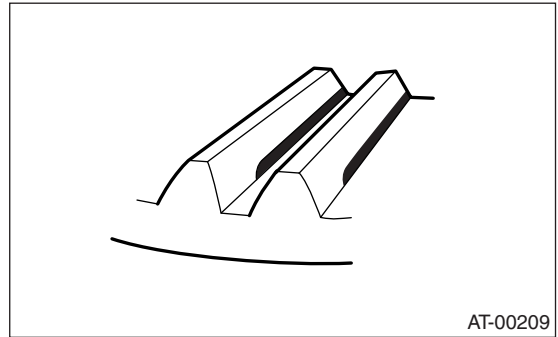


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

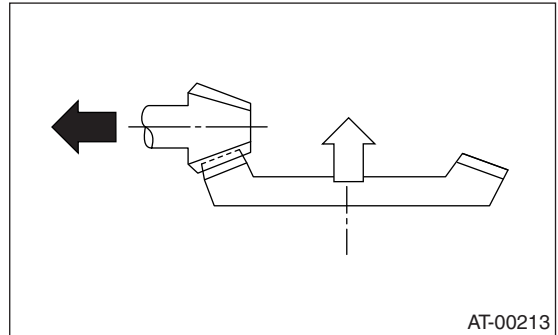


- Flank contact

Checking item: Backlash is too small.
Contact pattern

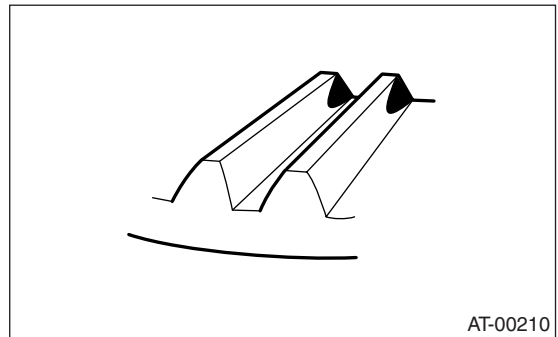


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.

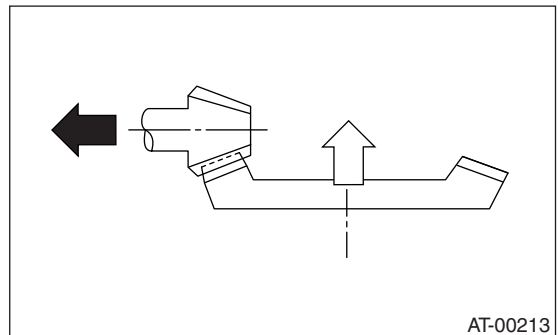


- Toe contact (Inside end contact)

Checking item: Contact area is small.
Contact pattern



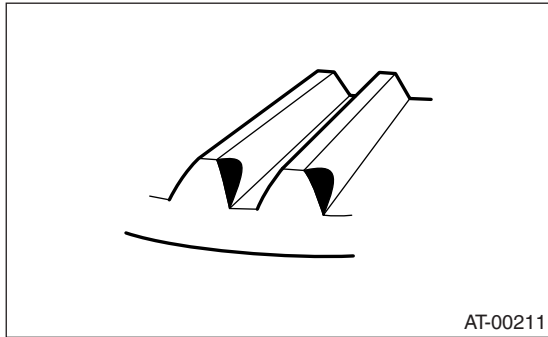
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.



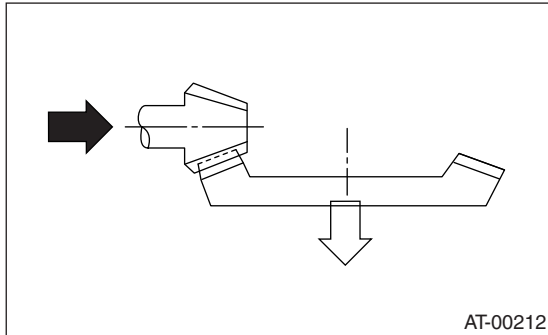
- Heel contact (Outside end contact)

Checking item: Contact area is small.

Contact pattern



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



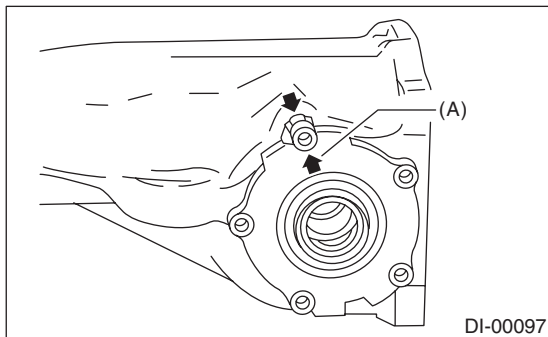
19) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.

20) Remove the side bearing retainers on right and left side.

21) Install new O-rings to side bearing retainers on right and left side.

22) Install the oil seals to side bearing retainers on right and left side.

23) Align the arrow mark on differential carrier with the mark on side bearing retainer during installation.



(A) Arrow mark

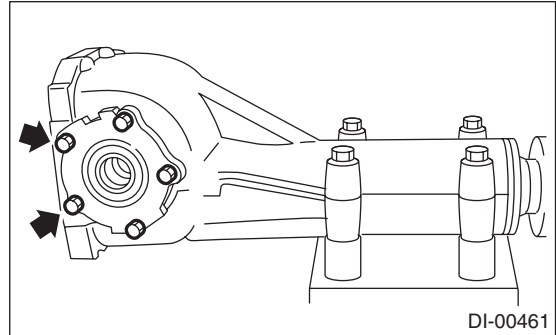
24) Apply liquid gasket to the bolt with arrow mark, and install the side bearing retainer.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

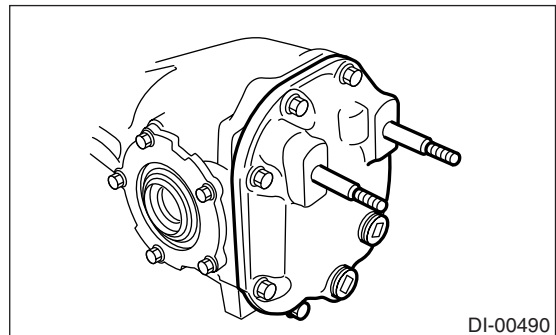
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



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

Tightening torque:

29.5 N·m (3.0 kgf-m, 21.8 ft-lb)



26) Install the air breather cap.

27) Install the drain plug and filler plug.

Tightening torque:

49 N·m (5.0 kgf-m, 36.2 ft-lb)

2. STI MODEL

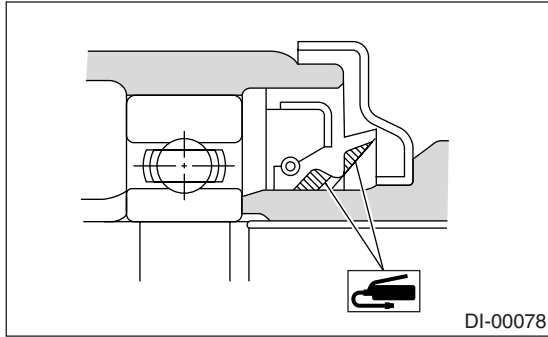
1) Precautions for assembling

- 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.

Rear Differential

DIFFERENTIALS

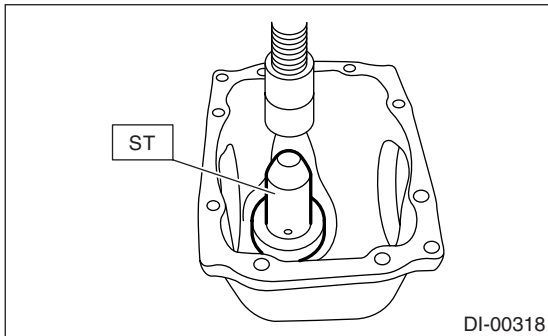
- Replace the oil seal with a new one at every dis-assembly. Apply chassis grease between the lips when installing the oil seal.



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

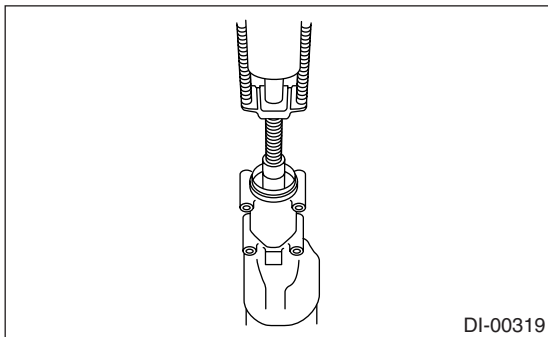
2) Press-fit the rear bearing race into differential carrier using ST.

ST 398417700 DRIFT



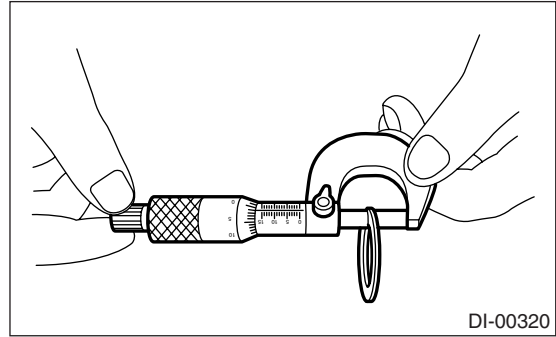
3) Press-fit the front bearing race into differential carrier using ST.

ST 398477702 DRIFT



4) Pinion height adjusting washer selection.

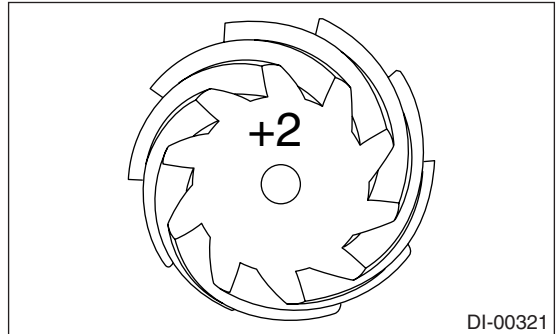
(1) Measure the thickness of inserted pinion height adjusting washer.



(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 washer.
T1 mm	Thickness of inserted pinion height adjusting washer.
T2 mm	Punch mark number on installed drive pinion gear.
T3 mm	Punch mark number on new drive pinion gear.

(Example of calculation)

$$T1 = 3.30, T2 = +2, T3 = -1$$

$$T = 3.30 + \{(2 \times 0.01) - (-1 \times 0.01)\} = 3.33$$

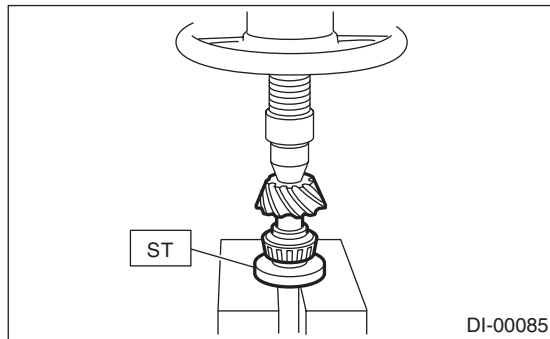
Result: Thickness = 3.33 mm

Therefore use the washer 38336AA310.

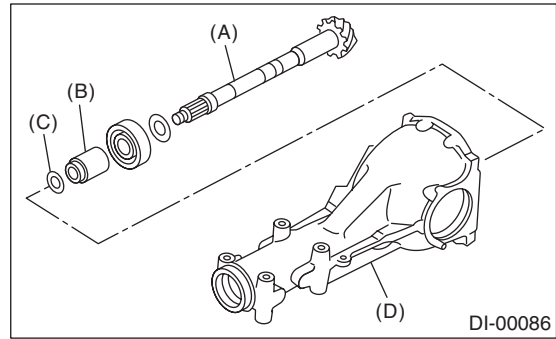
Pinion height adjusting washer	
Part No.	Thickness T mm (in)
38336AA230	3.09 (0.1217)
38336AA240	3.12 (0.1228)
38336AA250	3.15 (0.1240)
38336AA260	3.18 (0.1252)
38336AA270	3.21 (0.1264)
38336AA280	3.24 (0.1276)
38336AA290	3.27 (0.1287)
38336AA300	3.30 (0.1299)
38336AA310	3.33 (0.1311)
38336AA320	3.36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

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

ST 18674AA000 INSTALLER



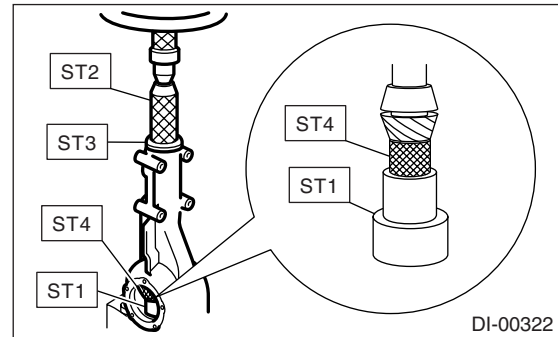
6) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



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

7) Insert the spacer, then press-fit the pilot bearing with STs.

ST1 399780104 WEIGHT
 ST2 899580100 INSTALLER
 ST3 398507703 DUMMY COLLER
 ST4 498937110 HOLDER

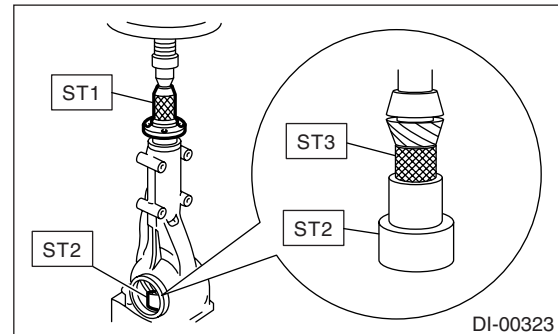


8) Press-fit the companion flange with ST1, ST2 and ST3.

NOTE:

Be careful not to damage the bearing.

ST1 899874100 INSTALLER
 ST2 399780104 WEIGHT
 ST3 498937110 HOLDER



Rear Differential

DIFFERENTIALS

9) Apply Lock Tite to the bolt threads of drive pinion shaft, and the seating surface of new self-locking nut.

Lock Tite:

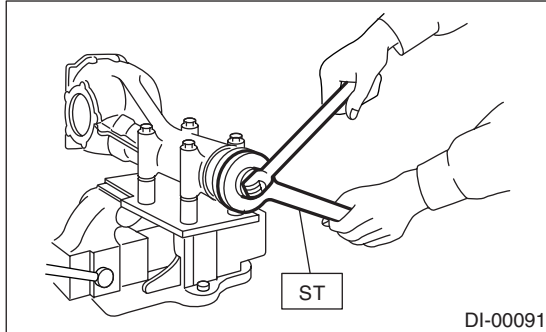
THREE BOND 1324 (Part No. 004403042)

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

ST 18633AA000 WRENCH COMPL

Tightening torque:

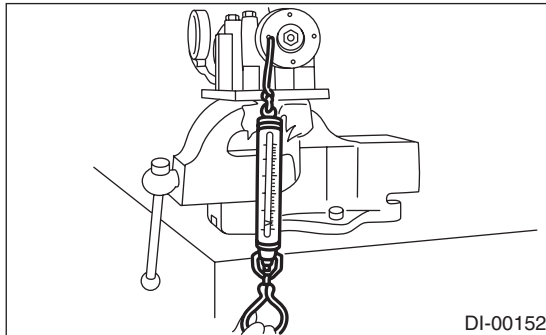
181.5 N·m (18.5 kgf-m, 134 ft-lb)



11) 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 lbf)

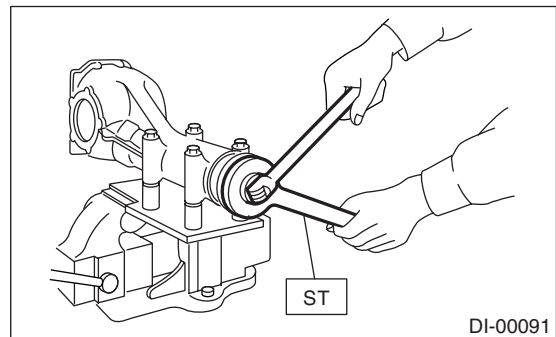


12) If bearing preload is out of specification, adjust to specification by selecting preload adjusting washer and spacer from the following table.

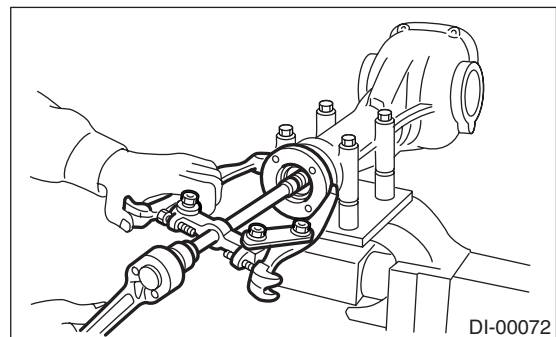
Preload adjusting washer	Part No.	Thickness mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
Preload adjusting spacer	Part No.	Length mm (in)
	31454AA130	52.2 (2.055)
	31454AA140	52.4 (2.063)
	31454AA150	52.6 (2.071)
	31454AA160	52.8 (2.079)
	31454AA170	53.0 (2.087)
	31454AA180	53.2 (2.094)

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

ST 18633AA000 WRENCH COMPL



14) Extract the companion flange with a puller.

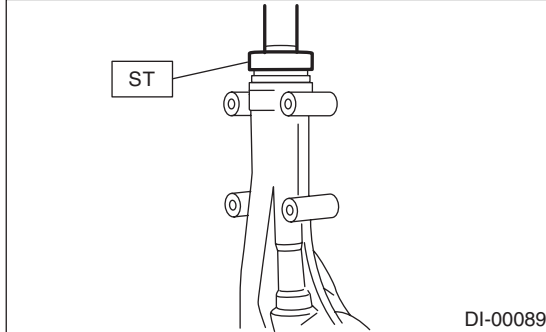


15) Fit a new oil seal with ST.

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



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

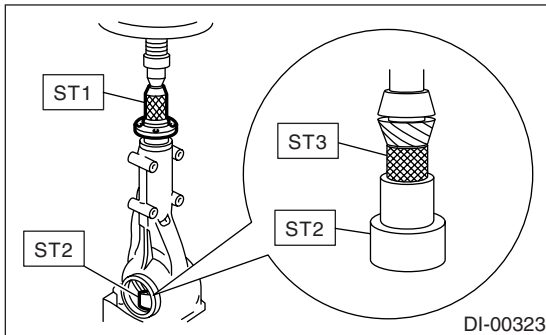
ST1 899874100 INSTALLER

ST2 399780104 WEIGHT

ST3 498937110 HOLDER

NOTE:

Be careful not to damage the bearing.



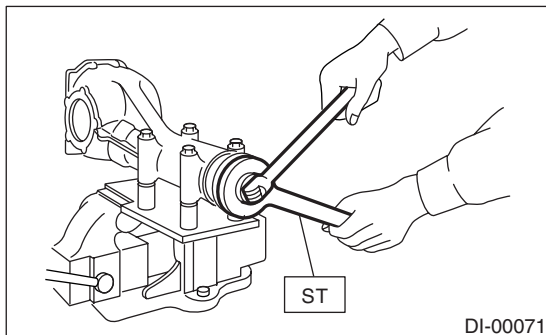
17) Apply Lock Tite to the bolt threads of drive pinion shaft, and the seating surface of new self-locking nut.

Lock Tite:

THREE BOND 1324 (Part No. 004403042)

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

ST 18633AA000 WRENCH COMPL



19) Install the hypoid driven gear on differential case.

NOTE:

- Before installing the bolts, apply Lock Tite to bolt threads.
- Make sure that there is no clearance between differential case and driven gear.

Lock Tite:

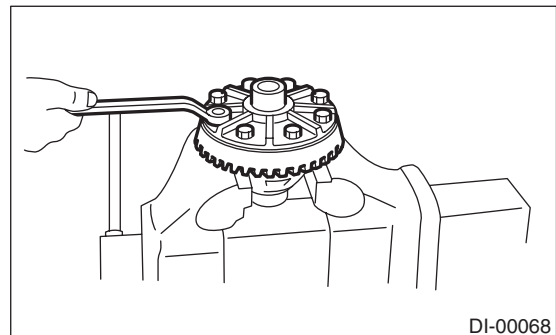
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:

Tighten diagonally while tapping the bolt heads.

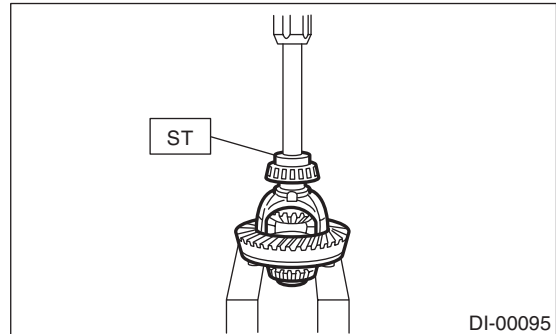
Tightening torque:

103 N·m (10.5 kgf-m, 76 ft-lb)



20) Press-fit the side bearing onto differential case with ST.

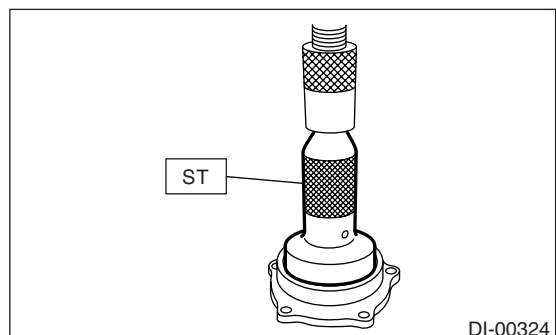
ST 398487700 DRIFT



21) Assembling side bearing retainer.

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

ST 398417700 DRIFT



Rear Differential

DIFFERENTIALS

(2) Install the oil seal. <Ref. to DI-50, REPLACEMENT, Rear Differential Side Oil Seal.>

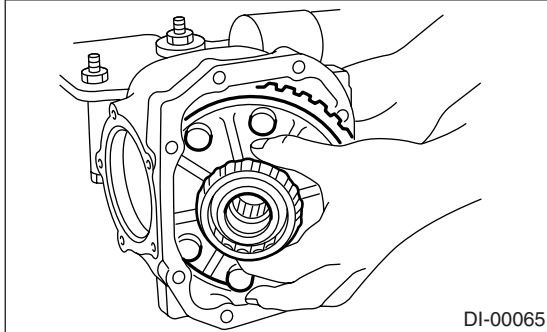
22) Adjusting side bearing retainer shims

(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.

NOTE:

Be careful not to hit the teeth against the case.



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

NOTE:

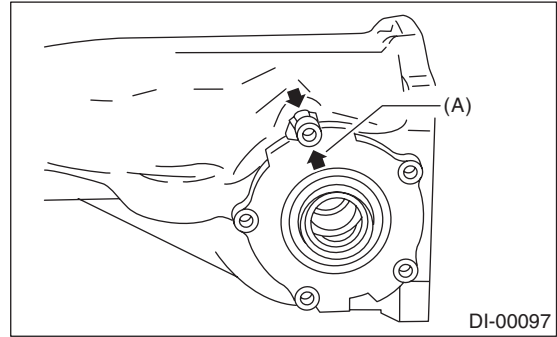
Replace the broken or corroded side bearing retainer shim with a new one of same thickness.

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 bearing retainer during installation.

NOTE:

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

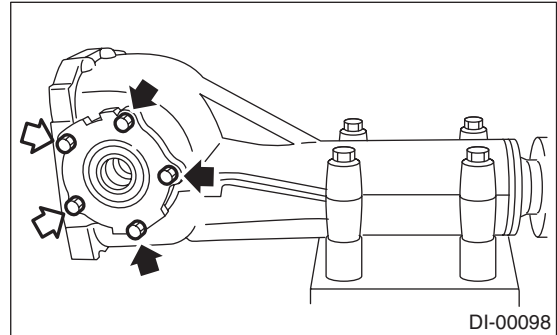


(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

Tightening torque:

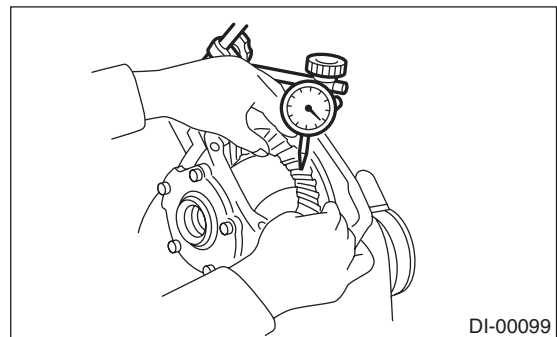
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



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

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)



NOTE:

If the backlash exceeds 0.20 mm (0.008 in), reduce the thickness of shim on the back face of hypoid driven gear and increase the thickness of shim on the tooth face of hypoid driven gear. If the backlash is less than 0.10 mm (0.004 in), increase the thickness of shim on the back face of hypoid driven gear and reduce the thickness of shim on the tooth face of hypoid driven gear.

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

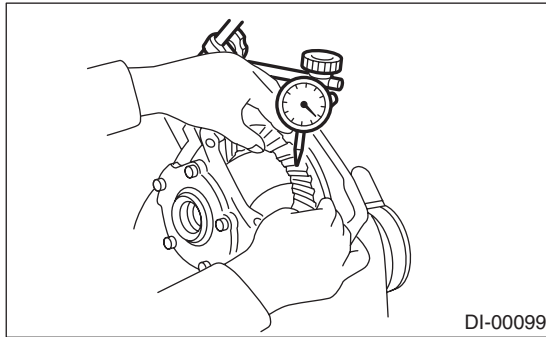
Total preload:

27 — 54 N (2.8 — 5.50 kgf, 6.1 — 12.2 lbf)

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

Backlash:

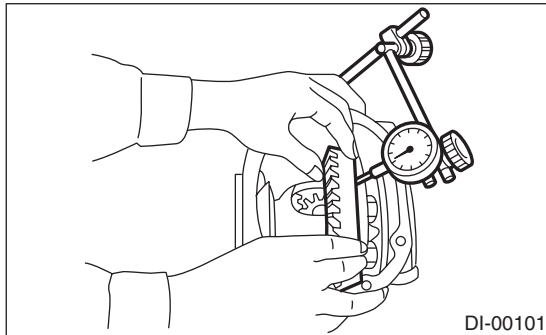
0.10 — 0.20 mm (0.004 — 0.008 in)



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

Limit of runout:

Less than 0.05 mm (0.0020 in)



25) Checking and adjusting tooth contact of hypoid driven gear

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

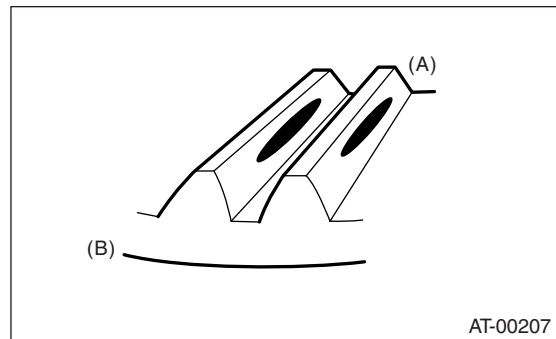
(2) When the contact pattern is incorrect, readjust according to the instructions given in "TOOTH CONTACT PATTERN".

NOTE:

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

- Correct tooth contact

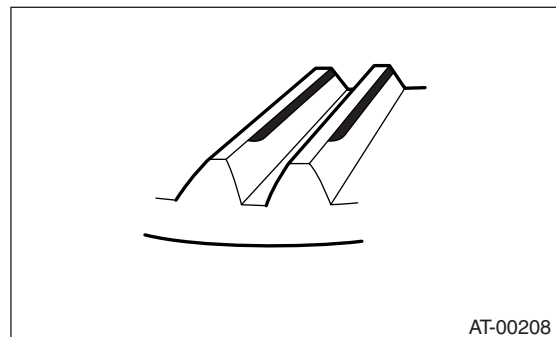
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)



- (A) Toe side
- (B) Heel side

- Face contact

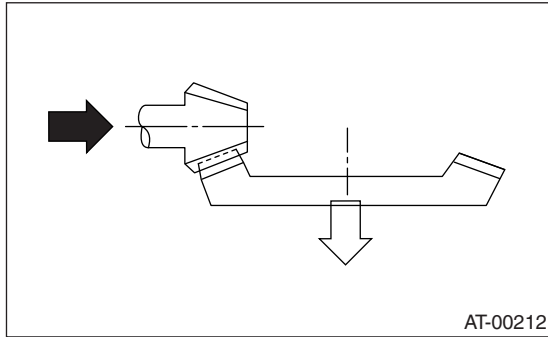
Checking item: Backlash is too large. Contact pattern



Rear Differential

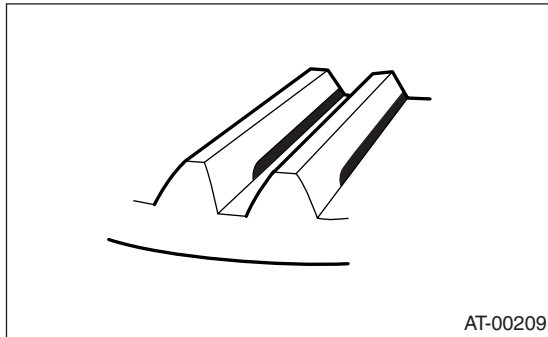
DIFFERENTIALS

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

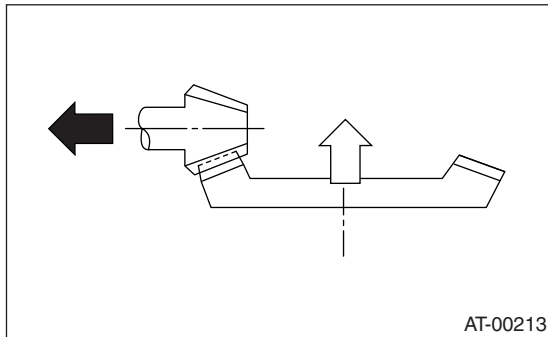


- Flank contact

Checking item: Backlash is too small.
Contact pattern

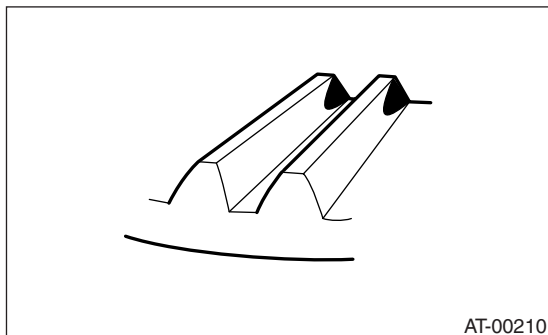


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.

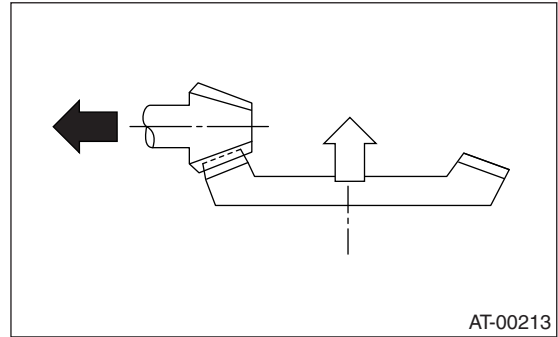


- Toe contact (Inside end contact)

Checking item: Contact area is small.
Contact pattern

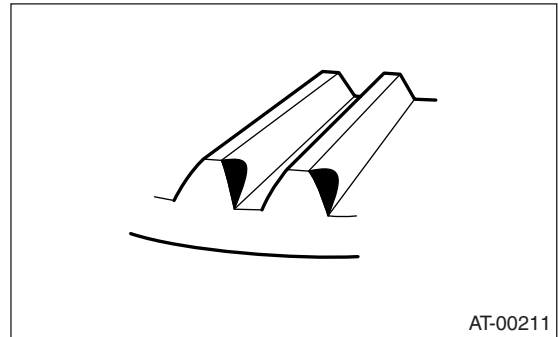


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.

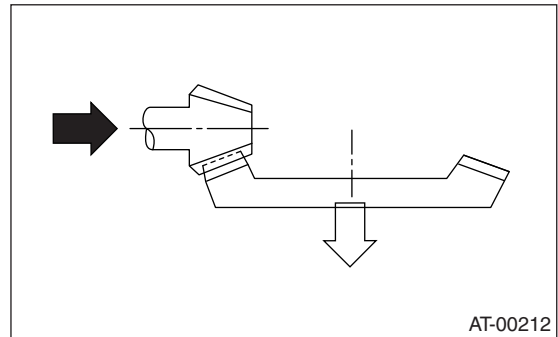


- Heel contact (Outside end contact)

Checking item: Contact area is small.
Contact pattern



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

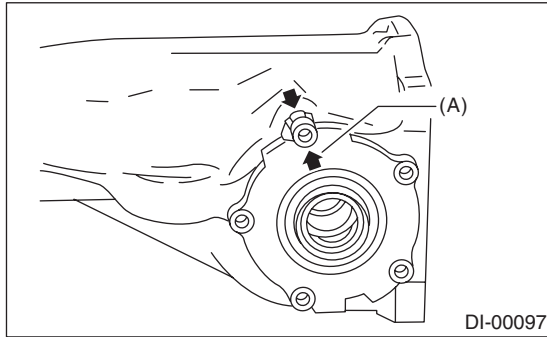


26) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.

27) Remove the side bearing retainers on right and left side.

28) Install new O-rings to side bearing retainers on right and left side.

29) Align the arrow mark on differential carrier with the mark on side bearing retainer during installation.



(A) Arrow mark

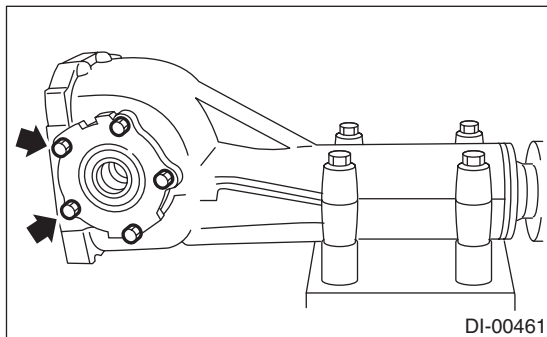
30) Apply liquid gasket to the bolt with arrow mark, and install the side bearing retainer.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

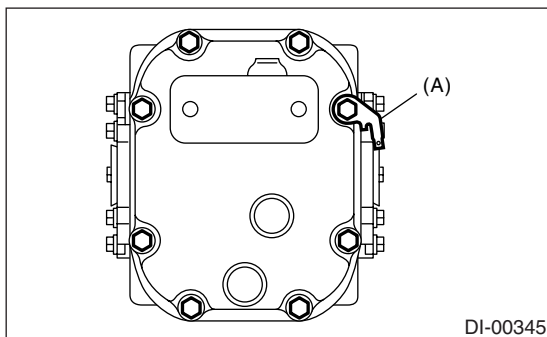
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



31) 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

32) Install the new air breather cap.

33) 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) Hypoid driven gear and drive pinion

- If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.

- If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if crack, score, or other defects are evident on tooth surface.

- Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washers of side gear and pinion mate gear

Replace if seizure, flaw, abnormal wear or other defect is evident.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if its sliding surfaces are worn or cracked.

8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

9) Rear differential oil temperature switch

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).

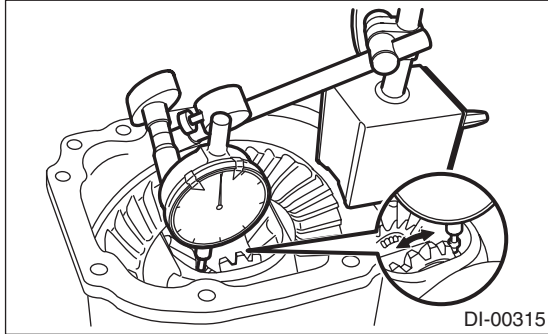
1. SIDE GEAR BACKLASH

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.



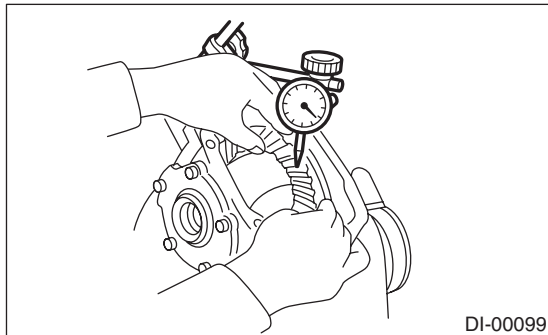
2. HYPOID DRIVEN GEAR BACKLASH

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

Hypoid driven gear backlash:

0.1 — 0.2 mm (0.004 — 0.008 in)

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



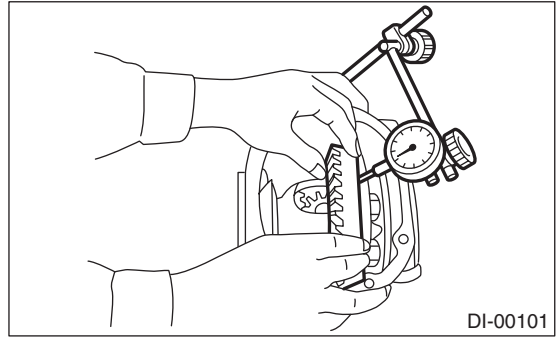
3. HYPOID DRIVEN GEAR RUNOUT

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

Hypoid driven gear runout:

Less than 0.05 mm (0.0020 in)

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



4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between hypoid driven gear and driven pinion. <Ref. to DI-29, ASSEMBLY, Rear Differential.>

5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Total preload:

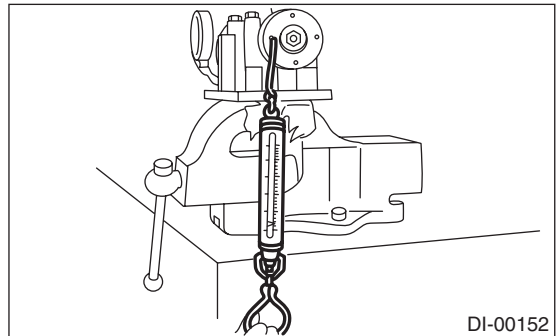
Except STI model:

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

STI model:

27 — 54 N (2.8 — 5.50 kgf, 6.1 — 12.2 lbf)

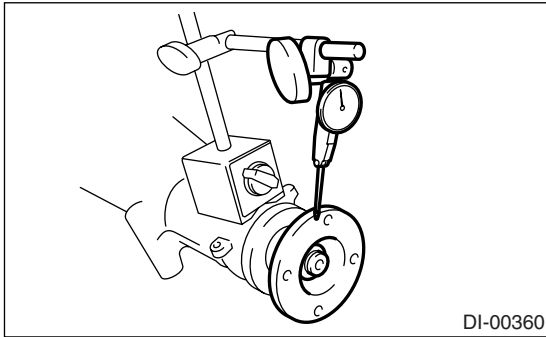
If the total preload is not within the specification, adjust the side bearing retainer shims.



6. COMPANION FLANGE

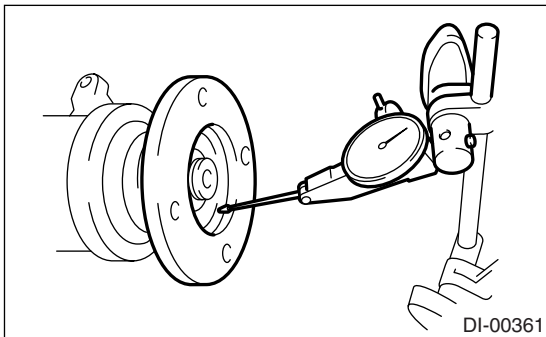
- 1) If rust or dirt is attached to the companion flange, remove them.
- 2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.003 in)



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

Limit of runout:
0.08 mm (0.003 in)



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

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash. <Ref. to DI-29, ASSEMBLY, Rear Differential.>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust the hypoid driven gear backlash. <Ref. to DI-29, ASSEMBLY, Rear Differential.>

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear. <Ref. to DI-29, ASSEMBLY, Rear Differential.>

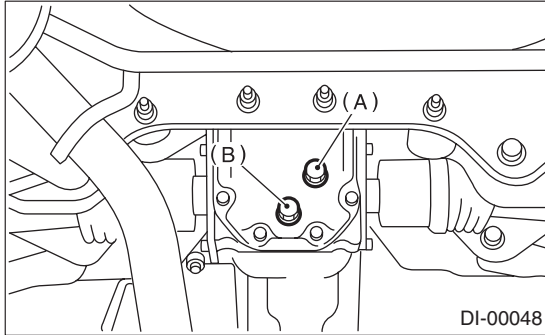
4. TOTAL PRELOAD

Adjust the side bearing shim. <Ref. to DI-29, 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)

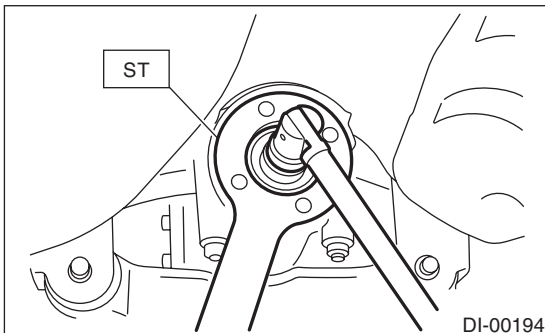
- 7) Lift-up the vehicle.
- 8) Remove the rear exhaust pipe and muffler.
- 9) Remove the propeller shaft from body. <Ref. to DS-16, REMOVAL, Propeller Shaft.>
- 10) Remove the self-locking nut while holding the companion flange with ST.

Except STI model

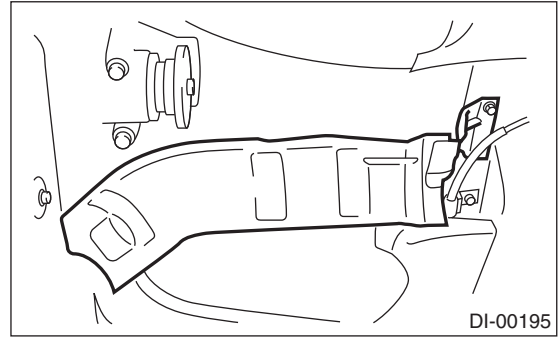
ST 498427200 FLANGE WRENCH

STI model

ST 18633AA000 WRENCH COMPL

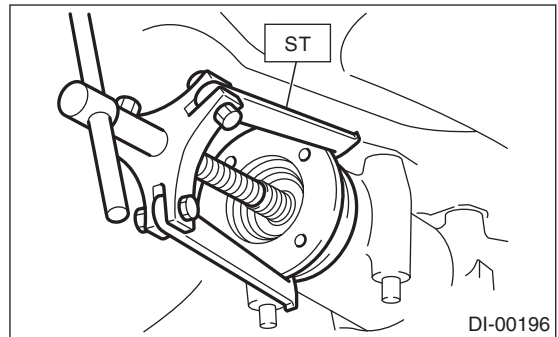


- 11) Remove the center heat shield cover.



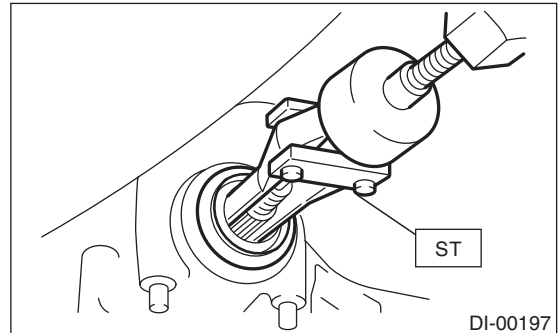
- 12) Extract the companion flange using ST.

ST 399703600 PULLER ASSY



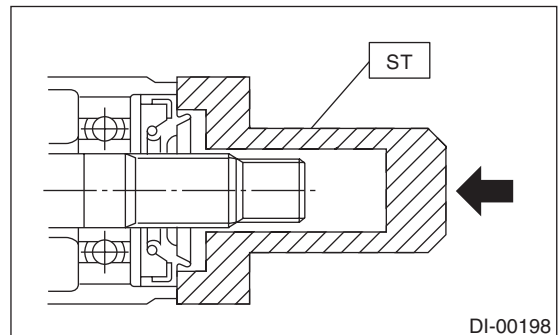
- 13) Remove the oil seal using ST.

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) Apply Lock Tite to the bolt threads of drive pinion shaft, and the seating surface of new self-locking nut.

Lock Tite:

THREE BOND 1324 (Part No. 004403042)

17) 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

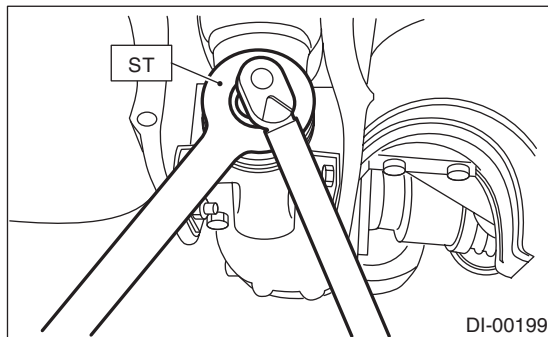
ST 18633AA000 WRENCH COMPL

NOTE:

Use a new self-locking nut.

Tightening torque:

181.5 N·m (18.5 kgf-m, 134 ft-lb)



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

19) Fill the differential carrier with gear oil to the bottom of filler plug hole after installing. <Ref. to DI-18, Differential Gear Oil.>

6. Rear Differential Side Oil Seal

A: INSPECTION

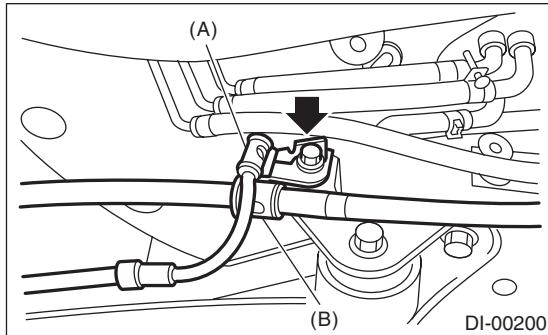
Make sure that there is no oil leakage from side oil seal.

If there is any oil leakage, replace the oil seal.

B: REPLACEMENT

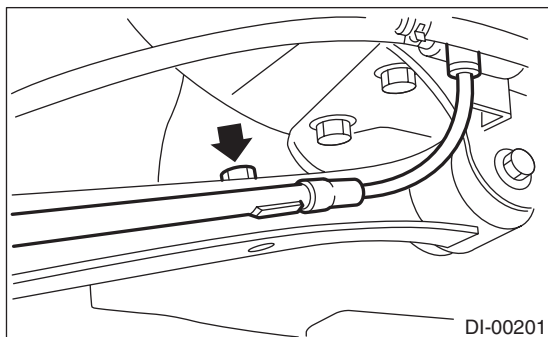
- 1) Move the select lever or gear shift lever to "N".
- 2) Release the parking brake.
- 3) Loosen both wheel nuts.
- 4) Lift-up the vehicle.
- 5) Remove the wheels.
- 6) Remove the rear exhaust pipe and muffler.
 - Non-turbo model
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
 - Turbo model and STI model
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 7) 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.

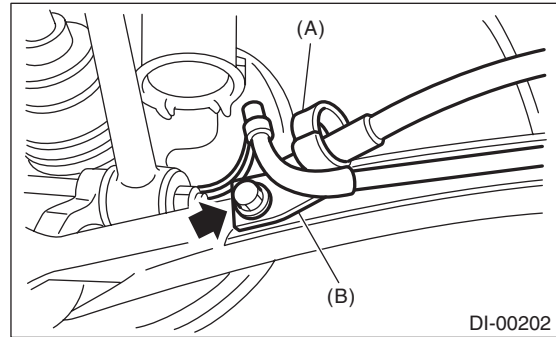


- (A) ABS wheel speed sensor cable clamp
(B) Parking brake cable clamp

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

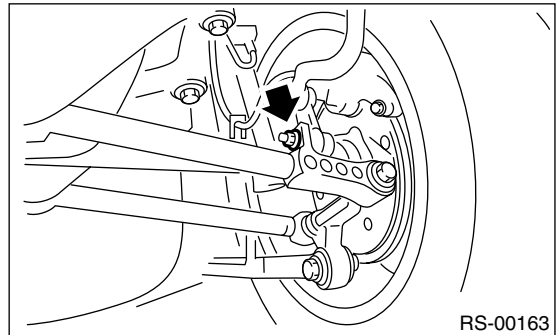


- (3) Remove the ABS wheel speed sensor cable clamp and parking brake cable guide from trailing link.

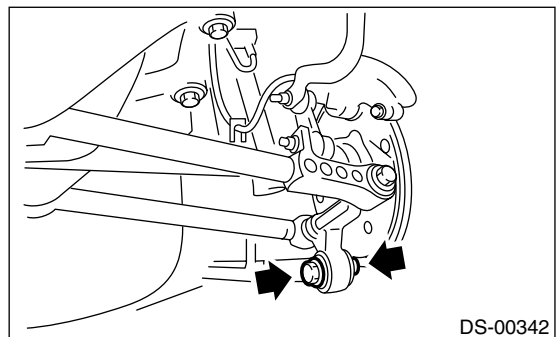


- (A) Parking brake cable guide
(B) ABS wheel speed sensor cable clamp

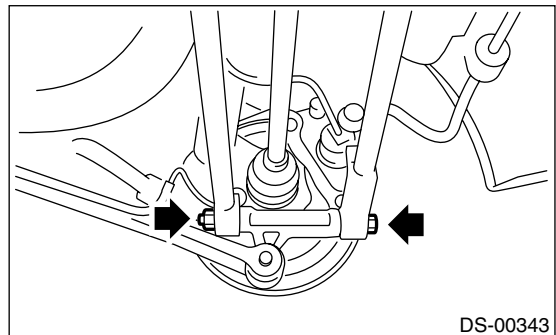
- (4) Remove the rear stabilizer link.



- (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.

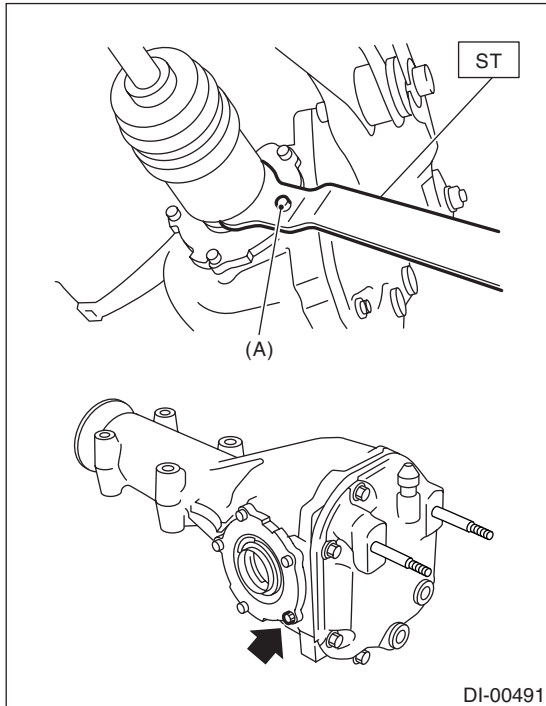


(7) Remove the DOJ from the rear differential by using ST.

NOTE:

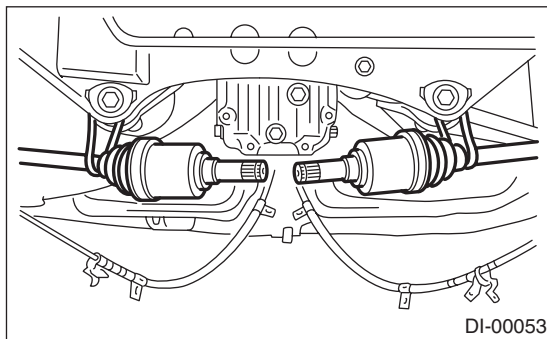
When removing the DOJ from rear differential, fit ST to the bolts as shown in the figure so as not to damage the side bearing retainer.

ST 208099PA100 DRIVE SHAFT REMOVER



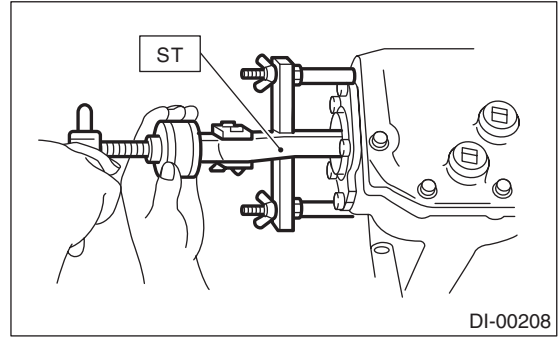
(A) Bolt

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



9) Remove the oil seal using ST.

ST 398527700 PULLER ASSY

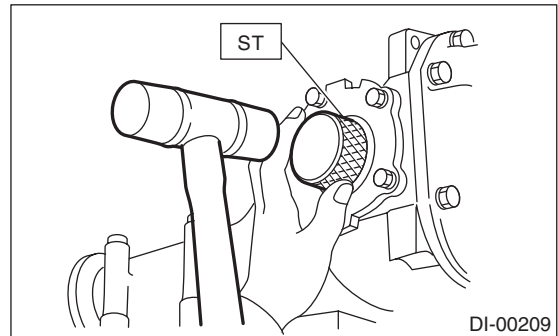


10) Drive in a new side oil seal using ST.

NOTE:

Apply chassis grease between the oil seal lips.

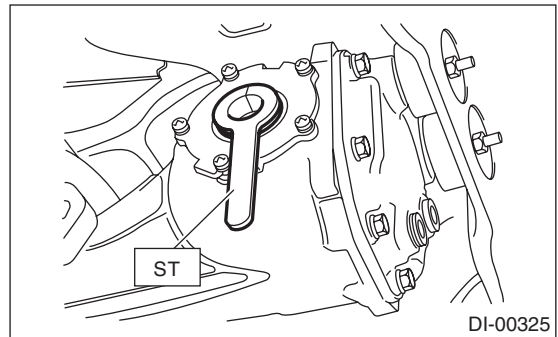
ST 398437700 DRIFT



11) Insert the DOJ into rear differential.

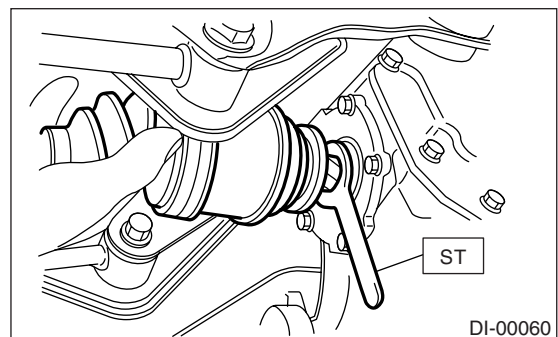
(1) Install the ST to rear differential.

ST 28099PA090 OIL SEAL PROTECTOR



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

ST 28099PA090 OIL SEAL PROTECTOR



Rear Differential Side Oil Seal

DIFFERENTIALS

(3) Remove the ST.

ST 28099PA090 OIL SEAL PROTECTOR

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

7. Rear Differential Member

A: REMOVAL

When removing the differential front member, work the removal procedure as rear differential.

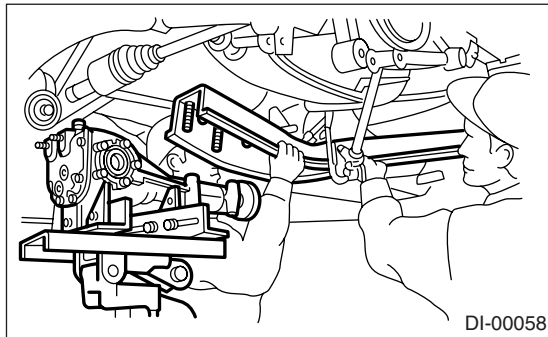
<Ref. to DI-21, REMOVAL, Rear Differential.>

B: INSTALLATION

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

NOTE:

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

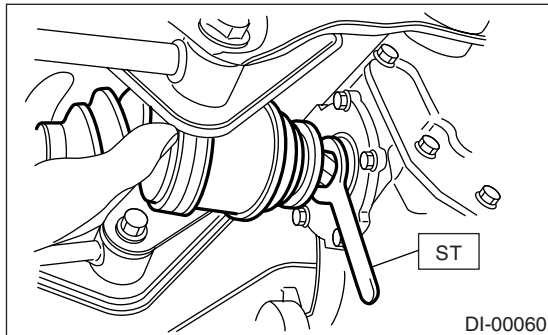


2) Insert the DOJ of rear drive shaft into rear differential. <Ref. to DI-50, REPLACEMENT, Rear Differential Side Oil Seal.>

NOTE:

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

ST 28099PA090 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.

General Diagnostic Table

DIFFERENTIALS

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 cap.	Clean, repair or replace.
	(3) Loose bolts on differential spindle or side bearing 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 gasket.
	(5) Loose oil filler or drain plug.	Retighten and apply liquid gasket.
	(6) Wear, damage or incorrectly fitting for spindle, side bearing retainer and oil seal.	Repair or replace.
2. Seizure NOTE: Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Insufficient backlash for hypoid gear.	Readjust or replace.
	(2) Excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) Insufficient or improper oil used.	Replace the seized part and fill with specified oil to specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Improper backlash for hypoid gear.	Replace.
	(2) Insufficient or excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) Excessive backlash for differential gear.	Replace the gear or thrust washer.
	(4) Loose bolts and nuts such as hypoid driven gear bolt.	Retighten.
	(5) Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly.	(1) Excessive backlash for hypoid gear.	Readjust.
	(2) Excessive backlash for differential gear.	Replace the gear or thrust washer.
	(3) Insufficient preload for front or rear bearing.	Readjust.
	(4) Loose drive pinion nut.	Tighten to specified torque.
	(5) Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace.
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Seized or damaged side bearing.	Replace.

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 lifting-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

DRIVE SHAFT SYSTEM

General Description

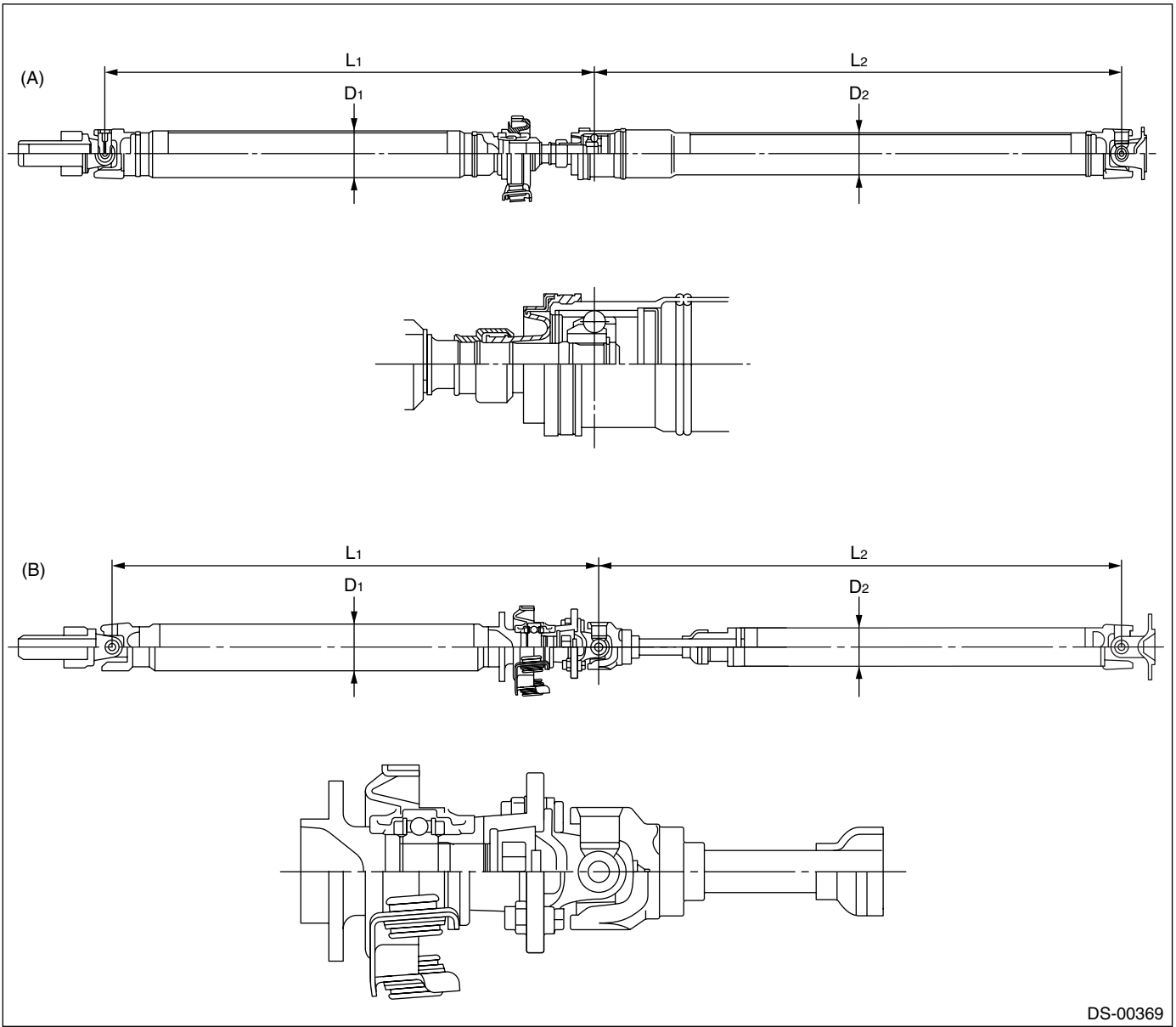
DRIVE SHAFT SYSTEM

1. General Description

A: SPECIFICATION

1. PROPELLER SHAFT

Model		Except STI	STI
Propeller shaft type		EDJ	3UJ
Front propeller shaft Joint-to-joint length: L ₁	mm (in)		
	AT	608 (23.94)	—
	MT	668 (26.30)	574 (22.60)
Rear propeller shaft Joint-to-joint length: L ₂		684 (26.93)	706 (27.80)
Outer diameter of tube:	mm (in)		
	D ₁	63.5 (2.500)	70 (2.756)
	D ₂	57.5 (2.264)	57 (2.244)



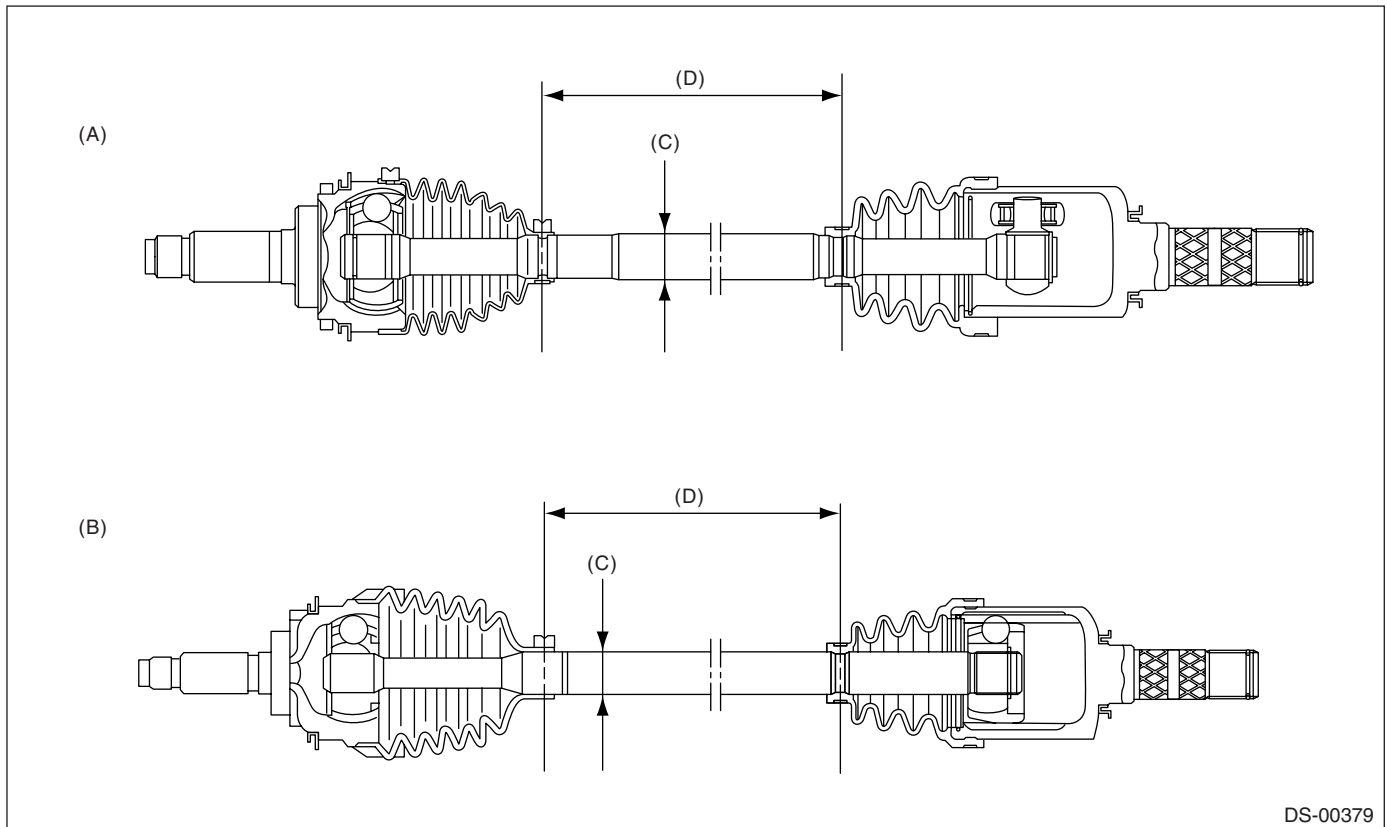
DS-00369

(A) EDJ type (Except STI model)

(B) 3UJ type (STI model)

2. FRONT DRIVE SHAFT ASSEMBLY

Model		Type of drive shaft	Axle diameter ϕ D mm (in)	Axle length L mm (in)
Sedan	Non-turbo, Turbo AT	EBJ+PTJ	26 (1.02)	338.8 (13.34)
	Turbo MT (except for STI)	EBJ+PTJ	28 (1.10)	338.8 (13.34)
	Turbo MT (STI)	BJ+DOJ	28 (1.10)	295.6 (11.64)
Wagon	Non-turbo, Turbo AT	EBJ+PTJ	26 (1.02)	329.6 (12.98)
	Turbo MT	EBJ+PTJ	28 (1.10)	329.6 (12.98)



(A) EBJ+PTJ

(C) Axle diameter D

(D) Axle length L

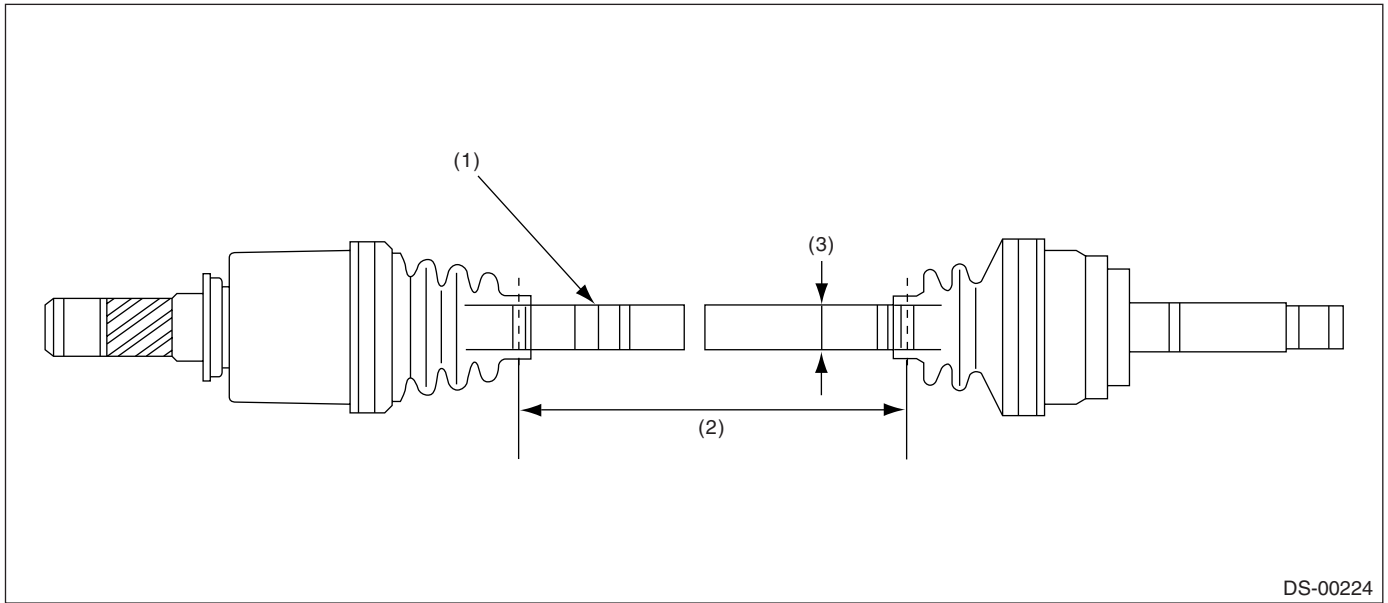
(B) BJ+DOJ

General Description

DRIVE SHAFT SYSTEM

3. REAR DRIVE SHAFT ASSEMBLY

Model	Type of drive shaft assembly	No. of identification protrusion on shaft	Axle diameter ϕD mm (in)	Axle length L mm (in)
Sedan	EBJ+DOJ RH	1 (One)	24 (0.94)	367.4 (14.46)
	EBJ+DOJ LH	0 (Zero)	24 (0.94)	357.4 (14.07)
Wagon	EBJ+DOJ RH	2 (Two)	24 (0.94)	357.5 (14.07)
	EBJ+DOJ LH	1 (One)	24 (0.94)	347.5 (13.68)
STI	EBJ+EDJ	—	25 (0.98)	316 (12.44)



DS-00224

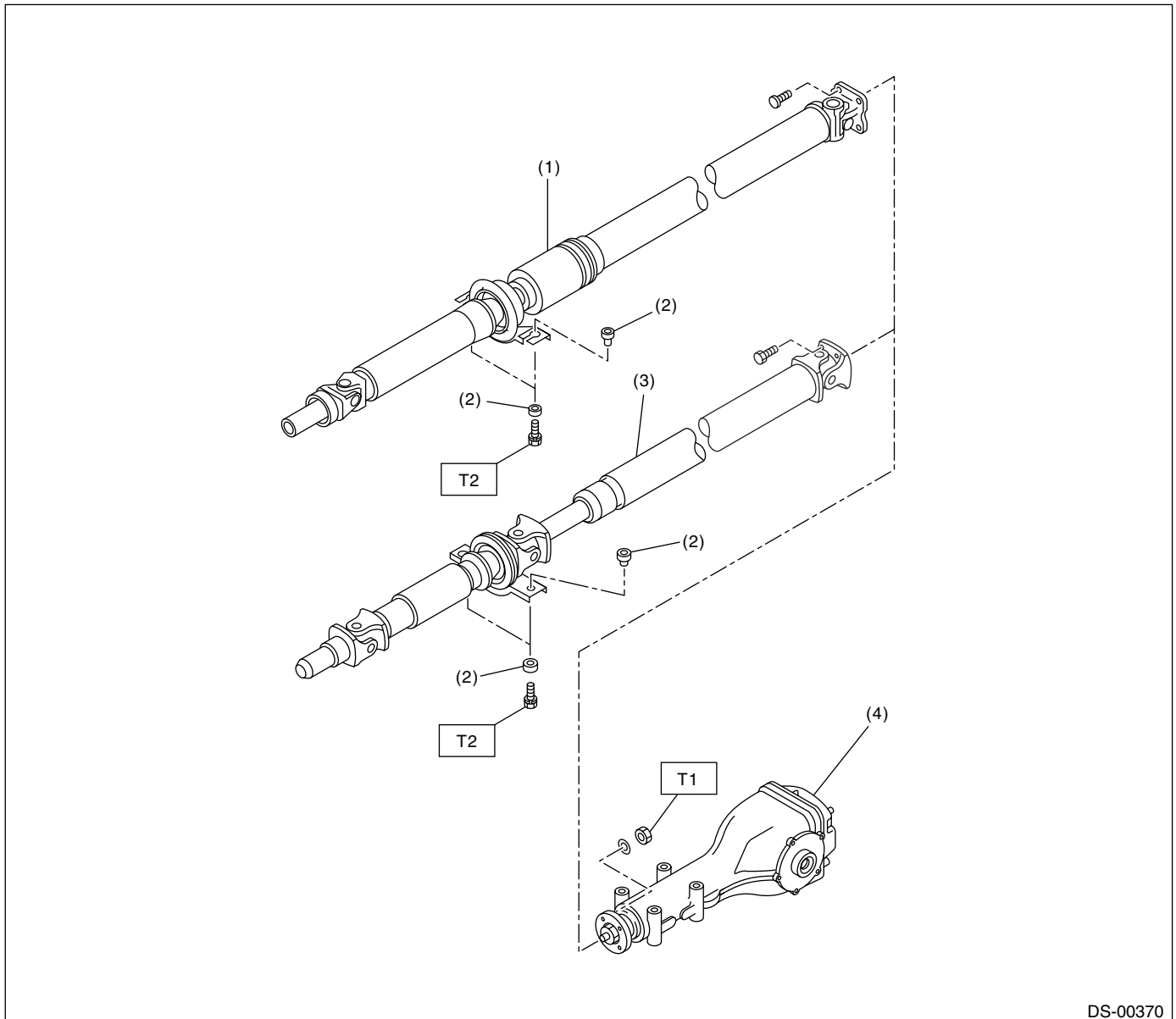
(1) Identification protrusion

(2) Axle length L

(3) Axle diameter D

B: COMPONENT

1. PROPELLER SHAFT



DS-00370

(1) Propeller shaft (EDJ type) (Except STI model)

(3) Propeller shaft (3UJ type) (STI model)

(2) Bushing

(4) Rear differential

Tightening torque: N·m (kgf-m, ft-lb)

T1: 31 (3.2, 22.9)

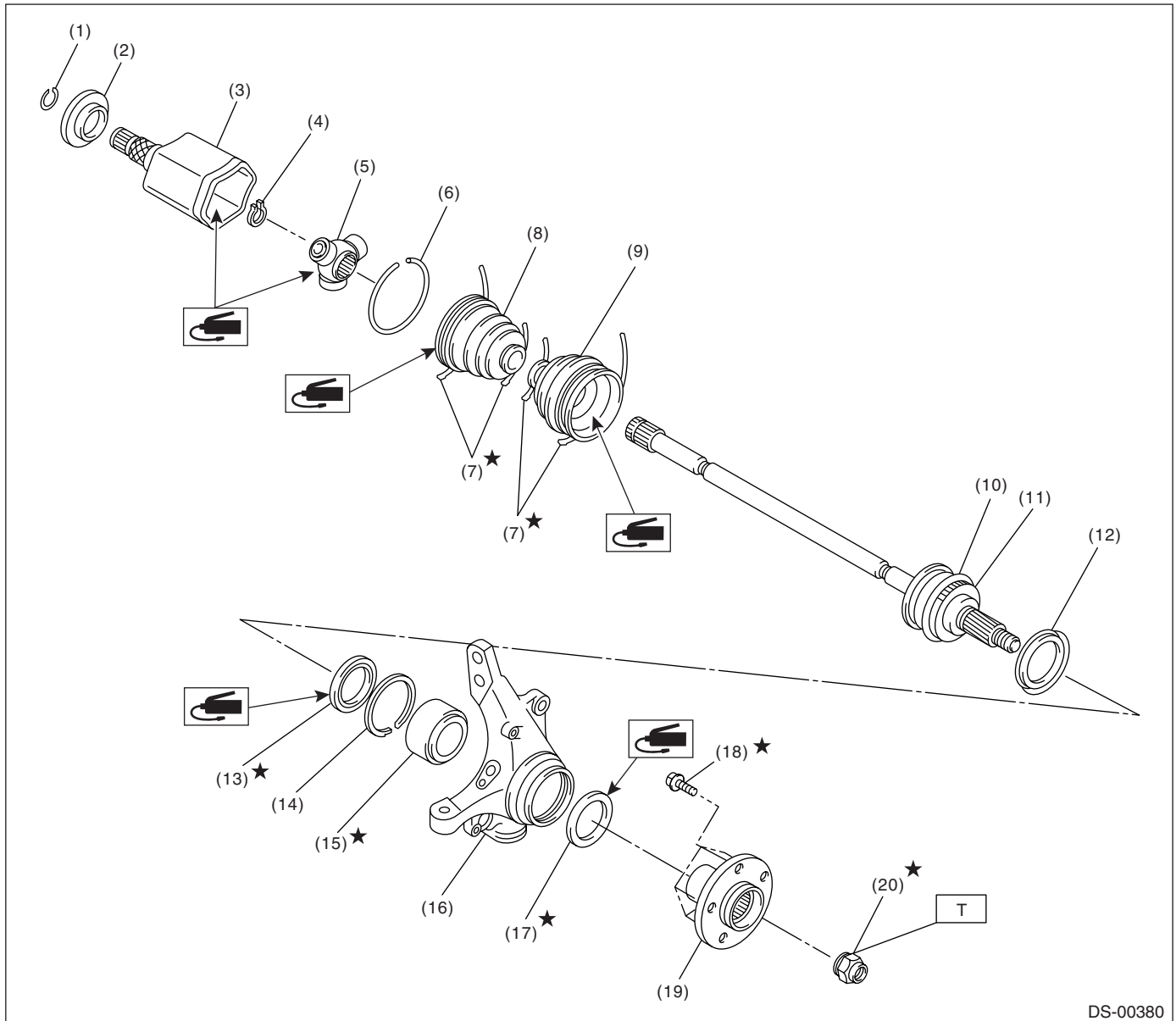
T2: 52 (5.3, 38.3)

General Description

DRIVE SHAFT SYSTEM

2. FRONT AXLE

- EBJ+PTJ type

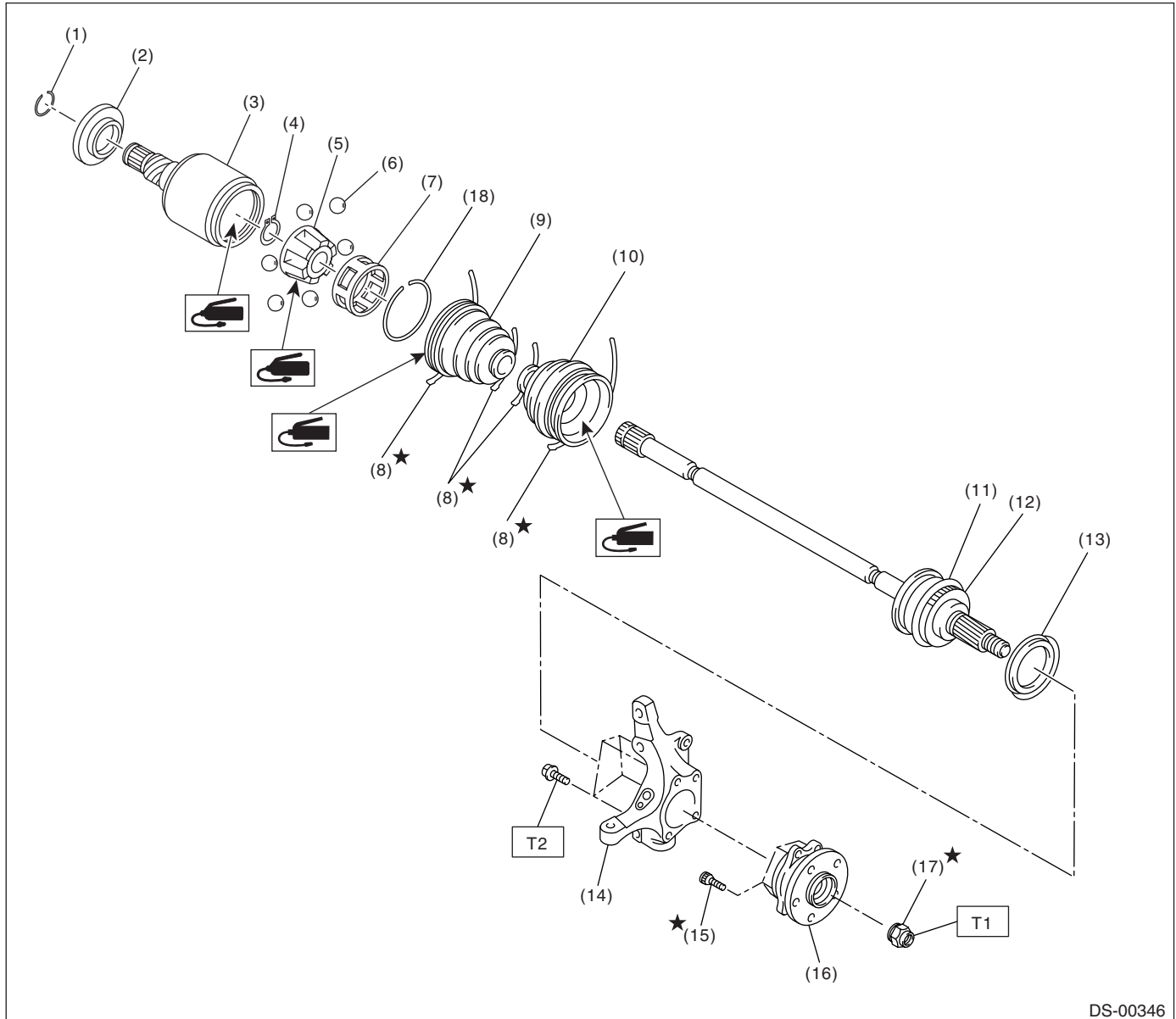


DS-00380

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

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

- BJ+DOJ type



DS-00346

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

- | |
|----------------|
| (17) Axle nut |
| (18) Snap ring |

Tightening torque: N·m (kgf-m, ft-lb)

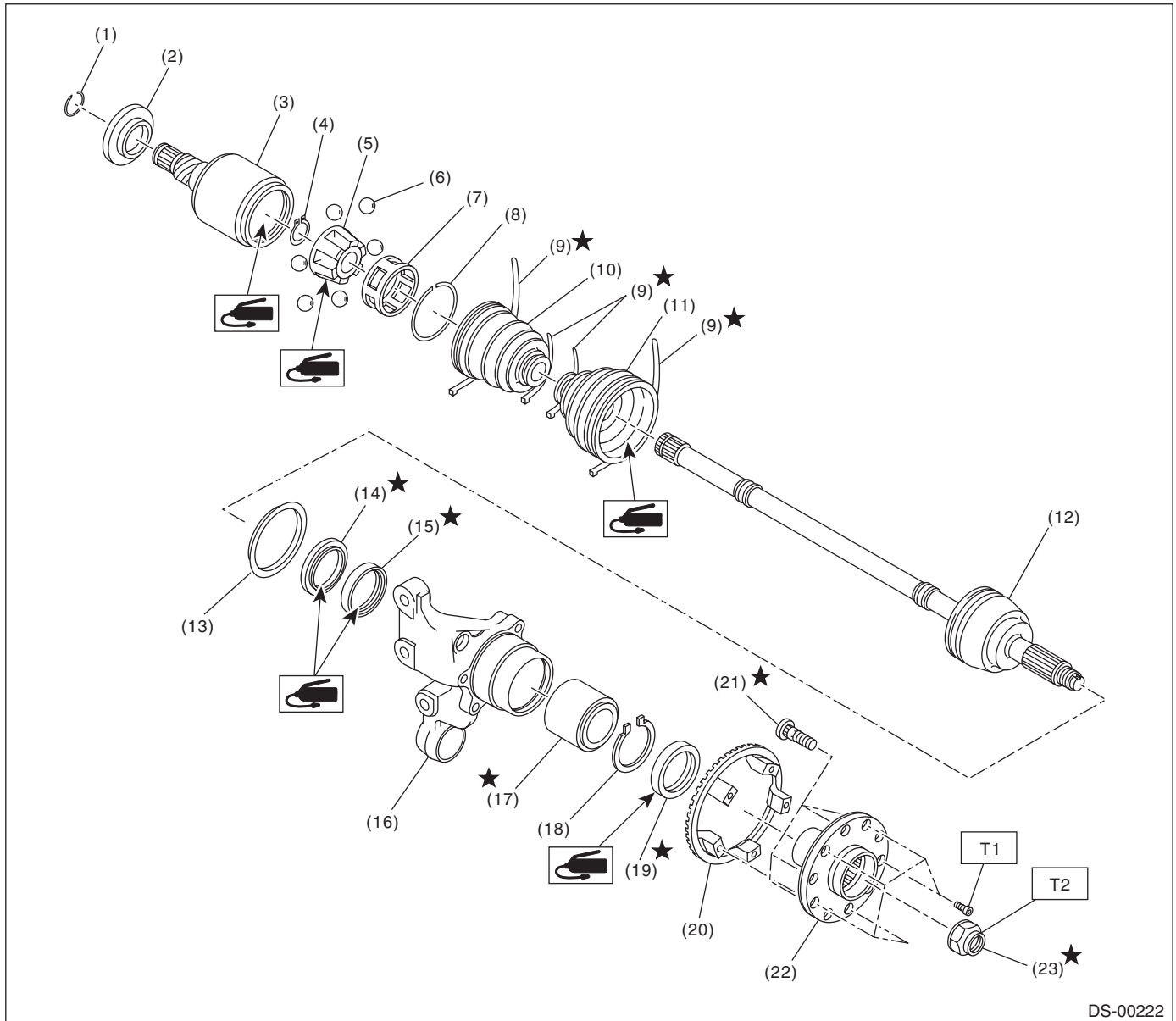
T1: 220 (22.4, 162)

T2: 65 (6.6, 47.9)

General Description

DRIVE SHAFT SYSTEM

3. REAR AXLE



- (1) Circlip
- (2) Baffle plate (DOJ)
- (3) Outer race DOJ: Except STI model
Outer race EDJ: STI model
- (4) Snap ring
- (5) Inner race
- (6) Ball
- (7) Cage
- (8) Snap ring

- (9) Boot band
- (10) Boot (DOJ)
- (11) Boot
- (12) EBJ ASSY
- (13) Baffle plate
- (14) Oil seal (IN. No. 2)
- (15) Oil seal (IN.)
- (16) Housing
- (17) Bearing
- (18) Snap ring

- (19) Oil seal (OUT)
- (20) Tone wheel
- (21) Hub bolt
- (22) Hub
- (23) Axle nut

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

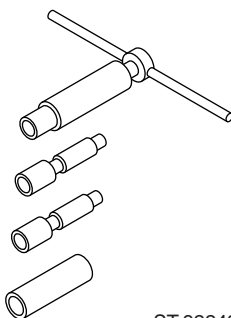
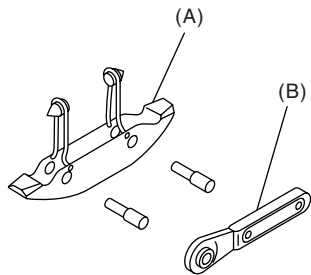
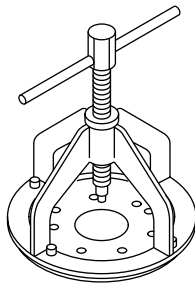
C: CAUTION

- Wear work 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 and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.

- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- 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.

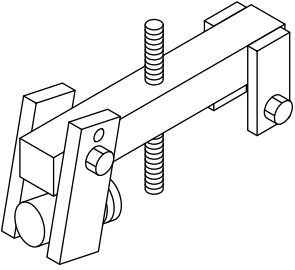
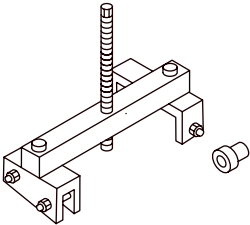
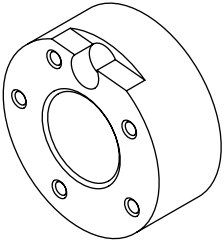
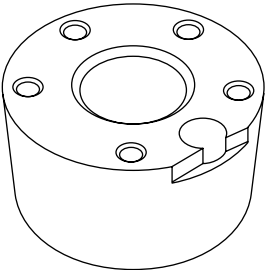
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-922431000	922431000	AXLE SHAFT INSTALLER	• Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening boot band. (A) Jig for band (B) Ratchet wrench
 ST-926470000	926470000	AXLE SHAFT PULLER	• Used for removing axle shaft. • Used with AXLE SHAFT PULLER PLATE (28099PA110).

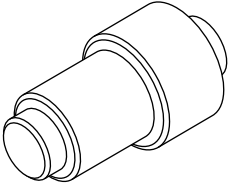
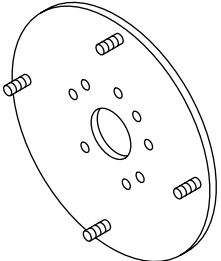
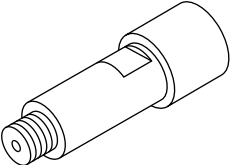
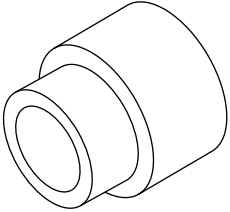
General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 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. (Except STI model)
 ST28099PA080	28099PA080	HUB STAND	Used for disassembling and assembling hub bolt in hub. (STI model)

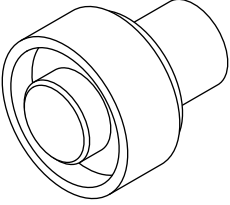
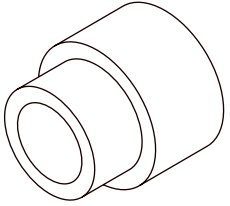
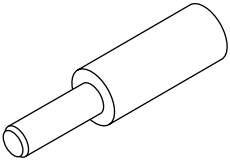
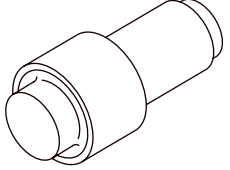
General Description

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) (Except STI model). - Used with HOUSING STAND (28099PA060) (STI model).
 ST28099PA110	28099PA110	AXLE SHAFT PULLER PLATE	Replace plate of AXLE SHAFT PULLER (926470000) with this PLATE to be used.
 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).

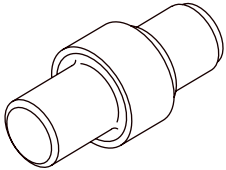
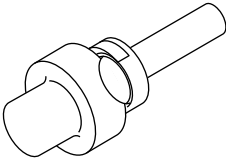
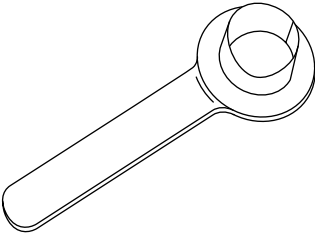
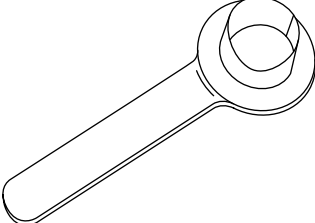
General Description

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 PULLER	- Used for disassembling and assembling rear wheel bearing. - Used with HOUSING STAND (927430000).

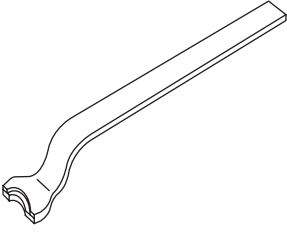
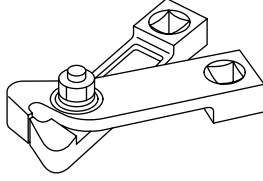
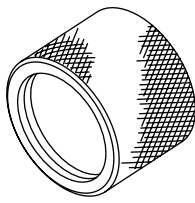
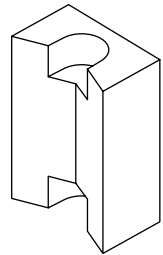
General Description

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.
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	- Used for installing front drive shaft to transmission. - For protecting oil seal.

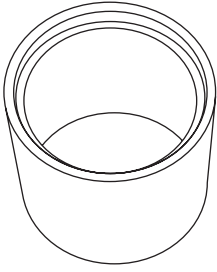
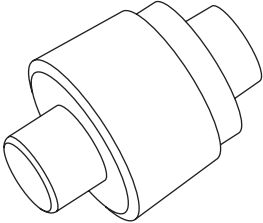
General Description

DRIVE SHAFT SYSTEM

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

General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-28099PA060	28099PA060	HOUSING STAND	- Used for disassembling and assembling rear housing bearing. (STI model) - Used with BEARING PULLER (927100000).
 ST-28099PA070	28099PA070	OIL SEAL INSTALLER	- Used for press-fitting the rear housing oil seal. (STI model) - Used with HOUSING STAND (28099PA060).

2. GENERAL TOOL

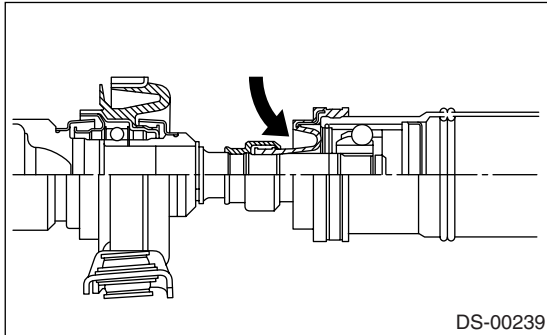
TOOL NAME	REMARKS
Puller	Used for removing ball joint from knuckle arm.
Dial gauge	Used for inspecting propeller shaft run-out.
Snap ring pliers	Used for installing and removing snap ring.
Bar	Used for extracting drive shaft.

2. Propeller Shaft

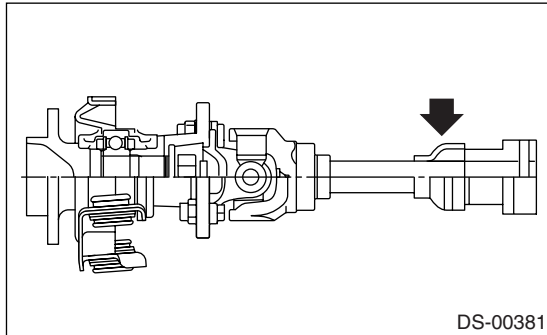
A: REMOVAL

NOTE:

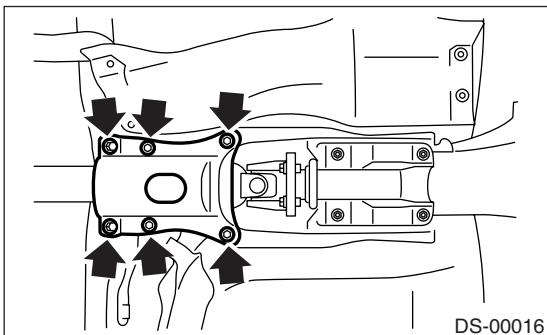
- Before removing the propeller shaft, wrap the metal parts with a cloth or rubber material.
- In case of EDJ type, before removing the propeller shaft, wrap the metal parts (installed at the rubber boot of center EDJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be damaged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



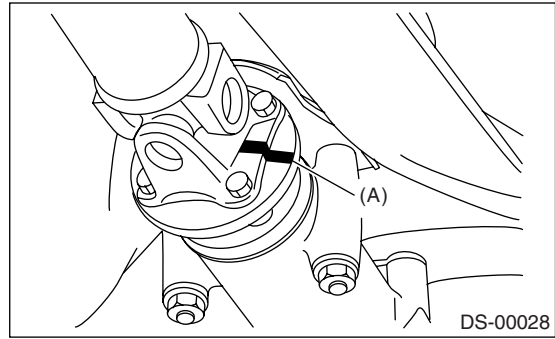
- STI model



- 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.

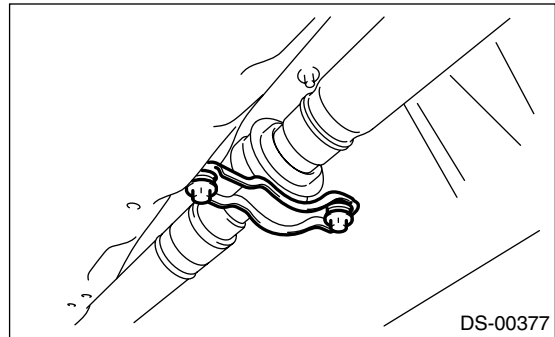


- 8) Make matching marks on affected parts before removal.



(A) Matching mark

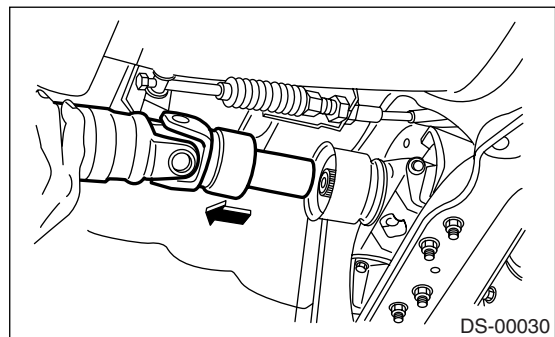
- 9) Remove the three bolts which hold the propeller shaft to rear differential.
- 10) Remove the remaining bolt.
- 11) Remove the two bolts which hold the center bearing to vehicle body.



- 12) Remove the propeller shaft from transmission.

CAUTION:

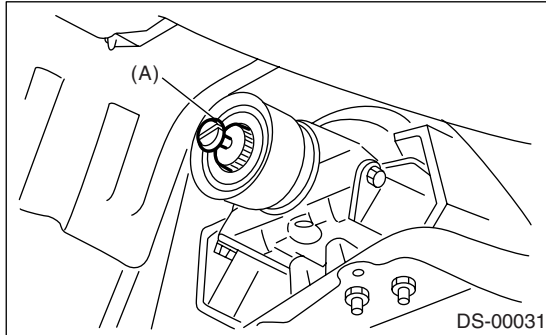
- Be careful not to damage the oil seals and frictional surface of sleeve yoke.
- Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing the propeller shaft.



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.



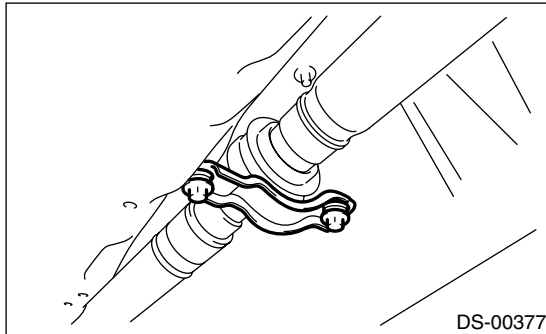
(A) Extension cap

B: INSTALLATION

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

Tightening torque:

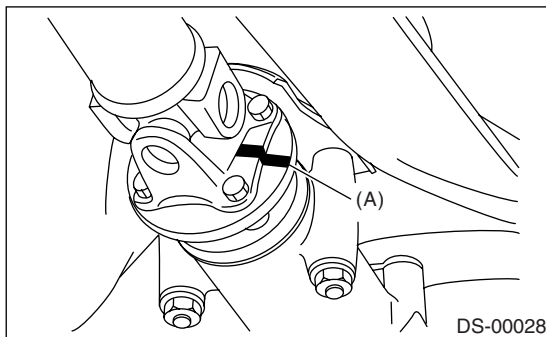
52 N·m (5.3 kgf-m, 38.3 ft-lb)



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

Tightening torque:

31 N·m (3.2 kgf-m, 22.9 ft-lb)



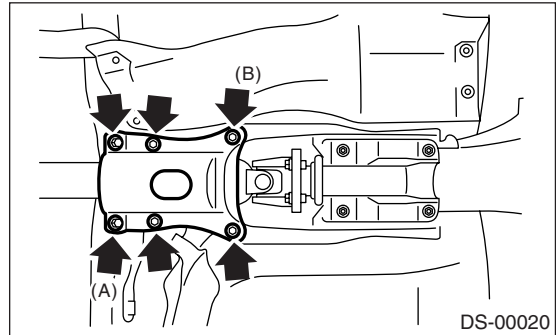
(A) Matching mark

3) Using new bolts, install the differential mount front cover.

- (1) Temporarily tighten the bolt (A) while pushing cover forward.
- (2) Tighten the bolt (B) to specified torque.
- (3) Tighten the bolt (A) to specified torque.
- (4) Tighten the remaining bolts to specified torque.

Tightening torque:

90 N·m (9.2 kgf-m, 66 ft-lb)



4) Install the center exhaust pipes.

5) Install the rear exhaust pipe and muffler.

C: INSPECTION

NOTE:

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

- 1) Tube surfaces for dents or cracks
 - 2) Splines for deformation or abnormal wear
 - 3) Joints for non-smooth operation or abnormal noise
 - 4) Center bearing for free play, noise or non-smooth operation
 - 5) Oil seals for abnormal wear or damage
 - 6) Center bearing for breakage
- Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

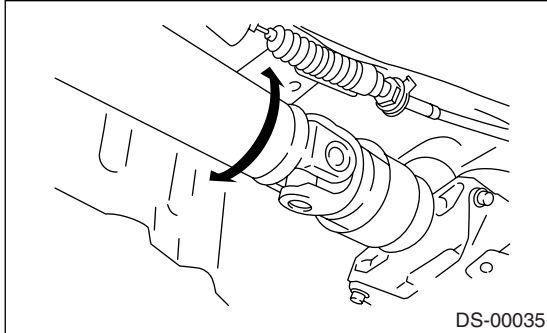
- 1) Remove the center exhaust pipes.
- 2) Check for any looseness of the yoke flange mounting bolts which connect to rear differential and center bearing bracket mounting bolts.

Propeller Shaft

DRIVE SHAFT SYSTEM

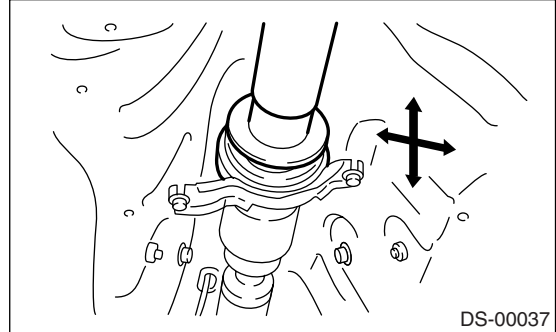
2. SPLINES AND BEARING LOCATIONS

- 1) Remove the center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) 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) 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.

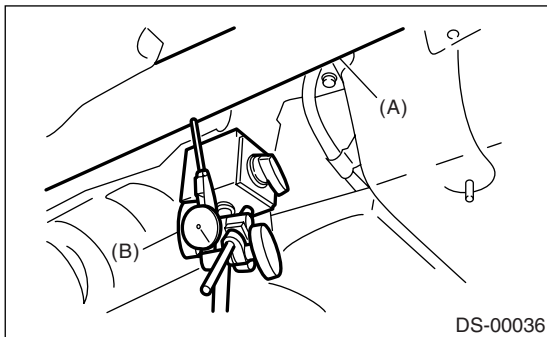


3. RUNOUT OF PROPELLER SHAFT

- 1) Remove the center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Set the dial gauge with its indicator stem at center of propeller shaft tube.
- 4) Turn the propeller shaft slowly by hands to check for "runout" of propeller shaft.

Runout:

Limit 0.6 mm (0.024 in)

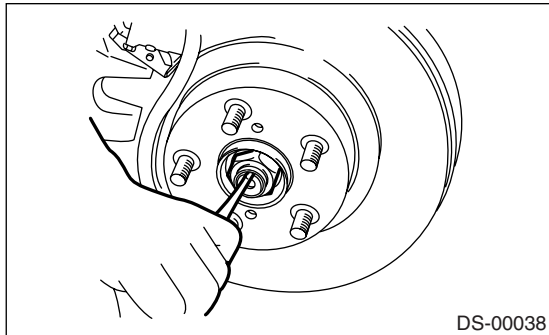


- (A) Propeller shaft
(B) Dial gauge

3. Front Axle

A: REMOVAL

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



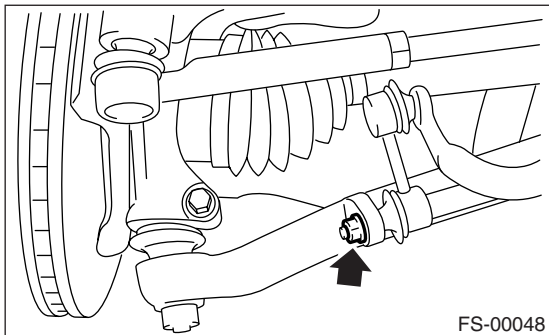
- 3) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:

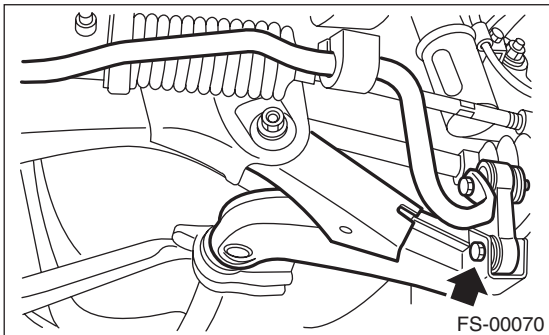
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

- 4) Remove the stabilizer link.

- Sedan model



- Wagon model

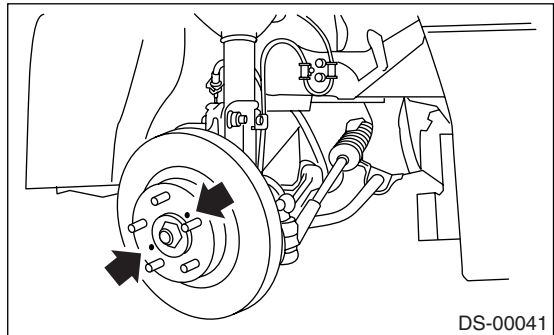


- 5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.

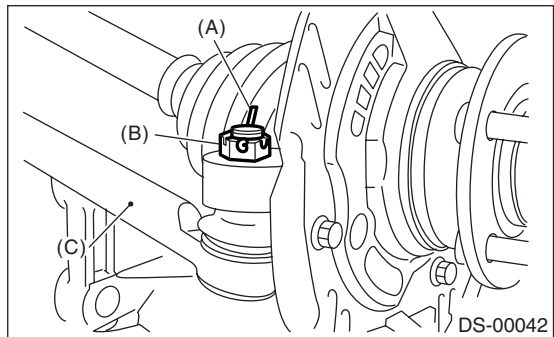
- 6) Remove the disc rotor from hub.

NOTE:

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

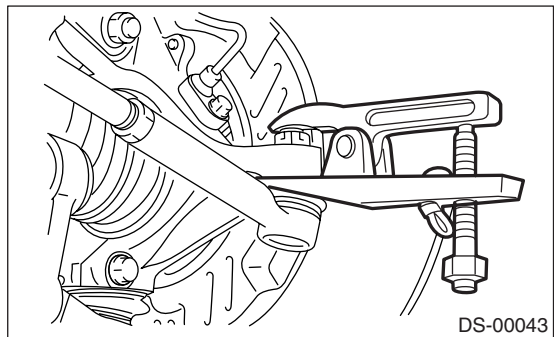


- 7) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.



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

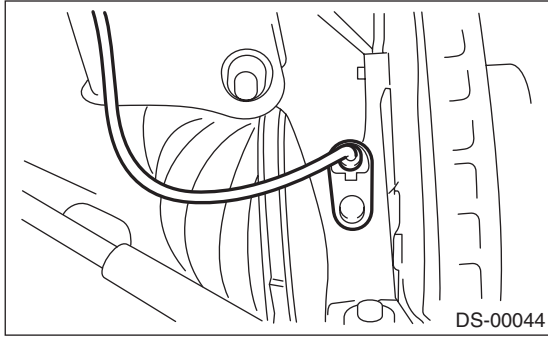
- 8) Using a puller, remove the tie-rod ball joint from knuckle arm.



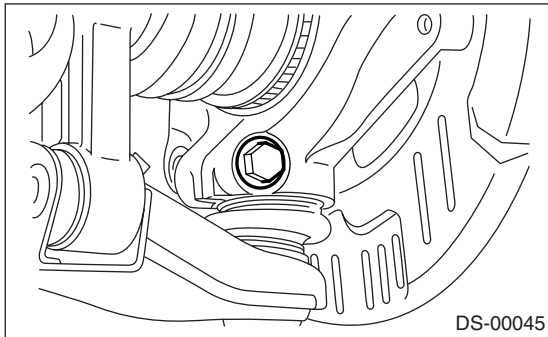
Front Axle

DRIVE SHAFT SYSTEM

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



10) Remove the transverse link ball joint from housing.

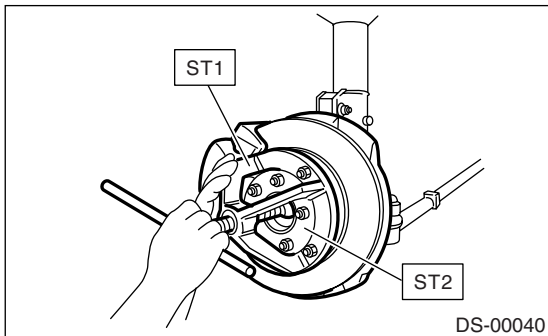


11) Remove the front drive shaft assembly from hub. If it is hard to remove, use the STs.

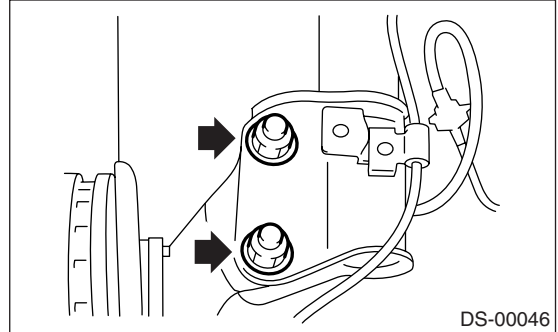
ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER
PLATE

CAUTION:

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



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



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.

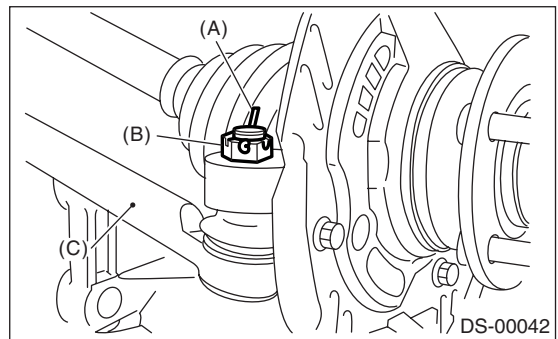
Tightening torque:

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)

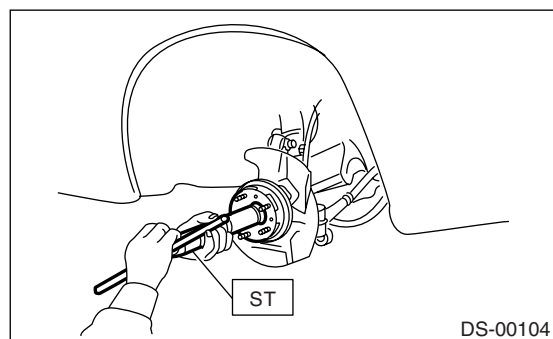
CAUTION:

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.

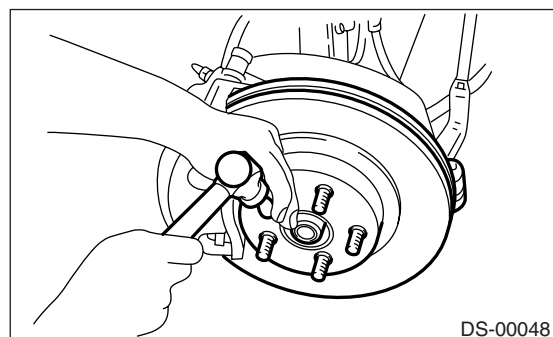
Tightening torque:

220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:

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 ft-lb)

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

Tightening torque:

90 N·m (9.1 kgf-m, 65.7 ft-lb)

C: DISASSEMBLY

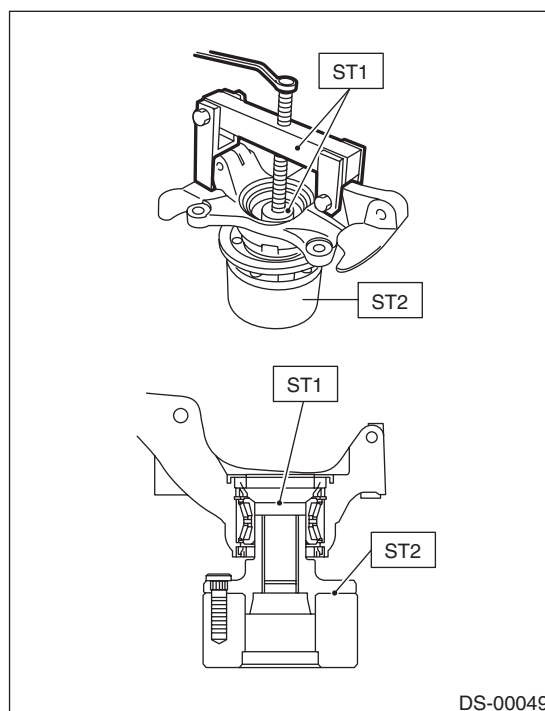
1. EXCEPT STI MODEL

1) Using the ST1, support the housing and hub securely.

2) Attach the ST2 to housing and drive the hub out.

ST1 927060000 HUB REMOVER

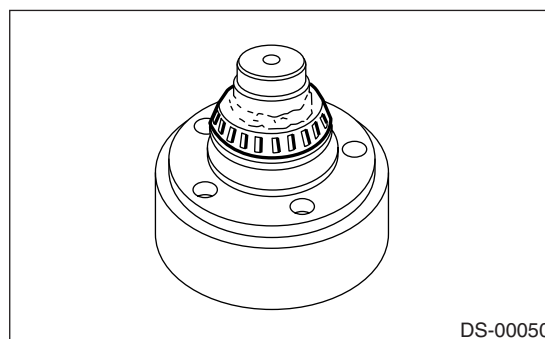
ST2 927080000 HUB STAND



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

NOTE:

Be careful not to scratch the polished area of hub.



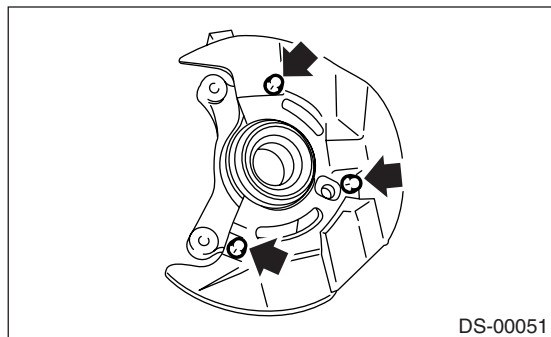
CAUTION:

Do not reuse the bearing if the hub was removed.

Front Axle

DRIVE SHAFT SYSTEM

3) Remove the disc cover from housing.

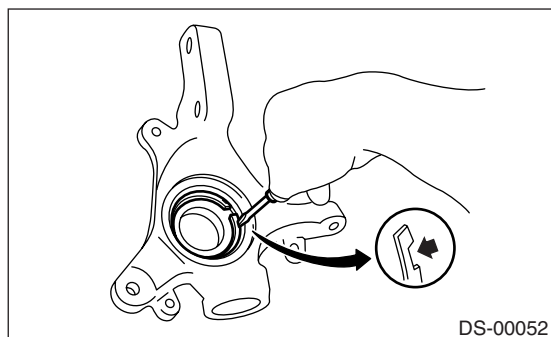


4) Using a standard screwdriver, remove the outer and inner oil seals.

5) Using a flat tip screwdriver, remove the snap ring.

NOTE:

Be careful not to damage the housing at removal.

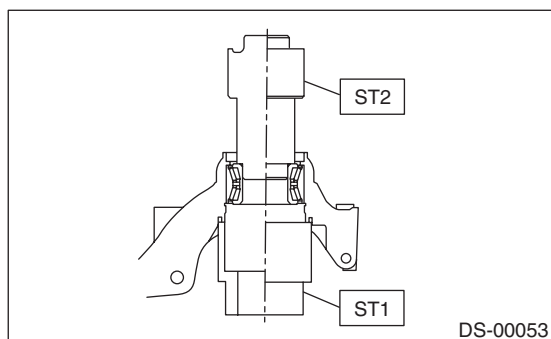


6) Using the ST1, support the housing securely.

7) Using the ST2, hold the inner race to drive out the outer race of bearing.

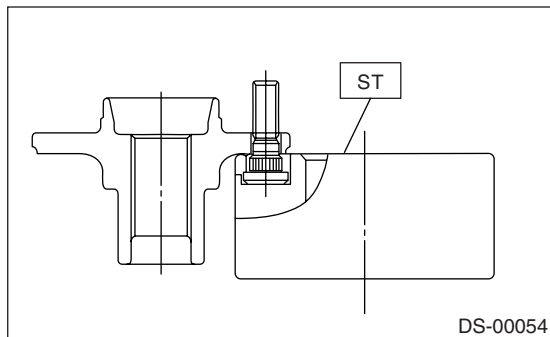
ST1 927400000 HOUSING STAND

ST2 927100000 BEARING PULLER



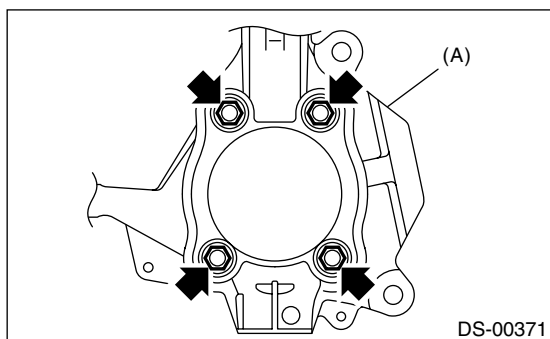
8) Using the ST and a hydraulic press, drive the hub bolts out.

ST 927080000 HUB STAND



2. STI MODEL

1) Remove the four bolts from housing, and remove the front hub unit bearing.



(A) Housing

2) Disassemble the front hub unit bearing. <Ref. to DS-21, DISASSEMBLY, Front Axle.>

D: ASSEMBLY

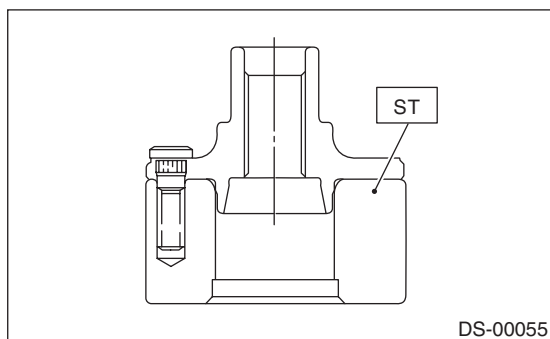
1. EXCEPT STI MODEL

NOTE:

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

1) Attach the hub to ST securely.

ST 927080000 HUB STAND



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

NOTE:

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

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

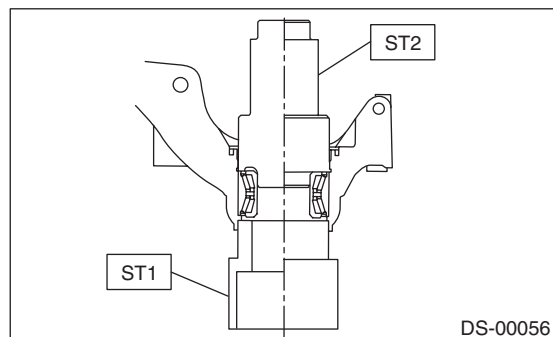
4) Using the ST1 and ST2, press a new bearing into place.

ST1 927400000 HOUSING STAND

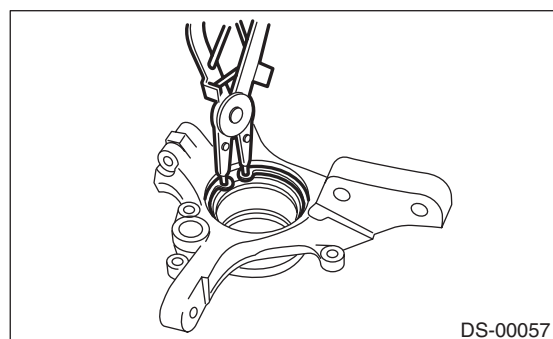
ST2 927100000 BEARING PULLER

NOTE:

Be careful not to remove the plastic lock from inner race when installing the bearing.



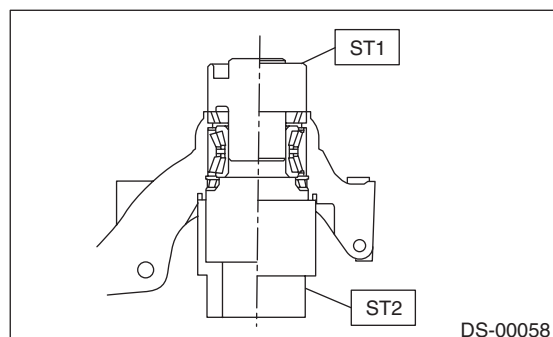
5) Using pliers, install the snap ring firmly.



6) Using the ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.

ST1 927410000 OIL SEAL INSTALLER

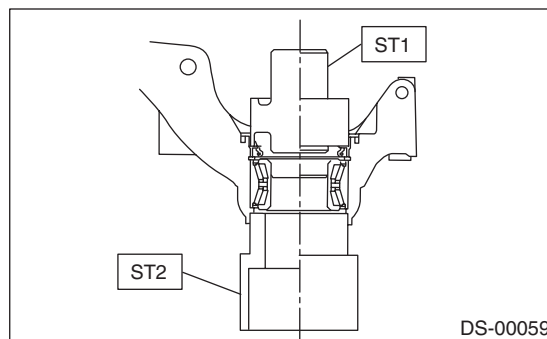
ST2 927400000 HOUSING STAND



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)

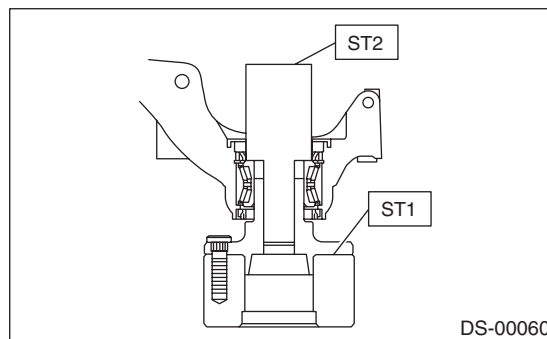
11) Attach the hub to ST1 securely.

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

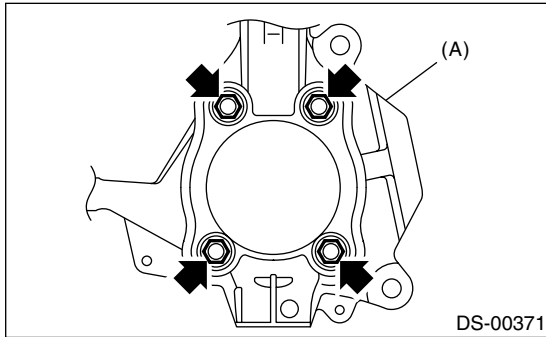


2. STI MODEL

- 1) Assemble the front hub unit bearing. <Ref. to DS-26, ASSEMBLY, Front Hub Unit Bearing.>
- 2) Tighten the front hub unit bearing to the housing with four bolts.

Tightening torque:

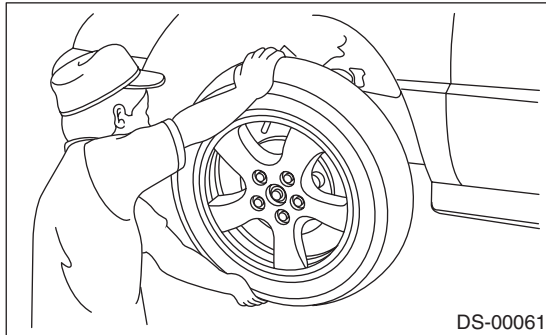
65 N·m (6.6 kgf-m, 47.9 ft-lb)



(A) Housing

E: INSPECTION

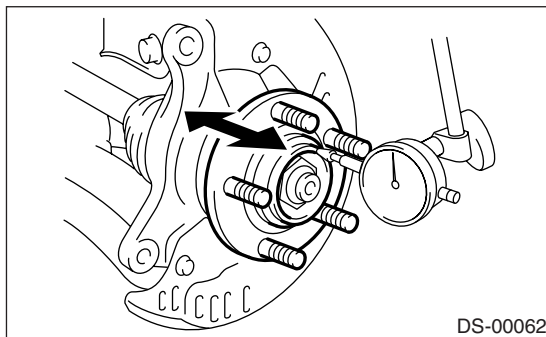
- 1) Moving the front tire up and down by hand, check there is no play in bearing, and check the wheel rotates smoothly.



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

Limit:

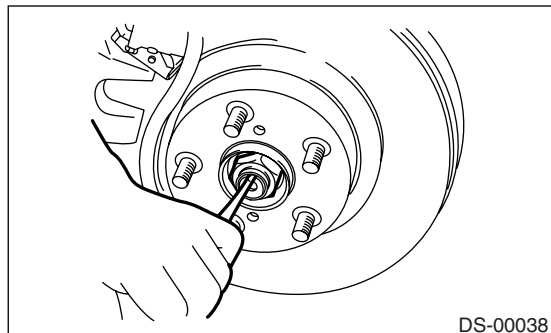
Maximum: 0.05 mm (0.0020 in)



4. Front Hub Unit Bearing

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle and remove the front wheels.
- 3) Unlock the axle nut.



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

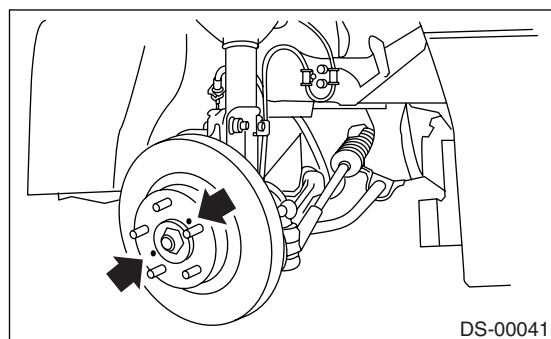
CAUTION:

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

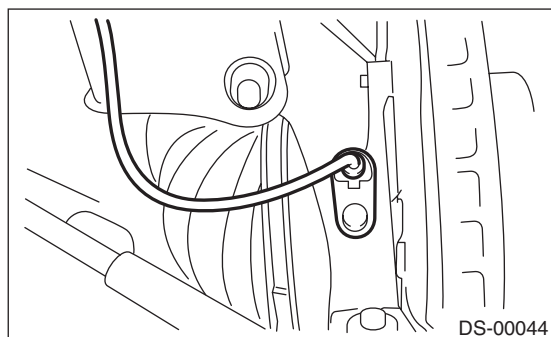
- 5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.
- 6) Remove the disc rotor from hub.

NOTE:

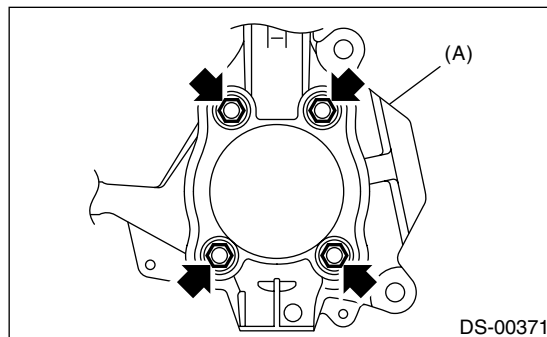
If the disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on rotor.



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



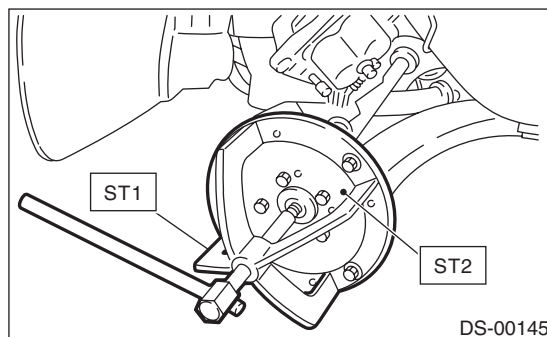
- 8) Remove four bolts from housing.



(A) Housing

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

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

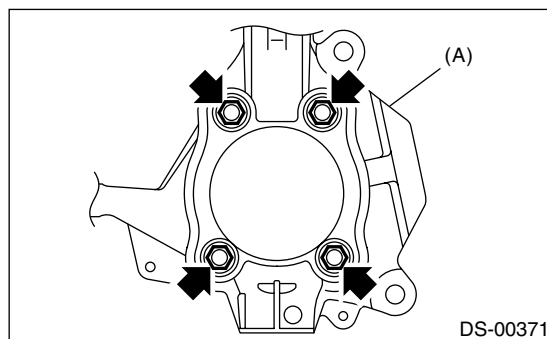


B: INSTALLATION

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

Tightening torque:

65 N·m (6.6 kgf-m, 47.9 ft-lb)



(A) Housing

- 2) Install the front drive shaft. <Ref. to DS-33, INSTALLATION, Front Drive Shaft.>
- 3) Tighten the axle nut temporarily.
- 4) Install the disc rotor on hub.
- 5) Install the disc brake caliper on the housing.

Front Hub Unit Bearing

DRIVE SHAFT SYSTEM

Tightening torque:

78 N·m (8.0 kgf-m, 57.9 ft-lb)

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

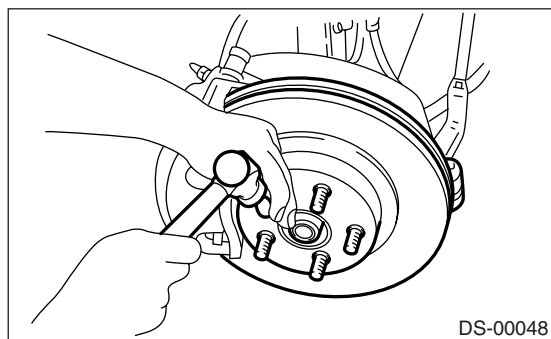
Tightening torque:

220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:

- Install the wheel after installation of the axle nut. Failure to follow this rule may damage the wheel bearing.
- Do not overtighten it as this may damage wheel bearing.

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



8) Install the ABS wheel speed sensor on housing.

Tightening torque:

33 N·m (3.4 kgf-m, 24 ft-lb)

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

Tightening torque:

90 N·m (9.1 kgf-m, 65.7 ft-lb)

C: DISASSEMBLY

Using the ST and a hydraulic press, drive hub bolts out.

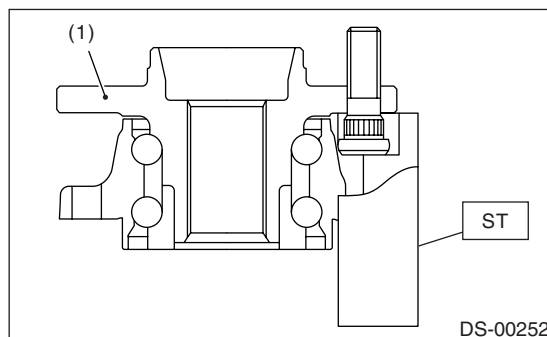
ST 28399AG000 HUB STAND

CAUTION:

- Be careful not to hammer the hub bolts. This may deform the hub.
- Do not reuse the hub bolt.

NOTE:

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

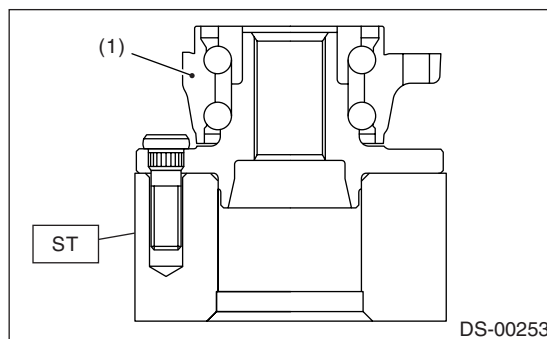


(1) Front hub unit bearing

D: ASSEMBLY

1) Attach the hub to ST securely.

ST 28099PA080 HUB STAND



(1) Front hub unit bearing

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

NOTE:

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

E: INSPECTION

Refer to "FRONT AXLE" for inspection procedures.
<Ref. to DS-24, INSPECTION, Front Axle.>

CAUTION:

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

5. Rear Axle

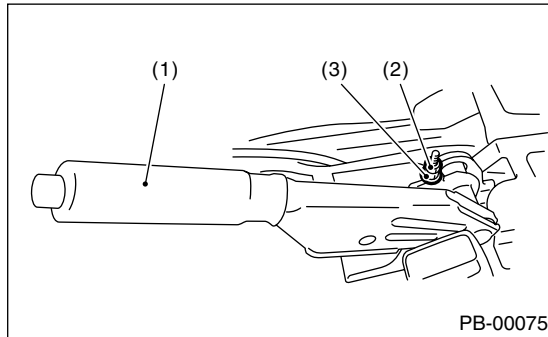
A: REMOVAL

- 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:

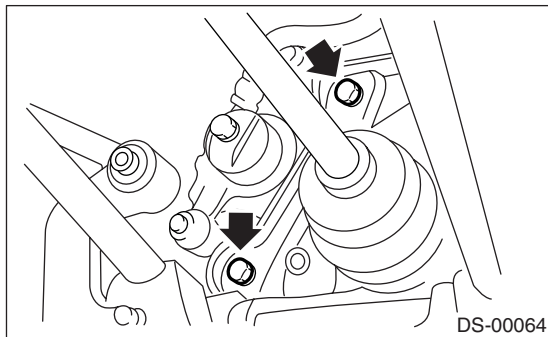
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

- 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.

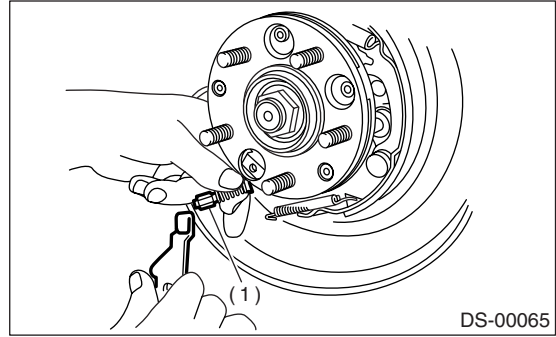


- 7) Remove the disc rotor from hub.

NOTE:

If the disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

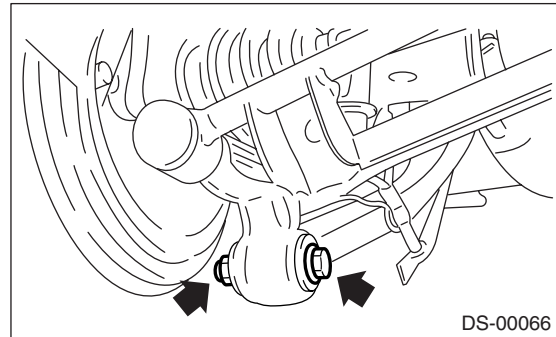
- 8) Disconnect the parking brake cable end.



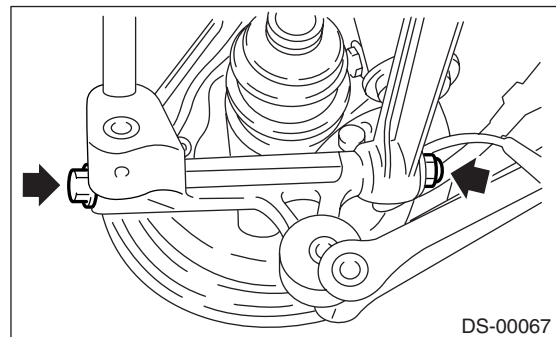
- (1) Cable end

- 9) Disconnect the rear stabilizer from rear lateral link.

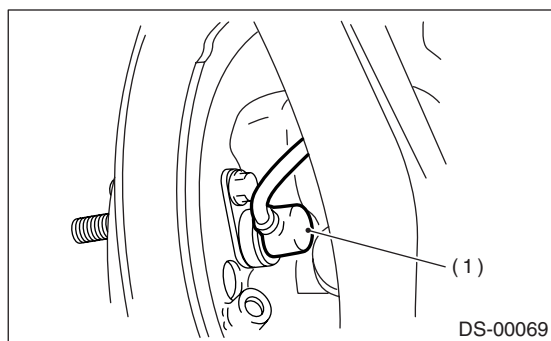
- 10) Remove the bolts which secure the trailing link assembly to rear housing.



- 11) Remove the bolts which secure the lateral assembly to rear housing.



12) Remove the rear ABS wheel speed sensor from back plate.



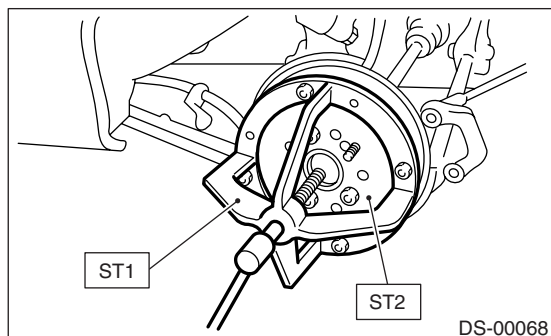
(1) ABS wheel speed sensor

13) Disengage the BJ from housing splines, and then remove the rear drive shaft assembly. If it is hard to remove, use the STs.

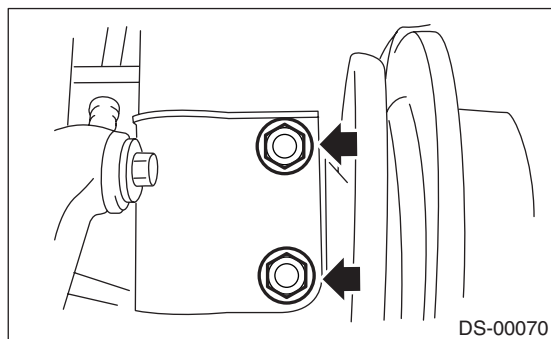
ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER PLATE

NOTE:

- Be careful not to damage the oil seal lip when removing the rear drive shaft.
- When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



14) Remove the bolts which secure the rear housing to strut, and separate the two.



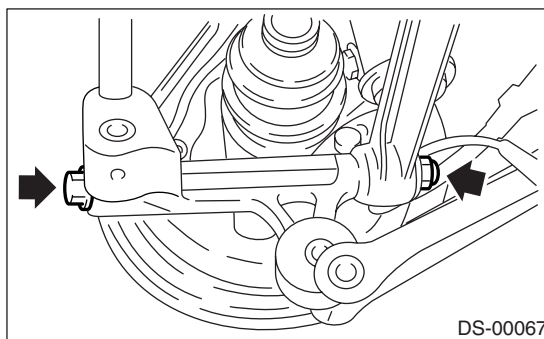
B: INSTALLATION

- 1) Temporarily tighten the rear axle to strut.
- 2) Insert the rear drive shaft into rear axle.

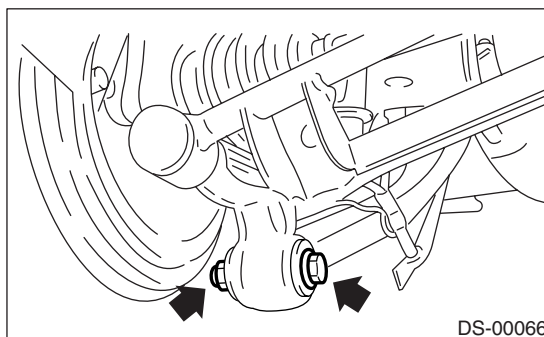
NOTE:

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 (20.0 kgf-m, 145 ft-lb)

- 7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

Tightening torque:

45 N·m (4.5 kgf-m, 33.2 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.

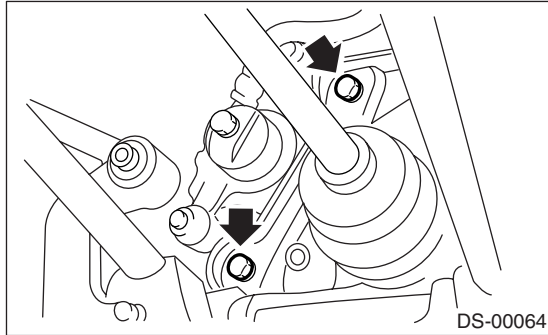
Tightening torque:

Except STI model

53 N·m (5.4 kgf-m, 39.1 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.

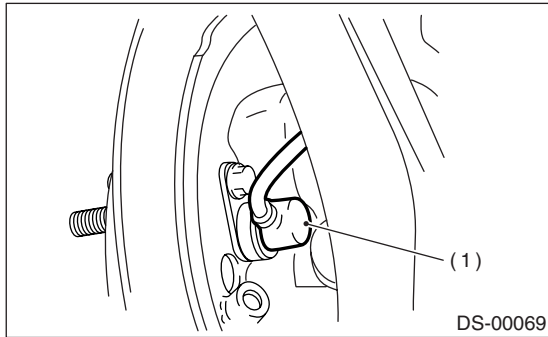
Tightening torque:

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 (9.1 kgf-m, 65.7 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 bushing 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)

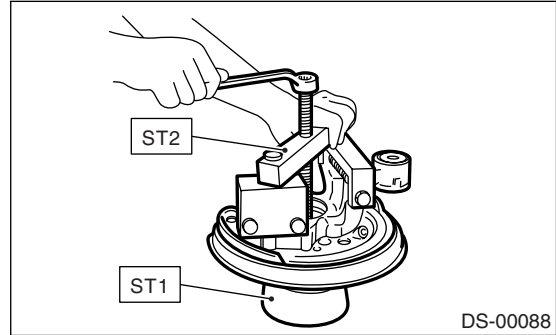
C: DISASSEMBLY

1) Using the ST1 and ST2, remove the hub from rear housing.

ST1 927080000 HUB STAND (Except STI model)

ST1 28099PA080 HUB STAND (STI model)

ST2 927420000 HUB REMOVER



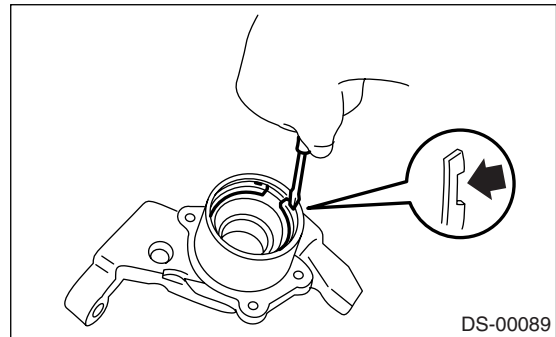
2) Remove the back plate from rear housing.

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

4) Using a flat tip screwdriver, remove the snap ring.

NOTE:

Be careful not to damage the housing at removal.



Rear Axle

DRIVE SHAFT SYSTEM

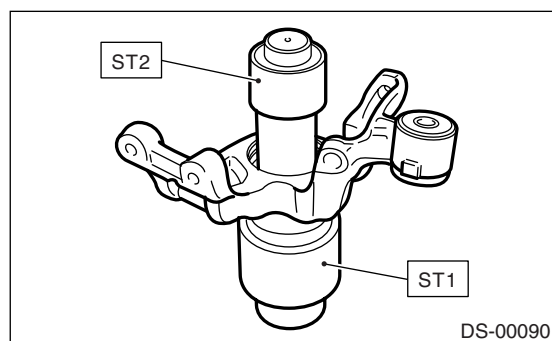
5) Using the ST1 and ST2, remove the bearing by pressing the inner race.

ST1 927430000 HOUSING STAND (Except STI model)

ST1 28099PA060 HOUSING STAND (STI model)

ST2 927440000 BEARING PULLER (Except STI model)

ST2 927100000 BEARING PULLER (STI model)



6) Remove the tone wheel bolts, and then remove the tone wheel from hub.

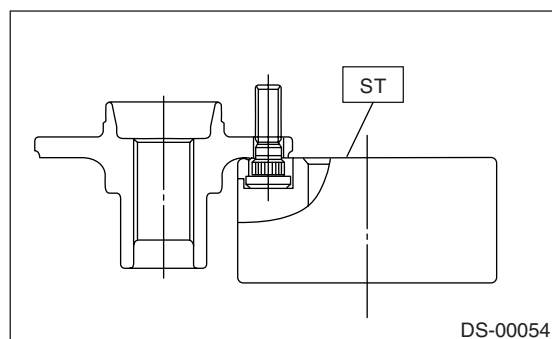
7) Using the ST, press the hub bolt out.

ST 927080000 HUB STAND (Except STI model)

ST 28099PA080 HUB STAND (STI model)

CAUTION:

Be careful not to hammer the hub bolts. This may deform the hub.



D: ASSEMBLY

NOTE:

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

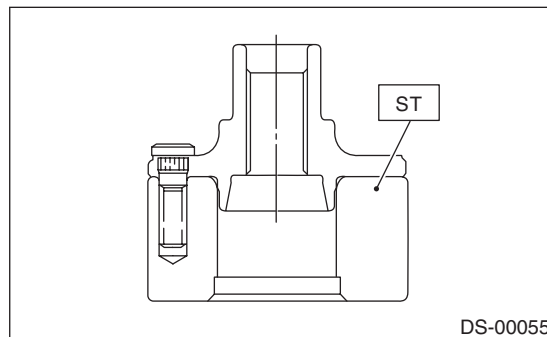
1) Using the ST, press the new hub bolt into place.

NOTE:

- Ensure the hub bolt closely contacts the hub.
- Use a 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

ST 927080000 HUB STAND (Except STI model)

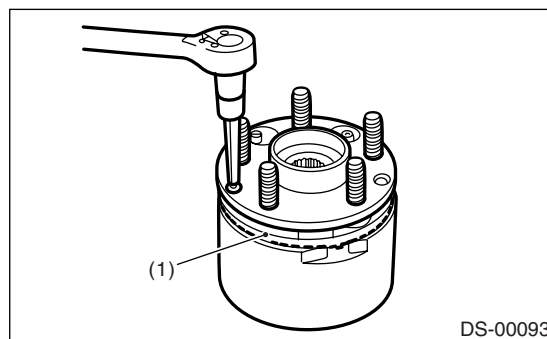
ST 28099PA080 HUB STAND (STI model)



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of the hub tone wheel, and then install the tone wheel to hub.

NOTE:

- Ensure the tone wheel closely contacts the hub.
- Be careful not to damage the tone wheel teeth.



(1) Tone wheel

3) Clean the housing interior completely. Using the ST1 and ST2, press the bearing into housing.

ST1 927430000 HOUSING STAND (Except STI model)

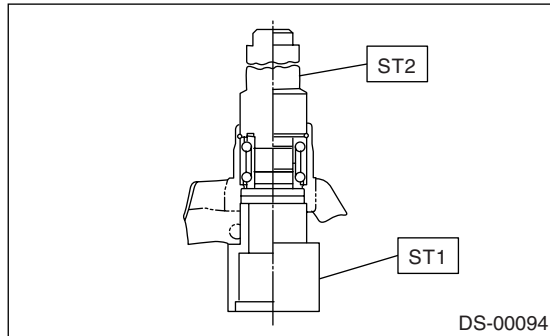
ST1 28099PA060 HOUSING STAND (STI model)

ST2 927440000 BEARING PULLER (Except STI model)

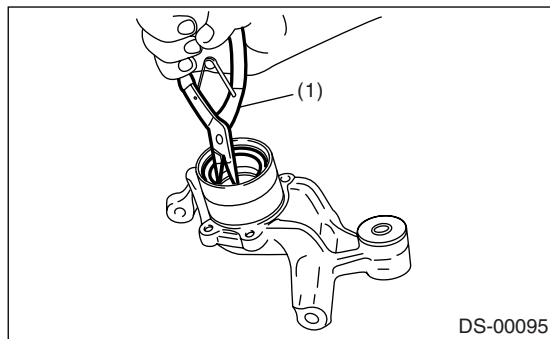
ST2 927100000 BEARING PULLER (STI model)

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

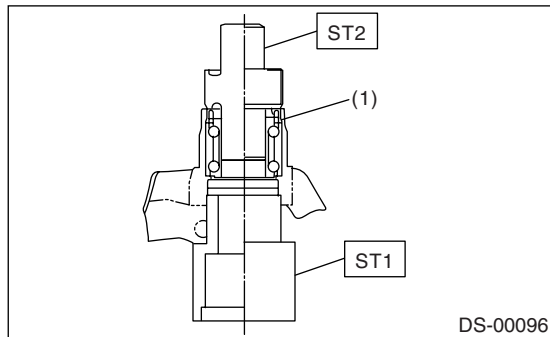
5) Using the ST1 and ST2, press the outer oil seal until it comes in contact with snap ring.

ST1 927430000 HOUSING STAND (Except STI model)

ST1 28099PA060 HOUSING STAND (STI model)

ST2 927460000 OIL SEAL INSTALLER (Except STI model)

ST2 28099PA070 OIL SEAL INSTALLER (STI model)



(1) Snap ring

6) Invert both ST1 and housing.

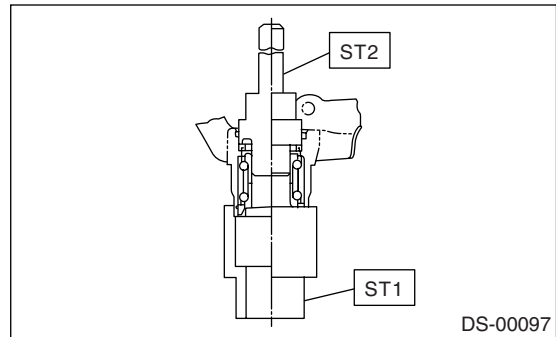
7) Using the ST2, press the inner oil seal into housing until it touches the bottom.

ST1 927430000 HOUSING STAND (Except STI model)

ST1 28099PA060 HOUSING STAND (STI model)

ST2 927460000 OIL SEAL INSTALLER (Except STI model)

ST2 28099PA070 OIL SEAL INSTALLER (STI model)



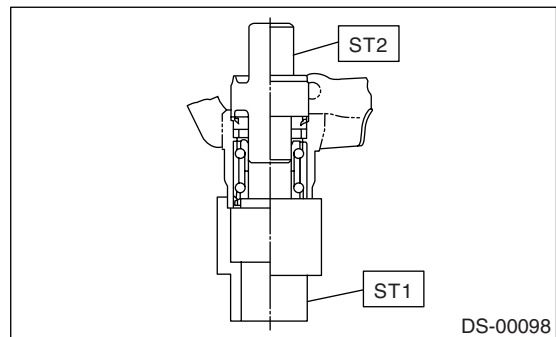
8) Using the ST1 and ST2, press the sub seal into place.

ST1 927430000 HOUSING STAND (Except STI model)

ST1 28099PA060 HOUSING STAND (STI model)

ST2 927460000 OIL SEAL INSTALLER (Except STI model)

ST2 28099PA070 OIL SEAL INSTALLER (STI model)



9) Apply sufficient grease to oil seal lip.

Specified grease:
SHELL 6459N

NOTE:

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

10) Install the back plate to rear housing.

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

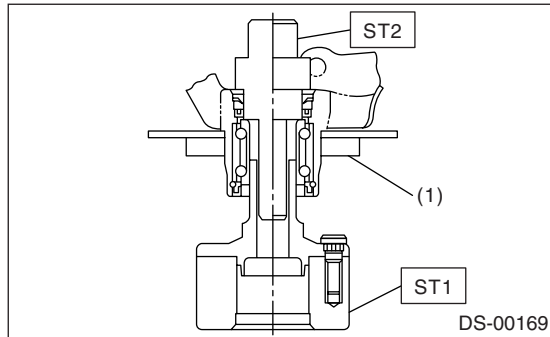
11) Using the ST1 and ST2, press the bearing into hub.

ST1 927080000 HUB STAND (Except STI model)

ST1 28099PA080 HUB STAND (STI model)

ST2 927450000 HUB INSTALLER (Except STI model)

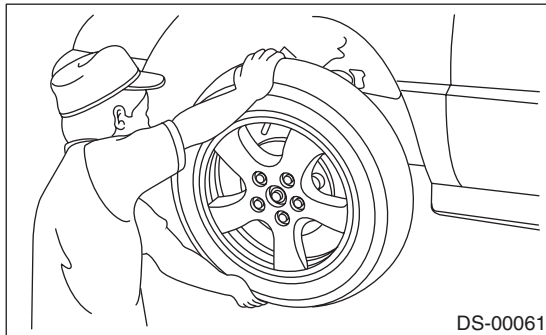
ST2 927120000 HUB INSTALLER (STI model)



(1) Back plate

E: INSPECTION

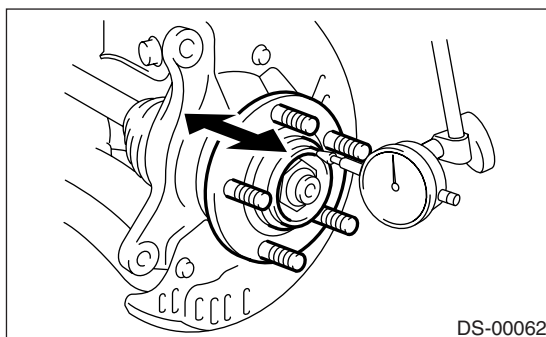
1) Moving the rear tire up and down by hand, check there is no play in bearing, and check the wheel rotates smoothly.



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

Limit:

Maximum: 0.05 mm (0.0020 in)



6. 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.

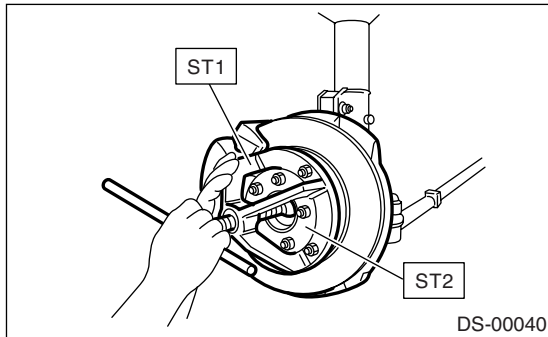
- 4) Remove the stabilizer link from transverse link.
- 5) Disconnect the transverse link from housing.
- 6) Remove the front drive shaft assembly. If it is hard to remove, use the ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER

ST2 28099PA110 AXLE SHAFT PULLER PLATE

CAUTION:

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



- 7) Remove the front drive shaft from transmission using bar.

CAUTION:

Be careful not to damage the holder portion.

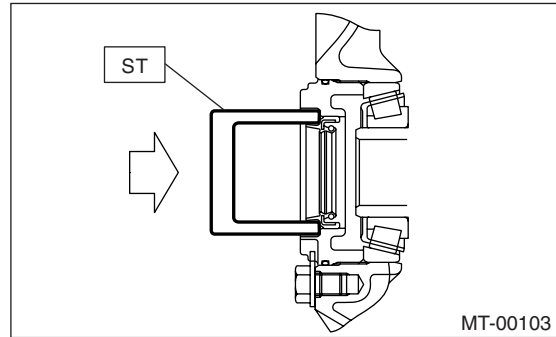
B: INSTALLATION

- 1) Using the ST, replace the differential side retainer oil seal with a new one.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

NOTE:

After pulling out the drive shaft, be sure to replace with a new oil seal.



- 2) Insert the EBJ into hub splines.

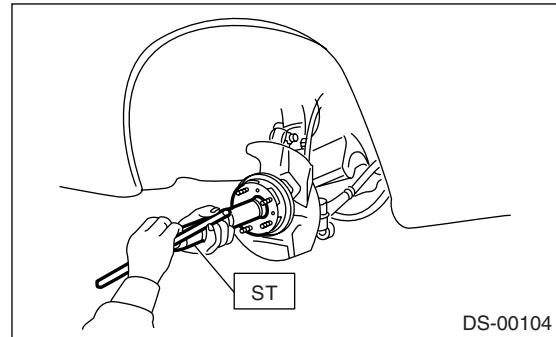
CAUTION:

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

- 3) Using the ST1 and ST2, pull the drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER

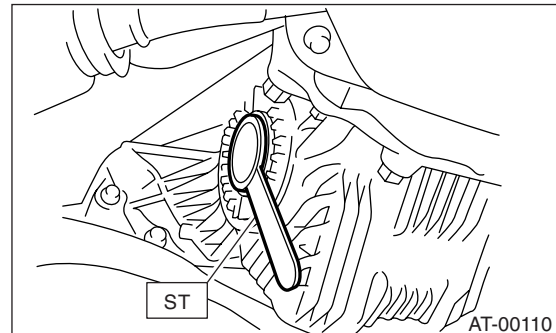
ST2 927390000 ADAPTER



- 4) Tighten the axle nut temporarily.

- 5) Using the ST, install the front drive shaft to transmission.

ST 28399SA010 OIL SEAL PROTECTOR



Front Drive Shaft

DRIVE SHAFT SYSTEM

6) Connect the transverse link to housing.

Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)

7) Install the stabilizer bracket.

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

Tightening torque:

220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:

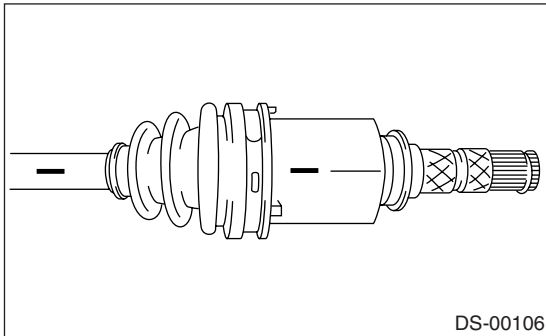
- Always tighten the axle nut before installing wheel on vehicle. If the tire is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Do not overtighten it as this may damage the wheel bearing.

9) After tightening the axle nut, caulk and lock it.

C: DISASSEMBLY

1. EBJ+PTJ TYPE

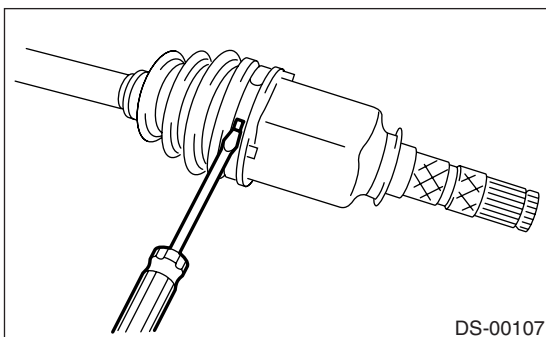
1) Place alignment marks on shaft and outer race.



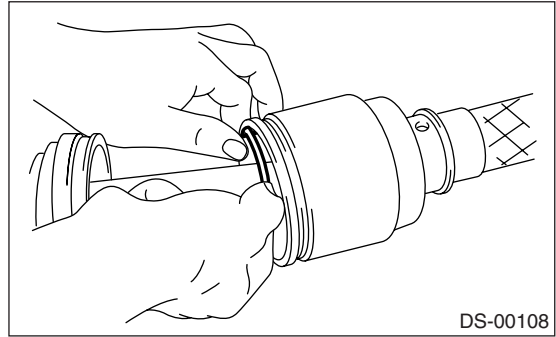
2) Remove the PTJ boot band and boot.

CAUTION:

Be careful not to damage the boot.



3) Remove the circlip from PTJ outer race using a screwdriver.



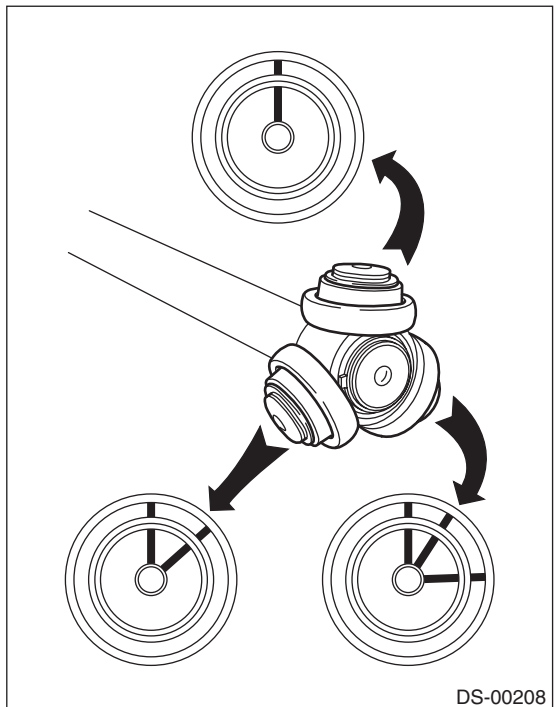
4) Remove the PTJ outer race from shaft assembly.

5) Wipe off the grease.

CAUTION:

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

6) Place alignment marks on roller kit and trunnion.

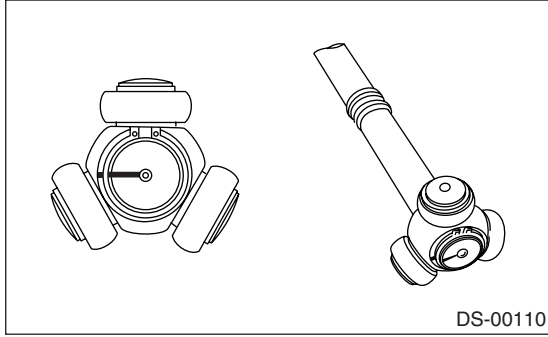


7) Remove the roller kit from trunnion.

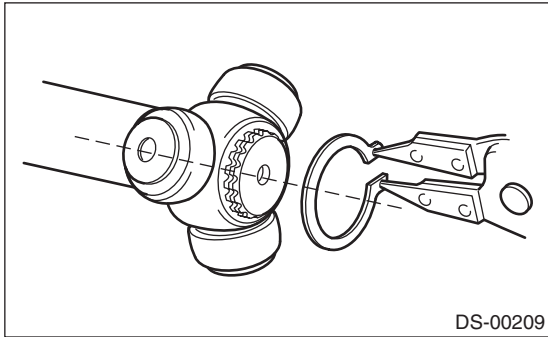
CAUTION:

Be careful with the roller kit 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.

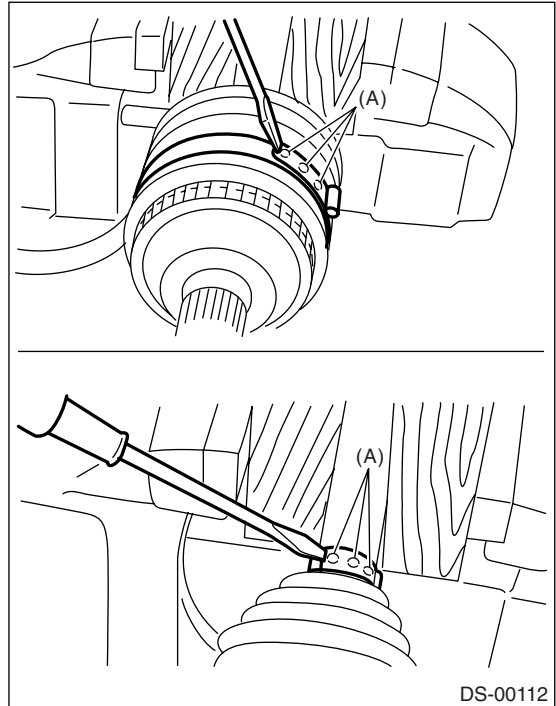
10) Remove the PTJ boot.

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

CAUTION:

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

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

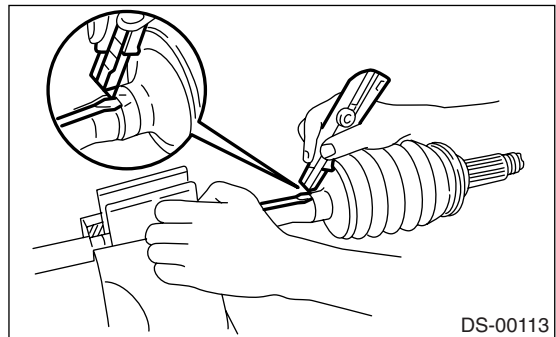


(A) Boot band claws

13) Cut and remove the boot.

CAUTION:

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



NOTE:

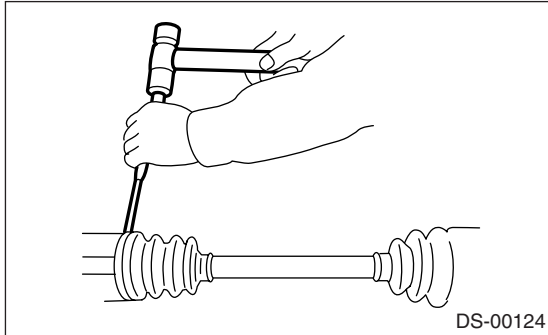
Further disassembly of axle is impossible because the EBJ cannot be disassembled.

Front Drive Shaft

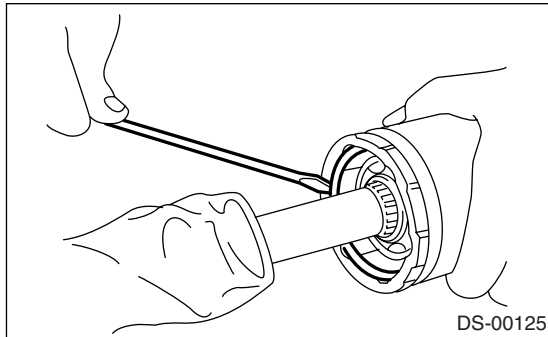
DRIVE SHAFT SYSTEM

2. BJ+DOJ TYPE

- 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.

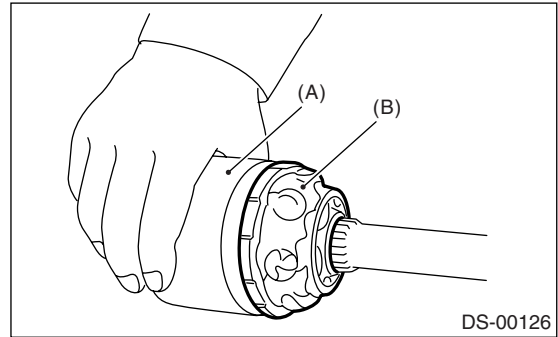


- 6) Take out the DOJ outer race from shaft assembly.
- 7) Wipe off the grease, and then take out the balls.

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

1. EBJ+PTJ TYPE

NOTE:

Use specified grease.

EBJ side:

NTG2218-M (Part No. 28395AG010)

PTJ side:

NKG302 (Part No. 28495AE010)

- 1) Place the EBJ boot and small boot band on EBJ side of shaft.

CAUTION:

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

- 2) Place the drive shaft in a vise.

CAUTION:

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

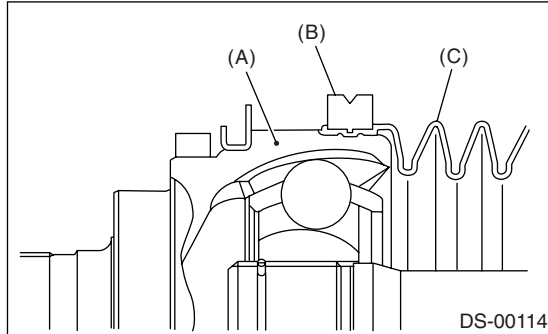
- 3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to EBJ.

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

NOTE:

EBJ installation surface of EBJ boot shall be cleaned so as to be free from grease and other substances.

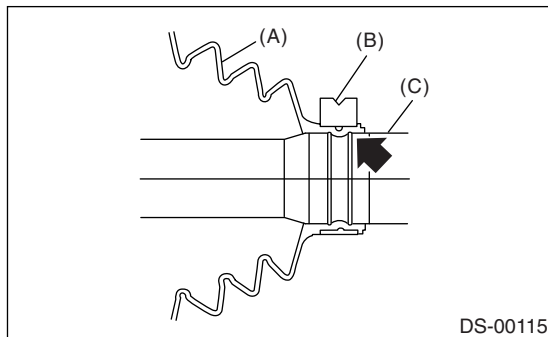
5) Install the boot projecting portion to EBJ groove.



- (A) EBJ
- (B) Large boot band
- (C) Boot

6) Set the large boot band in place.

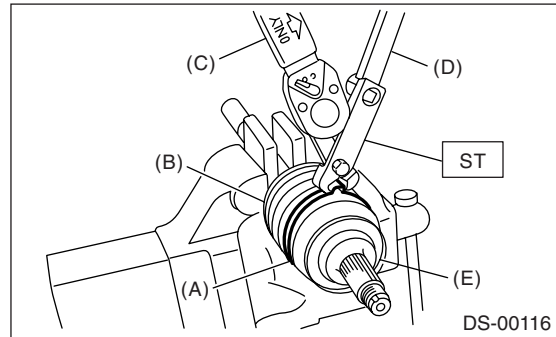
7) Install the boot projecting portion to shaft groove.



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

8) Tighten the boot bands using the ST, torque wrench and socket flex handle.

ST 28099AC000 BOOT BAND PLIER



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

Tightening torque:

Large boot band

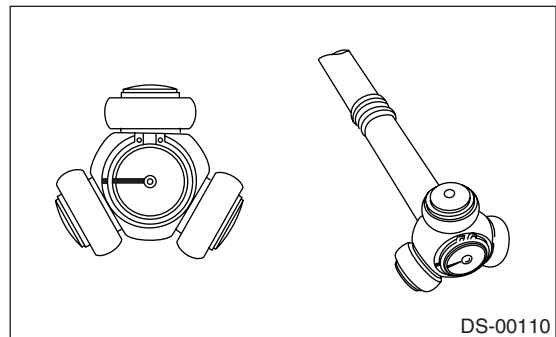
157 N·m (16.0 kgf-m, 116 ft-lb) or more

Small boot band

133 N·m (13.6 kgf-m, 98 ft-lb) or more

9) Place the PTJ boot at the center of shaft.

10) Align the alignment marks, and then install the trunnion on shaft.



11) Install the snap ring to shaft.

CAUTION:

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

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

13) Apply a coat of specified grease to roller kit and trunnion.

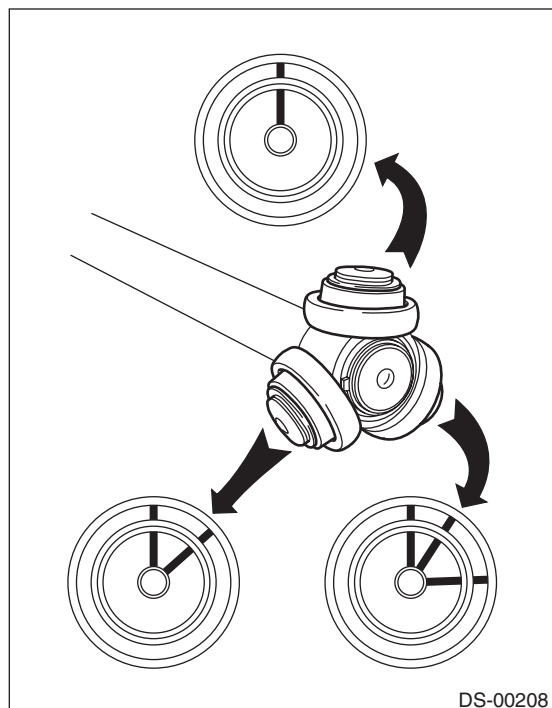
14) Align the alignment marks on roller kit and trunnion, and then install the free ring.

Front Drive Shaft

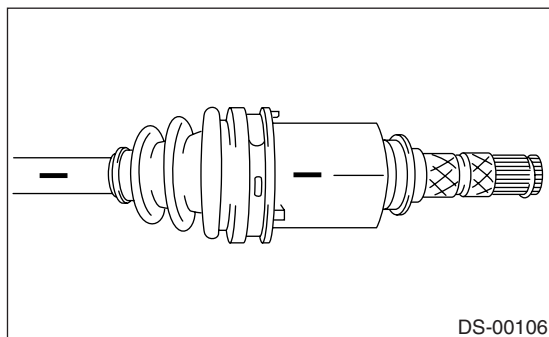
DRIVE SHAFT SYSTEM

CAUTION:

Be careful with the roller kit 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 PTJ outer race.

CAUTION:

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

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

18) Install the PTJ boot taking care not to twist it.

CAUTION:

- PTJ installation surface of PTJ boot shall be cleaned so as to be free from grease and other substances.

- When installing the PTJ boot, position the outer race of PTJ at center of its travel.

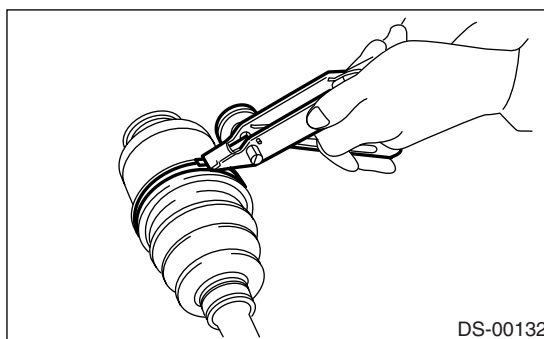
19) Put a new band through the clip and wind twice in alignment with band groove of boot.

20) Tighten the band by using the ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten the band until it cannot be moved by hand.

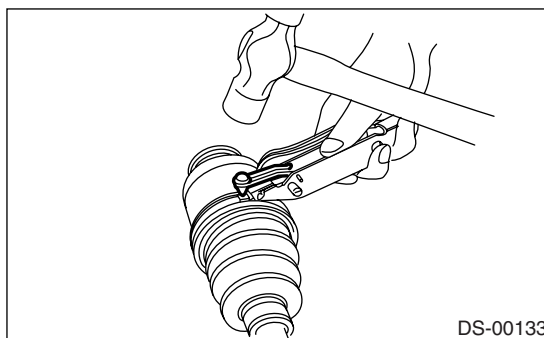


21) Tap on the clip with punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

CAUTION:

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



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

CAUTION:

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

23) Extend and retract the PTJ to provide equal grease coating.

2. BJ+DOJ TYPE

NOTE:

Use specified grease.

BJ side:

NTG2218-M (Part No. 28395AG030)

DOJ side:

NKG205 (Part No. 28495AG010)

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

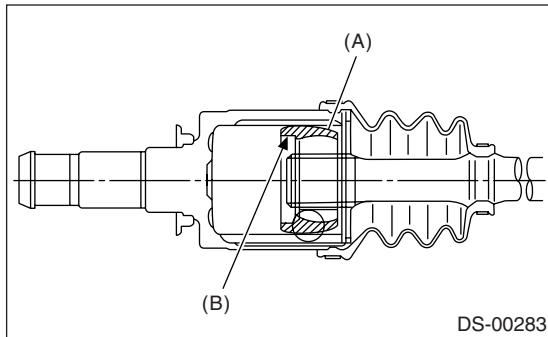
2) Place the DOJ boot at the center of shaft.

3) Wrap the shaft splines with vinyl tape.

4) Insert the DOJ cage onto shaft.

NOTE:

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

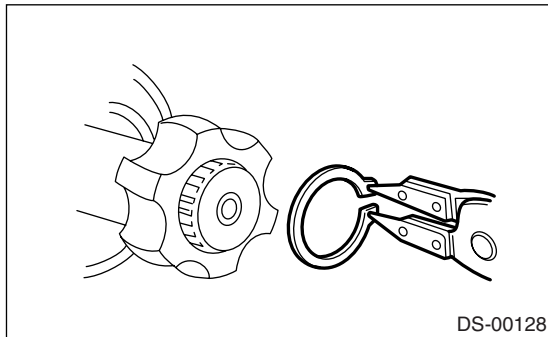


(A) Cage
(B) Cut-out portion

5) Install the DOJ inner race on shaft, and fit the snap ring with pliers.

NOTE:

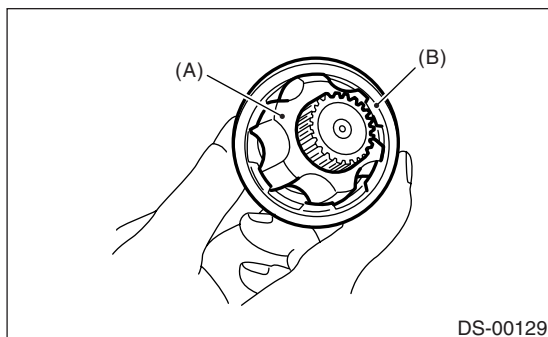
Confirm the snap ring is completely fitted in shaft groove.



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.



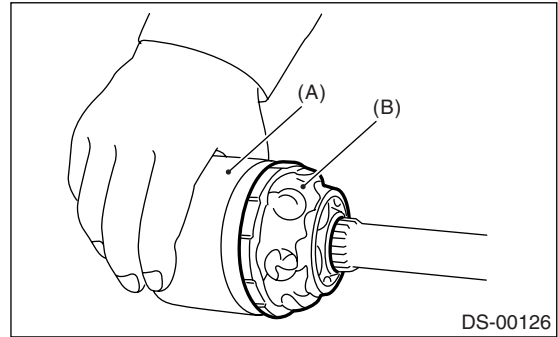
(A) Inner race
(B) Cage

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.

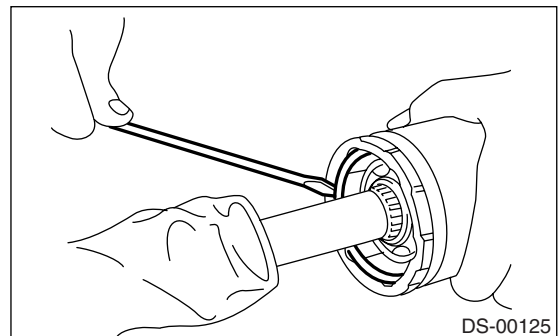


(A) Outer race
(B) Grease

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.

Front Drive Shaft

DRIVE SHAFT SYSTEM

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

NOTE:

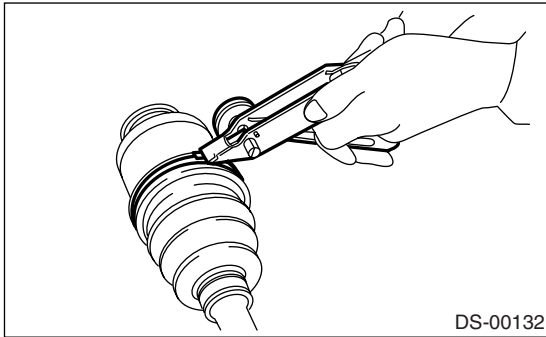
When tightening the boot, exercise care so that air within boot is appropriate.

15) Tighten the band using the ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten the band until it cannot be moved by hand.

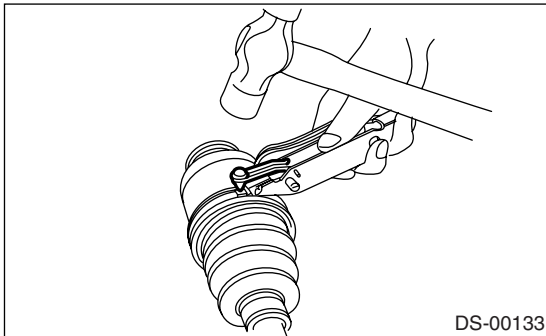


16) Tap on the clip with the punch provided at the end of ST.

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) PTJ (Pillow tripod Joint)

Check seizure, corrosion, damage and excessive play.

3) Shaft

Check excessive bending, twisting, damage and wear.

4) EBJ (High-efficiency compact ball fixed joint)

Check seizure, corrosion, damage and excessive play.

5) Boot

Check for wear, warping, breakage or scratches.

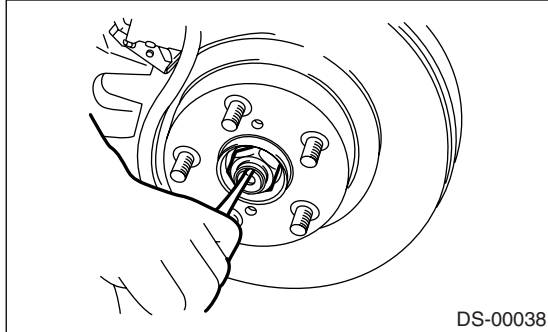
6) Grease

Check for discoloration or fluidity.

7. Rear Drive Shaft

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and remove the rear wheel.
- 3) Unlock the axle nut.

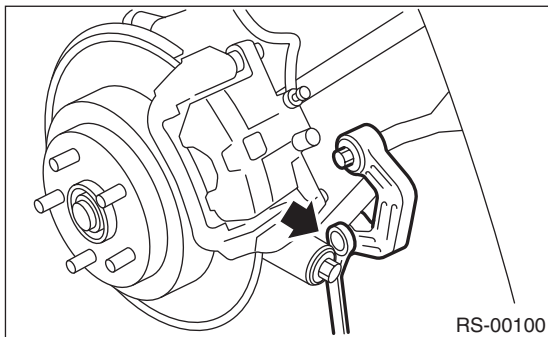


- 4) Remove the axle nut using a socket wrench with parking brake applied.

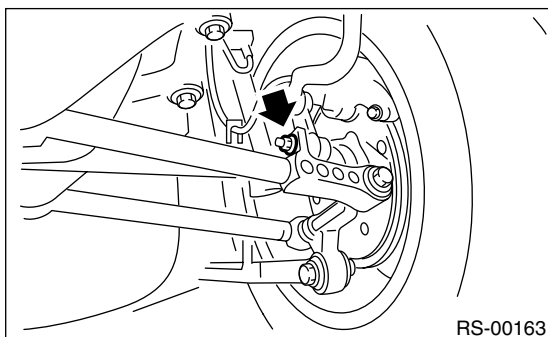
CAUTION:

Remove the axle nut with vehicle weight not applied on axle.

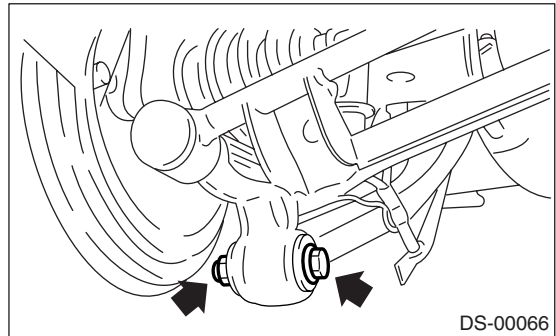
- 5) Disconnect the stabilizer link.
 - Except STI model



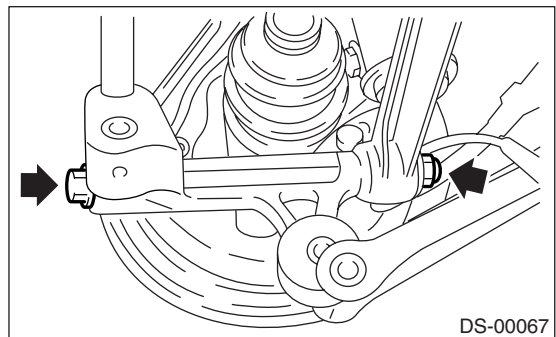
- STI model



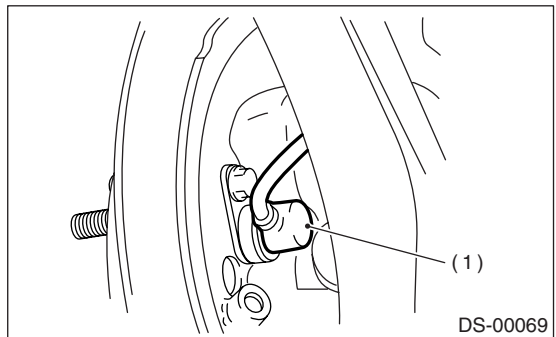
- 6) Remove the bolt which secures the trailing link to housing.



- 7) Remove the bolts which secure the front lateral link and rear lateral link to housing.



- 8) Remove the rear ABS wheel speed sensor from back plate.



(1) ABS wheel speed sensor

- 9) Remove the rear drive shaft from rear axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

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

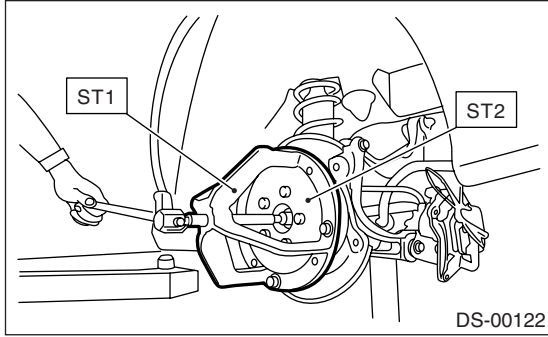
CAUTION:

- Do not hammer the drive shaft when removing.

Rear Drive Shaft

DRIVE SHAFT SYSTEM

- Do not damage the oil seal and tone wheel.

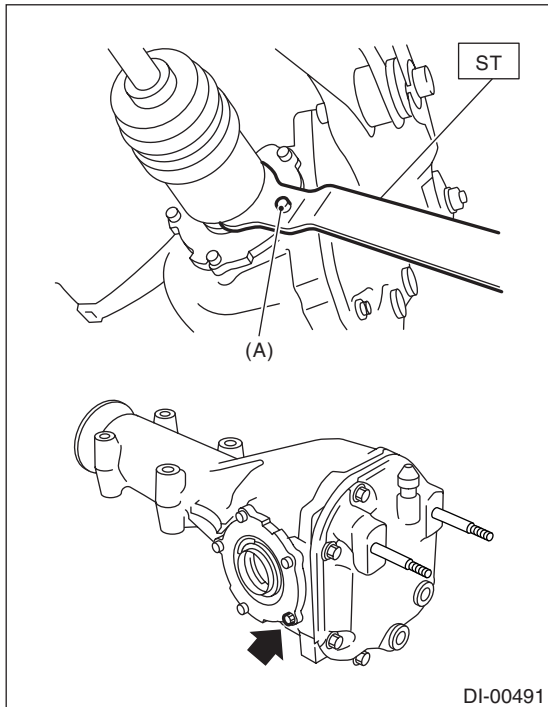


10) Remove the rear drive shaft from rear differential using the ST.

ST 28099PA100 DRIVE SHAFT REMOVER

NOTE:

Fit the ST to the bolt (A) as shown in the figure to avoid damage on the side bearing retainer.

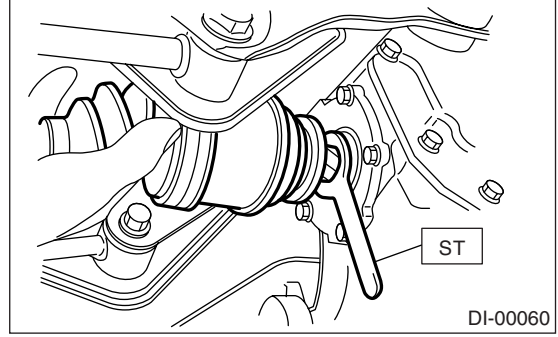


(A) Bolt

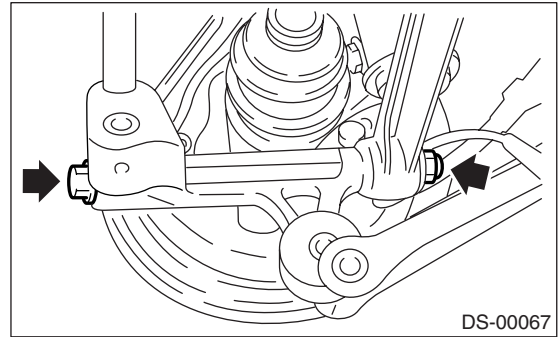
B: INSTALLATION

- 1) Insert the rear drive shaft into rear axle.
- 2) Temporarily tighten the axle nut.
- 3) Install the rear drive shaft to rear differential using the ST.

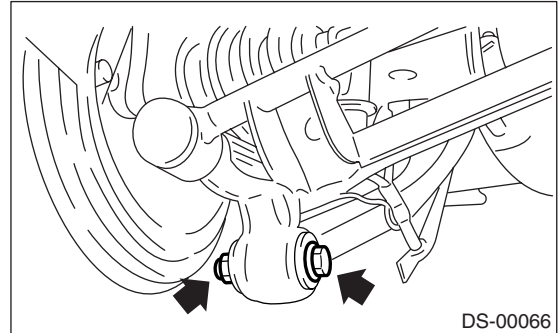
ST 28099PA090 OIL SEAL PROTECTOR



4) Temporarily tighten the front lateral link and rear lateral link to housing using a new self-locking nuts.



5) Temporarily tighten the trailing link to housing using a new self-locking nut.

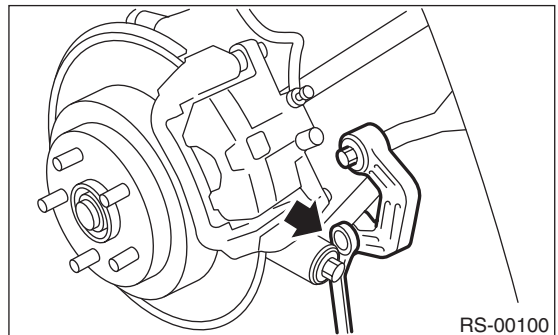


6) Install the stabilizer link.

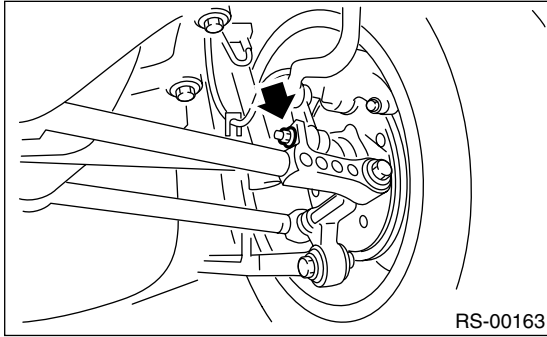
Tightening torque:

45 N·m (4.5 kgf-m, 33.2 ft-lb)

- Except STI model



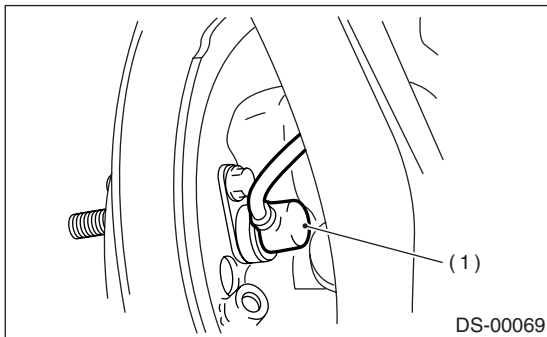
- STI model



7) Install the ABS wheel speed sensor.

Tightening torque:

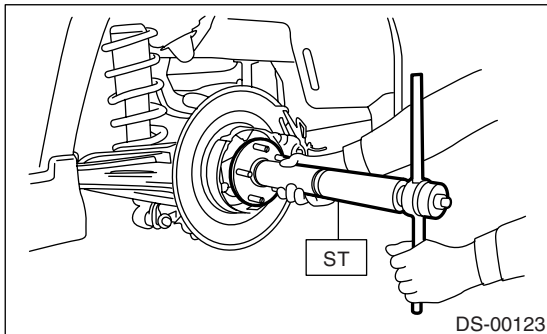
32 N·m (3.3 kgf-m, 24 ft-lb)



(1) ABS wheel speed sensor

8) Using the ST1 and ST2, pull the rear drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

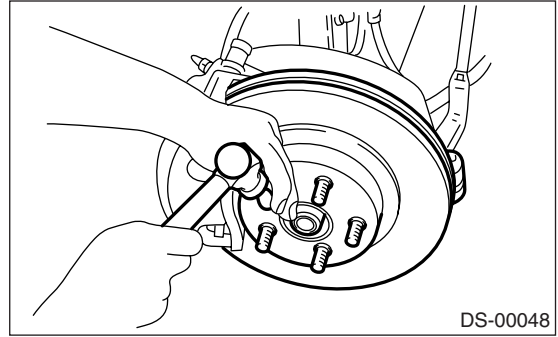


9) Tighten a new axle nut to the specified torque with parking brake applied.

Tightening torque:

190 N·m (19.4 kgf-m, 140 ft-lb)

10) Lock the axle nut.



11) Install the wheel.

Tightening torque:

90 N·m (9.1 kgf-m, 65.7 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 bushing 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.

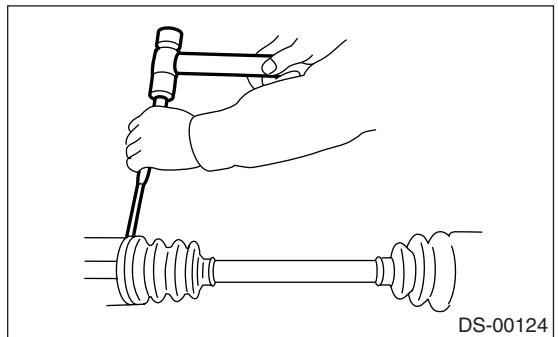
Tightening torque:

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.



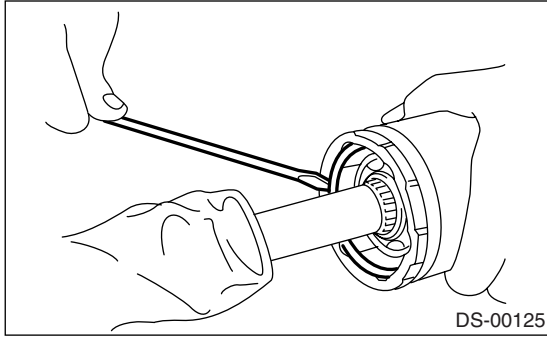
3) Remove the boot band on the small end of DOJ boot in the same manner.

4) Remove the larger end of DOJ boot from DOJ outer race.

Rear Drive Shaft

DRIVE SHAFT SYSTEM

5) Pry and remove the round circlip located at neck of DOJ outer race with a screwdriver.

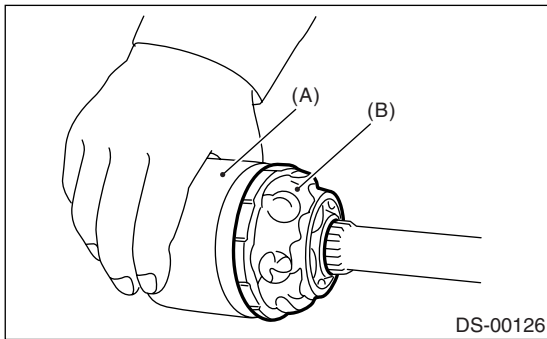


6) Take out the DOJ outer race from shaft assembly.

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 EBJ boot in the same procedure as DOJ boot.

NOTE:

Further disassembly of axle is impossible because the EBJ cannot be disassembled.

D: ASSEMBLY

NOTE:

Use specified grease.

EBJ side:

NTG2218-M (Part No. 28395AG010)

DOJ side:

Except STI model

NKG205 (Part No. 28495AG000)

EDJ side:

STI model

NKG205 (Part No. 28495AG010)

1) Install the EBJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.

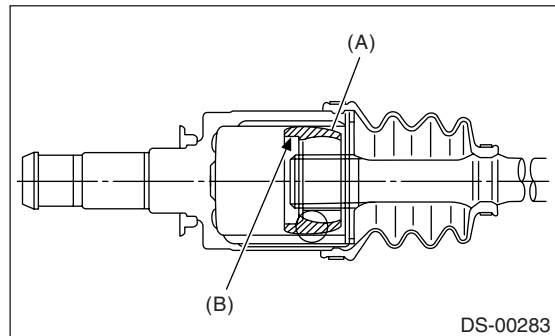
2) Place the DOJ boot at the center of shaft.

3) Wrap the shaft splines with vinyl tape.

4) Insert the DOJ cage onto shaft.

NOTE:

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



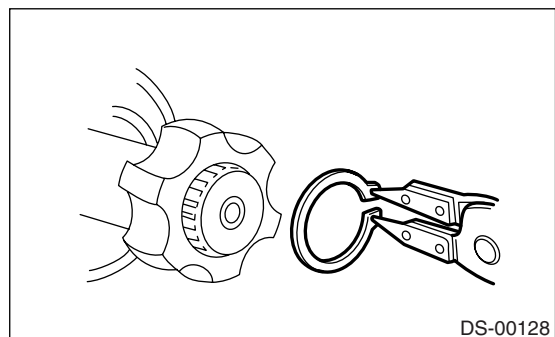
(A) Cage

(B) Cut-out portion

5) Install the DOJ inner race on shaft, and fit the snap ring with pliers.

NOTE:

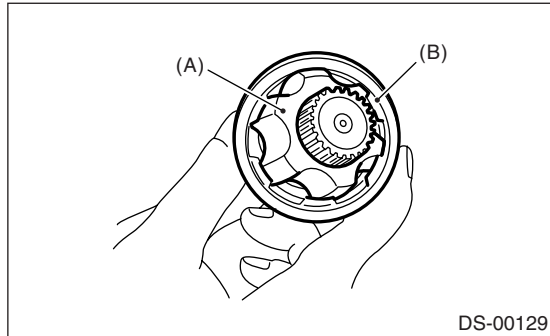
Confirm the snap ring is completely fitted in shaft groove.



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

NOTE:

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



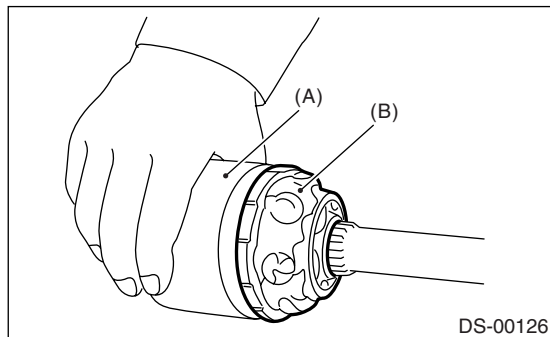
- (A) Inner race
- (B) Cage

7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.

8) Apply a coat of specified grease to cage pocket and six balls.

9) Insert six balls into cage pocket.

10) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit the outer race.



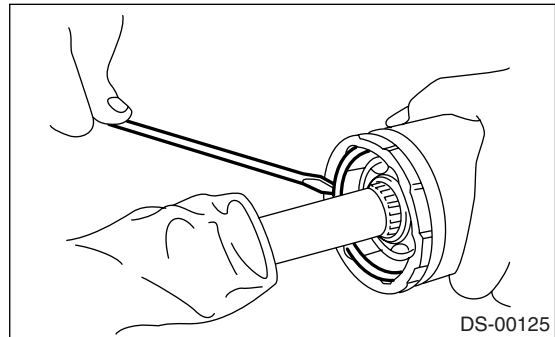
- (A) Outer race
- (B) Grease

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

NOTE:

- Assure the balls, cage and inner race are completely fitted in the outer race of DOJ.
- Exercise care not to place the matched position of circlip in ball groove of outer race.

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



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

13) Install the DOJ boot taking care not to twist it.

NOTE:

- Inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
- When installing the DOJ boot, position the outer race of DOJ at center of its travel.

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

NOTE:

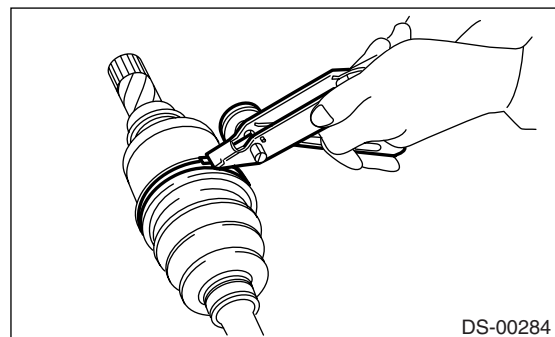
When tightening the boot, exercise care so that air within boot is appropriate.

15) Tighten the band using the ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten the band until it cannot be moved by hand.

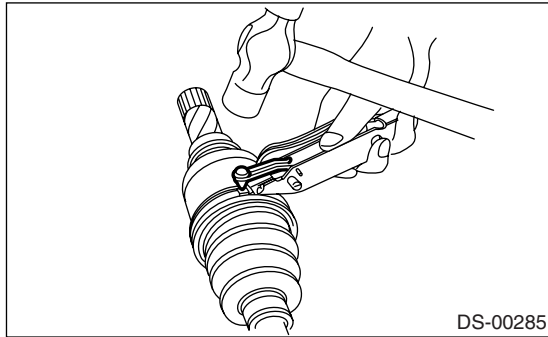


16) Tap on the clip with the punch provided at the end of ST.

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 EBJ 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) EDJ (High-efficiency compact double offset joint)

Check for seizure, corrosion, damage, wear or excessive play.

3) Shaft

Check excessive bending, twisting, damage and wear.

4) EBJ (High-efficiency compact ball fixed Joint)

Check seizure, corrosion, damage and excessive play.

5) Boot

Check for wear, warping, breakage or scratches.

6) Grease

Check for discoloration or fluidity.

8. General Diagnostic Table

A: INSPECTION

NOTE:

Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Corrective action
Noise or vibration from propeller shaft	Center bearing	Check the center bearing. <Ref. to DS-18, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>
	Runout of propeller shaft	Check the vibration of propeller shaft. <Ref. to DS-18, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>
	Loose or free play of connection	Check joint and connector. <Ref. to DS-17, JOINTS AND CONNECTIONS, INSPECTION, Propeller Shaft.>
		Check splines and bearing. <Ref. to DS-18, SPLINES AND BEARING LOCATIONS, INSPECTION, Propeller Shaft.>
Abnormal wheel vibration	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-6, INSPECTION, Wheel Balancing.>
	Wheel alignment	Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-13, INSPECTION, Rear Strut.>
	Front drive shaft	Check the front drive shaft. <Ref. to DS-40, INSPECTION, Front Drive Shaft.>
	Rear drive shaft	Check the rear drive shaft. <Ref. to DS-46, INSPECTION, Rear Drive Shaft.>
	Front axle	Check the front axle. <Ref. to DS-24, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-26, INSPECTION, Front Hub Unit Bearing.>
	Rear axle	Check the rear axle. <Ref. to DS-32, INSPECTION, Rear Axle.>
Noise from the underbody	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-6, INSPECTION, Wheel Balancing.>
	Wheel alignment	Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-13, INSPECTION, Rear Strut.>

General Diagnostic Table

DRIVE SHAFT SYSTEM

FRONT SUSPENSION

General Description

FRONT SUSPENSION

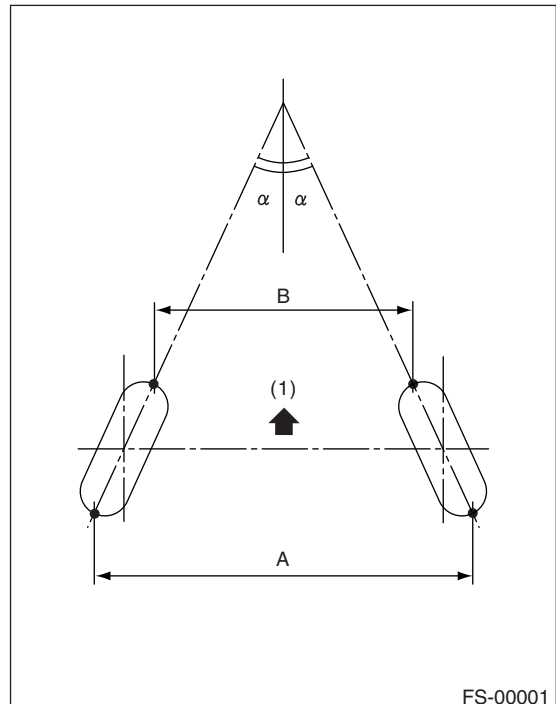
1. General Description

A: SPECIFICATION

	Model	Sedan			Wagon		OUT-BACK
		Non-turbo	Turbo	STI	Non-turbo	Turbo	
Front	Camber (tolerance: $\pm 0^{\circ}45'$ adjustment standard: $\pm 0^{\circ}30'$)	$-0^{\circ}15'$	$-0^{\circ}25'$	$-0^{\circ}30'$	$-0^{\circ}10'$	$-0^{\circ}20'$	$-0^{\circ}05'$
	Caster	$3^{\circ}25'$	$3^{\circ}30'$	$4^{\circ}50'$	$3^{\circ}25'$	$3^{\circ}30'$	$3^{\circ}25'$
	Toe-in	Tolerance: 0 ± 3 mm (0 ± 0.12 in), Toe angle (The sum of both wheels): $0^{\circ} \pm 15'$ Adjustment standard: 0 ± 2 mm (0 ± 0.08 in), Toe angle (The sum of both wheels): $0^{\circ} \pm 10'$					
	Kingpin anglet	$14^{\circ}20'$	$14^{\circ}35'$	$14^{\circ}50'$	$13^{\circ}30'$	$13^{\circ}45'$	$13^{\circ}20'$
	Wheel arch height [tolerance: $+12_{-24}$ mm ($+0.47_{-0.94}$ 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)					
Rear	Camber (tolerance: $\pm 0^{\circ}45'$ adjustment standard: $\pm 0^{\circ}30'$)	$-1^{\circ}25'$	$-1^{\circ}30'$	$-1^{\circ}40'$	$-1^{\circ}15'$	$-1^{\circ}20'$	$-1^{\circ}10'$
	Toe-in	Tolerance: 0 ± 3 mm (0 ± 0.12 in), Toe angle (The sum of both wheels): $0^{\circ} \pm 15'$ Adjustment standard: 0 ± 2 mm (0 ± 0.08 in), Toe angle (The sum of both wheels): $0^{\circ} \pm 10'$					
	Thrust angle	Tolerance: $\pm 0^{\circ}30'$, Adjustment standard value: $0^{\circ} \pm 20'$					
	Wheel arch height [tolerance: $+12_{-24}$ mm ($+0.47_{-0.94}$ in)]	381 mm (15.0 in)	376 mm (14.80 in)	363 mm (14.29 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-in and front camber can be adjusted. If toe-in or camber exceeds tolerance, adjust toe-in and camber to the adjustment standard.
- The other items indicated in the specification table cannot be adjusted. If the other items exceed specifications, check suspension parts and connections for deformities; replace with new ones as required.



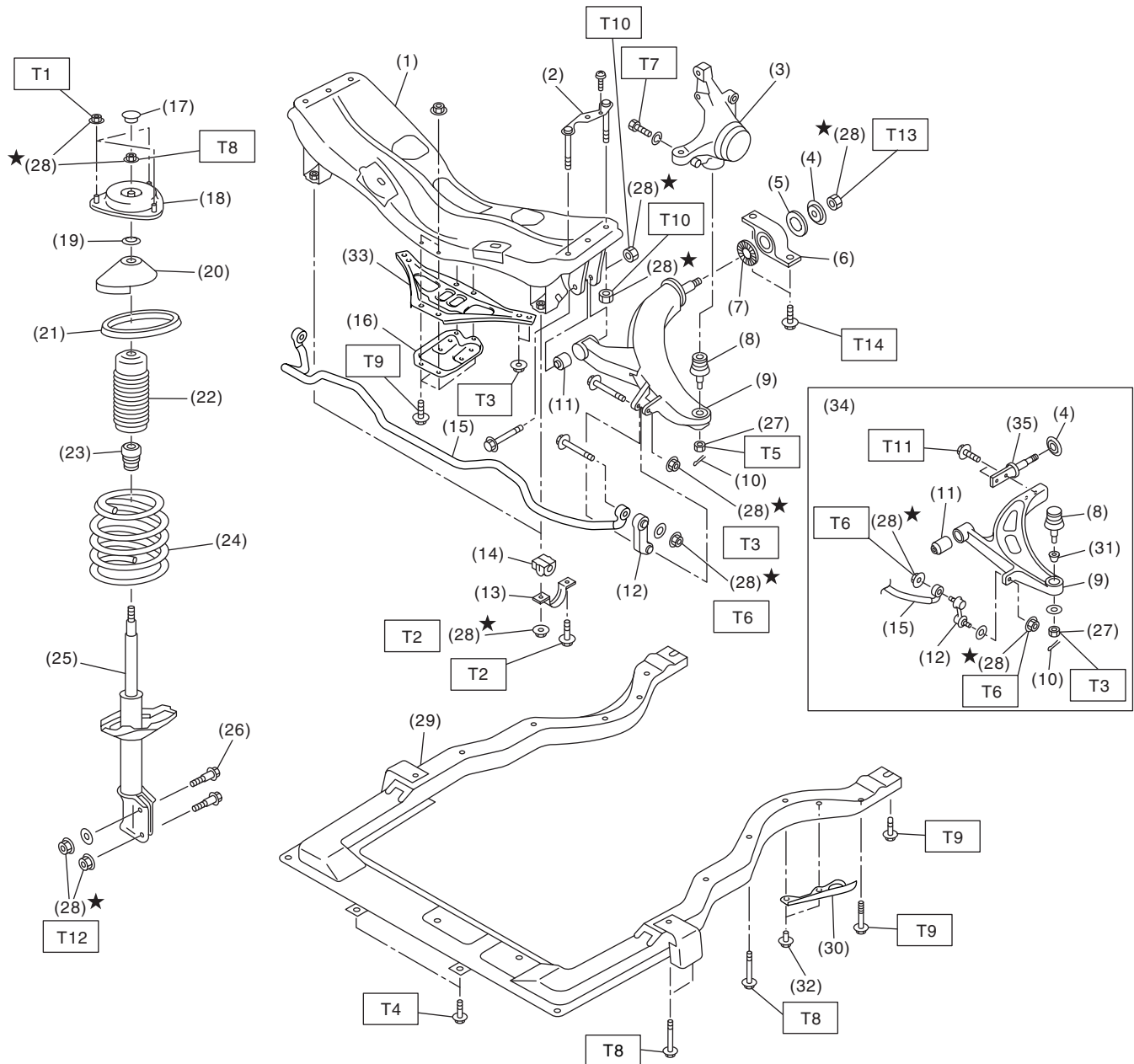
FS-00001

(1) Front

A – B = Positive: Toe-in, Negative: Toe-out

α = Each toe angle

B: COMPONENT



FS-00222

General Description

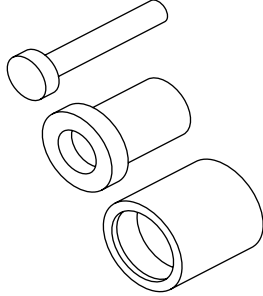
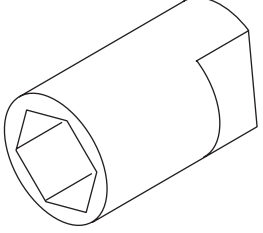
FRONT SUSPENSION

(1) Front crossmember	(19) Spacer	<i>Tightening torque: N-m (kgf-m, ft-lb)</i>
(2) Bolt ASSY	(20) Upper spring seat	<i>T1: 20 (2.0, 14.5)</i>
(3) Housing	(21) Rubber seat	<i>T2: 25 (2.5, 18.1)</i>
(4) Washer	(22) Dust cover	<i>T3: 30 (3.1, 22)</i>
(5) Stopper rubber (Rear)	(23) Helper	<i>T4: 34 (3.5, 25)</i>
(6) Rear bushing	(24) Coil spring	<i>T5: 40 (4.1, 30)</i>
(7) Stopper rubber (Front)	(25) Damper strut	<i>T6: 45 (4.6, 33)</i>
(8) Ball joint	(26) Adjusting bolt	<i>T7: 50 (5.1, 37)</i>
(9) Transverse link	(27) Castle nut	<i>T8: 55 (5.6, 41)</i>
(10) Cotter pin	(28) Self-locking nut	<i>T9: 70 (7.1, 52)</i>
(11) Front bushing	(29) Sub frame	<i>T10: 95 (9.7, 70.1)</i>
(12) Stabilizer link	(30) Cover	<i>T11: 155 (15.8, 114)</i>
(13) Clamp	(31) Boss	<i>T12: 175 (17.8, 129)</i>
(14) Bushing	(32) Clip	<i>T13: 190 (19.4, 140)</i>
(15) Stabilizer	(33) Jack-up plate (Turbo model and STI model)	<i>T14: 250 (25.5, 184)</i>
(16) Jack-up plate (Non-turbo model)		
(17) Dust seal	(34) Sedan turbo model and STI model	
(18) Strut mount	(35) Fitting	

C: CAUTION

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

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

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 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 TOOL

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Alignment gauge adapter	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.

Wheel Alignment

FRONT SUSPENSION

2. Wheel Alignment

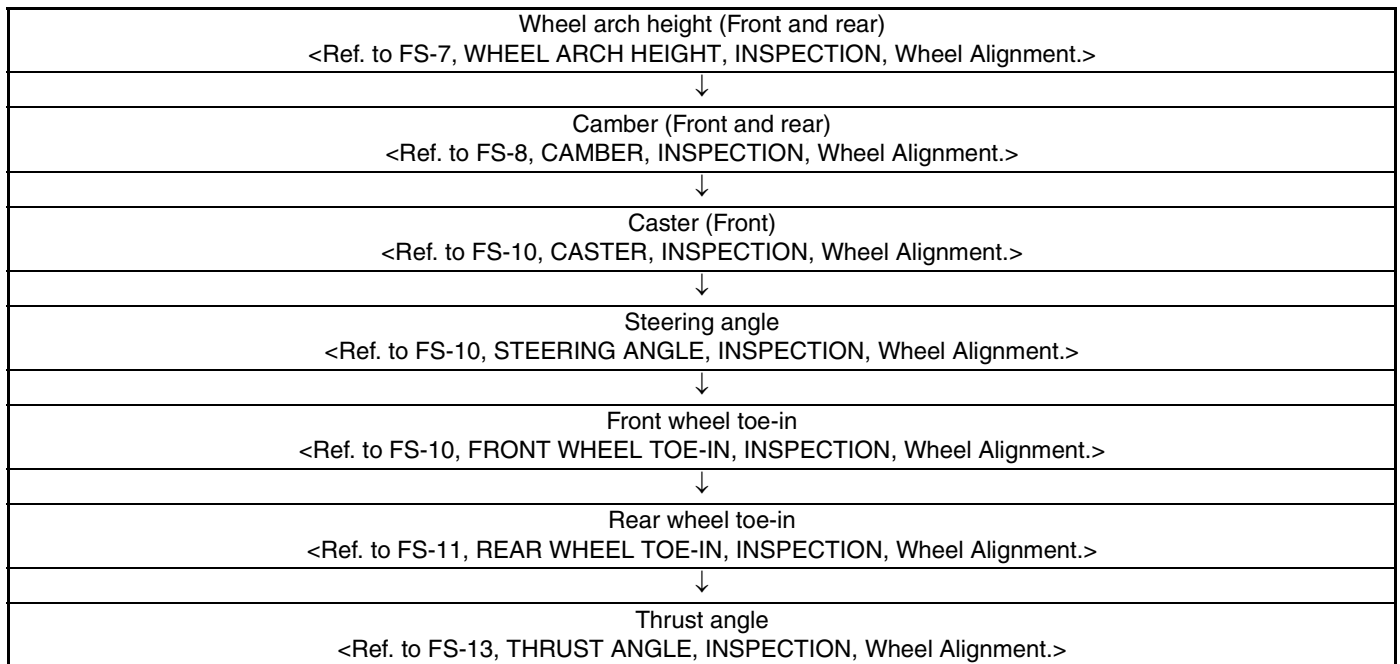
A: INSPECTION

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

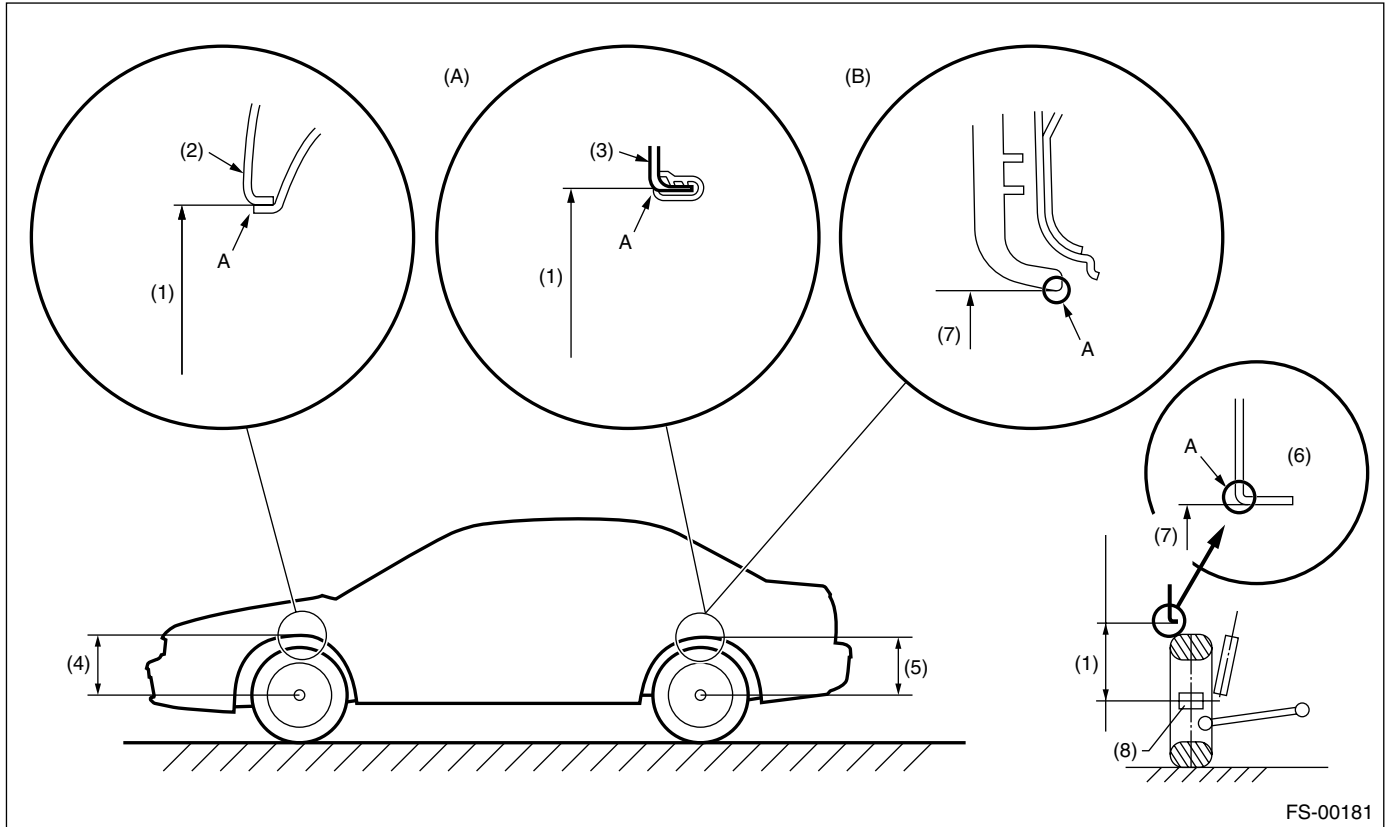
Check, adjust and/or measure the wheel alignment in accordance with procedures indicated in the figure:



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-00181

(A) Except STI model

(B) STI model

(1) Wheel arch height

(2) Front fender

(3) Rear quarter

(4) Front wheel arch height

(5) Rear wheel arch height

(6) Flange bend line

(7) Measuring point

(8) End of spindle

Model		Specified wheel arch height [Tolerance: $+12_{-24}$ mm ($+0.47_{-0.94}$ in)]	
		Non-turbo	Turbo
Sedan	Front	406 mm (15.98 in)	396 mm (15.59 in)
	Rear	381 mm (15.0 in)	376 mm (14.80 in)
Wagon	Front	397 mm (15.63 in)	387 mm (15.24 in)
	Rear	381 mm (15.0 in)	376 mm (14.80 in)
OUTBACK	Front	402 mm (15.83 in)	—
	Rear	386 mm (15.20 in)	—
STI	Front	—	386 mm (15.20 in)
	Rear	—	363 mm (14.29 in)

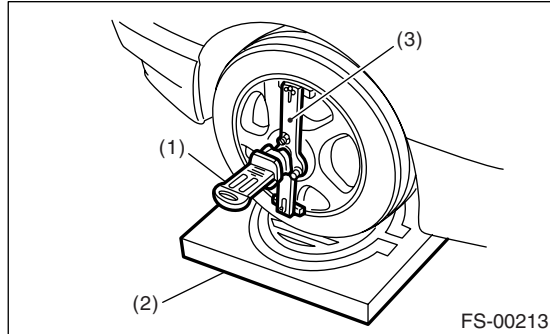
Wheel Alignment

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 adapter into the center of wheel, and then install the wheel alignment gauge.



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

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

NOTE:

Refer to the "SPECIFICATION" for camber values.
Front: <Ref. to FS-2, SPECIFICATION, General Description.>
Rear: <Ref. to RS-2, SPECIFICATION, General Description.>

• Front Camber Adjustment

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

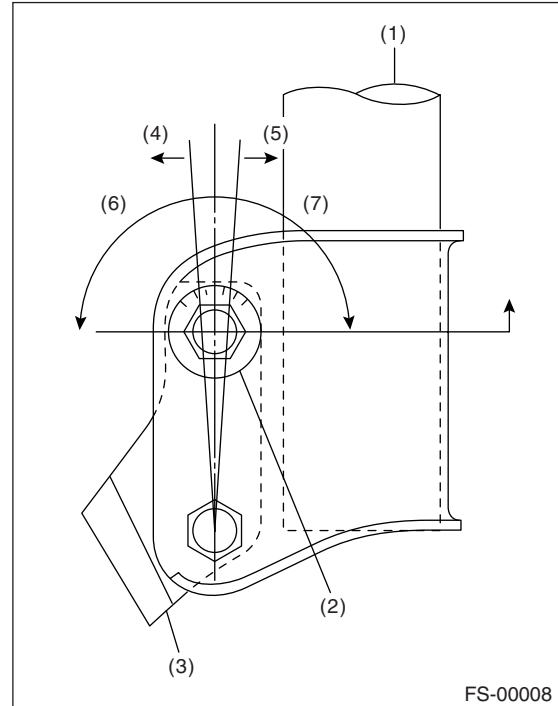
NOTE:

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:

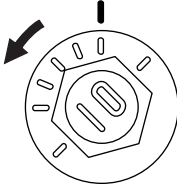
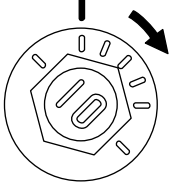
Moving the adjusting bolt by one scale graduation changes camber by approx. $0^{\circ}10'$.

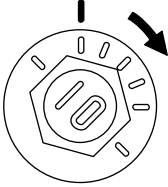
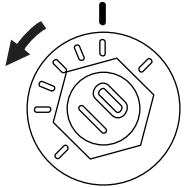


- (1) Strut
- (2) Adjusting bolt
- (3) Housing
- (4) Outer
- (5) Inner
- (6) Camber is increased.
- (7) Camber is decreased.

Wheel Alignment

FRONT SUSPENSION

To increase Camber:	
Rotate camber adjusting bolt LH counterclockwise.	Rotate camber adjusting bolt RH clockwise.
 FS-00009	 FS-00010

To decrease Camber:	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00010	 FS-00009

3) Tighten two new self-locking nuts.

Tightening torque:

175 N·m (17.8 kgf-m, 129 ft-lb)

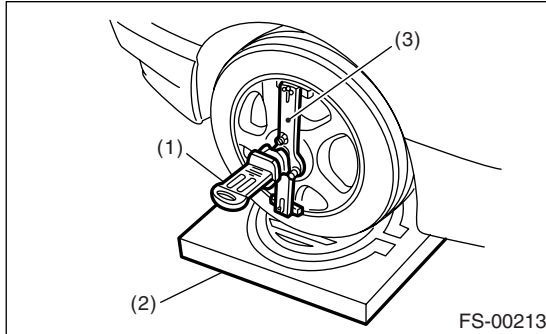
Wheel Alignment

FRONT SUSPENSION

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 adapter into center of wheel, and then install the wheel alignment gauge.



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

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

NOTE:

Refer to "SPECIFICATION" for caster values.
<Ref. to FS-2, SPECIFICATION, General Description.>

4. STEERING ANGLE

• Inspection

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

Steering angle:

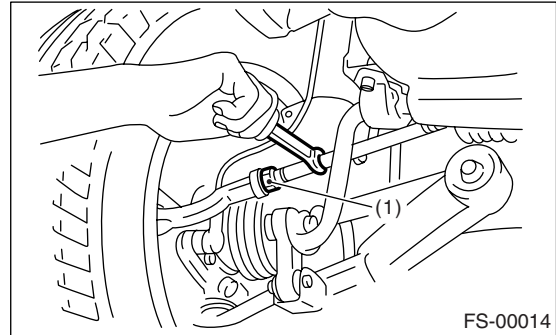
Model	Except STI model	STI model
Inner wheel	$34.5^{\circ} \pm 1.5^{\circ}$	$32.9^{\circ} \pm 1.5^{\circ}$
Outer wheel	$30.3^{\circ} \pm 1.5^{\circ}$	$28.5^{\circ} \pm 1.5^{\circ}$

• 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:

$0 \pm 3 \text{ mm}$ ($0 \pm 0.12 \text{ in}$) (tolerance)

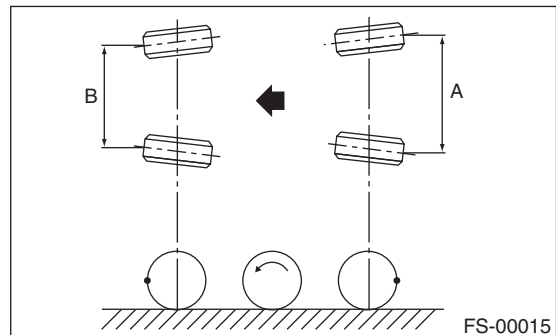
- 1) Set the toe-in gauge to rear sides of right and left front tires at height corresponding to center of spindle.
- 2) Mark each right and left tires at height corresponding to center of spindle and measure the distance "A" between marks.
- 3) Move the vehicle forward to rotate wheels 180° .

NOTE:

Whenever rotating the wheels, drive the vehicle forward.

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

$$A - B = \text{Toe-in}$$



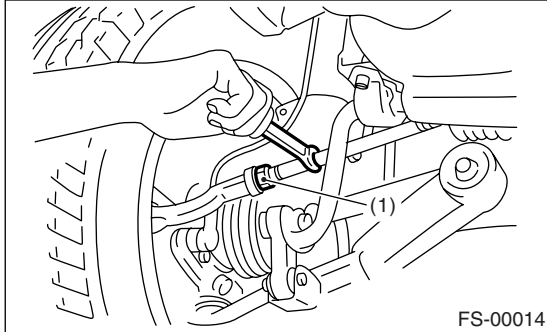
• Adjustment

- 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.

Toe-in:

$0 \pm 2 \text{ mm}$ ($0 \pm 0.08 \text{ in}$) (adjustment standard)

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:

Non- turbo model:

$83 \text{ N}\cdot\text{m}$ ($8.5 \text{ kgf}\cdot\text{m}$, $61.5 \text{ ft}\cdot\text{lb}$)

Turbo model and STI model:

$85 \text{ N}\cdot\text{m}$ ($8.6 \text{ kgf}\cdot\text{m}$, $62.2 \text{ ft}\cdot\text{lb}$)

NOTE:

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

6. REAR WHEEL TOE-IN

• Inspection

Toe-in:

$0 \pm 3 \text{ mm}$ ($0 \pm 0.12 \text{ in}$) (tolerance)

For rear toe-in inspection procedure, refer to FRONT WHEEL TOE-IN procedure.

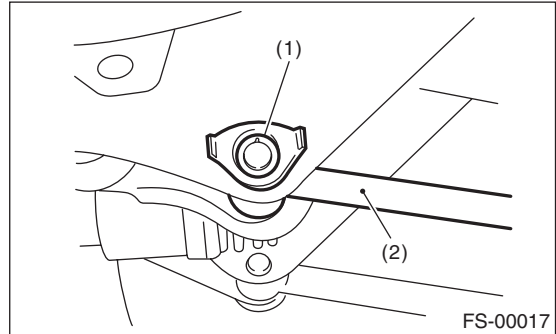
<Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

• 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.

Toe-in:

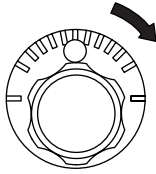
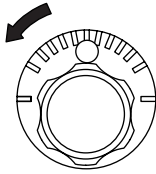
$0 \pm 2 \text{ mm}$ ($0 \pm 0.08 \text{ in}$) (adjustment standard)

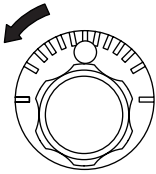
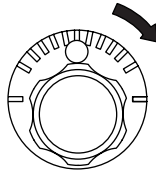
NOTE:

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

To increase Toe-in:	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00018	 FS-00019

To decrease Toe-in:	
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

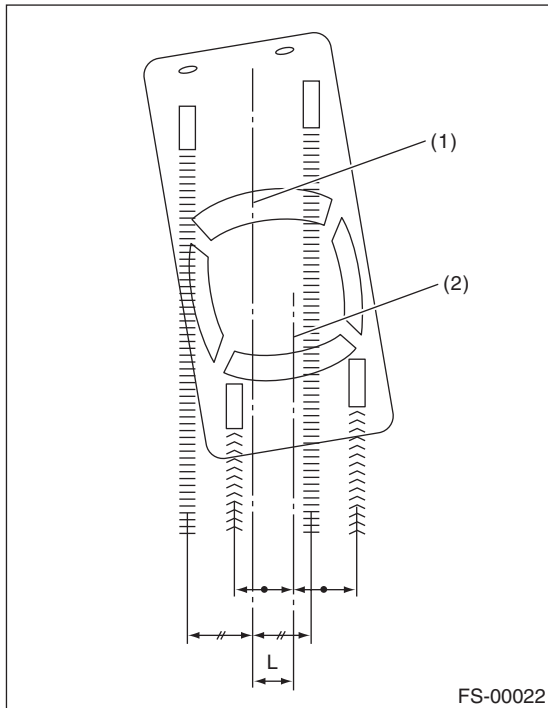
• Inspection

- 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:

$0^{\circ} \pm 30'$ (tolerance)

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)

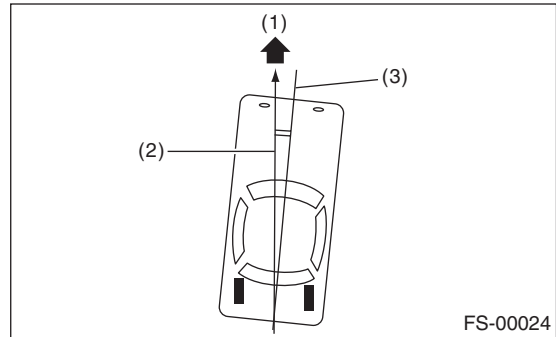
• Adjustment

- 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:

$0^{\circ} \pm 20'$ (adjustment standard)

Less than $20'$ when “L” is less than 13 mm (0.51 in).



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

NOTE:

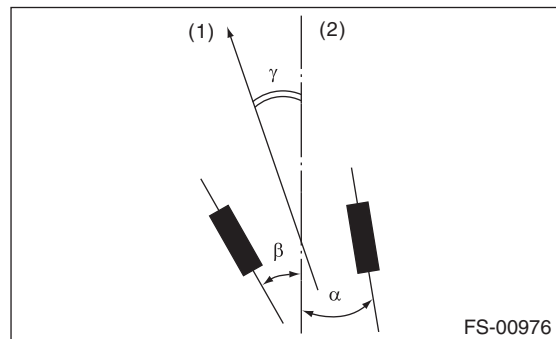
Thrust angle refers to a mean value of right and left rear wheel toe angles in relation to the vehicle body center line. Vehicle is driven straight in the thrust angle direction while swinging in the oblique direction depending on the degree of the mean thrust angle.

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

α : Right rear wheel toe-in angle

β : Left rear wheel toe-in angle

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



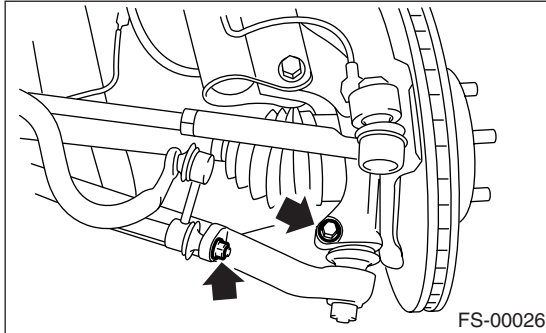
- (1) Front
- (2) Body center line

3. Front Transverse Link

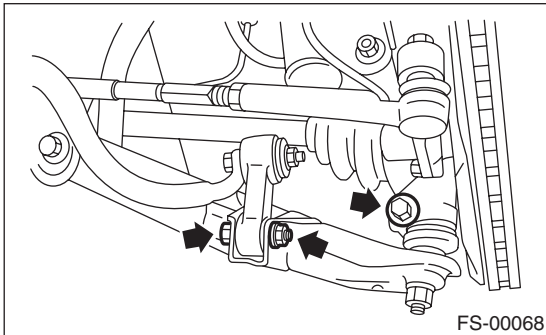
A: REMOVAL

- 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.

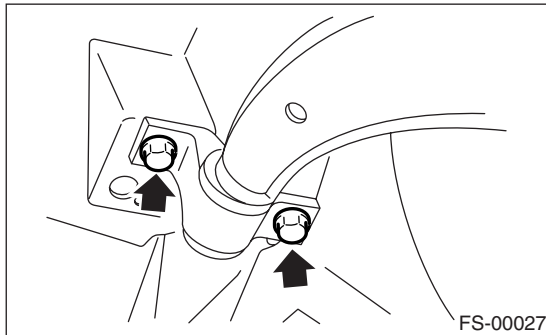
- Sedan turbo model and STI model



- Except Sedan turbo model and STI model

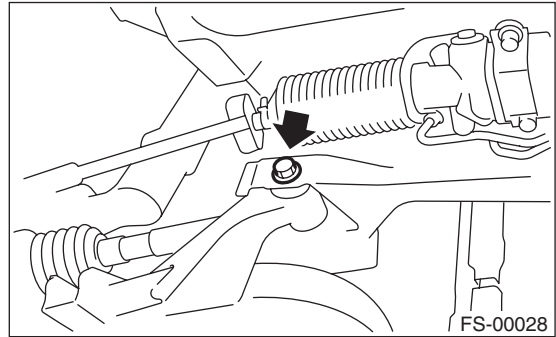


- 6) Remove the nut (do not remove bolt) securing transverse link to crossmember.
- 7) Remove the two bolts securing bushing bracket of transverse link to the vehicle body at rear bushing location.



- 8) Extract the ball joint from housing.

- 9) Remove the bolt securing transverse link to crossmember, and then extract the transverse link from crossmember.



B: INSTALLATION

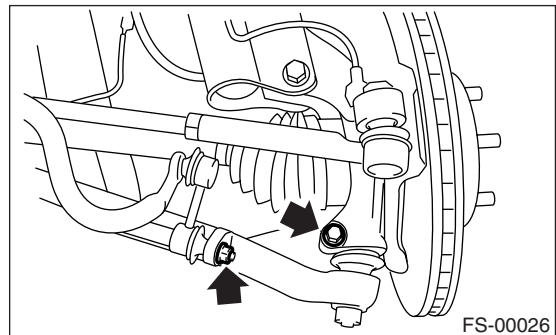
- 1) Temporarily tighten the two bolts used to secure rear bushing of transverse link to body.

NOTE:

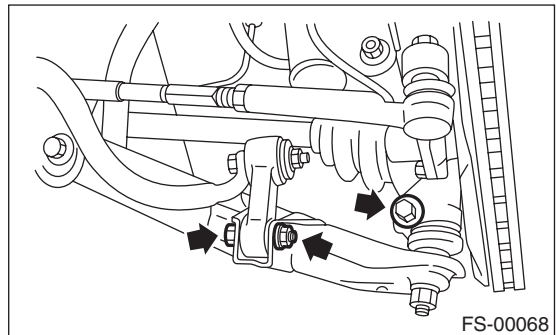
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

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

- Sedan turbo model and STI model



- Except Sedan turbo model and STI model



- 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 to stabilizer link, and stabilizer to stabilizer link (Sedan turbo model and STI model)

Tightening torque:

45 N·m (4.6 kgf-m, 33 ft-lb)

- (2) Transverse link to stabilizer link, and stabilizer to stabilizer link (Except Sedan turbo model and STI model)

Tightening torque:

Transverse link to stabilizer link:

30 N·m (3.1 kgf-m, 22 ft-lb)

Stabilizer to stabilizer link:

45 N·m (4.6 kgf-m, 33 ft-lb)

- (3) Transverse link and crossmember

Tightening torque:

95 N·m (9.7 kgf-m, 70.1 ft-lb)

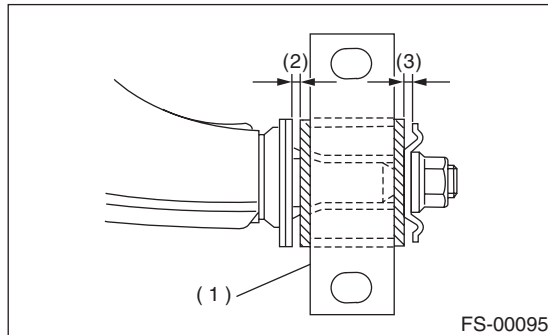
- (4) Transverse link rear bushing and body

Tightening torque:

250 N·m (25.5 kgf-m, 184 ft-lb)

NOTE:

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



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

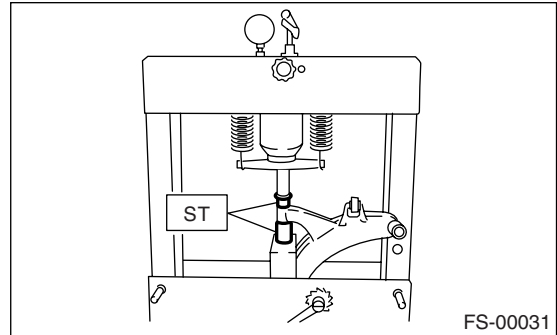
- 6) Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

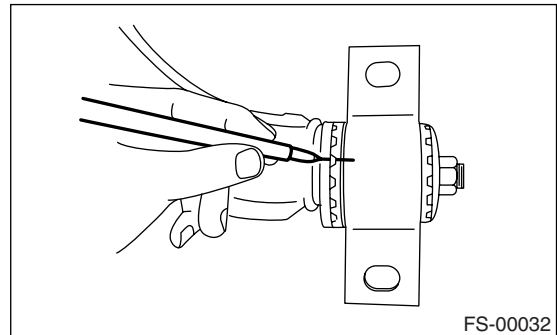
Using the ST, press the front bushing out of place.

ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

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



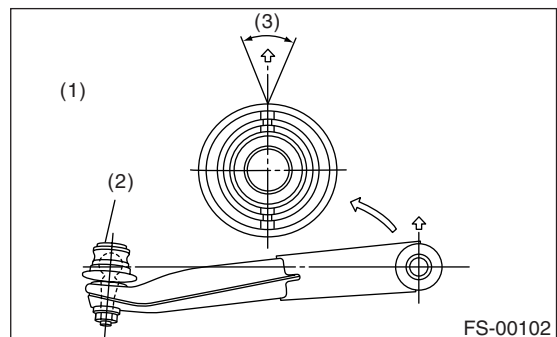
D: ASSEMBLY

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)

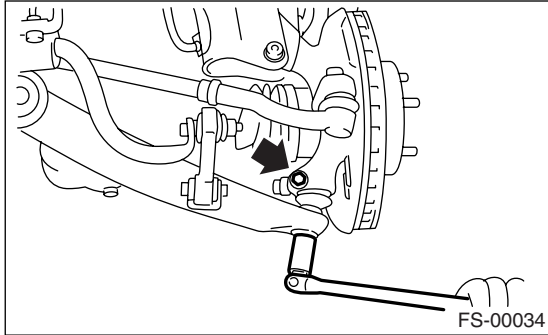
E: INSPECTION

- 1) Check the transverse link for wear, damage and cracks, and correct or replace if defective.
- 2) Check the bushings for large 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.

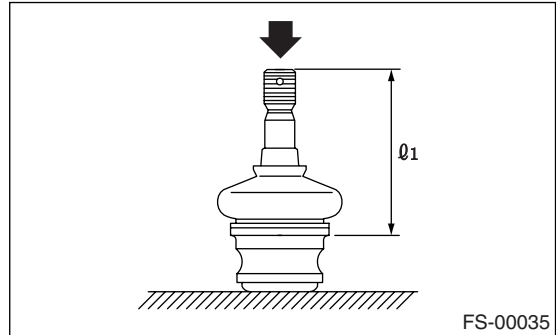
Tightening torque (Castle nut):
Sedan turbo model and STI model:
30 N·m (3.1 kgf-m, 22 ft-lb)
Except Sedan turbo model and STI model:
40 N·m (4.1 kgf-m, 30 ft-lb)

- 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.

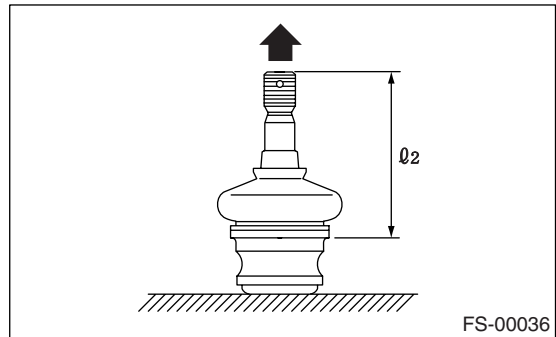
C: INSPECTION

- 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 lbf) loaded in direction shown in the figure, measure the dimension $\varnothing_1$.



- (2) With 686 N (70 kgf, 154 lbf) 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:

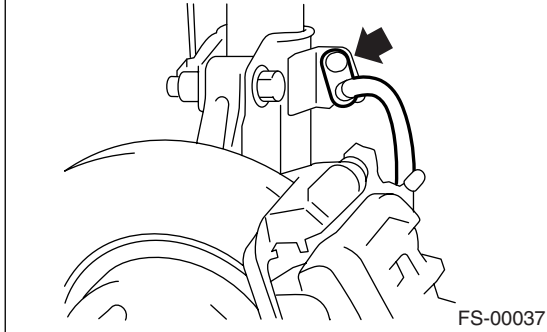
Specified play for replacement S:
Less than 0.3 mm (0.012 in)

- 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.

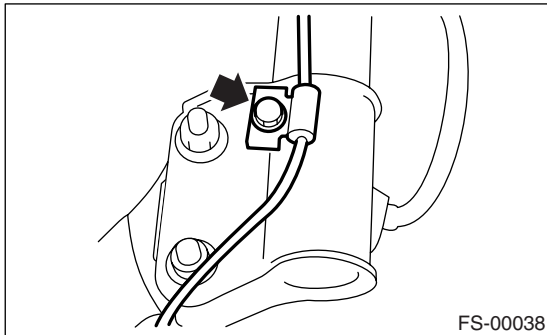
5. Front Strut

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.

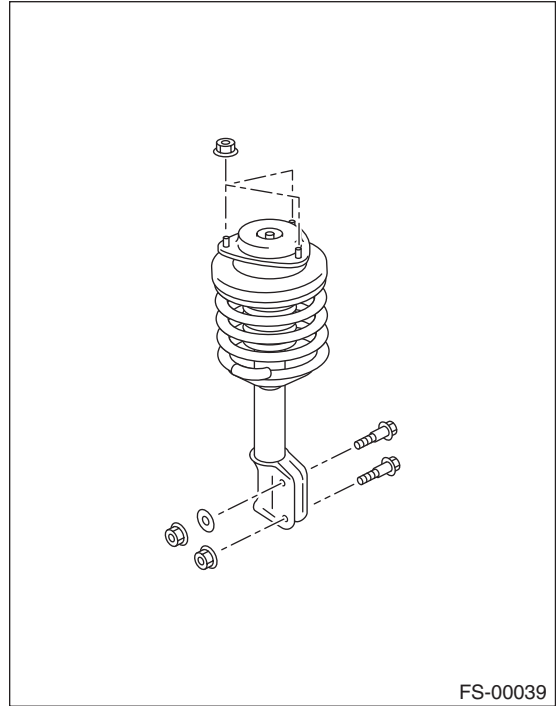


- 5) Remove the two bolts securing housing to strut.

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 (3.3 kgf-m, 24 ft-lb)

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

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

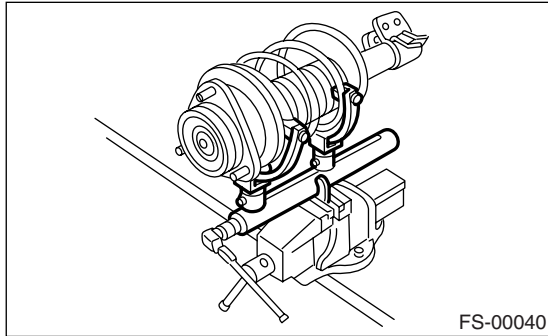
- 5) Install the wheels.

NOTE:

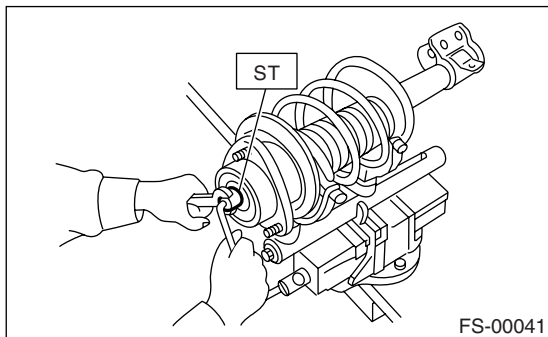
Check the wheel alignment and adjust if necessary.

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.

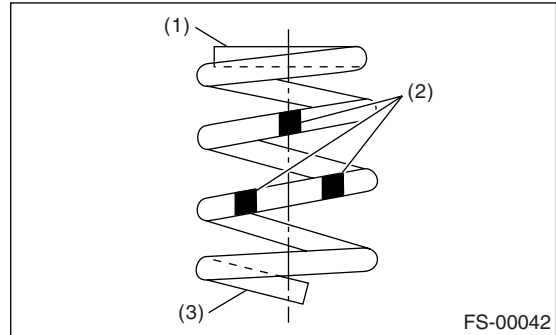
NOTE:

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.

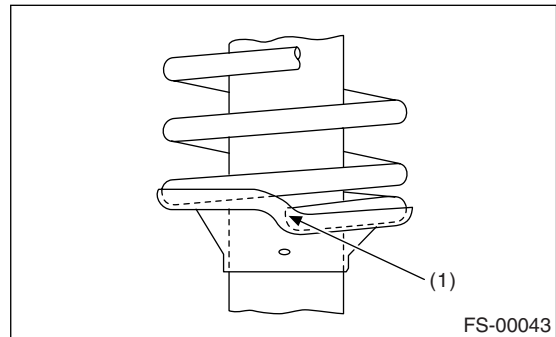
NOTE:

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.

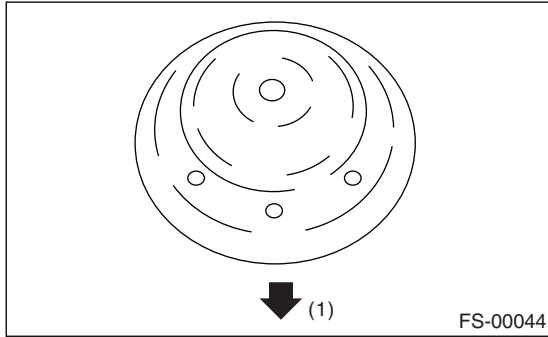
7) Pull the piston rod fully upward, and install the rubber seat and spring seat.

Front Strut

FRONT SUSPENSION

NOTE:

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



(1) Outside of body

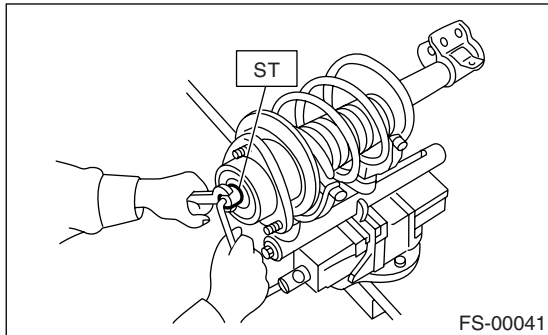
8) Install the strut mount to the piston rod, and then tighten a new self-locking nut temporarily.

9) Using a hexagon wrench to prevent strut rod from turning, tighten the self-locking nut with ST.

ST 927760000 STRUT MOUNT SOCKET

Tightening torque:

55 N·m (5.6 kgf·m, 41 ft-lb)



10) Loosen the coil spring carefully.

E: INSPECTION

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

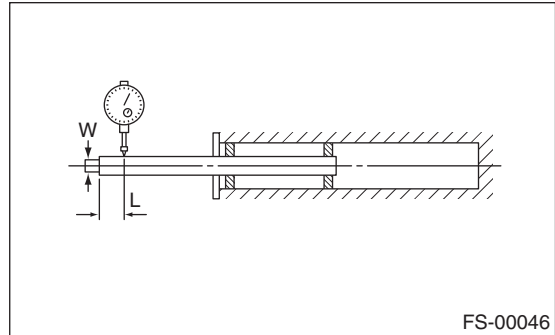
1. DAMPER STRUT

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

3) Play of piston rod

- Measure the play as follows:

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



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

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

2. STRUT MOUNT

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

3. DUST COVER

If any large 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 excessively or damaged.

F: DISPOSAL

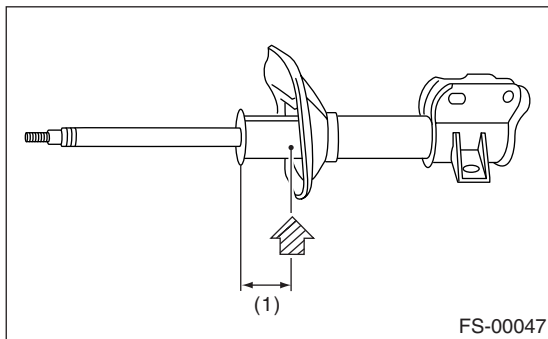
1. EXCEPT STI MODEL

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.

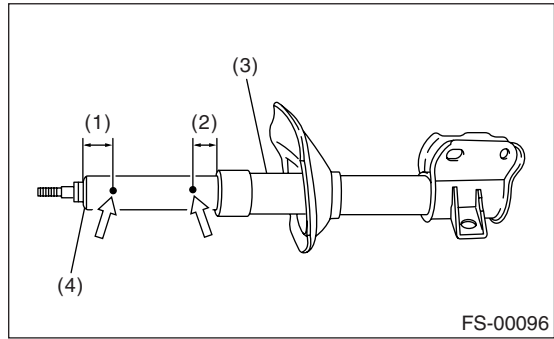
1) Place the gas filled strut on a flat and level surface with piston rod fully extended.

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.

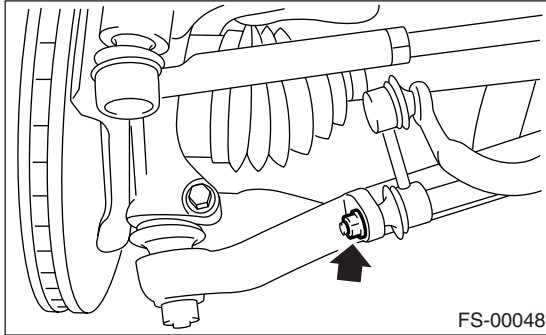
1) Place the gas filled strut on a flat and level surface with damping tube fully extended.

6. Front Stabilizer

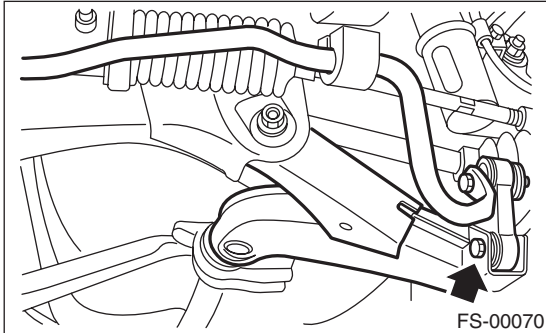
A: REMOVAL

- 1) Lift-up the vehicle.
- 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.

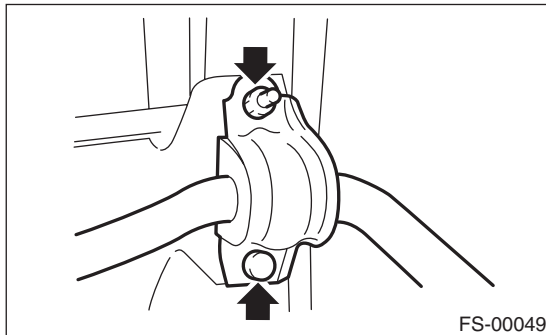
- Sedan turbo model and STI model



- Except Sedan turbo model and STI model



- 5) Remove the bolts which secure stabilizer to crossmember.



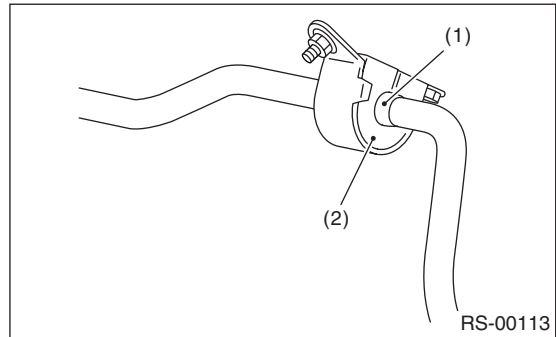
B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

- Install the bushing (on front crossmember side) while aligning it with paint mark on stabilizer.

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



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

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

Tightening torque:

Jack-up plate to crossmember:

70 N·m (7.1 kgf-m, 52 ft-lb)

Stabilizer link to front transverse link (Sedan turbo model and STI model):

45 N·m (4.6 kgf-m, 33 ft-lb)

Stabilizer link to front transverse link (Except Sedan turbo model and 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)

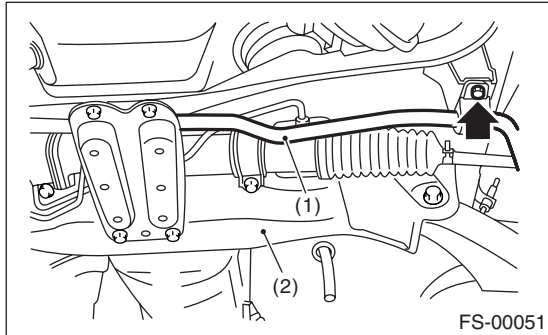
C: INSPECTION

- 1) Check the bushing for large 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

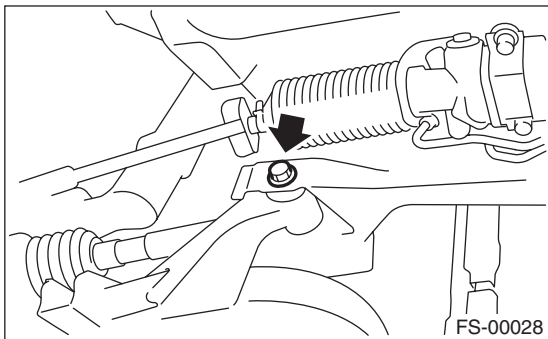
A: REMOVAL

- 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. <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>
<Ref. to EX(H4DOTC)-8, REMOVAL, 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:

95 N·m (9.7 kgf-m, 70.1 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:

95 N·m (9.7 kgf-m, 70.1 ft-lb)

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

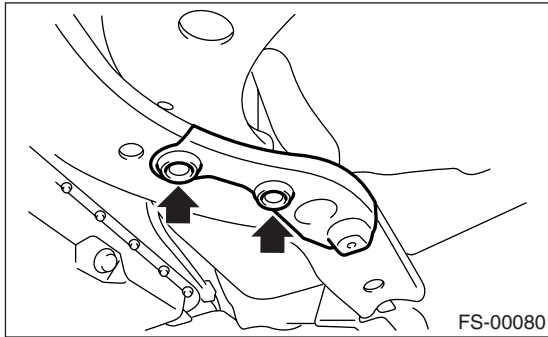
C: INSPECTION

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

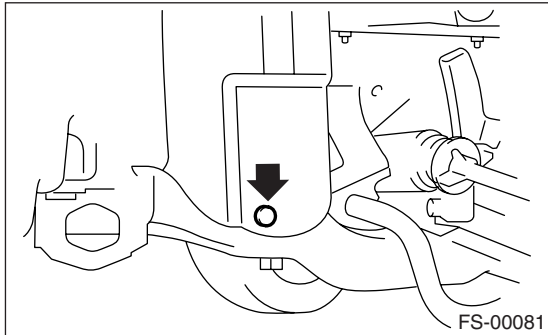
8. Sub Frame

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover. <Ref. to EI-23, REMOVAL, Front Under Cover.>
- 3) Remove the bolt cover.



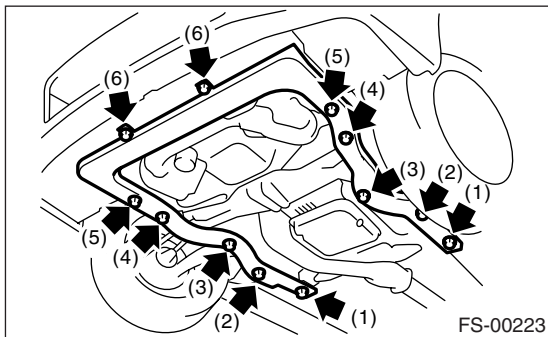
- 4) Remove the clip.



- 5) Remove the sub frame.

NOTE:

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



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

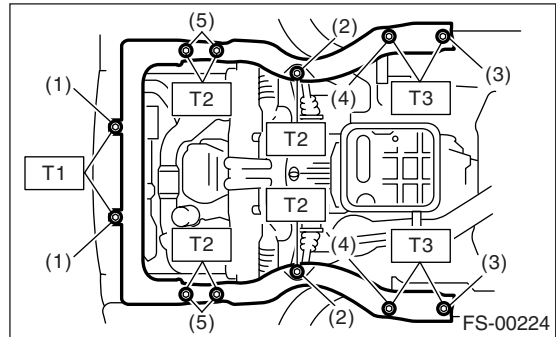
Replace the M12 bolt with a new one.

Tightening torque:

T1: 34 N·m (3.5 kgf-m, 25 ft-lb)

T2: 55 N·m (5.6 kgf-m, 41 ft-lb)

T3: 70 N·m (7.1 kgf-m, 52 ft-lb)



- (1) M8 bolt
- (2) M12 bolt (with wax)
- (3) M10 bolt
- (4) M10 bolt
- (5) M12 bolt (with wax)

C: INSPECTION

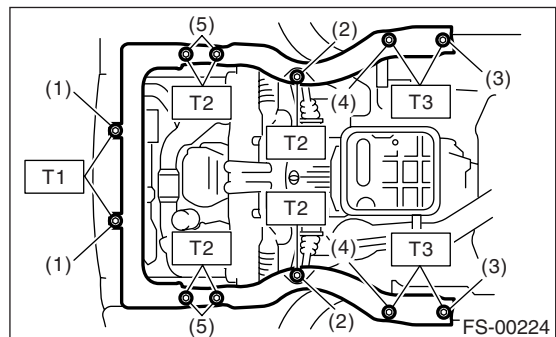
- 1) Check that there is no damage and distortion at the sub frame.
- 2) Check that the bolts are tightened with the specified torque. If there is looseness, tighten to the specified torque.

Tightening torque:

T1: 34 N·m (3.5 kgf-m, 25 ft-lb)

T2: 55 N·m (5.6 kgf-m, 41 ft-lb)

T3: 70 N·m (7.1 kgf-m, 52 ft-lb)

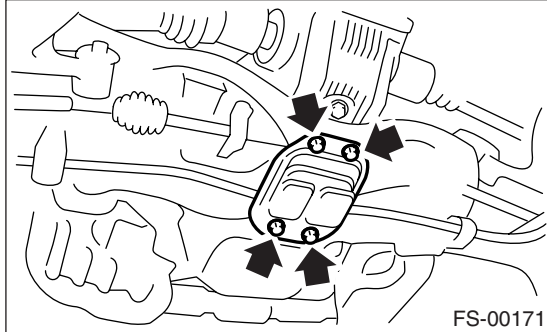


- (1) M8 bolt
- (2) M12 bolt
- (3) M10 bolt
- (4) M10 bolt
- (5) M12 bolt

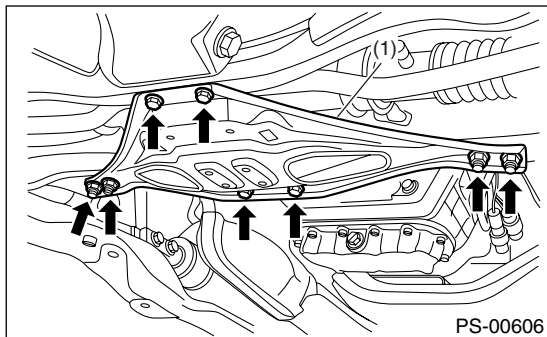
9. Jack-up Plate

A: REMOVAL

- 1) Set the vehicle on a lift.
 - 2) Lift-up the vehicle.
 - 3) Remove the under cover. <Ref. to EI-23, REMOVAL, Front Under Cover.>
 - 4) Remove the jack-up plate.
- Non-turbo model



- Turbo model and STI model



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Jack-up plate to crossmember:

70 N·m (7.1 kgf-m, 52 ft-lb)

Turbo model and STI model

Tightening torque:

Both end of jack-up plate to crossmember:

30 N·m (3.1 kgf-m, 22 ft-lb)

C: INSPECTION

Check the jack-up plate for wear, damage and cracks, and correct or replace if defective.

General Diagnostic Table

FRONT SUSPENSION

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) Large crack 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) Large 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) Large 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

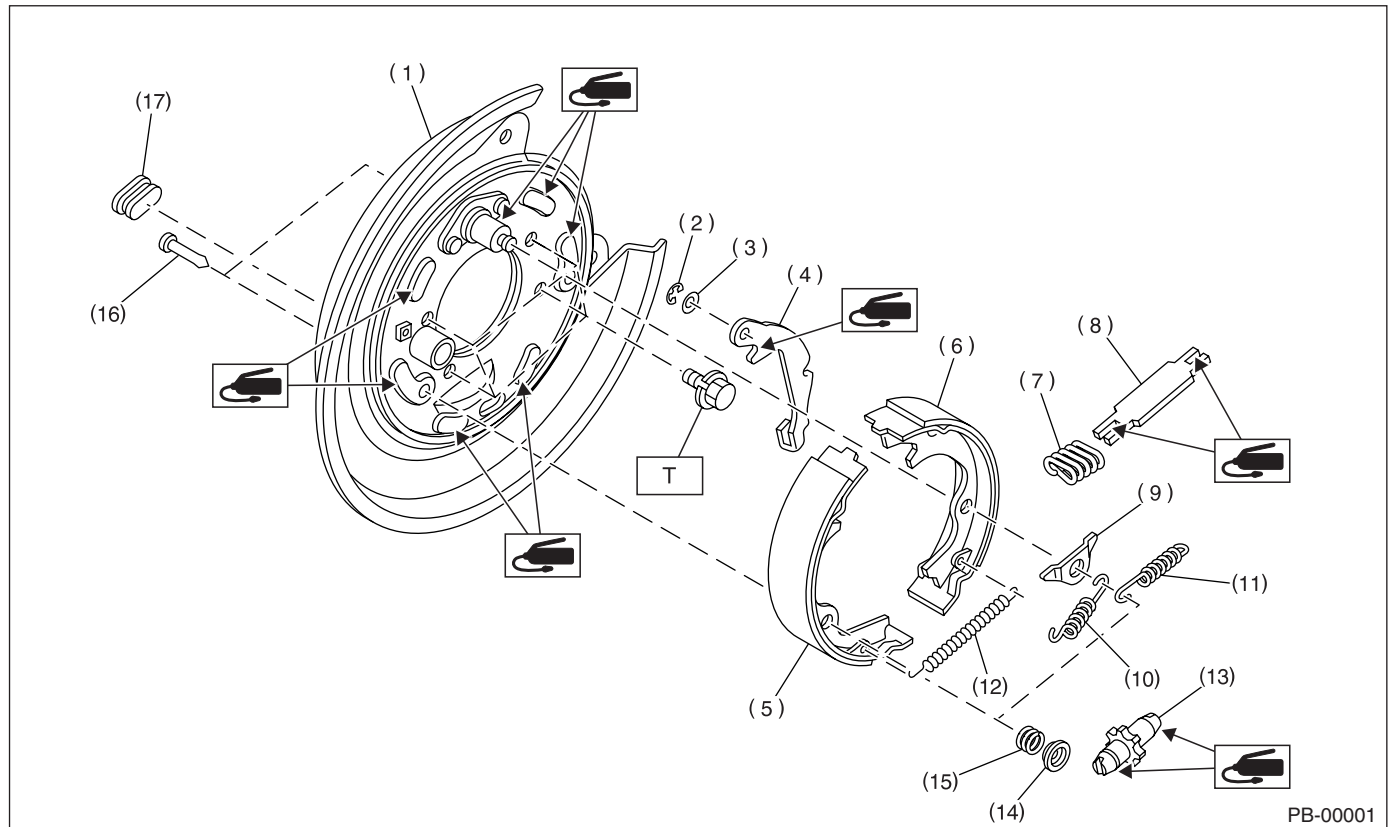
1. General Description

A: SPECIFICATION

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, lbf)	7 to 8/196 (20, 44)	

B: COMPONENT

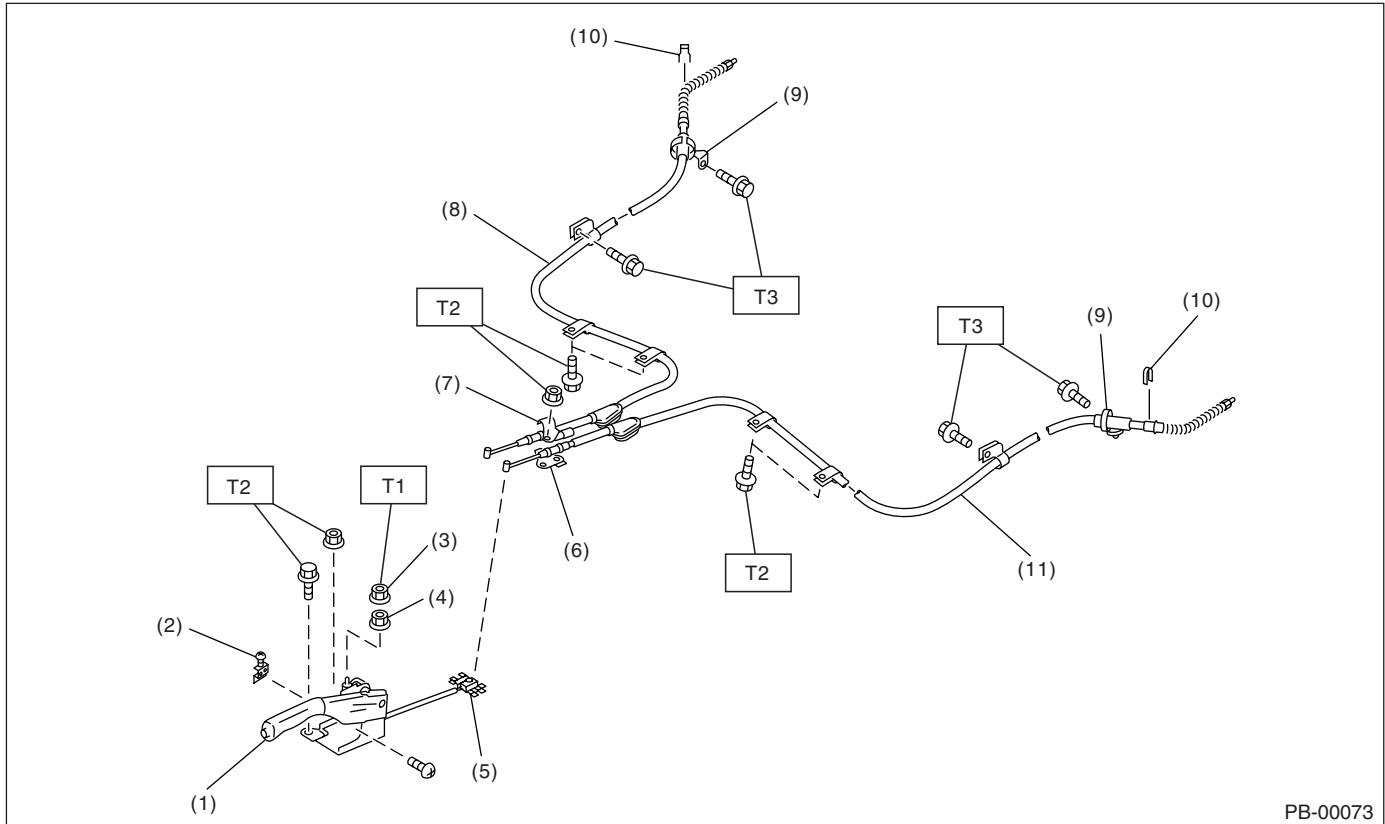
1. PARKING BRAKE (REAR DISC BRAKE)



(1) Back plate	(8) Strut	(15) Shoe hold-down spring
(2) Retainer	(9) Shoe guide plate	(16) Shoe hold-down pin
(3) Spring washer	(10) Primary return spring	(17) Adjusting hole cover
(4) Lever	(11) Secondary return spring	
(5) Parking brake shoe (Primary)	(12) Adjusting spring	
(6) Parking brake shoe (Secondary)	(13) Adjuster	
(7) Strut spring	(14) Shoe hold-down cup	

Tightening torque: N·m (kgf-m, ft-lb)
T: 53 (5.4, 39.1)

2. PARKING BRAKE CABLE



PB-00073

(1) Parking brake lever	(7) Clamp
(2) Parking brake switch	(8) Parking brake cable RH
(3) Lock nut	(9) Cable guide
(4) Adjusting nut	(10) Clamp (Rear disc brake model)
(5) Equalizer	(11) Parking brake cable LH
(6) Bracket	

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6 (0.6, 4.4)**T2: 18 (1.8, 13.0)****T3: 32 (3.3, 23.6)**

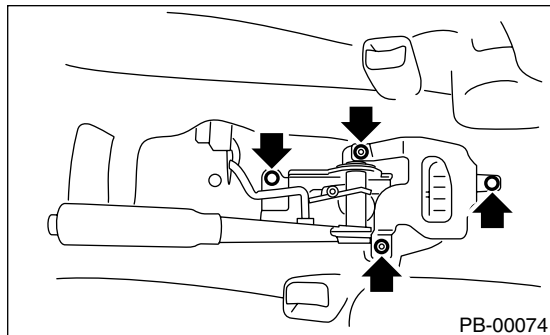
C: CAUTION

- Wear work 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 yourself, because each part on the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep grease etc. away from parking brake shoes.

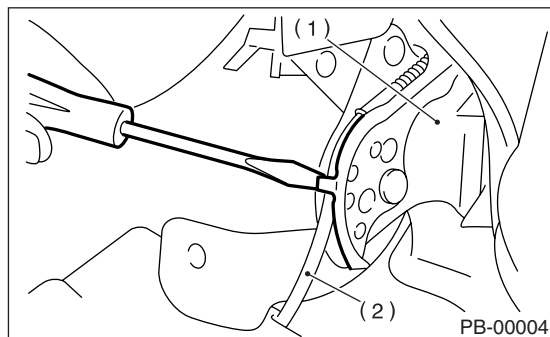
2. Parking Brake Lever

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)

Lock nut;

6 N·m (0.6 kgf-m, 4.4 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 lbf)

If not as specified, adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

D: ADJUSTMENT

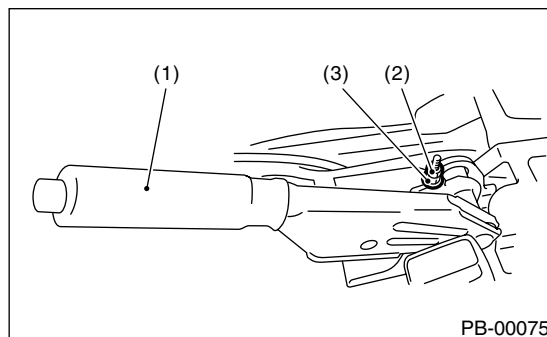
- 1) Remove the console cover.
- 2) Forcibly pull the parking brake lever 3 to 5 times.
- 3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lbf).
- 4) Tighten the lock nut.

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)

Tightening torque (Lock nut):

6 N·m (0.6 kgf-m, 4.4 ft-lb)



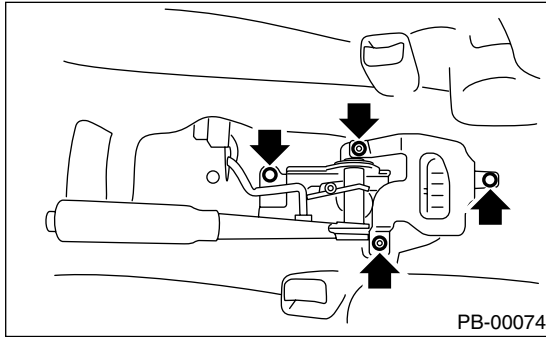
- (1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

- 5) Install the console cover.

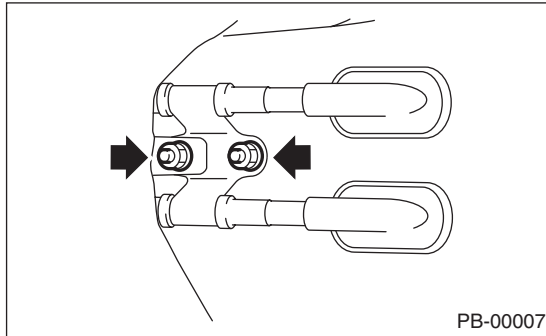
3. Parking Brake Cable

A: REMOVAL

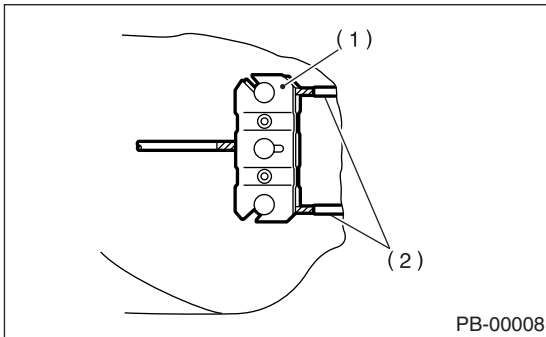
- 1) Lift up the vehicle.
- 2) Remove the rear wheels.
- 3) Remove the rear seat cushion.
- 4) Remove the console box.
- 5) Loosen the parking cable adjusting nut and console bracket.
- 6) Remove the parking brake lever.



- 7) Roll up the floor mat and remove clamps.



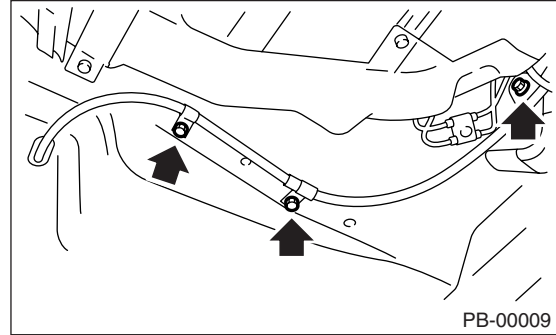
- 8) Remove the equalizer cover.
- 9) Remove the inner cable end from equalizer.



- (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 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.

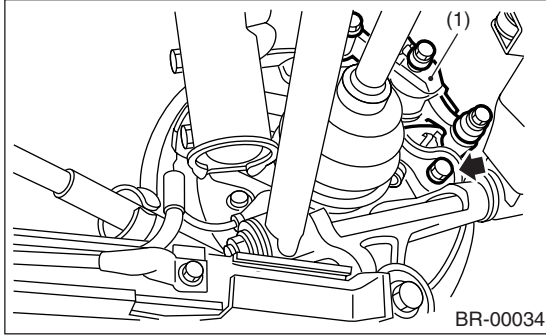
Parking Brake Assembly (Rear Disc Brake)

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.



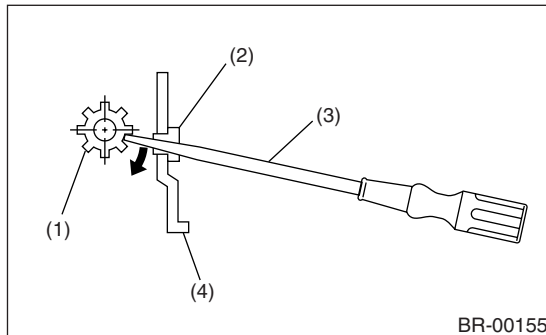
(1) Brake caliper ASSY

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

NOTE:

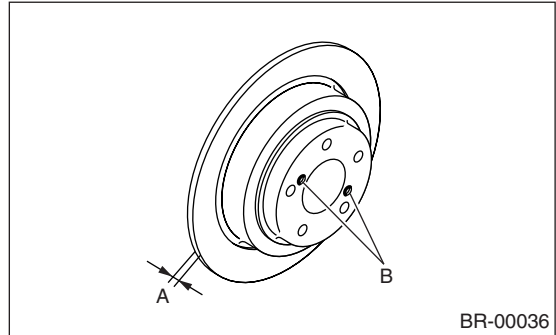
If the disc rotor is difficult to remove, try the two following methods in order.

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

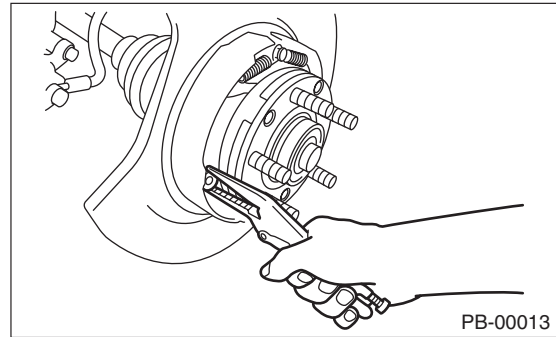


- (1) Adjusting screw
- (2) Adjusting hole cover (rubber)
- (3) Flat tip screwdriver
- (4) Back plate

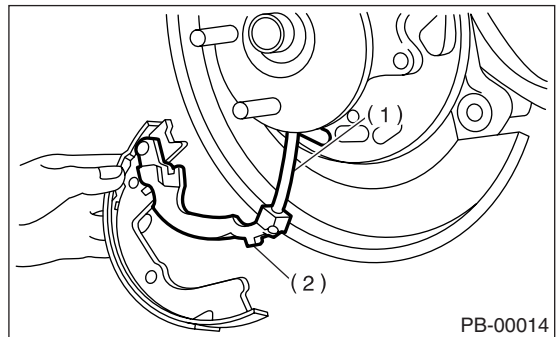
- (2) If the disc rotor seizes up within hub, drive the disc rotor out by installing two 8-mm bolts in holes B on rotor.



- 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 lever.



- (1) Parking brake cable
- (2) Lever

- 12) Using a standard screwdriver, raise the retain-er. Remove the 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:

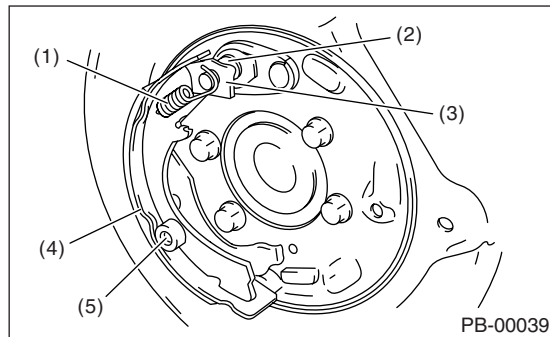
Brake Grease (Part No. 003602002)

- 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) Shoe guide plate
- (4) Primary shoe
- (5) Shoe hold-down pin & cup

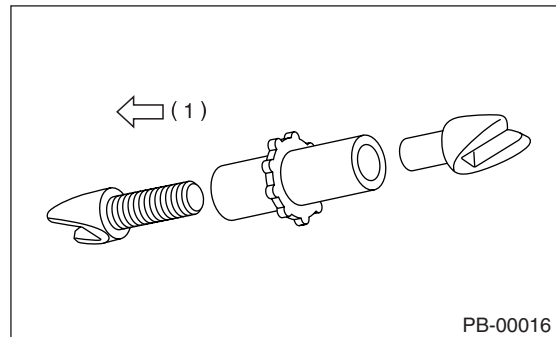
5) Install the parking brake cable to lever.

6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with shoe hold-down pin & cup.

NOTE:

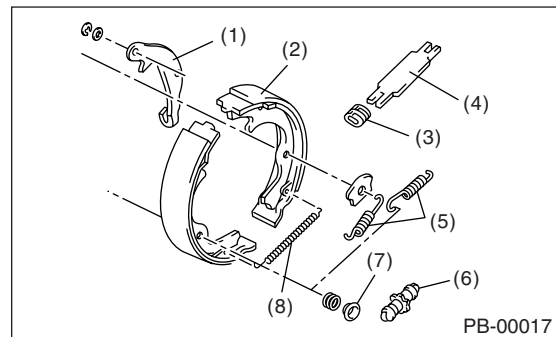
- Install the strut spring of both right and left wheels facing vehicle front.

- 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)

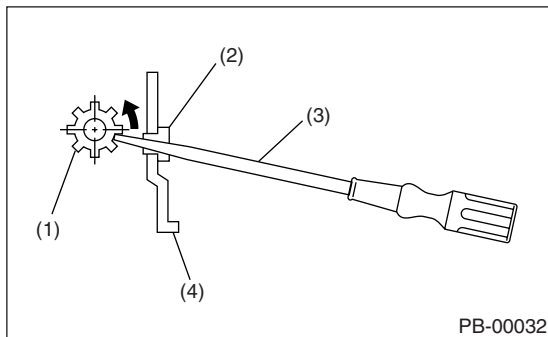
NOTE:

Replace the right and left brake shoes at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

- 1) Return the parking brake completely.
- 2) Remove the adjusting hole cover from back plate.
- 3) Turn the adjusting screw using a flat tip screwdriver until brake shoe is in close contact with disc rotor.



- (1) Adjusting screw
- (2) Adjusting hole cover (rubber)
- (3) Flat tip screwdriver
- (4) Back plate

4) Turn back (downward) the adjusting screw 3 or 4 notches.

CAUTION:

Be sure that the brake is not dragging.

5) Install the adjusting hole cover to back plate.

6) Adjust the parking brake lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

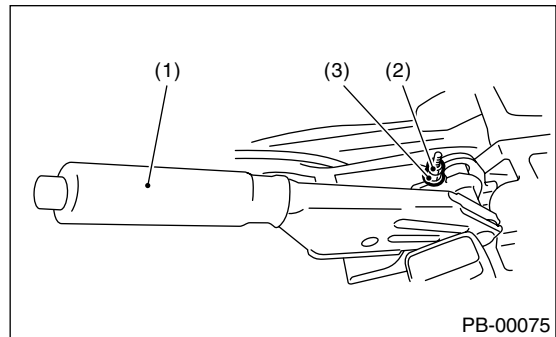
2. LEVER STROKE

1) Before adjusting the lever stroke, adjust the shoe clearance. <Ref. to PB-8, SHOE CLEARANCE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

2) Remove the console box lid.

3) Forcibly pull the parking brake lever 3 to 5 times.

4) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lbf).



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

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)

5) Tighten the lock nut.

Tightening torque (Lock nut):

6 N·m (0.6 kgf-m, 4.4 ft-lb)

6) Install the console box lid.

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: SPECIFICATION

Model			NON-TURBO	TURBO	
			2.5i, OUTBACK	WRX	STI
Whole system	Minimum turning radius m (ft)		5.4 (17.7)		5.7 (18.7)
	Steering angle (Inside-Outside)		34.5° — 30.3°		32.9° — 28.5°
	Steering wheel diameter mm (in)		375 (14.76)		375 (14.76)
	Lock-to-lock speed (Turns lock to lock, Gear box)		3.0	2.7	2.6
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				

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

Steering wheel	Free play		mm (in)	17 (0.67)
Turning angle	Inner wheel	2.5i, OUTBACK, WRX		34.5°±1.5°
		STI		32.9°±1.5°
	Outer wheel	2.5i, OUTBACK, WRX		30.3°±1.5°
		STI		28.5°±1.5°
Steering shaft	Clearance between steering wheel and column cover		mm (in)	4.0 (0.16)
Steering gear-box (Power steering system)	Sliding resistance		N (kgf, lbf)	400 (41, 90) or less
	Rack shaft play in radial direction	Right-turn steering	mm (in)	0.19 (0.0075) or less
		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, lbf)	Maximum allowable value: Less than 10.5 (1.1, 2.4) Difference between right and left sliding resistance: Less than 20%
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less
		Axial play	mm (in)	0.9 (0.035) or less
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less
		Resistance to rotation	N (kgf, lbf)	9.22 (0.94, 2.07) or less
	Regular pressure (Unloaded)		kPa (kgf/cm ² , psi)	981 (10, 142) or less
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road		N (kgf, lbf)	31.4 (3.2, 7.1) or less
	At standstill with engine stalled on a concrete road		N (kgf, lbf)	294.2 (30, 66.2) or less

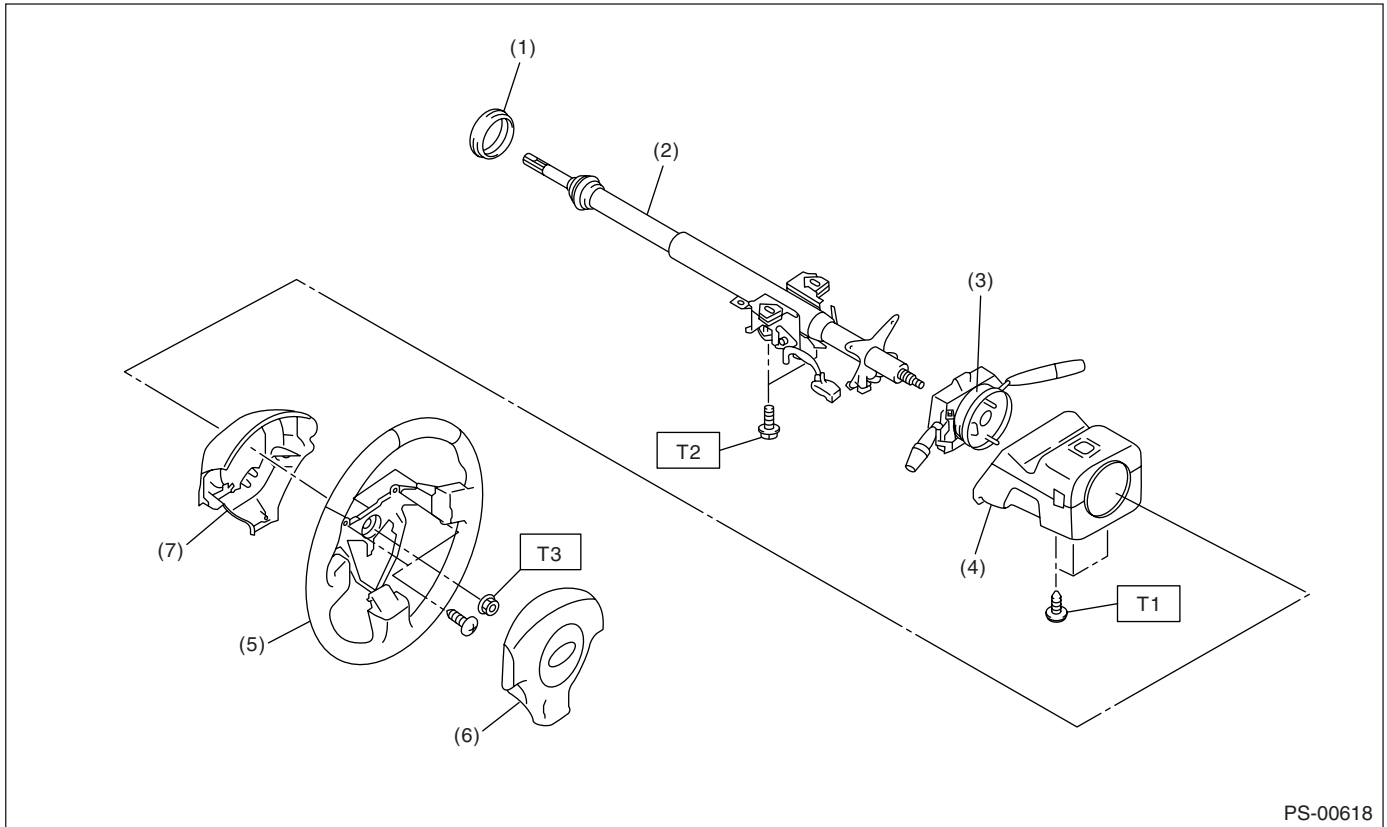
Recommended power steering fluid	Manufacturer
ATF DEXRON III	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

B: COMPONENT

1. STEERING WHEEL AND COLUMN



(1) Bushing	(5) Steering wheel
(2) Steering shaft	(6) Airbag module
(3) Steering roll connector	(7) Steering wheel lower cover
(4) Column cover	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 1.2 (0.12, 0.9)

T2: 25 (2.5, 18.1)

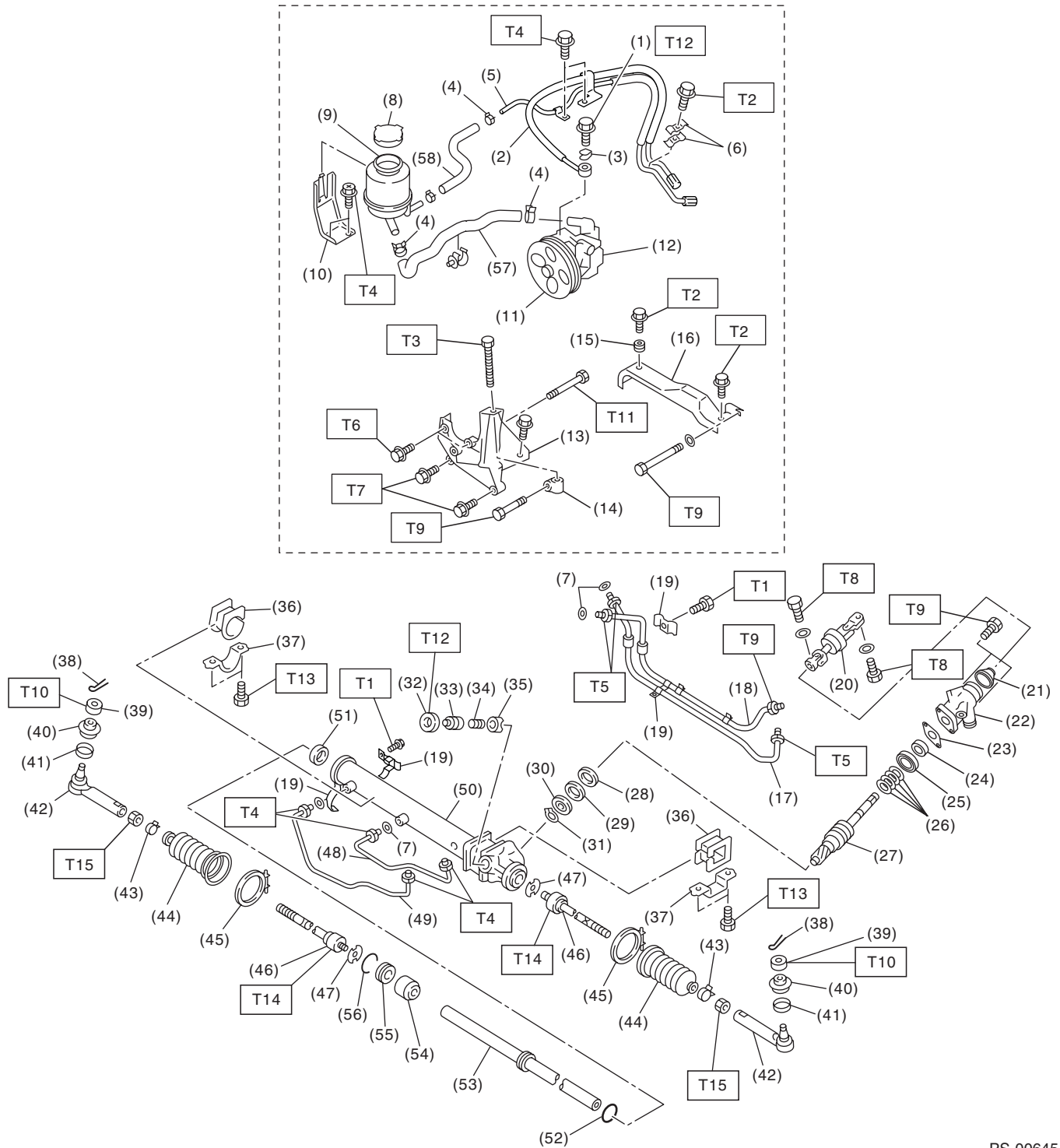
T3: 45 (4.6, 33.2)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

2. POWER ASSISTED SYSTEM

• NON-TURBO MODEL



PS-00645

General Description

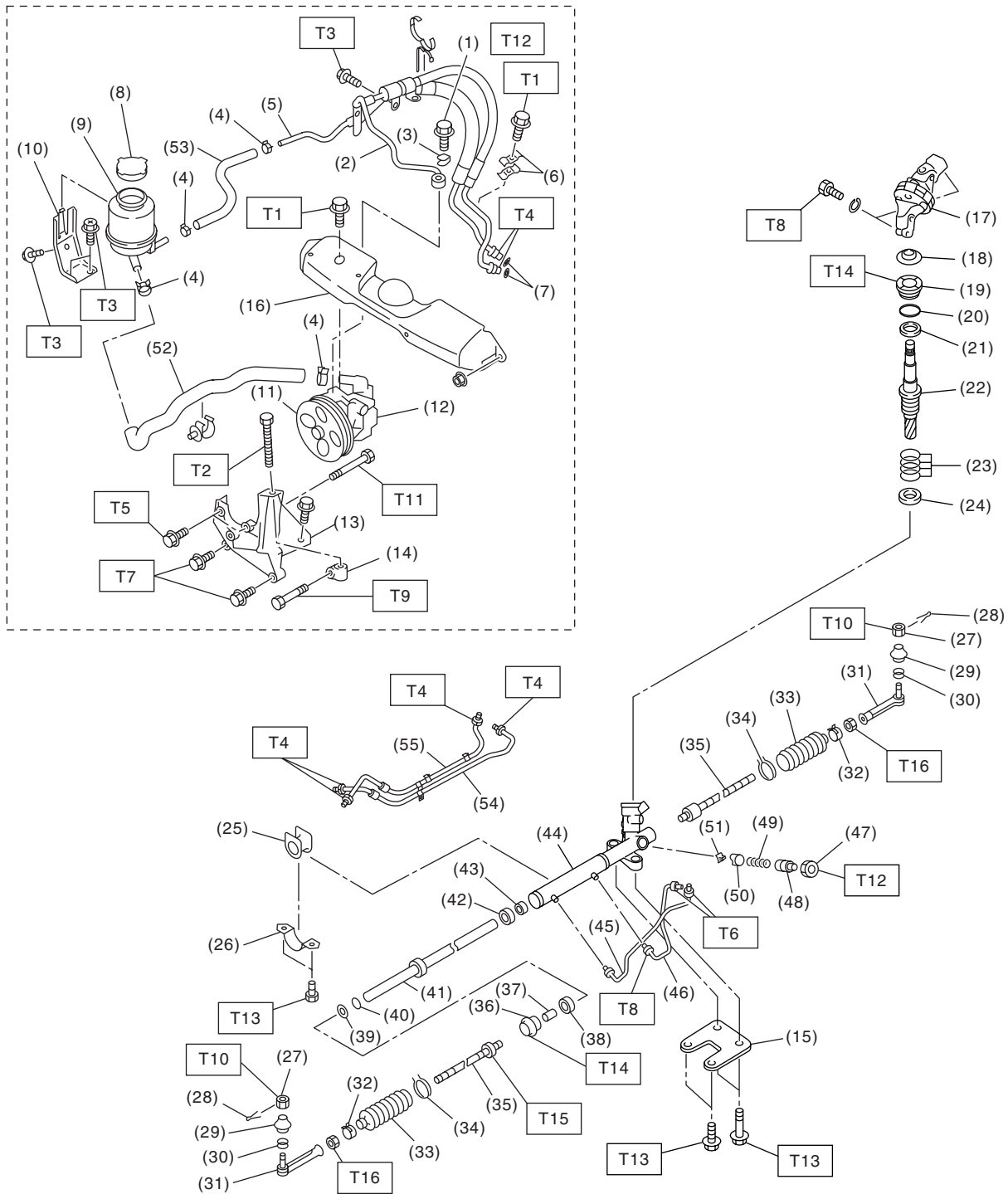
POWER ASSISTED SYSTEM (POWER STEERING)

(1) Eye bolt	(26) Seal ring	(51) Oil seal
(2) Pipe C	(27) Pinion and valve ASSY	(52) Piston ring
(3) Gasket	(28) Oil seal	(53) Rack
(4) Clip	(29) Back-up washer	(54) Rack bushing
(5) Pipe D	(30) Ball bearing	(55) Rack stopper
(6) Clamp E	(31) Snap ring	(56) Snap ring
(7) O-ring	(32) Lock nut	(57) Suction hose
(8) Cap	(33) Adjusting screw	(58) Hose
(9) Reservoir tank	(34) Spring	
(10) Reservoir tank bracket	(35) Sleeve	Tightening torque: N·m (kgf-m, ft-lb)
(11) Pulley	(36) Adapter	T1: 6 (0.6, 4.3)
(12) Oil pump	(37) Clamp	T2: 7.4 (0.75, 5.4)
(13) Bracket	(38) Cotter pin	T3: 8 (0.8, 5.8)
(14) Belt tension nut	(39) Castle nut	T4: 13 (1.3, 9.4)
(15) Bushing	(40) Dust cover	T5: 15 (1.5, 10.8)
(16) Belt cover	(41) Clip	T6: 15.7 (1.6, 11.6)
(17) Pipe E	(42) Tie-rod end	T7: 22 (2.2, 15.9)
(18) Pipe F	(43) Clip	T8: 24 (2.4, 17.4)
(19) Clamp plate	(44) Boot	T9: 25 (2.5, 18.1)
(20) Universal joint	(45) Band	T10: 27 (2.75, 19.9)
(21) Dust seal	(46) Tie-rod	T11: 37.3 (3.8, 27.5)
(22) Valve housing	(47) Lock washer	T12: 40 (4.1, 29.5)
(23) Gasket	(48) Pipe B	T13: 60 (6.1, 44.3)
(24) Oil seal	(49) Pipe A	T14: 78 (8.0, 57.9)
(25) Ball bearing	(50) Steering body	T15: 83 (8.5, 61.5)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

• TURBO MODEL AND STI MODEL



PS-00644

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

- (1) Eye bolt
- (2) Pipe C
- (3) Gasket
- (4) Clip
- (5) Pipe D
- (6) Clamp E
- (7) O-ring
- (8) Cap
- (9) Reservoir tank
- (10) Reservoir tank bracket
- (11) Pulley
- (12) Oil pump
- (13) Bracket
- (14) Belt tension nut
- (15) Stiffener
- (16) Belt cover
- (17) Universal joint
- (18) Dust cover
- (19) Plug
- (20) O-ring
- (21) Oil seal
- (22) Pinion
- (23) Seal ring
- (24) Oil seal
- (25) Adapter

- (26) Clamp
- (27) Castle nut
- (28) Cotter pin
- (29) Dust seal
- (30) Clip
- (31) Tie-rod end
- (32) Clip
- (33) Boot
- (34) Wire
- (35) Tie-rod
- (36) Holder
- (37) Bushing
- (38) Oil seal
- (39) Oil seal
- (40) O-ring
- (41) Rack
- (42) Oil seal
- (43) Back-up washer
- (44) Steering body
- (45) Pipe A
- (46) Pipe B
- (47) Lock nut
- (48) Adjusting screw
- (49) Spring
- (50) Sleeve

- (51) Seat pad
- (52) Suction hose
- (53) Return hose
- (54) Pipe G
- (55) Pipe H

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

T1: 7.4 (0.75, 5.4)

T2: 8 (0.8, 5.8)

T3: 13 (1.3, 9.4)

T4: 15 (1.5, 10.8)

T5: 15.7 (1.6, 11.6)

T6: 20 (2.0, 14.5)

T7: 22 (2.2, 15.9)

T8: 24 (2.4, 17.4)

T9: 25 (2.5, 18.1)

T10: 27 (2.75, 19.9)

T11: 37.3 (3.8, 27.5)

T12: 40 (4.1, 29.5)

T13: 60 (6.1, 44.3)

T14: 64 (6.5, 47.0)

T15: 90 (9.0, 65.1)

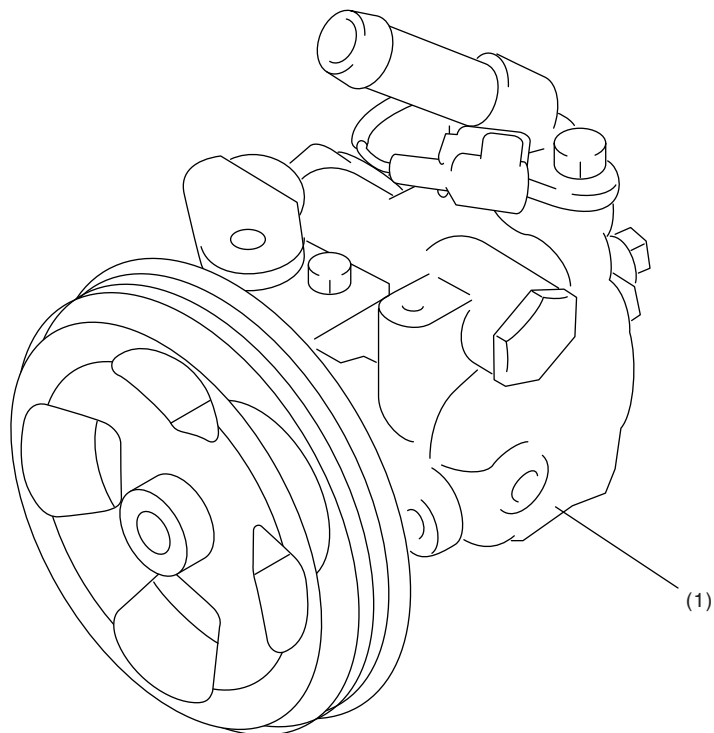
T16: 85 (8.6, 62.2)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

3. OIL PUMP

• NON-TURBO MODEL



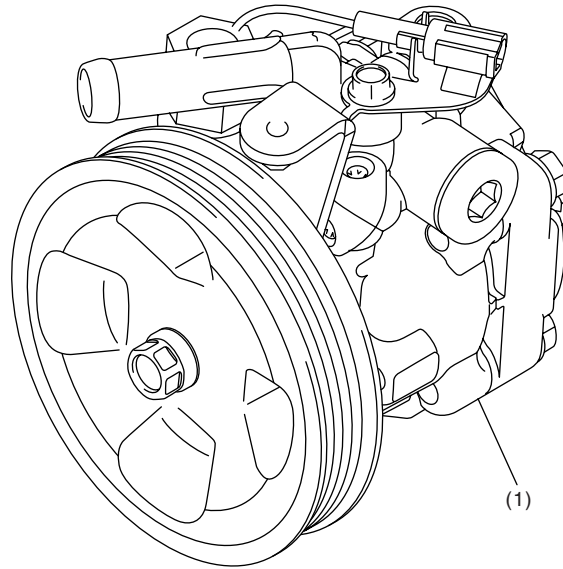
PS-00024

(1) Power steering oil pump ASSY

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

• TURBO MODEL AND STI MODEL



PS-00440

(1) Power steering oil pump ASSY

C: CAUTION

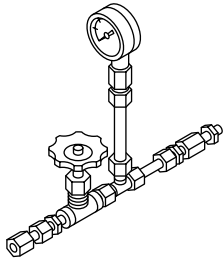
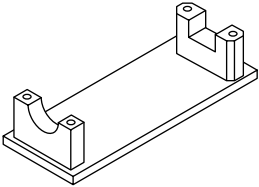
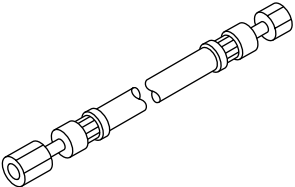
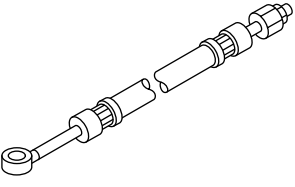
- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use genuine power steering fluid, grease etc. or the equivalent. Do not mix steering fluid, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

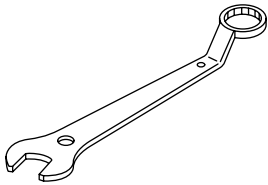
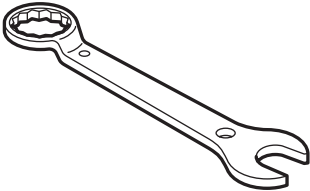
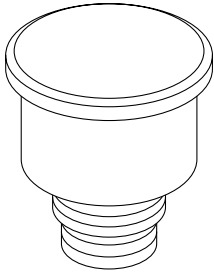
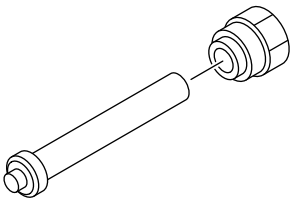
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	- Used when inspecting characteristic of gear-box assembly and disassembling it. - For Non-turbo model.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).

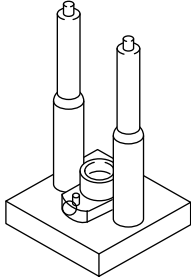
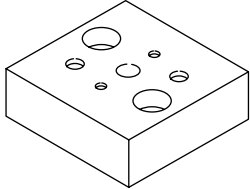
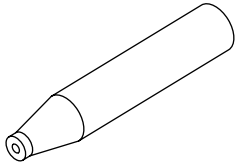
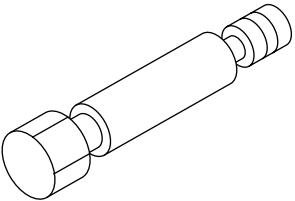
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gear-box.
 ST34099PA100	34099PA100	SPANNER	Used for measuring the rotating resistance of gear-box assembly.
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering fluid.
 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.

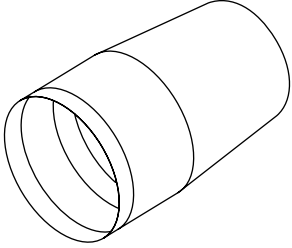
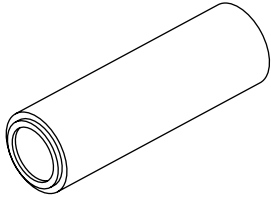
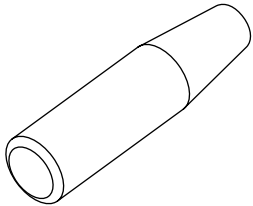
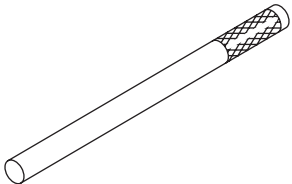
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 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.
 ST-926400000	926400000	GUIDE	- Right side of rack when installing rack bushing. - Used with GUIDE (927660000).

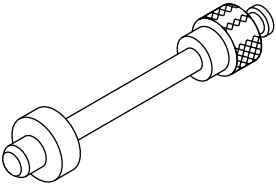
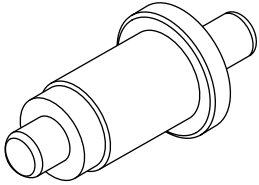
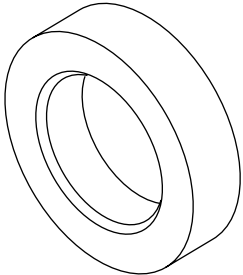
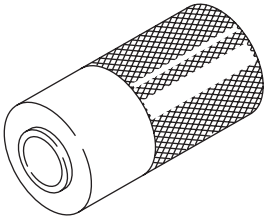
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927660000	927660000	GUIDE	• Right side of rack when installing rack bushing. • Used with GUIDE (926400000).
 ST-927620000	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).
 ST-926360000	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000).
 ST34199AE050	34199AE050	OIL SEAL REMOVER	Used for removing oil seal.

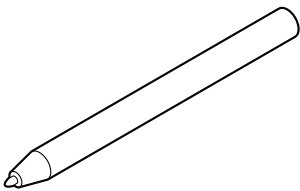
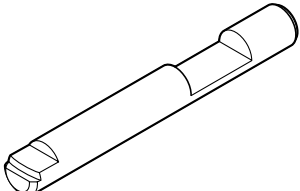
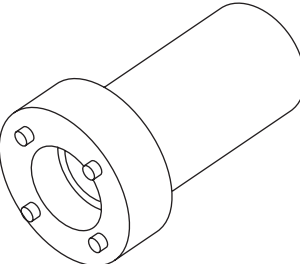
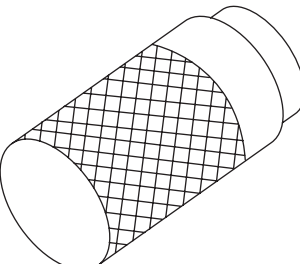
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 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).
 ST-927640000	927640000	INSTALLER B	Used for ball bearing into housing.

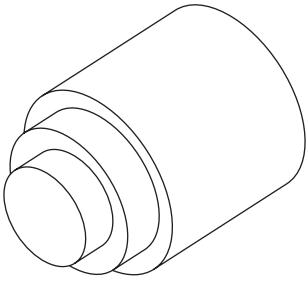
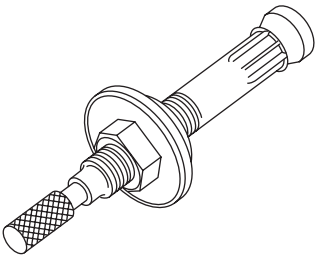
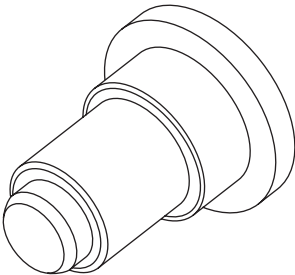
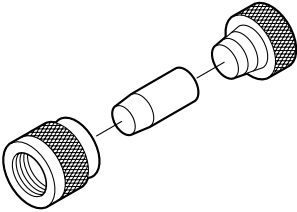
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA060	34099FA060	PUNCH HOLDER	- Used for caulking. - For Turbo model and STI model.
 ST34099FA080	34099FA080	PUNCH	- Used for removing caulking. - For Turbo model and STI model.
 ST34199AE090	34199AE090	PLUG WRENCH	- Used for removing plug. - For Turbo model and STI model.
 ST34199AE100	34199AE100	PLUG OIL SEAL REMOVER	- Used for removing plug oil seal. - For Turbo model and STI model.

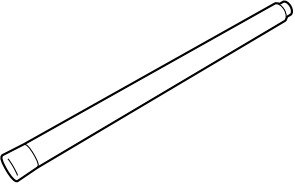
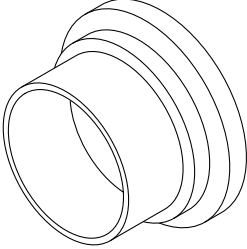
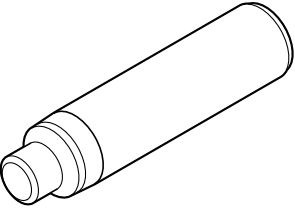
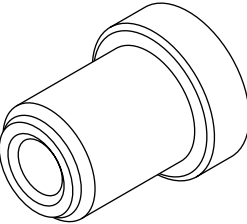
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE110	34199AE110	PLUG OIL SEAL INSTALLER	- Used for installing plug oil seal. - For Turbo model and STI model.
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	- Used for removing gearbox oil seal. - For Turbo model and STI model.
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	- Used for installing gearbox oil seal. - For Turbo model and STI model.
 ST34199FE040	34199FE040	INSTALLER A, B, C	- Used for installing oil seal into rack assembly. - For Turbo model and STI model.

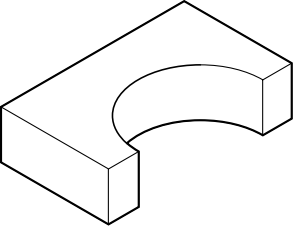
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199FE010	34199FE010	REMOVER	• Used for removing back-up ring and oil seal. • For Turbo model and STI model.
 ST34199FE050	34199FE050	GUIDE	• Used for installing rack and seal into housing assembly. • For Turbo model and STI model.
 ST34199FE000	34199FE000	INSTALLER & REMOVER	• Used for removing and installing rack oil seal (outer & inner). • For Turbo model and STI model.
 ST34199FE060	34199FE060	INSTALLER	• Used for installing rack oil seal (outer). • For Turbo model and STI model.

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199FE020	34199FE020	BASE	• Used for supporting housing assembly. • For Turbo model and STI model.

2. GENERAL TOOL

TOOL NAME	REMARKS
Spring scale	Used for measuring tightening torque.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring steering gearbox.
C-clamp	Used for disassembling and assembling steering gearbox of Turbo model and STI model.

Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

2. Steering Wheel

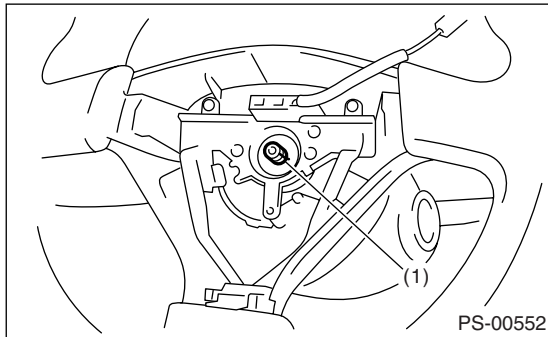
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Set the tires to straight-ahead position.
- 3) Remove the airbag module. <Ref. to AB-14, 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-20, 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.

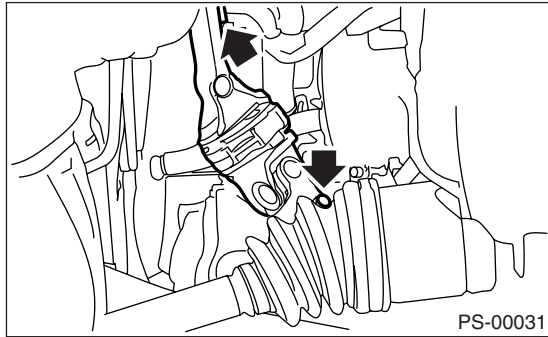
Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

3. Universal Joint

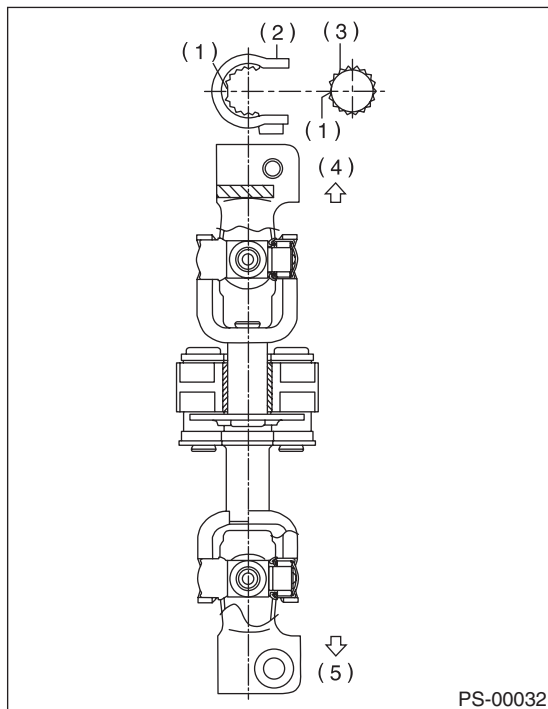
A: REMOVAL

- 1) Remove the steering wheel. <Ref. to PS-20, 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-20, ADJUSTMENT, Roll Connector.>

- 5) Install the steering wheel and airbag module. <Ref. to PS-20, INSTALLATION, Steering Wheel.>

WARNING:

Always refer to “Airbag System” before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

C: INSPECTION

Check for wear, damage, or any other faults. If necessary, replace.

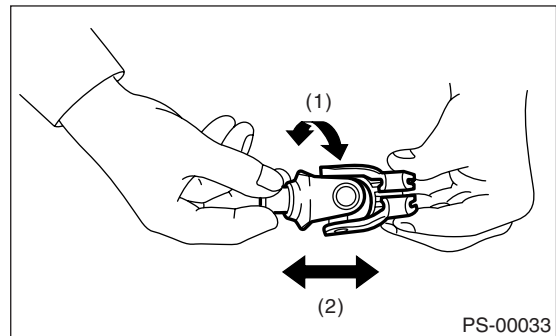
Service limit:

Universal joint play:

0 mm (0 in)

Maximum swing torque:

0.3 N (0.03 kgf, 0.07 lbf)



- (1) Swing torque
- (2) Play

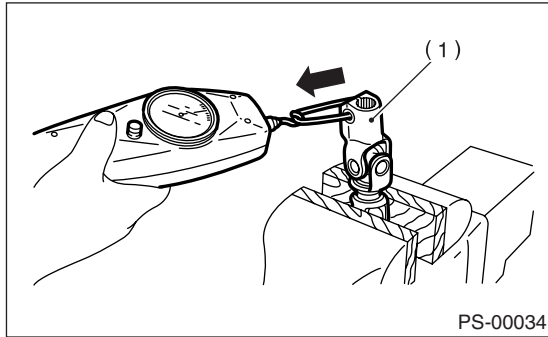
Measurement of swing torque of universal joint is as shown in the figures.

Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

Service limit:

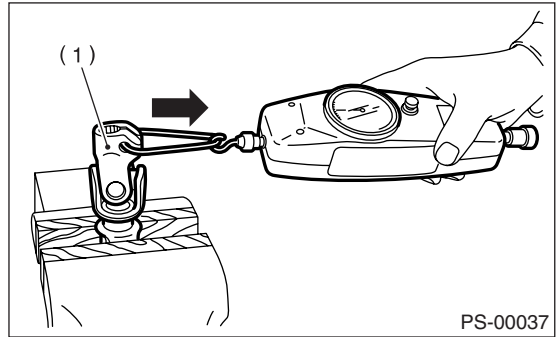
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



(1) Yoke (gearbox side)

Service limit:

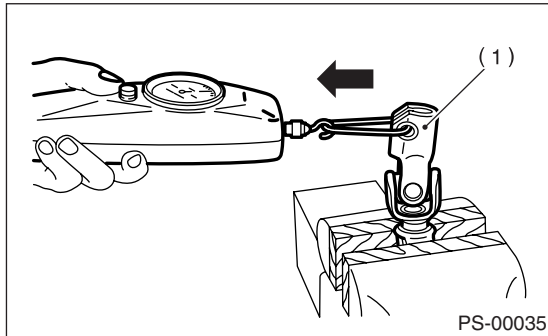
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

Service limit:

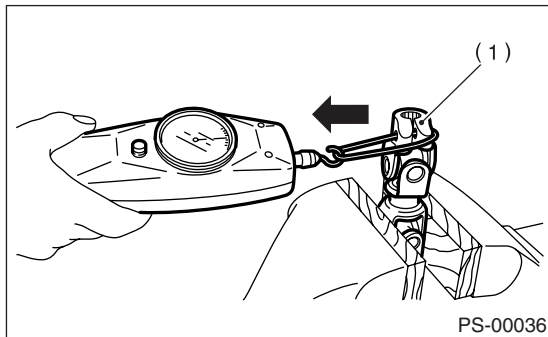
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



(1) Yoke (gearbox side)

Service limit:

Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



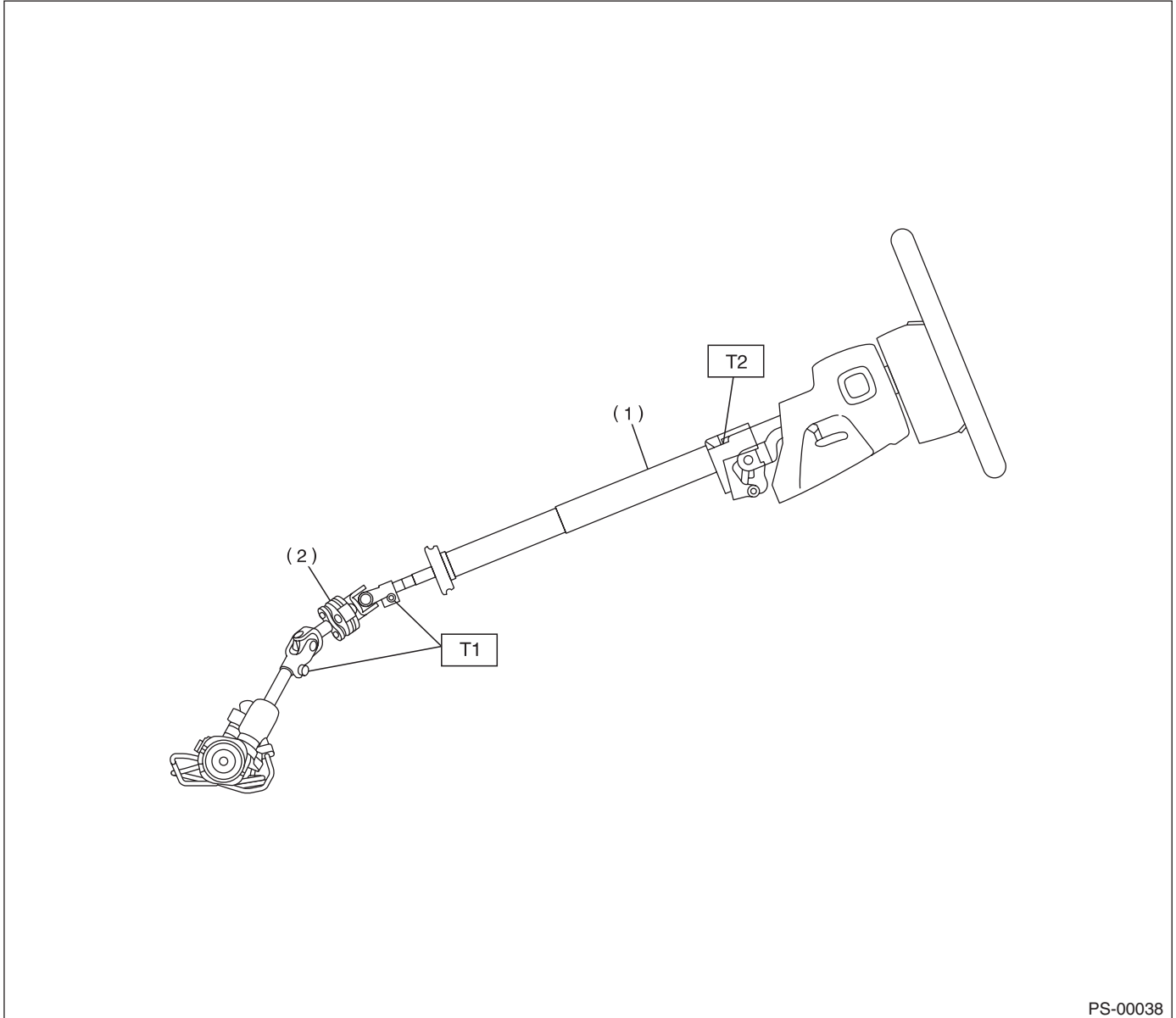
(1) Yoke (Steering column side)

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

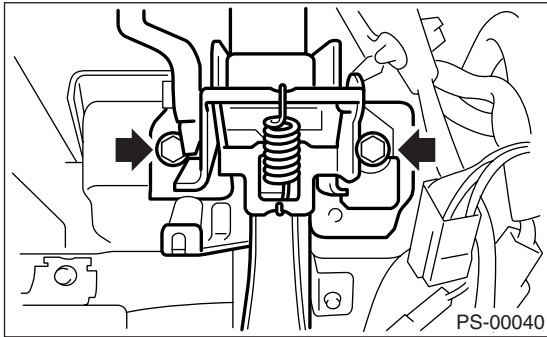
POWER ASSISTED SYSTEM (POWER STEERING)

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the airbag module. <Ref. to AB-14, 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-20, REMOVAL, Steering Wheel.>
- 5) Remove the universal joint. <Ref. to PS-21, 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.



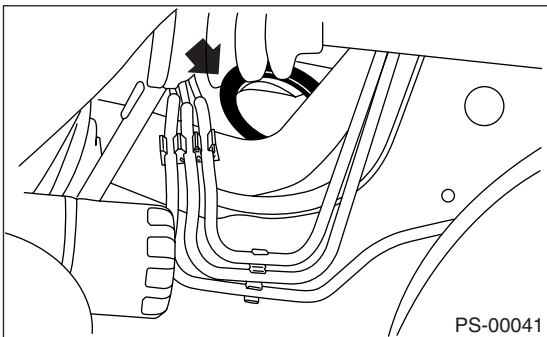
- 10) Pull out the steering shaft assembly from hole on toe board.

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-21, INSTALLATION, Universal Joint.>
- 8) Align center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
- 9) Install the steering wheel. <Ref. to PS-20, INSTALLATION, Steering Wheel.>

CAUTION:

Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

- 10) Install the airbag module to steering wheel.

WARNING:

Always refer to "Airbag System" before performing the service operation. <Ref. to AB-3, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and two screws securing combination switch, and then remove the related parts.

D: ASSEMBLY

- 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

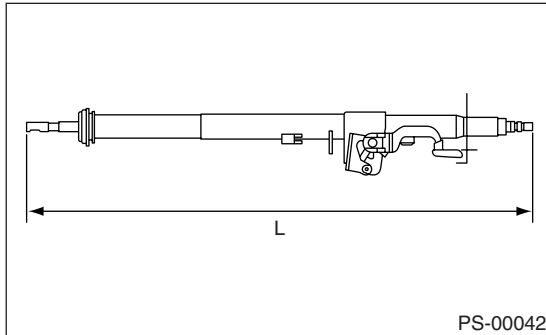
1. BASIC INSPECTION

Measure overall length of the steering column. If not as specified, replace.

Standard value:

Overall length L

$818.7 \pm 1.5 \text{ mm}$ ($32.23 \pm 0.059 \text{ in}$)



PS-00042

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

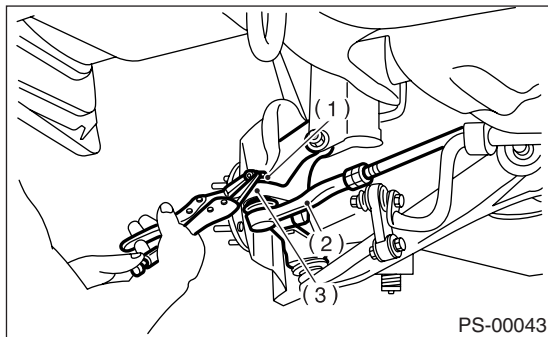
A: REMOVAL

- 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. <Ref. to EI-23, REMOVAL, Front Under Cover.>
- 6) Remove the sub frame. <Ref. to FS-24, REMOVAL, Sub Frame.>
- 7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

WARNING:

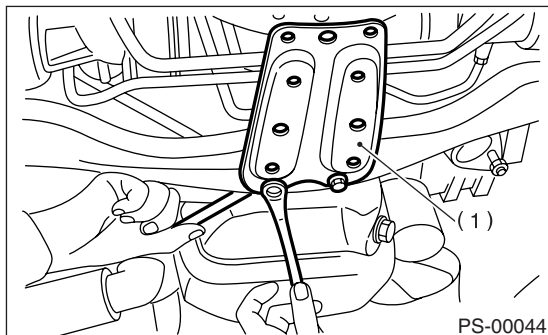
Be careful, the exhaust pipe is hot.

- 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

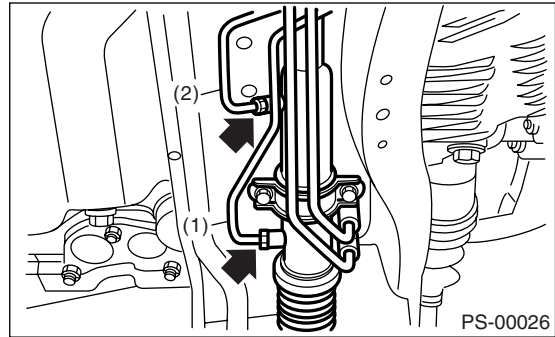
- 9) Remove the jack-up plate and front stabilizer.



- (1) Jack-up plate

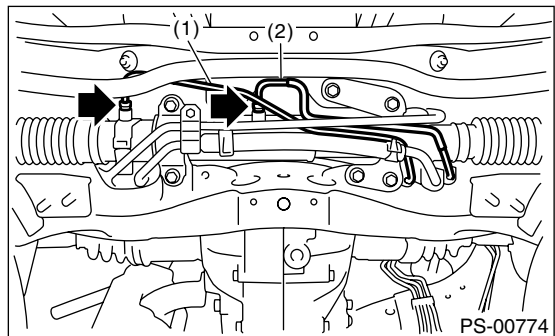
- 10) Remove the one pipe joint at center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

- Non-turbo model



- (1) Pipe A
- (2) Pipe B

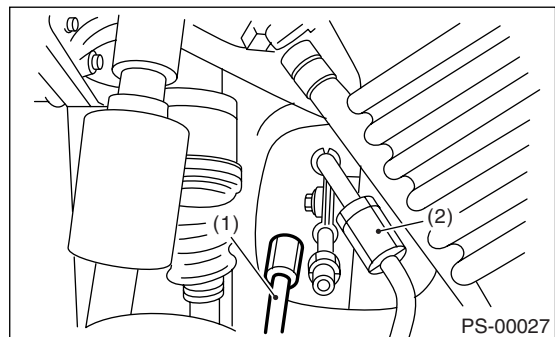
- Turbo model



- (1) Pipe A
- (2) Pipe B

- 11) Remove the universal joint. <Ref. to PS-21, REMOVAL, Universal Joint.>

- 12) Disconnect the lower pipe C from gear box first, and upper pipe D second.



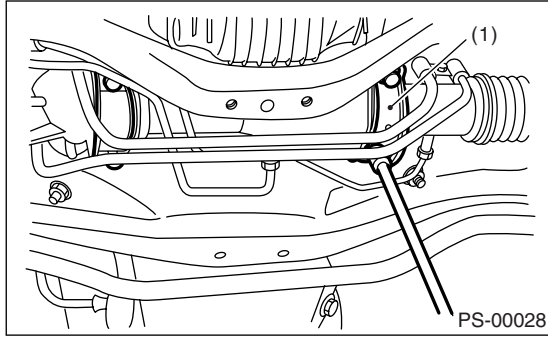
- (1) Pipe C
- (2) Pipe D

- 13) Remove the clamp bolts securing the gearbox to crossmember, and then remove the gearbox.

Steering Gearbox

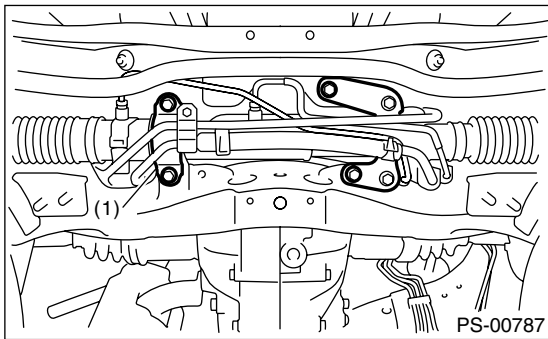
POWER ASSISTED SYSTEM (POWER STEERING)

- Non-turbo model



(1) Clamp

- Turbo model



(1) Clamp

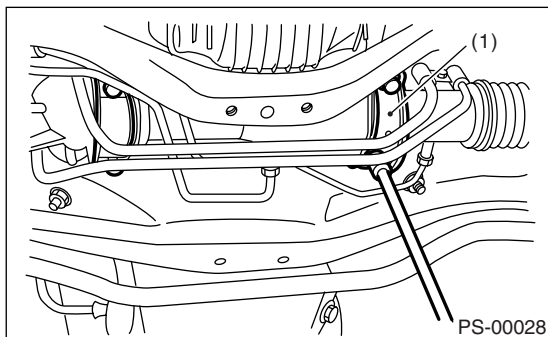
B: INSTALLATION

- 1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.
- 2) Tighten the gearbox to crossmember bracket via clamp with bolts to specified torque.

Tightening torque:

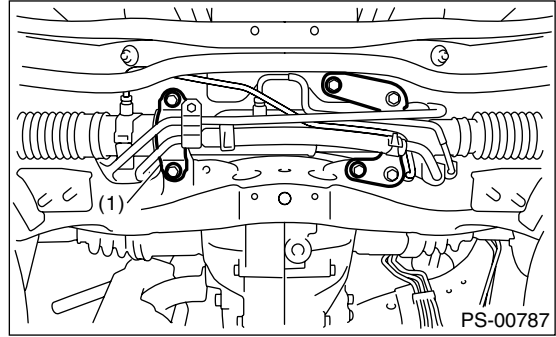
60 N·m (6.1 kgf-m, 44.3 ft-lb)

- Non-turbo model



(1) Clamp

- Turbo model

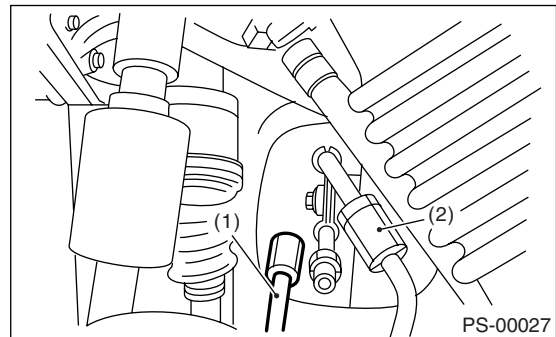


(1) Clamp

- 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-21, INSTALLATION, Universal Joint.>
- 5) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

Tightening torque (Castle nut):

27 N·m (2.75 kgf-m, 19.9 ft-lb)

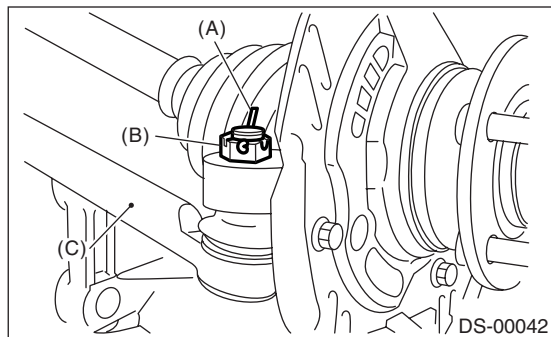
CAUTION:

When connecting, do not hit the cap at bottom of tie-rod end with hammer.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

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-22, INSTALLATION, Front Stabilizer.>

8) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

9) Install the sub frame. <Ref. to FS-24, INSTALLATION, Sub Frame.>

10) Install the under cover. <Ref. to EI-23, INSTALLATION, Front Under Cover.>

11) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

12) Install the steering wheel. <Ref. to PS-20, INSTALLATION, Steering Wheel.>

13) Install the front wheels.

14) Tighten the wheel nuts to specified torque.

Tightening torque:

90 N·m (9.0 kgf-m, 65.1 ft-lb)

15) Connect the battery ground cable to battery.

16) Pour fluid into the oil tank, and bleed air.

<Ref. to PS-68, 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.

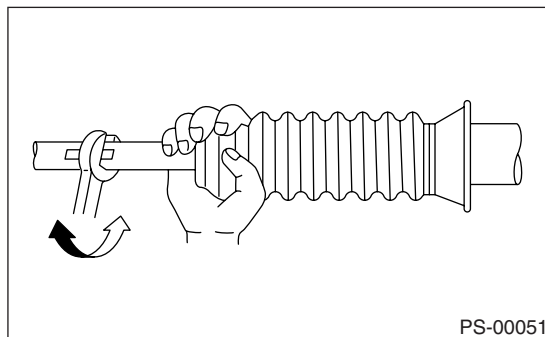
21) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:

83 N·m (8.5 kgf-m, 61.5 ft-lb)

NOTE:

When adjusting the toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

1. NON-TURBO MODEL

• RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:

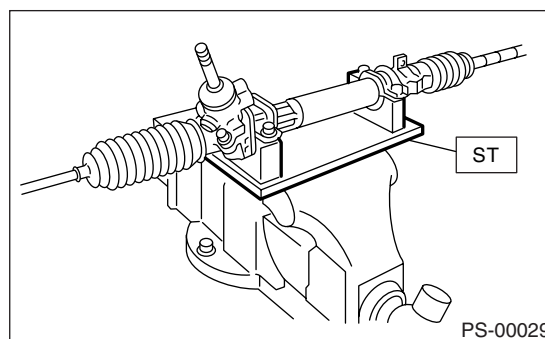
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from vehicle in vice using ST.

ST 926200000 STAND

CAUTION:

Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.

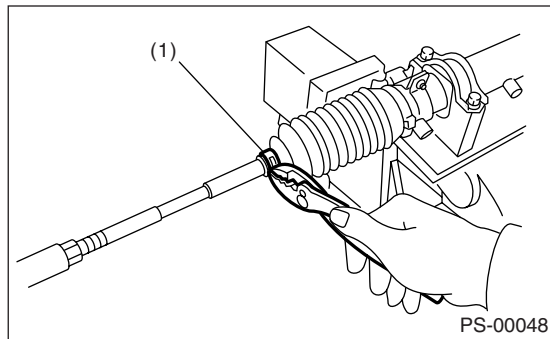


3) Remove the tie-rod end and lock nut from gearbox.

Steering Gearbox

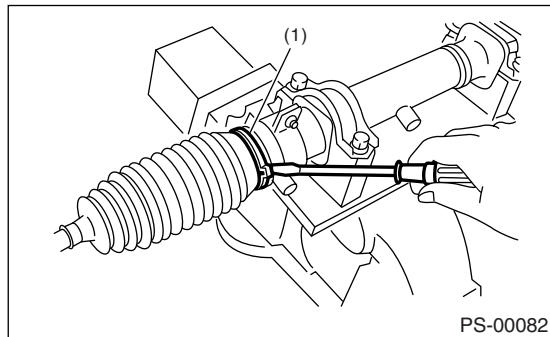
POWER ASSISTED SYSTEM (POWER STEERING)

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.

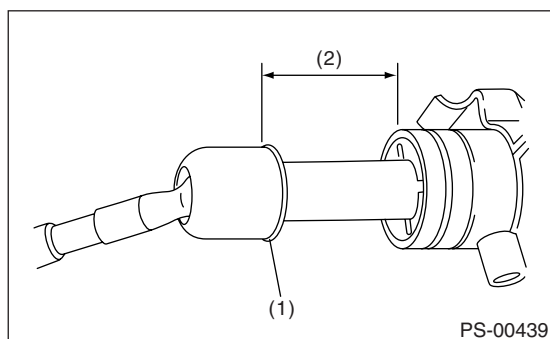


(1) Band

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.

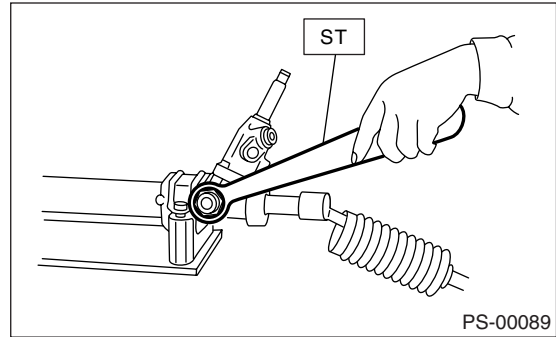


(1) Lock washer

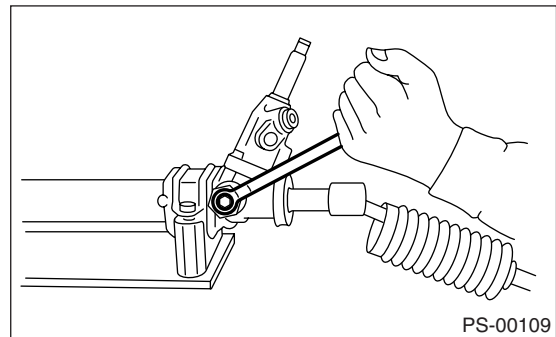
(2) Approx. 40 mm (1.57 in)

7) Using the ST, loosen the lock nut.

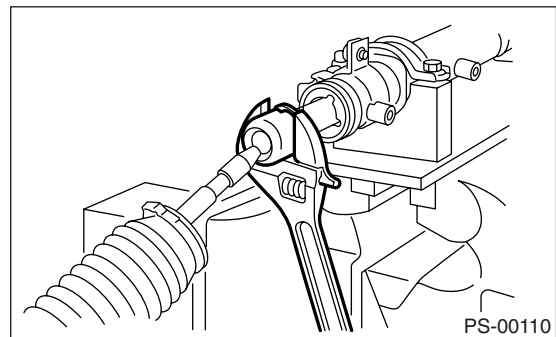
ST 926230000 SPANNER



8) Tighten the adjusting screw until it no longer tightens.

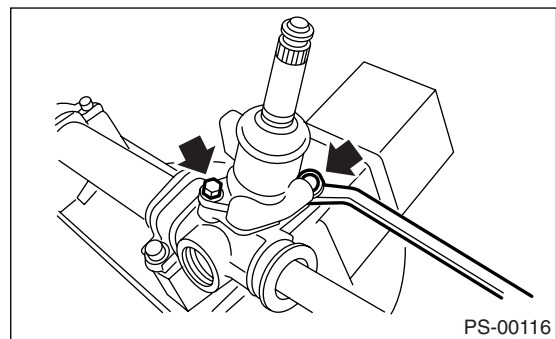


9) Using a wrench [32 mm width across flats] or adjustable wrench, remove the tie-rod.



10) Loosen the adjusting screw, and then remove the spring and sleeve.

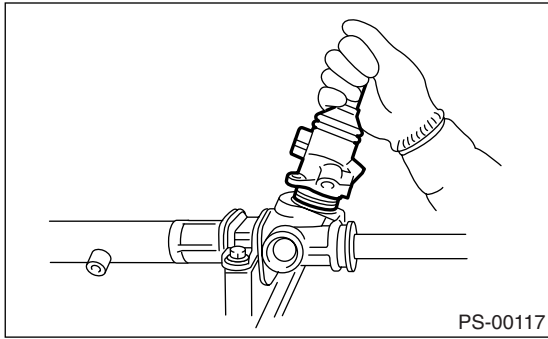
11) Remove the two bolts securing valve assembly.



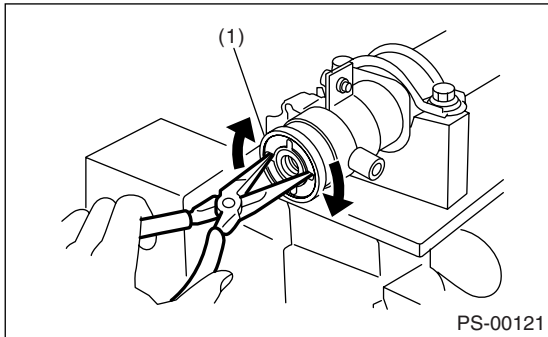
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

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.

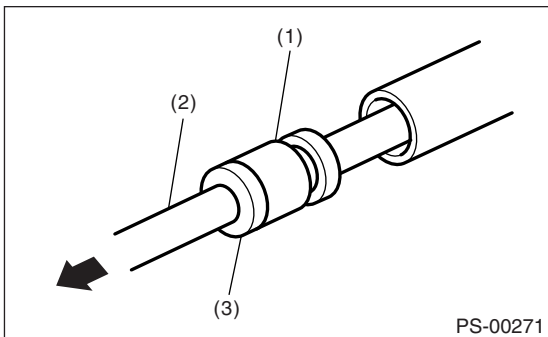


(1) Rack stopper

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.



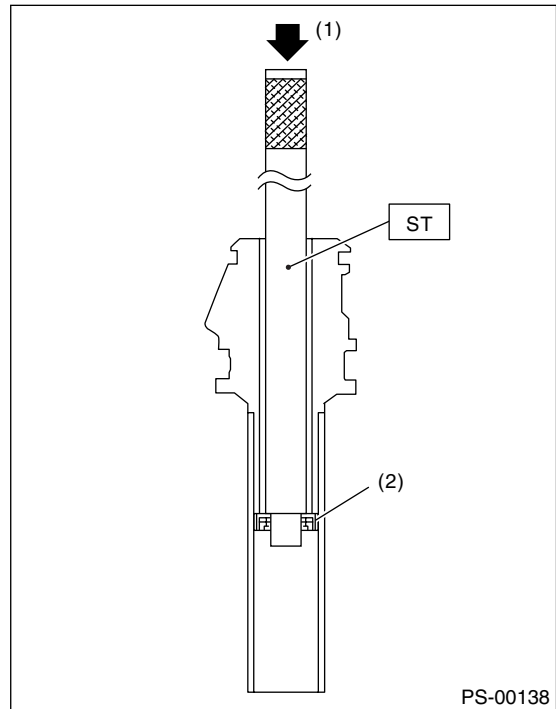
- (1) Rack bushing
- (2) Rack ASSY
- (3) Rack stopper

15) Remove the rack bushing and rack stopper from rack assembly.

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 OIL SEAL REMOVER



- (1) Press
- (2) Oil seal

• CONTROL VALVE ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:

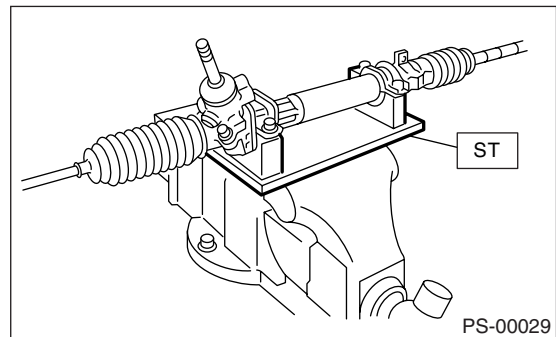
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from the vehicle in vise using ST.

ST 926200000 STAND

CAUTION:

Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.

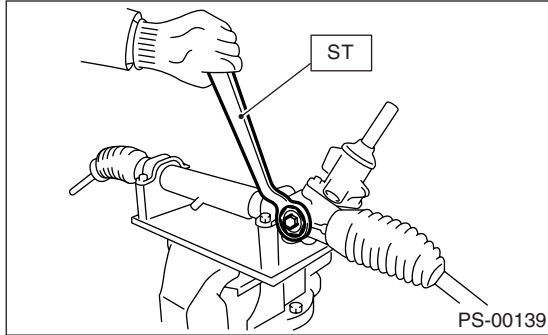


3) Using the ST, loosen the lock nut.

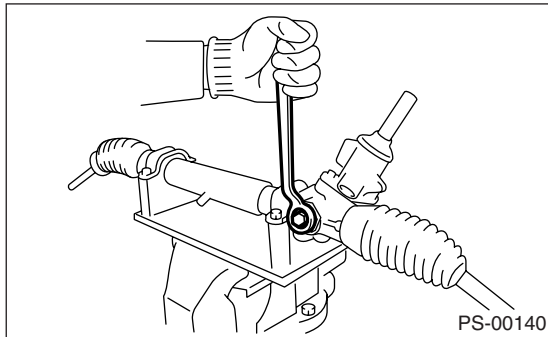
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

ST 926230000 SPANNER

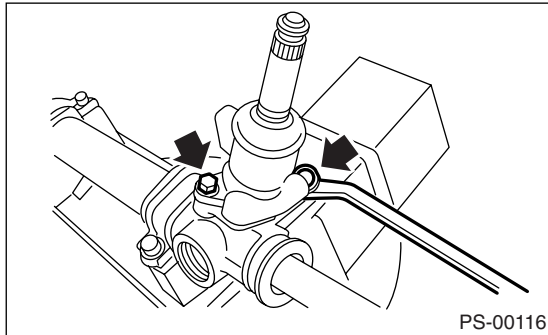


4) Tighten the adjusting screw until it no longer tightens.

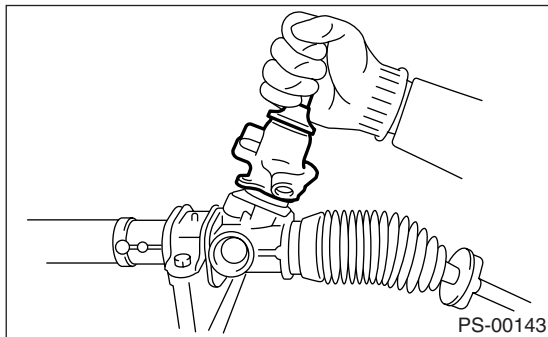


5) Loosen the adjusting screw, and then remove the spring and sleeve.

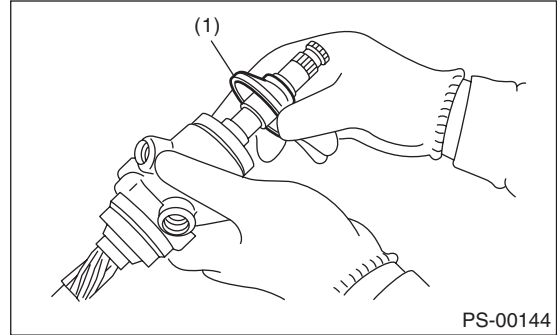
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft, and then remove the valve assembly.

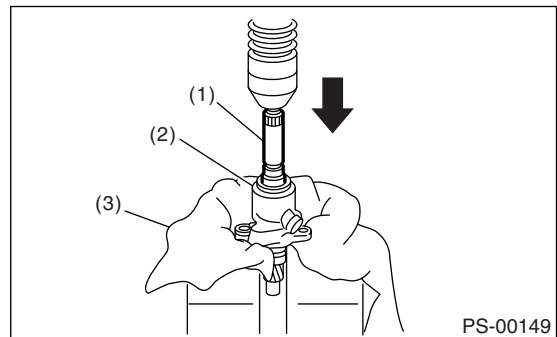


8) Slide the dust cover out.



(1) Dust cover

9) Using a press remove the pinion and valve assembly from valve housing.



(1) Valve ASSY

(2) Valve housing

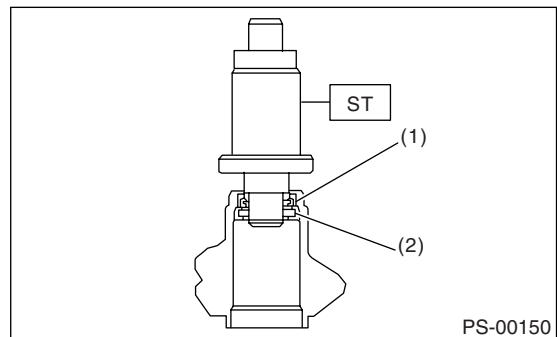
(3) Cloth

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

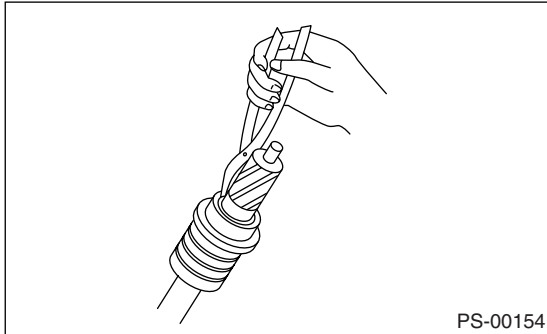
11) Remove the snap ring using snap ring pliers.

Steering Gearbox

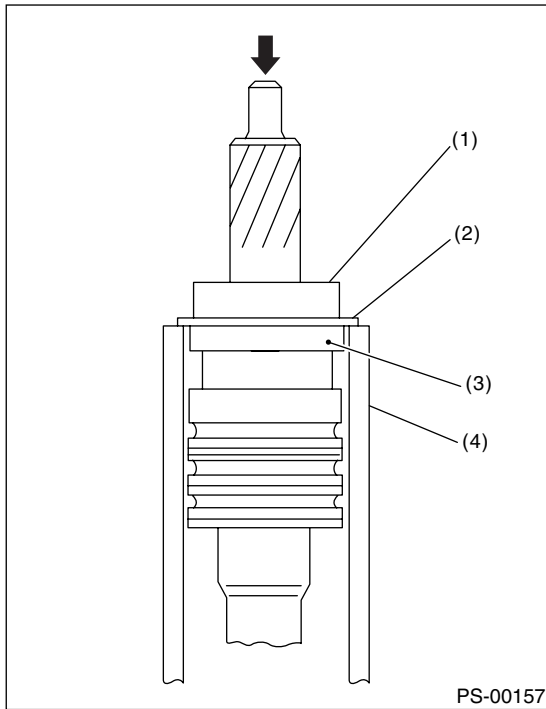
POWER ASSISTED SYSTEM (POWER STEERING)

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.



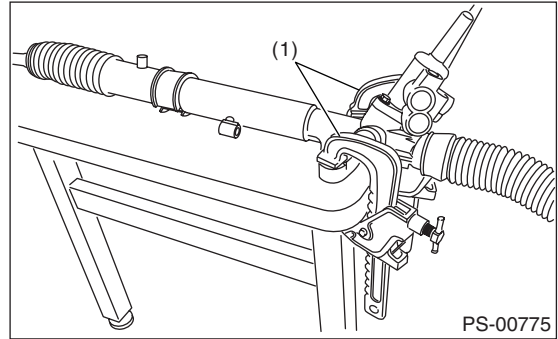
- (1) Bearing
- (2) Backing washer
- (3) Oil seal
- (4) Pipe

13) Remove the oil seal.

2. TURBO MODEL

1) Disconnect the pipes A and B from steering body and control valve housing.

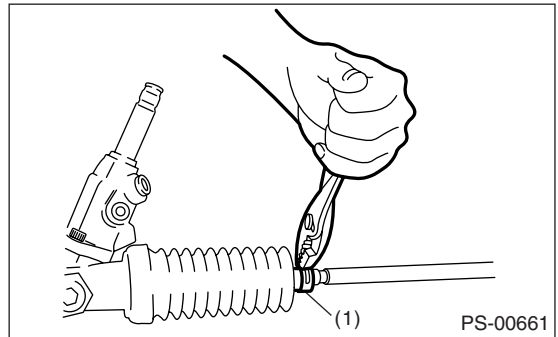
2) Secure the gearbox removed from vehicle using a C-clamp.



(1) C-clamp

3) Remove the tie-rod end and lock nut from gearbox.

4) Remove the clip on outside of boot using pliers, and then slide the boot to tie-rod end side.

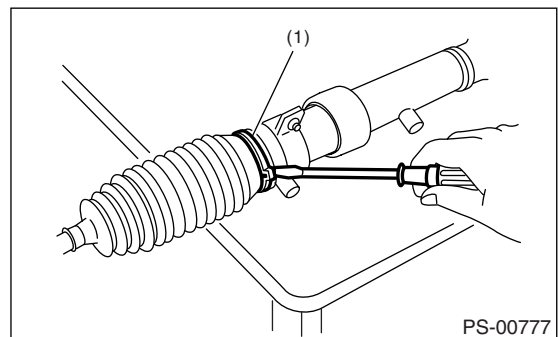


(1) Clip

5) Using flat tip screwdriver, remove the band from boot.

NOTE:

Check the boot for crack, damage or deterioration. Replace the boot with a new one if necessary.



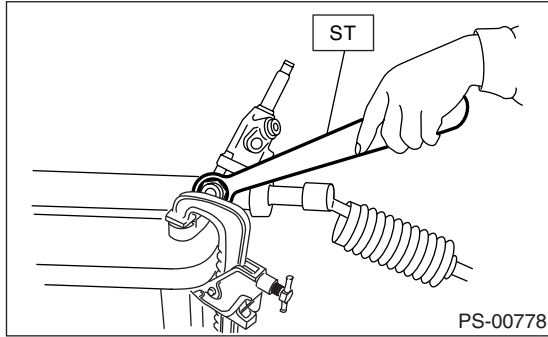
(1) Band

6) Using the ST, loosen lock nut.

Steering Gearbox

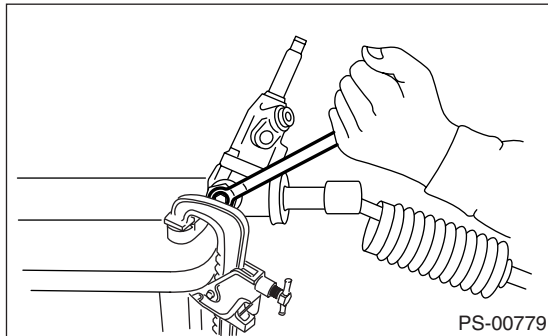
POWER ASSISTED SYSTEM (POWER STEERING)

ST 926230000 SPANNER

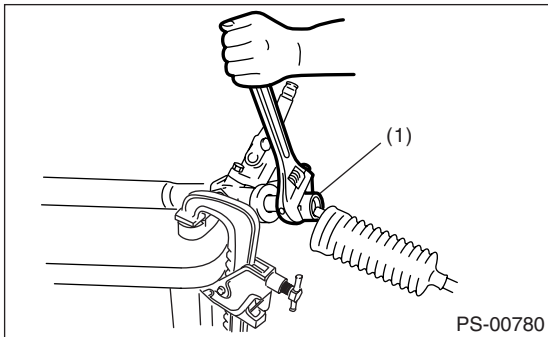


(1) Lock nut

7) Tighten the adjusting screw until it no longer tightens.



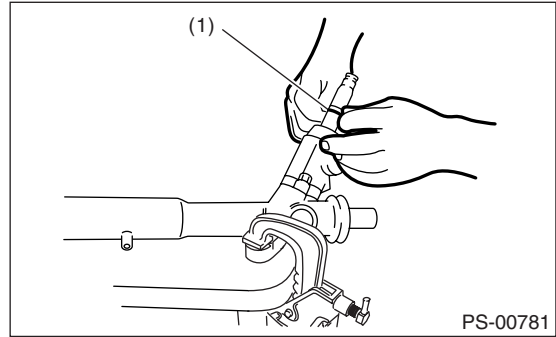
8) Using a wrench (32 mm width across flats) or adjustable wrench with cinching boot, remove the tie-rod.



(1) Tie-rod

9) Loosen the adjusting screw, and then remove the spring and sleeve.

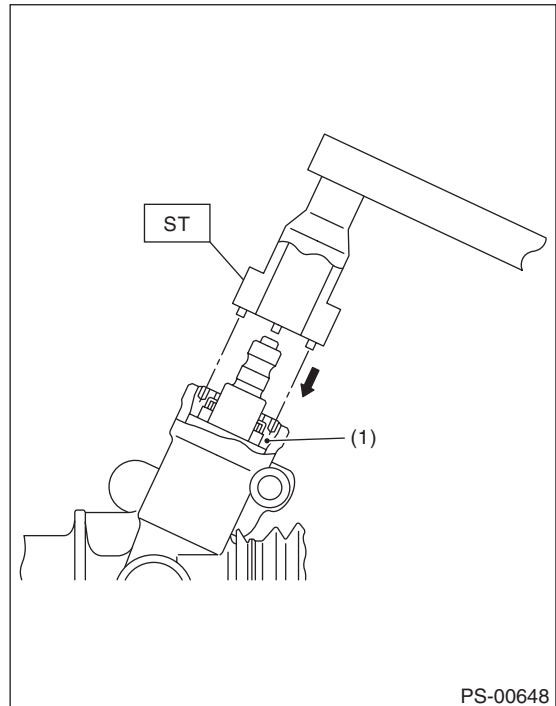
10) Clean the dirt of input shaft. Remove the dust cover taking care not to scratch the housing or input shaft and allow foreign matter to enter gear box interior.



(1) Dust cover

11) Align the ST pin to plug hole to install. Rotate the ST counterclockwise to remove plug.

ST 34199AE090 PLUG WRENCH

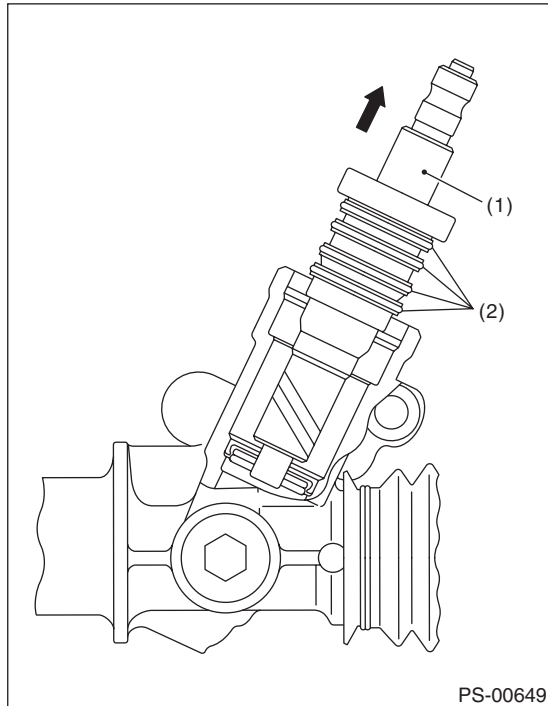


(1) Plug

Steering Gearbox

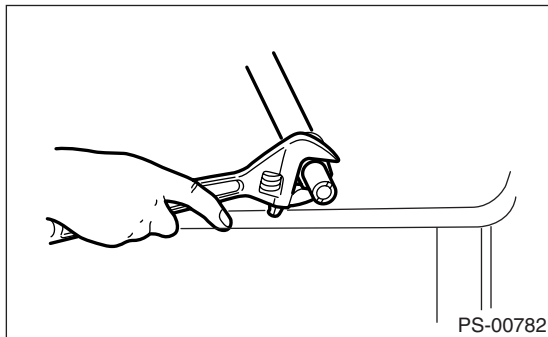
POWER ASSISTED SYSTEM (POWER STEERING)

12) Remove the valve assembly taking care not to scratch seal ring and valve housing inner surface.



- (1) Valve ASSY
- (2) Seal ring

13) Remove the holder using a wrench (36 mm width across flats) or adjustable wrench.

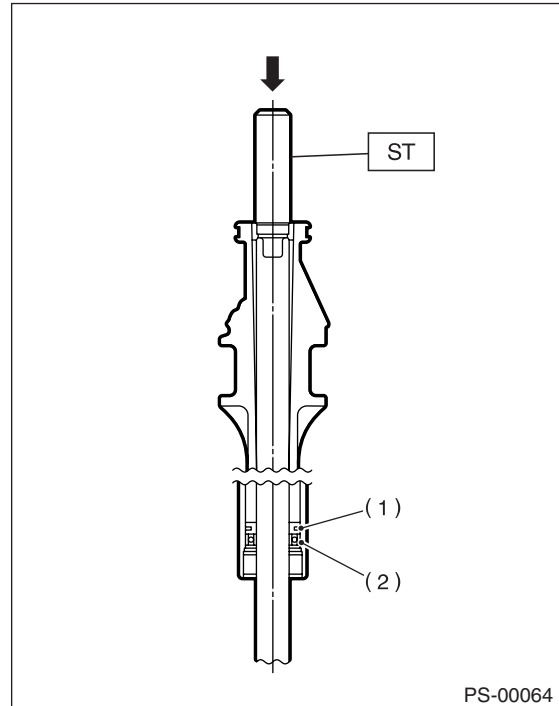


14) Install the ST on valve side of rack and press outer side oil seal out taking care not to contact rack with steering body inner surface.

ST 34199FE000 INSTALLER & REMOVER

NOTE:

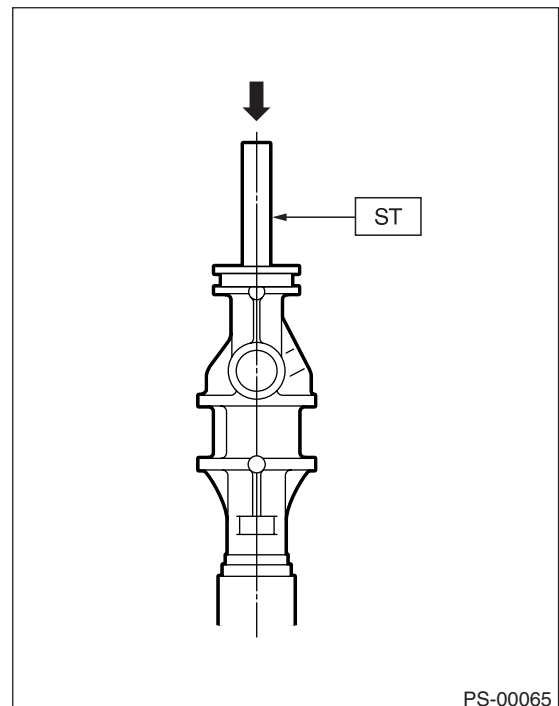
Block the pipe connection of steering body to prevent fluid from flowing out.



- (1) Rack piston
- (2) Outer side oil seal

15) Insert the ST from valve side and press back-up ring and oil seal out.

ST 34199FE010 REMOVER



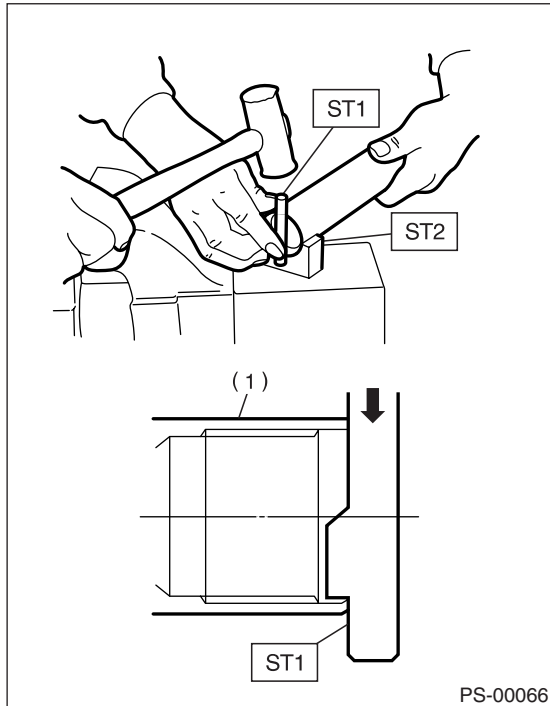
16) Using the ST1 and ST2, repair the cylinder's clinched sections.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

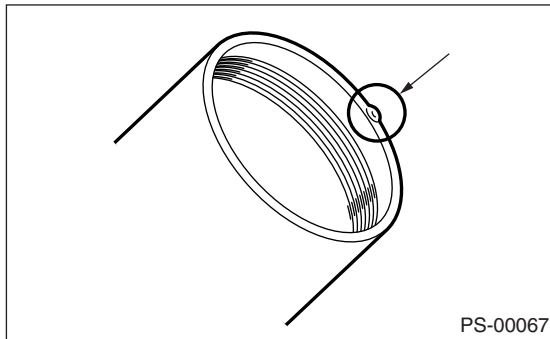
ST1 34099FA080 PUNCH
ST2 34199FE020 BASE

NOTE:
Do not apply force on the plug edge surface.



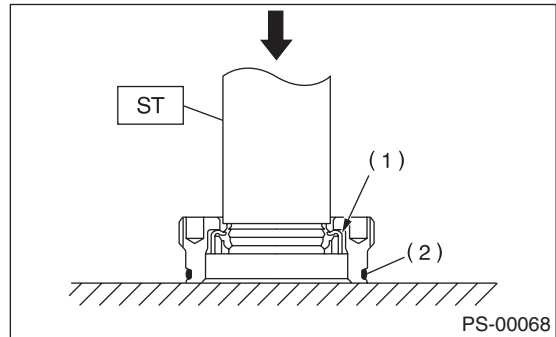
(1) Cylinder

17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



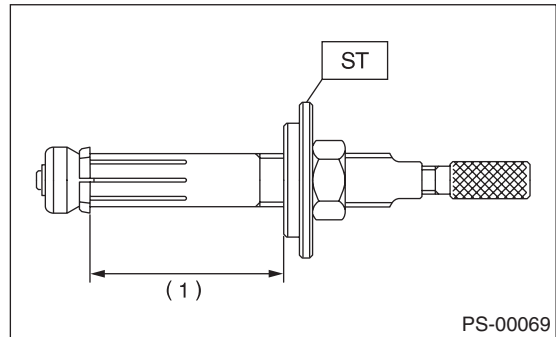
18) Remove the oil seal using ST and press from plug.

ST 34199AE100 PLUG OIL SEAL REMOVER



19) Set the ST on drawing dimension.

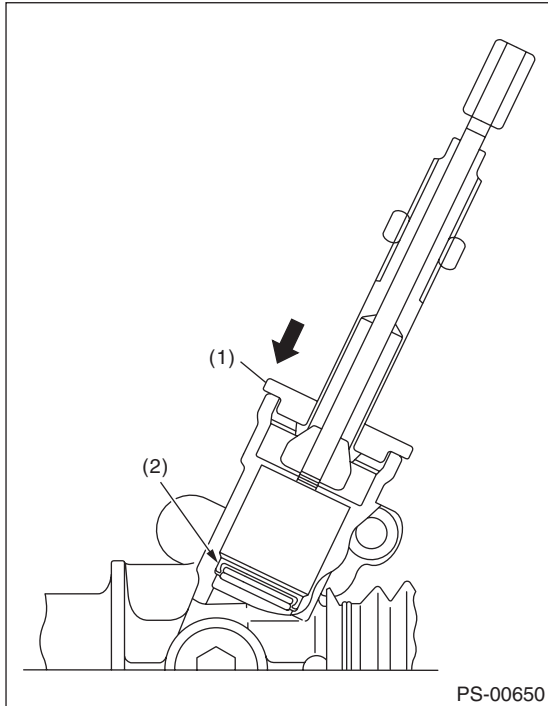
ST 34199AE120 GEARBOX OIL SEAL RE-
MOVER



Steering Gearbox

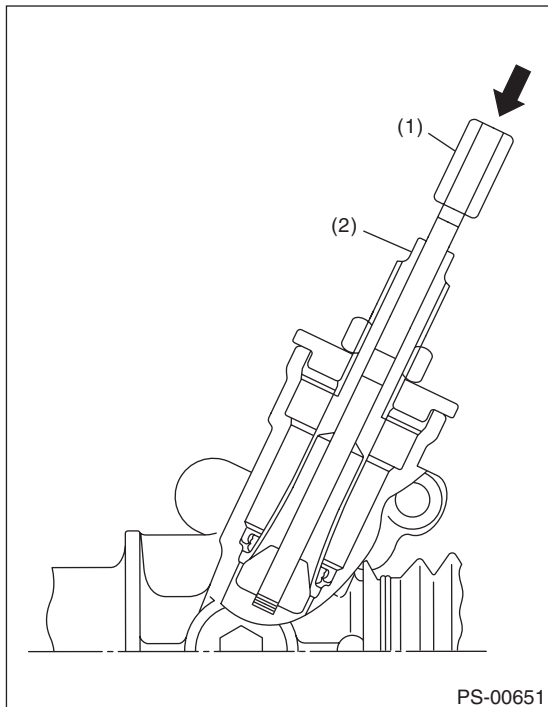
POWER ASSISTED SYSTEM (POWER STEERING)

20) Set the stopper to gear box, and then insert the tip of ST to gear box.



- (1) Stopper
- (2) Oil seal

21) By fixing the 2-surface width, press in by rotating the rod and attach to oil seal.

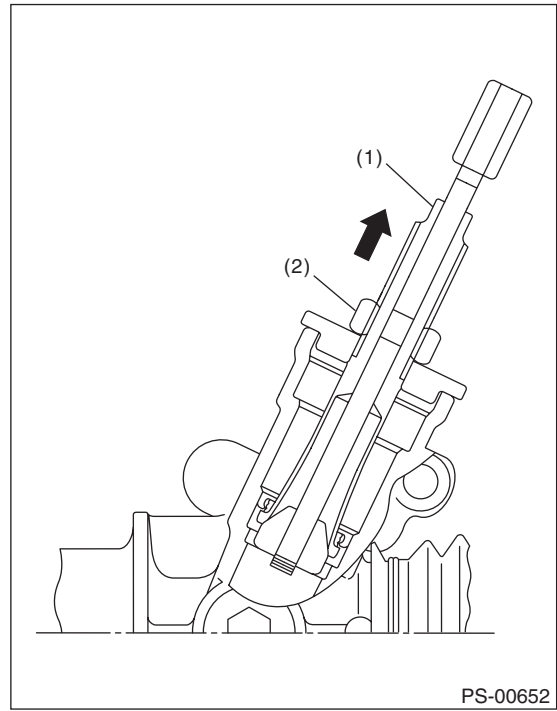


- (1) Rod
- (2) 2-surface width

22) While fixing the 2-surface width, pull out the oil seal by rotating nut.

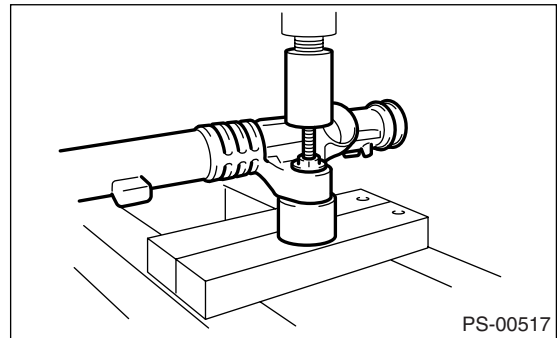
CAUTION:

Take care not to scratch the gear box inner surface.



- (1) 2-surface width
- (2) Nut

23) Using a press, remove the bushing of gearbox installation portion.



Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

D: ASSEMBLY

1. NON-TURBO MODEL

• RACK HOUSING ASSEMBLY

CAUTION:

Use only genuine grease for the gearbox.

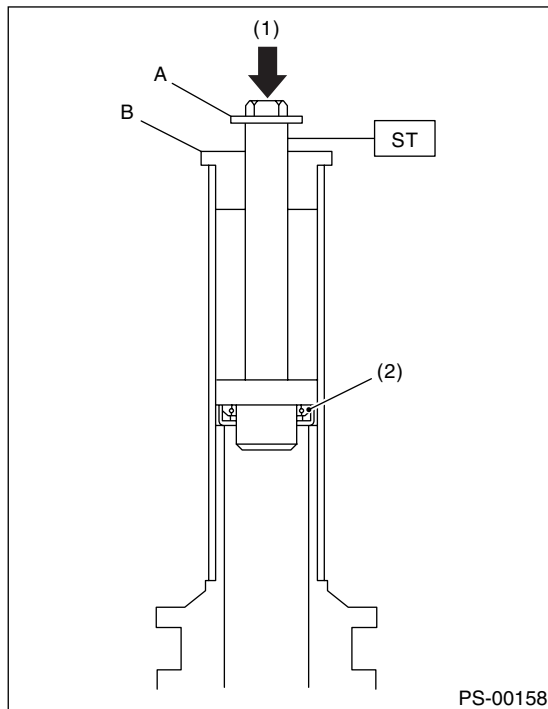
Specified grease for gearbox:

VALIANT GREASE M-2 (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.



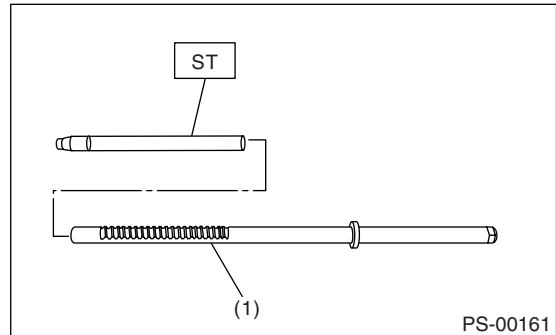
- (1) Press
(2) Oil seal

- 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 ASSY



- (1) Rack ASSY

- 5) Apply genuine grease to the teeth of thoroughly washed rack assembly, and then fit the ST over the toothed portion.

CAUTION:

- Be careful not to block the air passage with grease. Remove excessive grease.
- After fitting cover, check the air passage hole for clogging. If clogged, open by removing grease from the hole.

- 6) Before inserting the rack assembly, apply a coat of specified power steering fluid to the surfaces of ST and rack piston.

- 7) Insert the rack assembly into rack housing from cylinder side, and then remove the ST after it has passed completely through oil seal.

- 8) Fit the ST1 and ST2 over the end of rack, and then install a new rack bushing.

ST1 926400000 GUIDE
ST2 927660000 GUIDE

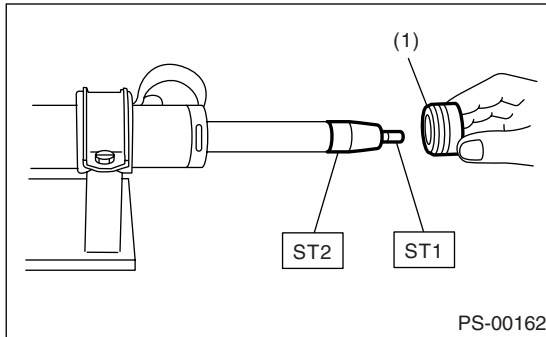
CAUTION:

- If burrs or nicks are found on this guide and rack shaft portion, remove by filing.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

- 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 ASSY

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.

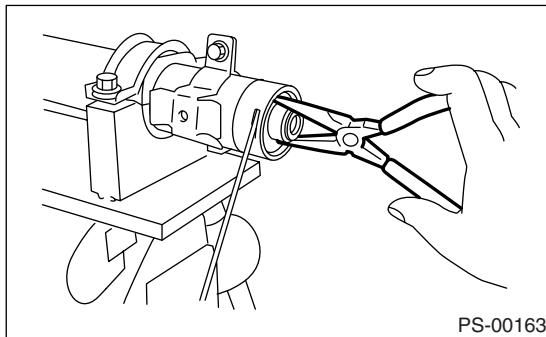
10) Insert the rack stopper into the rack housing, and then wrap a new circlip using a sharp pointed pliers to secure the rack stopper in position.

CAUTION:

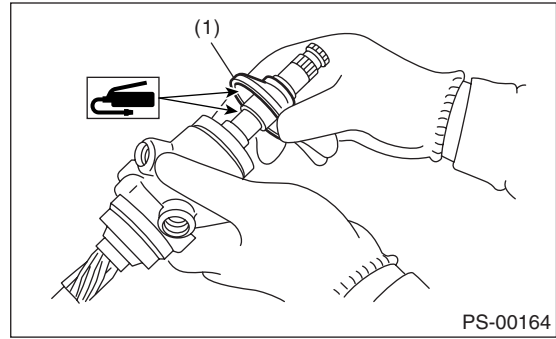
Be careful not to scratch the rack while winding circlip.

NOTE:

Rotate the wrench another 90 to 180° after end of circlip has been wrapped in.

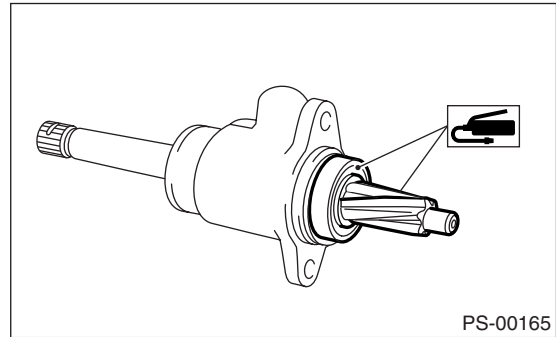


11) Apply genuine grease to dust cover, and then install the dust cover to valve assembly.

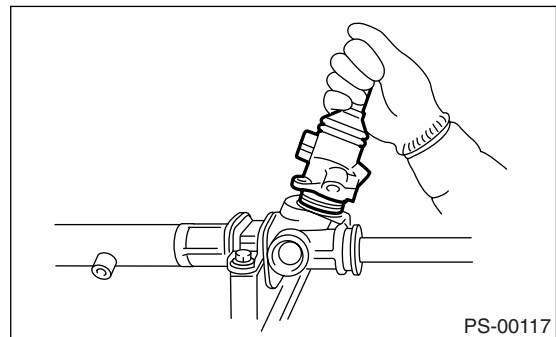


(1) Dust cover

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.

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.

Steering Gearbox

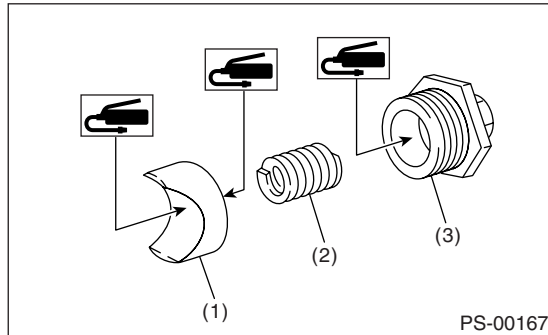
POWER ASSISTED SYSTEM (POWER STEERING)

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°.

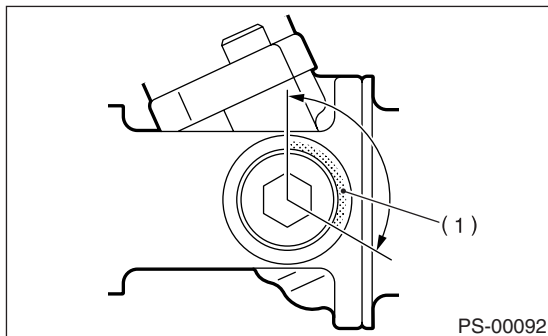
19) Remove the tie-rod.

20) Verify that play is within specified value. <Ref. to PS-51, 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 (Part No. 004403006)



- (1) Apply liquid gasket to at least 1/3 of entire perimeter.

22) Tighten the adjusting screw to specified torque.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

23) After tightening to the specified tightening torque, loosen it by 25°.

24) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):

40 N·m (4.1 kgf-m, 29.5 ft-lb)

NOTE:

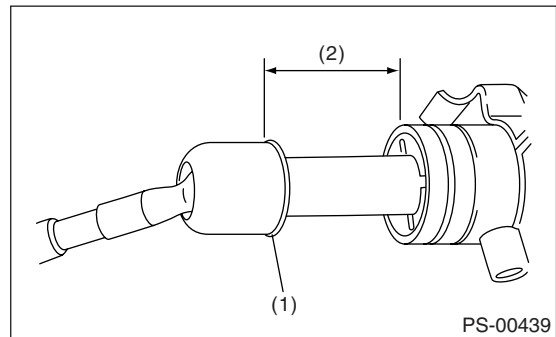
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

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)

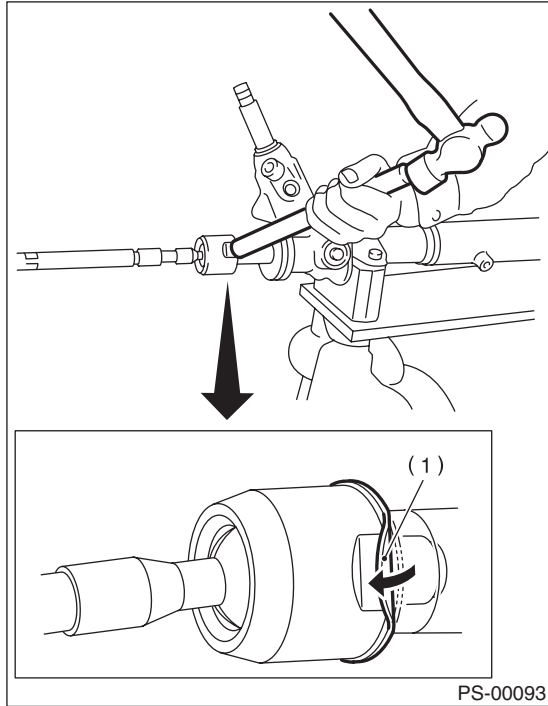
27) Bend the lock washer.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

Be careful not to scratch the rack when bending lock washer.

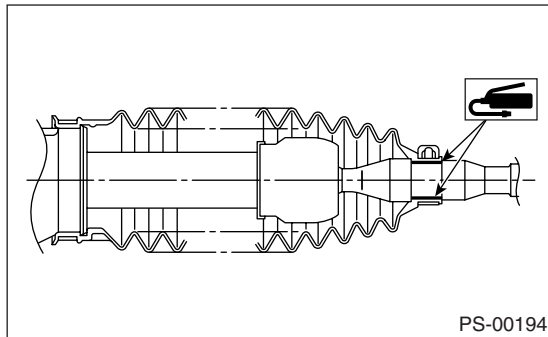


(1) Lock washer

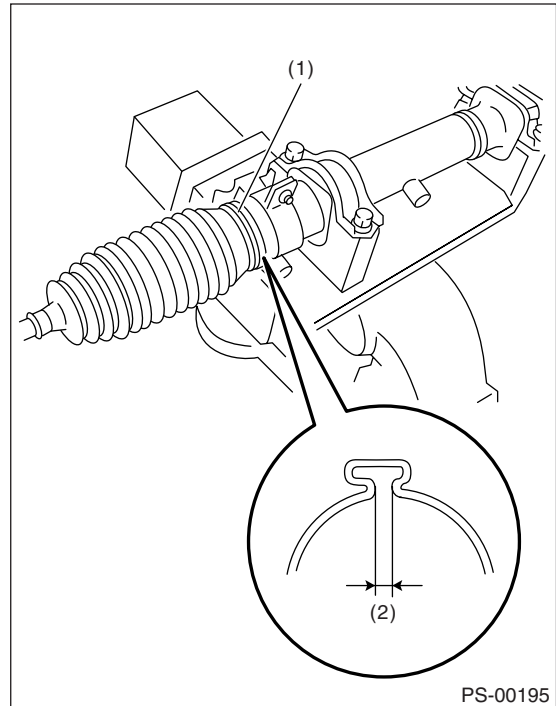
28) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:

Make sure that the boot is installed without unusual inflation or deflation.



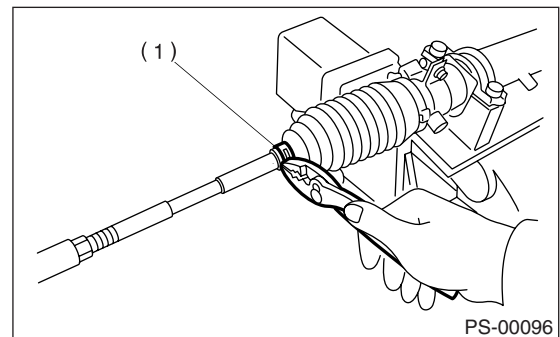
29) Install a new boot band. Using band clamp pliers, caulk the boot band until caulking part clearance is 2 mm (0.079 in) or less.



(1) Boot band

(2) 2 mm (0.079 in) or less

30) Fix the boot end with clip (small).



(1) Clip

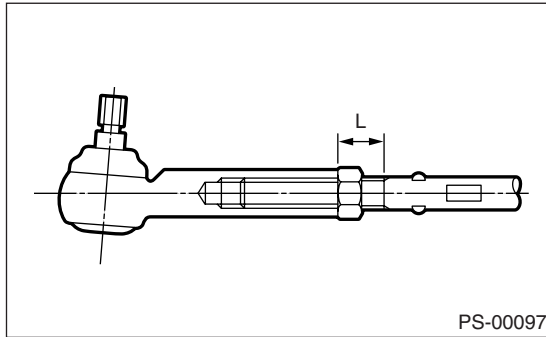
31) After installing, check the boot end is positioned into groove on tie-rod.

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.

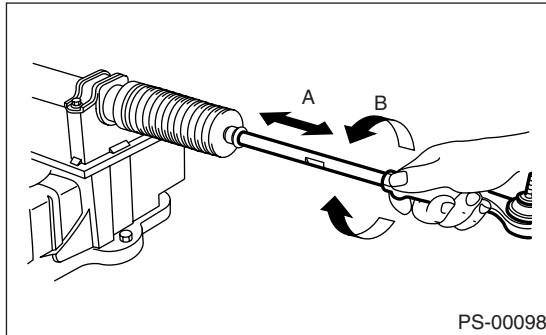
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

Installed tie-rod length L:
15 mm (0.59 in)



33) Inspect the gearbox as follows:
“A” Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
“B” Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that the boot is installed in specified position without deflation.



34) Remove the gearbox from ST.

ST 926200000 STAND

35) Install the four pipes on gearbox.

(1) Connect the pipe A and B to four pipe joints of gearbox.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect the pipe E and F to gearbox.

Tightening torque:

Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

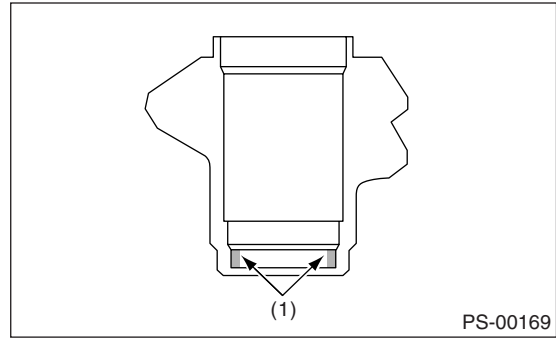
• CONTROL VALVE ASSEMBLY

Specified steering grease:

VALIANT GREASE M-2 (Part No. 003608001)

1) Clean all parts and tools before reassembling.

2) Apply a coat of specified power steering fluid to the inner wall of valve housing.



(1) Apply fluid.

3) Attach the ST2 to ST1.

ST1 34099FA120 INSTALLER & REMOVER
SEAL

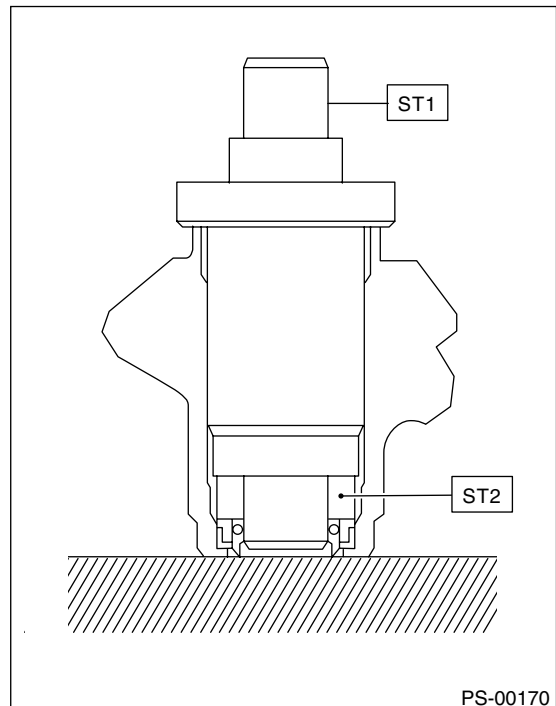
ST2 34099FA130 INSTALLER SEAL

4) To avoid scratching the oil seal, apply a coat of grease to the contact surface of installer and oil seal.

5) Verify the oil seal direction.

Attach the oil seal to installer and position in valve housing before pressing into place.

6) Press the oil seal into place using a press.

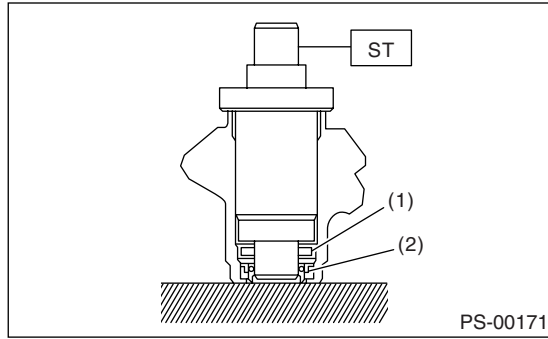


7) Attach the bearing to ST, and then position in value housing. Using the ST and press, install the special bearing in valve housing.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

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

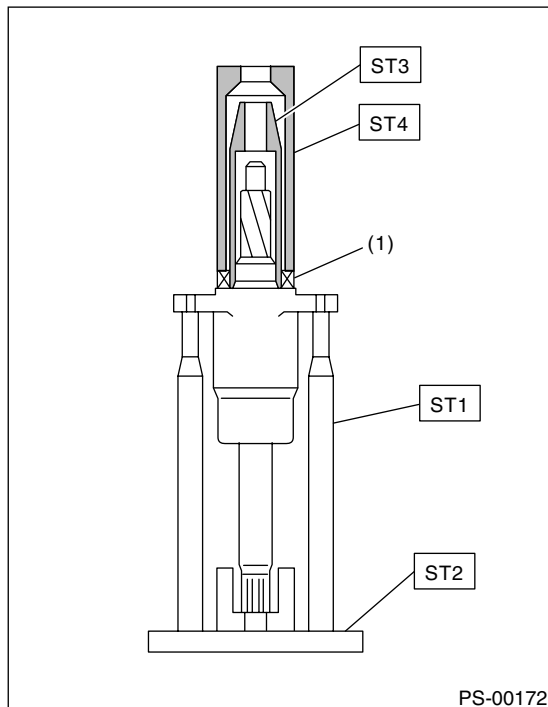
ST2 34099FA100 STAND BASE

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

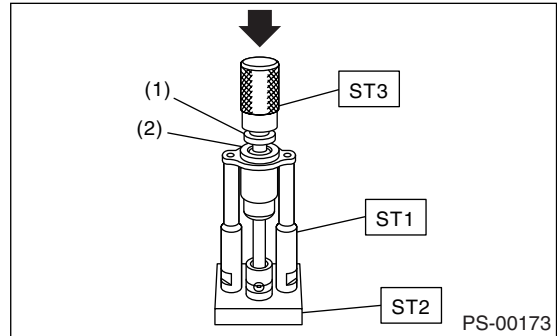
13) Remove the ST3, and then fit the back-up washer.

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.

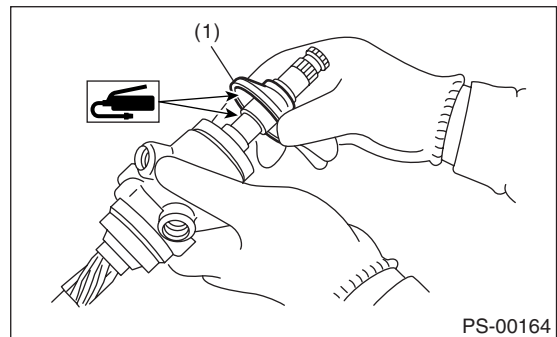
15) Install the snap ring using snap ring pliers.

NOTE:

Rotate the snap ring to check for proper installation.

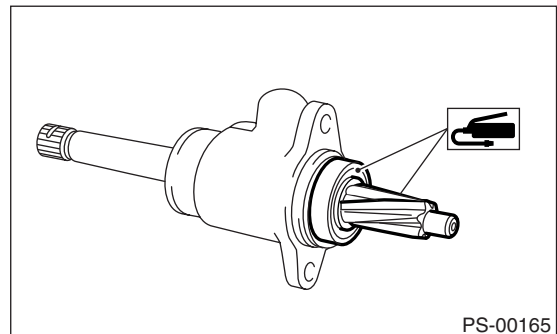
16) Apply the specified grease to dust cover.

17) Install the dust cover on valve assembly.



- (1) Dust cover

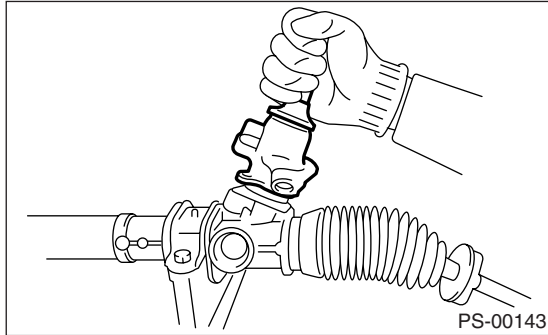
18) Apply genuine grease to the pinion gear and bearing of valve assembly.



Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

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:

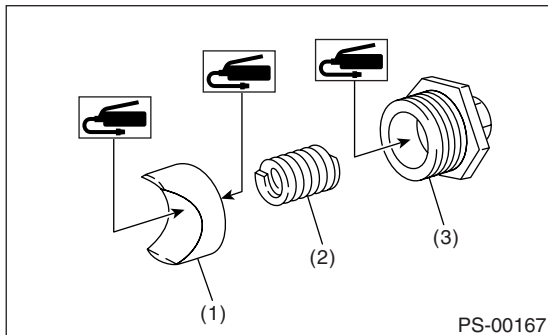
25 N·m (2.5 kgf-m, 18.1 ft-lb)

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)

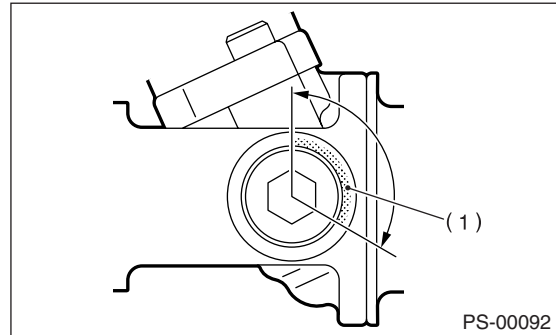
23) After tightening to the specified tightening torque, loosen it by 25°.

24) Verify that play is within specified value. <Ref. to PS-51, 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 (Part No. 004403006)



- (1) Apply liquid gasket to at least 1/3 of entire perimeter.

26) Tighten the adjusting screw to specified torque.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

27) After tightening to the specified tightening torque, loosen it by 25°.

28) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):

40 N·m (4.1 kgf-m, 29.5 ft-lb)

NOTE:

Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

29) Remove the gearbox from ST.

30) Install the four pipes on gearbox.

- (1) Connect the pipe A and B to the gearbox.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

- (2) Connect the pipe E and F to gearbox.

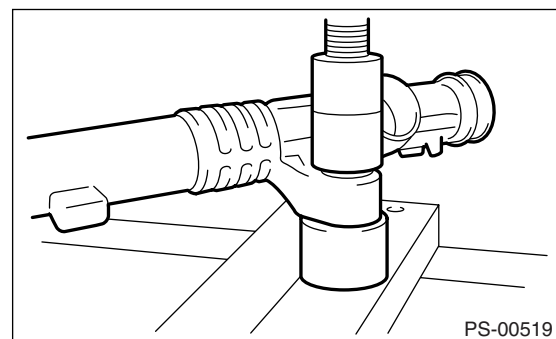
Tightening torque:

Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

2. TURBO MODEL AND STI MODEL

1) Using a press, install the bushing to gearbox installation portion.



Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

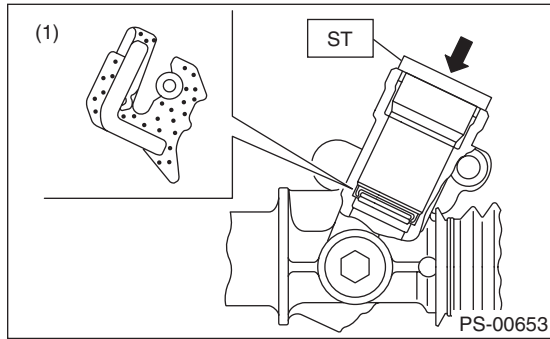
2) Apply a coat of grease to inside and outside of new oil seal.

Specified steering grease:

VALIANT GREASE M-2 (Part No. 003608001)

3) Verify the oil seal direction and installation position. Using the ST and press, press fit the oil seal to gear box.

ST 34199AE130 GEARBOX OIL SEAL INSTALLER

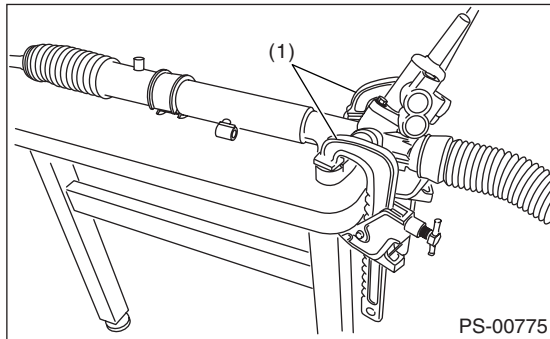


(1) Oil seal

4) Using a C-clamp, attach the steering body as shown in the figure. Apply a coat of grease to needle bearing.

CAUTION:

Ensure the needle bearing is free from defects. If it is faulty, replace the steering body with a new one.



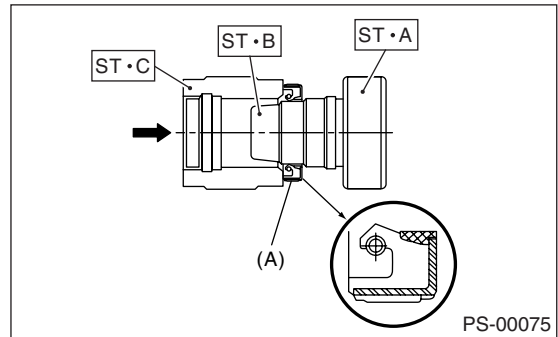
(1) C-clamp

5) Using the ST-B and ST-C, attach the oil seal to ST-A.

ST 34199FE040 INSTALLER A, B, C

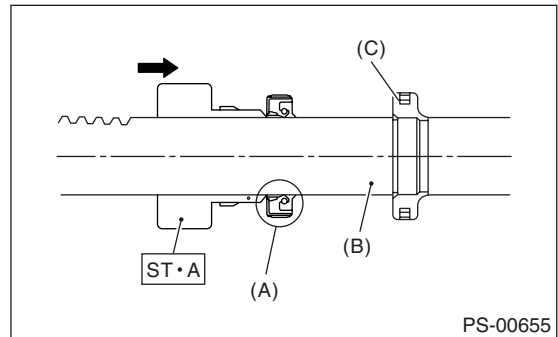
NOTE:

Face the oil seal in direction shown in the figure.



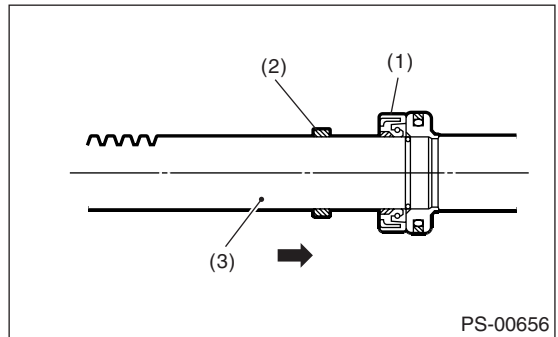
(A) Oil seal

6) Insert the ST-A with oil seal assembled, through gear side of rack. Remove the oil seal from ST-A near piston, and then remove the ST-A from rack.



(A) Oil seal
(B) Rack
(C) Piston

7) Install the back-up washer from gear side of rack.



(1) Oil seal
(2) Back-up washer
(3) Rack

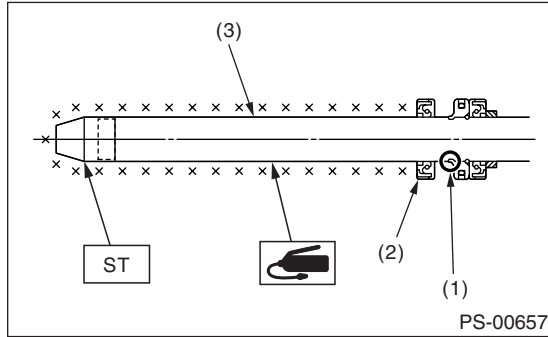
8) Equally apply a thin coat of grease to the rack, then install the oil seal.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

Be careful not to scratch the oil seal lips with piston's inner ring section.



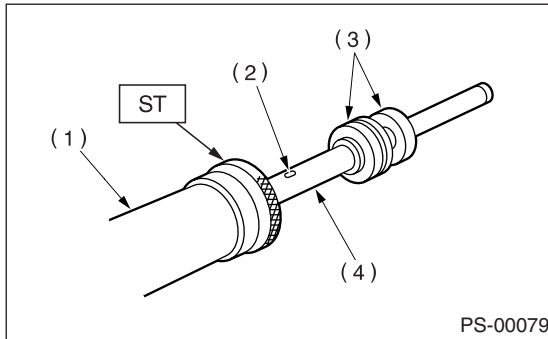
- (1) Rack piston inner ring
- (2) Outer side oil seal
- (3) Rack

9) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Install the ST on end of steering body cylinder. Then insert the rack into steering body from cylinder side.

ST 34199FE050 GUIDE

CAUTION:

Do not allow grease to block the air vent hole on rack.



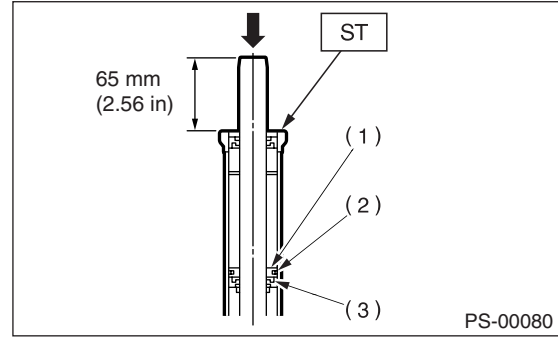
- (1) Cylinder side of steering body
- (2) Air vent hole
- (3) Oil seal
- (4) Rack

10) Using the press, slowly press the inner side oil seal until distance between the ST and end of rack becomes 65 mm (2.56 in).

ST 34199FE050 GUIDE

CAUTION:

Ensure the ST's inner wall is free of scratches since it may damage the oil seal.

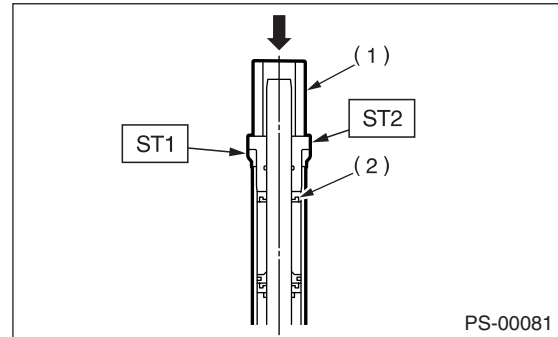


- (1) Rack piston
- (2) Inner side oil seal
- (3) Back-up ring

11) Pass the ST2 and pipe through rack and press outer side oil seal until ST1 is in contact with ST2 using press.

ST1 34199FE050 GUIDE

ST2 34199FE060 INSTALLER

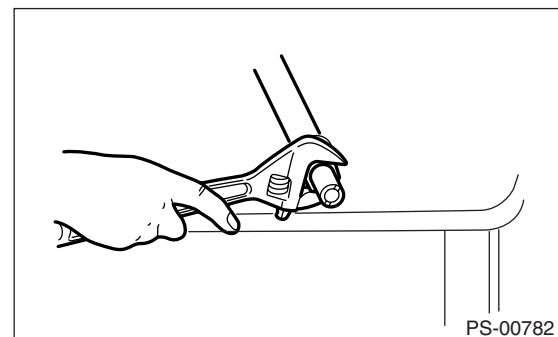


- (1) Pipe
- (2) Outer side oil seal

12) Install a new holder to cylinder side of steering body.

Tightening torque:

90 N·m (9.0 kgf-m, 65.1 ft-lb)

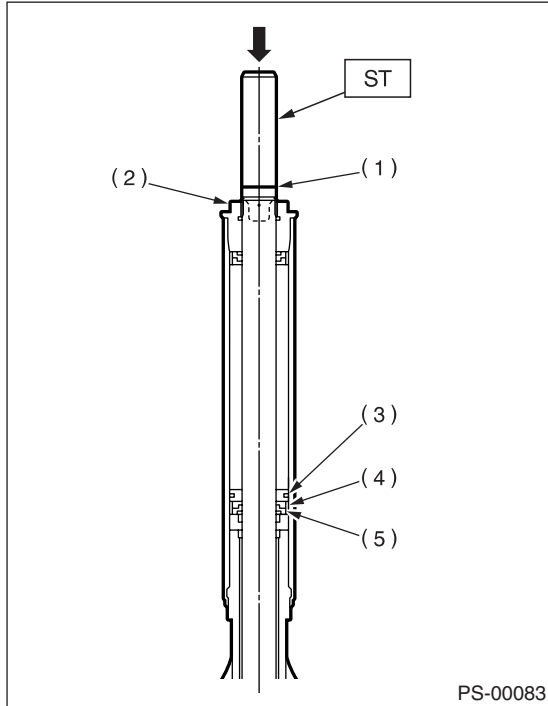


Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

13) Install the ST to rack cylinder. Using a press, press the ST until its groove is aligned with end of holder.

ST 34199FE000 INSTALLER & REMOVER



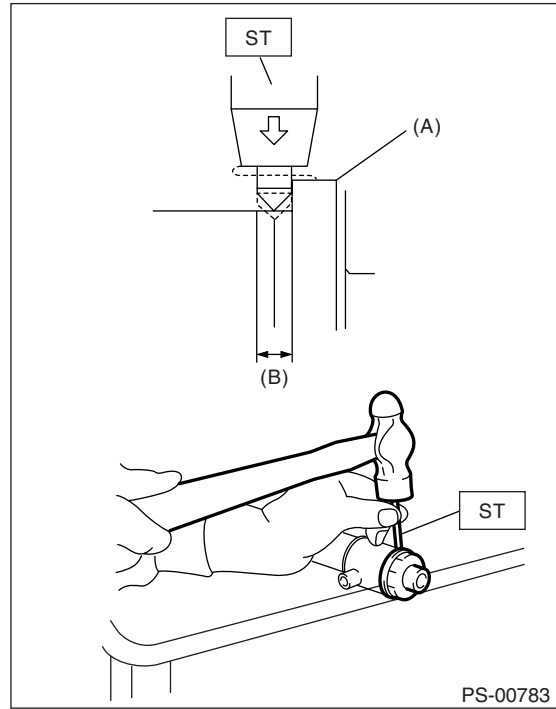
- (1) Groove
- (2) Holder
- (3) Rack piston
- (4) Oil seal
- (5) Back-up ring

14) Using the ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

CAUTION:

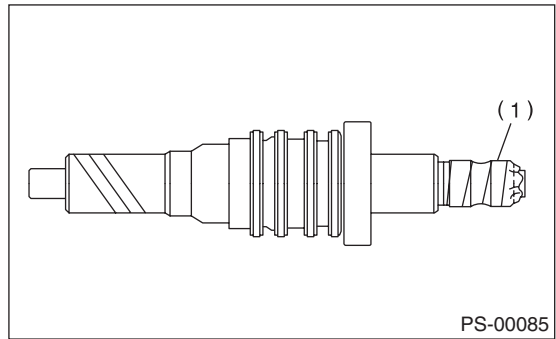
Be careful not to deform the holder.

ST 34099FA060 PUNCH HOLDER



- (A) Holder
- (B) 3 mm (0.1 in)

15) Roll the vinyl tape on serration part of valve assembly, and then apply grease on the tape surface.

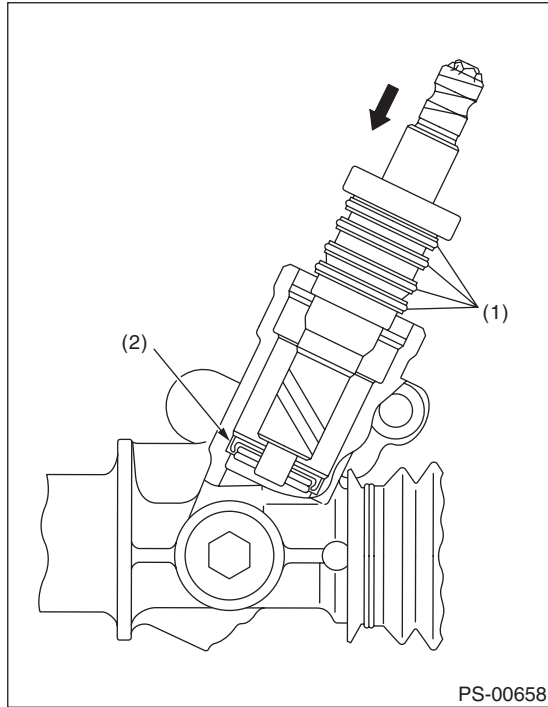


- (1) Vinyl tape

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

16) Apply a coat of grease on the gear teeth of valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.



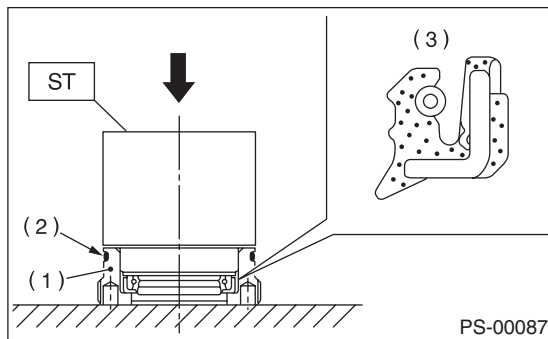
- (1) Seal ring
- (2) Oil seal

17) Apply grease on the oil seal circumference, and then press into the plug using ST and a press. Replace the plug circumference O-rings with new ones.

ST 34199AE110 PLUG OIL SEAL INSTALLER

CAUTION:

Pay attention to the oil seal direction, and attaching position.



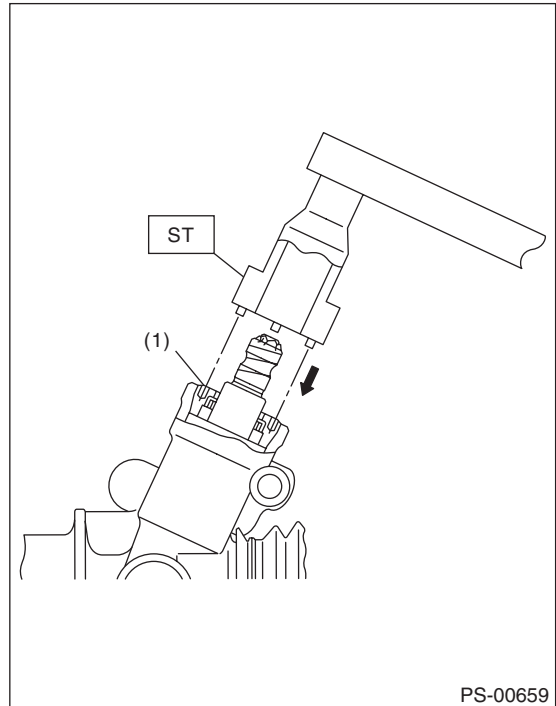
- (1) Plug
- (2) O-ring
- (3) Oil seal

18) Using the ST, install the plug.

ST 34199AE090 PLUG WRENCH

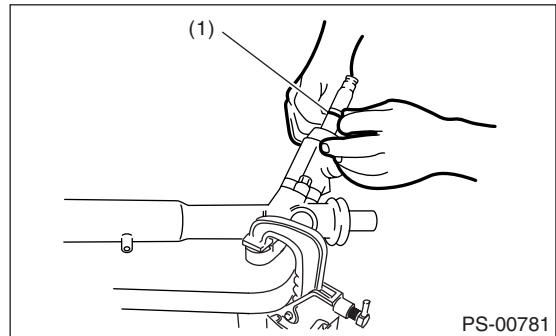
Tightening torque:

64 N·m (6.5 kgf-m, 47.0 ft-lb)



- (1) Plug

19) Install the dust cover. Remove the vinyl tape.



- (1) Dust cover

20) 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:

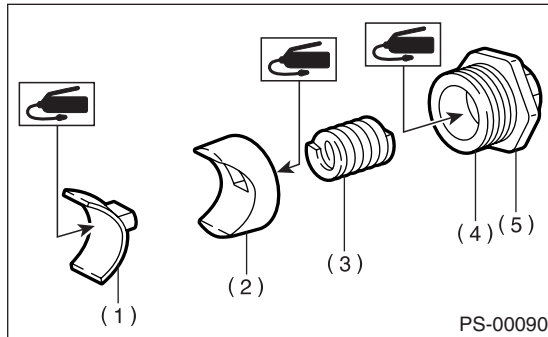
If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

21) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



- (1) Seat pad
- (2) Sleeve
- (3) Spring
- (4) Adjusting screw
- (5) Lock nut

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 37°.

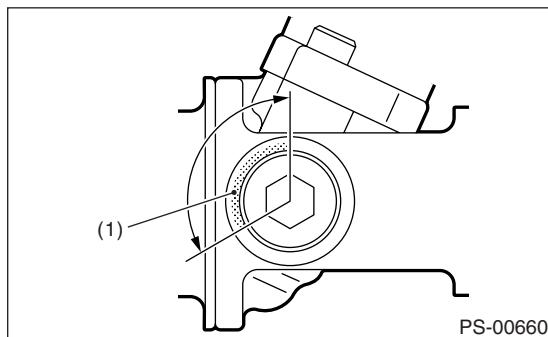
24) Remove the tie-rod.

25) Verify that play is within specified value. <Ref. to PS-51, SERVICE LIMIT, INSPECTION, Steering Gearbox.>

26) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:

THREE BOND 1141 (Part No. 004403006)



- (1) Apply liquid gasket to at least 1/3 of entire perimeter.

27) Tighten the adjusting screw.

Tightening torque:

9.8 N·m (1.0 kgf-m, 7.2 ft-lb)

28) After tightening to the specified tightening torque, loosen it.

29) Tighten the adjusting screw.

Tightening torque:

4.8 N·m (0.49 kgf-m, 3.5 ft-lb)

30) After tightening to the specified tightening torque, loosen it.

31) Tighten the adjusting screw.

Tightening torque:

4.8 N·m (0.49 kgf-m, 3.5 ft-lb)

32) After tightening to the specified tightening torque, loosen it by 37°.

33) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):

40 N·m (4.1 kgf-m, 29.5 ft-lb)

NOTE:

Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

34) Install the tie-rod into rack.

Tightening torque:

90 N·m (9.0 kgf-m, 65.1 ft-lb)

NOTE:

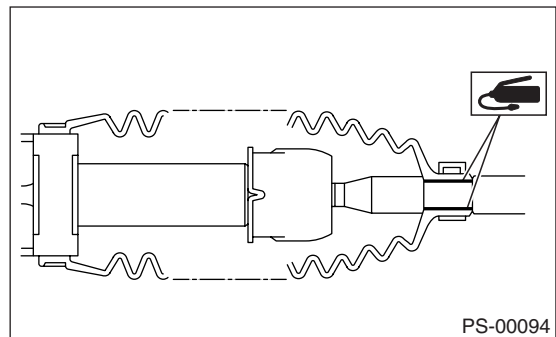
Check the mating face of rack and tie-rod for foreign material, dirt, dust and etc.

If required, clean the mating face.

35) 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.



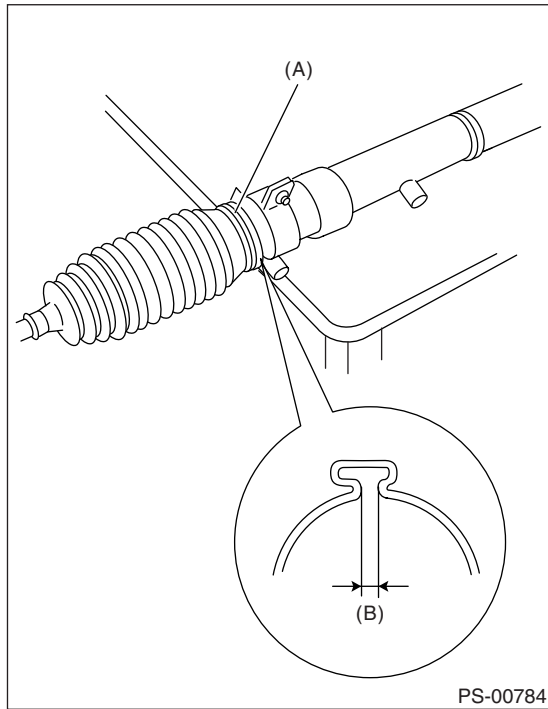
36) Caulk the boot so the space inside boot band caulking portion becomes 2 mm (0.08 in) or less.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:

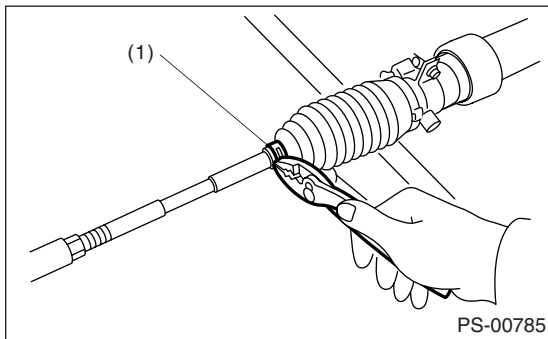
Use a new boot band.



(A) Boot band

(B) Less than 2 mm (0.08 in)

37) Fix the boot end with clip (small).



(1) Clip

38) After installing, check the boot end is positioned into groove on tie-rod.

39) 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.

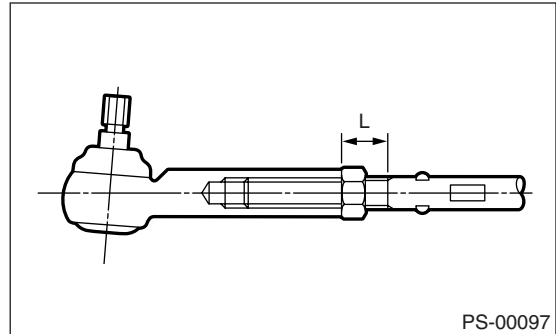
Installed tie-rod length L:

Sedan:

25 mm (0.98 in)

Wagon:

15 mm (0.59 in)

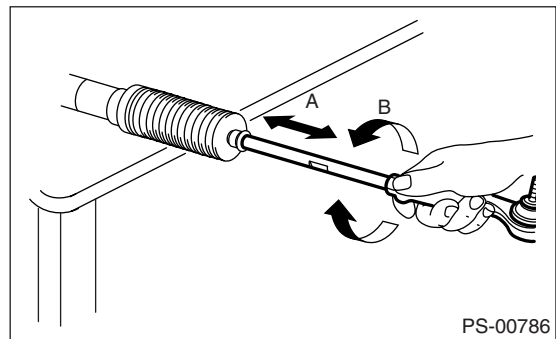


40) Inspect the gearbox as follows:

“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.



41) Remove the gearbox from ST.

ST 926200000 STAND

42) Install the four pipes on gearbox.

(1) Connect the pipe A and B to gearbox.

Tightening torque:

Housing side

20 N·m (2.0 kgf-m, 14.5 ft-lb)

Cylinder side

24 N·m (2.4 kgf-m, 17.4 ft-lb)

(2) Connect the pipe G and H to gearbox.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

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 bushing	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:

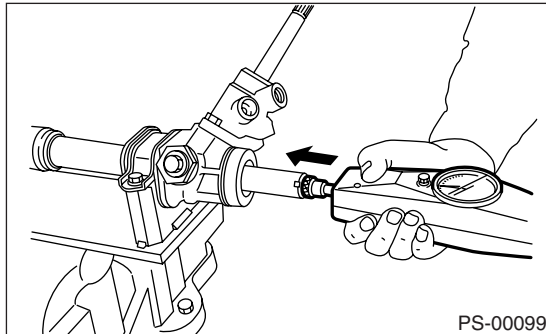
When making a measurement, vise the gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

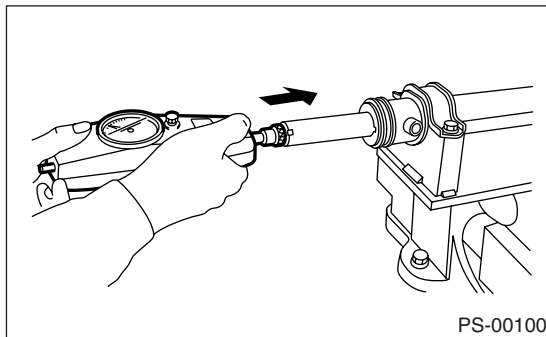
Sliding resistance of rack shaft:

Service limit

400 N (41 kgf, 90 lbf) or less



PS-00099



PS-00100

3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

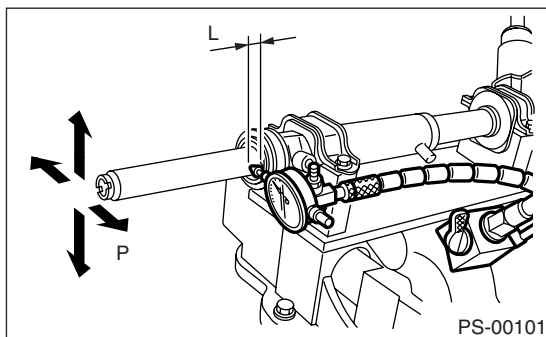
Service limit

0.19 mm (0.0075 in) or less

On condition

L: 5 mm (0.20 in)

P: 122.6 N (12.5 kgf, 27.6 lbf)



PS-00101

Left-turn steering:

Service limit

Direction ⇐ ⇨

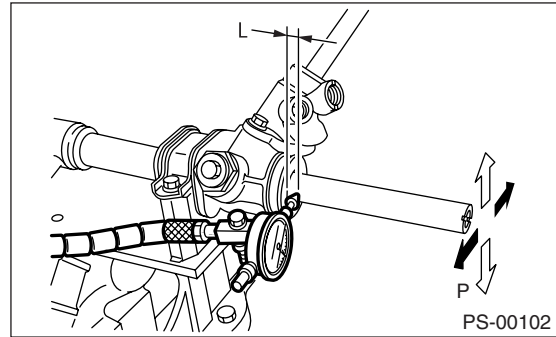
0.3 mm (0.012 in) or less

Direction ⇐ ⇨

0.15 mm (0.0059 in) or less

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lbf)



PS-00102

4. INPUT SHAFT PLAY

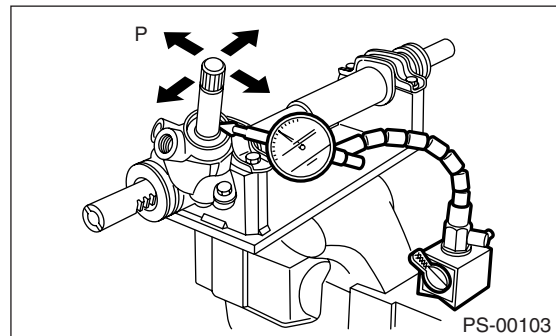
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

On condition

P: 98 N (10 kgf, 22 lbf)



PS-00103

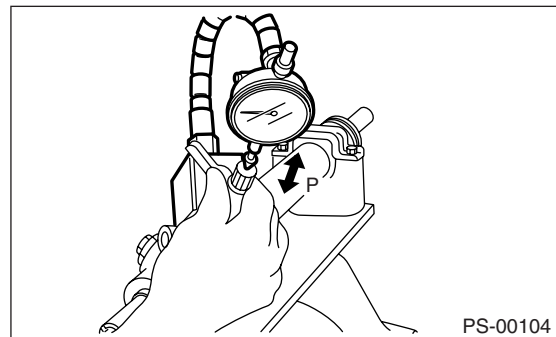
In axial direction:

Service limit

0.5 mm (0.020 in) or less

On condition

P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)



PS-00104

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.

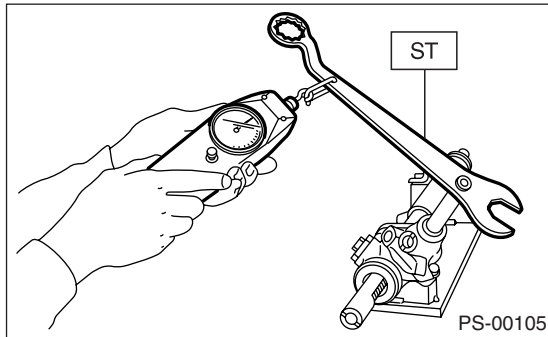
ST 34099PA100 SPANNER

Service limit

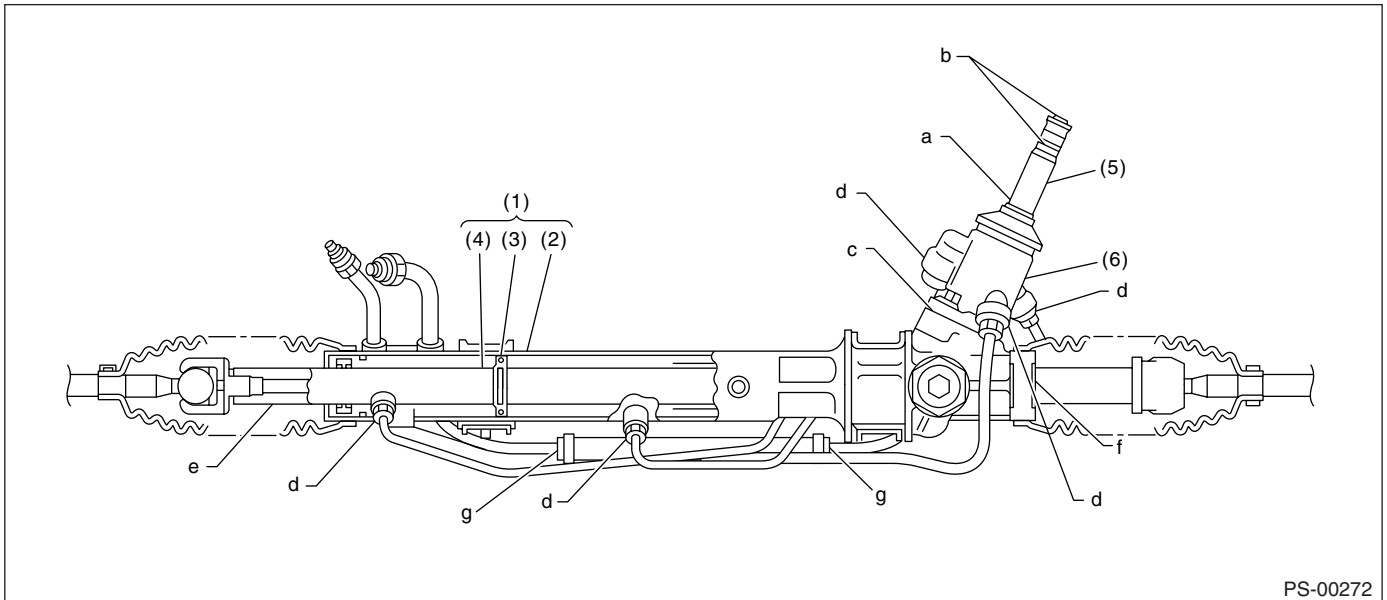
Maximum allowable resistance

10.5 N (1.1 kgf, 2.4 lbf) or less

Difference between right and left turning resistance: Less than 20%



6. OIL LEAKING



(1) Power cylinder

(2) Cylinder

(3) Rack piston

(4) Rack axle

(5) Input shaft

(6) Valve housing

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.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

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 bushing 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":

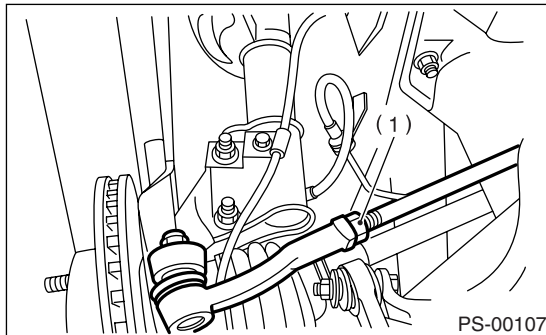
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

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)



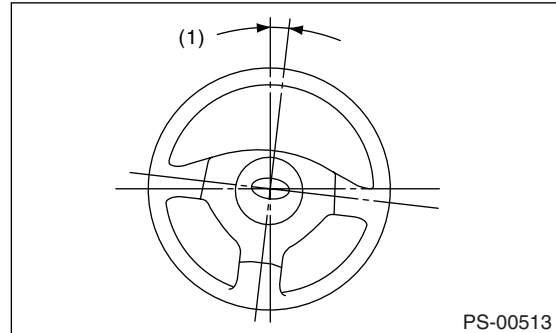
(1) Lock nut

2) Adjust the steering angle of wheels.

Standard of steering angle:

Model	2.5i, OUTBACK, WRX	STI
Inner wheel	$34.5^{\circ} \pm 1.5^{\circ}$	$32.9^{\circ} \pm 1.5^{\circ}$
Outer wheel	$30.3^{\circ} \pm 1.5^{\circ}$	$28.5^{\circ} \pm 1.5^{\circ}$

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



(1) Within 5°

4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in opposite direction by same angle.

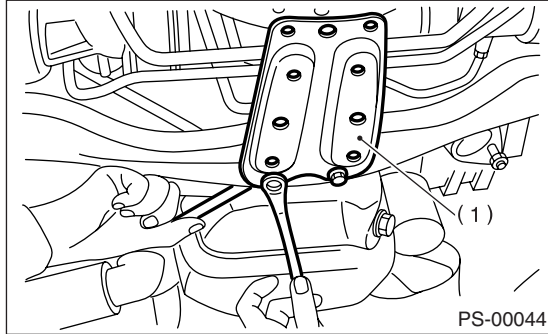
Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

6. Pipe Assembly

A: REMOVAL

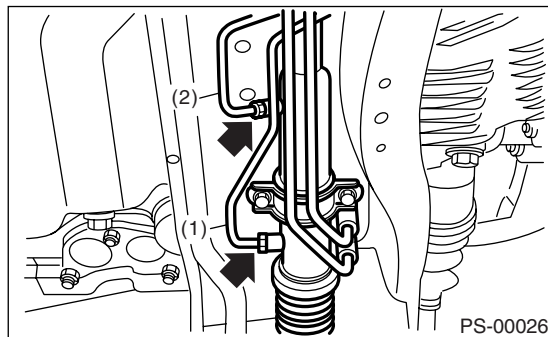
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and then remove the jack-up plate.



(1) Jack-up plate

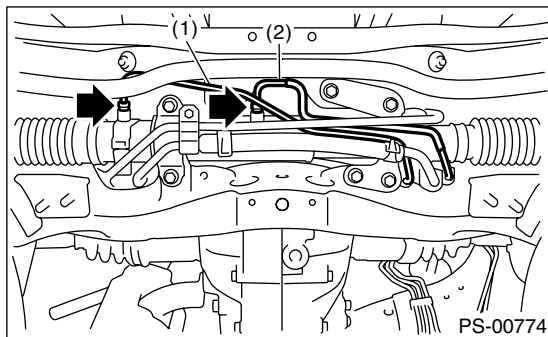
- 3) Remove the one pipe joint at the center of gear-box, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

- Non-turbo model



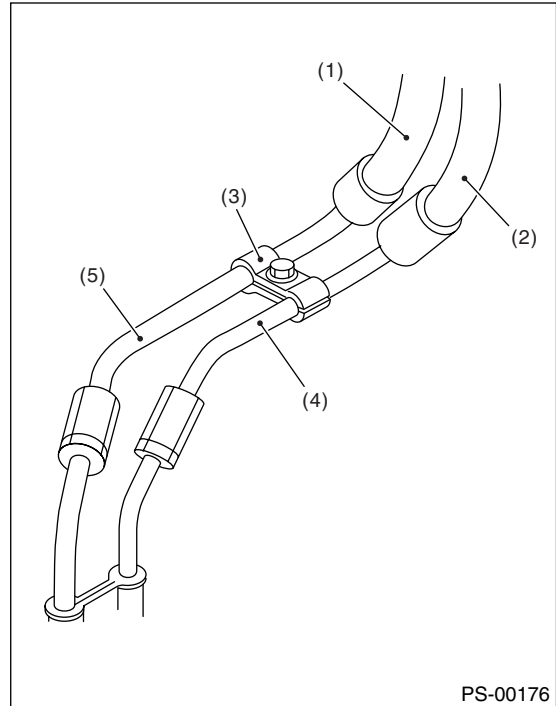
(1) Pipe A
(2) Pipe B

- Turbo model



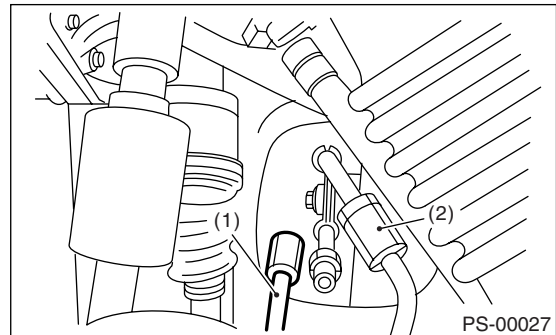
(1) Pipe A
(2) Pipe B

- 4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

- 5) Disconnect the pipe C and D from gear box.



(1) Pipe C
(2) Pipe D

- 6) Non-turbo model

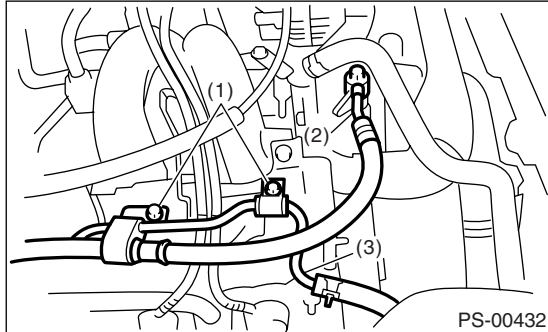
- (1) Remove the air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- (2) Remove the bolt A.
- (3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

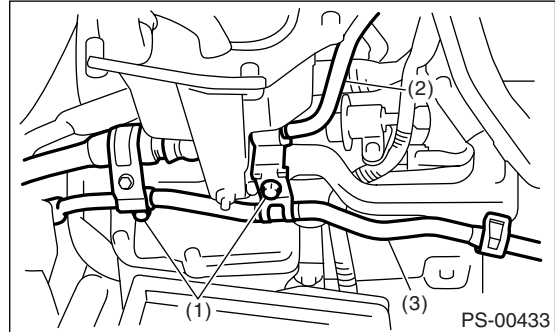
- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

CAUTION:

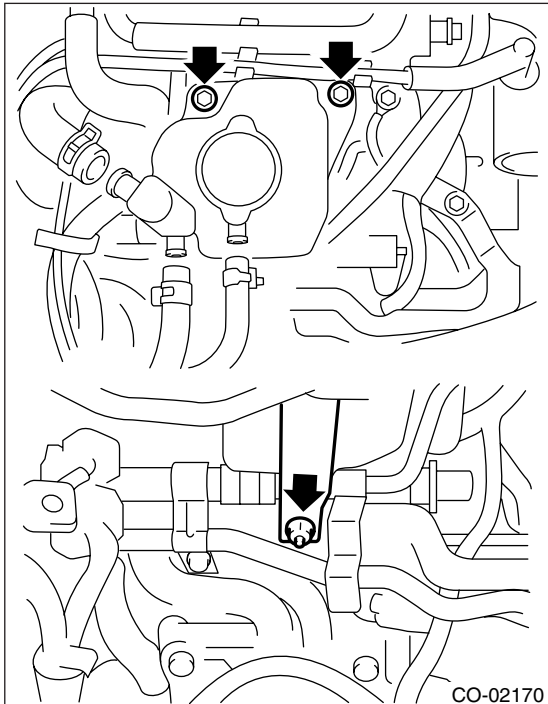
- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

7) Turbo model

- (1) Remove the air cleaner.
<Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- (2) Remove the coolant filler tank.



- (3) Remove the two bolts fixing pipe C and D. (bolt A)
- (4) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

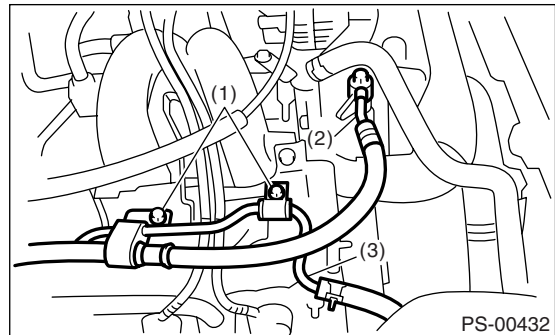
B: INSTALLATION

- 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

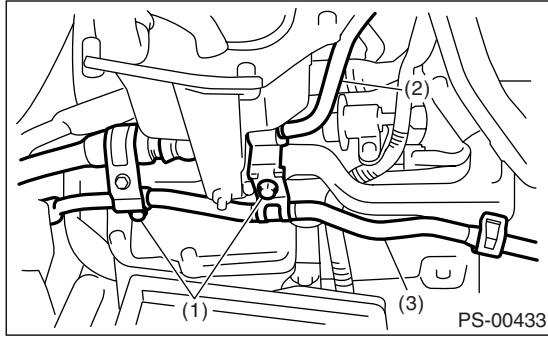


- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

- Turbo model and STI 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:

40 N·m (4.1 kgf-m, 29.5 ft-lb)

- (3) Tighten the two bolts fixing pipe C and D. (bolt A)

Tightening torque:

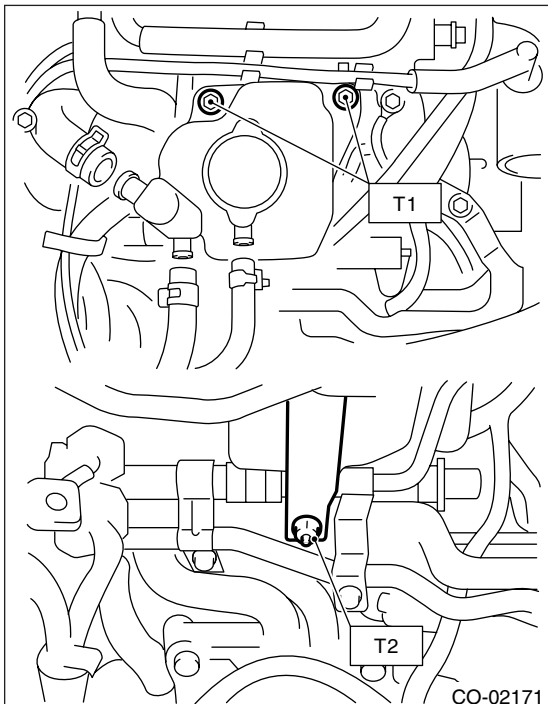
13 N·m (1.3 kgf-m, 9.4 ft-lb)

- 2) Install the coolant filler tank. (Turbo model)

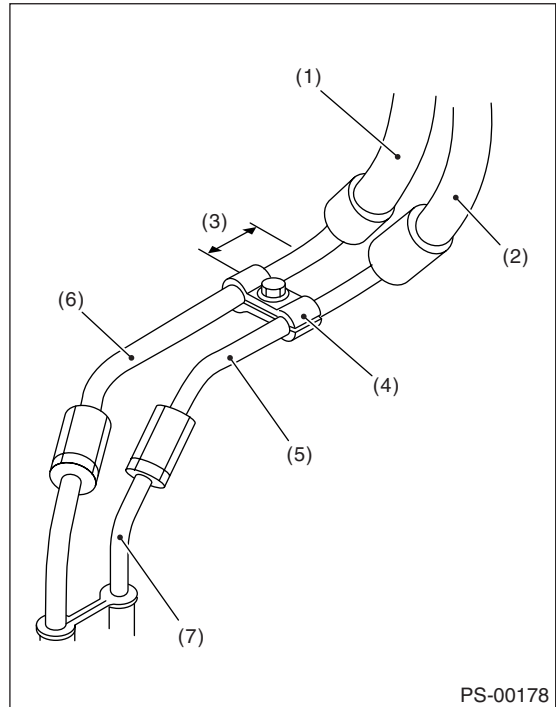
Tightening torque:

T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)

T2: 13 N·m (1.3 kgf-m, 9.4 ft-lb)



- 3) Temporarily connect the pipe C and D to gear box.

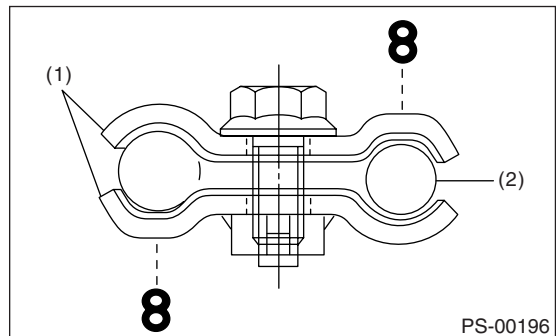


- (1) Return hose
- (2) Pressure hose
- (3) Approx. 30 mm (1.18 in)
- (4) Clamp E
- (5) Pipe C
- (6) Pipe D
- (7) Pipe (Gear box side)

- 4) Temporarily install the clamp E on pipes C and D.

NOTE:

Ensure the letter "8" on each clamp are diagonally opposite each other as shown in the figure.



- (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)

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

6) Tighten the joint nut.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A second.

Tightening torque:

Non-turbo model:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

Turbo model and STI model:

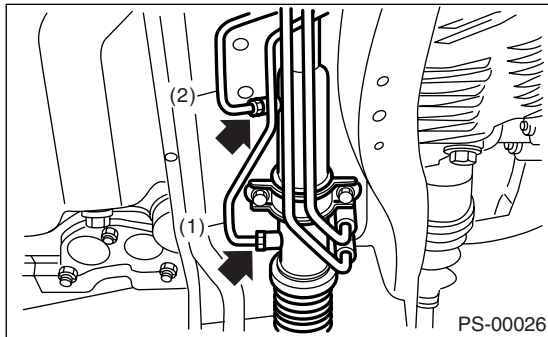
Housing side:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

Cylinder side:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

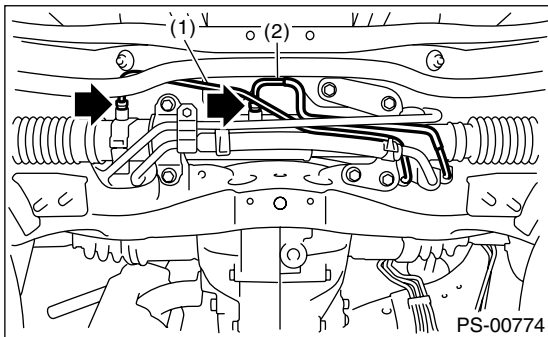
- Non-turbo model



(1) Pipe A

(2) Pipe B

- Turbo model



(1) Pipe A

(2) Pipe B

8) Install the jack-up plate.

9) Install the air intake duct. <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>

10) Install the air intake duct, air cleaner upper cover and air intake boot.

<Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>

11) Connect the battery ground cable to battery.

12) Feed the specified fluid.

CAUTION:

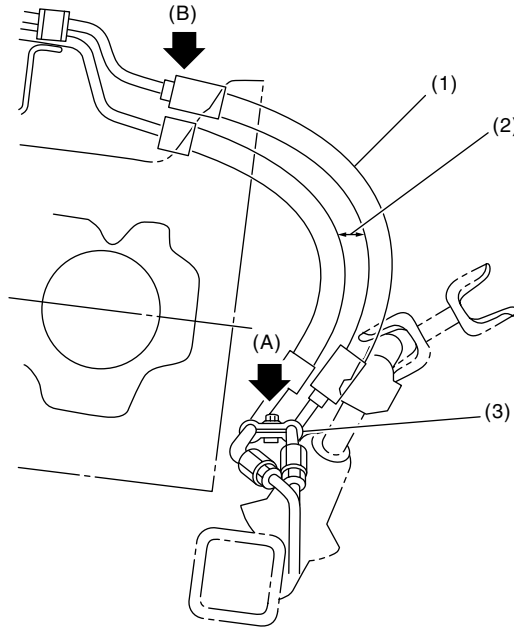
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

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.

POWER ASSISTED SYSTEM (POWER STEERING)

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.



Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

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.
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 gearbox (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

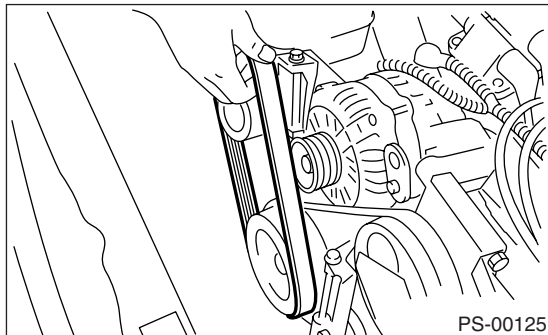
Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

7. Oil Pump

A: REMOVAL

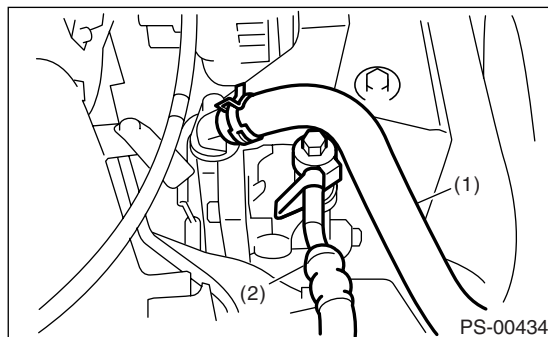
- 1) Disconnect the ground cable from battery.
- 2) Remove the pulley belt cover.
- 3) Loosen the belt tension adjusting bolt and generator securing bolt, and then remove the power steering pump V-belt.



- 4) Disconnect the connector from power steering pump switch.
- 5) Disconnect the pipe C and suction hose from oil pump.

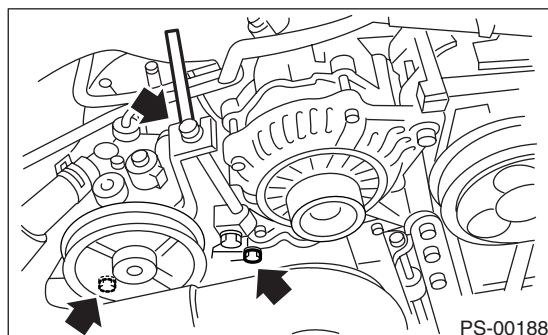
CAUTION:

- 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

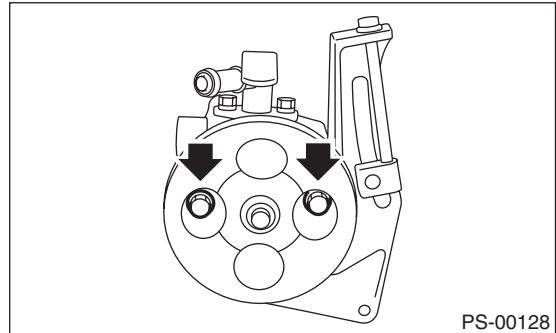
- 6) Remove the bolts which install the power steering pump bracket.



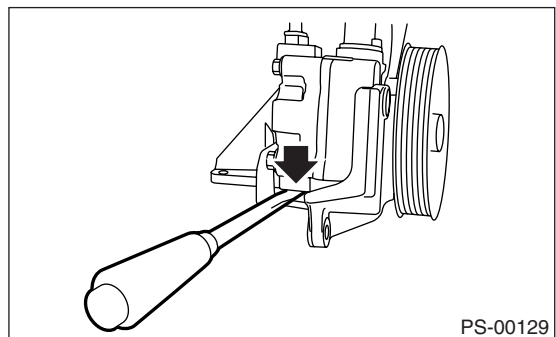
- 7) Place the oil pump bracket in a vise, remove the two bolts from front side of oil pump.

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.



B: INSTALLATION

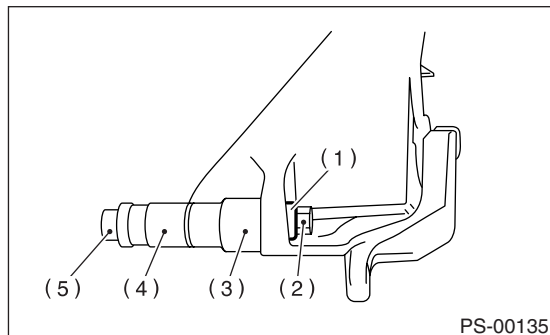
- 1) Install the oil pump to bracket.
 - (1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2") type 14 mm and 21 mm box wrench until it is in contact with the oil pump mounting surface.

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

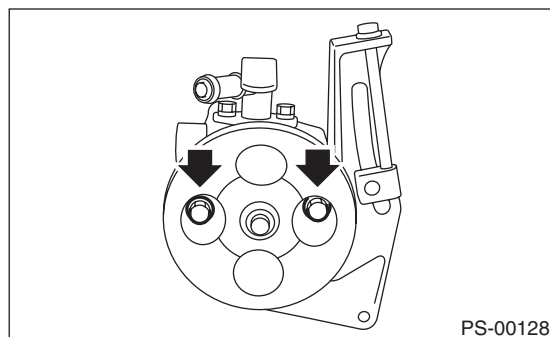


- (1) Bushing
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

(2) Tighten the bolts which install the oil pump to bracket.

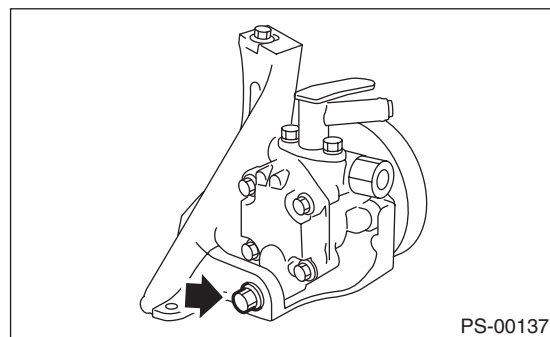
Tightening torque:

15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

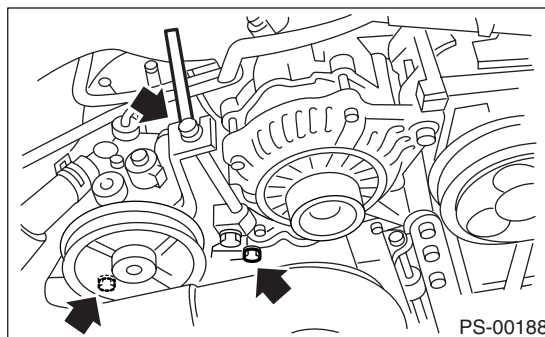


Tightening torque:

37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten the bolts which install the power steering pump bracket.



3) Interconnect the pipe C and suction hose.

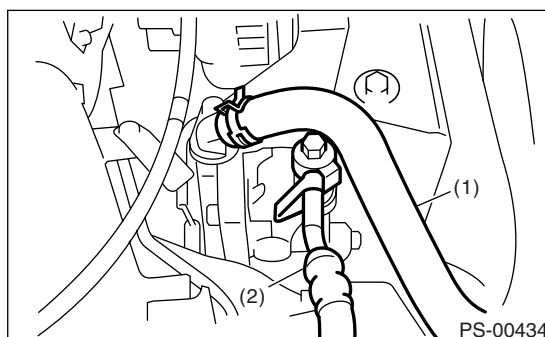
Tightening torque:

Eye bolt

40 N·m (4.1 kgf-m, 29.5 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.>

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-68, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

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.

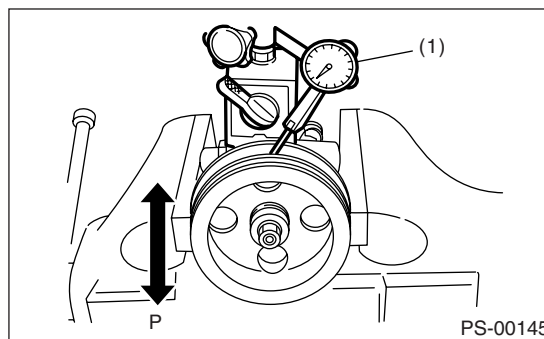
1) Play of the pulley shaft

Condition:

P: When applying the force of 9.8 N (1.0 kgf, 2.2 lbf)

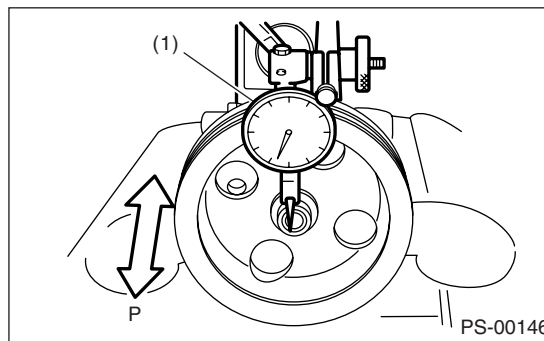
Service limit:

Radial play (Direction ← →)
0.4 mm (0.016 in) or less



(1) Dial gauge

Axial play (Direction ⇐ ⇒)
0.9 mm (0.035 in) or less



(1) Dial gauge

2) Ditch deflection of pulley

Oil Pump

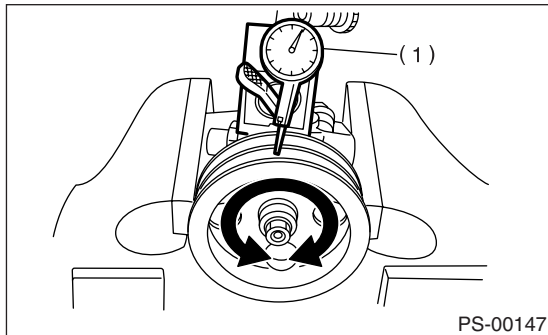
POWER ASSISTED SYSTEM (POWER STEERING)

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 gauge

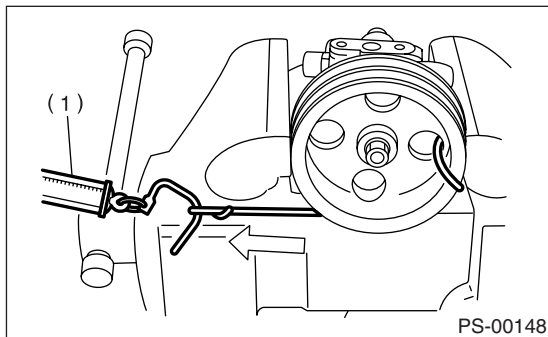
3) Resistance to rotation of pulley

Service limit:

Maximum load: 9.22 N (0.94 kgf, 2.07 lbf) or less

NOTE:

- A rather higher value may be indicated when pulley starts turning.
- Measure the load during rotation and make a judgment.



(1) Spring balance

3. HYDRAULIC PRESSURE

NOTE:

- Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-69, 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 925711000 PRESSURE GAUGE

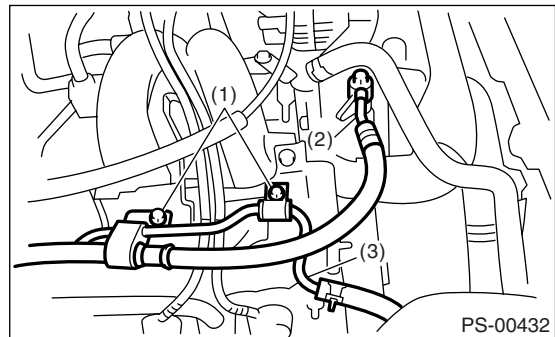
ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A

(2) Remove the air intake duct.

(3) Disconnect the pipe C from the pump.

(4) Using the gasket (Part No. 34621AC022) and bolt (Part No. 34620AC010), install the ST2 to the pump instead of pipe C.



(1) Bolt A

(2) Pipe C

(3) Pipe D

(5) Install the ST3 to end of pipe C removed from pump.

(6) Replenish power steering fluid up to the specified level.

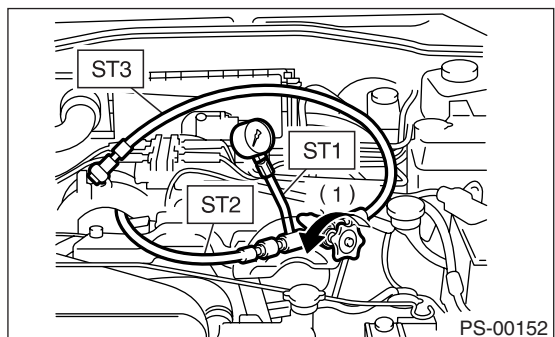
(7) Open the valve, and start the engine.

(8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE

ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A



(1) Valve

Service limit:

981 kPa (10 kgf/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.

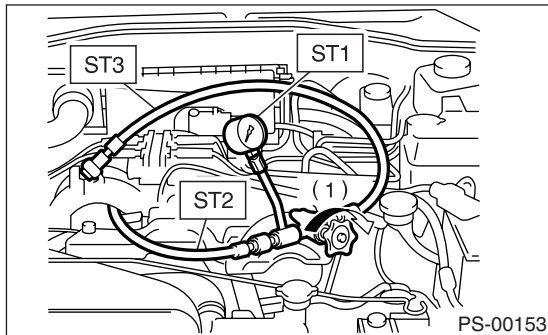
(1) Using the STs, measure the relief pressure.

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

- (2) Close the valve.
- (3) Measure the relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



(1) Valve

Service limit:

Non-turbo model:

6,700 — 7,400 kPa (68 — 75 kgf/cm², 972 — 1,073 psi)

Turbo model and STI model:

7,350 — 8,036 kPa (75 — 82 kgf/cm², 1,067 — 1,165 psi)

- (4) If it is within the specified value, measure the steering effort. <Ref. to PS-72, 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.

Service limit:

Non-turbo model:

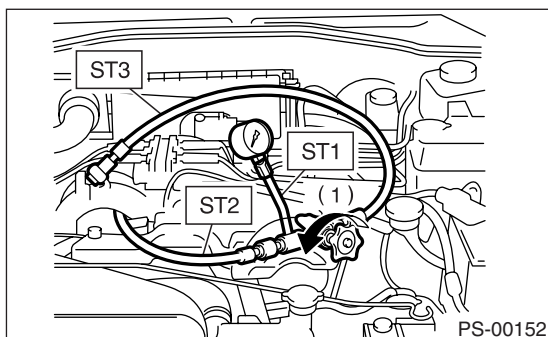
6,700 — 7,400 kPa (68 — 75 kgf/cm², 972 — 1,073 psi)

Turbo model and STI model:

7,350 — 8,036 kPa (75 — 82 kgf/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



(1) Valve

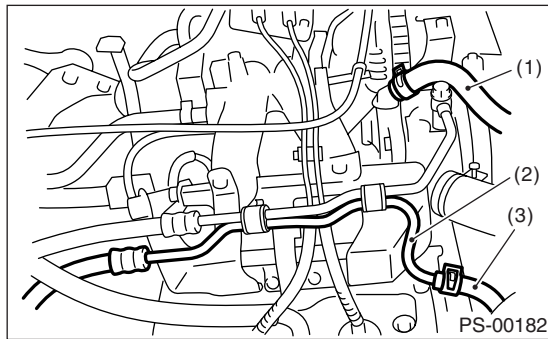
8. Reservoir Tank

A: REMOVAL

- 1) Remove the air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- 2) Drain fluid from the reservoir tank.
- 3) Disconnect the pipe D from 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.

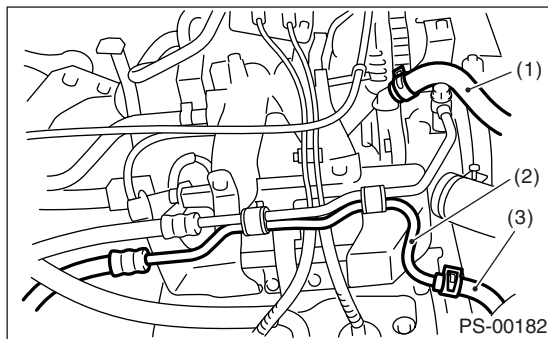


- (1) Suction hose
- (2) Pipe D
- (3) Return hose

- 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-68, 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.

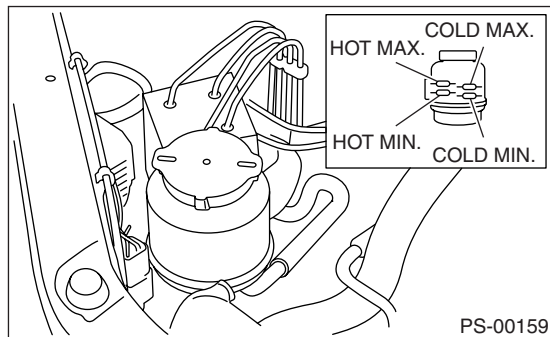
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.

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

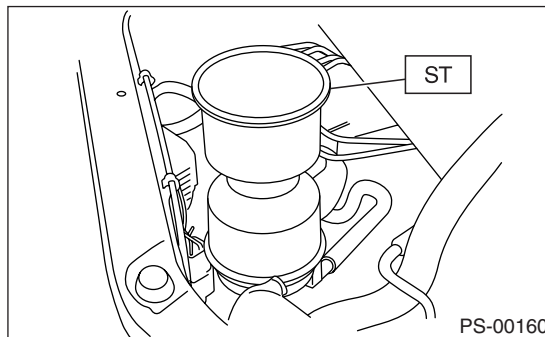
1) Lift up the vehicle.

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 GUIDE



5) Continue to turn the steering wheel slowly from lock to lock until bubbles stop appearing on oil surface while keeping the fluid at that level.

6) If turning the steering wheel in low fluid level condition, air will be sucked in pipe. In this case, leave it about half an hour and then do the step 5) again.

7) Lift up the vehicle, start the engine and let it idle.

8) Continue to turn the steering wheel slowly from lock to lock again until bubbles stop appearing on oil surface while keeping the fluid at that level.

It is normal that bubbles stop appearing after three times turning of steering wheel from lock to lock.

9) In case the bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 4) all over again.

10) Lower the vehicle, and then idle the engine.

11) Continue to turn the steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).

12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.

(1) The fluid level changes over 3 mm (0.12 in).

(2) Bubbles remain on the upper surface of the fluid.

(3) Grinding noise is generated from oil pump.

13) Check the fluid leakage after turning steering wheel from lock to lock with engine running.

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-64, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure steering effort. <Ref. to PS-69, 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-69, 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 AT model.

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.	Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-59, 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.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

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 lbf)?	Go to step 2.	Adjust the backlash.
2 CHECK STEERING EFFORT. 1) Stop the engine. 2) Pull the spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort.	Is the steering effort less than 294.2 N (30 kgf, 66.2 lbf)?	Go to step 3.	Perform adjustment.
3 CHECK STEERING WHEEL EFFORT. 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is the maximum steering effort less than 2.26 N (0.23 kgf, 0.51 lbf)?	Go to step 4.	Check, adjust and replace if necessary.
4 CHECK STEERING WHEEL EFFORT. Measure the steering wheel effort.	Is the difference of steering effort between clockwise and counterclockwise less than 20%?	Go to step 5.	Check, adjust and replace if necessary.
5 CHECK UNIVERSAL JOINT. Measure the swing torque of the joint (yoke of steering column side). <Ref. to PS-21, INSPECTION, Universal Joint.>	Is the swing torque less than 7.3 N (0.74 kgf, 1.64 lbf)?	Go to step 6.	Replace with new one.
6 CHECK UNIVERSAL JOINT. Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-21, INSPECTION, Universal Joint.>	Is the swing torque less than 3.8 N (0.39 kgf, 0.86 lbf)?	Go to step 7.	Replace with new one.
7 CHECK FRONT WHEEL. Check the front wheel.	Are the front wheels for unsteady revolution or rattling and brake for dragging?	Inspect, readjust and replace if necessary.	Go to step 8.
8 CHECK TIE-ROD ENDS. Remove the tie-rod ends.	Are the tie-rod ends of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 9.
9 CHECK BALL JOINT. Remove the ball joint.	Are the ball joints of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 10.
10 CHECK GEARBOX. Measure the rotating of gearbox. <Ref. to PS-52, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the rotating resistance of gear box less than 10.5 N (1.1 kgf, 2.4 lbf)? Is the difference between clockwise and counterclockwise 20%?	Go to step 11.	Readjust the backlash, and if ineffective, replace the faulty parts.
11 CHECK GEARBOX. Measure the sliding of gearbox. <Ref. to PS-51, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is the sliding resistance of gear box less than 400 N (41 kgf, 90 lbf)? Is the difference between right and left 20%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

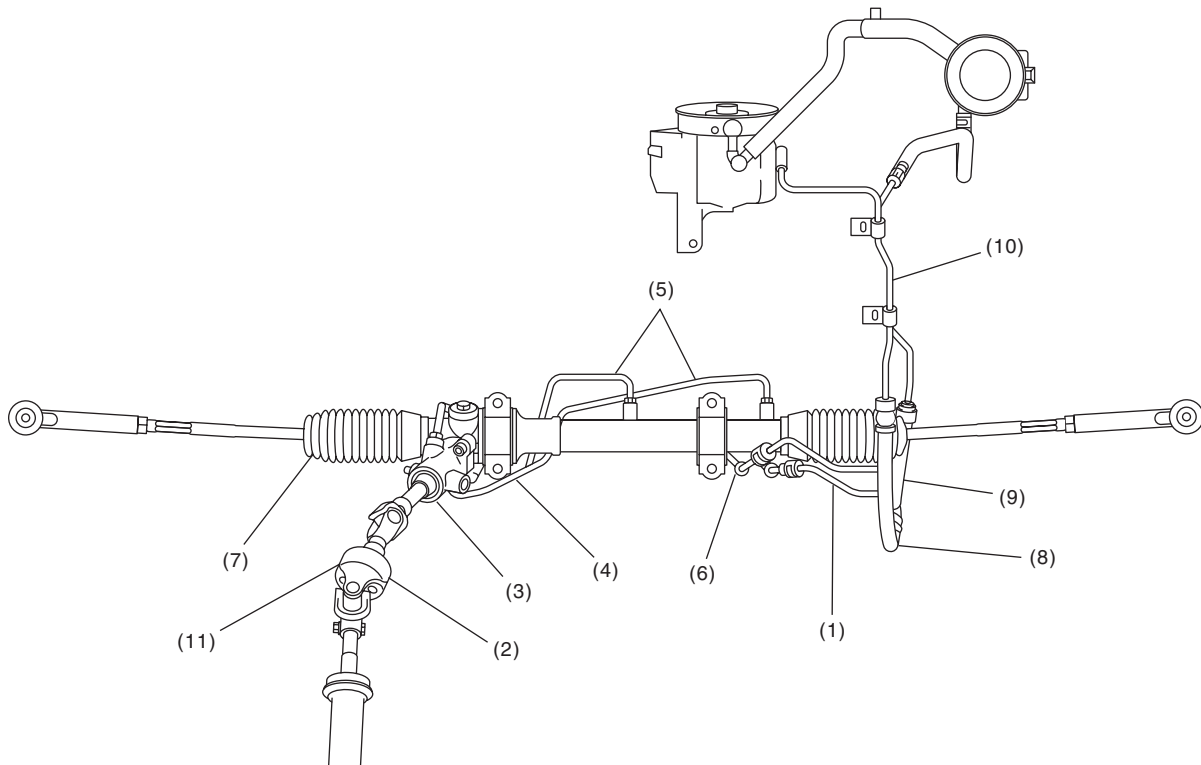
General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

3. CLEARANCE CHECK

This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

Location	Minimum allowance
(1) Crossmember — Pipe	5 mm (0.20 in)
(2) DOJ — Shaft or joint	14 mm (0.55 in)
(3) DOJ — Valve housing	11 mm (0.43 in)
(4) Pipe — Pipe	2 mm (0.08 in)
(5) Stabilizer — Pipe	5 mm (0.20 in)
(6) Exhaust pipe — Pipe	11 mm (0.43 in)
(7) Exhaust pipe — Gearbox bolt	15 mm (0.59 in)
(8) Side frame — Hose A and B	10 mm (0.39 in)
(9) Cruise control pump — Hose A and B	15 mm (0.59 in)
(10) Pipe portion of hose A — Pipe portion of hose B	1.5 mm (0.059 in)
(11) AT cooling hose — Joint	20 mm (0.79 in)



PS-00773

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

REAR SUSPENSION

General Description

REAR SUSPENSION

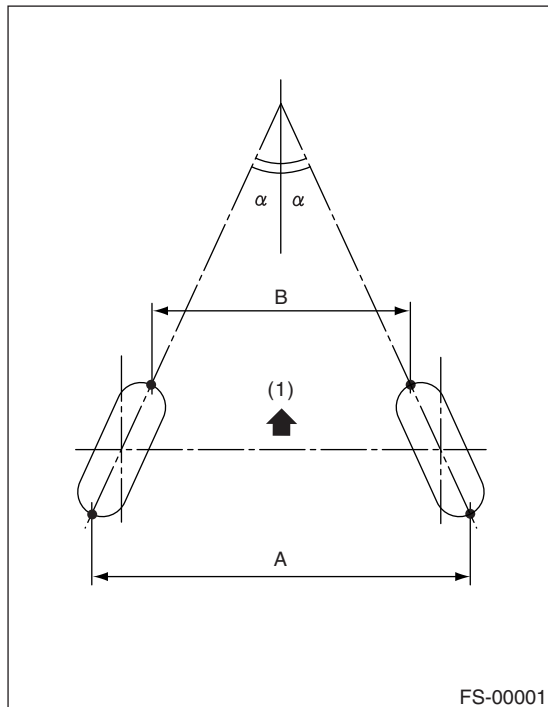
1. General Description

A: SPECIFICATION

Model	Sedan			Wagon		OUTBACK
	Non-turbo	Turbo	STI	Non-turbo	Turbo	
Camber (Tolerance: $\pm 0^{\circ}45'$ Adjustment standard: $\pm 0^{\circ}30'$)	$-1^{\circ}25'$	$-1^{\circ}30'$	$-1^{\circ}40'$	$-1^{\circ}15'$	$-1^{\circ}20'$	$-1^{\circ}10'$
Toe-in	Tolerance: 0 ± 3 mm (0 ± 0.12 in), Toe angle (The sum of both wheels): $\pm 0^{\circ}15'$ Tolerance: 0 ± 2 mm (0 ± 0.08 in), Toe angle (The sum of both wheels): $\pm 0^{\circ}10'$					
Wheel arch height [Tolerance: $+12_{-24}$ mm ($+0.47_{-0.94}$ in)]	381 mm (15.0 in)	376 mm (14.80 in)	363 mm (14.29 in)	381 mm (15.0 in)	376 mm (14.80 in)	386 mm (15.20 in)
Thrust angle	Tolerance: $\pm 0^{\circ}30'$, Adjustment standard: $\pm 0^{\circ}20'$					
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-in and front camber can be adjusted. If toe-in or camber exceeds tolerance, adjust toe-in and camber to the adjustment standard.
- The other items indicated in the specification table cannot be adjusted. If the other items exceed specifications, check suspension parts and connections for deformities; replace with new ones as required.



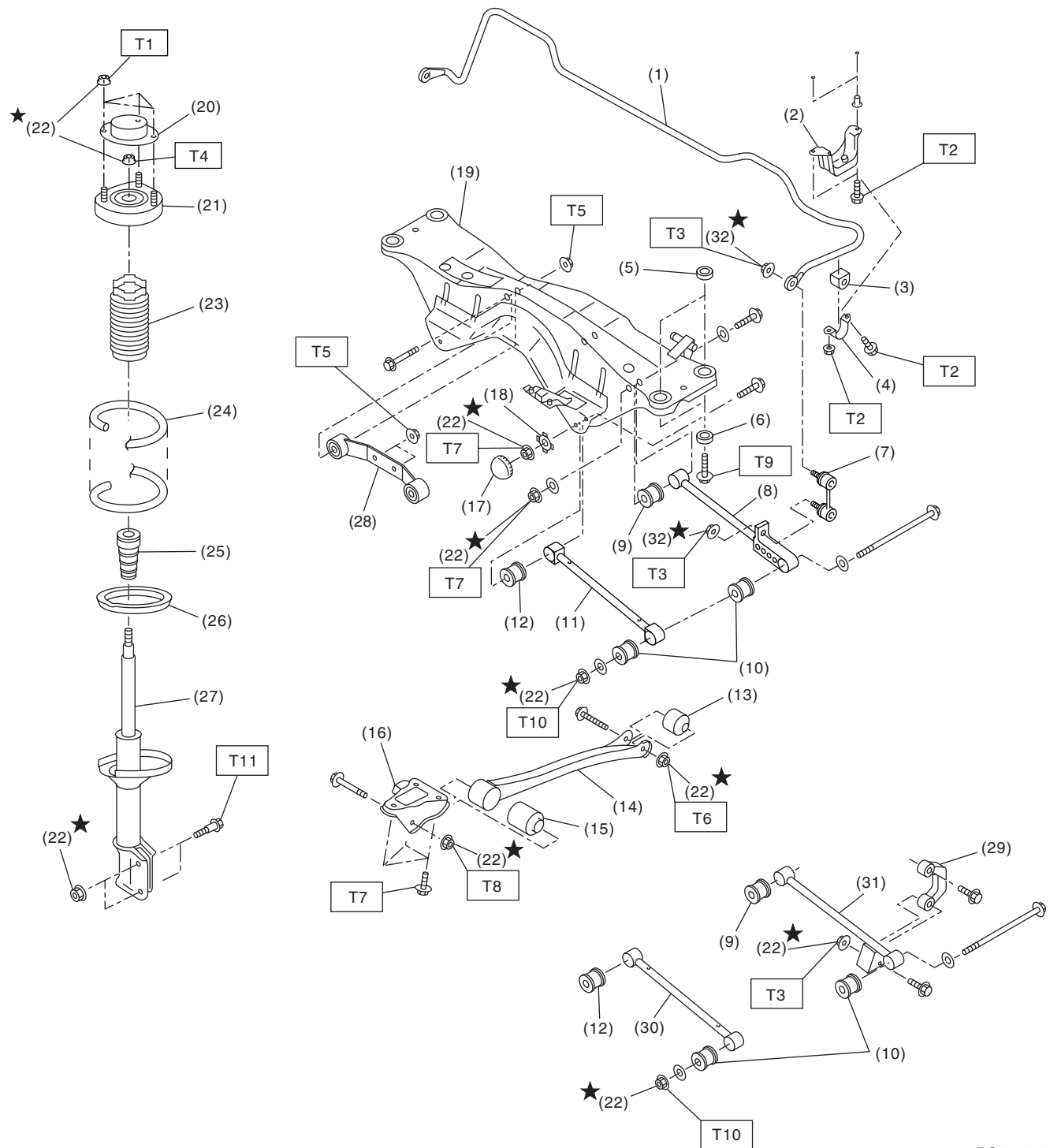
(1) Front

$A - B$ = Positive: Toe-in, Negative: Toe-out

α = Each toe angle

B: COMPONENT

1. REAR SUSPENSION



RS-00170

General Description

REAR SUSPENSION

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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 20 (2.0, 14.5)

T2: 25 (2.5, 18.1)

T3: 45 (4.6, 33.2)

T4: 55 (5.6, 40.6)

T5: 70 (7.1, 52)

T6: 90 (9.2, 66)

T7: 100 (10.2, 74)

T8: 115 (11.7, 85)

T9: 130 (13.3, 96)

T10: 140 (14.3, 103)

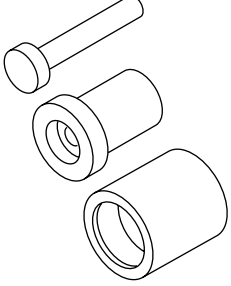
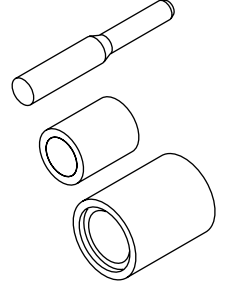
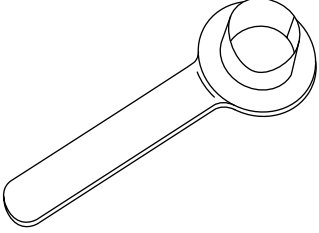
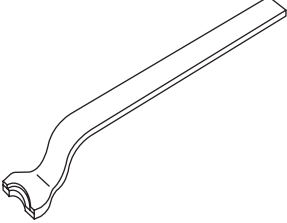
T11: 200 (20.0, 145)

C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

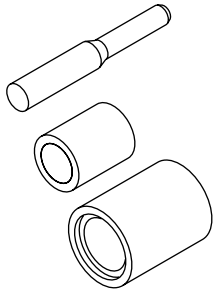
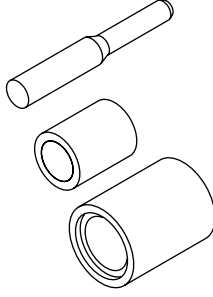
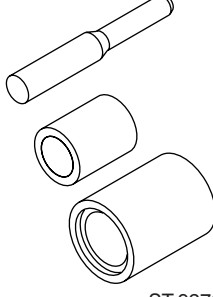
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927720000	927720000	INSTALLER & REMOVER SET	Used for replacing front bushing.
 ST-927730000	927730000	INSTALLER & REMOVER SET	Used for replacing rear bushing.
 ST28099PA090	28099PA090	OIL SEAL PROTEC- TOR	• Used for installing rear drive shaft to rear differential. • For protecting oil seal.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing DOJ.

General Description

REAR SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927710000	927710000	INSTALLER & REMOVER SET	Used for replacing lateral link bushing.
 ST-927700000	927700000	INSTALLER & REMOVER SET	Used for replacing lateral link bushing.
 ST-927690000	927690000	INSTALLER & REMOVER SET	Used for replacing lateral link bushing.

2. GENERAL TOOL

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Alignment gauge adapter	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

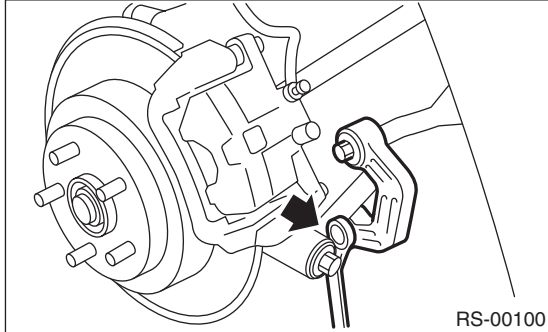
NOTE:

Front and rear wheel alignment must be measured and/or adjusted at a time. Follow the procedure in "FS" section "Wheel Alignment" for measurement and/or adjustment of wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

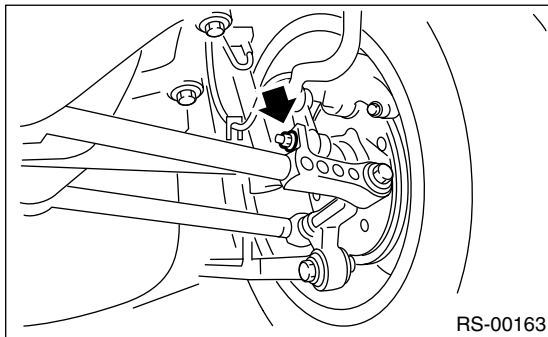
3. Rear Stabilizer

A: REMOVAL

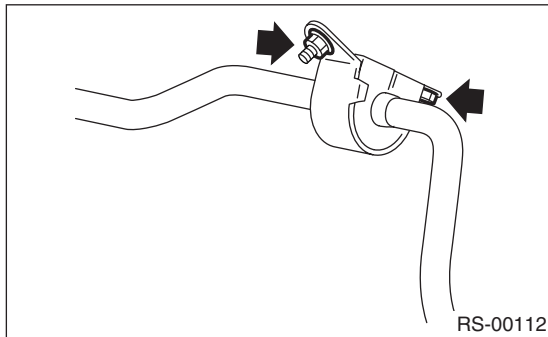
- 1) Lift-up the vehicle.
 - 2) Remove the stabilizer link.
- Except STI model



- STI model



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



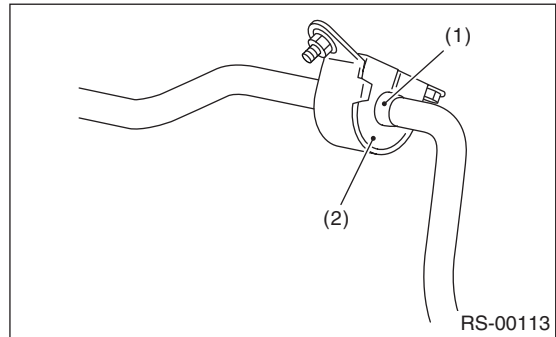
B: INSTALLATION

- 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)

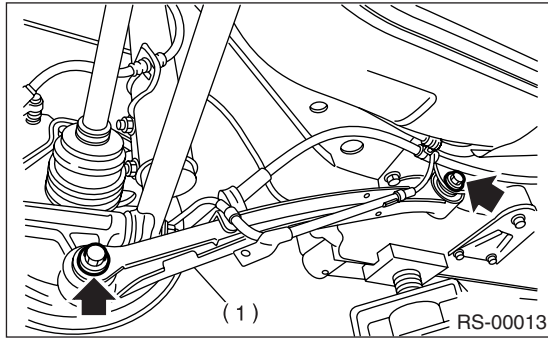
C: INSPECTION

- 1) Check the bushing for large 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:

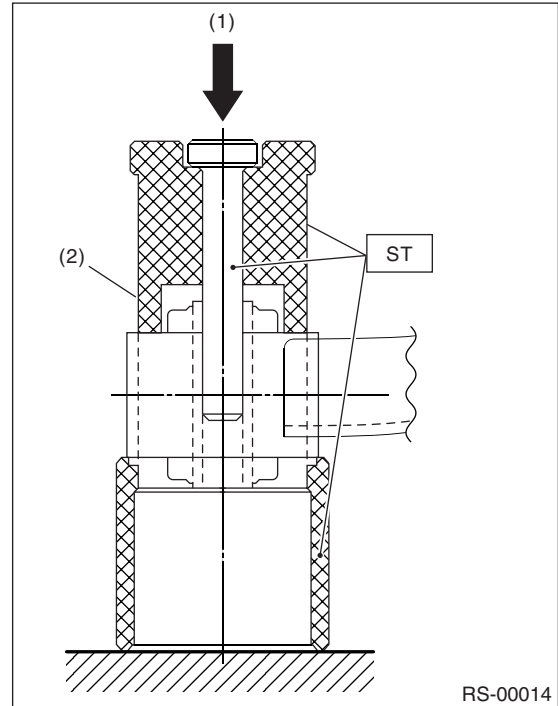
Check the wheel alignment and adjust if necessary.

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

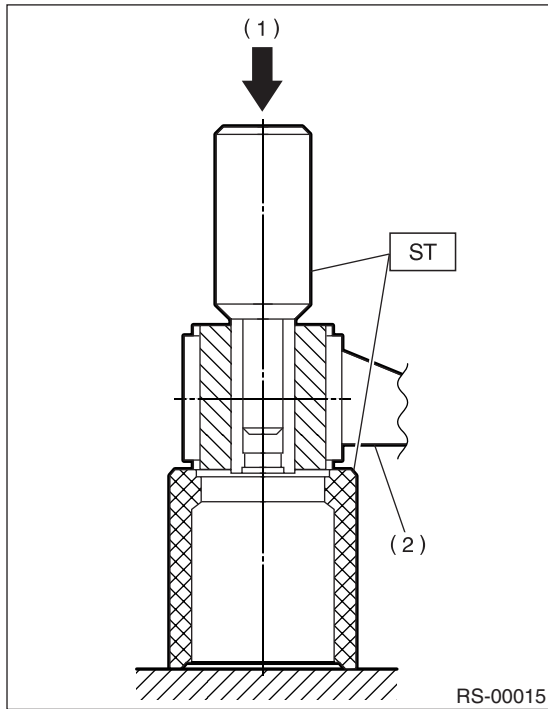
2. REAR BUSHING

- 1) Remove the housing. <Ref. to DS-27, REMOVAL, Rear Axle.>
- 2) Using the ST, press the rear bushing out of place.

Rear Trailing Link

REAR SUSPENSION

ST 927730000 INSTALLER & REMOVER SET



- (1) Press
- (2) Housing

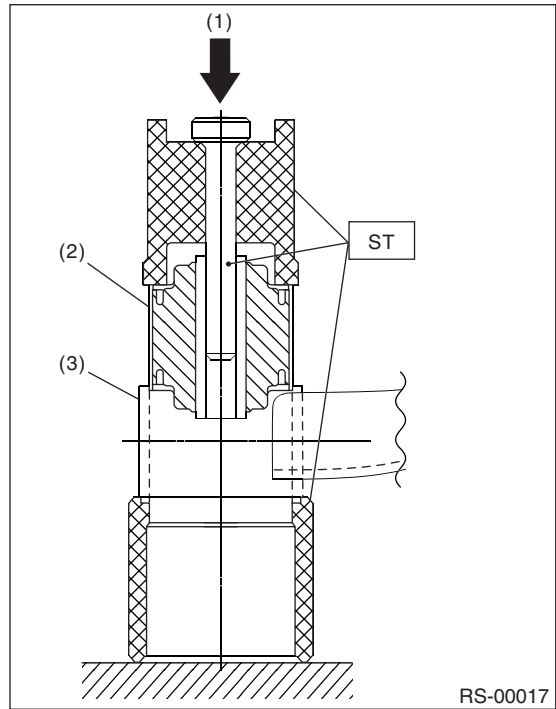
D: ASSEMBLY

1. FRONT BUSHING

Using the ST, press the bushing into trailing link.

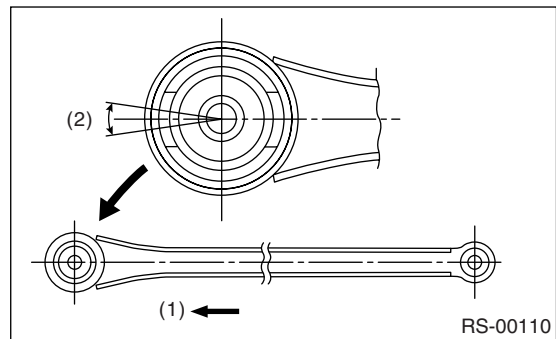
ST 927720000 INSTALLER & REMOVER SET

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) $\pm 5^\circ$

2. REAR BUSHING

1) Using the ST, press the bushing into trailing link.

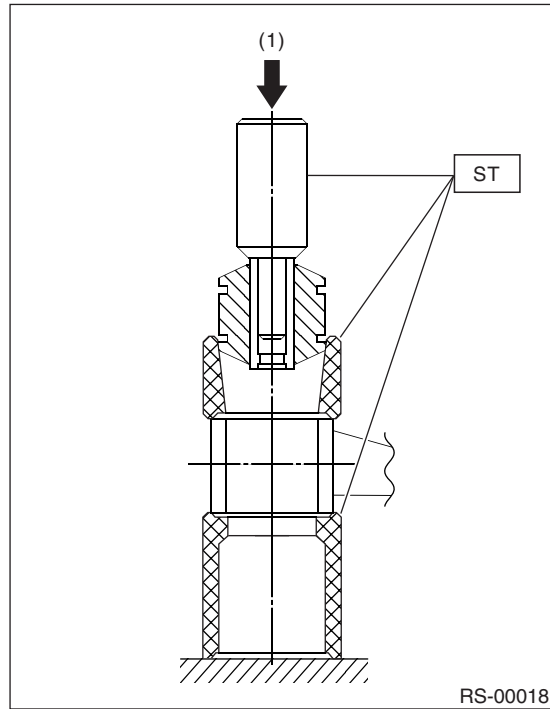
ST 927730000 INSTALLER & REMOVER SET

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

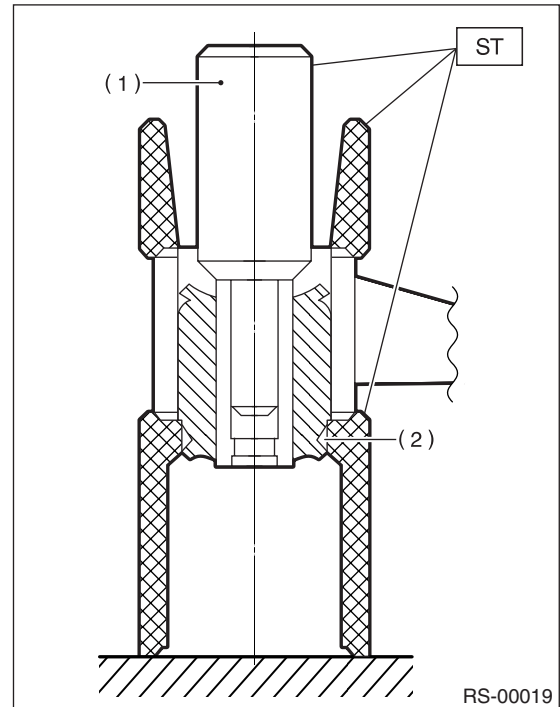


(1) Press

2) Press the ST plunger until the bushing flange protrudes beyond trailing link.

ST 927730000

INSTALLER & REMOVER SET



(1) Plunger

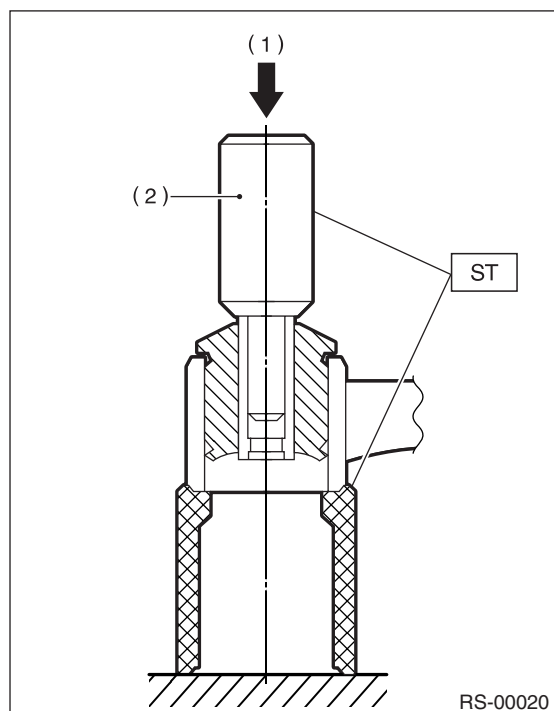
(2) Flange

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.

Rear Trailing Link

REAR SUSPENSION

ST 927730000 INSTALLER & REMOVER
SET



- (1) Press
- (2) Plunger

4) Install the housing. <Ref. to DS-28, INSTALLATION, Rear Axle.>

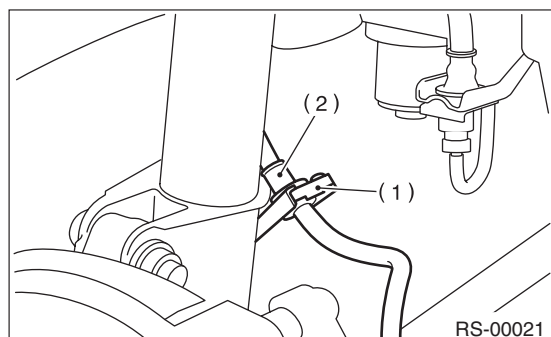
E: INSPECTION

Check the trailing links for bends, corrosion or damage.

5. Rear Strut

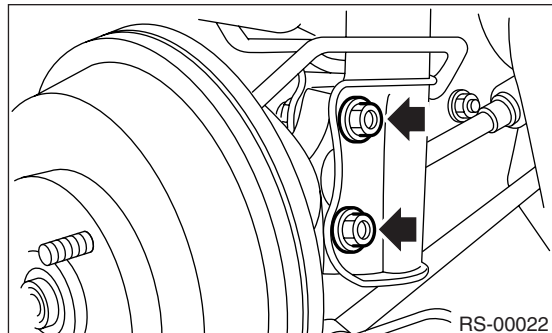
A: REMOVAL

- 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-19, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures. <Ref. to FS-19, ASSEMBLY, Front Strut.>

E: INSPECTION

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

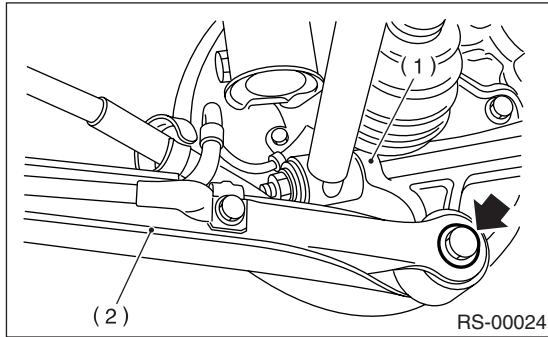
F: DISPOSAL

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

6. Lateral link

A: REMOVAL

- 1) Loosen the wheel nuts. Lift-up the vehicle and remove 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.

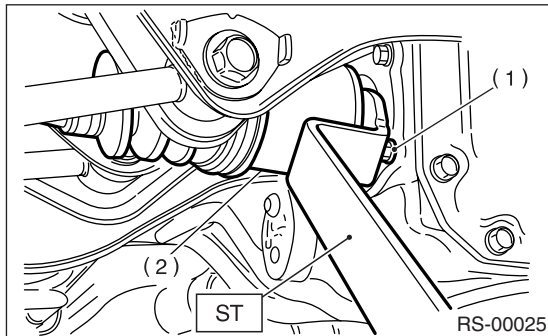


- (1) Rear housing
(2) Trailing link

- 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 snap ring 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-42, INSTALLATION, Rear Drive Shaft.>

CAUTION:

- Replace the self-locking nut and DOJ snap ring 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.

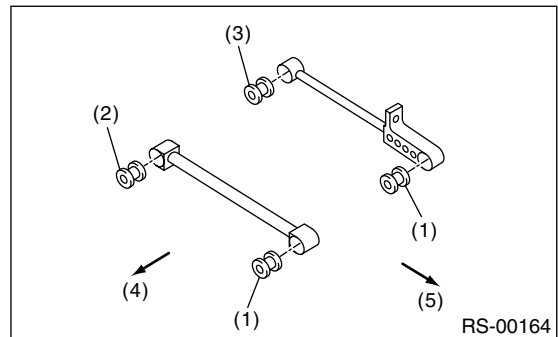
NOTE:

Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

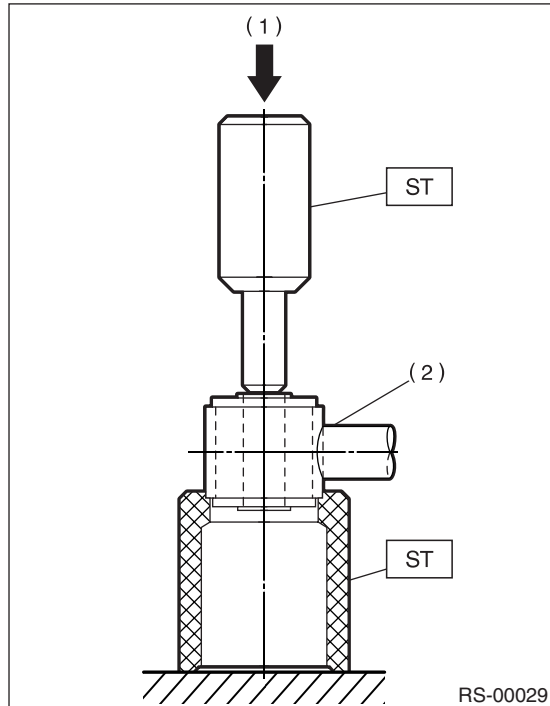
- 1) Using the following table as a guide, verify the type of bushings.
- 2) Select the ST according to type of bushings used.

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



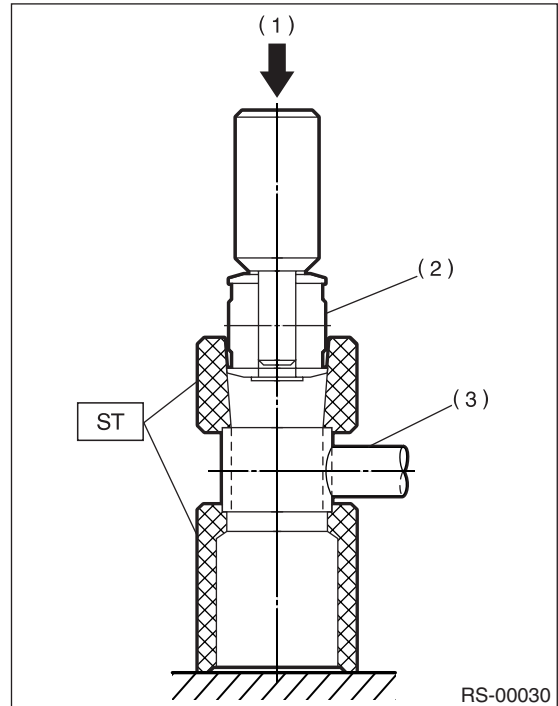
- (1) Bushing A
(2) Bushing B
(3) Bushing C
(4) Front
(5) Outside of body

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.

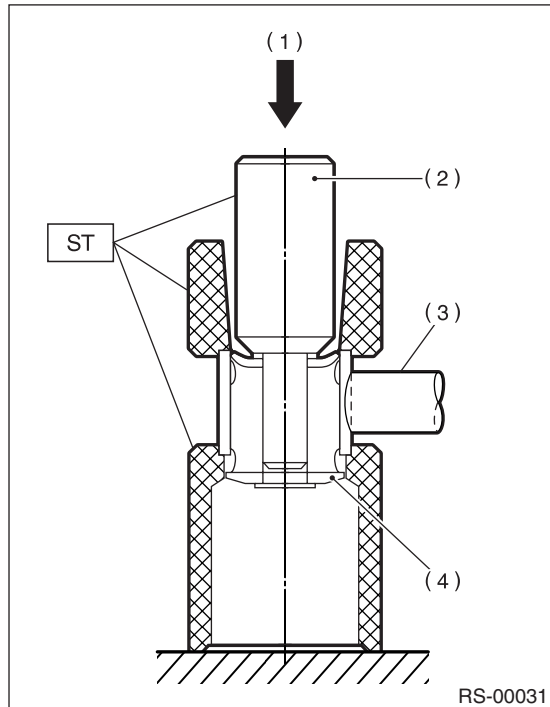
Specified lubricant:

TIRE LUBE: water = 1: 3

Lateral link

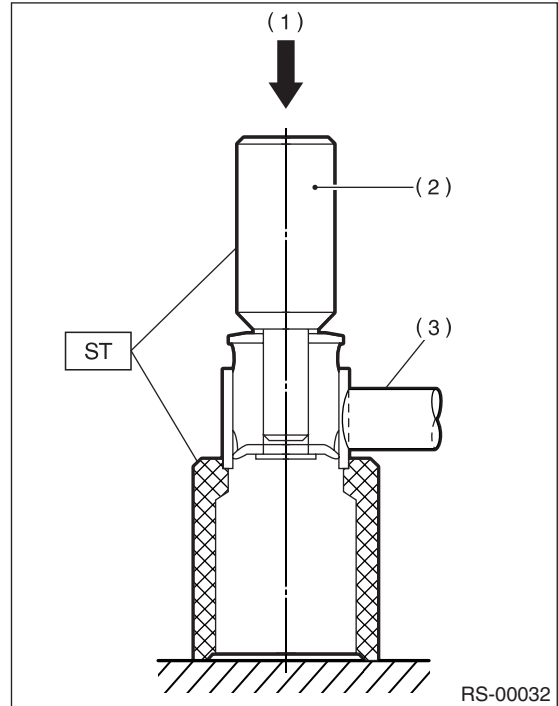
REAR SUSPENSION

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.

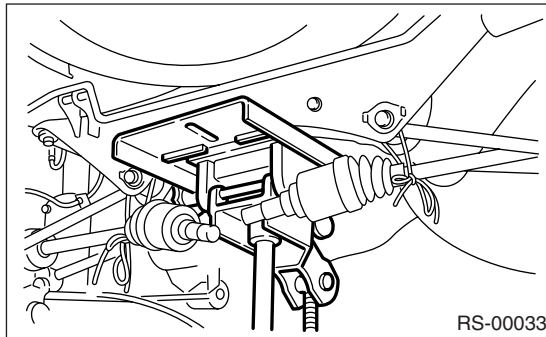
7. Rear Crossmember

A: REMOVAL

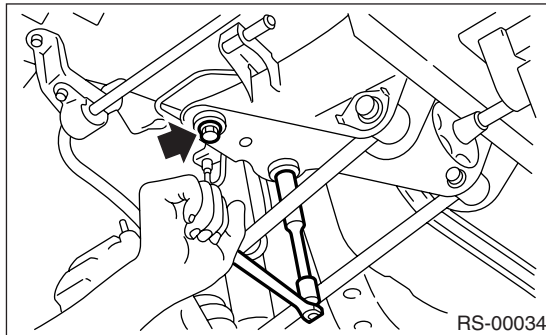
CAUTION:

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.
 - Non-turbo model
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
 - Turbo model
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 3) Remove the rear differential. <Ref. to DI-21, 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) Install the rear differential.
<Ref. to DI-23, 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.

General Diagnostic Table

REAR SUSPENSION

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) Large crack 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) Large 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) Large 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.

SECTION 6

CHASSIS

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 Case Assembly

A: NOTE

For removal, installation and inspection work, refer to "5MT" or "6MT" section.

5MT model:

<Ref. to 5MT-40, Transfer Case and Extension Case Assembly.>

6MT model:

<Ref. to 6MT-48, Extension Case.>

3. Transfer Clutch

A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-72, Transfer Clutch.>

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to "4AT", "5MT" or "6MT" section.

4AT model:

<Ref. to 4AT-46, Extension Case Oil Seal.>

5MT model:

<Ref. to 5MT-34, Oil Seal.>

6MT model:

<Ref. to 6MT-30, Oil Seal.>

5. Transfer Drive Gear

A: NOTE

For removal, installation and inspection work, refer to "5MT" or "6MT" section.

5MT model:

<Ref. to 5MT-44, Transfer Drive Gear.>

6MT model:

<Ref. to 6MT-57, Transfer Drive Gear.>

6. Transfer Driven Gear

A: NOTE

For removal, installation and inspection work, refer to "5MT" or "6MT" section.

5MT model:

<Ref. to 5MT-46, Transfer Driven Gear.>

6MT model:

<Ref. to 6MT-59, Transfer Driven Gear.>

7. Reduction Drive Gear

A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-82, Reduction Drive Gear.>

8. Reduction Driven Gear

A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-80, Reduction Driven Gear.>

9. Center Differential

A: NOTE

For removal, installation and inspection work, refer to "4AT", "5MT" or "6MT" section.

4AT model:

<Ref. to 4AT-84, Center Differential Carrier.>

5MT model:

<Ref. to 5MT-48, Center Differential.>

6MT model:

<Ref. to 6MT-61, Center Differential.>

10. Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to "4AT" section. <Ref. to 4AT-37, Transfer Clutch Pressure Test.>

Transfer Clutch Pressure Test

TRANSFER CASE

WHEEL AND TIRE SYSTEM

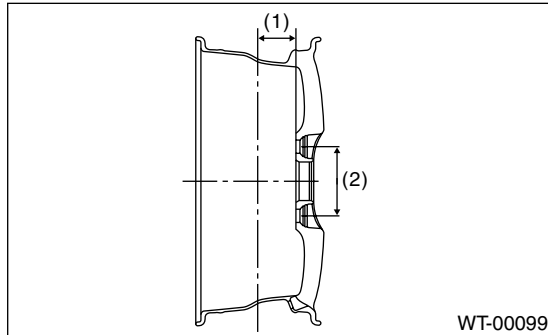
General Description

WHEEL AND TIRE SYSTEM

1. General Description

A: SPECIFICATION

1. WHEEL AND TIRE SIZE



(1) Offset

(2) P.C.D.

Specification		Tire size	Wheel size	Offset mm (in)	P.C.D. mm (in)	Tire inflation pressure kPa (kgf/cm ² , psi)	
						Front wheel	Rear wheel
2.5i, OUTBACK		205/55R16 89V	16×6 1/2JJ	55 (2.17)	100 (3.94)	230 (2.3, 33)	210 (2.1, 30)
WRX		215/45R17 91W	17 × 7JJ	55 (2.17)		230 (2.3, 33)	220 (2.2, 32)
STI		225/45R17 90W	17 × 8JJ	53 (2.09)	114.3 (4.50)	250 (2.5, 36)	210 (2.1, 30)
“T-type” Tire	2.5i, OUTBACK, WRX	T135/70D16 100M	16 × 4T	50 (1.97)	100 (3.94)	420 (4.2, 60)	
	STI	T135/70D17 102M	17 × 4T	40 (1.57)	114.3 (4.50)		

NOTE:

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

General Description

WHEEL AND TIRE SYSTEM

2. SERVICE DATA

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

3. ADJUSTING PARTS

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

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

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG001	5 g (0.18 oz)
28101AG011	7.5 g (0.26 oz)
28101AG021	10 g (0.35 oz)
28101AG031	12.5 g (0.44 oz)
28101AG041	15 g (0.53 oz)
28101AG051	17.5 g (0.62 oz)
28101AG061	20 g (0.71 oz)
28101AG071	22.5 g (0.79 oz)
28101AG081	25 g (0.88 oz)
28101AG091	27.5 g (0.97 oz)
28101AG101	30 g (1.06 oz)
28101AG111	32.5 g (1.15 oz)
28101AG121	35 g (1.23 oz)
28101AG131	37.5 g (1.32 oz)
28101AG141	40 g (1.41 oz)
28101AG151	42.5 g (1.50 oz)
28101AG161	45 g (1.59 oz)
28101AG171	47.5 g (1.68 oz)
28101AG181	50 g (1.76 oz)
28101AG191	52.5 g (1.85 oz)
28101AG201	55 g (1.94 oz)
28101AG211	57.5 g (2.03 oz)
28101AG221	60 g (2.12 oz)
28101AG231	62.5 g (2.20 oz)
28101AG241	65 g (2.29 oz)

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG251	67.5 g (2.38 oz)
28101AG261	70 g (2.47 oz)
28101AG271	72.5 g (2.56 oz)
28101AG281	75 g (2.65 oz)
28101AG291	77.5 g (2.73 oz)
28101AG301	80 g (2.82 oz)
28101AG311	82.5 g (2.91 oz)
28101AG321	85 g (3.00 oz)
28101AG331	87.5 g (3.09 oz)
28101AG341	90 g (3.17 oz)
28101AG351	92.5 g (3.26 oz)
28101AG361	95 g (3.35 oz)
28101AG371	97.5 g (3.44 oz)
28101AG381	100 g (3.53 oz)

B: PREPARATION TOOL

1. GENERAL TOOL

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

2. Tire

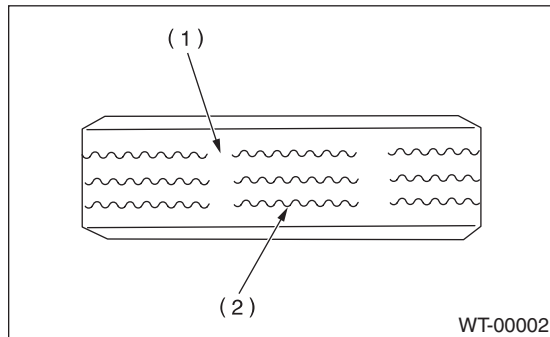
A: INSPECTION

- 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.

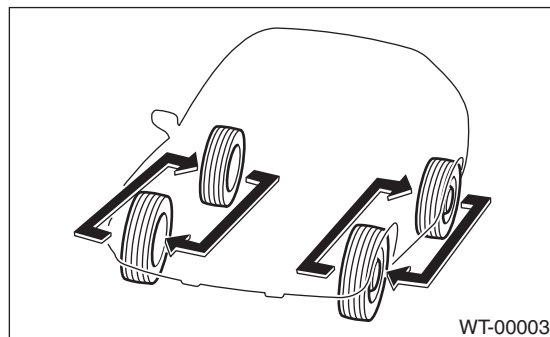


- (1) Tread wear indicator
- (2) Tire tread

- 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. Aluminum Wheel

A: REMOVAL

- 1) Apply parking brake, and position the select lever or shift lever to "P" range (AT model) or "1st gear" (MT model).
- 2) Set jacks or a lift to the specified point, and support the vehicle with its tires slightly contacting the floor.
- 3) Loosen the wheel nuts.
- 4) Raise the vehicle until its tires 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, using SUBARU genuine wheel nut.
- 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:

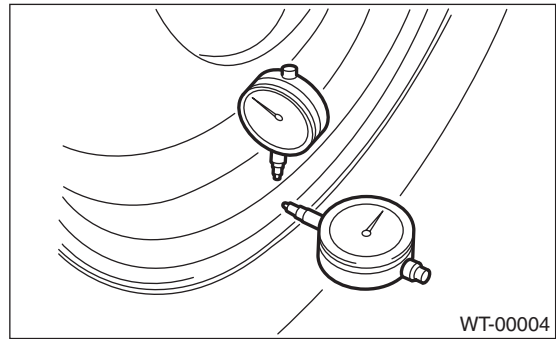
- Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached.
- Do not depress the wrench with foot; Always use both hands when tightening.
- Make sure the bolt, nut and nut seating surface of the wheel are free from oils.

- 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

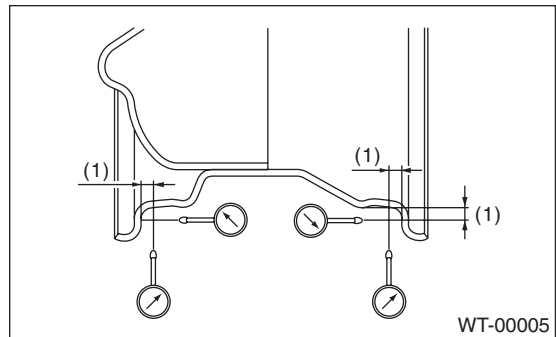
- 1) Deformation or damage on the rim can cause air leakage. Check the rim flange for deformation, crack or damage, and repair or replace as necessary.
- 2) Jack-up the vehicle until tires clear the floor.

- 3) Slowly rotate the wheel to check the rim "runout" using a dial gauge.



Axial runout limit	Radial runout limit
1.0 mm (0.039 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.



(1) Approx. 7 mm (0.28 in)

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

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, 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 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.

Wheel Balancing

WHEEL AND TIRE SYSTEM

4. Wheel Balancing

A: REPLACEMENT

1. STICK-ON TYPE BALANCE WEIGHT

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

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

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

2. PASTE-ON TYPE BALANCE WEIGHT

- 1) Remove balance weights.
- 2) Remove traces of two-sided tape on wheel and clean adhesive layer.
- 3) Set balancing (dynamic balancing for stick-on balance weight is available) and measure wheel balance.

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG001	5 g (0.18 oz)
28101AG011	7.5 g (0.26 oz)
28101AG021	10 g (0.35 oz)
28101AG031	12.5 g (0.44 oz)
28101AG041	15 g (0.53 oz)
28101AG051	17.5 g (0.62 oz)
28101AG061	20 g (0.71 oz)
28101AG071	22.5 g (0.79 oz)
28101AG081	25 g (0.88 oz)
28101AG091	27.5 g (0.97 oz)
28101AG101	30 g (1.06 oz)
28101AG111	32.5 g (1.15 oz)

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG121	35 g (1.23 oz)
28101AG131	37.5 g (1.32 oz)
28101AG141	40 g (1.41 oz)
28101AG151	42.5 g (1.50 oz)
28101AG161	45 g (1.59 oz)
28101AG171	47.5 g (1.68 oz)
28101AG181	50 g (1.76 oz)
28101AG191	52.5 g (1.85 oz)
28101AG201	55 g (1.94 oz)
28101AG211	57.5 g (2.03 oz)
28101AG221	60 g (2.12 oz)
28101AG231	62.5 g (2.20 oz)
28101AG241	65 g (2.29 oz)
28101AG251	67.5 g (2.38 oz)
28101AG261	70 g (2.47 oz)
28101AG271	72.5 g (2.56 oz)
28101AG281	75 g (2.65 oz)
28101AG291	77.5 g (2.73 oz)
28101AG301	80 g (2.82 oz)
28101AG311	82.5 g (2.91 oz)
28101AG321	85 g (3.00 oz)
28101AG331	87.5 g (3.09 oz)
28101AG341	90 g (3.17 oz)
28101AG351	92.5 g (3.26 oz)
28101AG361	95 g (3.35 oz)
28101AG371	97.5 g (3.44 oz)
28101AG381	100 g (3.53 oz)

- 4) Select a weight close to the calculated value, clean the point designated by balancing and paste on the weight there.

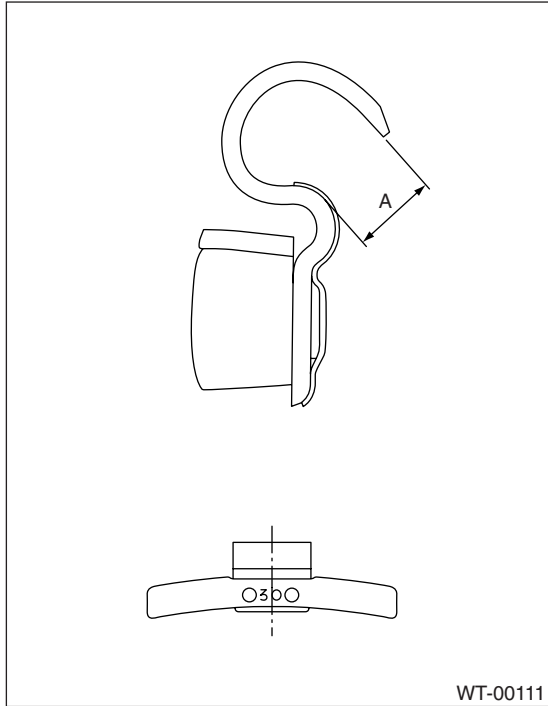
CAUTION:

- Press on the weight for more than 2 seconds with a force of 25 N·m (2.6 kgf-m, 18 ft-lb) or more per 5 g (0.18 oz) to paste on.
- Adjust weight balance from outside first and then inside.
- The weight to be pasted on must be under 100 g (3.53 oz).

B: INSPECTION

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

4) Use genuine balance weights.



Service limit A:
5.0 mm (0.20 in)

5. “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 Aluminum Wheel for removal and installation of “T-type” tires. <Ref. to WT-5, Aluminum Wheel.>

CAUTION:

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

C: INSPECTION

- 1) Check the tire inflation pressure.

Specification:

420 kPa (4.2 kgf/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.

6. General Diagnostic 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.
Sways/shimmies	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.

General Diagnostic Table

WHEEL AND TIRE SYSTEM
