

General Description

BRAKE

1. General Description

A: SPECIFICATION

Model		2.5 i	OUTBACK	WRX
Front disc brake	Size	15-inch type		16-inch type
	Type	Disc (Floating type, ventilated)		
	Effective disc diameter mm (in)	228 (8.98)		244 (9.61)
	Disc thickness × Diameter mm (in)	24 × 277 (0.94 × 10.91)		24 × 294 (0.94 × 11.57)
	Effective cylinder diameter mm (in)	42.8 (1.685) × 2		
	Pad dimensions (Length × Width × Thickness) mm (in)	117.8 × 50.5 × 11.0 (4.638 × 1.988 × 0.433)		
	Clearance adjustment	Automatic adjustment		
Rear disc brake	Size	—	15-inch type	
	Type	—	Disc (Floating type, solid)	
	Effective disc diameter mm (in)	—	250 (9.84)	
	Disc thickness × Diameter mm (in)	—	10 × 286 (0.39 × 11.26)	
	Effective cylinder diameter mm (in)	—	38.1 (1.500)	
	Pad dimensions (Length × Width × Thickness) mm (in)	—	92.0 × 33.0 × 9.0 (3.622 × 1.299 × 0.354)	
	Clearance adjustment	—	Automatic adjustment	
Rear drum brake	Type	Drum (Leading/Trailing type)	—	—
	Effective drum inner diameter mm (in)	254 (10)	—	—
	Effective cylinder diameter mm (in)	19 (0.75)	—	—
	Lining dimensions (Length × Width × Thickness) mm (in)	243.8 × 40.0 × 4.5 (9.6 × 1.575 × 0.177)	—	—
	Clearance adjustment	Automatic adjustment	—	—
Master cylinder	Type	Tandem		
	Effective diameter mm (in)	23.8 (15/16)		
	Reservoir type	Sealed type		
	Brake fluid reservoir capacity cm ³ (cu in)	205 (12.51)		
Brake booster	Type	Vacuum suspended		
	Effective diameter mm (in)	208 + 229 (8.19 + 9.02)		
Brake line		Dual circuit system		
Brake fluid CAUTION: • Avoid mixing brake fluid of different brands to prevent fluid performance from degrading. • When filling with brake fluid, be careful not to allow any dust to enter the reservoir. • Use new SUBARU genuine brake fluid when replacing or refilling the fluid.		FMVSS No. 116, DOT3, or DOT4		

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NOTE:

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

Item		Specification	Service limit
Front brake	Pad thickness	mm (in) 11 (0.43)	1.5 (0.059)
	Disc thickness	mm (in) 24 (0.94)	22 (0.87)
	Disc runout	mm (in) —	0.05 (0.0020)
Rear brake (disc type)	Pad thickness	mm (in) 9.0 (0.354)	1.5 (0.059)
	Disc thickness	mm (in) 10 (0.39)	8.5 (0.335)
	Disc runout	mm (in) —	0.05 (0.0020)
Rear brake (drum type)	Inside diameter	mm (in) 254 (10)	256 (10.08)
	Lining thickness	mm (in) 4.5 (0.177)	1.5 (0.059)
Rear brake (disc type)	Inside diameter	mm (in) 190 (7.48)	191 (7.52)
	Lining thickness	mm (in) 2.8 (0.11)	1.5 (0.059)
Parking brake	Lever stroke	7 — 8 notches/200 N (20 kgf, 45 lbf)	

		Brake pedal force N (kgf, lbf)	Fluid pressure kPa (kgf/cm ² , psi)
			All models
Brake booster	Brake fluid pressure with engine stopped	147 (15, 33)	545 (6, 79)
		294 (30, 66)	1,564 (16, 227)
	Brake fluid pressure with engine running and vacuum pressure at 66.7 kPa (500 mmHg, 19.69 inHg)	147 (15, 33)	6,003 (61, 871)
		294 (30, 66)	11,273 (115, 1,635)

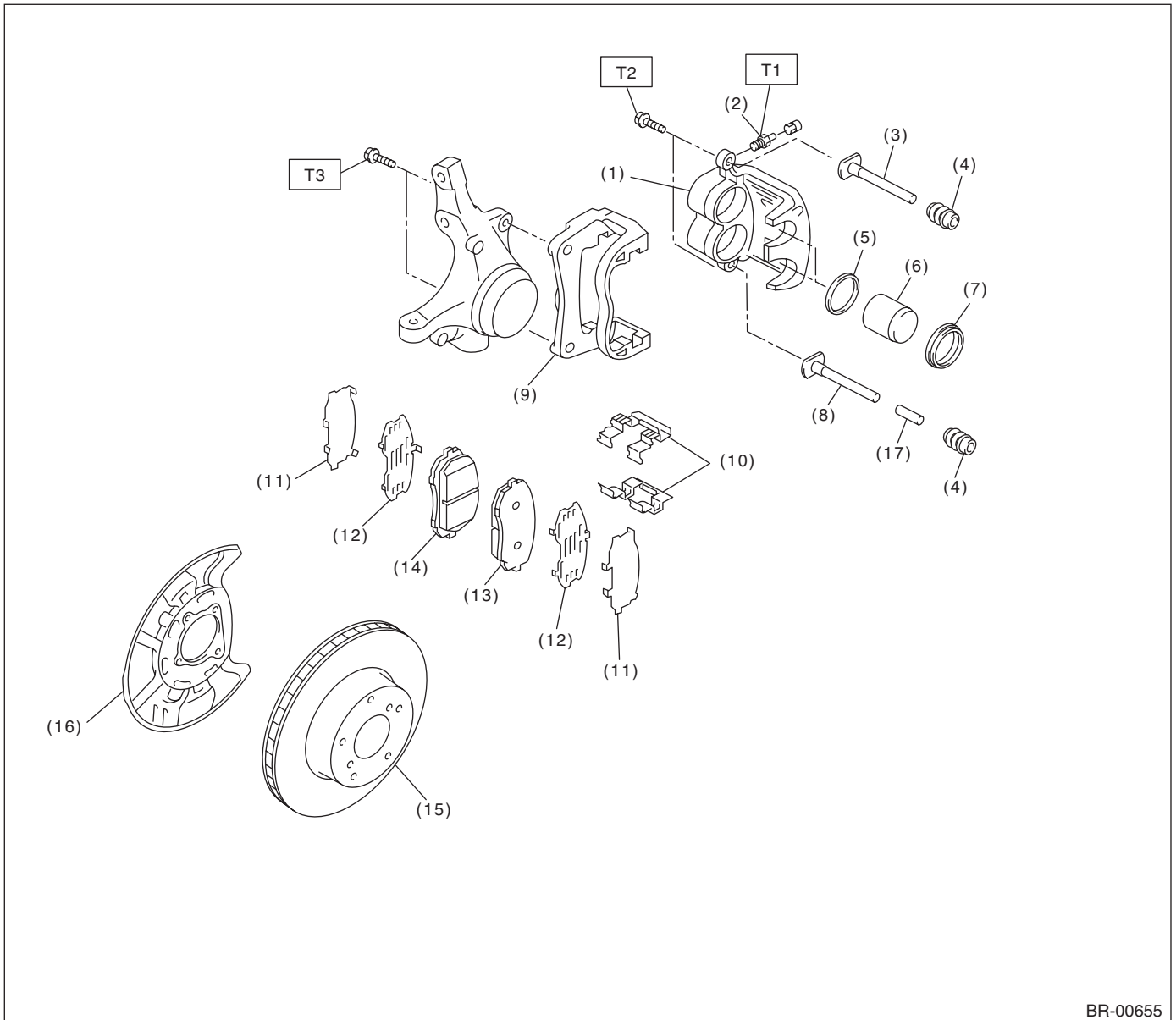
Brake pedal	Free play	mm (in)	0.5 — 2 (0.020 — 0.079) [When pulling the brake pedal upward with a force of less than 10 N (1 kgf, 2 lbf)]

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B: COMPONENT

1. FRONT DISC BRAKE



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

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

- (16) Disc cover
- (17) Bushing

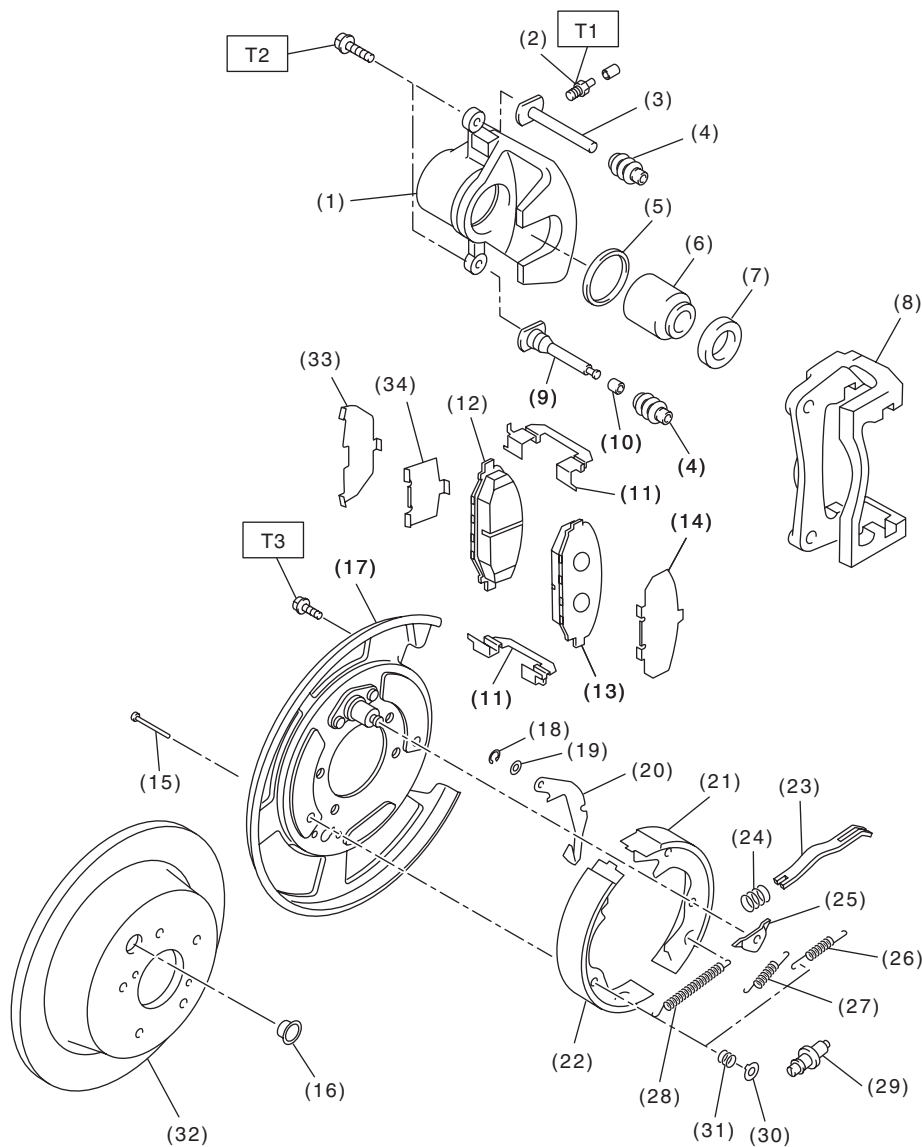
Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.9)

T2: 27 (2.8, 19.9)

T3: 80 (8.2, 59)

2. REAR DISC BRAKE



BR-00656

(1) Caliper body	(14) Outer shim	(27) Primary shoe return spring
(2) Air bleeder screw	(15) Shoe hold-down pin	(28) Adjusting spring
(3) Guide pin (black)	(16) Adjusting hole 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) Wave washer	(32) Disc rotor
(7) Piston boot	(20) Lever	(33) Outer shim (SUS)
(8) Support	(21) Parking brake shoe (Secondary)	(34) Inner shim
(9) Lock pin (silver)	(22) Parking brake shoe (Primary)	
(10) Bushing	(23) Strut	
(11) Pad clip	(24) Strut 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, 5.9)

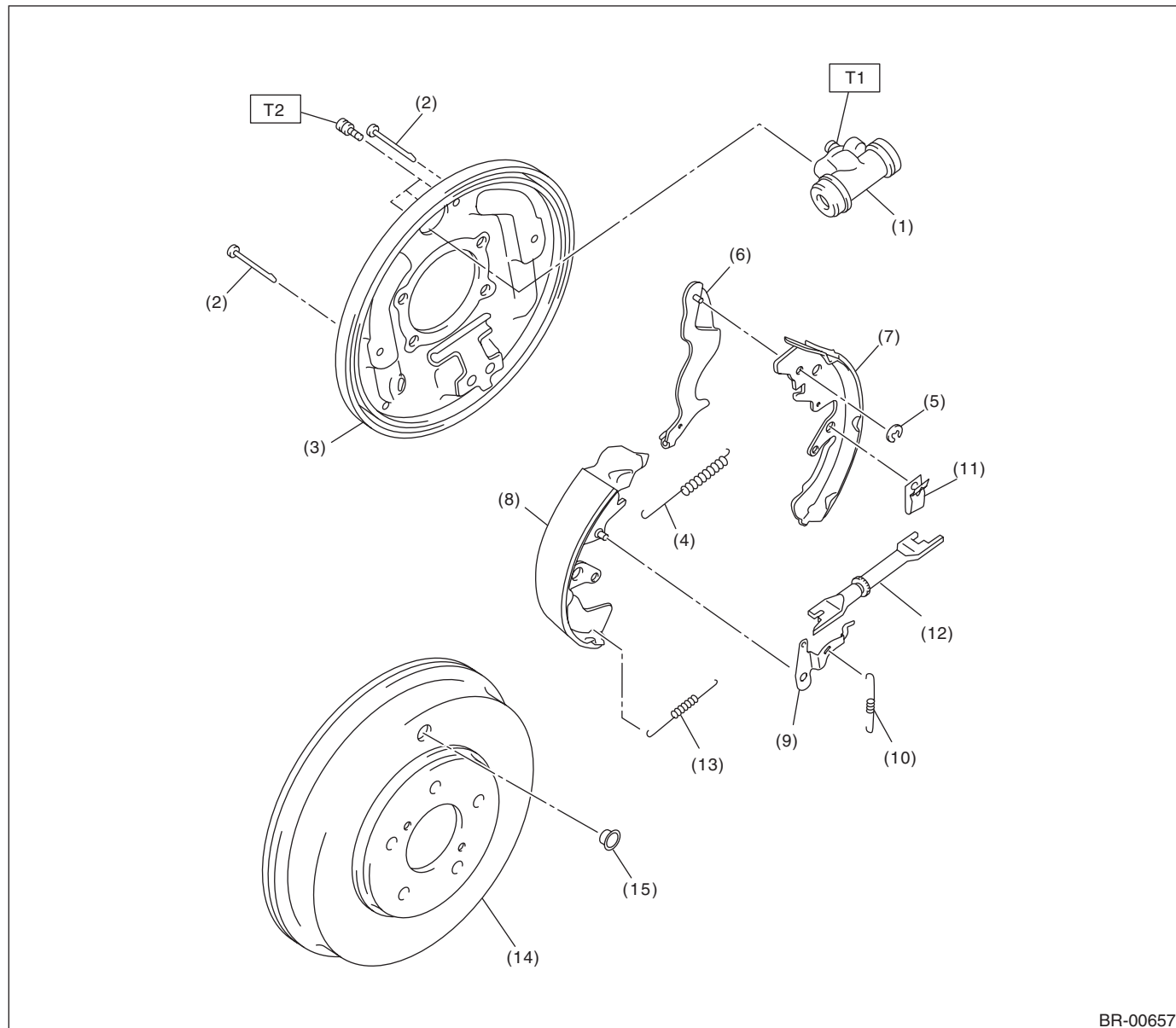
T2: 27 (2.8, 19.9)

T3: 66 (6.7, 48.7)

General Description

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3. REAR DRUM BRAKE



BR-00657

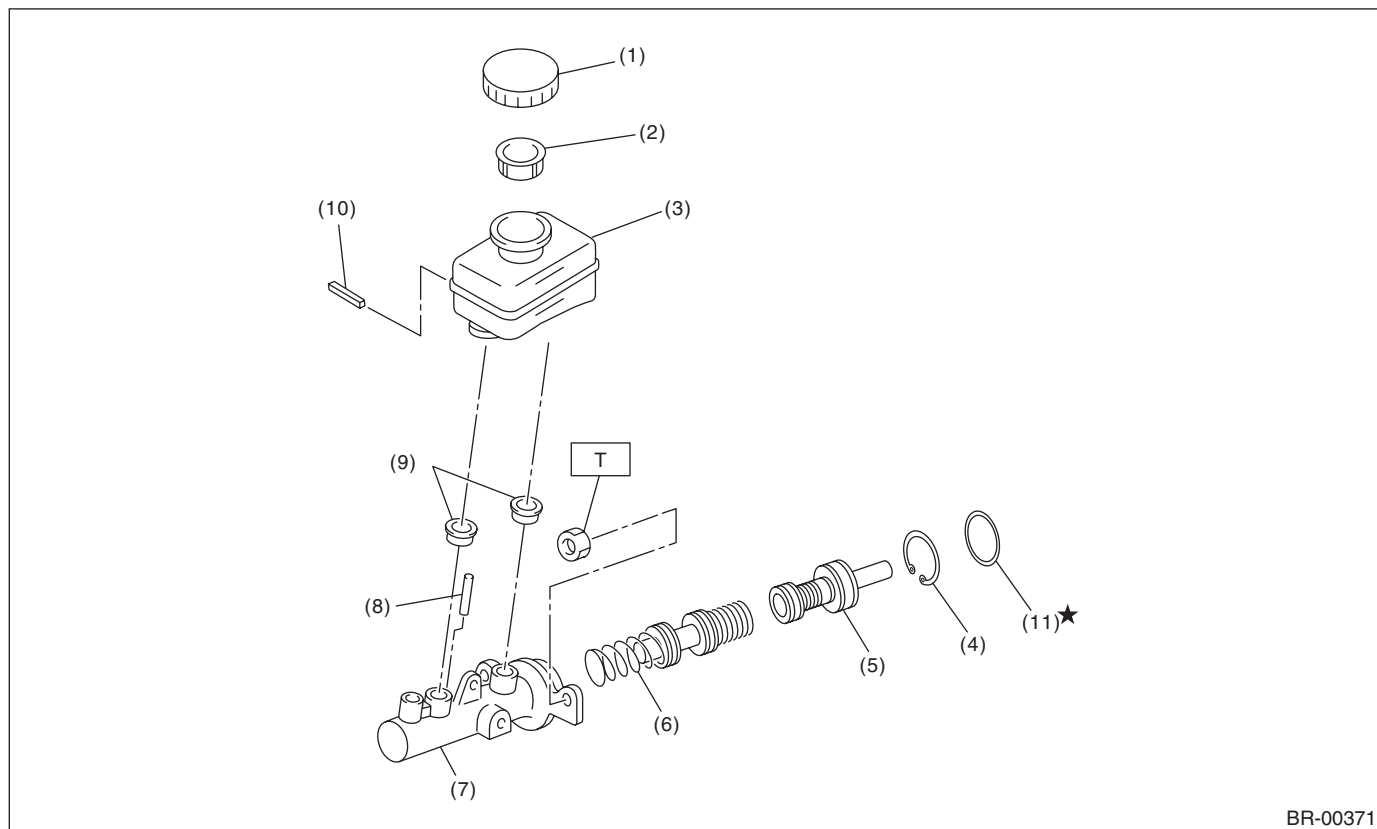
(1) Wheel cylinder ASSY	(8) Brake shoe (Leading)	(15) Adjusting hole cover
(2) Pin	(9) Adjusting lever	
(3) Back plate	(10) Adjusting spring	
(4) Upper shoe return spring	(11) Shoe hold-down spring	
(5) Retainer	(12) Adjuster	
(6) Parking brake lever	(13) Lower shoe return spring	
(7) Brake shoe (Trailing)	(14) Drum	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.9)

T2: 9 (0.9, 6.6)

4. MASTER CYLINDER



- (1) Cap
- (2) Filter
- (3) Reservoir tank
- (4) C-ring
- (5) Primary piston

- (6) Secondary piston
- (7) Cylinder body
- (8) Cylinder pin
- (9) Seal
- (10) Pin

- (11) O-ring

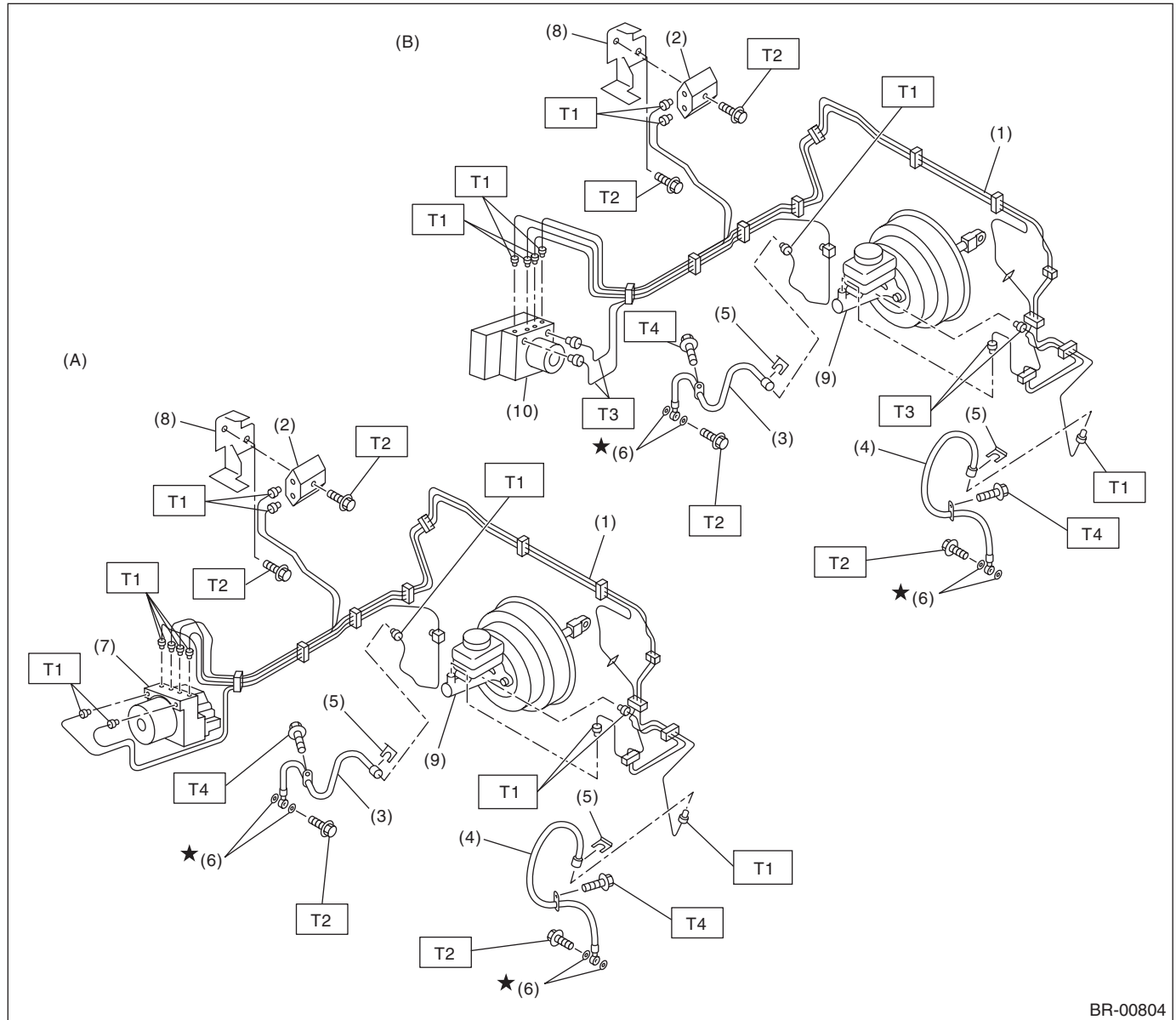
Tightening torque: N·m (kgf-m, ft-lb)

T: 13 (1.3, 9.6)

General Description

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5. FRONT BRAKE PIPES AND HOSES



BR-00804

(A) Model without vehicle dynamics control (VDC)

(B) Model with vehicle dynamics control (VDC)

- (1) Front brake pipe ASSY
- (2) Two-way connector
- (3) Front brake hose RH
- (4) Front brake hose LH
- (5) Clamp

- (6) Gasket
- (7) ABS control module and hydraulic control unit (ABSCM&H/U)
- (8) Bracket
- (9) Master cylinder
- (10) VDC control module and hydraulic control unit (VDCCM&H/U)

Tightening torque: N·m (kgf·m, ft·lb)

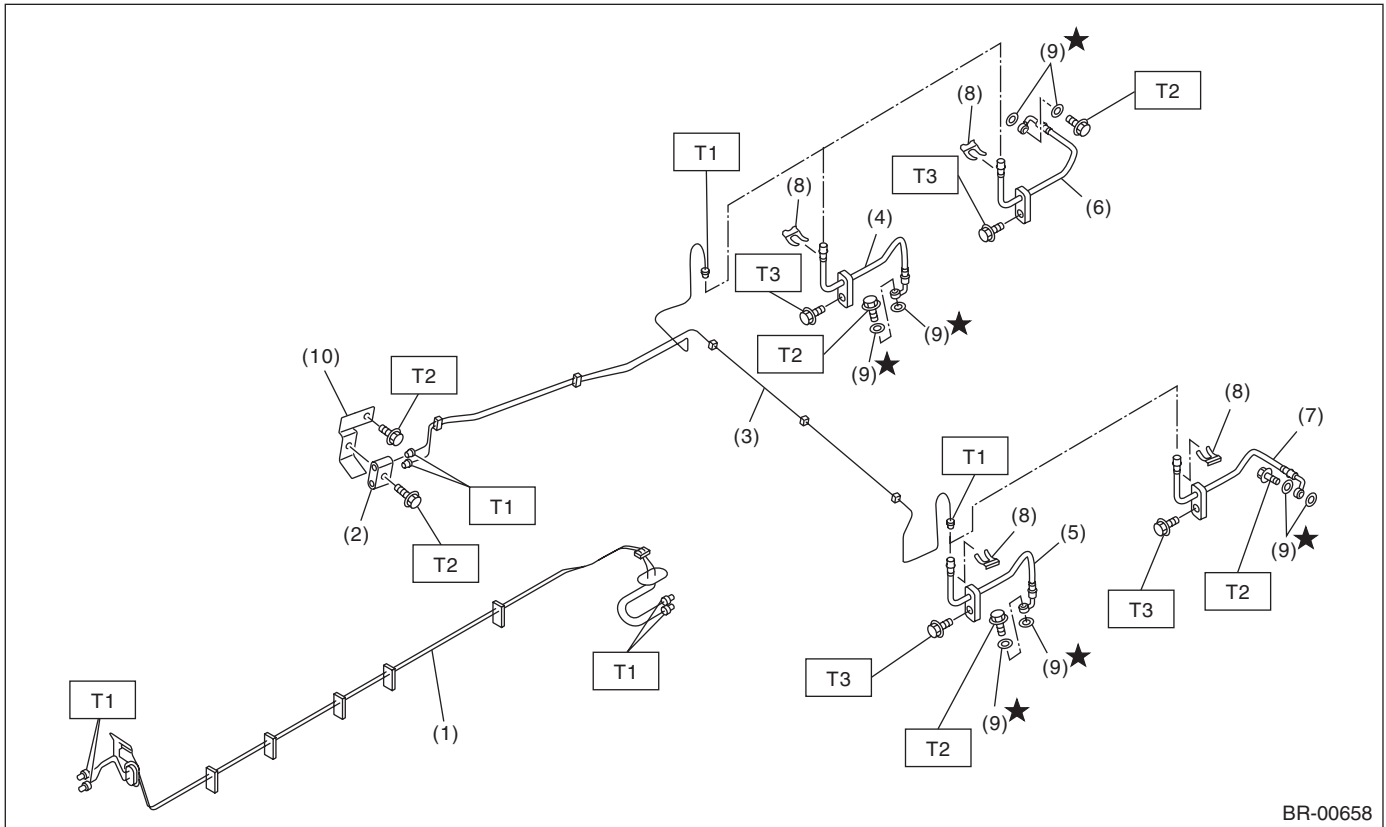
T1: 15 (1.5, 11.1)

T2: 18 (1.8, 13.3)

T3: 19 (1.9, 14)

T4: 33 (3.4, 24.3)

6. CENTER AND REAR BRAKE PIPES AND HOSES



BR-00658

(1) Center brake pipe ASSY	(6) Rear brake hose RH (Drum brake model)
(2) Two-way connector	(7) Rear brake hose LH (Drum brake model)
(3) Rear brake pipe ASSY	(8) Clamp
(4) Rear brake hose RH (Disc brake model)	(9) Gasket
(5) Rear brake hose LH (Disc brake model)	(10) Bracket

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

T1: 15 (1.5, 11.1)

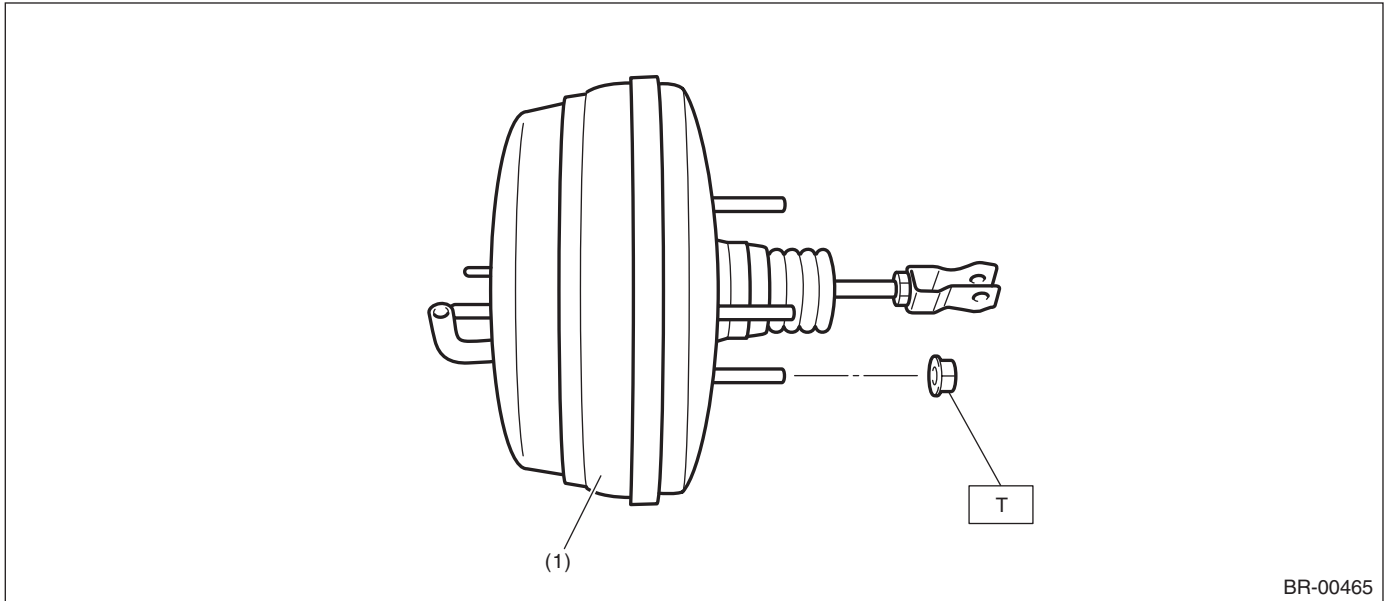
T2: 18 (1.8, 13.3)

T3: 33 (3.4, 24.3)

General Description

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7. BRAKE BOOSTER



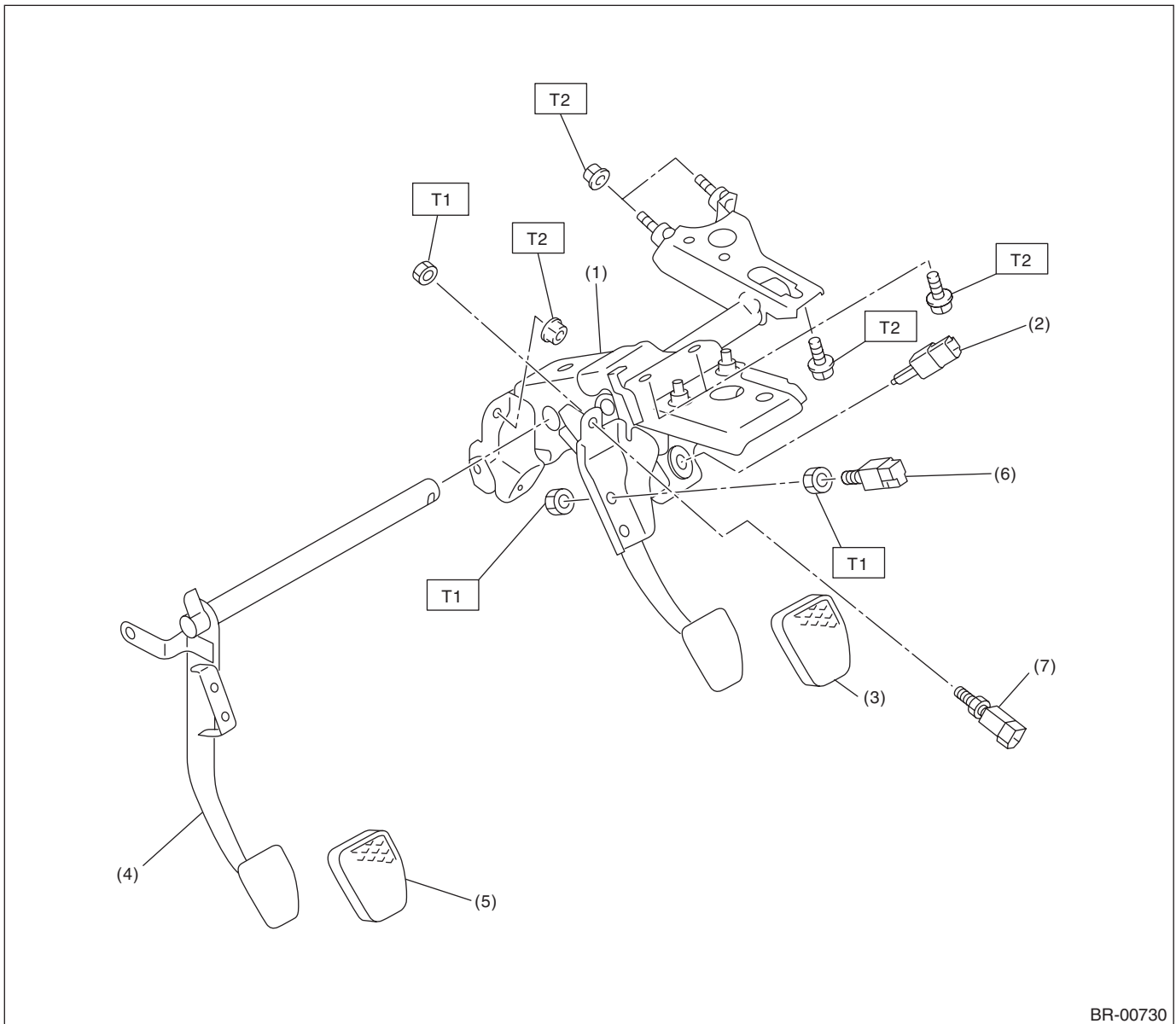
(1) Brake booster

Tightening torque: N·m (kgf-m, ft-lb)

T: 18 (1.8, 13.3)

8. BRAKE PEDAL

- MT model



- (1) Brake pedal ASSY
- (2) Stop light switch
- (3) Brake pedal pad
- (4) Clutch pedal

- (5) Clutch pedal pad
- (6) Clutch switch (cruise control)
- (7) Clutch switch (clutch start)

Tightening torque: N·m (kgf-m, ft-lb)

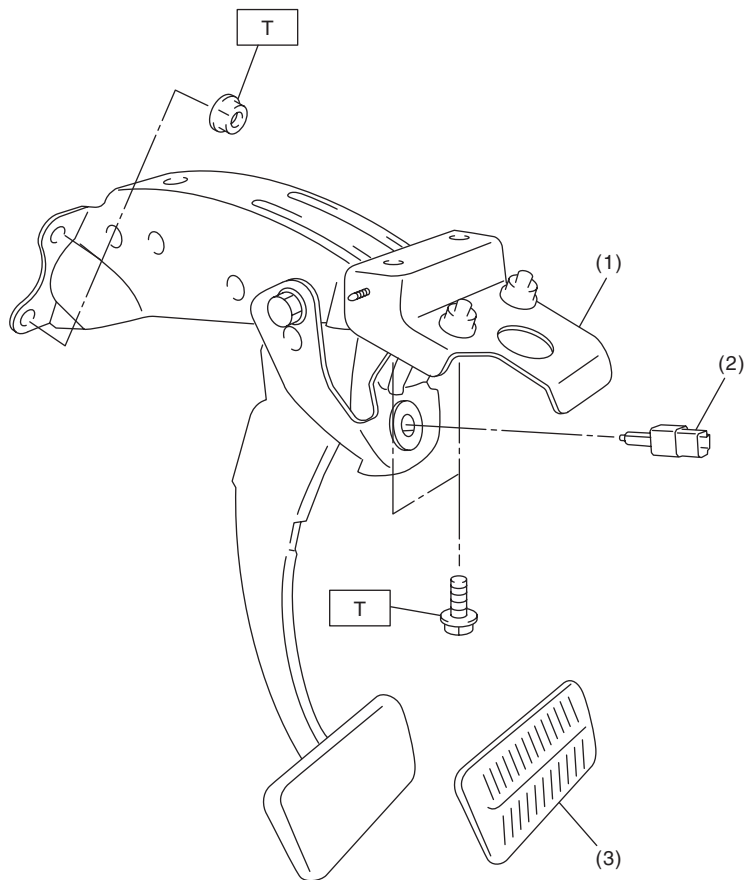
T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.3)

General Description

BRAKE

- AT model



BR-00659

- (1) Brake pedal ASSY
(2) Stop light switch

- (3) Brake pedal pad

Tightening torque: N·m (kgf-m, ft-lb)

T: 18 (1.8, 13.3)

C: CAUTION

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

D: PREPARATION TOOL**1. GENERAL TOOL**

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

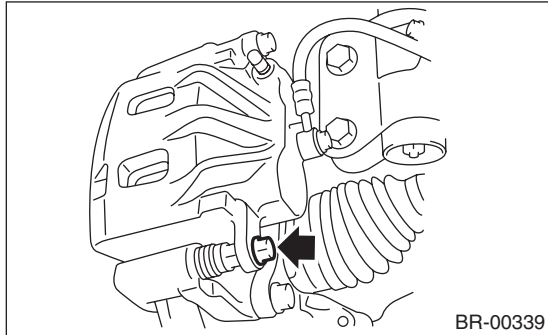
Front Brake Pad

BRAKE

2. Front Brake Pad

A: REMOVAL

- 1) Lift up the vehicle, and remove the front wheels.
- 2) Remove the caliper bolt.

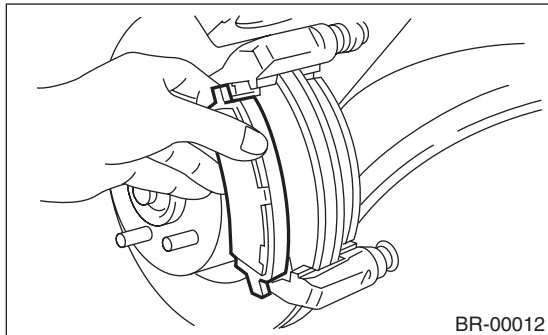


- 3) Raise the caliper body and support it.

NOTE:

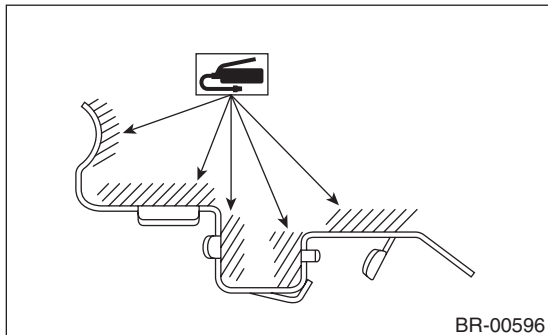
Do not disconnect the brake hose from the caliper body.

- 4) Remove the pads.

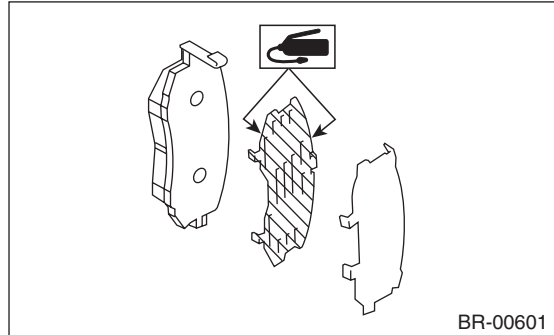


B: INSTALLATION

- 1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.



- 2) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



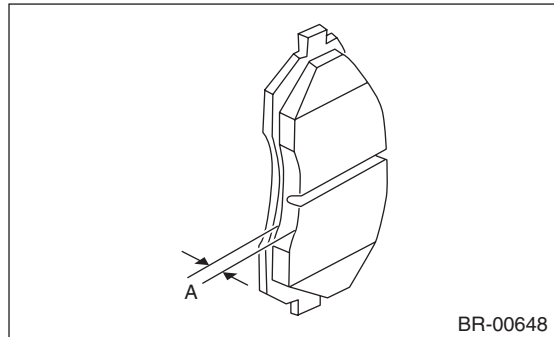
- 3) Install the pad to support.
- 4) Install the caliper body to the support.

Tightening torque:

27 N·m (2.8 kgf-m, 19.9 ft-lb)

C: INSPECTION

Check the pad thickness A.



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

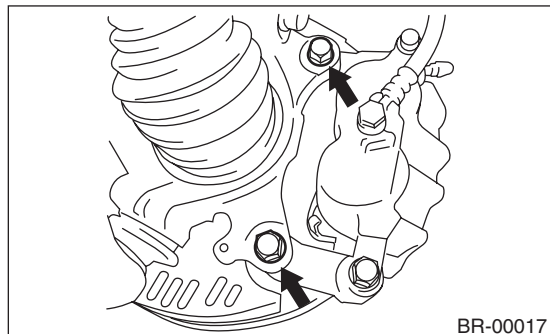
NOTE:

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

3. Front Disc Rotor

A: REMOVAL

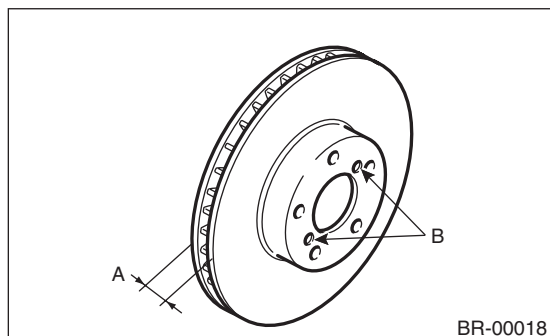
- 1) Lift up the vehicle, and remove the front wheels.
- 2) Remove the caliper body and the support from housing, and suspend it from the strut using a wire.



- 3) Remove the disc rotor.

NOTE:

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



- 4) Remove mud and foreign matter from the caliper body assembly and the support.

B: INSTALLATION

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

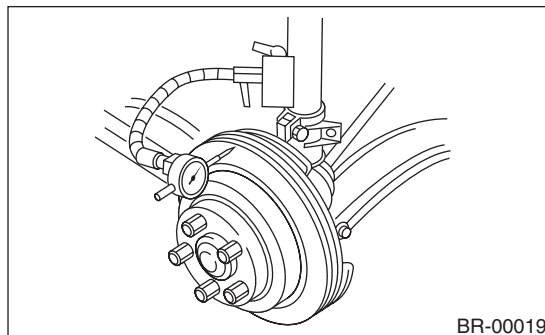
Tightening torque:

80 N·m (8.2 kgf-m, 59 ft-lb)

- 3) Install the front wheels.

C: INSPECTION

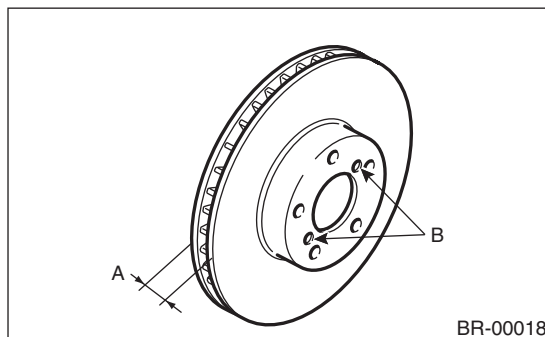
- 1) Check the front wheel bearing play and axle hub runout before the inspection of disc rotor runout limit. <Ref. to DS-16, INSPECTION, Front Axle.>
- 2) Secure the disc rotor by tightening the five wheel nuts.
- 3) Set a dial gauge 10 mm (0.39 in) inward from the disc rotor outer circumference. Rotate the disc rotor to check runout. If the disc rotor runout exceeds the limit, resurface the disc rotor. After grinding, check the thickness of the disc rotor according to the procedure in step 4).



Disc rotor runout limit:

0.05 mm (0.0020 in)

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



		Specifica- tion	Service limit	Disc rotor diameter
Disc rotor thickness A mm (in)	15"	24 (0.94)	22 (0.87)	277 (10.91)
	16"	24 (0.94)	22 (0.87)	294 (11.57)

Front Disc Brake Assembly

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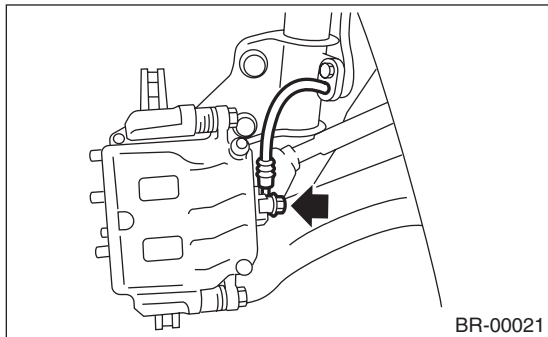
4. Front Disc Brake Assembly

A: REMOVAL

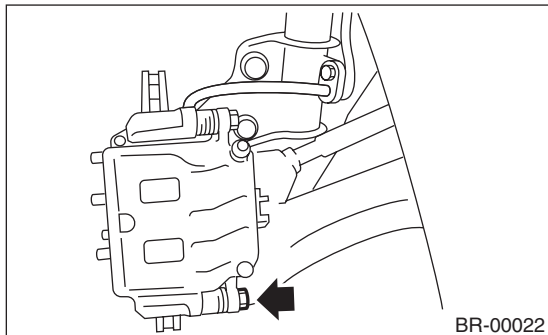
CAUTION:

Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water and wipe away completely.

- 1) Lift up the vehicle, and remove the front wheels.
- 2) Remove the union bolt, and disconnect the brake hose from the caliper body assembly.



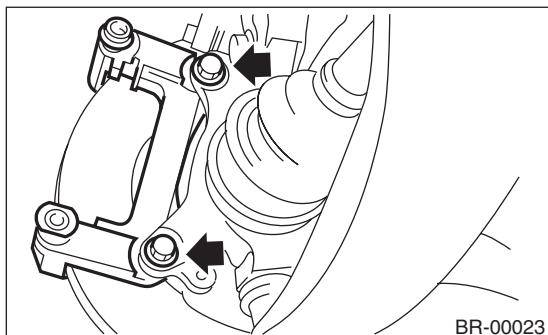
- 3) Remove the bolts which secure the caliper body.



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

NOTE:

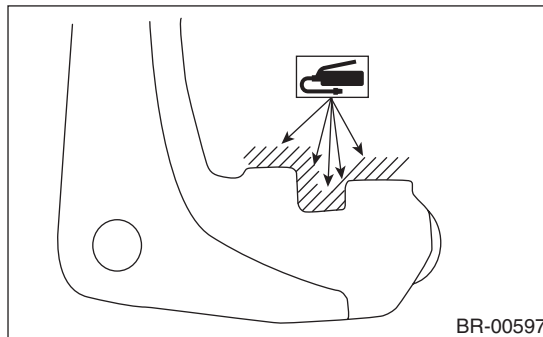
Remove the support only when replacing the rotor or support. It is not necessary to remove it when servicing the caliper body assembly.



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

B: INSTALLATION

- 1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the support.

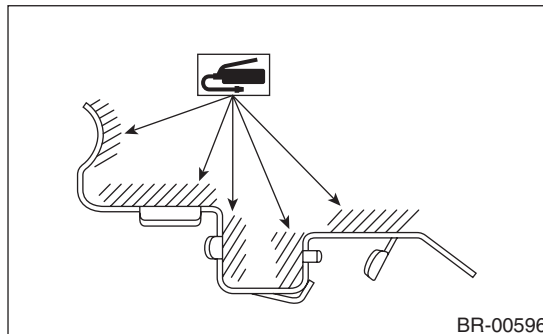


- 2) Install the support to the housing.

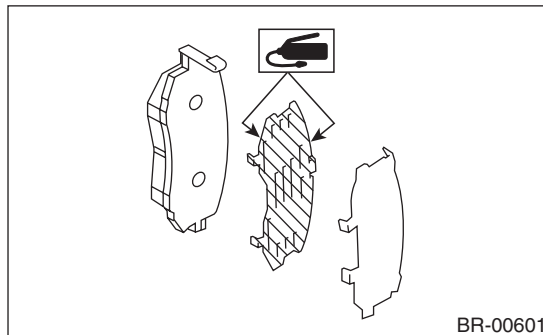
Tightening torque:

80 N·m (8.2 kgf-m, 59 ft-lb)

- 3) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.



- 4) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



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

Tightening torque:

27 N·m (2.8 kgf-m, 19.9 ft-lb)

- 7) Connect the brake hose using a new brake hose gasket.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

- 8) Bleed air from the brake system.

C: DISASSEMBLY

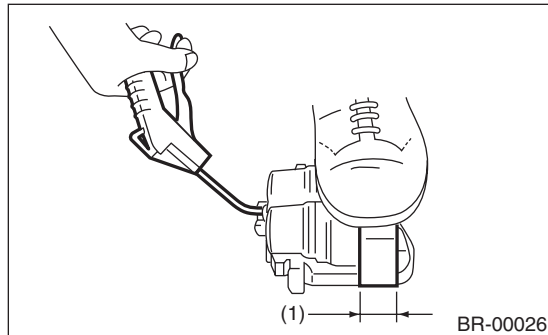
1) Remove mud and foreign matter from the caliper body assembly and the support.

CAUTION:

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

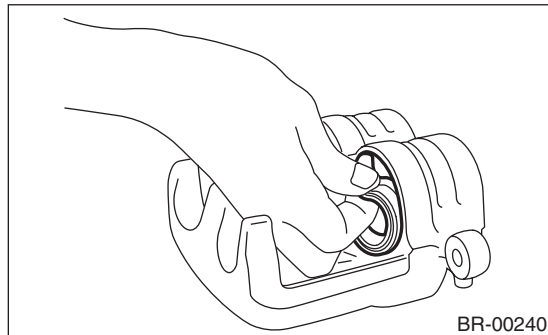
2) Place a wooden block in the caliper body as shown in the figure to prevent the piston from jumping out and being damaged.

3) Gradually apply compressed air via the brake hose installation hole to push the piston out.



(1) Place a wooden block of 30 mm (1.18 in) width.

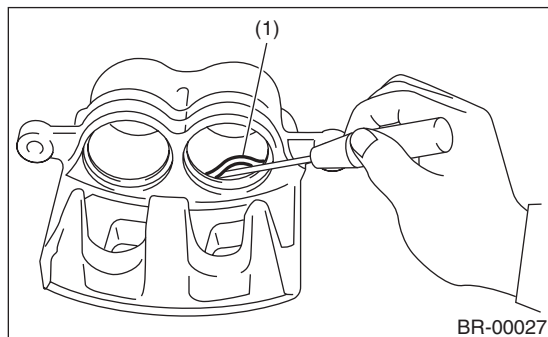
4) Remove the piston boot.



5) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the cylinder and piston seal groove.



(1) Piston seal

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

D: ASSEMBLY

1) Clean the inside of the caliper body using brake fluid.

2) Apply a coat of brake fluid to piston seal and install the piston seal to the caliper body groove.

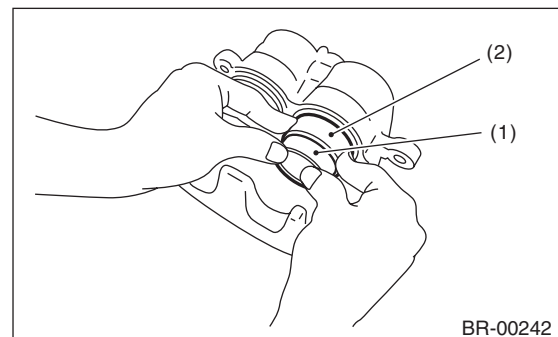
3) Apply a coat of brake fluid to the inner surface of cylinder and the entire outer surface of the piston.

4) Apply NIGLUBE RX-2 (Part No. 000041000) or grease contained in the piston seal kit to the boot, and install it to the groove at the end of the cylinder.

5) Insert the piston into cylinder.

CAUTION:

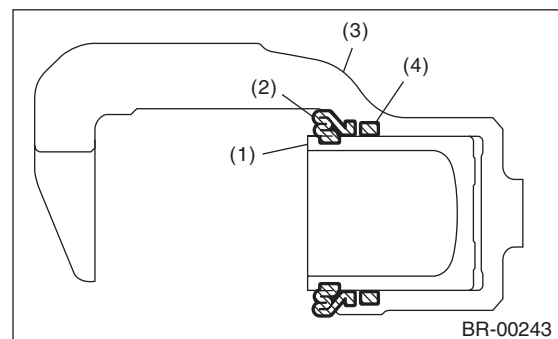
Do not force the piston into cylinder.



(1) Piston

(2) Piston boot

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



(1) Piston

(2) Piston boot

(3) Caliper body

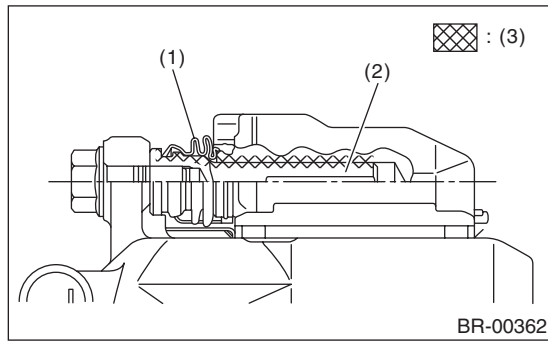
(4) Piston seal

7) Apply NIGLUBE RX-2 (Part No. 000041000) or grease contained in the piston seal kit to the lock pin, guide pin outer surface, cylinder inner surface, and boot grooves.

Front Disc Brake Assembly

BRAKE

8) Insert the lock pin and guide pin boot into the support.



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

CAUTION:

Insert the lock pin and guide pin into specified position, and make sure that they slide and seat properly.

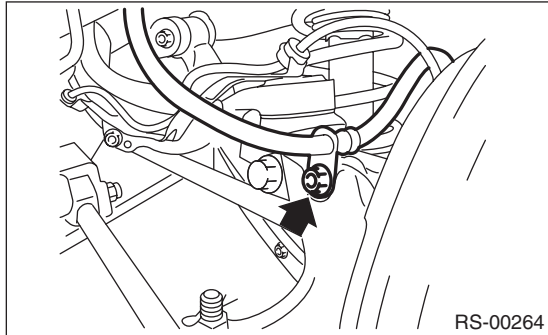
E: INSPECTION

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

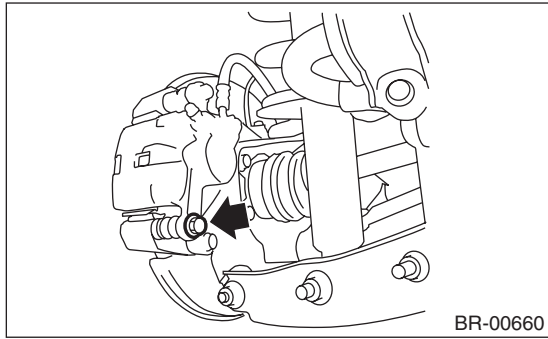
5. Rear Brake Pad

A: REMOVAL

- 1) Lift up the vehicle, and remove the rear wheels.
- 2) Remove the brake hose bracket.



- 3) Remove the caliper bolt.

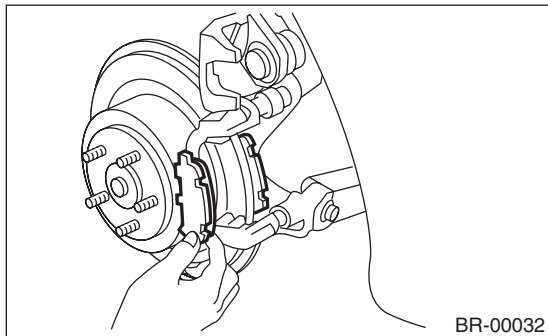


- 4) Raise the caliper body and support it.

NOTE:

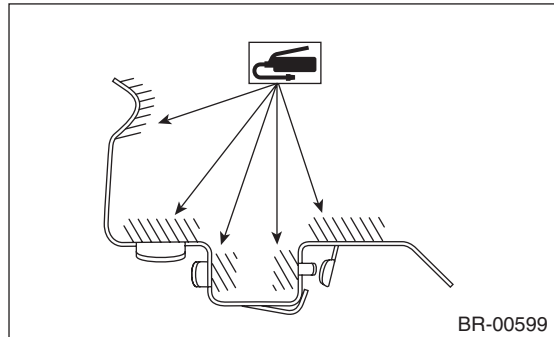
Do not disconnect the brake hose from the caliper body.

- 5) Remove the pads.

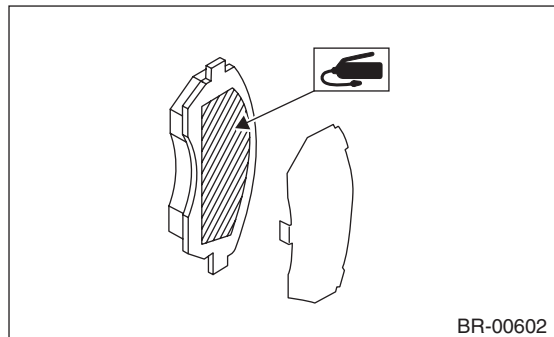


B: INSTALLATION

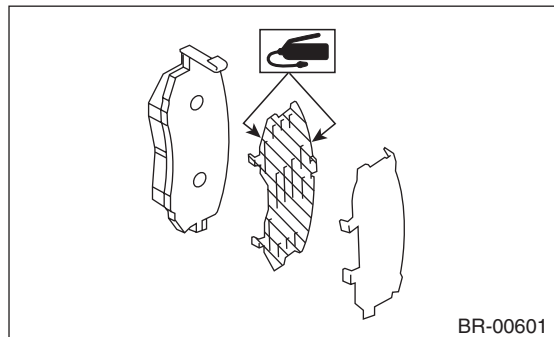
- 1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.



- 2) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or the grease contained in the pad kit to the contact surface between the pad and shim.



- 3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



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

Tightening torque:

27 N·m (2.8 kgf-m, 19.9 ft-lb)

- 6) Install the brake hose bracket.

Tightening torque:

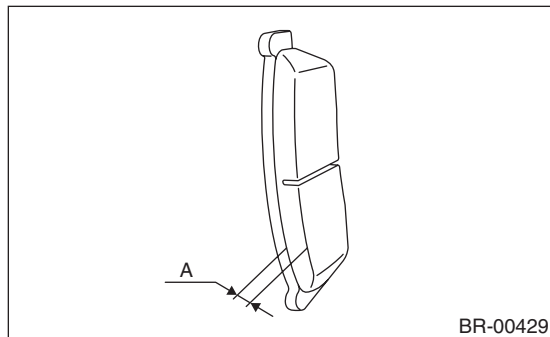
33 N·m (3.4 kgf-m, 24.3 ft-lb)

Rear Brake Pad

BRAKE

C: INSPECTION

Check the pad thickness A.



Pad thickness	Specification	9.0 (0.35)
mm (in)	Wear limit	1.5 (0.059)

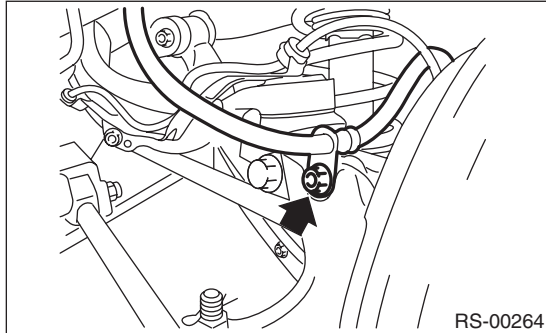
NOTE:

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

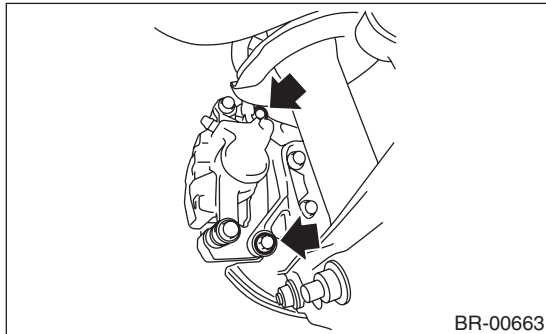
6. Rear Disc Rotor

A: REMOVAL

- 1) Lift up the vehicle, and remove the rear wheels.
- 2) Release the parking brake.
- 3) Remove the brake hose bracket.



- 4) Remove the two mounting bolts, and remove the disc brake assembly.

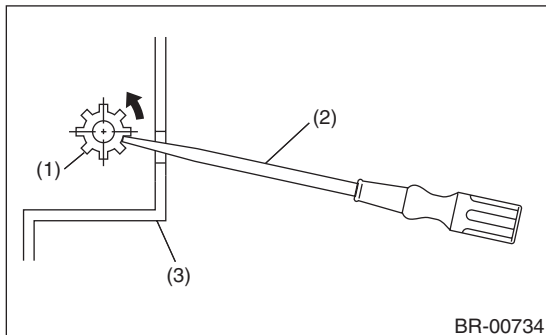


- 5) Suspend the disc brake assembly so that the hose is not stretched.
- 6) Remove the disc rotor.

NOTE:

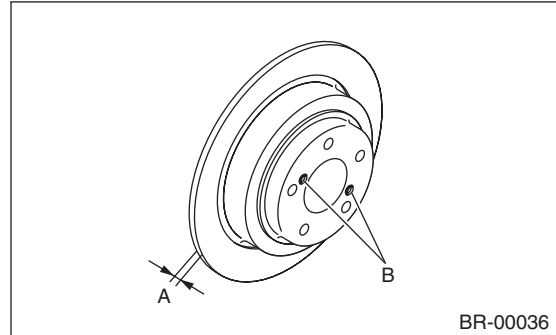
If it is difficult to remove the disc rotor, perform the following two methods in order.

- (1) Turn the adjuster using a flat tip screwdriver until the brake shoe is far enough away to allow removal of the disc rotor.



- (1) Adjuster
- (2) Flat tip screwdriver
- (3) Disc rotor

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

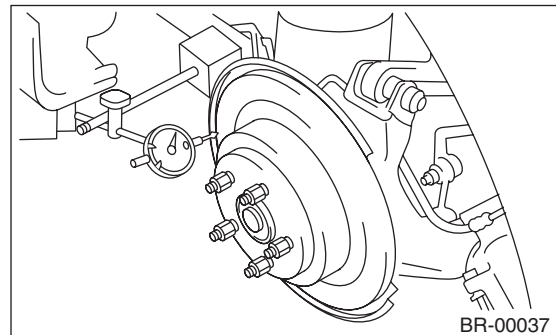


B: INSTALLATION

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

C: INSPECTION

- 1) Check the rear wheel bearing play and axle hub runout before inspecting the disc rotor runout. <Ref. to DS-25, INSPECTION, Rear Hub Unit Bearing.>
- 2) Secure the disc rotor by tightening the five wheel nuts.
- 3) Set a dial gauge 10 mm (0.39 in) inward from the disc rotor outer circumference. Rotate the disc rotor to check runout. If the disc rotor runout exceeds the limit, resurface the disc rotor. After grinding, check the thickness of the disc rotor according to the procedure in step 4).

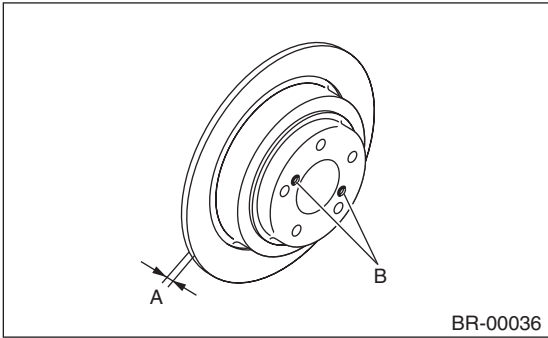


Disc rotor runout limit:
0.05 mm (0.0020 in)

Rear Disc Rotor

BRAKE

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



	Specification	Service limit	Disc diameter
Disc rotor thickness A	10 (0.39)	8.5 (0.335)	286 (11.26)
mm (in)			

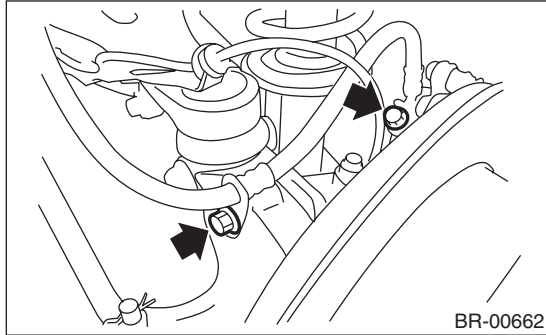
7. Rear Disc Brake Assembly

A: REMOVAL

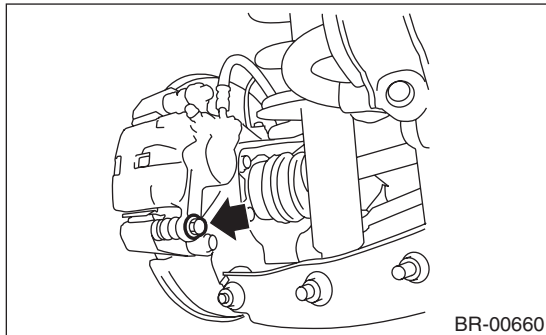
CAUTION:

Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water and wipe away completely.

- 1) Lift up the vehicle, and remove the rear wheels.
- 2) Disconnect the brake hose.



- 3) Remove the caliper mounting bolts.



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

NOTE:

Remove the support only when replacing the rotor or support. It is not necessary to remove it when servicing the caliper body assembly.

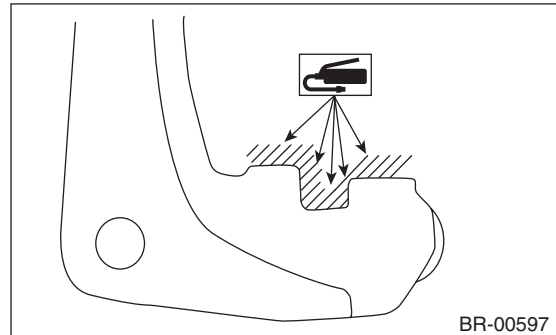
- 6) Remove mud and foreign matter from the caliper body assembly and the support.

CAUTION:

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

B: INSTALLATION

- 1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the support.

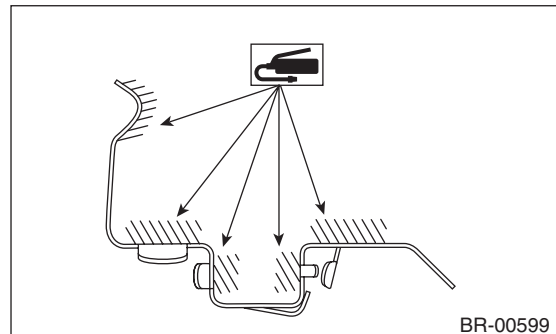


- 2) Install the support to the housing.

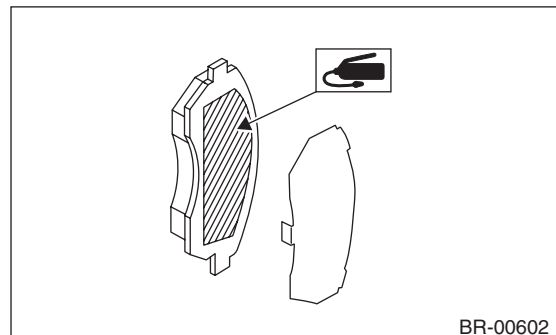
Tightening torque:

66 N·m (6.7 kgf-m, 48.7 ft-lb)

- 3) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.



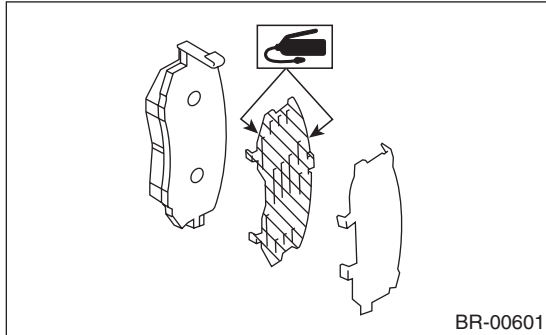
- 4) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or the grease contained in the pad kit to the contact surface between the pad and shim.



Rear Disc Brake Assembly

BRAKE

5) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



- 6) Install the pad to support.
7) Install the caliper body to the support.

Tightening torque:

27 N·m (2.8 kgf-m, 19.9 ft-lb)

8) Connect the brake hose using a new brake hose gasket.

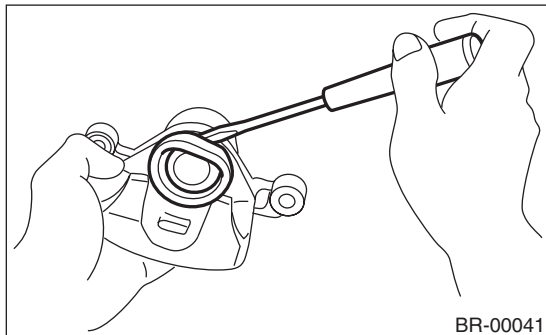
Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

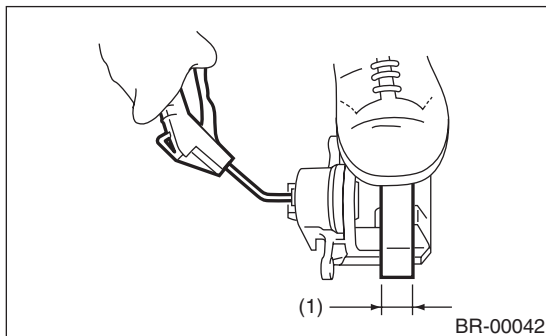
9) Bleed air from the brake system.

C: DISASSEMBLY

1) Remove the piston boot.



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

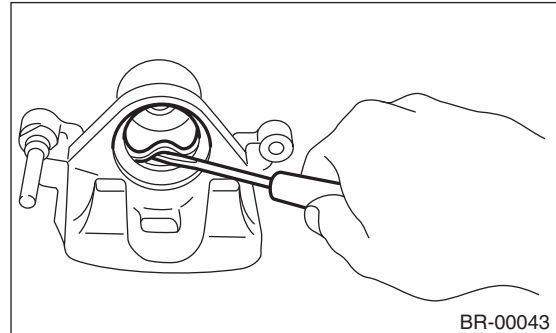


(1) Place a wooden block of 30 mm (1.18 in) width.

4) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the cylinder and piston seal groove.



5) Remove the pin boot.

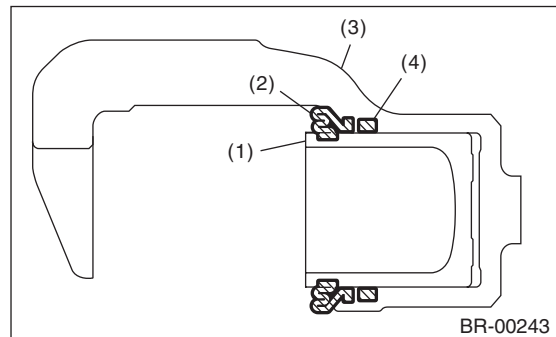
D: ASSEMBLY

- 1) Clean the inside of the caliper body using brake fluid.
2) Apply a coat of brake fluid to piston seal and install the piston seal to the caliper body groove.
3) Apply a coat of brake fluid to the inner surface of cylinder and the entire outer surface of the piston.
4) Apply NIGLUBE RX-2 (Part No. 000041000) or grease contained in the piston kit to the boot, and install it to the groove at the end of the cylinder.
5) Insert the piston into cylinder.

CAUTION:

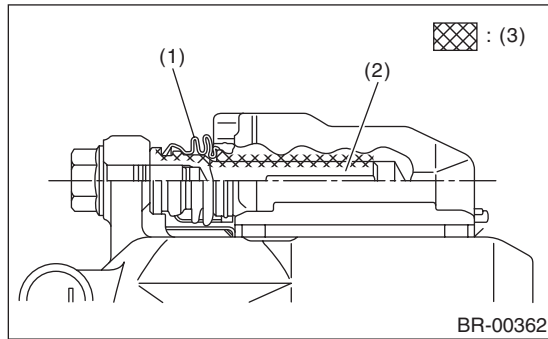
Do not force the piston into cylinder.

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



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

7) Apply NIGLUBE RX-2 (Part No. 000041000) or grease contained in the piston kit to cylinder inner surface, pin, bushing outer surface, and boot grooves.



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

8) Insert the pin boot into the support.

9) Install the pin boot to the support, and then insert the pin into the specified position.

CAUTION:

Insert pin into position, and make sure that it slides and seats properly.

E: INSPECTION

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

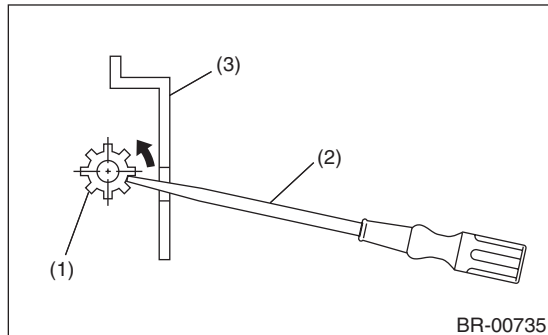
8. Rear Drum Brake Drum

A: REMOVAL

- 1) Lift up the vehicle, and remove the rear wheels.
- 2) Release the parking brake.
- 3) Remove the brake drum from brake assembly.

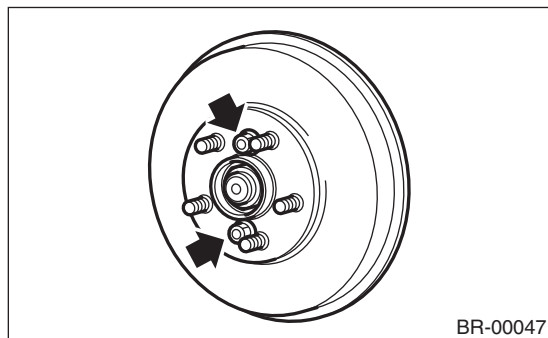
NOTE:

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



- (1) Adjuster
- (2) Flat tip screwdriver
- (3) Brake drum

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



B: INSTALLATION

Install in the reverse order of removal.

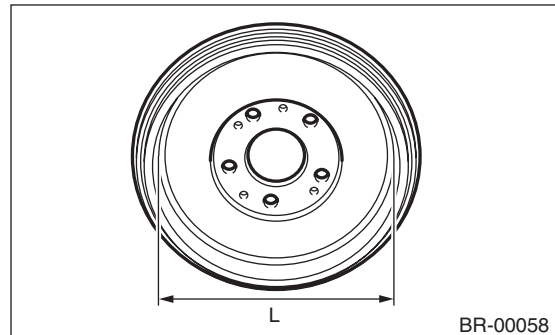
C: INSPECTION

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

Drum inner diameter L:

Standard value 254 mm (10 in)

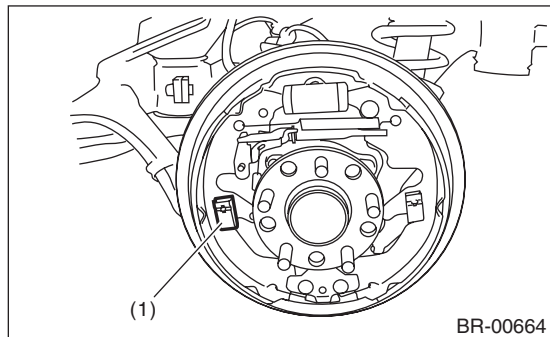
Limit: 256 mm (10.08 in)



9. Rear Drum Brake Shoe

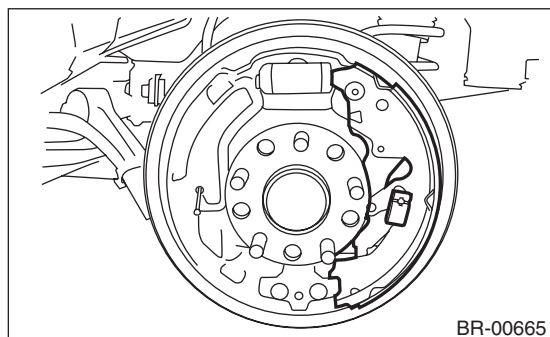
A: REMOVAL

- 1) Remove the rear drum brake drum. <Ref. to BR-26, REMOVAL, Rear Drum Brake Drum.>
- 2) Remove the shoe hold-down spring.

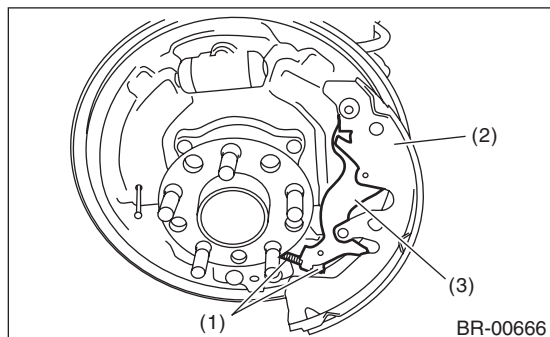


(1) Shoe hold-down spring

- 3) Remove upper shoe return spring, lower shoe return spring and adjuster, then remove the leading shoe.
- 4) Remove the shoe hold-down spring and trailing shoe.



- 5) Disconnect the parking brake cable from the parking brake lever.



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

B: INSTALLATION

CAUTION:

Be sure the lining surface is free from brake fluid and grease.

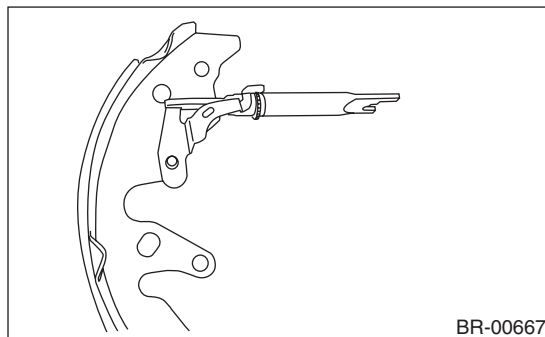
- 1) Apply brake grease to the following locations.

Brake grease:

Molykote M7439 (Part No. K0770YA000)

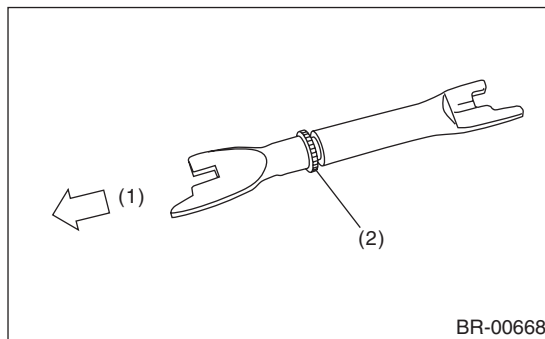
- Six contact surfaces of the brake shoe rim and back plate
- Contact surface of the brake shoe and the wheel cylinder
- Contact surface of the brake shoe and adjuster
- Contact surface of the lever and brake shoe

- 2) Connect the parking brake cable to the parking brake lever.
- 3) Check that the parking brake cable does not fall from the cable guide.
- 4) Install the trailing shoe and hold it down with the shoe hold-down spring.
- 5) Install the adjuster and adjusting lever to the leading shoe.



NOTE:

Install the adjuster with the adjusting wheel facing toward the front side of vehicle.



- (1) Front side of vehicle
- (2) Adjusting wheel

- 6) Install the leading shoe and hold it down with the shoe hold-down spring.
- 7) Install the adjusting spring and return spring.
- 8) Install the rear brake drum. <Ref. to BR-26, INSTALLATION, Rear Drum Brake Drum.>

C: INSPECTION

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

Lining thickness:

Standard value 4.5 mm (0.177 in)

Limit 1.5 mm (0.059 in)

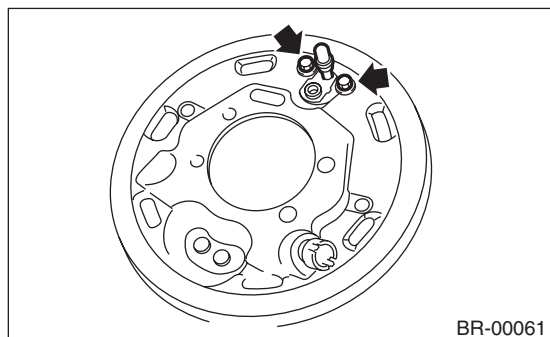
10. Rear Drum Brake Assembly

A: REMOVAL

CAUTION:

- Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water immediately and wipe away completely.
- If there is any fault in the wheel cylinder, replace the wheel cylinder ASSY as a unit or repair it with the repair kit.

- 1) Lift up the vehicle, and remove the rear wheels.
- 2) Release the parking brake.
- 3) Remove the brake drum from brake assembly. <Ref. to BR-26, REMOVAL, Rear Drum Brake Drum.>
- 4) Remove the brake shoe. <Ref. to BR-27, REMOVAL, Rear Drum Brake Shoe.>
- 5) Disconnect the brake hose. <Ref. to BR-39, REAR BRAKE HOSE, REMOVAL, Brake Hose.>
- 6) Remove the rear hub unit bearing. <Ref. to DS-23, REMOVAL, Rear Hub Unit Bearing.>
- 7) Remove the rear drum brake assembly.
- 8) Remove the bolts, and then detach the wheel cylinder assembly.

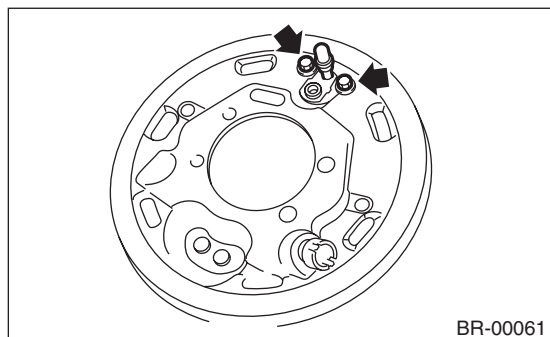


B: INSTALLATION

- 1) Clean the back plate and wheel cylinder assembly.
- 2) Attach the wheel cylinder assembly onto the back plate, and tighten the bolts.

Tightening torque:

9 N·m (0.9 kgf-m, 6.6 ft-lb)



- 3) Install the rear hub unit bearing. <Ref. to DS-24, INSTALLATION, Rear Hub Unit Bearing.>

- 4) Install the brake hose. <Ref. to BR-40, REAR BRAKE HOSE, INSTALLATION, Brake Hose.>

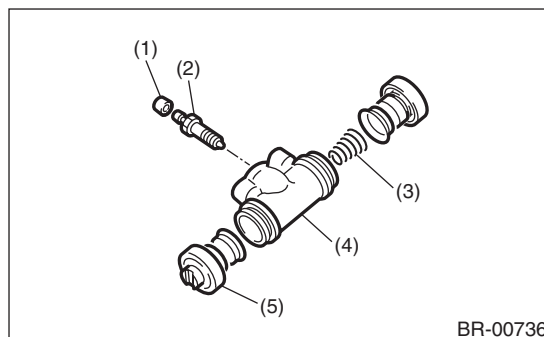
CAUTION:

When connecting the brake hose, do not twist it.

- 5) Install the brake shoe. <Ref. to BR-27, INSTALLATION, Rear Drum Brake Shoe.>
- 6) Install the brake drum. <Ref. to BR-26, INSTALLATION, Rear Drum Brake Drum.>
- 7) After installing the rear drum brake assembly, bleed air from the brake line. <Ref. to BR-37, Air Bleeding.>

C: REPLACEMENT

- 1) Remove the piston & cup and the spring from the wheel cylinder.



- (1) Bleeder cap
- (2) Bleeder screw
- (3) Spring
- (4) Cylinder
- (5) Piston & cup

- 2) Remove the air bleeder screw and the cap.
- 3) Clean the inside of wheel cylinder with brake fluid. Check the inside of the cylinder for damage, deformation and wear. Replace the wheel cylinder with ASSY if defective.
- 4) Apply brake fluid to the inner surface of wheel cylinder and the cup.
- 5) Make sure that the inner surface of the wheel cylinder and the piston & cup are free of foreign matter. Install the piston & cup to the wheel cylinder, while taking care not to scratch inner surface of the wheel cylinder.

D: INSPECTION

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

11.Master Cylinder

A: REMOVAL

CAUTION:

Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water and wipe away completely.

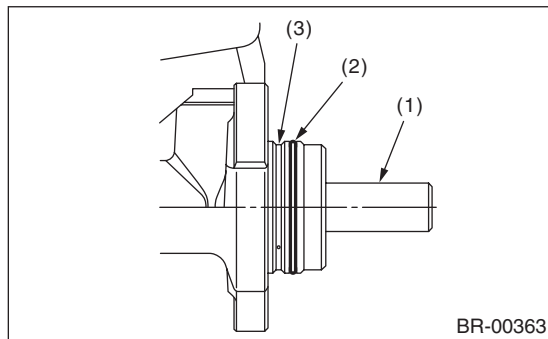
- 1) Drain brake fluid from the reservoir tank completely.
- 2) Disconnect the harness connector of the fluid level gauge.
- 3) Remove the brake pipe from the master cylinder.
- 4) Remove the master cylinder mounting nuts, and carefully remove the master cylinder from the brake booster.

B: INSTALLATION

- 1) Replace the O-ring for the master cylinder with a new part.

CAUTION:

Be careful not to install the O-ring in the wrong location.



- (1) Primary piston
- (2) O-ring
- (3) Do not install the O-ring on this groove.

- 2) Install in the reverse order of removal.

Tightening torque:

Master cylinder mounting nut

13 N·m (1.3 kgf-m, 9.6 ft-lb)

Piping flare nut

15 N·m (1.5 kgf-m, 11.1 ft-lb)

CAUTION:

Be sure to use recommended brake fluid.

- 3) Bleed air from brake system. <Ref. to BR-37, PROCEDURE, Air Bleeding.>

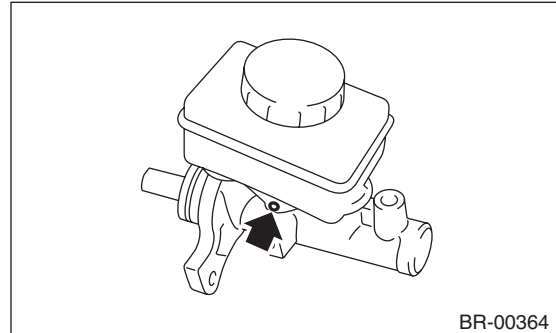
C: REPLACEMENT

- 1) Remove mud and dirt from the surface of brake master cylinder.
- 2) Secure the master cylinder in a vise.

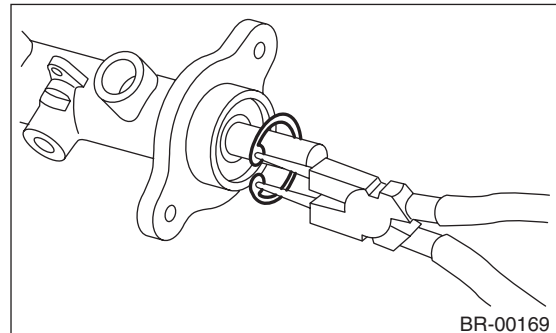
NOTE:

To avoid damaging the master cylinder, place between aluminum plates or other material when holding with a vise.

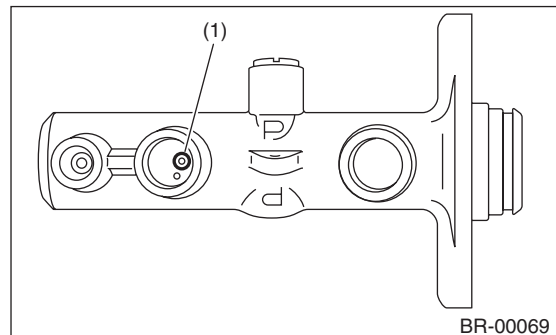
- 3) Remove the pin which secures the master cylinder and reservoir tank, then remove the reservoir tank and seal.



- 4) While pushing in the primary piston, remove the C-ring using pliers.



- 5) While pushing in the primary piston, remove the cylinder pin from the port on the reservoir tank attachment location using a magnet pick-up tool.



- (1) Cylinder pin

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

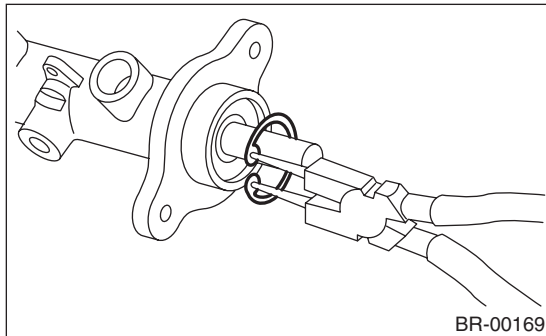
7) Clean the inside of master cylinder with brake fluid. Check the inside of the cylinder for damage, deformation and wear. Replace the master cylinder as an assembly if faulty.

8) Apply brake fluid to the inner surface of master cylinder and piston assembly.

9) Make sure that the inner surface of master cylinder and the piston assembly are free of foreign matter. Install the primary piston assembly and the secondary piston assembly to master cylinder, while taking care not to scratch the master cylinder inner surface.

10) While pushing-in the primary piston, install the cylinder pin.

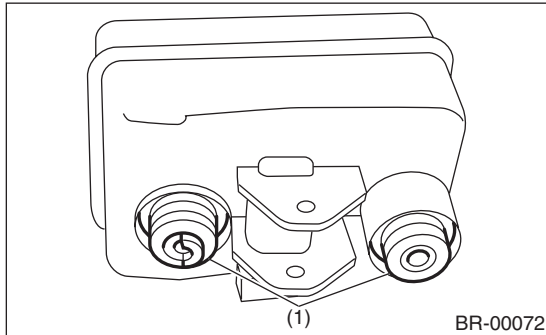
11) While pushing-in the primary piston, install the C-ring to the groove using pliers.



CAUTION:

Make sure the C-ring is installed to the groove securely.

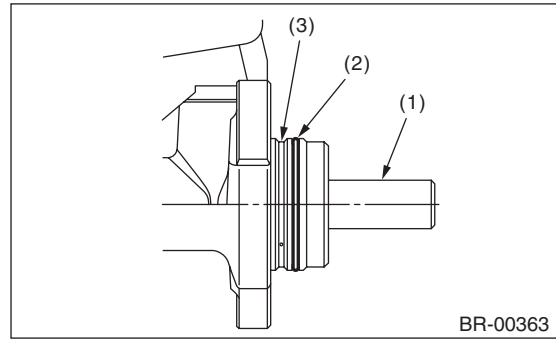
12) Install the seal to reservoir tank.



(1) Seal

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

14) Replace the O-ring for the master cylinder with a new part.



(1) Primary piston

(2) O-ring

(3) Do not install the O-ring on this groove.

D: INSPECTION

Inspect for brake fluid leakage from the master cylinder.

NOTE:

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

12.Brake Booster

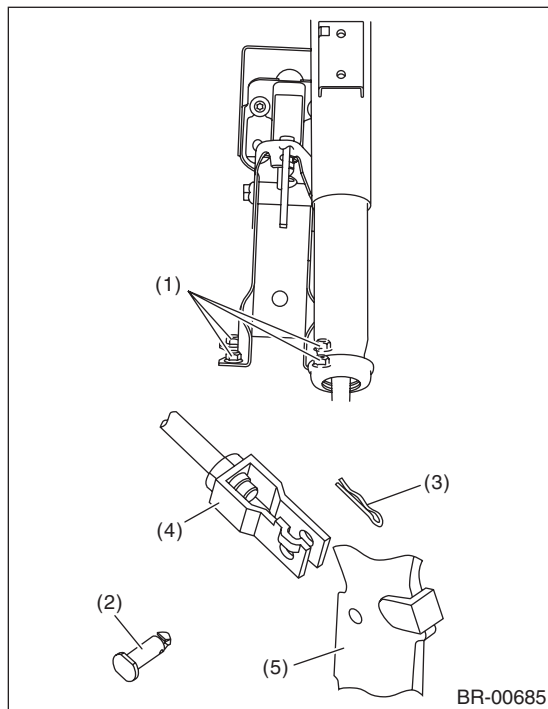
A: REMOVAL

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

- (1) Disconnect the connector of brake fluid level gauge.
- (2) Remove the brake pipe from the master cylinder.
- (3) Remove the master cylinder installation nut.
- (4) Disconnect the vacuum hose from brake booster.

2) Remove the following parts from the pedal bracket.

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



- (1) Nut
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod
- (5) Brake pedal

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

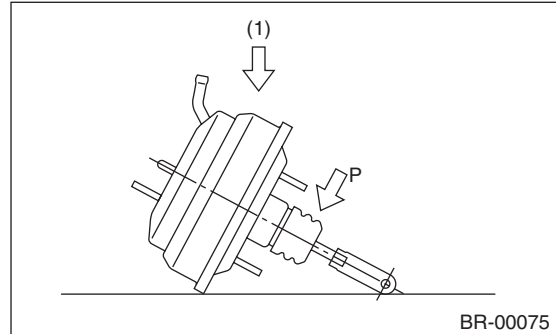
NOTE:

- Make sure that the booster shell and vacuum pipe are not subject to strong impacts.
- Be careful not to drop the brake booster. If the booster is dropped, replace it.
- Use special care when handling the operating rod. If excessive force is applied to the operating rod, the angle may change by $\pm 3^\circ$, and it may result in damage to power piston cylinder.

- Be careful when placing the brake booster on floor.
- Do not change the push rod length.

CAUTION:

- **Do not disassemble the brake booster.**
- **If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by "P" may become damaged.**



(1) Force

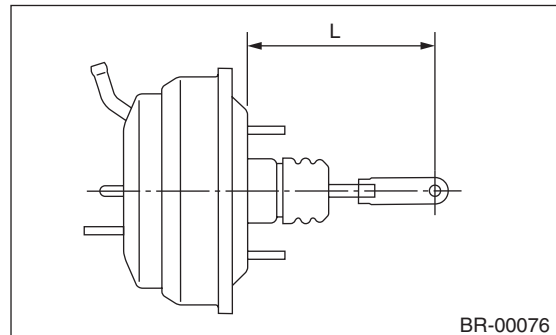
B: INSTALLATION

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

Specification L:

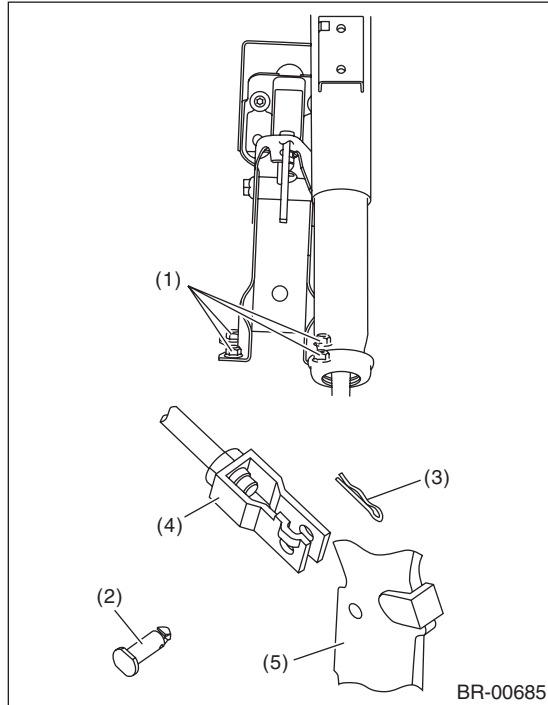
136.3 mm (5.37 in)

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



2) Mount the brake booster in position.

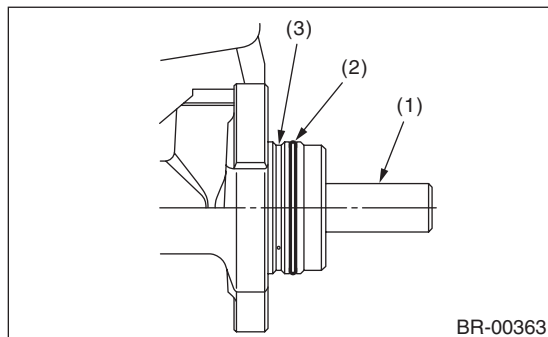
3) Install clevis pin and snap pin which secure the operating rod to the brake pedal.



- (1) Nut
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod
- (5) Brake pedal

NOTE:

- Replace with a new clevis pin.
- Apply a thin coat of NIGTIGHT LYW No. 2 grease to the clevis pin.
- 4) Connect the vacuum hose to the brake booster.
- 5) After replacing the O-ring, install the master cylinder to brake booster.



- (1) Primary piston
- (2) O-ring
- (3) Do not install the O-ring on this groove.

6) Connect the brake pipes to the master cylinder.
7) Connect the connector of the brake fluid level gauge.

8) Apply grease to the operating rod connecting pin to prevent it from wear.

9) Bleed air from brake system.

Tightening torque (air bleeder screw):
8 N·m (0.8 kgf-m, 5.9 ft-lb)

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

C: INSPECTION

NOTE:

On the model with brake assist mechanism, the following phenomena occur when the brake pedal is depressed. However, those are not malfunction but the phenomena that occur when the brake assist mechanism functions properly.

- Brake feel is soft when brake pedal is depressed hard or quicker than usual.
- A light crack is heard when brake pedal is depressed hard or quicker than usual.

1. OPERATION CHECK (WITHOUT GAUGES)

CAUTION:

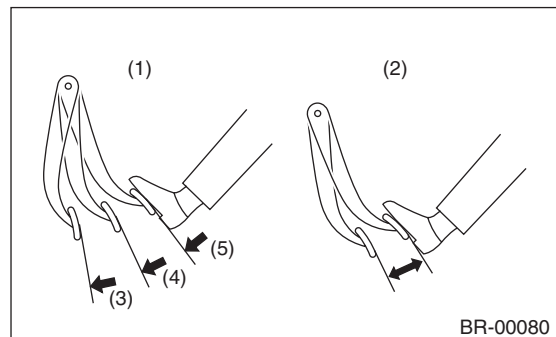
When checking operation, be sure to apply the parking brake securely.

• **Check without gauges**

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

• **Air tightness check**

Start the engine, and idle it for 1 to 2 minutes, then turn it OFF. Depress the brake pedal several times applying the normal pedal force. The pedal stroke should be the longest at the 1st depression, and it should become shorter at each successive depression. If no change occurs in the pedal height when pressed, the brake booster is faulty.



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

Brake Booster

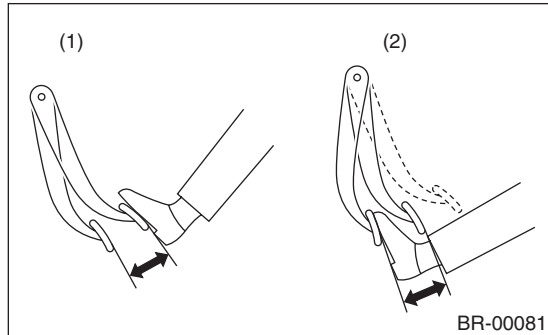
BRAKE

NOTE:

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

• Check operation

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



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

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

3) As the engine starts, the brake pedal should move slowly toward the floor. If the pedal height does not change, the brake booster is faulty.

NOTE:

If faulty, check precisely with gauges.

• Loaded air tightness check

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

NOTE:

If faulty, check precisely with gauges.

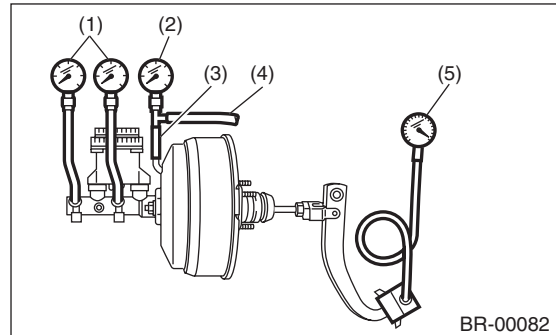
2. OPERATION CHECK (WITH GAUGE)

CAUTION:

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

• Check with gauge

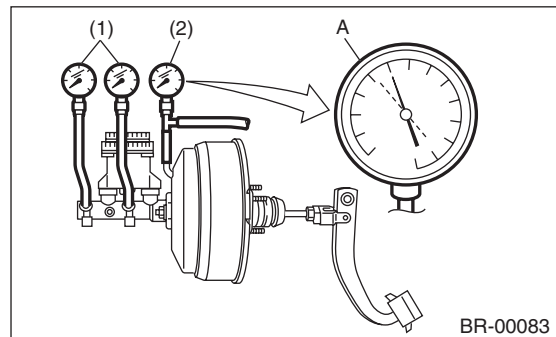
Connect the gauge as shown in the figure. After bleeding air from the pressure gauge, perform each check.



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

• Air tightness check

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



- (1) Pressure gauge
(2) Vacuum gauge

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

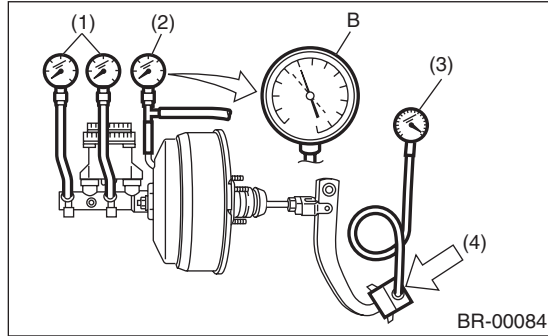
If faulty, the cause may be one of the following.

- Check valve malfunction
- Leak from vacuum hose
- Leak from shell joint section or stud bolt welded section
- Damaged diaphragm

- Leak from valve body seal and bearing section
- Leak from plate and seal assembly section
- Leak from poppet valve assembly section

• Loaded air tightness check

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



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

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

If defective, refer to “AIR TIGHTNESS CHECK”.

<Ref. to BR-33, INSPECTION, Brake Booster.>

3) If the brake booster is faulty, replace it with a new part.

• Lack of boost action check

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

Brake pedal operation force N (kgf, lbf)	147 (15, 33)	294 (30, 66)
Fluid pressure kPa (kgf/cm ² , psi)	545 (6, 79)	1,564 (16, 227)

• Boosting action check

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

Brake pedal operation force N (kgf, lbf)	147 (15, 33)	294 (30, 66)
Fluid pressure kPa (kgf/cm ² , psi)	6,003 (61, 871)	11,273 (115, 1,635)

13.Brake Fluid

A: INSPECTION

1) Check that the amount of brake fluid is between the lines of “MIN” and “MAX”. If out of the specified range, refill or drain the fluid. If the fluid level is close to “MIN”, check the brake pad for wear and refill the fluid.

2) Check the fluid for discoloration. If the fluid is extremely discolored, replace with the new fluid.

B: REPLACEMENT

CAUTION:

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

NOTE:

- During the operation, keep the reservoir tank filled with brake fluid to prevent entry of air.
- Operate the brake pedal slowly.
- For convenience and safety, perform the work with 2 people.
- The required amount of brake fluid is approximately 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for the entire brake system.

1) Lift up the vehicle and set rigid racks at the specified locations, or keep the vehicle lifted.

2) Remove both the front and rear wheels.

3) Drain brake fluid from the reservoir tank.

4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:

Refer to “General Description”. <Ref. to BR-2, SPECIFICATION, General Description.>

Perform the same procedure as for bleeding the brake line, until new brake fluid comes out from vinyl tube. <Ref. to BR-37, PROCEDURE, Air Bleeding.>

14. Air Bleeding

A: PROCEDURE

CAUTION:

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

1. MASTER CYLINDER

NOTE:

- When the master cylinder is disassembled or the reservoir tank is empty, bleed the master cylinder.
- If bleeding of the master cylinder is not necessary, omit the following procedures, and perform bleeding of the brake line. <Ref. to BR-37, BRAKE LINE, PROCEDURE, Air Bleeding.>

1) Fill the reservoir tank of the master cylinder with brake fluid.

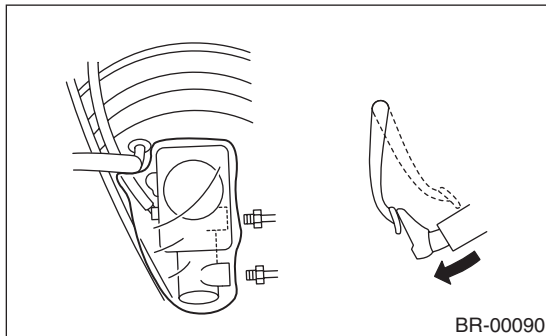
NOTE:

While bleeding air, keep the reservoir tank filled with brake fluid to prevent entry of air.

2) Disconnect the brake line at primary and secondary sides.

3) Wrap the master cylinder with a plastic bag.

4) Depress the brake pedal slowly and hold it.

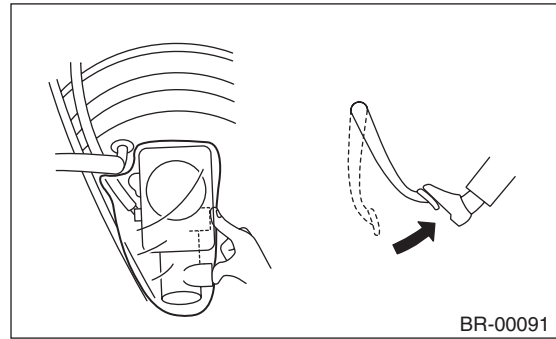


NOTE:

On the model with brake assist mechanism, the following phenomena occur when the brake pedal is depressed. However, those are not malfunction but the phenomena that occur when the brake assist mechanism functions properly.

- Brake feel is soft when brake pedal is depressed hard or quicker than usual.
- A light crack is heard when brake pedal is depressed hard or quicker than usual.

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



6) Repeat the step 4) and 5) several times.

7) Remove the plastic bag.

8) Install the brake pipe to the master cylinder.

Tightening torque:

Model with ABS

15 N·m (1.5 kgf-m, 11.1 ft-lb)

Model with VDC

19 N·m (1.9 kgf-m, 14 ft-lb)

9) Bleed air from the brake line. <Ref. to BR-37, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

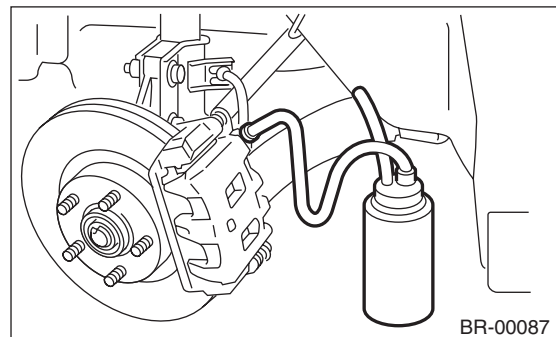
1) When the master cylinder is disassembled or the reservoir tank is empty, bleed the master cylinder before bleeding the brake line. <Ref. to BR-37, MASTER CYLINDER, PROCEDURE, Air Bleeding.>

2) Fill the reservoir tank of the master cylinder with brake fluid.

NOTE:

While bleeding air, keep the reservoir tank filled with brake fluid to prevent entry of air.

3) Attach one end of the vinyl tube to the air bleeder and the other end to the brake fluid container.



4) Depress the brake pedal several times, and hold it.

5) Loosen the air bleeder screw to drain brake fluid. Tighten the air bleeder quickly, and release the brake pedal.

6) Repeat the steps 4) to 5) until there are no more air bubbles in the vinyl tube.

7) Repeat the steps from 2) to 6) above to bleed air from each wheel.

NOTE:

Perform air bleed starting in the order from the farthest wheel cylinder from the master cylinder.

8) Securely tighten the air bleeder screws.

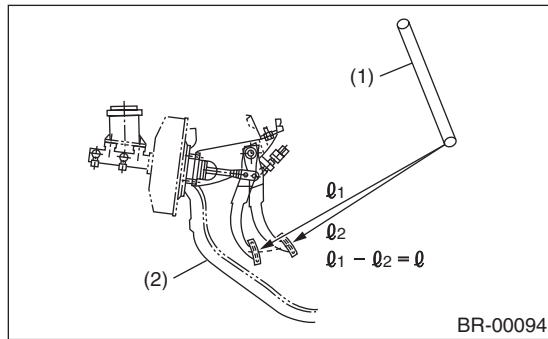
Tightening torque:

8 N·m (0.8 kgf-m, 5.9 ft-lb)

9) Check that there are no brake fluid leaks in the entire system.

10) Check the pedal stroke.

Run the engine at idle after warming up the engine, and depress the brake pedal with a force of 500 N (51 kgf, 112 lbf). Measure the distance between the brake pedal and steering wheel. Release the pedal, and measure the distance between pedal and steering wheel again.



(1) Steering wheel

(2) Toe board

Specification of pedal stroke:

When depressing the pedal with a force of 500 N (51 kgf, 112 lbf).

95 mm (3.74 in) or less

11) If the distance is more than specification, there is a possibility of air being caught in the brake line. Bleed the brake line of all air until the pedal stroke meets the specification.

12) Operate the hydraulic control unit in the sequence control mode. <Ref. to VDC-13, ABS Sequence Control.>

13) Check the pedal stroke again.

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

15) Fill the reservoir tank with brake fluid up to the "MAX" level.

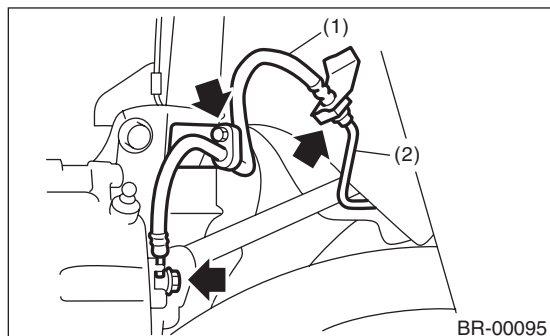
16) Test run the vehicle and ensure that the brakes operate normally.

15.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

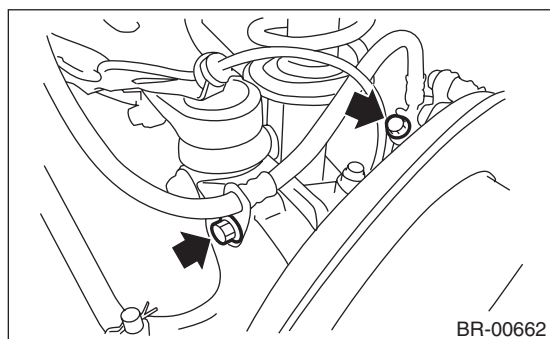
- 1) Separate the brake pipe from brake hose using a flare nut wrench.
- 2) Remove the clamp, the strut mount bolts, and union bolt.



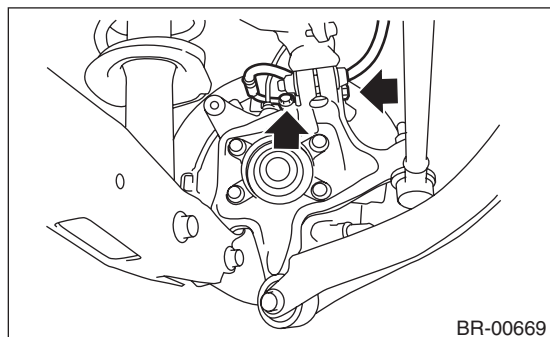
- (1) Brake hose
- (2) Brake pipe

2. REAR BRAKE HOSE

- 1) Remove union bolt and brake hose bracket bolt.
- Disc brake model

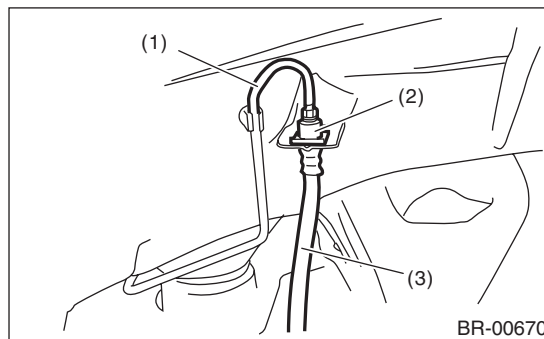


- Drum brake model



- 2) Separate the brake pipe from brake hose using a flare nut wrench.

- 3) Remove the clamp, and then remove the brake hose.



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

B: INSTALLATION

1. FRONT BRAKE HOSE

- 1) Secure the brake hose to strut mount.

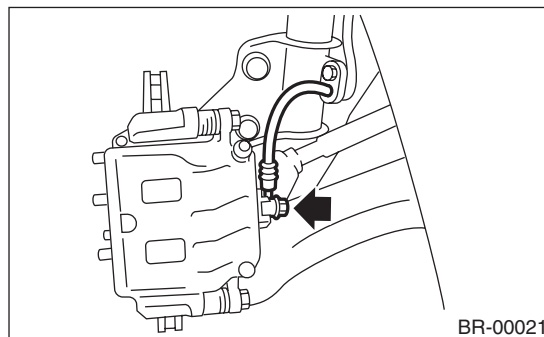
Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

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

Tightening torque (union bolt):

18 N·m (1.8 kgf-m, 13.3 ft-lb)



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

CAUTION:

Do not twist the brake hose.

- 4) Temporarily tighten the flare nut which connects brake pipe and hose.
- 5) Secure the brake hose to wheel apron bracket with clamp.
- 6) Tighten the flare nut to the specified torque.

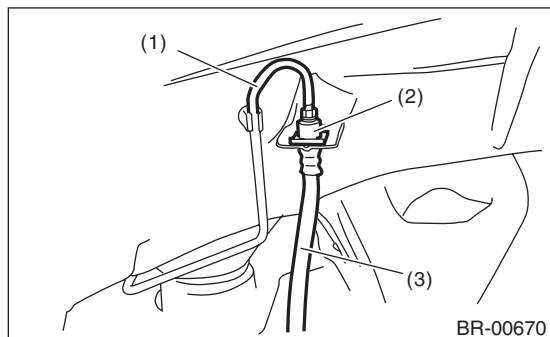
Tightening torque (brake pipe flare nut):

15 N·m (1.5 kgf-m, 11.1 ft-lb)

- 7) Bleed air from brake system.

2. REAR BRAKE HOSE

- 1) Route the brake hose through the hole of bracket, and lightly tighten the flare nut to connect brake pipe.
- 2) Insert the clamp to secure brake hose.



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

- 3) Install the brake hose bracket.

Tightening torque:

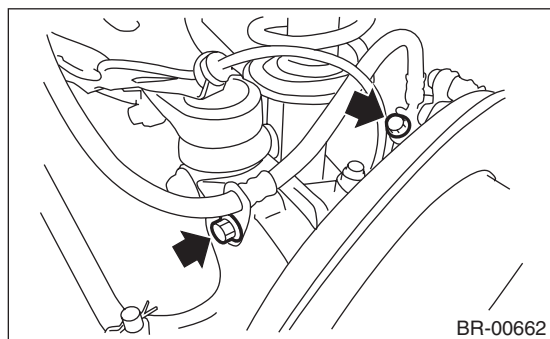
33 N·m (3.4 kgf-m, 24.3 ft-lb)

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

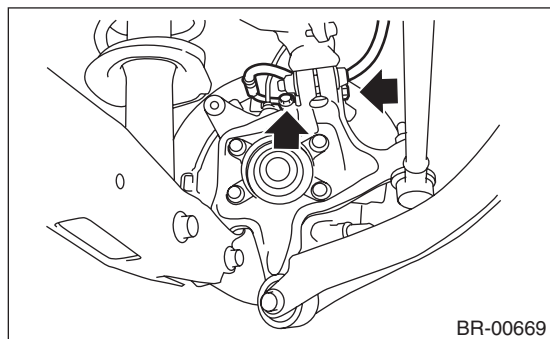
Tightening torque (union bolt):

18 N·m (1.8 kgf-m, 13.3 ft-lb)

- Disc brake



- Drum brake



- 5) Tighten the flare nut to the specified torque.

Tightening torque (brake pipe flare nut):

15 N·m (1.5 kgf-m, 11.1 ft-lb)

- 6) Bleed air from the brake system.

C: INSPECTION

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

16.Brake Pipe

A: REMOVAL

NOTE:

The airbag system wiring harness is routed near the center brake pipe.

CAUTION:

- Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
- When removing the brake pipe, do not bend.

B: INSTALLATION

NOTE:

The airbag system wiring harness is routed near the center brake pipe.

CAUTION:

- Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
- When installing the brake pipe, do not bend.
- After installing the brake pipe and hose, perform air bleed.
- After installing the brake hoses, make sure that they do not contact the tires or suspension assembly, etc.

Brake pipe tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to BR-8, FRONT BRAKE PIPES AND HOSES, COMPONENT, General Description.> <Ref. to BR-9, CENTER AND REAR BRAKE PIPES AND HOSES, COMPONENT, General Description.>

C: INSPECTION

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

NOTE:

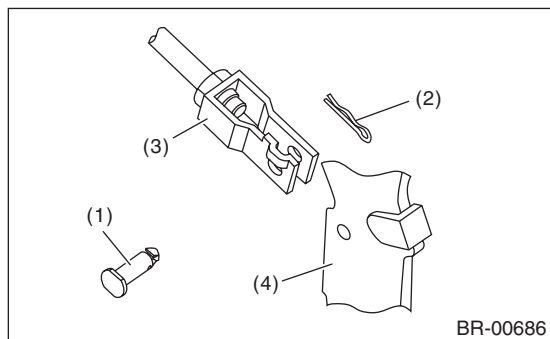
Use a mirror when inspecting back sides and other locations which are hard to see.

17.Brake Pedal

A: REMOVAL

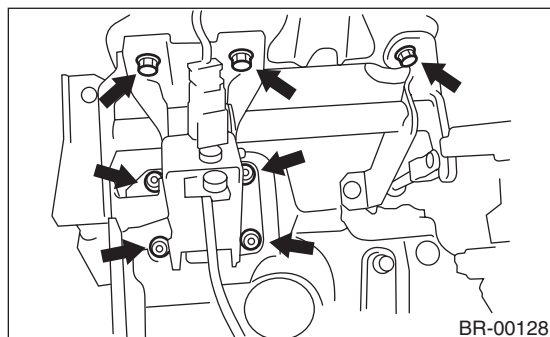
1. MT MODEL

- 1) Remove the steering column. <Ref. to PS-15, REMOVAL, Tilt Steering Column.>
- 2) Disconnect the connector from the clutch switch.
- 3) Disconnect the connector from stop light switch.
- 4) Remove the stop light switch. <Ref. to BR-44, REMOVAL, Stop Light Switch.>
- 5) Remove the clevis pin which secures the pedal and operating rod.



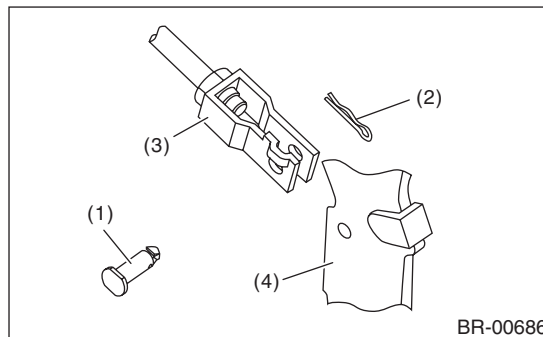
- (1) Clevis pin
- (2) Snap pin
- (3) Operating rod
- (4) Pedal

- 6) Remove the nut which secures the clutch master cylinder.
- 7) Remove the bolt and nut which secure the pedal bracket.



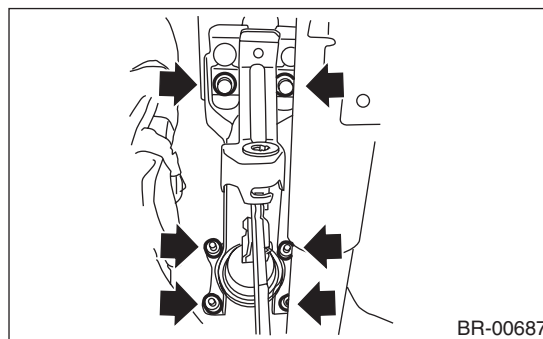
2. AT MODEL

- 1) Remove the steering column. <Ref. to PS-15, REMOVAL, Tilt Steering Column.>
- 2) Disconnect the connector from stop light switch.
- 3) Remove the stop light switch. <Ref. to BR-44, REMOVAL, Stop Light Switch.>
- 4) Remove the clevis pin which secures the brake pedal and operating rod.



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

- 5) Remove the bolt and nut which secure the brake pedal bracket.



B: INSTALLATION

CAUTION:

- Install the stop light switch according the following procedure.
- Do not install the stop light switch before step 2). Installing the stop light switch before step 2) may result in the switch falling off, remaining illuminated constantly, or an illumination fault.

1) Install the bolt and nut which secure the brake pedal bracket.

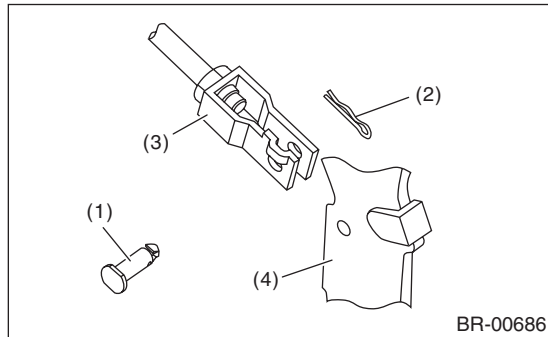
Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

2) Install clevis pin and snap pin which secure the operating rod to the brake pedal.

NOTE:

- Replace with a new clevis pin.
- Apply a thin coat of NIGTIGHT LYW No. 2 grease to the clevis pin.



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

3) Install the stop light switch. <Ref. to BR-44, INSTALLATION, Stop Light Switch.>

4) Check the brake pedal after installation. <Ref. to BR-43, INSPECTION, Brake Pedal.>

C: INSPECTION

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

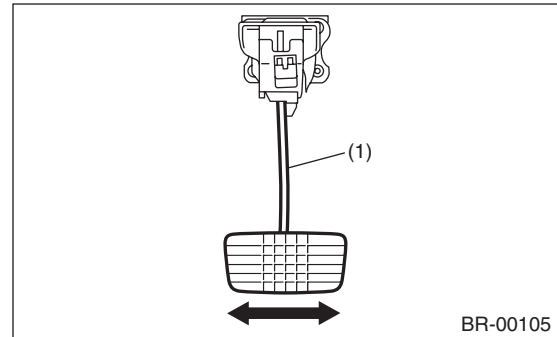
CAUTION:

If excessive deflection is noted, replace with a new bushing.

Deflection of brake pedal:

Service limit

5.0 mm (0.197 in) or less



- (1) Brake pedal

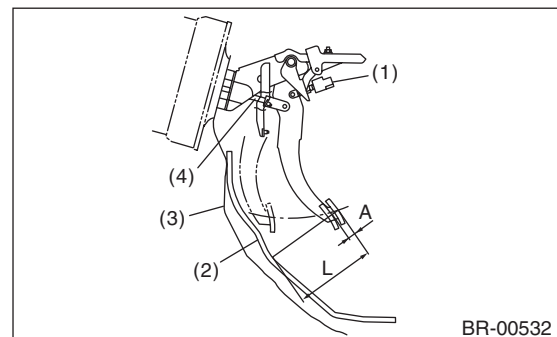
2) Check the position of the pedal pad.

Pedal height L:

150 — 160 mm (5.91 — 6.29 in)

Brake pedal free play A:

0.5 — 2 mm (0.020 — 0.079 in) [When pulling the brake pedal upward 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

3) If out of specification, perform the procedures below to adjust.

4) Remove the stop light switch. <Ref. to BR-44, REMOVAL, Stop Light Switch.>

5) Loosen the lock nut of the brake booster operating rod, and rotate the rod to adjust the pedal height L to be within the standard value.

6) Tighten the lock nut.

Tightening torque:

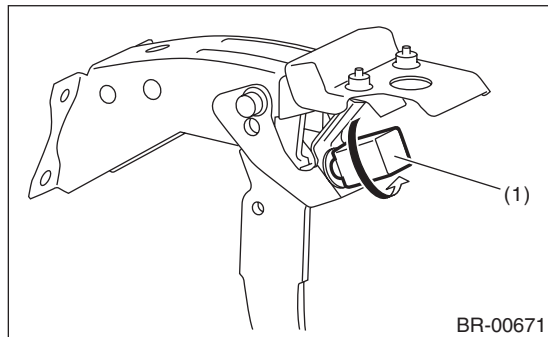
22 N·m (2.2 kgf-m, 16.2 ft-lb)

7) Install the stop light switch. <Ref. to BR-44, INSTALLATION, Stop Light Switch.>

18.Stop Light Switch

A: REMOVAL

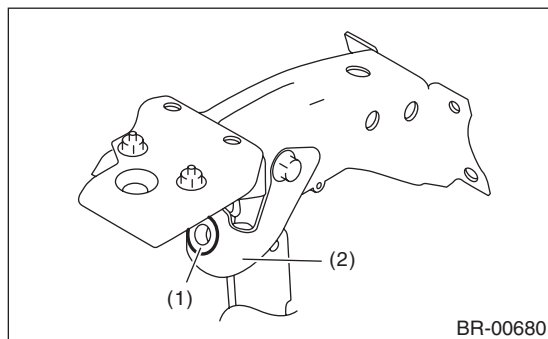
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the stop light switch connector.
- 3) Turn the stop light switch counterclockwise and remove the switch.



(1) Stop light switch

B: INSTALLATION

- 1) Make sure that the holder is securely installed to the brake pedal bracket.



(1) Holder
(2) Brake pedal bracket

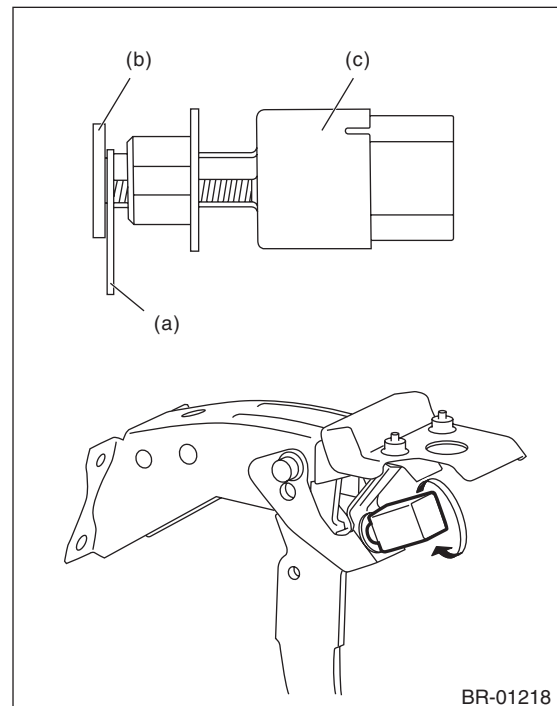
- 2) Install the stop light switch.

CAUTION:

- When pushing the stop light switch against the spacer, do not apply excessive force.
- Tighten the stop light switch with a turning torque of 3.0 N·m (0.31 kgf-m, 2.2 ft-lb) or less.

- (1) Prepare the spacer (a) with approx. 0.5 mm (0.020 in) in thickness.
- (2) Align the groove of holder with the cutout portion of stop light switch push rod.
- (3) While pulling up the brake pedal toward you, set the spacer (a) between the stopper (b) and stop light switch (c).

- (4) Insert the stop light switch (c) and turn it clockwise by 45° to secure.

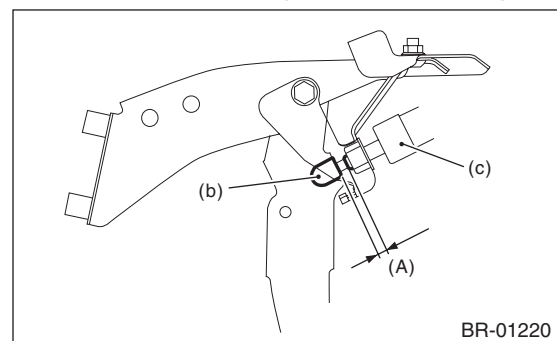


- 3) Remove the spacer (a).
- 4) Pull up the brake pedal and make sure that the clearance (A) between the stop light switch end and the stopper is 1.5 — 2.5 mm (0.06 — 0.1 in).

Stop light switch clearance (A):

Standard

1.5 mm — 2.5 mm (0.06 in — 0.1 in)



(b) Stopper
(c) Stop light switch

- 5) Connect the stop light switch connector.
- 6) Connect the battery ground terminal.
- 7) Check that the brake light operate properly.

NOTE:

Operate the brake pedal by 5 mm (0.2 in) or more, check that the stop light illuminates.

- 8) Check the stop light switch operation.
 - (1) Turn to IG OFF and connect the Subaru Select Monitor.
 - (2) Turn to IG ON and display the data of the "Brake Switch" and "Pressure Sensor Output" according to the Subaru Select Monitor display.
 - (3) Check that the stop light switch is OFF with the brake pedal not depressed.
 - (4) Quickly depress the brake pedal 5 times.
 - (5) Slowly release the brake pedal depressed at the fifth time and check that the master cylinder pressure is within the standard value when the stop light switch changes from OFF to ON.

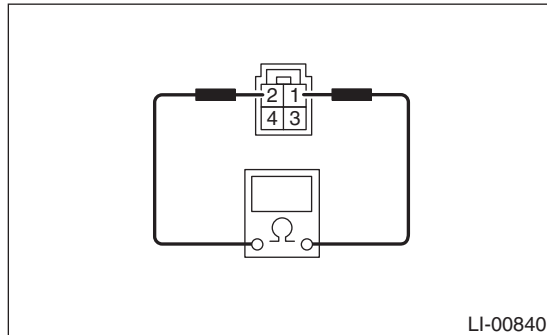
Specification:

Less than 1 Mpa (10 bar)

C: INSPECTION

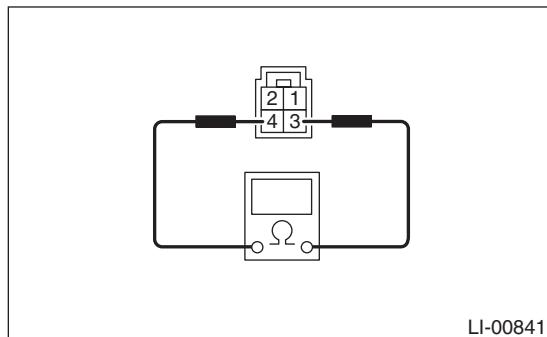
- 1) Measure the resistance between stop light switch terminals.

- 5 door model



Switch	Pedal	Terminal No.	Standard
Stop light	Released	1 and 2	1 MΩ or more
	Depressed		Less than 1 Ω

- 4 door model



Switch	Pedal	Terminal No.	Standard
Stop light	Released	3 and 4	1 MΩ or more
	Depressed		Less than 1 Ω

- 2) If the stop light switch does not operate properly, replace with a new part.

General Diagnostic Table

BRAKE

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

PARKING BRAKE

PB

	Page
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2. Parking Brake Lever	4
3. Parking Brake Cable	5
4. Parking Brake Assembly (Rear Disc Brake)	6
5. General Diagnostic Table	9

General Description

DIFFERENTIALS

1. General Description

A: SPECIFICATION

1. REAR DIFFERENTIAL

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

NOTE:

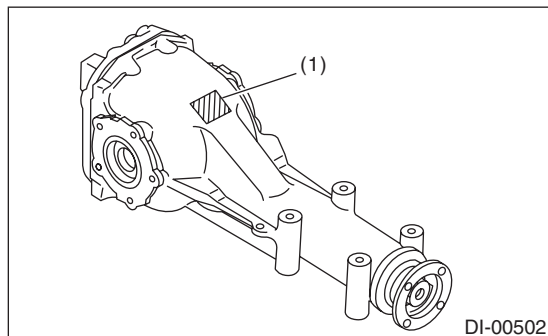
Using a different rear differential assembly will cause the drive train and tires to drag or emit abnormal noise.

Model	2.5 L non-turbo	
	4AT	5MT
Rear differential type	T-type	
Identification	T2	T1
Type of gear	Hypoid gear	
Gear ratio (Number of gear teeth)	4.111 (37/9)	3.900 (39/10)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)	
Rear differential gear oil	GL-5	

Model	2.5 L Turbo	
	4AT	5MT
Rear differential type	T-type	
Identification	B2	
Type of gear	Hypoid gear	
Gear ratio (Number of gear teeth)	3.900 (39/10)	
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)	
Rear differential gear oil	GL-5	

2. IDENTIFICATION

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



(1) Identification

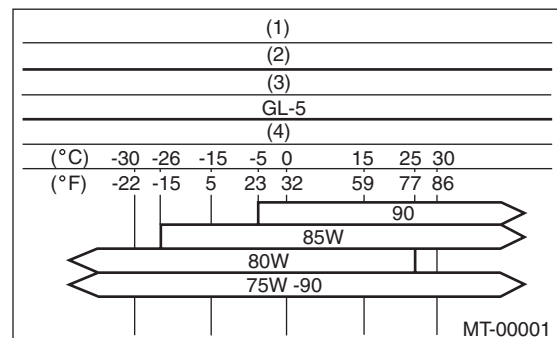
3. REAR DIFFERENTIAL GEAR OIL

Recommended gear oil:

GL-5 (75W-90)

CAUTION:

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



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

4. SERVICE DATA

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

5. ADJUSTING PARTS

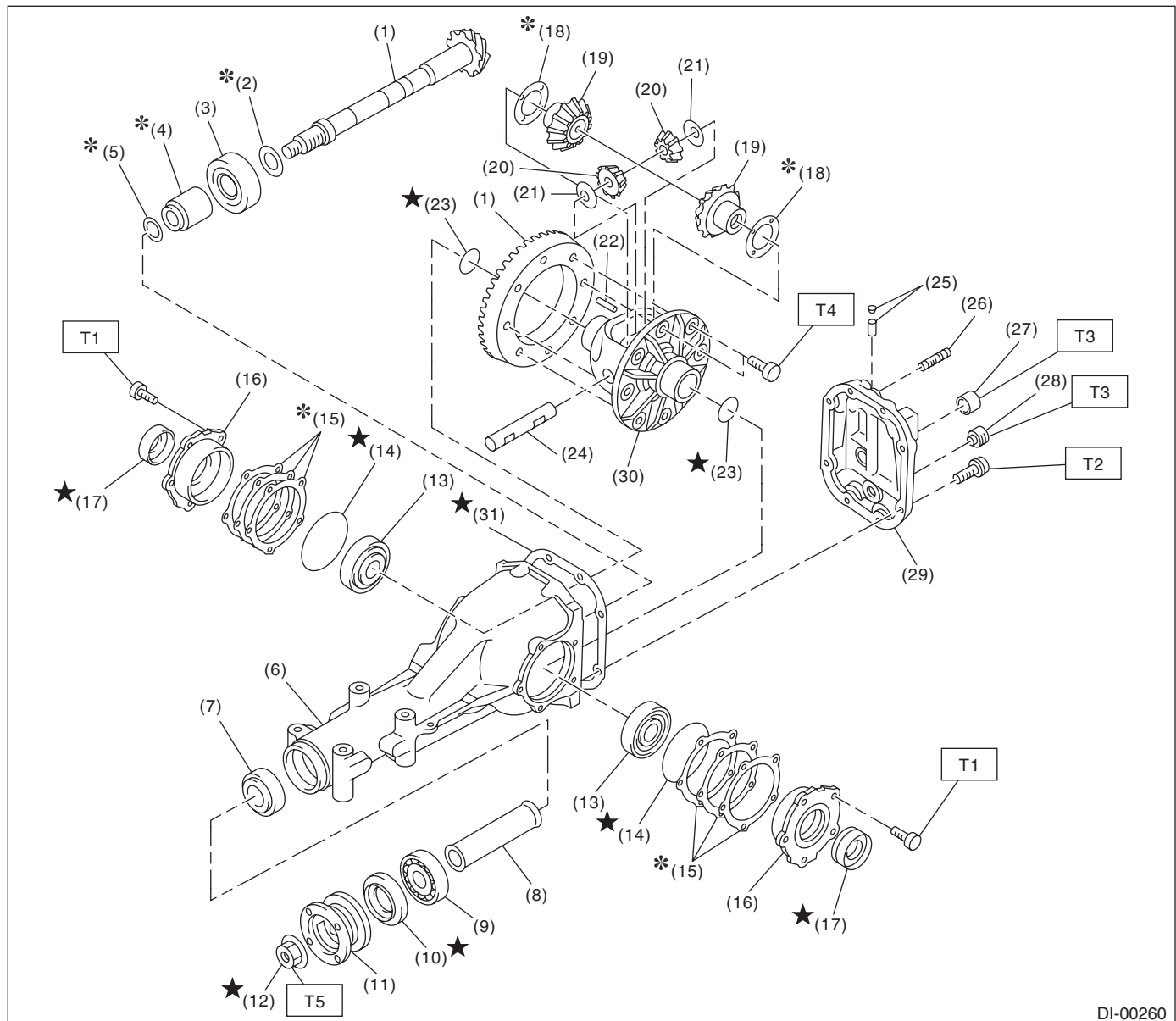
Preload adjusting spacer	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)

Preload adjusting washer	Part No.	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)

General Description

DIFFERENTIALS

Pinion height adjusting washer	383495200	3.09 (0.1217)
	383505200	3.12 (0.1228)
	383515200	3.15 (0.1240)
	383525200	3.18 (0.1252)
	383535200	3.21 (0.1264)
	383545200	3.24 (0.1276)
	383555200	3.27 (0.1287)
	383565200	3.30 (0.1299)
	383575200	3.33 (0.1311)
	383585200	3.36 (0.1323)
	383595200	3.39 (0.1335)
	383605200	3.42 (0.1346)
	383615200	3.45 (0.1358)
	383625200	3.48 (0.1370)
	383635200	3.51 (0.1382)
	383645200	3.54 (0.1394)
	383655200	3.57 (0.1406)
	383665200	3.60 (0.1417)
	383675200	3.63 (0.1429)
	383685200	3.66 (0.1441)
Side gear thrust washer	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 retainer shim	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)

B: COMPONENT**1. REAR DIFFERENTIAL (T-TYPE)**

DI-00260

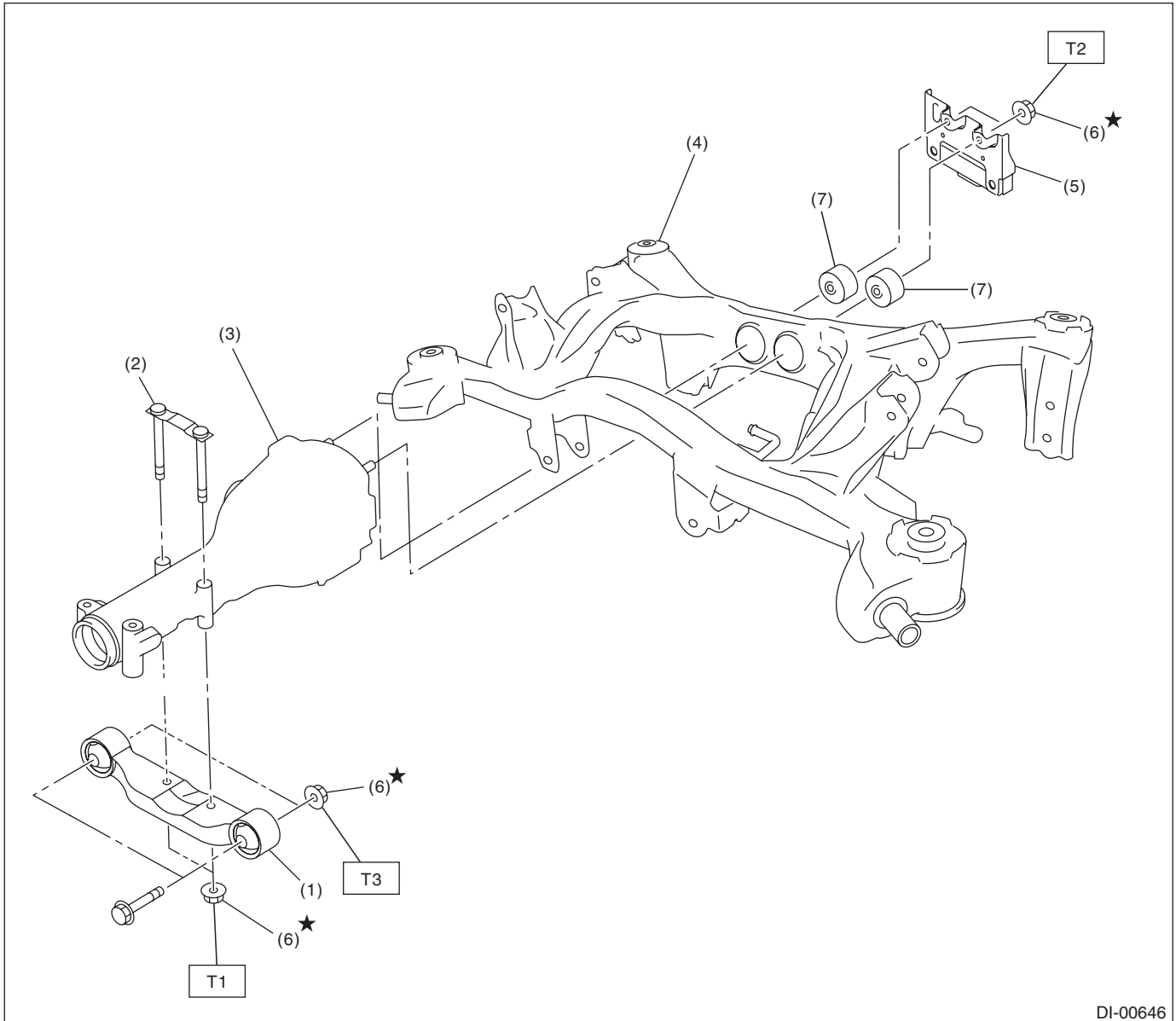
(1) Hypoid driven gear and drive pinion set	(14) O-ring	(27) Oil filler plug
(2) Pinion height adjusting washer	(15) Side retainer shim	(28) Oil drain plug
(3) Rear bearing	(16) Side retainer	(29) Rear cover
(4) Bearing preload adjusting spacer	(17) Side oil seal	(30) Differential case
(5) Bearing preload 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, 76.0)****T5: 181.5 (18.5, 134.0)**

General Description

DIFFERENTIALS

2. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Rear differential front member	(5) Dynamic damper ASSY (5 door AT model)
(2) Rear differential member plate	(6) Self-locking nut
(3) Rear differential ASSY	(7) Rear differential mounting bushing
(4) Sub frame	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 50 (5.1, 36.9)

T2: 70 (7.1, 51.6)

T3: 110 (11.2, 81.1)

C: CAUTION

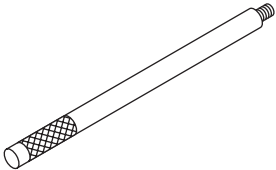
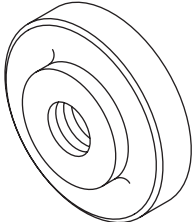
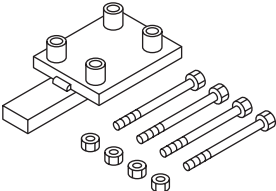
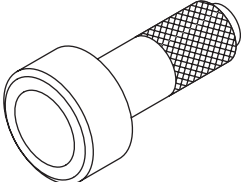
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal,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

General Description

DIFFERENTIALS

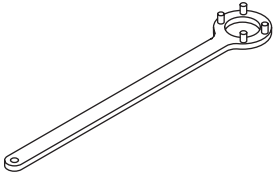
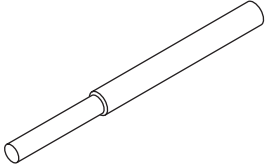
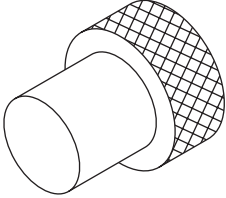
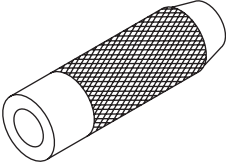
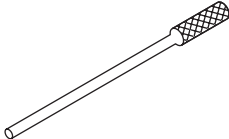
D: PREPARATION TOOL

1. SPECIAL TOOL

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

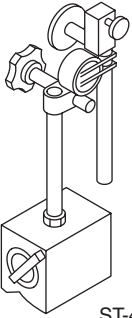
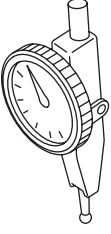
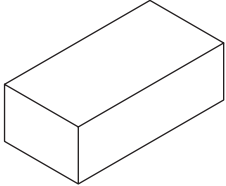
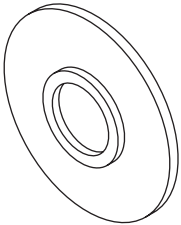
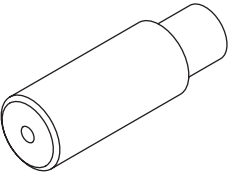
General Description

DIFFERENTIALS

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

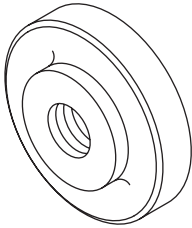
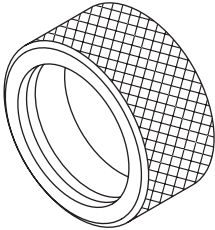
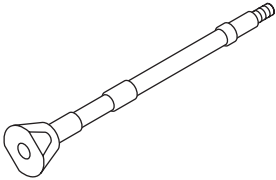
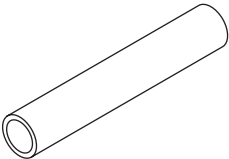
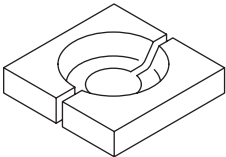
General Description

DIFFERENTIALS

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

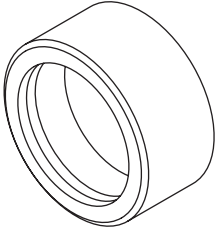
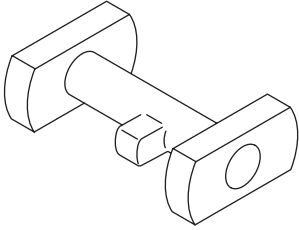
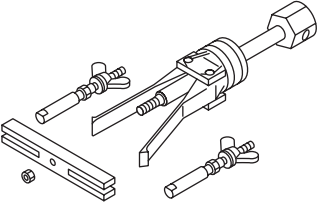
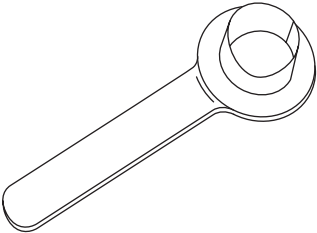
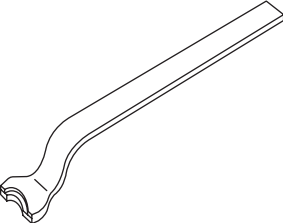
General Description

DIFFERENTIALS

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

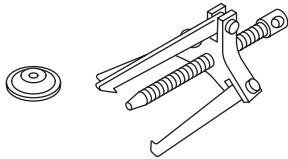
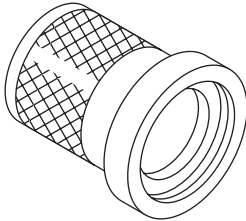
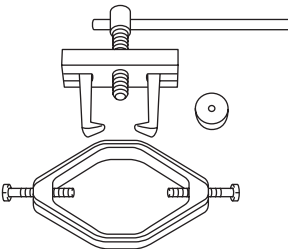
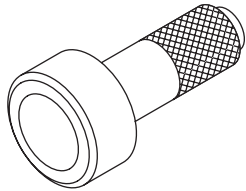
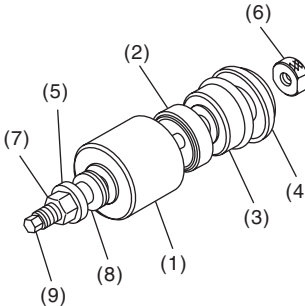
General Description

DIFFERENTIALS

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

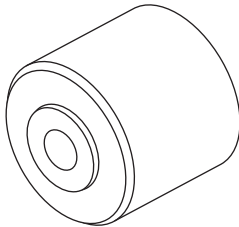
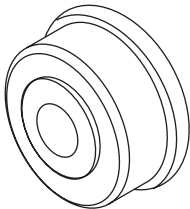
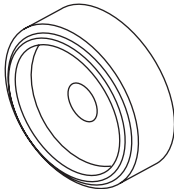
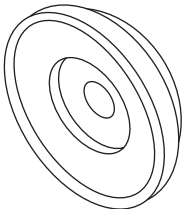
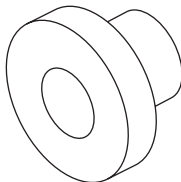
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-899874100	899874100	INSTALLER	Used for installing the companion flange.
 ST18759AA000	18759AA000	PULLER ASSY	Used for removing the differential side bearing cone.
 ST-398417700	398417700	DRIFT	Used for installing side bearing race.
 ST41399FG000	41399FG000	Special tool ASSY	• Used for removing and installing the rear differential mounting bushing. • Use (1) (3) (5) (6) (7) (8) (9) for removal. • Use (2) (4) (5) (6) (7) (8) (9) for installation. (1) Special tool A (41399FG010) (2) Special tool B (41399FG020) (3) Special tool C (41399FG030) (4) Special tool D (41399FG040) (5) Special tool sleeve (41399FG050) (6) Special tool ring (41399FG060) (7) Special tool nut (41399FG070) (8) Special tool bearing (41399FG080) (9) Special tool shaft (41399FG090)

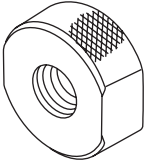
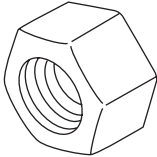
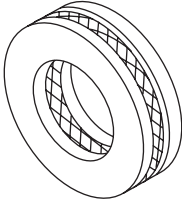
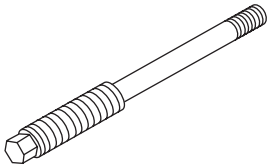
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG010	41399FG010	Special tool A	- Used for removing the rear differential mounting bushing. - Refer to the special tool ASSY (41399FG000) for the combination of removal tools.
 ST41399FG020	41399FG020	Special tool B	- Used for installing the rear differential mounting bushing. - Refer to the special tool ASSY (41399FG000) for the combination of installation tools.
 ST41399FG030	41399FG030	Special tool C	- Used for removing the rear differential mounting bushing. - Refer to the special tool ASSY (41399FG000) for the combination of removal tools.
 ST41399FG040	41399FG040	Special tool D	- Used for installing the rear differential mounting bushing. - Refer to the special tool ASSY (41399FG000) for the combination of installation tools.
 ST41399FG050	41399FG050	Special tool sleeve	- Used for removing and installing the rear differential mounting bushing. - Refer to the special tool ASSY (41399FG000) for the combination of removal and installation tools.

General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG060	41399FG060	Special tool ring	- Used for removing and installing the rear differential mounting bushing. - Refer to the special tool ASSY (41399FG000) for the combination of removal and installation tools.
 ST41399FG070	41399FG070	Special tool nut	- Used for removing and installing the rear differential mounting bushing. - Refer to the special tool ASSY (41399FG000) for the combination of removal and installation tools.
 ST41399FG080	41399FG080	Special tool bearing	- Used for removing and installing the rear differential mounting bushing. - Refer to the special tool ASSY (41399FG000) for the combination of removal and installation tools.
 ST41399FG090	41399FG090	Special tool shaft	- Used for removing and installing the rear differential mounting bushing. - Refer to the special tool ASSY (41399FG000) for the combination of removal and installation tools.

2. GENERAL TOOL

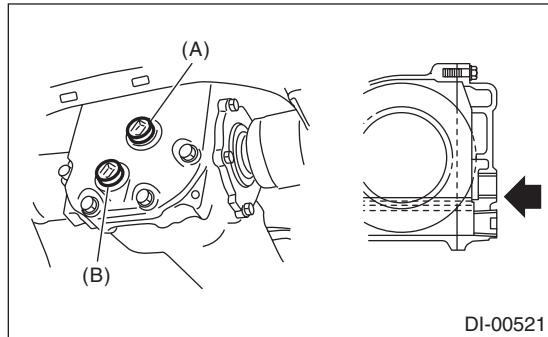
TOOL NAME	REMARKS
Transmission jack	Used for assembly/disassembly of the rear differential.
Puller	Used for removing the side bearing retainer.
Thickness gauge	Used for measuring clearance.

2. Differential Gear Oil

A: INSPECTION

1) Remove the filler plug, and then check the gear oil. Replace the gear oil if it is contaminated or deteriorated. <Ref. to DI-16, REPLACEMENT, Differential Gear Oil.>

2) Check that the gear oil level is within –5 mm (–0.2 in) from the bottom of the filler plug hole. If the level is low, make sure that there is no oil leakage and refill up to the bottom of filler plug hole.



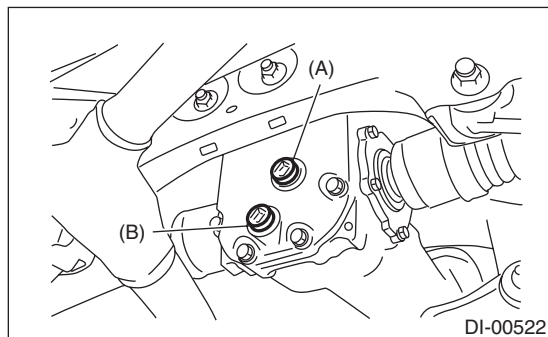
(A) Filler plug
(B) Oil drain plug

B: REPLACEMENT

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

CAUTION:

Gear oil is extremely hot just after driving. Be wary of receiving burns.



(A) Filler plug
(B) Oil drain plug

3) Tighten the oil drain plug.

NOTE:

Apply liquid gasket to the drain plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

49 N·m (5.0 kgf-m, 36.1 ft-lb)

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

NOTE:

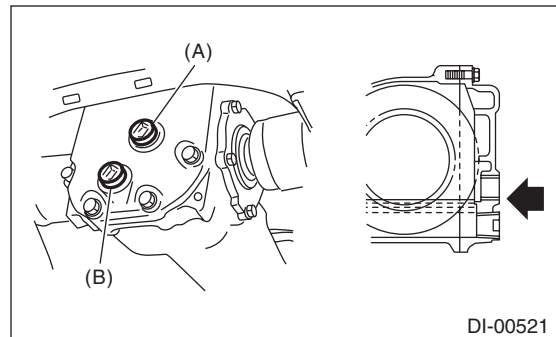
Carefully refill oil while watching the level. Excessive or insufficient oil must be avoided.

Recommended gear oil:

<Ref. to DI-2, SPECIFICATION, General Description.>

Oil capacity:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)



(A) Filler plug
(B) Oil drain plug

5) Install the filler plug.

NOTE:

Apply liquid gasket to the filler plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

49 N·m (5.0 kgf-m, 36.1 ft-lb)

3. Front Differential Assembly

A: NOTE

1. AT MODEL

For front differential of automatic transmissions, refer to the “4AT” section. <Ref. to 4AT-94, Front Differential Assembly.>

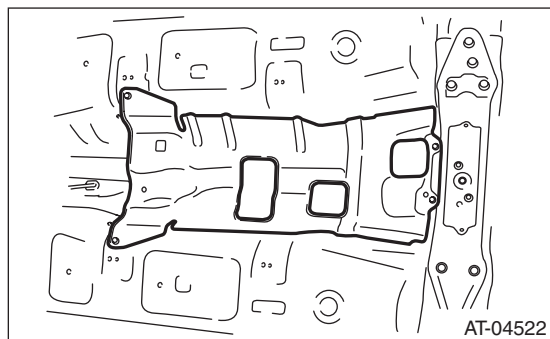
2. MT MODEL

For front differential of the manual transmission, refer to “5MT” section. <Ref. to 5MT-63, Front Differential Assembly.>

4. Rear Differential

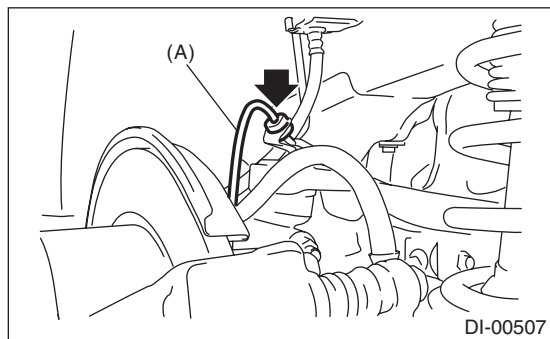
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Shift the select lever or gear shift lever to neutral.
- 4) Release the parking brake.
- 5) Loosen the wheel nuts.
- 6) Lift up the vehicle.
- 7) Remove the wheels.
- 8) Drain differential gear oil. <Ref. to DI-16, REPLACEMENT, Differential Gear Oil.>
- 9) Remove the rear exhaust pipe and muffler.
 - Non-turbo model
<Ref. to EX(H4SO)-10, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-12, REMOVAL, Muffler.>
 - Turbo model
<Ref. to EX(H4DOTC)-14, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 10) Remove the heat shield cover.



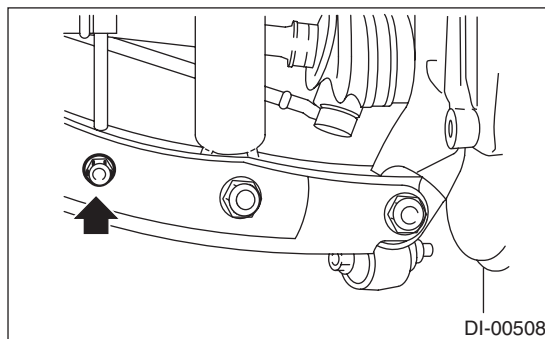
- 11) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
- 12) Remove the DOJ of rear drive shaft from rear differential.

- (1) Remove the ABS wheel speed sensor cable from the clamp.

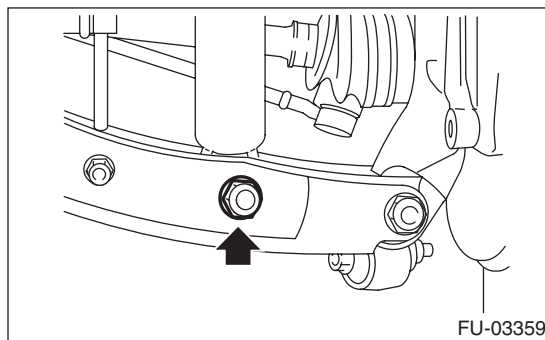


(A) ABS wheel speed sensor cable

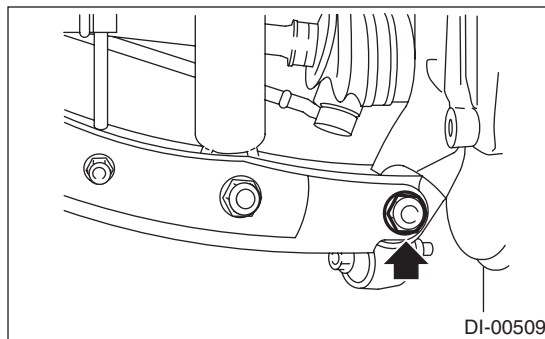
- (2) Remove the bolts which secure the rear stabilizer link to the rear lateral link.



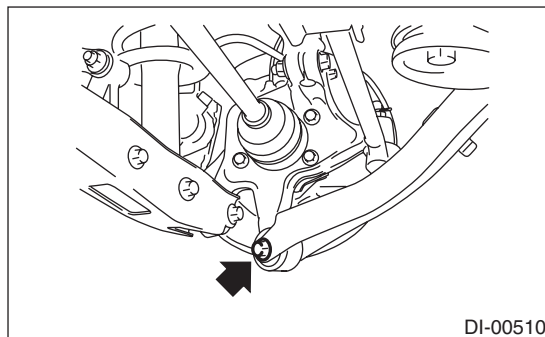
- (3) Remove the bolts which secure the shock absorber to the rear lateral link.



- (4) Remove the bolts which secure the rear lateral link to the housing.



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

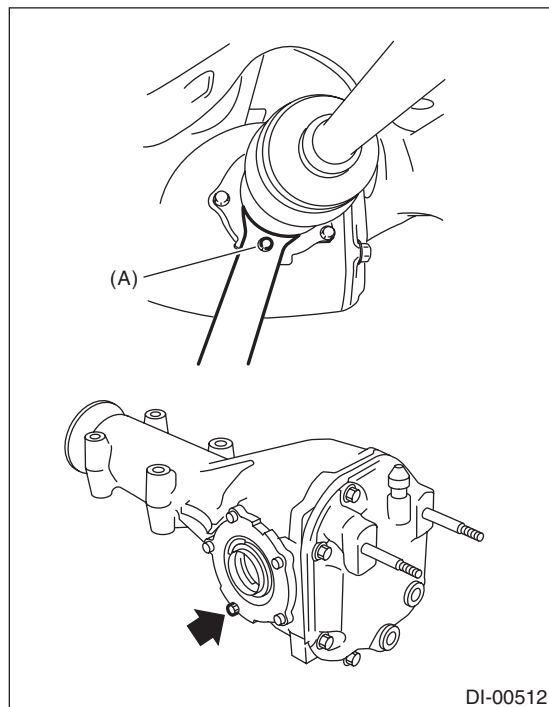


- (6) Remove the DOJ from the rear differential by using ST.

NOTE:

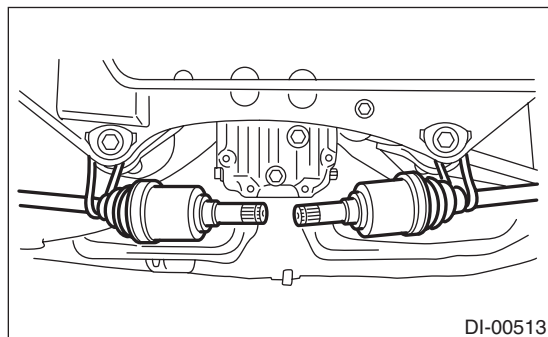
When removing the DOJ from the rear differential, fit the ST to the bolts as shown in the figure so as not to damage the side retainer.

ST 28099PA100 DRIVE SHAFT REMOVER

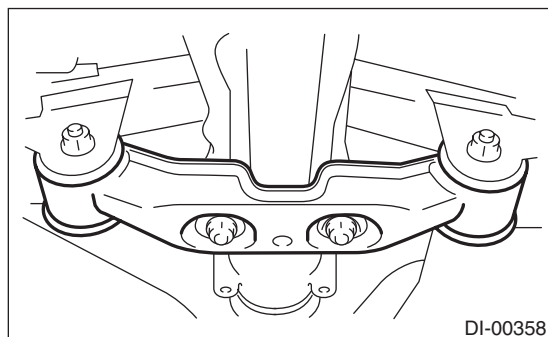


(A) Bolt

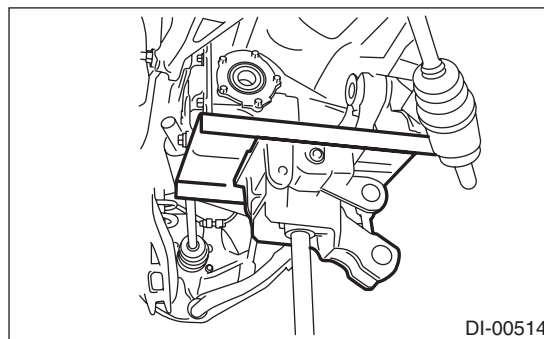
13) Suspend the rear drive shaft to the rear cross-member using wire.



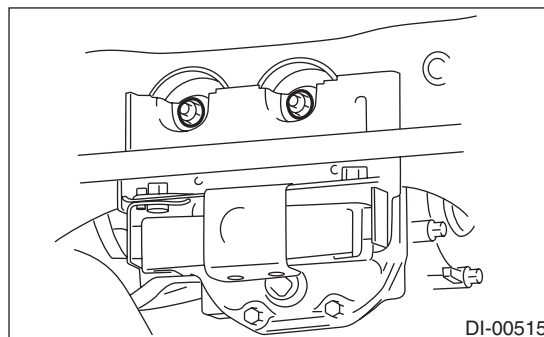
14) Remove the rear differential front member.



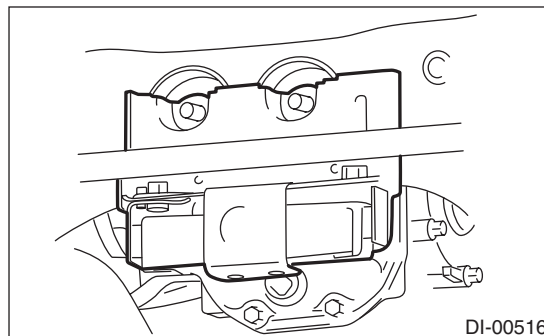
15) Support the rear differential with the transmission jack.



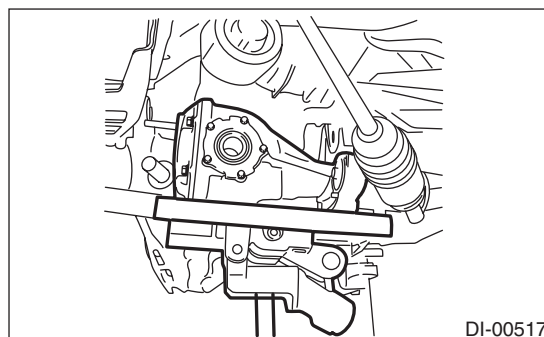
16) Remove the self-lock nuts which hold the rear differential to the rear crossmember.



17) Remove the dynamic damper assembly. (5 door AT model)



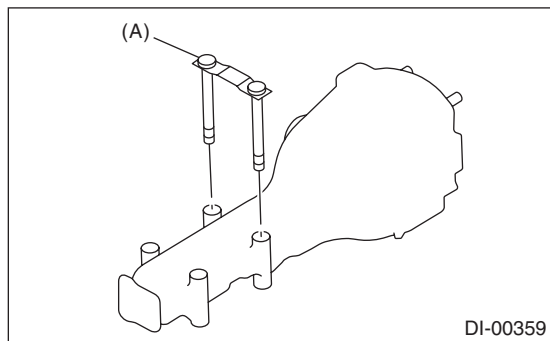
18) While slowly lowering the transmission jack, move the rear differential forward, and remove the rear differential from the vehicle.



Rear Differential

DIFFERENTIALS

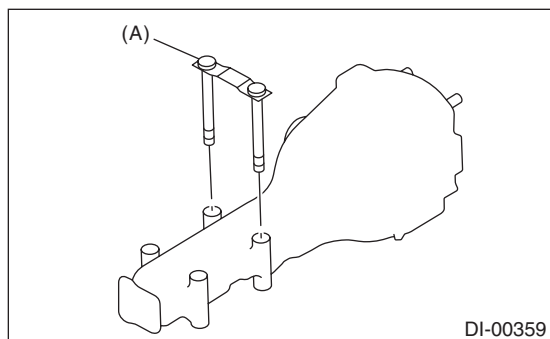
19) Remove the rear differential member plate from the rear differential.



(A) Rear differential member plate

B: INSTALLATION

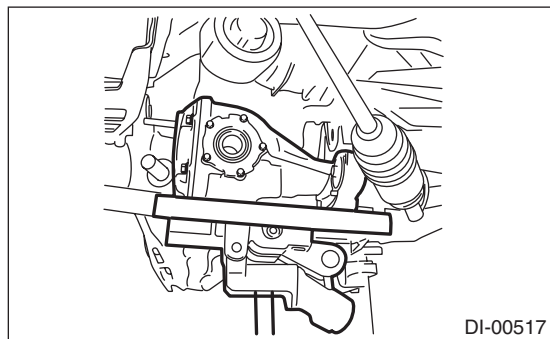
1) Attach the rear differential member plate to the rear differential.



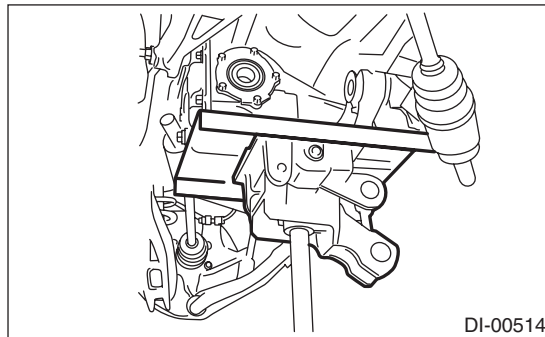
(A) Rear differential member plate

2) Set the rear differential to transmission jack.

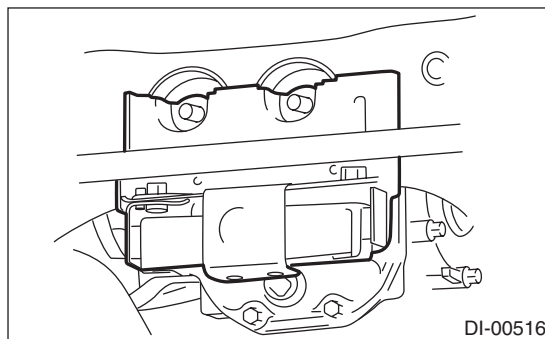
3) Adjust the transmission jack and properly insert the rear differential stud bolt into rear crossmember bushing.



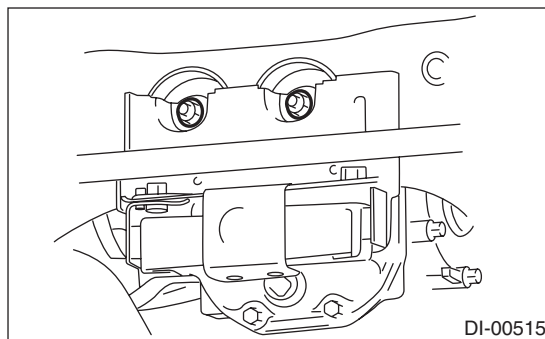
4) After inserting the rear differential stud bolt into the rear crossmember bushing, lift up the transmission jack and align the rear differential to its attachment position.



5) Install the dynamic damper assembly. (5 door AT model)



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

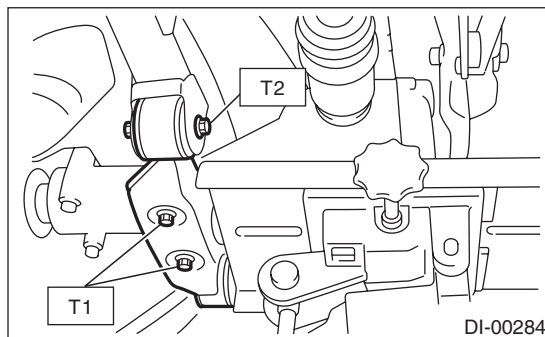


7) Install the rear differential front member with a new self-locking nut.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

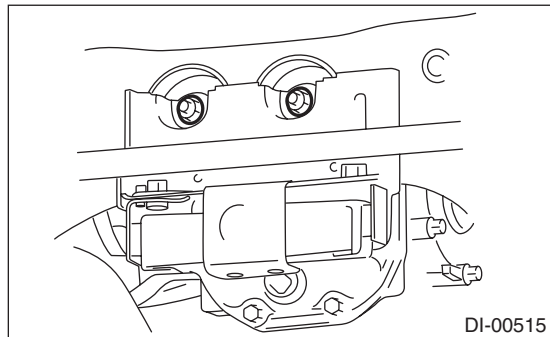
T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)



8) Tighten the self-locking nut.

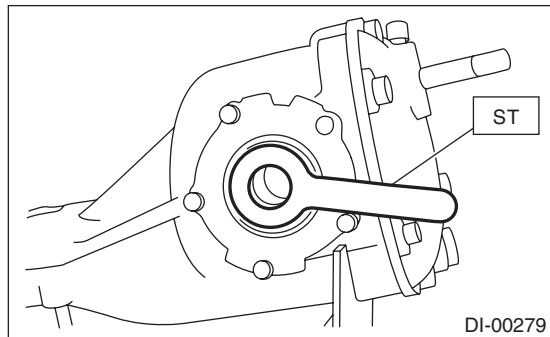
Tightening torque:

70 N·m (7.1 kgf-m, 51.6 ft-lb)

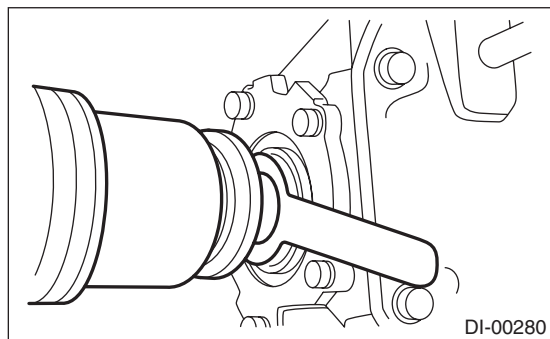


9) Attach the ST to rear differential.

ST 28099PA090 OIL SEAL PROTECTOR

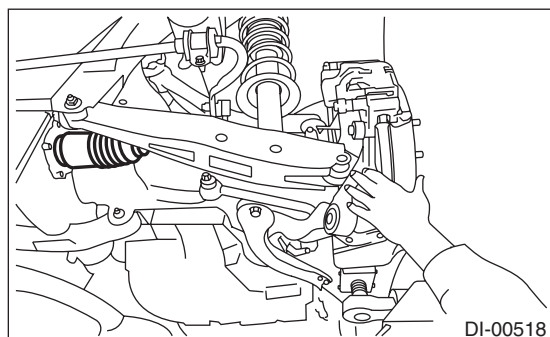


10) Insert the spline shaft until the spline portion comes inside the side oil seal.



11) Remove ST from rear differential.

12) Push the housing to fully insert the DOJ into the rear differential.



13) Lower the transmission jack.

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

15) After installing, fill the differential carrier with gear oil up to the bottom of the filler plug hole. <Ref. to DI-16, Differential Gear Oil.>

16) Inspect the wheel alignment and adjust if necessary.

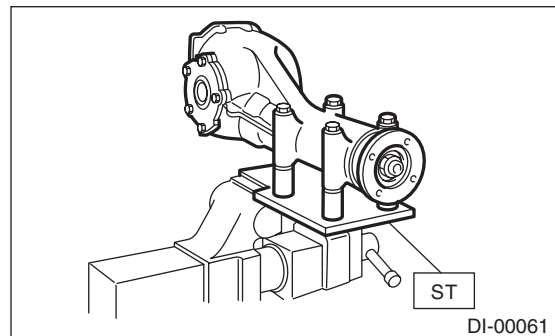
C: DISASSEMBLY

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

- Tooth contact and backlash between hypoid driven gear and drive pinion
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

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

ST 398217700 ATTACHMENT

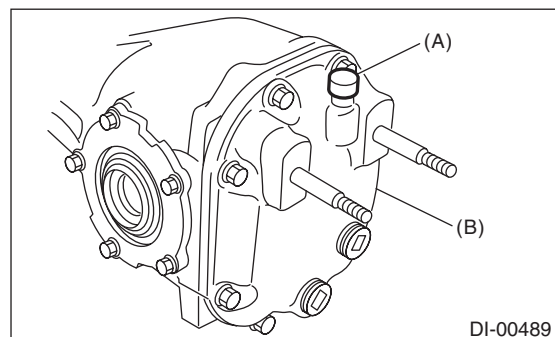


2) Remove the oil drain plug and filler plug, and drain the gear oil.

3) Remove the air breather cap.

NOTE:

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



(A) Air breather cap

(B) Rear cover

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

Rear Differential

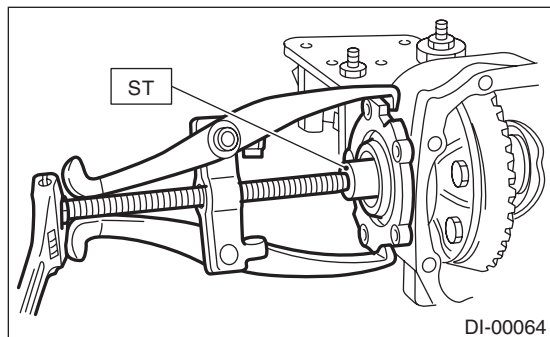
DIFFERENTIALS

5) Keep the side retainers separate to make it possible to identify RH and LH sides. Remove the side retainer attachment bolts, set the ST to differential case, and extract the side retainers RH and LH with a puller.

NOTE:

- Side retainer shim of each side should be kept together with its mating retainer.
- Keep the side retainers separate with tags to make it possible to identify RH and LH sides.

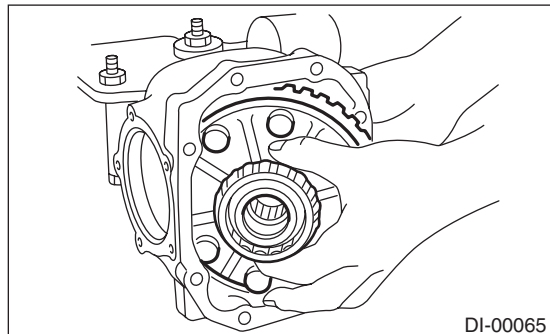
ST 398457700 ATTACHMENT



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

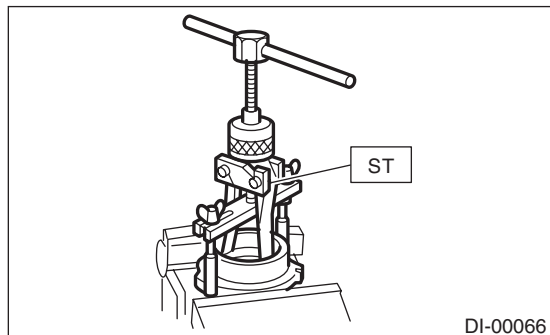
NOTE:

Be careful not to hit the hypoid driven gear teeth against the case.



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

ST 398527700 PULLER ASSY



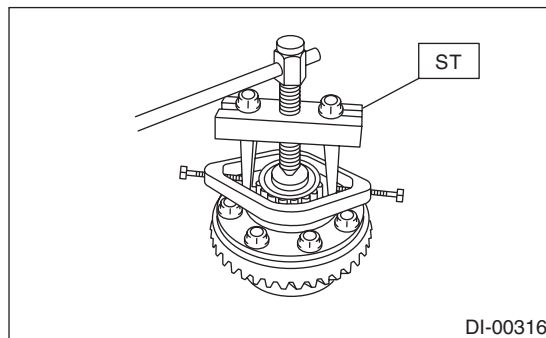
8) Remove the bearing cone with ST.

NOTE:

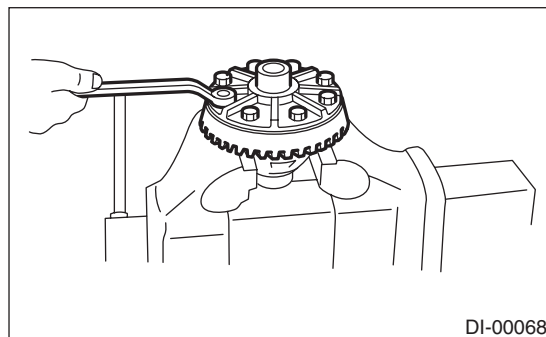
- Do not attempt to disassemble the parts unless necessary.

- Set the puller so that its claws catch the edge of the bearing cone.
- Never mix up the RH and LH bearing races and cones.

ST 18759AA000 PULLER ASSY



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

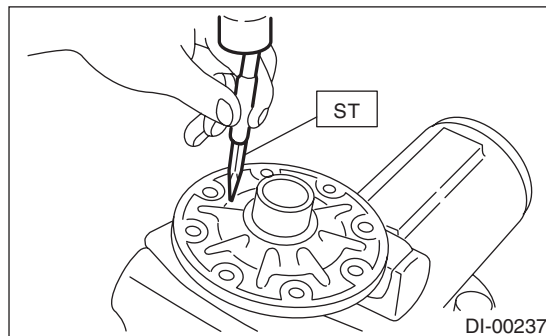


10) Drive out the pinion shaft lock pin from the hypoid driven gear side.

NOTE:

The lock pin is staked at the pin hole end on the differential carrier. Do not drive it out forcibly before removing the stake.

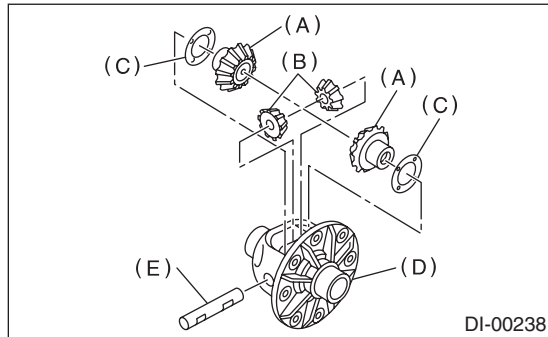
ST 899904100 STRAIGHT PIN REMOVER



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

NOTE:

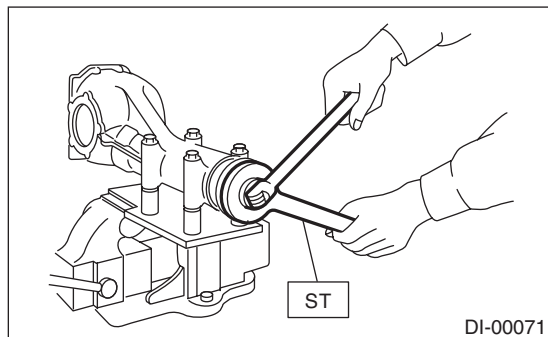
The gears should be marked or kept separated right and left, and front and rear as well as thrust washers.



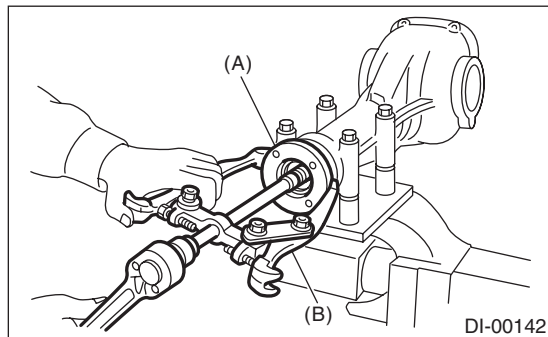
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

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

ST 498427200 FLANGE WRENCH



13) Extract the companion flange with a puller.



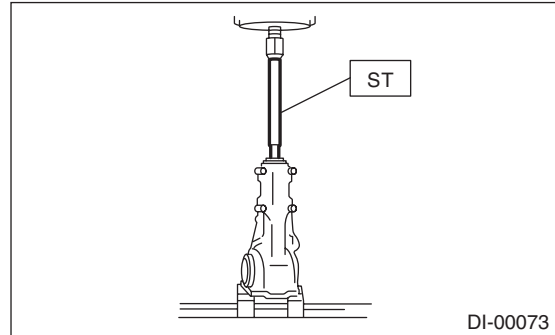
- (A) Companion flange
- (B) PULLER

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

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

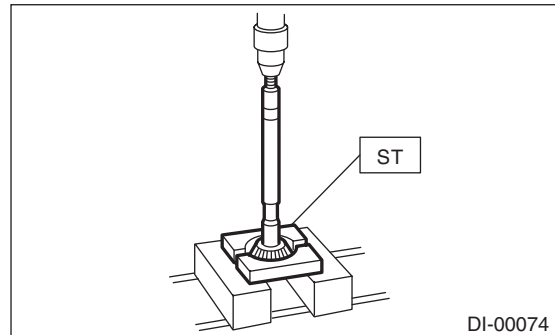


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:

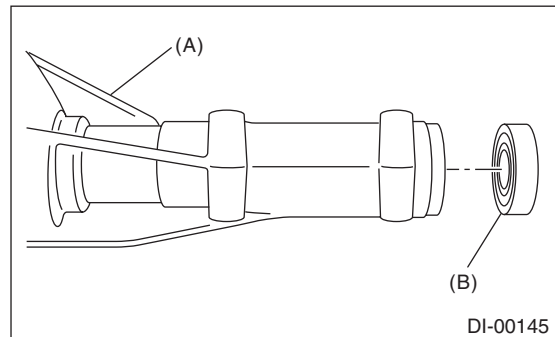
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



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

ST 398527700 PULLER ASSY



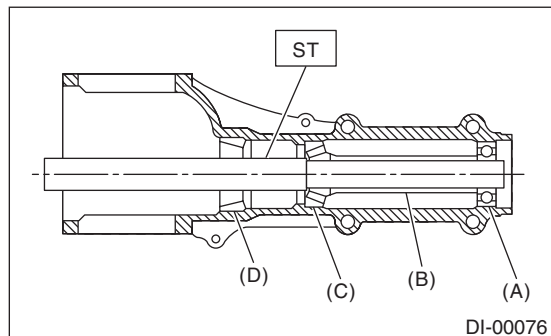
- (A) Differential carrier
- (B) Front oil seal

Rear Differential

DIFFERENTIALS

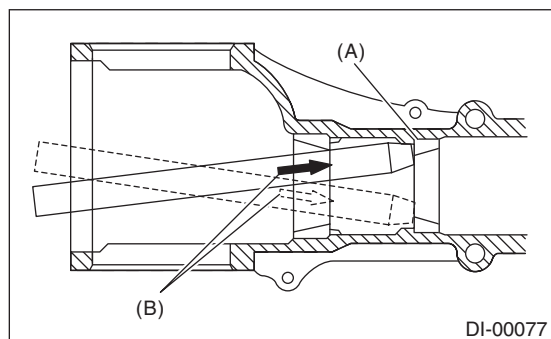
17) Remove the pilot bearing together with the front bearing cone and spacer using the ST.

ST 398467700 DRIFT



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

18) When replacing the bearings, use a brass bar to tap out the front bearing cup and rear bearing cup (in this order).



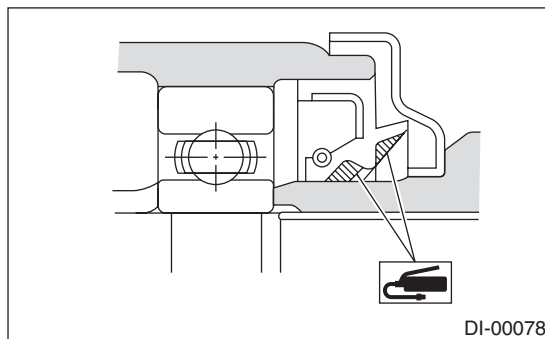
- (A) 2 cutout portions along diagonal lines
- (B) Tap alternately with brass bar.

D: ASSEMBLY

NOTE:

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

- Apply differential gear oil to the lips when installing the oil seal.



1) Adjusting preload for front and rear bearings

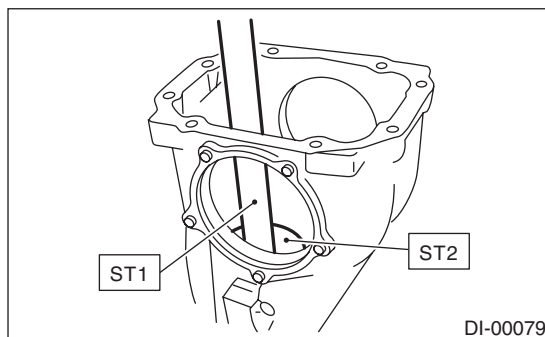
NOTE:

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

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

ST1 398477701 HANDLE

ST2 398477703 DRIFT 2



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

ST1 398477701 HANDLE

ST2 398477702 DRIFT

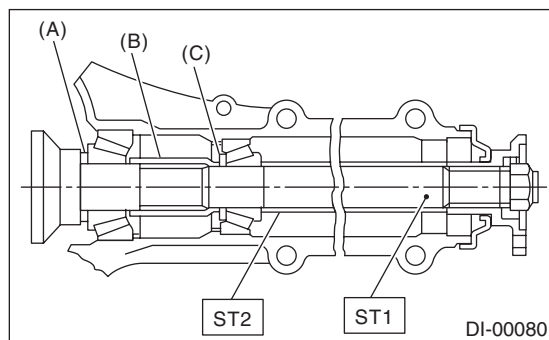
- (3) Insert the ST1 into carrier with the pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:

- If tooth contact (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 new rear bearing cone.

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

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



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

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

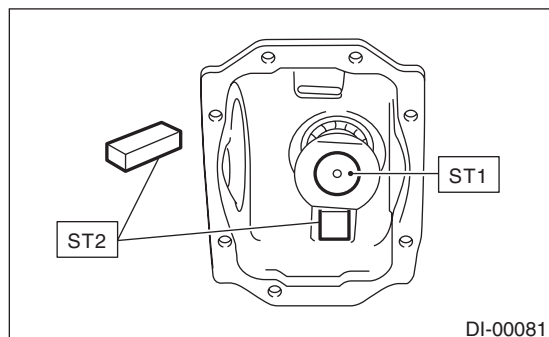
NOTE:

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

ST1 398507702 DUMMY SHAFT
ST2 398507704 BLOCK

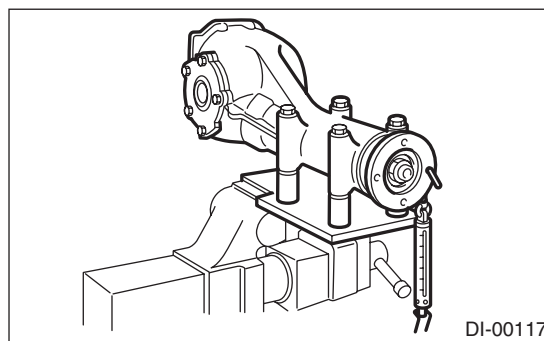
Tightening torque:

181.5 N·m (18.5 kgf-m, 133.9 ft-lb)



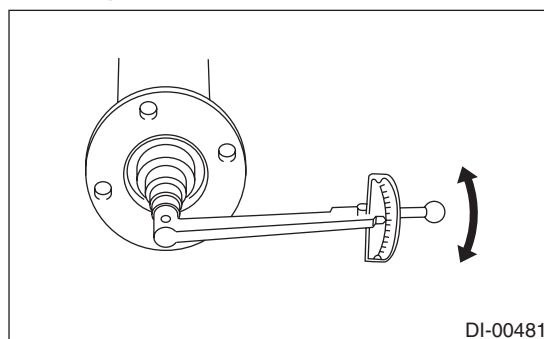
Initial load:

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



Initial torque:

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



Preload adjusting washer

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

Preload adjusting spacer

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

Rear Differential

DIFFERENTIALS

2) Adjusting drive pinion height:

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

(1) Attach the ST2.

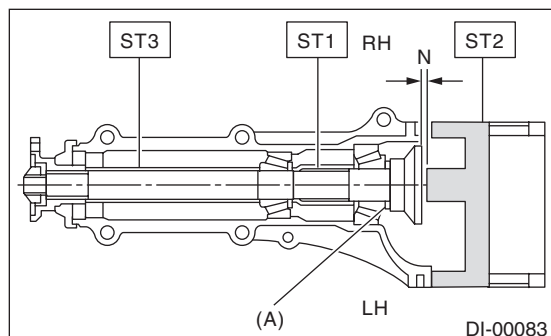
NOTE:

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

ST1 398507702 DUMMY SHAFT

ST2 398507701 DIFFERENTIAL CARRIER GAUGE

ST3 398507703 DUMMY COLLAR



N Measured value

(A) Pinion height adjusting washer

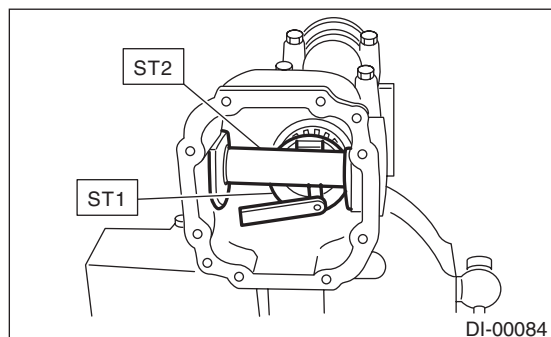
(2) Measure the clearance “N” between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:

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

ST1 398507702 DUMMY SHAFT

ST2 398507701 DIFFERENTIAL CARRIER GAUGE



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

$$T = To + N - (H \times 0.01) - 0.20 \text{ mm (0.0079 in)}$$

NOTE:

Use copies of this page.

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

(Example of calculation)

$$To = 2.20 \text{ mm (0.0866 in)} + 1.20 \text{ mm (0.0472 in)} = 3.40 \text{ mm (0.1339 in)}$$

$$N = 0.23 \text{ mm (0.0091 in)}$$

$$H = + 1$$

$$T = 3.40 \text{ mm (0.1339 in)} + 0.23 \text{ mm (0.0091 in)} - 0.01 \text{ mm (0.0004 in)} - 0.20 \text{ mm (0.0079 in)} = 3.42 \text{ mm (0.1346 in)}$$

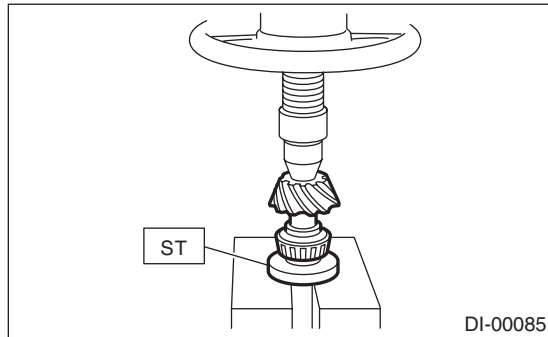
Result: Thickness = 3.42 mm (0.1346 in)

Therefore use washer 383605200.

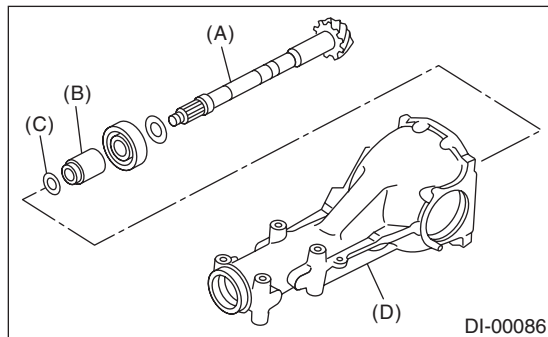
Pinion height adjusting washer	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200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

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

ST 398177700 INSTALLER



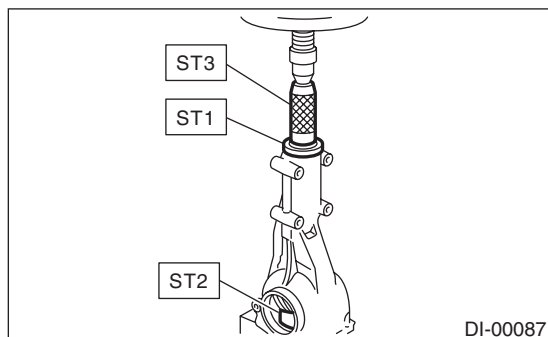
4) Insert the drive pinion into the differential carrier, and install the preselected bearing preload adjusting spacer and washer.



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

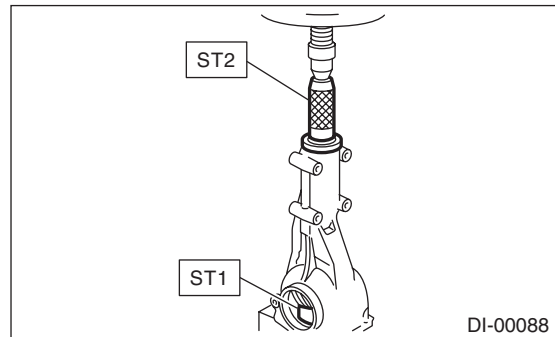
5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.

ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



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

ST1 399780104 WEIGHT
ST2 899580100 INSTALLER

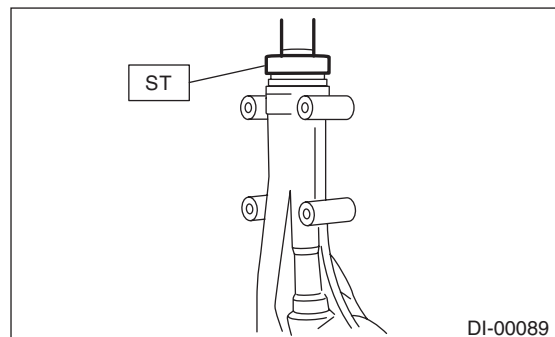


7) Fit a new oil seal with ST.

NOTE:

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

ST 498447120 INSTALLER

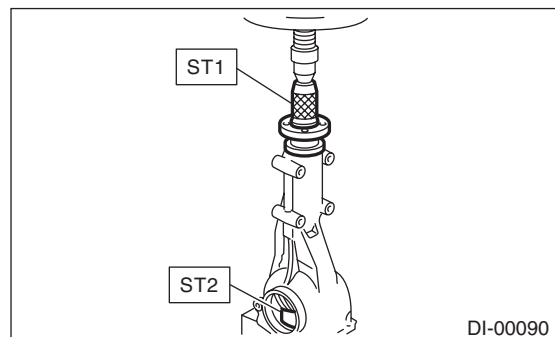


8) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



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

Seal material:

THREE BOND 1324 (Part No. 004403042) or equivalent

Rear Differential

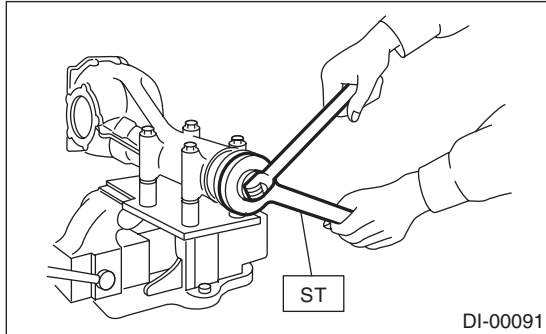
DIFFERENTIALS

10) Attach new self-locking nuts, and tighten with the ST.

ST 498427200 FLANGE WRENCH

Tightening torque:

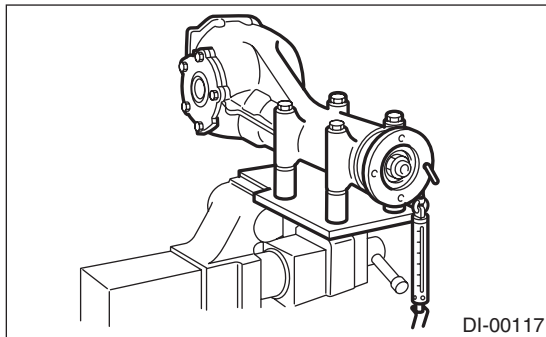
181.5 N·m (18.5 kgf-m, 133.9 ft-lb)



11) Check the initial torque or initial load.

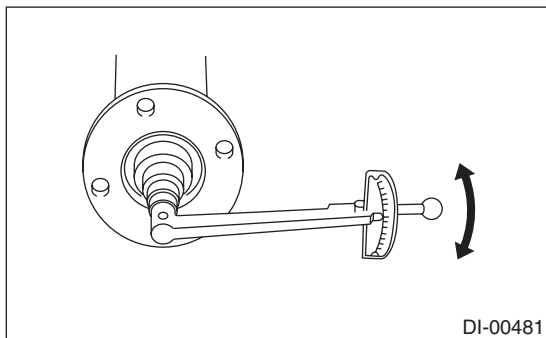
Initial load:

17.7 — 38.8 N·m (1.8 — 4.0 kgf-m, 4.0 — 8.7 ft-lb)



Initial torque:

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



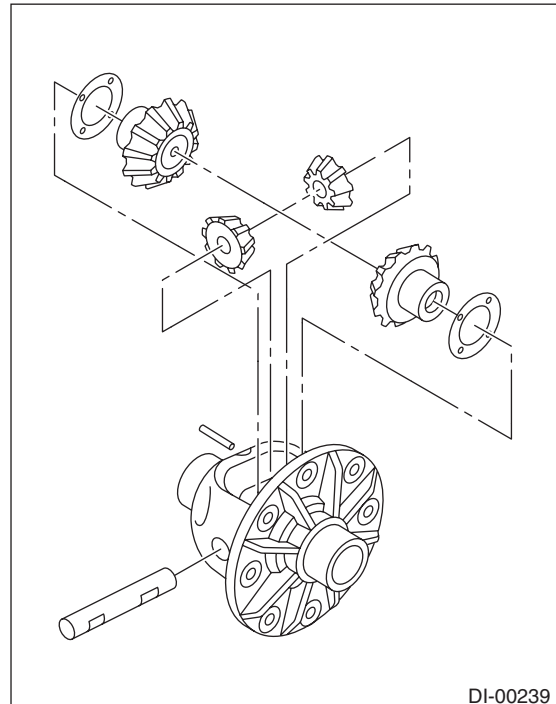
12) Assembling differential case

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

NOTE:

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

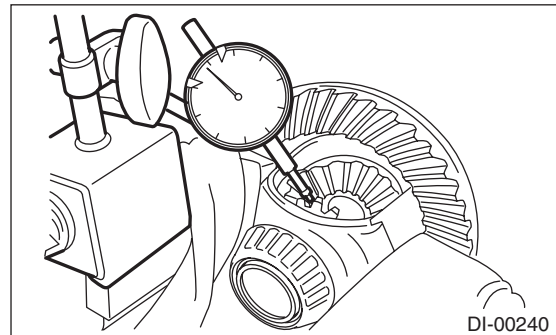
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(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 side gear thrust washer.

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

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust washer surfaces.

(4) After inserting the pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

13) Install the driven gear to the differential case.

NOTE:

- Before installing bolts, apply seal material to bolt threads.

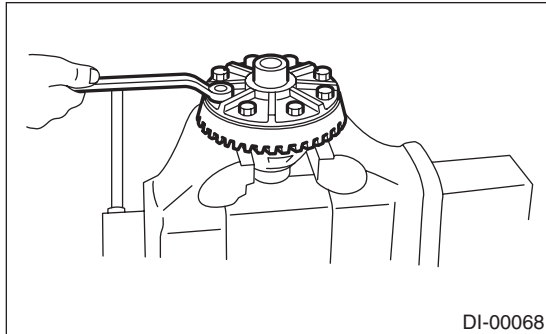
Seal material:

THREE BOND 1324 (Part No. 004403042) or equivalent

- Make sure there is no clearance between the differential case and driven gear.
- Tighten opposing bolts in order.

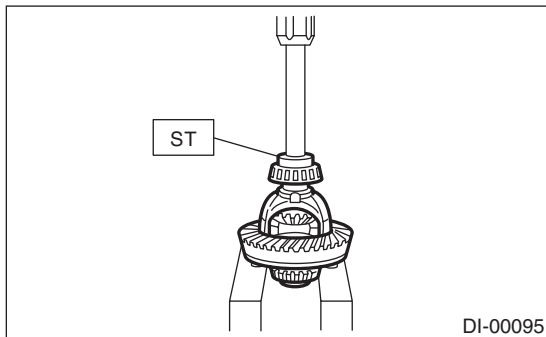
Tightening torque:

103 N·m (10.5 kgf-m, 76.0 ft-lb)



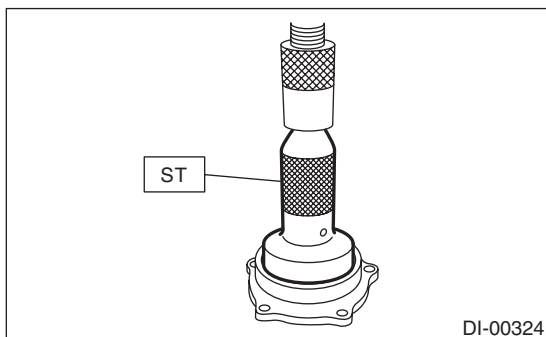
14) Press the side bearing into differential case using ST.

ST 398487700 DRIFT



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

ST 398417700 DRIFT



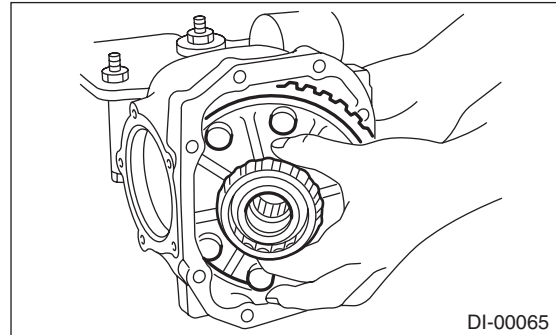
16) Side retainer shim adjustment

(1) The driven gear backlash and side bearing preload can be adjusted by the side retainer shim thickness.

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

NOTE:

Be careful not to hit the hypoid driven gear teeth against the case.



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

NOTE:

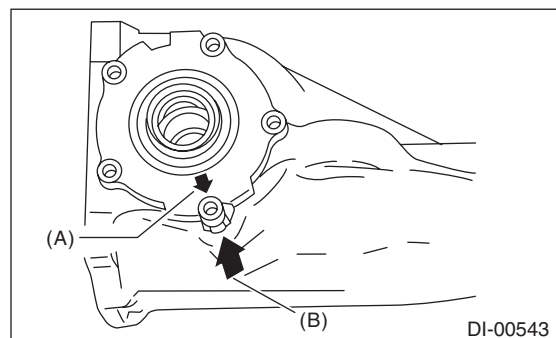
- Replace the O-ring with a new part.
- Replace broken or corroded side retainer shims with a new part of the same thickness.

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

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

NOTE:

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



- (A) Arrow mark (on the side retainer)
(B) Arrow mark (on the differential carrier)

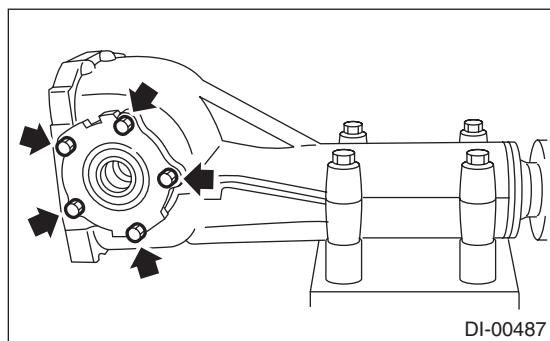
(5) Tighten the side retainer bolts.

Rear Differential

DIFFERENTIALS

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 hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge. If the backlash is outside the standard range, adjust the side retainer shim by the following method.

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

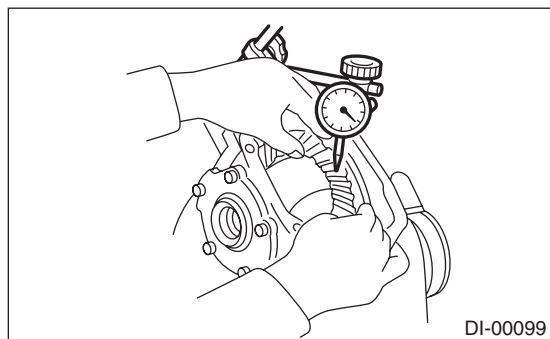
Reduce the thickness of shim on the back side of the hypoid driven gear and increase the thickness of shims on the teeth side of the hypoid driven gear.

•When backlash exceeds 0.2 mm (0.008 in):

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

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)



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

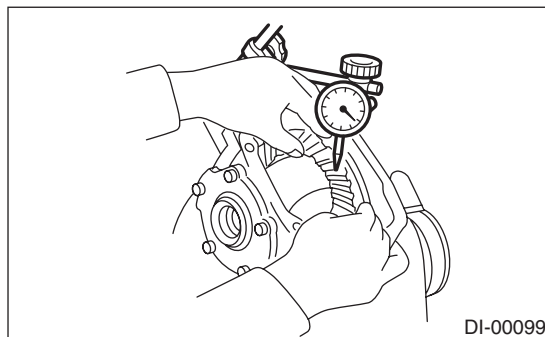
Total preload:

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

17) Recheck the hypoid driven gear to drive pinion backlash.

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)

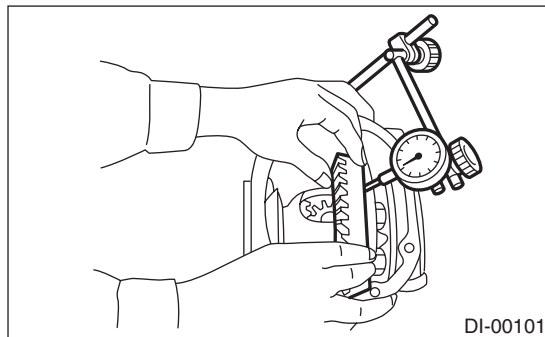


18) Check the runout on the back side of the hypoid driven gear, and make sure that the pinion and hypoid driven gears rotate smoothly.

If the runout on the back side of the hypoid driven gear exceeds the specification, check for any foreign material between the hypoid driven gear and differential case, and for any deformation of the case or gear.

Hypoid driven gear back surface runout:

0.05 mm (0.002 in)



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

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

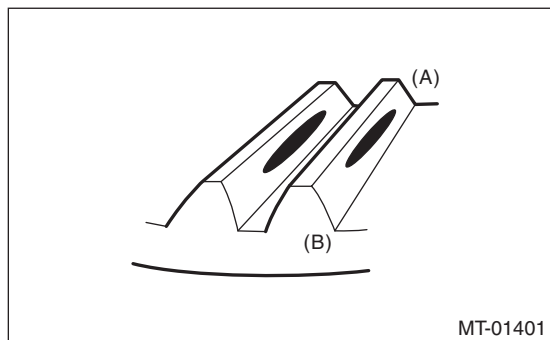
(2) When the contact pattern is not correct, re-adjust.

NOTE:

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

- Correct tooth contact

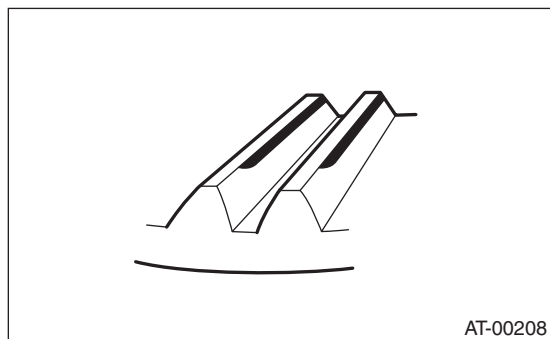
Check item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. (When driving, it moves towards the heel side.)



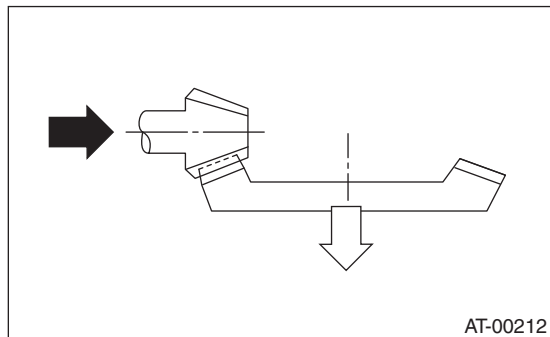
- (A) Toe side
(B) Heel side

- Face contact

Check item: Backlash is too large.
Contact pattern

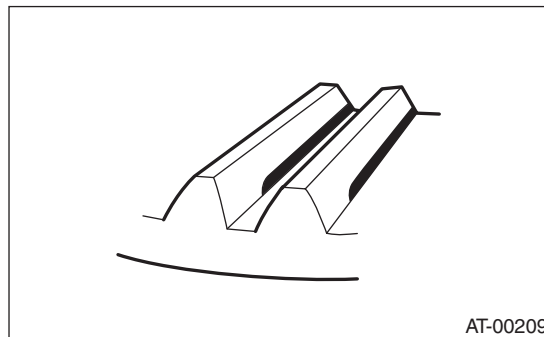


Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.

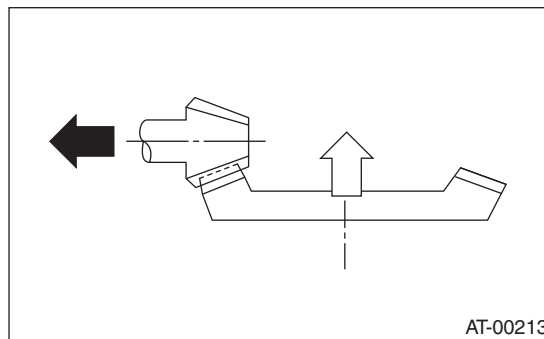


- Flank contact

Check item: Backlash is too small.
Contact pattern



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



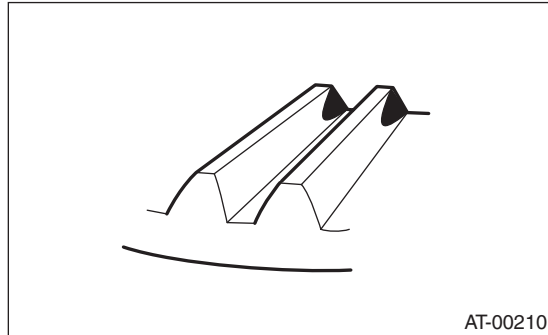
Rear Differential

DIFFERENTIALS

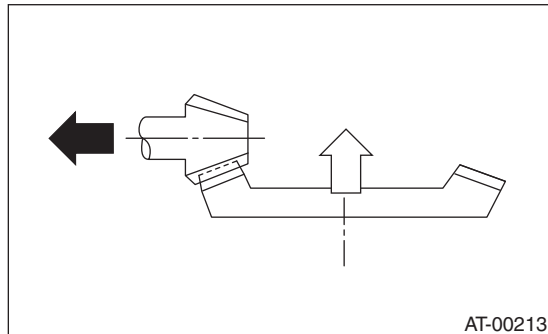
- Toe contact (inside contact)

Check item: Teeth contact area is too small.

Contact pattern



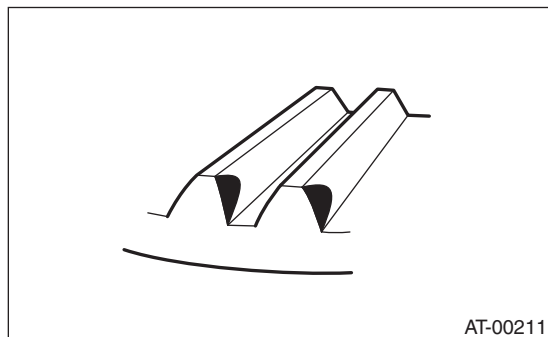
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



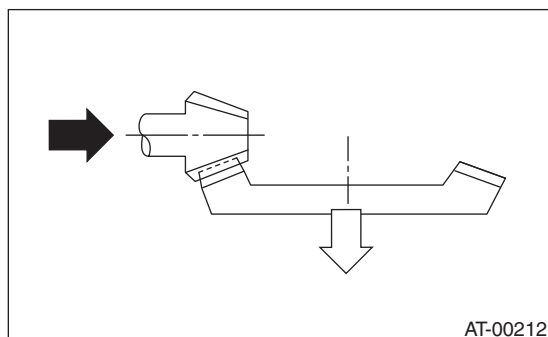
- Heel contact (outside end contact)

Check item: Teeth contact area is too small.

Contact pattern



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

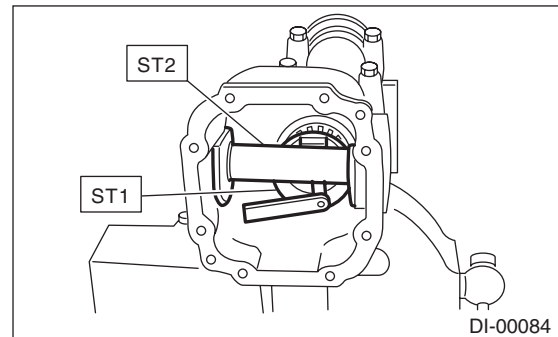


20) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing the RH and LH side retainer shims and the hypoid gear backlash.

(1) Drive pinion height

ST1 398507702 DUMMY SHAFT

ST2 398507701 DIFFERENTIAL CARRIER GAUGE



$$T = T_o + N - (H \times 0.01) - 0.20 \text{ mm (0.008 in)}$$

Place:

T = Thickness of pinion height adjusting washer mm (in)

T_o = Thickness of washer temporarily inserted mm (in)

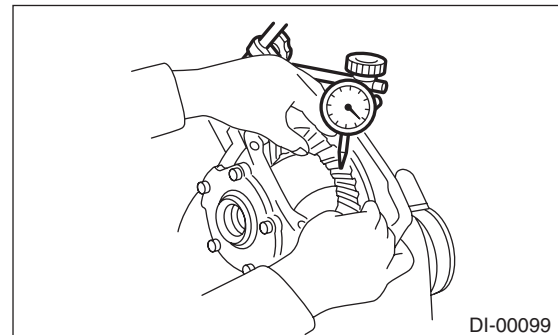
N = Clearance of thickness gauge mm (in)

H = Figure marked on drive pinion head

(2) Hypoid gear backlash

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)

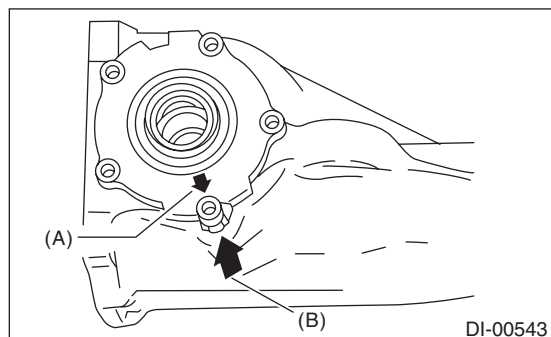


21) Remove the RH and LH side retainers.

22) Install new O-rings to the side retainers on both sides.

23) Install the oil seal to the side retainer of both sides. <Ref. to DI-38, REPLACEMENT, Rear Differential Side Oil Seal.>

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



- (A) Arrow mark (on the side retainer)
(B) Arrow mark (on the differential carrier)

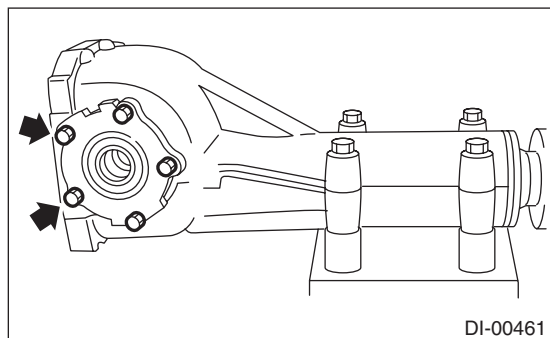
25) Apply liquid gasket to the bolt with arrow marks and install the side retainer.

Liquid gasket:

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

Tightening torque:

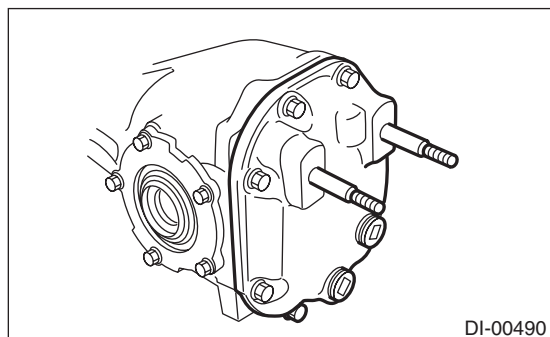
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



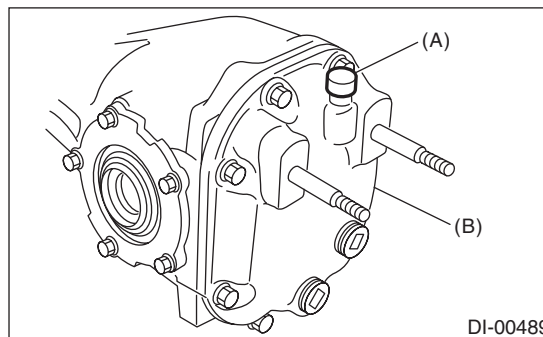
26) Install the new gasket and rear cover, and tighten the bolts to the specified torque.

Tightening torque:

29.5 N·m (3.0 kgf-m, 21.8 ft-lb)



27) Install the air breather cap.



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

28) Install the oil drain plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

49 N·m (5.0 kgf-m, 36.1 ft-lb)

29) Install the oil filter plug.

E: INSPECTION

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

1) Hypoid driven gear and drive pinion

- If there is evidently an abnormal tooth contact, find out the cause and adjust until the teeth contact correctly. Replace the gear if there is an excessive worn or an incapable adjustment.

- If crack, cutout or seizure is found, replace the parts as a set. Slight damage of some teeth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if cracks, scoring or other defects are evident on the tooth surface.

- Replace if thrust washer contact surface is worn or seized. Slight damages of the surface can be corrected by oil stones or equivalent.

3) Bearing

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

4) Thrust washer of the side gear and pinion mate gear

Replace if seized, flawed, abnormally worn or having other defects.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

Rear Differential

DIFFERENTIALS

7) Differential case

Replace if its sliding surfaces are abnormally worn, burned, or cracked.

8) Companion flange

Replace if the oil seal lip contact surface shows cracking.

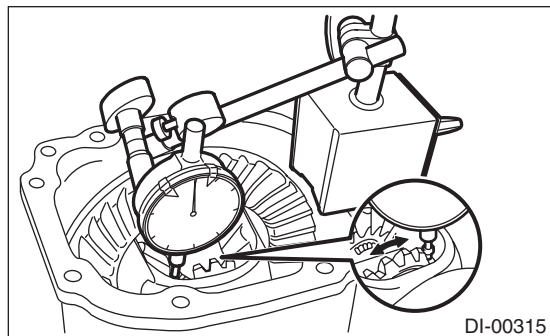
1. SIDE GEAR BACKLASH

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

Side gear backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)

If the side gear backlash is not within the specification, select the side gear thrust washer and adjust the side gear backlash as specified.



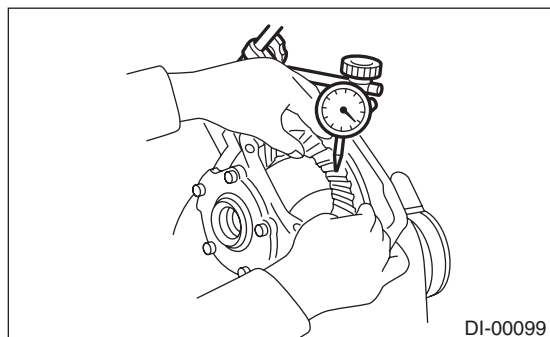
2. HYPOID DRIVEN GEAR BACKLASH

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

Hypoid driven gear backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)

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



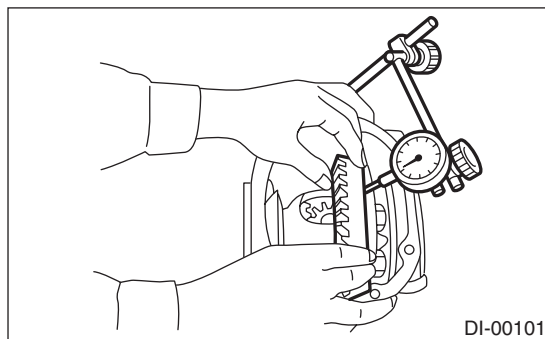
3. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

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

Hypoid driven gear back surface runout:

0.05 mm (0.002 in)

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



4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

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

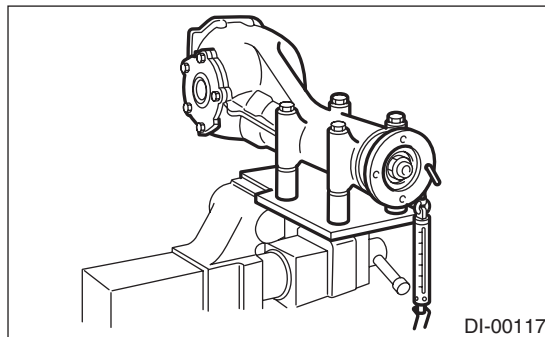
5. TOTAL PRELOAD

Using a spring scale, check the total preload.

Total preload:

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

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

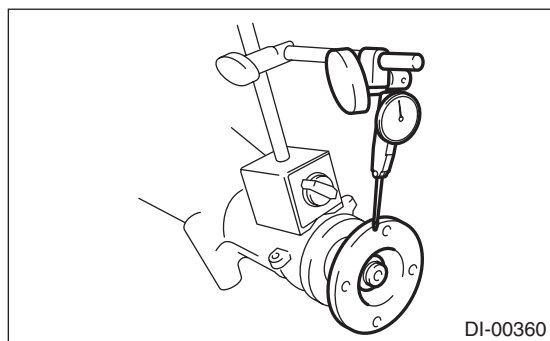


6. COMPANION FLANGE

1) If rust or dirt is attached to the companion flange, remove them.

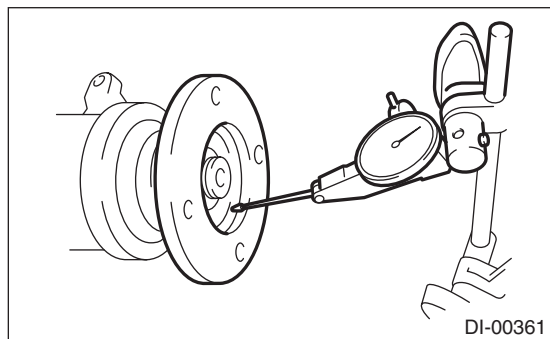
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.003 in)



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

Limit of runout:
0.08 mm (0.003 in)



4) If either runout exceeds the limit, move the phase of companion flange and drive pinion 90° each, and find the point where the runout is within the limit.

5) If the runout exceeds the limit after changing the phase, replace the companion flange and recheck the runout.

6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

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

2. HYPOID DRIVEN GEAR BACKLASH

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

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

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

4. TOTAL PRELOAD

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

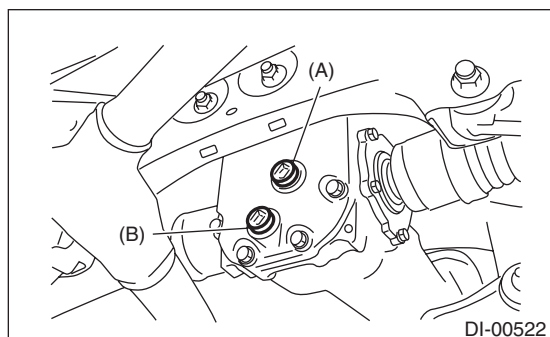
5. Rear Differential Front Oil Seal

A: INSPECTION

Check that there is no leakage from front oil seal portion. If there is any leakage, replace the oil seal and inspect the companion flange.

B: REPLACEMENT

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



- (A) Filler plug
(B) Oil 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, 36.1 ft-lb)

- 7) Remove the rear exhaust pipe and muffler.

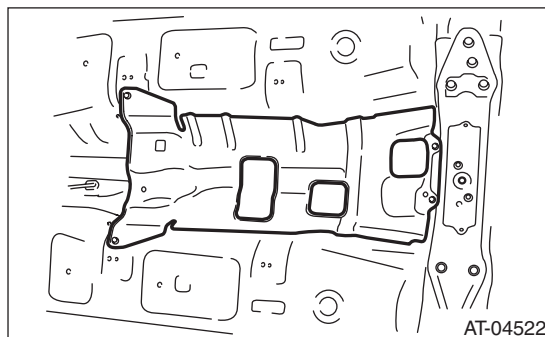
- Non-turbo model

<Ref. to EX(H4SO)-10, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-12, REMOVAL, Muffler.>

- Turbo model

<Ref. to EX(H4DOTC)-14, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

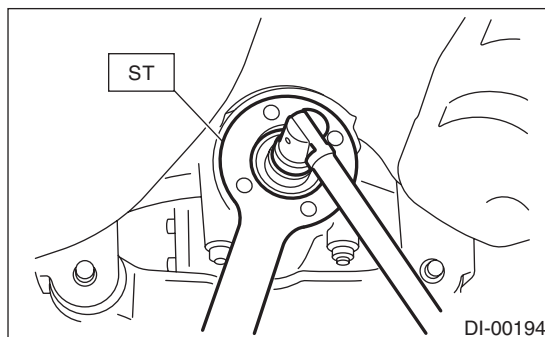
- 8) Remove the heat shield cover.



- 9) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>

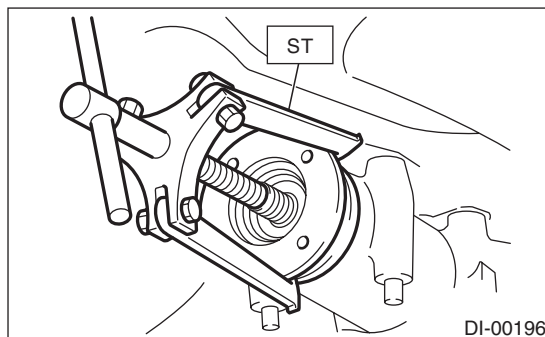
- 10) Remove the self-locking nut while holding the companion flange with ST.

ST 498427200 FLANGE WRENCH



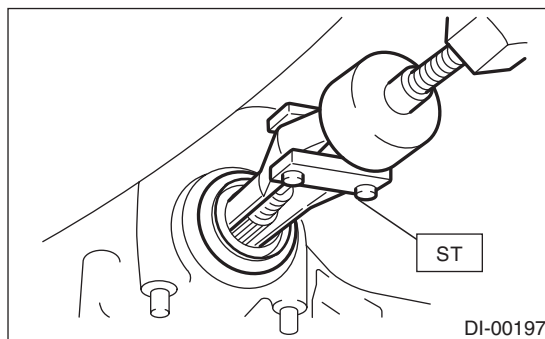
- 11) Extract the companion flange using ST.

ST 399703600 PULLER ASSY



- 12) Remove the oil seal using ST or screwdriver.

ST 398527700 PULLER ASSY

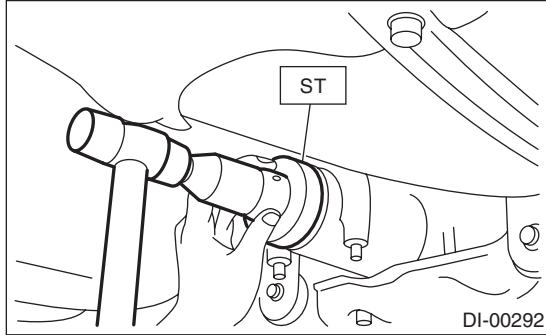


- 13) Install a new oil seal using ST.

NOTE:

Apply differential gear oil to the oil seal lips.

ST 498447120 INSTALLER



14) Install the companion flange.

NOTE:

Use a plastic hammer to install companion flange.

15) Tighten the self-locking nut to the specified torque so that the rotating resistance of the companion flange is the same value as that before replacing the oil seal.

ST 498427200 FLANGE WRENCH

NOTE:

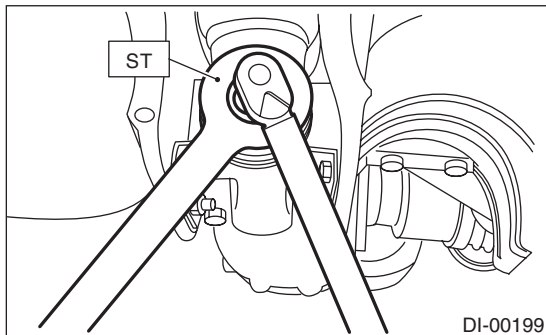
- Use a new self-locking nut.
- Before installing the self-locking nut, apply seal material to self-locking nut threads.

Seal material:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

181.5 N·m (18.5 kgf-m, 133.9 ft-lb)



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

17) After installing, fill the differential carrier with gear oil up to the bottom of the filler plug hole. <Ref. to DI-16, Differential Gear Oil.>

6. Rear Differential Side Oil Seal

A: INSPECTION

Check that there is no oil leakage from the side oil seal. If there is any leakage, replace the oil seal.

B: REPLACEMENT

1) Remove the rear differential. <Ref. to DI-18, REMOVAL, Rear Differential.>

2) Remove the rear differential side oil seal using an ST or a screwdriver wrapped with vinyl tape to prevent the side retainer from scratching.

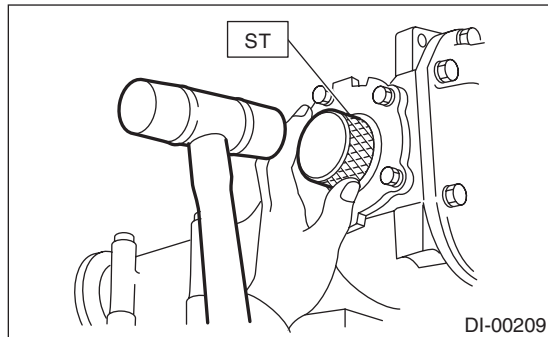
ST 398527700 PULLER ASSY

3) Using the ST, install the oil seal to the side retainer.

NOTE:

Apply differential gear oil to the oil seal lips.

ST 398437700 DRIFT

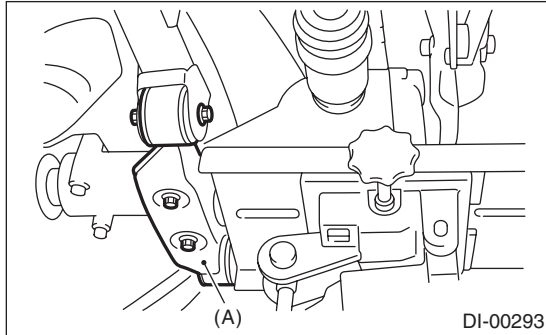


4) Install the rear differential. <Ref. to DI-20, INSTALLATION, Rear Differential.>

7. Rear Differential Front Member

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Support the rear differential using transmission jack, and then remove the rear differential front member.



(A) Rear differential front member

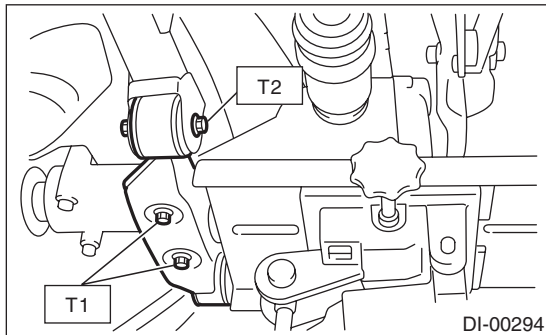
B: INSTALLATION

Using new self-locking nuts, install the rear differential front member.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)



C: INSPECTION

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

Rear Differential Mount Bushing

DIFFERENTIALS

8. Rear Differential Mount Bushing

A: INSPECTION

Check the rear differential mounting bushing for cracks, hardening, or damage. If cracking, hardening, or damage is excessive, replace the rear differential mounting bushing.

B: REPLACEMENT

1) Remove the rear differential. <Ref. to DI-18, REMOVAL, Rear Differential.>

2) Remove the rear differential mounting bushing using ST1 to 7.

(1) Select the removal tools from the special tool ASSY (41399FG000).

(2) Apply grease to the thread area of the shaft of ST1 and to the bearing of ST4.

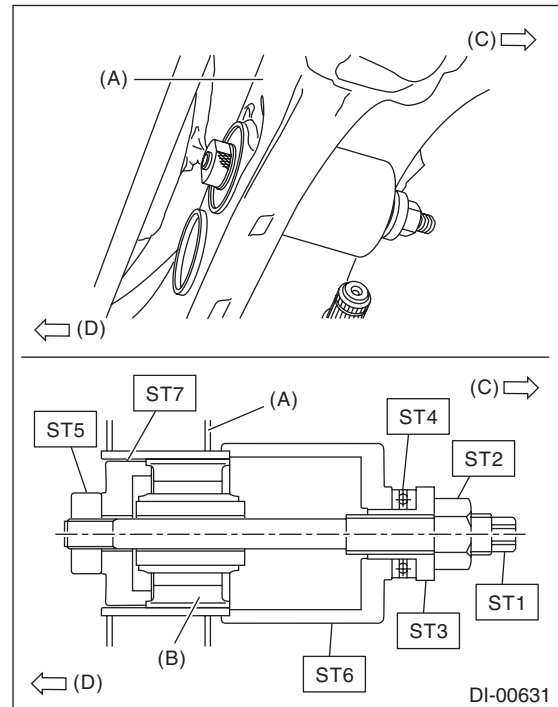
(3) Set the ST as the illustration shows, and manually tighten the ring of ST5 until it stops.

(4) Hold the end of the shaft of ST1 using a spanner, and tighten the nut of ST2 until the rear differential mounting bushing is detached from the sub frame.

CAUTION:

Rotating the shaft of ST1 may loosen ST5 and cause damage to the ST; therefore, be sure to hold the ST1.

ST1	41399FG090	SPECIAL TOOL SHAFT
ST2	41399FG070	SPECIAL TOOL NUT
ST3	41399FG050	SPECIAL TOOL SLEEVE
ST4	41399FG080	SPECIAL TOOL BEARING
ST5	41399FG060	SPECIAL TOOL RING
ST6	41399FG010	SPECIAL TOOL A
ST7	41399FG030	SPECIAL TOOL C



- (A) Sub frame
- (B) Rear differential mounting bushing
- (C) Front
- (D) Rear

3) Install the rear differential mounting bushing using ST1 to 7.

(1) Select the installation tools from the special tool ASSY (41399FG000).

(2) Set the ST as the illustration shows, and manually tighten the ring of ST5 until it stops.

CAUTION:

Be careful not to mistake the orientation of the ST7 to be installed.

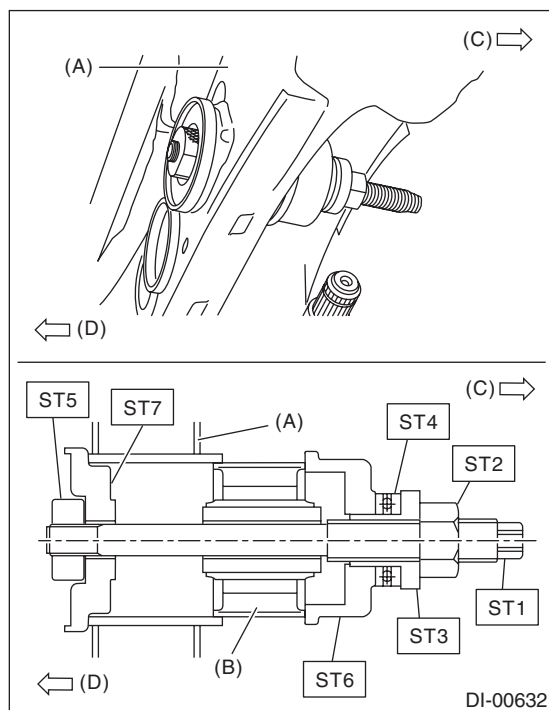
(3) Hold the end of the shaft of ST1 using a spanner, tighten the nut of ST2, and press-fit until ST6 touches the end face of the sub frame.

CAUTION:

• **Rotating the shaft of ST1 may loosen ST5 and cause damage to the ST. Be sure to hold the ST1.**

- Be aware that, after ST6 has touched the sub frame end face, tightening the nut of ST2 again may cause damage to the ST.

ST1	41399FG090	SPECIAL TOOL SHAFT
ST2	41399FG070	SPECIAL TOOL NUT
ST3	41399FG050	SPECIAL TOOL SLEEVE
ST4	41399FG080	SPECIAL TOOL BEARING
ST5	41399FG060	SPECIAL TOOL RING
ST6	41399FG020	SPECIAL TOOL B
ST7	41399FG040	SPECIAL TOOL D



- (A) Sub frame
 (B) Rear differential mounting bushing
 (C) Front
 (D) Rear

4) Install the rear differential. <Ref. to DI-20, INSTALLATION, Rear Differential.>

General Diagnostic Table

DIFFERENTIALS

9. General Diagnostic Table

A: INSPECTION

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

General Diagnostic Table

DIFFERENTIALS

TRANSFER CASE

TC

	Page
1. General Description	2
2. Transfer Case and Extension Case Assembly	3
3. Transfer Clutch	4
4. Extension Case	5
5. Oil Seal	6
6. Transfer Drive Gear	7
7. Transfer Driven Gear	8
8. Reduction Drive Gear	9
9. Reduction Driven Gear	10
10. Center Differential	11
11. Transfer Clutch Pressure Test	12

General Description

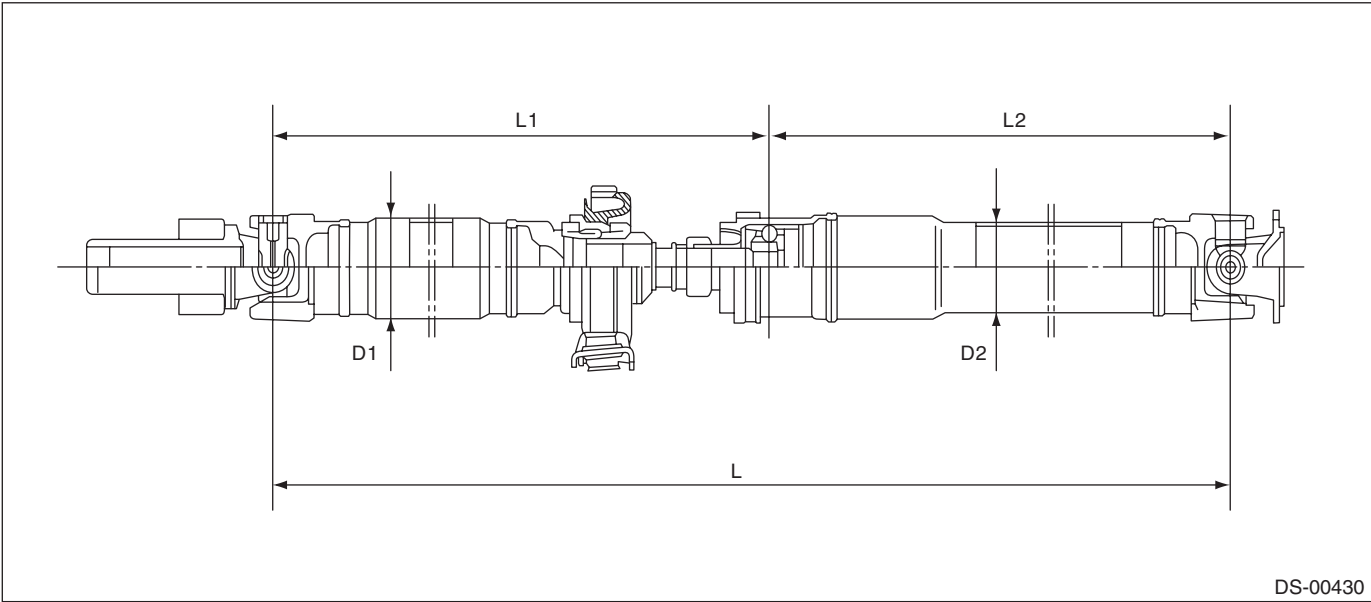
DRIVE SHAFT SYSTEM

1. General Description

A: SPECIFICATION

1. PROPELLER SHAFT

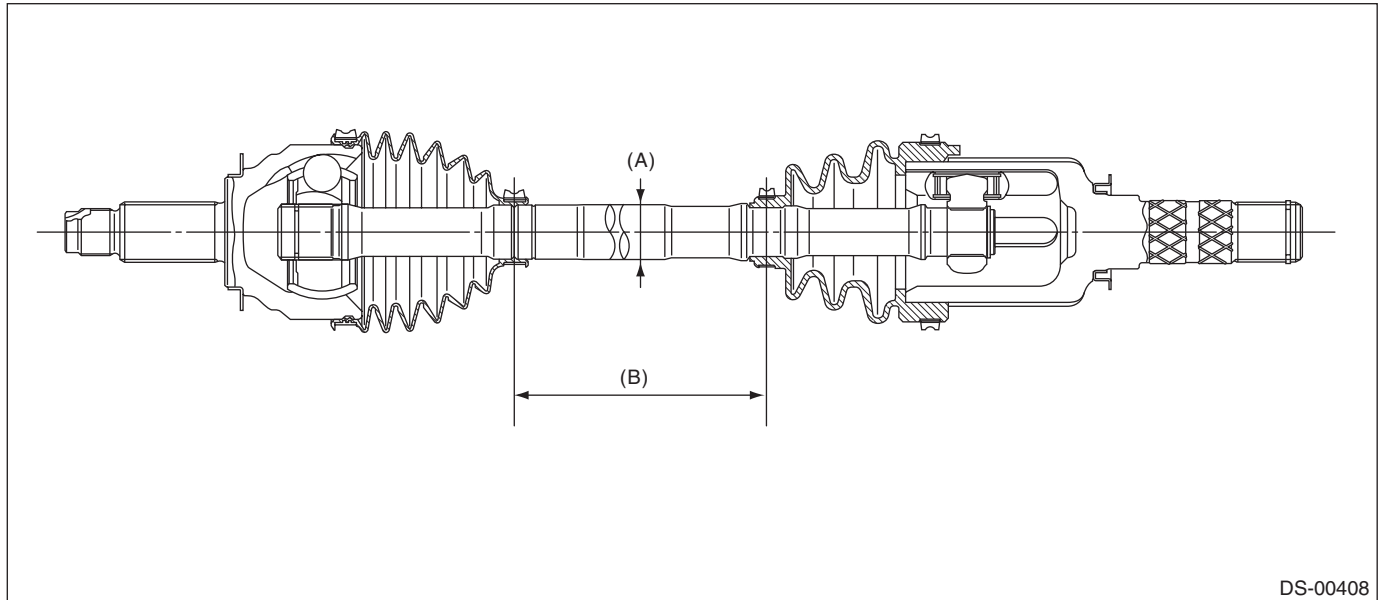
Car line		All models	
Propeller shaft type		EDJ	
Front propeller shaft Joint-to-joint length: L ₁	mm (in)	AT	735.5 (28.96)
		MT	675.5 (26.59)
Rear propeller shaft Joint-to-Joint length: L ₂		mm (in)	698 (27.48)
Outer diameter of tube:	mm (in)	D ₁	63.5 (2.500)
		D ₂	57.5 (2.264)



DS-00430

2. FRONT DRIVE SHAFT ASSEMBLY

Model	Type of drive shaft	Axle diameter ϕ D mm (in)	Axle length L mm (in)
All models	AC + AAR	26 (1.02)	335.2 (13.20)

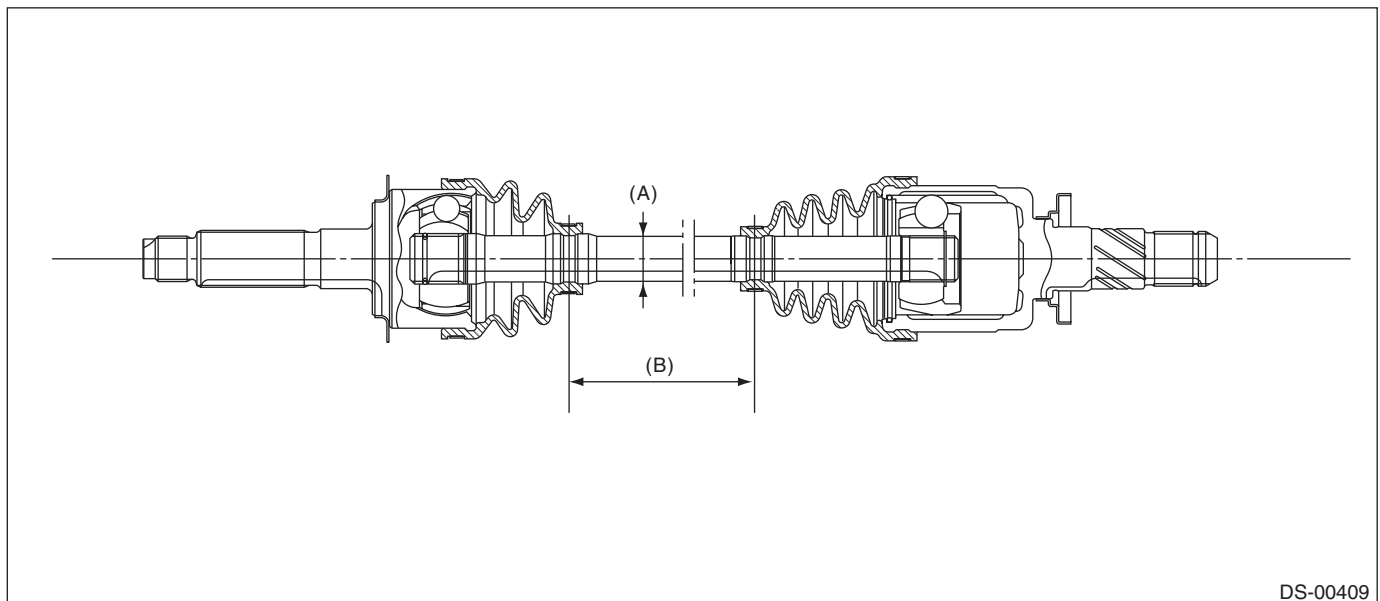


(A) Axle diameter

(B) Axle length

3. REAR DRIVE SHAFT ASSEMBLY

Model	Type of drive shaft	Axle diameter ϕ D mm (in)	Axle length L mm (in)
All models	EBJ + DOJ	22 (0.87)	368.3 (14.50)



(A) Axle diameter

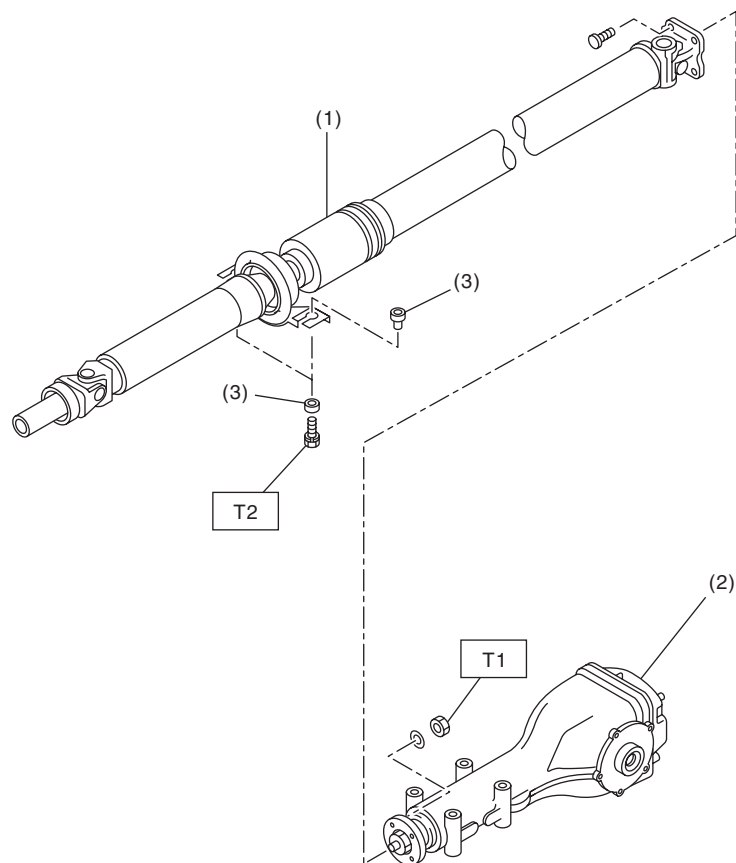
(B) Axle length

General Description

DRIVE SHAFT SYSTEM

B: COMPONENT

1. PROPELLER SHAFT



DS-00368

- (1) Propeller shaft
- (2) Rear differential

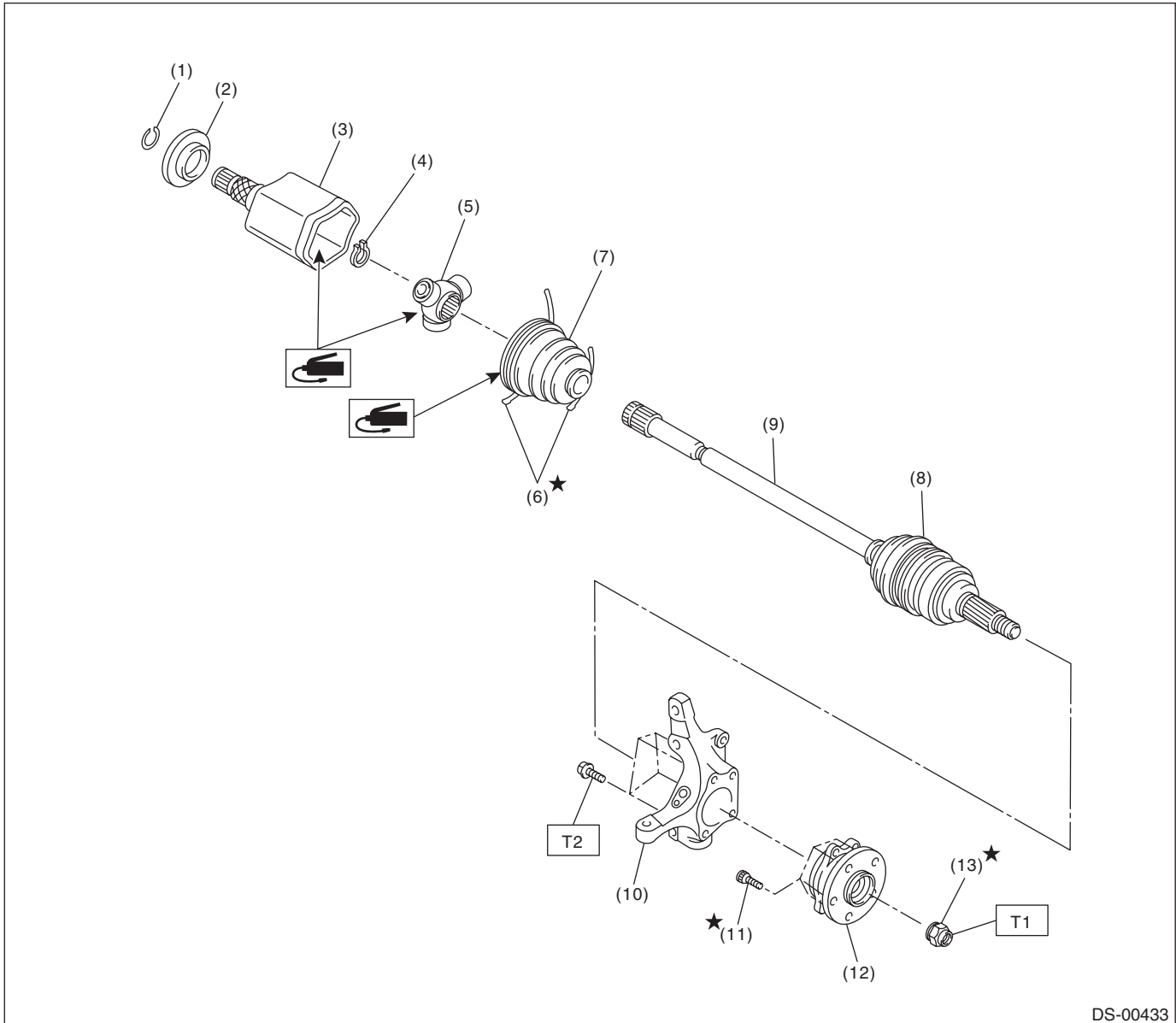
- (3) Bushing

Tightening torque: N·m (kgf-m, ft-lb)

T1: 31 (3.2, 22.9)

T2: 52 (5.3, 38.4)

2. FRONT AXLE



DS-00433

(1) Circlip	(7) Boot (AAR)
(2) Baffle plate	(8) Boot (AC)
(3) Outer race (AAR)	(9) AC shaft ASSY
(4) Snap ring	(10) Housing
(5) Trunnion	(11) Hub bolt
(6) Boot band	(12) Front hub unit bearing

- (13) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)

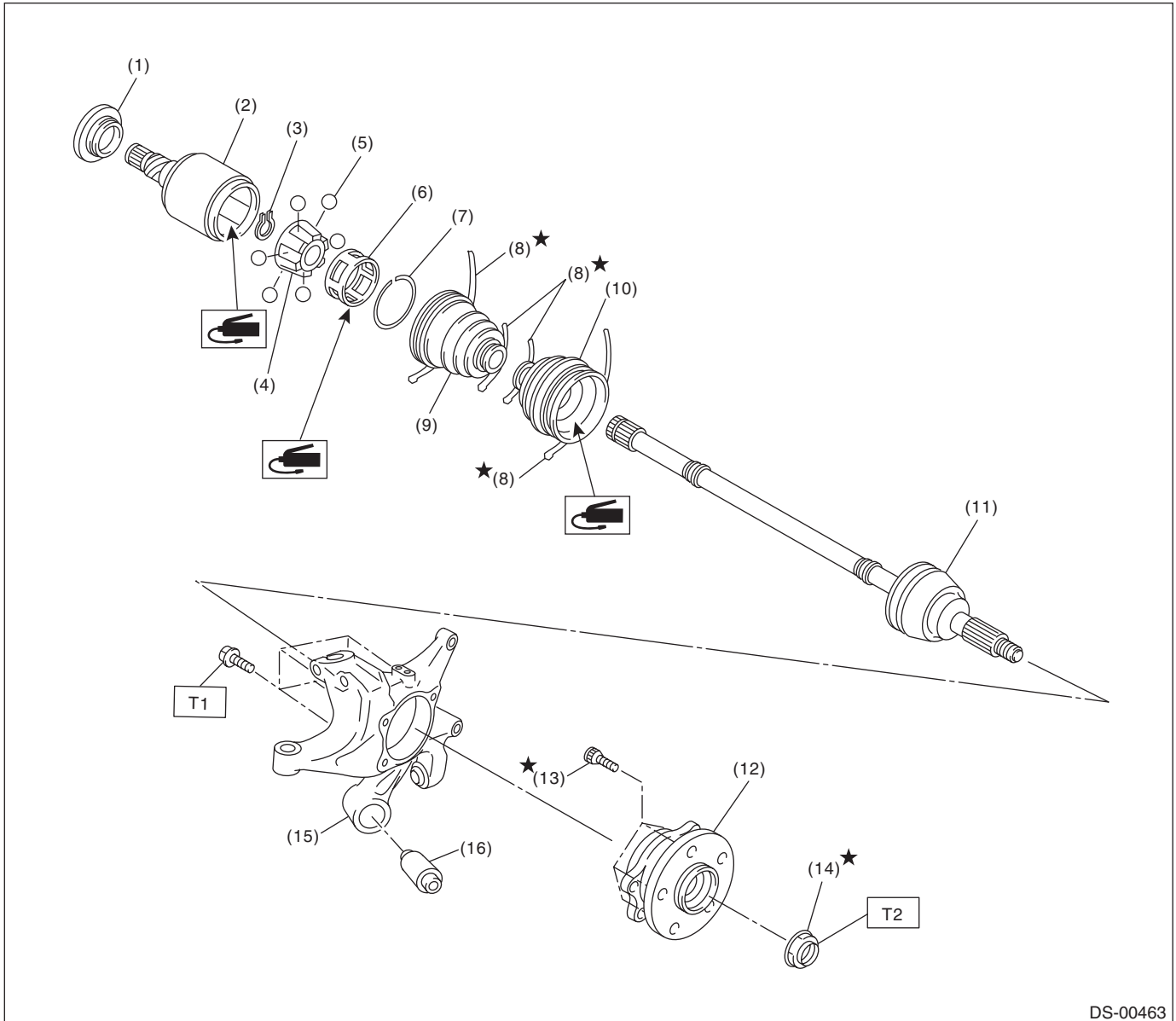
T1: 220 (22.4, 162.3)

T2: 65 (6.6, 47.9)

General Description

DRIVE SHAFT SYSTEM

3. REAR AXLE



DS-00463

(1) Baffle plate	(8) Boot band	(15) Rear axle housing
(2) Outer race (DOJ)	(9) Boot (DOJ)	(16) Bushing
(3) Snap ring	(10) Boot (BJ)	
(4) Inner race	(11) EBJ shaft ASSY	
(5) Ball	(12) Rear hub unit bearing	
(6) Cage	(13) Hub bolt	
(7) Snap ring	(14) Axle nut	

Tightening torque: N·m (kgf-m, ft-lb)

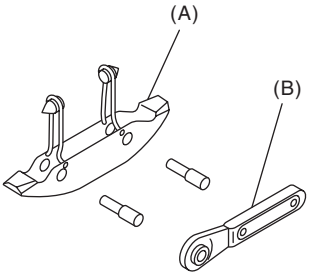
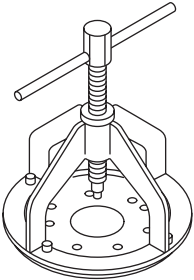
T1: 65 (6.6, 47.9)

T2: 190 (19.4, 140.1)

C: CAUTION

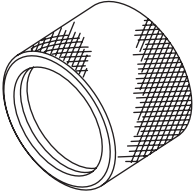
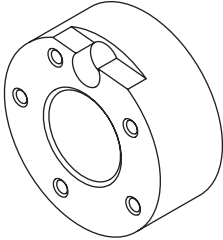
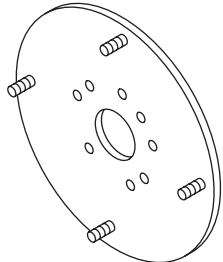
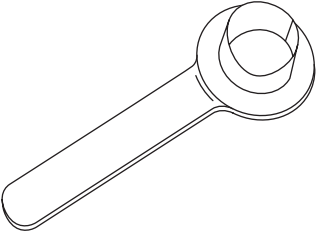
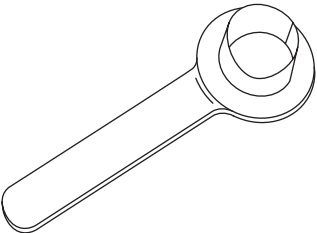
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal,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

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

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening the boot band. (A) Jig for the band (B) Ratchet wrench
 ST-926470000	926470000	AXLE SHAFT PULLER	• Used for removing the axle shaft. • Used together with AXLE SHAFT PULLER PLATE (28099PA110).

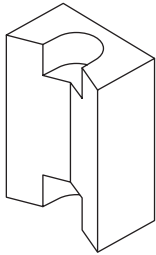
General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.
 ST-927080000	927080000	HUB STAND	Used for assembling hub bolt in hub.
 ST28099PA110	28099PA110	AXLE SHAFT PULLER PLATE	Exchange with the plate of the AXLE SHAFT PULLER (926470000) to use.
 ST28099PA090	28099PA090	OIL SEAL PROTEC- TOR	• Used for installing the rear drive shaft to the rear differential. • For protecting the oil seal.
 ST28399SA010	28399SA010	OIL SEAL PROTEC- TOR	• Used for installing front drive shaft into front differential. • For protecting the oil seal.

General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28399AG000	28399AG000	HUB STAND	Used for extracting hub bolt.

2. GENERAL TOOL

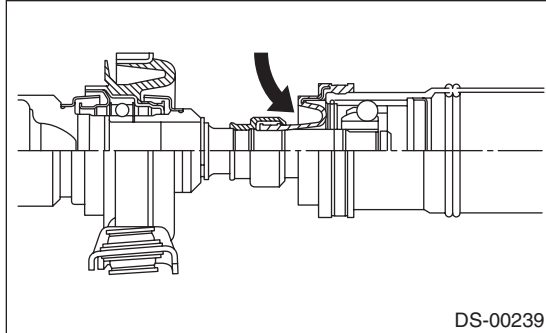
TOOL NAME	REMARKS
Puller	Used for removing the ball joint from knuckle arm.
Dial gauge	Used for inspecting the propeller shaft run-out.
Extension cap	Used for preventing leakage of gear oil or ATF.
Crowbar	Used for extracting drive shaft.

2. Propeller Shaft

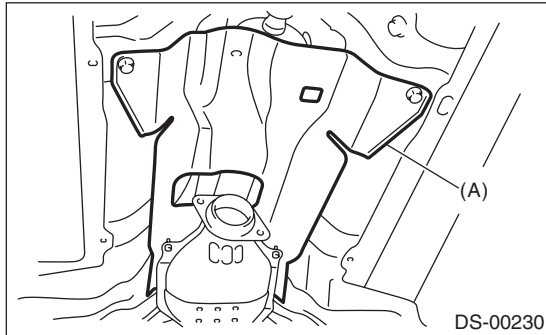
A: REMOVAL

NOTE:

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

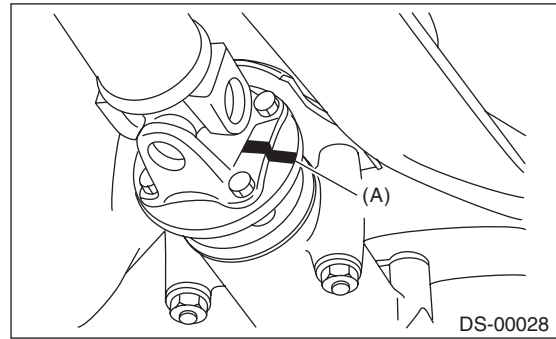


- 1) Disconnect the ground cable from battery.
- 2) Shift the select lever or gear shift lever to neutral.
- 3) Release the parking brake.
- 4) Lift up the vehicle.
- 5) Remove the center exhaust pipe.
- 6) Remove the rear exhaust pipe and muffler.
- 7) Remove the heat shield cover.



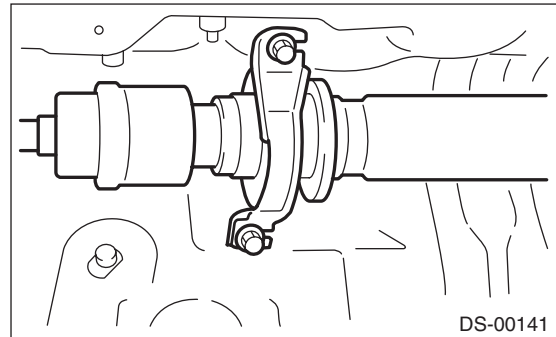
(A) Heat shield cover

- 8) Make alignment marks on the flange yoke and rear differential before removal.



(A) Alignment mark

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



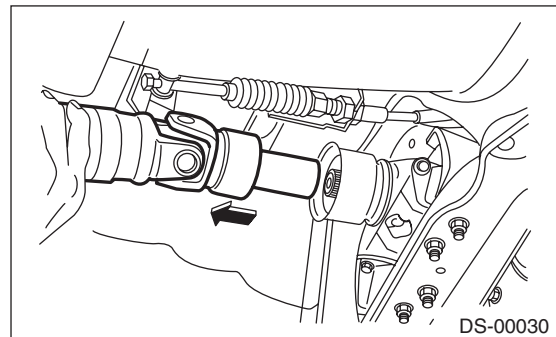
- 12) Remove the propeller shaft from transmission.

CAUTION:

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

NOTE:

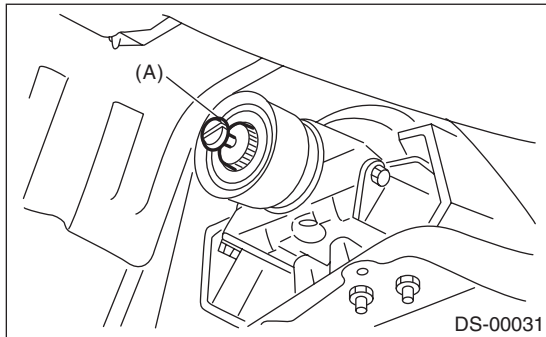
Use a container to catch ATF or oil flowing from propeller shaft.



- 13) Install an extension cap to the transmission.

NOTE:

If extension cap is not available, place vinyl bag over opening and fasten with string to prevent gear oil or ATF from leaking.



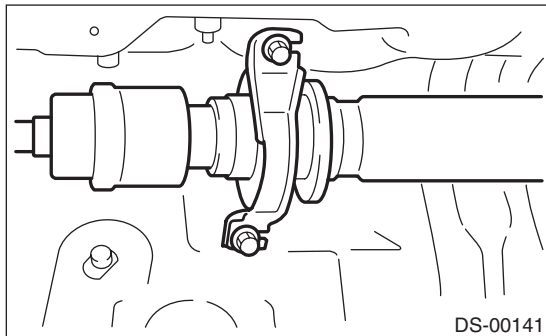
(A) Extension cap

B: INSTALLATION

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

Tightening torque:

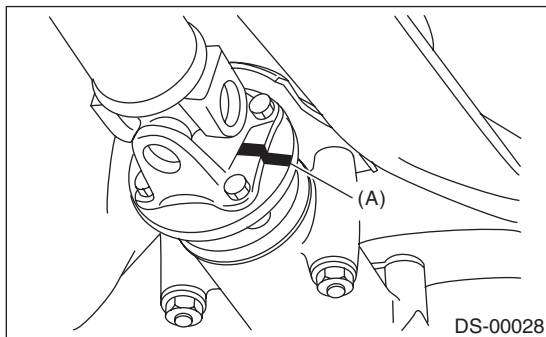
52 N·m (5.3 kgf-m, 38.4 ft-lb)



2) Align the alignment marks and connect the flange yoke and rear differential.

Tightening torque:

31 N·m (3.2 kgf-m, 22.9 ft-lb)



(A) Alignment mark

- 3) Install the heat shield cover.
- 4) Install the center exhaust pipe.
- 5) Install the rear exhaust pipe and muffler.
- 6) Lower the vehicle.
- 7) Connect the ground cable to battery.

C: INSPECTION

NOTE:

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

- Dents or cracks on the tube surface
- Splines for deformation or abnormal wear
- Unsmooth joint operation or abnormal noise
- Center bearing for free play, noise or non-smooth operation.
- Oil seals for abnormal wear or damage
- Damaged center bearing

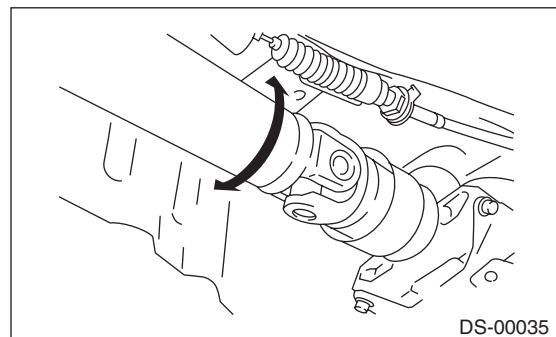
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

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

2. SPLINES AND BEARING

- 1) Remove the center exhaust pipe.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the heat shield cover.
- 4) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to see if abnormal free play exists at spiders and bearings.



3. RUNOUT OF PROPELLER SHAFT

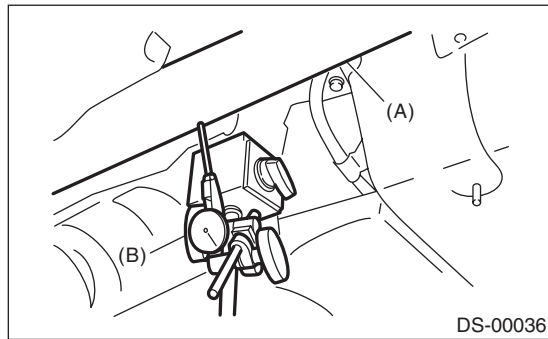
- 1) Remove the center exhaust pipe.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the heat shield cover.
- 4) Set the dial gauge with its indicator stem at the center of the propeller shaft tube.
- 5) Turn the propeller shaft slowly by hands to check for runout of the propeller shaft.

Propeller Shaft

DRIVE SHAFT SYSTEM

Runout:

Limit: 0.6 mm (0.024 in)

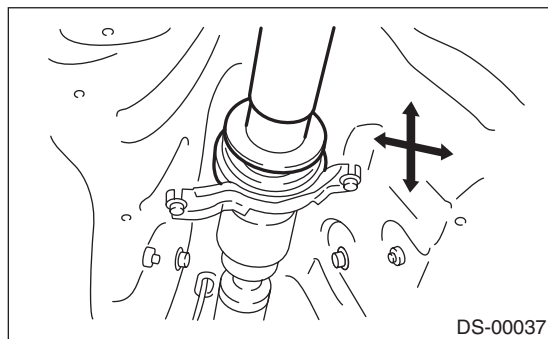


(A) Propeller shaft

(B) Dial gauge

4. CENTER BEARING FREE PLAY

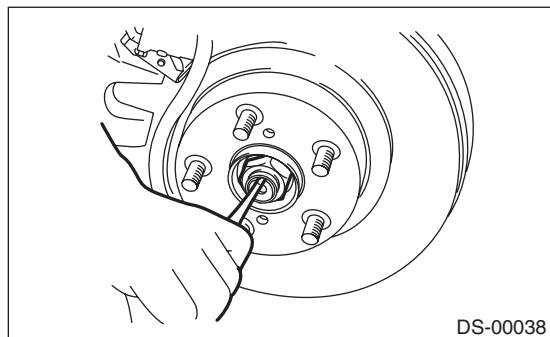
- 1) Remove the front and center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the heat shield cover.
- 4) Move the propeller shaft near the center bearing up, down, left, right by hand, to check for any abnormal free play of the bearings.



3. Front Axle

A: REMOVAL

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

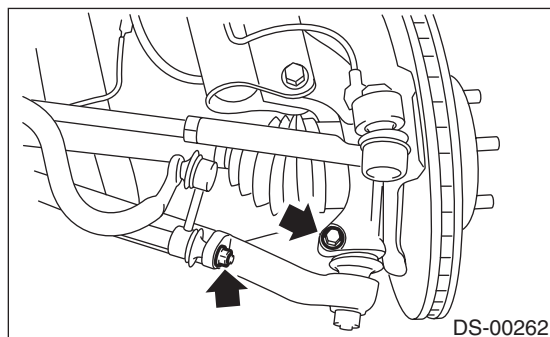


- 4) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:

Do not loosen the axle nut with a load applied to the front axle. Otherwise the hub bearing may become damaged.

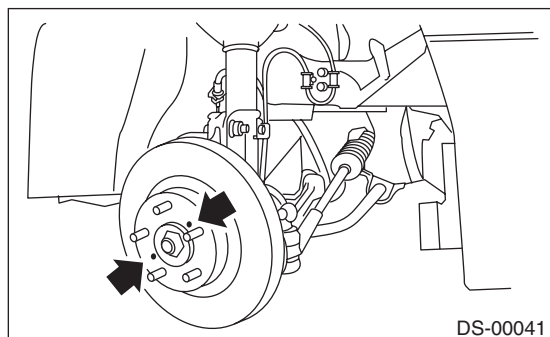
- 5) Remove the stabilizer link.



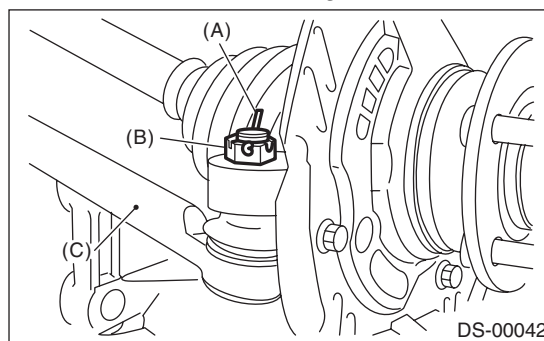
- 6) Remove the disc brake caliper from the housing, and suspend it from strut using a wire.
- 7) Remove the disc rotor from the hub.

NOTE:

If it is difficult to remove the disc rotor from the hub, drive the 8 mm bolt into the threaded end of rotor, and then remove the rotor.

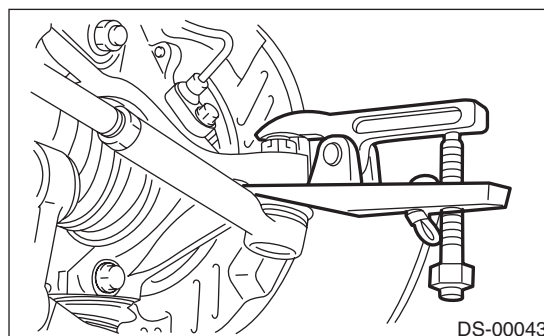


- 8) Remove the cotter pin and castle nut securing the tie-rod end to the housing knuckle arm.

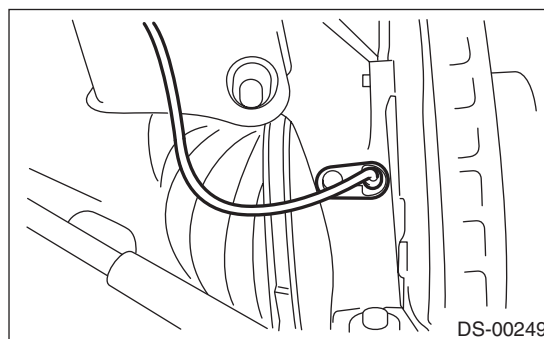


- (A) Cotter pin
- (B) Castle nut
- (C) Tie-rod

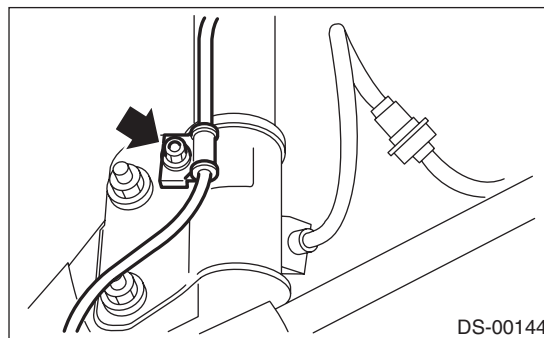
- 9) Using a puller, remove the tie-rod ball joint from knuckle arm.



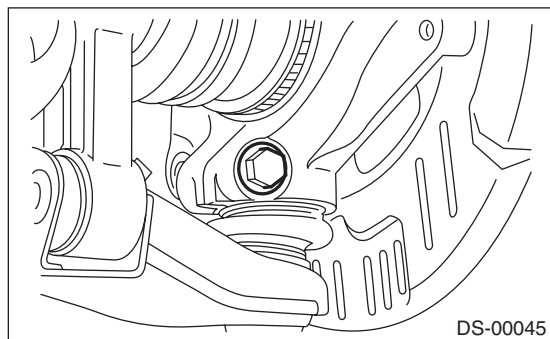
- 10) Remove the ABS wheel speed sensor assembly and harness.



- 11) Remove the bolts which secure the sensor harness to the strut.



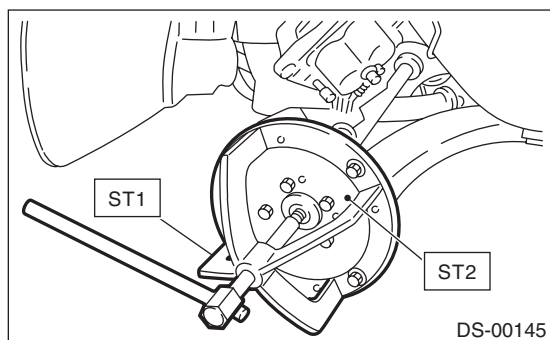
- 12) Remove the front arm ball joint from the housing.



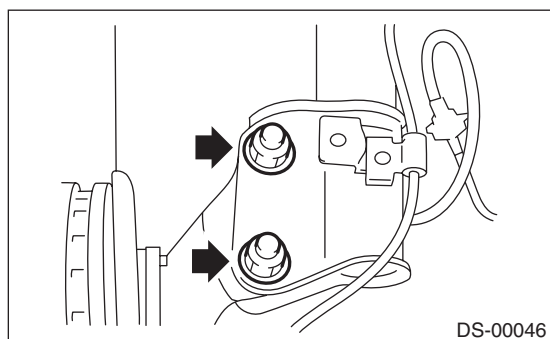
- 13) Remove the front drive shaft from the transmission.

- 14) Remove the front drive shaft assembly from the hub. If it is hard to remove, use the ST.

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



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



B: INSTALLATION

- 1) Align the alignment mark on the camber adjusting bolt head, and tighten the housing and strut using a new flange nut.

Tightening torque:

155 N·m (15.8 kgf-m, 114.3 ft-lb)

- 2) Install the front drive shaft. <Ref. to DS-26, INSTALLATION, Front Drive Shaft.>

- 3) Install the front arm ball joint to the housing.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

- 4) Install the ABS sensor harness to the strut.

- 5) Install the ABS wheel speed sensor on the housing.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

- 6) Install the disc rotor to hub.

- 7) Install the disc brake caliper on the housing.

Tightening torque:

80 N·m (8.2 kgf-m, 59 ft-lb)

- 8) Install the stabilizer link.

- 9) Connect the tie-rod end ball joint to the knuckle arm with a castle nut.

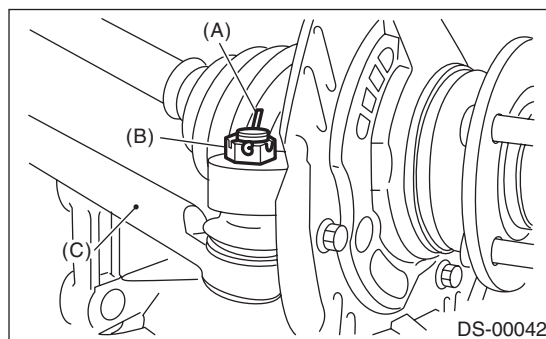
Tightening torque:

27 N·m (2.8 kgf-m, 19.9 ft-lb)

CAUTION:

When connecting the tie-rod, do not hit the cap at bottom of tie-rod end with a hammer.

- 10) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in the nut. Bend the cotter pin to lock.



(A) Cotter pin

(B) Castle nut

(C) Tie-rod

- 11) While depressing the brake pedal, tighten a new axle nut to the specified torque and lock it securely.

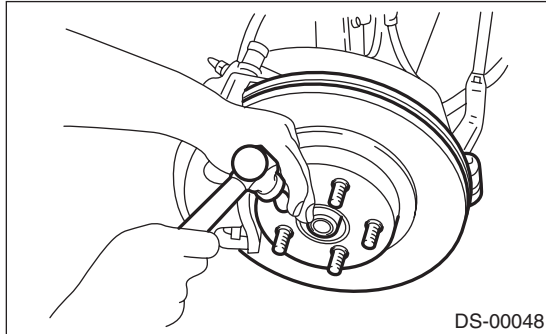
Tightening torque:

220 N·m (22.4 kgf-m, 162.3 ft-lb)

CAUTION:

Do not apply a load to the front axle before tightening the axle nut. Otherwise the hub bearing may become damaged.

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



13) Install the wheel.

Tightening torque:

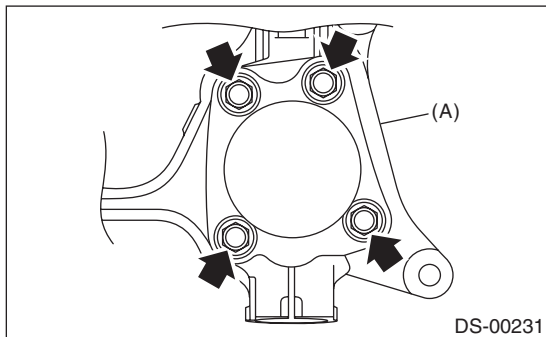
100 N·m (10.2 kgf-m, 73.8 ft-lb)

14) Connect the ground cable to battery.

15) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

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

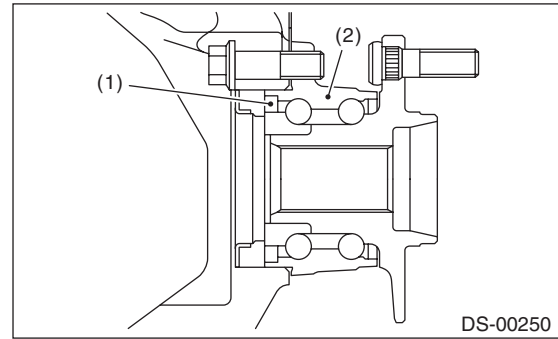


(A) Housing

CAUTION:

- Do not get closer the tool which charged magnetism to magnetic encoder.

- Be careful not to damage the magnetic encoder.



(1) Magnetic encoder

(2) Front hub unit bearing

2) Disassemble the front hub unit bearing. <Ref. to DS-18, DISASSEMBLY, Front Hub Unit Bearing.>

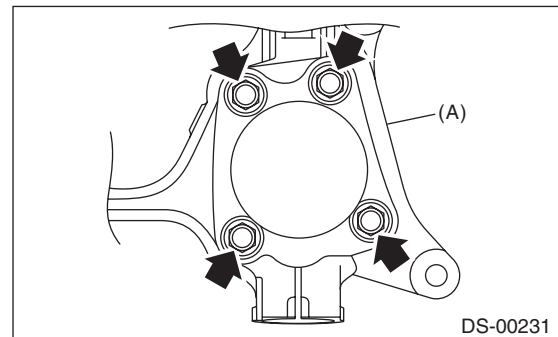
D: ASSEMBLY

1) Assemble the front hub unit bearing. <Ref. to DS-18, ASSEMBLY, Front Hub Unit Bearing.>

2) Place the disc cover between housing and front hub unit, and tighten the four bolts.

Tightening torque:

65 N·m (6.6 kgf-m, 47.9 ft-lb)

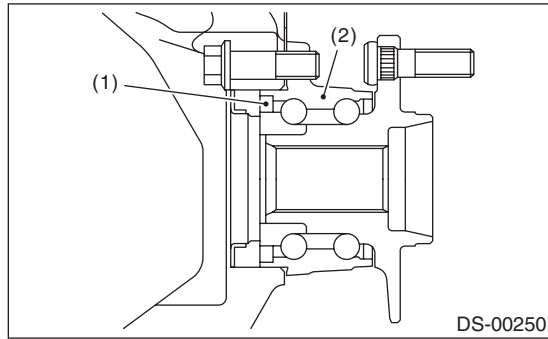


(A) Housing

CAUTION:

- Do not get closer the tool which charged magnetism to magnetic encoder.

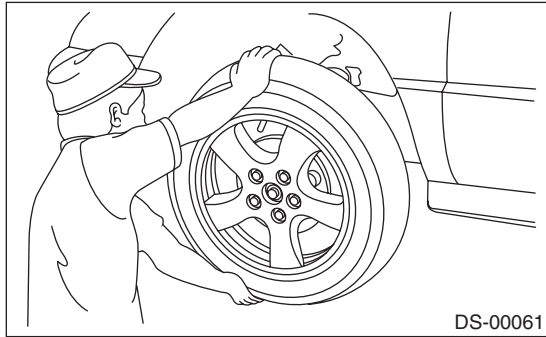
- Be careful not to damage the magnetic encoder.



- (1) Magnetic encoder
(2) Front hub unit bearing

E: INSPECTION

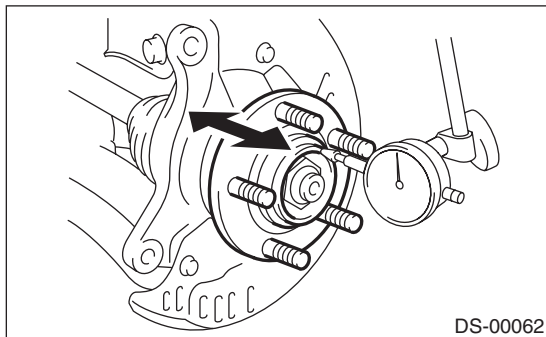
1) Moving the front tire up and down by hand, check there is no play in bearing, and check the wheel rotates smoothly.



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

Service limit:

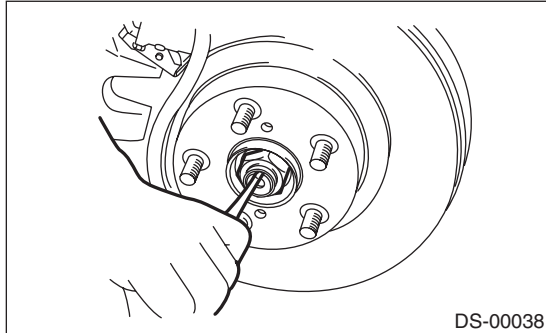
Maximum: 0.05 mm (0.0020 in)



4. Front Hub Unit Bearing

A: REMOVAL

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



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

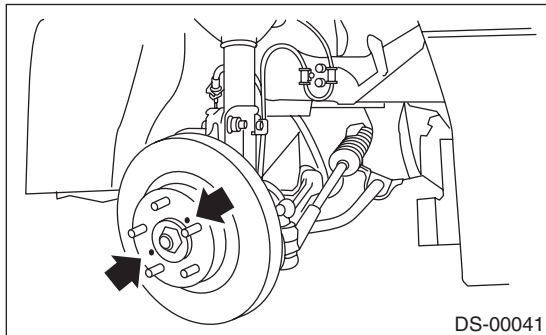
CAUTION:

Do not loosen the axle nut with a load applied to the front axle. Otherwise the hub bearing may become damaged.

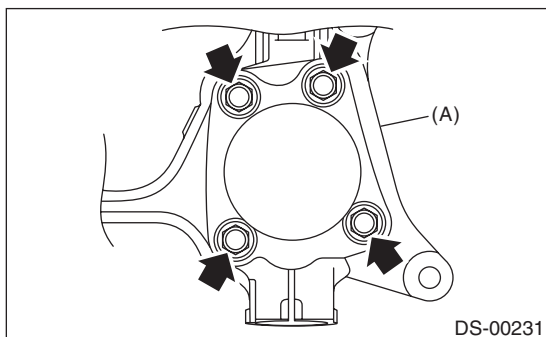
- 5) Remove the disc brake caliper from the housing, and suspend it from strut using a wire.
- 6) Remove the disc rotor from the hub.

NOTE:

If it is difficult to remove the disc rotor from the hub, drive the 8 mm bolt into the threaded end of rotor, and then remove the rotor.



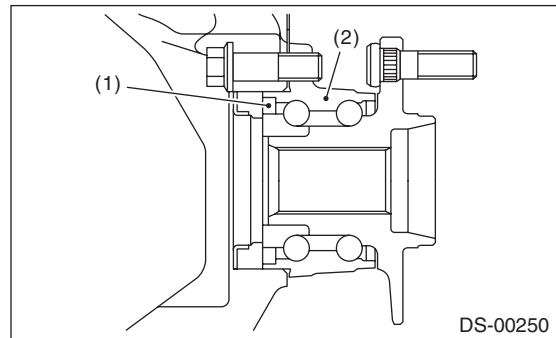
- 7) Remove the four bolts from the housing.



(A) Housing

CAUTION:

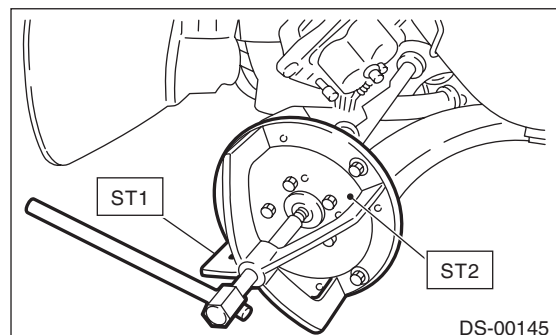
- Do not get closer the tool which charged magnetism to magnetic encoder.
- Be careful not to damage the magnetic encoder.



- (1) Magnetic encoder
- (2) Front hub unit bearing

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

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

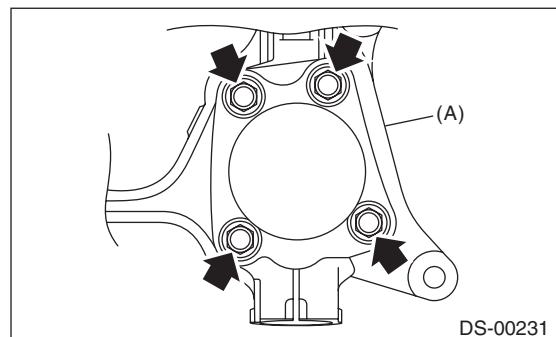


B: INSTALLATION

- 1) Place the disc cover between housing and front hub unit, and tighten the four bolts.

Tightening torque:

65 N·m (6.6 kgf-m, 47.9 ft-lb)



(A) Housing

- 2) Install the front drive shaft. <Ref. to DS-26, INSTALLATION, Front Drive Shaft.>

Front Hub Unit Bearing

DRIVE SHAFT SYSTEM

- 3) Tighten the axle nut temporarily.
- 4) Install the disc rotor to hub.
- 5) Install the disc brake caliper on the housing.

Tightening torque:

80 N·m (8.2 kgf-m, 59 ft-lb)

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

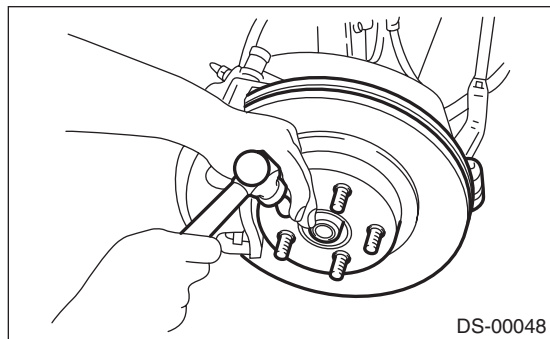
Tightening torque:

220 N·m (22.4 kgf-m, 162.3 ft-lb)

CAUTION:

Do not apply a load to the front axle before tightening the axle nut. Otherwise the hub bearing may become damaged.

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



- 8) Install the wheel.

Tightening torque:

100 N·m (10.2 kgf-m, 73.8 ft-lb)

C: DISASSEMBLY

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

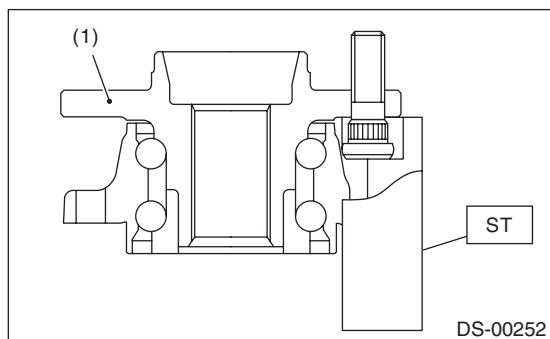
ST 28399AG000 HUB STAND

CAUTION:

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

NOTE:

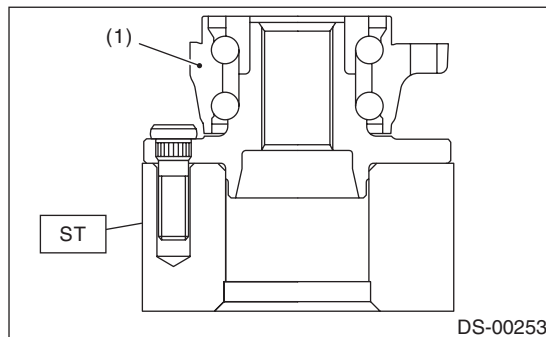
Since the hub unit bearing can not be disassembled, only hub bolts can be removed.



(1) Front hub unit bearing

D: ASSEMBLY

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



(1) Front hub unit bearing

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

NOTE:

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

E: INSPECTION

Refer to "Front Axle" for inspection procedures.
<Ref. to DS-16, INSPECTION, Front Axle.>

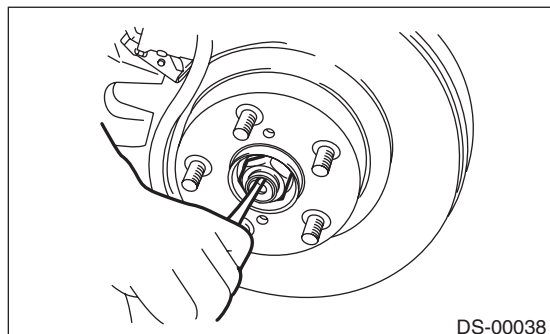
CAUTION:

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

5. Rear Axle

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle, and remove the rear wheels.
- 3) Lift the crimped section of axle nut.



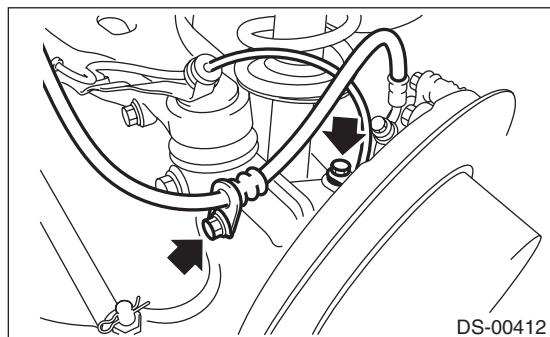
- 4) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:

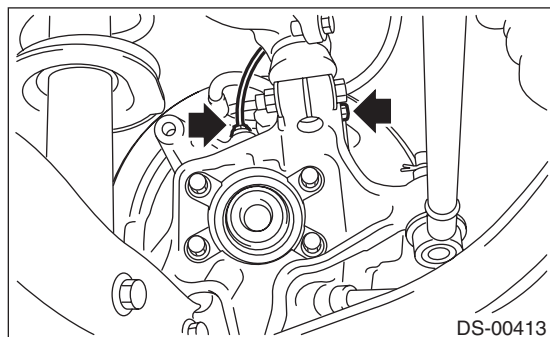
Do not loosen the axle nut with a load applied to the rear axle. Otherwise the hub bearing may become damaged.

- 5) Remove the brake hose bracket and the rear ABS wheel speed sensor.

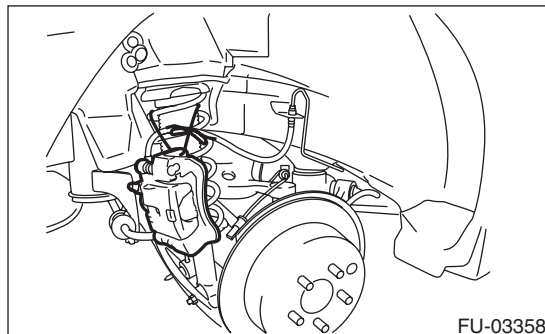
- Disc brake model



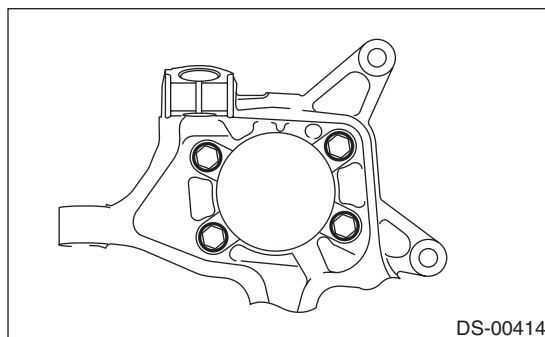
- Drum brake model



- 6) Remove the disc brake caliper from the rear housing, and suspend it from vehicle using a string. (Disc brake model)



- 7) Remove the rear disc rotor. (Disc brake model)
- 8) Remove the brake drum. (Drum brake model)
- 9) Remove the four bolts from the rear housing.



- 10) Remove the rear hub unit bearing.

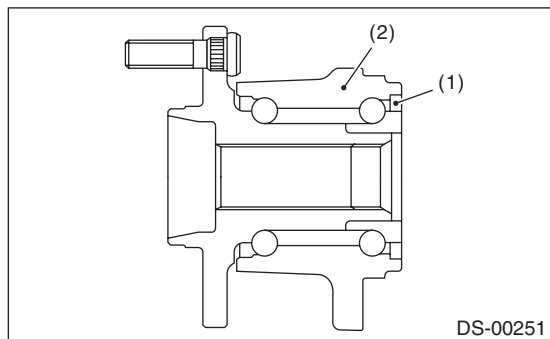
CAUTION:

- Be careful not to damage the magnetic encoder.

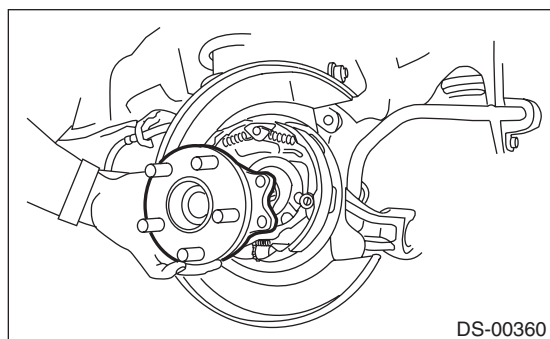
Rear Axle

DRIVE SHAFT SYSTEM

- Do not get closer the tool which charged magnetism to magnetic encoder.



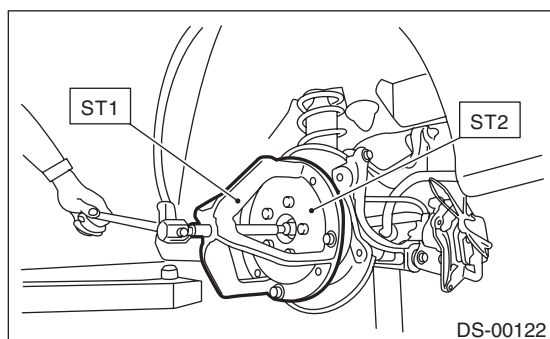
- (1) Magnetic encoder
(2) Rear hub unit bearing



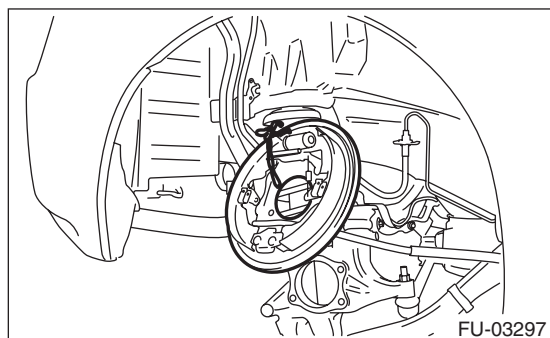
NOTE:

If it is hard to remove, use the ST.

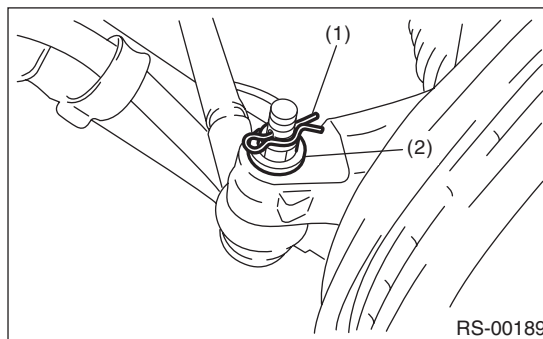
ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER
PLATE



- 11) Suspend the rear brake from the shock absorber. (Drum brake model)

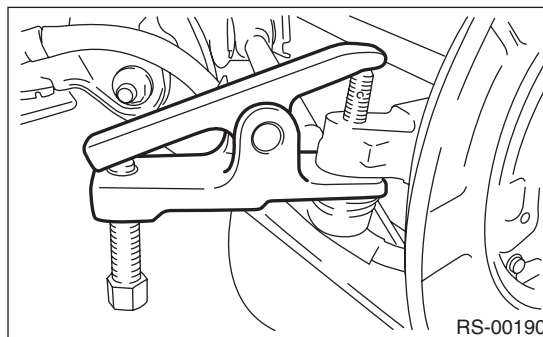


- 12) Remove the snap pin and nut from the front lateral link.

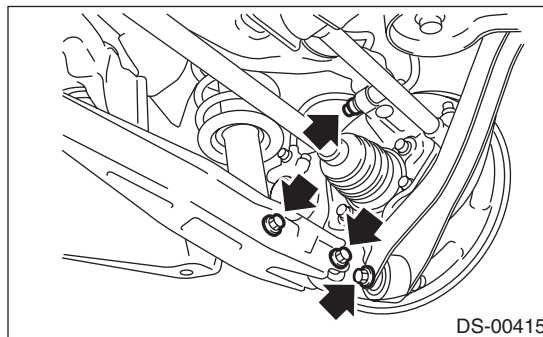


- (1) Snap pin
(2) Nut

- 13) Separate the rear housing and the ball joint using the puller.



- 14) Separate the upper arm, trailing link and rear lateral link from the rear housing.



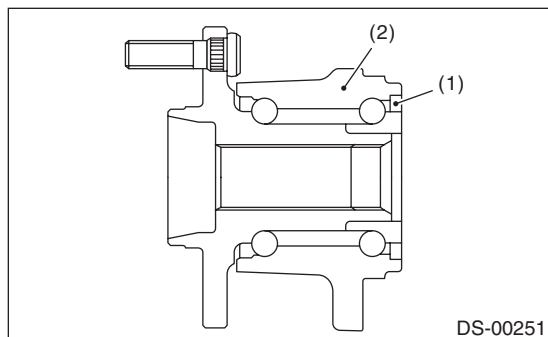
- 15) Remove the rear axle.

B: INSTALLATION

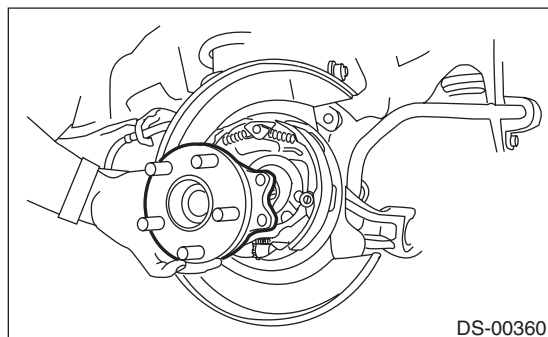
- 1) Temporarily tighten the rear housing to the upper arm.
- 2) Aligning with the mounting hole of the rear brake back plate, temporarily tighten the rear hub unit bearing to the rear housing.

CAUTION:

- Be careful not to damage the magnetic encoder.
- Do not get closer the tool which charged magnetism to magnetic encoder.



- (1) Magnetic encoder
(2) Rear hub unit bearing



- 3) Attach the rear drive shaft to the rear hub unit bearing.
- 4) Tighten the new axle nut temporarily.

CAUTION:

Use new axle nuts.

- 5) Attach the links to the rear housing and tighten them to the specified torque.

Tightening torque:**Upper arm**

80 N·m (8.2 kgf-m, 59 ft-lb)

Front lateral link

60 N·m (6.1 kgf-m, 44.3 ft-lb)

Rear lateral link

120 N·m (12.2 kgf-m, 88.5 ft-lb)

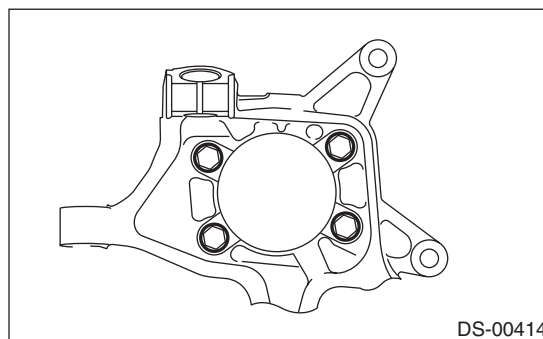
Trailing link

90 N·m (9.2 kgf-m, 66.4 ft-lb)

- 6) Tighten the four bolts of the rear housing.

Tightening torque:

65 N·m (6.6 kgf-m, 47.9 ft-lb)



- 7) Install the rear disc rotor. (Disc brake model)
- 8) Install the brake drum. (Drum brake model)
- 9) Install the rear disc brake caliper on the rear housing. (Disc brake model)

Tightening torque:

66 N·m (6.7 kgf-m, 48.7 ft-lb)

- 10) Install the brake hose bracket and rear ABS wheel speed sensor.

Tightening torque:**Brake hose bracket**

33 N·m (3.4 kgf-m, 24.3 ft-lb)

Rear ABS wheel speed sensor

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

- 11) While pressing the brake pedal, tighten the new axle nuts to the specified torque.

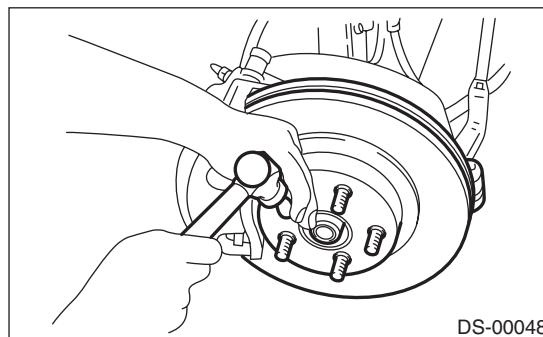
Tightening torque:

190 N·m (19.4 kgf-m, 140.1 ft-lb)

CAUTION:

Do not apply a load to the rear axle before tightening the axle nut. Otherwise the hub bearing may become damaged.

- 12) After tightening the axle nut, lock it securely.



- 13) Install the rear wheels.

Tightening torque:

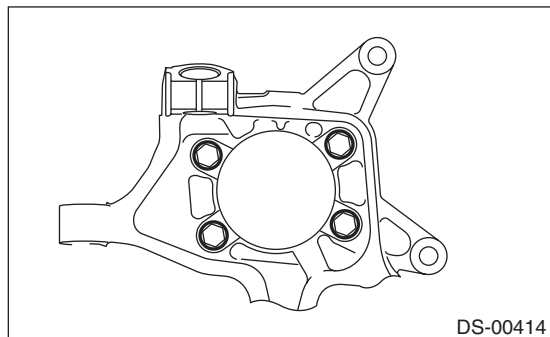
100 N·m (10.2 kgf-m, 73.8 ft-lb)

- 14) Connect the ground cable to battery.
- 15) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

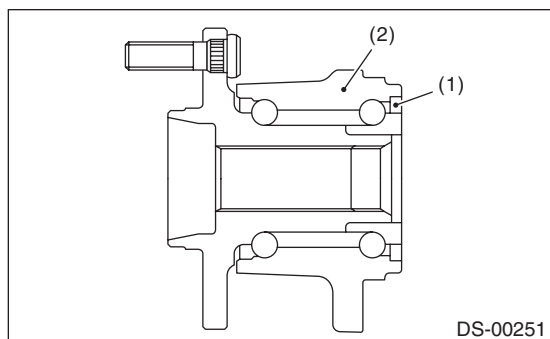
1. REAR HUB UNIT BEARING

1) Remove the four bolts from the rear housing, and remove the rear hub unit bearing and back plate.



CAUTION:

- Be careful not to damage the magnetic encoder.
- Do not get closer the tool which charged magnetism to magnetic encoder.



- (1) Magnetic encoder
(2) Rear hub unit bearing

2) Disassemble the rear hub unit bearing. <Ref. to DS-24, DISASSEMBLY, Rear Hub Unit Bearing.>

2. BUSHING

For the removal procedure of bushing, refer to "Rear Trailing Link" in "REAR SUSPENSION".
<Ref. to RS-10, REAR HOUSING BUSHING, DISASSEMBLY, Rear Trailing Link.>

D: ASSEMBLY

1. REAR HUB UNIT BEARING

Assemble in the reverse order of disassembly.

Tightening torque:

Rear hub unit bearing

65 N·m (6.6 kgf·m, 47.9 ft-lb)

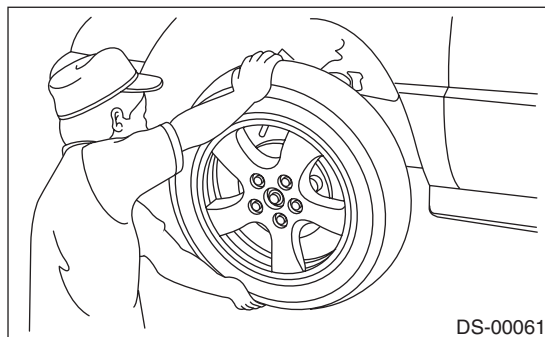
2. BUSHING

For the installation procedure of bushing, refer to "Rear Trailing Link" in "REAR SUSPENSION".

<Ref. to RS-11, REAR HOUSING BUSHING, ASSEMBLY, Rear Trailing Link.>

E: INSPECTION

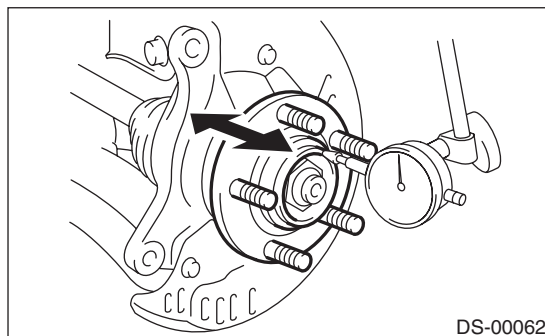
1) Moving the rear tire up and down by hand, check that there is no backlash in bearing, and check that the wheel rotates smoothly.



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

Service limit:

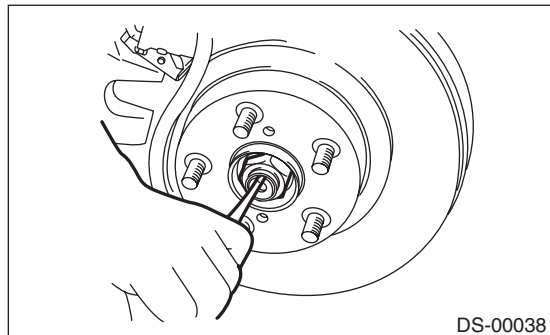
Maximum: 0.05 mm (0.0020 in)



6. Rear Hub Unit Bearing

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle, and remove the rear wheels.
- 3) Lift the crimped section of axle nut.

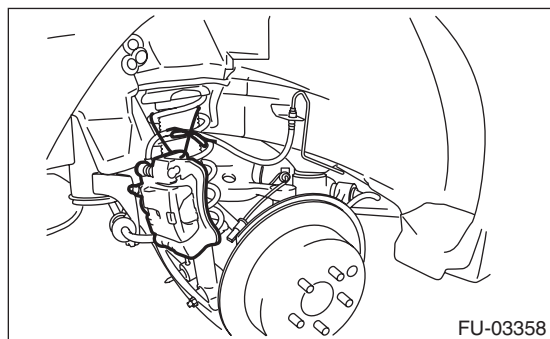


- 4) Remove the axle nut using a socket wrench while depressing the brake pedal.

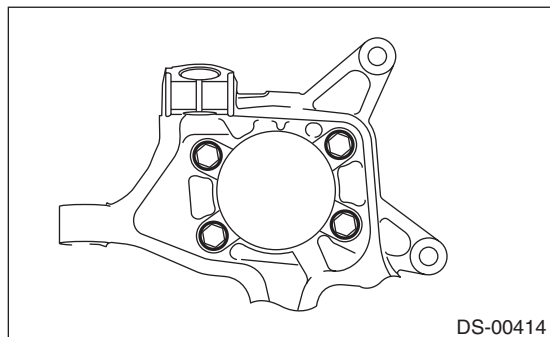
CAUTION:

Do not loosen the axle nut with a load applied to the rear axle. Otherwise the hub bearing may become damaged.

- 5) Remove the disc brake caliper from the rear housing, and suspend it from vehicle using a string. (Disc brake model)



- 6) Remove the rear disc rotor. (Disc brake model)
- 7) Remove the brake drum. (Drum brake model)
- 8) Remove the four bolts from the rear housing.

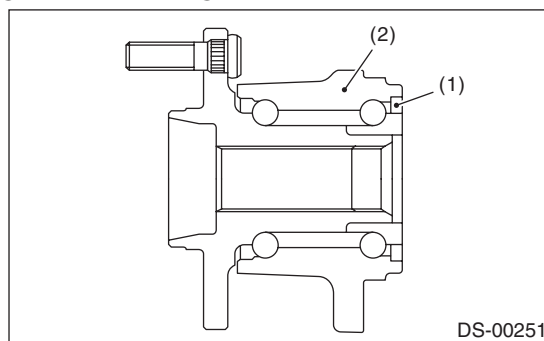


- 9) Remove the rear hub unit bearing.

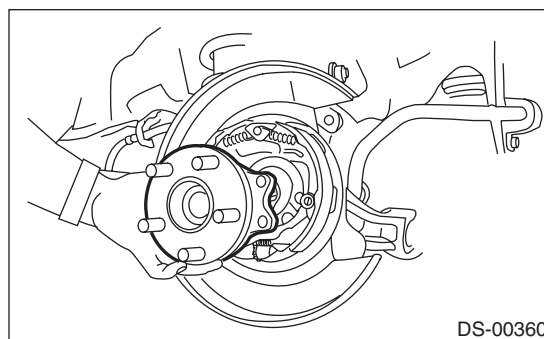
CAUTION:

- Be careful not to damage the magnetic encoder.

- Do not get closer the tool which charged magnetism to magnetic encoder.



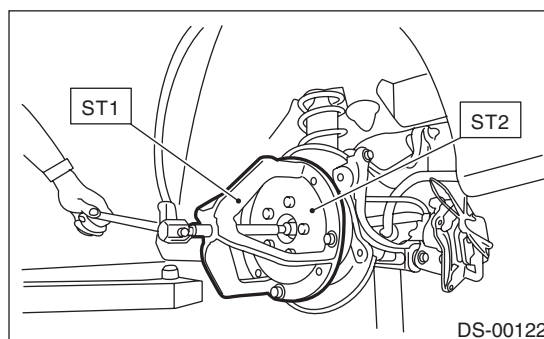
- (1) Magnetic encoder
- (2) Rear hub unit bearing



NOTE:

If it is hard to remove, use the ST.

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



Rear Hub Unit Bearing

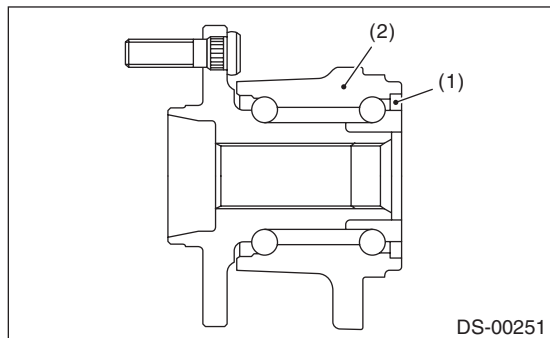
DRIVE SHAFT SYSTEM

B: INSTALLATION

1) Aligning with the mounting hole of the rear brake back plate, temporarily tighten the rear hub unit bearing to the rear housing.

CAUTION:

- Be careful not to damage the magnetic encoder.
- Do not get closer the tool which charged magnetism to magnetic encoder.

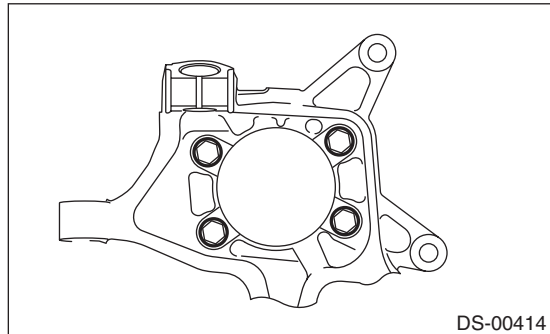


- (1) Magnetic encoder
(2) Rear hub unit bearing

2) Tighten the four bolts of the rear housing.

Tightening torque:

65 N·m (6.6 kgf-m, 47.9 ft-lb)



3) Tighten the new axle nut temporarily.

CAUTION:

Use new axle nuts.

- 4) Install the rear disc rotor. (Disc brake model)
- 5) Install the rear brake drum. (Drum brake model)
- 6) Install the disc brake caliper on the rear housing. (Disc brake model)

Tightening torque:

66 N·m (6.7 kgf-m, 48.7 ft-lb)

7) While pressing the brake pedal, tighten the new axle nuts to the specified torque.

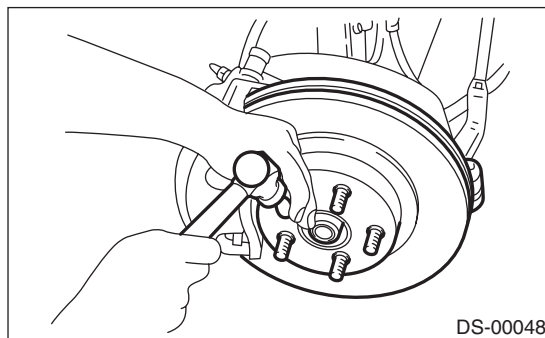
Tightening torque:

190 N·m (19.4 kgf-m, 140.1 ft-lb)

CAUTION:

Do not apply a load to the rear axle before tightening the axle nut. Otherwise the hub bearing may become damaged.

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



9) Install the rear wheels.

Tightening torque:

100 N·m (10.2 kgf-m, 73.8 ft-lb)

C: DISASSEMBLY

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

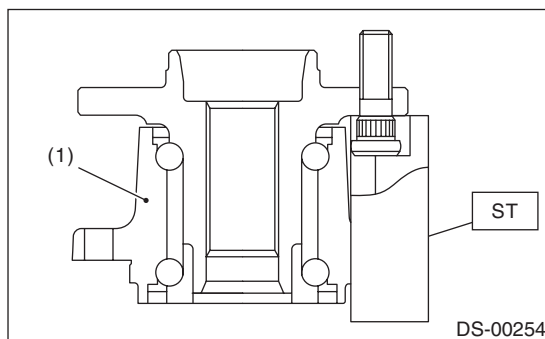
ST 28399AG000 HUB STAND

CAUTION:

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

NOTE:

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

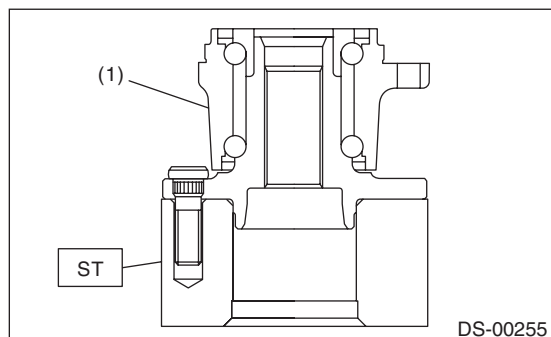


- (1) Rear hub unit bearing

D: ASSEMBLY

1) Attach the hub to the ST securely.

ST 927080000 HUB STAND



(1) Rear hub unit bearing

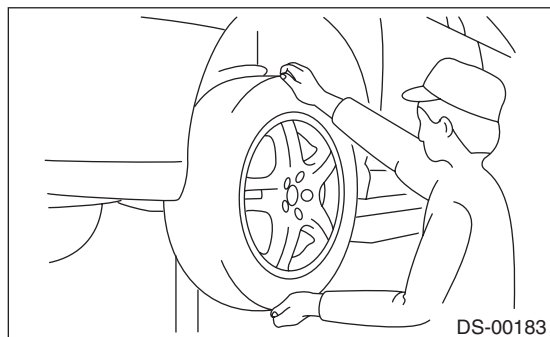
2) Using a press, press the new hub bolts until their seating surfaces contact the hub.

NOTE:

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

E: INSPECTION

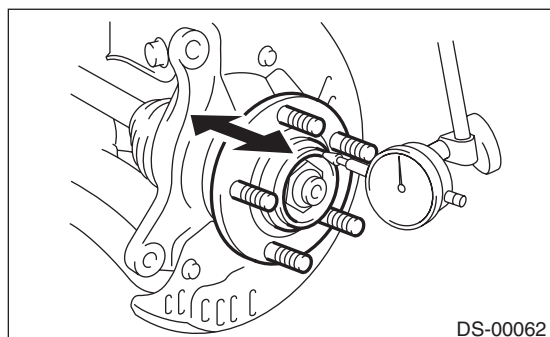
1) Moving the rear tire up and down by hand, check there is no backlash in bearing, and check the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the play exceeds the limit value.

Service limit:

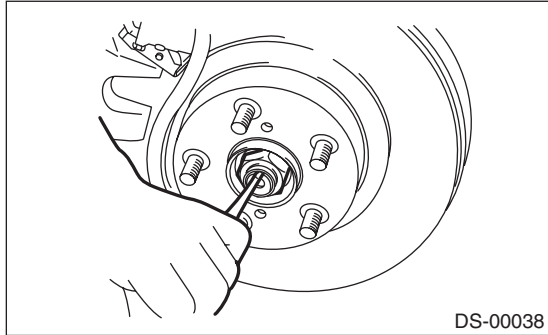
Maximum: 0.05 mm (0.0020 in)



7. Front Drive Shaft

A: REMOVAL

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

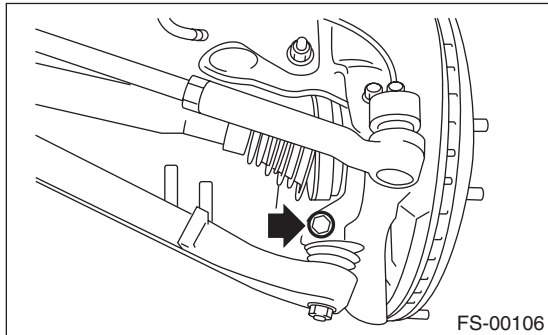


- 4) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:

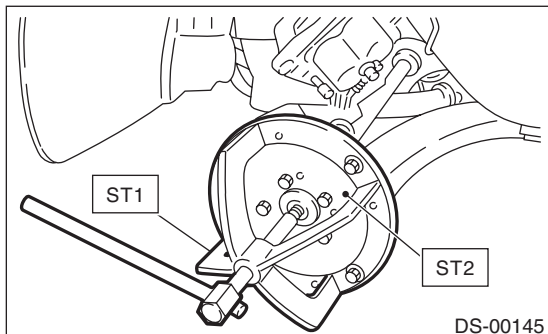
Do not loosen the axle nut with a load applied to the front axle. Otherwise the hub bearing may become damaged.

- 5) Drain the transmission gear oil. (MT model)
- 6) Drain differential gear oil. (AT model)
- 7) Remove the stabilizer link from front arm.
- 8) Disconnect the front arm ball joint from the housing.



- 9) Remove the front drive shaft assembly. If it is hard to remove, use ST1 and ST2.

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



- 10) Using a bar, remove the front drive shaft from transmission.

CAUTION:

Be careful not to allow the bar to damage holder area.

B: INSTALLATION

- 1) Replace the differential side retainer oil seal with a new part.

NOTE:

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

4AT model <Ref. to 4AT-45, REPLACEMENT, Differential Side Retainer Oil Seal.>

5MT model <Ref. to 5MT-31, REPLACEMENT, Differential Side Retainer Oil Seal.>

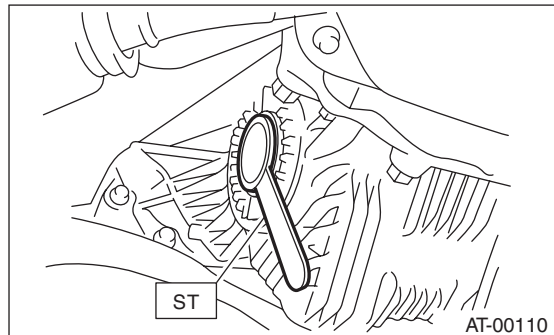
- 2) Insert the AC into hub splines.
- 3) Draw the drive shaft into specified position.

CAUTION:

Do not hammer drive shaft when installing it.

- 4) Tighten the axle nut temporarily.
- 5) Using the ST, install the front drive shaft to transmission.

ST 28399SA010 OIL SEAL PROTECTOR



- 6) Connect the front arm ball joint to the housing.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

- 7) Install the stabilizer link.

CAUTION:

Be sure to use a new self-locking nut.

Tightening torque:

45 N·m (4.6 kgf-m, 33.2 ft-lb)

- 8) While pressing the brake pedal, tighten the new axle nuts to the specified torque.

Tightening torque:

220 N·m (22.4 kgf-m, 162.3 ft-lb)

CAUTION:

Do not apply a load to the front axle before tightening the axle nut. Otherwise the hub bearing may become damaged.

- 9) After tightening axle nut, lock it securely.

- 10) Fill transmission gear oil. (MT model)
- 11) Fill differential gear oil. (AT model)
- 12) Install the front wheels.

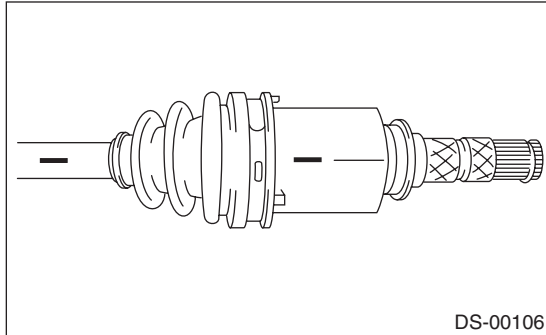
Tightening torque:

100 N·m (10.2 kgf-m, 73.8 ft-lb)

- 13) Connect the ground cable to battery.
- 14) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

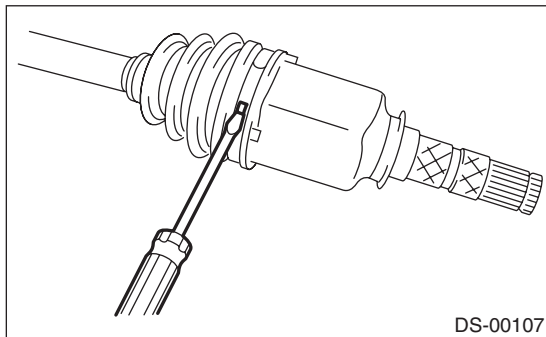
- 1) Place alignment marks on the shaft and outer race.



- 2) Remove the AAR boot band and boot.

CAUTION:

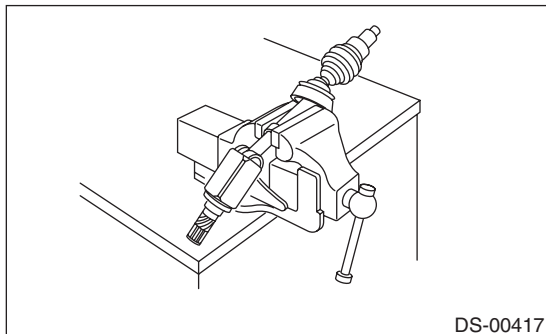
Be careful not to damage the boot.



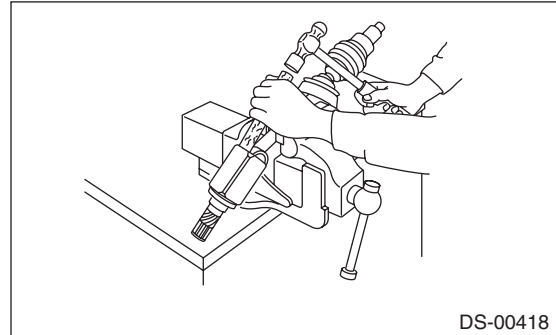
- 3) Place the drive shaft between wooden blocks and fix it on a vise.

CAUTION:

Do not set the only drive shaft on a vise.

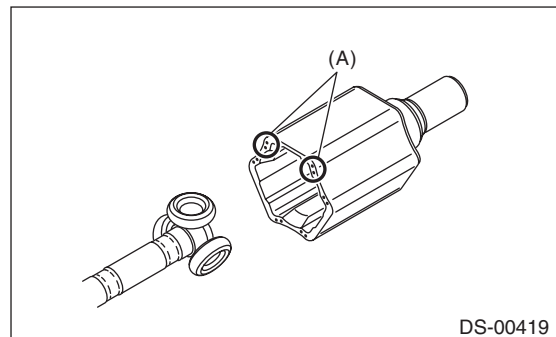


- 4) Tap the staking area of the outer race alternately with a plastic or wooden bar, and remove one roller at a time.



CAUTION:

- Tap the staking area (A) of the outer race.
- Do not use a metal bar as the outer race may deform.
- Be careful not to damage the roller parts.



- 5) Remove the outer race from shaft assembly.

CAUTION:

Make sure to have your associate held the outer race when removing the third roller to prevent the outer race from falling.

- 6) Wipe off grease.

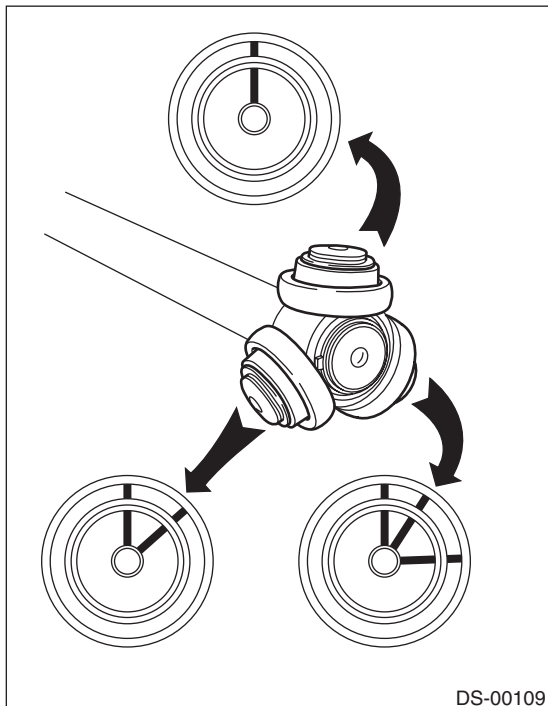
CAUTION:

The grease is a special type of grease. Do not mix with other grease.

Front Drive Shaft

DRIVE SHAFT SYSTEM

7) Place alignment marks on the roller kit and trunnion.

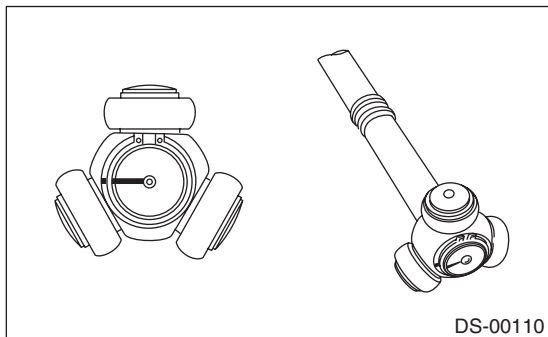


8) Remove the roller kit from trunnion.

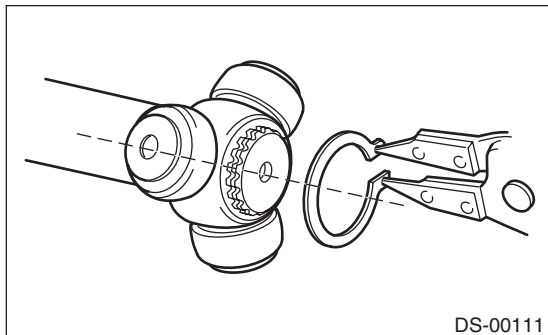
CAUTION:

Be careful with the roller kit position.

9) Place alignment marks on the trunnion and shaft.



10) Remove the snap ring and trunnion.



CAUTION:

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

11) Remove the AAR boot.

NOTE:

The AC is a non-disassembly part, so the drive shaft disassembly stops here.

D: ASSEMBLY

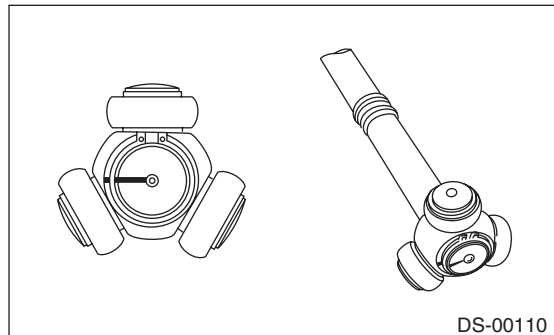
NOTE:

Use specified grease.

AAR side:

ONE LUBER C

- 1) Pass the AAR boot through the shaft.
- 2) Align alignment marks and install the trunnion on the shaft. Install the snap ring into the shaft groove securely.



3) Fill 50 to 60 g (1.76 to 2.12 oz) of specified grease into the interior of AAR outer race.

4) Apply a thin coat of specified grease to the roller and trunnion.

5) Place the drive shaft between wooden blocks and fix it on a vise.

CAUTION:

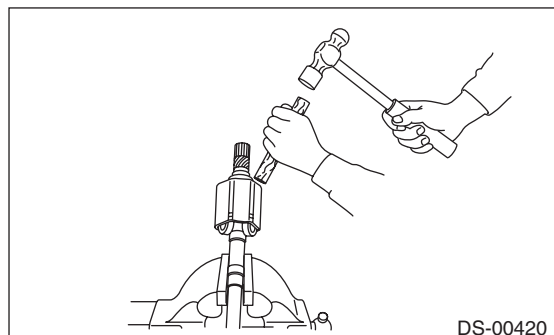
Do not set the only drive shaft on a vise.

6) Align the alignment marks on the shaft and outer race.

7) Tap the insertion upper part of the outer race alternately using a plastic or wood bar shown in the figure, and then insert the roller one by one.

CAUTION:

- Do not use a metal bar as the outer race may deform.
- Do not tap on the end of outer race (shaft part).
- Be careful not to deform the baffle plate.



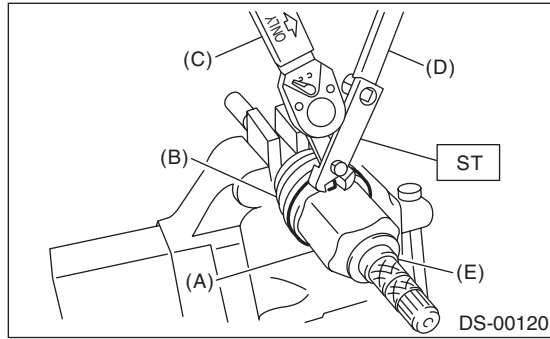
8) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.

9) Install the AAR boot taking care not to twist it.

10) Install the new large boot band and small boot band at the required positions.

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

ST 28099AC000 BOOT BAND PLIER



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

Clearance at the crimped section of the boot band:

Large boot band

1 mm (0.04 in) or less

Small boot band

1 mm (0.04 in) or less

12) Extend and retract the AAR repeatedly to provide an equal coating of grease.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.

- AAR and AC

Check for seizure, corrosion, damage, wear and excessive play.

- Shaft

Check for excessive bending, twisting, damage and wear.

- Boot

Check for wear, warping, breakage and scratches.

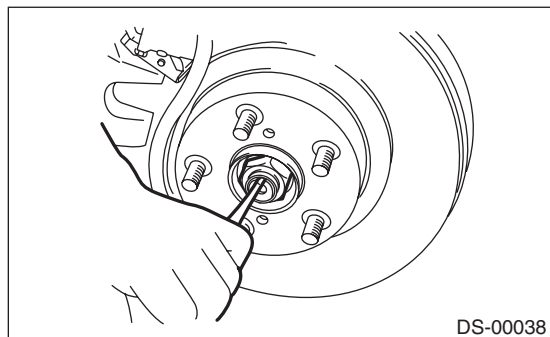
- Grease

Check for discoloration and fluidity.

8. Rear Drive Shaft

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle, and remove the rear wheels.
- 3) Lift the crimped section of axle nut.



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

CAUTION:

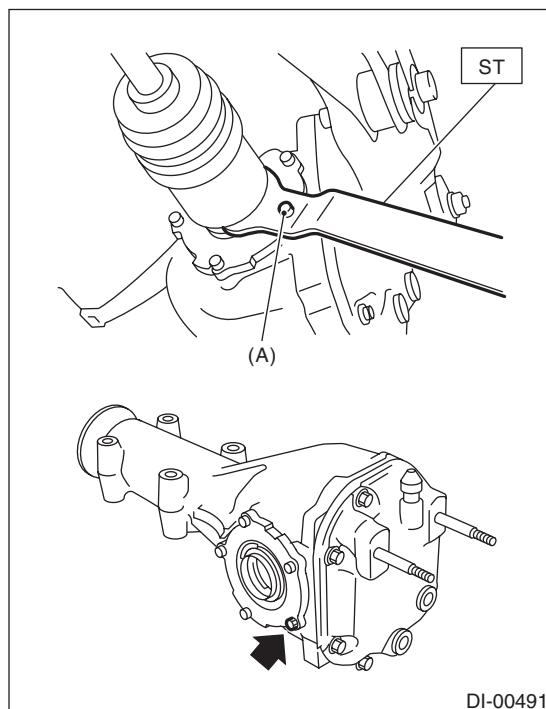
Do not loosen the axle nut with a load applied to the rear axle. Otherwise the hub bearing may become damaged.

- 5) Drain differential gear oil.
- 6) Remove the rear trailing link. <Ref. to RS-10, REMOVAL, Rear Trailing Link.>
- 7) Remove the rear lateral link. <Ref. to RS-16, REMOVAL, Rear Lateral Link.>
- 8) Remove the rear drive shaft from the rear differential by using the ST.

ST 28099PA100 DRIVE SHAFT REMOVER

NOTE:

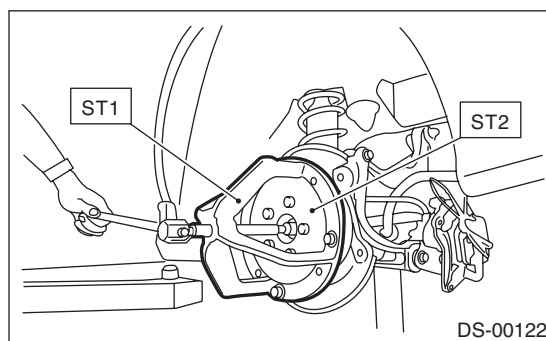
Fit the ST to the bolts as shown in the figure to prevent damage of the side bearing retainer.



(A) Bolt

- 9) Remove the rear drive shaft from the rear axle. If it is hard to remove, use ST1 and ST2.

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



B: INSTALLATION

1) Replace the rear differential side oil seal. <Ref. to DI-38, REPLACEMENT, Rear Differential Side Oil Seal.>

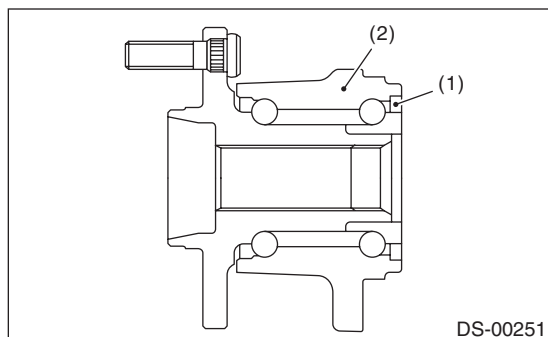
NOTE:

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

2) Insert the EBJ into rear hub splines.

CAUTION:

- Be careful not to damage the magnetic encoder.
- Do not get closer the tool which charged magnetism to magnetic encoder.



- (1) Magnetic encoder
(2) Rear hub unit bearing

3) Draw the rear drive shaft into specified position.

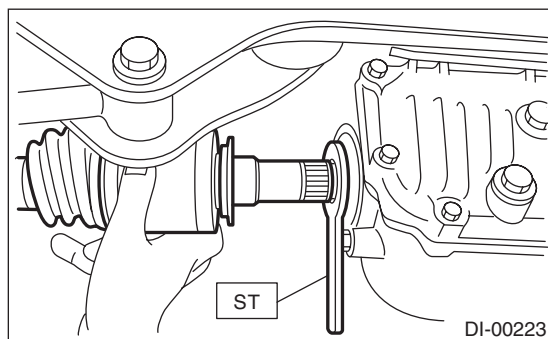
CAUTION:

Do not hammer drive shaft when installing it.

4) Tighten the axle nut temporarily.

5) Using the ST, install the rear drive shaft to the rear differential.

ST 28099PA090 OIL SEAL PROTECTOR



6) Attach the links to the rear housing and tighten them to the specified torque.

Tightening torque:

Stabilizer link

38 N·m (3.9 kgf-m, 28 ft-lb)

Shock absorber

120 N·m (12.2 kgf-m, 88.5 ft-lb)

Rear lateral link

120 N·m (12.2 kgf-m, 88.5 ft-lb)

Trailing link

90 N·m (9.2 kgf-m, 66.4 ft-lb)

7) While pressing the brake pedal, tighten the new axle nuts to the specified torque.

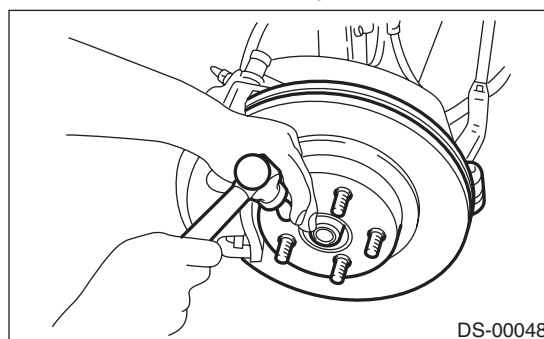
Tightening torque:

190 N·m (19.4 kgf-m, 140.1 ft-lb)

CAUTION:

Do not apply a load to the rear axle before tightening the axle nut. Otherwise the hub bearing may become damaged.

8) Lock the axle nut securely.



9) Fill differential gear oil.

10) Install the rear wheels.

Tightening torque:

100 N·m (10.2 kgf-m, 73.8 ft-lb)

11) Connect the ground cable to battery.

12) Inspect the wheel alignment and adjust if necessary.

Rear Drive Shaft

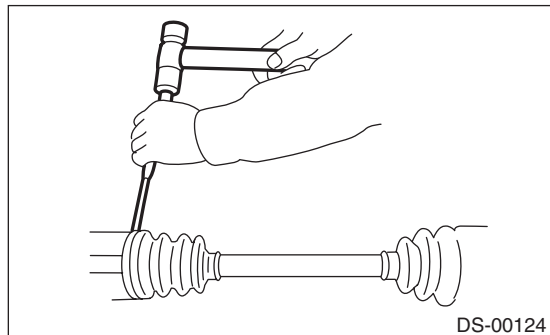
DRIVE SHAFT SYSTEM

C: DISASSEMBLY

1) Using a flat tip screwdriver or plier, loosen the boot band on the large end of DOJ boot.

CAUTION:

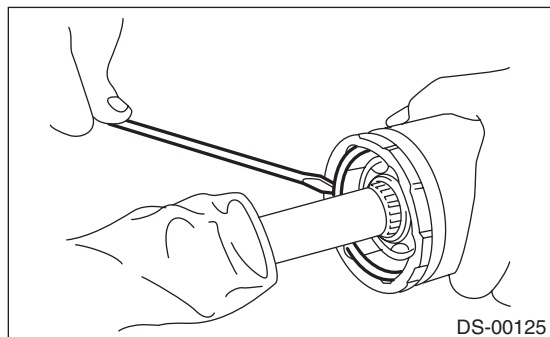
Be careful not to damage the boot.



2) Remove the boot band on the small end of DOJ boot in the same manner.

3) Remove the large end of DOJ boot from DOJ outer race.

4) Remove the round snap ring at the neck of DOJ outer race with a flat tip screwdriver.



5) Take out the DOJ outer race from the shaft assembly.

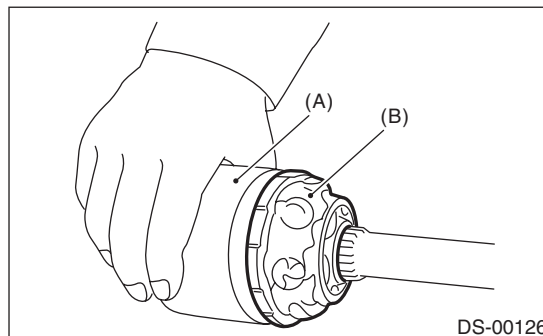
6) Wipe off the grease and take out the ball bearings.

CAUTION:

The grease is a special grease (grease for constant velocity joints). Do not mix with other greases.

NOTE:

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



(A) Outer race

(B) Grease

7) 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.

8) Using pliers, remove the snap ring fixing the inner race to the shaft.

9) Take out the DOJ inner race.

10) Take off the DOJ cage from shaft and remove the DOJ boot.

CAUTION:

Wrap shaft splines with vinyl tape to protect the boot from scratches.

11) Remove the EBJ boot using the same procedures as for the DOJ boot.

NOTE:

The EBJ is a non-disassembly part, so the drive shaft disassembly stops here.

D: ASSEMBLY

CAUTION:

Wrap shaft splines with vinyl tape to protect the boot from scratches.

NOTE:

Use specified grease.

EBJ side:

NKG106

DOJ side:

NKG205

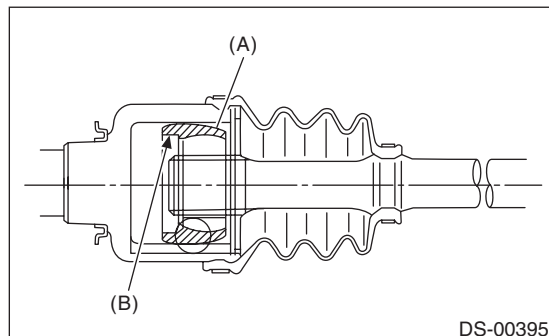
1) Install the EBJ boot to the specified position, and fill it with 50 to 60 g (1.76 to 2.12 oz) of specified grease.

2) Place the DOJ boot at the center of shaft.

3) Insert the DOJ cage onto shaft.

NOTE:

Insert the cage with the cutout portion facing the shaft end, since the cage has an orientation.

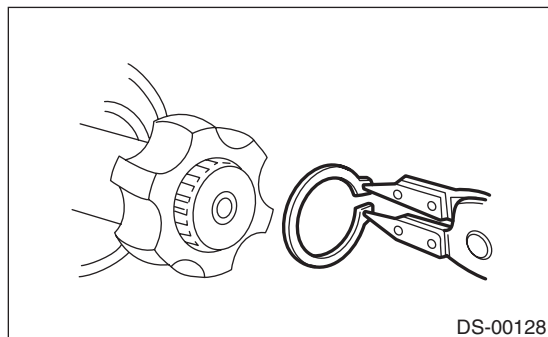


(A) Cage
(B) Cutout portion

4) Install the DOJ inner race on shaft and fix the snap ring in place with pliers.

NOTE:

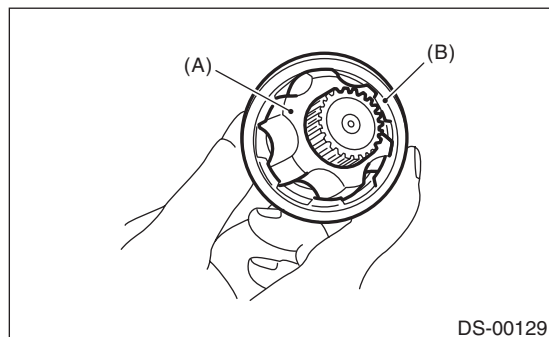
Confirm that the snap ring is completely fitted in the shaft groove.



5) Install the cage to inner race fixed upon shaft.

NOTE:

Fit the cage with the protruding section aligned with the track on the inner race, and turn by a half pitch.



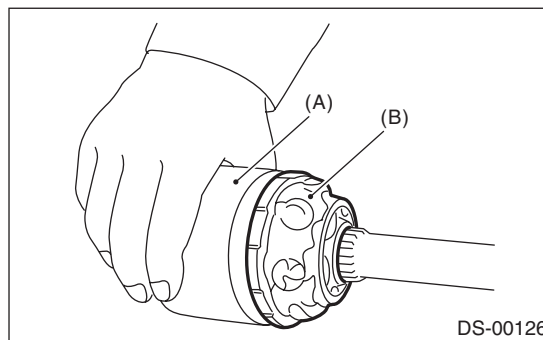
(A) Inner race
(B) Cage

6) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the inner side of the DOJ outer race.

7) Apply a thin coat of specified grease to the cage pocket and six ball bearings.

8) Insert the six ball bearings into the cage pocket.

9) Align the outer race track and ball positions, and place the shaft, inner race, cage and ball bearings in the original positions, and then fix outer race in place.

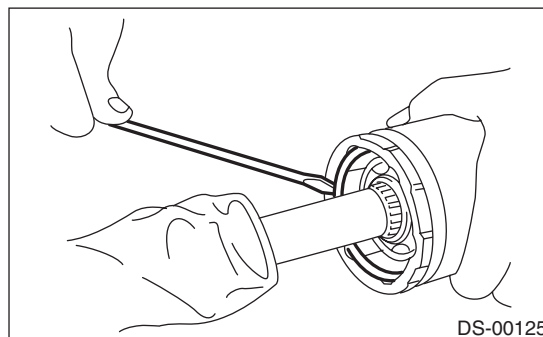


(A) Outer race
(B) Grease

10) Install the snap ring in the groove on the DOJ outer race.

NOTE:

- Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
- Use care not to place the matched position of snap ring in the ball groove of outer race.
- Pull the shaft lightly and assure that the circlip is completely fitted in the groove.



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

12) Install the DOJ boot taking care not to twist it.

NOTE:

- The inside of the large end of DOJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.
- When installing the DOJ boot, position the outer race of DOJ at center of the stroke.

13) Put a new band through the clip and wind twice in the band groove of the boot.

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

Rear Drive Shaft

DRIVE SHAFT SYSTEM

NOTE:

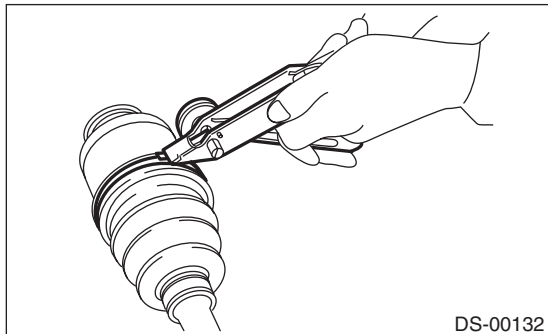
When tightening boot, use care so that the air within the boot is appropriate.

15) Tighten the band using the ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten the band until it cannot be moved by hand.

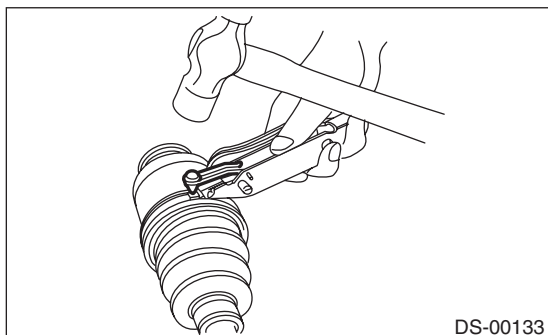


16) Tap the clip with the punch provided at the end of the ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

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



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

NOTE:

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

18) Install the EBJ boot using the same procedures as for the DOJ boot.

19) Extend and retract the DOJ repeatedly to provide an equal coating of grease.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. Repair or replace if defective.

- DOJ (Double Offset Joint)

Check for seizure, corrosion, damage, wear and excessive play.

- EBJ (high-efficiency compact ball fixed joint)

Check for seizure, corrosion, damage, wear and excessive play.

- Shaft

Check for excessive bending, twisting, damage and wear.

- Boot

Check for wear, warping, breakage and scratches.

- Grease

Check for discoloration and fluidity.

9. General Diagnostic Table

A: INSPECTION

NOTE:

Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptoms	Possible cause	Corrective action
Noise or vibration from propeller shaft	Center bearing	Check the center bearing. <Ref. to DS-12, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>
	Runout of propeller shaft	Check for deflection of the propeller shaft. <Ref. to DS-11, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>
	Loose or gap at connections	Check the joints and connectors. <Ref. to DS-11, JOINTS AND CONNECTIONS, INSPECTION, Propeller Shaft.>
		Check the spline and bearing. <Ref. to DS-11, SPLINES AND BEARING, INSPECTION, Propeller Shaft.>
Abnormal wheel vibration	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-23, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-14, INSPECTION, Rear Shock Absorber.>
	Front drive shaft	Check the front drive shaft. <Ref. to DS-29, INSPECTION, Front Drive Shaft.>
	Rear drive shaft	Check the rear drive shaft. <Ref. to DS-34, INSPECTION, Rear Drive Shaft.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-25, INSPECTION, Rear Hub Unit Bearing.>
Noise from the underbody	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-23, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-14, INSPECTION, Rear Shock Absorber.>

General Diagnostic Table

DRIVE SHAFT SYSTEM

VEHICLE DYNAMICS CONTROL (VDC)

VDC

	Page
1. General Description	2
2. VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)	7
3. ABS Sequence Control	13
4. VDC Sequence Control	16
5. Yaw Rate and G Sensor	19
6. Steering Angle Sensor	21
7. Front ABS Wheel Speed Sensor	23
8. Rear ABS Wheel Speed Sensor	25
9. Front Magnetic Encoder	26
10. Rear Magnetic Encoder	27
11. VDC OFF Switch	28

General Description

FRONT SUSPENSION

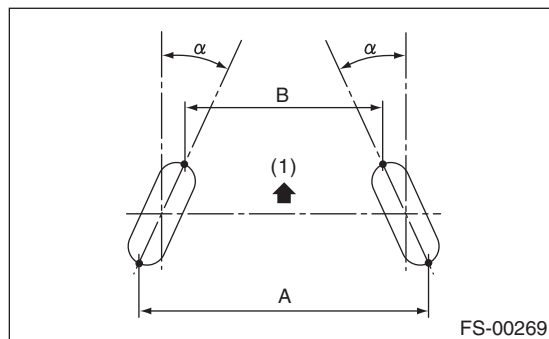
1. General Description

A: SPECIFICATION

Model			OUTBACK	non-turbo	Turbo (except for WRX-SS)	Turbo (WRX-SS)
Front	Wheel arch height (Tolerance: $+12\text{ mm}$ -24 mm mm (in) ($+0.47\text{ in}$ -0.94 in))		392 (15.4)	387 (15.2)		
	Camber (Tolerance: $\pm 0^{\circ}45'$ Differences between RH and LH: 45' or less)		$-0^{\circ}05'$	$-0^{\circ}10'$		
	Caster (Referential Value)		$5^{\circ}50'$	$5^{\circ}55'$		
	Steering angle (Tolerance: $\pm 1.5^{\circ}$)	Inner wheel	37.9°	37.8°		37.2°
		Outer wheel	33.5°	33.4°		32.9°
	Toe-in mm (in)		0 ± 3 (0 ± 0.12) Toe angle (sum of both wheels): $0^{\circ}\pm 0^{\circ}15'$			
	Kingpin angle (Referential Value)		$13^{\circ}30'$	$13^{\circ}35'$		
Rear	Wheel arch height (Tolerance: $+12\text{ mm}$ -24 mm mm (in) ($+0.47\text{ in}$ -0.94 in))		380 (15)		375 (14.8)	
	Camber (Tolerance: $\pm 0^{\circ}45'$ Differences between RH and LH: 45' or less)		$-1^{\circ}05'$		$-1^{\circ}15'$	
	Toe-in mm (in)		0 ± 3 (0 ± 0.12) Toe angle (sum of both wheels): $0^{\circ}\pm 0^{\circ}15'$			
	Thrust angle (Tolerance: $\pm 0^{\circ}30'$)		0°			

NOTE:

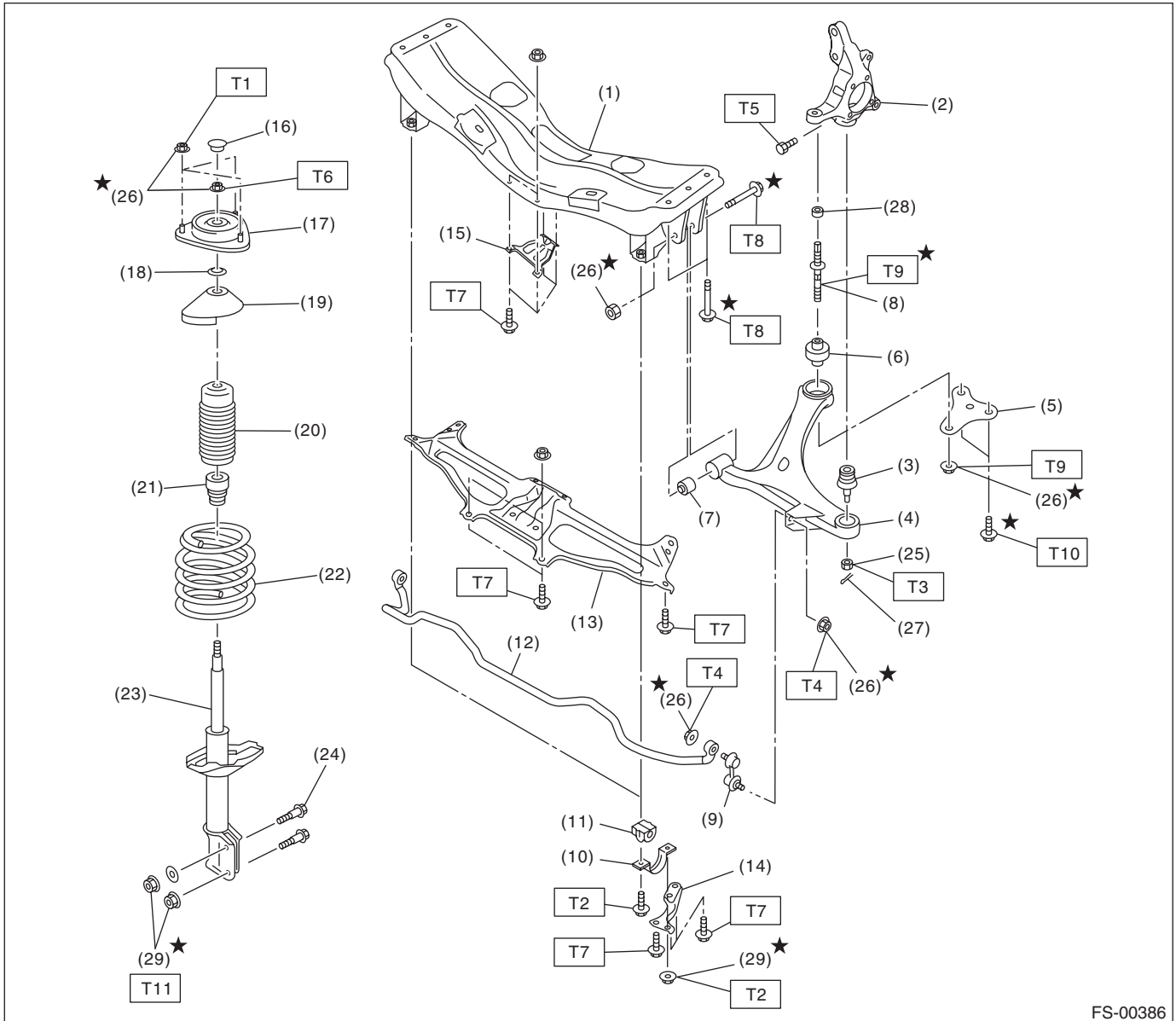
- Front and rear toe-in and front camber can be adjusted. Adjust if the toe-in or camber tolerance exceeds specifications.
- Other items indicated in the specifications is not equipped with adjustment mechanisms. If other items exceed specifications, check the suspension parts and connections for deformation. If defective, replace with new parts.



(1) Front

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

B: COMPONENT



FS-00386

General Description

FRONT SUSPENSION

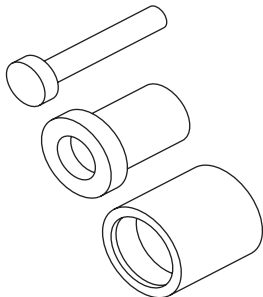
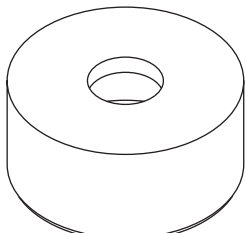
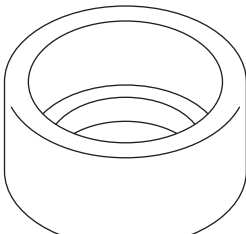
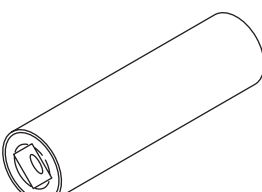
(1) Front crossmember	(16) Dust seal	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(2) Housing	(17) Strut mount	<i>T1: 20 (2.0, 14.8)</i>
(3) Ball joint	(18) Spacer	<i>T2: 25 (2.5, 18.4)</i>
(4) Front arm	(19) Upper spring seat	<i>T3: 39 (4.0, 28.8)</i>
(5) Support plate	(20) Dust cover	<i>T4: 45 (4.6, 33.2)</i>
(6) Rear bushing	(21) Helper	<i>T5: 50 (5.1, 36.9)</i>
(7) Front bushing	(22) Coil spring	<i>T6: 55 (5.6, 40.6)</i>
(8) Stud bolt	(23) Strut	<i>T7: 60 (6.1, 44.3)</i>
(9) Stabilizer link	(24) Adjusting bolt	<i>T8: 95 (9.7, 70.1)</i>
(10) Bracket	(25) Castle nut	<i>T9: 110 (11.2, 81.1)</i>
(11) Bushing	(26) Self-locking nut	<i>T10: 150 (15.3, 110.6)</i>
(12) Stabilizer	(27) Cotter pin	<i>T11: 155 (15.8, 114.3)</i>
(13) Crossmember support plate (Large type)	(28) Stopper	
(14) Crossmember support plate (Small type)	(29) Flange nut	
(15) Jack-up plate		

C: CAUTION

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

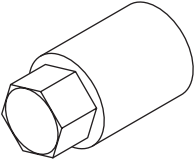
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing front arm front bushing.
 ST20299AG000	20299AG000	REMOVER	- Used for replacing front arm rear bushing. - Used together with BASE (20299AG010).
 ST20299AG010	20299AG010	BASE	- Used for replacing front arm rear bushing. - Used together with REMOVER (20299AG000).
 ST20299AG020	20299AG020	STUD BOLT SOCKET	Used for removing and installing the stud bolt for front arm installing portion.

General Description

FRONT SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20399AG000	20399AG000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut mount.

2. GENERAL TOOL

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

2. Wheel Alignment

A: INSPECTION

Check the following items before performing the wheel alignment measurement.

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

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

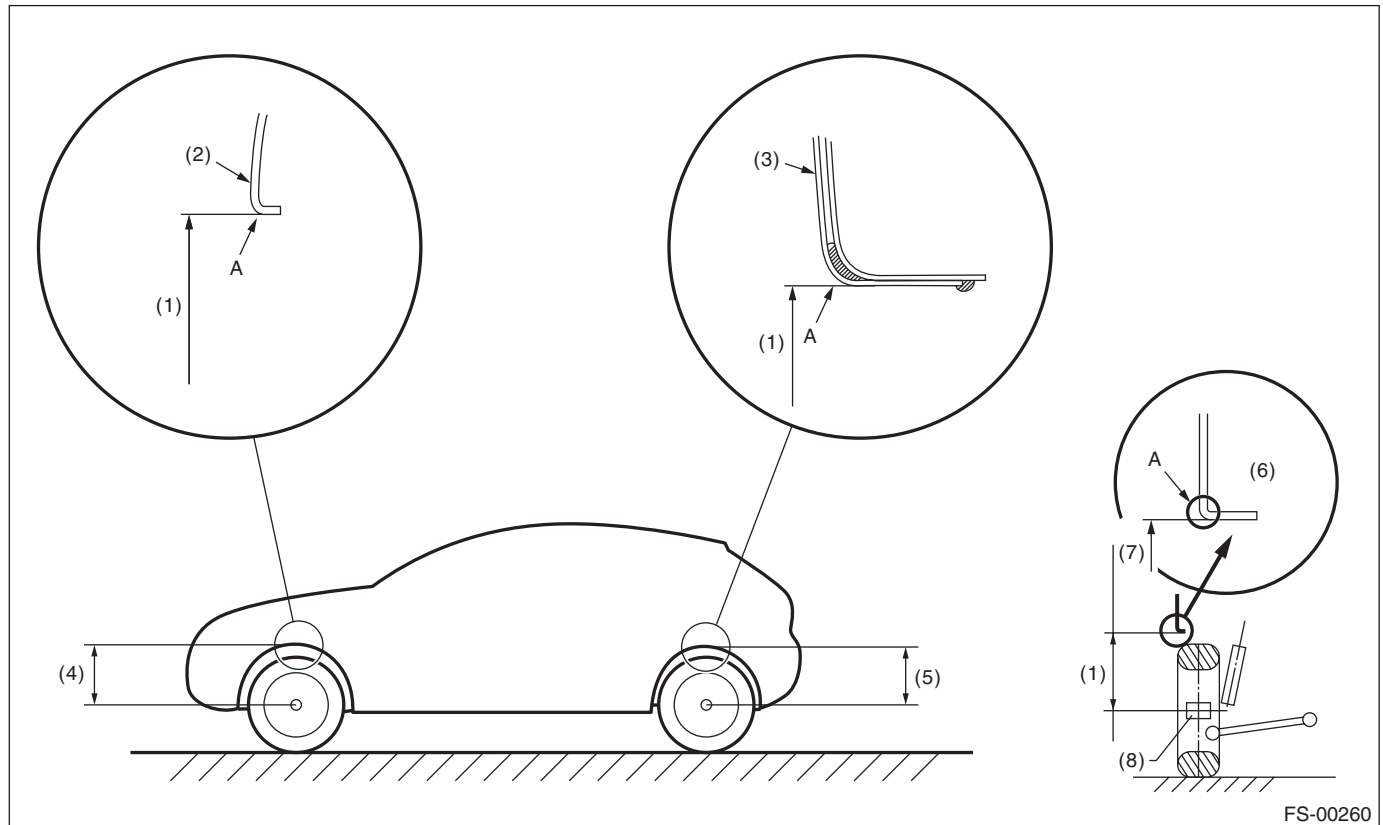
Wheel arch height (front and rear wheels) <Ref. to FS-8, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (front and rear wheels) <Ref. to FS-9, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (front wheel) <Ref. to FS-10, CASTER, INSPECTION, Wheel Alignment.>
↓
Steering angle <Ref. to FS-10, STEERING ANGLE, INSPECTION, Wheel Alignment.>
↓
Front wheel toe-in <Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Rear wheel toe-in <Ref. to FS-11, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Thrust angle <Ref. to FS-13, THRUST ANGLE, INSPECTION, Wheel Alignment.>

Wheel Alignment

FRONT SUSPENSION

1. WHEEL ARCH HEIGHT

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



FS-00260

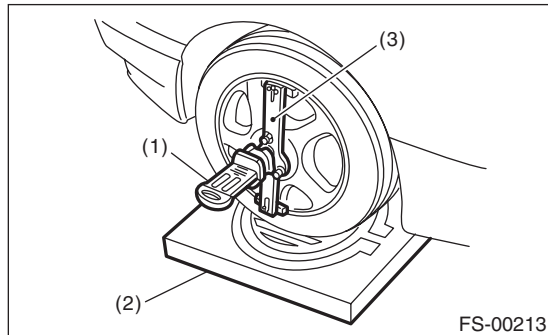
(1) Wheel arch height	(4) Front wheel arch height	(7) Point of measurement
(2) Front fender	(5) Rear wheel arch height	(8) End of spindle
(3) Rear quarter	(6) Flange bend line	

Wheel arch height specification mm (in) (Tolerance: +12 mm -24 mm (+0.47 in -0.94 in))			
Model	OUTBACK	non-turbo	Turbo
Front	392 (15.4)	387 (15.2)	
Rear	380 (15)		375 (14.8)

2. CAMBER

• Inspection

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



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

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

Model	Camber (Difference between RH and LH 45' or less)
Except for OUTBACK	$-0^{\circ}10' \pm 0^{\circ}45'$
OUTBACK	$-0^{\circ}05' \pm 0^{\circ}45'$

• Front camber adjustment

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

Model	Camber (Difference between RH and LH 45' or less)
Except for OUTBACK	$-0^{\circ}10' \pm 0^{\circ}30'$
OUTBACK	$-0^{\circ}05' \pm 0^{\circ}30'$

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

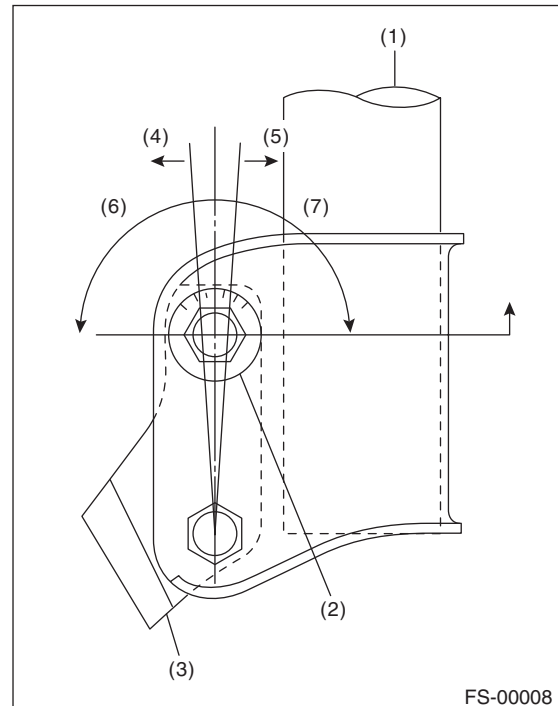
NOTE:

When the adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn the flange nut.

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

NOTE:

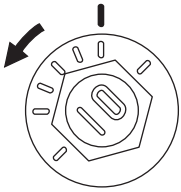
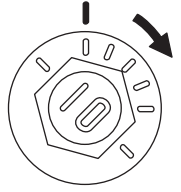
Moving the adjusting bolt by one scale changes the camber by approximately $0^{\circ}15'$.

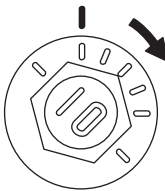
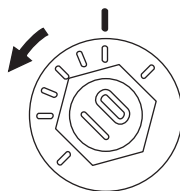


- (1) Strut
- (2) Adjusting bolt
- (3) Housing
- (4) Outer
- (5) Inner
- (6) Camber is increased.
- (7) Camber is decreased.

Wheel Alignment

FRONT SUSPENSION

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

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

4) Tighten two new flange nuts.

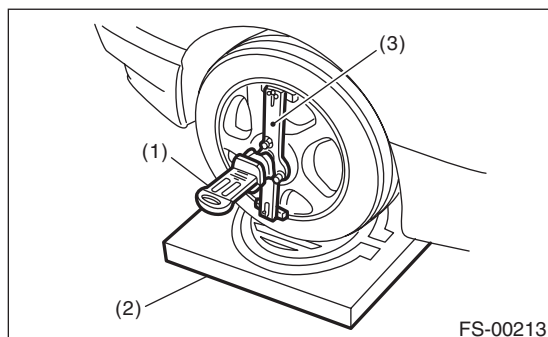
Tightening torque:

155 N·m (15.8 kgf·m, 114.3 ft·lb)

3. CASTER

• Inspection

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



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

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

Model	Caster
Except for OUTBACK	5°55'
OUTBACK	5°50'

4. STEERING ANGLE

• Inspection

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

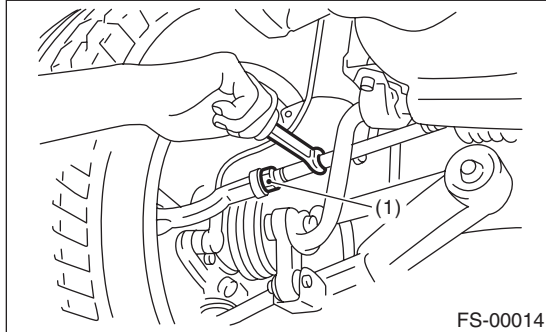
Model	Inner wheel	Outer wheel
OUTBACK	37.9°±1.5°	33.5°±1.5°
WRX-SS	37.2°±1.5°	32.9°±1.5°
Other than above	37.8°±1.5°	33.4°±1.5°

• Adjustment

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

NOTE:

Correct the boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• Inspection

Toe-in:

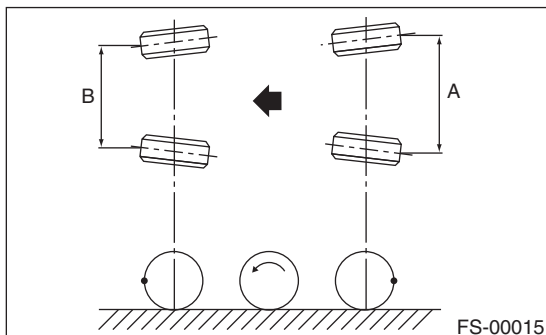
$0 \pm 3 \text{ mm } (0 \pm 0.12 \text{ in})$

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

NOTE:

Be sure to rotate the tires in the forward direction.
4) Measure the distance "B" between the left and right marks. Find toe-in using the following calculation:

$$A - B = \text{Toe-in}$$



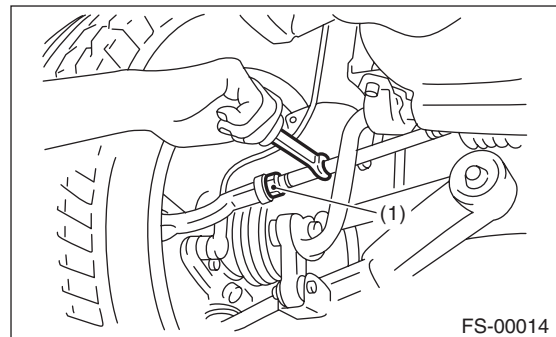
• Adjustment

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

Toe-in:

$0 \pm 2 \text{ mm } (0 \pm 0.08 \text{ in})$

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



(1) Lock nut

- 4) Tighten the tie-rod lock nut.

Tightening torque:

$85 \text{ N}\cdot\text{m } (8.7 \text{ kgf}\cdot\text{m}, 62.7 \text{ ft}\cdot\text{lb})$

NOTE:

Check and correct the tie-rod boot if twisted.

6. REAR WHEEL TOE-IN

• Inspection

Toe-in:

$0 \pm 3 \text{ mm } (0 \pm 0.12 \text{ in})$

Refer to FRONT WHEEL TOE-IN for rear toe-in inspection procedures.
<Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

• Adjustment

When adjusting, adjust it to the following value.

Toe-in:

$0 \pm 2 \text{ mm } (0 \pm 0.08 \text{ in})$

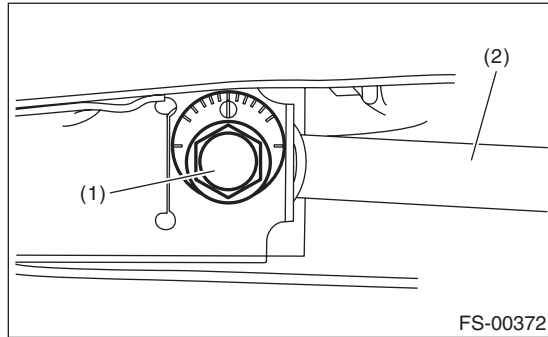
- 1) Loosen the self-locking nut on the inner side of front lateral ink.

Wheel Alignment

FRONT SUSPENSION

NOTE:

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



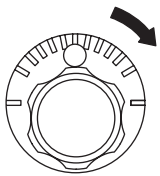
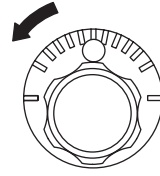
(1) Adjusting bolt

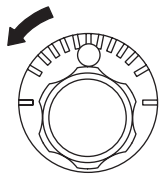
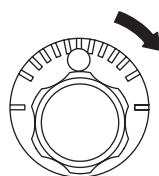
(2) Lateral link

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

NOTE:

When the left and right wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.3 mm (0.05 in).

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

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

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

Tightening torque:

100 N·m (10.2 kgf-m, 73.8 ft-lb)

7. THRUST ANGLE

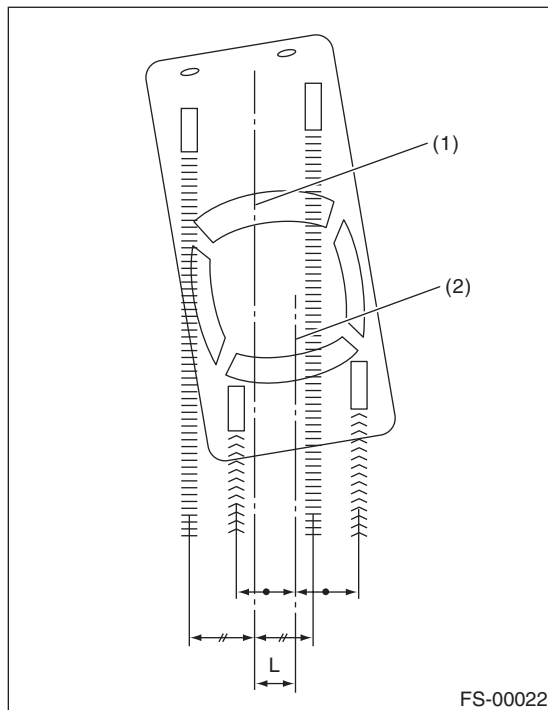
• Inspection

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

Thrust angle

$0^{\circ} \pm 30'$

Less than 30' when "L" is 23 mm (0.9 in) or less



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

• Adjustment

When adjusting, adjust it to the following value.

Thrust angle

$0^{\circ} \pm 20'$

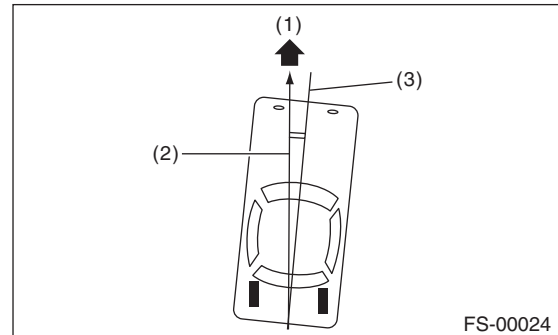
Less than 20' when "L" is 15 mm (0.6 in) or less

- 1) Make thrust angle adjustments by turning the toe-in adjusting bolts of the rear suspension equally in the same direction.
- 2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make the thrust angle adjustment.

- 3) When the left and right adjusting bolts are turned by one graduation, the thrust angle will change approx. 15' ("L" is approx. 11 mm (0.43 in)).

NOTE:

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



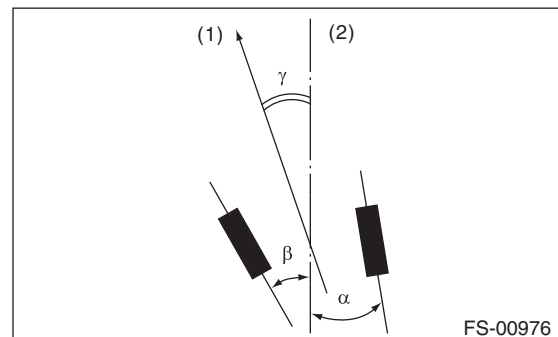
- (1) Front
- (2) Thrust angle
- (3) Body center line

Thrust angle: $\gamma = (\alpha - \beta)/2$

α : Rear RH wheel toe-in angle

β : Rear LH wheel toe-in angle

Substitute only the positive toe-in values from each wheel into α and β in the calculation.

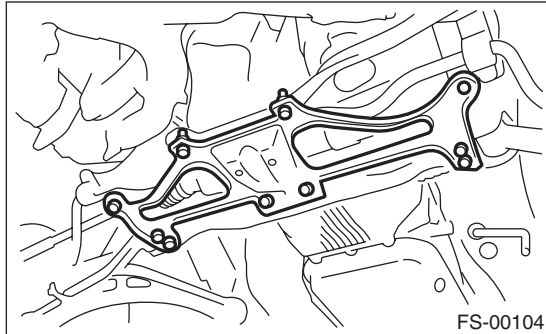


- (1) Front
- (2) Body center line

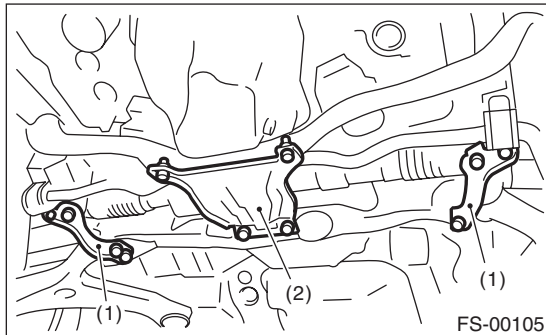
3. Front Crossmember Support Plate

A: REMOVAL

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



- Small type



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

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Tighten the small type crossmember support plate together with stabilizer bracket.

After attaching the stabilizer bracket to the crossmember, tighten the crossmember support plate together with the bracket.

Tightening torque:

Crossmember support plate:

60 N·m (6.1 kgf-m, 44.3 ft-lb)

Crossmember support plate (sections tightened together with the stabilizer bracket):

25 N·m (2.5 kgf-m, 18.4 ft-lb)

Jack-up plate:

60 N·m (6.1 kgf-m, 44.3 ft-lb)

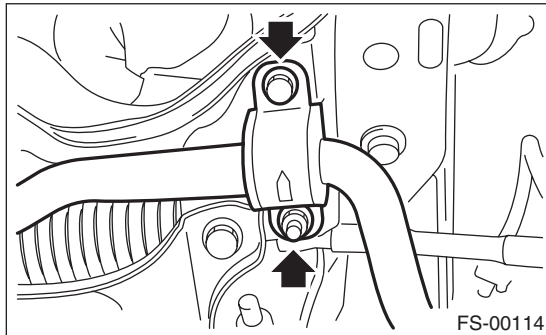
4. Front Stabilizer

A: REMOVAL

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



- 5) Remove the stabilizer bracket.

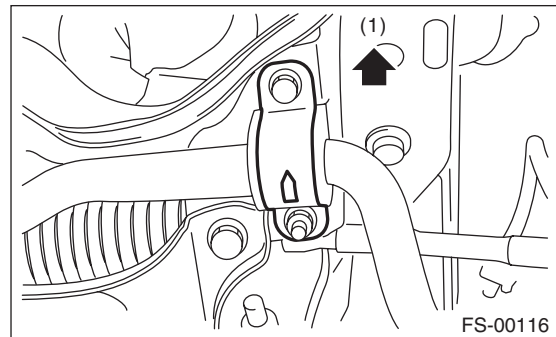


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

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



(1) Front side of vehicle

Tightening torque:

Stabilizer link:

45 N·m (4.6 kgf-m, 33.2 ft-lb)

Stabilizer bracket:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

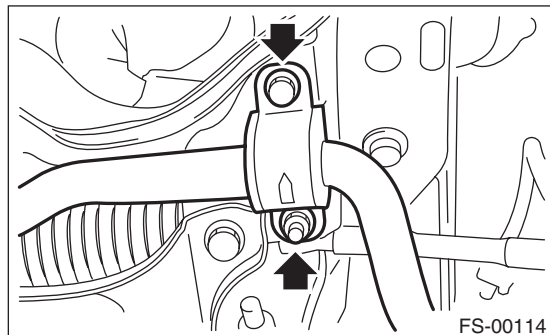
C: INSPECTION

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

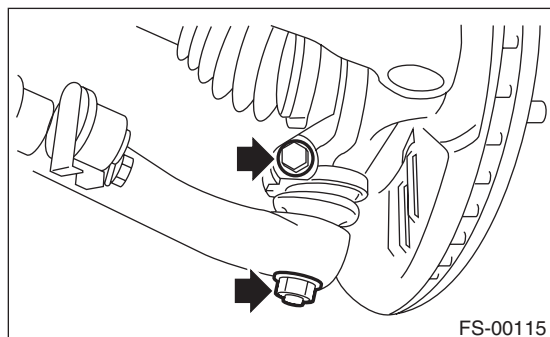
5. Front Ball Joint

A: REMOVAL

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



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



- 5) Extract the ball joint from housing.

B: INSTALLATION

- 1) Insert the ball joint into housing.

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

CAUTION:

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

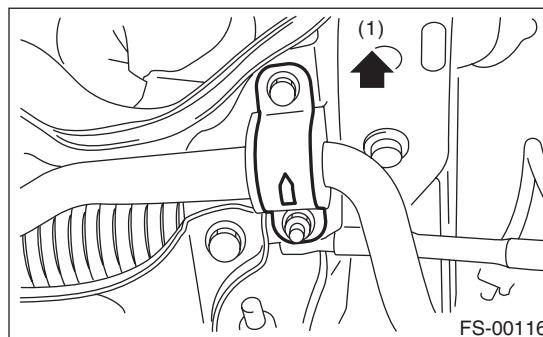
- 2) Install the ball joint into front arm.

Tightening torque (Castle nut):
39 N·m (4.0 kgf-m, 28.8 ft-lb)

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

NOTE:

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



(1) Front side of vehicle

Tightening torque:

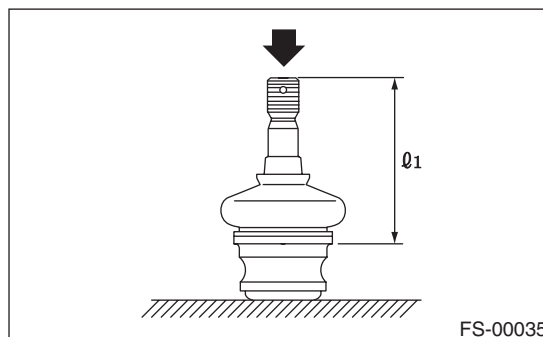
25 N·m (2.5 kgf-m, 18.4 ft-lb)

- 5) Install the front wheels.

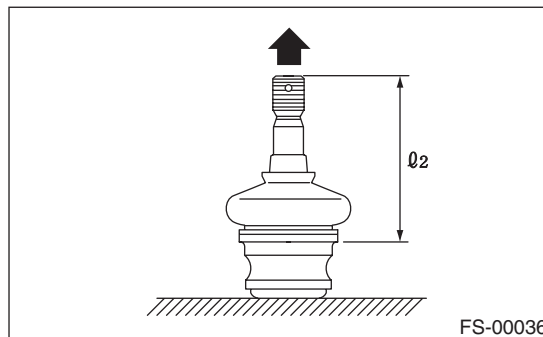
C: INSPECTION

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

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



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



- (3) Determine free play using the following formula.

$$S = l_2 - l_1$$

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

Front ball joint

Specification for replacement S:

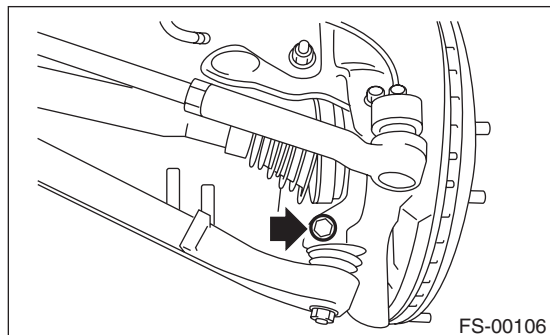
Less than 0.3 mm (0.012 in)

- 2) If the play is within specification, visually check the dust cover.
- 3) Remove the ball joint and cover, and check for wear, damage or cracks. If any damage is found, replace the corresponding part.
- 4) If the dust cover is damaged, replace with a new ball joint.

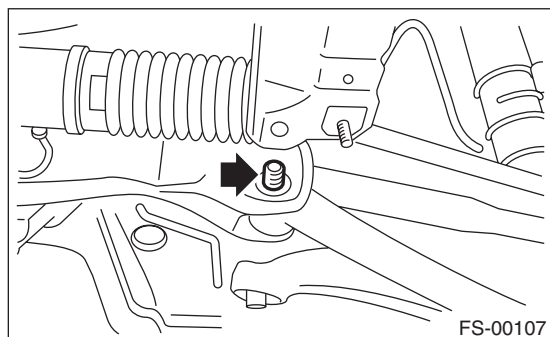
6. Front Arm

A: REMOVAL

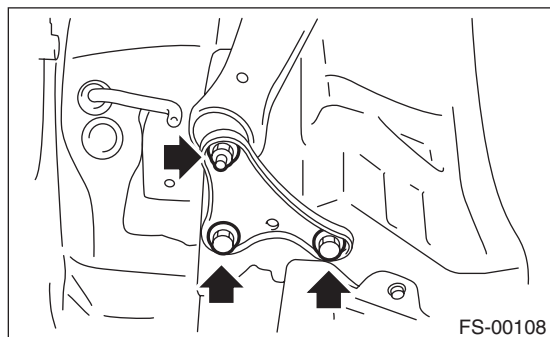
- 1) Lift up the vehicle, and then remove the front wheels.
- 2) Remove the front crossmember support plate. <Ref. to FS-14, REMOVAL, Front Crossmember Support Plate.>
- 3) Remove the front stabilizer. <Ref. to FS-15, REMOVAL, Front Stabilizer.>
- 4) Remove the ball joint of front arm.



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



- 6) Remove the front arm support plate.

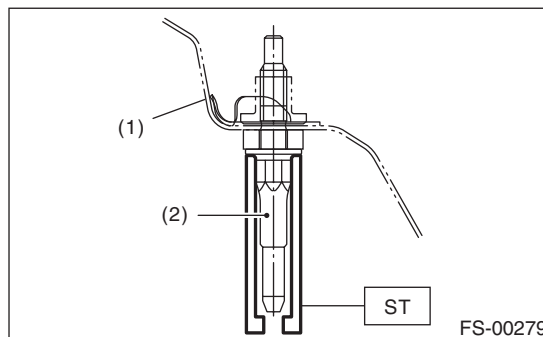


- 7) Remove the bolt securing front arm to crossmember and pull the front arm out of the crossmember.
- 8) To remove the stud bolt, use the ST.

ST 20299AG020 STUD BOLT SOCKET

CAUTION:

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



- (1) Vehicle body
- (2) Stud bolt

B: INSTALLATION

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

Tightening torque:

110 N·m (11.2 kgf-m, 81.1 ft-lb)

- 2) Using new bolts and self-locking nuts, temporarily tighten the front arm to crossmember.
- 3) Secure the front arm to body, and then install the support plate with new bolts and self-locking nuts.

Tightening torque:

Support plate to Front arm:

110 N·m (11.2 kgf-m, 81.1 ft-lb)

Support plate to Body:

150 N·m (15.3 kgf-m, 110.6 ft-lb)

- 4) Install the ball joint into housing.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

- 5) Install the stabilizer. <Ref. to FS-15, INSTALLATION, Front Stabilizer.>
- 6) Install the front wheels.
- 7) Lower the vehicle from lift, and tighten the bolt which secures the front arm to crossmember with wheels in full contact with the ground and the vehicle at curb weight.

Tightening torque:

95 N·m (9.7 kgf-m, 70.1 ft-lb)

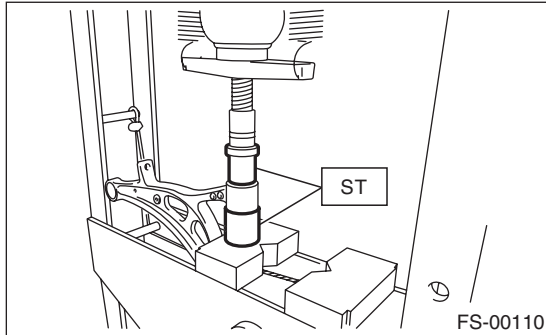
- 8) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

Using the ST and a press, remove the front bushing.

ST 927680000 INSTALLER & REMOVER SET

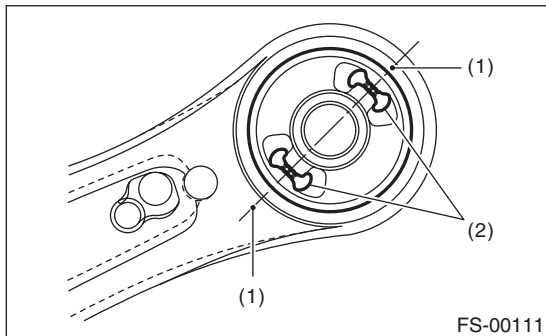


2. REAR BUSHING

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

CAUTION:

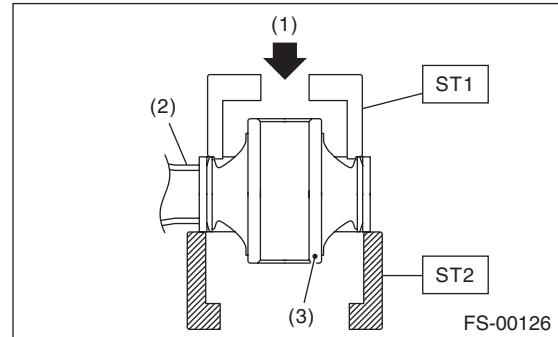
Always put an alignment mark for aligning the position on bushing installation.



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

2) Using the ST and a press, remove the rear bushing.

ST1 20299AG000 REMOVER
ST2 20299AG010 BASE



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

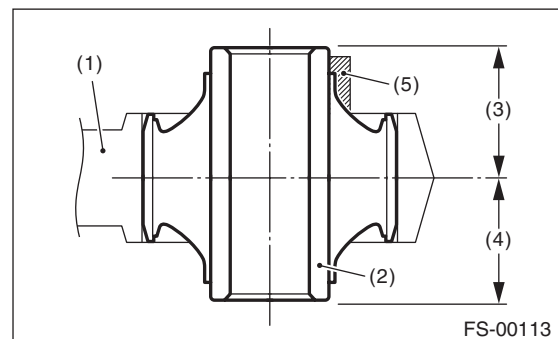
D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

2. REAR BUSHING

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

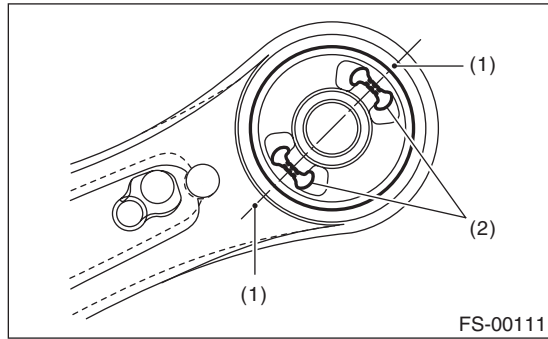


- (1) Front arm
- (2) Bushing inner cylinder
- (3) Longer
- (4) Shorter
- (5) Protrusion portion

Front Arm

FRONT SUSPENSION

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

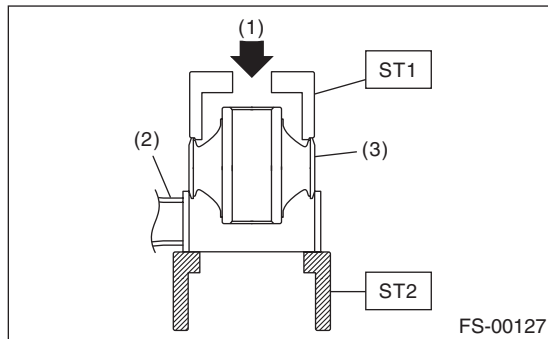


- (1) Alignment mark
- (2) Recess section

3) Using the ST and a press, install the rear bushing.

ST1 20299AG000 REMOVER

ST2 20299AG010 BASE



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

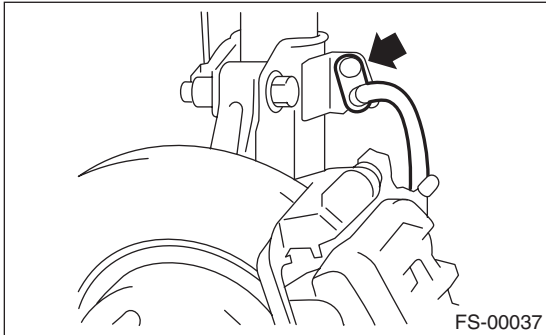
E: INSPECTION

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

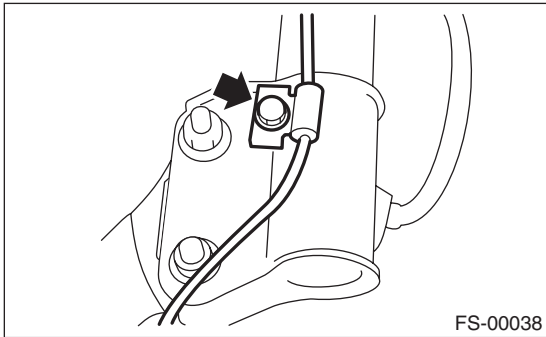
7. Front Strut

A: REMOVAL

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



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

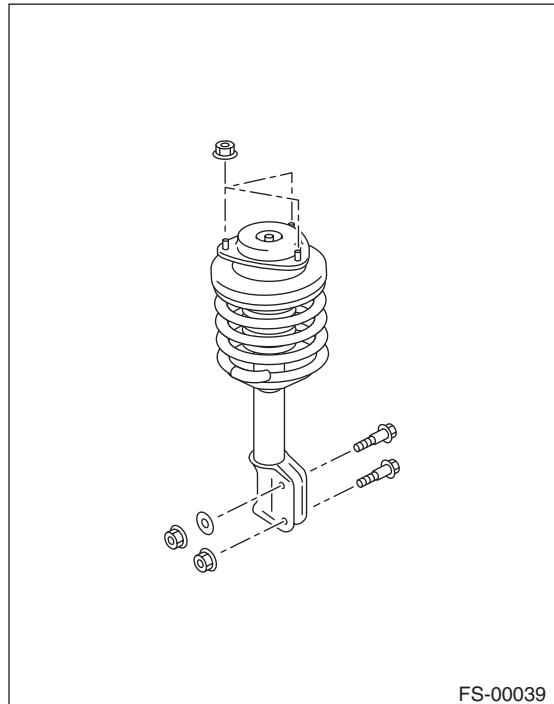


- 5) Remove the two bolts securing the housing to the strut.

NOTE:

While holding the head of the adjusting bolt, loosen the flange nut.

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



B: INSTALLATION

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

Tightening torque:

20 N·m (2.0 kgf-m, 14.8 ft-lb)

- 2) Align alignment marks on the camber adjusting bolt and strut.

Using new flange nuts, install the strut to the housing.

NOTE:

While holding the head of adjusting bolt, tighten the flange nut.

Tightening torque:

155 N·m (15.8 kgf-m, 114.3 ft-lb)

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

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

- 4) Install the brake hose bracket.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

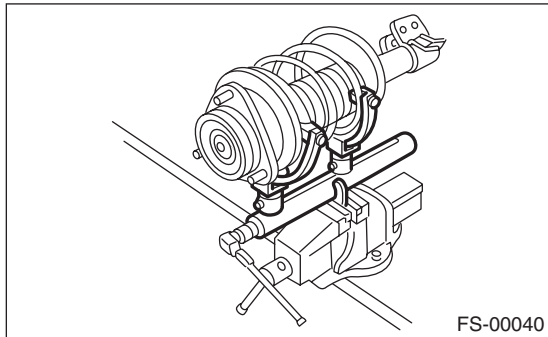
- 5) Install the front wheels.
- 6) Inspect the wheel alignment and adjust if necessary.

Front Strut

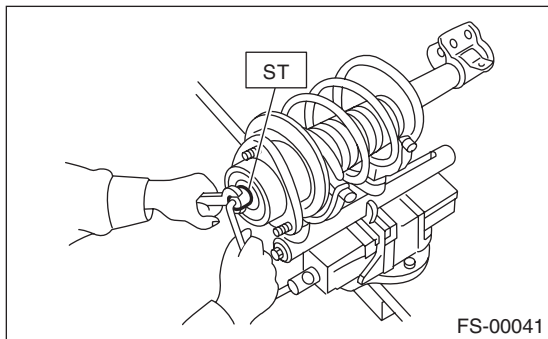
FRONT SUSPENSION

C: DISASSEMBLY

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



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



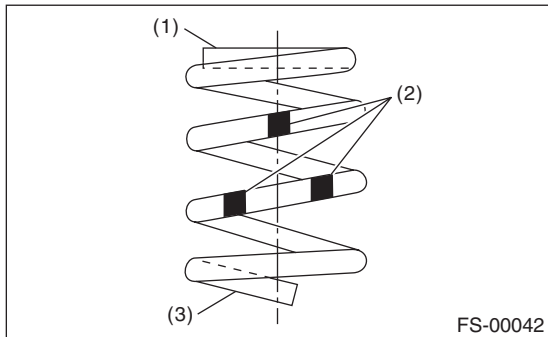
3) Remove the strut mount and upper spring seat from strut.
4) Gradually decrease the compression force of compressor, and remove the coil spring.
5) Remove the dust cover and helper spring.

D: ASSEMBLY

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

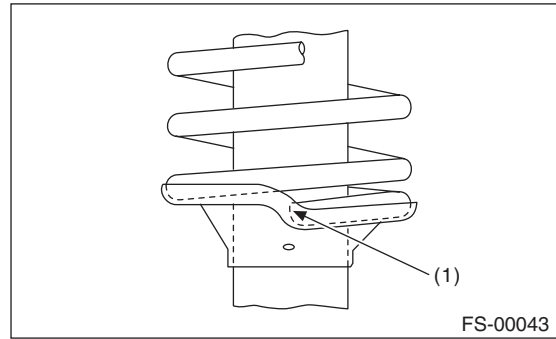
NOTE:

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



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

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



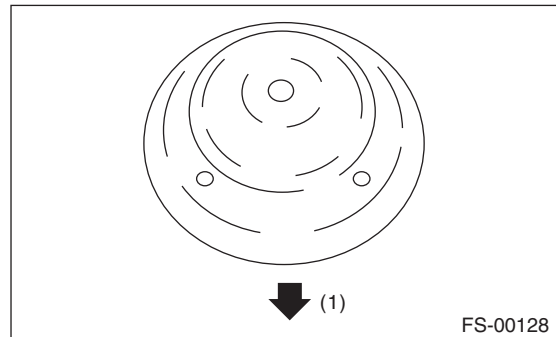
(1) Coil spring end face

3) Install the helper and dust cover to the piston rod.

4) Pull the piston rod fully upward, and install the spring seat.

NOTE:

Position the upper spring seat as shown in the figure.



(1) Outside of body

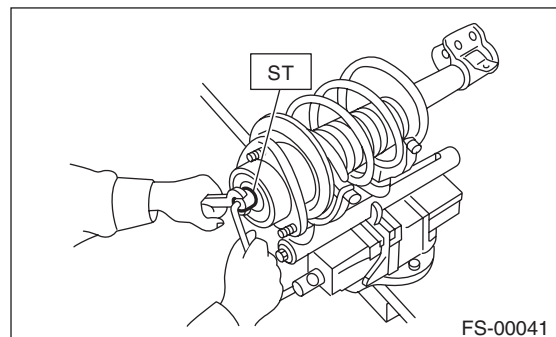
5) Install the strut mount to piston rod, and temporarily attach and tighten a new self locking nut.

6) Using a hexagon wrench to prevent strut rod from turning, tighten the new self-locking nut with ST.

ST 20399AG000 STRUT MOUNT SOCKET

Tightening torque:

55 N·m (5.6 kgf-m, 40.6 ft-lb)



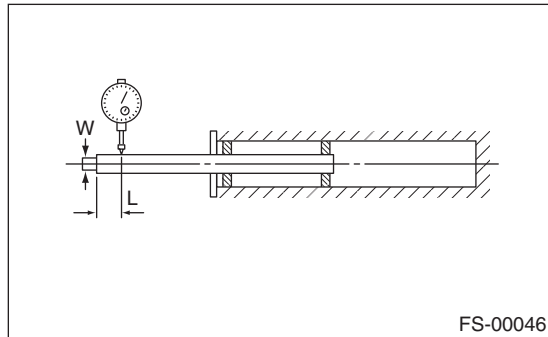
7) Loosen the coil spring compressor carefully.

E: INSPECTION

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

1. STRUT

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



Play limit ($P_1 + P_2$):
0.8 mm (0.031 in)

If the play exceeds limit, replace the strut.

2. STRUT MOUNT

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

3. DUST COVER

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

4. COIL SPRING

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

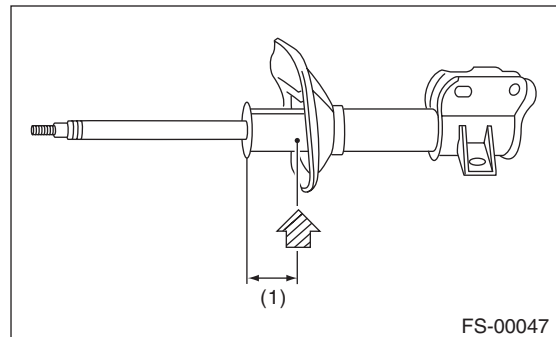
5. HELPER

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

F: DISPOSAL

CAUTION:

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

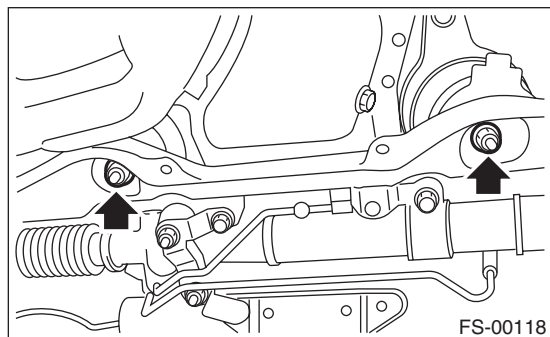


(1) 40 mm (1.57 in)

8. Front Crossmember

A: REMOVAL

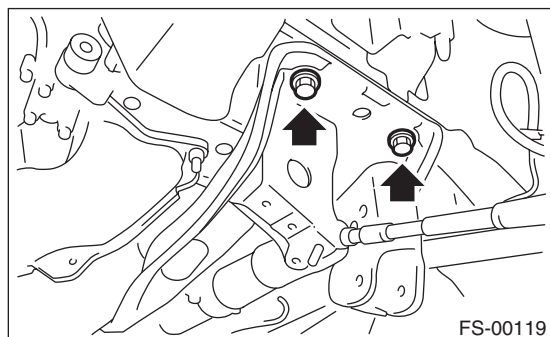
- 1) Lift up the vehicle, and then remove the front wheels.
- 2) Remove the front exhaust pipe.
- 3) Remove the front crossmember support plate. <Ref. to FS-14, REMOVAL, Front Crossmember Support Plate.>
- 4) Remove the front stabilizer. <Ref. to FS-15, REMOVAL, Front Stabilizer.>
- 5) Disconnect the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



- 8) Remove the steering universal joint.
- 9) Disconnect the power steering hose from the steering gearbox.
- 10) Lift the engine by approx. 10 mm (0.39 in) by using the chain block.
- 11) Support the crossmember with jack, remove the bolts which secure the crossmember to the vehicle body, and gradually lower the crossmember together with the steering gearbox.

CAUTION:

When removing the crossmember downward, make sure that the tie-rod end does not interfere with the drive shaft boot.



B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

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

Tightening torque:

Crossmember to Body:

95 N·m (9.7 kgf-m, 70.1 ft-lb)

Engine mounting to Crossmember:

85 N·m (8.7 kgf-m, 62.7 ft-lb)

Front arm to Crossmember:

95 N·m (9.7 kgf-m, 70.1 ft-lb)

Front arm to Support plate:

110 N·m (11.2 kgf-m, 81.1 ft-lb)

Support plate body:

150 N·m (15.3 kgf-m, 110.6 ft-lb)

Tie-rod end to Housing:

27 N·m (2.8 kgf-m, 19.9 ft-lb)

After tightening to the specified torque, tighten the castle nut further but within 60° until the hole in the ball stud is aligned with a slot in castle nut

Tightening torque:

Universal joint:

24 N·m (2.4 kgf-m, 17.7 ft-lb)

Stabilizer bracket:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

Stabilizer link:

45 N·m (4.6 kgf-m, 33.2 ft-lb)

Power steering hose to Steering gearbox:

15 N·m (1.5 kgf-m, 11.1 ft-lb)

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

C: INSPECTION

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

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

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

2. POOR RIDE COMFORT

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

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

3. NOISE

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

General Diagnostic Table

FRONT SUSPENSION

REAR SUSPENSION

RS

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6. Rear Shock Absorber	14
7. Front Lateral Link	15
8. Rear Lateral Link	16
9. Rear Sub Frame	17
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General Description

PARKING BRAKE

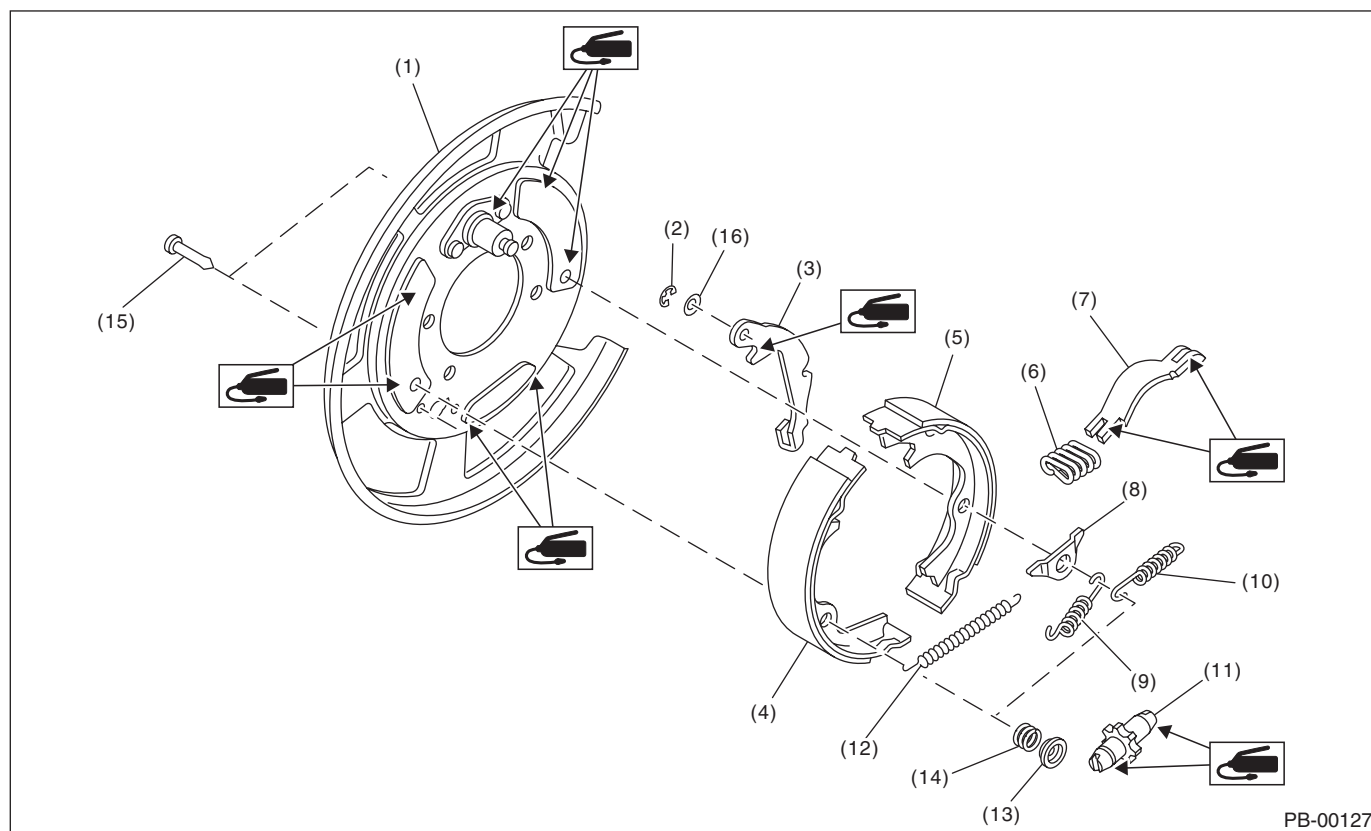
1. General Description

A: SPECIFICATION

Model		Rear drum brake	Rear disc brake
Type		Rear brake mechanical	Mechanical, drum in disc rear brakes
Effective drum diameter	mm (in)	254 (10)	190 (7.48)
Lining dimensions (Length × Width × Thickness)	mm (in)	243.8 × 40.0 × 4.5 (9.6 × 1.575 × 0.177)	165.8 × 30.0 × 2.8 (6.53 × 1.181 × 0.11)
Clearance adjustment		Automatic adjusting	Manual adjustment
Lever stroke	Notches/N (kgf, lbf)	7 — 8/200 (20.4, 45)	

B: COMPONENT

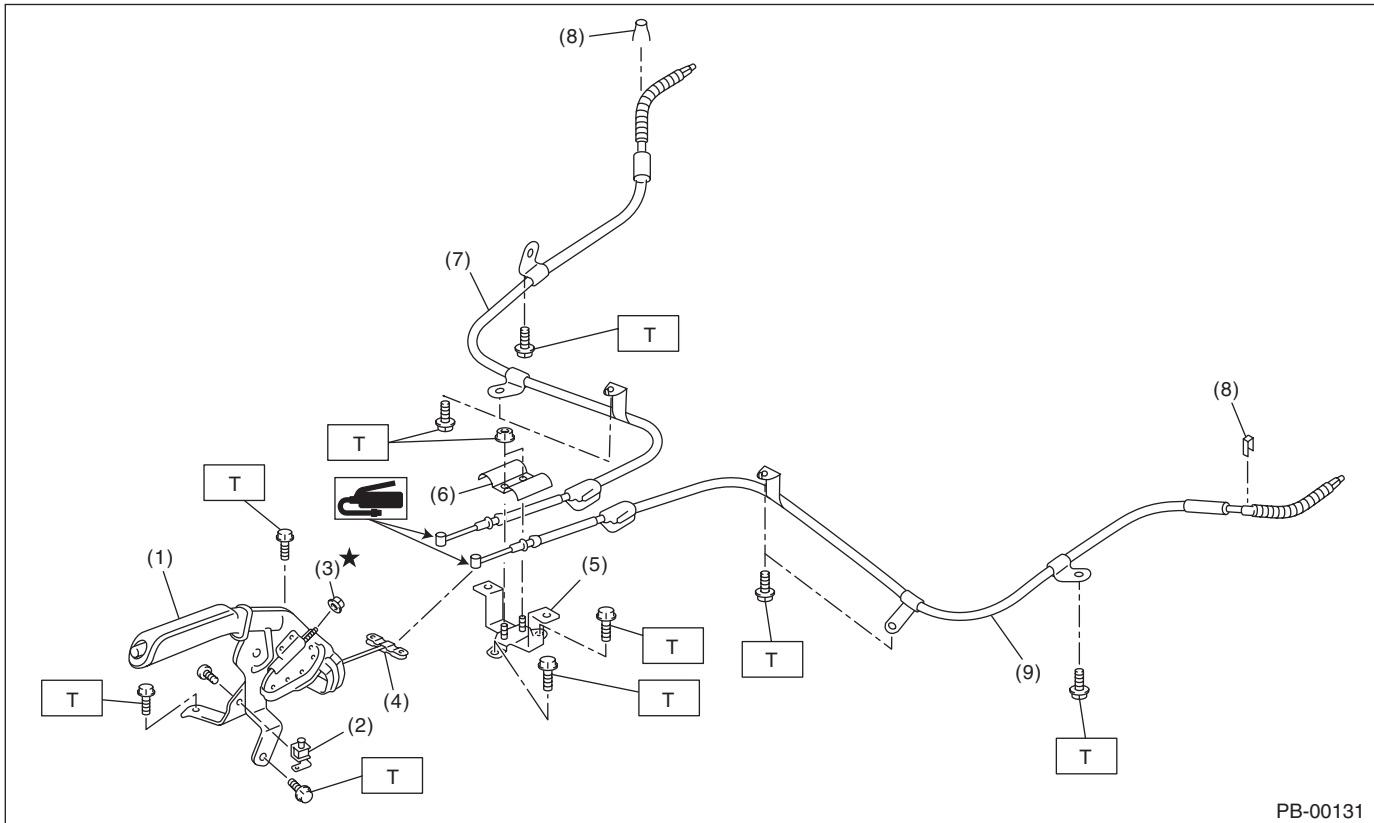
1. PARKING BRAKE (REAR DISC BRAKE)



PB-00127

(1) Back plate	(7) Strut	(13) Shoe hold-down cup
(2) Retainer	(8) Shoe guide plate	(14) Shoe hold-down spring
(3) Lever	(9) Primary return spring	(15) Shoe hold-down pin
(4) Parking brake shoe (Primary)	(10) Secondary return spring	(16) Wave washer
(5) Parking brake shoe (Secondary)	(11) Adjuster	
(6) Strut spring	(12) Adjusting spring	

2. PARKING BRAKE LEVER & CABLE



(1) Parking brake lever	(6) Clamp
(2) Parking brake switch	(7) Parking brake cable RH
(3) Adjusting nut (self-locking nut)	(8) Clamp
(4) Equalizer	(9) Parking brake cable LH
(5) Bracket	

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.3)

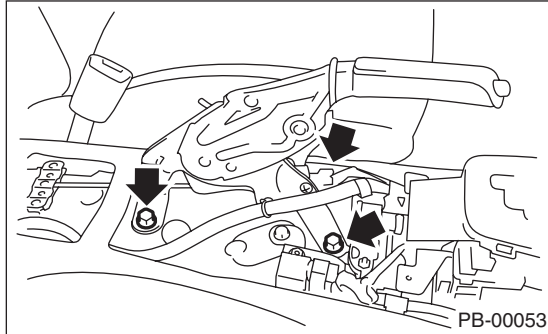
C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Make sure grease does not come into contact with the parking shoes.

2. Parking Brake Lever

A: REMOVAL

- 1) Set the wheel stoppers to tires.
- 2) Remove the console box.
- 3) Disconnect the parking brake switch connector.
- 4) Remove the parking cable adjusting nut (self-locking nut).
- 5) Remove the parking brake lever.



B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

Parking brake lever

18 N·m (1.8 kgf-m, 13.3 ft-lb)

- 2) Install a new adjusting nut (self-locking nut).
- 3) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

- 1) Operate the parking brake lever 3 to 4 times and fully return the lever.
- 2) While slowly pulling the parking brake lever upward, count the notches.

Lever stroke:

7 to 8 notches when pulled with a force of 200 N (20.4 kgf, 45 lbf)

If it is not within the specified value, adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

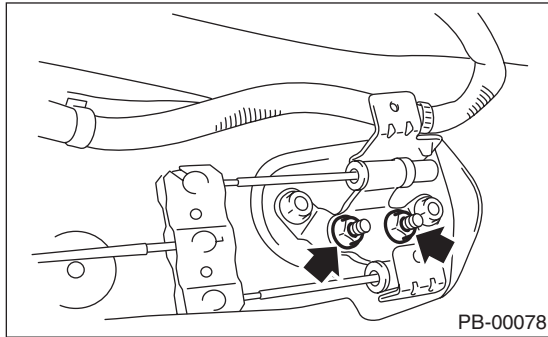
D: ADJUSTMENT

Adjust the parking lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

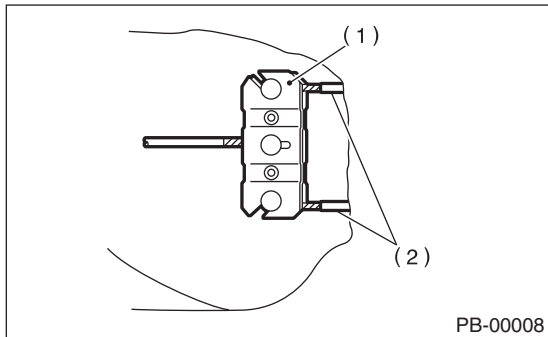
3. Parking Brake Cable

A: REMOVAL

- 1) Remove the rear seat cushion.
- 2) Remove the console box.
- 3) Remove the parking cable adjusting nut (self-locking nut).
- 4) Remove the parking brake lever. <Ref. to PB-4, REMOVAL, Parking Brake Lever.>
- 5) Roll up the floor mat and remove the clamps.

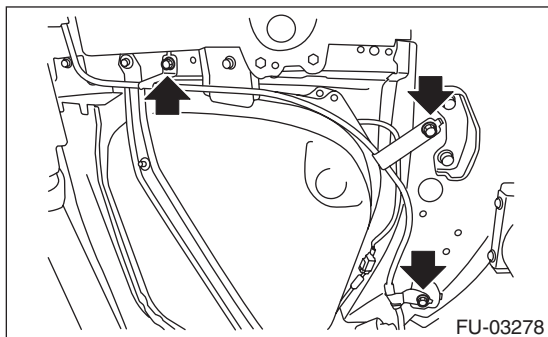


- 6) Remove the inner cable end from equalizer.



- (1) Equalizer
- (2) Inner cable end

- 7) Lift up the vehicle, and remove the rear wheels.
- 8) Remove the parking brake cable from rear brake. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).> <Ref. to BR-27, REMOVAL, Rear Drum Brake Shoe.>
- 9) Remove the clamp from the rear brake.
- 10) Remove the cable clamp from the rear arm bracket.
- 11) Remove the cable clamp from rear floor.



- 12) Remove the grommet from the rear floor, and remove the cable assembly.

B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

- Be sure to pass the cable through the tunnel in the cable guide.
- 2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

Check and replace the removed cable if damaged, rusty or faulty.

- 1) Check the cable for smooth operation.
- 2) Check the inner cable for damage and rust.
- 3) Check the outer cable for damage, bends and cracks.
- 4) Check the boot for damage, cracks, and corrosion.

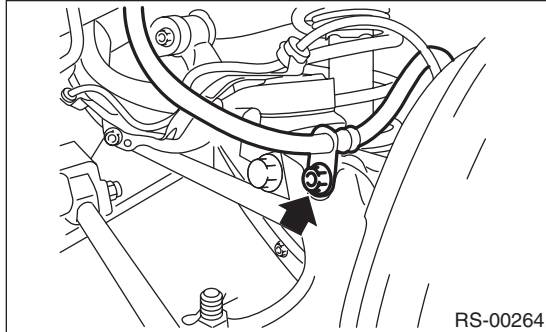
Parking Brake Assembly (Rear Disc Brake)

PARKING BRAKE

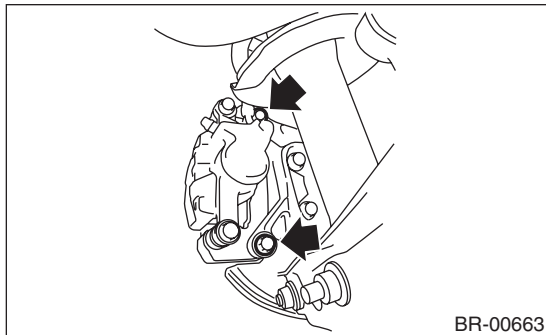
4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

- 1) Release the parking brake.
- 2) Lift up the vehicle, and then remove the rear wheels.
- 3) Remove the brake hose bracket.



- 4) Remove the two mounting bolts and remove the rear disc brake caliper.

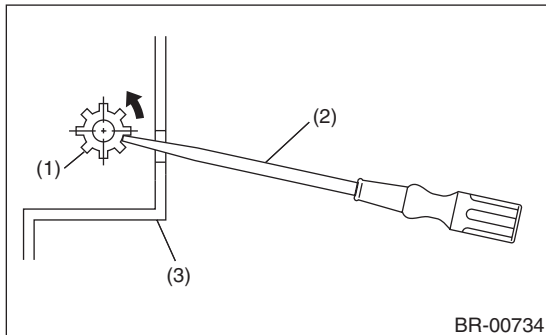


- 5) Suspend the rear disc brake caliper so that the brake hose is not stretched.
- 6) Remove the rear disc brake rotor.

NOTE:

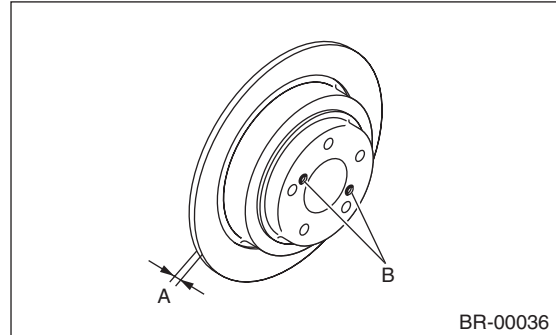
If the disc rotor is difficult to remove, try the following two methods in order.

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

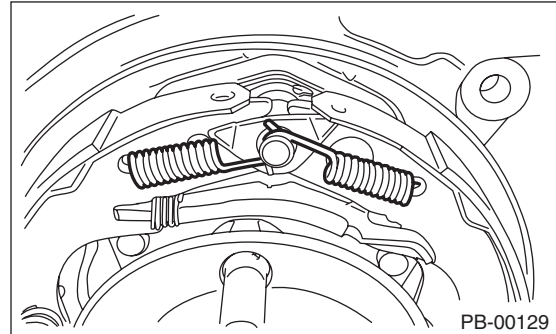


- (1) Adjuster
- (2) Flat tip screwdriver
- (3) Disc rotor

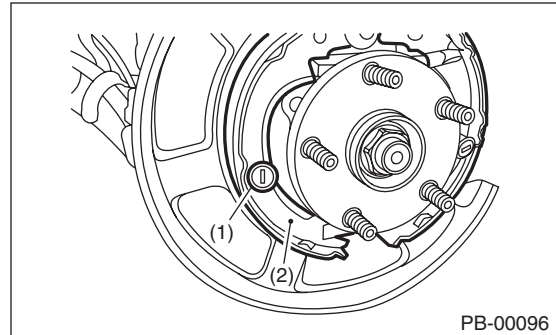
- (2) If disc rotor is seized on the hub, drive the disc rotor out by pushing two 8 mm bolts in holes B on the rotor.



- 7) Remove the shoe return spring.



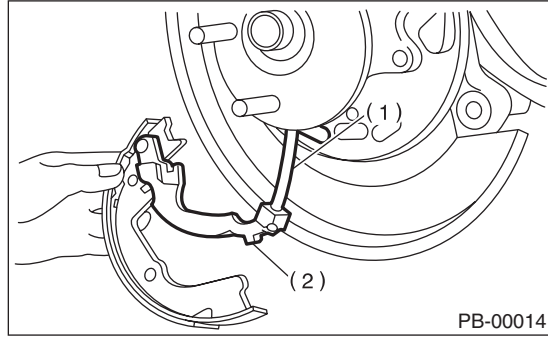
- 8) Remove the brake shoe cup and brake shoe spring, and remove the primary brake shoe.



- (1) Brake shoe cup
- (2) Primary brake shoe

- 9) Remove the strut and strut spring.
- 10) Remove the adjuster.
- 11) Remove brake shoe cup and brake shoe spring, and remove the secondary brake shoe.

12) Remove the parking brake cable from lever.



- (1) Parking brake cable
- (2) Lever

13) Remove a retainer from the secondary side brake shoe. Remove the lever from the brake shoe.

B: INSTALLATION

CAUTION:

Be sure the lining surface is free from brake fluid and grease.

1) Apply brake grease to the following locations.

Brake grease:

Brake Grease (Part No. 003602002)

- Six contact surfaces of the brake shoe rim and back plate gasket
- Contact surface of the brake shoe and the anchor pin
- Contact surface of the parking brake lever and strut
- Contact surface of the brake shoe and adjuster
- Contact surface of the brake shoe and strut
- Contact surface of the lever and brake shoe

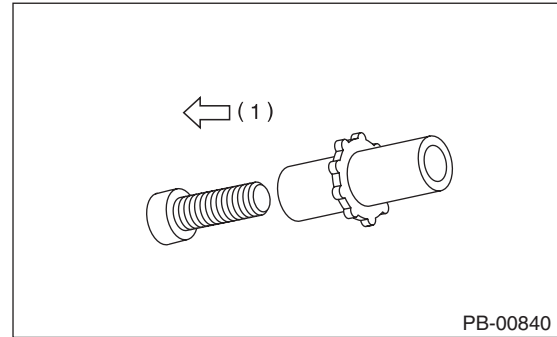
2) Install the wave washer and lever to the secondary side brake shoe pin, and lock the retainer securely.

3) Install the parking brake cable to the lever.

4) Install the adjuster and adjusting spring to the brake shoe.

NOTE:

Install the adjuster with screw section on the direction side in the figure below.



- (1) Left wheel: front side of vehicle, right wheel: rear side of vehicle

5) Check that the parking brake cable does not fall from the cable guide.

6) Install the brake shoes to the back plate with shoe hold pins, brake shoe springs, and brake shoe cups.

7) Install the strut and strut spring to the brake shoes.

NOTE:

Install the strut springs on front side of the vehicle.

8) Install the return springs; first the primary side then the secondary side.

9) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

10) If new brake shoes are replaced, drive the vehicle to break-in the parking brake lining.

(1) Drive the vehicle at about 35 km/h (22 MPH).

(2) With the parking brake lever button pushed in, pull the parking brake lever gently.

(3) Drive the vehicle for about 200 m (0.12 mile) in this condition.

(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat steps (1) through (3) again.

(5) After breaking-in, re-adjust the parking brakes.

Parking Brake Assembly (Rear Disc Brake)

PARKING BRAKE

C: INSPECTION

1) Measure the inner diameter of the brake disc rotor. If scoring or worn is found on the disk, replace the brake disc rotor.

Disc rotor inner diameter:

Standard

190 mm (7.48 in)

Service limit

191 mm (7.52 in)

2) Measure the lining thickness. If it exceeds the limit, replace the brake shoe.

Lining thickness:

Standard

2.8 mm (0.11 in)

Service limit

1.5 mm (0.059 in)

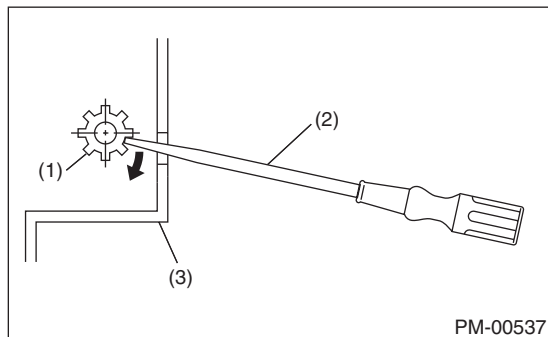
NOTE:

Replace the right and left brake shoe as a set.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Return the parking brake lever fully.
2) Loosen the adjusting nut, and make the cable free.
3) Remove the adjusting hole cover from the disc rotor.
4) Using a flat tip screwdriver, turn the adjusting screw in the direction of the arrow as shown in the figure until the brake shoe is in close contact with the disc rotor.



- (1) Adjusting screw
- (2) Flat tip screwdriver
- (3) Disc rotor

5) Loosen the adjusting screw by 5 notches to opposite direction of arrow.

CAUTION:

- Check there is no brake drag.
 - If the amount that the adjusting screw is turned back is little, securely loosen it by 5 notches to avoid dragging.
- 6) Install the adjusting hole cover to the disc rotor.

7) Adjust the parking lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

2. LEVER STROKE

1) Adjust the shoe clearance before adjusting lever stroke. <Ref. to PB-8, SHOE CLEARANCE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

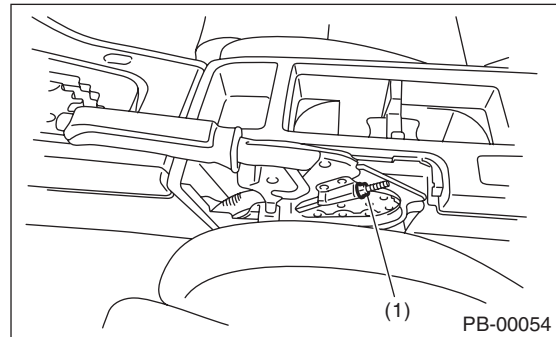
2) Remove the parking lever cover.

3) Pull the parking brake lever hard 3 to 5 times.

4) Turn the adjusting nut until the lever stroke is at the specified value.

Lever stroke:

7 to 8 notches when pulled with a force of 200 N (20.4 kgf, 45 lbf)



- (1) Adjusting nut (self-locking nut)

5) Check there is no brake drag.
6) Install the parking lever cover.

5. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Brake drag	Parking brake lever not adjusted correctly.	Adjust.
	Parking brake cable does not move.	Repair or replace.
	Parking brake shoe clearance is maladjusted.	Adjust.
	Return spring is faulty.	Replace.
Noise from brake	Return spring is faulty.	Replace.
	Shoe hold-down spring faulty.	Replace.

General Diagnostic Table

PARKING BRAKE

POWER ASSISTED SYSTEM (POWER STEERING)

PS

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1. General Description	2
2. Steering Wheel	12
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4. Tilt Steering Column	15
5. Steering Gearbox	17
6. Pipe Assembly	37
7. Oil Pump	43
8. Reservoir Tank	48
9. Power Steering Fluid	49
10. General Diagnostic Table	50

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

1. General Description

A: SPECIFICATION

Model			Non-turbo model	WRX, WRX-S	WRX-SS
Whole system	Minimum turning radius m (ft)		5.3 (17.4)		5.4 (17.7)
	Steering angle	Inner wheel	OUTBACK: 37.9°±1.5° Except for OUTBACK: 37.8°±1.5°		37.2°±1.5°
		Outer wheel	OUTBACK: 33.5°±1.5° Except for OUTBACK: 33.4°±1.5°		32.9°±1.5°
	Steering wheel diameter mm (in)		375 (14.76)		
	Whole gear ratio (Turn, from lock to lock. Gearbox)		2.8		
Gearbox	Type		Rack and Pinion, Integral		
	Backlash		0 (Automatic adjusting)		
	Valve (Power steering system)		Rotary valve		
	Type		Vane pump		
Pump (Power steering system)	Oil tank		Installed on body		
	Specific output	cm ³ (cu in)/rev.	7.2 (0.439)	8.5 (0.519)	
	Relief pressure	kPa (kgf/cm ² , psi)	7,350 — 8,050 (75 — 82, 1,066 — 1,167)	8,100 — 8,800 (83 — 90, 1,174 — 1,276)	
	Hydraulic fluid control		Engine speed sensitive		
	Hydraulic fluid	ℓ (US qt, Imp qt)	1,000 rpm: 6.5 (6.9, 5.7) 3,000 rpm: 5 (5.3, 4.4)	1,000 rpm: 6.3 (6.7, 5.5) 3,000 rpm: 5.9 (6.2, 5.2)	
	RPM range rpm		680 — 9,800	680 — 9,600	
	Direction of rotation		Clockwise		
	Hydraulic oil (Power steering system)	Capacity ℓ (US qt, Imp qt)	Oil tank	0.2 (0.2, 0.2)	
Whole system			0.7 (0.7, 0.6)		

Steering wheel	Free play mm (in)		17 (0.67)		
Steering shaft	Clearance between the steering wheel and column cover mm (in)		2 — 4 (0.08 — 0.16)		
Steering gear-box (Power steering system)	Rack shaft play in the radial direction	Right-turn steering mm (in)	0.12 (0.005) or less		
		Left-turn steering mm (in)	0.3 (0.012) or less		
	Input shaft play	In radial direction mm (in)	0.26 (0.01) or less		
		In axial direction mm (in)	Without play		
	Rotation resistance N (kgf, lbf)		Maximum allowable value: 11.3 (1.15, 2.54) or less Difference between right and left sliding resistance: 24%		
Oil pump (Power steering system)	Pulley shaft	Radial play mm (in)	0.4 (0.016) or less		
		Axial play mm (in)	0.9 (0.035) or less		
	Pulley	Ditch deflection mm (in)	1.0 (0.039) or less		
		Rotation resistance N (kgf, 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 paved road N (kgf, lbf)		29.4 (3.0, 6.6) or less		
	At standstill with engine stalled on paved road N (kgf, lbf)		294.2 (30, 66.2) or less		

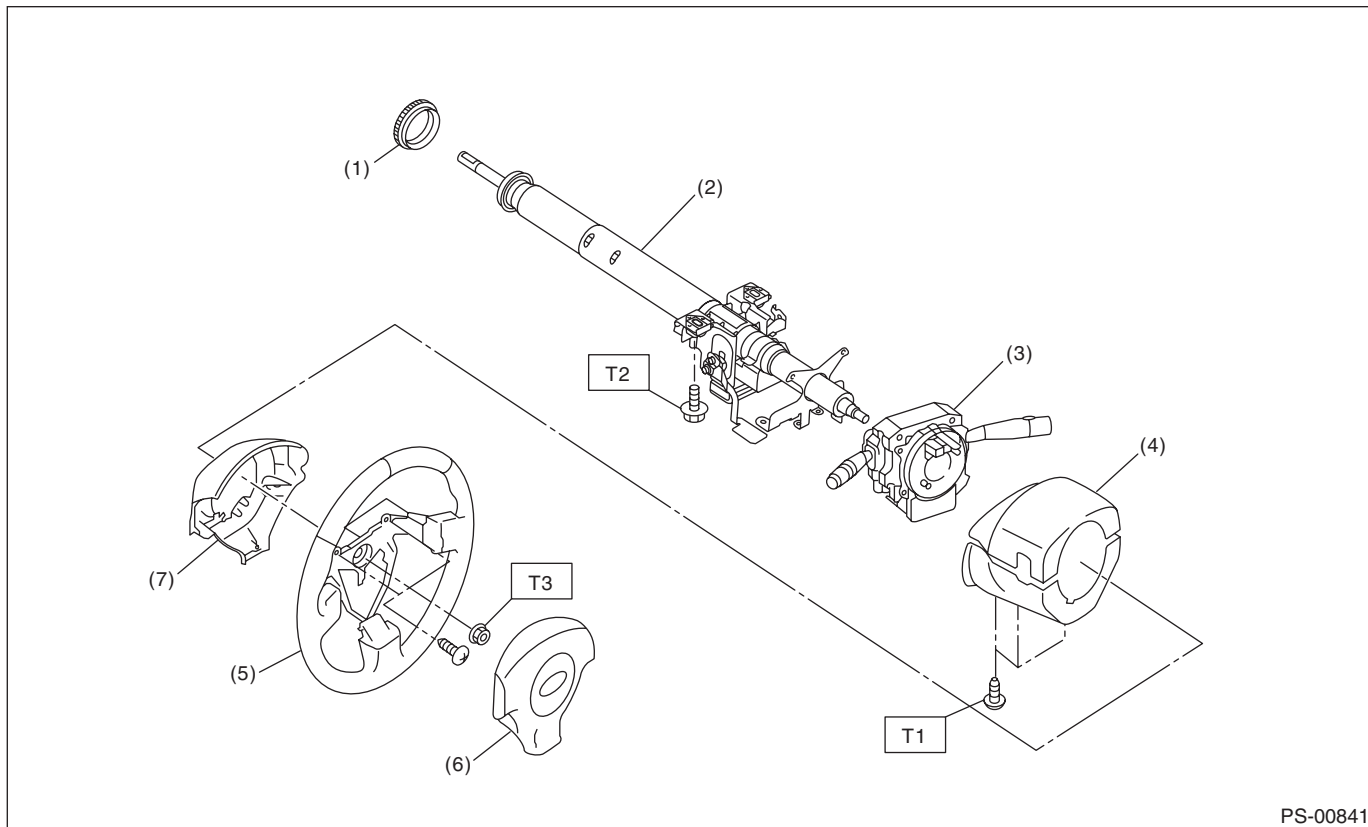
Recommended power steering fluid
SUBARU ATF or DEXRON III

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: 20 (2.0, 14.8)

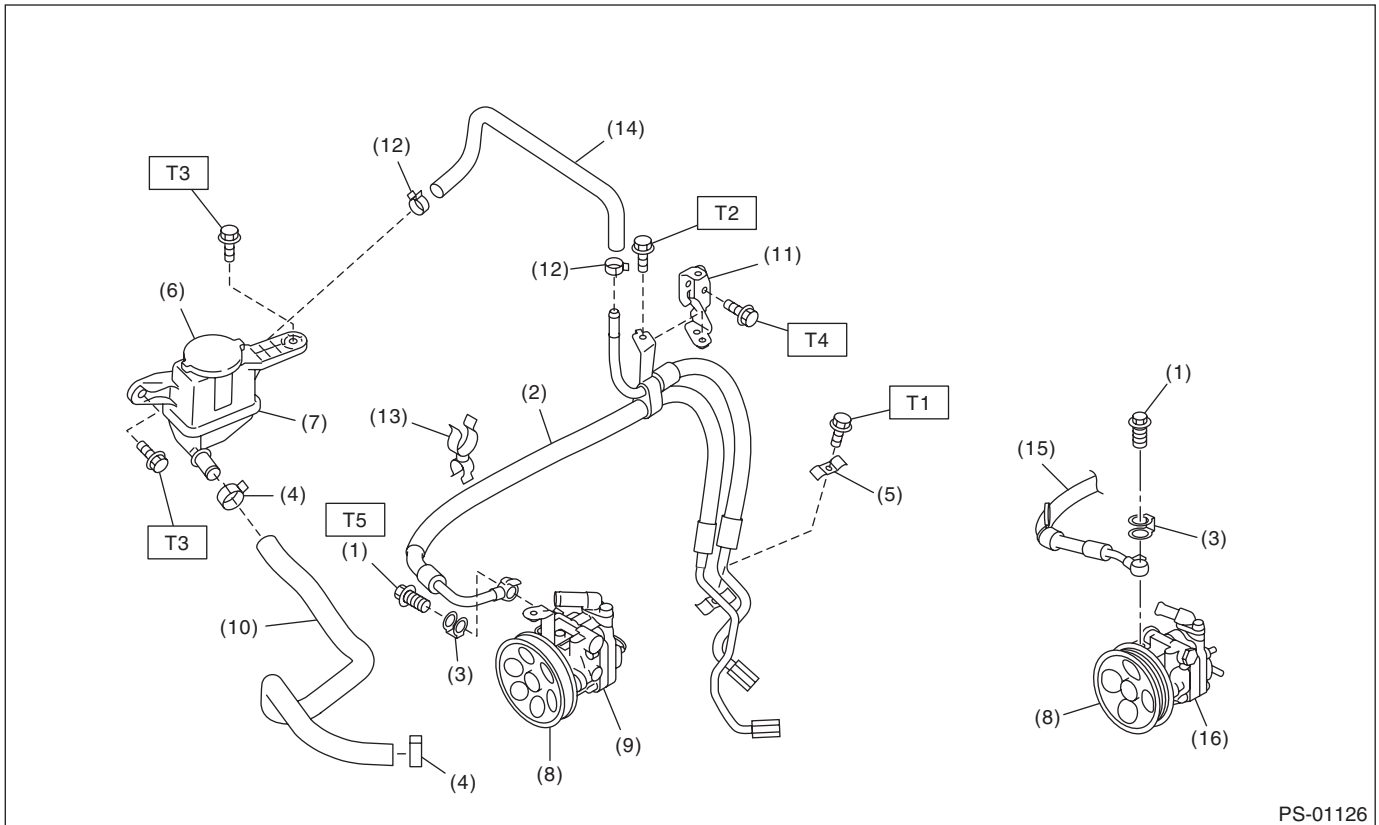
T3: 39 (4.0, 28.8)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

2. POWER ASSISTED SYSTEM

- Hose and tank



(1) Eye bolt	(9) Oil pump (turbo model)
(2) Hose (turbo model)	(10) Suction hose
(3) Eye bolt gasket	(11) Hose bracket
(4) Clip	(12) Clip
(5) Clamp E	(13) Clip
(6) Cap	(14) Return hose
(7) Reservoir tank	(15) Hose (non-turbo model)
(8) Pulley	(16) Oil pump (non-turbo model)

Tightening torque:N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

T2: 10 (1.0, 7.4)

T3: 13 (1.3, 9.6)

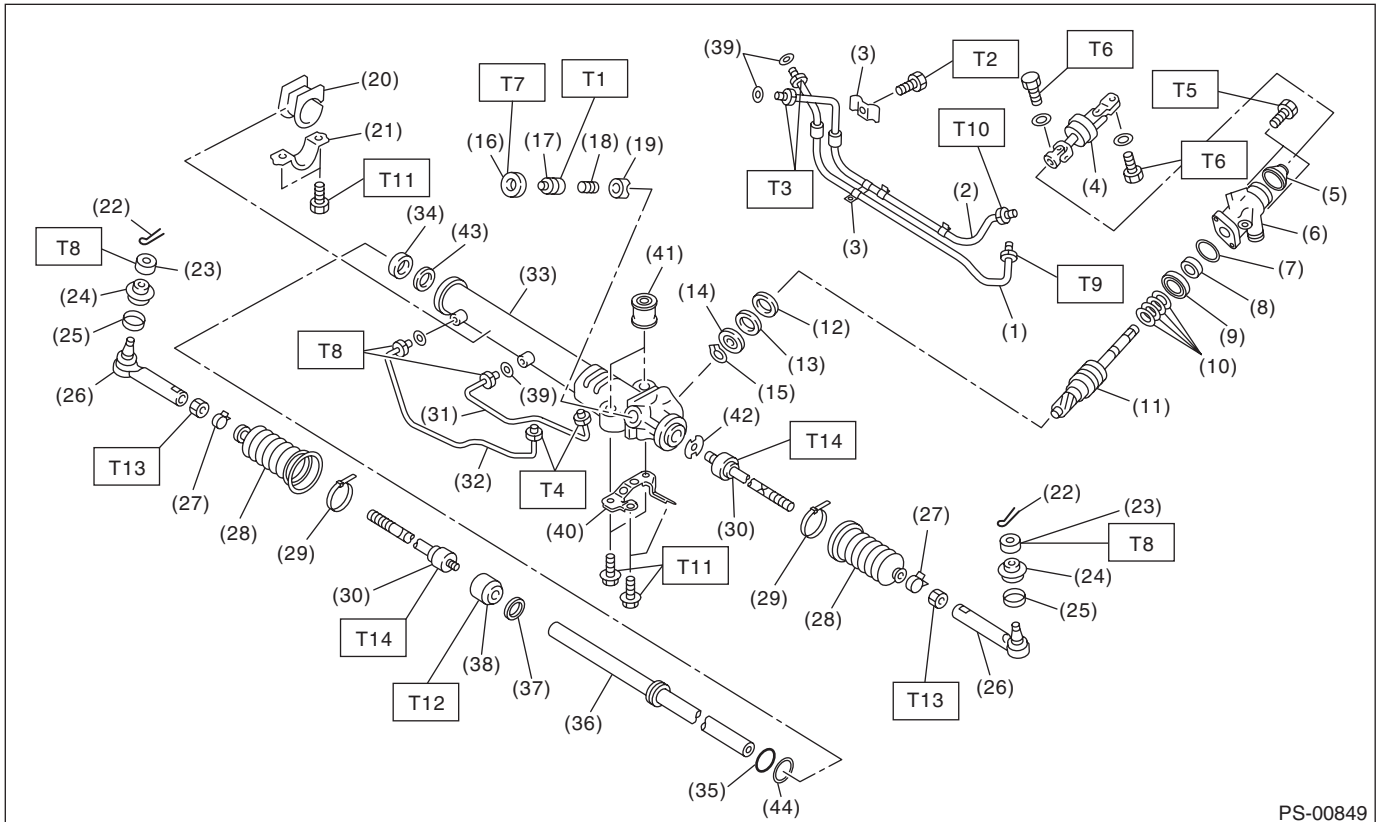
T4: 18 (1.8, 13.3)

T5: 40 (4.1, 29.5)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

• Gearbox



PS-00849

(1) Feed pipe	(21) Clamp	(41) Bushing
(2) Return pipe	(22) Cotter pin	(42) Lock washer
(3) Clamp plate	(23) Castle nut	(43) Back-up washer
(4) Universal joint	(24) Dust cover	(44) O-ring
(5) Dust seal	(25) Clip	
(6) Valve housing	(26) Tie-rod end	
(7) O-ring	(27) Clip	
(8) Oil seal	(28) Boot	
(9) Bushing	(29) Band	
(10) Seal ring	(30) Tie-rod	
(11) Pinion & valve ASSY	(31) Pipe B	
(12) Oil seal	(32) Pipe A	
(13) Back-up washer	(33) Steering body	
(14) Ball bearing	(34) Oil seal	
(15) Snap ring	(35) Piston ring	
(16) Lock nut	(36) Rack	
(17) Adjusting screw	(37) Oil seal	
(18) Spring	(38) Holder	
(19) Sleeve	(39) O-ring	
(20) Adapter	(40) Stiffener	

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

T1: 3.9 (0.4, 2.9)

T2: 10 (1.0, 7.4)

T3: 15 (1.5, 11.1)

T4: 17 (1.7, 12.5)

T5: 20 (2.0, 14.8)

T6: 24 (2.4, 17.7)

T7: 25 (2.5, 18.4)

T8: 27 (2.8, 19.9)

T9: 37 (3.8, 27.3)

T10: 29 (3.0, 21.4)

T11: 60 (6.1, 44.3)

T12: 70 (7.1, 51.6)

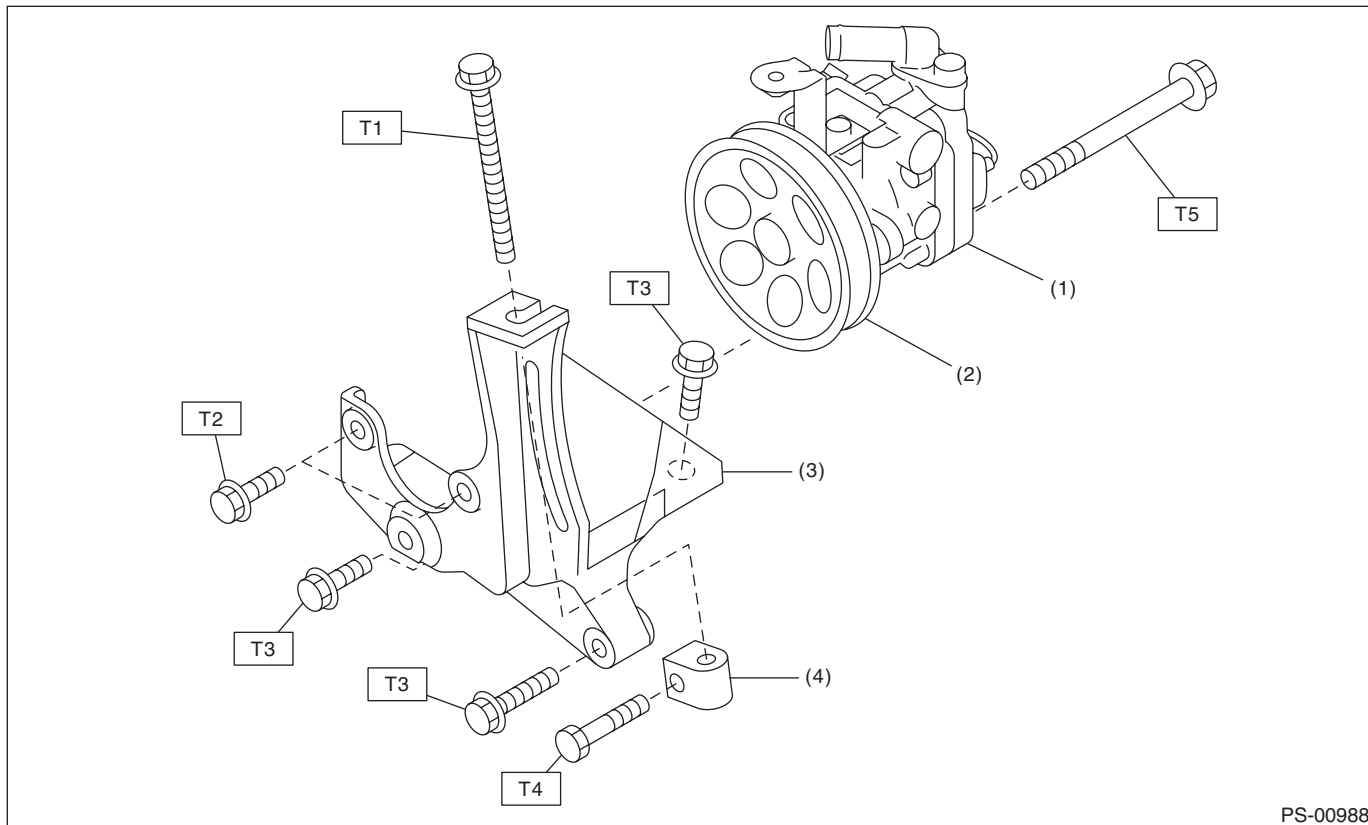
T13: 85 (8.7, 62.7)

T14: 90 (9.2, 66.4)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

3. OIL PUMP



PS-00988

- (1) Oil pump
- (2) Pulley
- (3) Bracket
- (4) Belt tension nut

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.9)

T2: 16 (1.6, 11.8)

T3: 22 (2.2, 16.2)

T4: 25 (2.5, 18.4)

T5: 36 (3.7, 26.6) (non-turbo model)

48 (4.9, 35.4) (turbo model)

General Description

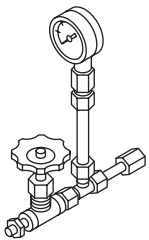
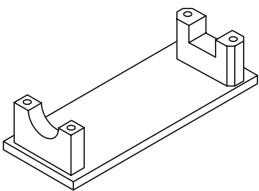
POWER ASSISTED SYSTEM (POWER STEERING)

C: CAUTION

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

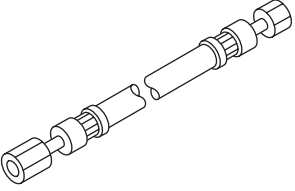
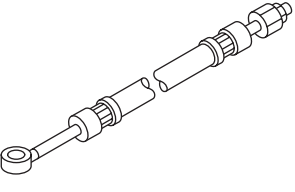
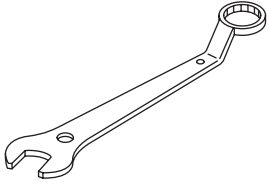
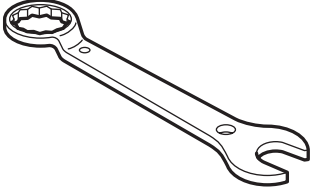
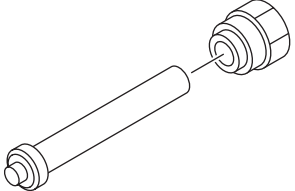
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pressure.
 ST-926200000	926200000	STAND	• Used when inspecting characteristic of gear-box assembly and disassembling it. • Used together with BOSS D (34199AG000).

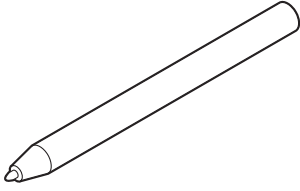
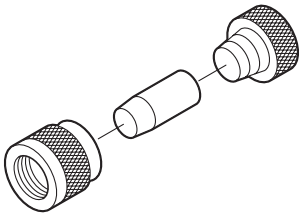
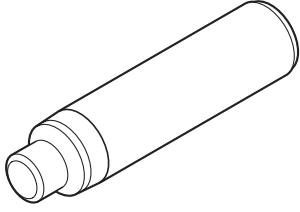
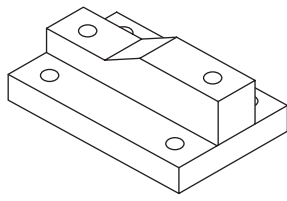
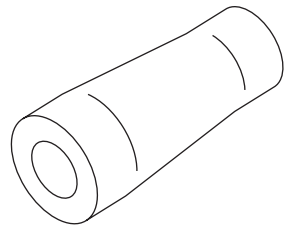
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used together with PRESSURE GAUGE (925711000).
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used together with PRESSURE GAUGE (925711000).
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gearbox.
 ST34099PA100	34099PA100	SPANNER	Used when measuring the rotating resistance of gearbox assembly.
 ST-926420000	926420000	PLUG	When fluid leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check fluid leaking points.

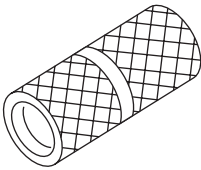
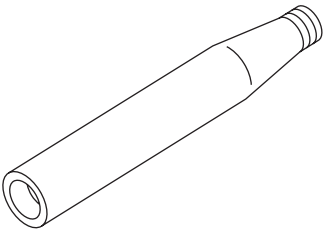
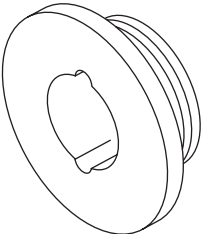
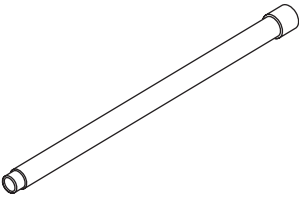
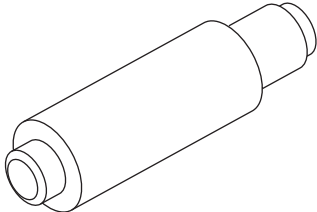
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA060	34099FA060	PUNCH HOLDER	Used for crimping.
 ST34199FE040	34199FE040	INSTALLER A, B, C	• Used for installing the oil seal to the rack assembly. • INSTALLER A: 34199FE070 • INSTALLER B: 34199FE080 • INSTALLER C: 34199FE090
 ST34199FE000	34199FE000	INSTALLER & REMOVER	Used for removing and installing the rack oil seal (outer and inner).
 ST34199AG000	34199AG000	BOSS D	• Used when inspecting characteristic of gear-box assembly and disassembling it. • Used together with STAND (926200000).
 ST34199AG040	34199AG040	GUIDE	Used for installing seal ring of rack.

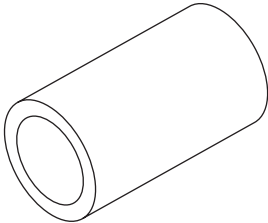
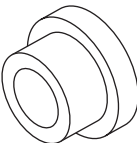
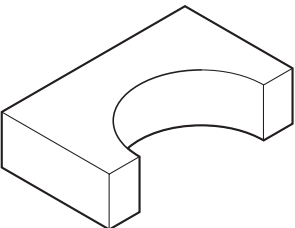
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AG070	34199AG070	FORMER	Used for forming seal ring of pinion.
 ST34199AG020	34199AG020	GUIDE	Used for installing seal ring of pinion.
 ST34199AG060	34199AG060	GUIDE G (26)	• Used for forming seal ring of rack. • Used together with FORMER PISTON (34199AG080).
 ST34099PA010	34099PA010	OIL SEAL REMOVER	Used for removing oil seal.
 ST34199AG090	34199AG090	INSTALLER & REMOVER	• Used for installing oil seal of valve housing. • Used together with SEAL INSTALLER (34099FA130). • Used for installing ball bearing of valve housing. • Used for removing oil seal and ball bearing from valve housing.

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AG080	34199AG080	FORMER PISTON	- Used for forming seal ring of rack. - Used together with GUIDE G (26) (34199AG060).
 ST34199AG010	34199AG010	INSTALLER	Used for pressing-fit oil seal of gearbox cylinder.
 ST34199FE020	34199FE020	BASE	Used for crimping.

Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

2. Steering Wheel

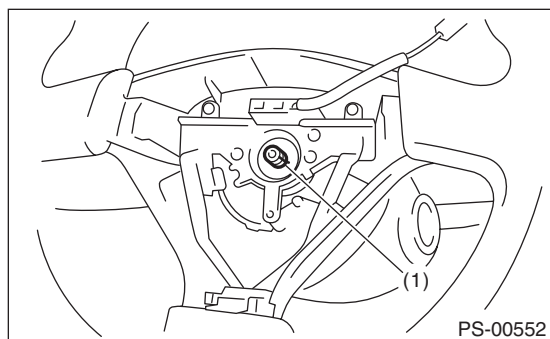
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Set the tire to the straight-ahead position.
- 3) Remove the airbag module. <Ref. to AB-15, REMOVAL, Driver's Airbag Module.>

WARNING:

Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-5, CAUTION, General Description.>

- 4) Place alignment marks on the steering wheel and steering shaft.



(1) Alignment mark

- 5) Remove the steering wheel nut, and then draw out the steering wheel from shaft using steering puller.

B: INSTALLATION

WARNING:

Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-5, CAUTION, General Description.>

- 1) Align the center position of the roll connector. <Ref. to AB-26, ADJUSTMENT, Roll Connector.>
- 2) Install in the reverse order of removal.

NOTE:

Align the alignment marks on the steering wheel and steering shaft.

Tightening torque:

39 N·m (4.0 kgf-m, 28.8 ft-lb)

Column cover-to-steering wheel clearance:

2 — 4 mm (0.08 — 0.16 in)

CAUTION:

Insert the roll connector guide pin into the guide hole on the lower end of the steering wheel surface. Avoid damaging the pin.

C: INSPECTION

- 1) Check the steering wheel for deformation. If the deformation is excessive, replace the steering wheel.
- 2) Check the splines on the steering wheel for damage. If the damage is excessive, replace the steering wheel.

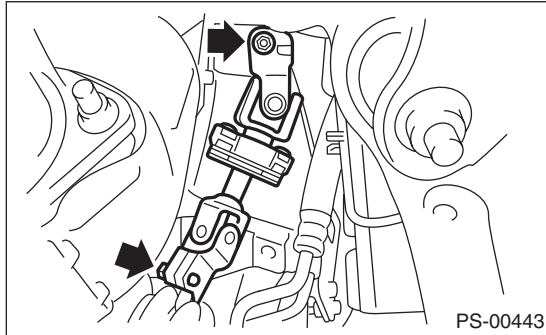
Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

3. Universal Joint

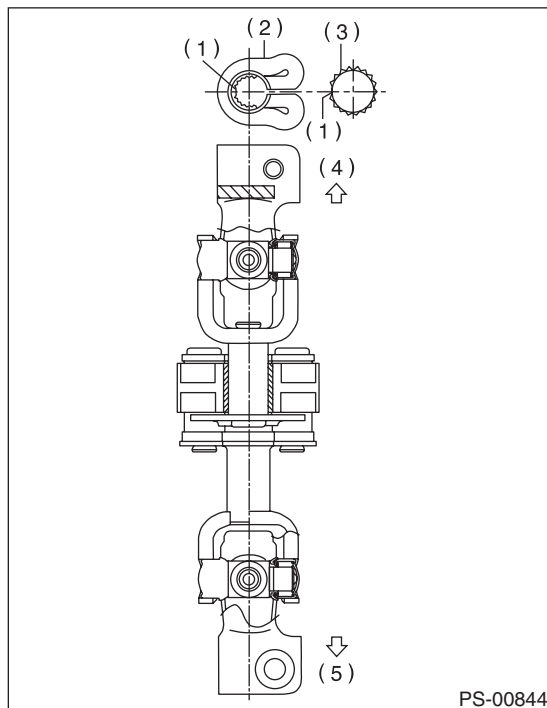
A: REMOVAL

- 1) Remove the steering wheel. <Ref. to PS-12, REMOVAL, Steering Wheel.>
- 2) Place alignment marks on universal joint.
- 3) Remove the universal joint bolt and remove the universal joint.



B: INSTALLATION

- 1) Align the cutout portion at serrated section of the column shaft and yoke, then install the universal joint into column shaft.



- (1) Cutout portion
- (2) Yoke
- (3) Column shaft
- (4) Column shaft side
- (5) Gearbox side

- 2) Install the universal joint to the serrations of gearbox assembly by matching alignment marks.
- 3) Tighten the bolts.

Tightening torque:

24 N·m (2.4 kgf-m, 17.7 ft-lb)

CAUTION:

Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Clearance between coupling of universal joint and turbo cover:

15 mm (0.59 in) or more

- 4) Align the center position of the roll connector. <Ref. to AB-26, ADJUSTMENT, Roll Connector.>
- 5) Install the steering wheel. <Ref. to PS-12, INSTALLATION, Steering Wheel.>

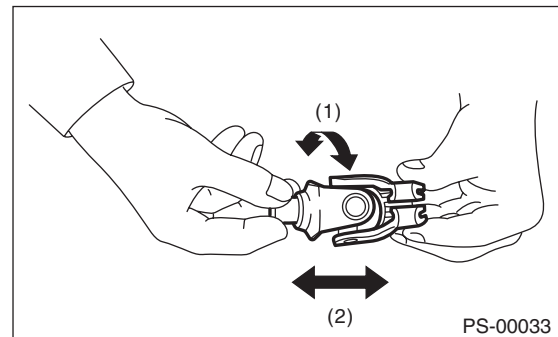
C: INSPECTION

- 1) Check for wear, damage or any other faults. Replace as necessary

Service limit:

Universal joint play: 0 mm (0 in)

Maximum swing torque: 0.3 N (0.03 kgf, 0.07 lbf)

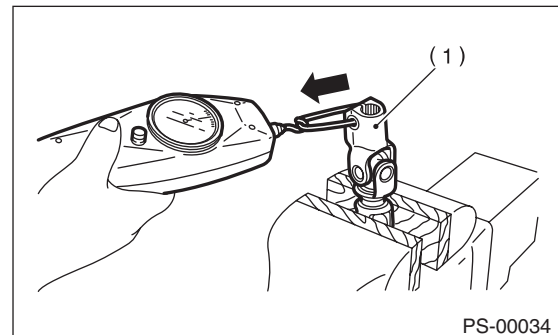


- (1) Swing torque
- (2) Play

- 2) Measure the swing torque of universal joint.

Service limit:

Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



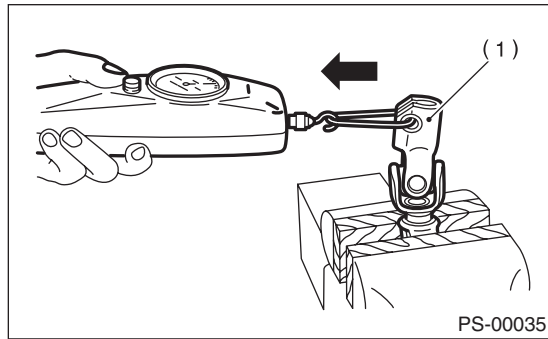
- (1) Yoke (Gearbox side)

Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

Service limit:

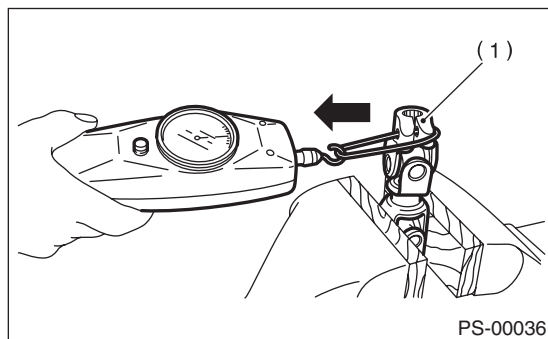
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



(1) Yoke (Gearbox side)

Service limit:

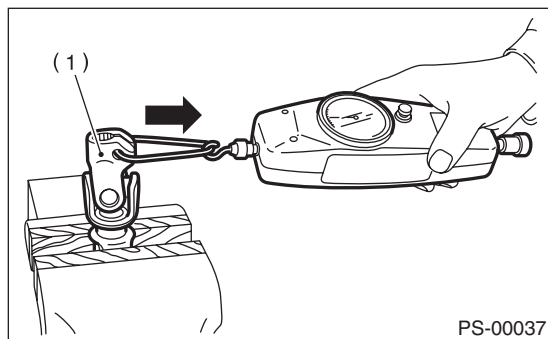
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

Service limit:

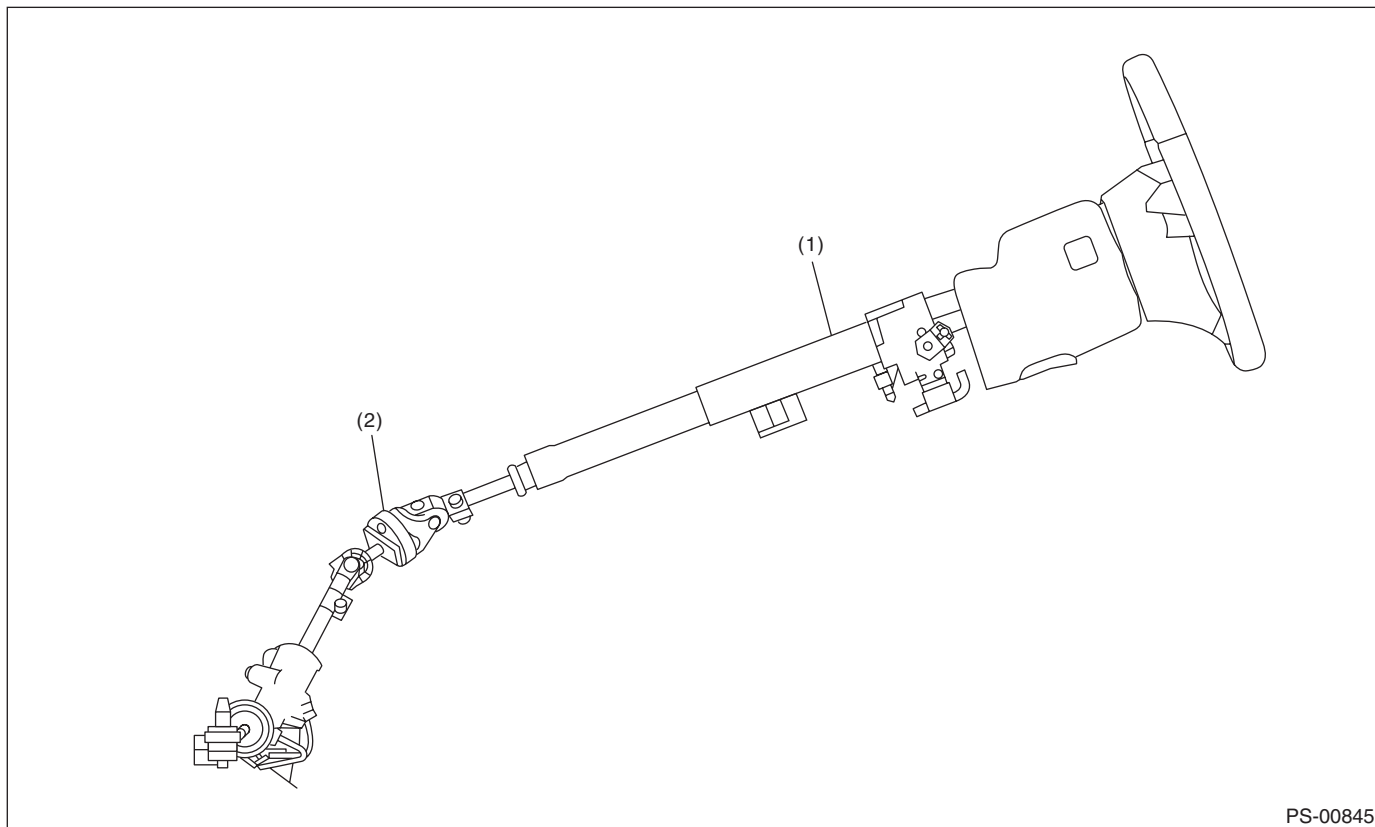
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

4. Tilt Steering Column

A: REMOVAL



PS-00845

(1) Tilt steering column

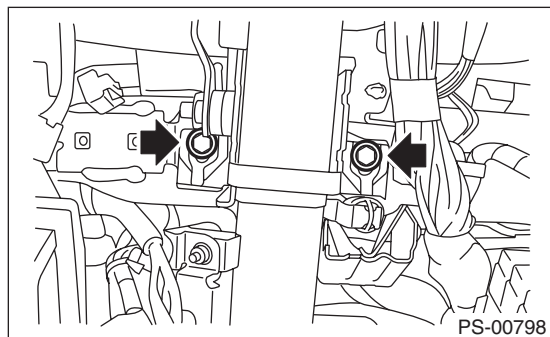
(2) Universal joint

- 1) Adjust the tilt position of the steering column to the highest position and lock the tilt lever.
- 2) Remove the steering wheel. <Ref. to PS-12, REMOVAL, Steering Wheel.>
- 3) Remove the universal joint. <Ref. to PS-13, REMOVAL, Universal Joint.>
- 4) Remove the instrument panel lower cover under.
- 5) Remove the instrument panel lower cover upper.
- 6) Remove all connectors from the steering column.
- 7) Remove the two bolts under instrument panel securing the steering column.

- 8) Pull out the steering shaft assembly from the hole on toe board.

CAUTION:

- Always remove the universal joint before removing the steering column installation bolt to avoid damage to the universal joint.
- Do not loosen the tilt lever when the steering column is not secured to the vehicle.



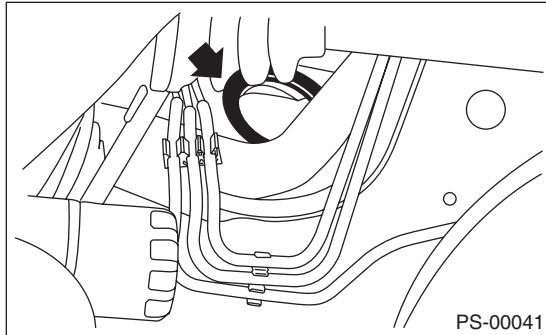
PS-00798

Tilt Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

- 1) Install the grommet to the toe board.



- 2) Insert the end of the steering shaft into the toe board grommet.
- 3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:

20 N·m (2.0 kgf-m, 14.8 ft-lb)

- 4) Connect all the connectors under the instrument panel.
- 5) Connect the airbag system connector at the harness spool.

NOTE:

Make sure to apply double lock.

- 6) Install the instrument panel lower cover with tilt lever held in the lowered position.
- 7) Install the universal joint. <Ref. to PS-13, INSTALLATION, Universal Joint.>
- 8) Align the center position of the roll connector. <Ref. to AB-26, ADJUSTMENT, Roll Connector.>
- 9) Install the steering wheel. <Ref. to PS-12, INSTALLATION, Steering Wheel.>

CAUTION:

Insert the roll connector guide pin into the guide hole on lower end of steering wheel surface to prevent damage.

C: DISASSEMBLY

Remove the two screws securing the upper steering column covers, and the two screws securing the combination switch, and then remove related parts.

D: ASSEMBLY

Insert the combination switch to the upper column shaft, and install the upper column cover. Then route the ignition key harness and combination switch harness between the column cover mounting bosses.

Tightening torque:

1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

CAUTION:

Do not overtorque the screw.

E: INSPECTION

1. BASIC INSPECTION

Measure the overall length of steering column. If not within specification, replace it.

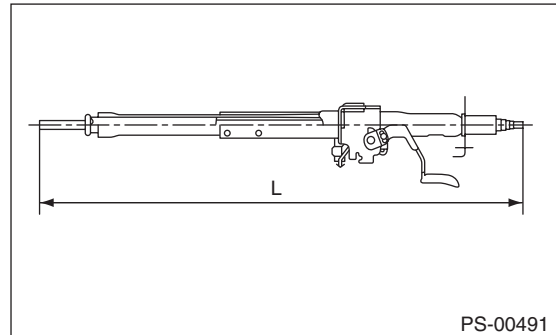
Standard: Overall length L

Tilt column

$833.6^{+1.3}_{-0.3}$ mm ($32.82^{+0.051}_{-0.012}$ in)

Tilt & telescopic column (measure while minimized)

$818.6^{+1.5}_{-1.5}$ mm ($32.23^{+0.059}_{-0.059}$ in)



2. INSPECTION OF AIRBAG SYSTEM

Refer to "Airbag System" for airbag inspection procedure. <Ref. to AB-15, INSPECTION, Driver's Airbag Module.>

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

5. Steering Gearbox

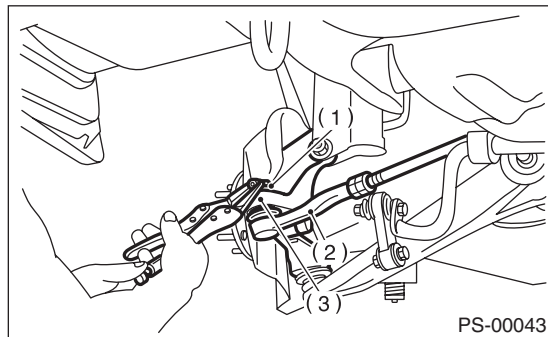
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Loosen the front wheel nuts.
- 4) Lift up the vehicle, and remove the front wheels.
- 5) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
- 6) Remove the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-6, REMOVAL, Front Exhaust Pipe.>

WARNING:

Be careful not to burn yourself because the exhaust pipe is hot.

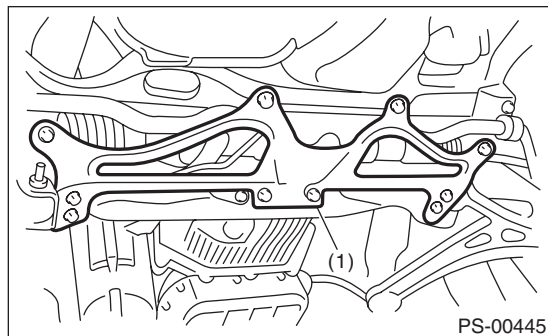
- 7) After pulling off the cotter pin and removing the castle nut, use a puller to remove the tie-rod end from the knuckle arm.



- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

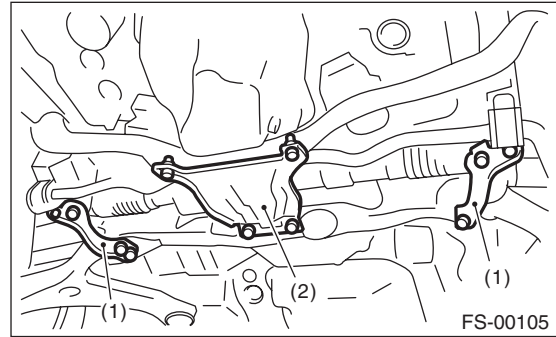
- 8) Remove the front crossmember support plate, jack-up plate and front stabilizer. <Ref. to FS-15, REMOVAL, Front Stabilizer.>

• Large type



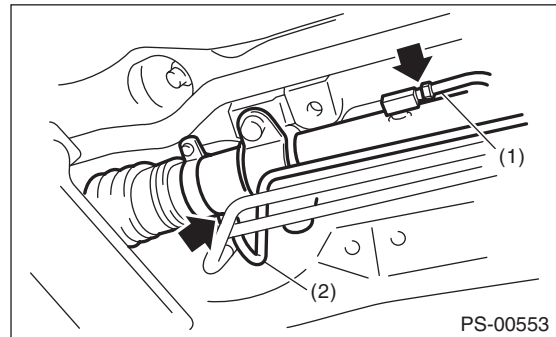
- (1) Front crossmember support plate

• Small type



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

- 9) Remove the one pipe joint at the center of the gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



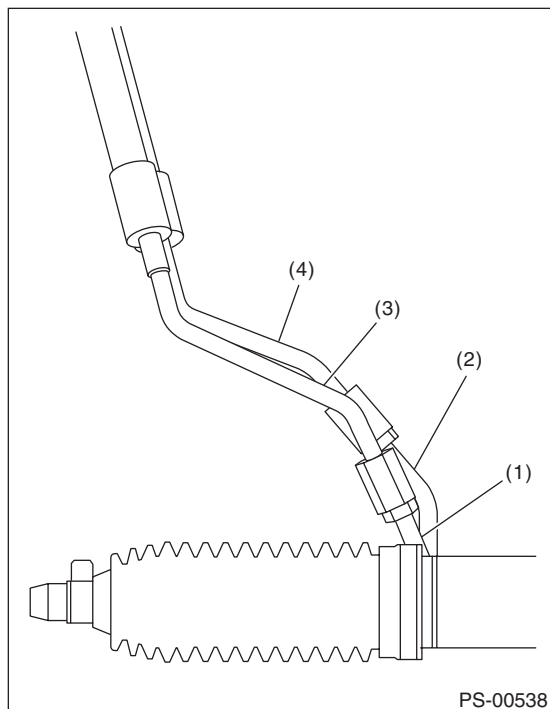
- (1) Pipe A
- (2) Pipe B

- 10) Remove the universal joint. <Ref. to PS-13, REMOVAL, Universal Joint.>

Steering Gearbox

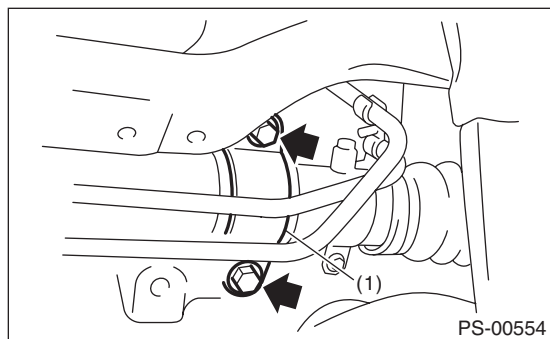
POWER ASSISTED SYSTEM (POWER STEERING)

11) Disconnect the feed pipe from pressure hose first, then disconnect return pipe from the return hose.



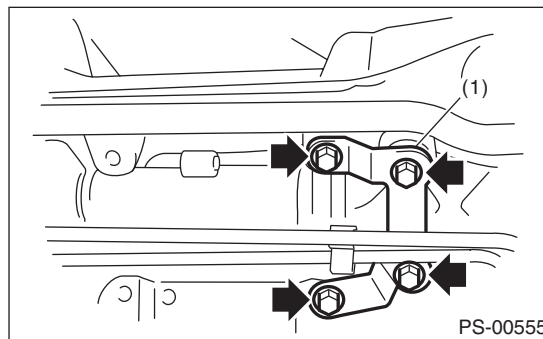
- (1) Feed pipe
- (2) Return pipe
- (3) Pressure hose
- (4) Return hose

12) Remove the clamp bolts securing the gearbox to the crossmember, and remove the clamp.



- (1) Clamp

13) Remove the bolts which secure the gearbox bracket, and remove the stiffener and gearbox.

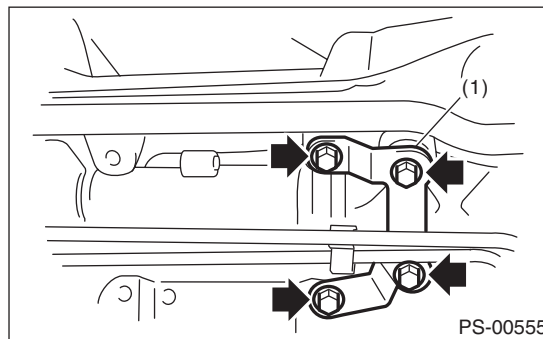


- (1) Stiffener

B: INSTALLATION

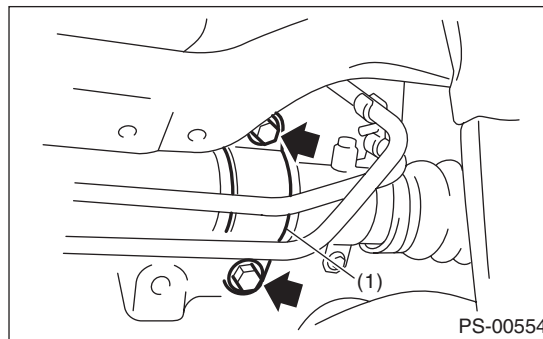
1) Insert the gearbox into crossmember, being careful not to damage gearbox boot.

2) Install the gearbox and stiffener. Temporarily tighten the bolts.



- (1) Stiffener

3) Insert bolts through the clamp to temporarily tighten the gearbox to the crossmember bracket.



- (1) Clamp

4) Tighten the bolts temporarily holding the gearbox clamp and bracket together to the specified torque.

Tightening torque:

60 N·m (6.1 kgf-m, 44.3 ft-lb)

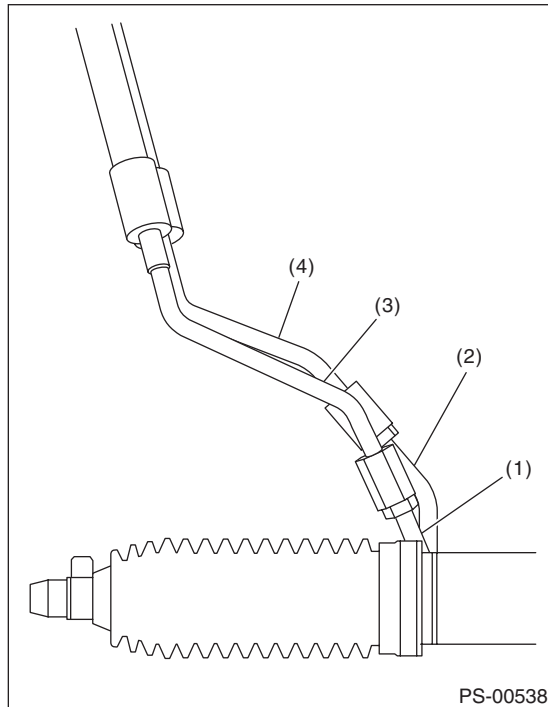
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

5) Connect return pipe to the return hose, then connect feed pipe to the pressure hose.

Tightening torque:

15 N·m (1.5 kgf-m, 11.1 ft-lb)



- (1) Feed pipe
- (2) Return pipe
- (3) Pressure hose
- (4) Return hose

6) Install the universal joint. <Ref. to PS-13, INSTALLATION, Universal Joint.>

7) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

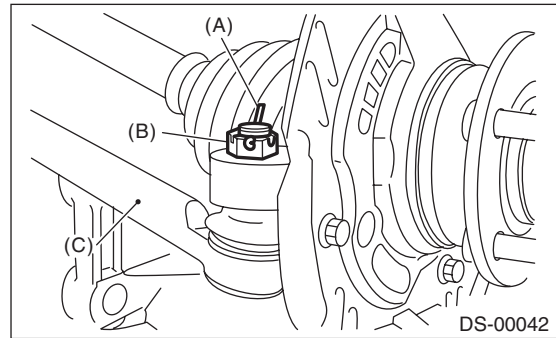
Castle nut tightening torque:

27 N·m (2.8 kgf-m, 19.9 ft-lb)

CAUTION:

When connecting, do not hit the cap at the bottom of tie-rod end with hammer.

8) After tightening the castle nut to the specified tightening torque, tighten it further within 60° until the cotter pin hole is aligned with slot in the nut. Fit the cotter pin into the nut, and then bend the pin to lock.



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

9) Install the front stabilizer. <Ref. to FS-15, INSTALLATION, Front Stabilizer.>

10) Install the front crossmember support plate and jack-up plate.

11) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-7, INSTALLATION, Front Exhaust Pipe.>

12) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>

13) Install the front wheels.

14) Tighten the wheel nuts to the specified torque.

Tightening torque:

100 N·m (10.2 kgf-m, 73.8 ft-lb)

15) Lower the vehicle.

16) Remove the steering wheel. <Ref. to PS-12, REMOVAL, Steering Wheel.>

17) Align the center position of the roll connector. <Ref. to AB-26, ADJUSTMENT, Roll Connector.>

18) Install the steering wheel. <Ref. to PS-12, INSTALLATION, Steering Wheel.>

19) Connect the ground cable to battery.

20) Pour fluid into the oil tank, and bleed air. <Ref. to PS-49, Power Steering Fluid.>

21) Check for fluid leaks.

22) Check the fluid level in oil tank.

23) After adjusting toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:

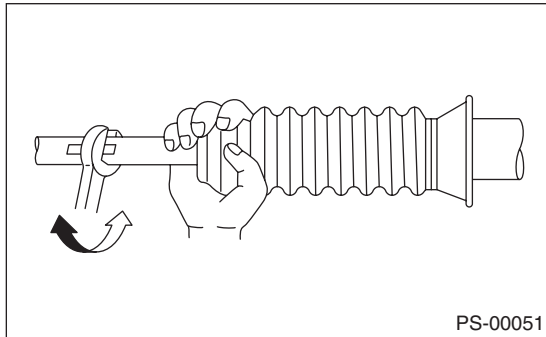
85 N·m (8.7 kgf-m, 62.7 ft-lb)

Steering Gearbox

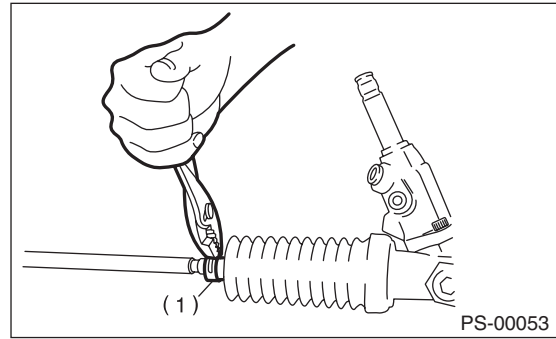
POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:

When adjusting toe-in, hold the boot as shown to prevent it from being rotated or twisted. If it becomes twisted, straighten it.



4) Remove the small clip from the boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

C: DISASSEMBLY

1. RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:

Remove the pipes C and D, which are fixed to clamp plate, as a unit.

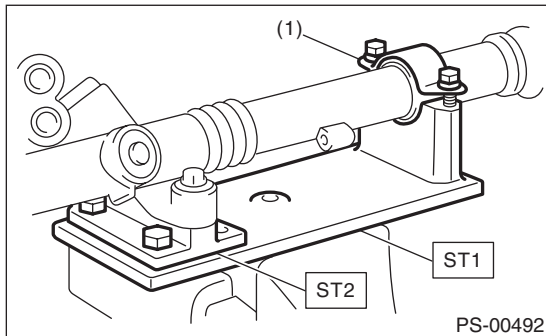
2) Secure the gearbox removed from vehicle in a vise using ST.

ST1 926200000 STAND

ST2 34199AG000 BOSS D

CAUTION:

Secure the gearbox in a vise using ST as shown in the figure. Do not secure the gearbox without this ST.



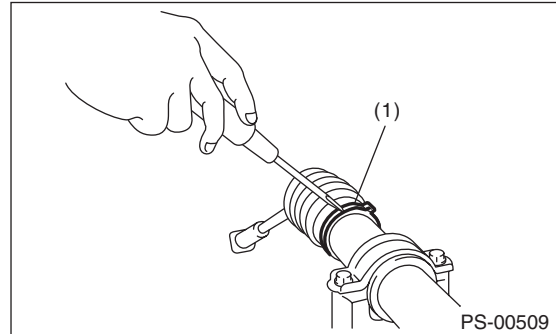
(1) Clamp

3) Remove the tie-rod end and lock nut from gearbox.

5) Using a flat tip screwdriver, remove the band from boot.

NOTE:

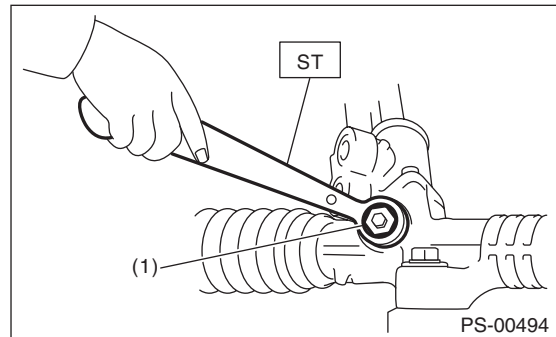
Replace the boot if there is damage, cracks or deterioration.



(1) Band

6) Using the ST, loosen the lock nut.

ST 926230000 SPANNER

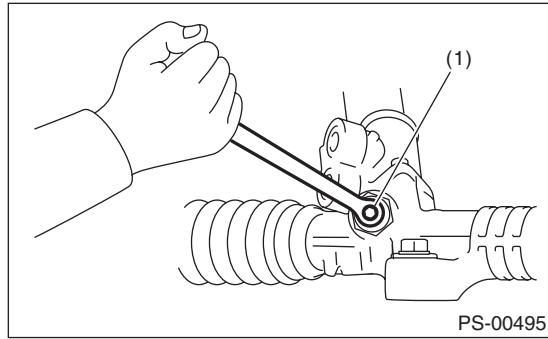


(1) Lock nut

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

7) Tighten the adjusting screw until it can no longer be tightened.

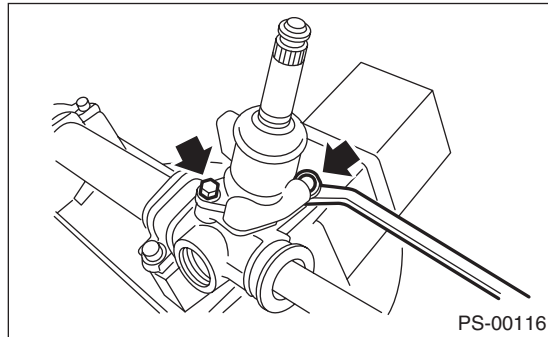


(1) Adjusting screw

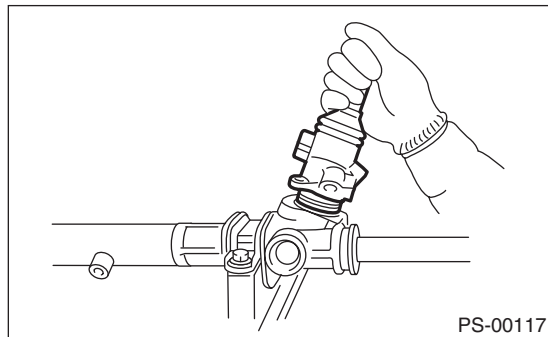
8) Remove the tie-rod.

9) Loosen the adjusting screw, and remove the spring and sleeve.

10) Remove the two bolts securing valve assembly.



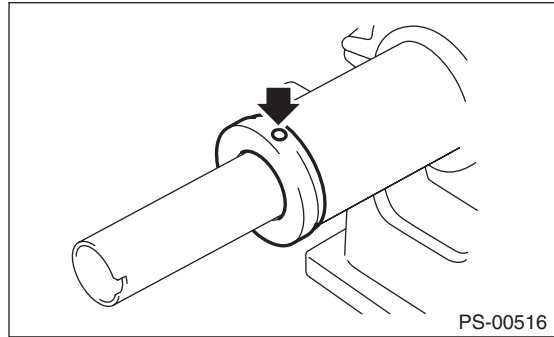
11) Carefully draw out the input shaft and remove the valve assembly.



12) Using a drill, release the crimping of holder.

CAUTION:

Make a hole of 2 mm (0.08 in) depth using a drill with 3 mm (0.12 in) diameter.



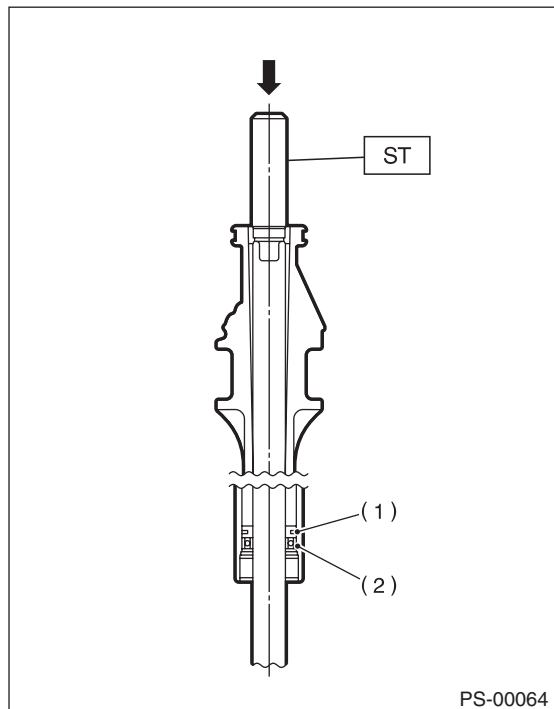
13) Remove the holder.

14) Attach the ST to the pinion housing side of the rack, and push out the rack together with the outer side oil seal.

ST 34199FE000 INSTALLER & REMOVER

NOTE:

Block the pipe connection of steering body to prevent fluid from flowing out.



(1) Rack piston

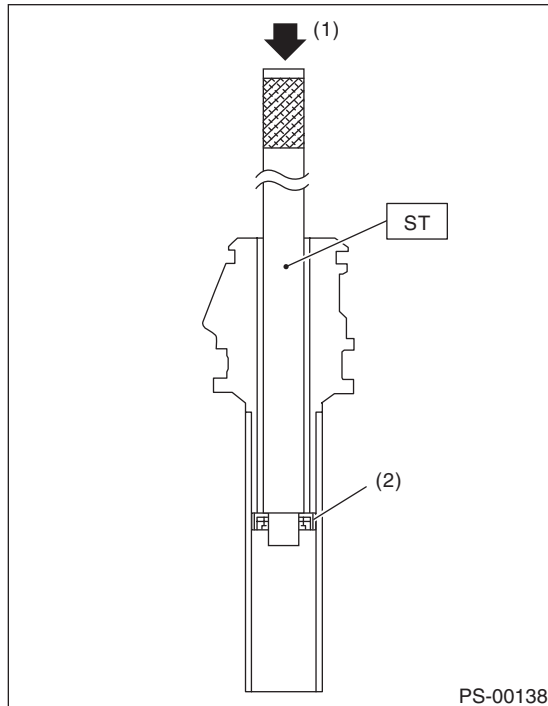
(2) Outer side oil seal

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

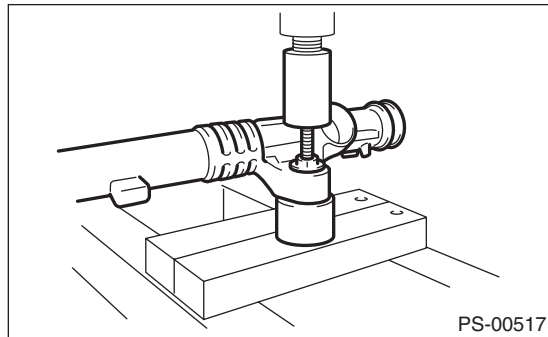
15) Insert the ST from pinion housing side and remove the oil seal using a press.

ST 34099PA010 OIL SEAL REMOVER



- (1) Press
- (2) Oil seal

16) Using a press, remove the bushing of gearbox installation portion.



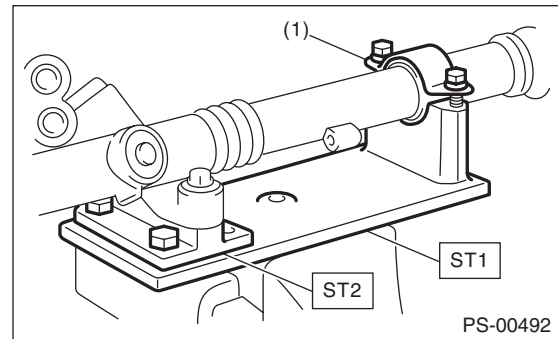
2. CONTROL VALVE

1) Disconnect the pipes A and B from gearbox.
2) Secure the gearbox removed from vehicle in a vise using ST.

ST1 926200000 STAND
ST2 34199AG000 BOSS D

CAUTION:

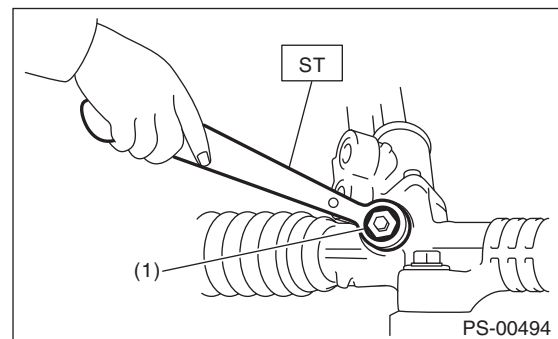
Secure the gearbox in a vise using ST as shown in the figure. Do not secure the gearbox without this ST.



- (1) Clamp

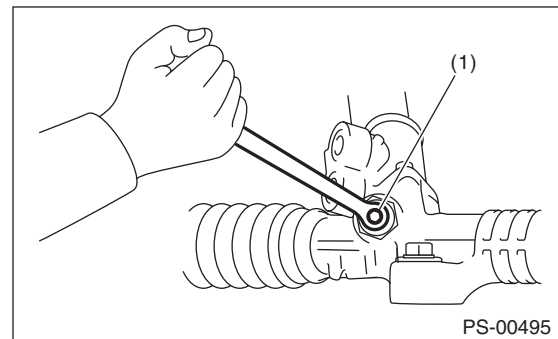
3) Using the ST, loosen the lock nut.

ST 926230000 SPANNER



- (1) Lock nut

4) Tighten the adjusting screw until it can no longer be tightened.



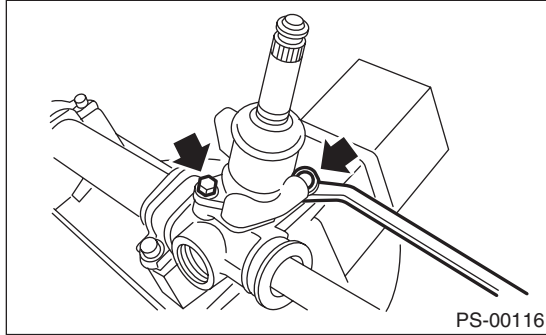
- (1) Adjusting screw

5) Loosen the adjusting screw, and remove the spring and sleeve.

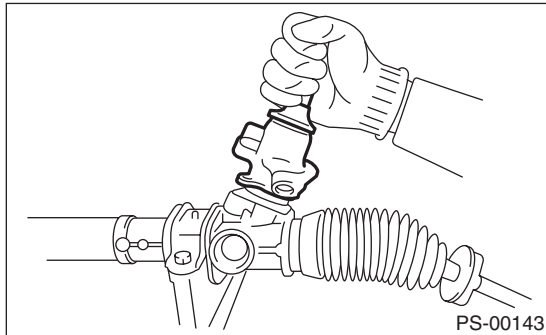
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

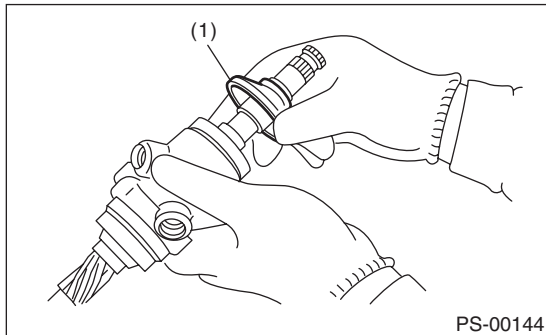
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft and remove the valve assembly.

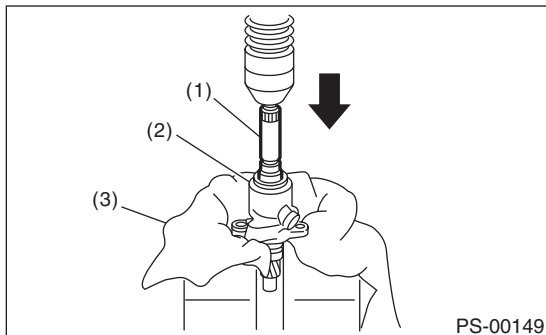


8) Put a vinyl tape around the spline portion, and slide the dust cover to remove.



(1) Dust cover

9) Using a press, remove the pinion & valve assembly from valve housing.



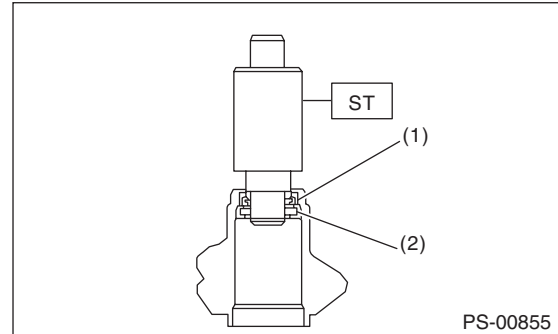
(1) Pinion & valve ASSY
(2) Valve housing
(3) Cloth

10) Using the ST and a press, remove the bushing and oil seal from the valve housing.

ST 34199AG090 INSTALLER & REMOVER

CAUTION:

- Do not apply a force to the end surface of valve housing.
- Do not reuse the oil seal after removal.

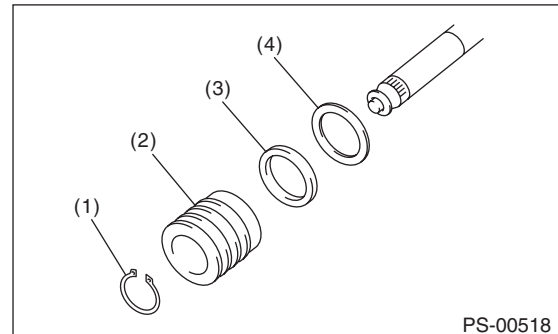


(1) Oil seal
(2) Bushing

11) Using a snap ring pliers, remove the snap ring, valve, oil seal and back-up washer.

CAUTION:

Be careful not to scratch the pinion and valve assembly.



(1) Snap ring
(2) Valve
(3) Oil seal
(4) Back-up ring

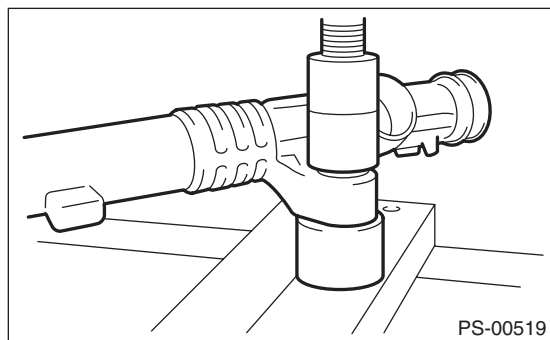
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

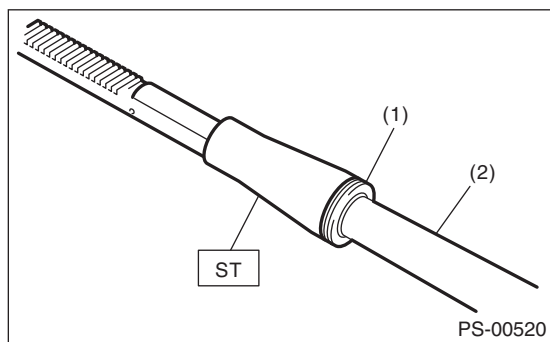
D: ASSEMBLY

1. RACK HOUSING ASSEMBLY

1) Using a press, install the bushing to gearbox installation portion.



2) Insert the ST to rack.
ST 34199AG040 GUIDE



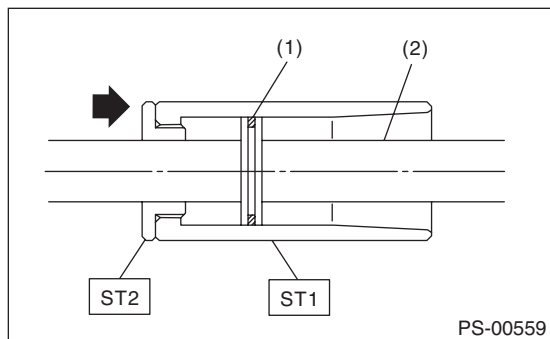
- (1) Seal ring
- (2) Rack

3) Install the seal ring to piston portion of rack.

4) Using the ST, form the seal ring properly.

ST1 34199AG080 FORMER PISTON

ST2 34199AG060 GUIDE G (26)



- (1) Seal ring
- (2) Rack

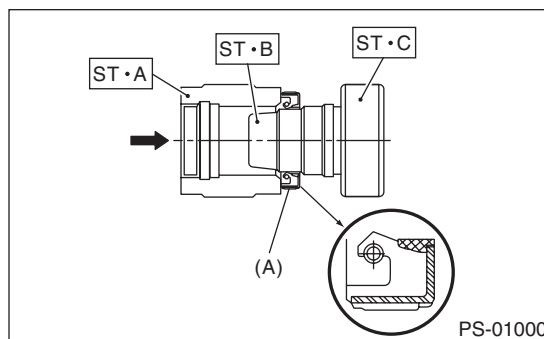
5) Using the ST A and ST B, attach the oil seal to ST C.

ST 34199FE040 INSTALLER A, B, C

- INSTALLER A: 34199FE070
- INSTALLER B: 34199FE080
- INSTALLER C: 34199FE090

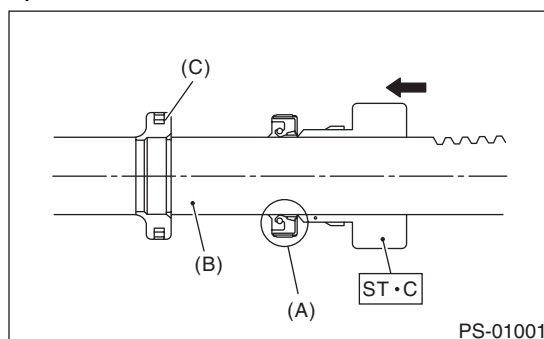
NOTE:

Face the oil seal in the direction as shown in the figure.



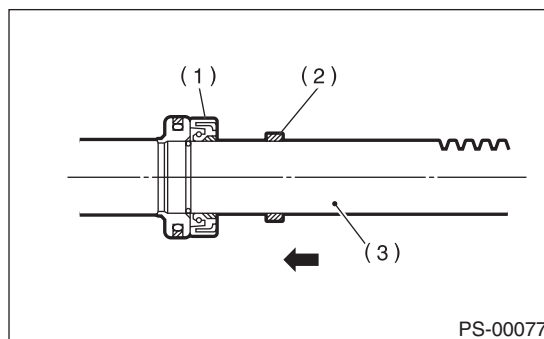
(A) Oil seal

6) Insert the ST C with oil seal assembled from the gear side of rack. Remove the oil seal from ST C near piston, and then remove the ST C from rack.



- (A) Oil seal
- (B) Rack
- (C) Piston

7) Install the back-up washer from the gear side of rack.



- (1) Oil seal
- (2) Back-up washer
- (3) Rack

8) Check the threaded end of holder and gearbox cylinder end for burrs, damage, etc. Correct if faulty.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

9) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Then insert the rack into steering body from cylinder side.

10) Temporarily tighten a new holder to the gearbox cylinder.

11) Put a mark at the specified position measured from the end surface of ST, as shown in the figure.

Specified position:

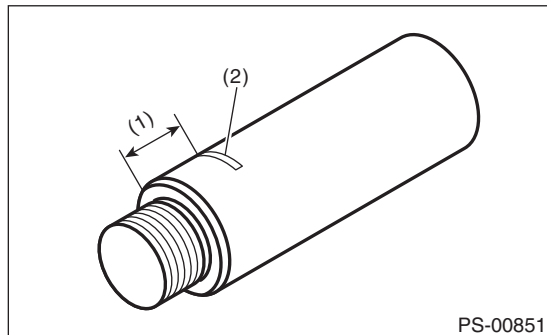
Except for WRX-SS:

12.7 mm (0.5 in)

WRX-SS:

13.5 mm (0.53 in)

ST 34199FE000 INSTALLER & REMOVER



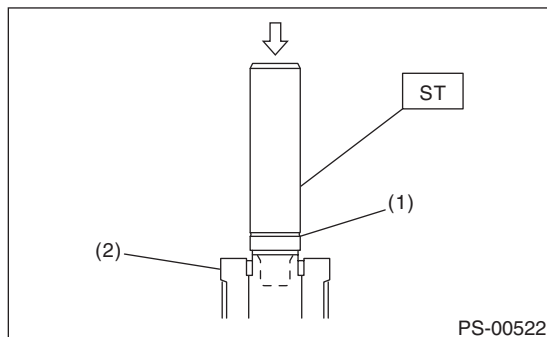
(1) 12.7 mm (0.5 in) or 13.5 mm (0.53 in)

(2) Put a mark.

12) Set the ST to the end of rack.

ST 34199FE000 INSTALLER & REMOVER

13) Using a press, press-fit until the mark on the ST is aligned with the end surface of the holder.



(1) Mark

(2) Holder

14) Remove the ST and holder.

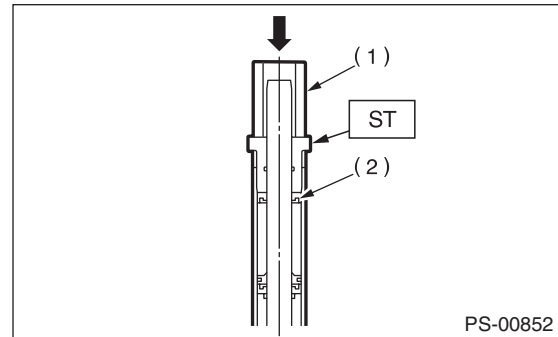
15) Insert the outer side oil seal into the rack using the same procedure as steps 5) and 6).

ST 34199FE040 INSTALLER A, B, C

- INSTALLER A: 34199FE070
- INSTALLER B: 34199FE080
- INSTALLER C: 34199FE090

16) Put the ST and pipe through the rack, and press-fit the outer side oil seal using a press.

ST 34199AG010 INSTALLER



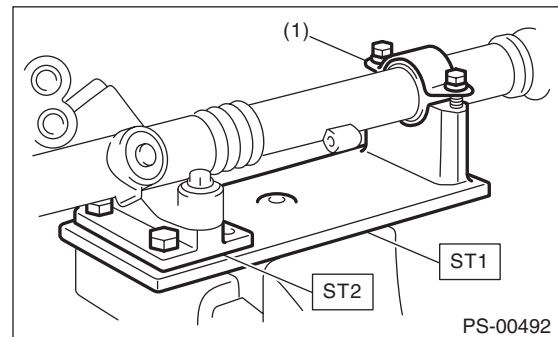
(1) Pipe

(2) Outer side oil seal

17) Secure the gearbox in a vise using ST.

ST1 926200000 STAND

ST2 34199AG000 BOSS D



(1) Clamp

18) Tighten the holder.

Tightening torque:

70 N·m (7.1 kgf-m, 51.6 ft-lb)

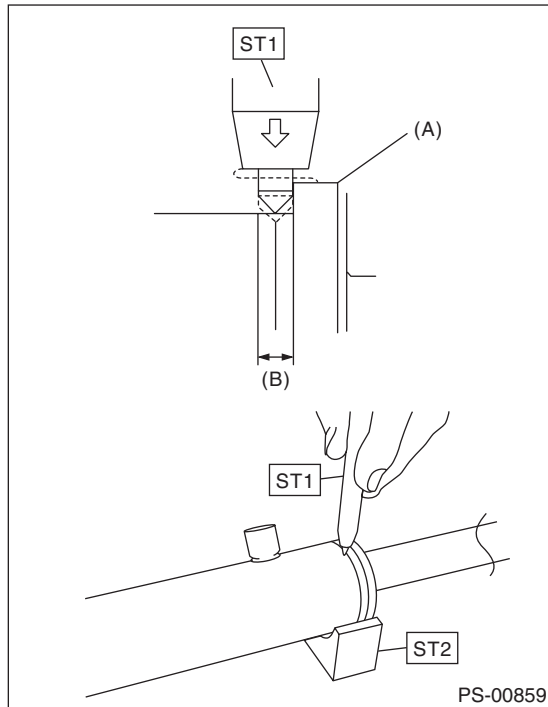
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

19) Using the ST, crimp so that the diameter of punch hole is 2 — 2.5 mm (0.08 — 0.10 in) and is aligned to the position of 2 mm (0.08 in) from gear-box cylinder end surface.

ST1 34099FA060 PUNCH HOLDER

ST2 34199FE020 BASE



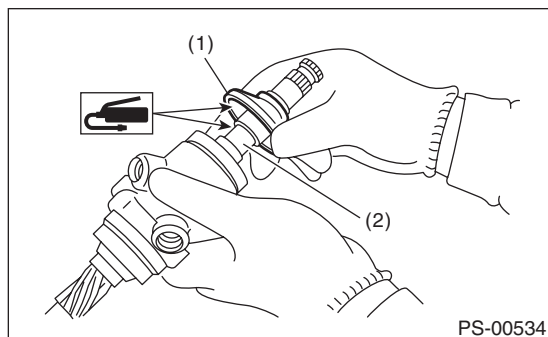
(A) Holder

(B) 2 mm (0.08 in)

20) Put a vinyl tape around the spline portion and apply genuine grease to the dust cover and install to valve assembly.

CAUTION:

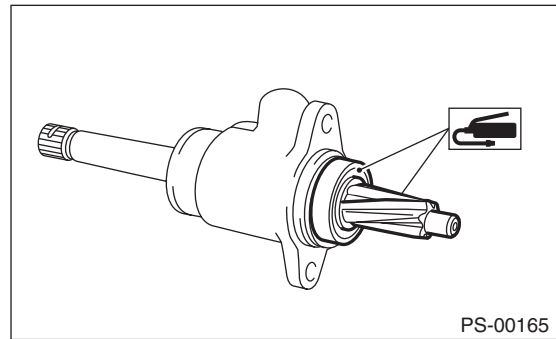
Be sure to install the dust cover to groove of shaft.



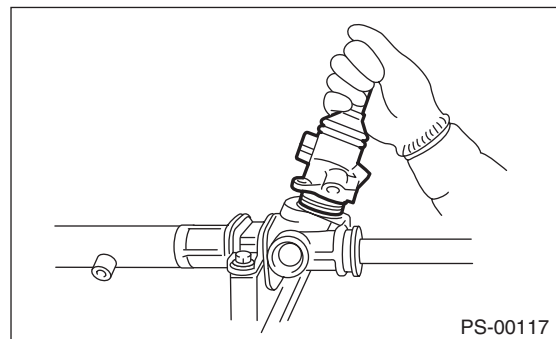
(1) Dust cover

(2) Groove

21) Apply the genuine grease to the pinion gear and bearing of valve assembly.



22) Install a new gasket on valve assembly. Insert the valve assembly into place while facing the rack teeth toward pinion.



23) Tighten the bolts alternately to secure the valve assembly.

Tightening torque:

20 N·m (2.0 kgf-m, 14.8 ft-lb)

CAUTION:

Be sure to alternately tighten the bolts.

24) Temporarily install the tie-rod to rack end, and then operate the rack from lock to lock for two or three times to make it fit in.

CAUTION:

Operating the rack from lock to lock without installing tie-rods may damage the oil seal. Always install the left and right tie-rods.

25) Apply liquid gasket to 1/3 or more of entire perimeter of adjusting screw thread.

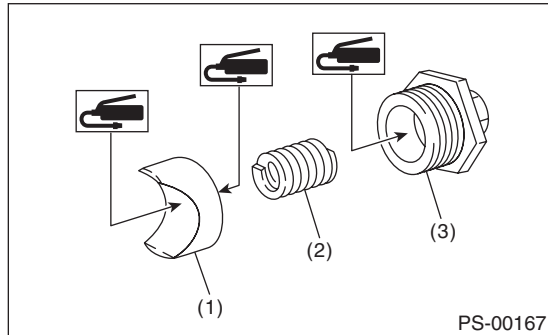
Liquid gasket:

THREE BOND 1141

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

26) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the sleeve into steering body. Charge the adjusting screw with grease, and then insert the spring into adjusting screw. Then install on the steering body.



- (1) Sleeve
- (2) Spring
- (3) Adjusting screw

27) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

28) Tighten the adjusting screw to the specified torque, then loosen it within 20°.

Tightening torque:

3.9 N·m (0.4 kgf-m, 2.9 ft-lb)

29) Remove the tie-rod.

30) Adjust the turning resistance of gearbox so that it is within specification using adjusting screw. <Ref. to PS-34, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>

31) Apply liquid gasket to lock nut and install it into adjusting screw. While holding the adjusting screw with wrench, tighten the lock nut using ST.

Liquid gasket:

THREE BOND 1141

ST 926230000 SPANNER

Tightening torque (lock nut):

25 N·m (2.5 kgf-m, 18.4 ft-lb)

NOTE:

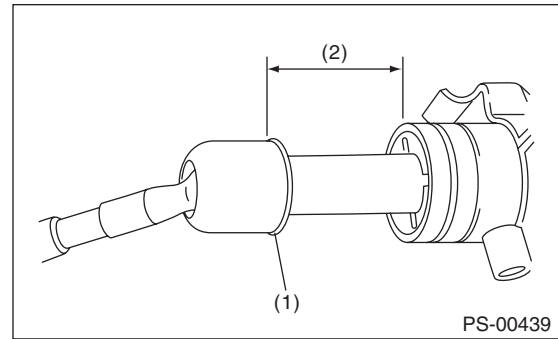
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

32) Extend the rack approx. 40 mm (1.57 in) from steering body.

33) Install the tie-rod and new lock washer into rack.

Tightening torque:

90 N·m (9.2 kgf-m, 66.4 ft-lb)

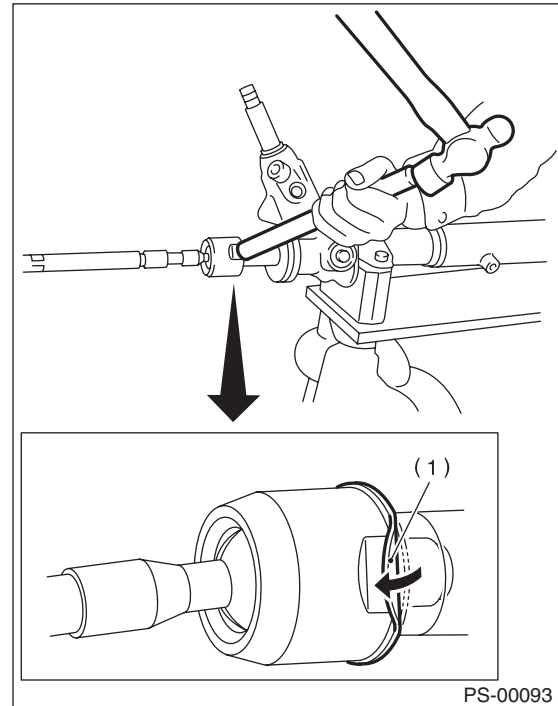


- (1) Lock washer
- (2) Approx. 40 mm (1.57 in)

34) Bend the lock washer and crimp it.

CAUTION:

Be careful not to scratch the rack when crimping lock washer.



- (1) Lock washer

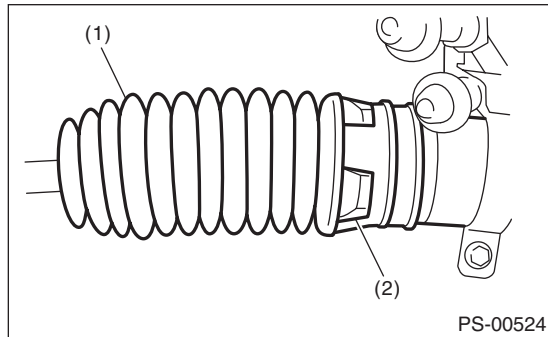
35) Apply a coat of grease to the tie-rod groove, and then install the boot to the housing.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

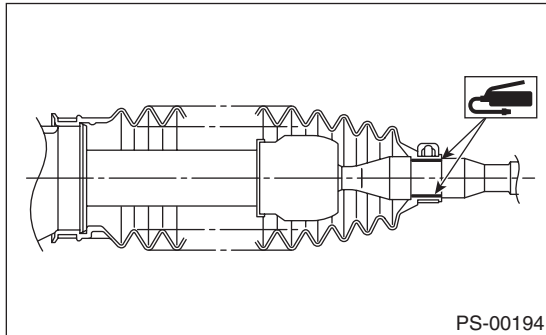
Right side boot has groove for identification, be sure to install the right and left of boot.



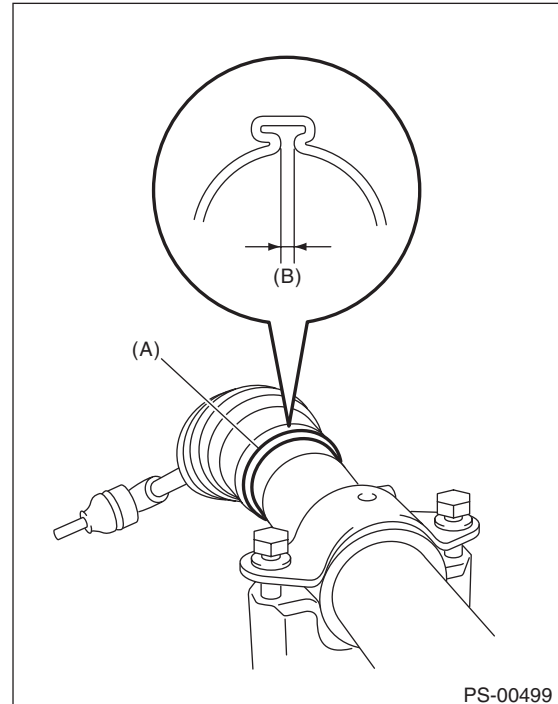
- (1) Right side boot
- (2) Groove for identification

NOTE:

Make sure that the boot is installed without unusual inflation or deflation.

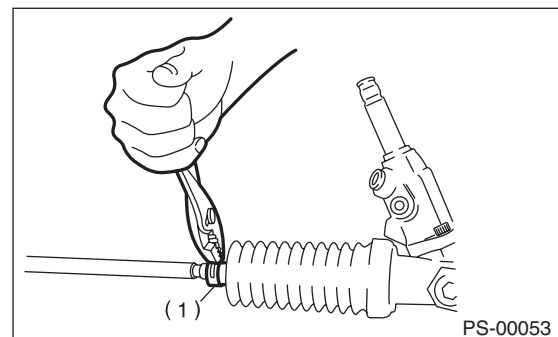


36) Install a new boot band. Using band clamp pliers, crimp it so that the clearance of crimping portion becomes 2 mm (0.079 in) or less.



- (A) Boot band
- (B) 2 mm (0.079 in) or less

37) Fix the boot end with small clip.



- (1) Clip

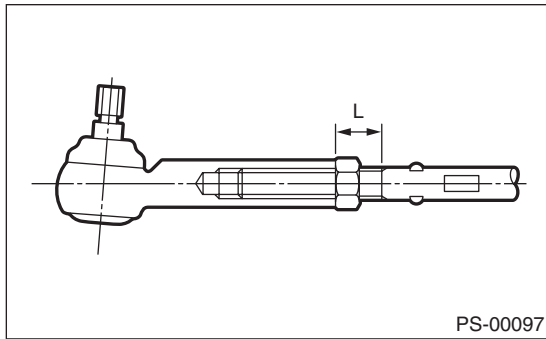
38) After installing, check that the boot end is installed to the groove of the tie-rod.

39) If the tie-rod end has been removed, screw in lock nut and tie-rod end to the screwed portion of tie-rod, and tighten the lock nut temporarily in a position as shown in the figure.

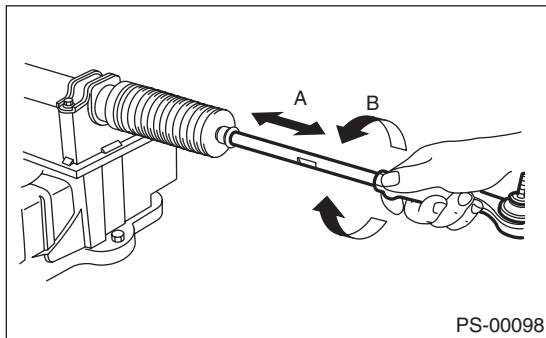
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

Installed tie-rod length L:
29 mm (1.14 in)



40) Inspect the gearbox as follows:
“A” Holding the tie-rod end, repeat lock to lock several times as quickly as possible.
“B” Holding the tie-rod end, turn it slowly at a radius several times as large as possible.
Finally, make sure that the boot is installed in the specified position without inflating.



41) Remove the gearbox from ST.

ST1 926200000 STAND

ST2 34199AG000 BOSS D

42) Install the four pipes on gearbox.

(1) Connect the pipes A and B to the four pipe joints of gearbox.

Tightening torque:

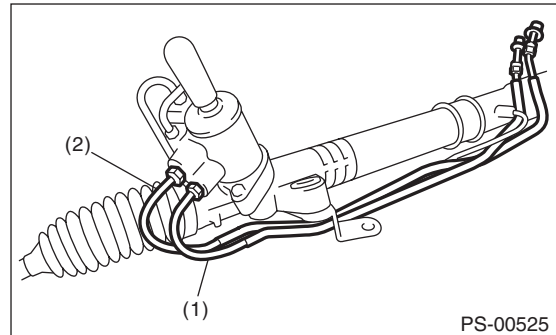
Refer to the component parts. <Ref. to PS-4, POWER ASSISTED SYSTEM, COMPONENT, General Description.>

(2) Connect the feed pipe and return pipe to gearbox.

Tightening torque:

Feed pipe: 37 N·m (3.8 kgf-m, 27.3 ft-lb)

Return pipe: 29 N·m (3.0 kgf-m, 21.4 ft-lb)



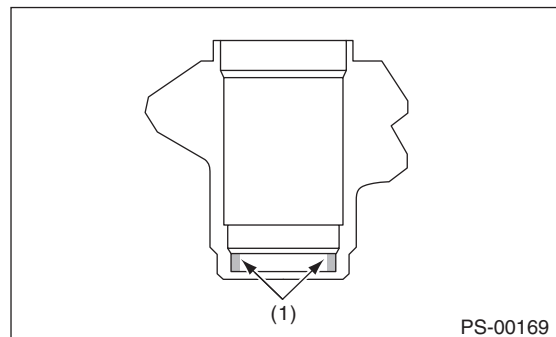
- (1) Feed pipe
- (2) Return pipe

2. CONTROL VALVE ASSEMBLY

Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

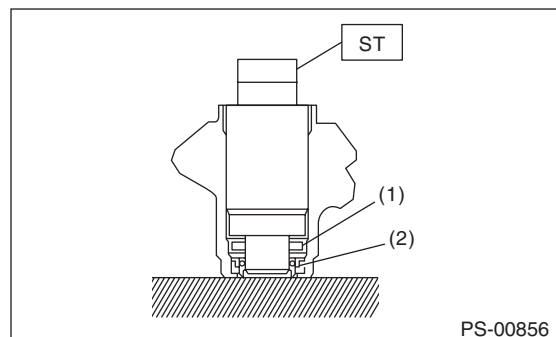
- 1) Clean all parts and tools before reassembling.
- 2) Apply a coat of specified power steering fluid to the inner wall of valve housing.



- (1) Apply fluid.

- 3) Apply grease to the oil seal.
- 4) Verify the direction of oil seal.
- 5) Using the ST and a press, install the oil seal and the bushing in valve housing.

ST 34199AG090 INSTALLER & REMOVER



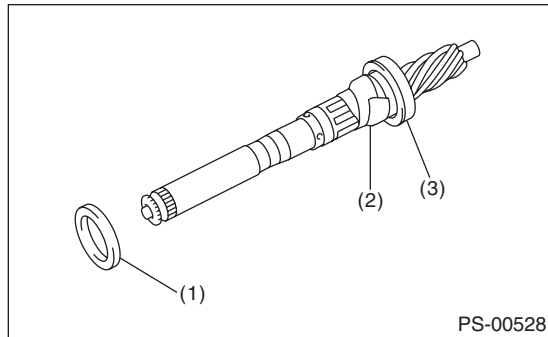
- (1) Bushing
- (2) Oil seal

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

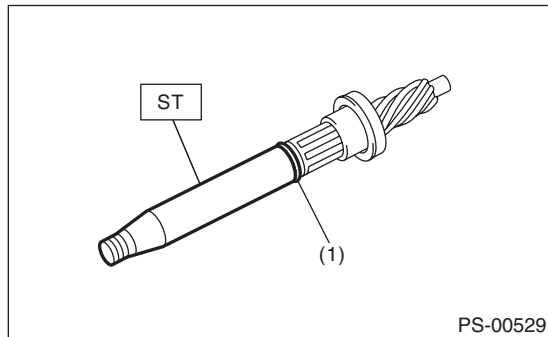
6) Apply vinyl tape to the groove of pinion.

7) Install the back-up ring and oil seal to pinion, and then remove the vinyl tape.



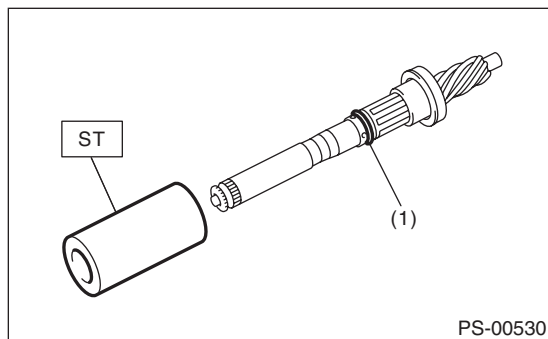
- (1) Oil seal
- (2) Vinyl tape
- (3) Back-up ring

8) Attach the ST to pinion, and install the seal ring.
ST 34199AG020 GUIDE



- (1) Seal ring

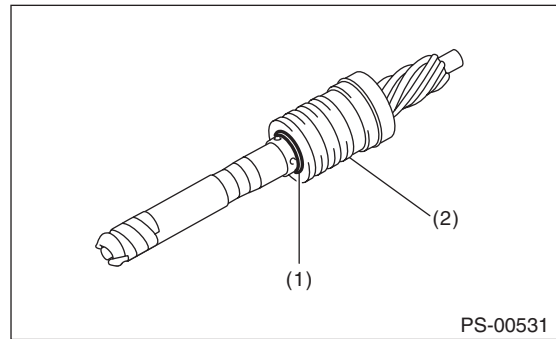
9) Remove the ST GUIDE, and form the seal ring properly using ST FORMER.
ST 34199AG070 FORMER



- (1) Seal ring

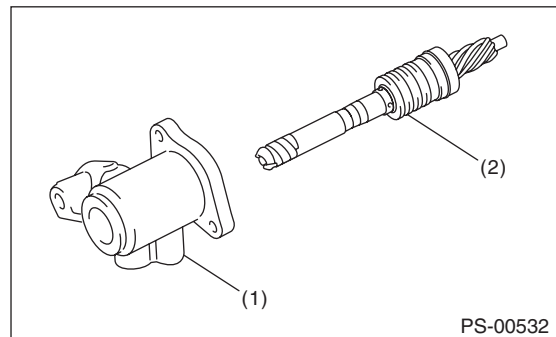
10) Put vinyl tape around pinion shaft spline to protect oil seal from damage.

11) Install the valve to pinion, and install the snap ring.



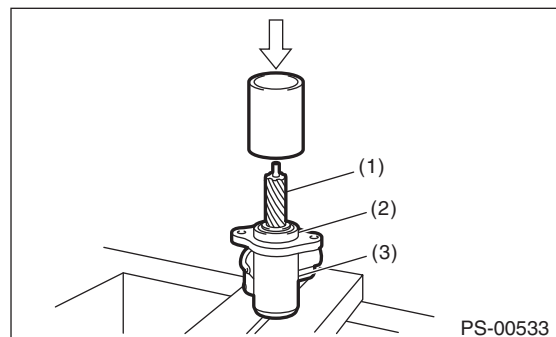
- (1) Snap ring
- (2) Valve

12) Attach the pinion & valve assembly into the valve housing.



- (1) Valve housing
- (2) Pinion & valve ASSY

13) Using a press, push the outer race of bearing and press-fit the pinion & valve assembly into housing.



- (1) Pinion & valve ASSY
- (2) Bearing
- (3) Housing

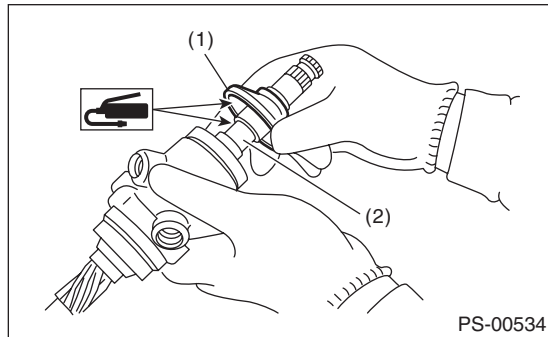
14) Apply the specified grease to dust cover.
15) Install the dust cover on valve assembly.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

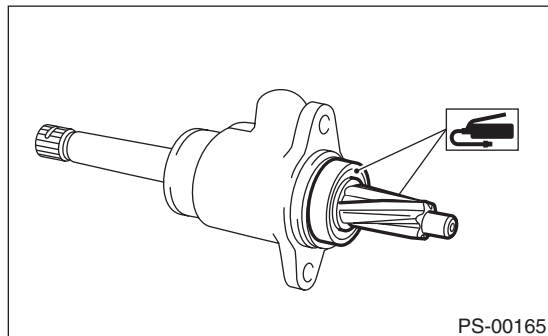
CAUTION:

Be sure to install the dust cover to groove of shaft.

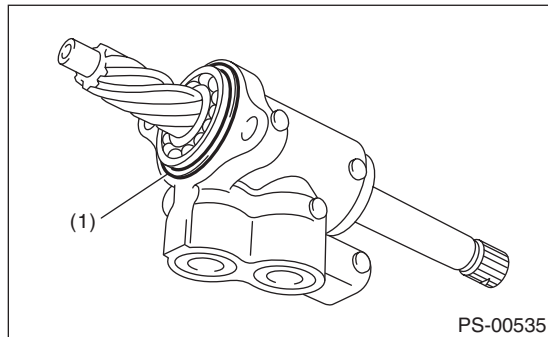


- (1) Dust cover
- (2) Groove

16) Apply the genuine grease to the pinion gear and bearing of valve assembly.

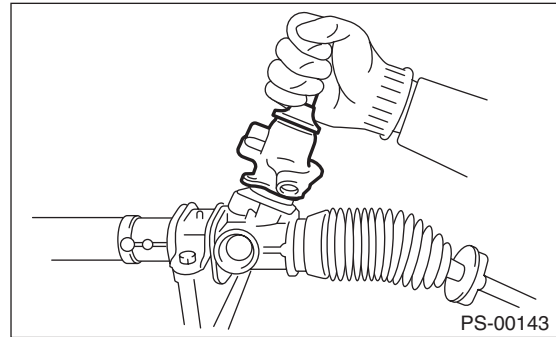


17) Install new O-ring to valve assembly.



- (1) O-ring

18) Insert the valve assembly into place while facing the rack teeth toward pinion.



19) Tighten the bolts alternately to secure the valve assembly.

Tightening torque:

20 N·m (2.0 kgf-m, 14.8 ft-lb)

CAUTION:

Be sure to alternately tighten the bolts.

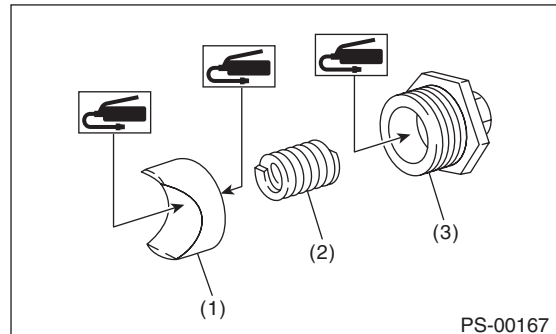
20) Apply liquid gasket to 1/3 or more of entire perimeter of adjusting screw thread.

Liquid gasket:

THREE BOND 1141 (Part No. 004403006)

21) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the sleeve into steering body.

Charge the adjusting screw with grease, and then insert the spring into adjusting screw. Then install on the steering body.



- (1) Sleeve
- (2) Spring
- (3) Adjusting screw

22) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

23) Tighten the adjusting screw to the specified torque, then loosen it within 20°.

Tightening torque:

3.9 N·m (0.4 kgf-m, 2.9 ft-lb)

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

24) Adjust the turning resistance of gearbox so that it is within specification using adjusting screw.
<Ref. to PS-34, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>

25) Apply liquid gasket to lock nut and install it into adjusting screw. While holding the adjusting screw with wrench, tighten the lock nut using ST.

Liquid gasket:

THREE BOND 1141

ST 926230000 SPANNER

Tightening torque (lock nut):

25 N·m (2.5 kgf-m, 18.4 ft-lb)

NOTE:

Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

26) Remove the gearbox from ST.

ST1 926200000 STAND

ST2 34199AG000 BOSS D

27) Install the four pipes on gearbox.

(1) Connect the pipes A and B to gearbox.

Tightening torque:

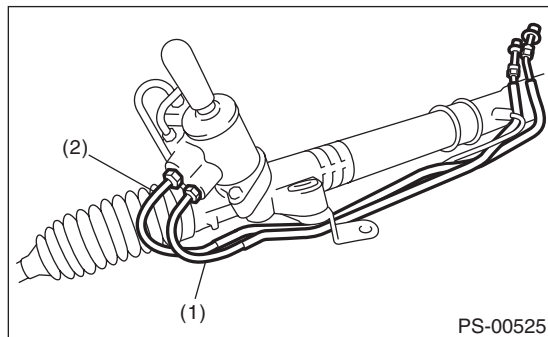
Refer to the component parts. <Ref. to PS-4, POWER ASSISTED SYSTEM, COMPONENT, General Description.>

(2) Connect the feed pipe and return pipe to gearbox.

Tightening torque:

Feed pipe: 37 N·m (3.8 kgf-m, 27.3 ft-lb)

Return pipe: 29 N·m (3.0 kgf-m, 21.4 ft-lb)



- (1) Feed pipe
- (2) Return pipe

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

1. BASIC INSPECTION

1) Clean all the disassembled parts, and check for wear, damage or any other faults, then repair or replace as necessary.

2) When disassembling, check the inside of gearbox for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bent input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new part.
3	Rack & pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of the gearbox and sliding resistance of rack, check if the rack & pinion engage uniformly and smoothly with each other. (Refer to "Service limit".) (2) Pull out the entire rack to allow viewing of the teeth, and check for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bending of the rack shaft (2) Bending of the cylinder portion (3) Crack or damage on the aluminum portion	Replace the gearbox with a new part.
		(4) Wear or damage on rack bushing	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with new part. (Refer to "Service limit".)
		(5) Wear on input shaft bearing	If the free play of input shaft in radial and axial direction is out of the specified range, replace the gearbox with a new part. (Refer to "Service limit".)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration of dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipe	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

2. SERVICE LIMIT

Make a measurements as follows. If it exceeds the specified service limits, adjust or replace.

NOTE:

When making a measurement, vise the gearbox using ST. Never vise the gearbox by inserting aluminum plates etc. between vise and gearbox.

ST1 926200000 STAND

ST2 34199AG000 BOSS D

3. RACK SHAFT PLAY IN THE RADIAL DIRECTION

Right-turn steering:

Service limit

0.12 mm (0.005 in) or less

Condition

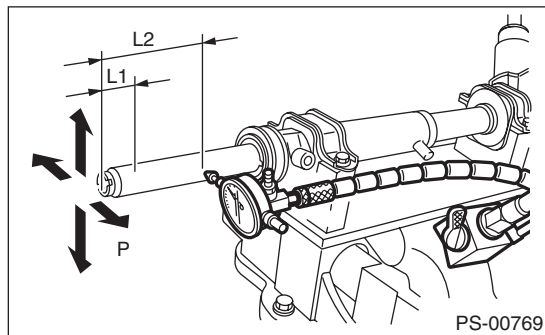
Weighting point

L1: 10 mm (0.39 in)

P: 98 N (10 kgf, 22 lb)

Measuring point

L2: 25 mm (0.98 in)



Left-turn steering:

Service limit

Direction ⇐ ⇨

0.3 mm (0.012 in) or less

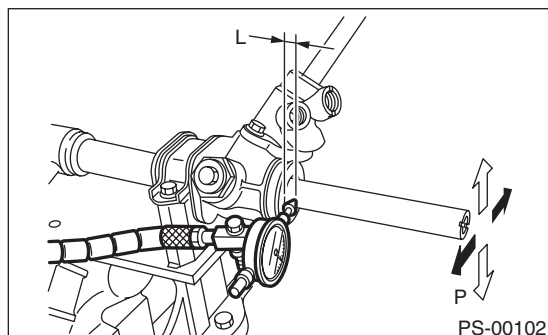
Direction ⇐ ⇨

0.15 mm (0.0059 in) or less

Condition

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lbf)



4. INPUT SHAFT PLAY

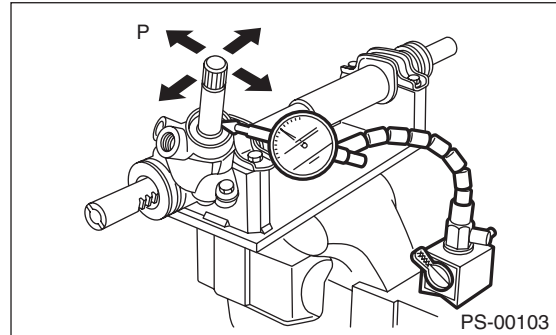
In radial direction:

Service limit

0.26 mm (0.01 in) or less

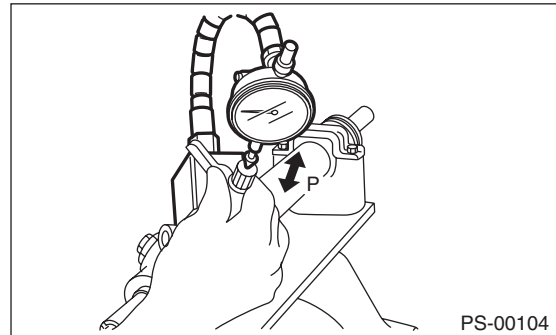
Condition

P: 98 N (10 kgf, 22 lb)



In axial direction:

Without play



5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.

ST 34099PA100 SPANNER

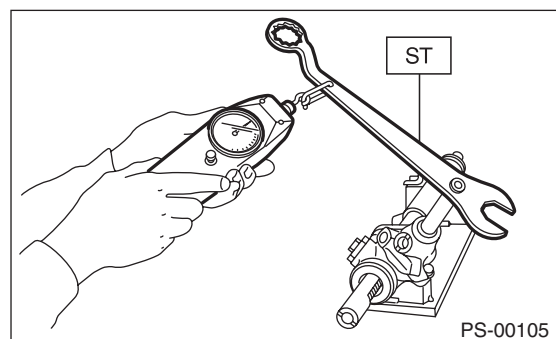
Service limit:

Maximum allowable resistance:

11.3 N (1.15 kgf, 2.54 lb) or less

Difference between right and left turning resistance:

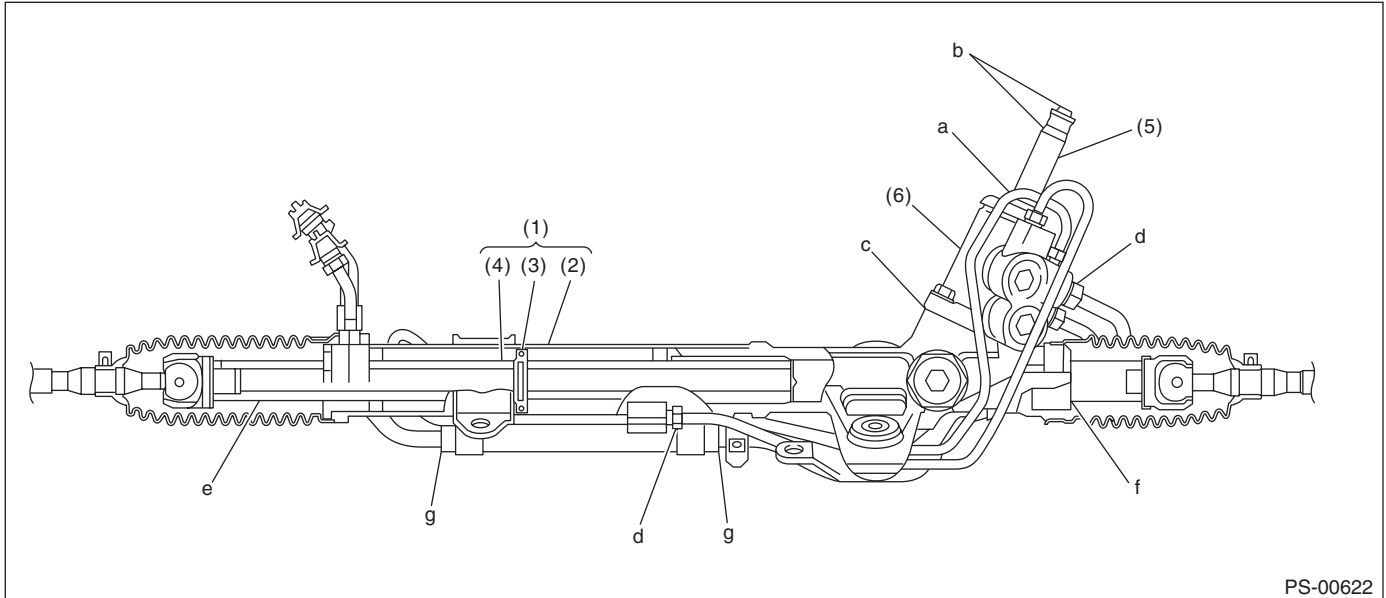
24% or less



Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

6. OIL LEAKAGE



(1) Power cylinder

(2) Cylinder

(3) Rack piston

(4) Rack axle

(5) Input shaft

(6) Valve housing

1) Lift up the vehicle.

2) If a fluid leak is found, clean the fluid completely from the suspect area, and turn the steering wheel 30 to 40 times to the left and right from lock to lock, with the engine running, and check again for leaks immediately, and also after a few hours have passed.

3) Cause and solution for oil leakage from "a"

The oil seal is damaged. Replace the valve assembly or oil seal with a new part.

4) Cause and solution for oil leakage from "b"

The torsion bar O-ring is damaged. Replace the valve assembly with a new part.

5) Cause and solution for oil leakage from "c"

The oil seal is damaged. Replace the valve assembly or oil seal with a new part.

6) Cause and solution for oil leakage from "d"

The pipe is damaged. Replace the faulty pipe or O-ring.

7) Cause and solution for oil leakage from "g".

The hose is damaged. Replace the hose with a new part.

8) If leak is other than a, b, c, d or g, or if oil is leaking from gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from surrounding portions. Then, turn the steering wheel from lock to lock about 30 to 40 times with the engine running, then re-inspect the leaking area immediately after and several hours after this operation.

(1) Leakage from "e"

The cylinder seal is damaged. Replace the oil seal with a new part.

(2) Leakage from "f"

There are two possible causes. Perform the following step first. Remove the pipe assembly B from the valve housing, and close the circuit using ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock approx. 30 to 40 times with the engine running, then inspect the leaked portion immediately after and several hours after this operation.

- If leakage from "f" is noted again:

The oil seal of pinion and valve assembly is damaged. Replace the pinion & valve assembly with a new part. Or replace the oil seal with a new part.

- If oil stops leaking from "f":

The oil seal of rack housing is damaged. Replace the oil seal and back-up washer with new parts.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

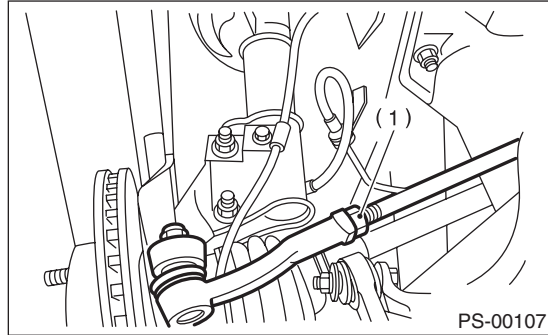
F: ADJUSTMENT

1) Adjust the front toe.

<Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:

IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



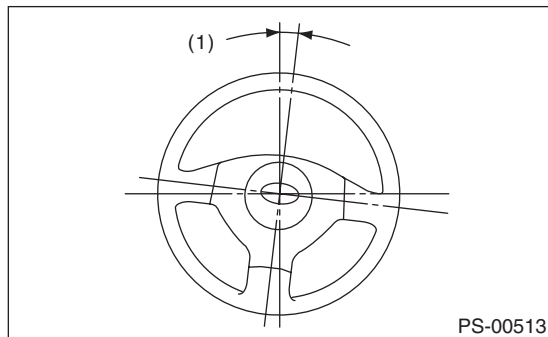
(1) Lock nut

2) Adjust the steering angle of the wheels.

Standard of steering angle:

Model	Inner wheel	Outer wheel
OUTBACK	$37.9^{\circ} \pm 1.5^{\circ}$	$33.5^{\circ} \pm 1.5^{\circ}$
WRX-SS	$37.2^{\circ} \pm 1.5^{\circ}$	$32.9^{\circ} \pm 1.5^{\circ}$
Other than above	$37.8^{\circ} \pm 1.5^{\circ}$	$33.4^{\circ} \pm 1.5^{\circ}$

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of the steering wheel, correctly re-install the steering wheel.



(1) 5° or less

4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction from each other by the same angle.

Pipe Assembly

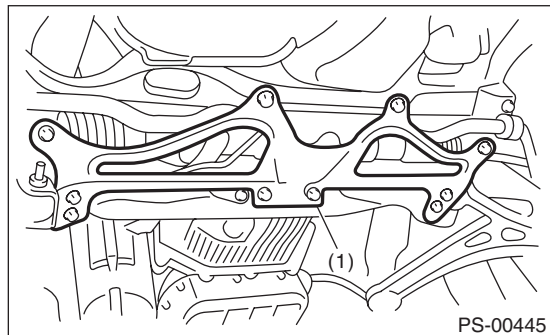
POWER ASSISTED SYSTEM (POWER STEERING)

6. Pipe Assembly

A: REMOVAL

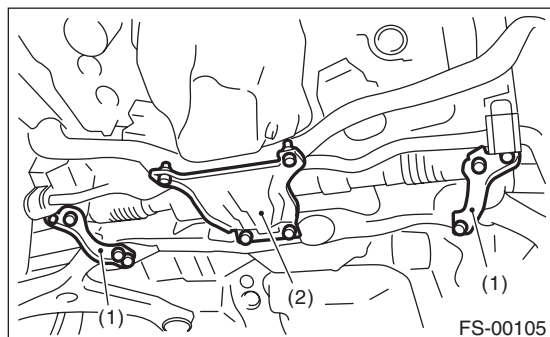
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle, and then remove the front crossmember support plate and jack-up plate.

- Large type



(1) Front crossmember support plate

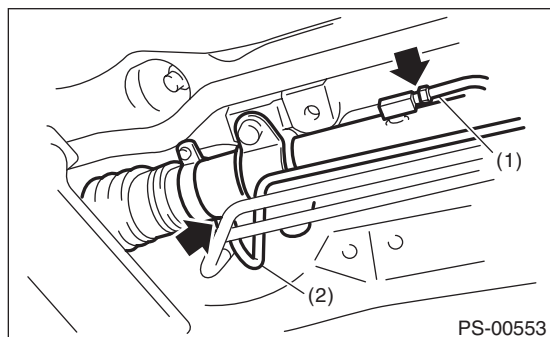
- Small type



(1) Front crossmember support plate

(2) Jack-up plate

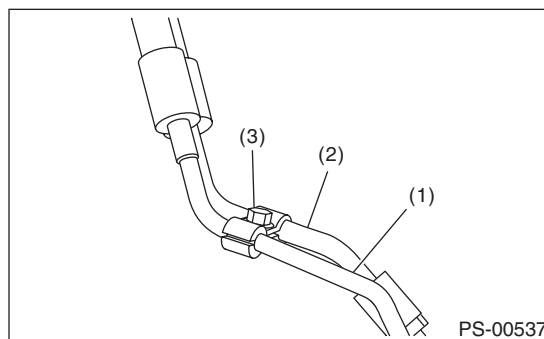
- 3) Remove the one pipe joint at the center of the gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



(1) Pipe A

(2) Pipe B

- 4) Remove the clamp E from return hose and pressure hose.

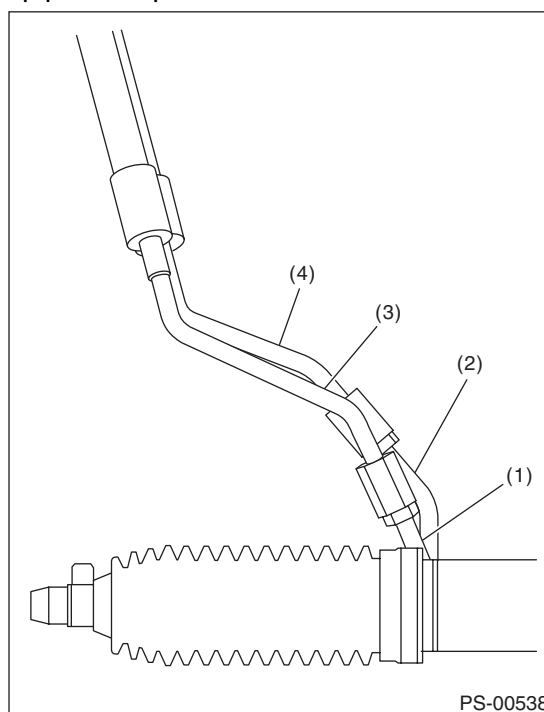


(1) Return hose

(2) Pressure hose

(3) Clamp E

- 5) Disconnect the return pipe from return hose and feed pipe from pressure hose.



(1) Feed pipe

(2) Return pipe

(3) Pressure hose

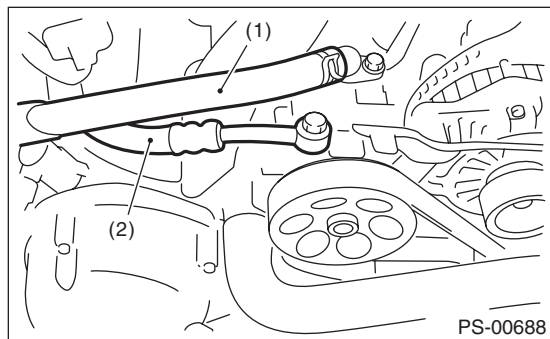
(4) Return hose

- 6) Remove the air intake duct.
- 7) Disconnect the suction hose and pressure hose from oil pump.

Pipe Assembly

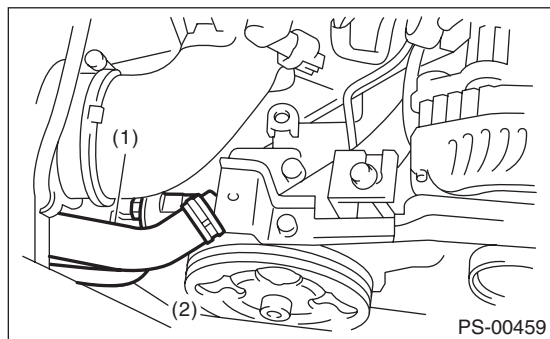
POWER ASSISTED SYSTEM (POWER STEERING)

- Non-turbo model



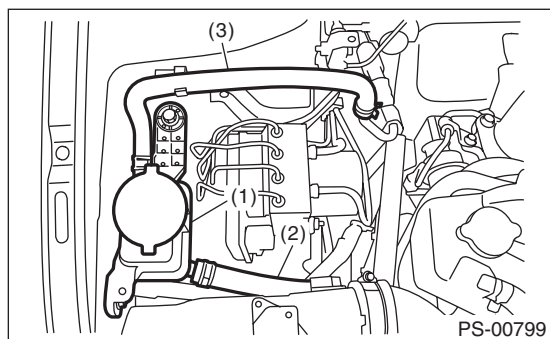
- (1) Suction hose
- (2) Pressure hose

- Turbo model



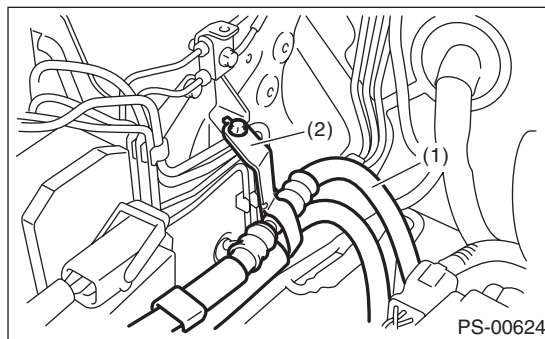
- (1) Suction hose
- (2) Pressure hose

8) Disconnect the suction hose and return hose from the reservoir tank.



- (1) Reservoir tank
- (2) Suction hose
- (3) Return hose

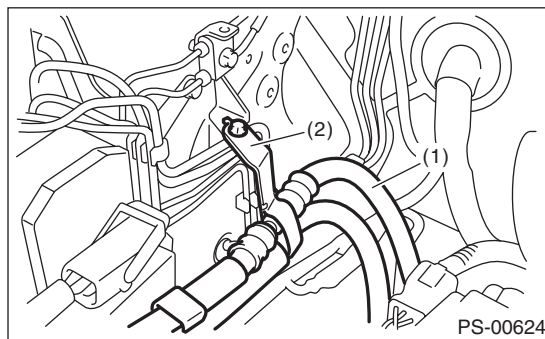
9) Remove the hose bracket and take out the hose assembly from vehicle.



- (1) Hose ASSY
- (2) Hose bracket

B: INSTALLATION

1) Temporarily tighten the hose bracket bolt.



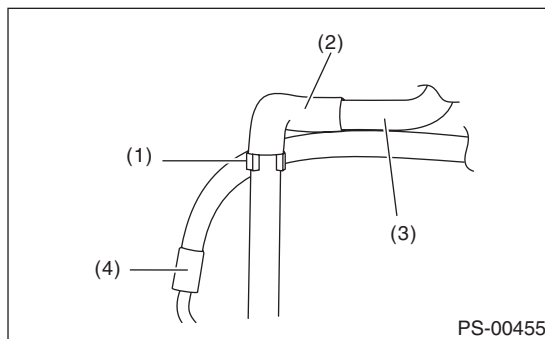
- (1) Hose ASSY
- (2) Hose bracket

2) Install the plastic clip to the pressure hose and suction hose.

CAUTION:

Align the installation position of the plastic clip with the protector edge of the suction hose.

- Non-turbo model

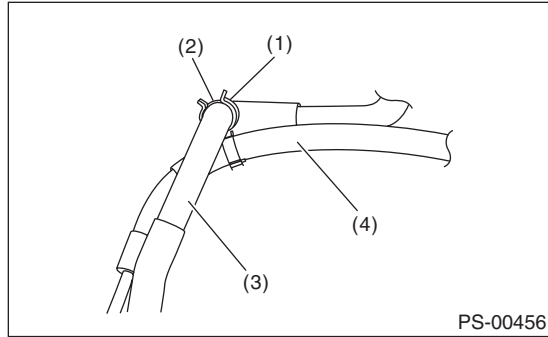


- (1) Plastic clip
- (2) Protector
- (3) Suction hose
- (4) Pressure hose

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

- Turbo model

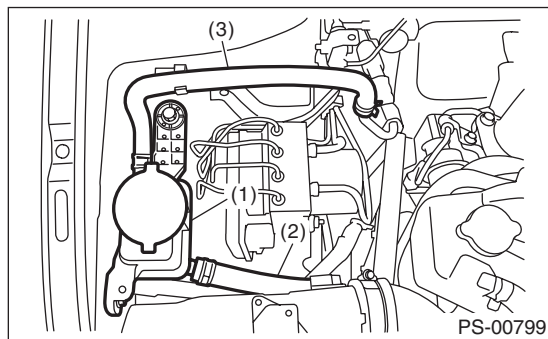


- (1) Plastic clip
- (2) Protector
- (3) Suction hose
- (4) Pressure hose

3) Connect the suction hose and return hose to the reservoir tank.

CAUTION:

Firmly insert the plastic clip of return hose to the bracket.



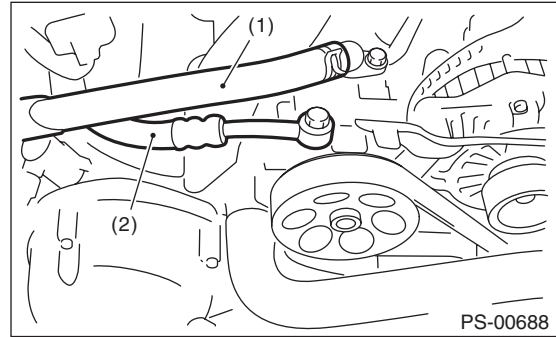
- (1) Reservoir tank
- (2) Suction hose
- (3) Return hose

4) Connect the suction hose and pressure hose to the oil pump. Tighten the eye bolt of pressure hose.

Tightening torque:

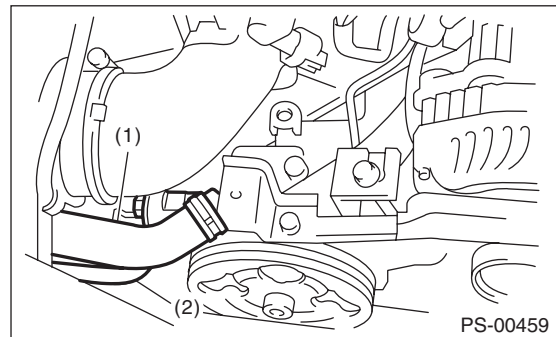
40 N·m (4.1 kgf-m, 29.5 ft-lb)

- Non-turbo model



- (1) Suction hose
- (2) Pressure hose

- Turbo model

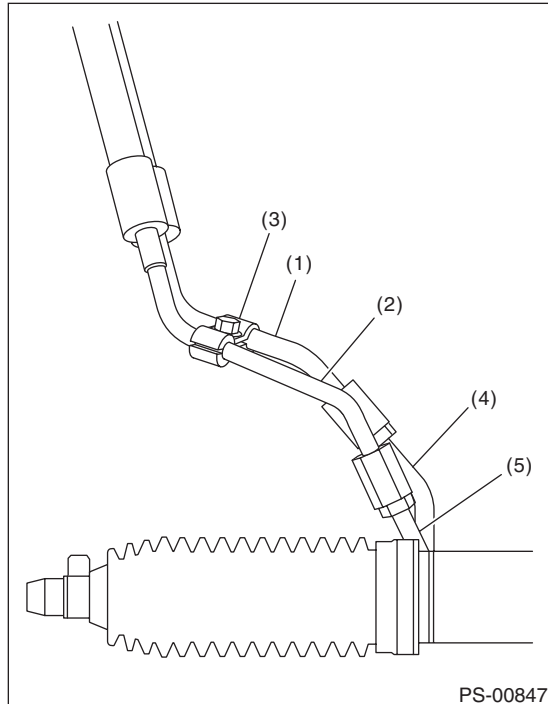


- (1) Suction hose
- (2) Pressure hose

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

5) Temporarily connect pressure hose and feed pipe, and the return hose and return pipe. Temporarily tighten the bolt of clamp E.



- (1) Return hose
- (2) Pressure hose
- (3) Clamp E
- (4) Return pipe
- (5) Feed pipe

6) Tighten clamp E.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

7) Tighten the pressure hose and feed pipe, and the return hose and return pipe.

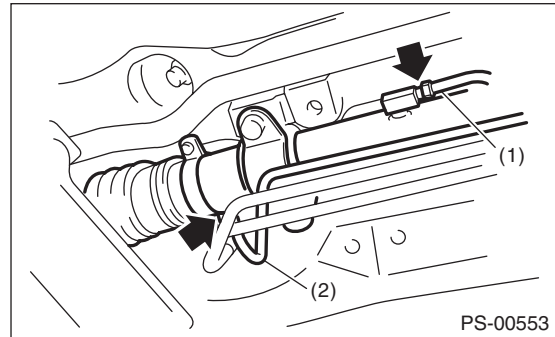
Tightening torque:

15 N·m (1.5 kgf-m, 11.1 ft-lb)

8) Connect pipes A and B to the four pipe joints of the gearbox.

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to PS-4, POWER ASSISTED SYSTEM, COMPONENT, General Description.>



- (1) Pipe A
- (2) Pipe B

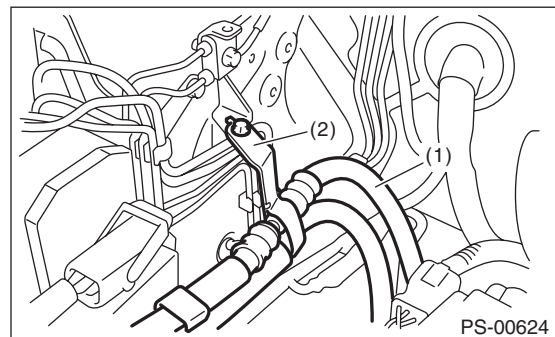
9) Install the front crossmember support plate and jack-up plate.

10) Lower the vehicle.

11) Tighten the bolts which hold the hose bracket.

Tightening torque:

10 N·m (1.0 kgf-m, 7.4 ft-lb)



- (1) Hose ASSY
- (2) Hose bracket

12) Install the air intake duct.

13) Connect the ground cable to battery.

14) Fill with the specified fluid.

CAUTION:

Never start the engine before filling with fluid; otherwise the vane pump may become seized.

15) Finally, check the clearance between pipes or hoses as shown in the figure indicated in "General Diagnostic Table". <Ref. to PS-54, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

C: INSPECTION

Check all disassembled parts for wear, damage or other problems. Repair or replace the defective parts as necessary.

Part	Maintenance parts	Corrective action
Pipe	• O-ring fitting surface damage • Nut damage • Pipe damage	Replace with a new part.
Hose	• Flare surface damage • Flare nut damage • Outer surface cracks • Outer surface wear • Clip damage • End coupling or adapter deformation	Replace with a new part.

CAUTION:

Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. Wipe off hoses immediately if any of these come into contact with the hoses. Since resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather areas and a driving condition in which many steering operations are required in short time.

Continuous discharge of the relief valve for 5 seconds or more will reduce the service lives of hoses, oil pump, fluid, etc., due to over heating.

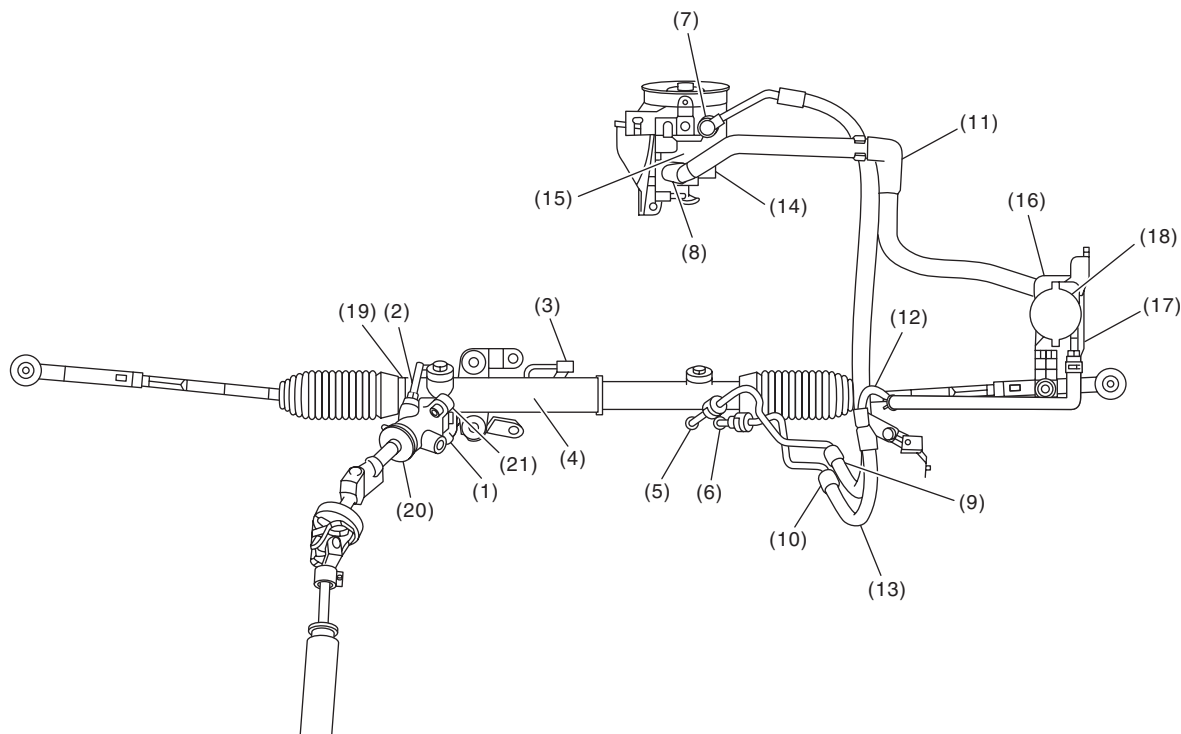
Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of the relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Disconnection of the return hose	Improper connection	Repair.
	Loosening of the clip	Replace the hose clip.
	Poor cold characteristic of fluid	Replace fluid.
Fluid slightly leaking out of hose	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the parts if defective.
	Improper stop position of pitching stopper	Replace the parts if defective.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customers.
	Power steering fluid, engine oil, electrolyte adhere on the hose surface	Replace. Be careful during service work.
	Too many uses in extremely cold weather	Replace. Instruct customers.

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:

There are conditions in which a fluid leak is diagnosed, but is not actually leaking. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



PS-00805

Fluid leaking area	Possible cause	Corrective action
Leakage from the connections of pipes and hoses, numbered (1) through (8) in the figure	Insufficient tightening of flare nut, adhesion of dirt, damage to flare or flare nut or eye bolt	Loosen and retighten. Replace if ineffective.
	Improper installation of hose or clamp	Replace.
	Damaged O-ring or gasket	Replace the O-ring, gasket pipe or hose with new part, if still no improvement, replace the gearbox or oil pump as well.
Leakage from hose (9) through (13) in the figure	Crack or damage in hose	Replace with a new part.
	Crack or damage in hose hardware	Replace with a new part.
Leakage from surrounding of aluminum portion of oil pump, (14) and (15) in the figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank, (16) and (17) in the figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck of (18)	Damaged cap gasket	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	Fluid level too high	Adjust the fluid level.
Leakage from power cylinder of gearbox area (19) in the figure	Damaged oil seal	Replace the oil seal.
Leakage from (20), (21) in the figure and control valve of gearbox	Damaged gasket or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

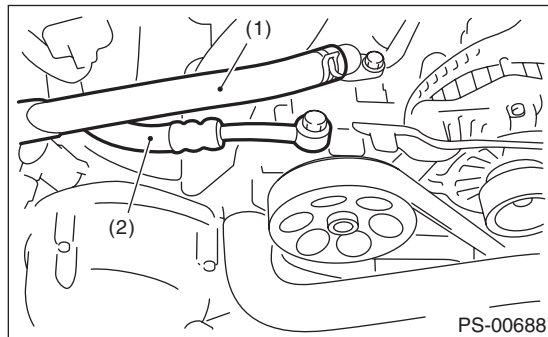
7. Oil Pump

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the V-belts (front side belt). <Ref. to ME(H4SO)-39, FRONT SIDE BELT, REMOVAL, V-belt.> <Ref. to ME(H4DOTC)-40, FRONT SIDE BELT, REMOVAL, V-belt.>
- 3) Disconnect the connector from power steering pump switch.
- 4) Disconnect the pressure hose and suction hose from the oil pump.

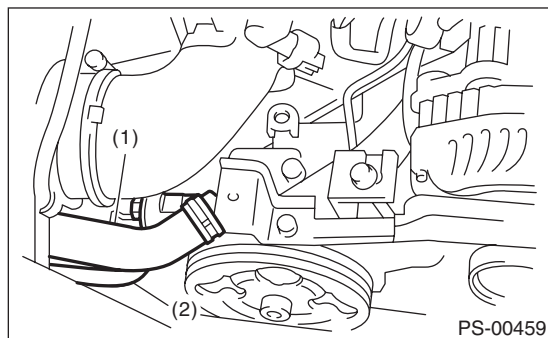
CAUTION:

- Do not allow fluid to come into contact with the pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends with clean cloth.
- Non-turbo model



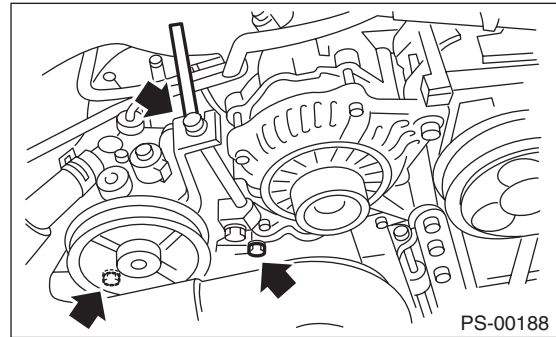
- (1) Suction hose
(2) Pressure hose

- Turbo model



- (1) Suction hose
(2) Pressure hose

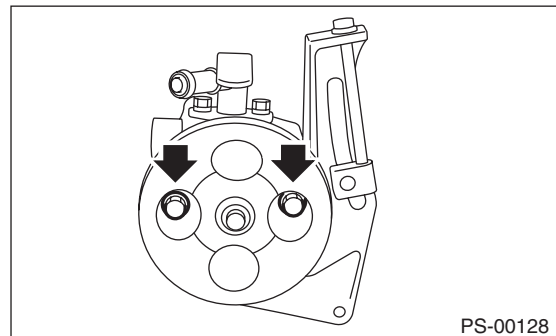
- 5) Remove the installation bolt of the power steering pump bracket.



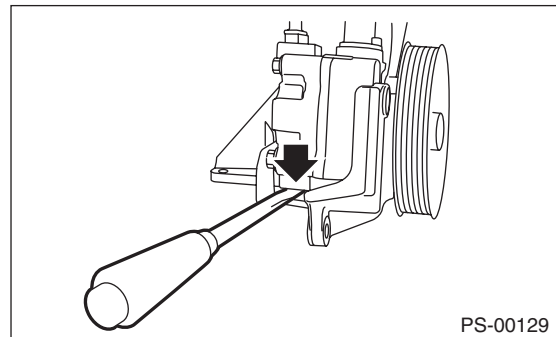
- 6) Place the oil pump bracket in a vise, and remove the two bolts from the front side of the oil pump.

CAUTION:

When securing the oil pump bracket in a vise, hold the oil pump bracket with the least possible force between two pieces of wood.



- 7) Remove the bolt from the rear side of oil pump.
- 8) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



Oil Pump

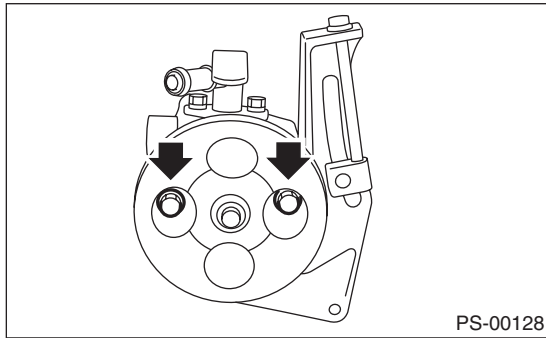
POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

1) Install the oil pump to bracket.

Tightening torque:

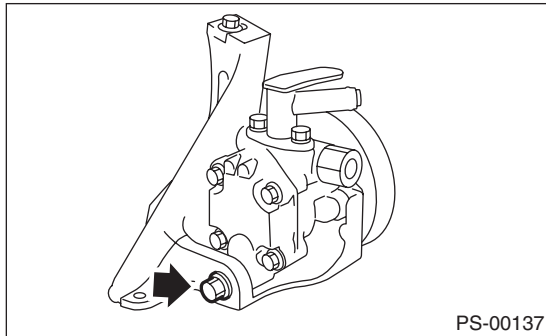
16 N·m (1.6 kgf-m, 11.8 ft-lb)



Tightening torque:

36 N·m (3.7 kgf-m, 26.6 ft-lb) (non-turbo model)

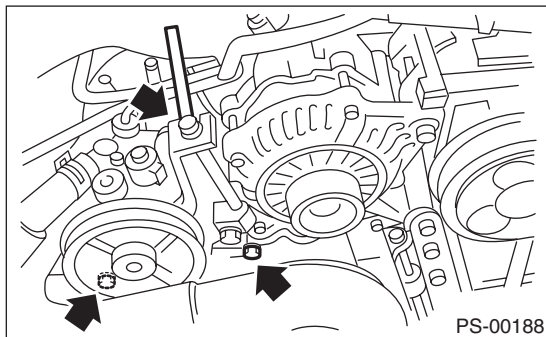
48 N·m (4.9 kgf-m, 35.4 ft-lb) (turbo model)



2) Attach the installation bolts of the power steering pump bracket.

Tightening torque:

<Ref. to PS-6, OIL PUMP, COMPONENT, General Description.>



3) After installing the oil pump, fill the oil pump with fluid while rotating the pulley by hand and bleed the air from the oil pump.

CAUTION:

Always fill the oil pump with the fluid to prevent abnormal noise and seizure of the oil pump.

4) Connect the pressure hose and suction hose.

Tightening torque:

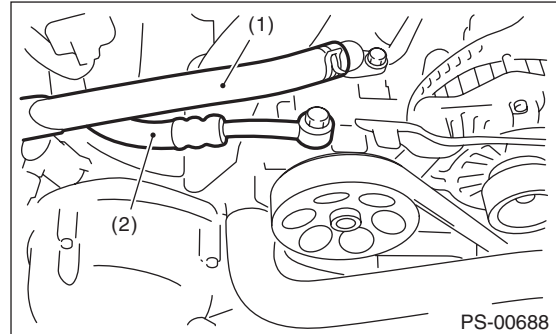
Eye bolt

40 N·m (4.1 kgf-m, 29.5 ft-lb)

CAUTION:

Be careful when installing; If the hose is twisted it may come into contact with other parts.

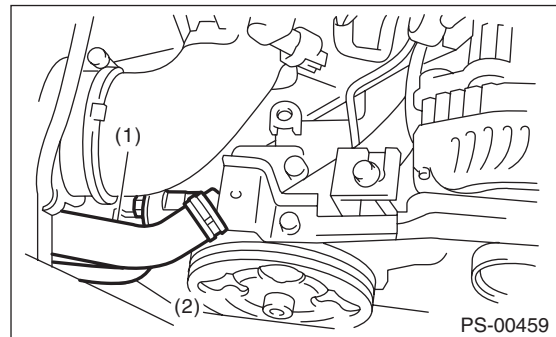
- Non-turbo model



(1) Suction hose

(2) Pressure hose

- Turbo model



(1) Suction hose

(2) Pressure hose

5) Connect the power steering pump switch to the connector.

6) Install the V-belts (front side belt). <Ref. to ME(H4SO)-39, FRONT SIDE BELT, INSTALLATION, V-belt.> <Ref. to ME(H4DOTC)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>

7) Connect the ground cable to battery.

8) Fill with the specified power steering fluid. <Ref. to PS-49, Power Steering Fluid.>

CAUTION:

Never start the engine before filling with fluid; otherwise the vane pump may become seized.

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and replace faulty parts.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new part.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new part.
2	Pulley	(1) Damage	Replace with a new part.
		(2) Bend	Measure the V groove deflection. If it exceeds the service limit, replace the pulley with a new part.
3	Oil pump (Interior)	(1) Faulty or seized of vane pump	Check the rotating resistance of pulley. If it exceeds the service limit, replace the oil pump with a new part.
		(2) Bend in the shaft or damage to bearing	If the a string is wrapped on the pulley and rotated, and the oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump, replace the oil pump with a new part.
4	O-ring	Cracking or deterioration	Replace with a new part.
5	Bracket	Crack	Replace with a new part.

2. SERVICE LIMIT

Make a measurements as follows. If it exceeds the service limit, replace with a new part.

CAUTION:

- When securing the oil pump on a vise, hold the oil pump with the least possible force between two pieces of wood.
- Do not set the outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

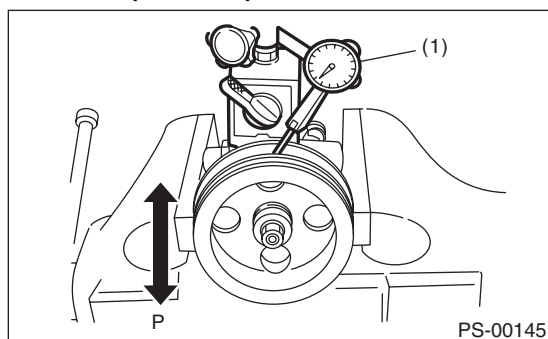
1) Play of the pulley shaft

Condition:

P: When applying the force of 9.8 N (1.0 kgf, 2.2 lbf)

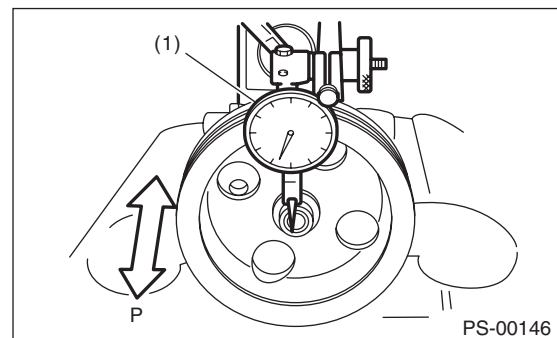
Service limit:

Play in the radial direction (Direction ◀ ▶) 0.4 mm (0.016 in) or less



(1) Dial gauge

Axial play (Direction ⇐ ⇒) 0.9 mm (0.035 in) or less



(1) Dial gauge

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

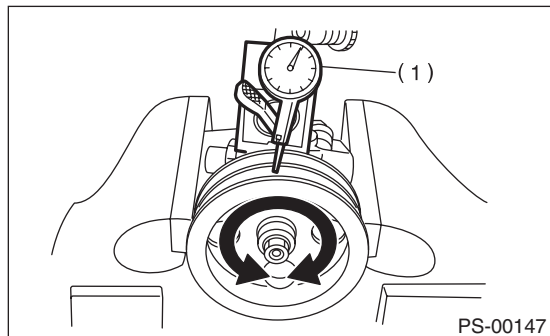
2) Deflection of the pulley groove

Service limit:

1.0 mm (0.039 in) or less

NOTE:

Read the value for one surface of V ditch, and then the value for another off the dial gauge.



(1) Dial gauge

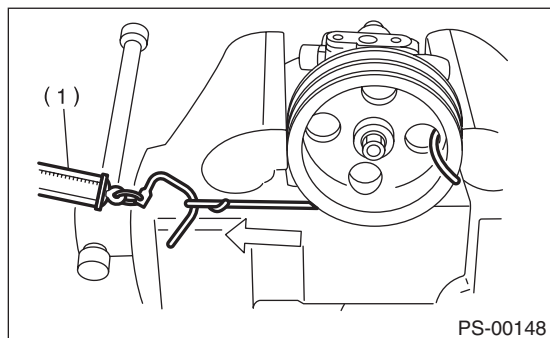
3) Rotating resistance of pulley

Service limit:

Maximum load: 9.22 N (0.94 kgf, 2.07 lbf) or less

NOTE:

- A rather higher value may be indicated when pulley starts turning.
- Measure the load during rotation to make a judgement.



(1) Spring scale

3. HYDRAULIC PRESSURE

NOTE:

- To measure hydraulic pressure correctly, be sure to complete all the items in "INSPECTION", prior to performing the measurement. <Ref. to PS-50, INSPECTION, General Diagnostic Table.>
- Do not leave the valve of pressure gauge closed or hold the steering wheel at lock for 5 seconds or more in any case, this can damage the oil pump.
- Before attaching a pressure gauge, place cloth at locations where fluid is expected to spill. Wipe off any spilt fluid completely after the measurement.

1) Regular pressure measurement

- (1) Connect the ST1, ST2 and ST3.

ST1 925711000 PRESSURE GAUGE

ST2 34099AC020 ADAPTER HOSE B

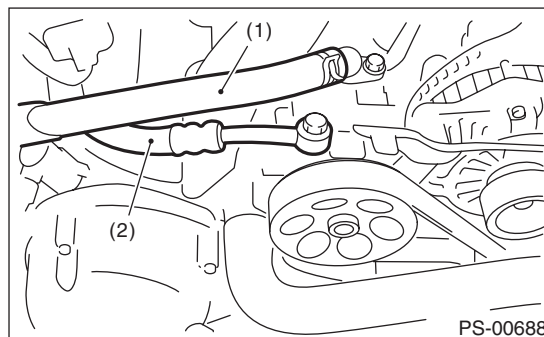
ST3 34099AC010 ADAPTER HOSE A

- (2) Remove the air intake duct.

- (3) Disconnect the pressure hose from pump.

- (4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to pump instead of pressure hose.

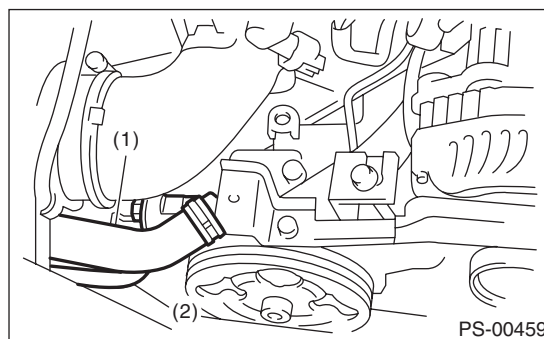
- Non-turbo model



(1) Suction hose

(2) Pressure hose

- Turbo model



(1) Suction hose

(2) Pressure hose

- (5) Attach the ST3 to the end of pressure hose which is removed from pump.

- (6) Replenish power steering fluid up to the specified level.

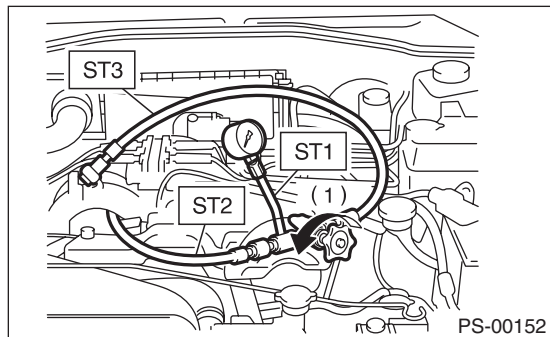
- (7) Open the valve, and start the engine.

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

(8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



(1) Valve

Service limit:

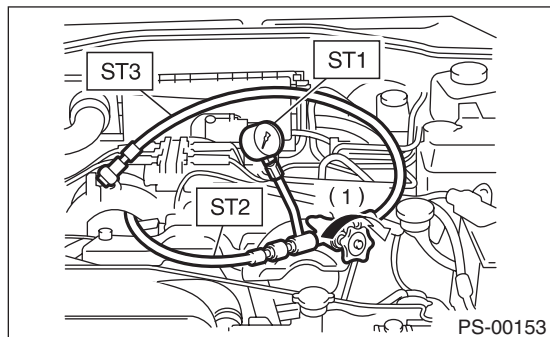
981 kPa (10 kgf/cm², 142 psi) or less

(9) If it is not within the specification, replace the problem part for the following problems. (Pipe or hose clogged, leaks from fluid line, and mixture of foreign matter in fluid line)

2) Measure the relief pressure.

- (1) Using the STs, measure the relief pressure.
- (2) Close the valve.
- (3) Measure the relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



(1) Valve

Service limit:

Non-turbo model:

7,350 — 8,050 kPa (75 — 82 kgf/cm², 1,066 — 1,167 psi)

Turbo model:

8,100 — 8,800 kPa (83 — 90 kgf/cm², 1,174 — 1,276 psi)

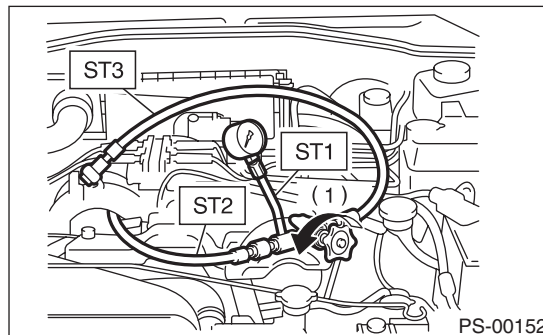
(4) If it is not within the specification, replace the oil pump.

3) Measure the working pressure.

- (1) Using the ST, measure the working pressure.
- (2) Open the valve.

(3) Measure the working pressure of control valve by turning steering wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



(1) Valve

Service limit:

Non-turbo model:

7,350 — 8,050 kPa (75 — 82 kgf/cm², 1,066 — 1,167 psi)

Turbo model:

8,100 — 8,800 kPa (83 — 90 kgf/cm², 1,174 — 1,276 psi)

(4) If it is out of specification, measure the steering effort. <Ref. to PS-53, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specification, replace the control valve itself or control valve and pinion as a single unit, using new parts.

Reservoir Tank

POWER ASSISTED SYSTEM (POWER STEERING)

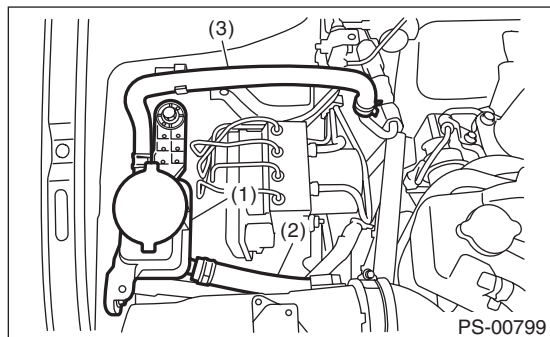
8. Reservoir Tank

A: REMOVAL

- 1) Drain fluid from the reservoir tank.
- 2) Disconnect the hose from reservoir tank.

CAUTION:

To prevent foreign matter from entering the hose and pipe, cover the open ends of them with clean cloth.



- (1) Reservoir tank
- (2) Suction hose
- (3) Return hose

- 3) Remove the reservoir tank from the body.

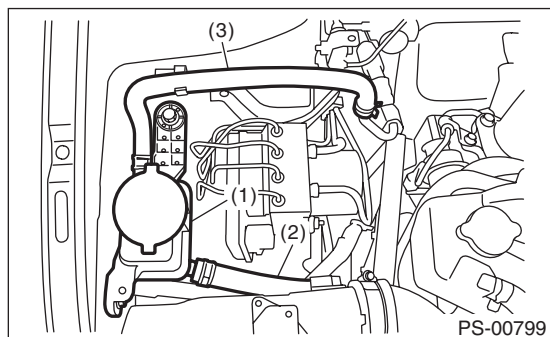
B: INSTALLATION

- 1) Install the reservoir tank to the body.

Tightening torque:

13 N·m (1.3 kgf-m, 9.6 ft-lb)

- 2) Connect the hose to the reservoir tank.



- (1) Reservoir tank
- (2) Suction hose
- (3) Return hose

- 3) Replenish power steering fluid up to the specified level. <Ref. to PS-49, INSPECTION, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage or damage. If a failure is found, replace the reservoir tank.

9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid
SUBARU ATF or DEXRON III

B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.

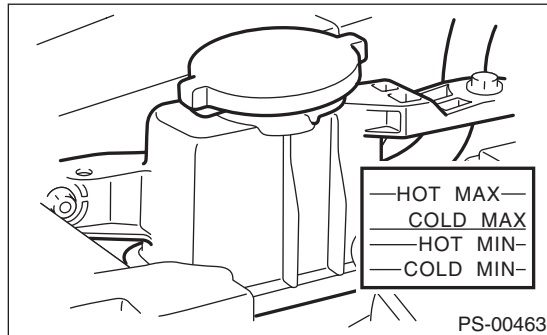
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.

3) Inspect the fluid level of reservoir tank with vehicle on level surface and engine stopped.

If the level is at "MIN." point or below, add fluid to keep the level in the specified range of the indicator. If at "MAX." point or above, drain fluid by using a syringe or the like.

(1) Check at power steering fluid temperature 20°C (68°F); read the fluid level on the "COLD" side.

(2) Check at power steering fluid temperature 80°C (176°F); read the fluid level on the "HOT" side.



C: REPLACEMENT

1) Lift up the vehicle.

2) Remove the crossmember support.

3) Remove the pipe joint in the center of gearbox, and connect the vinyl hose to the pipe and joint. Wipe fluid off while turning the steering wheel.

4) Add the specified fluid to reservoir tank at "MAX" level.

5) Continue to turn the steering wheel slowly from lock to lock until the bubbles stop appearing on oil surface while keeping the fluid at the level in the Step 4).

6) If the steering wheel is turned in a low fluid level condition, air will be sucked into the pipe. If air has entered, leave it for about half an hour and then repeat step 5) again.

7) Start the engine and let it idle.

8) Continue to turn the steering wheel slowly from lock to lock again until the bubbles stop appearing on oil surface, while keeping the fluid at the level in Step 4).

Normally bubbles will stop appearing after turning the steering wheel from lock to lock three times.

9) In case bubbles do not stop appearing in the tank, leave it for about half an hour and then repeat from step 4) again.

10) Lower the vehicle, and then idle the engine.

11) Continue to turn the steering wheel from lock to lock until the bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).

12) In case the following happens, leave it about half an hour and then perform step 8) to 11) again.

(1) The fluid level changes by 3 mm (0.12 in) or more.

(2) Bubbles remain on the upper surface of the fluid.

(3) Grinding noise is generated from oil pump.

13) Check the fluid leakage after turning steering wheel from lock to lock with engine running.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
- Steering effort is heavy in all ranges. - Steering effort is heavy at stand still. - Steering wheel vibrates when turning.	1. Pulley belt - Unequal length of pulley belts - Contact with oil or grease - Looseness or damage of the pulley belt - Poor uniformity of the pulley belt cross section - Pulley belt touches to pulley bottom - Poor revolution of pulleys (except oil pump pulley) - Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and wheel - Improper tire out of specifications^{*1} - Improper wheel out of specifications^{*1} - Tires not properly inflated	Replace or reinflate.
	3. Fluid - Low fluid level - Air entry in fluid - Dust entry in fluid - Fluid deterioration - Inadequate warm up of fluid^{*2}	Refill, bleed air, replace or instruct customer.
	4. Idle speed - Lower idle speed - Excessive drop of idle speed at start or when turning the steering wheel^{*3}	Adjust or instruct customer.
	5. Measure the hydraulic pressure. <Ref. to PS-45, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure the steering wheel effort. <Ref. to PS-53, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.
- Vehicle leads to one side or the other. - Returning force of steering wheel to center is poor. - Steering wheel vibrates when turning.	1. Fluid line - Folded hose - Flattened pipe	Repair or replace.
	2. Tire and wheel - Flat tire - Mixed use of different tires - Mixed use of different wheels - Abnormal wear of tire - Unequal tread remaining - Unequal pressure of tire	Adjust, fix or replace.
	3. Front alignment - Improper or unequal caster - Improper or unequal toe-in - Loose suspension connections	Adjust or retighten.
	4. Others - Damaged joint assembly - Unbalanced height - Unbalanced weight	Replace, adjust or instruct customer.
	5. Measure the steering wheel effort. <Ref. to PS-53, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.

^{*1} If the tires or wheels are wider than standard, the load to power steering system is increased. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before reaching maximum turning angle. In this case, steering effort may be heavy. When the measured hydraulic pressure is normal, there is no abnormal thing.

^{*2} In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn the steering wheel from stop to stop several times to warm up fluid. If steering effort reduces normally, function is normal.

^{*3} In cold weather or with insufficient warm up of the engine, steering effort may be heavy due to excessive drop of idling when turning the steering wheel. In this case, start the vehicle with increasing engine speed than usual. If steering effort reduces normally, function is normal.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

1. NOISE AND VIBRATION

CAUTION:

Do not keep the relief valve operated for five seconds or more at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:

- A screeching noise may be heard immediately after the engine start in extremely cold conditions. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristics in extremely cold condition.
- The oil pump normally makes a small whining noise due to its mechanism. Even if a noise is heard when steering wheel is turned at stand still, there is no abnormal function in the system provided that the noise eliminates when the vehicle is driving.
- When turning the steering wheel with the brake applied when the vehicle is parked, a screeching noise may be generated by the brake disc and pads. This is not a fault in the steering system.
- There may be a small vibration around the steering devices when turning the steering wheel at standstill, even though the component parts are operating properly.

Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.

These conditions do not indicate a problem in the system.

Confirm vibration for an AT model, by applying the parking brake on a concrete surface, shifting into the "D" range, and turning the steering wheel repeatedly from slow to rapid, step by step.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Do not keep this condition for 5 seconds or more.)	Normal operation
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is defective.	Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-54, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loose oil pump pulley or other pulley(s)	Retighten.
	Looseness of linkage, play of steering, improper tightening (looseness) of suspension joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace faulty parts in the gearbox or oil pump.
Knocking When turning steering wheel in both directions with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Insufficient tightening or play in the tie-rod or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Air in vane pump	Inspect and retighten the fluid line connection. Refill the fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Oil pump pulley bearing seized	Replace the oil pump.
	Folded hose, flattened pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Improper adjustment of pulley belt Damaged or over tensioned pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Runout or dirty V-groove surface of oil pump pulley	Clean or replace.

General Diagnostic Table

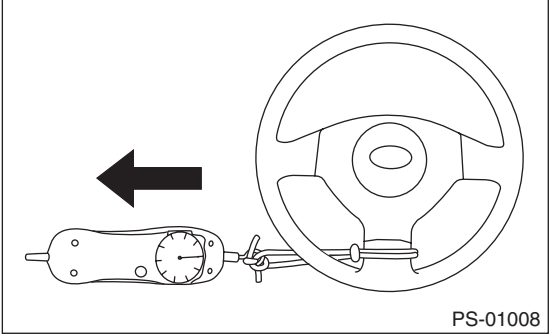
POWER ASSISTED SYSTEM (POWER STEERING)

Trouble	Possible cause	Corrective action
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the faulty part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Faulty inside of hose or pipe Flattened hose or pipe	Correct or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Faulty pipe of gearbox or faulty hose	Replace the faulty parts of the gearbox or the hose.
Whine or growl (intermittent or continuous) While engine is running with/ without steering turned.	Looseness of oil pump, oil pump bracket attachment	Retighten.
	Fault inside of oil pump or hose	Replace the oil pump or hose, if the noise can be heard when vehicle is running as well as being stopped.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and check.
Grinding noise (continuous) While engine is running with the steering turned.	Fault inside of gearbox	Replace the faulty parts of gearbox.
	Faulty steering shaft bearing	Apply grease or replace.
	Occurs when turning the steering wheel with brakes (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Engine speed is too low.	Adjust, and notify customer.
	Air in vane pump	Repair faulty part Vent air.
	Damaged valve in oil pump or gearbox	Replace the faulty parts in gearbox and oil pump.
	Excessive play in steering, looseness of suspension parts	Retighten.

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 paved road. 2) Start the engine. 3) Run the engine at idle. 4) Install a spring scale on the steering wheel. 5) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.  NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed of 2,000 rpm or higher, steering effort may be heavy. This is caused by flow characteristic of the fluid in the oil pump and is not a defect.	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lbf)?	Steering effort is normal.	Go to step 2.
2 CHECK STEERING EFFORT. 1) Stop the engine. 2) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.	Is the steering effort less than 294.2 N (30 kgf, 66.2 lbf)?	Go to step 3.	Adjust the backlash.
3 CHECK STEERING WHEEL EFFORT. 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is the steering effort less than 2.26 N (0.23 kgf, 0.51 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 right and left less than 20%?	Go to step 5.	Check, adjust and replace if necessary.
5 CHECK UNIVERSAL JOINT. Measure the swing torque of the joint (yoke of steering column side). <Ref. to PS-13, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 7.3 N (0.74 kgf, 1.64 lbf)?	Go to step 6.	Replace with a new part.
6 CHECK UNIVERSAL JOINT. Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-13, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 3.8 N (0.39 kgf, 0.86 lbf)?	Go to step 7.	Replace with a new part.
7 CHECK FRONT WHEEL. Check the front wheels.	Does the front wheels have unsteady revolution or rattling, or does the brake drag?	Inspect, readjust and replace if necessary.	Go to step 8.
8 CHECK TIE-ROD ENDS. Remove the tie-rod ends.	If the tie-rod ends of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 9.
9 CHECK BALL JOINT. Remove the ball joint.	If the ball joints of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 10.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

Step	Check	Yes	No
10 CHECK GEARBOX. Measure the rotating of gearbox. <Ref. to PS-34, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the rotating resistance of steering gearbox less than 11.3 N (1.15 kgf, 2.54 lbf)? Is the difference between right and left sides less than 24%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

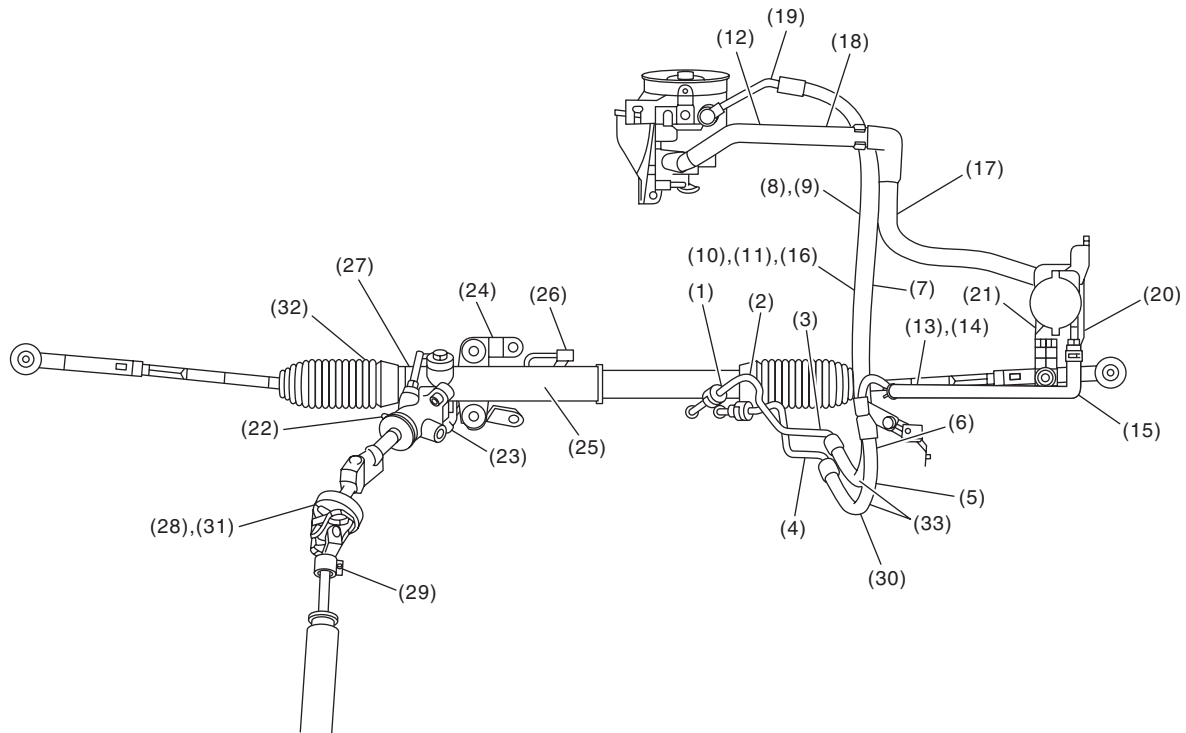
3. INSPECTION OF CLEARANCE

This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

Location	Minimum allowance mm (in)
(1) Crossmember to-Hose ASSY	3 (0.12)
(2) Front exhaust pipe to Hose ASSY (Turbo model)	15 (0.59)
(3) Front frame side to Hose ASSY	10 (0.39)
(4) Turbo cover to Hose ASSY (Turbo model)	10 (0.39)
(5) Master cylinder to Return hose (Turbo model)	10 (0.39)
(6) Master cylinder to Hose clip (Model with vehicle dynamics control (VDC))	10 (0.39)
(7) VDC H/U to Hose ASSY (Model with vehicle dynamics control (VDC))	5 (0.20)
(8) Air cleaner to Hose ASSY (Turbo model)	5 (0.20)
(9) Air boot to Hose ASSY	10 (0.39)
(10) Protector to Hose ASSY	10 (0.39)
(11) Blow-by hose to Hose ASSY (Turbo model)	8 (0.31)
(12) Over flow hose to Hose ASSY (Turbo model)	8 (0.31)
(13) Brake pipe to Return hose (Model with ABS)	10 (0.39)
(14) Front suspension bracket to Return hose	5 (0.20)
(15) Front wheel apron to Return hose	5 (0.20)
(16) VDC H/U bracket to Suction hose (Model with vehicle dynamics control (VDC))	5 (0.20)
(17) Air cleaner case to Suction hose	5 (0.20)
(18) Air intake duct to Suction hose (Turbo model)	10 (0.39)
(19) Air duct to Suction hose (Turbo model)	10 (0.39)
(20) Front wheel apron to Reservoir tank	5 (0.20)
(21) VDC H/U to Reservoir tank (Model with vehicle dynamics control (VDC))	5 (0.20)
(22) Valve housing to DOJ (MT model)	12 (0.47)
(23) Valve housing to Crossmember (Hole)	1 (0.04)
(24) Bracket to Crossmember	1 (0.04)
(25) Cylinder to Crossmember	5 (0.20)
(26) Elbow to Crossmember	1 (0.04)
(27) Cylinder to Exhaust pipe	18 (0.71)
(28) Universal joint coupling to Turbo cover (Turbo model)	15 (0.59)
(29) Universal joint column side yoke to Master cylinder (Closest point of approach when the universal joint turns by 360°)	5 (0.20)
(30) Cruise control to Hose ASSY (Model with cruise control)	10 (0.39)
(31) Universal joint coupling to ATF level gauge (LHD model)	10 (0.39)
(32) Boot to Exhaust pipe (LHD model)	18 (0.71)
(33) Return hose to Pressure hose	No contact between hoses

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)



PS-00772

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

BODY SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

**HVAC SYSTEM
(HEATER, VENTILATOR AND A/C)** AC

**HVAC SYSTEM (AUTO A/C)
(DIAGNOSTICS)** AC(diag)

AIRBAG SYSTEM AB

AIRBAG SYSTEM (DIAGNOSTICS) AB(diag)

**OCCUPANT DETECTION SYSTEM
(DIAGNOSTICS)** OD(diag)

SEAT BELT SYSTEM SB

LIGHTING SYSTEM LI

WIPER AND WASHER SYSTEMS WW

ENTERTAINMENT ET

COMMUNICATION SYSTEM COM

GLASS/WINDOWS/MIRRORS GW

BODY STRUCTURE BS

INSTRUMENTATION/DRIVER INFO IDI

SEATS SE

SECURITY AND LOCKS SL

**SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF)** SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION**EXTERIOR BODY PANELS****EB****CRUISE CONTROL SYSTEM****CC****CRUISE CONTROL SYSTEM
(DIAGNOSTICS)****CC(diag)****IMMOBILIZER (DIAGNOSTICS)****IM(diag)****LAN SYSTEM (DIAGNOSTICS)****LAN(diag)**

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

AC

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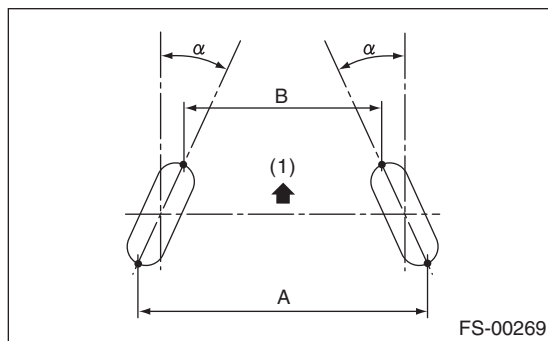
1. General Description

A: SPECIFICATION

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

NOTE:

- Front and rear toe-in and front camber can be adjusted. Adjust if the toe-in or camber tolerance exceeds specifications.
- Other items indicated in the specifications are not equipped with adjustment mechanisms. If other items exceed specifications, check the suspension parts and connections for deformation. If defective, replace with new parts.



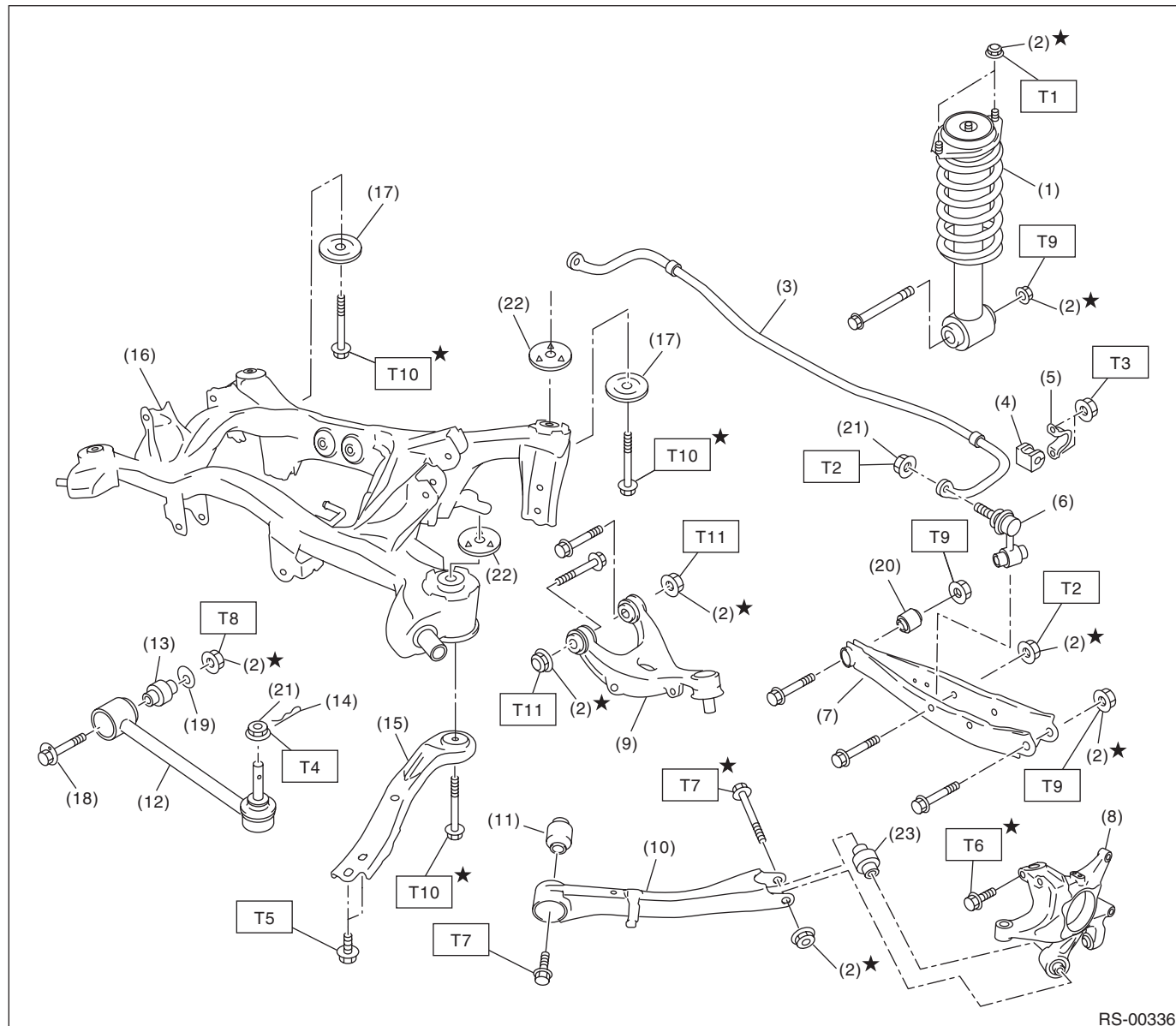
(1) Front

$A - B = \text{Positive: Toe-in, Negative: Toe-out}$

$\alpha = \text{Individual toe angles}$

B: COMPONENT

1. REAR SUSPENSION



(1) Shock absorber	(13) Front lateral link bushing
(2) Self-locking nut	(14) Snap pin
(3) Rear stabilizer	(15) Front sub frame support plate
(4) Stabilizer bushing	(16) Rear sub frame
(5) Stabilizer clamp	(17) Rear sub frame stopper plate (lower)
(6) Stabilizer link	(18) Adjusting bolt
(7) Rear lateral link	(19) Adjusting washer
(8) Rear housing	(20) Rear lateral link bushing
(9) Upper arm	(21) Flange nut
(10) Trailing link	(22) Rear sub frame stopper plate (upper)
(11) Trailing link bushing	(23) Rear housing bushing
(12) Front lateral link	

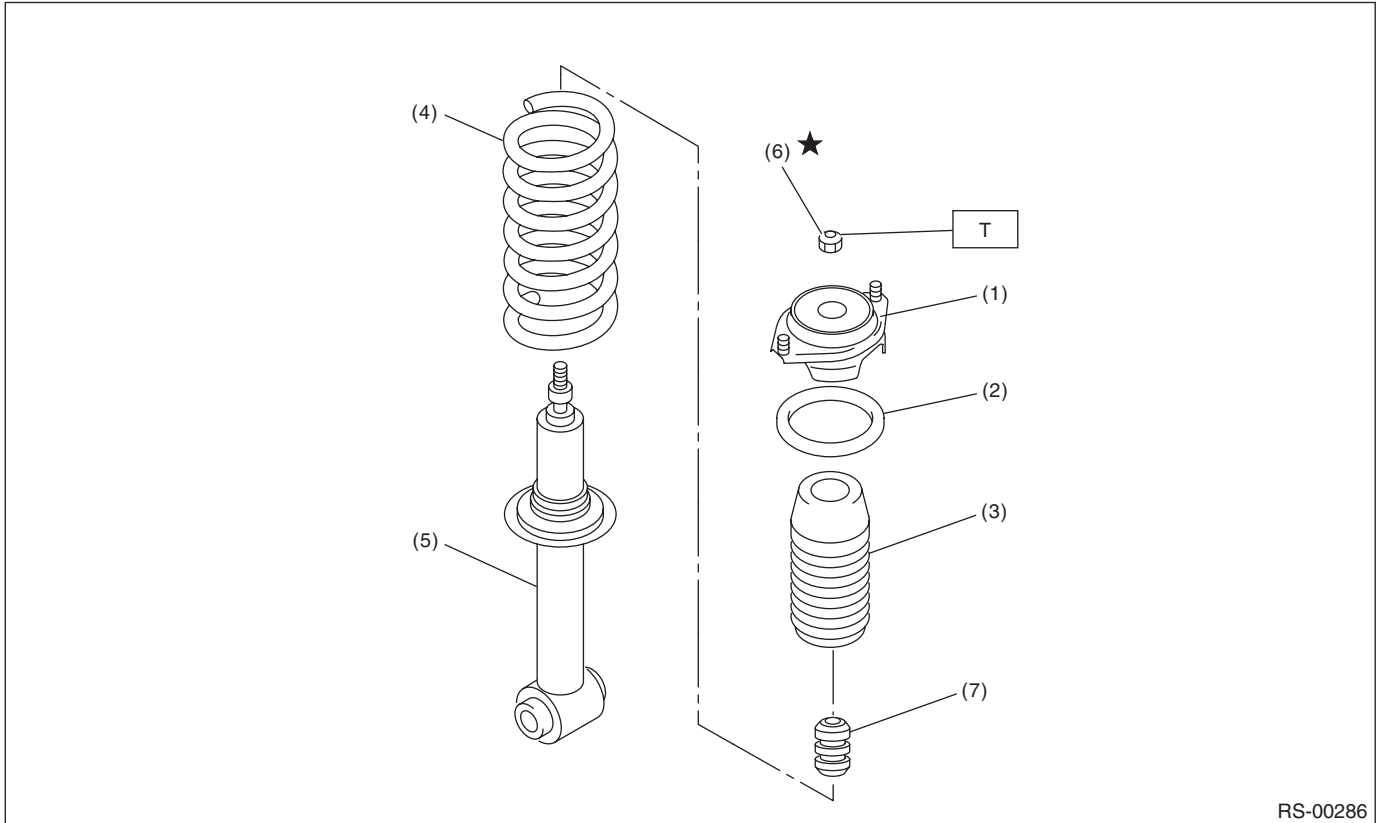
Tightening torque: N-m (kgf-m, ft-lb)

T1:	30 (3.1, 22.1)
T2:	38 (3.9, 28)
T3:	40 (4.1, 29.5)
T4:	60 (6.1, 44.3)
T5:	70 (7.1, 51.6)
T6:	80 (8.2, 59)
T7:	90 (9.2, 66.4)
T8:	100 (10.2, 73.8)
T9:	120 (12.2, 88.5)
T10:	145 (14.8, 106.9)
T11:	150 (15.3, 110.6)

General Description

REAR SUSPENSION

2. SHOCK ABSORBER



(1) Mount	(5) Shock absorber
(2) Upper rubber sheet	(6) Self-locking nut
(3) Dust cover	(7) Helper
(4) Coil spring	

Tightening torque: N·m (kgf-m, ft-lb)
T: 25 (2.5, 18.4)

C: CAUTION

Please clearly understand and adhere to the following general precautions. They must be strictly followed to avoid minor or serious injury to the person doing the work or people in the area.

1. CAUTIONS

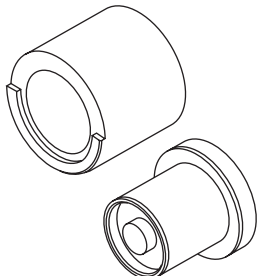
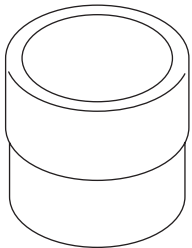
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before disposing of shock absorbers, be sure to bleed the gas out completely. Also, do not expose to flames or fire.
- Before removal, installation or disassembly, be sure to clarify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

2. OIL

When handling oil, adhere to the following to prevent unexpected accident.

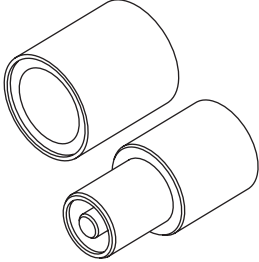
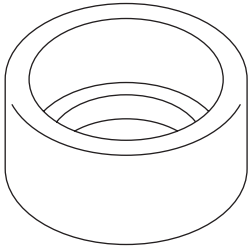
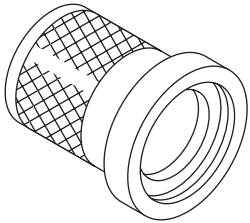
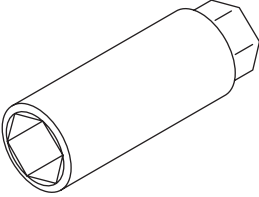
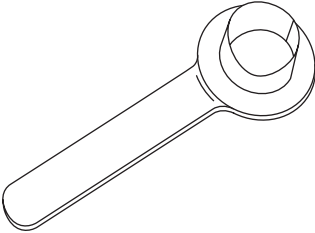
- Prepare container and waste cloths when performing work which oil could possibly spill. If oil spills, wipe it off immediately to prevent from penetrating into floor or flowing outside, for environmental protection.
- Follow all government regulations concerning disposal of refuse when disposing.

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

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099AE000	20099AE000	INSTALLER & REMOVER	Used for replacing the front lateral link bushing.
 ST-499755602	499755602	PRESS	Used for replacing the rear trailing link bushing.

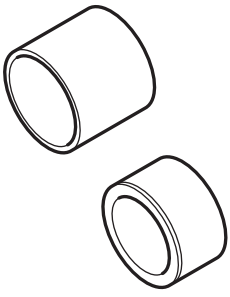
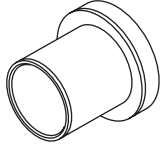
General Description

REAR SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099AE010	20099AE010	INSTALLER & REMOVER	Used for replacing the rear lateral link bushing.
 ST20299AG010	20299AG010	BASE	Used for replacing the rear trailing link bushing.
 ST-899874100	899874100	INSTALLER	Used for replacing the rear trailing link bushing.
 ST20399FG000	20399FG000	STRUT MOUNT SOCKET	• Used for removing and installing shock mount. • Used for checking torque of shock mount center nut.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to the rear differential. • For oil seal protection

General Description

REAR SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099PA010	20099PA010	INSTALLER & REMOVER	- Used for replacing the bushing of the rear housing. - Used together with BUSHING REMOVER (20099FG000).
 ST20099FG000	20099FG000	BUSHING REMOVER	- Used for replacing the bushing of the rear housing. - Used together with INSTALLER & REMOVER (20099PA010).

2. GENERAL TOOL

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

2. Wheel Alignment

A: INSPECTION

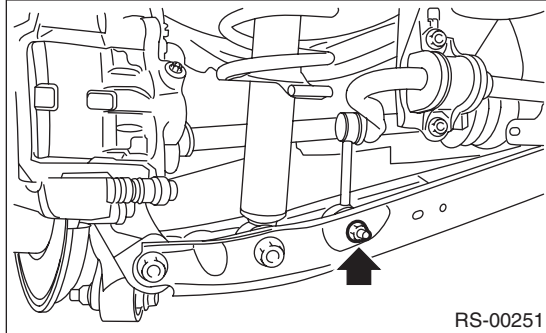
NOTE:

Measure and adjust the front and rear wheel alignment at a time. Refer to “FS” section for measurement and adjustment of wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>

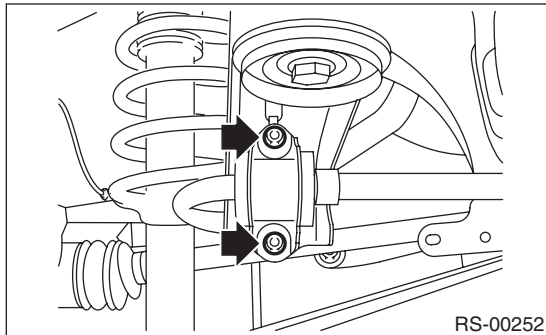
3. Rear Stabilizer

A: REMOVAL

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



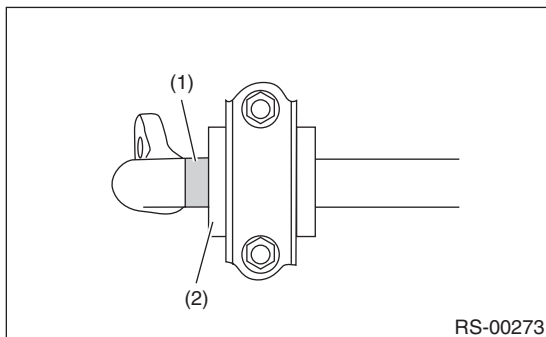
- 3) Remove the stabilizer clamp.



B: INSTALLATION

CAUTION:

- Be sure to use a new flange nut and self-locking nut.
- Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.
- Align the paint mark end of stabilizer to the end of bushing when installing.



- (1) Identification paint
- (2) Bushing

Install in the reverse order of removal.

Tightening torque:

Stabilizer link

38 N·m (3.9 kgf-m, 28 ft-lb)

Stabilizer clamp

40 N·m (4.1 kgf-m, 29.5 ft-lb)

C: INSPECTION

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

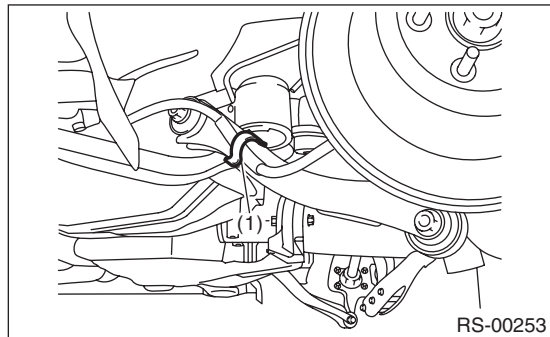
Rear Trailing Link

REAR SUSPENSION

4. Rear Trailing Link

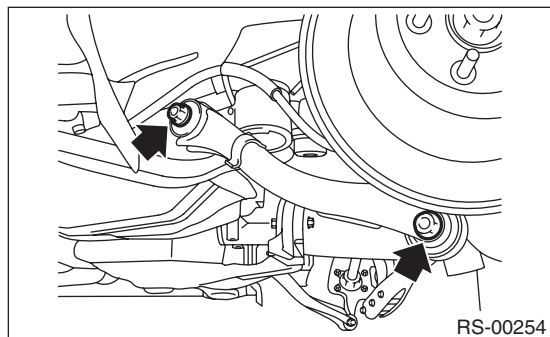
A: REMOVAL

- 1) Lift up the vehicle, and then remove the rear wheels.
- 2) Remove the bracket, and remove the parking brake cable from the guide.



(1) Guide

- 3) Remove the trailing link.



B: INSTALLATION

CAUTION:

- Be sure to use a new self-locking nut.
- Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.

Install in the reverse order of removal.

Tightening torque:

90 N·m (9.2 kgf-m, 66.4 ft-lb)

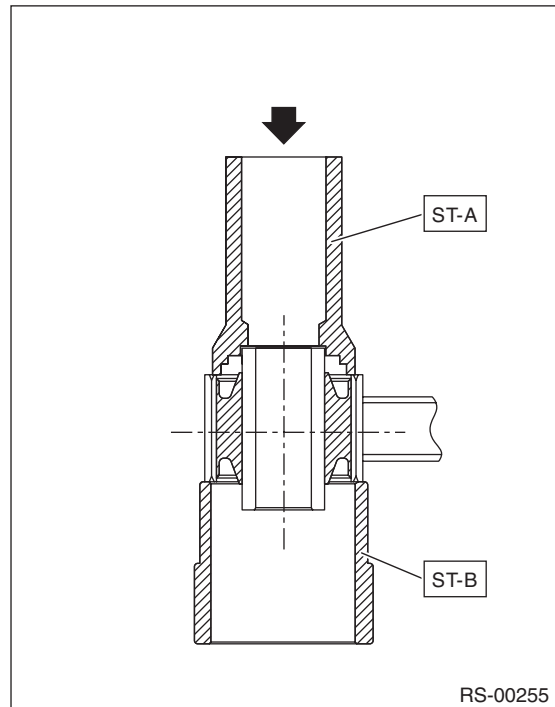
C: DISASSEMBLY

1. REAR TRAILING LINK BUSHING

Using the ST A and ST B, press the bushing out.

ST A 8998741000 INSTALLER

ST B 499755602 PRESS

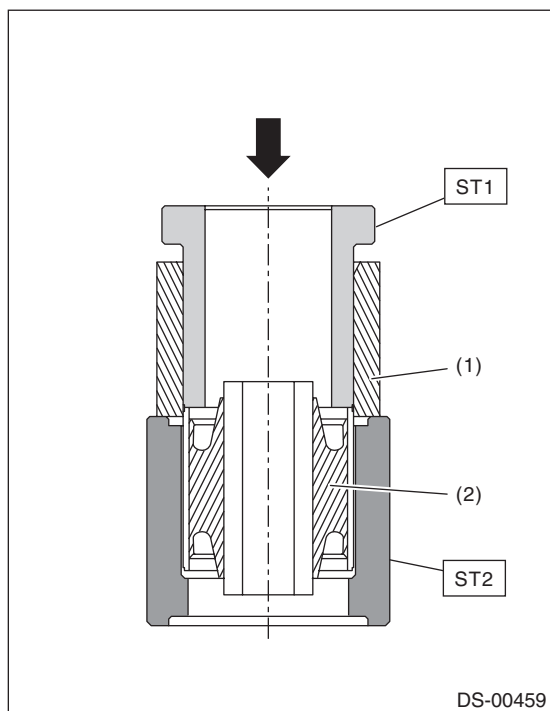
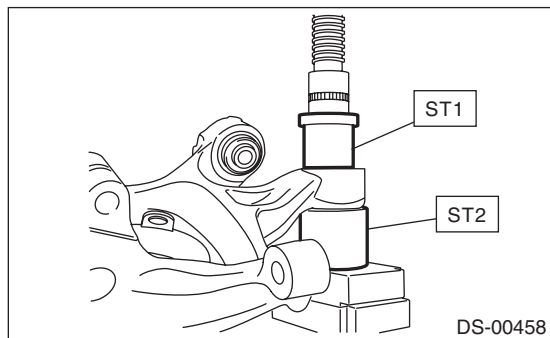


2. REAR HOUSING BUSHING

- 1) Remove the rear housing. <Ref. to DS-19, REMOVAL, Rear Axle.>

2) Using the ST and a hydraulic press, push out the bushing.

ST1 200099FG000 BUSHING REMOVER
ST2 20099PA010 INSTALLER & REMOVER (BASE)



- (1) Rear housing
- (2) Bushing

D: ASSEMBLY

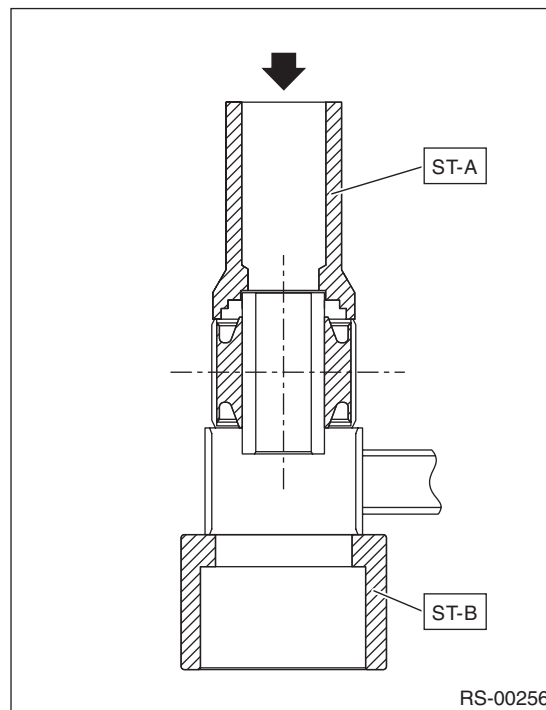
1. REAR TRAILING LINK BUSHING

Using the ST A and ST B, press-fit the bushing.

ST A 8998741000 INSTALLER
ST B 20299AG010 BASE

CAUTION:

Make sure to press the bushing straight in.



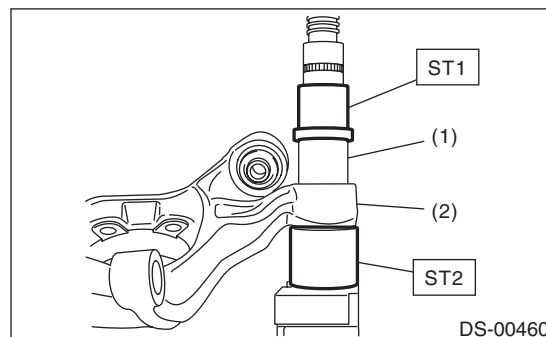
2. REAR HOUSING BUSHING

Press-fit the bushing using ST and the hydraulic press.

ST1 20099FG000 BUSHING REMOVER
ST2 20099PA010 INSTALLER & REMOVER (BASE)

CAUTION:

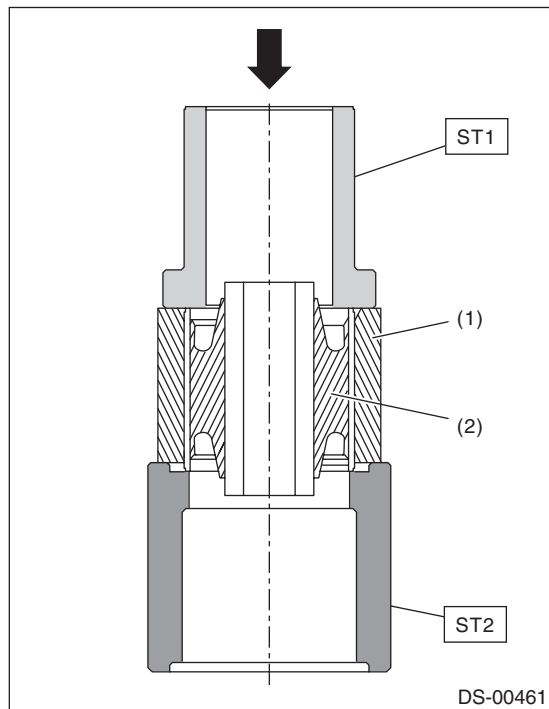
Make sure to press the bushing straight in.



- (1) Bushing
- (2) Rear housing

Rear Trailing Link

REAR SUSPENSION



- (1) Rear housing
- (2) Bushing

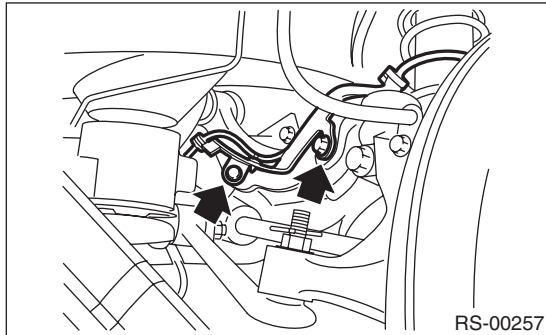
E: INSPECTION

Perform visual check for damage or bend on the trailing link.

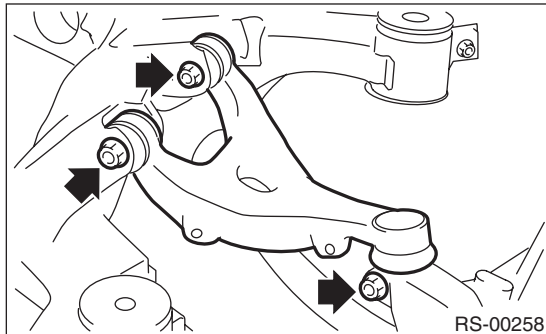
5. Upper Arm

A: REMOVAL

- 1) Remove the rear sub frame. <Ref. to RS-17, REMOVAL, Rear Sub Frame.>
- 2) Remove the rear ABS wheel speed sensor bracket.



- 3) Remove the bolts, then remove the upper arm.



B: INSTALLATION

CAUTION:

- Be sure to use a new self-locking nut.
- Always tighten the bushing when the arm is positioned in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.

- 1) Install in the reverse order of removal.
- 2) Inspect the wheel alignment and adjust if necessary.

Tightening torque:

Upper arm — Rear sub frame

150 N·m (15.3 kgf-m, 110.6 ft-lb)

Upper arm — Rear housing

80 N·m (8.2 kgf-m, 59 ft-lb)

Rear ABS wheel speed sensor bracket

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

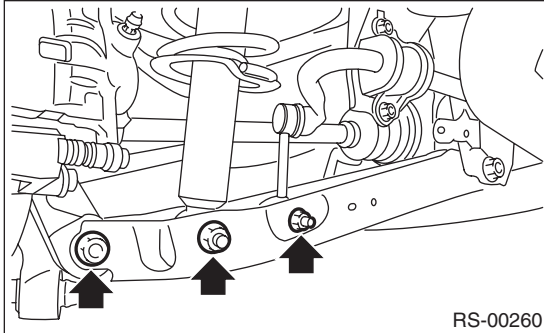
C: INSPECTION

- 1) Visually check the upper arm for damage and deformation.
- 2) Visually check the bushing for abnormal cracks, fatigue or damage.

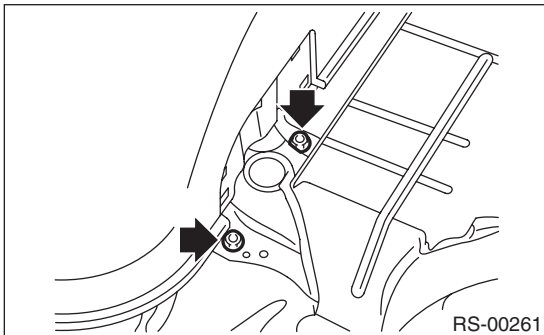
6. Rear Shock Absorber

A: REMOVAL

- 1) Remove the luggage floor mat.(5 door model)
- 2) Remove the trunk room mat.(4 door model)
- 3) Remove the strut cap of the quarter trim.
- 4) Lift up the vehicle, and then remove the rear wheels.
- 5) Remove the nut and disconnect the rear stabilizer link.
- 6) Remove the shock absorber lower bolt.
- 7) Disconnect the rear lateral link.



- 8) Remove the shock absorber mount nut.



- 9) Remove the shock absorber.

B: INSTALLATION

CAUTION:

- Be sure to use a new self-locking nut.
- Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.

- 1) Install in the reverse order of removal.

Tightening torque:

Refer to “COMPONENT” of “General Description” for the tightening torque. <Ref. to RS-3, COMPONENT, General Description.>

- 2) Check the wheel alignment and adjust it if necessary.

C: DISASSEMBLY

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

D: ASSEMBLY

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

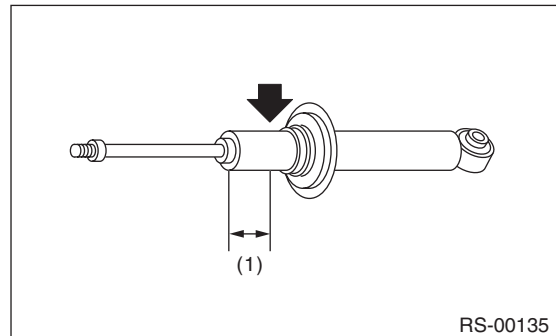
E: INSPECTION

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

F: DISPOSAL

CAUTION:

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

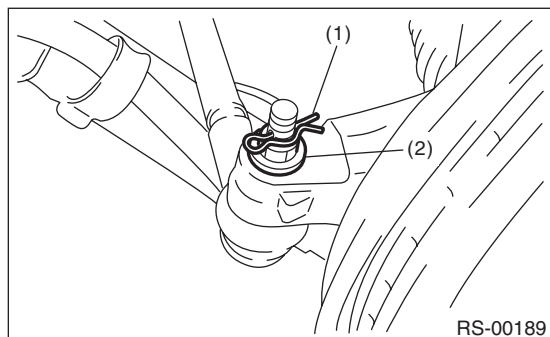


(1) 40 mm (1.57 in)

7. Front Lateral Link

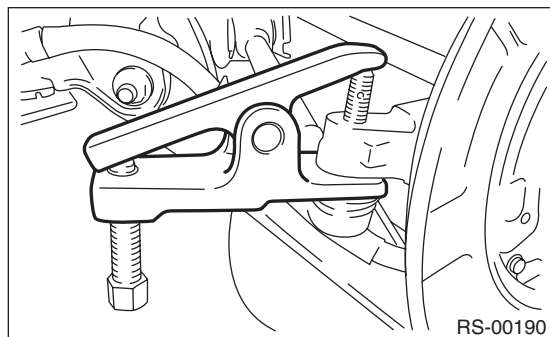
A: REMOVAL

- 1) Lift up the vehicle, and then remove the rear wheels.
- 2) Remove the rear trailing link. <Ref. to RS-10, REMOVAL, Rear Trailing Link.>
- 3) Remove the snap pin and nut.



- (1) Snap pin
- (2) Nut

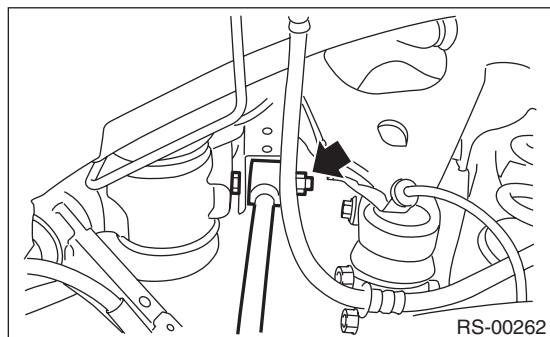
- 4) Using a puller, remove the ball joint.



- 5) Scribe an alignment mark on the front lateral link adjusting bolt and rear sub frame.
- 6) Remove the adjusting bolt, and remove the front lateral link.

CAUTION:

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



B: INSTALLATION

CAUTION:

- Be sure to use a new self-locking nut.
- Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.

- 1) Install in the reverse order of removal.

Tightening torque:

Front lateral link — Sub frame

100 N·m (10.2 kgf-m, 73.8 ft-lb)

Front lateral link — Rear axle housing

60 N·m (6.1 kgf-m, 44.3 ft-lb)

- 2) Inspect the wheel alignment and adjust if necessary.

C: INSPECTION

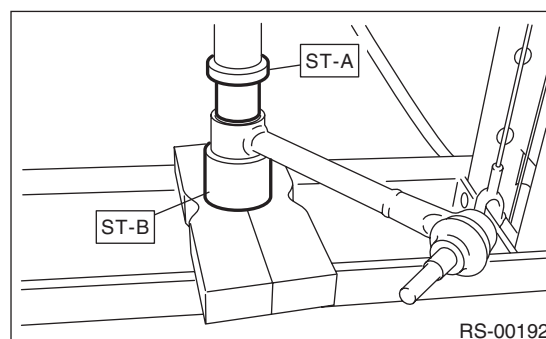
Visually check the front lateral link for damage and deformation.

D: DISASSEMBLY

Using the ST A and ST B, press the bushing out.

ST A 20099AE000 INSTALLER & REMOVER

ST B 20099AE000 INSTALLER & REMOVER



E: ASSEMBLY

Using the ST A and ST B, press-fit the bushing.

ST A 20099AE000 INSTALLER & REMOVER

ST B 20099AE000 INSTALLER & REMOVER

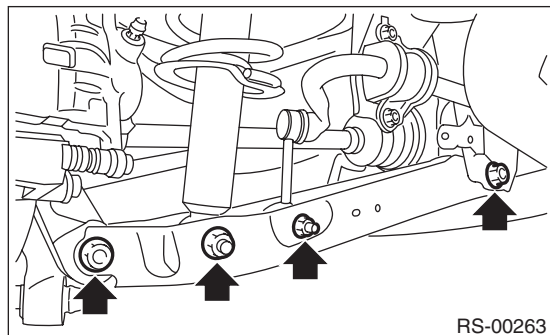
CAUTION:

Make sure to press the bushing straight in.

8. Rear Lateral Link

A: REMOVAL

- 1) Lift up the vehicle, and then remove the rear wheels.
- 2) Remove the nut and disconnect the stabilizer link.
- 3) Remove the shock absorber lower bolt.
- 4) Remove the bolt, and remove rear lateral link.



B: INSTALLATION

CAUTION:

- Be sure to use a new self-locking nut.
- Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.

- 1) Install in the reverse order of removal.

Tightening torque:

Rear lateral link

120 N·m (12.2 kgf-m, 88.5 ft-lb)

Shock absorber

120 N·m (12.2 kgf-m, 88.5 ft-lb)

Stabilizer link

38 N·m (3.9 kgf-m, 28 ft-lb)

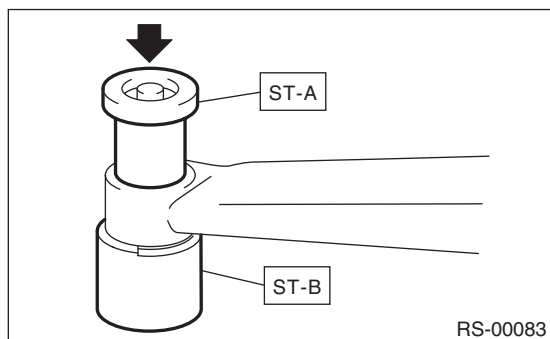
- 2) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

Using the ST A and ST B, press the bushing out.

ST A 20099AE010 INSTALLER & REMOVER

ST B 20099AE010 INSTALLER & REMOVER

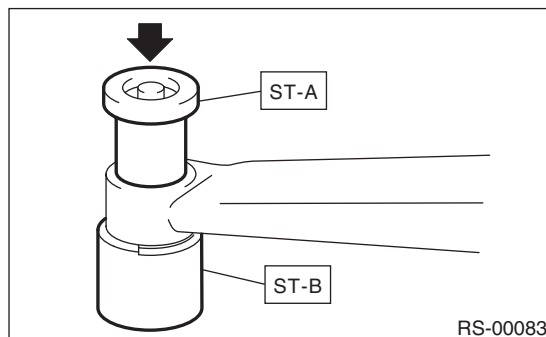


D: ASSEMBLY

Using the ST A and ST B, press-fit the bushing.

ST A 20099AE010 INSTALLER & REMOVER

ST B 20099AE010 INSTALLER & REMOVER



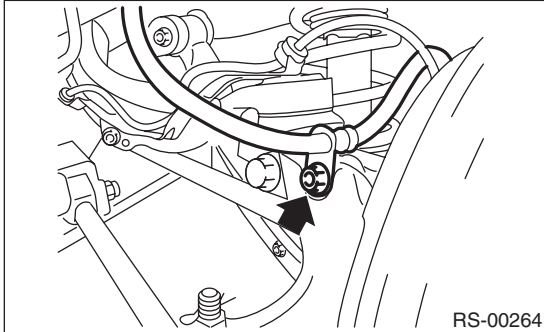
E: INSPECTION

Visually check the rear lateral link for damage and deformation.

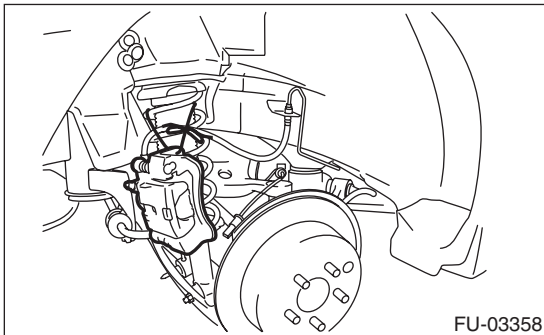
9. Rear Sub Frame

A: REMOVAL

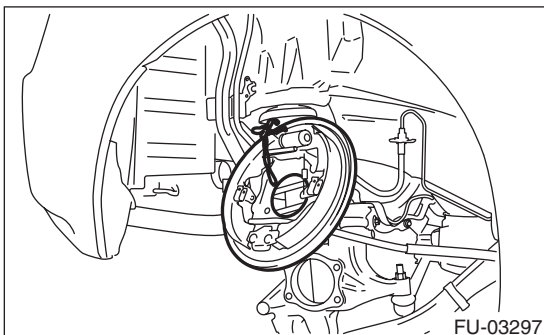
- 1) Separate the front exhaust pipe and rear exhaust pipe.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the propeller shaft.
<Ref. to DS-10, REMOVAL, Propeller Shaft.>
- 4) Remove the brake hose bracket.



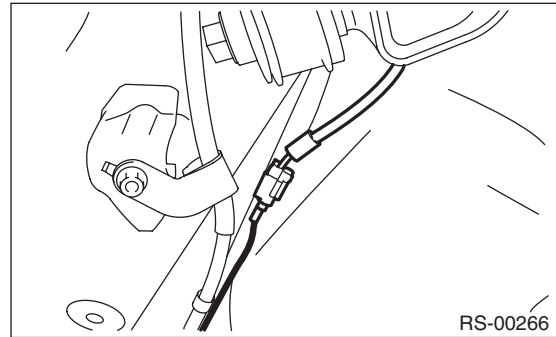
- 5) Remove the rear disc brake caliper, and suspend it from the shock absorber. (Disc brake model)



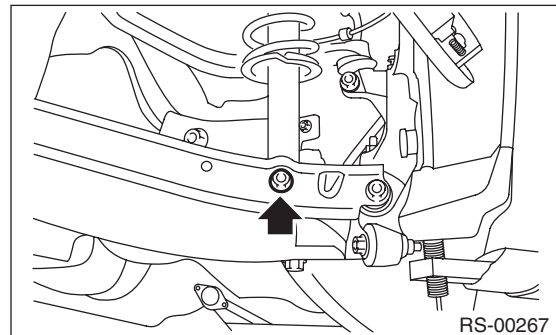
- 6) Remove the rear parking brake cable from the parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
- 7) Remove the rear hub unit bearing, and suspend the rear brake from the shock absorber. (Drum brake model) <Ref. to DS-23, REMOVAL, Rear Hub Unit Bearing.>



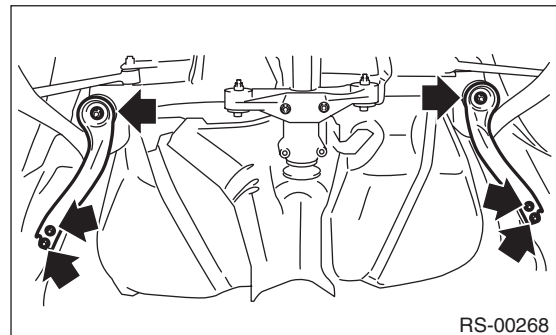
- 8) Disconnect the ABS wheel speed sensor connector.



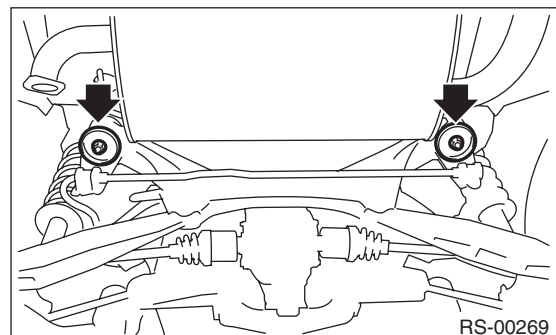
- 9) Remove the shock absorber lower bolt.



- 10) Support the sub frame using a jack.
- 11) Remove the support plate.



- 12) Remove the rear sub frame.



B: INSTALLATION

CAUTION:

- Be sure to use a new self-locking nut.
- Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.

1) Install in the reverse order of removal.

Tightening torque:

Refer to “COMPONENT” of “General Description” for the tightening torque. <Ref. to RS-3, COMPONENT, General Description.>

2) Inspect the wheel alignment and adjust if necessary.

C: INSPECTION

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

10. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

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

2. POOR RIDE COMFORT

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

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

3. NOISE

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

General Diagnostic Table

REAR SUSPENSION

WHEEL AND TIRE SYSTEM

WT

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Basic Diagnostic Procedure

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:

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

NOTE:

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

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

General Description

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

2. General Description

A: CAUTION

1. SRS AIRBAG SYSTEM

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

CAUTION:

- Do not use electrical test equipment on any of the airbag system wiring harness circuits.
- Be careful not to damage the airbag system wiring harness when servicing the tire pressure monitoring control module.

2. TIRE PRESSURE MONITORING CONTROL MODULE

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

P205/50R17 and P205/55R16

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

B: INSPECTION

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

1. TIRES

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

2. BATTERY

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

Standard voltage: 12 V or more

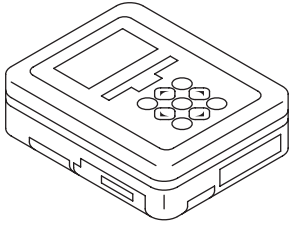
Specific gravity: 1.260 or more

General Description

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

C: PREPARATION TOOL

1. SPECIAL TOOL

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

2. GENERAL TOOL

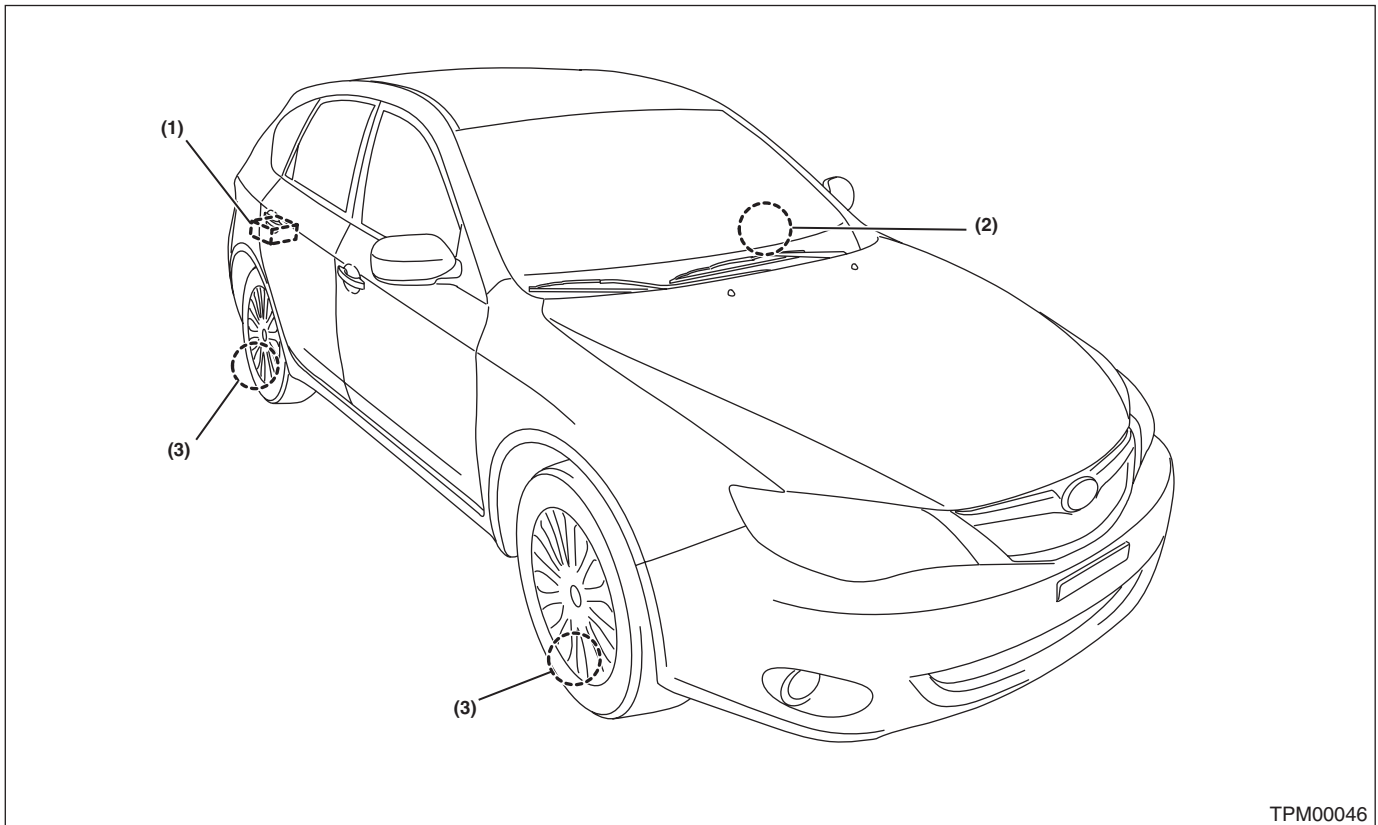
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Transmitter registration tool	Used to register the transmitter ID. Manufacturer: Kent-Moore Item number: J45295

Electrical Component Location

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

3. Electrical Component Location

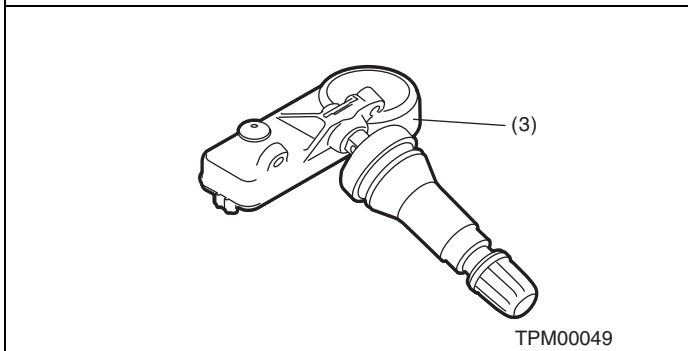
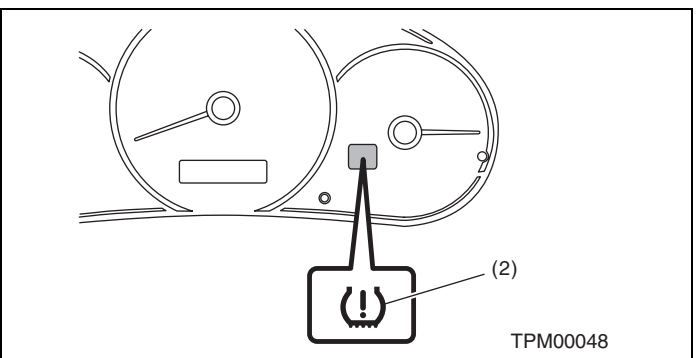
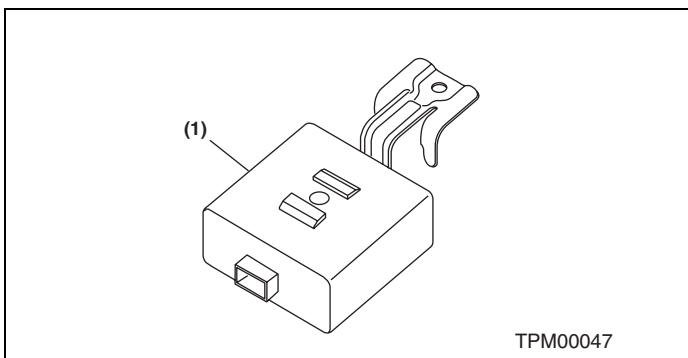
A: LOCATION



(1) TIRE PRESSURE MONITORING
CONTROL MODULE

(2) Tire pressure warning light

(3) Snap-in type transmitter



SUBARU

Control Module I/O Signal

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

4. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

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

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Diagram illustrating a radio receiver circuit. The central component is a rectangular block labeled (3) with pins 1 through 9. The circuit includes various components and connections:

- Pin 6 is connected to a line labeled (1).
- Pin 5 is connected to a line labeled (2).
- Pin 4 is connected to a box labeled (8).
- Pin 8 is connected to a box labeled (10).
- Pin 2 is connected to a box labeled (7).
- Pin 1 is connected to a line labeled (9).
- Pin 9 is connected to a ground symbol labeled (5).
- A lightning bolt symbol is positioned above the central block (3).
- Two boxes labeled (6) are positioned to the left of the lightning bolt.
- One box labeled (6) is positioned to the right of the lightning bolt.
- Below the central block (3) is a 2x6 grid of boxes numbered 1 through 12, with a small bridge connecting the top of boxes 3 and 4.

- ## TPM(diag)-7

5. Subaru Select Monitor

A: OPERATION

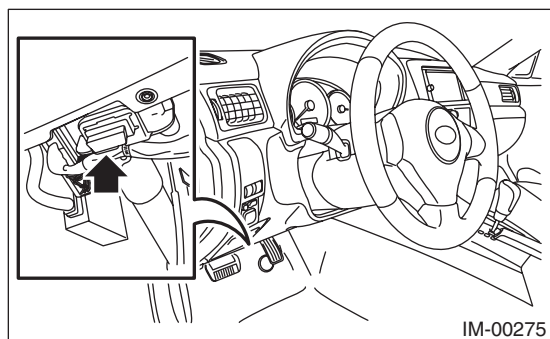
1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit. <Ref. to TPM(diag)-4, SPECIAL TOOL, PREPARATION TOOL, General Description.>

2) Connect the diagnosis cable to Subaru Select Monitor.

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

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



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

CAUTION:

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

4) Turn the ignition switch to ON and run the Subaru Select Monitor.

5) On «Main Menu» display, select {Each System Check}.

6) On «System Selection Menu» display, select {Tire pressure monitor}.

7) On «Tire pressure monitor diagnosis» display, select {Diagnostic Code(s) Display}.

NOTE:

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

8) If communication is not possible between the tire pressure monitoring control module and the Subaru Select Monitor, check the communication circuit. <Ref. to TPM(diag)-11, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

9) When DTC is not displayed, check the indicator circuit and communication circuit. <Ref. to TPM(diag)-14, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

Subaru Select Monitor

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

2. DATA DISPLAY

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

1. Data monitor (Analog)

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

Subaru Select Monitor

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

3. CLEAR MEMORY

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

NOTE:

For details concerning the operation procedure, refer to “PC application help for Subaru Select Monitor”.

4. REGISTER TRANSMITTER ID

Perform the procedures below to register the transmitter.

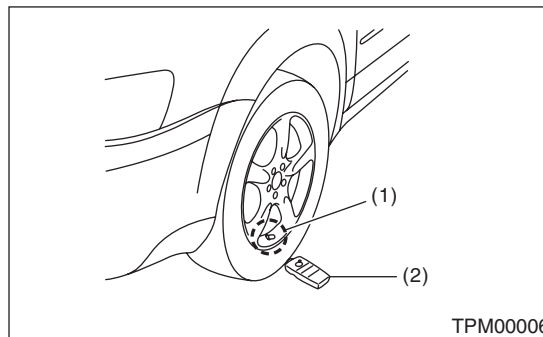
- Transmitter replaced.
- Replaced the tire pressure monitoring control module.

NOTE:

- If registration of the transmitter ID is not possible after 2 attempts, replace the tire pressure monitoring control module. <Ref. to WT-12, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.> <Ref. to WT-13, TIRE PRESSURE MONITORING CONTROL MODULE, INSTALLATION, Tire Pressure Monitoring System.>
- During the registration, turn the ignition switch to OFF and end the Subaru Select Monitor. Or if the registration is not performed for 5 minutes or more, the registration mode is cancelled.
- When rotating tires, there is no affect on the performance or functions of the tire pressure monitoring control module even if the transmitter (ID) is not registered, however, the tire position displayed on the Subaru Select Monitor will be incorrect.

- 1) Adjust all tire pressures to the specifications.
- 2) Connect Subaru Select Monitor and select the {Each System Check} on the «Main Menu».
- 3) On «System Selection Menu» display, select {Tire pressure monitor}.
- 4) After the {Tire pressure monitor} is displayed, select [OK].
- 5) On «Tire pressure monitor diagnosis» display, select {Transmitter ID regist confirm}.
- 6) {ID registration mode When execute Registered ID is deleted. Continue?} is displayed, select [OK].

- 7) Touch the transmitter registration tool to the side wall area near the air valve on the front left tire, and press the switch. The transmitter ID is sent to the tire pressure monitoring control module. (At that time, the tire pressure warning light blinks to confirm that the registration has started.)



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

NOTE:

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

5. DISPLAY TRANSMITTER (ID).

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

Subaru Select Monitor

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

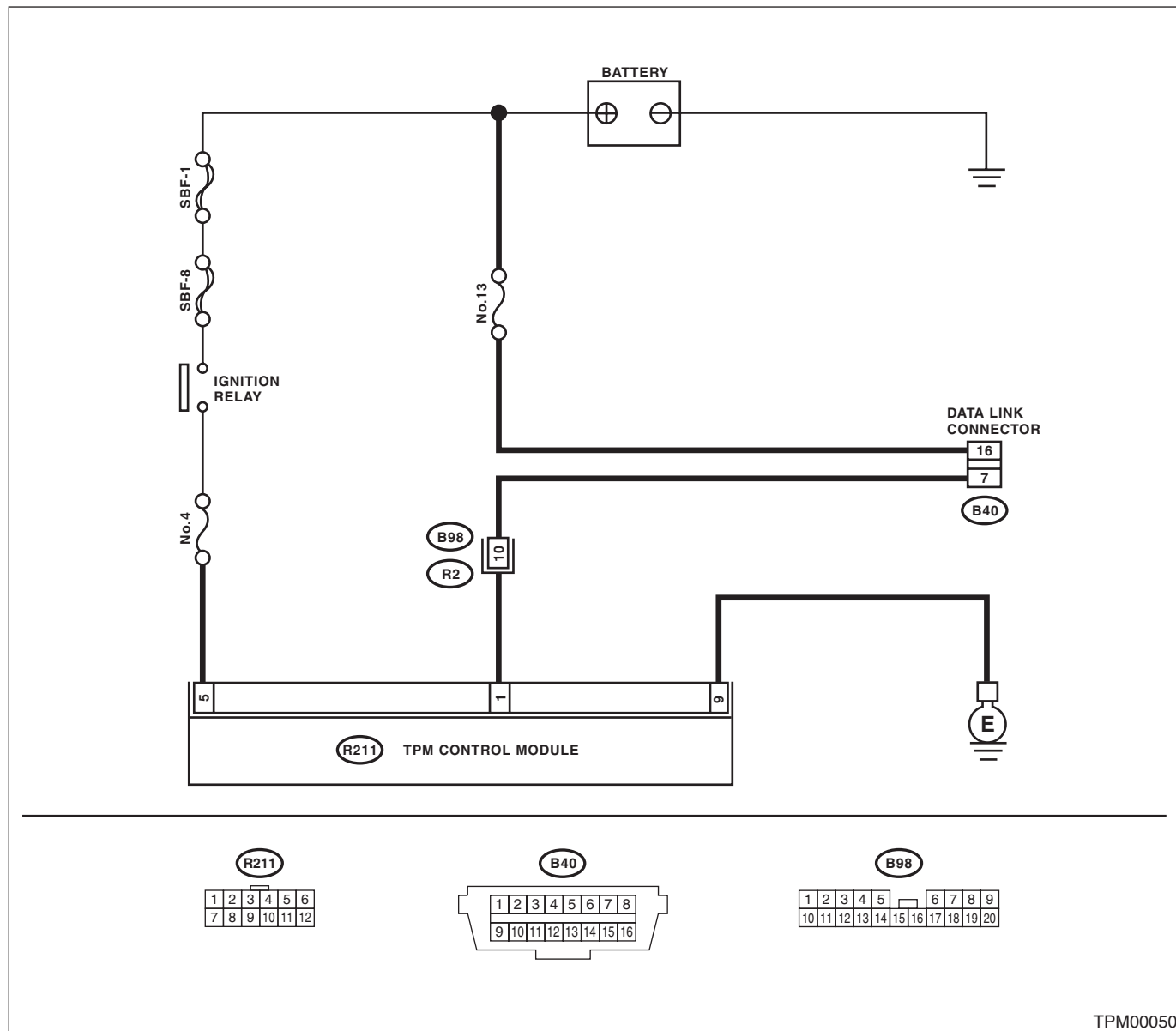
DETECTING CONDITION:

Defective harness connector

TROUBLE SYMPTOM:

Communication is impossible between the tire pressure monitoring control module and the Subaru Select Monitor.

WIRING DIAGRAM:



Step	Check	Yes	No
1	CHECK IGNITION SWITCH.	Is the ignition switch ON?	Go to step 2.
2	CHECK BATTERY.	Is the voltage 11 V or more?	Go to step 3.

Subaru Select Monitor

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK BATTERY TERMINAL.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step 4.
4 CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Go to step 8.	Go to step 5.
5 CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to OFF. 2) Disconnect the tire pressure monitoring control module connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Replace the tire pressure monitoring control module. <Ref. to WT-12, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	Go to step 6.
6 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the tire pressure monitoring control module. 3) Measure the resistance between data link connector and chassis ground. Connector & terminal (B40) No. 7 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 7.	Repair the harness and connector between each control module and data link connector.
7 CHECK TIRE PRESSURE MONITORING CONTROL MODULE OUTPUT SIGNAL. 1) Turn the ignition switch to ON. 2) Measure the voltage between tire pressure monitoring control module and chassis ground. Connector & terminal (B40) No. 7 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 8.	Repair the harness and connector between each control module and data link connector.
8 CHECK HARNESS CONNECTOR BETWEEN TIRE PRESSURE MONITORING CONTROL MODULE AND DATA LINK CONNECTOR. Measure the resistance between tire pressure monitoring control module and data link connector. Connector & terminal (R211) No. 1 — (B40) No. 7:	Is the resistance less than 0.5 Ω ?	Go to step 9.	Repair the harness and connector between tire pressure monitoring control module and data link connector.
9 CHECK TIRE PRESSURE MONITORING CONTROL MODULE CONNECTOR. Turn the ignition switch to OFF.	Is the tire pressure monitoring control module connector inserted in the tire pressure monitoring control module until it locks?	Go to step 10.	Insert the tire pressure monitoring control module connector into the tire pressure monitoring control module.
10 CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. 2) Measure the ignition power voltage between tire pressure monitoring control module connector and chassis ground. Connector & terminal (R211) No. 5 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 11.	Repair open circuit of the harness between the tire pressure monitoring control module and battery.

Subaru Select Monitor

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

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

Subaru Select Monitor

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

2. WITHOUT DTC

DETECTING CONDITION:

- Defective combination meter
- Defective harness

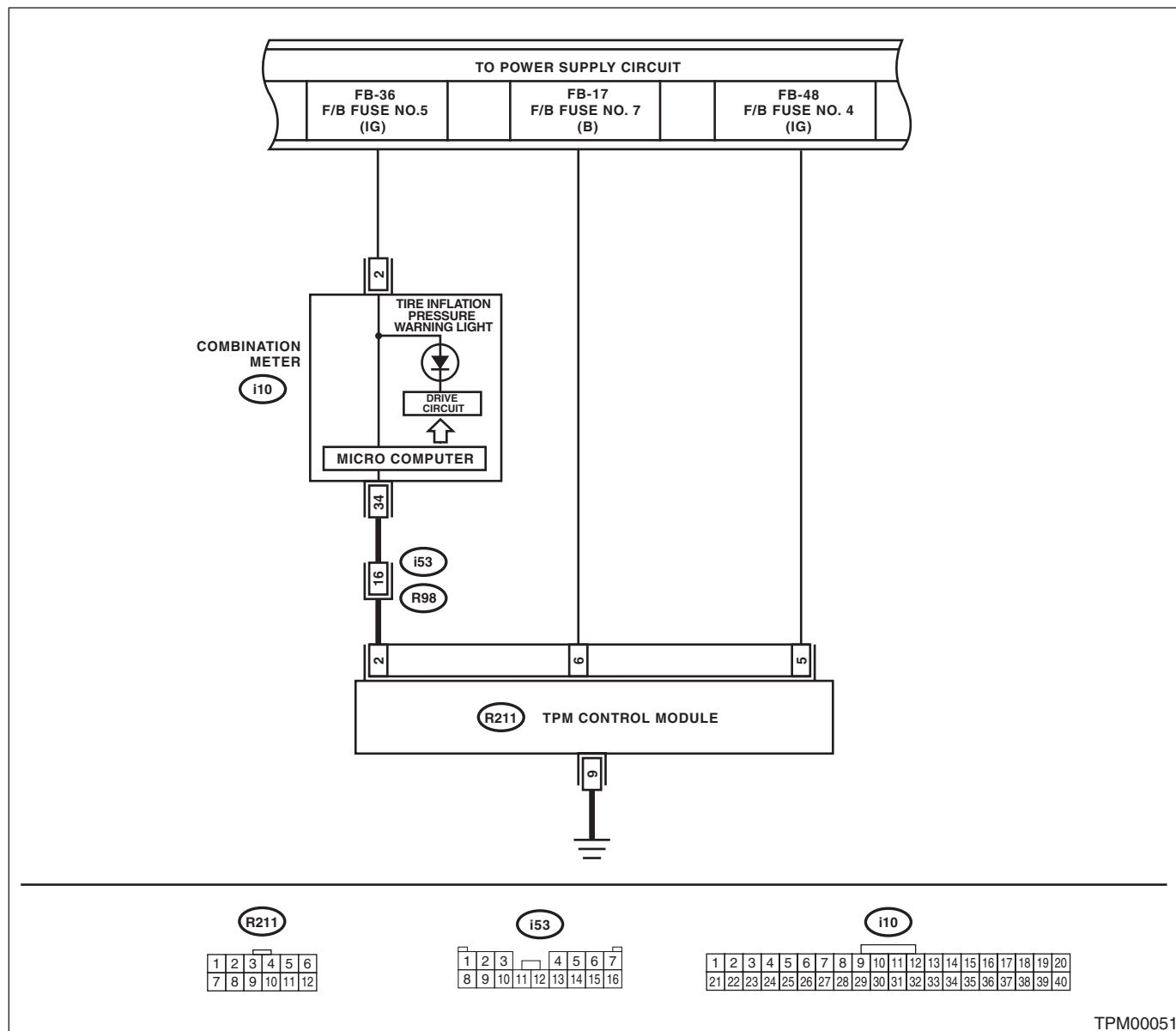
TROUBLE SYMPTOM:

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

NOTE:

When the tire pressure warning light is OFF and “No diagnostic Code Present” is displayed on Subaru Select Monitor, the system is operating properly.

WIRING DIAGRAM:



TPM00051

Subaru Select Monitor

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SUBARU SELECT MONITOR DATA. 1) Select {Current Data Display & Save} in the Subaru Select Monitor. 2) Read the data of the "Tire pressure warning light".	Is "ON" indicated?	Replace the tire pressure monitoring control module. <Ref. to WT-12, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	Go to step 2.
2 CHECK WIRING HARNESS. Measure the resistance between tire pressure monitoring control module and combination meter connector. Connector & terminal (i10) No. 34 — (R211) No. 2:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the harness and connector between tire pressure monitoring control module and combination meter.
3 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact of the tire pressure monitoring control module connector and combination meter connector?	Repair the connector.	Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>

Read Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details about reading of DTCs, refer to “Subaru Select Monitor”. <Ref. to TPM(diag)-8, Subaru Select Monitor.>

7. Inspection Mode

A: PROCEDURE

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

Clear Memory Mode

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

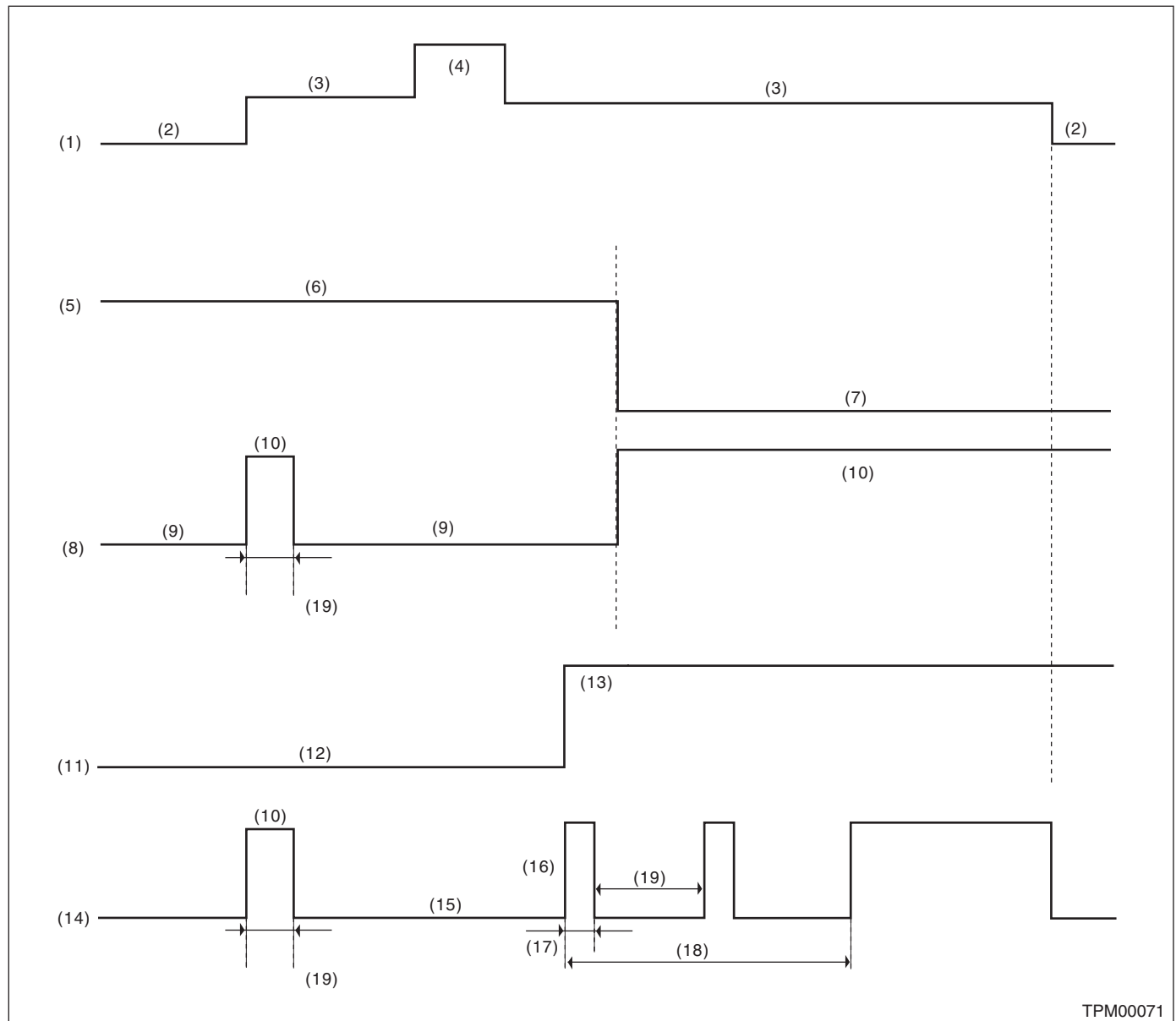
8. Clear Memory Mode

A: OPERATION

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

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

A: INSPECTION



TPM00071

(1) Ignition switch	(8) Tire pressure warning light (tire pressure status)	(15) Light OFF
(2) OFF	(9) Light OFF	(16) Blink
(3) ON	(10) Light ON	(17) 1 second
(4) Start	(11) System status	(18) Blinks 25 times
(5) Tire pressure	(12) Normal	(19) 2 second
(6) Meet the specification	(13) Malfunction	
(7) Below the specification (for alarm pressure, refer to "current data".) <Ref. to TPM(diag)-9, DATA DISPLAY, OPERATION, Subaru Select Monitor.>	(14) Tire pressure warning light (system status)	

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

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

2) If the tire pressure warning light does not go off, check the tire pressure monitoring control module/warning light circuit and the combination meter circuit. <Ref. to TPM(diag)-22, TIRE PRESSURE WARNING LIGHT DOES NOT COME OFF, Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern.>

NOTE:

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

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

B: TIRE PRESSURE WARNING LIGHT DOES NOT COME ON

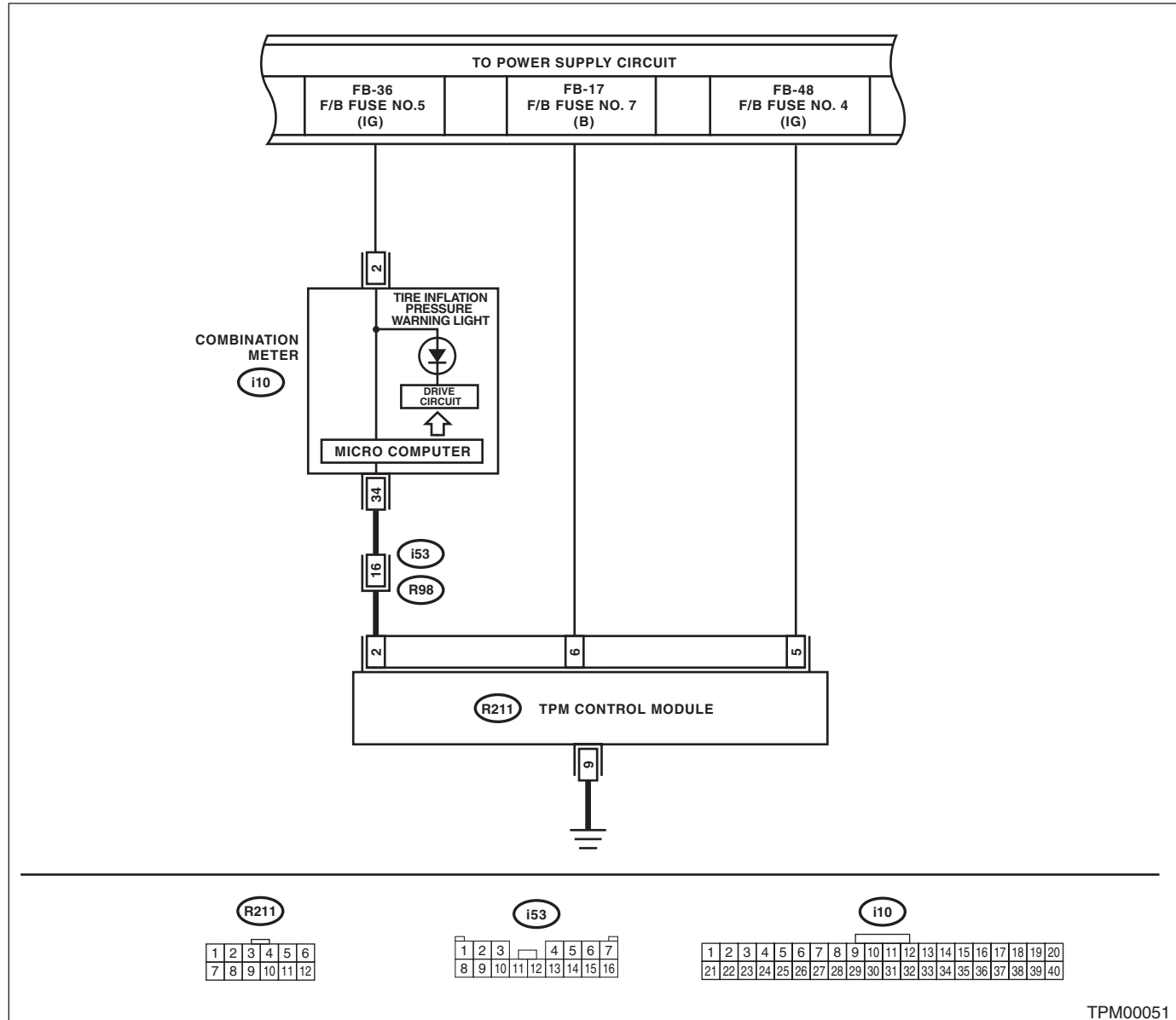
DETECTING CONDITION:

Defective combination meter

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



Step	Check	Yes	No
1	CHECK DIAGNOSTIC TROUBLE CODE (DTC). Connect the Subaru Select Monitor, and read the Diagnostic Trouble Code. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Perform the diagnosis according to the DTC. <Ref. to TPM(diag)-26, List of Diagnostic Trouble Code (DTC).>	Replace the combination meter. <Ref. to IDI-15, REMOVAL, Combination Meter.>

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

C: TIRE PRESSURE WARNING LIGHT DOES NOT COME OFF

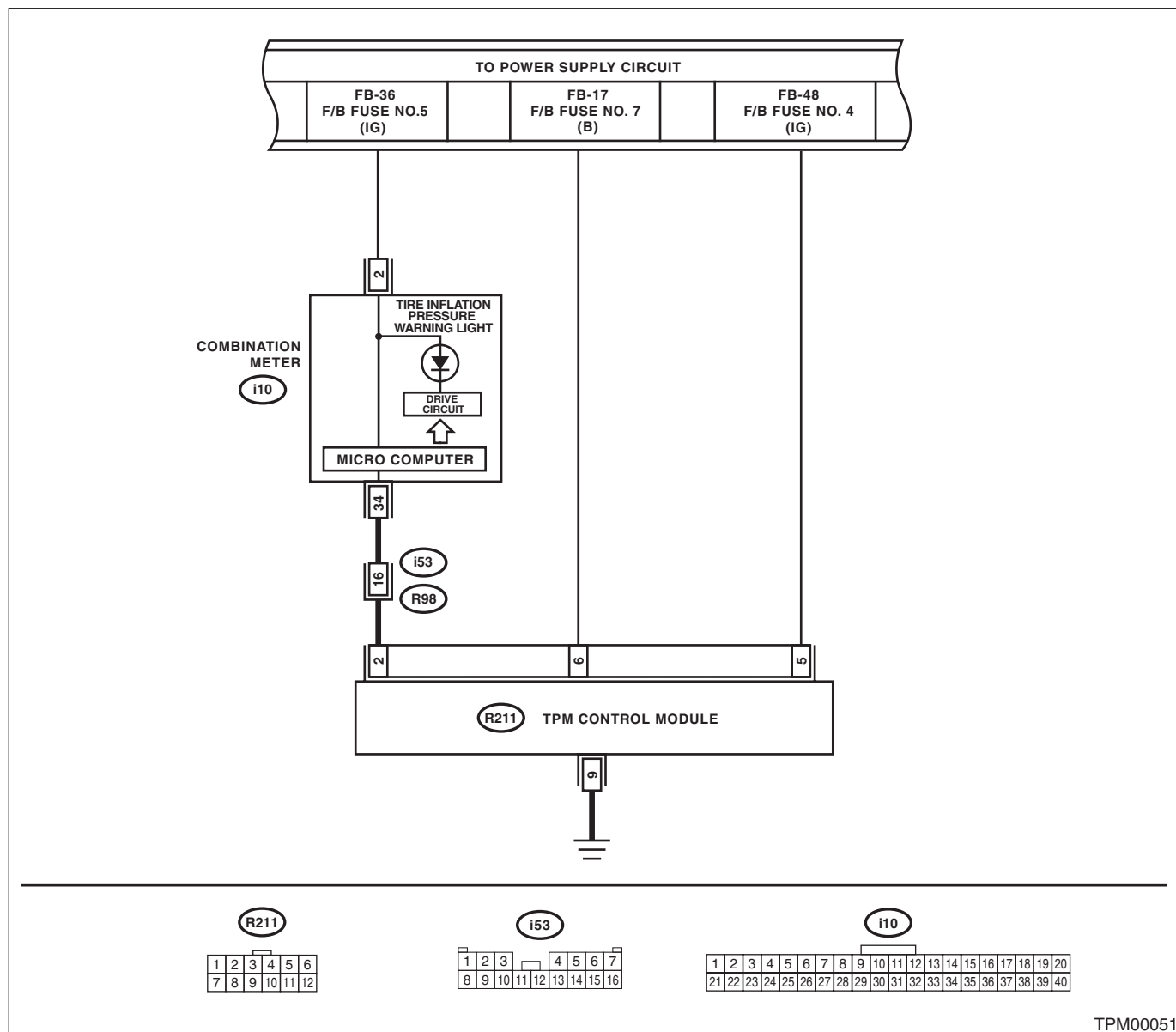
DETECTING CONDITION:

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

TROUBLE SYMPTOM:

Tire pressure warning light remains illuminating after engine starts.

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK DTC. Connect the Subaru Select Monitor, and read the Diagnostic Trouble Code. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is a DTC displayed?	Perform the diagnosis according to the DTC. <Ref. to TPM(diag)-26, List of Diagnostic Trouble Code (DTC).>	Go to step 2.

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Step		Check	Yes	No
2	CHECK TRANSMITTER (ID). Display the transmitter ID of the tire pressure monitor system.	Is the transmitter ID registered?	Go to step 3.	Register the transmitter ID. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.>
3	CHECK TRANSMITTER DATA OUTPUT. 1) Select data display of the tire pressure monitoring. 2) Start the engine and check the tire pressure warning light output.	Is the warning light output ON?	Replace the tire pressure monitoring control module. <Ref. to WT-12, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	Replace the combination meter. <Ref. to IDI-15, REMOVAL, Combination Meter.>

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

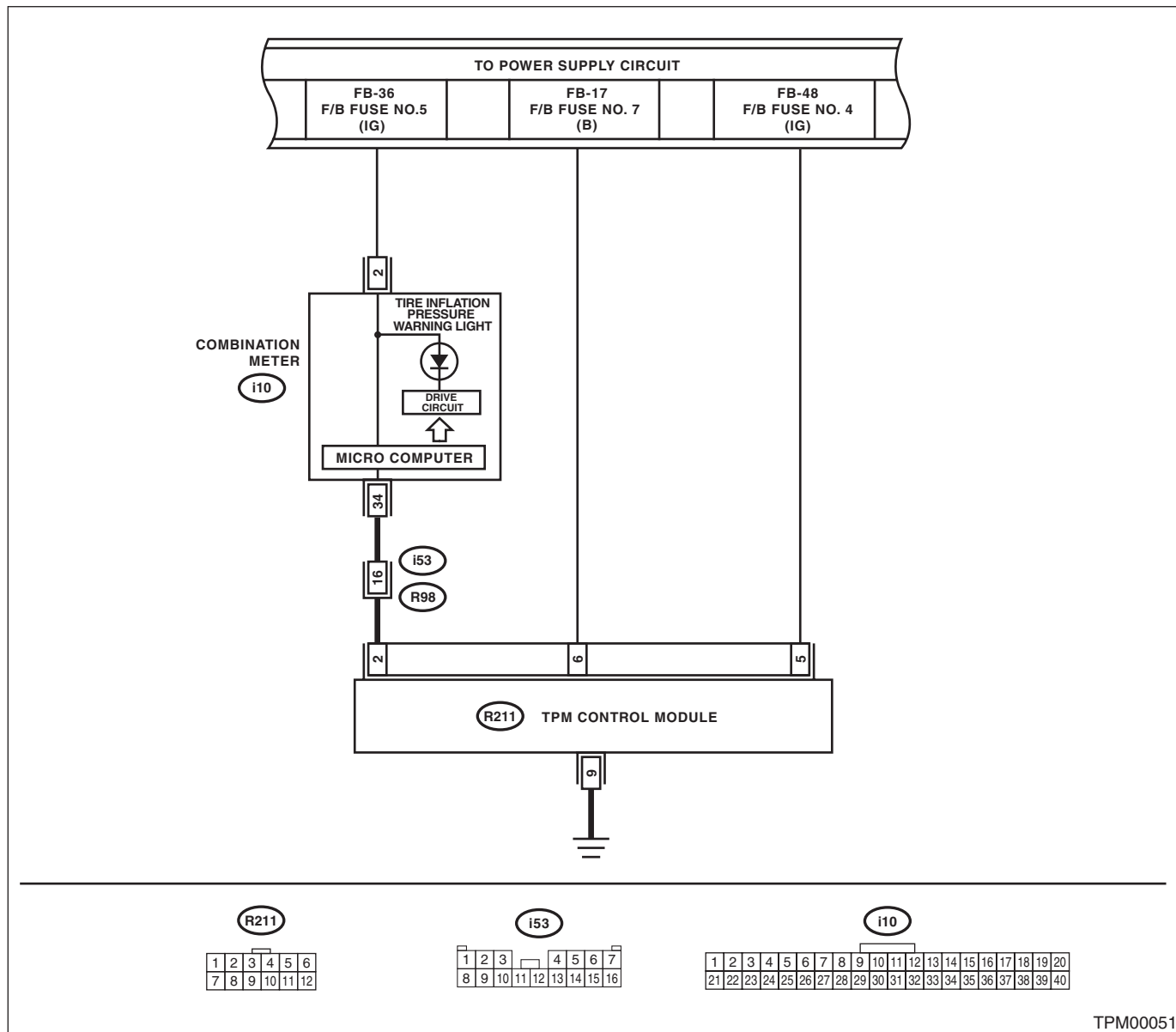
D: TIRE PRESSURE WARNING LIGHT IS 25 TIMES BLINKING AND TURN ON DETECTING CONDITION:

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

TROUBLE SYMPTOM:

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

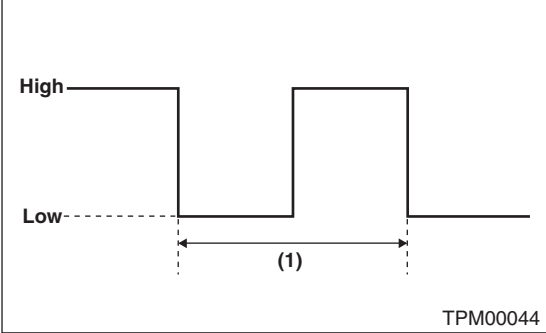
WIRING DIAGRAM:



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

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS. 1) Connect the Subaru Select Monitor to the terminal No. 2 of the tire pressure monitoring control module connector (R211). Connector & terminal (R211) No. 2 (+) — Chassis ground (-): 2) Turn the ignition switch to ON, and select "Oscilloscope" from the Main Menu of Subaru Select Monitor. 3) Check the voltage displayed.	Is the voltage 10 V or more?	Go to step 3.	Go to step 4.
3 CHECK HARNESS. 1) Check the output waveform displayed in the oscilloscope of Subaru Select Monitor. 	Is the pattern the same output waveform as shown in the figure? (1) 400±20 ms Duty 50 % High: Battery voltage Low: 1.5 V or less	Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Replace the tire pressure monitoring control module. <Ref. to WT-12, REMOVAL, Tire Pressure Monitoring System.>
4 CHECK HARNESS. 1) Disconnect the tire pressure monitoring control module connector. 2) Connect the Subaru Select Monitor to the terminal No. 2 of the tire pressure monitoring control module connector (R211). Connector & terminal (R211) No. 2 (+) — Chassis ground (-): 3) Turn the ignition switch to ON, and select "Oscilloscope" from the Main Menu of Subaru Select Monitor. 4) Check the voltage displayed.	Is the voltage 10 V or more?	Replace the tire pressure monitoring control module. <Ref. to WT-12, REMOVAL, Tire Pressure Monitoring System.>	The harness between the combination meter connector and the tire pressure monitoring control module connector is shorted or open. Repair or replace the harness.

List of Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

10. List of Diagnostic Trouble Code (DTC)

A: LIST

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

List of Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

DTC	Item	Contents of diagnosis	Remarks
42	Transmitter 2 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-33, DTC 42 TRANSMITTER 2 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
43	Transmitter 3 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-33, DTC 43 TRANSMITTER 3 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
44	Transmitter 4 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-34, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Transmitter 1 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 51 TRANSMITTER 1 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	Transmitter 2 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 52 TRANSMITTER 2 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
53	Transmitter 3 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 53 TRANSMITTER 3 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	Transmitter 4 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-35, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
61	Vehicle Speed is Abnormal	Vehicle speed signal is not input to the control module when the vehicle speed is 6 km/h (3.7 MPH) or more.	<Ref. to TPM(diag)-36, DTC 61 VEHICLE SPEED IS ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

11. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 TIRE 1 AIR PRESSURE DECREASE

NOTE:

Refer to DTC 14 for diagnostic procedure. <Ref. to TPM(diag)-28, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC 12 TIRE 2 AIR PRESSURE DECREASE

NOTE:

Refer to DTC 14 for diagnostic procedure. <Ref. to TPM(diag)-28, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC 13 TIRE 3 AIR PRESSURE DECREASE

NOTE:

Refer to DTC 14 for diagnostic procedure. <Ref. to TPM(diag)-28, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC 14 TIRE 4 AIR PRESSURE DECREASE

DTC DETECTING CONDITION:

Inflation pressure of tires dropped under specifications.

NOTE:

For specifications, refer to “current data”. <Ref. to TPM(diag)-9, DATA DISPLAY, OPERATION, Subaru Select Monitor.>

TROUBLE SYMPTOM:

Tire pressure warning light illuminates.

Step	Check	Yes	No
1 CHECK TIRES. Lift up the vehicle and check for damage in the tires.	Are there cracks or damage?	Replace the tire. <Ref. to WT-5, Tire.>	Go to step 2.
2 CHECK TIRES. Check the tire air pressure.	Is the tire pressure in the specifications?	Go to step 3.	Adjust the air pressure.
3 CHECK TRANSMITTER. Drive the vehicle at 40 km/h (25 MPH) or faster and compare the data from the transmitter on the four wheels.	Is there a transmitter with different data?	Replace the transmitter (tire pressure sensor). <Ref. to WT-12, Tire Pressure Monitoring System.>	Go to step 4.
4 PERFORM DRIVING TEST. 1) Perform the Clear Memory Mode. <Ref. to TPM(diag)-10, CLEAR MEMORY, OPERATION, Subaru Select Monitor.> 2) Perform a driving test. <Ref. to TPM(diag)-17, PROCEDURE, Inspection Mode.> 3) Read the DTC. <Ref. to TPM(diag)-8, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Inspect using “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to TPM(diag)-28, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

CAUTION:

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

E: DTC 21 TRANSMITTER 1 NO DATA

NOTE:

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

F: DTC 22 TRANSMITTER 2 NO DATA

NOTE:

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

G: DTC 23 TRANSMITTER 3 NO DATA

NOTE:

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

H: DTC 24 TRANSMITTER 4 NO DATA

DTC DETECTING CONDITION:

Data from each transmitter is not received for 8 minutes.

TROUBLE SYMPTOM:

Tire pressure warning light blinks 25 times and then illuminates.

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

CAUTION:

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

I: DTC 31 TRANSMITTER 1 PRESSURE DATA ABNORMAL

NOTE:

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

J: DTC 32 TRANSMITTER 2 PRESSURE DATA ABNORMAL

NOTE:

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

K: DTC 33 TRANSMITTER 3 PRESSURE DATA ABNORMAL

NOTE:

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

L: DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL

DTC DETECTING CONDITION:

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

TROUBLE SYMPTOM:

Tire pressure warning light blinks 25 times and then illuminates.

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

M: DTC 41 TRANSMITTER 1 FUNCTION CODE ABNORMAL

NOTE:

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

N: DTC 42 TRANSMITTER 2 FUNCTION CODE ABNORMAL

NOTE:

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

O: DTC 43 TRANSMITTER 3 FUNCTION CODE ABNORMAL

NOTE:

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

P: DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL

DTC DETECTING CONDITION:

Unexpected function codes received from each transmitter.

TROUBLE SYMPTOM:

Tire pressure warning light blinks 25 times and then illuminates.

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Q: DTC 51 TRANSMITTER 1 BATTERY VOLTAGE DECREASE

NOTE:

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

R: DTC 52 TRANSMITTER 2 BATTERY VOLTAGE DECREASE

NOTE:

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

S: DTC 53 TRANSMITTER 3 BATTERY VOLTAGE DECREASE

NOTE:

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

T: DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE

DTC DETECTING CONDITION:

Low battery signals received 20 times from each transmitter.

TROUBLE SYMPTOM:

Tire pressure warning light blinks 25 times and then illuminates.

Step	Check	Yes	No
1 CHECK TRANSMITTER. 1) Replace all transmitters and register their IDs. <Ref. to TPM(diag)-10, REGISTER TRANSMITTER ID, OPERATION, Subaru Select Monitor.> 2) Perform the Clear Memory Mode, and perform driving test.	Is the fault eliminated?	Internal battery of the transmitter had worn out.	Replace the tire pressure monitoring control module. <Ref. to WT-12, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

U: DTC 61 VEHICLE SPEED IS ABNORMAL

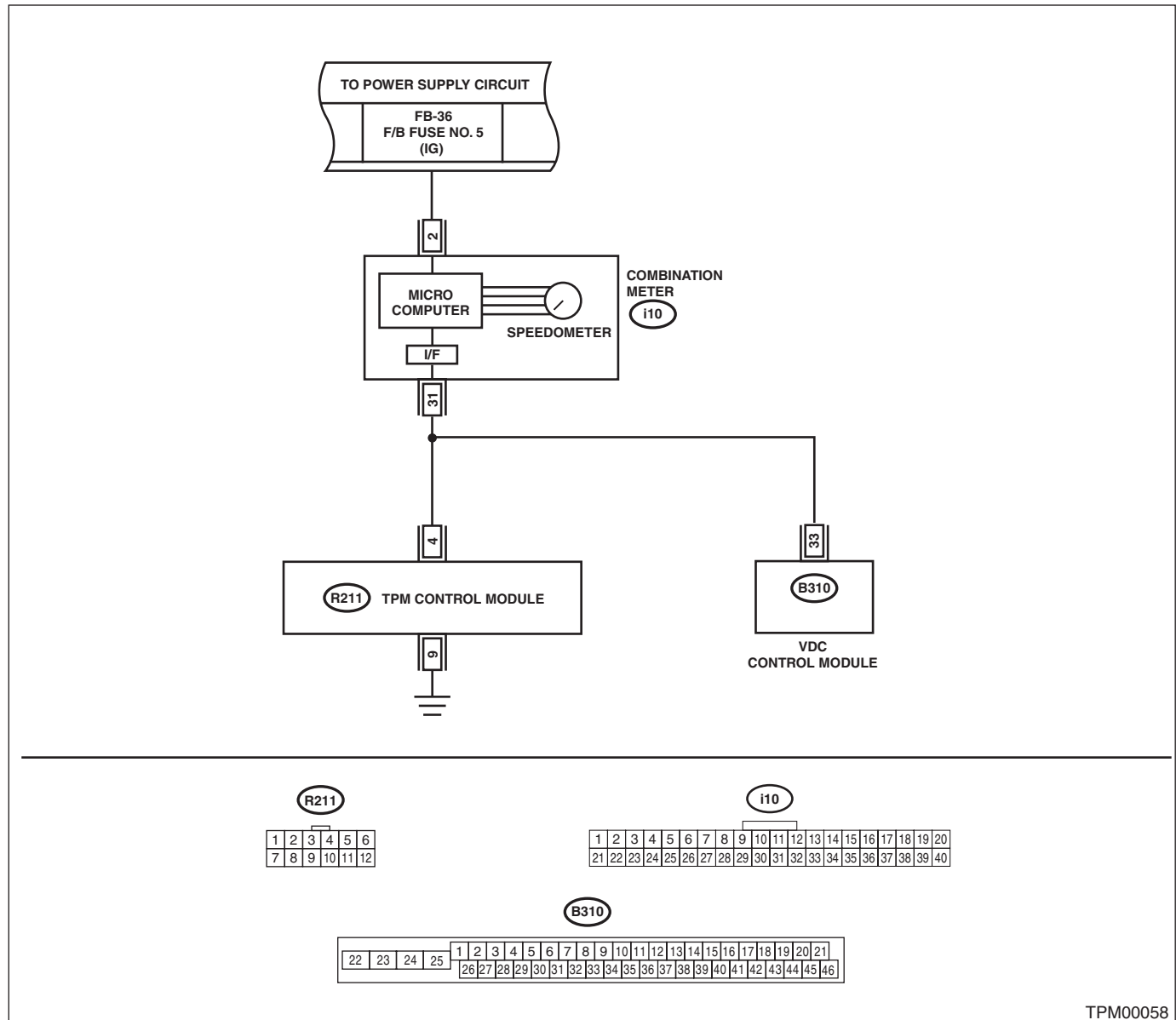
DTC DETECTING CONDITION:

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

TROUBLE SYMPTOM:

Tire pressure warning light blinks 25 times and then illuminates.

WIRING DIAGRAM:



TPM00058

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK TIRE PRESSURE MONITORING CONTROL MODULE. 1) Connect an oscilloscope to the terminal No. 4 of the tire pressure monitoring control module connector (R211). 2) Lift up the vehicle and then drive the vehicle at 40 km/h (25 MPH) and check the vehicle speed signal at that time.	Is the vehicle speed being input?	Replace the tire pressure monitoring control module. <Ref. to WT-12, TIRE PRESSURE MONITORING CONTROL MODULE, REMOVAL, Tire Pressure Monitoring System.>	Go to step 2.
2	CHECK HARNESS. 1) Disconnect the combination meter connector (i10). 2) Connect the tire pressure monitoring control module connector (R211) and combination meter connector (i10) and measure the resistance.	Is the resistance less than 0.5 Ω ?	Replace the combination meter. <Ref. to IDI-15, REMOVAL, Combination Meter.>	Repair or replace the open circuit of the harness.

General Diagnostic Table

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

12.General Diagnostic Table

A: INSPECTION

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

DIFFERENTIALS

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1. General Description

A: NOTE

For general description, refer to “4AT” or “5MT” section.

4AT model:

<Ref. to 4AT-2, General Description.>

5MT model:

<Ref. to 5MT-2, General Description.>

2. Transfer Case and Extension Case Assembly

A: NOTE

For removal, installation and inspection, refer to “5MT” section. <Ref. to 5MT-35, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch

A: NOTE

For removal, installation and inspection, refer to "4AT" section. <Ref. to 4AT-71, Transfer Clutch.>

4. Extension Case

A: NOTE

For removal, installation and inspection, refer to "4AT" section. <Ref. to 4AT-69, Extension Case.>

5. Oil Seal

A: NOTE

For removal, installation and inspection, refer to “4AT” or “5MT” section.

4AT model:

<Ref. to 4AT-44, Extension Case Oil Seal.>

5MT model:

<Ref. to 5MT-30, Oil Seal.>

6. Transfer Drive Gear

A: NOTE

For removal, installation and inspection, refer to "5MT" section. <Ref. to 5MT-39, Transfer Drive Gear.>

7. Transfer Driven Gear

A: NOTE

For removal, installation and inspection, refer to "5MT" section. <Ref. to 5MT-41, Transfer Driven Gear.>

8. Reduction Drive Gear

A: NOTE

For removal, installation and inspection, refer to "4AT" section. <Ref. to 4AT-78, Reduction Drive Gear.>

9. Reduction Driven Gear

A: NOTE

For removal, installation and inspection, refer to "4AT" section. <Ref. to 4AT-76, Reduction Driven Gear.>

10.Center Differential

A: NOTE

For removal, installation and inspection, refer to "5MT" section. <Ref. to 5MT-43, Center Differential.>

11. Transfer Clutch Pressure Test

A: NOTE

For inspection, refer to the “4AT” section. <Ref. to 4AT-33, Transfer Clutch Pressure Test.>

DRIVE SHAFT SYSTEM

DS

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Basic Diagnostic Procedure

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:

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

NOTE:

- To check the harness for open or short circuits, shake problem spot or connector.
- Refer to "Check List for Interview". <Ref. to VDC(diag)-4, Check List for Interview.>

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to VDC(diag)-4, Check List for Interview.> 2) Before performing diagnostics, check the component which might affect VDC problems. <Ref. to VDC(diag)-8, INSPECTION, General Description.>	Is the component that might influence the VDC problem normal?	Go to step 2.	Repair or replace each component.
2 CHECK INDICATION OF DTC. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. 4) Read the DTC using the Subaru Select Monitor. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of the Subaru Select Monitor cannot be executed properly, check the communication circuit. <Ref. to VDC(diag)-20, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>	Is DTC displayed on Subaru Select Monitor?	Record the DTC. Go to step 4.	Go to step 3.
3 PERFORM GENERAL DIAGNOSTICS. 1) Perform the inspection by referring to "General Diagnostic Table". <Ref. to VDC(diag)-104, INSPECTION, General Diagnostic Table.> 2) Perform the Clear Memory Mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 4) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Check the DTC is not displayed.	Do the VDC warning light and ABS warning light go off after starting the engine?	Finish the diagnosis.	Check the combination meter circuit. <Ref. to VDC(diag)-30, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-31, VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.>
4 CHECK FREEZE FRAME DATA. Using the Subaru Select Monitor, check the freeze frame data of the VDC control module.	Are freeze frame data recorded?	Record the freeze frame data. Go to step 5.	Go to step 5.

Basic Diagnostic Procedure

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step		Check	Yes	No
5	PERFORM DIAGNOSIS. 1) Refer to "List of Diagnostic Trouble Code (DTC)". NOTE: For the DTC list, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to VDC(diag)-34, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the cause of trouble. 3) Perform the Clear Memory Mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 5) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Repeat step 5 until DTC is not shown.	Finish the diagnosis.

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following item about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

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

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

2. STATE OF VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT

VDC warning light & VDC OFF indicator light illuminate.	☐ Always ☐ Sometimes ☐ Only once ☐ Does not illuminate • When/How long does it illuminate?		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (Before starting engine) ☐ START ☐ ON (After starting engine, engine is running) ☐ ON (After starting engine, engine is at a standstill)		
Timing	☐ Immediately after turning the ignition switch to ON ☐ Immediately after turning the ignition switch to START		
	☐ When accelerating	— km/h	
		— MPH	
	☐ While driving at a constant speed	km/h	MPH
	☐ While decelerating	— km/h	
		— MPH	
	☐ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	☐ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
☐ When other electrical parts are operating			
• Part name: • Operating condition:			

3. STATE OF VDC INDICATOR LIGHT

VDC operation indicator light illuminate.	☐ Always ☐ Sometimes ☐ Only once ☐ Does not illuminate • When/How long does it illuminate?		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (Before starting engine) ☐ START ☐ ON (After starting engine, engine is running) ☐ ON (After starting engine, engine is at a standstill)		
Timing	☐ Immediately after turning the ignition switch to ON ☐ Immediately after turning the ignition switch to START		
	☐ When accelerating	— km/h	
		— MPH	
	☐ While driving at a constant speed	km/h	MPH
	☐ While decelerating	— km/h	
		— MPH	
	☐ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	☐ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
☐ When other electrical parts are operating			
• Part name: • Operating condition:			

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (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 ☐ Straight road ☐ Sharp curve ☐ Gentle curve ☐ S-curve ☐ Road with a slope on both sides ☐ Others:
	d) Road surface	☐ Dry ☐ Wet ☐ Covered with fresh snow ☐ Covered with hardened snow ☐ Frozen slope ☐ Others:

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Condition	a) Brakes	Deceleration: G	
		☐ continuous / ☐ intermittent	
	b) Accelerator	Acceleration: G	
		☐ continuous / ☐ intermittent	
	c) Vehicle speed	km/h	MPH
		☐ Advancing ☐ When accelerating ☐ While decelerating ☐ At low speed ☐ When turning ☐ Others:	
	d) Tire inflation pressure	Front RH tire:	kPa
		Front LH tire:	kPa
		Rear RH tire:	kPa
		Rear LH tire:	kPa
	e) Degree of wear	Front RH tire:	mm (in)
		Front LH tire:	mm (in)
		Rear RH tire:	mm (in)
		Rear LH tire:	mm (in)
	f) Steering wheel	☐ Sharp turning ☐ Gentle turning ☐ Straight forward motion ☐ Gentle return ☐ Sharp return	
	g) Tire/Wheel size	☐ Specified size ☐ Except specification ()	
	h) Tire variation	☐ Summer tire ☐ Studless tire (Brand:)	
	i) Tire chain is attached: ☐ Yes / ☐ No		
j) Using T-type tires: ☐ Yes / ☐ No			
k) Condition of suspension alignment:			
l) Load condition:			
m) Repaired parts are used: ☐ Yes / ☐ No			
• Content:			
n) Others:			

General Description

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

3. General Description

A: CAUTION

1. SRS AIRBAG SYSTEM

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

CAUTION:

- Do not use electrical test equipment on wiring harness and connector circuits of the airbag system.
- Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor and VDCCM&H/U.

B: INSPECTION

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

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage:

12 V or more

Specific gravity:

1.260 or more

2. GROUND

Check the tightening torque of ground (GB-5) bolt of VDC.

Tightening torque:

13 N·m (1.3 kgf-m, 9.6 ft-lb)

3. BRAKE FLUID

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

4. HYDRAULIC UNIT

Check the hydraulic unit.

- When using the brake tester <Ref. to VDC-9, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
- When not using the brake tester <Ref. to VDC-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

Check the brake pad and rotor.

- Front <Ref. to BR-14, INSPECTION, Front Brake Pad.> <Ref. to BR-15, INSPECTION, Front Disc Rotor.>
- Rear <Ref. to BR-20, INSPECTION, Rear Brake Pad.> <Ref. to BR-21, INSPECTION, Rear Disc Rotor.>

7. TIRES

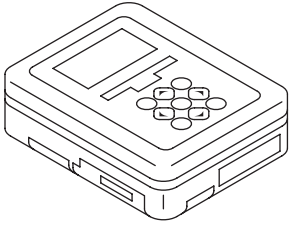
Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>

General Description

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

C: PREPARATION TOOL

1. SPECIAL TOOL

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

2. GENERAL TOOL

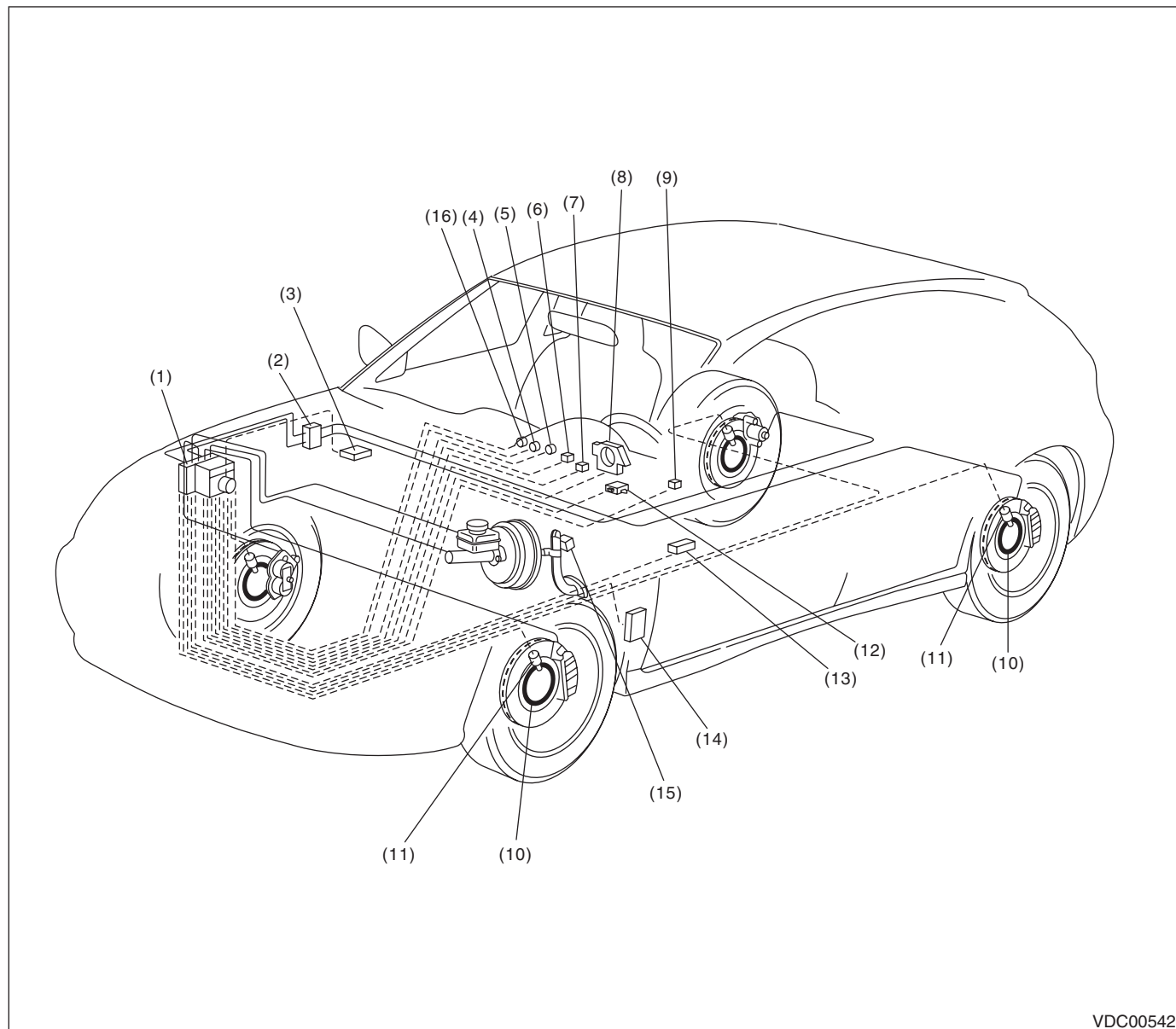
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

Electrical Component Location

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

4. Electrical Component Location

A: LOCATION

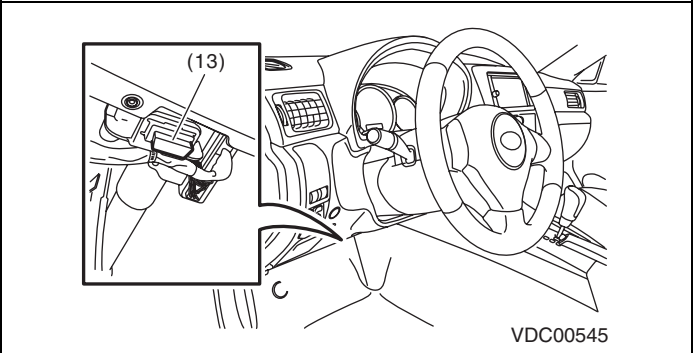
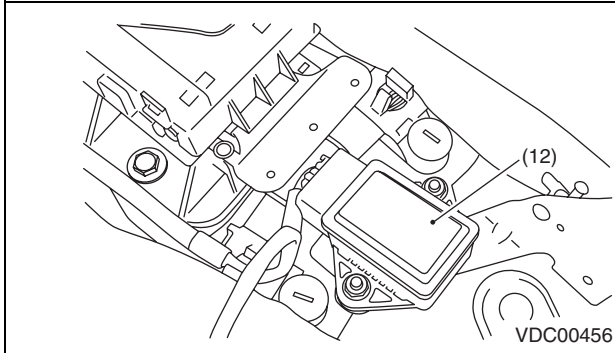
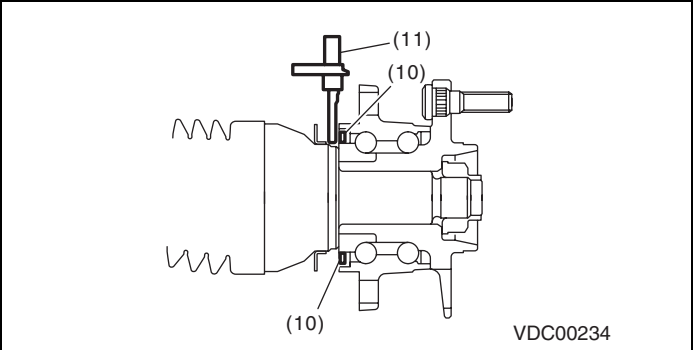
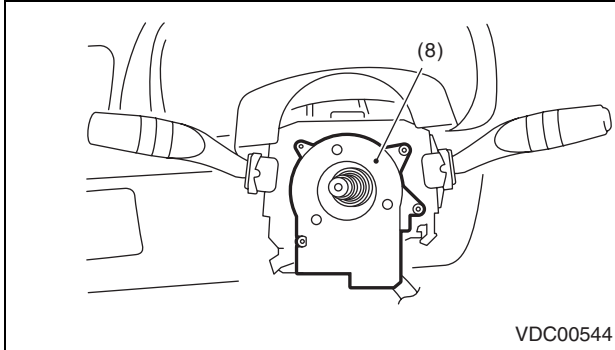
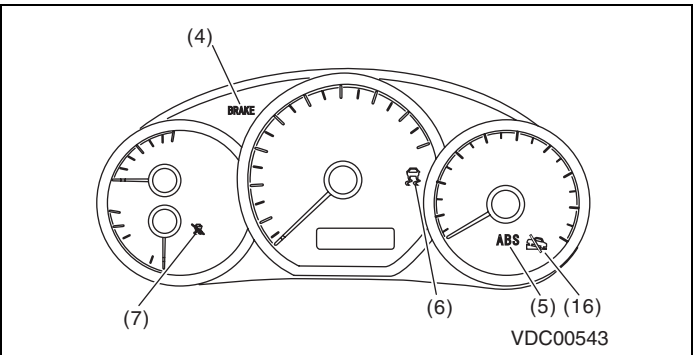
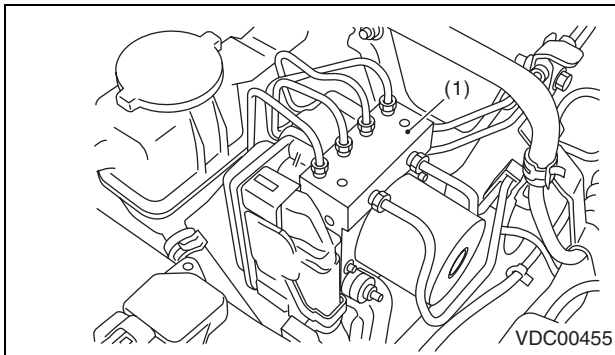


VDC00542

(1) VDC control module and hydraulic control unit (VDCCM&H/U)	(7) VDC warning light & VDC OFF indicator light	(13) Data link connector
(2) Connector	(8) Steering angle sensor	(14) Engine control module (ECM)
(3) Transmission control module (TCM)	(9) VDC OFF switch	(15) Stop light and brake switch
(4) Brake warning light (EBD warning light)	(10) Magnetic encoder	(16) Hill start assist warning light (MT model only)
(5) ABS warning light	(11) ABS wheel speed sensor	
(6) VDC indicator light	(12) Yaw rate & G sensor	

Electrical Component Location

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

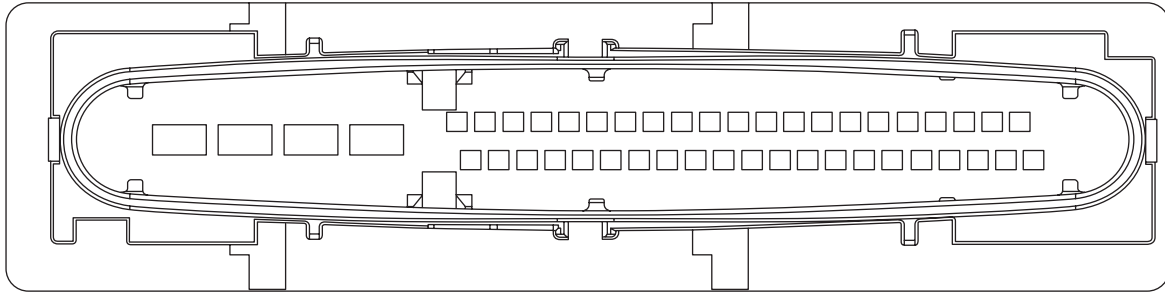


Control Module I/O Signal

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



B310

22	23	24	25	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
				26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46

VDC00457

NOTE:

- Terminal numbers in VDCCM&H/U connector are shown in the figure.
- When the connector is removed from the VDCCM&H/U, the brake warning light (EBD warning light), ABS warning light, VDC warning light, VDC OFF indicator light, and the hill start assist warning light illuminate.

Control Module I/O Signal

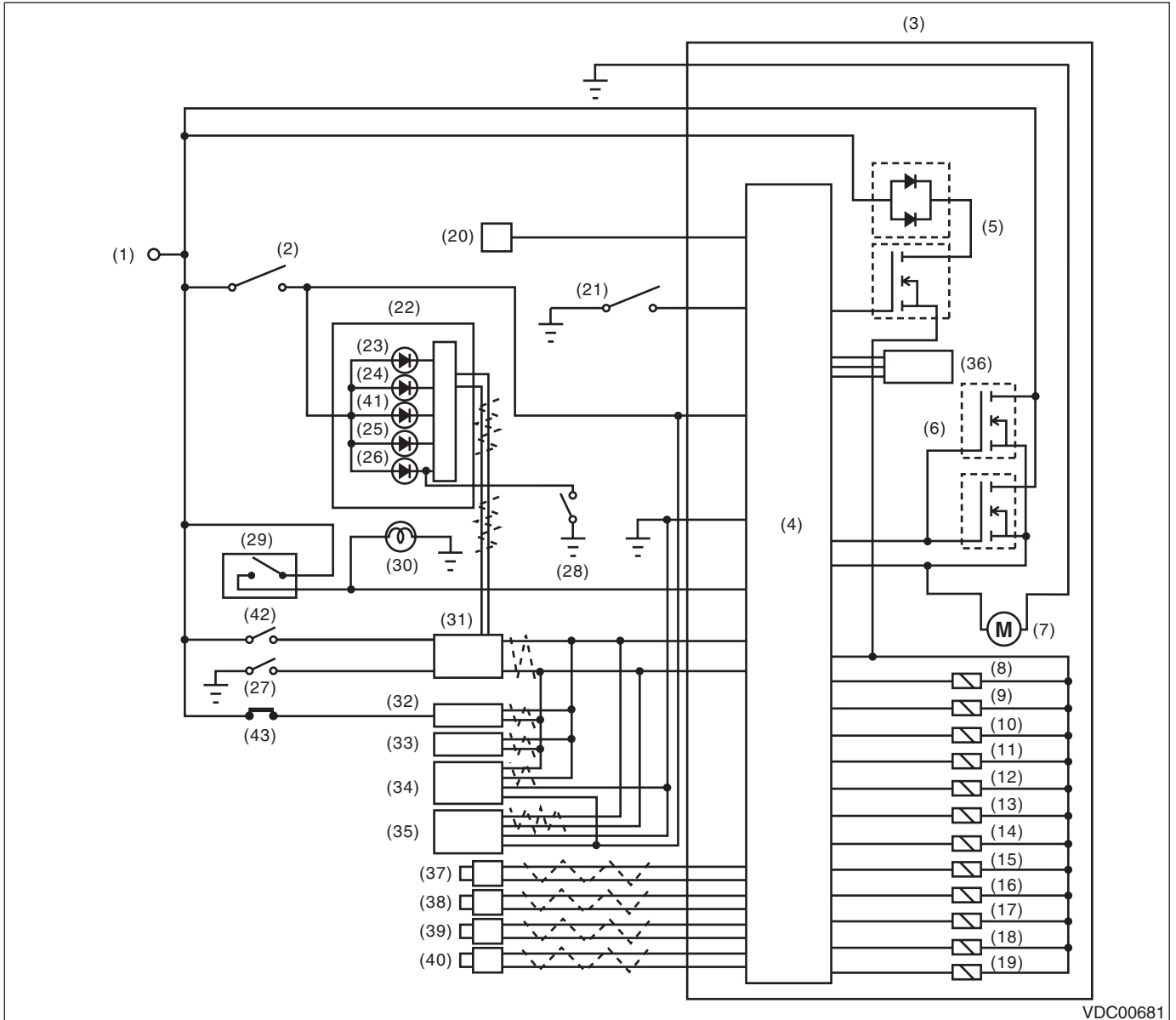
VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Content			Terminal No. (+) — (–)	Input/Output signal
				Measured value and measuring conditions
Power supply			28 — 25	10 — 15 V when the ignition switch is ON.
ABS wheel speed sensor	Front LH wheel	Power supply	26 — 25	4.5 — 16.5 V
		Signal	1	5.9 — 16.8 mA: Rectangle waveform
	Front RH wheel	Power supply	5 — 25	4.5 — 16.5 V
		Signal	6	5.9 — 16.8 mA: Rectangle waveform
	Rear LH wheel	Power supply	2 — 25	4.5 — 16.5 V
		Signal	27	5.9 — 16.8 mA: Rectangle waveform
	Rear RH wheel	Power supply	3 — 25	4.5 — 16.5 V
		Signal	4	5.9 — 16.8 mA: Rectangle waveform
CAN communication line (+)			35	2.5 — 1.5 V pulse signal
CAN communication line (–)			10	3.5 — 2.5 V pulse signal
Valve relay power supply			24 — 25	10 — 15 V when the ignition switch is ON.
Motor relay power supply			23 — 22	10 — 15 V when the ignition switch is ON.
Stop light switch			30 — 25	1.5 V or less when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.
Subaru Select Monitor			7 — 25	0 ↔ 12 V pulse (in communication)
Vehicle speed output signal			33	0 ↔ 5 V pulse
VDC OFF switch			31 — 22	0.5 Ω or less when the OFF switch is ON; otherwise 1 MΩ or more when it is OFF.
Ground			25	—

Control Module I/O Signal

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

B: WIRING DIAGRAM



Control Module I/O Signal

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

(1) Battery	(16) Primary cut solenoid valve	(31) Body integrated unit
(2) Ignition switch	(17) Primary suction solenoid valve	(32) Engine control module (ECM)
(3) VDC control module and hydraulic control unit (VDCCM&H/U)	(18) Secondary cut solenoid valve	(33) Transmission control module (TCM)
(4) VDC control module	(19) Secondary suction solenoid valve	(34) Steering angle sensor
(5) Valve relay	(20) Data link connector	(35) Yaw rate & G sensor
(6) Motor relay	(21) VDC OFF switch	(36) Pressure sensor
(7) Motor	(22) Combination meter	(37) Front ABS wheel speed sensor LH
(8) Front inlet solenoid valve LH	(23) VDC indicator light	(38) Front ABS wheel speed sensor RH
(9) Front outlet solenoid valve LH	(24) VDC warning light & VDC OFF indicator light	(39) Rear ABS wheel speed sensor LH
(10) Front inlet solenoid valve RH	(25) ABS warning light	(40) Rear ABS wheel speed sensor RH
(11) Front outlet solenoid valve RH	(26) Brake warning light (EBD warning light)	(41) Hill start assist warning light (MT model only)
(12) Rear inlet solenoid valve LH	(27) Parking brake switch	(42) Back-up light switch (MT model only)
(13) Rear outlet solenoid valve LH	(28) Brake fluid level switch	(43) Clutch switch (MT model only)
(14) Rear inlet solenoid valve RH	(29) Stop light and brake switch	
(15) Rear outlet solenoid valve RH	(30) Stop light	

Subaru Select Monitor

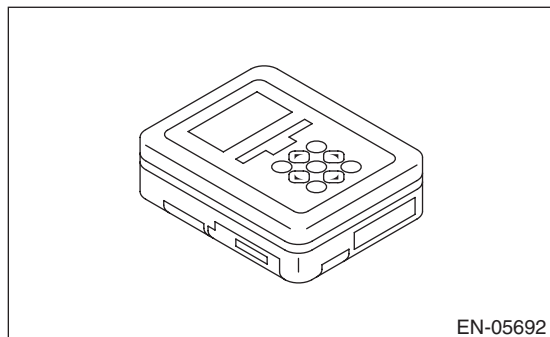
VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

6. Subaru Select Monitor

A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

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



2) Prepare PC with Subaru Select Monitor installed.

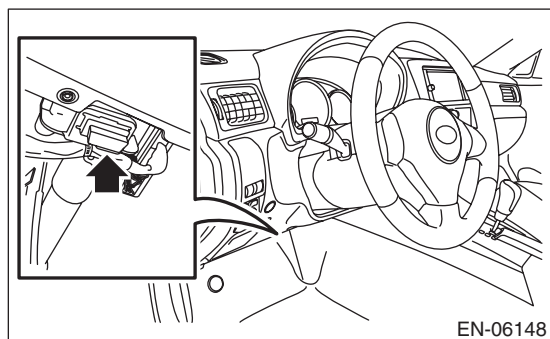
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:

The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to SDI.

5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:

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

6) Start the PC.

7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".

8) Record the DTC and data.

NOTE:

For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

9) If VDC and Subaru Select Monitor cannot communicate, check the communication circuit. <Ref. to VDC(diag)-20, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

Subaru Select Monitor

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

2. READ CURRENT DATA

- 1) On «Main Menu» display, select {Each System Check}.
 - 2) On «System Selection Menu» display, select {Brake Control System}.
 - 3) Click the [OK] button after {VDC} is displayed.
 - 4) On «Brake Control Diagnosis» display, select {Current Data Display & Save}.
 - 5) On «Data Display Menu» display, select the data display method.
 - 6) Using the scroll key, scroll the display screen up or down until necessary data is shown.
- A list of the support data is shown in the following table.

Display	Contents to be displayed	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h or MPH
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h or MPH
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h or MPH
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h or MPH
Steering Angle Sensor Op	Steering angle detected by steering angle sensor is displayed.	deg
Yaw Rate Sensor Output	Vehicle angular speed detected by yaw rate sensor is displayed.	deg/s
Pressure Sensor Output	Brake fluid pressure detected by pressure sensor is displayed.	bar
Lateral G sensor Output	Vehicle lateral acceleration detected by lateral G sensor is displayed.	m/s ²
IG power supply voltage	Voltage supplied to VDCCM&H/U is displayed.	V
E/G Control Stop Flag	Engine control command signal is displayed.	1 or 0
ABS Control Flag	ABS operation condition is displayed.	ON or OFF
EBD Control Flag	EBD operation condition is displayed.	ON or OFF
TCS Control Flag	TCS operation condition is displayed.	ON or OFF
VDC Control Flag	VDC operation condition is displayed.	ON or OFF
OFF Lamp	ON/OFF condition of VDC OFF indicator light is displayed.	ON or OFF
EBD Warning Light	ON operation of the EBD warning light is displayed.	ON or OFF
ABS Warning Light	ON operation of the ABS warning light is displayed.	ON or OFF
VDC Warning Light	ON operation of the VDC warning light is displayed.	ON or OFF
Valve Relay Signal	Valve relay operation signal is displayed.	ON or OFF
Motor Relay Signal	Motor relay operation signal is displayed.	ON or OFF
M. Relay monitor Voltage	Voltage applied to the motor relay is displayed.	V
OFF SW Signal	Operation condition of VDC OFF switch is displayed.	ON or OFF
Brake Switch	Brake ON/OFF is displayed.	ON or OFF
Longitudinal G sensor output	Vehicle forward/reverse acceleration detected by the forward/reverse G sensor is displayed. (For MT vehicle only. For AT vehicle: At -0.1 m/s ² constantly)	m/s ²
Clutch Switch	Clutch ON/OFF is displayed. (For MT vehicle only. For AT vehicle: OFF fixed)	ON or OFF
Reverse Signal	Reverse gear ON/OFF is displayed. (For MT vehicle only. For AT vehicle: OFF fixed)	ON or OFF

NOTE:

For details concerning the operation procedure, refer to “PC application help for Subaru Select Monitor”.

Subaru Select Monitor

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

3. FUNCTION CHECK

Display	Contents of display	Index No.
ABS Sequence Control Mode	Operate the valve and pump motor continuously to perform the ABS sequence control.	<Ref. to VDC-13, ABS Sequence Control.>
VDC Check Mode	Operate the valve and pump motor continuously to perform the VDC sequence control.	<Ref. to VDC-16, VDC Sequence Control.>
Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point	Set the steering angle sensor neutral position and the lateral G sensor 0 point.	<Ref. to VDC-21, Steering Angle Sensor.>

4. FREEZE FRAME DATA

NOTE:

- Data stored at the time of trouble occurrence is shown on display.
- Each time a trouble occurs, the latest information is stored in the freeze frame data in memory.
- If a freeze frame data is not properly stored in memory (due to a drop in VDCCM power supply, etc.), a DTC suffixed with a question mark “?” appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

Display	Contents to be displayed
Steering Angle Sensor Op	Steering angle detected by steering angle sensor is displayed.
Yaw Rate Sensor Output	Vehicle angular speed detected by yaw rate sensor is displayed.
Lateral G sensor Output	Vehicle lateral acceleration detected by lateral G sensor is displayed.
Pressure Sensor Output	Brake fluid pressure detected by pressure sensor is displayed.
Vehicle speed	Vehicle speed calculated by VDC control module is displayed.
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed in km/h or MPH.
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed in km/h or MPH.
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed in km/h or MPH.
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed in km/h or MPH.
Accel. Opening Angle	Acceleration opening is displayed.
Engine Speed	Engine speed on malfunction occurrence is displayed.
Gear Position	Gear position on malfunction occurrence is displayed.
IG power supply voltage	Voltage supplied to VDC control module is displayed.
Steering angle flag	Whether the absolute angle of the steering angle sensor was determined is displayed.

Display	Contents to be displayed
E/G Control Stop Flag	Engine control command signal is displayed.
VDC Control Flag	VDC control condition is displayed.
EBD Control Flag	EBD control condition is displayed.
TCS Control Flag	TCS control condition is displayed.
ABS Control Flag	ABS control condition is displayed.
OFF Switch Detection	ON/OFF condition of the VDC operated by the driver is displayed.
Brake Switch	Brake ON/OFF is displayed.
Longitudinal G sensor output	Vehicle forward/reverse acceleration detected by the forward/reverse G sensor is displayed. (For MT vehicle only. For AT vehicle: At -0.1 m/s^2 constantly)
Clutch Switch	Clutch ON/OFF is displayed. (For MT vehicle only. For AT vehicle: OFF fixed)
Reverse Signal	Reverse gear ON/OFF is displayed. (For MT vehicle only. For AT vehicle: OFF fixed)

5. PARAMETER SELECTION

CAUTION:

- **Subaru Select Monitor is required for parameter selection.**
- **This function can be used for the replacement part of VDCCM&H/U and VDCCM.**

NOTE:

- When the VDCCM is replaced with a replacement part, be sure to perform the parameter selection/registration to the VDCCM using this function.
- To confirm the applied model, refer to the “model number plate” attached on the vehicle. <Ref. to ID-2, IDENTIFICATION, Identification.>
- When the applied model is entered wrong, re-entry is possible.
- When the registration has not been performed, the DTC code “Parameter selection error” is detected together with the ABS/EBD/VDC warning light illumination.

- 1) Connect the Subaru Select Monitor.
- 2) On «Main Menu» display, select {Each System Check}.

- 3) On «System Selection Menu» display, select {Brake Control System}.
- 4) Click the [OK] button after {VDC} is displayed.
- 5) On «Brake Control Diagnosis» display, select {Selection of Parameter}.
- 6) Check the applied model indicated in the “Model number plate”. <Ref. to ID-2, IDENTIFICATION, Identification.>
- 7) Enter the applied model of 7-digit alphanumeric characters and press the [Enter] key.
- 8) If option code entry screen is displayed after entering applied model, enter the option code of 4-digit alphanumeric characters and press the [Enter] key. If the option code is 3 digits, add “0” on the top to enter as 4 digits.
- 9) When the confirmation screen indicating the vehicle information appears, check that the correct applied model and grade are displayed and click the [OK] button.

NOTE:

When the displayed applied model and grade are different from those of the vehicle, perform registration operations again after clicking the [OK] button.

- 10) Execute Clear Memory after parameter selection and registration operations because the DTC for “Parameter selection error” is memorized.

6. PARAMETER CHECK

NOTE:

The parameter data registered in the VDCCM is shown on the display.

- 1) Connect the Subaru Select Monitor.
- 2) On «Main Menu» display, select {Each System Check}.
- 3) On «System Selection Menu» display, select {Brake Control System}.
- 4) Click the [OK] button after {VDC} is displayed.
- 5) On «Brake Control Diagnosis» display, select {Confirm on parameter}.
- 6) On the {Confirm on parameter} display screen, check that the applied model and grade of the target vehicle are included, and click the [OK] button.
- 7) If the applied model and grade of the target vehicle are not included on the {Confirm on parameter} display screen, perform parameter selection and registration. <Ref. to VDC(diag)-18, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

Defective harness connector

Communication is impossible between VDC and Subaru Select Monitor.

BATTERY

MAIN SBF

SBF-6

IGNITION SWITCH

F/B No. 33

DATA LINK CONNECTOR

B40

B440

B441

B310 VDCCM & H/U

28

7

25

16

7

1 2 3 4 5 6 7 8

9 10 11 12 13 14 15 16

22 23 24 25

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

26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46

1 2 3 4 5

B40

B310

B440

B441

VDC00547

Step	Check	Yes	No
1 CHECK IGNITION SWITCH.	Is the ignition switch ON?	Go to step 2 .	Turn the ignition switch to ON, and select VDC mode using Subaru Select Monitor.
2 CHECK BATTERY. 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage 11 V or more?	Go to step 3 .	Charge or replace the battery.

Subaru Select Monitor

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No	
3	CHECK BATTERY TERMINAL.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step 4.
4	CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Go to step 8.	Go to step 5.
5	CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 6.
6	CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U, ECM and TCM. 3) Measure the resistance between data link connector and chassis ground. Connector & terminal (B40) No. 7 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the harness and connector between each control module and data link connector.
7	CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND DATA LINK CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. Connector & terminal (B40) No. 7 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 8.	Repair the harness and connector between each control module and data link connector.
8	CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND DATA LINK CONNECTOR. Measure the resistance between VDCCM&H/U connector and data link connector. Connector & terminal (B310) No. 7 — (B40) No. 7:	Is the resistance less than 1 Ω?	Go to step 9.	Repair harness and connector between VDCCM&H/U and data link connector.
9	CHECK INSTALLATION OF VDCCM&H/U CONNECTOR. Turn the ignition switch to OFF.	Is the VDCCM&H/U connector inserted into VDCCM&H/U until the clamp locks onto it?	Go to step 10.	Insert VDCCM&H/U connector into VDCCM&H/U.
10	CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power supply voltage between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 28 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 11.	Repair open circuit in harness between VDCCM&H/U and battery.

Subaru Select Monitor

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Measure the resistance of harness between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 25 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 12.	Repair the open circuit of VDCCM&H/U ground harness and poor contact of connector.
12 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact of control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

- 1) On «Main Menu» display, select {Each System Check}.
- 2) On «System Selection Menu» display, select {Brake Control System}.
- 3) Click the [OK] button after {VDC} is displayed.
- 4) On «Brake Control Diagnosis» display, select {Diagnostic Code(s) Display}.
- 5) Record the DTC and data.

NOTE:

- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- For details concerning DTCs, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>
- Up to 3 DTCs are displayed in the order of detection.
- If a particular DTC is not stored in memory properly at the occurrence of problem (due to a drop in VDCCM&H/U power supply etc.), the DTC suffixed with a question mark “?” is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.

Display	Contents to be displayed
(Current)	The current DTC is displayed on Subaru Select Monitor display screen.
(Before 1)	The latest DTC in previous troubles is displayed on Subaru Select Monitor display screen.
(Before 2)	The second latest DTC in previous troubles is displayed on Subaru Select Monitor display screen.
(Before 3)	The third latest DTC in previous problems is displayed on Subaru Select Monitor display screen.

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as much as possible.

Drive the vehicle at least ten minutes.

NOTE:

Make sure the vehicle is not dragged to one side under usual driving condition.

9. Clear Memory Mode

A: OPERATION

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

NOTE:

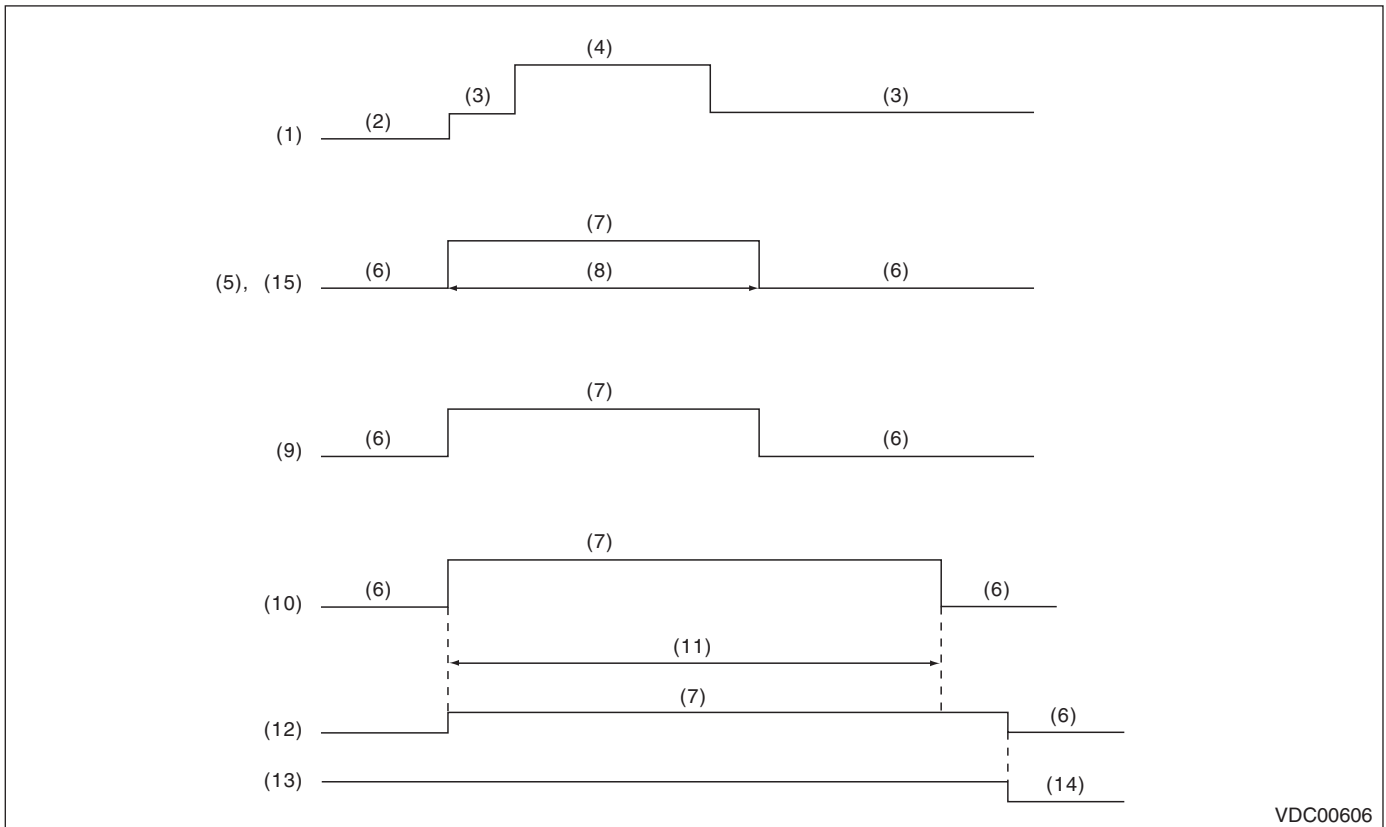
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

10.Warning Light Illumination Pattern

A: INSPECTION



VDC00606

(1) Ignition switch	(6) Light OFF	(11) Several seconds (depending on engine coolant temperature)
(2) OFF	(7) Light ON	(12) Brake warning light (EBD warning light)
(3) ON	(8) 2 seconds	(13) Parking brake
(4) Engine start	(9) VDC indicator light	(14) Released
(5) ABS warning light	(10) VDC warning light & VDC OFF indicator light	(15) Hill start assist warning light (MT model only)

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

1) When warning lights or indicator lights do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.

2) When warning lights or indicator lights remain constantly OFF, check the combination meter circuit or CAN communication circuit. <Ref. to VDC(diag)-28, VDC WARNING LIGHT, VDC OFF INDICATOR LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-29, ABS WARNING LIGHT DOES NOT COME ON, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-29, HILL START ASSIST WARNING LIGHT DOES NOT COME ON, Warning Light Illumination Pattern.>

3) When ABS warning light and hill start assist warning light do not go off, check the combination meter circuit. <Ref. to VDC(diag)-30, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-30, HILL START ASSIST WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>

4) When the VDC indicator light, VDC warning light & VDC OFF indicator light do not go off, check the combination meter circuit or CAN communication circuit. <Ref. to VDC(diag)-30, VDC INDICATOR LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-31, VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.>

NOTE:

- Even though the ABS warning light does not go off after 2 seconds from ABS warning light illumination, the ABS system operates normally when the warning light goes off while driving at approximately 12 km/h (7 MPH). However, the ABS system does not work while the ABS warning light is illuminated.
- It may take several minutes before VDC warning light & VDC OFF indicator light goes off if the vehicle is parked under low temperature for a specified time. This is not defective because it is resulted from low engine coolant temperature.
- With the vehicle jack-up/lift-up or set on free rollers, when the wheels lock or spin after starting the engine, ABS warning light, VDC warning light & VDC OFF indicator light may illuminate because VDCCM&H/U detects the abnormal conditions from ABS wheel speed sensors. In this case, this is not a malfunction. Perform the Clear Memory Mode. <Ref. to VDC(diag)-25, Clear Memory Mode.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

B: VDC WARNING LIGHT, VDC OFF INDICATOR LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), VDC indicator light, VDC warning light & VDC OFF indicator light do not illuminate.

NOTE:

When pressing the VDC OFF switch for 10 seconds or more, the VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the OFF operation enabled status is restored.

Step	Check	Yes	No
1 CHECK OTHER INDICATOR LIGHT. Turn the ignition switch to ON.	Does other indicator light illuminate soon after "ON"?	Go to step 2.	Perform the self-diagnosis of combination meter.
2 CHECK VDCCM. When the engine does not start, display the current data of VDCCM using Subaru Select Monitor.	Is "VDC Warning Light" output set to ON?	Go to step 3.	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step 4.
4 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-15, Combination Meter.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

C: ABS WARNING LIGHT DOES NOT COME ON

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), ABS warning light and hill start assist warning light do not come on.

Step	Check	Yes	No
1 CHECK OTHER LIGHTS TURN ON. Turn the ignition switch to ON. (engine OFF)	Do other warning lights illuminate?	Go to step 2.	Check the combination meter.
2 READ DTC. Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step 4.
4 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-15, Combination Meter.>

D: HILL START ASSIST WARNING LIGHT DOES NOT COME ON

For the diagnostic procedures, refer to "ABS WARNING LIGHT DOES NOT COME ON". <Ref. to VDC(diag)-29, ABS WARNING LIGHT DOES NOT COME ON, Warning Light Illumination Pattern.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

E: ABS WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When starting the engine, the ABS warning light and hill start assist warning light are kept ON.

Step	Check	Yes	No
1 READ DTC. Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step 3.
3 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-15, Combination Meter.>

F: HILL START ASSIST WARNING LIGHT DOES NOT GO OFF

For the diagnostic procedures, refer to "ABS WARNING LIGHT DOES NOT GO OFF". <Ref. to VDC(diag)-30, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>

G: VDC INDICATOR LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When starting the engine, VDC indicator light is kept ON.

Step	Check	Yes	No
1 READ DTC. Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step 3.
3 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-15, Combination Meter.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

H: VDC WARNING LIGHT AND VDC OFF INDICATOR LIGHT DO NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication
- Defective engine
- VDC OFF switch is shorted.

TROUBLE SYMPTOM:

When starting the engine, VDC OFF indicator light is kept ON.

NOTE:

When pressing the VDC OFF switch for 10 seconds or more, the VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the OFF operation enabled status is restored.

Step	Check	Yes	No
1 READ DTC. Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK ENGINE.	Does the malfunction indicator light illuminate?	Repair the engine.	Go to step 3.
3 CHECK ENGINE COOLANT TEMPERATURE. Warm up the engine and check if VDC warning light & VDC OFF indicator light illumination condition changes.	When the engine coolant temperature is too low, VDC warning light & VDC OFF indicator light illuminate. Do the lights go off when the engine is warmed up?	Normal	Go to step 4.
4 CHECK VDC OFF SWITCH. Remove and check VDC OFF switch. <Ref. to VDC-28, VDC OFF Switch.>	Is the VDC OFF switch normal?	Go to step 5.	Replace the VDC OFF switch. <Ref. to VDC-28, VDC OFF Switch.>
5 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step 6.
6 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-15, Combination Meter.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

I: BRAKE WARNING LIGHT DOES NOT GO OFF

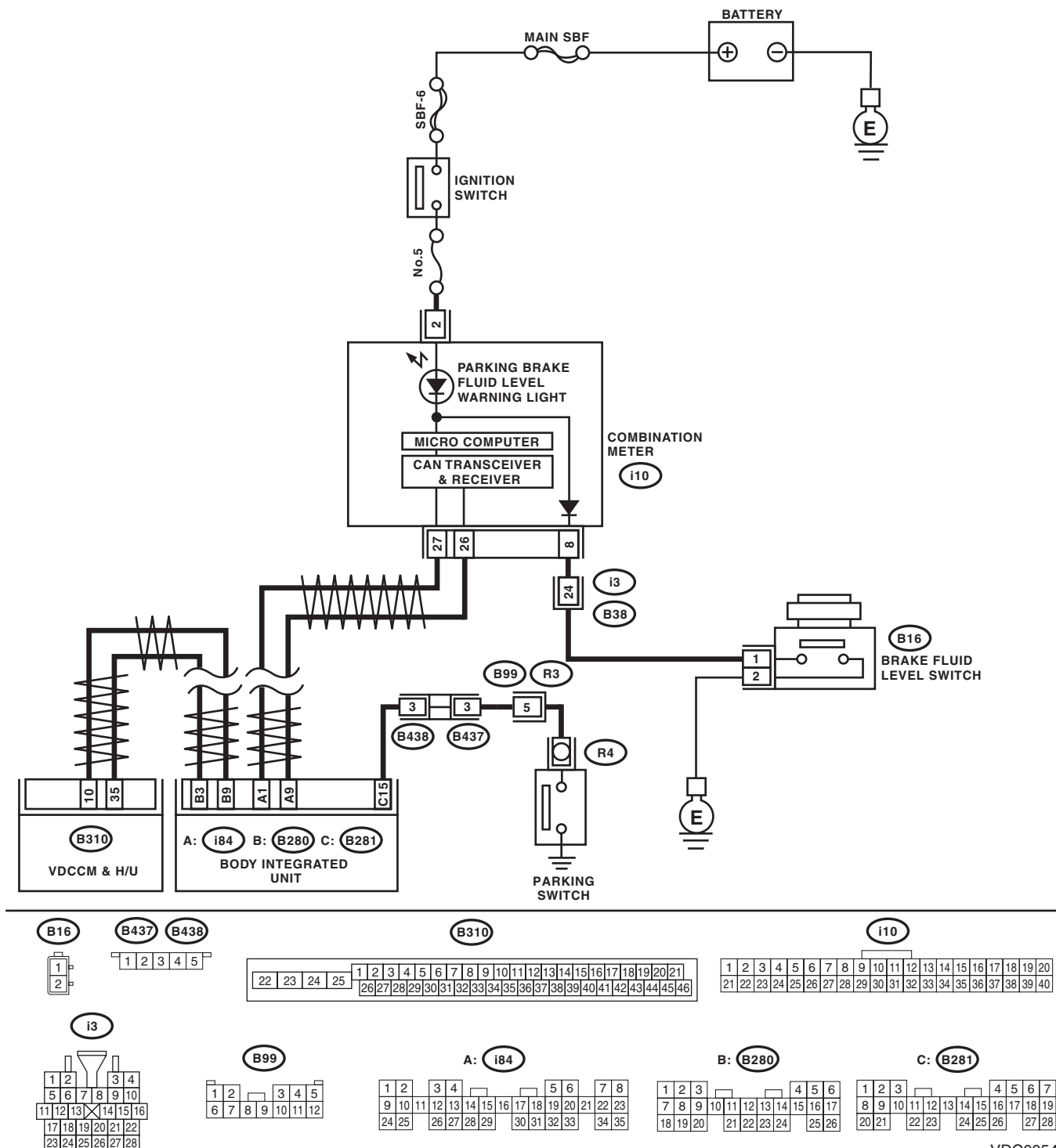
DETECTING CONDITION:

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

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



VDC00548

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INSTALLATION OF VDCCM&H/U CONNECTOR. 1) Turn the ignition switch to OFF. 2) Check that the VDCCM&H/U connector is inserted until it is locked by clamp.	Is the connector firmly inserted?	Go to step 2.	Insert the VDCCM&H/U connector until it is locked by clamp.
2 READ DTC. Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK BRAKE FLUID AMOUNT. Check the amount of brake fluid in the reservoir tank of master cylinder.	Is the amount of brake fluid between the lines of "MAX" and "MIN"?	Go to step 4.	Replenish brake fluid to the specified value.
4 CHECK BRAKE FLUID LEVEL SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the level switch connector (B16) from master cylinder. 3) Measure the resistance of master cylinder terminals. Terminals No. 1 — No. 2:	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the master cylinder.
5 CHECK GROUND SHORT OF HARNESS. 1) Disconnect the connector (i10) from combination meter. 2) Measure the resistance between combination meter connector and chassis ground. Connector & terminal (i10) No. 8 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the harness between combination meter and brake fluid level switch.
6 CHECK PARKING BRAKE SWITCH. 1) Disconnect the connector (R4) from parking brake switch. 2) Release the parking brake. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance 1 MΩ or more?	Go to step 7.	Replace the parking brake switch.
7 CHECK GROUND SHORT OF HARNESS. 1) Disconnect the connector (B281) from body integrated unit. 2) Measure the resistance between body integrated unit connector and chassis ground. Connector & terminal (B281) No. 15 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 8.	Repair the harness between body integrated unit and parking brake switch.
8 CHECK POOR CONTACT OF CONNECTOR. Check for poor contact of all connectors.	Is there poor contact?	Repair the connector.	Go to step 9.
9 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step 10.
10 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-15, Combination Meter.>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

11. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Detailed code	Display	Content of diagnosis	Reference
C0021	07B1H 07B2H 07C0H	Front Right ABS Sensor Circuit Open or Shorted Battery	Open/high input of front ABS wheel speed sensor RH	<Ref. to VDC(diag)-39, DTC C0021 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0022	0720H 072FH 0736H 0737H 0738H 073AH 073CH	Front Right ABS Sensor Signal	Front ABS wheel speed sensor RH signal malfunction	<Ref. to VDC(diag)-42, DTC C0022 FRONT RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0023	06B1H 06B2H 06C0H	Front Left ABS Sensor Circuit Open or Shorted Battery	Open/high input of front ABS wheel speed sensor LH	<Ref. to VDC(diag)-39, DTC C0023 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0024	0620H 062FH 0636H 0637H 0638H 063AH 063CH	Front Left ABS Sensor Signal	Front ABS wheel speed sensor LH signal malfunction	<Ref. to VDC(diag)-42, DTC C0024 FRONT LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0025	09B1H 09B2H 09C0H	Rear Right ABS Sensor Circuit Open or Shorted Battery	Open/high input of rear ABS wheel speed sensor RH	<Ref. to VDC(diag)-39, DTC C0025 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0026	0920H 092FH 0936H 0937H 0938H 093AH 093CH	Rear Right ABS Sensor Signal	Rear ABS wheel speed sensor RH signal malfunction	<Ref. to VDC(diag)-42, DTC C0026 REAR RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0027	08B1H 08B2H 08C0H	Rear Left ABS Sensor Circuit Open or Shorted Battery	Open/high input of rear ABS wheel speed sensor LH	<Ref. to VDC(diag)-40, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0028	0820H 082FH 0836H 0837H 0838H 083AH 083CH	Rear Left ABS Sensor Signal	Rear ABS wheel speed sensor LH signal malfunction	<Ref. to VDC(diag)-43, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0029	0A10H 0A41H 0A4BH 0A4DH 0A52H 0A56H 0A60H	Any One of Four ABS Sensors Signal	ABS wheel speed sensor signal malfunction in one of four wheels	<Ref. to VDC(diag)-46, DTC C0029 ANY OF WHEEL SENSORS SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0031	0DB8H 0DC0H 0DC1H 0DD0H	FR Hold Valve malfunction	Front inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0031 FR HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

DTC	Detailed code	Display	Content of diagnosis	Reference
C0032	0EB8H 0EC0H 0EC1H 0ED0H	FR Pressure Reducing Valve malfunction	Front outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0032 FR PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0033	0BB8H 0BC0H 0BC1H 0BD0H	FL Hold Valve malfunction	Front inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0033 FL HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0034	0CB8H 0CC0H 0CC1H 0CD0H	FL Pressure Reducing Valve malfunction	Front outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0034 FL PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0035	11B8H 11C0H 11C1H 11D0H	RR Hold Valve malfunction	Rear inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0035 RR HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0036	12B8H 12C0H 12C1H 12D0H	RR Pressure Reducing Valve malfunction	Rear outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-48, DTC C0036 RR PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0037	0FB8H 0FC0H 0FC1H 0FD0H	RL Hold Valve malfunction	Rear inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0037 RL HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0038	10B8H 10C0H 10C1H 10D0H	RL Pressure Reducing Valve malfunction	Rear outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0038 RL PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0039	0FB5H 11B5H	Any One of Four Solenoid Valves	Solenoid valve malfunction in one of four wheels	<Ref. to VDC(diag)-49, DTC C0039 ANY ONE OF FOUR SOLENOID VALVES, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0041	—	ECM	VDC control module malfunction	<Ref. to VDC(diag)-52, DTC C0041 ECM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1630H 1645H 16C0H	Parameter selection error	VDC control module parameter selection failure	<Ref. to VDC(diag)-54, DTC C0041 PARAMETER SELECTION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0042	0316H 031CH 0322H 0324H	Power Supply Voltage Failure	Power voltage malfunction	<Ref. to VDC(diag)-55, DTC C0042 POWER SUPPLY VOLTAGE FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0044	2921H	TCM Communication Circuit	CAN communication failure of transmission control module	<Ref. to VDC(diag)-57, DTC C0044 TCM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0045	2922H 2932H	Incorrect VDC Control Module specifications	Different VDC control module specification	<Ref. to VDC(diag)-58, DTC C0045 INCORRECT VDC CONTROL MODULE SPECIFICATIONS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2923H	TCM malfunction	AT control module malfunction	<Ref. to VDC(diag)-59, DTC C0045 TCM MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

DTC	Detailed code	Display	Content of diagnosis	Reference
C0047	1504H	Improper CAN Communication	Improper CAN communication	<Ref. to VDC(diag)-60, DTC C0047 CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1505H			
	1506H			
	1507H			
	1508H			
	150EH			
	1512H			
	1514H			
	1518H			
	1519H			
	151AH			
	151DH			
	151EH			
	151FH			
	1520H			
	1531H			
	1540H			
	15C0H			
C0051	021FH	Valve Relay	Valve Relay	<Ref. to VDC(diag)-62, DTC C0051 VALVE RELAY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	0220H			
	0221H			
	0280H			
	0281H			
	02B0H			
	02B1H			
C0052	0562H	Motor and Motor Relay OFF Failure	Motor/motor relay OFF malfunction	<Ref. to VDC(diag)-64, DTC C0052 MOTOR AND MOTOR RELAY OFF FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	0574H			
	0580H	Motor and Motor Relay ON Failure	Motor/motor relay ON malfunction	<Ref. to VDC(diag)-66, DTC C0052 MOTOR AND MOTOR RELAY ON FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	05A0H			
	0560H	Motor malfunction	Motor	<Ref. to VDC(diag)-67, DTC C0052 MOTOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0054	04B0H	BLS open circuit	BLS open circuit	<Ref. to VDC(diag)-68, DTC C0054 BLS CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	043CH	BLS ON malfunction	BLS ON malfunction	<Ref. to VDC(diag)-70, DTC C0054 BLS ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	04C1H	BLS OFF malfunction	BLS OFF malfunction	<Ref. to VDC(diag)-72, DTC C0054 BLS OFF MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0056	1760H 1770H 1780H	Longitudinal G Sensor Signal	Abnormal forward/reverse G sensor output signal	<Ref. to VDC(diag)-74, DTC C0056 G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0057	2931H	ECM Communication Circuit	CAN communication failure of engine control module	<Ref. to VDC(diag)-76, DTC C0057 ECM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2930H	ECM Control System	Coordinate control prohibition of engine control module	<Ref. to VDC(diag)-77, DTC C0057 ECM CONTROL SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0061	19B8H 19C0H 19C1H 19D0H	Normal Opening Valve 1 malfunction	Secondary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0061 NORMAL OPENING VALVE 1 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

DTC	Detailed code	Display	Content of diagnosis	Reference
C0062	1AB8H 1AC0H 1AC1H 1AD0H	Normal Closing Valve 1 malfunction	Primary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0062 NORMAL OPENING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0063	1BB8H 1BC0H 1BC1H 1BD0H	Normal Opening Valve 2 malfunction	Secondary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0063 NORMAL CLOSING VALVE 1 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0064	1CB8H 1CC0H 1CC1H 1CD0H	Normal Closing Valve 2 malfunction	Primary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0071	2130H	Steering Angle Sensor Offset is too big	Excessive steering angle sensor output offset	<Ref. to VDC(diag)-78, DTC C0071 STEERING ANGLE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2134H	Change range of Steering Angle Sensor is too big	Excessive variation amount of steering angle sensor output	<Ref. to VDC(diag)-80, DTC C0071 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	212EH 2132H 2136H 2138H 213CH 2150H 2151H 2152H 2153H 2154H 2155H 2156H 2157H 2158H 2159H 215AH	Steering Angle Sensor Op	Steering angle sensor output	<Ref. to VDC(diag)-82, DTC C0071 STEER ANGLE SENSOR OP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2104H	Steering angle sensor malfunction	Steering angle sensor power supply malfunction	<Ref. to VDC(diag)-84, DTC C0071 STEERING ANGLE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

DTC	Detailed code	Display	Content of diagnosis	Reference
C0072	1E1AH 1E1EH 1E22H 1E26H 1E28H 1E2CH 1E34H 1E38H 1E3AH 1E3FH	Yaw Rate Sensor Output	Yaw rate sensor output	<Ref. to VDC(diag)-86, DTC C0072 ABNORMAL YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1EB6H	Voltage inputted to Yaw Rate Sensor exceeds specification	Yaw rate sensor power supply/output	<Ref. to VDC(diag)-88, DTC C0072 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1E30H	Change range of Yaw Rate Sensor Signal is too big	Excessive variation amount of yaw rate sensor output	<Ref. to VDC(diag)-90, DTC C0072 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1EB7H 1EBFH 1EB5H 1EBCH 1EBDH 1EBEH 1EC0H 1EC2H 1EC3H 1EC4H 1EC6H 1ECEH 1ECFH 1ED0H 1ED3H 1ED4H 1ED5H	Yaw Rate Sensor Communication	Yaw rate sensor communication	<Ref. to VDC(diag)-92, DTC C0072 YAW RATE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1EB9H 1ED6H	Sensor Type Abnormal	Different yaw rate sensor specification	<Ref. to VDC(diag)-94, DTC C0072 SENSOR TYPE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D46H 1D47H	Lateral G Sensor offset is too big	Excessive amount of lateral G sensor output offset	<Ref. to VDC(diag)-94, DTC C0073 LATERAL G SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D44H 1D45H	Lateral G sensor Output	Lateral G sensor output	<Ref. to VDC(diag)-94, DTC C0073 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0073	1D49H	Excessive Lateral G Sensor signal	Excessive lateral G sensor output	<Ref. to VDC(diag)-95, DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1F4EH 1F4FH 1FB1H 1FC0H	Pressure Sensor	Pressure sensor	<Ref. to VDC(diag)-97, DTC C0074 PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2510H 2520H	Reverse Signal	Abnormal reverse signal	<Ref. to VDC(diag)-98, DTC C0075 REVERSE SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0076	2610H 2620H	Clutch Signal	Abnormal clutch signal	<Ref. to VDC(diag)-100, DTC C0076 CLUTCH SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0081	2201H 2202H	System malfunction	System malfunction	<Ref. to VDC(diag)-103, DTC C0081 SYSTEM FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC C0021 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:

For the diagnostic procedure, refer to DTC C0027 “RL WHEEL SPEED SENSOR CIRCUIT OPEN/HIGH INPUT”. <Ref. to VDC(diag)-40, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC C0023 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:

For the diagnostic procedure, refer to DTC C0027 “RL WHEEL SPEED SENSOR CIRCUIT OPEN/HIGH INPUT”. <Ref. to VDC(diag)-40, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC C0025 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:

For the diagnostic procedure, refer to DTC C0027 “RL WHEEL SPEED SENSOR CIRCUIT OPEN/HIGH INPUT”. <Ref. to VDC(diag)-40, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

D: DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

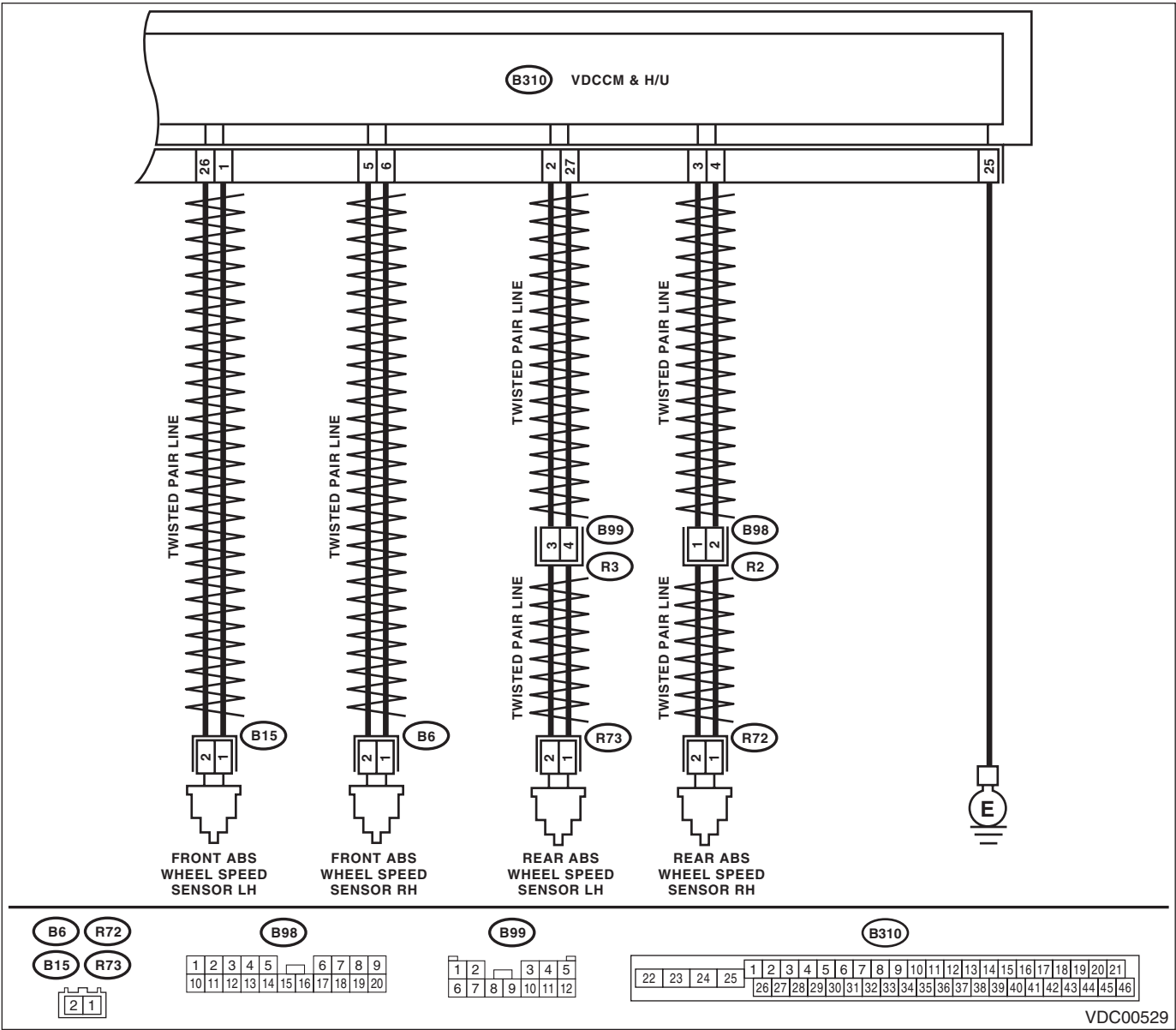
DTC DETECTING CONDITION:

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

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00529

Step	Check	Yes	No
1	CHECK POOR CONTACT OF CONNECTOR. Check if there is poor contact between VDCCM&H/U and ABS wheel speed sensor.	Is there poor contact? Repair the connector.	Go to step 2.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND ABS WHEEL SPEED SENSOR. 1) Disconnect the connector (B310) from the VDCCM&H/U. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between VDCCM&H/U connector and ABS wheel speed sensor connector. Connector & terminal DTC C0021 (B310) No. 6 — (B6) No. 1: (B310) No. 5 — (B6) No. 2: DTC C0023 (B310) No. 1 — (B15) No. 1: (B310) No. 26 — (B15) No. 2: DTC C0025 (B310) No. 4 — (R72) No. 1: (B310) No. 3 — (R72) No. 2: DTC C0027 (B310) No. 27 — (R73) No. 1: (B310) No. 2 — (R73) No. 2:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness connector between VDCCM&H/U and ABS wheel speed sensor.
3 CHECK GROUND SHORT OF HARNESS. Measure the resistance between VDCCM&H/U connector and chassis ground. Connector & terminal DTC C0021 (B310) No. 6 — Chassis ground: DTC C0023 (B310) No. 1 — Chassis ground: DTC C0025 (B310) No. 4 — Chassis ground: DTC C0027 (B310) No. 27 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 4.	Repair the harness connector between VDCCM&H/U and ABS wheel speed sensor.
4 CHECK ABS WHEEL SPEED SENSOR POWER SUPPLY CIRCUIT. 1) Connect the VDCCM&H/U connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ABS wheel speed sensor connector and chassis ground. Connector & terminal DTC C0021 (B6) No. 2 (+) — Chassis ground (–): DTC C0023 (B15) No. 2 (+) — Chassis ground (–): DTC C0025 (R72) No. 2 (+) — Chassis ground (–): DTC C0027 (R73) No. 2 (+) — Chassis ground (–):	Is the voltage 5 — 16 V?	Go to step 6.	Go to step 5.
5 CHECK VDCCM&H/U POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector terminals. Connector & terminal (B310) No. 28 (+) — (B310) No. 25 (–):	Is the voltage 10 — 15 V?	Go to step 6.	Check the generator, battery and VDCCM&H/U power supply circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to VDC-23, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Is the pattern the same waveform as shown in the figure?	Go to step 7.	Replace the ABS wheel speed sensor.
7 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 8.
8 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

E: DTC C0022 FRONT RIGHT ABS SENSOR SIGNAL

NOTE:

For the diagnostic procedure, refer to DTC C0028 "RL WHEEL SPEED SENSOR SIGNAL". <Ref. to VDC(diag)-43, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC C0024 FRONT LEFT ABS SENSOR SIGNAL

NOTE:

For the diagnostic procedure, refer to DTC C0028 "RL WHEEL SPEED SENSOR SIGNAL". <Ref. to VDC(diag)-43, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC C0026 REAR RIGHT ABS SENSOR SIGNAL

NOTE:

For the diagnostic procedure, refer to DTC C0028 "RL WHEEL SPEED SENSOR SIGNAL". <Ref. to VDC(diag)-43, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

H: DTC C0028 REAR LEFT ABS SENSOR SIGNAL

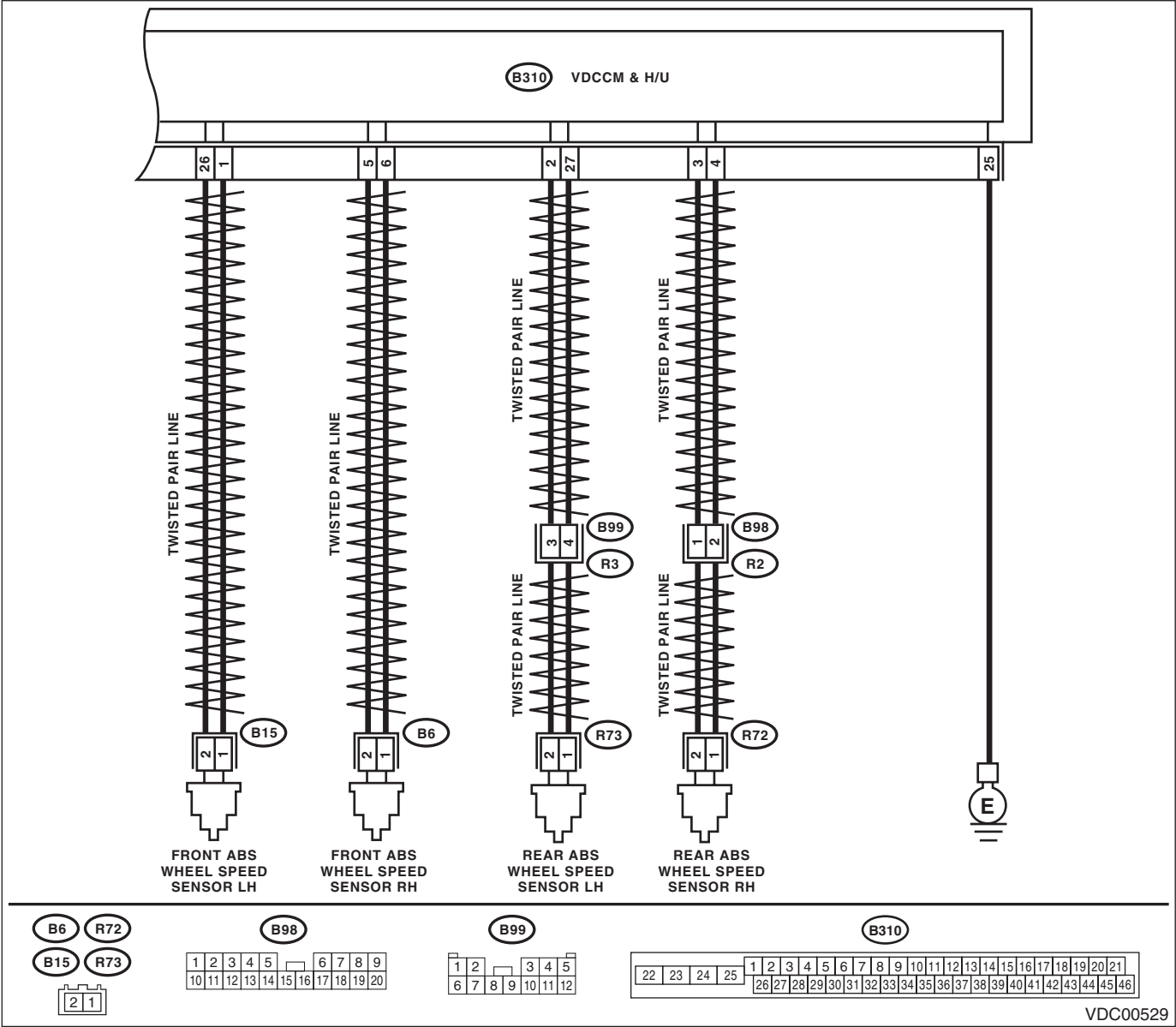
DTC DETECTING CONDITION:

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

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00529

Step	Check	Yes	No	
1	CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the defective ABS wheel speed sensor output.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step 2.	Go to step 7.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2	CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact of connectors between VDCCM&H/U and ABS wheel speed sensor?	Repair the connector. Go to step 3.
3	CHECK CAUSE OF SIGNAL NOISE. Make sure the radio wave devices and electronic components are installed correctly.	Are the radio wave devices and electronic components installed correctly?	Go to step 4. Install the radio wave devices and electronic components properly.
4	CHECK CAUSE OF SIGNAL NOISE. Check if the noise sources (such as an antenna) are installed near the sensor harness.	Are noise sources installed?	Install the noise sources apart from sensor harness. Go to step 5.
5	CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).> Go to step 6.
6	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).> It results from a temporary noise interference.
7	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Is the ABS wheel speed sensor installation bolt tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step 8. Tighten the ABS wheel speed sensor installation bolts.
8	CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to VDC-23, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for one rotation or more?	Go to step 10. Go to step 9.
9	CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.	Are there foreign matter, breakage or damage at the tip of ABS wheel speed sensor or magnetic encoder?	Remove dirt thoroughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged. Go to step 10.
10	CHECK CAUSE OF SIGNAL NOISE. Make sure the radio wave devices and electronic components are installed correctly.	Are the radio wave devices and electronic components installed correctly?	Go to step 11. Install the radio wave devices and electronic components properly.
11	CHECK CAUSE OF SIGNAL NOISE. Check if the noise sources (such as an antenna) are installed near the sensor harness.	Is the noise sources installed?	Go to step 12. Install the noise sources apart from sensor harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 13.
13 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

I: DTC C0029 ANY OF WHEEL SENSORS SIGNAL

DTC DETECTING CONDITION:

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

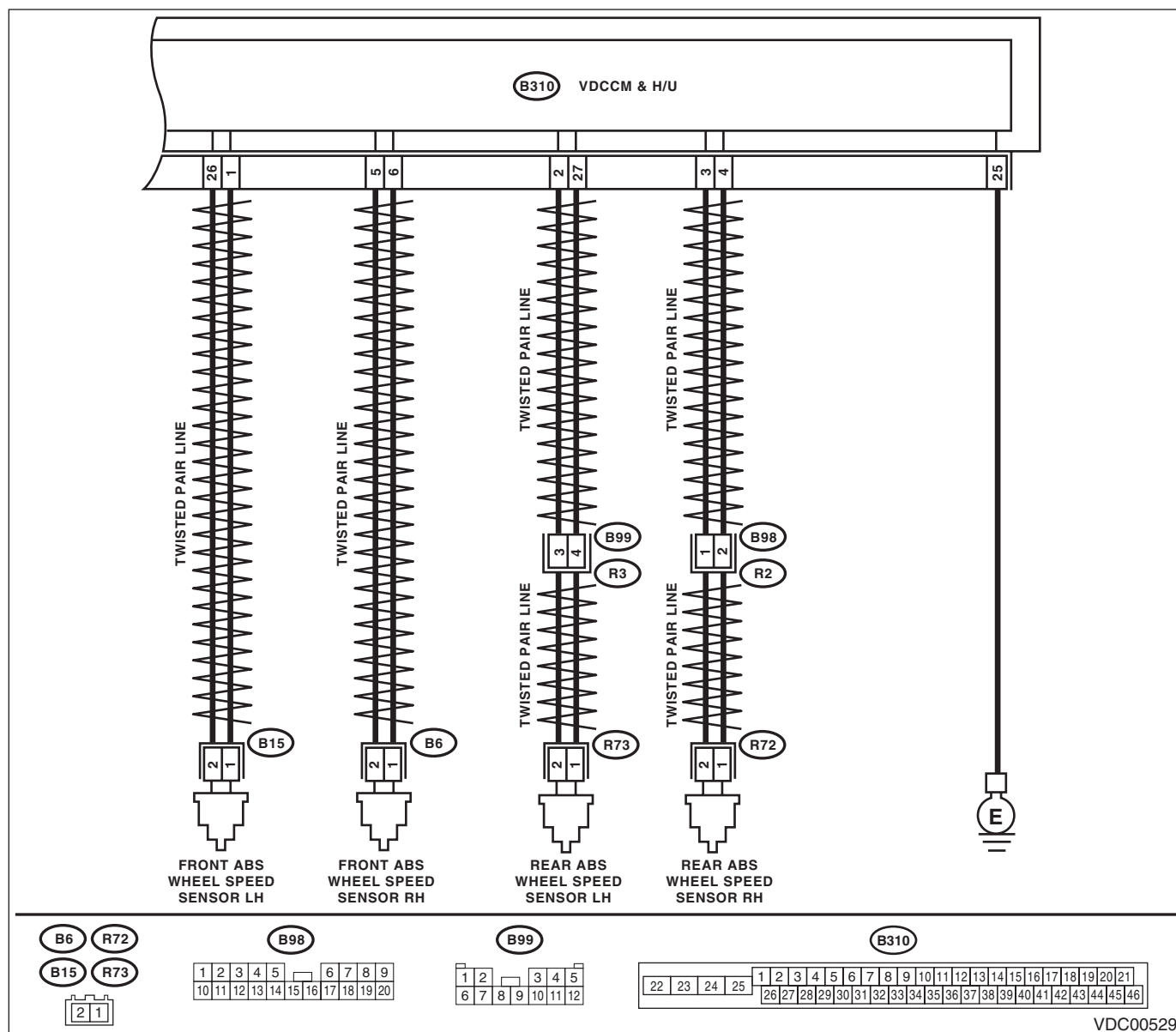
TROUBLE SYMPTOM:

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

NOTE:

Brake warning light comes on as well as ABS warning light when EBD does not operate.

WIRING DIAGRAM:



VDC00529

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 WHETHER A WHEEL TURNED FREELY OR NOT. Check if the wheels have been turned freely for one minute or more, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface.	Did the wheels turn freely?	VDC is normal. Clear the memory. NOTE: This diagnostic trouble code may sometimes occur if the wheels turn freely for a long time, for example when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way.	Go to step 2.
2 CHECK TIRE SPECIFICATIONS. Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step 3.	Replace the tire.
3 CHECK WEAR OF TIRE.	Is the tire worn excessively?	Replace the tire.	Go to step 4.
4 CHECK TIRE INFLATION PRESSURE.	Is the tire pressure correct?	Go to step 5.	Adjust the tire pressure.
5 CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Are the ABS wheel speed sensor installation bolts tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)? (For four wheels)	Go to step 6.	Tighten the ABS wheel speed sensor installation bolts.
6 CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to VDC-23, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for one rotation or more?	Go to step 8.	Go to step 7.
7 CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.	Are there foreign matter, breakage or damage at the tip of ABS wheel speed sensor or magnetic encoder?	Remove dirt thoroughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step 8.
8 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

J: DTC C0031 FR HOLD VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC C0032 FR PRESSURE REDUCING VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC C0033 FL HOLD VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC C0034 FL PRESSURE REDUCING VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC C0035 RR HOLD VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC C0036 RR PRESSURE REDUCING VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC C0037 RL HOLD VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC C0038 RL PRESSURE REDUCING VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC C0039 ANY ONE OF FOUR SOLENOID VALVES

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

S: DTC C0061 NORMAL OPENING VALVE 1 MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

T: DTC C0062 NORMAL OPENING VALVE 2 MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC C0063 NORMAL CLOSING VALVE 1 MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-50, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

V: DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION

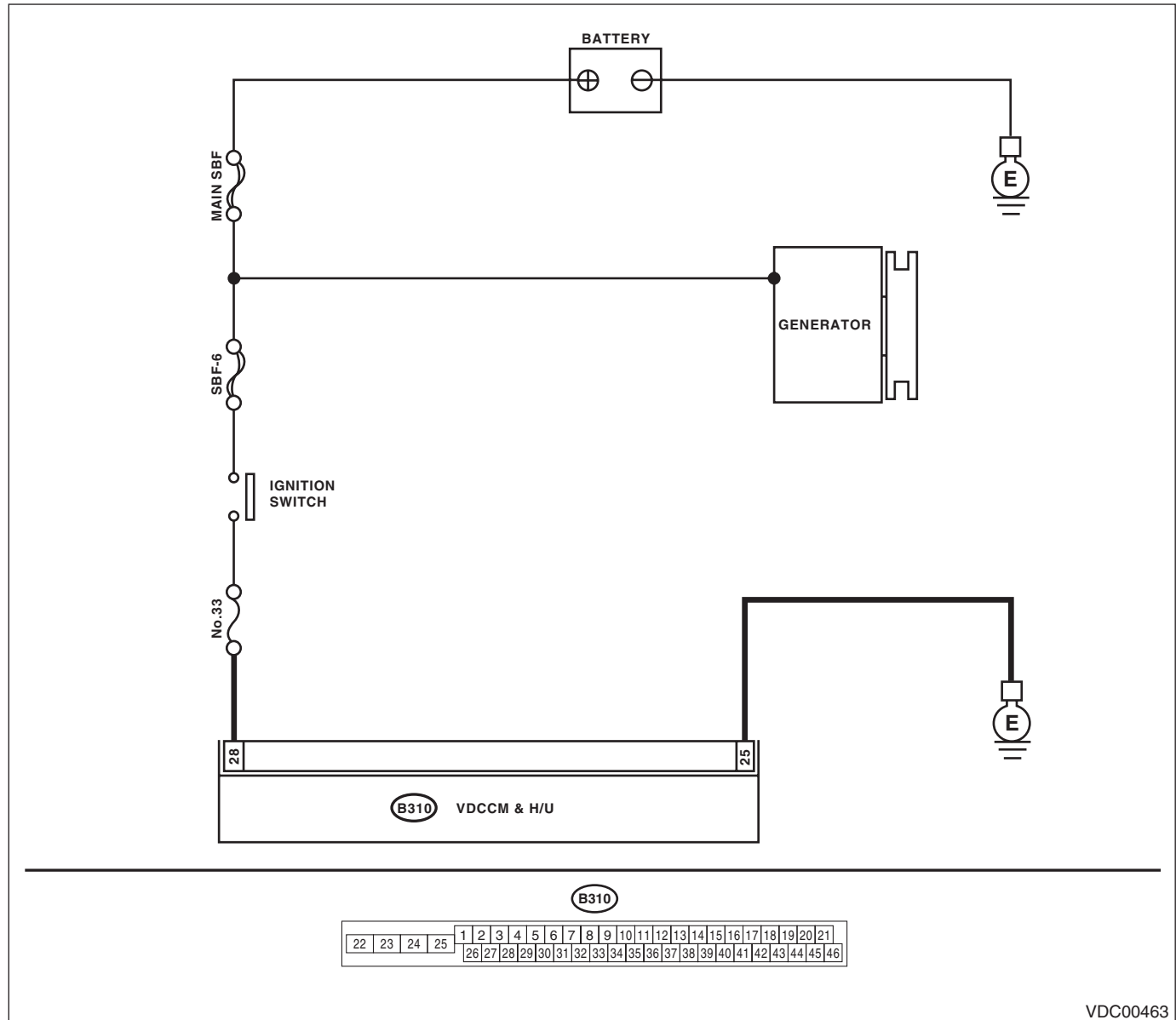
DTC DETECTING CONDITION:

- Defective harness connector
- Defective VDCH/U solenoid valve

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK VDCCM&H/U INPUT VOLTAGE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 28 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the power supply circuit.
2 CHECK VDCCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 25 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the VDCCM&H/U ground harness.
3 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step 4.
4 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 5.
5 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

W: DTC C0041 ECM

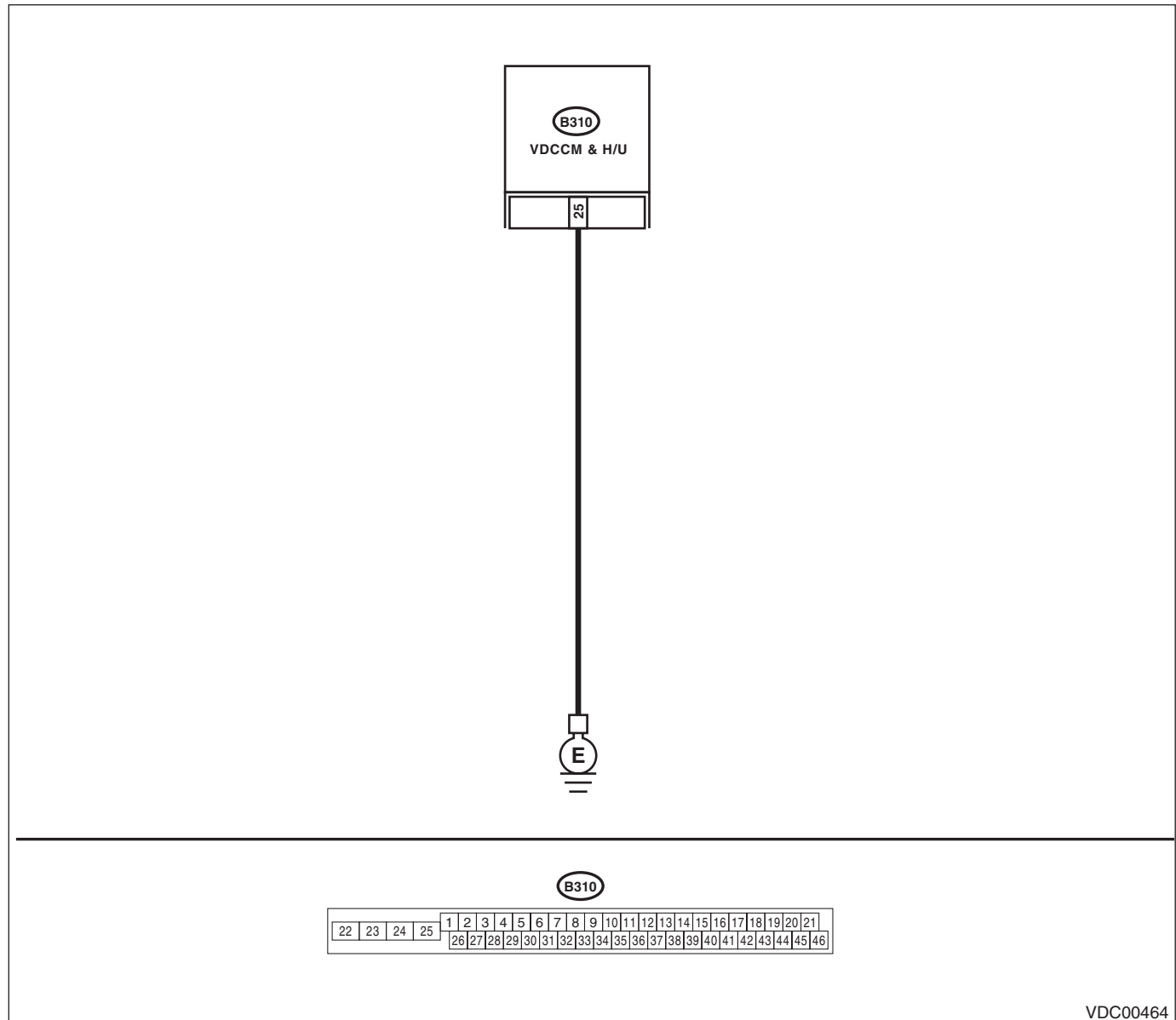
DTC DETECTING CONDITION:

Defective VDCCM&H/U

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



VDC00464

Step	Check	Yes	No
1 CHECK VDCCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Measure the resistance between VDCCM&H/U and chassis ground. Connector & terminal (B310) No. 25 — Chassis ground:	Is the resistance less than 10 Ω?	Go to step 2.	Repair the VDCCM&H/U ground harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2	CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of the connector between the battery, ignition switch and VDCCM&H/U?	Repair the connector. Go to step 3.
3	CHECK CAUSE OF SIGNAL NOISE.	Are the radio wave devices and electronic components installed correctly?	Go to step 4. Install the radio wave devices and electronic components properly.
4	CHECK CAUSE OF SIGNAL NOISE.	Is there a noise source (such as an antenna) installed near the sensor harness?	Install the noise source apart from the sensor harness. Go to step 5.
5	CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).> Go to step 6.
6	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).> Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

X: DTC C0041 PARAMETER SELECTION ERROR

DTC DETECTING CONDITION:

VDCCM parameter selection error

TROUBLE SYMPTOM:

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

NOTE:

When the VDCCM or VDCCM&H/U is replaced, this DTC may be stored.

Step	Check	Yes	No
1 CHECK VDCCM&H/U REPLACEMENT HISTORY.	Is there history of VDCCM replacement by itself?	Go to step 2.	Go to step 3.
2 CHECK VDCCM IDENTIFICATION SYMBOL. Check the identification symbol of the seal attached on the side of the VDCCM. AT: S1 MT: S5 (WRX-SS) S2 (except for WRX-SS)	Is the identification symbol correct?	Go to step 4.	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3 CHECK VDCCM&H/U IDENTIFICATION SYMBOL. Check the identification symbol stamped on the upper part of the H/U. AT: S1 MT: S5 (WRX-SS) S2 (except for WRX-SS)	Is the identification symbol correct?	Go to step 4.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4 CHECK PARAMETER SELECTED IN VDC-CM. <Ref. to VDC(diag)-19, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>	Does the parameter registered in the VDCCM match the relevant vehicle?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Select and register the correct parameter. <Ref. to VDC(diag)-18, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK GENERATOR. 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator terminal B and chassis ground. Terminals Generator terminal B (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the generator.
2	CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and negative battery terminals clamped tightly?	Go to step 3.	Tighten the terminal.
3	CHECK VDCCM&H/U INPUT VOLTAGE. 1) Disconnect the connector from the VDCCM&H/U. 2) Run the engine at idle. 3) Operate devices such as headlights, air conditioner, defogger, etc. which produce an electrical load. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 28 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the power supply circuit.
4	CHECK VDCCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 25 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the VDCCM&H/U ground harness.
5	CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step 6.
6	CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 7.
7	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Z: DTC C0044 TCM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal from TCM.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step	Check	Yes	No
1 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step 2.
2 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of TCM connector?	Repair the connector.	Go to step 3.
3 CHECK TCM.	Is the TCM normal?	Go to step 4.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
4 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 5.
5 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AA:DTC C0045 INCORRECT VDC CONTROL MODULE SPECIFICATIONS

DTC DETECTING CONDITION:

Different control module specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

NOTE:

When parameter selection for VDCCM is improper, this DTC may be memorized.

Step	Check	Yes	No
1 CHECK VDCCM REPLACEMENT HISTORY.	Is there history of VDCCM replacement by itself?	Go to step 2.	Go to step 3.
2 CHECK VDCCM IDENTIFICATION SYMBOL. Check the identification symbol of the seal attached on the side of the VDCCM. AT: S1 MT: S5 (WRX-SS) S2 (except for WRX-SS)	Is the identification symbol correct?	Go to step 4.	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3 CHECK VDCCM&H/U IDENTIFICATION SYMBOL. Check the identification symbol stamped on the upper part of the H/U. AT: S1 MT: S5 (WRX-SS) S2 (except for WRX-SS)	Is the identification symbol correct?	Go to step 4.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4 CHECK PARAMETER SELECTED IN VDC-CM. <Ref. to VDC(diag)-19, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>	Does the parameter registered in the VDCCM match the relevant vehicle?	Go to step 5.	Select and register the correct parameter. <Ref. to VDC(diag)-18, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>
5 CHECK TCM SPECIFICATION. Check the TCM specification.	Is the specification of TCM same as vehicle specification?	Go to step 6.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
6 CHECK AT SYSTEM. 1) Start the engine. 2) Check the DTC in AT system.	Is DTC of AT system displayed?	Repair the AT system.	Go to step 7.
7 CHECK ECM SPECIFICATION. Check the ECM specification.	Is the specification of ECM same as vehicle specification?	Go to step 8.	Replace the ECM. <Ref. to FU(H4SO)-45, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-51, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 9.
9 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AB:DTC C0045 TCM MALFUNCTION

DTC DETECTING CONDITION:

Defective TCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step	Check	Yes	No
1 CHECK AT SYSTEM. 1) Start the engine. 2) Check the DTC in AT system.	Is DTC of AT system displayed?	Repair the AT system.	Go to step 2.
2 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 3.
3 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



VDC(diag)-60

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK OUTPUT OF STEERING ANGLE SENSOR WITH SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 2) Check the steering angle sensor output.	Does the output signal change?	Go to step 4.	Check output of the steering angle sensor. <Ref. to VDC(diag)-82, DTC C0071 STEER ANGLE SENSOR OP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
4 CHECK OUTPUT OF YAW RATE & G SENSOR WITH SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 2) Check the yaw rate & G sensor output.	Does the output signal change?	Go to step 5.	Check output of the yaw rate & G sensor. <Ref. to VDC(diag)-92, DTC C0072 YAW RATE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
5 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Temporary poor contact occurs.

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK VDCCM&H/U INPUT VOLTAGE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 28 (+) — Chassis ground (-): (B310) No. 24 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the power supply circuit.
2 CHECK VDCCM&H/U INPUT VOLTAGE. Calculate the voltage difference measured in step 1. A: (B310) No. 28 (+) — Chassis ground (-): B: (B310) No. 24 (+) — Chassis ground (-):	Is the voltage difference between A and B 2 V or more?	Repair the power supply circuit.	Go to step 3.
3 CHECK VDCCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 25 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 4.	Repair the VDCCM&H/U ground harness.
4 CHECK VDCCM&H/U VALVE RELAY. Measure the resistance between VDCCM&H/U connector terminals. Connector & terminal (B310) No. 24 — (B310) No. 25:	Is the resistance 1 M Ω or more?	Go to step 5.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
5 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step 6.
6 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 7.
7 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AE:DTC C0052 MOTOR AND MOTOR RELAY OFF FAILURE

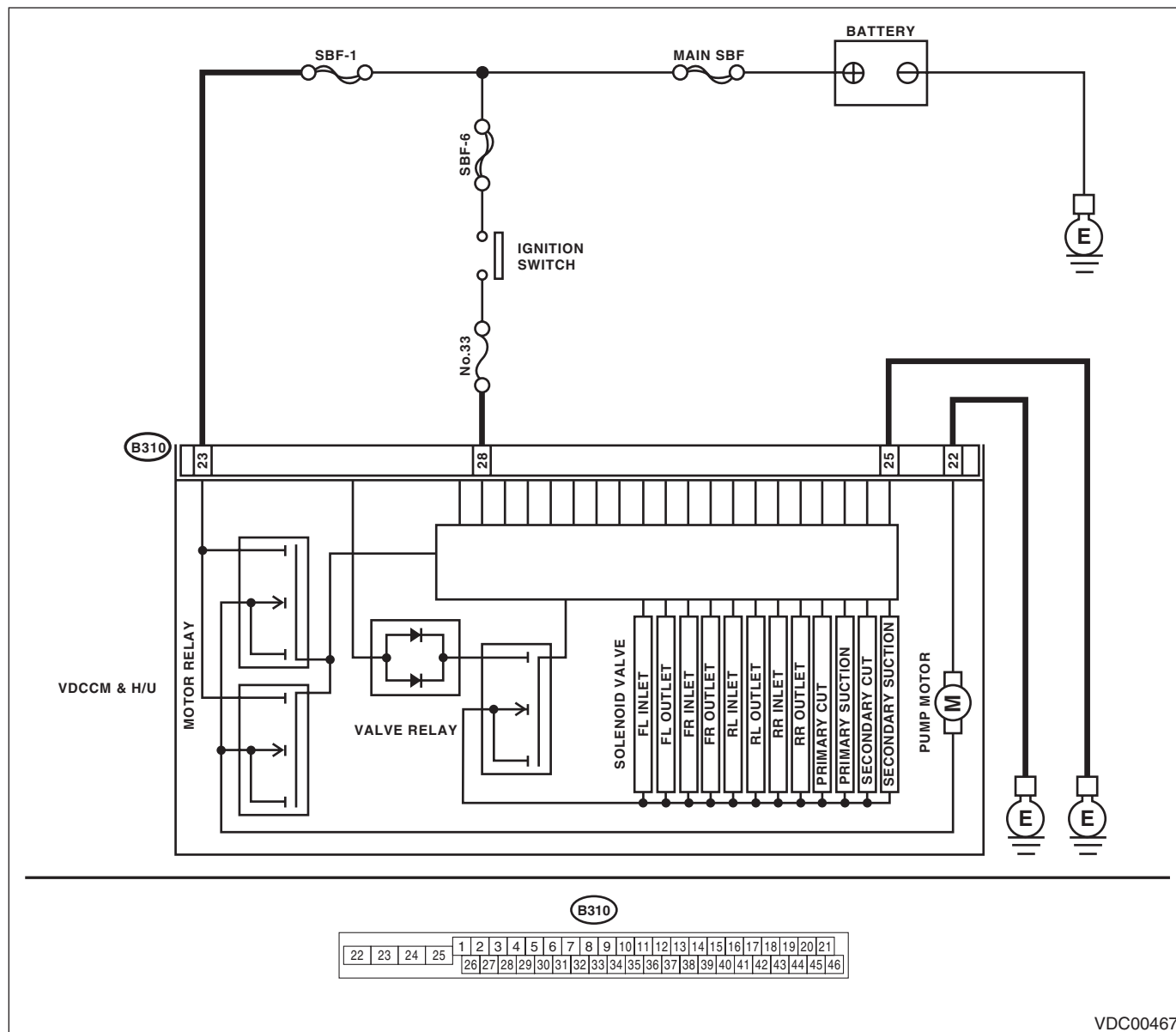
DTC DETECTING CONDITION:

- Defective motor and motor relay
- Defective harness connector

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK VDCCM&H/U INPUT VOLTAGE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 23 (+) — Chassis ground (-): (B310) No. 28 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the VDCCM&H/U power supply circuit.
2 CHECK INSTALLATION OF MOTOR GROUND.	Is the motor ground terminal installation bolt tightened 33 N·m (3.4 kgf-m, 24.3 ft-lb)?	Go to step 3.	Tighten the motor ground terminal installation bolt.
3 CHECK VDCCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 25 — Chassis ground: (B310) No. 22 — Chassis ground:	Is the resistance less than 10 Ω?	Go to step 4.	Repair the VDCCM&H/U ground harness.
4 CHECK VDCCM&H/U MOTOR RELAY. Measure the resistance between VDCCM&H/U connector terminals. Terminals No. 23 — No. 22:	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
5 CHECK POOR CONTACT OF CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact of connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step 6.
6 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 7.
7 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK INSTALLATION OF MOTOR GROUND.	Is the motor ground terminal installation bolt tightened 33 N·m (3.4 kgf-m, 24.3 ft-lb)?	Go to step 2.	Tighten the motor ground terminal installation bolt.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK VDCCM&H/U MOTOR RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Measure the resistance between VDCCM&H/U connector terminals. Terminals No. 23 — No. 22:	Is the resistance 1 MΩ or more?	Go to step 3.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 4.
4 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

AG:DTC C0052 MOTOR MALFUNCTION

DTC DETECTING CONDITION:

- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

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

NOTE:

For the diagnostic procedure, refer to DTC C0052 "MOTOR/MOTOR RELAY OFF FAILURE". <Ref. to VDC(diag)-64, DTC C0052 MOTOR AND MOTOR RELAY OFF FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AH:DTC C0054 BLS CIRCUIT OPEN

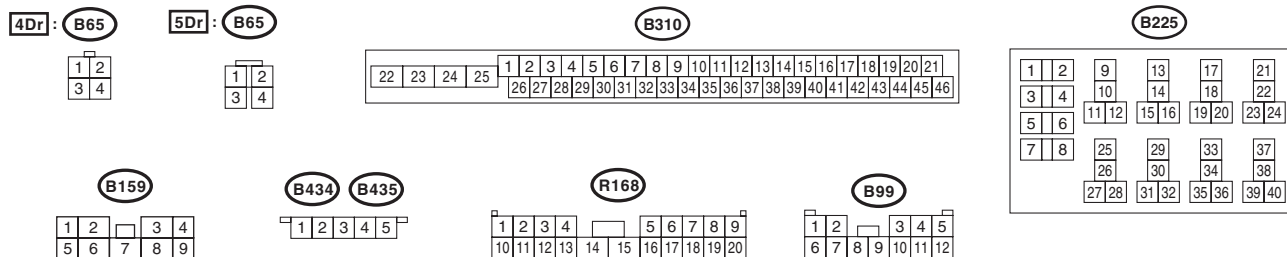
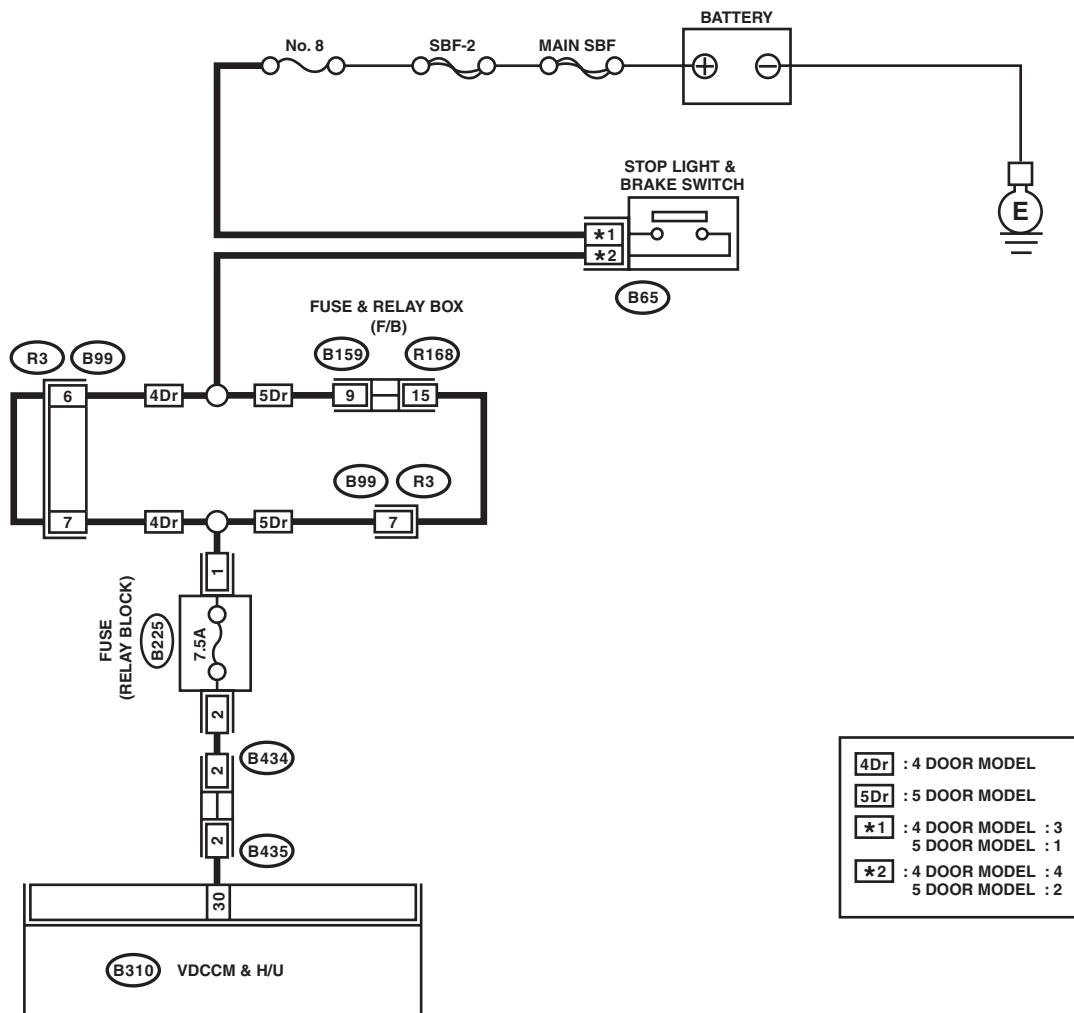
DTC DETECTING CONDITION:

Defective stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00819

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF STOP LIGHT SWITCH WITH SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 2) Release the brake pedal. 3) Read the stop light switch output in Subaru Select Monitor.	Is OFF displayed on the display screen?	Go to step 2.	Go to step 3.
2 CHECK OUTPUT OF STOP LIGHT SWITCH WITH SUBARU SELECT MONITOR. 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor.	Is ON displayed on the display screen?	Go to step 6.	Go to step 3.
3 CHECK IF STOP LIGHTS ILLUMINATE. Depress the brake pedal.	Does the stop light illuminate?	Go to step 4.	Repair the stop light circuit.
4 CHECK FUSE. Check the fuse (B225) in the relay block.	Is the fuse OK?	Go to step 5.	Replace the fuse.
5 CHECK OPEN CIRCUIT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 30 (+) — Chassis ground (–):	Is the voltage 10 — 15 V?	Go to step 6.	Repair the harness between stop light switch and VDCCM&H/U connector.
6 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of connector between stop light switch and VDCCM&H/U?	Repair the connector.	Go to step 7.
7 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 8.
8 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AI: DTC C0054 BLS ON MALFUNCTION

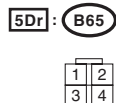
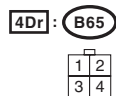
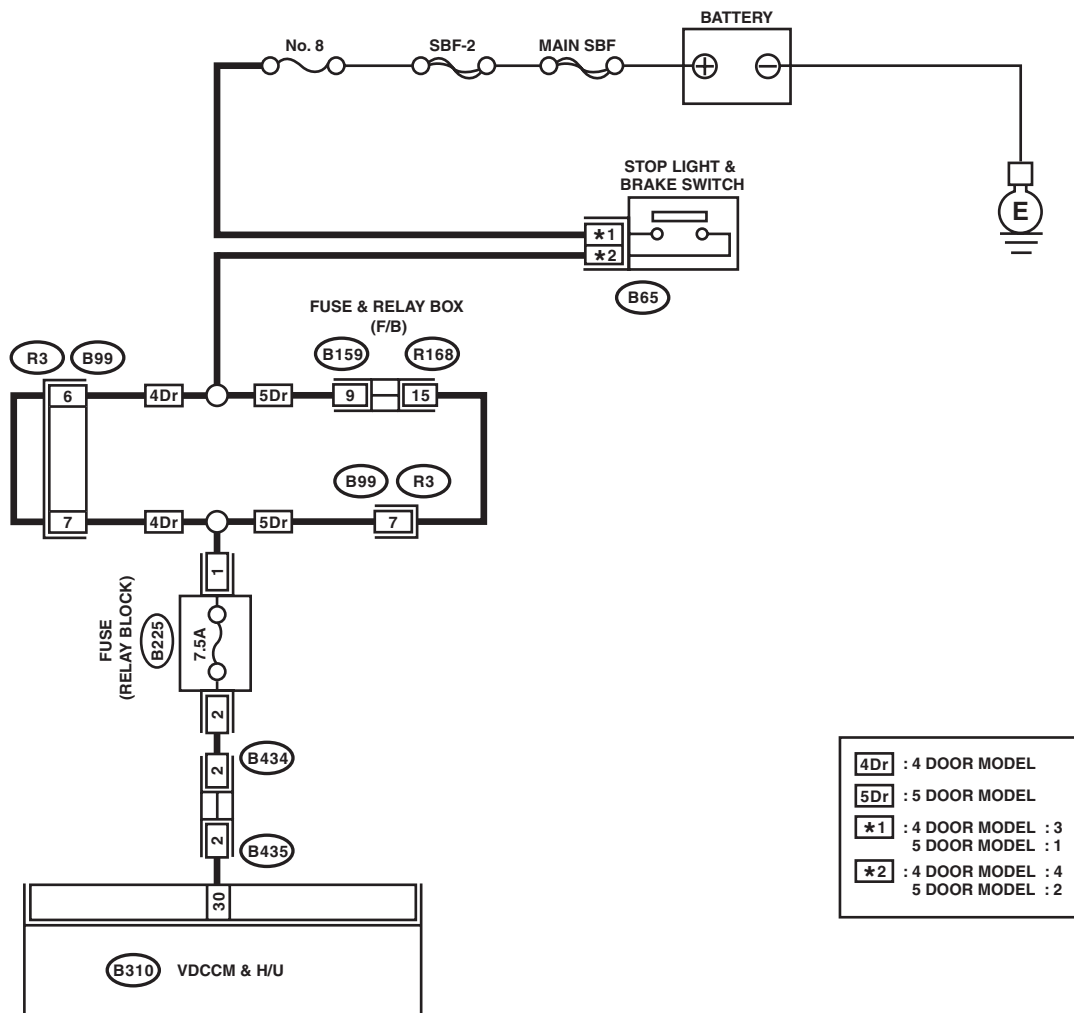
DTC DETECTING CONDITION:

Defective stop light switch

TROUBLE SYMPTOM:

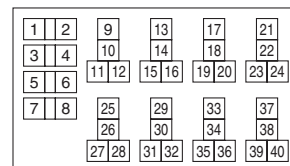
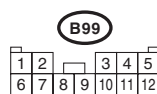
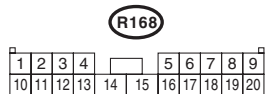
- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



B310

B225



VDC00819

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK STOP LIGHT SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch connector. 3) Measure the resistance of stop light switch terminals.	Is the resistance 1 MΩ or more when switch is OFF (when pedal is not depressed)?	Go to step 2.	Replace the stop light switch.
2 INTERVIEW CUSTOMERS. Make sure that the operation was performed in which accelerator pedal and brake pedal were depressed simultaneously (with depressing brake pedal with left foot).	Were the acceleration pedal and brake pedal depressed simultaneously?	System is normal. (DTC may be recorded while brake is applied during driving.)	Go to step 3.
3 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 4.
4 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AJ:DTC C0054 BLS OFF MALFUNCTION

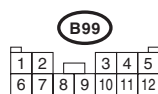
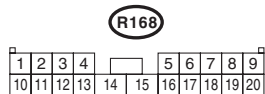
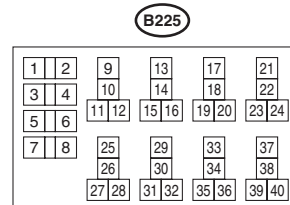
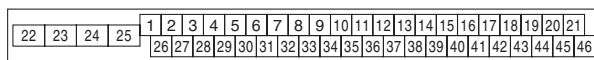
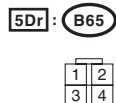
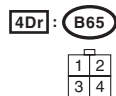
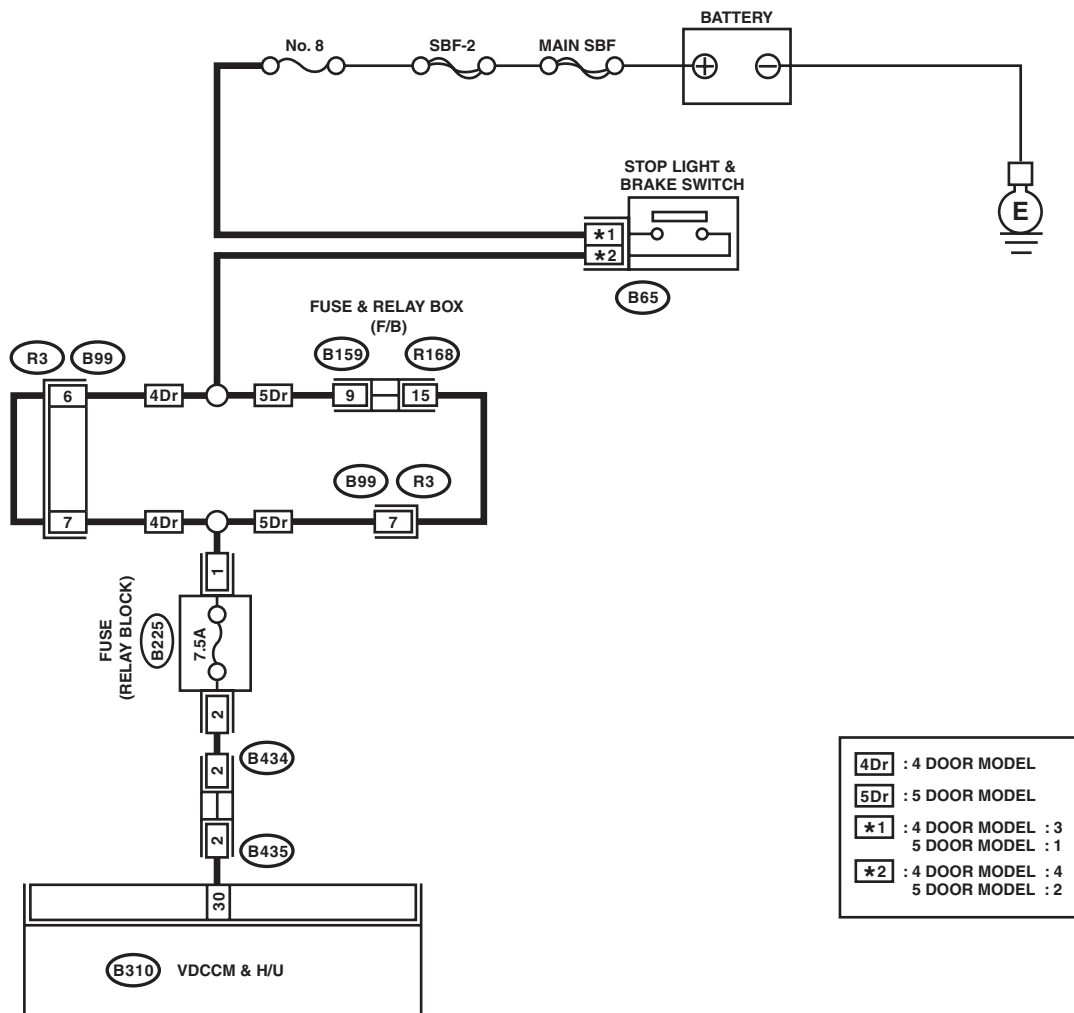
DTC DETECTING CONDITION:

Defective stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00819

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK STOP LIGHT SWITCH. Check the stop light switch. <Ref. to BR-44, INSTALLATION, Stop Light Switch.>	Is the installation position of the stop light switch correct?	Go to step 2.	Adjust the installation position of the stop light switch. <Ref. to BR-44, INSTALLATION, Stop Light Switch.>
2	CHECK STOP LIGHT SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch connector. 3) Measure the resistance of stop light switch terminals.	Is the resistance 1 Ω or less when the switch is ON (when pedal is depressed)?	Go to step 3.	Replace the stop light switch.
3	CHECK STOP LIGHT POWER SUPPLY. Measure the voltage between stop light switch terminal and chassis ground. Connector & terminal 4 DOOR MODEL (B65) No. 3 (+) — Chassis ground (–): 5 DOOR MODEL (B65) No. 1 (+) — Chassis ground (–):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the stop light power supply circuit.
4	CHECK STOP LIGHT SWITCH HARNESS. 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and stop light switch. Connector & terminal 4 DOOR MODEL (B65) No. 4 — (B310) No. 30: 5 DOOR MODEL (B65) No. 2 — (B310) No. 30:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the stop light switch circuit.
5	CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of connector between stop light switch and VDCCM&H/U?	Repair the connector.	Go to step 6.
6	CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 7.
7	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AK:DTC C0056 G SENSOR SIGNAL

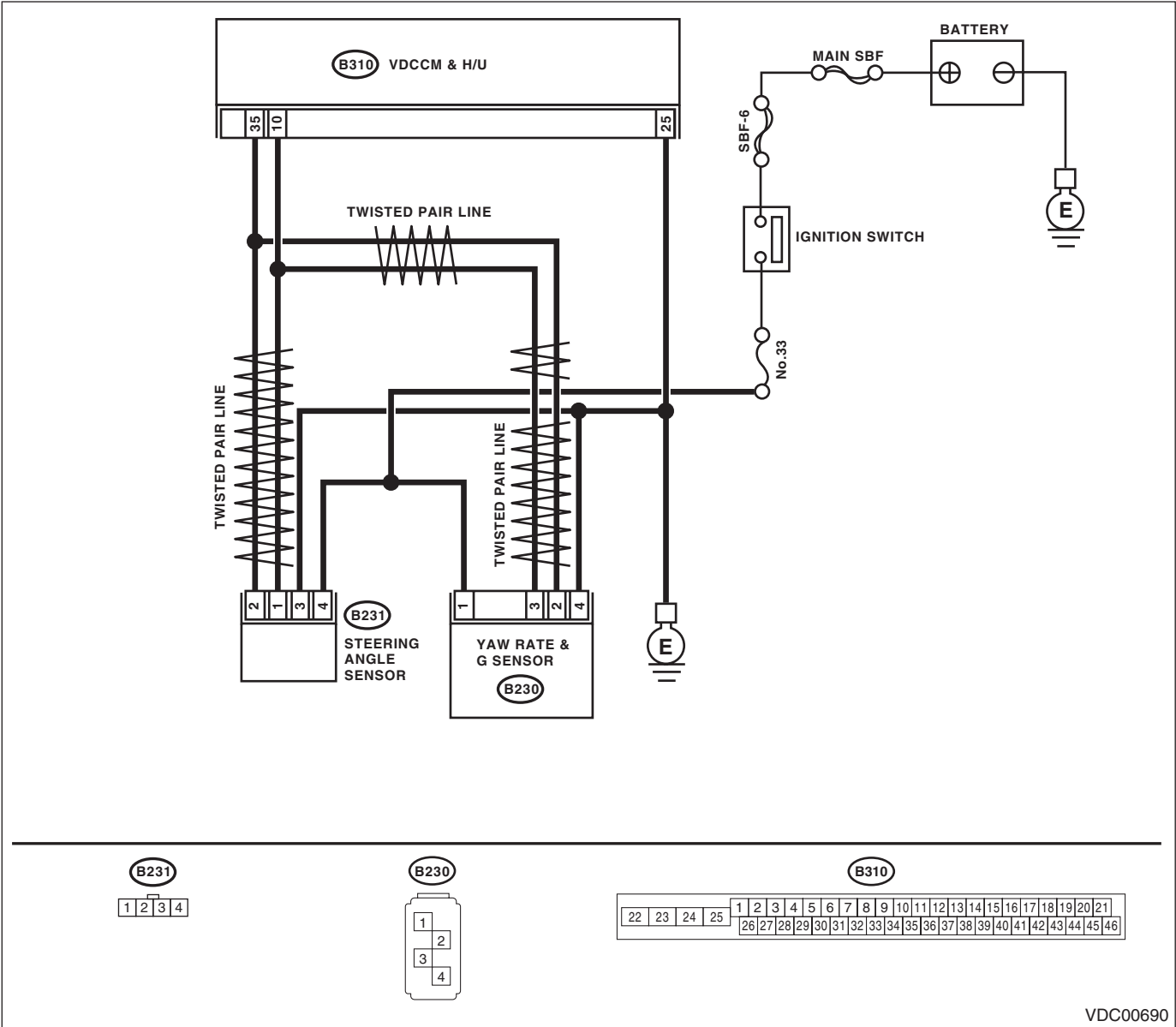
DTC DETECTING CONDITION:

Defective longitudinal G sensor output signal

TROUBLE SYMPTOM:

Hill start assist does not operate.

WIRING DIAGRAM:



Step	Check	Yes	No	
1	WHETHER A WHEEL TURNED FREELY OR NOT. Check if the wheels have been turned freely for one minute or more, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface.	Did the wheels turn freely?	VDC is normal. Clear the memory.	Go to step 2.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK OUTPUT OF LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR. 1) Park the vehicle on a level surface. 2) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 3) Read the indication of longitudinal G sensor output.	Is the indicated reading on the monitor display $-1.2 \sim 1.2 \text{ m/s}^2$?	Go to step 3.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
3 CHECK OUTPUT OF LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR. 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & G sensors from vehicle. <Ref. to VDC-19, Yaw Rate and G Sensor.> 3) Turn the ignition switch to ON, and select the {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 4) Read the indication of longitudinal G sensor output.	When the yaw rate & G sensor is inclined 90° to the front, is the indicated value $6.8 \sim 12.8 \text{ m/s}^2$?	Go to step 4.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
4 CHECK OUTPUT OF LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR. Read the indication of longitudinal G sensor output.	When the yaw rate & G sensor is inclined 90° to the rear, is the indicated value $-6.8 \sim -12.8 \text{ m/s}^2$?	Go to step 5.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
5 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact of connector between VDCCM& H/U and yaw rate & G sensor?	Repair the connector.	Go to step 6.
6 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 7.
7 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AL:DTC C0057 ECM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal from ECM.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step	Check	Yes	No
1 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step 2.
2 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of ECM connector?	Repair the connector.	Go to step 3.
3 CHECK ECM.	Is ECM normal?	Go to step 4.	Replace the ECM.
4 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 5.
5 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AM:DTC C0057 ECM CONTROL SYSTEM

DTC DETECTING CONDITION:

Cooperation control prohibition of ECM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

NOTE:

Warning lights go off if the cooperation control of ECM returns.

Step	Check	Yes	No
1 CHECK WARNING LIGHT. Check whether the VDC warning light illuminates after driving for 1 minute or more at a speed of 10 km/h or more.	Does the VDC warning light illuminate?	Go to step 2.	VDC is normal. Perform the Clear Memory Mode. NOTE: DTC may be re-corded if cranking is performed during driving.
2 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of ECM connector?	Repair the connector.	Go to step 3.
3 CHECK ECM.	Is ECM normal?	Go to step 4.	Replace the ECM.
4 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 5.
5 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AN:DTC C0071 STEERING ANGLE SENSOR OFFSET IS TOO BIG

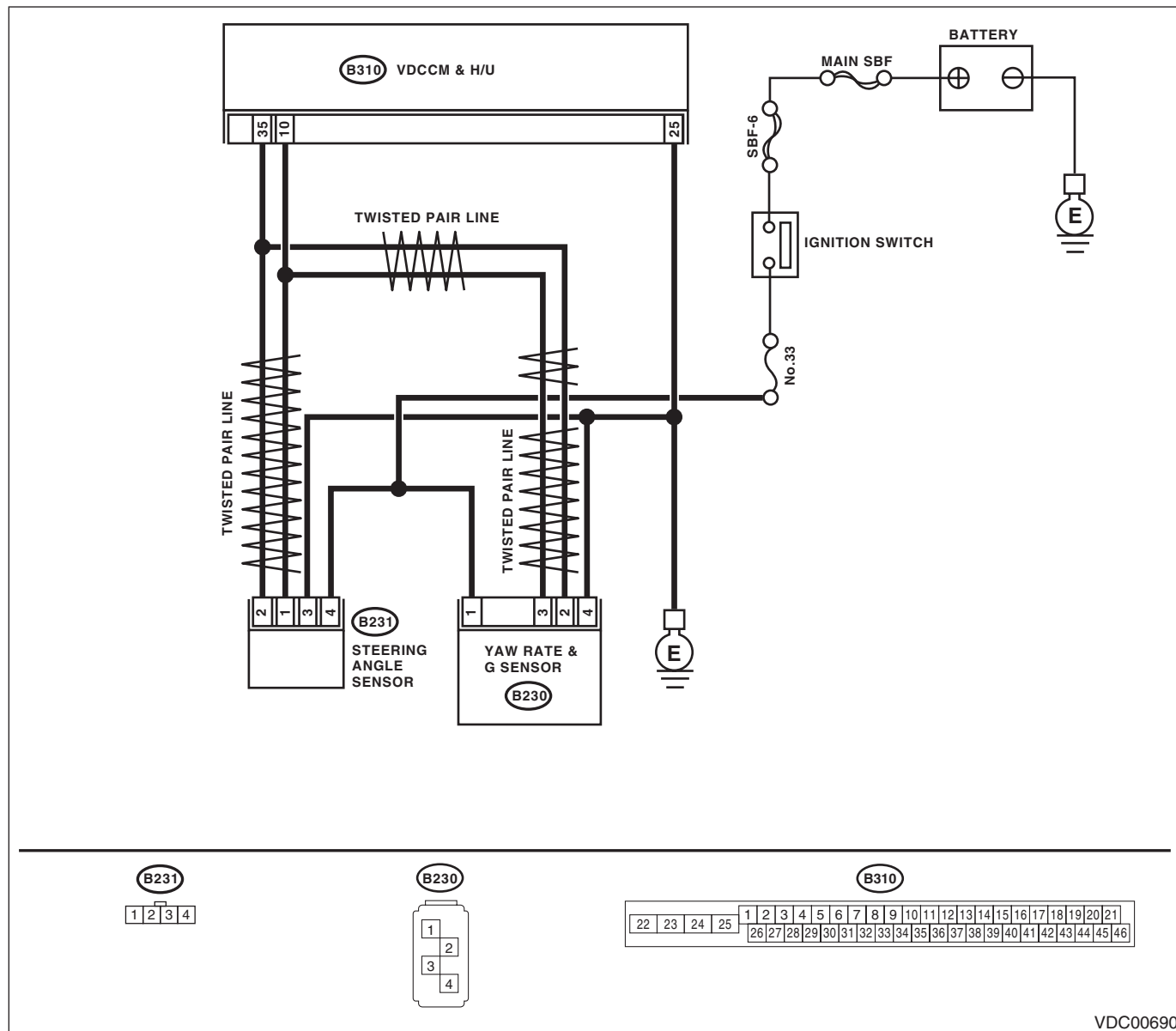
DTC DETECTING CONDITION:

Defective steering angle sensor

TROUBLE SYMPTOM:

VDC does not operate.

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK STEERING WHEEL. 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Check the steering wheel for deviation from center.	Is the deviation from the center of steering wheel less than 5°?	Go to step 2.	Perform the centering adjustment of steering wheel.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK VDCCM&H/U. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 3.
3 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AO:DTC C0071 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG

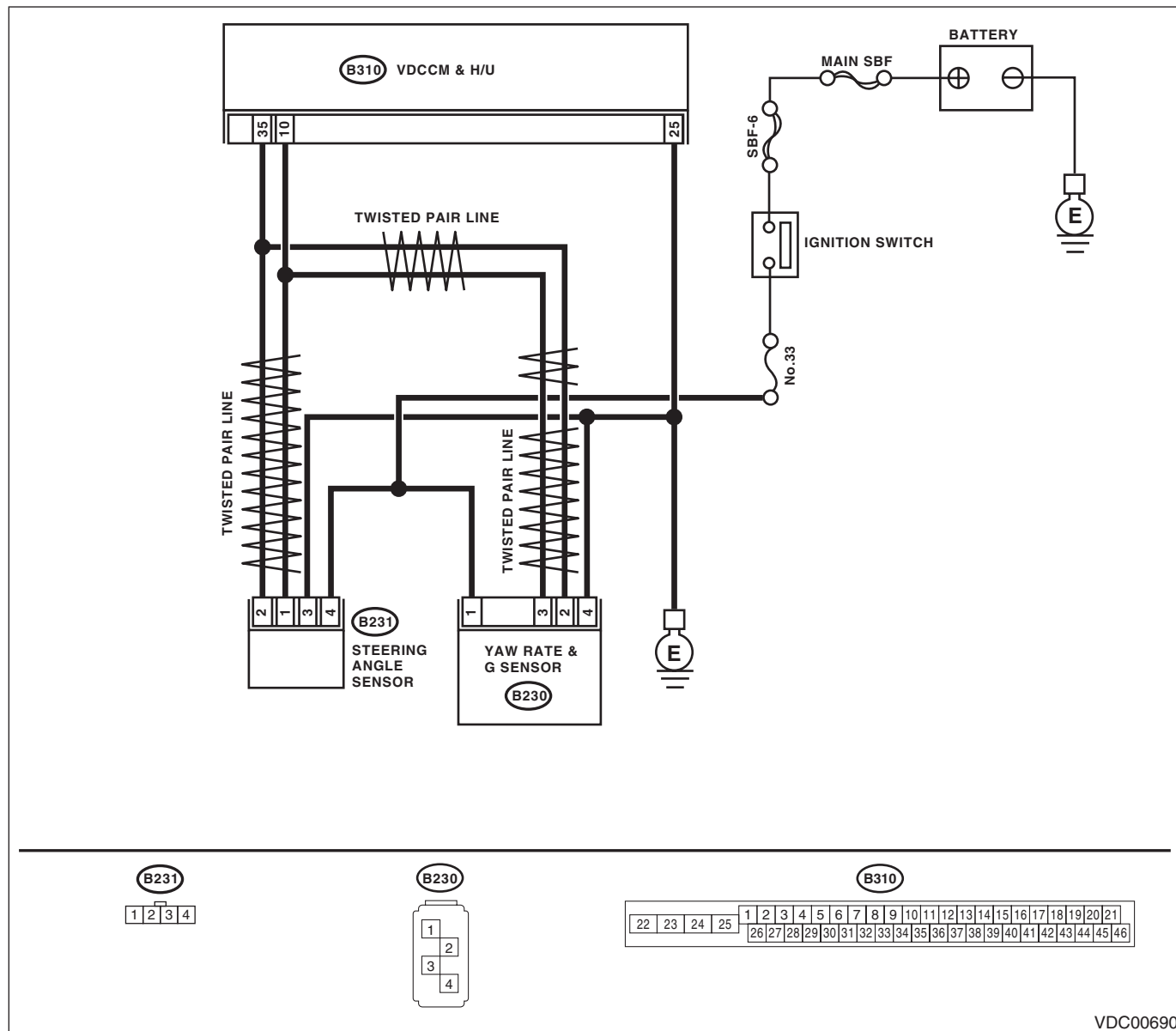
DTC DETECTING CONDITION:

Defective steering angle sensor

TROUBLE SYMPTOM:

VDC does not operate.

WIRING DIAGRAM:



VDC00690

Step	Check	Yes	No
1 CHECK VDCCM&H/U. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 2.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AP:DTC C0071 STEER ANGLE SENSOR OP

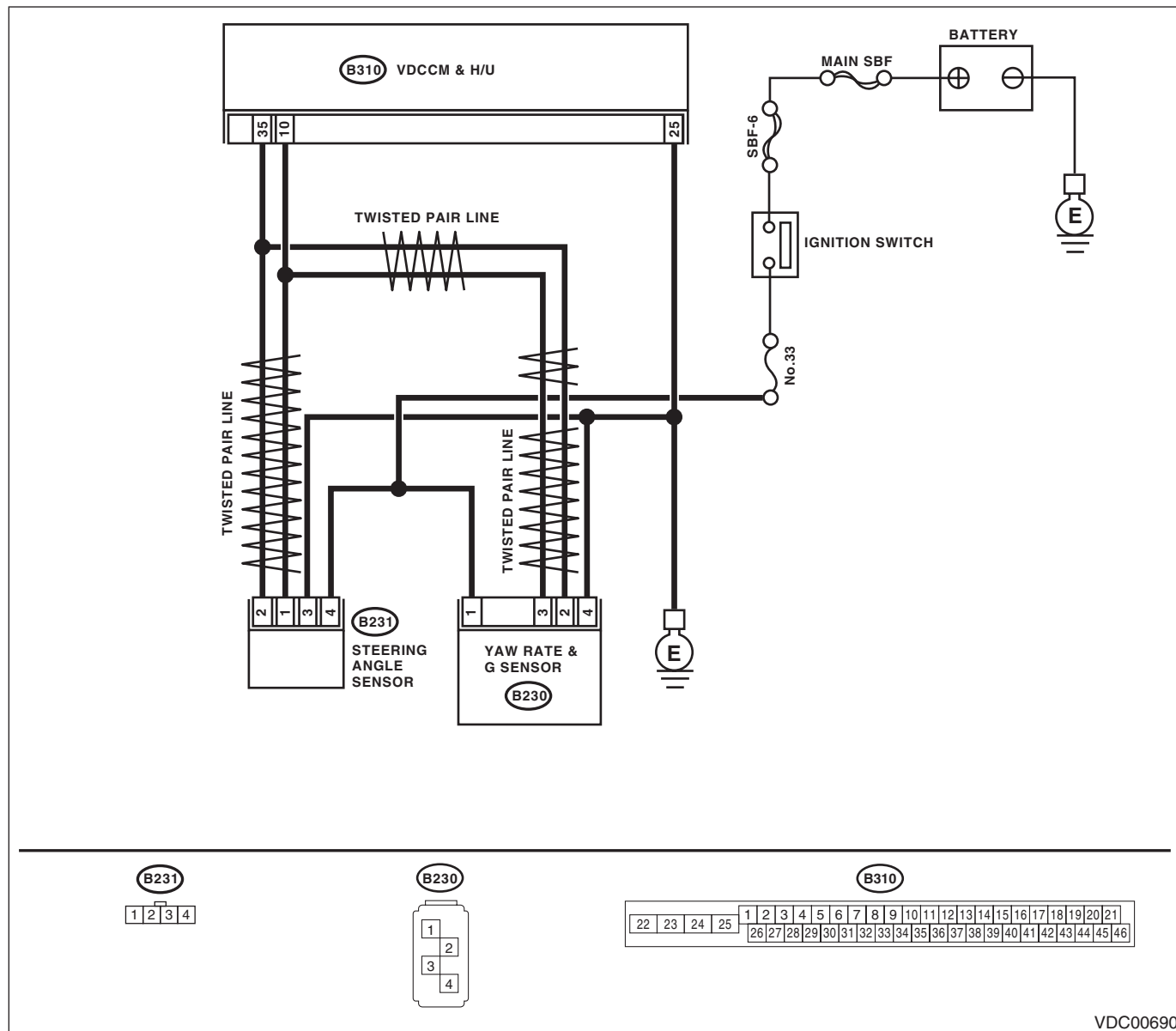
DTC DETECTING CONDITION:

Signal does not come from steering angle sensor.

TROUBLE SYMPTOM:

VDC does not operate.

WIRING DIAGRAM:



VDC00690

Step	Check	Yes	No
1 CHECK POWER SUPPLY FOR STEERING ANGLE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from steering angle sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between steering angle sensor and chassis ground. Connector & terminal (B231) No. 4 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the steering angle sensor power supply circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR. Measure the resistance between steering angle sensor and chassis ground. Connector & terminal (B231) No. 3 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 3.	Repair ground circuit in the steering angle sensor.
3 CHECK STEERING ANGLE SENSOR HARNESS. 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and steering angel sensor. Connector & terminal (B231) No. 1 — (B310) No. 10: (B231) No. 2 — (B310) No. 35:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness between the steering angle sensor and VDCCM&H/U.
4 CHECK GROUND SHORT CIRCUIT OF STEERING ANGLE SENSOR HARNESS. Measure the resistance between steering angle sensor and chassis ground. Connector & terminal (B231) No. 1 — Chassis ground: (B231) No. 2 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the harness between the steering angle sensor and VDCCM&H/U.
5 CHECK STEERING ANGLE SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step 6.	Go to step 7.
6 CHECK VDCCM&H/U. 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. <Ref. to VDC-21, Steering Angle Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 8.
7 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Original steering angle sensor malfunction

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AQ:DTC C0071 STEERING ANGLE SENSOR MALFUNCTION

DTC DETECTING CONDITION:

Defective steering angle sensor

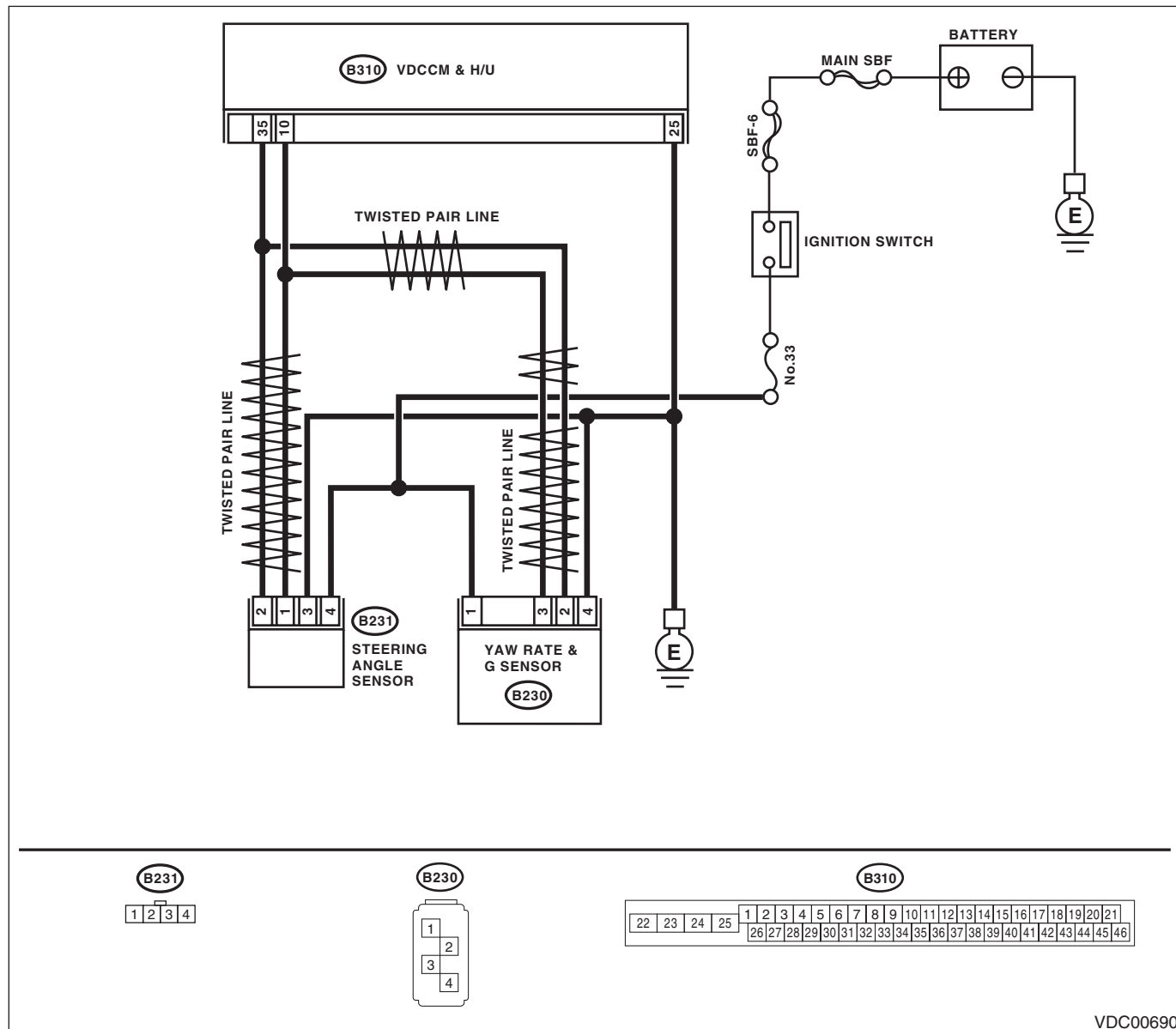
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

NOTE:

- Warning light does not illuminate though problem is detected.
- The ABS and VDC operate normally if voltage returns.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY FOR STEERING ANGLE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from steering angle sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between steering angle sensor and chassis ground. Connector & terminal (B231) No. 4 (+) — Chassis ground (–):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the steering angle sensor power supply circuit.
2 CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR. Measure the resistance between steering angle sensor and chassis ground. Connector & terminal (B231) No. 3 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 3.	Repair ground circuit in the steering angle sensor.
3 CHECK STEERING ANGLE SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step 4.	Go to step 5.
4 CHECK VDCCM&H/U. 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. <Ref. to VDC-21, Steering Angle Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 6.
5 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
6 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Original steering angle sensor malfunction

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AR:DTC C0072 ABNORMAL YAW RATE SENSOR OUTPUT

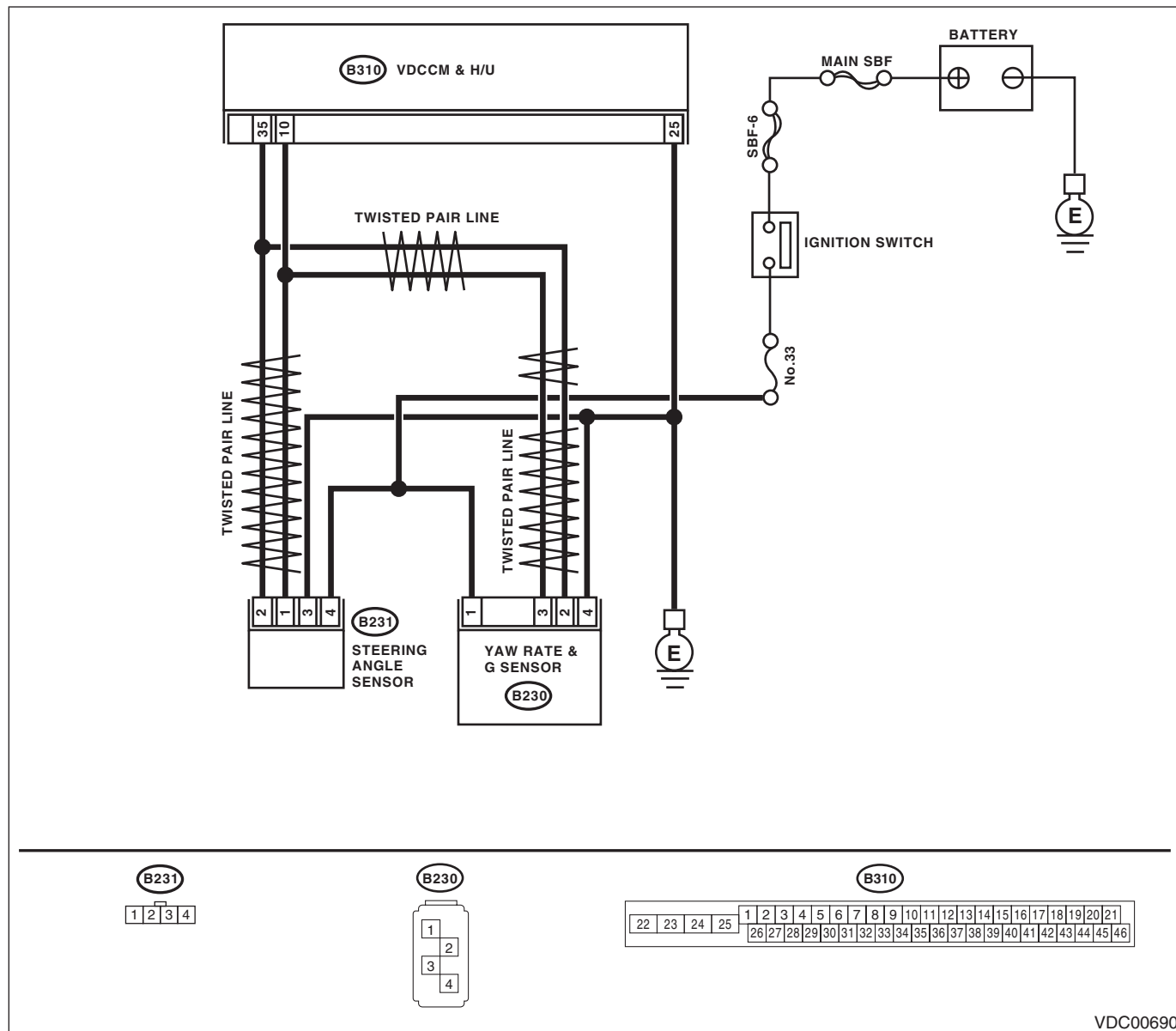
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

VDC does not operate.

WIRING DIAGRAM:



VDC00690

Step	Check	Yes	No	
1	INTERVIEW CUSTOMERS. Check if the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Did the vehicle run the road with banks or sandy surface (which does not mean a dirt road)?	VDCCM&H/U may record DTC when the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Go to step 2.
2	CHECK YAW RATE & G SENSOR INSTALLATION.	Is the yaw rate & G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step 3.	Tighten the yaw rate & G sensor installation bolt.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK OUTPUT OF YAW RATE & G SENSOR WITH SUBARU SELECT MONITOR. 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 4) Read the yaw rate output displayed on display.	Is the reading indicated on monitor display -4 — 4 deg/s?	Go to step 4.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
4 CHECK OUTPUT OF STEERING ANGLE SENSOR WITH SUBARU SELECT MONITOR. 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 4) Read the steering angle sensor output displayed on display.	Is the reading indicated on monitor display -5 — 5°?	Go to step 5.	Perform the centering adjustment of steering wheel.
5 CHECK YAW RATE & G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step 6.	Go to step 7.
6 CHECK VDCCM&H/U. 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 8.
7 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Malfunction is found in original yaw rate & G sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AS:DTC C0072 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION

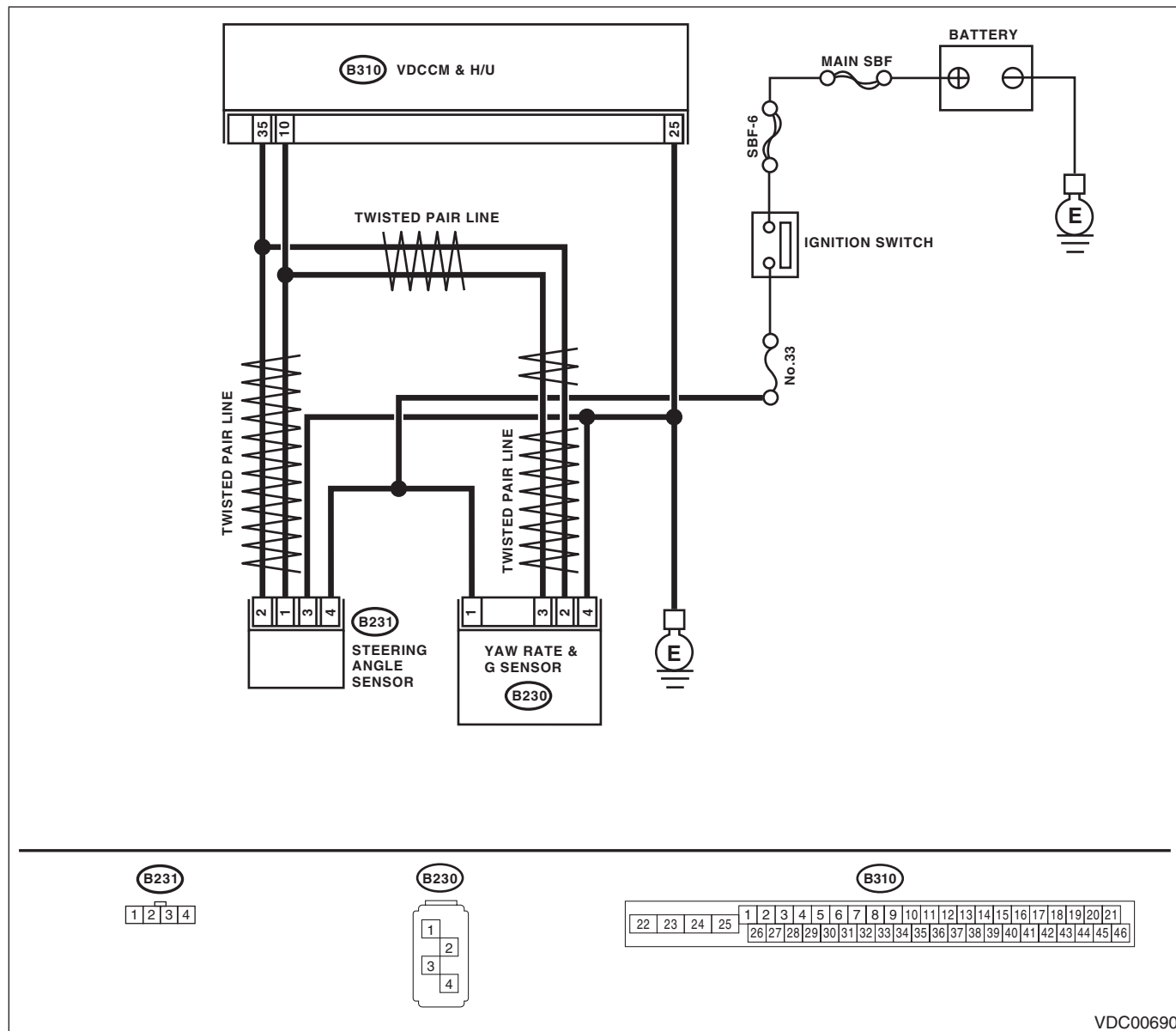
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

VDC does not operate.

WIRING DIAGRAM:



VDC00690

Step	Check	Yes	No
1 CHECK POWER SUPPLY OF YAW RATE & G SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & G sensor and chassis ground. Connector & terminal (B230) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the yaw rate & G sensor power supply circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK YAW RATE & G SENSOR GROUND CIRCUIT. Measure the resistance between yaw rate & G sensor and chassis ground. Connector & terminal (B230) No. 4 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the yaw rate & G sensor ground circuit.
3 CHECK YAW RATE & G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>	Go to step 4.
4 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AT:DTC C0072 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG

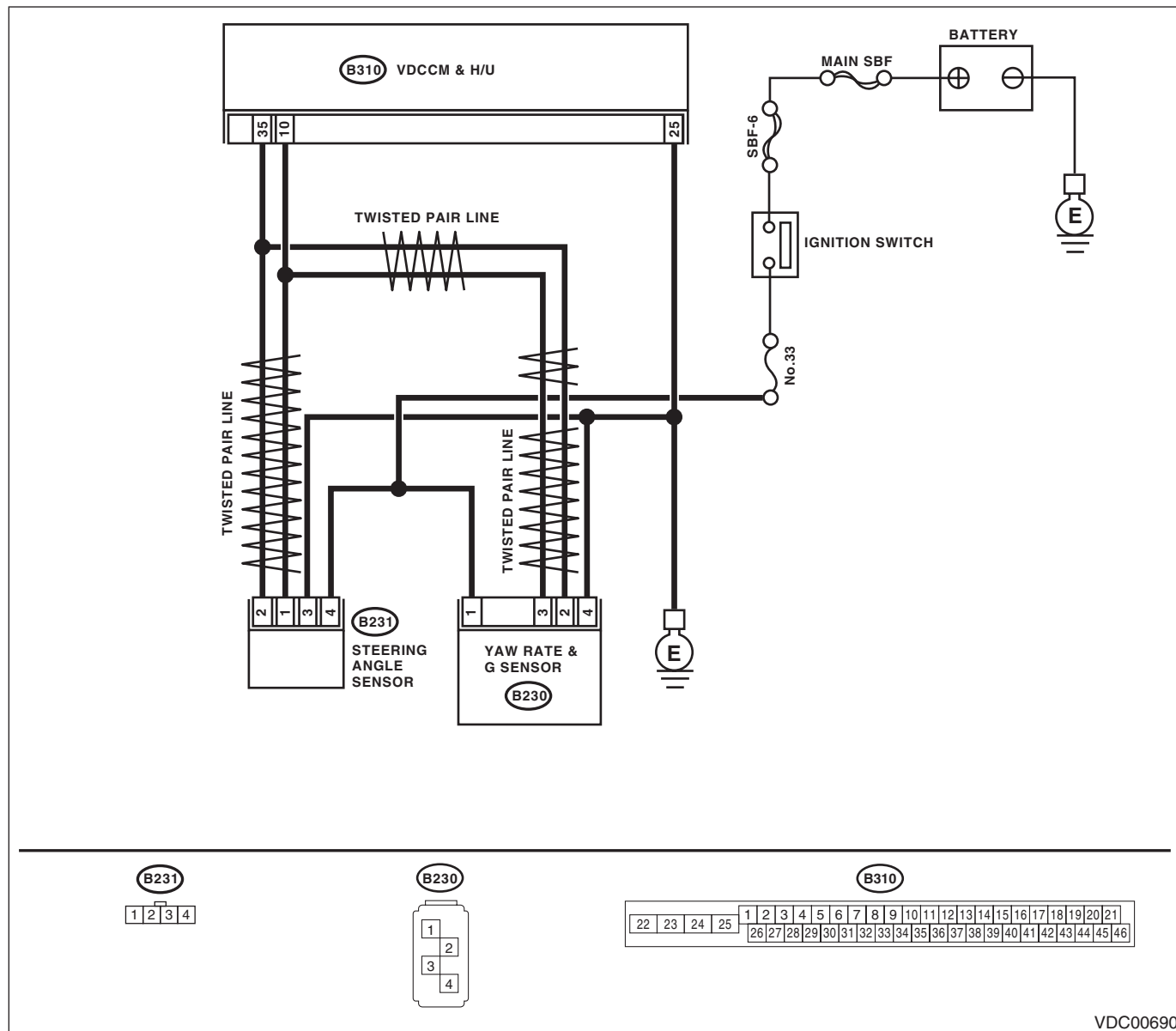
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

VDC does not operate.

WIRING DIAGRAM:



VDC00690

Step	Check	Yes	No
1	INTERVIEW CUSTOMERS. Check if the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	VDCCM&H/U may record DTC when the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Go to step 2.
2	CHECK YAW RATE & G SENSOR INSTALLATION.	Go to step 3.	Tighten the yaw rate & G sensor installation bolt.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK POWER SUPPLY OF YAW RATE & G SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & G sensor and chassis ground. Connector & terminal (B230) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the yaw rate & G sensor power supply circuit.
4 CHECK YAW RATE & G SENSOR GROUND CIRCUIT. Measure the resistance between yaw rate & G sensor and chassis ground. Connector & terminal (B230) No. 4 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the yaw rate & G sensor ground circuit.
5 CHECK OUTPUT OF YAW RATE & G SENSOR WITH SUBARU SELECT MONITOR. 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 4) Read the yaw rate output displayed on display.	Is the reading indicated on monitor display -4 — 4 deg/s?	Go to step 6.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
6 CHECK YAW RATE & G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step 7.	Go to step 8.
7 CHECK VDCCM&H/U. 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 9.
8 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
9 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Malfunction is found in original yaw rate & G sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AU:DTC C0072 YAW RATE SENSOR COMMUNICATION

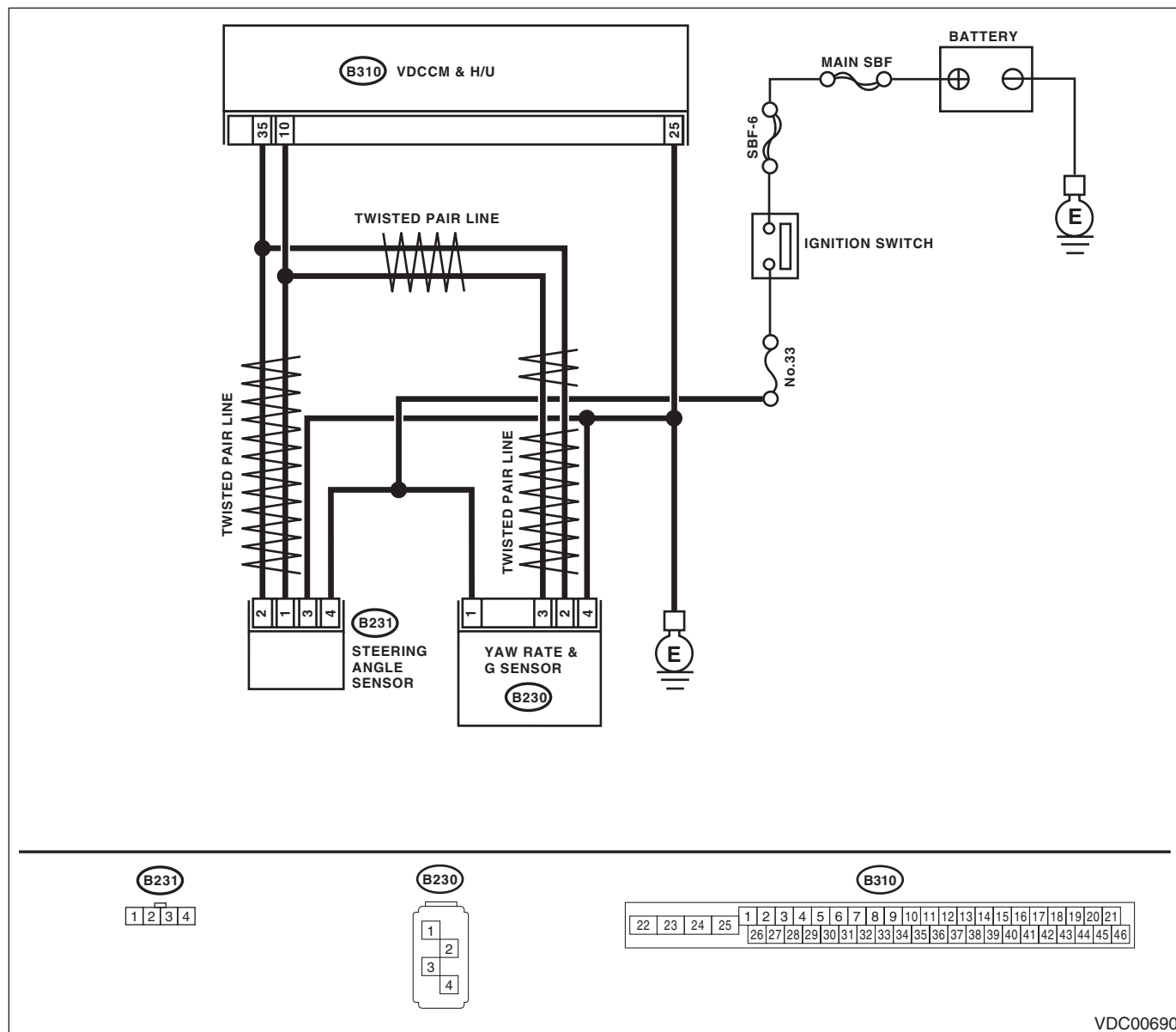
DTC DETECTING CONDITION:

Communication failure between yaw rate sensor and VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00690

Step	Check	Yes	No
1 CHECK POWER SUPPLY FOR YAW RATE & G SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & G sensor and chassis ground. Connector & terminal (B230) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the yaw rate & G sensor power supply circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK YAW RATE & G SENSOR GROUND CIRCUIT. Measure the resistance between yaw rate & G sensor and chassis ground. Connector & terminal (B230) No. 4 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the yaw rate & G sensor ground circuit.
3 CHECK YAW RATE & G SENSOR HARNESS. 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and yaw rate & G sensor. Connector & terminal (B230) No. 3 — (B310) No. 10: (B230) No. 2 — (B310) No. 35:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness between yaw rate & G sensor and VDCCM&H/U.
4 CHECK GROUND SHORT CIRCUIT IN YAW RATE & G SENSOR HARNESS. Measure the resistance between yaw rate & G sensor and chassis ground. Connector & terminal (B230) No. 2 — Chassis ground: (B230) No. 3 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the harness between yaw rate & G sensor and VDCCM&H/U.
5 CHECK YAW RATE & G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step 6.	Go to step 7.
6 CHECK YAW RATE & G SENSOR. 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 8.
7 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Malfunction is found in original yaw rate & G sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AV:DTC C0072 SENSOR TYPE ABNORMAL

DTC DETECTING CONDITION:

Different yaw rate sensor specification

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

Step	Check	Yes	No
1 CHECK YAW RATE & G SENSOR IDENTIFICATION MARK. Check the identification mark on the sticker applied on the top of the yaw rate & G sensor. MT: R AT: S	Is the identification symbol correct?	Go to step 2.	Replace the yaw rate & G sensor with a genuine part. <Ref. to VDC-19, Yaw Rate and G Sensor.>
2 CHECK VDCCM&H/U IDENTIFICATION SYMBOL. Check the identification mark stamped on the upper side of the H/U. AT: S1 MT: S5 (WRX-SS) S2 (except for WRX-SS)	Is the identification symbol correct?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

AW:DTC C0073 LATERAL G SENSOR OFFSET IS TOO BIG

NOTE:

For the diagnostic procedure, refer to DTC C0073 "EXCESSIVE LATERAL G SENSOR SIGNAL". <Ref. to VDC(diag)-95, DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AX:DTC C0073 ABNORMAL LATERAL G SENSOR OUTPUT

NOTE:

For the diagnostic procedure, refer to DTC C0073 "EXCESSIVE LATERAL G SENSOR SIGNAL". <Ref. to VDC(diag)-95, DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AY:DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL

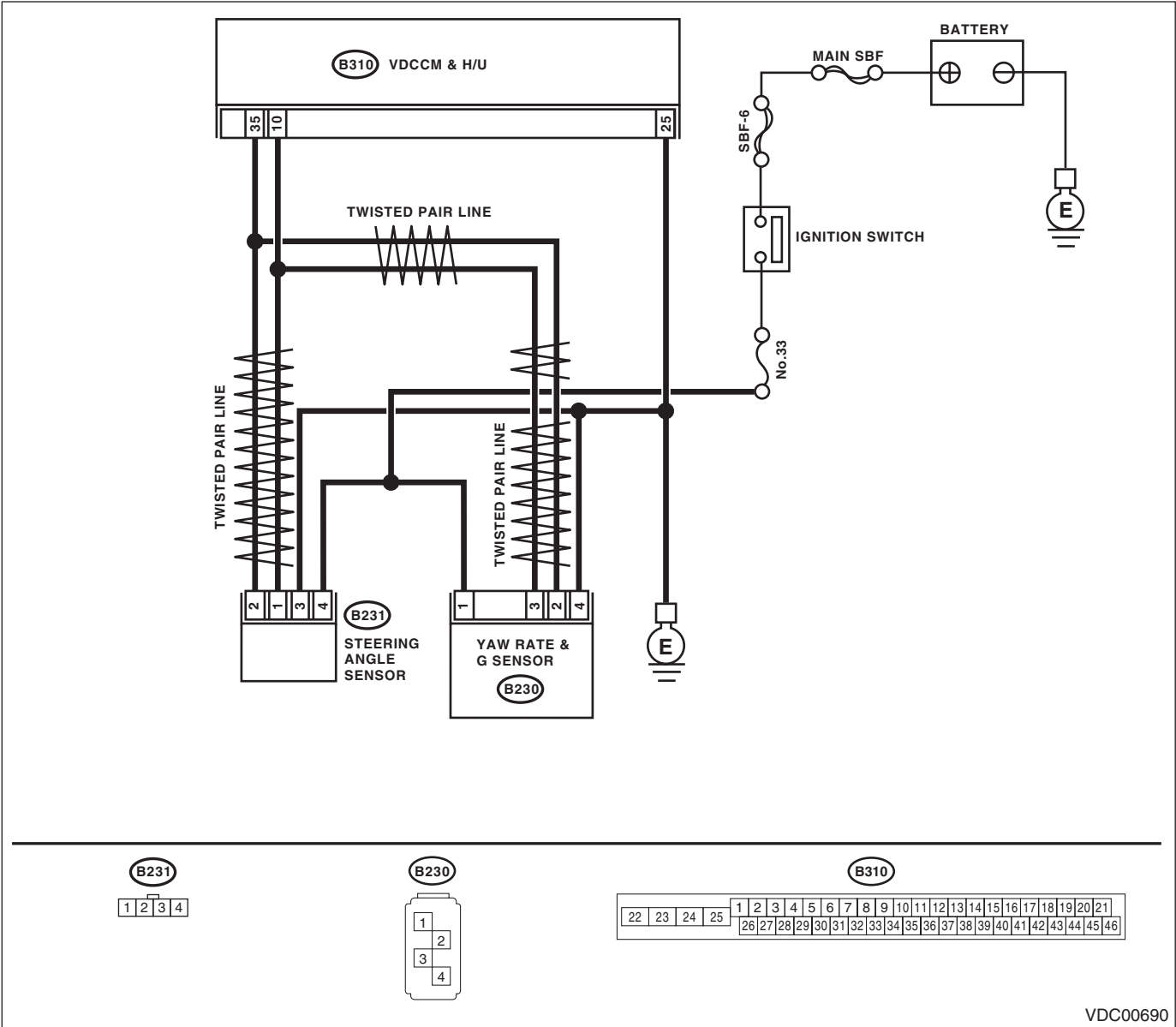
DTC DETECTING CONDITION:

Defective lateral G sensor

TROUBLE SYMPTOM:

VDC does not operate.

WIRING DIAGRAM:



VDC00690

Step	Check	Yes	No
1	CHECK YAW RATE & G SENSOR INSTALLATION.	Go to step 2.	Tighten the yaw rate & G sensor installation bolt.
	Is the yaw rate & G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?		

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK OUTPUT OF LATERAL G SENSOR WITH SUBARU SELECT MONITOR. 1) Park the vehicle on a level surface. 2) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 3) Read the lateral G sensor output displayed on screen.	Is the indicated reading on the monitor display $-1.5 \text{ — } 1.5 \text{ m/s}^2$?	Go to step 3.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
3 CHECK OUTPUT OF LATERAL G SENSOR WITH SUBARU SELECT MONITOR. 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & G sensors from vehicle. 3) Turn the ignition switch to ON, and select the {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 4) Read the lateral G sensor output displayed on screen.	When the yaw rate & G sensor is inclined 90° to the right, is the indicated value $6.8 \text{ — } 12.8 \text{ m/s}^2$?	Go to step 4.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
4 CHECK LATERAL G SENSOR WITH SUBARU SELECT MONITOR. Read the lateral G sensor output displayed on screen.	When the yaw rate & G sensor is inclined 90° to the left, is the indicated value $-6.8 \text{ — } -12.8 \text{ m/s}^2$?	Go to step 5.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
5 CHECK POOR CONTACT OF CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact of connector between VDCCM& H/U and yaw rate & G sensor?	Repair the connector.	Go to step 6.
6 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 7.
7 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AZ:DTC C0074 PRESSURE SENSOR

DTC DETECTING CONDITION:

Defective pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step	Check	Yes	No
1 CHECK STOP LIGHT SWITCH CIRCUIT. Check stop light switch open circuit.	Is the stop light switch circuit OK?	Go to step 2.	Repair the stop light switch circuit. NOTE: If there is malfunction in the stop light circuit, DTC may be recorded in the memory.
2 CHECK OUTPUT OF PRESSURE SENSOR WITH SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 2) Read the pressure sensor output displayed on display.	When the brake pedal is released, is the displayed value -40 — 40 bar?	Go to step 3.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3 CHECK OUTPUT OF PRESSURE SENSOR WITH SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 2) Read the pressure sensor output displayed on display.	When the brake pedal is operated, does the pressure sensor output value displayed on the screen change in accordance with the brake pedal?	Go to step 4.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4 CHECK PRESSURE SENSOR. 1) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 3) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 5.
5 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

BA:DTC C0075 REVERSE SIGNAL

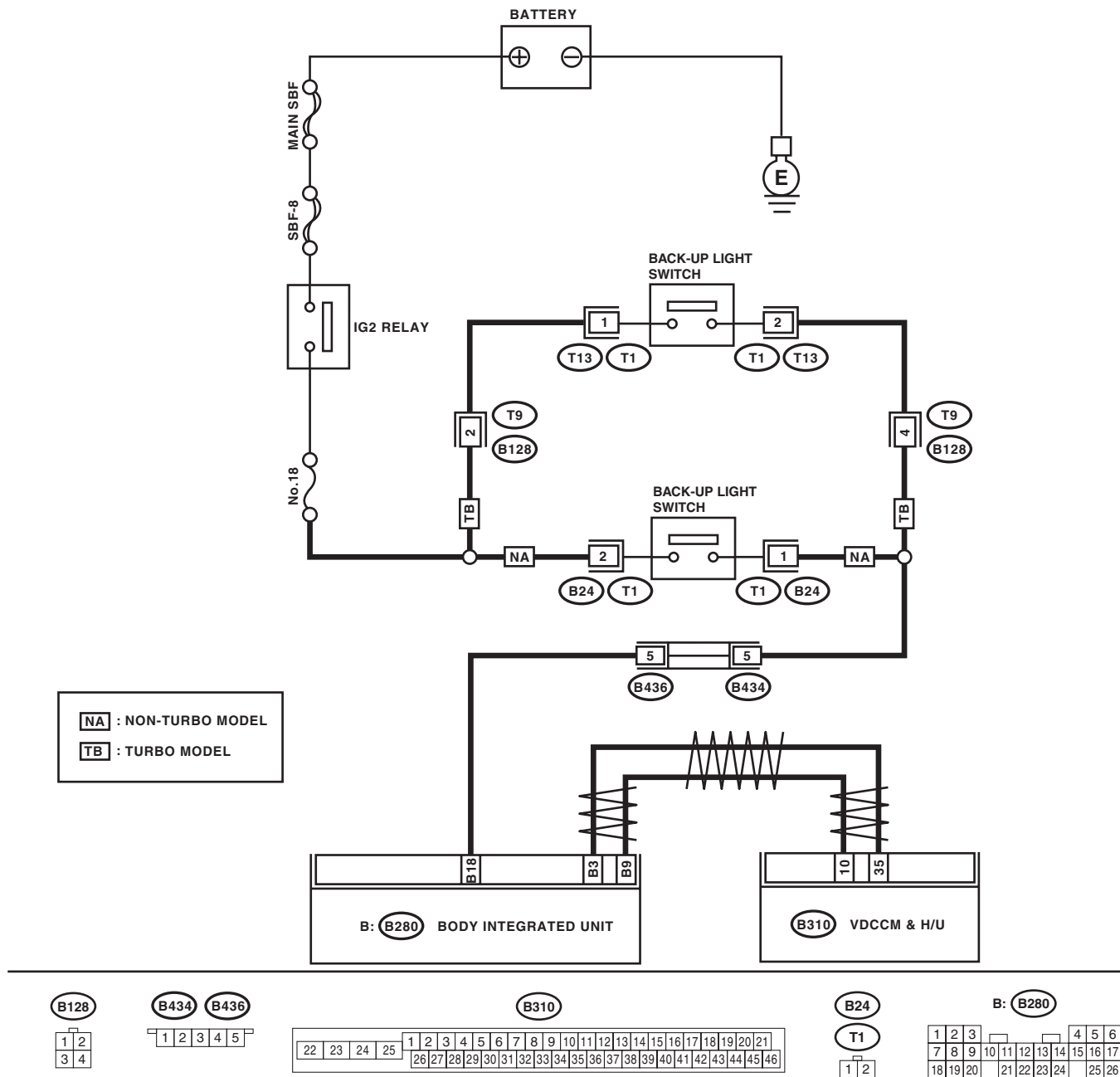
DTC DETECTING CONDITION:

Abnormal reverse signal

TROUBLE SYMPTOM:

Hill start assist does not operate.

WIRING DIAGRAM:



VDC00691

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system.	Go to step 2.
2 CHECK REVERSE SIGNAL USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 2) Read the indication of reverse signal.	Is OFF displayed when the shift lever is placed in any position other than reverse, and is ON displayed in reverse position?	Go to step 5.	Go to step 3.
3 CHECK BACK-UP LIGHT ILLUMINATION. 1) Turn the ignition switch to ON. 2) Place the shift lever in reverse position.	Does the back-up light illuminate?	Go to step 4.	Repair the back-up light circuit.
4 CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND BACK-UP LIGHT SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from body integrated unit and back-up light switch. 3) Measure the resistance of harness between body integrated unit and back-up light switch connector. Connector & terminal Non-turbo model (B280) No. 18 — (B24) No. 1: Turbo model (B280) No. 18 — (T13) No. 2:	Is the resistance less than 1 Ω ?	Replace the back-up light switch. <Ref. to 5MT-32, Switches and Harness.>	Repair the harness between body integrated unit and back-up light switch connector.
5 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 6.
6 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

BB:DTC C0076 CLUTCH SIGNAL

DTC DETECTING CONDITION:

Abnormal clutch signal

TROUBLE SYMPTOM:

Hill start assist does not operate.

NOTE:

Depending on the user clutch operation patterns, the hill start assist warning light may illuminate for a while, and then go off.

Illumination condition:

While the vehicle speed is above 10 km/h, and the clutch switch signal ON (depressed) condition continues five minutes or more, if the vehicle speed lowers below 10 km/h, the module judge as abnormal (clutch switch stuck ON), and then turn on the warning light.

Turning off condition:

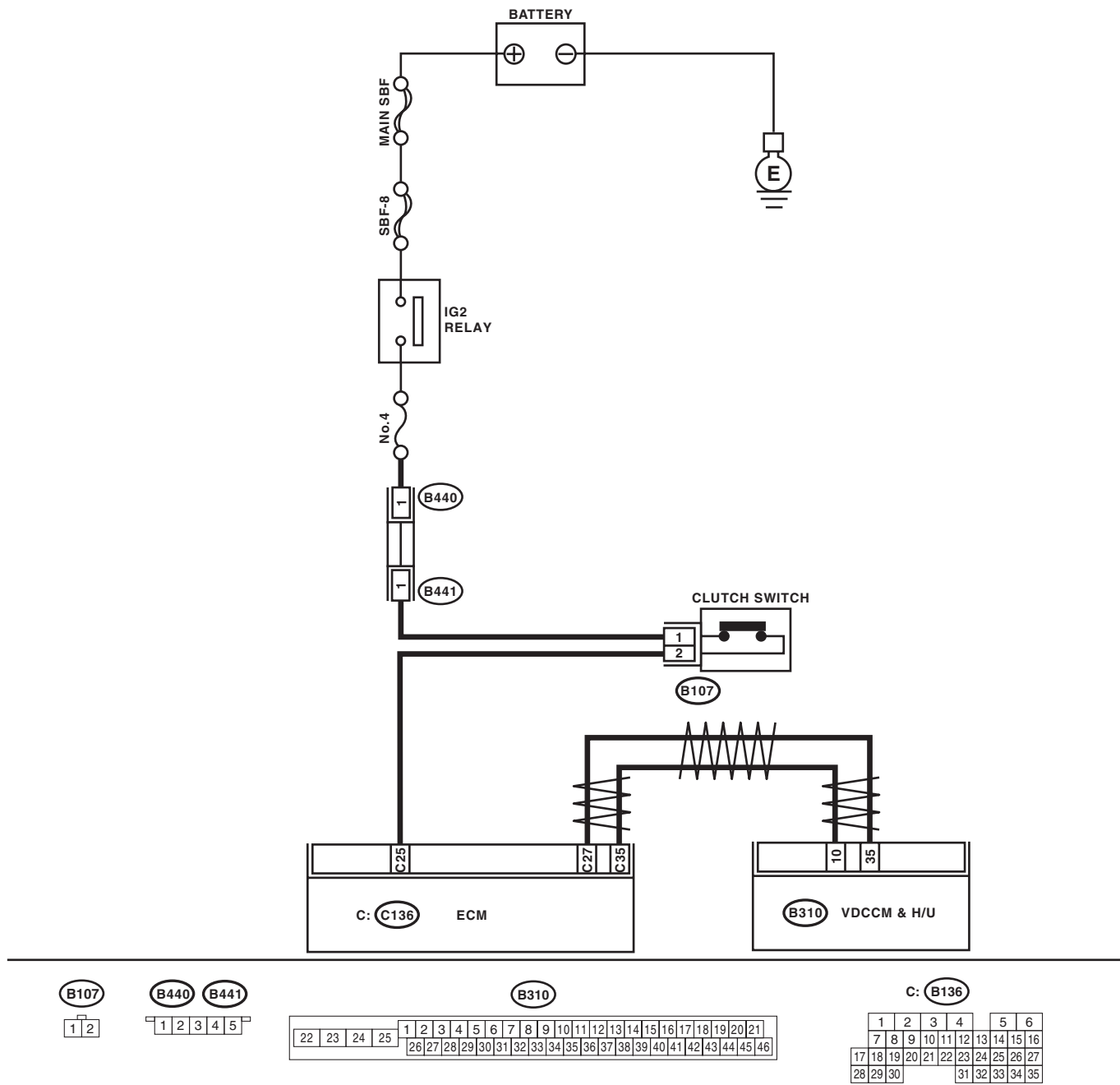
If the clutch switch signal OFF (foot released) condition continues one second, the module turns off the warning light.

The hill start assist function does not operate, while the warning light illuminates.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



VDC00561

Step	Check	Yes	No
1	CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-30, OPERATION, Read Diagnostic Trouble Code (DTC).>	Perform the diagnosis according to DTC for LAN system.	Go to step 2.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK CLUTCH SIGNAL USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to VDC(diag)-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 2) Read the indication of clutch switch signal.	Is OFF displayed when the clutch pedal is not depressed, and is ON displayed when depressed?	Go to step 5.	Go to step 3.
3 CHECK CLUTCH SIGNAL OF ECM USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} on Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-35, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.> <Ref. to EN(H4DOTC)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.> 2) Read the indication of clutch switch signal.	Is OFF displayed when the clutch pedal is not depressed, and is ON displayed when depressed?	Go to step 5.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND CLUTCH SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and clutch switch. 3) Measure the resistance of harness between ECM and clutch switch connector. Connector & terminal (B136) No. 25 — (B107) No. 2:	Is the resistance less than 1 Ω ?	Repair the power supply circuit of clutch switch. Or replace the clutch switch. <Ref. to CL-27, Clutch Switch.>	Repair the harness between ECM and clutch switch connector.
5 CHECK VDCCM&H/U. 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 6.
6 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

BC:DTC C0081 SYSTEM FAILURE

DTC DETECTING CONDITION:

VDC long time sequential control

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact of the VDCCM& H/U and yaw rate & G sensor connector?	Repair the connector.	Go to step 2.
2 CHECK VDCCM&H/U. 1) Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.> 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Malfunction is found in original yaw rate & G sensor.

General Diagnostic Table

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

13.General Diagnostic Table

A: INSPECTION

Symptoms		Main probable cause	Other probable cause
Poor brake performance	Long braking/stopping distance	• VDCCM&H/U • Brake pad • Aeration to brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Master cylinder • Brake caliper • Disc rotor • Brake pipe • Brake booster
	Wheel lock	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Incorrect wiring or piping connections	• Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake caliper • Brake pipe
	Brake drag	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Parking brake • Axle and wheels • Brake pedal play	• Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake pad • Brake pipe
	Long brake pedal stroke	• Aeration to brake line • Brake pedal play	• VDCCM&H/U • Master cylinder • Brake caliper • Brake pad • Brake pipe • Brake booster
	Vehicle vertical pitching	• VDCCM&H/U • Road surface (uneven) • Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation
Poor brake performance	Unstable or uneven braking	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Brake caliper • Brake pad • Road surface (uneven) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Master cylinder • Disc rotor • Brake pipe • Axle and wheels • Road with crowns or banks • Suspension play or fatigue (reduced damping)

General Diagnostic Table

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Symptoms		Main probable cause	Other probable cause
Vibration or noise • When braking suddenly • When accelerating suddenly • While driving on a slippery road	Excessive brake pedal vibration	• Road surface (uneven) • Incorrect wiring or piping connections	• VDCCM&H/U • Brake booster • Suspension play or fatigue (reduced damping)
	Noise from VDCH/U	• VDCCM&H/U (mount bushing) • Defective ABS wheel speed sensor or sensor gap • Brake pipe	• VDCCM&H/U • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation
	Noise from the front side of vehicle	• VDCCM&H/U (mount bushing) • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Brake pad • Disc rotor • Brake pipe • Brake booster • Suspension play or fatigue (reduced damping)	• Axle and wheels • Tire specifications, tire wear and air pressures
	Noise from the rear side of vehicle	• Defective ABS wheel speed sensor or sensor gap • Brake caliper • Brake pad • Disc rotor • Parking brake • Brake pipe • Suspension play or fatigue (reduced damping)	• Axle and wheels • Tire specifications, tire wear and air pressures
Engine does not accelerate or goes into a stall when accelerating suddenly or driving on a slippery surface.		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Parking brake • Incorrect wiring or piping	• Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake pad • Brake pipe

General Diagnostic Table

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Symptoms		Main probable cause	Other probable cause
Poor change-direction-operation stability of TCS	Deviation to right or left direction	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake caliper • Brake pad • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Disc rotor • Brake pipe • Axle and wheels • Suspension play or fatigue (reduced damping)
	Vehicle spin	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake pad • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Brake caliper • Brake pipe
Steering wheel drag while driving		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Incorrect wiring or piping connections • Power steering system	• Brake caliper • Brake pad • Disc rotor • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Suspension play or fatigue (reduced damping) • Tire specifications, tire wear and air pressures
VDC operates while driving normally.		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Suspension play or fatigue (reduced damping) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Power steering system	

General Diagnostic Table

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Symptoms	Main probable cause	Other probable cause
VDC OFF indicator light does not illuminate when the VDC OFF switch is depressed. NOTE: When pressing VDC OFF switch for 10 seconds or more, VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the previous status is re-stored.	• Harness • Combination meter • VDC OFF switch	

General Diagnostic Table

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

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General Description

VEHICLE DYNAMICS CONTROL (VDC)

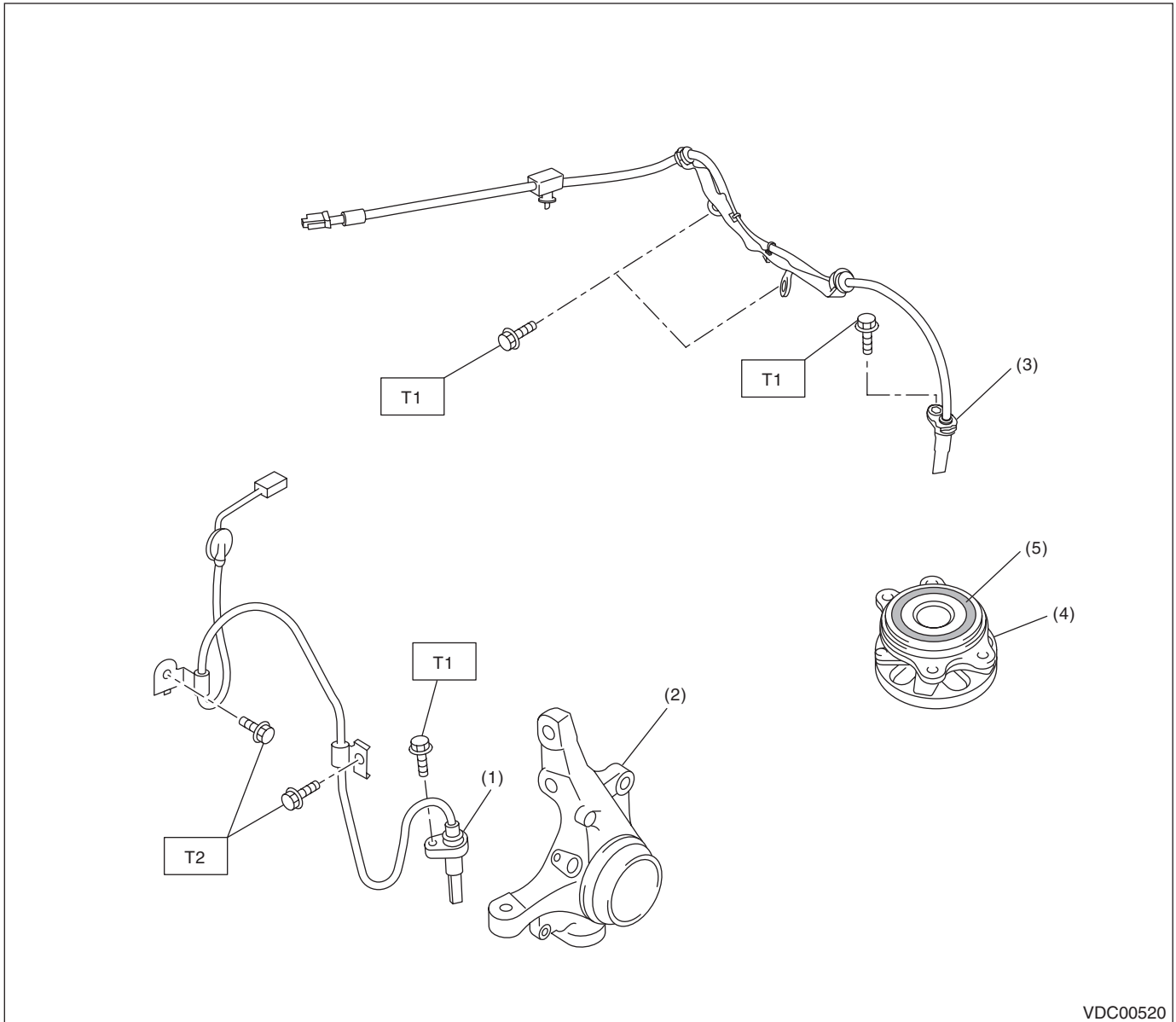
1. General Description

A: SPECIFICATION

Item				Specification or identification	
ABS wheel speed sensor	ABS wheel speed sensor gap (for reference)	Front		0.77 — 1.43 mm (0.030 — 0.056 in)	
		Rear		0.43 — 1.78 mm (0.017 — 0.070 in)	
	Identifications of harness (marks, color)	Front	RH	K1 (White)	
			LH	K2 (Yellow)	
		Rear	RH	P5 (White)	
			LH	P6 (Yellow)	
VDCCM&H/U Identification		AT		S1	
		MT(except for WRX-SS)		S2	
		MT(WRX-SS)		S5	

B: COMPONENT

1. ABS WHEEL SPEED SENSOR



VDC00520

(1) Front ABS wheel speed sensor	(4) Hub unit bearing
(2) Front housing	(5) Magnetic encoder
(3) Rear ABS wheel speed sensor	

Tightening torque: N·m (kgf-m, ft-lb)

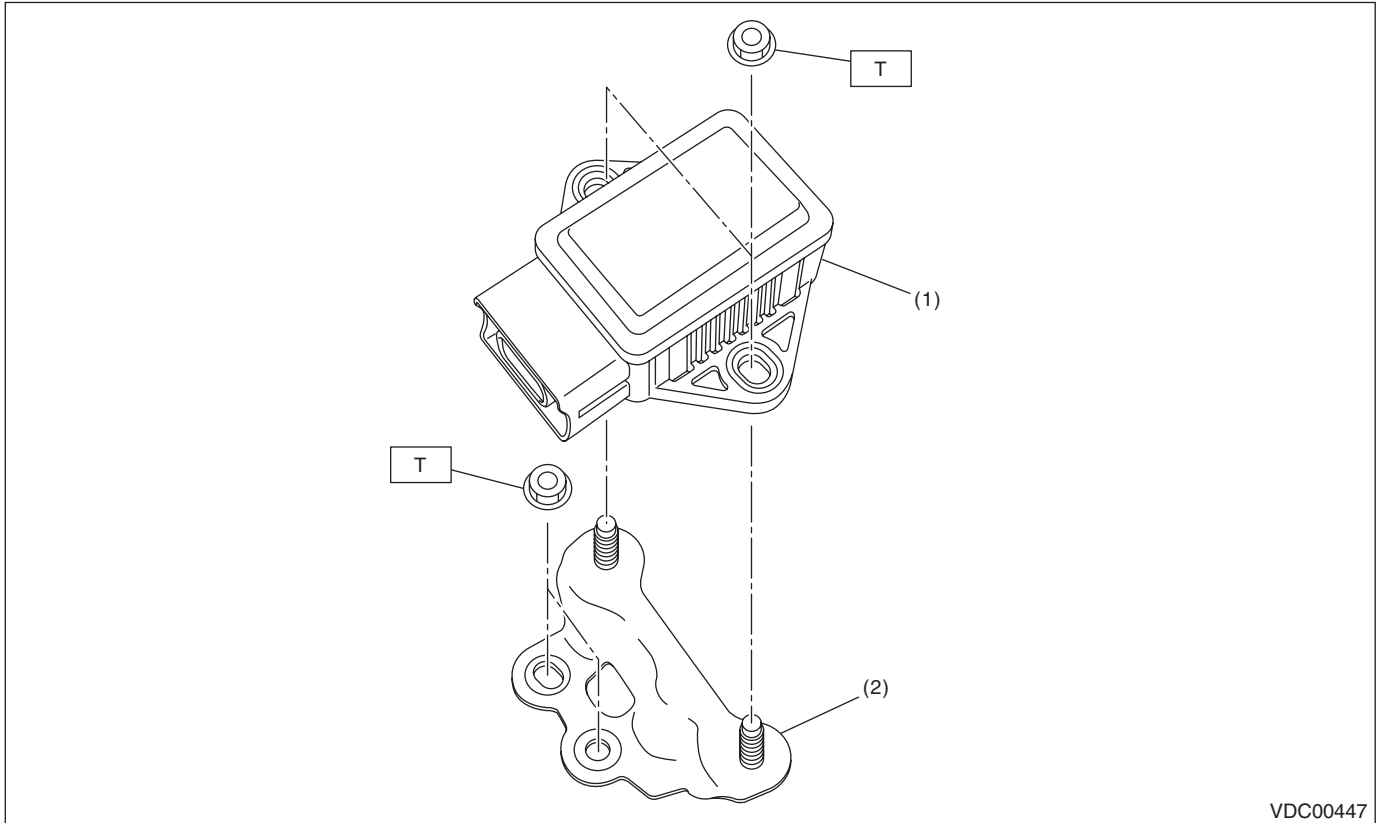
T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.3)

General Description

VEHICLE DYNAMICS CONTROL (VDC)

2. YAW RATE & G SENSOR



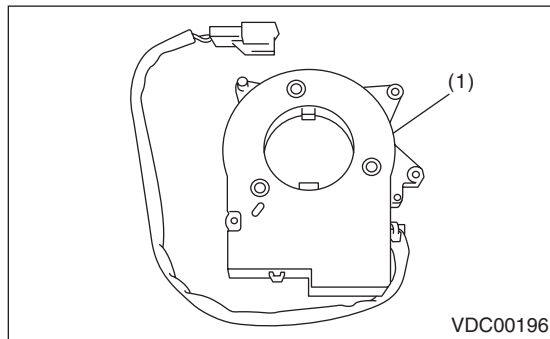
(1) Yaw rate & G sensor

(2) Bracket

Tightening torque: N·m (kgf-m, ft-lb)

T: 7.5 (0.76, 5.5)

3. STEERING ANGLE SENSOR

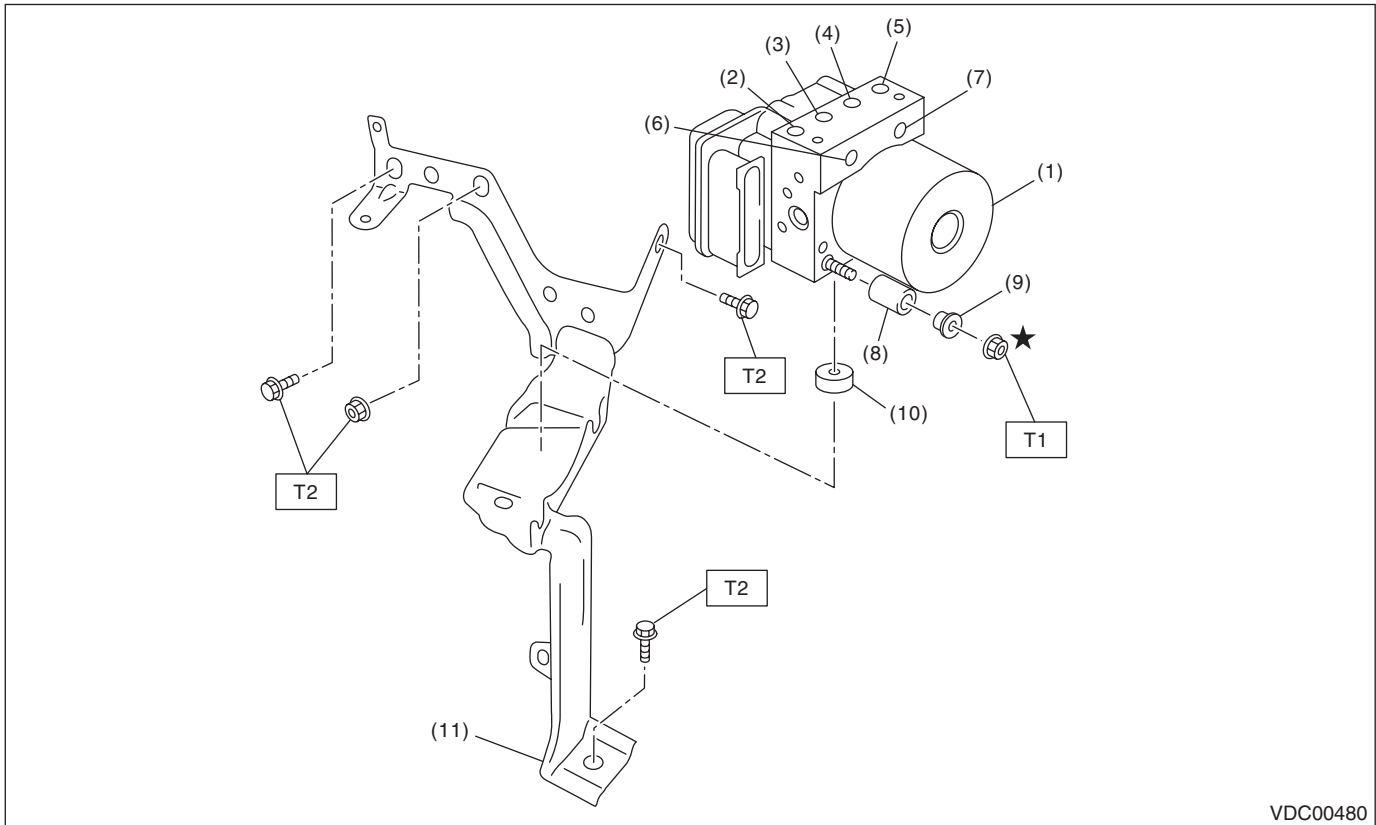


(1) Steering angle sensor

General Description

VEHICLE DYNAMICS CONTROL (VDC)

4. VDC CONTROL MODULE AND HYDRAULIC CONTROL UNIT (VDCCM&H/U)



(1) VDC control module and hydraulic control unit (VDCCM&H/U)

(2) Front RH outlet

(3) Rear LH outlet

(4) Rear RH outlet

(5) Front LH outlet

(6) Primary inlet

(7) Secondary inlet

(8) Damper

(9) Spacer

(10) Damper

(11) Bracket

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.3)

General Description

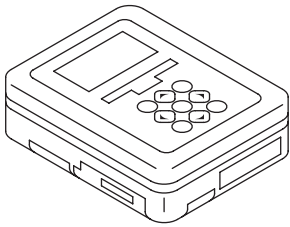
VEHICLE DYNAMICS CONTROL (VDC)

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOL

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

2. GENERAL TOOL

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

2. VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Use compressed air to remove moisture and dust around the VDCCM&H/U.

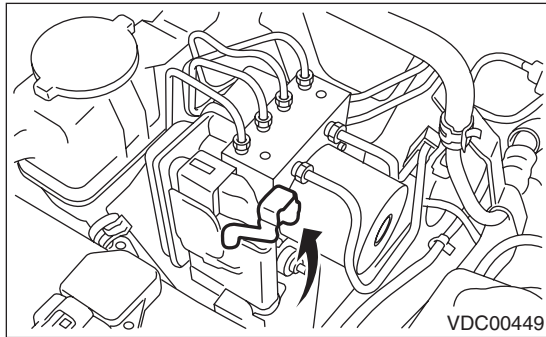
NOTE:

If the terminals become dirty, it may cause improper contact.

- 3) Lift the lock lever and Disconnect the VDCCM&H/U connector.

CAUTION:

Do not pull on the harness when disconnecting the connector.

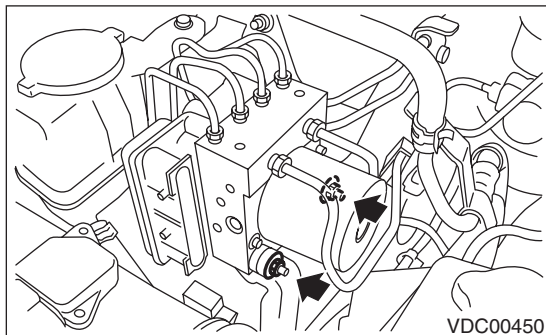


- 4) Disconnect the brake pipes from the VDCCM&H/U.
- 5) Wrap the brake pipe with a vinyl bag so as not to spill the brake fluid on the vehicle body.

CAUTION:

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

- 6) Remove the nuts and remove the VDCCM&H/U.



CAUTION:

- Do not drop or bump the VDCCM&H/U.
- Do not turn the VDCCM&H/U upside down or place it sideways for storage.
- Be careful not to let foreign matter enter the VDCCM&H/U.

- Be careful that no water enters the connectors.

- 7) Remove the VDCCM&H/U bracket.

B: INSTALLATION

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

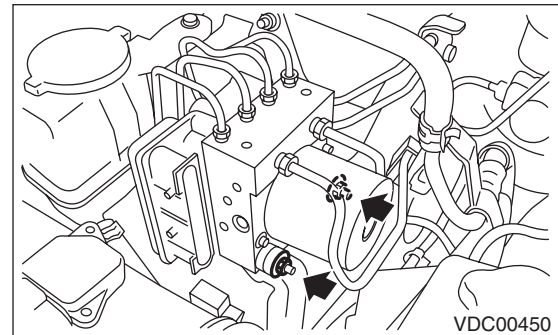
Tightening torque:

33 N·m (3.3 kgf-m, 24.3 ft-lb)

- 2) Install the VDCCM&H/U with a new nut (Part No. 023506000) by aligning the damper groove of the VDCCM&H/U to the bracket side claw.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

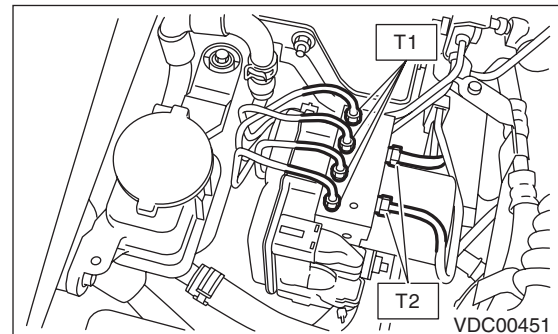


- 3) Connect the brake pipes to their correct VDCCM&H/U positions.

Tightening torque:

T1: 15 N·m (1.5 kgf-m, 11.1 ft-lb)

T2: 19 N·m (1.9 kgf-m, 14 ft-lb)



- 4) Connect the VDCCM&H/U connector.

NOTE:

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

- 5) Bleed air from the brake system.

- 6) Check the parameter to confirm that the applied models and grades of the relevant vehicle are included. <Ref. to VDC(diag)-19, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>

VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

VEHICLE DYNAMICS CONTROL (VDC)

7) If the applied model and grade of the target vehicle are not included on the {Confirm on parameter} display screen, perform parameter selection and registration. <Ref. to VDC(diag)-18, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

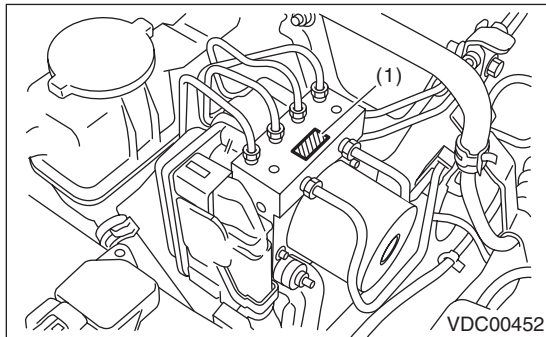
NOTE:

- When the VDCCM&H/U is replaced with a new part, be sure to perform the selection•registration operation.
- For the selection and registration of parameter, the Subaru Select Monitor is required.
- When the registration has not been performed, the DTC code “Parameter selection error” is detected together with the ABS/EBD/VDC warning light illumination.

C: INSPECTION

- 1) Check the condition of connection and settlement of connector.
- 2) Check the mark used for VDCCM&H/U identification.

Refer to “SPECIFICATION” for identification mark.
<Ref. to VDC-2, SPECIFICATION, General Description.>



(1) Identification mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

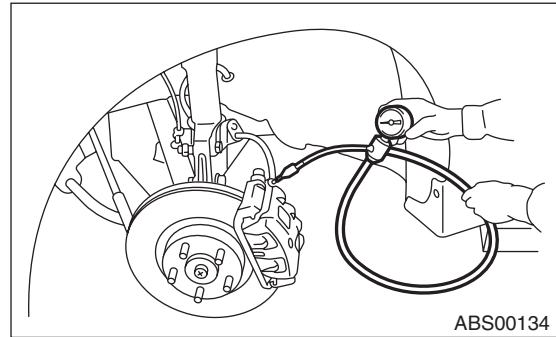
- 1) Lift up the vehicle, and remove the wheels.
- 2) Remove the air bleeder screws from FL and FR caliper bodies.
- 3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:

- Use a pressure gauge used exclusively for brake fluid measurement.
- Do not use the pressure gauge used for the measurement of transmission oil. Doing so will cause the piston seal to expand and deform.

NOTE:

Wrap sealing tape around the pressure gauge.



- 4) Bleed air from the pressure gauges and the FL and FR caliper bodies.
- 5) Perform ABS sequence control.
<Ref. to VDC-13, ABS Sequence Control.>
- 6) When the hydraulic unit begins to work, first the FL side performs decompression, hold and compression, and then the FR side performs decompression, hold and compression.
- 7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Depress the brake pedal and check that the kick-back is normal, and tightness is normal.

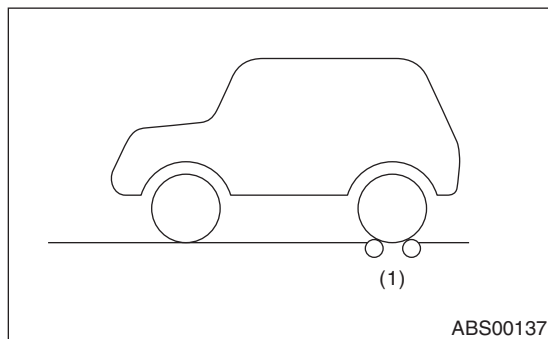
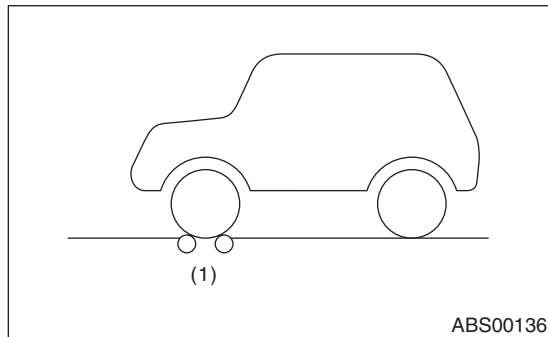
	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm ² , 511 psi)	3,500 kPa (36 kgf/cm ² , 511 psi)
When depressurized	500 kPa (5 kgf/cm ² , 73 psi) or less	500 kPa (5 kgf/cm ² , 73 psi) or less
When pressurized	3,500 kPa (36 kgf/cm ² , 511 psi) or more	3,500 kPa (36 kgf/cm ² , 511 psi) or more

- 8) Disconnect the pressure gauges from FL and FR caliper bodies.
- 9) Install the air bleeder screws of FL and FR caliper bodies.
- 10) Remove the air bleeder screws from RL and RR caliper bodies.
- 11) Connect two pressure gauges to RL and RR caliper bodies.
- 12) Bleed air from the brake system.
- 13) Bleed air from RL and RR caliper bodies, and pressure gauge.
- 14) Perform ABS sequence control.
<Ref. to VDC-13, ABS Sequence Control.>
- 15) When the hydraulic unit begins to work, first the RR side performs decompression, hold and compression, and then the RL side performs decompression, hold and compression.

- 16) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets specification. Depress the brake pedal and check that the kick-back is normal, and tightness is normal.
- 17) Disconnect the pressure gauge from the RL and RR caliper bodies.
- 18) Install the air bleeder screws of RL and RR caliper bodies.
- 19) Bleed air from the brake system.

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

- 1) Set wheels other than the one to measure on free rollers.
- 2) Prepare to operate the ABS sequence control.
<Ref. to VDC-13, ABS Sequence Control.>
- 3) Set the front wheels or rear wheels on the brake tester and set the gear to neutral.



(1) Brake tester

- 4) Operate the brake tester.
- 5) Perform ABS sequence control.
<Ref. to VDC-13, ABS Sequence Control.>
- 6) When the hydraulic unit begins to work, check the following work sequence.
 - (1) The FL wheel performs decompression, hold and compression in sequence, and subsequently the FR wheel repeats the cycle.
 - (2) The RR wheel performs decompression, hold and compression in sequence, and subsequently the RL wheel repeats the cycle.

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

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

- 8) After the inspection, depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

3. CHECKING THE HYDRAULIC UNIT VDC OPERATION USING A PRESSURE GAUGE

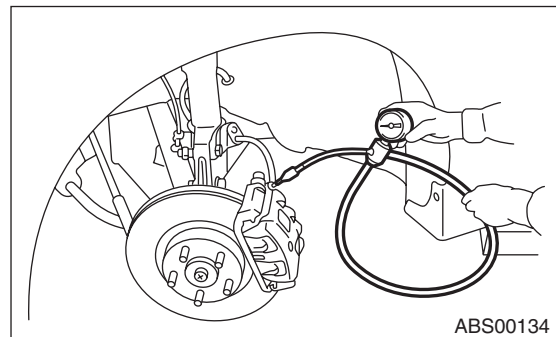
- 1) Lift up the vehicle, and remove the wheels.
- 2) Remove the air bleeder screws from FL and FR caliper bodies.
- 3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:

- Use a pressure gauge used exclusively for brake fluid measurement.
- Do not use a pressure gauge used for the measuring transmission oil pressure, as the piston seal may expand and deform.

NOTE:

Wrap sealing tape around the pressure gauge.



- 4) Bleed air from the pressure gauge.
- 5) Perform VDC sequence control.
<Ref. to VDC-16, VDC Sequence Control.>
- 6) When the hydraulic unit begins to work, first the FL side performs compression, hold, and decompression, and then the FR side performs compression, hold, and decompression.

VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

VEHICLE DYNAMICS CONTROL (VDC)

7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets specification. Depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

	Front wheel	Rear wheel
When pressurized	3,000 kPa (31 kgf/cm ² , 441 psi) or more	3,000 kPa (31 kgf/cm ² , 441 psi) or more
When depressurized	500 kPa (5 kgf/cm ² , 73 psi) or less	500 kPa (5 kgf/cm ² , 73 psi) or less

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

9) Install the air bleeder screws of FL and FR caliper bodies.

10) Remove the air bleeder screws from RL and RR caliper bodies.

11) Connect two pressure gauges to RL and RR caliper bodies.

12) Bleed air from RL and RR caliper bodies, and pressure gauge.

13) Perform VDC sequence control.

<Ref. to VDC-16, VDC Sequence Control.>

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

15) Read the values indicated on the pressure gauges and check if it is within specification. Depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

16) Disconnect the pressure gauge from the RL and RR caliper bodies.

17) Install the air bleeder screws of RL and RR caliper bodies.

18) Bleed air from the brake line.

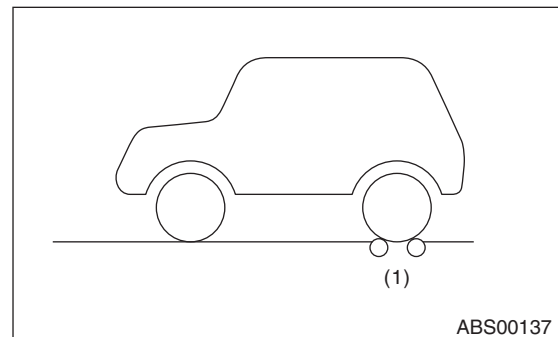
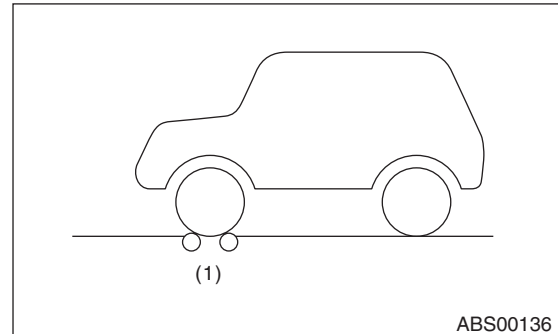
4. CHECK HYDRAULIC UNIT VDC OPERATION WITH BRAKE TESTER

1) Set wheels other than the one to measure on free rollers.

2) Prepare to operate the VDC sequence control.

<Ref. to VDC-16, VDC Sequence Control.>

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



(1) Brake tester

4) Operate the brake tester.

5) Perform VDC sequence control.

<Ref. to VDC-16, VDC Sequence Control.>

6) When the hydraulic unit begins to work, check the following work sequence.

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

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

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

	Front wheel	Rear wheel
When pressurized	2,000 N (204 kgf, 450 lbf) or more	2,000 N (204 kgf, 450 lbf) or more
When depressurized	500 N (51 kgf, 112 lbf) or less	500 N (51 kgf, 112 lbf) or less

8) After the inspection, depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

D: REPLACEMENT

CAUTION:

- Because the pressure sensor built into the H/U is easily damaged by static electricity, start the operation after performing static electricity measures.
- Be careful not to touch the sensors in the H/U to prevent damage.
- Because the seal of the VDCCM cannot be replaced, do not pull or peel it by lifting it up.
- Because the screw of the H/U will become slightly worn in every replacement procedure, 5 times is the maximum number of times for replacement. If a problem is found such as not being able to torque the screw to specifications even before 5 replacement operations are performed, replace the H/U body.
- When installing the VDCCM, always use new screws.
- When the sealing surface of the VDCCM or H/U is dirty or damaged and it cannot be cleaned or repaired, replace with a new part.

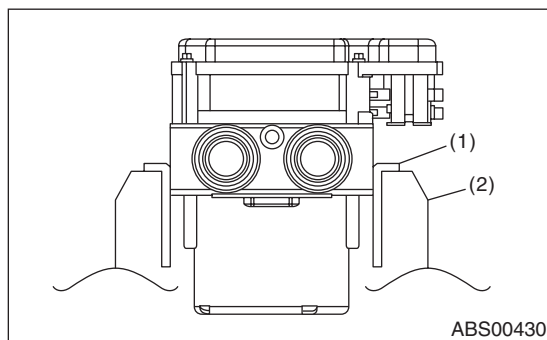
1) Remove the VDCCM&H/U. <Ref. to VDC-7, REMOVAL, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

2) To prevent entry of foreign objects and brake fluid leakage, plug the oil pressure port of the VDCCM&H/U using a screw plug, etc.

3) Set the pump motor section of the removed VDCCM&H/U face down on a vise.

NOTE:

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

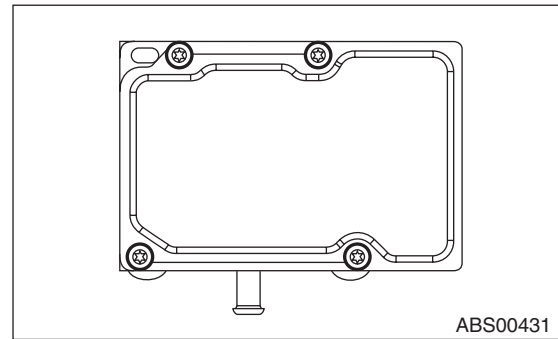


- (1) Aluminum plate, etc.
(2) Vise

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

NOTE:

These screws cannot be reused.



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

NOTE:

To prevent damaging of coil section, remove the VDCCM straight up from H/U without twisting.

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

CAUTION:

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

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

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

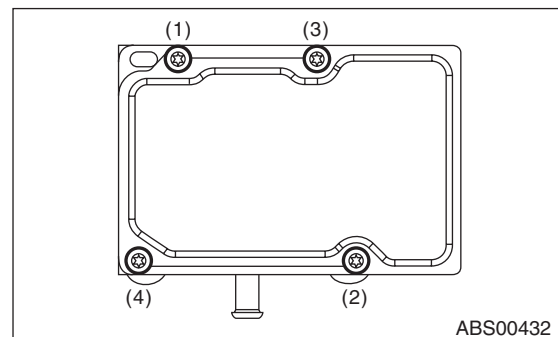
9) Using a TORX® bit E5, attach/tighten new screws in the order of (1) through (4).

CAUTION:

Always use new screws.

Tightening torque:

1.5 N·m (0.15 kgf·m, 1.1 ft·lb)



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

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

VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

VEHICLE DYNAMICS CONTROL (VDC)

Tightening torque:

3 N·m (0.3 kgf-m, 2.2 ft-lb)

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

13) Install the VDCCM&H/U to the vehicle.

14) Bleed air from the brake system.

15) Perform the selection•registration operation of parameter. <Ref. to VDC(diag)-18, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

NOTE:

- After replacing the VDCCM, be sure to perform the selection•registration operation of parameter.
- For the selection and registration of parameter, the Subaru Select Monitor is required.
- When the registration has not been performed, the DTC code “Parameter selection error” is detected together with the ABS/EBD/VDC warning light illumination.

16) Check the parameter to confirm that the applied models and grades of the relevant vehicle are included. <Ref. to VDC(diag)-19, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>

17) If the applied models and grades of the relevant vehicle are not included, perform the selection•registration operation of parameter with the {Confirm Parameter} screen again. <Ref. to VDC(diag)-18, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

18) Execute Clear Memory after parameter selection and registration operations because the DTC for “Parameter selection error” is memorized.

E: ADJUSTMENT

When the following replacement, removal and installation are performed, be sure to perform the centering of the steering angle sensor and zero point setting of yaw rate & G sensor.

- VDCCM&H/U
- Steering angle sensor
- Yaw rate & G sensor
- Steering wheel parts (Including airbag)
- Suspension parts
- Wheel alignment adjustment

1) Park the vehicle straight on a level surface. (Engine operation in the “P” or “N” range)

2) Check that steering wheel is positioned at the center. (When the center position is not correct, adjust the wheel alignment.)

3) Set the Subaru Select Monitor to the vehicle, and select the {Set mode Str.A.Sen.N&Lat.GSen.Op;} in the «Function Check Sequence» screen. (Follow the steps on the display.)

4) On «Brake Control System» display, select {Current Data Display & Save}, and check that the steering angle sensor shows “0 deg”.

5) When the “0 deg” is not displayed, repeat the above steps and check that the “0 deg” is displayed.

6) Drive the vehicle for 10 minutes, and check that the ABS and VDC warning light is not illuminated.

7) Check that there is no unnecessary VDC operation or steering control loss. If there is a malfunction, repeat the steps above.

3. ABS Sequence Control

A: OPERATION

1) While the ABS sequence control is being performed, the operation of the hydraulic unit can be checked using the brake tester or pressure gauge after the hydraulic unit solenoid valve operation.

2) ABS sequence control can be started by the Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:

In the event of any trouble, the ABS sequence control will not operate.

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

2) Turn the ignition switch to ON.

3) Run the "PC application for Subaru Select Monitor".

4) Set the Subaru Select Monitor to "Brake Control" mode.

5) When the "Function Check Sequence" is selected, the "ABS sequence control" will start.

6) Execute the following operations when the message "Press the brake pedal so that the brake pedal force is between 100 and 150 kgf" is displayed.

(1) When using a brake tester, press the brake pedal pad with a force of 1,000 N (102 kgf, 225 lbf).

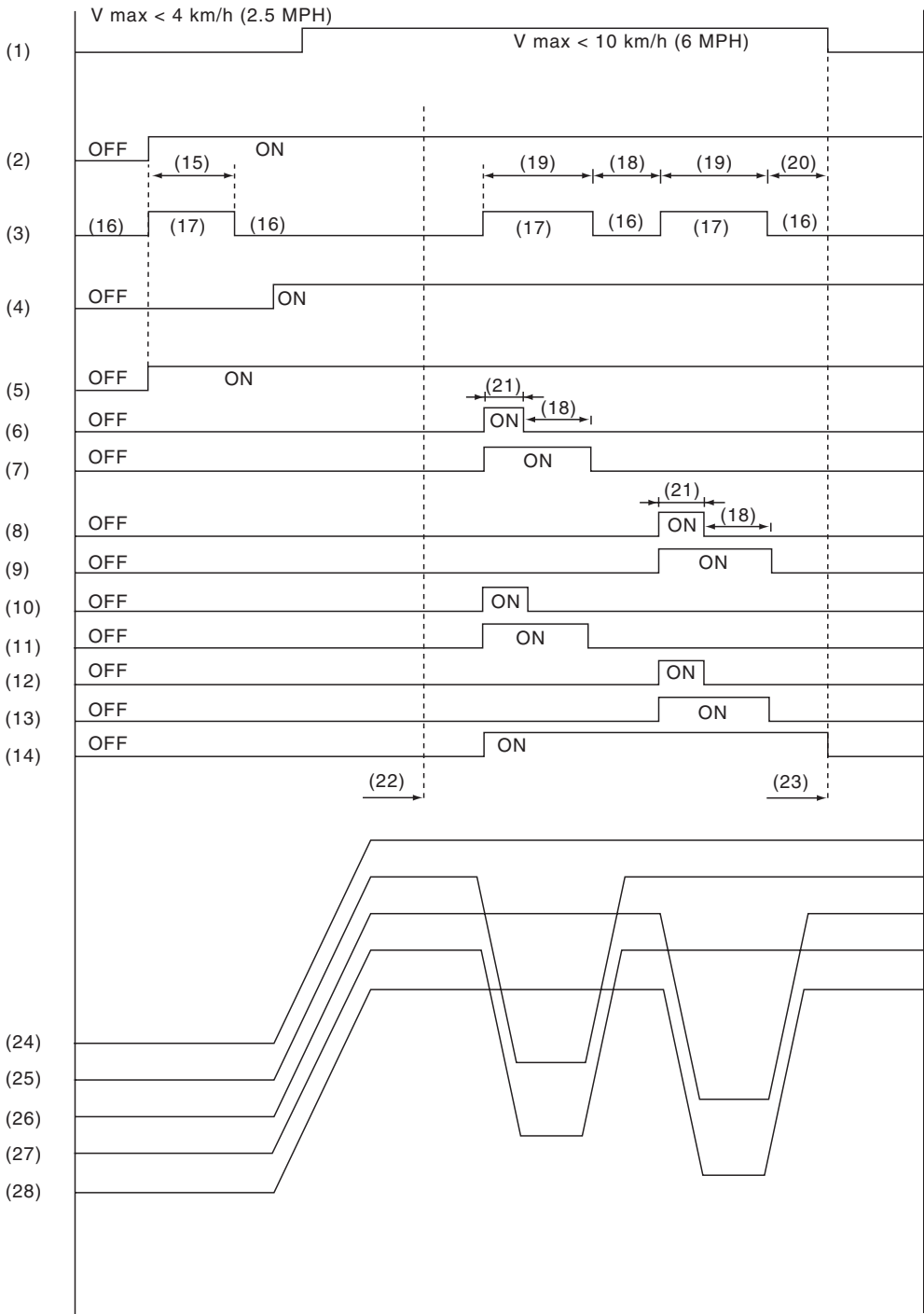
(2) When using a pressure gauge, press the brake pedal so that the pressure gauge indicates 3,500 kPa (36 kgf/cm², 511 psi).

7) The brake system being operated is displayed on the Subaru Select Monitor.

ABS Sequence Control

VEHICLE DYNAMICS CONTROL (VDC)

2. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00943

ABS Sequence Control

VEHICLE DYNAMICS CONTROL (VDC)

(1) All wheel speed	(11) RR compression valve	(20) 0.6 seconds
(2) Ignition key	(12) RL decompression valve	(21) 0.4 seconds
(3) ABS warning light	(13) RL compression valve	(22) Point A
(4) Stop light switch	(14) Pump motor	(23) Reset
(5) Valve relay	(15) 1.5 seconds	(24) Master cylinder pressure
(6) FL decompression valve	(16) Light OFF	(25) FL wheel cylinder pressure
(7) FL compression valve	(17) Light ON	(26) FR wheel cylinder pressure
(8) FR decompression valve	(18) 1.0 seconds	(27) RR wheel cylinder pressure
(9) FR compression valve	(19) 1.4 seconds	(28) RL wheel cylinder pressure
(10) RR decompression valve		

NOTE:

The control operation starts at point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

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

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

4. VDC Sequence Control

A: OPERATION

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

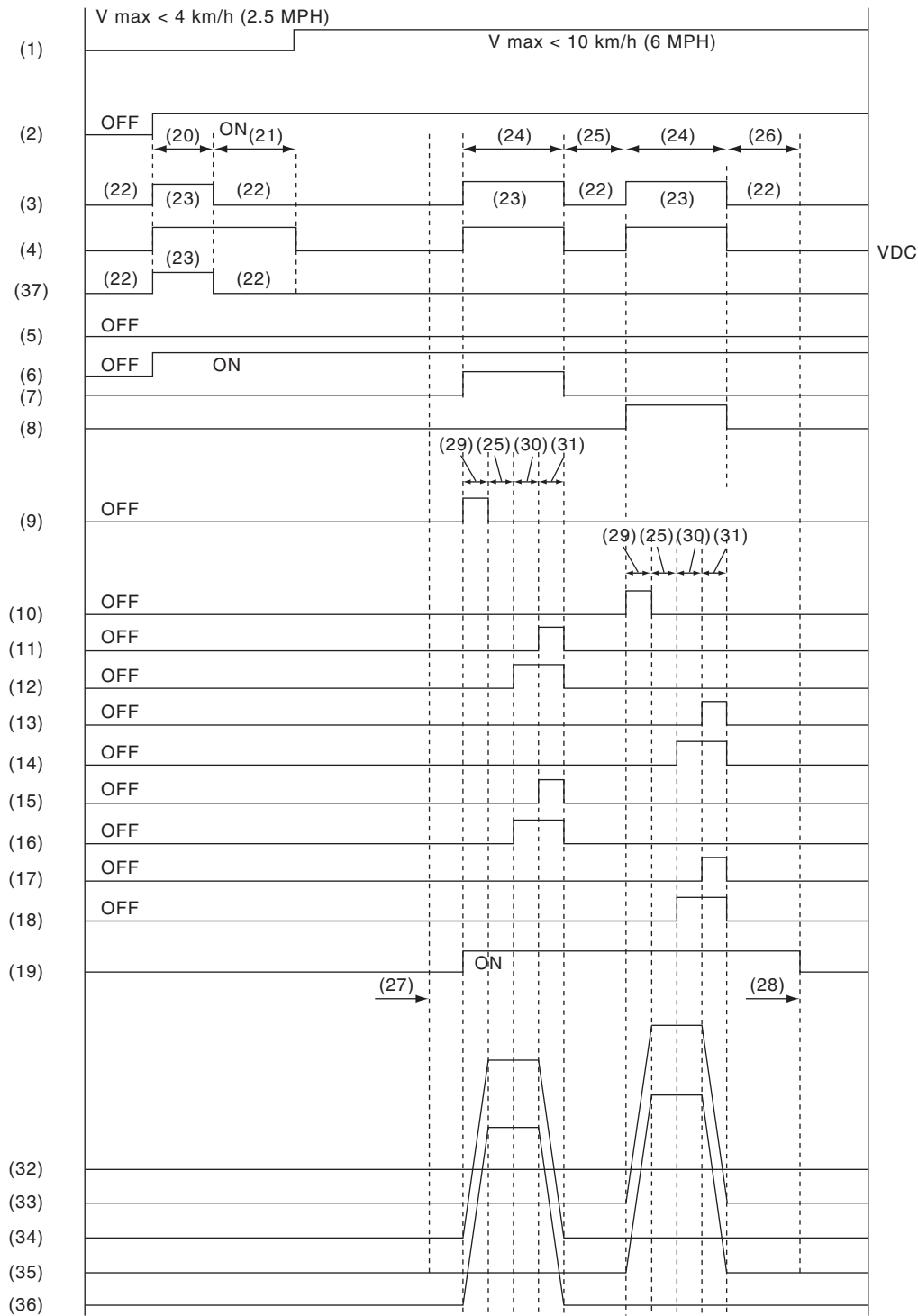
1. VDC SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:

In the event of any trouble, sequence control will not operate.

- 1) Connect the Subaru Select Monitor to data link connector under the driver's side instrument panel lower cover.
- 2) Turn the ignition switch to ON.
- 3) Run the "PC application for Subaru Select Monitor".
- 4) Set the Subaru Select Monitor to "Brake Control" mode.
- 5) When the "VDC Inspection Mode" is selected from the "Function Check Sequence" menu, the "VDC sequence control" will start.
- 6) Operation points will be displayed on Subaru Select Monitor.

2. CONDITIONS FOR VDC SEQUENCE CONTROL



VDC00607

VDC Sequence Control

VEHICLE DYNAMICS CONTROL (VDC)

(1) All wheel speed	(14) FR compression valve	(26) 1.6 seconds
(2) Ignition key	(15) RR decompression valve	(27) Point A
(3) ABS warning light	(16) RR compression valve	(28) Reset
(4) VDC warning light	(17) RL decompression valve	(29) 0.8 seconds
(5) Stop light switch	(18) RL compression valve	(30) 1.2 seconds
(6) Valve relay	(19) Pump motor	(31) 0.4 seconds
(7) VDC switching valve 1 FL	(20) 1.5 seconds	(32) Master cylinder pressure
(8) VDC switching valve 1 FR	(21) Approx. 3 seconds	(33) FR wheel cylinder pressure
(9) VDC switching valve 2 FL	(22) Light OFF	(34) FL wheel cylinder pressure
(10) VDC switching valve 2 FR	(23) Light ON	(35) RL wheel cylinder pressure
(11) FL decompression valve	(24) 3.4 seconds	(36) RR wheel cylinder pressure
(12) FL compression valve	(25) 1 seconds	(37) Hill start assist warning light
(13) FR decompression valve		

NOTE:

The control operation starts at point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

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

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

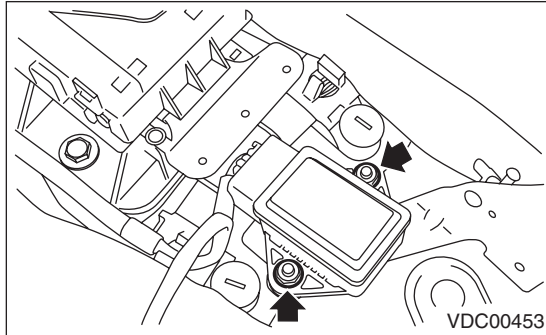
5. Yaw Rate and G Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the console box.
<Ref. to EI-48, Console Box.>
- 3) Disconnect the connector from yaw rate & G sensor.
- 4) Remove the yaw rate & G sensor.

CAUTION:

Do not drop or hit the yaw rate & G sensor.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

CAUTION:

After completion of installation, set the following two positions.

- Positioning to the center of steering angle sensor

- Positioning the yaw rate & G sensors to zero

The above procedure is required VDCCM&H/U to identify the vehicle position afterward. For the setting procedures of the 2 steps above, refer to “VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)”. <Ref. to VDC-12, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

Yaw Rate and G Sensor

VEHICLE DYNAMICS CONTROL (VDC)

C: INSPECTION

1. YAW RATE & G SENSOR SIGNAL

Step	Check	Yes	No
1 CHECK YAW RATE & G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor connector to the data link connector. 3) Turn the ignition switch to ON. 4) Set the Subaru Select Monitor connector to the {Brake Control System} mode. 5) Select {Current Data Display & Save}. 6) Read the output of yaw rate & G sensor.	Are the indicated values when the vehicle is placed horizontally, Lateral G sensor: $-1.5 \sim 1.5 \text{ m/s}^2$, Yaw rate sensor: $-4 \sim 4 \text{ deg/s}$?	Go to step 2.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.
2 CHECK VEHICLE.	Is the vehicle AT model?	Go to step 5.	Go to step 3.
3 CHECK G SENSOR. 1) Remove the console box. 2) Remove the yaw rate & G sensor from vehicle without disconnecting the connector. 3) Read the display of Subaru Select Monitor. NOTE: When the yaw rate & G sensor is moved with its power supply on, DTC of yaw rate & G sensor may be recorded.	Is the value $6.8 \sim 12.8 \text{ m/s}^2$ when the yaw rate & G sensor is inclined 90° to the forward?	Go to step 4.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.
4 CHECK G SENSOR. Read the display of Subaru Select Monitor. NOTE: When the yaw rate & G sensor is moved with its power supply on, DTC of yaw rate & G sensor may be recorded.	Is the value $-6.8 \sim -12.8 \text{ m/s}^2$ when the yaw rate & G sensor is inclined 90° to the rearward?	Go to step 5.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.
5 CHECK G SENSOR. 1) Remove the console box. (AT model only) 2) Remove the yaw rate & G sensor from vehicle without disconnecting the connector. (AT model only) 3) Read the display of Subaru Select Monitor. NOTE: When the yaw rate & G sensor is moved with its power supply on, DTC of yaw rate & G sensor may be recorded.	Is the value $6.8 \sim 12.8 \text{ m/s}^2$ when the yaw rate & G sensor is inclined 90° to the right?	Go to step 6.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.
6 CHECK G SENSOR. Read the display of Subaru Select Monitor. NOTE: When the yaw rate & G sensor is moved with its power supply on, DTC of yaw rate & G sensor may be recorded.	Is the value $-6.8 \sim -12.8 \text{ m/s}^2$ when the yaw rate & G sensor is inclined 90° to the left?	Yaw rate & G sensors are normal.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.

6. Steering Angle Sensor

A: REPLACEMENT

CAUTION:

- Do not perform the removal except unless replacing.
- If the sensor needs replacement, replace along with the combination switch assembly once every three times for the protection of the threaded portion.

1) Set the steering wheel in a straight-ahead position.

2) Disconnect the ground cable from battery.

3) Remove the airbag module.

<Ref. to AB-15, REMOVAL, Driver's Airbag Module.>

WARNING:

Always refer to "Airbag System" when performing the airbag module repair service.

<Ref. to AB-5, CAUTION, General Description.>

4) Remove the steering wheel.

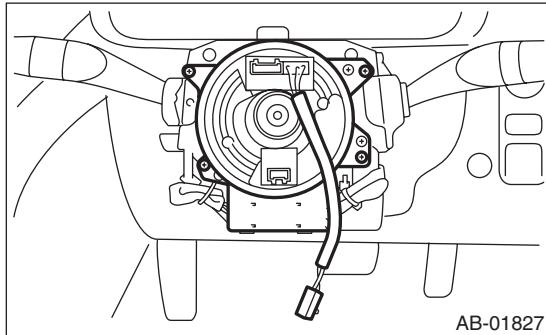
<Ref. to PS-12, REMOVAL, Steering Wheel.>

5) Remove the screws and remove the steering column lower cover.

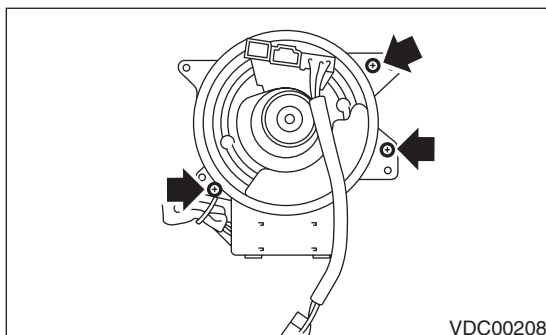
6) Remove the two screws securing the steering column upper cover.

7) Disconnect the connector of roll connector and steering angle sensor.

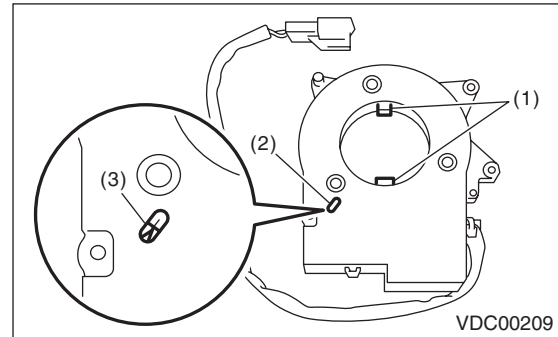
8) Remove the screws which secure the roll connector to steering column.



9) Remove the vinyl tape binding the harness, and remove the steering angle sensor from roll connector.



10) Turn the protrusion portion of new steering angle sensor to match the alignment mark of inspection hole.



(1) Protrusion portion

(2) Inspection hole

(3) Alignment mark

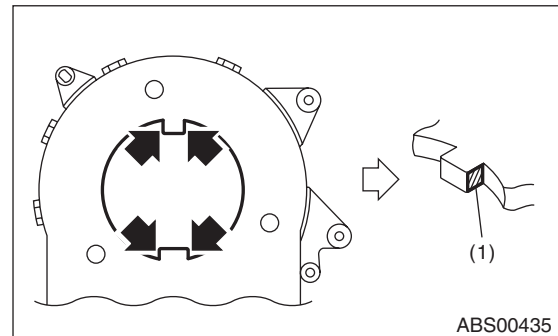
CAUTION:

Be careful not to allow foreign matter to enter into inspection hole.

11) Align the center of roll connector.

<Ref. to AB-26, INSTALLATION, Roll Connector.>

12) Apply the grease provided with the new part on the 4 locations of the protrusion on the steering angle sensor.

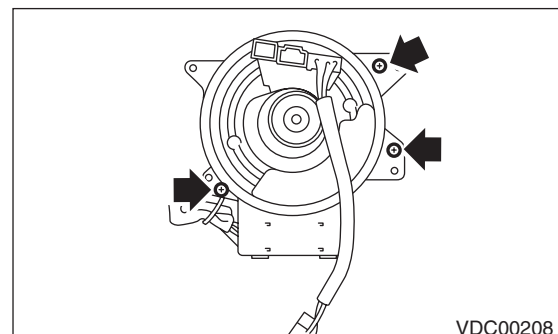


(1) Grease application location

13) Align the position of the protrusion and install roll connector to steering angle sensor.

Tightening torque:

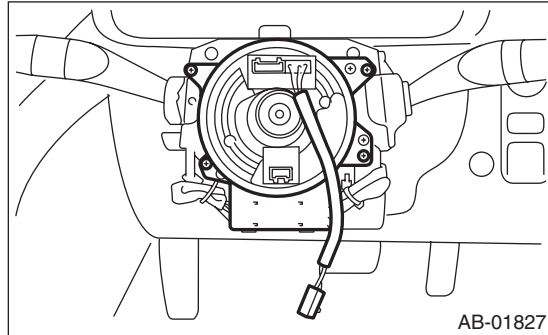
0.5 N·m (0.05 kgf-m, 0.36 ft-lb)



Steering Angle Sensor

VEHICLE DYNAMICS CONTROL (VDC)

14) Install the roll connector to combination switch and bind the harness with vinyl tape as originally bound.



15) Install the steering wheel.
<Ref. to PS-12, INSTALLATION, Steering Wheel.>

Tightening torque:

39 N·m (4.0 kgf-m, 28.8 ft-lb)

16) Install the airbag module to the steering wheel.
<Ref. to AB-15, INSTALLATION, Driver's Airbag Module.>

WARNING:

Always refer to “Airbag System” before performing the service operation.

<Ref. to AB-5, CAUTION, General Description.>

17) Connect the ground cable to battery.

CAUTION:

After completion of installation, adjust the following two positions.

- Positioning to the center of steering angle sensor

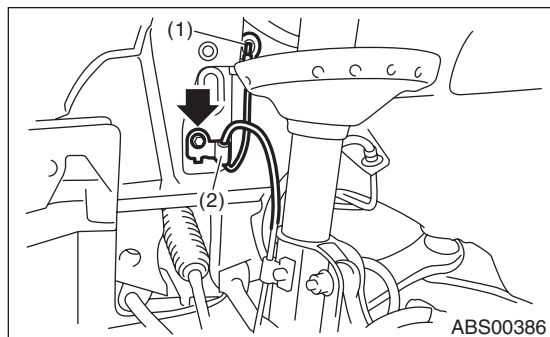
- Positioning the yaw rate & G sensors to zero

The above procedure is required for the VDC-CM to identify vehicle position afterward. For the setting procedures of the 2 steps above, refer to “VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)”. <Ref. to VDC-12, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

7. Front ABS Wheel Speed Sensor

A: REMOVAL

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

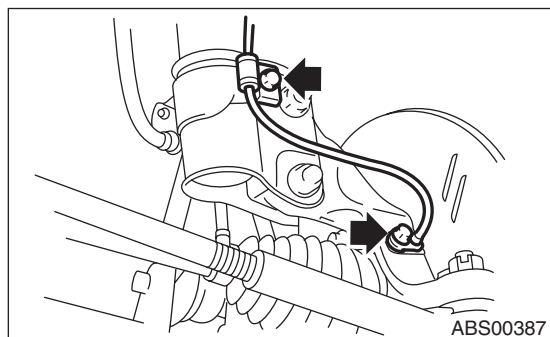


- (1) To the front ABS wheel speed sensor connector
- (2) Sensor harness bracket

- 4) Remove the bolts which secure the sensor harness to the front strut.
- 5) Remove the front ABS wheel speed sensor from housing.

CAUTION:

- Be careful not to damage the sensor.
- Do not apply excessive force to the sensor harness.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Sensor:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

Bracket:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

CAUTION:

Be careful not to damage the sensor.

NOTE:

- Check the identification (mark) on the harness to make sure there is no warpage. (RH: K1 (White), LH: K2 (Yellow))
- Check if the harness is not pulled and does not come in contact with the suspension or body during steering wheel effort.

C: INSPECTION

1. CHECK WITH SUBARU SELECT MONITOR

- 1) Connect the Subaru Select Monitor to data link connector.
- 2) Select {Current Data Display & Save}. Check if the speed indicated on the display changes in the same manner as the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position.
- 3) If the speed indicated on the display does not change, check the ABS wheel speed sensor. <Ref. to VDC-23, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>

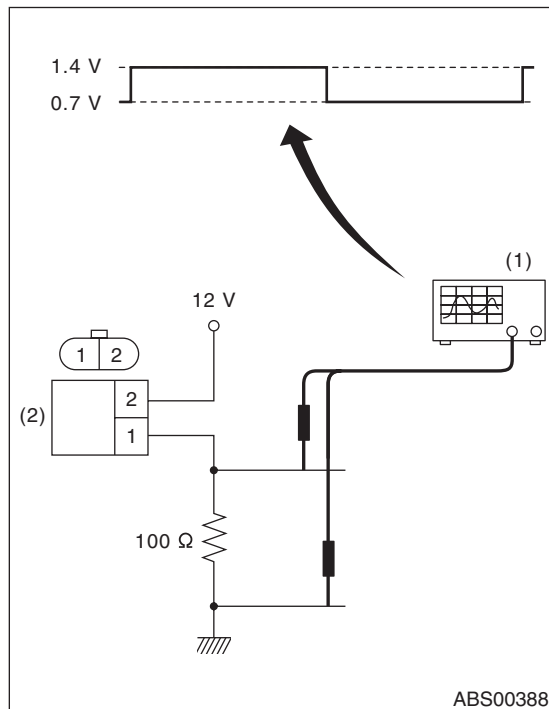
2. ABS WHEEL SPEED SENSOR

- 1) Check the tip of the ABS wheel speed sensor for foreign particles or damage. If necessary, clean the tip or replace the ABS wheel speed sensor.
- 2) Connect a 12 V power supply to No. 2 terminal of sensor connector as shown in the figure, then attach resistance to the No. 1 terminal. Rotate the wheel at about 2.75 km/h (2 MPH), and measure the voltage using an oscilloscope.

Front ABS Wheel Speed Sensor

VEHICLE DYNAMICS CONTROL (VDC)

Standard value of output voltage:
0.7 — 1.4 V



- (1) Oscilloscope
- (2) ABS wheel speed sensor

NOTE:

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

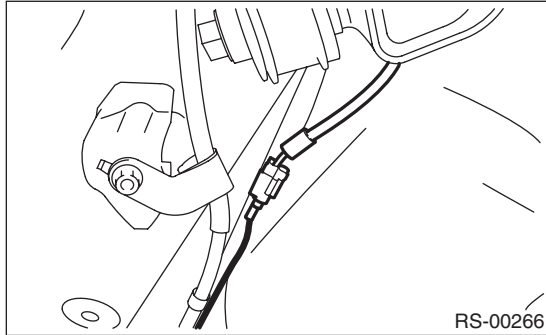
Rear ABS Wheel Speed Sensor

VEHICLE DYNAMICS CONTROL (VDC)

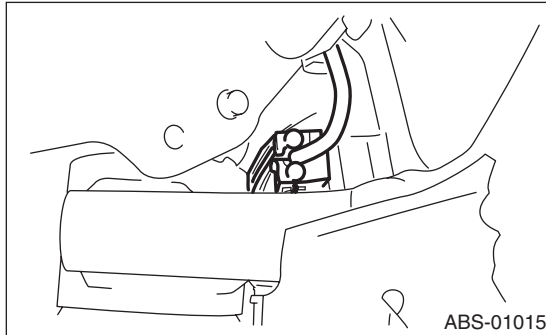
8. Rear ABS Wheel Speed Sensor

A: REMOVAL

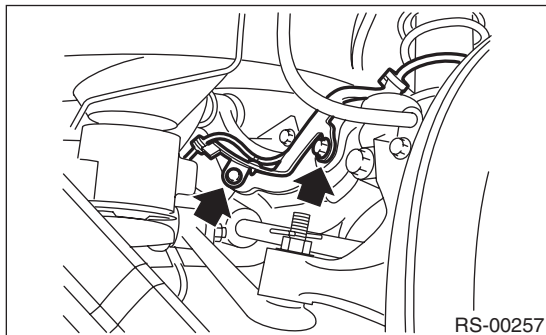
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from the rear ABS wheel speed sensor.



- 3) Remove the sensor harness clamp of the rear sub frame.



- 4) Remove the sensor harness bracket from the upper arm.

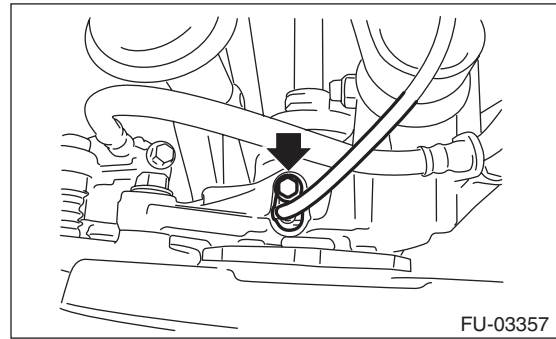


- 5) Remove the rear ABS wheel speed sensor from the rear axle.

CAUTION:

- Be careful not to damage the sensor.

- Do not apply excessive force to the sensor harness.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Be careful not to damage the sensor.

Tightening torque:

Sensor:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

Bracket:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:

Check the identification (mark) on the harness to make sure there is no warpage. (RH: P5 (White), LH: P6 (Yellow))

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

<Ref. to VDC-23, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>

9. Front Magnetic Encoder

A: REMOVAL

Refer to “Front Hub Bearing” for removal, because the front magnetic encoder is integrated with front hub bearing.

<Ref. to DS-17, REMOVAL, Front Hub Unit Bearing.>

B: INSTALLATION

Refer to “Front Hub Bearing” for installation, because the front magnetic encoder is integrated with front hub bearing.

<Ref. to DS-17, INSTALLATION, Front Hub Unit Bearing.>

C: INSPECTION

Visually check the magnetic encoder for any damage. If necessary, replace with a new hub unit bearing.

NOTE:

Because the magnetic encoder is integrated with hub unit bearing assembly, replace the hub unit bearing with a new part if there is any defect found on the magnetic encoder.

10.Rear Magnetic Encoder

A: REMOVAL

Refer to “Rear Hub Unit Bearing” for removal, because the rear magnetic encoder is integrated with rear hub unit bearing.

<Ref. to DS-23, REMOVAL, Rear Hub Unit Bearing.>

B: INSTALLATION

Refer to “Rear Hub Unit Bearing” for installation, because the rear magnetic encoder is integrated with rear hub unit bearing.

<Ref. to DS-24, INSTALLATION, Rear Hub Unit Bearing.>

C: INSPECTION

Visually check the magnetic encoder parts for any damage. If necessary, replace with a new hub unit bearing.

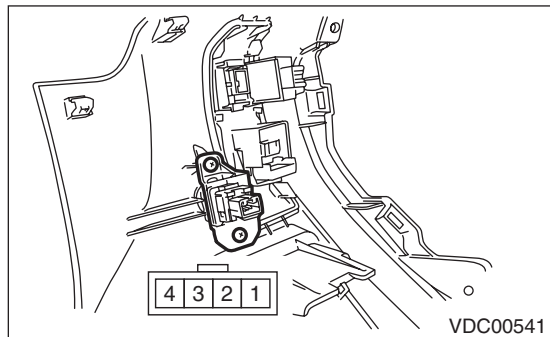
NOTE:

Because the magnetic encoder is integrated with hub unit bearing assembly, replace the hub unit bearing with a new part if there is any defect found on the magnetic encoder.

11.VDC OFF Switch

A: REMOVAL

- 1) Remove the instrument panel lower cover.
- 2) Remove the screws, and then remove the VDC OFF switch.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the resistance between the VDC OFF switch terminals.

Switch position	Terminal No.	Standard
OFF	2 — 3	1 M Ω or more
ON	2 — 3	Less than 1 Ω

If it is not within the standard, replace the VDC OFF switch.

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

VDC(diag)

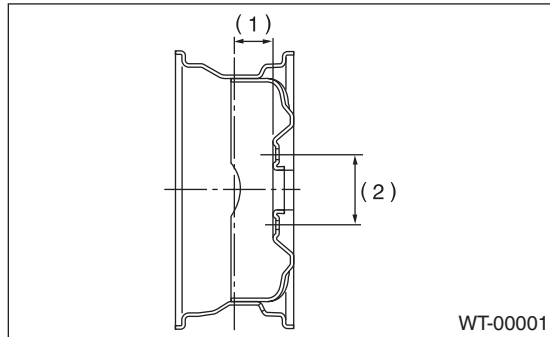
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1. Basic Diagnostic Procedure	2
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General Description

WHEEL AND TIRE SYSTEM

1. General Description

A: SPECIFICATION



(1) Offset

(2) P.C.D.

Tire size	Wheel size	Offset mm (in)	P.C.D. mm (in)	Tire inflation pressure kPa (kgf/cm ² , psi)	
				Front wheel	Rear wheel
P205/55R16 89V	16 × 6 ¹ / ₂ JJ	55 (2.17)	100 (3.94)	230 (2.3, 33)	220 (2.2, 32)
P205/50R17 88V	17 × 7JJ				
225/45 R17 91W	17 × 7JJ				

Spare tire size	Wheel size	Offset mm (in)	P.C.D. mm (in)	Tire inflation pressure kPa (kgf/cm ² , psi)	
				Front wheel	Rear wheel
T125/70 D17 98M	17 × 4T	30 (1.18)	100 (3.94)	—	420 (4.2, 60)
P205/55R16 89V P205/50R17 88V	16 × 6 ¹ / ₂ JJ 17 × 7JJ	55 (2.17)		230 (2.3, 33)	220 (2.2, 32)

NOTE:

The size and air pressure of standard and spare tires are shown on the “Tire inflation pressure” label on the body side behind the driver’s door.

1. SERVICE DATA

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

General Description

WHEEL AND TIRE SYSTEM

2. ADJUSTING PARTS

Wheel balancing	Standard	Service limit
Dynamic unbalance	5 g (0.18 oz) or less	

Balance weight part number (Knock-on type weight for steel wheels)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
28101SA160	30 g (1.06 oz)
28101SA170	35 g (1.23 oz)
28101SA180	40 g (1.41 oz)
28101SA190	45 g (1.59 oz)
28101SA200	50 g (1.76 oz)
28101SA210	55 g (1.94 oz)
28101SA220	60 g (2.12 oz)

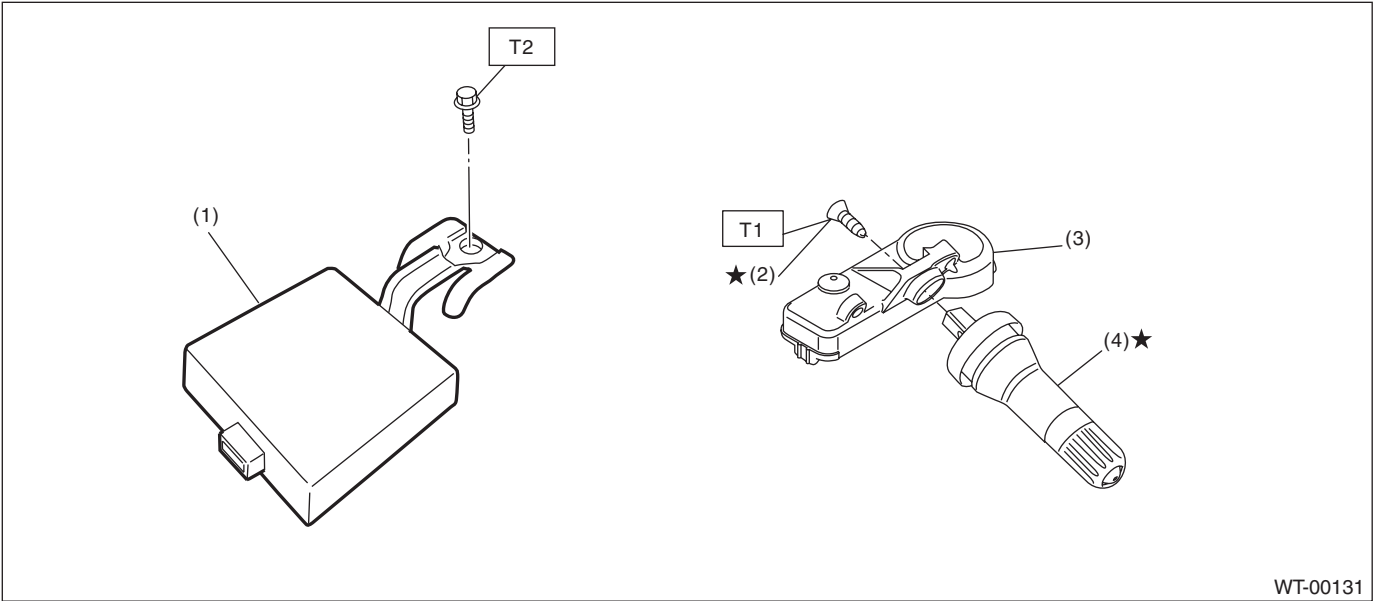
Balance weight part number (Knock-on type weight for aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
28101SA100	30 g (1.06 oz)
28101SA110	35 g (1.23 oz)
28101SA120	40 g (1.41 oz)
28101SA130	45 g (1.59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

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG002	5 g (0.18 oz)
28101AG012	7.5 g (0.26 oz)
28101AG022	10 g (0.35 oz)
28101AG032	12.5 g (0.44 oz)
28101AG042	15 g (0.53 oz)
28101AG052	17.5 g (0.62 oz)
28101AG062	20 g (0.71 oz)
28101AG072	22.5 g (0.79 oz)
28101AG082	25 g (0.88 oz)
28101AG092	27.5 g (0.97 oz)
28101AG102	30 g (1.06 oz)
28101AG112	32.5 g (1.15 oz)
28101AG122	35 g (1.23 oz)
28101AG132	37.5 g (1.32 oz)
28101AG142	40 g (1.41 oz)
28101AG152	42.5 g (1.50 oz)
28101AG162	45 g (1.59 oz)
28101AG172	47.5 g (1.68 oz)
28101AG182	50 g (1.76 oz)
28101AG192	52.5 g (1.85 oz)
28101AG202	55 g (1.94 oz)
28101AG212	57.5 g (2.03 oz)
28101AG222	60 g (2.12 oz)
28101AG232	62.5 g (2.20 oz)
28101AG242	65 g (2.29 oz)
28101AG252	67.5 g (2.38 oz)
28101AG262	70 g (2.47 oz)
28101AG272	72.5 g (2.56 oz)
28101AG282	75 g (2.65 oz)
28101AG292	77.5 g (2.73 oz)
28101AG302	80 g (2.82 oz)
28101AG312	82.5 g (2.91 oz)
28101AG322	85 g (3.00 oz)
28101AG332	87.5 g (3.09 oz)
28101AG342	90 g (3.17 oz)
28101AG352	92.5 g (3.26 oz)
28101AG362	95 g (3.35 oz)
28101AG372	97.5 g (3.44 oz)
28101AG382	100 g (3.53 oz)
28101SA300	102.5 g (3.62 oz)
28101SA310	105 g (3.70 oz)
28101SA320	107.5 g (3.79 oz)
28101SA330	110 g (3.88 oz)
28101SA340	112.5 g (3.97 oz)
28101SA350	115 g (4.06 oz)
28101SA360	117.5 g (4.14 oz)
28101SA370	120 g (4.23 oz)

General Description

WHEEL AND TIRE SYSTEM

B: COMPONENT



- (1)

Tire pressure monitoring control module
- (2)

Screw
- (3)

Transmitter (Snap in type)
- (4)

Valve

Tightening torque: N·m (kgf-m, ft-lb)

T1: 1.4 (0.14, 1)

T2: 7.5 (0.76, 5.5)

C: PREPARATION TOOL

1. GENERAL TOOL

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

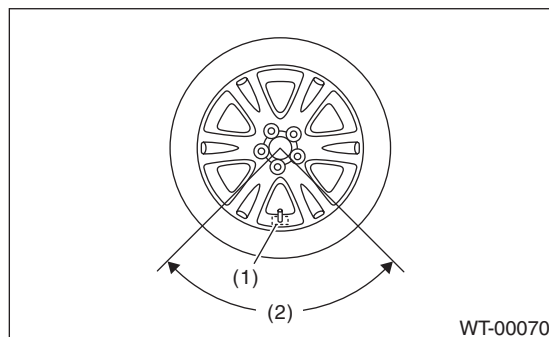
2. Tire

A: INSPECTION

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

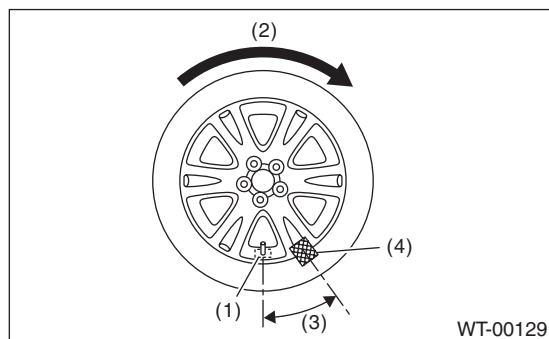
CAUTION:

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



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

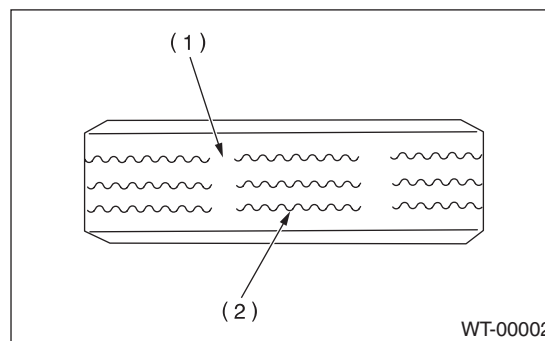
- To prevent damaging the transmitter, set the tire changer boom in the position as shown in the figure.



- (1) Transmitter
- (2) Direction of turn table rotation
- (3) 30°
- (4) Tire changer boom

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

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



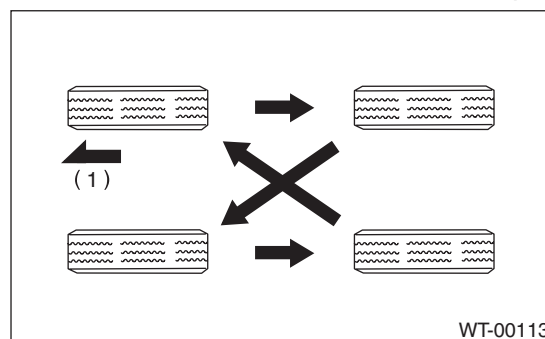
- (1) Tread wear indicator
- (2) Tire tread

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

1. TIRE ROTATION

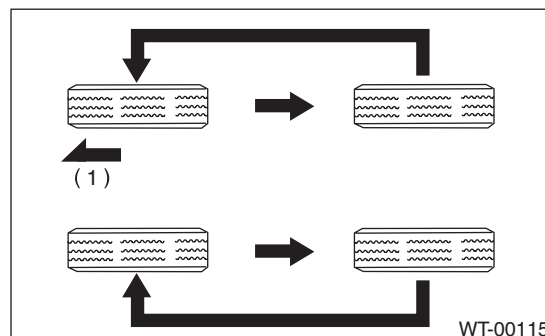
Rotate tires periodically (12,500 km/7,500 miles) as shown in the figure, in order to prevent them from uneven wear and to prolong their life.

- When the direction of tire rotation is not specified



- (1) Front

- When the direction of tire rotation is specified



- (1) Front

NOTE:

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

3. Aluminum Wheel

A: REMOVAL

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

NOTE:

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

B: INSTALLATION

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

Wheel nut tightening torque:

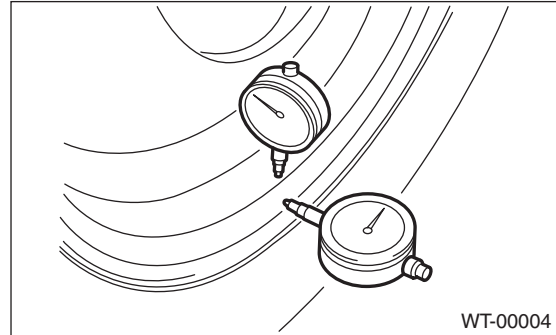
100 N·m (10.2 kgf-m, 73.8 ft-lb)

CAUTION:

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

C: INSPECTION

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



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

- 4) If the rim runout exceeds specifications, replace the wheel.

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, be careful of the following:

- 1) Be careful not to damage the aluminum wheels during removal, installation, wheel balancing, etc. After removing aluminum wheels, place them on a rubber mat etc.
- 2) When washing the aluminum wheel, use neutral synthetic detergent and water. Avoid using cleansers containing abrasives, hard brushes or an automatic car washer.

4. Steel Wheel

A: REMOVAL

Refer to “Aluminum Wheel” for removal procedure of steel wheels. <Ref. to WT-6, REMOVAL, Aluminum Wheel.>

B: INSTALLATION

Refer to “Aluminum Wheel” for installation procedure of steel wheels. <Ref. to WT-6, INSTALLATION, Aluminum Wheel.>

C: INSPECTION

Refer to “Aluminum Wheel” for inspection procedure of steel wheels. <Ref. to WT-6, INSPECTION, Aluminum Wheel.>

Rim runout

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

Wheel Balancing

WHEEL AND TIRE SYSTEM

5. Wheel Balancing

A: ADJUSTMENT

NOTE:

Change the setting of wheel balancer to adhesive type weight if adhesive type weight is adopted.

1) Remove the balance weights.

CAUTION:

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

2) Using the wheel balancer, measure wheel balance.

3) Select a weight close to the value measured by wheel balancer.

CAUTION:

Use SUBARU genuine balance weights.

Balance weight part number (Knock-on type weight for steel wheels)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
28101SA160	30 g (1.06 oz)
28101SA170	35 g (1.23 oz)
28101SA180	40 g (1.41 oz)
28101SA190	45 g (1.59 oz)
28101SA200	50 g (1.76 oz)
28101SA210	55 g (1.94 oz)
28101SA220	60 g (2.12 oz)

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

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG002	5 g (0.18 oz)
28101AG012	7.5 g (0.26 oz)
28101AG022	10 g (0.35 oz)
28101AG032	12.5 g (0.44 oz)
28101AG042	15 g (0.53 oz)
28101AG052	17.5 g (0.62 oz)
28101AG062	20 g (0.71 oz)
28101AG072	22.5 g (0.79 oz)
28101AG082	25 g (0.88 oz)
28101AG092	27.5 g (0.97 oz)
28101AG102	30 g (1.06 oz)
28101AG112	32.5 g (1.15 oz)
28101AG122	35 g (1.23 oz)
28101AG132	37.5 g (1.32 oz)
28101AG142	40 g (1.41 oz)
28101AG152	42.5 g (1.50 oz)
28101AG162	45 g (1.59 oz)
28101AG172	47.5 g (1.68 oz)
28101AG182	50 g (1.76 oz)
28101AG192	52.5 g (1.85 oz)
28101AG202	55 g (1.94 oz)
28101AG212	57.5 g (2.03 oz)
28101AG222	60 g (2.12 oz)
28101AG232	62.5 g (2.20 oz)
28101AG242	65 g (2.29 oz)
28101AG252	67.5 g (2.38 oz)
28101AG262	70 g (2.47 oz)
28101AG272	72.5 g (2.56 oz)
28101AG282	75 g (2.65 oz)
28101AG292	77.5 g (2.73 oz)
28101AG302	80 g (2.82 oz)
28101AG312	82.5 g (2.91 oz)
28101AG322	85 g (3.00 oz)
28101AG332	87.5 g (3.09 oz)
28101AG342	90 g (3.17 oz)
28101AG352	92.5 g (3.26 oz)
28101AG362	95 g (3.35 oz)
28101AG372	97.5 g (3.44 oz)
28101AG382	100 g (3.53 oz)
28101SA300	102.5 g (3.62 oz)
28101SA310	105 g (3.70 oz)
28101SA320	107.5 g (3.79 oz)
28101SA330	110 g (3.88 oz)
28101SA340	112.5 g (3.97 oz)
28101SA350	115 g (4.06 oz)
28101SA360	117.5 g (4.14 oz)
28101SA370	120 g (4.23 oz)

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

CAUTION:

- Degrease the wheel surface where the adhesive type weight will be applied.
- Press the adhesive type weight by 25 N (2.5 kgf, 5.6 lbf) or more per 5 g (0.18 oz) for 2 seconds or more and attain full adhesion.
- Total application of the adhesive type weight should be 120 g (4.23 oz) or less.

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

B: INSPECTION

1) When a tire is replaced or worn, proper wheel balance may be lost. Check the tire dynamic balance and repair if necessary.

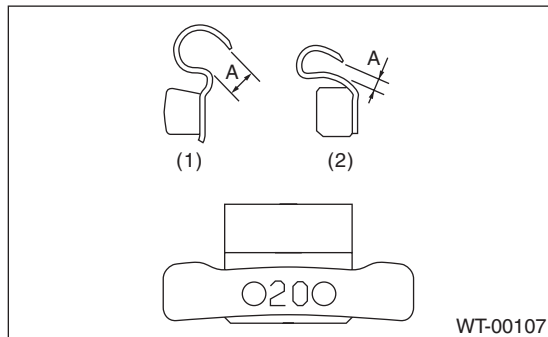
2) When checking the dynamic balance, use the wheel balancer. Insert the balance weights into the top and the rear side of rim.

3) With some types of balancer, wheels may be damaged. When adjusting the wheel balance, use a proper balancer.

4) Use Subaru genuine balance weights.

NOTE:

- Balance weights are not available in 55 g (1.94 oz) size for aluminum wheels.
- Balance weights can be used for any 15 to 18-inch wheels.



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

Service limit A:

Knock-on type weight for steel wheel:

2.0 mm (0.079 in)

Knock-on type weight for aluminum wheel:

5.0 mm (0.197 in)

6. “T-type” Tire

A: NOTE

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

CAUTION:

- Do not use tire chains for “T-type Tire”. Because tire size is small, tire chains can not be installed and will damage the vehicle and tires.
- Do not drive at a speed greater than 80 km/h (50 MPH).
- Drive the vehicle as slowly as possible and avoid bumps on the road.

B: REPLACEMENT

Refer to “Removal/Installation of Aluminum Wheel” for removal and installation procedures of the “T-type” tire. <Ref. to WT-6, Aluminum Wheel.>

CAUTION:

The “T-type” tire is only for temporary use. Replace with a conventional tire as soon as possible.

C: INSPECTION

- 1) Check the tire air pressure.

Specifications:

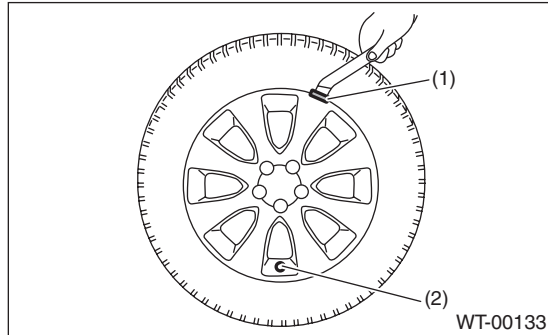
420 kPa (4.2 kgf/cm², 60 psi)

- 2) Take stones, glass, nails etc. out of the tread groove.
- 3) Check the tires for deformation, cracks, partial wear, or wear.

7. Full Wheel Cap

A: REMOVAL

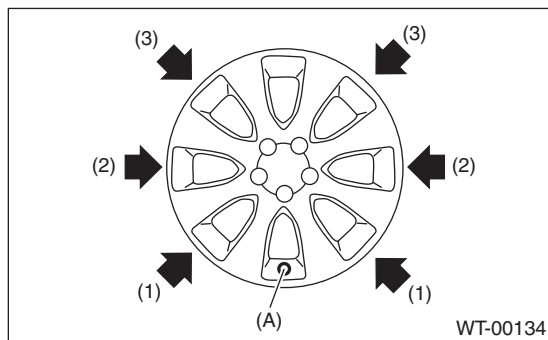
Insert a remover into the notch located diagonally to the valve hole, and remove the cap by prying the remover to the tire side.



- (1) Cutout portion
- (2) Valve hole

B: INSTALLATION

- 1) Align the valve with the valve hole in the hubcap.
- 2) Install the hubcap by tapping it in the order from (1) to (3) described in the figure.



- (A) Valve hole

C: INSPECTION

Check the hubcap for damage.

Tire Pressure Monitoring System

WHEEL AND TIRE SYSTEM

8. Tire Pressure Monitoring System

A: REMOVAL

1. TRANSMITTER (SNAP IN TYPE)

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

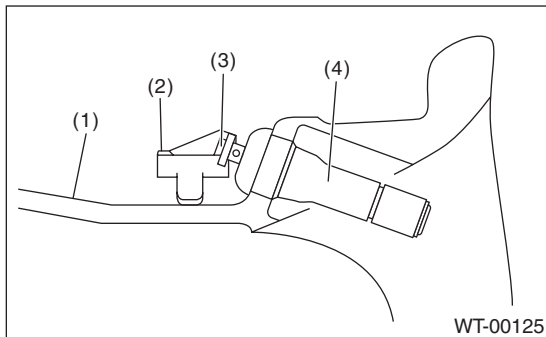
CAUTION:

Use a tire changer when removing the tire from the wheel.

- 3) Loosen the screw to remove the transmitter from the valve stem.

NOTE:

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

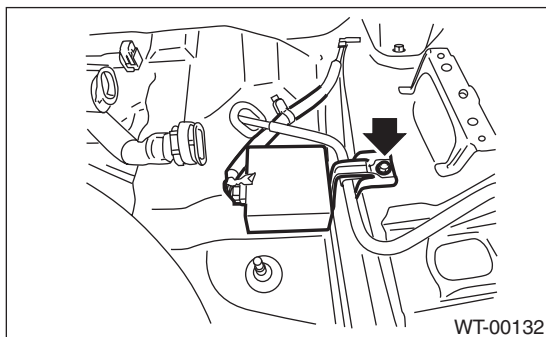


- (1) Wheel
- (2) Transmitter
- (3) Screw
- (4) Valve

- 4) Remove the valve from the wheel.

2. TIRE PRESSURE MONITORING CONTROL MODULE

- 1) Remove the canister. <Ref. to EC(H4SO)-5, REMOVAL, Canister.>
- 2) Remove the connector to remove tire pressure monitoring control module.



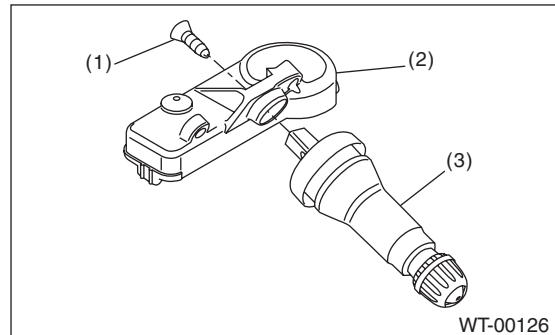
B: INSTALLATION

1. TRANSMITTER (SNAP IN TYPE)

CAUTION:

Use the new transmitter assembly or replace the new valve and screw, when installing.

- 1) Replace the valve and screw with a new part when reusing transmitter.



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

Tightening torque:

1.4 N·m (0.14 kgf-m, 1 ft-lb)

- 2) Install the transmitter to the wheel by aligning it with valve hole.

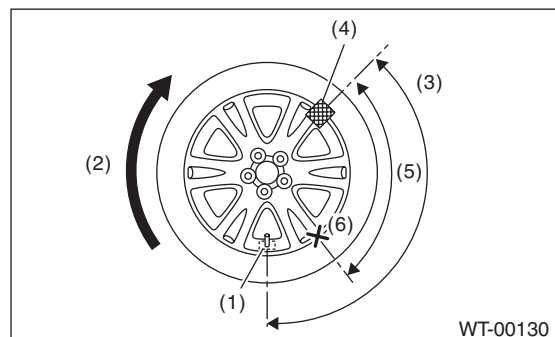
NOTE:

When using the jig that pulls the valve cap by hooking its neck part, use another short-type cap.

- 3) Install the tires to wheels.

CAUTION:

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



- (1) Transmitter
- (2) Direction of turn table rotation
- (3) 135°
- (4) Tire changer boom
- (5) 90°
- (6) Starting point for fitting the bead to the rim

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

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

2. TIRE PRESSURE MONITORING CONTROL MODULE

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: ADJUSTMENT

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

General Diagnostic Table

WHEEL AND TIRE SYSTEM

9. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Wheel is out of balance.	Improperly inflated tire.	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure and replace the tire.
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-23, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-14, INSPECTION, Rear Shock Absorber.>
	Front axle	Check the front axle. <Ref. to DS-16, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-25, INSPECTION, Rear Hub Unit Bearing.>
Vehicle is abnormally out of balance.	Improperly inflated tire.	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure and replace the tire.
	Front stabilizer	Inspect the front stabilizer. <Ref. to FS-15, INSPECTION, Front Stabilizer.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
Abnormal wheel vibration	Improperly inflated tire.	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure and replace the tire.
	Improper wheel balancing	Check the wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Front axle	Check the front axle. <Ref. to DS-16, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-25, INSPECTION, Rear Hub Unit Bearing.>
Abnormal tire wear	Improperly inflated tire.	Adjust the tire pressure.
	Improper wheel balancing	Check the wheel balance. <Ref. to WT-8, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

TPM(diag)

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